# AVISTA CORPORATION

# LAKE SPOKANE DISSOLVED OXYGEN WATER QUALITY ATTAINMENT PLAN FIVE YEAR REPORT

## WASHINGTON 401 CERTIFICATION
## FERC LICENSE APPENDIX B, SECTION 5.6

SPOKANE RIVER HYDROELECTRIC PROJECT
FERC PROJECT NO. 2545

Prepared By:

*March 24, 2017*

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# 1.0 INTRODUCTION

The Washington Department of Ecology (Ecology) has determined that the dissolved oxygen (DO) levels in certain portions of the Spokane River and Lake Spokane do not meet Washington's water quality standards. Consequently, those portions of the river and lake are listed as impaired water bodies under Section 303d of the Clean Water Act. To address this, Ecology developed the Spokane River and Lake Spokane Dissolved Oxygen Total Maximum Daily Load Water Quality Improvement Report (issued February 12, 2010).

Reduced DO levels are largely due to the discharge of nutrients into the Spokane River and Lake Spokane. Nutrients are discharged into the Spokane River and Lake Spokane by point sources, such as waste water treatment facilities and industrial facilities, and from non-point sources, such as tributaries, groundwater, and stormwater runoff, relating largely to land-use practices.

Avista Corporation (Avista) owns and operates the Spokane River Hydroelectric Project (Project), which consists of five dams on the Spokane River, including Long Lake Hydroelectric Development (HED) which creates Lake Spokane. Avista does not discharge nutrients into either the Spokane River or Lake Spokane. However, the impoundment creating Lake Spokane increases the residence time for water flowing down the Spokane River, and thereby influences the ability of nutrients contained in those waters to reduce DO levels.

Avista received a new, 50-year license for the Project from the Federal Energy Regulatory Commission (FERC) on June 18, 2009 (FERC 2009). The license incorporates a water quality certification (Certification) issued by Ecology under Section 401 of the Clean Water Act (Ecology 2009). As required by Section 5.6.C of the Certification, Avista submitted an Ecology-approved Lake Spokane Dissolved Oxygen Water Quality Attainment Plan (DO WQAP) to FERC on October 8, 2012. Avista began implementing the DO WQAP upon receiving FERC's December 19, 2012 approval.

## DO WQAP

The DO WQAP addresses Avista's proportional level of responsibility as determined in the Spokane River and Lake Spokane Dissolved Oxygen Total Maximum Daily Load (DO TMDL). It identified nine potentially reasonable and feasible measures to improve DO conditions in Lake Spokane, by reducing non-point source phosphorus loading into Lake Spokane. It also incorporated an implementation schedule to analyze, evaluate and implement such measures. In addition, it contains benchmarks and reporting sufficient for Ecology to track Avista's progress toward implementing the plan within the ten-year compliance period.

The DO WQAP included a prioritization of the nine reasonable and feasible mitigation measures based upon several criteria including, but not limited to, quantification of the phosphorus load reduction, DO response time, likelihood of success, practicality of implementation, longevity of load reduction, and assurance of obtaining credit. From highest to lowest priority, the following summarizes the results of the measure prioritization: reducing carp populations; managing aquatic weeds; acquiring, restoring, and enhancing wetlands; reducing phosphorus from Hangman Creek sediment loads; educating the public on improved septic system operations; reducing lawn area and providing native vegetation buffers; and converting grazing land to conservation or recreation use. One measure, which involved modifying the intake of an agricultural irrigation system, was removed from the list, as it was determined infeasible given it would likely create an adverse effect on crop production.

Based on preliminary evaluations, Avista proposed to focus its initial efforts on two measures: reducing carp populations and aquatic weed management, which were expected to have the greatest potential for phosphorus reduction.

In its 2014 Annual Summary Report, Avista included a recommendation to implement a pilot study utilizing a combination of mechanical methods (including spring electrofishing, passive netting, and winter seining), to identify which is the most effective method to remove carp from Lake Spokane. Ecology approved the 2014 Annual Report and the recommendation to move forward with the carp removal pilot study. Avista has been working with Ecology and WDFW to plan the carp removal efforts, a summary of which is provided in Section 3.2 (2016 Implementation Measures) and Section 5.0 (Proposed Activities for 2017).

In its 2013 Annual Summary Report, Avista concluded that harvesting macrophytes in Lake Spokane at senescence, would not be a reasonable and feasible mitigation measure to reduce total phosphorus in Lake Spokane. However, Avista will continue to implement winter drawdowns, herbicide applications at public and community lake access sites, and bottom barrier placement to control invasive/noxious aquatic weeds within Lake Spokane. Avista may also, through adaptive management, reassess opportunities to harvest macrophytes to control phosphorus in the future.

As required by the DO WQAP, this report provides a Five Year Report which broadly assesses the progress made towards improving Lake Spokane's water quality through the implementation of the selected reasonable and feasible measures. The water quality evaluation includes monitoring and modeling results, as available, and addresses year to year variability and trend analyses. In addition, the report includes the 2016 baseline monitoring, implementation activities, effectiveness of the implementation activities, and proposed actions for 2017. The report however does not include modeling results, as Avista did not run the CE-QUAL-W2 hydrodynamic and water quality model (CE-QUAL-W2 model) during 2016, based upon Ecology's determination that water quality improvements, as identified in the DO TMDL, need to occur in the upstream watershed prior to running the model. With this, the DO WQAP Implementation Schedule was then revised accordingly (revised March 2016).

# 2.0 BASELINE MONITORING

Longitudinally, the lake can be classified as having three distinct zones which consist of a riverine, transition and lacustrine zone. Six monitoring stations, LL5 through LL0, exist within these three zones (**Figure 1**). Station LL5 is the most upstream station and is located within a riverine zone, Stations LL3 and LL4 are located in the transition zone, and Stations LL0 through LL2 are located in the lacustrine zone. The vertical structure of Lake Spokane is set up by thermal stratification, largely determined by its inflow rates and temperature, climate, and location of the powerhouse intake. Within Lake Spokane’s lacustrine zone, thermal stratification creates three layers (the epilimnion, metalimnion, and hypolimnion) that are generally present between late spring and early fall. The epilimnion is the uppermost layer, and the warmest due to solar radiation. The metalimnion contains the thermocline and is the transition layer between the epilimnion and the hypolimnion that is influenced by both surface and interflow inflows. The hypolimnion is the deepest layer and is present throughout the lacustrine zone.

## 2.1 2016 Monitoring Results

Avista contracted with Tetra Tech to complete the baseline monitoring activities during 2016. Sample events were completed at all six stations during May through October. Results of the monitoring are summarized in **Appendix A** (Lake Spokane Annual Summary and Five-Year Assessment, 2016 Baseline Water Quality Monitoring Results And Assessment of Water Quality 2010 – 2016, Tetra Tech 2017) and include the water quality conditions in Lake Spokane as well as for its inflows and outflows, tables of water quality data collected for the DO WQAP, a description of the general hydrologic and climatic conditions, and an analysis of the phytoplankton and zooplankton populations present during the 2016 sampling events. Highlights taken from the Tetra Tech Report are provided as follows.

- Weather conditions during 2016 differed greatly from the 30-year norms reported at the Spokane International Airport, with cooler than normal temperatures at the start of the year, in the middle of June, and in September and warmer than normal temperatures in February through June, August, and November. The Spokane region experienced drought conditions, with below normal precipitation which started in June and continued into September. August was the warmest month of the year, with an average temperature of 71.2°F. Precipitation was above normal during most of the early spring and late winter. October saw above normal precipitation, breaking the monthly and daily rainfall records in Spokane.

- Peak flows in 2016 (18,200 cfs) were significantly smaller than those observed in 2011 and 2012, slightly smaller than in 2014 and 2015, and similar in magnitude to those in 2013 (**Figure 2**). Peak flow in 2016, however, occurred in March with an earlier peak at the middle of February, approximately two months earlier than normal. The annual mean daily flow during 2016 was 6,858 cfs.
- Whole lake water residence time during 2016 (June through October) in Lake Spokane was higher than previous years at 43.3, except than in 2015 (70.1 days). Comparatively, average whole lake water residence time (June through October) during 2010 through 2014 was 25 days. Average whole reservoir residence time was 34.2 days for the past seven years (2010 through 2016). Using the DO TMDL seasonal timeframe of July through September, the whole lake residence time was calculated at 66.8 days, which was less than in 2015 (84.8 days), but higher than 2010-2014.
- Thermal stratification was evident the first sampling event in May at the four downstream stations, LL3, LL2, LL1, and LL0. Stratification was present at all stations, except LL5, by the first sampling event in June, although stratification was weak at LL4. Stratification was present at station LL5 by the second sampling event in July. The water column remained stratified at LL4 until October and at LL5 through the beginning of September. This contrasted with conditions in 2015, when stratification was present from the first sampling event in June through the beginning of September.
- While the extent and depth of the hypolimnion varied throughout the summer, for most of the sampling dates the hypolimnion depth occurred at about 10 to 15 meters (m) from the surface, being shallow in June and deepening later in the summer.
- The maximum temperature reached at the surface was 23°C in the upper reservoir in early August and 23°C in the lacustrine zone during early June. These maximum temperatures are slightly lower than those observed in 2015 (26°C and 25°C in early July) and in 2014 (25°C in early August). Temperatures were below 20°C at depths greater than 10 m in the lacustrine zone during 2016, as was the case in 2013, 2014, and 2015.
- Conductivity varied from about 87 to 297 micro Siemens/cm (µS/cm) which was similar to 2015 levels (106 to 290 µS/cm). Conductivity was lower in 2014, ranging from 69 to 270 µS/cm. The difference was likely due to lower river flows in 2015 and 2016, resulting in a stronger signature from groundwater compared with inflows from the river. During 2016, water with increased conductivity (150 to 287 µS/cm), comprised the interflow zone that extended from about 7 to 18 m at stations LL3 through LL0 in June, and extended to 39 m at LL0 in September as higher conductivity water plunged and moved through the reservoir at those depths intervals. Below 30 m, conductivity was less than 150 µS/cm. Much of the metalimnion in the lower reservoir was composed of interflow.

- The water column profiles for pH showed a range of 6.7 to 9.0 at the six stations during 2016 with the highest pH values occurred in the epilimnion during August. Water column averages were much narrower, ranging from 7.3 to 8.1.
- Maximum epilimnetic DO concentrations ranged from 11.4 to 12.2 milligrams per liter (mg/L) at the six stations, with higher values occurring in the lacustrine zone. Average water column DO ranged from 7.3 to 10.2 mg/L. Minimum DO concentrations of 0.0 mg/L occurred near the bottom at the two deepest stations, LLO (~154 ft) and LL1 (~108 ft). Minimum DO concentrations in 2013 and 2016 were the lowest observed of the seven years sampled (2010-2016).
- Total phosphorus (TP) concentrations ranged from 3 to 122 micrograms per liter (µg/L) during 2016. Soluble reactive phosphorus (SRP) concentrations ranged from non-detect (1.0 µg/L) to 56 µg/L. TP and SRP were usually highest at stations LL0, LL1, and LL2 in the hypolimnion (15 m and deeper) with higher levels usually starting in July and decreasing in late August and September. The highest TP concentration (122 µg/L) was at station LL0 at one meter off the bottom in early August. Epilimnetic TP concentrations in the lacustrine zone (LL0, LL1, LL2) were consistently around 10 µg/L or less throughout the monitoring period. Surface TP did not exceed 27 µg/L. Volume-weighted water column TP concentrations for all stations was below 25 µg/L.
- Total nitrogen (TN) concentrations at all six stations ranged from 450 to 2,760 µg/L over the monitoring period, with most of the TN consisting of nitrate+nitrite. The average lacustrine epilimnetic TN and nitrate+nitrite concentrations during June through September were 912 and 683 µg/L, respectively. It should be noted, the TN and nitrate+nitrite concentrations measured at Ecology's Nine Mile and Little Spokane Stations (54A090 and 55B070) were high with most being nitrate+nitrate, roughly matched the levels in the metalimnion and hypolimnion of the lacustrine zone. This suggests that plunging river inflows were the source of the high summer N concentrations in the reservoir, with groundwater being an important contributor.
- Chlorophyll concentrations at the six stations ranged from 0.5 to 14.4 µg/L in 2016. Chlorophyll maximums at the lacustrine, transition, and riverine sites were slightly lower than in 2015. Chlorophyll was often highest at the 5 m depth (or 4 m depth at LL4) in 2016, which was the case in 2012 through 2015. However, chlorophyll differed more seasonally than with depth at the two up-reservoir sites, where maximums occurred in August and September, similar to conditions during both 2013, 2014, and 2015. The maximum chlorophyll concentration observed (14.4 µg/L) in 2016 was at 4 m at LL4 during early August. For comparison, the seven year maximum of 25.4 µg/L was observed in 2014.
- Transparency ranged from 2.2 to 9.2 m throughout the reservoir during 2016, and appears to be affected largely by phytoplankton abundance (except during May).

- Phytoplankton density and biovolume were much greater at all stations in 2016 and 2015 than the other years. This likely reflects the longer residence times documented for the whole reservoir during 2016 and 2015 (70 and 43 days, respectively) as compared to 2010 – 2014. The composition of the phytoplankton taxa showed diatoms (*Chrysophyta*) to be dominant at all the stations during spring, based on both cell counts and biovolume. Cyanobacteria (blue-green algae) increased numerically (cells/ml) at all sites in July and August, but were represented by significant biovolume at LL5 only in late July and late August. The 2016 pattern is similar to 2012, 2014, and 2015 when diatoms dominated during the spring at all sites, but cyanobacteria dominated cell counts at all sites in early summer in 2015 and late summer in 2012-2014. Diatoms and green algae tended to represent the greatest biovolume at most sites in 2016.
- Similar to 2014, there were no observed algal scums just downstream of LL5 and in between LL4 and LL5. This contrasts with 2015, where algal scums were observed just downstream of LL5 and in between LL4 and LL5 starting in early August. Scums were absent in 2016 even though residence time was longer (43 days) than in 2010 and 2012. Due to the lack of an observed scum, the Lake Spokane Association did not collect samples for toxicity during 2016.

Tetra Tech also completed a cursory review of Lake Spokane's aquatic habitat specific to Washington's designated aquatic life use, core summer salmonid habitat using the baseline nutrient monitoring data collected in 2016. Tetra Tech used a critical maximum temperature (18°C ) and a minimum DO (6 mg/L) to compute the percent volume acceptable for growth for rainbow trout at the six stations for 2016 (Tetra Tech 2017, Figures 96-101). For the majority of the summer, between 10 and 20 m, DO was usually near or above 6 mg/L at the four deepest stations (LL0, LL1, LL2, and LL3). In late August and September at LL0, DO dropped to near or below the often cited required minimum of 5 mg/L between 10 and 20 m and was even lower at deeper depths. However, at the other deep stations DO remained above 5 mg/L. These data suggest that rainbow trout are most likely inhabiting cooler water in the metalimnion and upper portions of the hypolimnion. Additionally, the habitat volumes for temperature and DO together, as well as separately, were shown to indicate which factor appears most limiting. The data suggest that trout were limited earlier in the summer at the deeper stations by temperature and then more so by DO concentrations as the summer progressed in 2016 (Figures 96-98). Trout were limited exclusively by temperature at the shallower stations (Figures 99-101). The above temperature and DO results suggest that trout likely avoid the epilimnion during most of the summer due to temperatures that reached 25°C and likely seek cooler water deeper than 10 m. However, to obtain site specific water quality limitations on fish habitat in Lake Spokane, a more thorough analysis would need to be completed.

## 2.2 Assessment of Lake Spokane Water Quality (2010 – 2016)

In accordance with the DO WQAP, an assessment of water quality for data collected from 2010 through 2016 and is summarized in **Appendix A**. The assessment addresses year to year variability and trend analysis specific to the following parameters: DO, phosphorus, nitrogen, trophic state, and fish habitat. Results of these analyses are discussed in **Appendix A** and are summarized below. The approaches used by TetraTech provide valuable information. Avista anticipates these or other approaches, along with the goals of the DO TMDL, will be used to determine compliance with the surface water quality standards at the end of the 10-year compliance schedule.

- The minimum volume-weighted hypolimnetic DO has substantially increased since 1977. In 1978, the City of Spokane's wastewater treatment plant implemented an 85% reduction in point-source TP in their discharge water. Prior to the TP reduction, minimum volume-weighted hypolimnetic DO ranged from 0.2 to 3.4 mg/L (1972 – 1977). Following the TP reduction, minimum volume-weighted hypolimnetic DO ranged from 2.5 to 4.5 mg/L (1978 – 1985). The current (2010 – 2016) minimum volume-weighted hypolimnetic DO ranged from 5.1 to nearly 8 mg/L, and averaged 6.3 mg/L with inflow TPs averaging 14.7 µg/L.

- Summer mean TP decreased slightly through the reservoir in all seven years with the lowest TP usually at station LL0. Area-weighted, whole-reservoir epilimnetic TPs averaged 11.3 ± 1.6 µg/L for the seven years, a variation of only 14% and with no evident trend. Area-weighted whole-reservoir epilimnetic TP was lowest in 2016 with 8.9 µg/L and highest in 2013 with 13.4 µg/L. Summer (June to September) hypolimnetic TPs have been rather consistent the past seven years, with a mean of 24.8 µg/L ± 16%. Maximum hypolimnetic TPs have been relatively low the past seven years usually less than 35 µg/L, and the average volume-weighted hypolimnetic TP was only 23.4 µg/L (May-October). The lowest concentrations were in 2011 while the highest were in 2016.

- Epilimnetic mean TN concentrations in summer (June to September) 2015 and 2016 were higher at LL0, LL1, LL2, and LL3 than the previous five years. Summer epilimnetic mean TN concentrations at LL4 were lowest in 2012 through 2015 and highest in 2010, while the near opposite occurred at LL5, with the lowest concentrations occurring in 2010 and highest in 2014 and 2016. Additionally, the data suggests that TN concentrations have been increasing in the Spokane River for several decades, which may be due to the lower river flows and greater influence of groundwater.

- The lake's tropic state, a general measure of biological production (utilizing concentrations of TP, chlorophyll, water clarity, etc.) is near borderline oligotrophic-mesotrophic on average in all zones for the last seven years, with the exception of the TP concentrations in the transition and riverine zones. The average TP and chl in the transition and riverine zones were usually slightly greater than the oligotrophic-mesotrophic boundary (10 µg/L). The trophic state of the lake is an important index to measure, especially when evaluating the lake's habitat. A eutrophic state indicates high biological production within the lake, an oligotrophic state indicates low biological production, and mesotrophic is between those two states.

- A cursory review of Lake Spokane's aquatic habitat specific to Washington's designated aquatic life use, core summer salmonid habitat using the baseline nutrient monitoring data collected over the past seven years, suggests temperature restricted habitat for rainbow trout during spring and early summer far more than did DO at all sites and that temperature continued to be more limiting than DO for the rest of much of the year at the shallower sites. That said, there appears to be a greater restriction by DO at LL0 during late July, August, and early September than at any of the other sites with more acceptable habitat available further upstream at LL1, LL2, and LL3.

## 2.3 Monitoring Recommendations

In accordance with the DO WQAP, following completion of the 2016 nutrient monitoring season, Avista and Ecology evaluated the results and success of monitoring baseline nutrient conditions in Lake Spokane. In order to gain a better understanding of core summer salmonid habitat in Lake Spokane, Avista proposes to expand the 2017 and 2018 sampling program.

In 2017, Avista plans to initiate a multi-year fish population and habitat assessment in Lake Spokane, the area impounded by Long Lake Dam (see Figure 2, the red area outlined as the Long Lake HED Project Boundary) to gain an understanding of the status of the rainbow trout population in the lake and determine habitat utilization. Avista is developing a broad study plan for the lake that outlines the overall project objectives, with specific techniques and logistics, in coordination with the Washington Department of Fish and Wildlife (WDFW). This includes the following three components: (1) determining whether stocked rainbow trout survive the summer and maintain healthy body conditions; (2) identifying the water quality conditions that are currently present; and (3) identifying the precise coordinates and depth rainbow trout occupy.

To address the first component, Avista plans on tagging a large number of the stocked rainbow trout that are planted in the lake with individually numbered identification (ID) tags. As fish are being released in the lake, a subsample of fish will be collected to measure weight and length. The body condition of the subsample of fish will be extrapolated to establish a baseline condition for all the tagged fish. Avista will then re-collect the fish. Presently Avista anticipates re-collecting these fish during creel survey angler interviews and voluntary angler returns. During re-collection, fish will be identified by the ID tag number and measured for weight and length.

The change in weight and length of individual fish will be used to determine growth rate and body condition. The number of ID tags re-collected in comparison with the total number tagged will be used to estimate the total population.

The second component includes continuing the baseline nutrient monitoring, during 2017, in accordance with the Ecology approved Quality Assurance Project Plan for Lake Spokane Nutrient Monitoring (Tetra Tech 2014). We anticipate the results of this data will be utilized to help assess the CE-QUAL-W2 model output data.  Avista will work with Ecology to determine whether or not to continue baseline nutrient monitoring during 2018, following the 2017 monitoring season.

The third component will be to identify what location and depth rainbow trout are occupying seasonally. The exact method for this component is still being explored, but will either be done by acoustic tagging and tracking the fish or sampling at strategic locations in the lake to see if fish are present. If a tracking study is selected, stocked rainbow trout will be tagged with acoustic radio tags that identify location as well as water column depth and temperature. Tagged fish will then be manually tracked at set intervals throughout the summer. The tracking will show the approximate latitude and longitude of individual fish along with the water depth and temperature the fish is utilizing. We anticipate these data will be compared to the hydrodynamics established with the CE-QUAL-W2 model to assess what water characteristics the fish inhabits.

The alternative technique used to identify the location of fish would be actively sampling for fish. To accomplish this, nets would be set at strategic locations, both around the lake and within the water column, with varying water quality characteristics to determine presence/absence at these locations.

The compilation of the data collected for these three components will be used to illustrate Lake Spokane’s rainbow trout population vitality while directly relating the lake’s water quality to fish occupancy. We anticipate sampling to occur over two years (2017 and 2018), in order to collect the amount of data needed to draw reliable conclusions. Results would be compiled and presented in 2019.

Avista will continue to work with WDFW to finalize the study plan for the habitat analysis.

# 3.0 IMPLEMENTATION ACTIVITIES

## 3.1 Studies

In accordance with the DO WQAP, Avista focused its initial efforts on analyzing two measures: reducing carp populations and aquatic weed management, which were identified as having high potential for phosphorus reduction.

### *3.1.1 Carp Population Reduction Program*

In order to investigate whether removing carp would improve water quality in Lake Spokane, a Lake Spokane Carp Population Abundance and Distribution Study consisting of a Phase I and Phase II component, was initiated during 2013 and 2014. The purpose of this study was to better understand carp population abundance, distribution, and seasonal habitat use, as well as to help define a carp population reduction program, that may benefit Lake Spokane water quality.

Three contractors were utilized to complete different components of the Phase I and II Analyses, including Golder Associates (Golder), Ned Horner LLC (Avista contract Fishery Biologist), and Tetra Tech. The results of the Phase I and II Analyses were summarized in the Lake Spokane DO WQAP 2014 Annual Summary Report (Avista 2015).

Results of the Phase I and Phase II Analyses indicate that carp removal from Lake Spokane may provide meaningful reductions in TP directly through removal of TP in carp biomass (5g of TP/kg of carp) and indirectly through the reduction of re-suspended TP from sediments that carp disturb (bioturbation). The telemetry study, conducted in 2014, defined two time periods when carp were concentrated and vulnerable to harvest; during the winter and during the spring spawning period (May/June). The Phase II Analysis indicated that several different mechanical methods, including but not limited to, spring electrofishing, passive netting, and winter seining would be the most biologically effective and cost efficient means to reduce carp in Lake Spokane. With this, Avista plans to implement a pilot study utilizing a combination of these methods to identify which is the most effective way to remove carp from Lake Spokane.

Based upon the findings of the Phase I and II Analyses, Avista estimates the combination of these efforts could capture from 10,000 to 20,000 carp. The data obtained in 2014 indicated that the average carp weighs 4 kg/fish with about 5 g of TP/kg carp (wet weight), removing 10,000 to 20,000 carp would equate to removing approximately 200 to 400 kg (440 to 882 lbs) of TP from Lake Spokane. Removal of carp would likely also reduce bioturbation and resuspension of TP in sediments.

### *3.1.2 Aquatic Weed Management*

There are approximately 940 acres of aquatic plants present in Lake Spokane, of which 315 acres consist of the non-native yellow floating heart and fragrant water lily (AquaTechnex 2012). In order to evaluate harvesting aquatic plants as a viable method of reducing phosphorus in the lake, Avista contracted Tetra Tech to complete a Phase I Analysis, which: 1) assessed whether harvesting would be a reasonable and feasible activity to perform in Lake Spokane; 2) refined TP concentrations of relevant weed species in Lake Spokane; and 3) quantified TP load reductions associated with selected control methods.

The results of the Phase I Analysis and Nutrient Reduction Evaluation were summarized in the Lake Spokane Dissolved Oxygen Water Quality Attainment Plan 2013 Annual Summary Report. Based upon the results, Avista concluded that harvesting aquatic plants in Lake Spokane at senescence, would not be effective in reducing TP in Lake Spokane. However, Avista will continue to implement winter drawdowns, herbicide applications at public and community lake access sites, and bottom barrier placement to control invasive/noxious aquatic weeds within the lake. Avista may also, through adaptive management, reassess opportunities to harvest aquatic plants to control phosphorus in the future.

## 3.2 2016 Implementation Measures

The following section highlights measures which Avista implemented, or assisted in the implementation in order to reduce phosphorus loading and improve DO concentrations in Lake Spokane.

### *3.2.1 Carp*

During 2016, Avista planned to assess the effectiveness of electrofishing and using gill nets during spring spawning when carp are concentrated in shallow areas. This effort was a cooperative project between Avista, WDFW, and the Idaho Cooperative Fishery Research Unit and was to take place over a two-week timeframe. Implementation of the project was initiated on June 13, however the warmer than normal temperatures experienced during the spring of 2016, combined with a lack of significant runoff, triggered carp spawning ahead of what has been historically observed. Additionally, these same weather conditions lead to excessive aquatic weed growth ahead of the normal growth season. As a result of these conditions Avista and its partners were unable to remove carp per our plans.

Avista submitted the status of the project to Ecology via letter correspondence on June 17, 2016. On June 24, 2016, Ecology agreed with Avista's plans to reschedule the carp removal efforts to the winter of 2017 and the 2017 spring spawning period. The status of the carp removal project, along with Ecology's concurrence was submitted to FERC, via letter correspondence, on July 6, 2016.

### 3.2.2 Wetlands

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. The property was purchased "in fee" and Avista will pursue a conservation easement in order to protect it in perpetuity. 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.

Avista and the Coeur d'Alene Tribe have acquired approximately 656 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 in agricultural use, including 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 8,000 native tree and shrub species have been planted on this wetland complex.

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 have been 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. Avista completed additional herbicide spot treatments in 2016.

Additionally, Avista worked with the Stevens County Conservation District (SCCD) to provide a cost share on the installation of a floating treatment wetland in Lake Spokane. The purpose of the floating treatment wetland was for wave attenuation outside a community swim area as well as for potential TP removal. Unfortunately, following the SCCD's award of the grant the Homeowner Association declined to participate in the project. The SCCD and Avista then worked to find a new potential location for the floating treatment wetland in the downstream portion of Lake Spokane adjacent to Avista owned shoreline, as well as to initiate the permitting process for the project.

### *3.2.3 Native Tree Planting*

Avista and the SCCD planted 13,625 ponderosa pines along Lake Spokane's shoreline on Avista-owned property. This project is part of the Long Lake Dam Reservoir and Tailrace Temperature Water Quality Attainment Plan. Once mature, the trees will help reduce water temperature and improve habitat along the lake's shoreline.

### *3.2.4 Land Protection*

Avista has identified approximately 215 acres of land that is currently 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 are pursuing a lease for the 215 acres of land from DNR with the intent of changing the land use.

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 2016). 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. During 2014 Avista continued to protect this area and will pursue identifying the potential TP load that could be avoided by maintaining a 200-foot buffer along the Avista-owned lake shoreline. Avista will pursue the quantification of this activity along the wetland/restoration enhancements as the 200-foot buffer should create similar sediment-filtering effects.

### *3.2.5 Rainbow Trout Stocking*

Avista stocked 155,000 triploid rainbow trout (approximately six inches in length) in Lake Spokane during May 2016 as part of a FERC License requirement. As in 2015, Avista continues to hear positive feedback from fisherman indicating the stocked fish were healthy and on average 14 inches long with some as long as 16 inches. Anecdotal information demonstrates the lake is becoming a more popular trout fishery as reported by local residents, news media, and agency staff.

### *3.2.6 Bulkhead Removal*

During 2016, Avista continued to work with the Stevens County Conservation District (SCCD) to plan and permit a design for an additional bulkhead removal project on an Avista-owned shoreline parcel located in TumTum. The project would consist of replacing a 90 foot bulkhead with native rocks and vegetation to provide a more natural shoreline. The final permit required for this project was issued in December 2016. Given the project has to take place with the lake is drawndown, we anticipate this project taking place during winter 2017/2018.

### *3.2.7 Education*

Avista participated with others to support passage of a Washington law[1], effective January 2013, limiting the use of phosphorus (except for certain circumstances) in residential lawn fertilizers, which includes those adjacent to Lake Spokane in Spokane, Stevens, and Lincoln counties. Although the new law legally restricts use of fertilizer containing phosphorus, homeowner education will be important in actually reducing phosphorus loads to the lake.

During 2016, Avista participated in the SCCD’s Best Management Implementation Project. This project is funded through an Ecology grant and one component includes educating Lake Spokane high school students about the water quality in the watershed. This includes discussing best management practices around the lake, such as, the benefits of natural shorelines with native vegetation buffers, proper disposal of lawn clippings and pet waste, use of phosphorus-free fertilizers, and regularly maintaining septic systems.

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[1] Engrossed Substitute House Bill 1489, Water Quality – Fertilizer Restrictions, Approved by Governor Christine Gregoire April 14, 2011 with the exception of Section 4 which is vetoed. Effective Date January 1, 2013.

In addition, during 2016 Avista managed a booth at the Northern Idaho/Eastern Washington Annual Lakes Conference to provide education materials for lakeshore owners and community members.

Avista actively participates with the Lake Spokane Association and periodically features articles regarding best management practices for shoreline homeowners in its annual Spokane River Newsletter which is distributed electronically to the Lake Spokane shoreline homeowners.

## 4.0 EFFECTIVENESS OF IMPLEMENTATION ACTIVITIES

Quantification of the implementation activities including wetlands, land protection, and carp removal are in progress as described for each of these activities below.

- **Wetlands**
  Avista is in the initial stages of implementing site-specific wetland management plans for the Sacheen Springs and Hangman Creek properties. As the wetland management plans are implemented Avista will work with Ecology to explore appropriate total phosphorus load reduction quantification tools.

- **Land Protection**
  Avista and State Parks are pursuing the 215 acre lease from DNR with the intent of changing the land use. Once this has been completed, Avista will provide a quantification of the estimated TP loading removed from eliminating, or limiting, grazing activities.

  In addition, Avista owns over 1,000 acres of land, of which approximately 350 acres are located within 200 feet of Lake Spokane's shoreline in Spokane, Stevens, and Lincoln counties at the downstream end of the reservoir. During 2015 Avista continued to protect this area and will pursue identifying the potential TP load that could be avoided by maintaining a 200-foot buffer along the Avista-owned lake shoreline.

  Avista will pursue quantifying TP load reduction for the 200-foot buffer and from the wetland/restoration enhancements, as these two activities should create similar sediment-filtering effects.

## 5.0 PROPOSED ACTIVITIES FOR 2017

The following activities are proposed for implementation in 2017.

- **Carp**

  Avista plans to assess the effectiveness of using gill nets during the winter of 2017 to remove carp from the vicinity of the Sportsman's Paradise area of Lake Spokane. Additionally, Avista plans to utilize electrofishing and using gill nets during spring spawning when carp are concentrated in shallow areas. Avista may also explore the effectiveness of carp removal through archery. Avista is coordinating these efforts with WDFW and will obtain a scientific collection permit prior to implementing the activities.

  An education outreach effort will be completed during the spring spawning carp reduction efforts in order inform shoreline homeowners of the programs main objective, to reduce TP from the lake and improve dissolved oxygen concentrations.

  The TP reduction associated with the carp removal efforts will be quantified based upon the results of the Phase I Analysis as well as any new information pertaining to loading estimates for Lake Spokane. Avista will analyze carp for phosphorus in order to either confirm the 5 g of TP/kg identified during the Phase I Analysis, or allow for adjustment based upon the analysis results.

  With regard to carp disposal, the carp will be transported to one of Waste Management's municipal landfills in either Wenatchee or Arlington.

- **Habitat Evaluation**

  Avista will continue to stock 155,000 triploid rainbow trout (approximately six inches in length) in Lake Spokane on an annual basis. Initial responses to the program indicate it is successful and the stocked trout are doing well. This program will assist Avista, Ecology and WDFW in the ongoing effort to evaluate suitable salmonid habitat in Lake Spokane. Avista and WDFW will evaluate the success of the stocking program after ten years of implementation.

  Additionally, as discussed in Section 2.3 (Monitoring Recommendations), Avista plans to initiate a multi-year fish population and habitat assessment for rainbow trout in Lake Spokane in 2017.

- **Wetlands**

  Avista will continue to implement site-specific wetland management plans for the Sacheen Springs and Hangman Creek properties.

  Additionally, Avista will continue to work with the SCCD to permit and plan for the placement of a floating treatment wetland in the downstream section of Lake Spokane, adjacent to Avista-owned shoreline. The anticipated timeframe for this project is 2017, pending permits. The purpose of the floating treatment wetland would be for water quality improvements including reducing surface water temperatures as well as potentially removing nutrients from the water column. Additionally the floating treatment wetland has an educational component allowing for the study to with regard to their impacts on fish, as well as wetland vegetation survival rates.

- **Native Tree Planting**

  Avista will monitor the tree survival for the trees planted to date along the Avista-owned Lake Spokane shorelines.

- **Land Protection**

  Avista and State Parks are pursuing the 215 acre lease of land from DNR with the intent of changing the land use. Avista will also continue to protect the 200-foot buffer of Avista-owned shoreline located in the lower portion of the reservoir.

- **Bulkhead Removal**

  During the 2017/2018 winter, now that all the permits have been issued, Avista will work with the SCCD to replace approximately 90 feet bulkhead with a more natural shoreline on the Avista-owned shoreline parcel in TumTum. Avista will explore additional bulkhead removal projects on Lake Spokane as it learns of them.

- **Education**

  Avista will continue to participate with Ecology, the Lake Spokane Association, the SCCD, and others to inform shoreline homeowners of best management practices they can implement to help protect the lake.

## 6.0 SCHEDULE

Avista’s implementation schedule incorporates several benchmarks and decision points important in implementing the DO WQAP. As part of the 2015 Annual Summary Report and based on Ecology’s recommendation, Avista revised the DO WQAP Implementation Schedule (Figure 3, Revised DO WQAP Implementation Schedule) to better sync with the compliance schedule of the DO TMDL, including point- and non-point source wasteload and load reductions. The revision consists of changing the initial implementation dates that Avista would run the CE-QUAL-W2 model (2016/2017, 2019/2020, and 2021/2022. Avista will continue to work with Ecology during 2017 to continue developing a plan to run the CE-QUAL-W2 model, as further described below.

Benchmarks and important milestones completed to date, and extending into 2019 include the following.

**2012**

- Prepared the DO WQAP, which identified nine potentially reasonable and feasible measures to improve DO conditions in Lake Spokane. Approval of the DO WQAP was obtained from Ecology on September 27, 2012 and from FERC on December 19, 2012.

**2013 (Year 1)**

- Conducted the baseline nutrient monitoring in Lake Spokane (May through October).
- Conducted the Aquatic Weed Management Phase I Analysis and Nutrient Reduction Evaluation.
- Initiated the Lake Spokane Carp Population Abundance and Distribution Study.
- Planted 300 trees on Lake Spokane.
- Assisted with a bulkhead removal on the Staggs parcel and began designing the bulkhead removal for the second property on Lake Spokane.
- Protected approximately 14-miles of Avista-owned shoreline from future development.
- Acquired 109-acres of wetland property in the Little Spokane Watershed and 656-acres in the upper Hangman Creek Watershed.
- Continued education activities targeted at Lake Spokane shoreline homeowners.

**2014 (Year 2)**

- Completed and submitted the 2013 DO WQAP Annual Summary Report to Ecology and FERC.
- Conducted baseline nutrient monitoring in Lake Spokane (May through October).
- Completed the Lake Spokane Carp Population Abundance and Distribution Study.
- Planned and began permitting a bulkhead removal on an Avista Lake Spokane parcel.
- Protected approximately 14-miles of Avista-owned shoreline from future development.
- Implemented site-specific wetland plans on the Sacheen Springs and Hangman Creek properties.
- Stocked 155,000 triploid rainbow trout in Lake Spokane.
- Continued education activities targeted at Lake Spokane shoreline homeowners.

**2015 (Year 3)**

- Completed and submitted the 2014 DO WQAP Annual Summary Report to Ecology and FERC.
- Conducted baseline nutrient monitoring in Lake Spokane (May through October).
- Worked with WDFW and Ecology in planning a carp reduction effort for 2016.
- Continued planning and permitting the bulkhead removal on an Avista Lake Spokane parcel.
- Protected approximately 14-miles of Avista-owned shoreline from future development.

- Implemented site specific wetland plans on the Sacheen Springs and Hangman Creek properties.
- Stocked 155,000 triploid rainbow trout in Lake Spokane.
- Continued education activities targeted at Lake Spokane shoreline homeowners.

**2016 (Year 4)**

- Completed and submitted the 2015 DO WQAP Annual Summary Report to Ecology and FERC.
- Conducted the baseline nutrient monitoring in Lake Spokane (May through October). Following monitoring, evaluated the results and success of monitoring baseline nutrient conditions in Lake Spokane and worked with Ecology to define future monitoring goals for the lake.
- Initiated carp removal activities during spring spawning. Activities were rescheduled due to timing of the hydrograph and early aquatic weed growth.
- Obtained all permits for the TumTum bulkhead replacement project.
- Stocked 155,000 triploid rainbow trout in Lake Spokane.
- Continued to implement site specific wetland plans on the Sacheen Springs and Hangman Creek properties.
- Protected approximately 14-miles of Avista-owned shoreline from future development.
- Planted 13,625 trees along Lake Spokane shoreline.

**2017 (Year 5)**

- Will submit the DO WQAP Five Year Report to Ecology and FERC by February 1 and April 1, respectively.
- Will continue baseline nutrient monitoring in Lake Spokane and initiate a multi-year fish population and habitat assessment to gain a better understanding of core summer salmonid habitat in Lake Spokane.
- Will complete other mitigation measures as proposed in previous years' Annual Summary Report.
- Avista will continue to work with Ecology during 2017 in regard to developing a plan to run the CE-QUAL-W2 model. This may include timing, objectives, data input, and a QA/QC plan for potential future model runs.

**2018 (Year 6)**

- Will submit the 2017 DO WQAP Annual Summary Report to Ecology and FERC by February 1 and April 1, respectively.
- Avista will continue implementing the multi-year fish population and habitat assessment and will work with Ecology to determine whether or not to continue baseline nutrient monitoring during 2018.

- Will complete other mitigation measures as proposed in previous years' Annual Summary Report.
- Will discuss timing, objectives, and data input of potential future CE-QUAL-W2 model runs with Ecology.

**2019 (Year 7)**

- Will submit the 2018 DO WQAP Annual Summary Report to Ecology and FERC by February 1 and April 1, respectively.
- May conduct the baseline nutrient monitoring in Lake Spokane (May through October), dependent upon the results of the 2017 (and possible 2018) monitoring program.
- Will complete other mitigation measures as proposed in previous years Annual Summary Report.
- Will discuss timing, objectives, and data input of potential future CE-QUAL-W2 model runs with Ecology.

## 7.0 REFERENCES

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# FIGURES

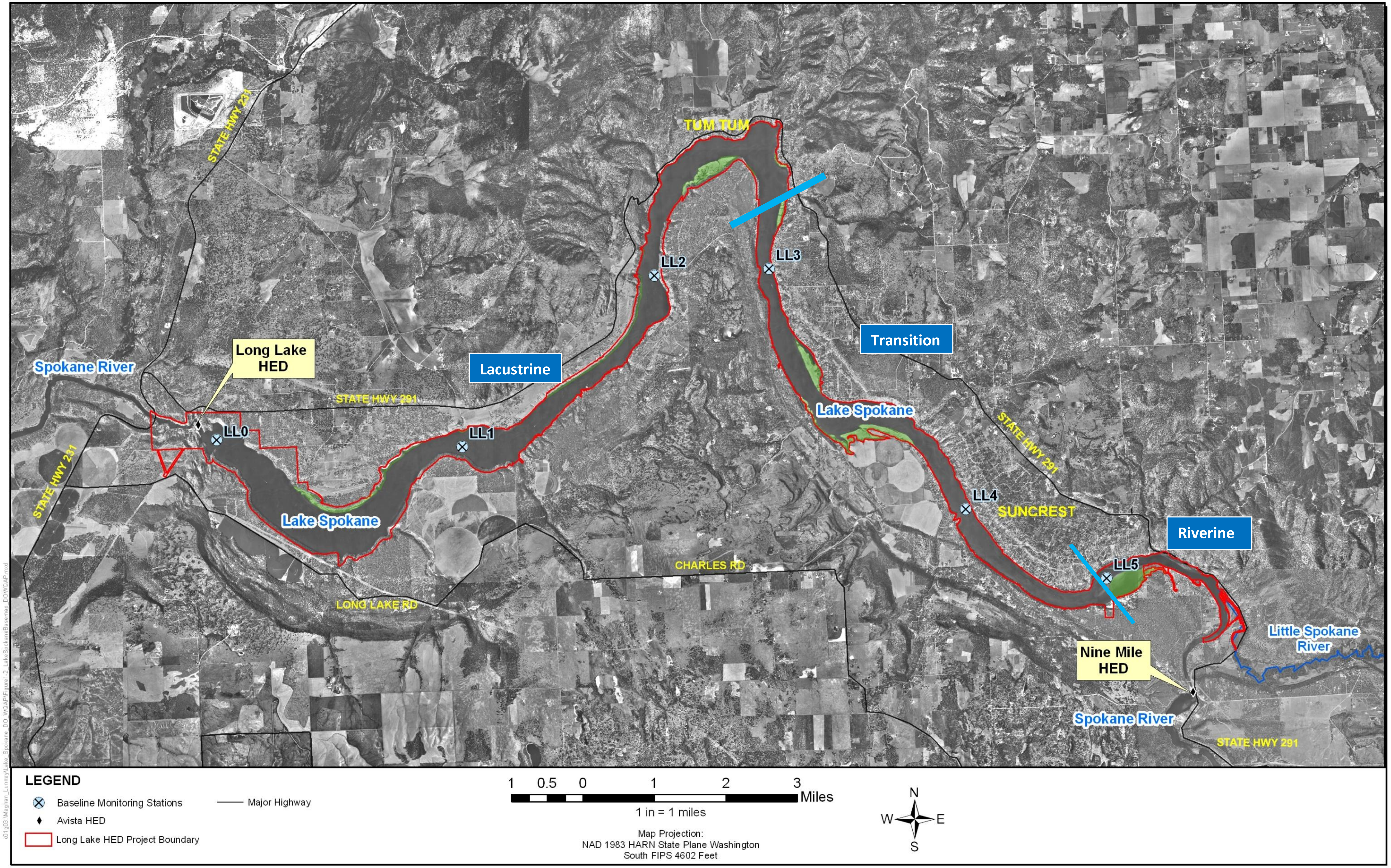

Figure 1. Lake Spokane Baseline Monitoring Stations

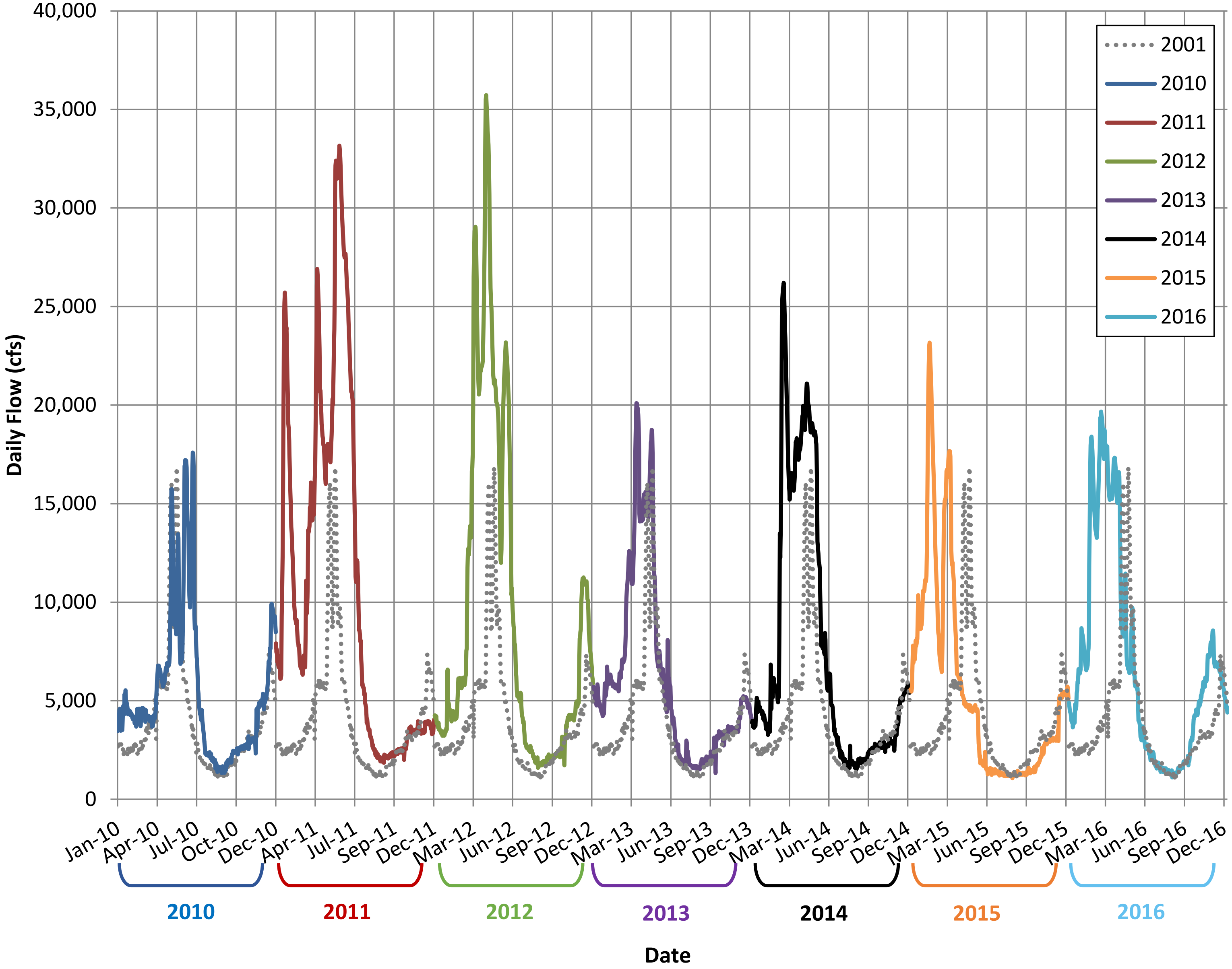

**Figure 2. Total Inflows[1] between 2010 and 2016 into Lake Spokane contrasted with 2001 inflows (Source: TetraTech, 2017).**

[1] Inflows calculated based on midnight to midnight lake elevation and day average outflow at midnight as recorded at Long Lake Dam.

| | Activity | Implementation Year[1] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Year 1 | | | | Year 2 | | | | Year 3 | | | | Year 4 | | | | Year 5 | | | | Year 6 | | | | Year 7 | | | | Year 8 | | | | Year 9 | | | | Year 10 | | | |
| | | 2012 | | | | 2013 | | | | 2014 | | | | 2015 | | | | 2016 | | | | 2017 | | | | 2018 | | | | 2019 | | | | 2020 | | | | 2021 | | | | 2022 | | | |
| | | Winter | Spring | Summer | Fall | Winter | Spring | Summer | Fall | Winter | Spring | Summer | Fall | Winter | Spring | Summer | Fall | Winter | Spring | Summer | Fall | Winter | Spring | Summer | Fall | Winter | Spring | Summer | Fall | Winter | Spring | Summer | Fall | Winter | Spring | Summer | Fall | Winter | Spring | Summer | Fall | Winter | Spring | Summer | Fall |
| **DO WQAP Submittal** | Submit DO WQAP to Ecology | | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Receive approval from Ecology* | | | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Submit DO WQAP to FERC* | | | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Receive approval from FERC* | | | | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Carp** | Phase I Analysis: Identify location and population of carp | | | | | | | x | x | x | x | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Summarize Phase I findings [2]* | | | | | | | | | x | | | | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Phase II Analysis: Evaluate harvest technology | | | | | | | | | x | x | x | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Select carp removal method(s) | | | | | | | | | | | | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Summarize Phase II findings[2] , consult and discuss with Ecology | | | | | | | | | | | | | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Determine with Ecology whether carp population reduction is reasonable and feasible to implement in Lake Spokane* | | | | | | | | | | | | | | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | If determined reasonable and feasible, implement measure; if not, revise implementation strategy, monitoring, and schedule* | | | | | | | | | | | | | | | x | x | x | x | x | x | | | | | | | | | | | | | | | | | | | | | | | | |
| | If implemented, monitor for nutrient reductions | | | | | | | | | | | | | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | | |
| **Aquatic Weed Management** | Phase I Analysis: Evaluate feasibility of mechanical harvesting | | | | | | x | x | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nutrient reduction evaluation | | | | | | | x | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Summarize findings[2] , consult and discuss with Ecology* | | | | | | | | | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Determine with Ecology whether aquatic weed harvesting is reasonable and feasible to implement in Lake Spokane* | | | | | | | | | | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | If determined reasonable and feasible, implement measure; if not, revise implementation strategy, monitoring, and schedule* | | | | | | | | | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | | |
| | If implemented, monitor for nutrient reductions | | | | | | | | | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | | |
| | Implement yearly aquatic weed controls through separate program[3] | | | | | | | | | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | | |
| **Other Measures** | Evaluate & implement additional measures, as appropriate | | | | | | | | | | | | | | | | | | | | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | | | |
| **Monitoring & Modeling** | Baseline Monitoring[4] | | x | x | x | | x | x | x | | x | x | x | | x | x | x | | x | x | x | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ongoing Habitat Analysis[5] | | | | | | | | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | x | x | | | | | |
| | Site Specific Nutrient Reduction Analysis[6] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | CE-QUAL Modeling[7] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Compliance Reporting** | DO WQAP Annual Summary Report* | | | | | | | | | x | | | | x | | | | x | | | | | | | | x | | | | x | | | | | | | | x | | | | | | | |
| | Five, Eight, and Ten-Year Reports* | | | | | | | | | | | | | | | | | | | | | x | | | | | | | | | | | | x | | | | | | | | x | | | |

Notes:

(1) = Implementation Year dependent upon date of FERC approval.

(2) = Findings would be summarized in the DO WQAP Annual Summary/Report, which will be submitted to Ecology for review and approval.

(3) = Annual aquatic weed control activities implemented under the Lake Spokane and Nine Mile Reservoir Aquatic Weed Management Program.

(4) = Avista and Ecology will re-evaluate baseline nutrient monitoring program following the completeing of the 2016 season.

(5) = Ongoing in nature with periodic reporting to Ecology.

(6) = Dependent upon outcome of carp population reduction and aquatic weed management phased analyses.

(7) = Avista will continue to work with Ecology to determine the timing for future CE-QUAL model runs.

**Revised Figure 3. DO WQAP Implementation Schedule (Source: Figure 3-3, DO WQAP)**

Revised: March 2016

# APPENDICES

# APPENDIX A

## Lake Spokane Annual Summary & Five-Year Assessment, 2016 Baseline Water Quality Monitoring Results And Assessment of Water Quality 2010 – 2016 (Tetra Tech 2017)

# LAKE SPOKANE ANNUAL SUMMARY & FIVE-YEAR ASSESSMENT

## 2016 Baseline Water Quality Monitoring Results
## And
## Assessment of Water Quality 2010 – 2016

## Prepared for

## AVISTA

**SPOKANE, WASHINGTON**

PREPARED BY:

***Tetra Tech, Inc.***

*316 W. Boone Avenue, Suite 363*
*Spokane, WA 99201*

**January 2017**

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| **µS/cm** | micro Siemens per centimeter |
| **AHOD** | areal hypolimnetic oxygen deficit |
| **Avista** | Avista Utilities |
| **chl** | chlorophyll a |
| **DNR** | Department of Natural Resources |
| **DO** | dissolved oxygen |
| **Ecology** | Washington Department of Ecology |
| **EWU** | Eastern Washington University |
| **HED** | Hydroelectric Development |
| **MDL** | Method detection limit |
| **N** | nitrogen |
| **N+P** | nitrogen plus phosphorus |
| **ND** | non-detect |
| **$NO_3$+$NO_2$** | Nitrate+nitrite |
| **P** | phosphorus |
| **QAPP** | Quality Assurance Project Plan |
| **RM** | river mile |
| **SRP** | soluble reactive phosphorus |
| **TMDL** | total maximum daily load |
| **TN** | total nitrogen or total persulfate nitrogen |
| **TN:TP** | total nitrogen to total phosphorus ratio |
| **TP** | total phosphorus |
| **TSI** | trophic state index |

# 1. INTRODUCTION

Water quality problems in Lake Spokane due to eutrophication have been investigated on several occasions since the 1960s. Studies by the Washington Department of Ecology (Ecology) and Eastern Washington University (EWU) provided much of the background data for a waste allocation analysis by Harper-Owes in the 1980s (Patmont 1987). The EWU studies defined the extent of algal blooms and hypolimnetic anoxia, which led to 85% of total phosphorus (TP) removal from the City of Spokane wastewater treatment plant effluent starting in 1977. Phosphorus removal from wastewater greatly improved water quality in the reservoir. During the 1970s to 1980s, the EWU group, headed by Dr. R.A. Soltero, produced 14 reports documenting water quality problems before and after wastewater phosphorus removal. This work showed the direct links between phosphorus input and algal blooms on the one hand, and the effect of that algal production on reservoir dissolved oxygen (DO) on the other (Soltero et al. 1982).

The degree of water quality improvement that occurred in the past is important to recognize in assessing the reservoir's water quality today. For example, chlorophyll a (chl) decreased from a June-October average of 20.5 micrograms per liter (µg/L) before phosphorus removal (5 years of data) to 11.1 µg/L after (7 years of data). That was in response to inflow TP decreasing from a June-October mean of 86 to 25 µg/L. Minimum, volume-weighted hypolimnetic DO increased from an average of 1.4 mg/L before (5 years of data) to 3.6 mg/L after (7 years of data) (Patmont 1987).

Improvement in water quality continued during the subsequent 15 to 20 years. By 2010 – 2014, average minimum DO increased 80% and chl decreased 40% as inflow TP declined 40% to 15 µg/L (5-years of data; Welch et al. 2015). These further improvements were probably attained during the 1990s, although there are no reservoir data between 1985 and 2010 to determine an actual rate of recovery. The magnitude of this long-term improvement will be compared with current water quality conditions determined in 2016, as well as during the seven-year period 2010 – 2016.

This report describes the monitoring effort by Tetra Tech in 2016, under contract to Avista Corporation (Avista), that included *in situ* profiles of temperature, DO, pH, and conductivity, as well as discrete sampling with depth for nutrients, chl, phytoplankton and net zooplankton. Lake Spokane water quality in 2016 will be assessed along with data from 2010 – 2015, including year-over-year variability and trends.

## 1.1. Report Purpose

Avista owns and operates the Long Lake Hydroelectric Development (HED) on the Spokane River. Long Lake Dam created a reservoir, Lake Spokane, in a 23-mile (37 kilometer) stretch of the Spokane River that was, at one time, free flowing. Portions of the river, including Lake Spokane, experience seasonal patterns in DO concentrations, some of which do not meet Washington State's water quality standards.

Table 1 lists the state water quality criteria for DO that apply to the Spokane River and Lake Spokane. In addition, the Spokane River has the following specific water quality criteria, per WAC 173-201A-130, from Long Lake Dam (RM 33.9) to Nine Mile Bridge (RM 58.0), which encompasses all of Lake Spokane:

> The average euphotic zone concentration of total phosphorus (TP) shall not exceed 25 µg/L during the period of June 1 to October 31.

**Table 1. Designated Aquatic Life Uses and DO Criteria for the Spokane River as Defined in the 2006 Water Quality Standards.**

| Portion of the Waterbody | Aquatic Life Uses | DO Criteria |
|---|---|---|
| **Spokane River (from Nine Mile Bridge to the Idaho Border)** | Migration/Rearing/Spawning | DO shall exceed 8.0 mg/L.<br>If "natural conditions"[1] are less than the criteria, the natural conditions[1] shall constitute the water quality criteria. |
| **Lake Spokane (from Long Lake Dam to Nine Mile Bridge)** | Core Summer Habitat | No measurable (0.2 mg/L) decrease from natural conditions[1]. |

[1] Washington water quality standards (WAC 173-201A-020) defines "natural conditions" or "natural background levels" as "surface water quality that was present before any human-caused pollution. When estimating natural conditions in the headwaters of a disturbed watershed, it may be necessary to use the less disturbed conditions of a neighboring or similar watershed as a reference condition."

Ecology has been working, along with several stakeholders, to address these water quality impairments through the development and implementation of a water quality improvement plan, or Spokane River and Lake Spokane Dissolved Oxygen Total Maximum Daily Load (DO TMDL) (Ecology 2010).

The DO TMDL relies on the CE-QUAL-W2 hydrodynamic and water quality model (CE-QUAL-W2 model) to assess the capacity of the Spokane River and Lake Spokane to assimilate oxygen-demanding pollutants (i.e., phosphorus, carbonaceous biological oxygen demand, and ammonia) under varying conditions (DO TMDL, page vi). Unlike point- and non-point source discharges, Avista does not discharge nutrients to either the Spokane River or Lake Spokane. Thus, it was not assigned a wasteload allocation or a load allocation. However, since the presence of the Long Lake HED increases the residence time (average amount of time it takes water to flow through Lake Spokane) the DO TMDL process assigned Avista a "proportional level of responsibility" for depressed DO levels in Lake Spokane through a water quality modeling scenario. This responsibility is reflected in Table 7 of the DO TMDL, which was subsequently corrected (Ecology 2010; Appendix B). Table 7 in the TMDL is based on a comparison of CE-QUAL-W2 model runs for the 2001 model year.

Ecology and Avista jointly conducted a 2-year baseline sampling effort that began in May 2010 and extended through October 2011 at six lake stations and two river stations. The main purpose was to gather more recent data to verify the baseline water quality conditions in 2001, which were used in the TMDL development process, and to account for any changes in water quality in the reservoir. Ecology and Avista collaborated on a monthly sampling routine extending from June through September in 2010 and 2011 in order to expand the frequency of observations at the six lake monitoring stations. To do that, Avista contracted with Tetra Tech.

Beginning in 2012, Avista took over monitoring of the six lake stations in Lake Spokane and continued that effort through 2016. Ecology would continue to provide water quality data for the three river stations (54A090, 55B070, and 54A070). Following the 2016 monitoring season, Avista, with Tetra Tech’s assistance would assess the results and success of the baseline nutrient monitoring and DO conditions in Lake Spokane and, following that assessment will work with Ecology to define future monitoring goals for the reservoir. This may include determining whether the parameters monitored, locations, duration, and frequency should be modified.

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# 2. MONITORING PROGRAM

Water samples were collected and *in situ* profiles were determined once per month in May and October and twice per month from June through September 2016 at the six in-lake locations (LL0, LL1, LL2, LL3, LL4, and LL5) (Figure 1). Station LL0 is located farthest downstream in the reservoir with a depth of 48-50 meter (m). Station LL1 is located across from the Lake Spokane Campground and Boat Launch at a depth of about 34 m. Station LL2 is down-reservoir from the City of TumTum and Sunset Bay at a depth of about 26 m. Station LL3 is just up-reservoir from Willow Bay at a depth of about 19-20 m. Station LL4 is across from Suncrest Park and boat launch at about 9 m depth. Station LL5 is the farthest up-reservoir, slightly up-reservoir from the Nine Mile Recreation Area on the north side of the river at about 6 m depth.

Longitudinally, the reservoir can be divided into three zones representing varying morphometric characteristics. The upper portion of the reservoir is considered to be the riverine zone where depths are shallow and the reservoir has morphological characteristics similar to a large river. Station LL5 is within this riverine zone. Stations LL4 and LL3 are located within the transition zone of the reservoir, where the reservoir is changing from a riverine environment to a more lacustrine environment and most of incoming particulate matter is deposited. Within the transition zone, depths are greater than in the riverine zone but the littoral areas are still similar to those in the riverine zone. Station LL3 is approximately 19-20 m deep and has a very small hypolimnion during stratification. Stations LL0, LL1, and LL2 are located in the lacustrine zone, or lake-like portion of the reservoir, where there is both littoral and pelagic (shallow and deep water) environments. Water depths in the lacustrine zone are much deeper than the rest of the reservoir and that zone stratifies into three thermal/density layers; the epilimnion, metalimnion, and hypolimnion, during summer.

The vertical structure of Lake Spokane is set up by thermal (or density) stratification, largely determined by its water inflow rates and temperature and often dissolved solids concentration (specific conductance), change in storage, climate, and location of the powerhouse intake. Within Lake Spokane's lacustrine zone, thermal stratification creates three density layers (the epilimnion, metalimnion, and hypolimnion) that are generally present between late spring and early fall. The epilimnion is the uppermost layer, and the warmest due to solar radiation. The metalimnion is the transition layer between the epilimnion and the hypolimnion and includes the thermocline. The surface inflow tends to plunge in this zone forming the interflow zone. The hypolimnion is the deepest layer and is present throughout the lacustrine zone. Inflowing water that plunges in the transition zone may enter the metalimnion and/or hypolimnion, depending on the flow rate and temperature/conductivity (density) of the inflow.

The 2016 sampling schedule is summarized in Table 2. Discrete samples at consistent depths were collected at each designated location (Table 3) and were shipped to IEH Analytical Laboratories (formerly known as Aquatic Research Inc.) for analyses. In 2013, an additional sample depth at Station LL4 was added at 4 m. This additional depth was also sampled in 2016. Water samples were analyzed for dissolved nitrate plus nitrite (DIN), total persulfate nitrogen (TN), soluble reactive phosphorus (SRP), total phosphorus (TP), and chl. Samples were collected in accordance with methods and procedures outlined in Avista's *Quality Assurance Project Plan for Lake Spokane Baseline Nutrient Monitoring* (QAPP), which was approved by Ecology and submitted to FERC in February 2014. This QAPP is a revised version of an earlier QAPP written by Ecology for the 2010 and 2011 monitoring efforts and amended in 2012.

Water temperature, DO, pH, and conductivity were determined *in situ* at each of the six sampling locations by lowering a Hydrolab® multi-parameter sonde from the boat. The *in situ* measurements were determined at prescribed depths through the water column. The measurements were determined in accordance with the methods and procedures outlined in the QAPP (Tetra Tech 2014). The Hydrolab® sonde was calibrated according to manufacturer's directions and standard measurement procedures were followed.

Volume-weighted DO and TP concentrations for each station were determined for sampling dates using CE-QUAL-W2 model segment volumes, which corresponded to 2016 monitoring stations. Volumes for model segments were obtained from Avista and Golder Associates. The monitoring stations correspond to model segments as follows:

- Station LL0: Model Segment 188, Reservoir Zone: Lacustrine
- Station LL1: Model Segment 181, Reservoir Zone: Lacustrine
- Station LL2: Model Segment 175, Reservoir Zone: Lacustrine
- Station LL3: Model Segment 168, Reservoir Zone: Transition
- Station LL4: Model Segment 161, Reservoir Zone: Transition
- Station LL5: Model Segment 157, Reservoir Zone: Riverine

Water samples for phytoplankton were collected at 0.5 m depth at each of the six sampling locations. These samples provided information on phytoplankton abundance seasonally and also longitudinally at several locations throughout the reservoir. Zooplankton were collected with a vertical haul at each of the six sampling locations from 1 m off the bottom through the water column. Both phytoplankton and zooplankton samples were sent to EcoAnalysts, Inc. in Moscow, ID for analysis. Previous (prior to 2015) phytoplankton and zooplankton analyses were performed by WATER Environmental Services, Inc.

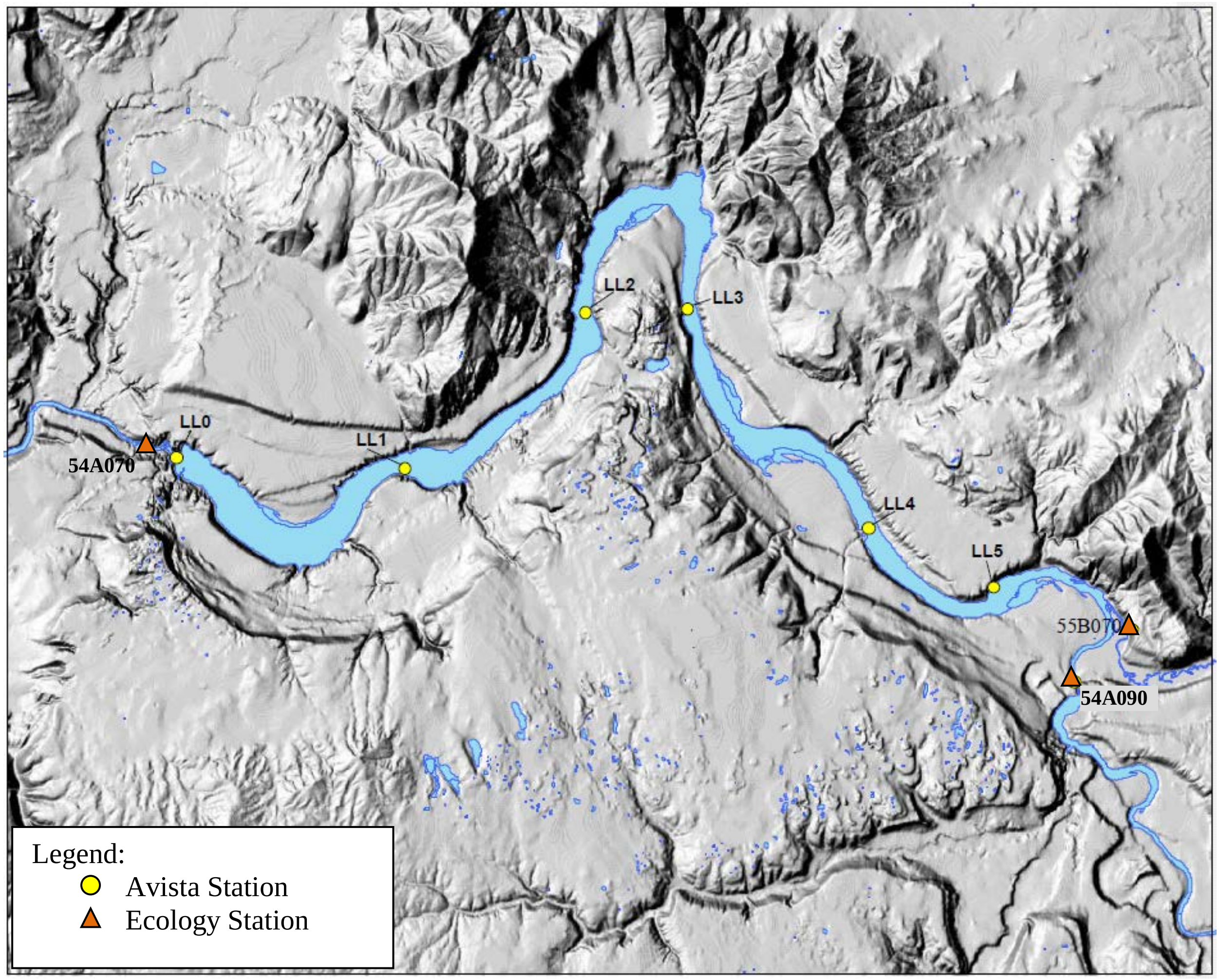

Figure 1. Lake Spokane Sampling Locations

**Table 2. Lake Spokane Monitoring Schedule during 2016**

| Sample Date | Type of Samples Collected |
|---|---|
| May 17 – 18, 2016 | Discrete Depth, *In situ*, Phytoplankton, and Zooplankton |
| June 6 – 7, 2016 | |
| June 21 – 22, 2016 | |
| July 5 – 6, 2016 | |
| July 19 – 20, 2016 | |
| August 10 – 11, 2016 | |
| August 24 – 25, 2016 | |
| September 6 – 7, 2016 | |
| September 19 – 20, 2016 | |
| October 12 – 13, 2016 | |

**Table 3. Discrete Depth Samples for Stations Monitored in Lake Spokane during 2016(1)**

| | **LL0** | **LL1** | **LL2** | **LL3** | **LL4** | **LL5** |
|---|---|---|---|---|---|---|
| Depths (m) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| | 5 | 5 | 5 | 5 | 4 | B-1 |
| | 15 | 20 | 15 | 10 | B-1 | |
| | 30 | B-1 | B-1 | B-1 | | |
| | B-1 | | | | | |

(1) B-1 is 1 m off the bottom.

# 3. 2016 RESULTS

This section summarizes water quality constituents determined *in situ*, as well as nutrient, chl, phytoplankton, and zooplankton data from water samples collected at discrete depths. The *in situ* data are presented in Appendix I. All data from water samples collected in 2016 are presented in Appendix II. Phytoplankton results are presented in Appendix III, and zooplankton results in Appendix IV.

This section also briefly summarizes the water quality conditions of the primary inflows and outflows to/from Lake Spokane as well as a description of general hydrologic and climatic conditions in 2016.

## 3.1 Climatic and Hydrologic Conditions

Weather during 2016 differed greatly from the 30-year norm reported at Spokane International Airport, with lower than normal air temperatures at the very beginning of the year, the middle of June, and then in September, and higher than normal temperatures in February through June, August, as well as in November. December temperatures started out colder than normal before returning to more normal temperatures in the middle and end of the month. Precipitation was above normal during most of late winter and spring and was well below normal from June through September. Temperatures ranged from a high of 97°F (36.1°C) on July 29 to a low of -7°F (-21.7°C) on December 16 (Figure 2). The annual cumulative rainfall total was 18.30 inches (46.5 cm), which was above the normal (Figure 2).

The year began with slightly less than normal precipitation in early January which was followed by wetter than normal conditions in late January and February. Precipitation in March was above normal by 1.69 inches (4.3 cm) with a total of 3.30 inches (8.4 cm). This contrasts with early spring dry conditions in 2013 when March rainfall was only 0.82 inches (2.1 cm). March precipitation was slightly higher than in 2014 and 2015 with 2.88 and 2.43 inches (7.3 and 6.2 cm), respectively. Precipitation was below normal in May with only 0.78 inches (2.0 cm), which was slightly less than half the normal of 1.62 inches (4.1cm) for that month.

Drought conditions, with below normal precipitation, started in June with only 0.51 inches (1.3 cm) of precipitation, which was 0.74 inches (1.9 cm) below normal. That contrasts with June 2014 which had above normal precipitation with a maximum one-day total of 1.01 inches (2.6 cm) on June 17. June 2016 precipitation also contrasts with the extremely dry June in 2015 when only 0.07 inches (0.2 cm) fell. That was also the warmest June on record with an average temperature of 71.4°F (21.9°C). The Spokane International Airport recorded a high temperature of 105°F (40.6°C) on June 28, 2015.

Drought conditions continued through July and August, 2016. August was also the hottest month of the year with an average temperature of 71.2°F (21.8°C). September brought close to normal temperatures but drought conditions prevailed with only 0.21 inches (0.5 cm) of precipitation, almost 0.5 inch below normal. October 2016 was slightly warmer than normal with an average temperature of 48.4°F (9.1°C). October 2015 was even warmer with an average temperature of

54.3°F (12.4°C) which is 6.7°F (3.7°C) above the normal average of 47.6°F (8.7°C) and the second warmest October on record. Temperatures at the airport in 2016 reached the freezing mark on two days in October, on the 11th and 12th. October 2016 was the wettest month on record at the Spokane International Airport with a record 6.23 inches (15.8 cm), breaking the old record of 5.85 inches (14.9 cm) set in November 1897. Two daily rainfall records were also set in October 2016, 0.94 inches (2.4 cm) on October 16th and 0.91 inches (2.3 cm) on October 30th.

October was warmer in 2015, temperatures did not reach the freezing mark for the entire month, similar to conditions in 2014 and the first time since 2005. November started and ended with warmer temperatures than normal but had a brief period of normal temperatures in the middle of the month. November mean temperature was 7.8°F (4.3°C) above the normal of 35.7°F (2.1°C). On November 16 temperatures finally dropped below the freezing mark for the first time in 2016. Minimum temperatures once again reached the freezing mark on November 27 following the warm spell in the middle of the month. Precipitation in November was below normal with 1.57 inches (4.0 cm) which is 0.73 inches (1.9 cm) below normal. December was slightly colder than normal with an average monthly temperature of 23.1°F (-4.9°C) despite more normal temperatures during the middle and end of the month (Figure 2). December was also drier than normal with a precipitation total of 1.49 inches (3.78 cm), 0.81 inches (2.1 cm) below normal, and a total snow accumulation of 19 inches (48.3 cm).

Figures 3 and 4 show inflows and outflows, respectively, during 2016. Inflows include all incoming water as calculated by Avista using midnight to midnight reservoir elevation and daily average outflow at midnight as recorded at Long Lake Dam. As expected, the inflows and outflows for Lake Spokane are very similar. Usually there are slight differences between inflow and outflow that occur during the early part of the year during the annual drawdown. That occurred for a short period of time in early January. Maximum inflows typically occur during March, April, and May due to spring runoff. Inflows in 2001, which was the 7Q10 for the DO TMDL, are shown in Figure 5 for comparison. Peak flows in 2016 were significantly smaller than those observed in 2011 and 2012, slightly smaller than in 2014 and 2015, and similar in magnitude to those in 2013 (Figure 5). Peak flow in 2016, however, occurred in March with an earlier peak at the middle of February, approximately two months earlier than normal. This is similar to flows in 2015 and evident in a comparison of peak flows in 2015 and 2016 with those in 2001 (Figure 5).

Both the Spokane River and the Little Spokane River had average to higher than average flows during January, February, March, and early April, 2016 (Figures 6 and 7). The peak flow in the Spokane River occurred much earlier, (late February to mid-March vs late May) in the year than historically recorded (Figure 6). Flows in the Spokane River in 2016 were much lower than average during the period of the historical peak, with an average monthly flow of 7,667 cfs (Figure 6). This is slightly higher than the 2015 average May flow of 4,134 cfs. Flows in the Spokane River from the middle of April through September were well below the historical median (Figure 6). Flows in the Little Spokane River were also below the historical median from April through the summer (Figure 7).

Water residence time can markedly affect reservoir quality. Long residence times tend to allow for more settling of particulate matter, including phosphorus in algae, and usually greater transparency. If residence times are relatively short, on the order of 10 days or less, algal biomass accumulation may be limited. Both effects can occur in reservoirs, which usually have shorter residence times than natural lakes.

Whole reservoir water residence time during 2016 (June through October) was higher than previous years at 43.3 days, except 2015 (Table 4). That was much longer than average, whole reservoir water residence time of 25 days during June through October 2010 through 2014. Including data for 2015 and 2016, average whole reservoir residence time was 34.2 days for the past seven years (2010 through 2016). Residence times in the transition and riverine zones averaged 4.7 days in 2010 – 2014, but were much higher in 2015 at 13.2 days and in 2016 at 8.1 days (Table 4). Bloom development would be limited, on average, in these zones during normal years, especially in the spring, but more able to develop during low flow in August – September of most years. Bloom development was most likely not limited by residence time in the riverine/transition zones during summer in 2016. Inflows and water residence times during 2010-2016, were separated into the seasonal timeframes consistent with the DO TMDL (Table 5). The whole reservoir residence time was 66.8 days in 2016 during the DO TMDL seasonal timeframe of July through September which was less than in 2015 (84.8 days) but higher than 2010 – 2014.

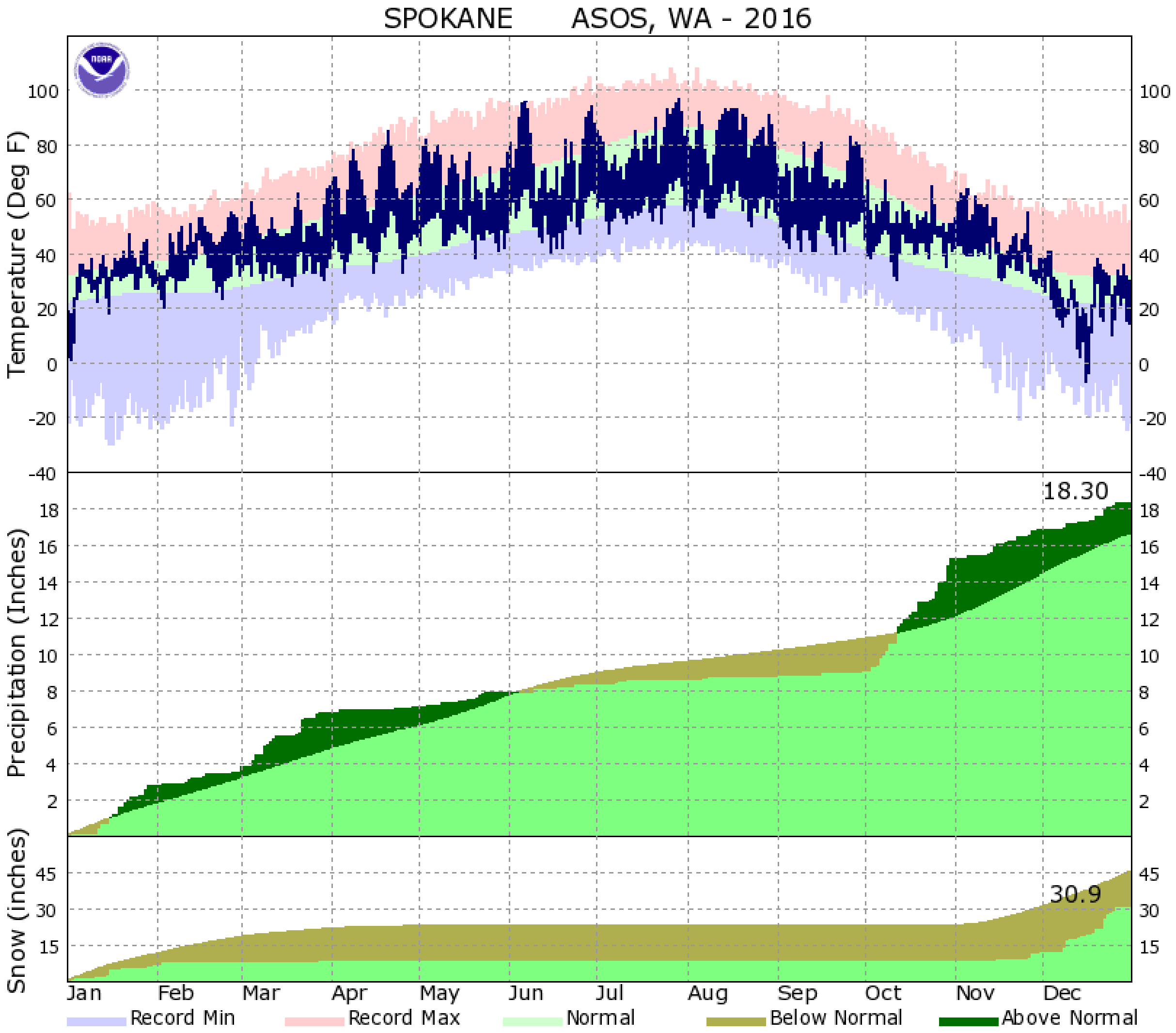

**Figure 2. Air Temperature and Precipitation at Spokane International Airport for 2016**

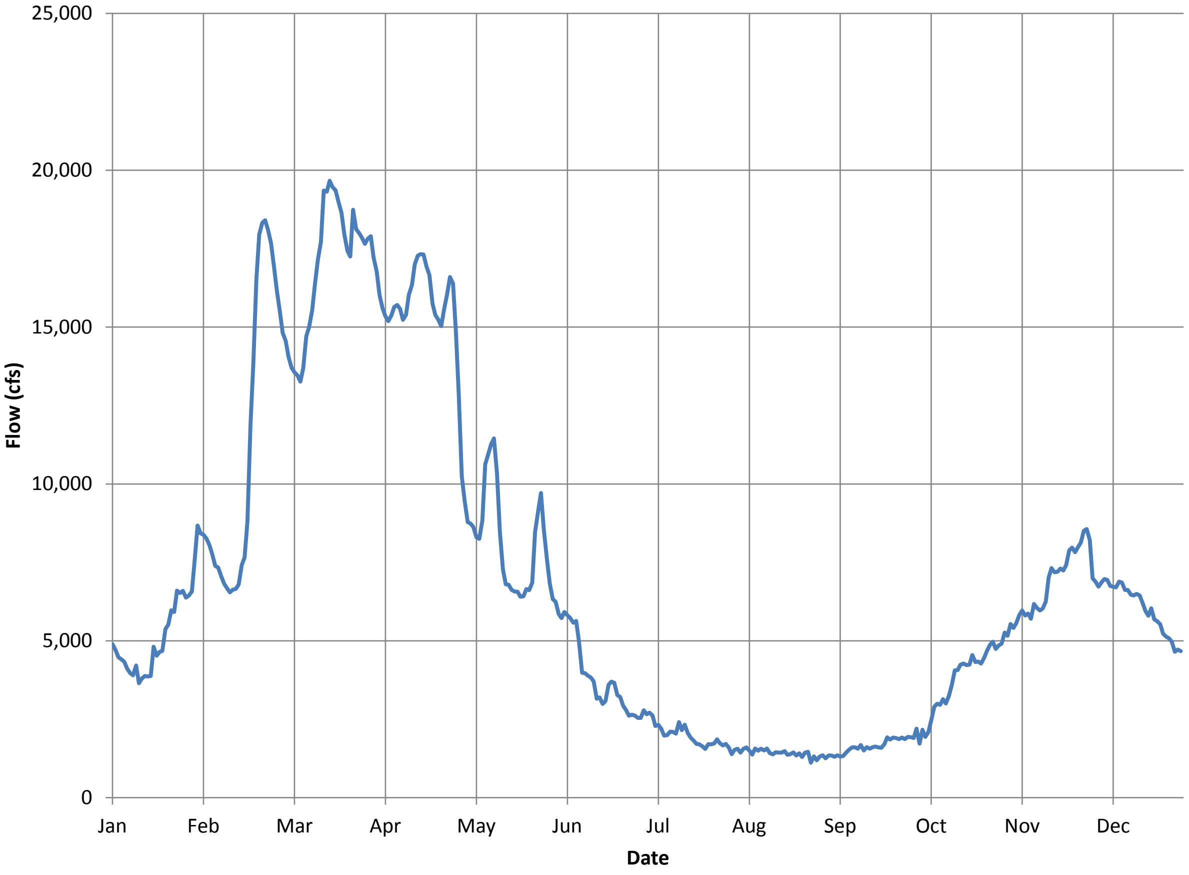

**Figure 3. Total Inflow into Lake Spokane, 2016**
**(Inflows calculated based on midnight to midnight reservoir elevation and day average outflow at midnight as recorded at Long Lake Dam)**

**Figure 4. Total Outflow from Lake Spokane, 2016
(Outflows as reported at Long Lake Dam at midnight daily)**

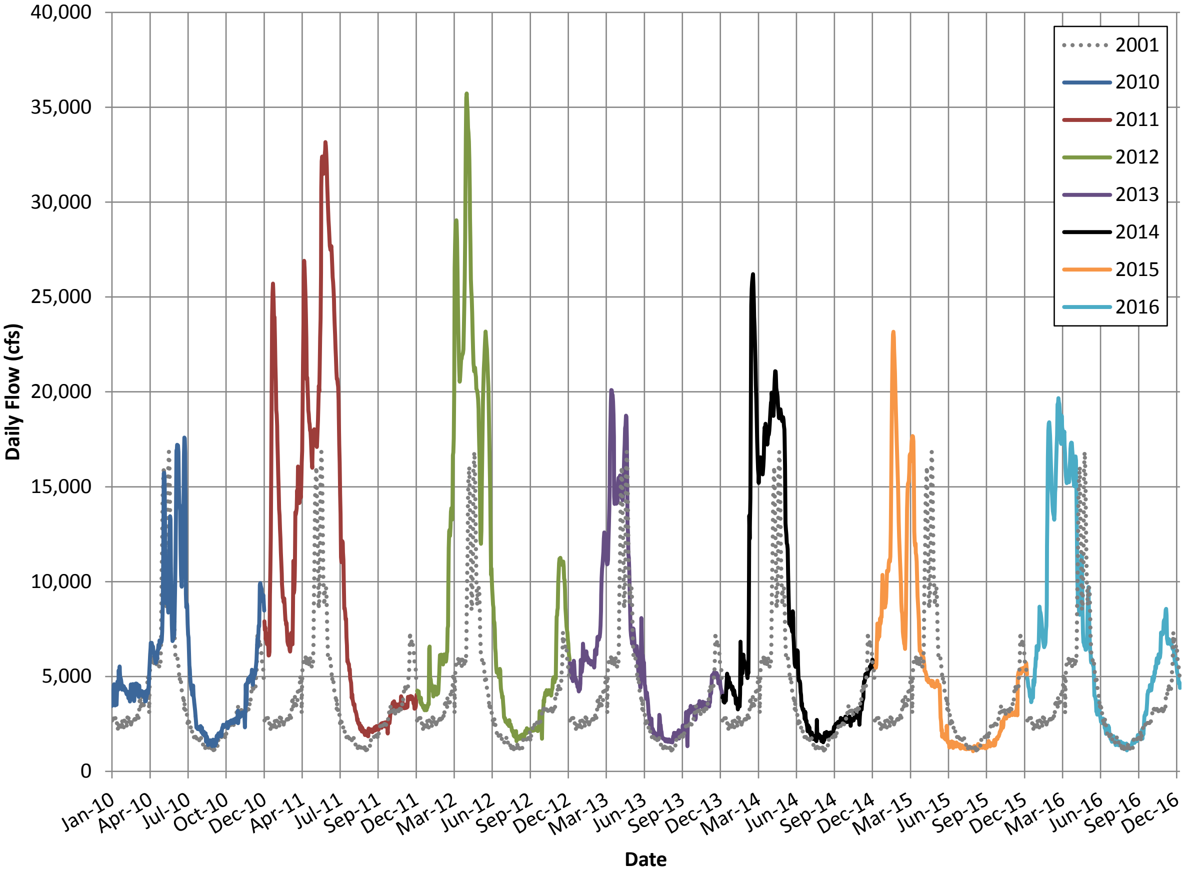

**Figure 5. Total Inflows into Lake Spokane 2010-2016**
**(Inflows calculated based on midnight to midnight reservoir elevation and day average outflow at midnight as recorded at Long Lake Dam)**

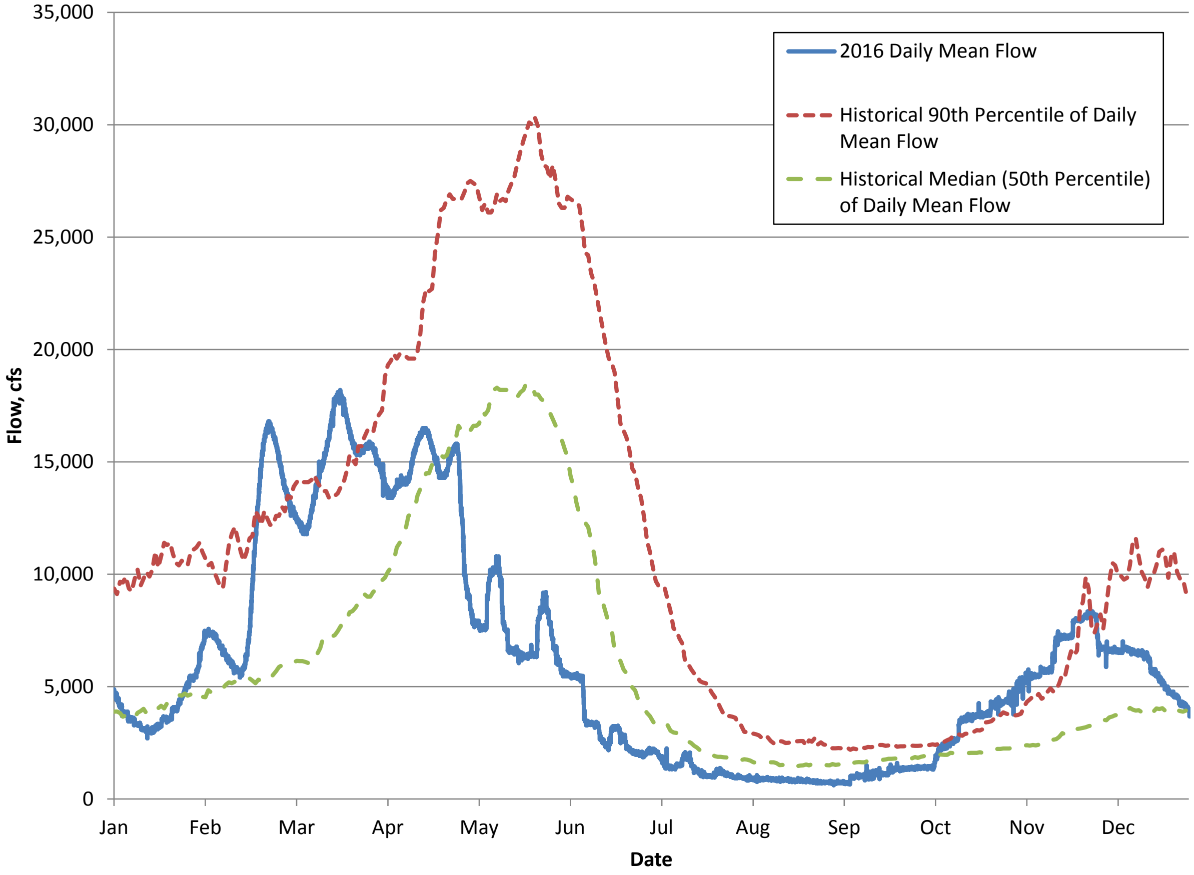

**Figure 6. Spokane River at Spokane (USGS Gage # 12422500) Daily mean flow, 2016 compared to Historical Daily Mean Flow**

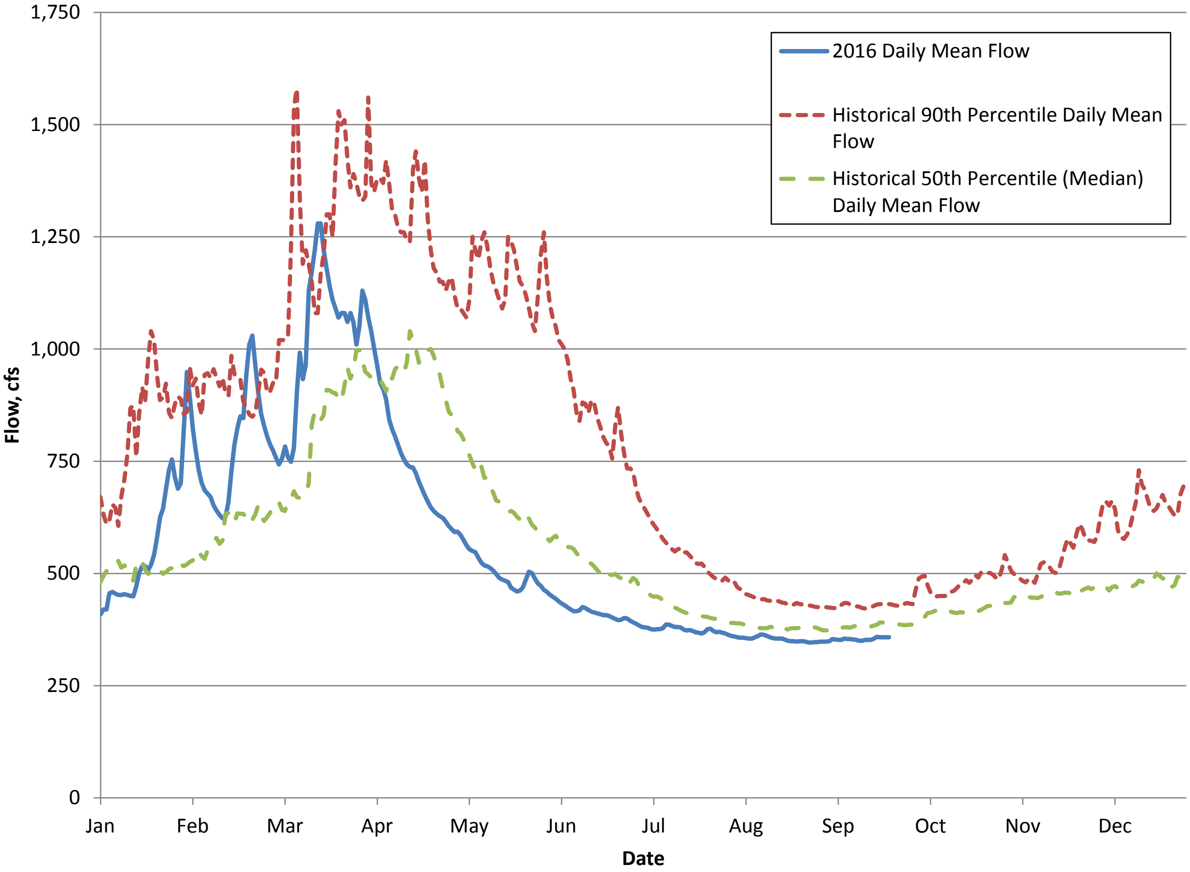

**Figure 7. Little Spokane River near Dartford (USGS Gage # 12431500) Daily mean flow, 2016 compared to Historical Daily Mean Flow (Data is through September 22$^{nd}$, 2016)**

**Table 4. Inflows and water residence times in Lake Spokane during 2001 and 2010-2016. Residence times are for June through October.**

| Year | Total Annual Flow Volume (cf x10$^6$) | Annual Mean Daily Flow (cfs) | Mean Daily Summer (June-October) Flow (cfs) | Residence Time[1] Whole Reservoir (days) | Residence Time[1] Transition/Riverine Zones (days) |
|---|---|---|---|---|---|
| 2001 | 125,782 | 3,989 | 2,413 | 46.3 | 8.7 |
| 2010 | 167,113 | 5,299 | 4,671 | 23.9 | 4.5 |
| 2011 | 337,576 | 10,704 | 7,828 | 14.4 | 2.7 |
| 2012 | 293,971 | 9,296 | 5,768 | 19.4 | 3.6 |
| 2013 | 189,846 | 6,020 | 3,035 | 36.8 | 6.9 |
| 2014 | 234,999 | 7,452 | 3,581 | 31.3 | 5.9 |
| 2015 | 171,137 | 5,427 | 1,595 | 70.1 | 13.2 |
| 2016 | 216,855 | 6,858 | 2,523 | 43.3 | 8.1 |

[1] residence time = reservoir volume/outflow

**Table 5. Daily flows and water residence times in Lake Spokane during 2001 and 2010-2016, using DO TDML seasonal timeframes.**

| Year | Mean Daily Summer Flow (cfs) | | | | Residence Time[1] Whole Reservoir (days) | | | | Residence Time[1] Transition/Riverine Zones (days) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | May | June | July – Sept. | Oct. | May | June | July – Sept. | Oct. | May | June | July– Sept. | Oct. |
| 2001 | 11,872 | 4,560 | 1,637 | 2,635 | 10.1 | 24.5 | 68.6 | 42.1 | 1.9 | 4.6 | 12.9 | 7.9 |
| 2010 | 10,036 | 13,297 | 2,550 | 2,620 | 11.2 | 8.4 | 43.8 | 42.7 | 2.1 | 1.6 | 8.2 | 8.0 |
| 2011 | 25,596 | 24,323 | 4,232 | 2,538 | 4.3 | 4.6 | 26.5 | 44.1 | 0.8 | 0.9 | 5.0 | 8.3 |
| 2012 | 23,667 | 17,333 | 3,092 | 2,520 | 4.8 | 6.5 | 36.1 | 44.4 | 0.9 | 1.2 | 6.8 | 8.3 |
| 2013 | 9,037 | 5,956 | 2,133 | 2,884 | 8.5 | 18.7 | 52.5 | 38.8 | 1.6 | 3.5 | 9.8 | 7.3 |
| 2014 | 19,127 | 8,243 | 2,373 | 2,657 | 5.9 | 13.6 | 47.2 | 41.9 | 1.1 | 2.6 | 8.9 | 7.9 |
| 2015 | 4,724 | 2,360 | 1,317 | 1,678 | 23.8 | 47.5 | 84.8 | 66.6 | 4.5 | 8.9 | 15.9 | 12.5 |
| 2016 | 8,101 | 3,865 | 1,677 | 3,735 | 13.8 | 28.8 | 66.8 | 27.7 | 2.6 | 5.4 | 12.5 | 5.2 |

[1] residence time = reservoir volume/outflow

## 3.2 Water Quality Conditions

### 3.2.1 TEMPERATURE

The maximum temperature at the surface in 2016 reached almost 23°C in the upper reservoir in early August and just over 23°C in the lacustrine zone during early June (Figures 8 through 13). These maximum temperatures are slightly lower than those observed in 2015 (26°C and 25°C in early July). In 2014, surface maximum temperatures also occurred in August but were similar to maximums observed in 2015 (25°C). Early June surface water temperatures were similar to those observed in August at all stations except LL4 and LL5. The warmer surface water observed in early June corresponded to much warmer than normal air temperatures and cooled by late June when more normal weather conditions returned. Temperatures were below 20°C at depths greater than 10 m in the lacustrine zone during 2016, as was the case in 2013, 2014, and 2015.

Thermal stratification was evident the first sampling event in May at stations LL0, LL1, LL2, and LL3. Surface temperatures were slightly higher (+0.3°C) than the rest of the water column at LL4 in May, however, stratification had not developed. This is similar to conditions in 2015, however, surface temperatures were slightly higher than the rest of the water column at both LL4 and LL5. Temperatures near the bottom in the lacustrine zone were much warmer than in 2015 (9.5 vs. 11.9-13.8°C). Lacustrine temperatures at the surface in May averaged about 2°C higher in 2016 than in 2015, due to an unseasonably warm spring. Lacustrine surface temperatures in May 2015 averaged about 2°C higher than in 2014.

Stratification had developed at all stations, except LL5, by the first sampling event in June, although stratification was weak at LL4. The water column at LL4 remained stratified until October. Stratification at station LL5 was present from the second sampling event in July through the beginning of September, which contrasted with conditions in 2015, when stratification was present from the first sampling event in June through the beginning of September, which was unusually long. In 2014, the water column at LL5 was stratified only during the month of August and in 2013 stratification was sporadic and brief (end of July, end of August, and beginning of September). The unusually high air temperatures in 2015 (mean summer temperature of 69.3°F (20.7°C) and mean summer maximum temperature of 82.1°F (27.8°C)) had a marked effect on water column temperature and density stratification.

Depth of mixing, which defines the epilimnion, was around 5 to 7 m at the three most down-reservoir stations during most of the summer, but deepened to around 10 m in September. Gradual deepening of the mixing depth toward summer end is due to surface water cooling and increased density that reduced energy needed to mix the water column by wind. A similar pattern of shallow mixing occurred at station LL3. Mixing depths at LL4 were more consistent over the summer at 3 to 4 m, but did not deepen in September when surface water cooled. Mixing depths at LL5, when stratified, were very shallow at 1 to 2 m with complete mixing occurring during mid to late September.

The extent of the metalimnion and depth of the hypolimnion varied throughout the summer, which is typical in reservoirs that are strongly affected by river inflow and plunging interflows. The metalimnion is the layer with greatest temperature change with depth – typically over 5 to 10 meters in Lake Spokane. Depth of the hypolimnion can be taken from roughly the inflection point, where rate of temperature change with depth begins to slow - about 10 m during the summer months - to the bottom (Figures 8 through 10). For most dates the hypolimnion depth began at about 10 m to 15 m, becoming shallower in June and deepening later in the summer as the thermocline eroded. That variation is due to the river inflow plunging to different depths consistent with inflow density (temperature and conductivity). Conductivity profiles show the pattern of plunging inflows, which cause much of the temperature variation in the reservoir.

The water column at all stations, except LL4 and LL5, during the October sampling event were still stratified. The deepening of the epilimnion at these stations in October indicates that the turnover process had begun. This pattern was similar to that observed in 2015, although the period of stratification was longer in 2015.

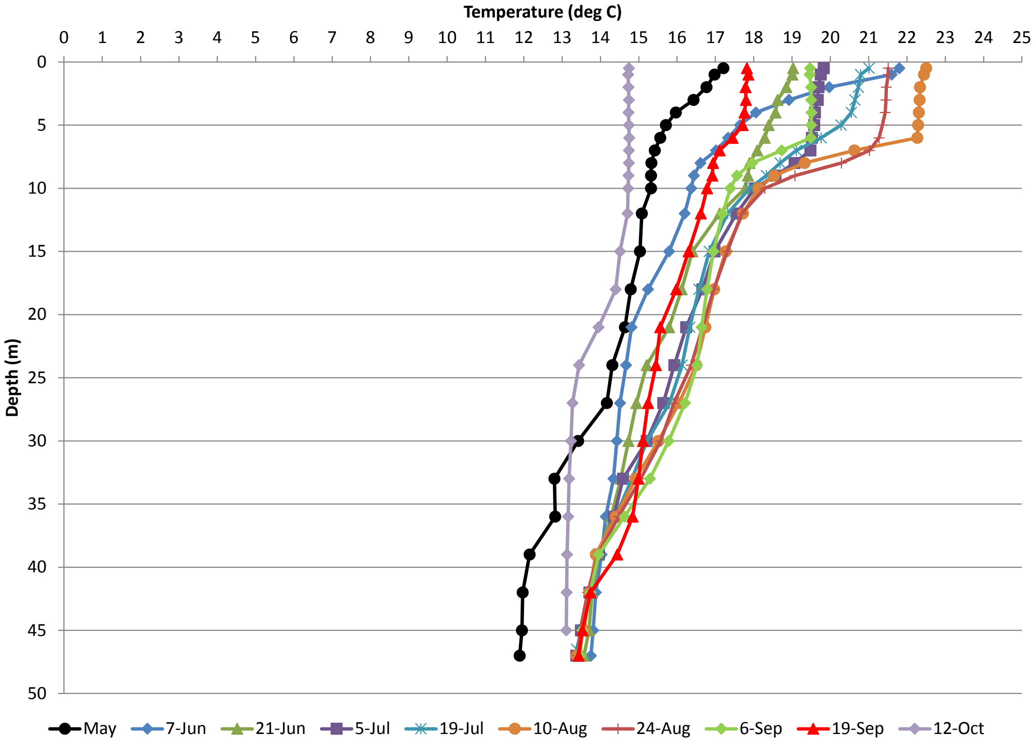

**Figure 8. Temperature Profiles for Station LL0, May-October 2016**

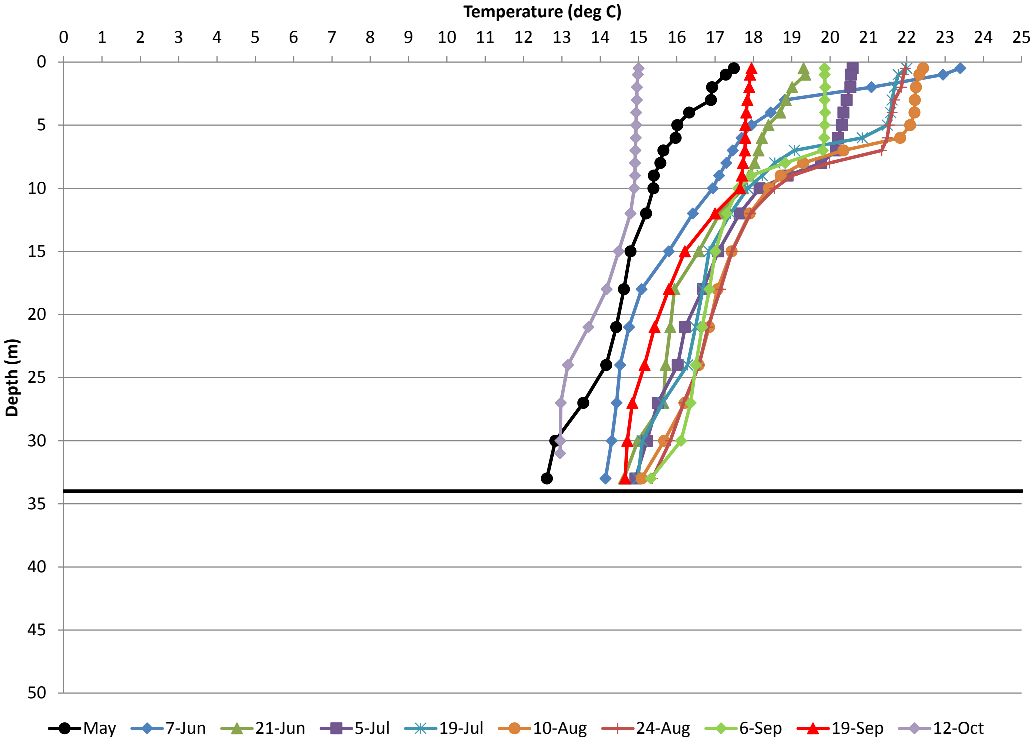

Figure 9. Temperature Profiles for Station LL1, May-October 2016

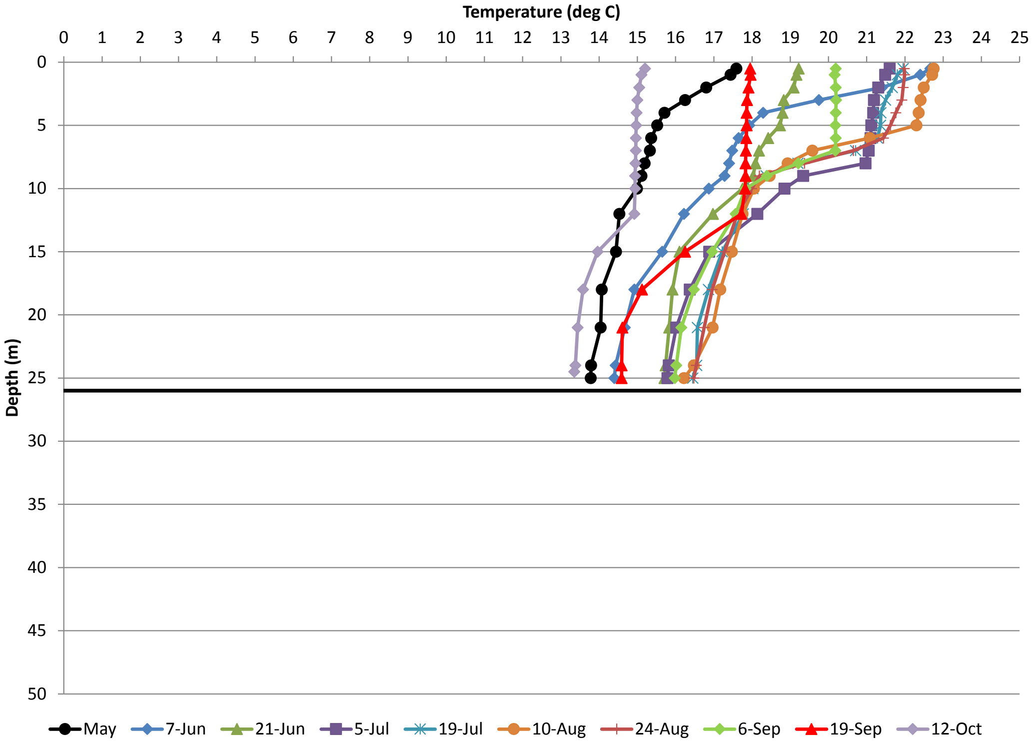

Figure 10. Temperature Profiles for Station LL2, May-October 2016

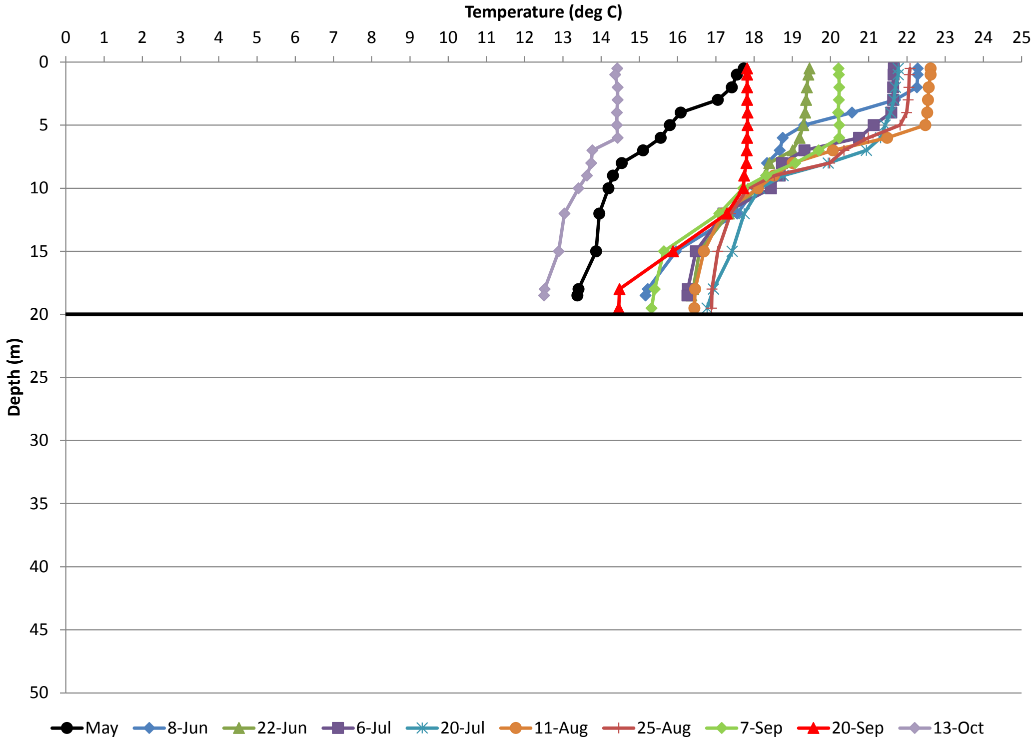

Figure 11. Temperature Profiles for Station LL3, May-October 2016

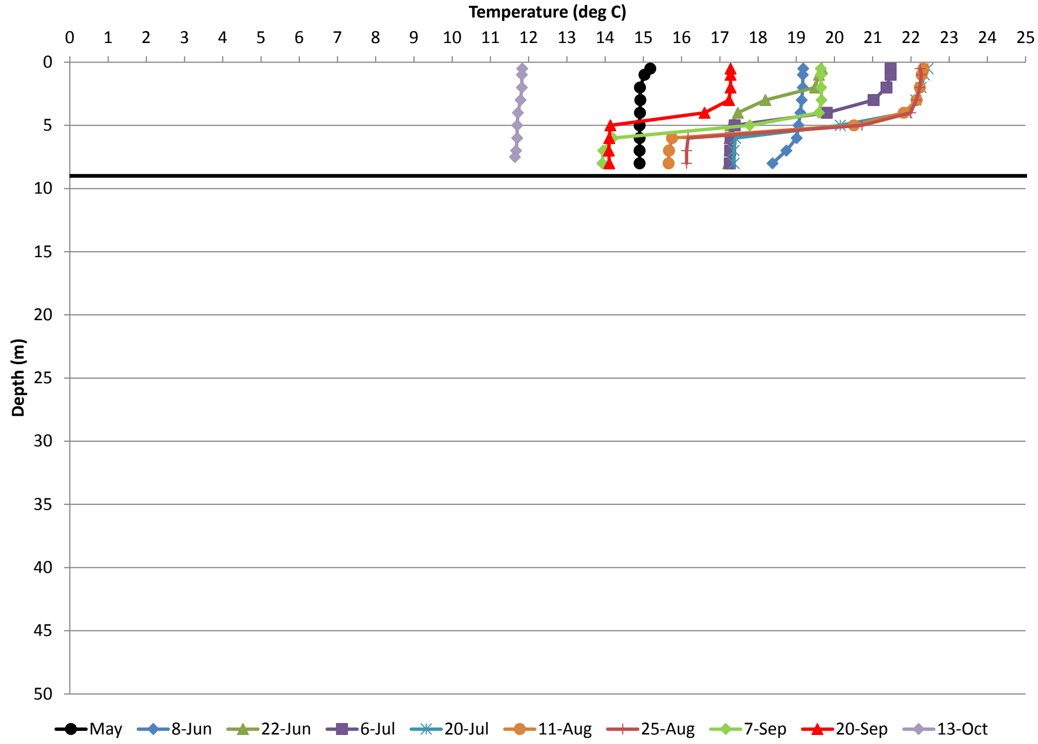

Figure 12. Temperature Profiles for Station LL4, May-October 2016

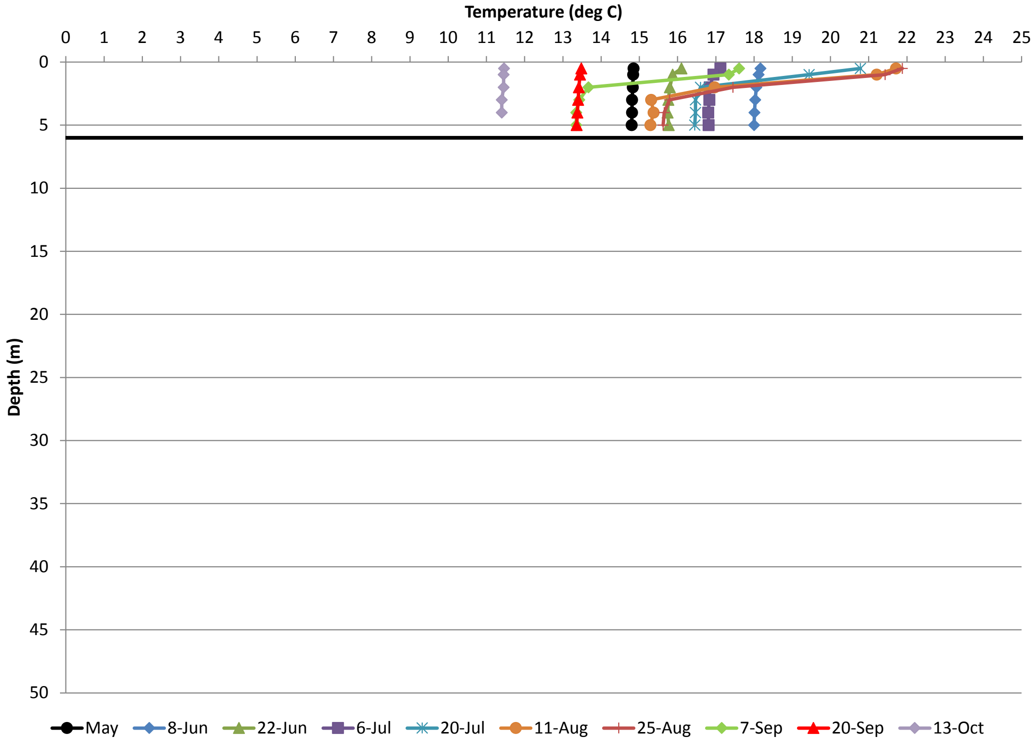

**Figure 13. Temperature Profiles for Station LL5, May-October 2016**

## 3.2.2 CONDUCTIVITY

Conductivity ranged from about 87 to 297 micro Siemens/cm (µS/cm) throughout the reservoir (Figures 14 to 19). Conductivity is a conservative constituent, because it largely represents the major ions (Ca, Mg, etc.) that are usually not influenced by gains and losses due to physical (sedimentation) or biological processes. It also represents the contribution of dissolved solids to density.

Conductivity throughout the reservoir in 2016 was similar to 2015 levels which ranged from 106 to 290 µS/cm. Conductivity was lower in 2014, ranging from 69 to 270 µS/cm. The difference was due to a concentration effect from lower river flows in 2015 and 2016. During May and early June, 2016, when river flows were relatively high, conductivity was low at all sites due to dilution with low conductivity inflow. Also, in May and early June, 2016, conductivity was somewhat uniform throughout the water column at the deeper stations. As river flow continued to decrease, inflow conductivity at LL5 increased to 256 µS/cm on July 20 and peaked at 297 µS/cm on September 24 (Figure 19).

The interflow zone was easily definable with high conductivity that increased from around 150 µS/cm in June and reached a maximum of 287 µS/cm in September. The interflow zone extended from about 7 to 18 m at stations LL3 to LL0 in June and expanded to 39 m at LL0 in September as the denser, higher conductivity water plunged and moved through the reservoir at those depth intervals. The high conductivity/density water (270-290 µS/cm) in August and early September moved along the reservoir bottom from LL5 to LL2, where depths were greater than or equal to 25 meters and entered the deeper reservoir portion between 10 and 25 m. Below 30 m, conductivity was usually less than 150 µS/cm. Conductivity in bottom waters at LL0 below 39 m had increased only slightly (112 to 123 µS/cm) from June through September. This pattern resulted in much of the metalimnion in the lower reservoir being composed of river inflow. River inflows in 2016 were high enough in October to mix higher conductivity water to the deepest portions of the reservoir, as was the case in the past years of monitoring, with the exception of 2015. In 2015, river inflows were still too low in September and October to mix the higher conductivity water to the deepest portions of the reservoir.

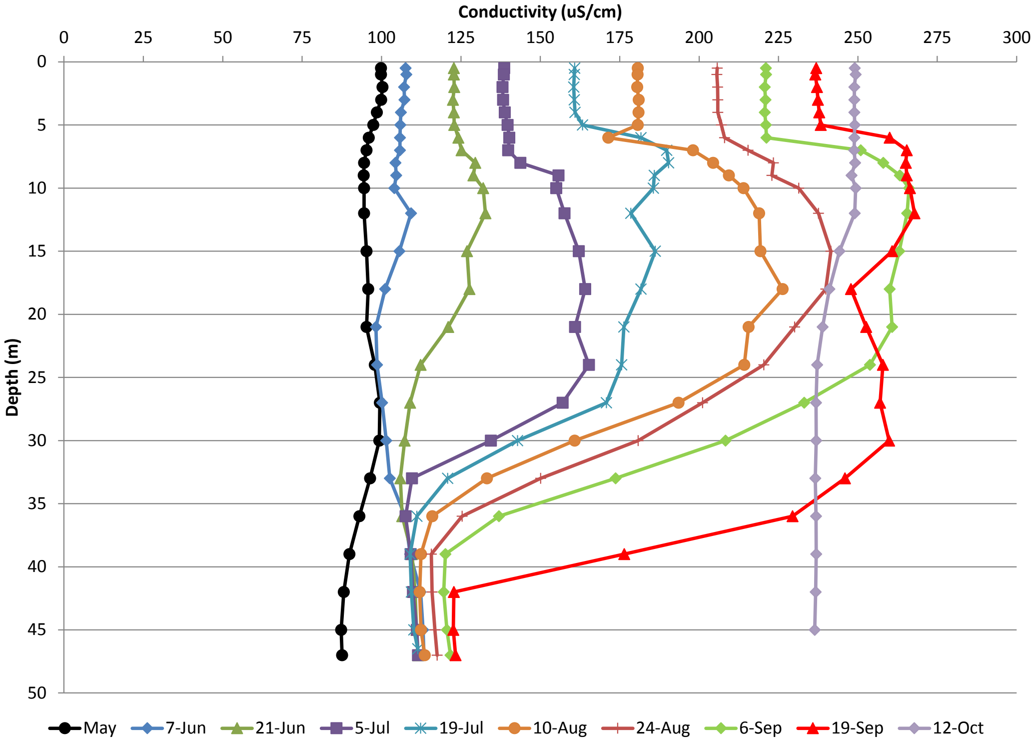

**Figure 14. Conductivity Profiles for Station LL0, May-October 2016**

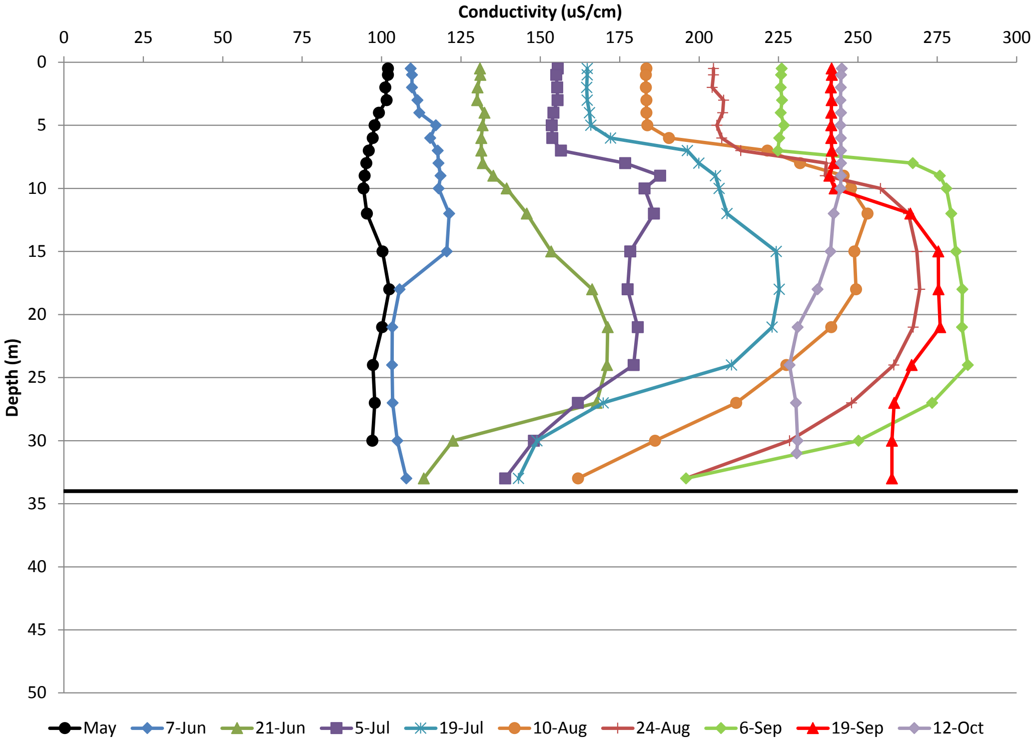

**Figure 15. Conductivity Profiles for Station LL1, May-October 2016**

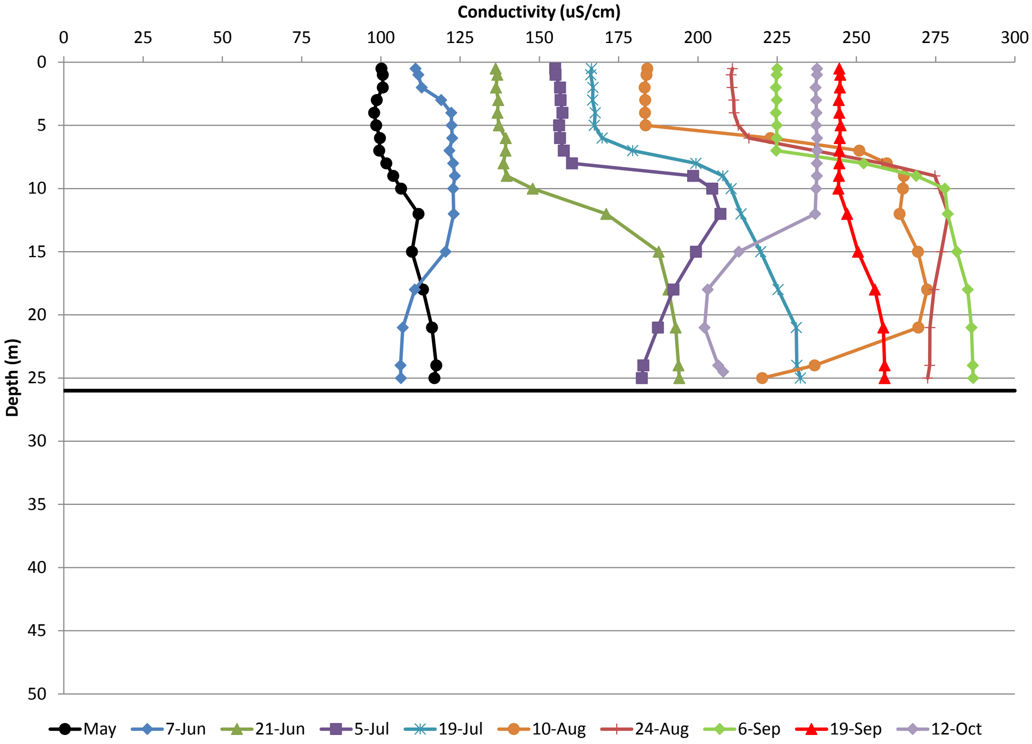

**Figure 16. Conductivity Profiles at Station LL2, May-October 2016**

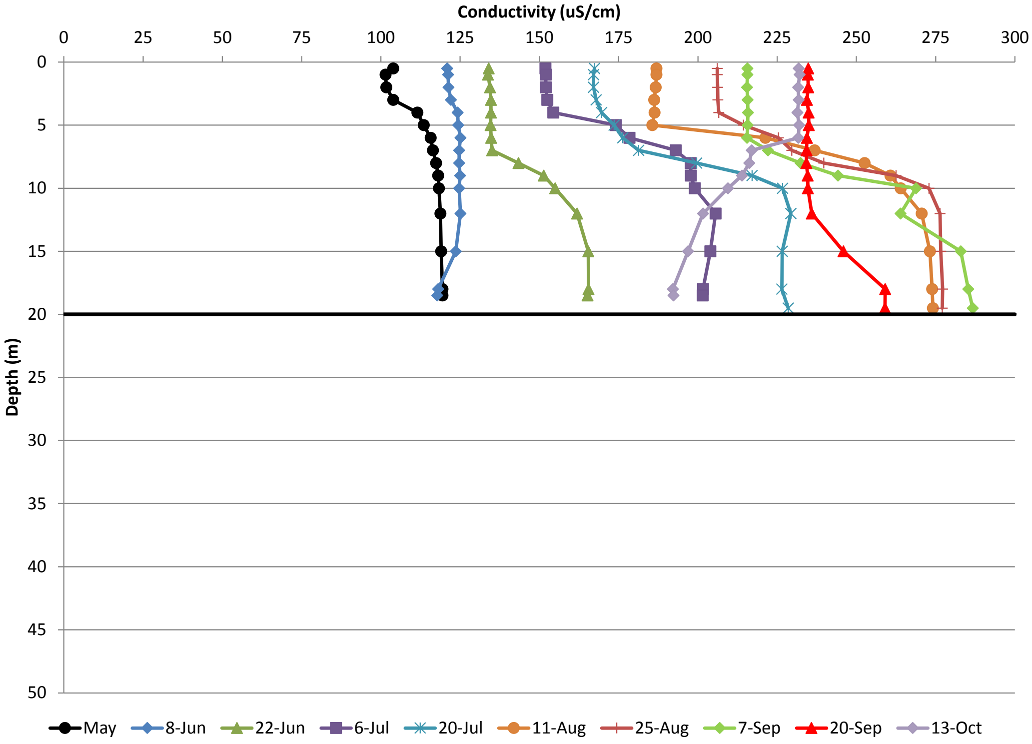

Figure 17. Conductivity Profiles at Station LL3, May-October 2016

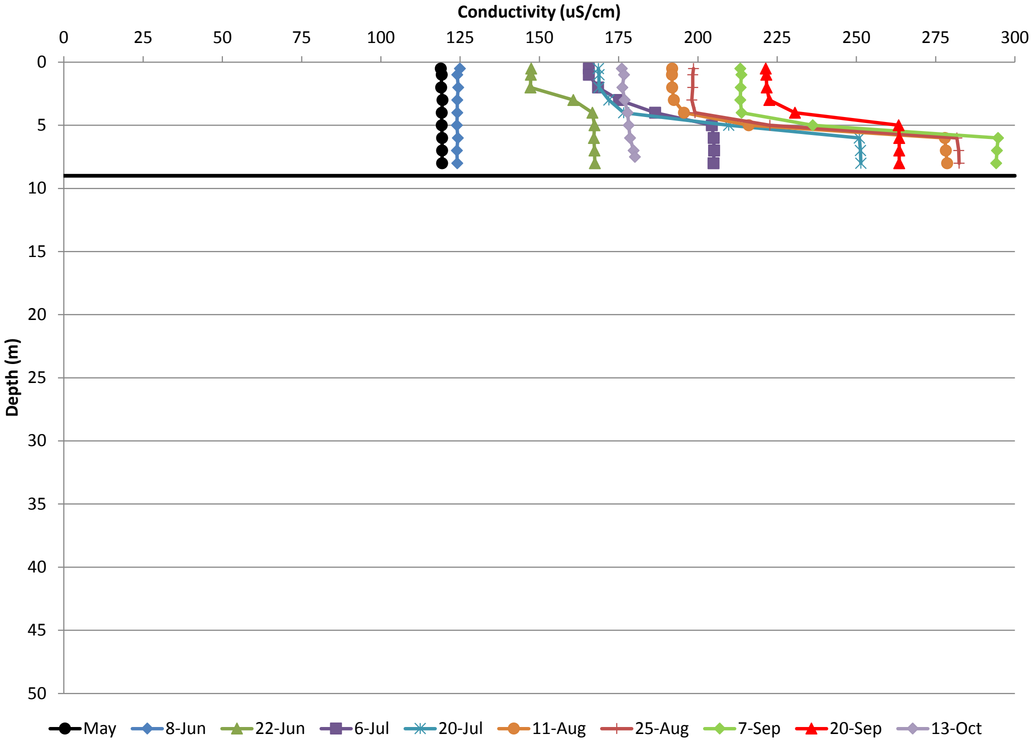

Figure 18. Conductivity Profiles at Station LL4, May-October 2016

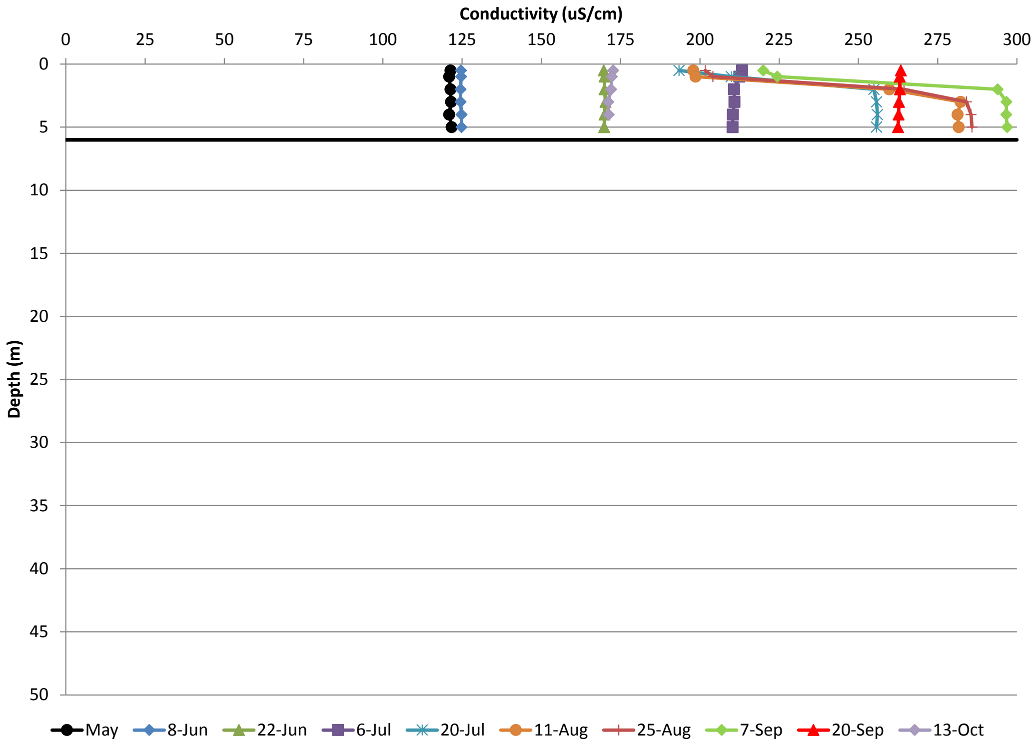

**Figure 19. Conductivity Profiles at Station LL5, May-October 2016**

### 3.2.3 DISSOLVED OXYGEN

Maximum epilimnetic DO concentrations were very similar between all six stations and ranged from 11.4 to 12.2 mg/L (Figures 20 to 25). Maximum epilimnetic DO concentrations ranged from 10.7 to 14.5 mg/L in 2010, 11.9 to 12.4 mg/L in 2011, 11.4 to 12.5 mg/L in 2012, 11.6 to 13.4 mg/L in 2013, 12.0 to 14.1 mg/L in 2014, and 11.4 to 14.5 mg/L in 2015. Epilimnetic water was super saturated in May at stations LL2 and LL3, indicating high photosynthetic rates (Figures 22 and 23). Concentrations were highest and super saturated at stations LL0, LL1, and LL4 in August around 4 to 7 m, also due to photosynthetic activity. High concentrations at LL0 similarly occurred in July in 2013, August in 2014, and July 2015.

During the 2016 monitoring period, minimum DO concentrations (0.0 mg/L) occurred near the bottom at the two deepest stations LL0 and LL1 (Figures 20 – 21). Hypolimnetic DO below 25 m declined progressively with time at these two sites. The deep hypolimnetic volume was probably not exchanged/diluted appreciably by the interflow (especially at LL0), as indicated by conductivity profiles (Figures 14 – 15), allowing DO at depth to gradually deplete. Anoxia (< 1 mg/L) was reached earlier (July) at LL0 than at LL1 (August). Vertical mixing of bottom waters and increased DO at station LL1 and LL2 occurred in September, but not until October at station LL0.

Minimum DO concentrations in 2010 – 2015 also occurred at the two deepest stations (LL0 and LL1), but in 2011 minimums were substantially higher (3.2, 6.9 mg/L) at those sites than observed in 2015 (all zero mg/L), in 2014 (all zero mg/L), in 2013 (zero and 0.9 mg/L), in 2012 (1.6, 0.5

mg/L), or in 2010 (0.13, 2.3 mg/L). Minimum DOs in 2013 through 2016 were the lowest observed of the seven years. Average water column DO in 2016 ranged from 7.3 to 10.2 mg/L, with the lowest values at the two deepest stations.

The effect of interflow on DO depletion, as indicated by conductivity profiles, was most pronounced during late July, August and September at stations LL0, LL1, and LL2 in the lacustrine zone, and to a lesser extent at LL3 in the transition zone. The DO depletion in the interflow zone (approximately 10 – 20 m) in August and September in 2016 was not as great as that in 2015. DO depletion in the metalimnion to levels less than 6 mg/L occurred only at Station LL0 in 2016 and only during late August and September. Dissolved oxygen depletion in 2015 occurred at multiple stations in August and September and at Station LL0 during July through September. This pattern of DO depletion persisted until October at LL0, as was the case in 2015, but minimum metalimnetic DO concentration was much higher in 2016 (7.4 mg/L vs. 5.5 mg/L). Unlike 2015, October hypolimnetic DO in 2016 was higher than in the interflow influenced metalimnion.

The pattern of plunging interflow effect on DO is further shown by combining profile data from the low-flow, high inflow conductivity summer period for the lacustrine zone (Figure 26). The marked decline in DO in the metalimnion below about 6 m corresponds with high conductivity water that plunged into the upper reservoir interflow, usually between 6 to 24 m. The plunging inflow likely carried DO-demanding organic matter from the productive transition and riverine zones. This pattern is similar to those in 2014 and 2015. However, it is likely that algae produced in the epilimnion may have also settled and contributed to hypolimnetic DO depletion.

Volume weighting DO concentrations is a method that provides an average DO concentration throughout the water column. Average volume-weighted DO concentrations were calculated for each station and sampling date using DO data from 9 m and deeper and CE-QUAL-W2 model segment volumes below 8.5 m (Avista and Golder Associates; Table 6). The purpose was to be consistent with the method Ecology used to produce Table 7 in the DO TMDL report. More specifically, the calculation was completed by the following procedure.

> *At each station, for each sampling day, measured DO concentrations from 9 m and deeper were multiplied by their associated volumes of water, products were summed, and then divided by the total volume of water at each station from 8.5 m and deeper. The volumes of water were obtained from the CE-QUAL-W2 model segments identified in the DO TMDL.*

The lacustrine zone average volume-weighted DO includes concentrations from LL0, LL1, and LL2 but not the very small portion of the hypolimnion at station LL3.

**Table 6. Volume-Weighted hypolimnetic DO concentrations in Lake Spokane, during May-October 2016, using DO concentrations determined from 9 meters and deeper**

| Station | Volume-Weighted DO (mg/L) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | May 17-18 | June 7-8 | June 21-22 | July 5-6 | July 19-20 | August 10-11 | August 24-25 | September 6-7 | September 19-20 | October 12-13 |
| **LL0** | 9.4 | 9.2 | 7.9 | 7.2 | 6.2 | 5.2 | 4.1 | 3.7 | 4.2 | 8.3 |
| **LL1** | 9.8 | 9.5 | 8.2 | 7.8 | 6.7 | 5.5 | 6.0 | 6.2 | 7.9 | 8.6 |
| **LL2** | 9.9 | 9.4 | 9.1 | 8.1 | 8.2 | 7.1 | 7.0 | 7.7 | 8.9 | 9.2 |
| **LL3** | 10.6 | 9.2 | 9.5 | 7.6 | 8.2 | 8.8 | 8.9 | 9.0 | 9.4 | 9.7 |
| **LL4** | -- | | | | | | | | | |
| **LL5** | -- | | | | | | | | | |
| **Lacustrine Zone only Average (LL0, LL1, LL2)** | 9.7 | 9.4 | 8.4 | 7.7 | 7.0 | 5.9 | 5.7 | 5.9 | 7.0 | 8.7 |

Volume-weighted DO concentrations for the hypolimnion from 15 m and deeper were also calculated using the same procedure and model segment volumes (Table 7). The lowest volume-weighted hypolimnetic DO (3.0 mg/L) observed at any site below 15 m in 2016 was during the early September sampling event at station LL0 (Table 7), which was 1.1 mg/L higher than in 2015 and only 0.4 mg/L higher than in 2014. The minimum average volume-weighted whole hypolimnetic DO in the lacustrine zone was 5.1 mg/L during late August and was higher than in 2015 (4.5 mg/L) but lower than in 2014 (6.0 mg/L) and 2013 (5.8 mg/L). Water residence times in 2013, 2014 and 2016 were about half that in 2015. However, timing of the minimum average whole hypolimnetic DO in late August, 2016, was similar to that in 2015 (late July/late August), 2014 (late July/early August) and in 2013 (late August).

While DO improved in Lake Spokane during years shortly after 1977, when 85% of point-source effluent phosphorus was removed from the inflowing river, and had improved further by 2010, the levels observed in 2016 still do not meet the surface water quality standard in the hypolimnion during portions of the critical summer season.

**Table 7. Volume-Weighted Hypolimnetic DO concentrations in Lake Spokane, during May-October 2016, using DO concentrations determined from 15 meters and deeper**

| Station | Volume-weighted DO (mg/L) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | May 17-18 | June 7-8 | June 21-22 | July 5-6 | July 19-20 | August 10-11 | August 24-25 | September 6-7 | September 19-20 | October 12-13 |
| **LL0** | 9.3 | 8.9 | 7.6 | 6.4 | 5.6 | 4.6 | 3.3 | 3.0 | 4.0 | 8.1 |
| **LL1** | 9.4 | 9.0 | 8.0 | 7.2 | 6.0 | 4.5 | 5.3 | 6.1 | 8.0 | 8.6 |
| **LL2** | 9.7 | 8.9 | 9.2 | 7.4 | 8.0 | 7.0 | 6.5 | 8.4 | 9.3 | 9.1 |
| **LL3** | 10.5 | 8.4 | 9.6 | 7.0 | 7.5 | 8.9 | 9.1 | 9.4 | 9.6 | 9.7 |
| **LL4** | -- | | | | | | | | | |
| **LL5** | -- | | | | | | | | | |
| **Lacustrine Zone only Average (LL0, LL1, LL2)** | 9.5 | 8.9 | 8.2 | 7.0 | 6.5 | 5.3 | 5.1 | 5.8 | 7.1 | 8.6 |
| **Whole Hypolimnetic Average (LL0, LL1, LL2, LL3)** | 9.7 | 8.8 | 8.6 | 7.0 | 6.8 | 6.2 | 6.1 | 6.7 | 7.7 | 8.9 |

Average lacustrine, volume-weighted DOs in 2016 were similar below 9 m and below 15 m, differing by only 0.3 mg/L on average with a range of 0 to 0.7 mg/L (Tables 6 and 7). Average lacustrine DOs were slightly higher in July and August below 9 m than below 15 m; this was similar to the pattern observed in 2014 and 2015. Average lacustrine DOs below 9 m were 0.8 mg/L higher in 2016 than in 2015, while the 2015 levels were 1.4 mg/L less than those in 2014. The largest difference in DOs below 9 m between 2015 and 2016 was during the early summer period (June and July) when average DOs in 2016 ranged from 1.1 to 1.7 mg/L higher than those in 2015 and during October when DOs were 1.5 mg/L higher. This was also the case for lacustrine, DOs below 15 m, that averaged (volume-weighted) 1.1 mg/L higher in 2016 than those in 2015 with the largest differences occurring during the same months – June, July, and October.

The rationale for including depths between 9 and 15 m for the TMDL was probably to include DOs in the metalimnion that are lower at times than in the hypolimnion, due to the influence of the interflow zone. However, DOs were usually consistently lower below 15 m than below 9 m, as shown in Figures 20 and 21 and by the volume-weighted average concentrations. That may be partly due to more oxygen input by photosynthesis in recent years given the increase in transparency. Transparency extended to 9 m in July. Given that the Secchi disk disappears at about 15% surface light intensity, the photic zone depth (1%) was about 22 m in July. While photosynthesis was possible at that depth, maximum photosynthesis was probably around 3 – 4 m, which is also indicated in Figures 20 and 21.

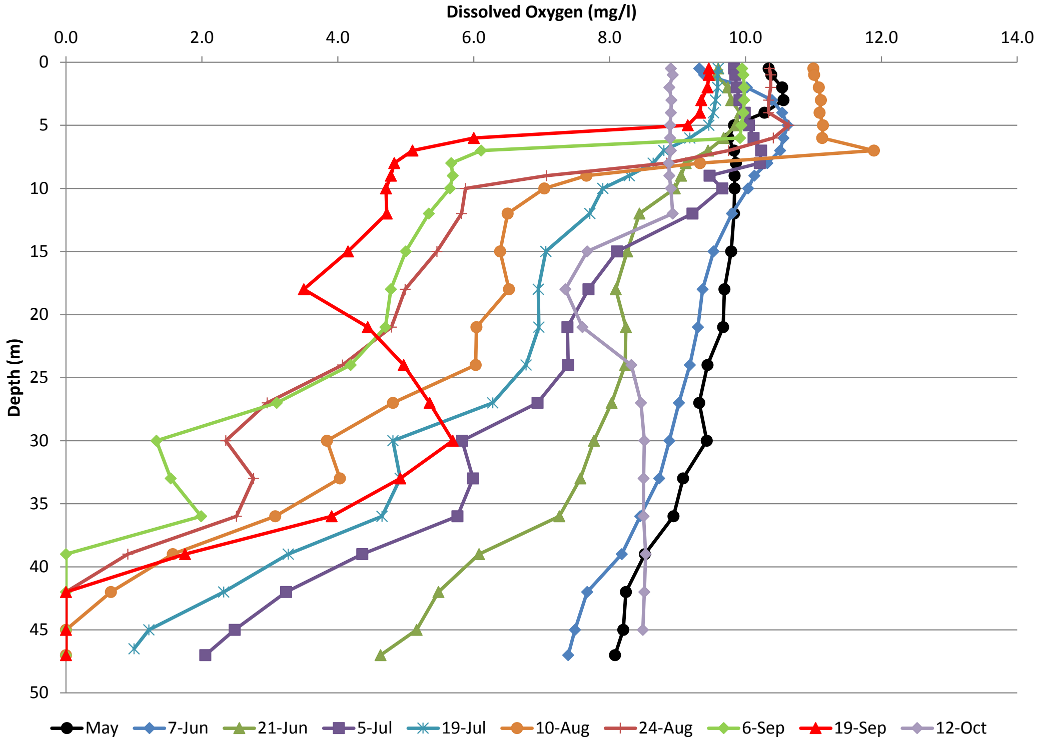

Figure 20. DO Profiles for Station LL0, May-October 2016

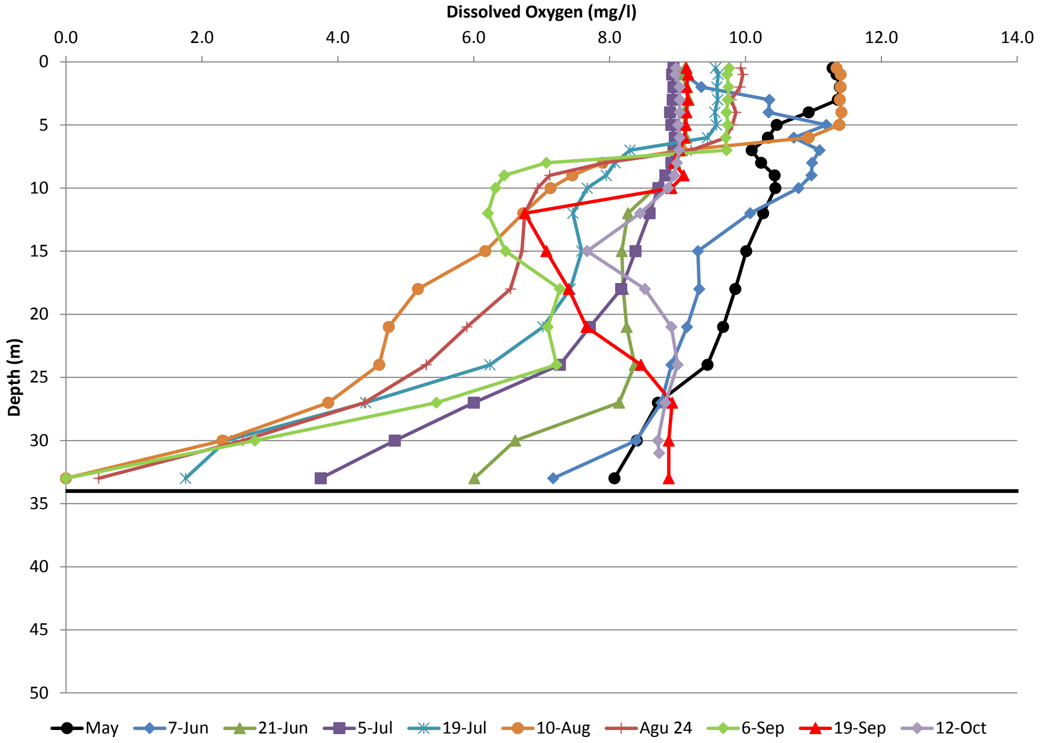

Figure 21. DO Profiles for Station LL1, May-October 2016

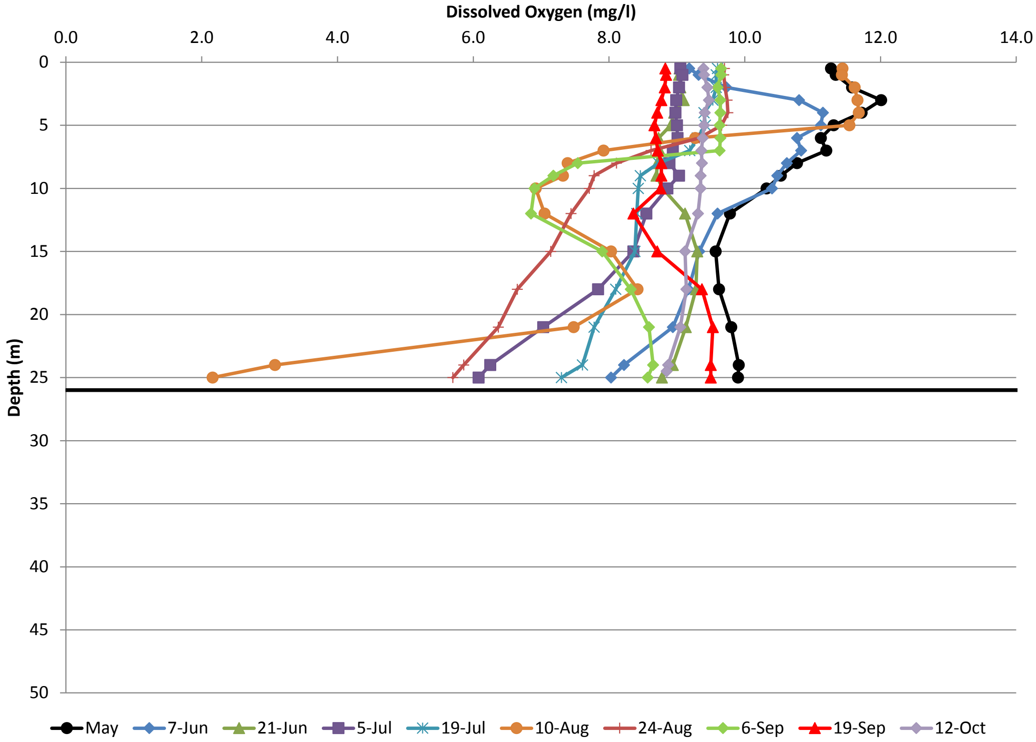

Figure 22. DO Profiles at Station LL2, May-October 2016

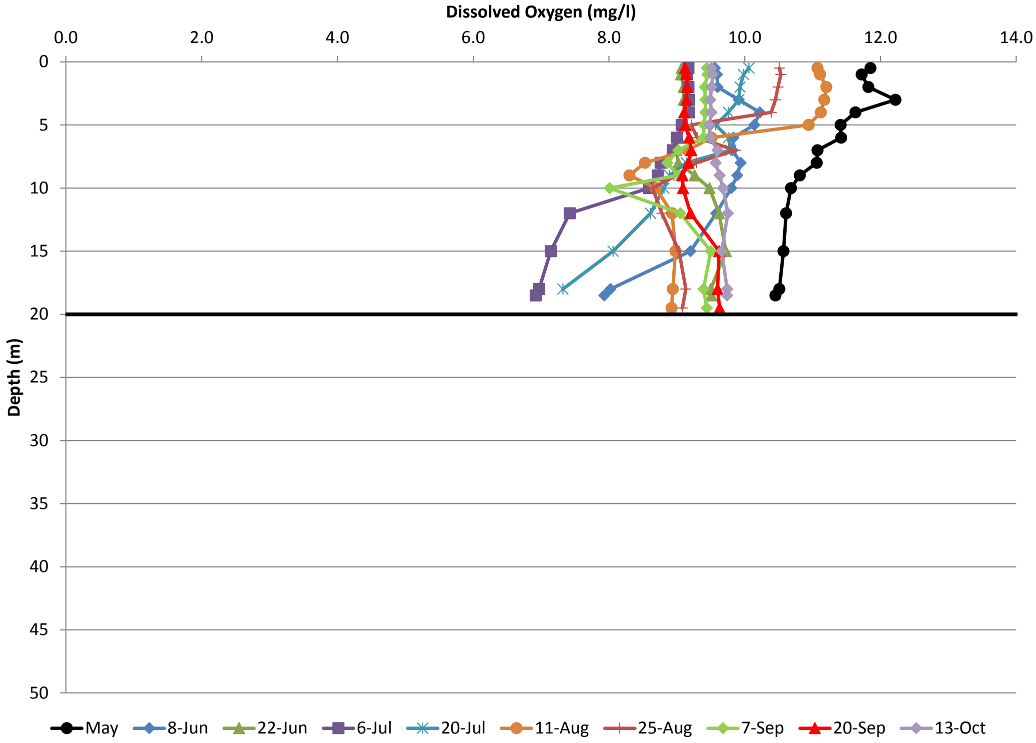

Figure 23. DO Profiles at Station LL3, May-October 2016

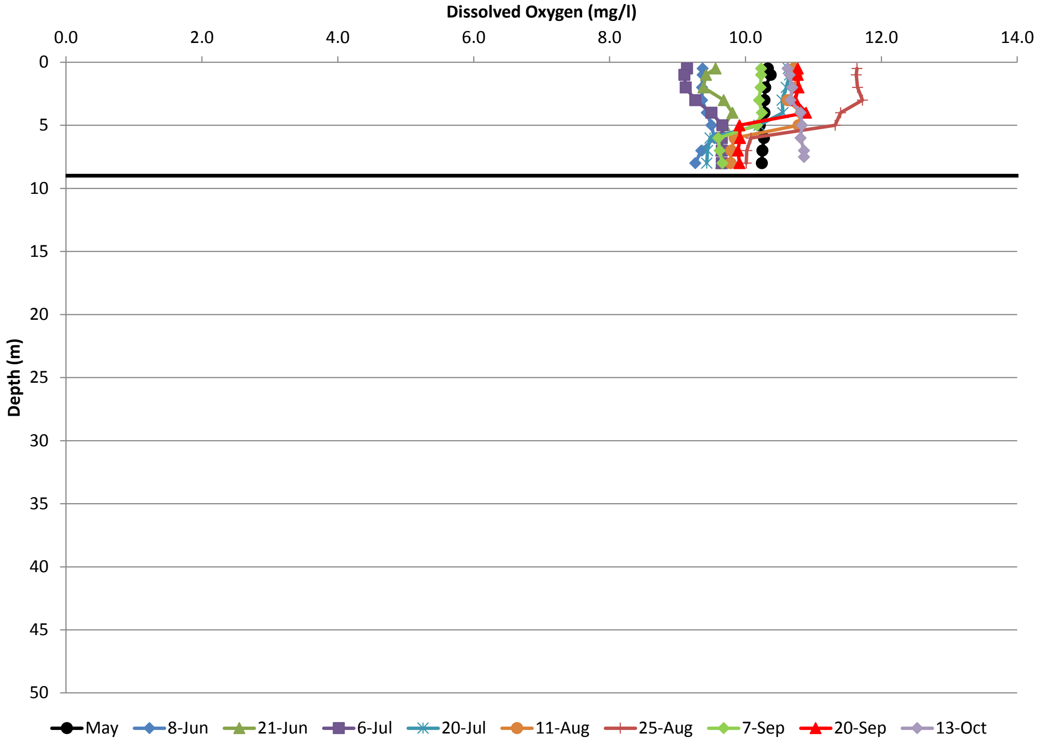

Figure 24. DO Profiles at Station LL4, May-October 2016

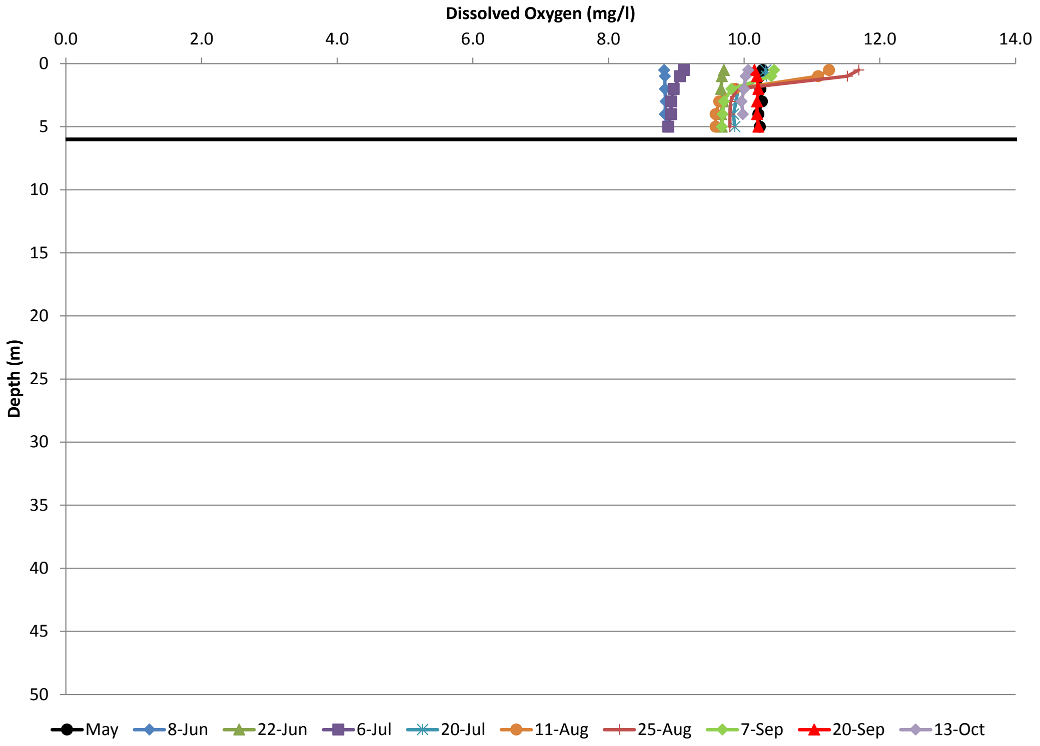

Figure 25. DO Profiles at Station LL5, May-October 2016

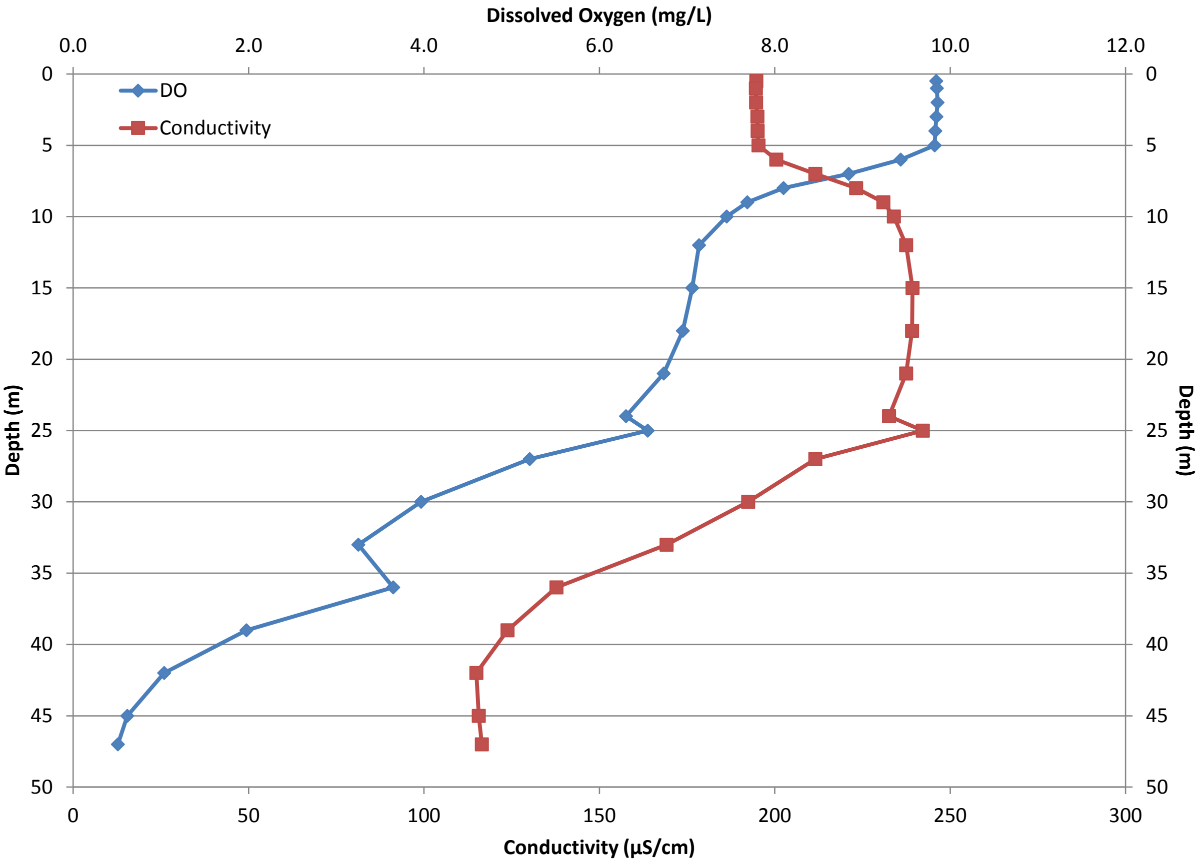

**Figure 26. Average DO and Conductivity Profiles for Stations LL0, LL1, and LL2 from July 5th through September 19th, 2016.**

### 3.2.4 PH

The range in pH through the water column was 6.7 to 9.0 at the six stations during 2016 (Figures 27 through 32). The range in water column average pH was narrower, less than one pH unit (7.3 to 8.1). The highest pH levels occurred in the epilimnion during early August at the deeper stations (LL0, LL1, and LL2) and during late August at the shallower stations (LL4 and LL5). The highest pH levels were in the epilimnion probably due to photosynthesis by phytoplankton which extract $CO_2$ from water faster than it can equilibrate by diffusion from the atmosphere. High rates of phytoplankton production can raise pH to levels above 10, although that has not occurred in Lake Spokane during the past six years. Levels of pH above the water quality criterion of 8.5 usually occurred within the top 8 m at LL0, LL1, LL2, and LL3 in August and September, in the top 4 m at station LL4 in late July through September, and just at the surface at station LL5 in August and September. These depths are all well within the photic zone (see Section 3.2.7 Transparency).

Residence time was long in 2016; 1.2 to 3 times longer than during 2010-2014, but shorter than in 2015. That allowed more time for photosynthetic activity, phytoplankton growth and production, which in turn likely raised pH above the 8.5 water quality criteria. This was also the case in 2015 when residence time was exceptionally long; 2 to nearly 5 times as long as during 2010-2014. Similarly, in 2014 maximum pH levels (9.0 to 9.2) occurred in the top 4 to 6 m at all stations, even at station LL5 in the riverine zone during low flow and longer water retention time. This was also the case in 2013 when residence time was slightly longer than in 2014, especially in late summer, allowing more time for phytoplankton activity, with pH reaching 9.1, well above the 8.5 water quality criterion. There were only a few data points in August 2012 at LL5 that were slightly above the water quality criteria, with the highest at 8.6.

Chlorophyll at LL5 was higher (5.1 to 7.7 µg/L) during August and early September in 2016 and corresponded with pH levels ranging from 8.9 to just over 9.0 at the surface. This was also the case in 2015 when high chl (5.9 to 11.7 µg/L) was associated with surface pH levels greater than 9.0 during July through September. Chlorophyll in 2014 peaked on August 21 at 18.2 µg/L at LL5 and corresponded with the peak in pH of 9.2. This was also the case in 2013 when chl at LL5 peaked on September 10 at 9.6 µg/L and corresponded with the peak in pH.

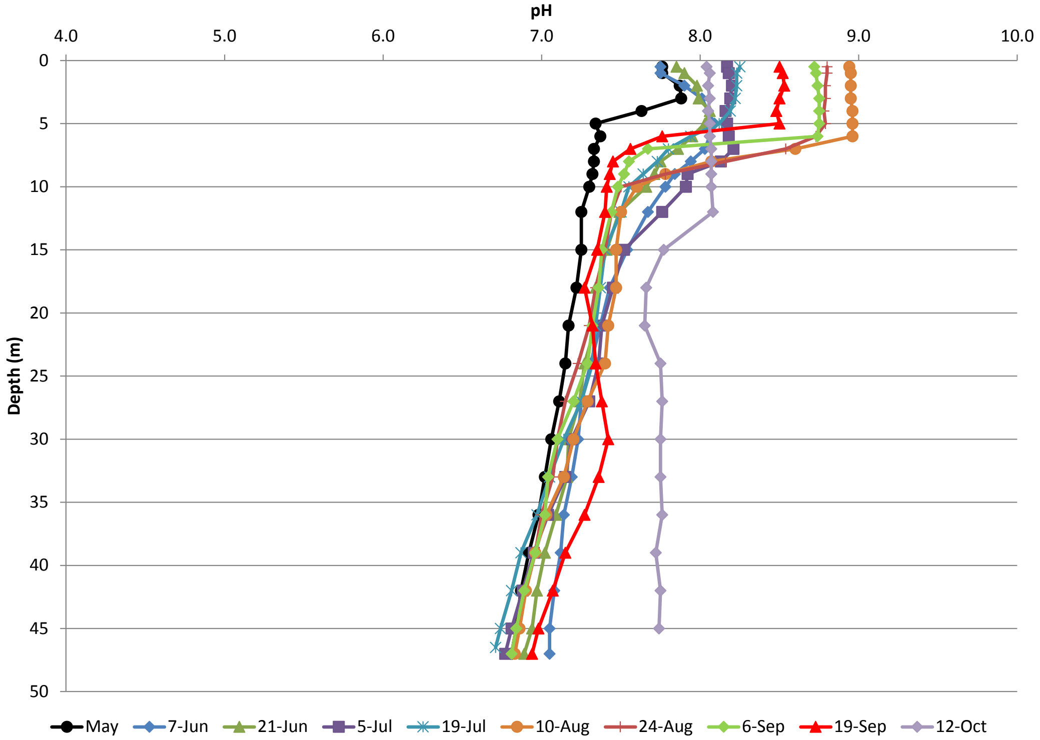

**Figure 27. pH Profiles for Station LL0, May-October 2016**

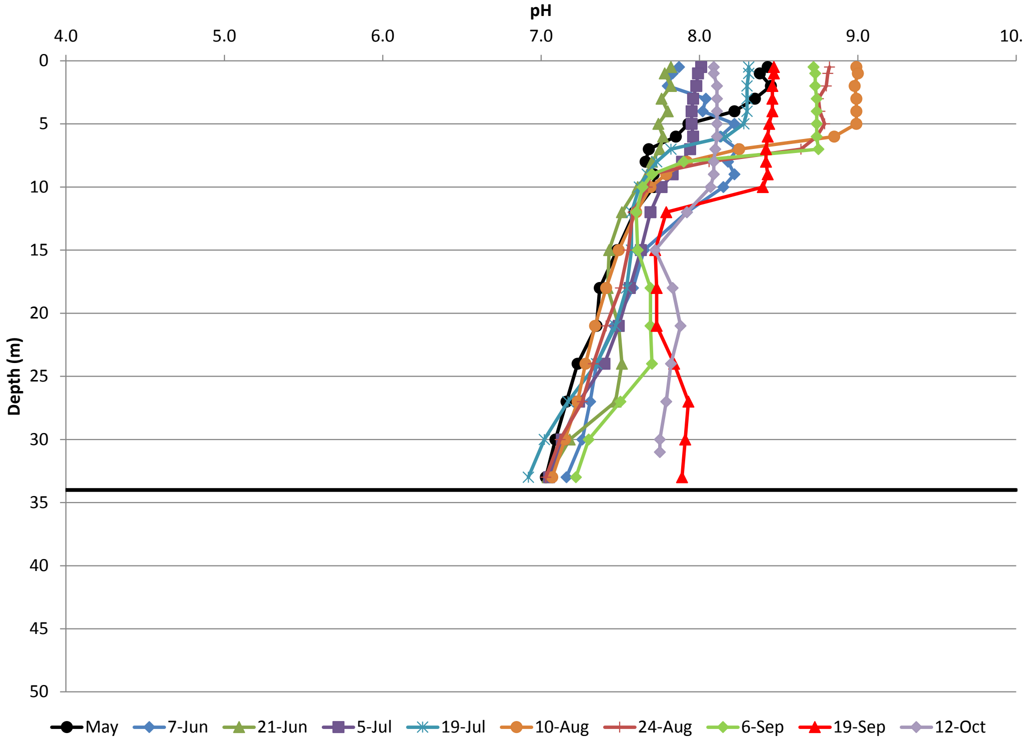

Figure 28. pH Profiles for Station LL1, May-October 2016

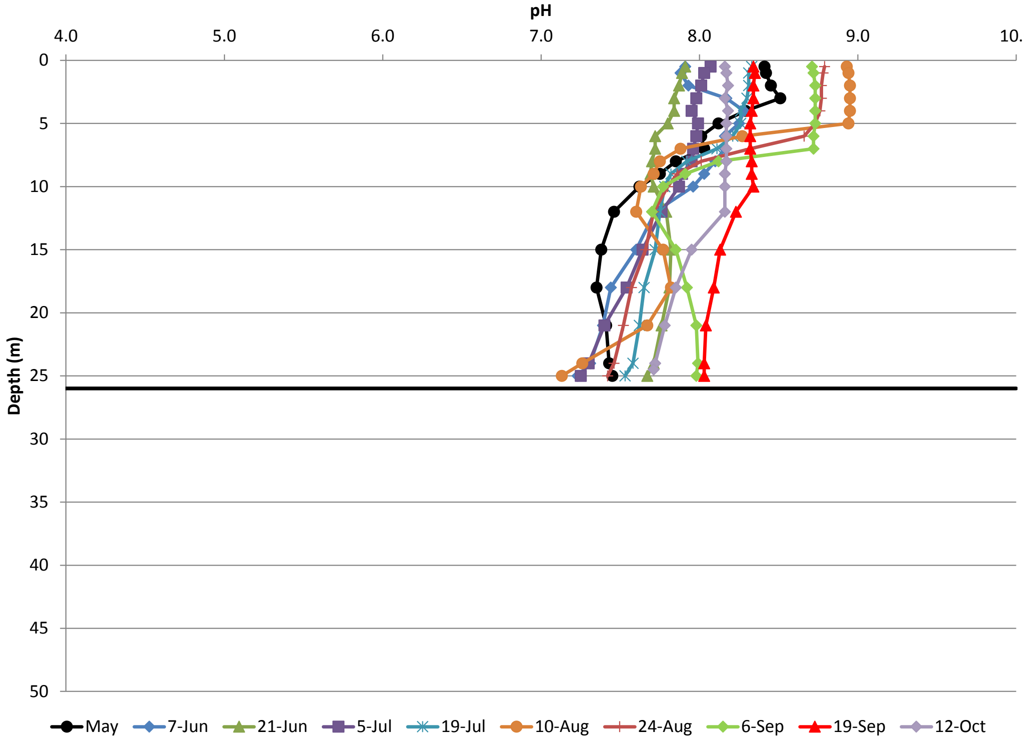

Figure 29. pH Profiles at Station LL2, May-October 2016

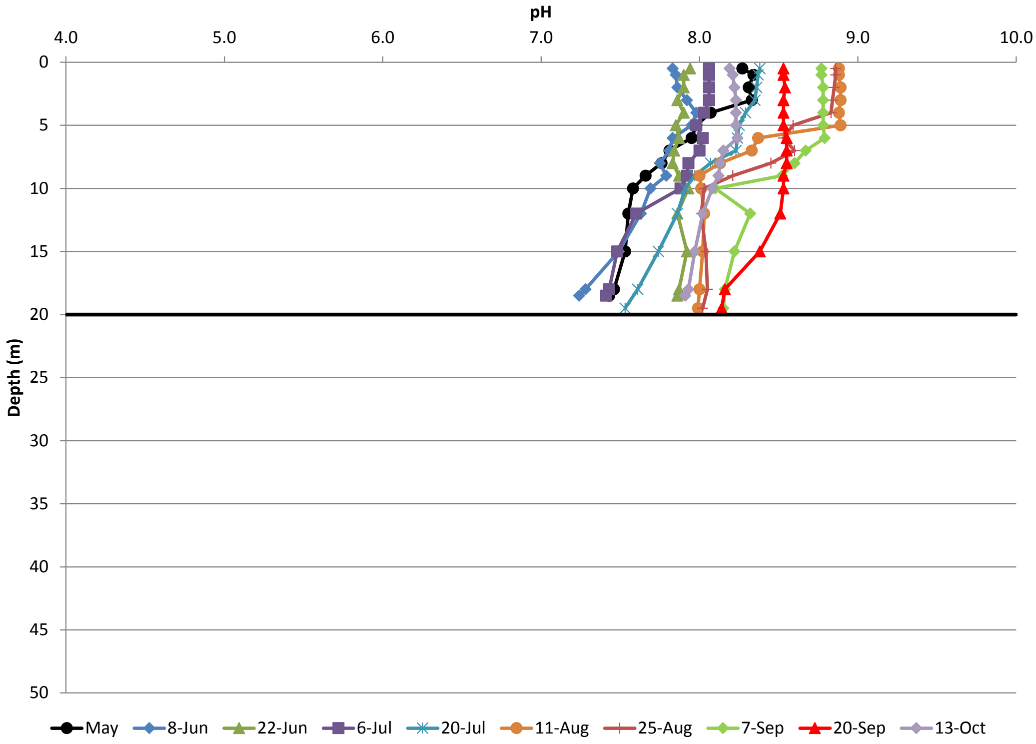

Figure 30. pH Profiles at Station LL3, May-October 2016

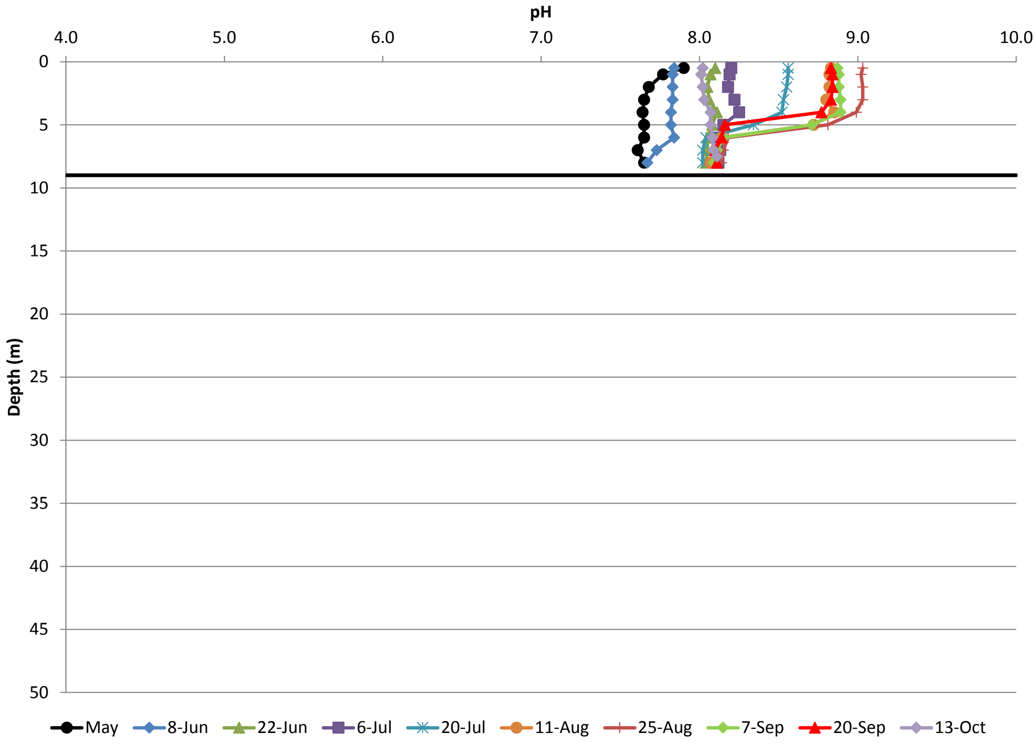

Figure 31. pH Profiles at Station LL4, May-October 2016

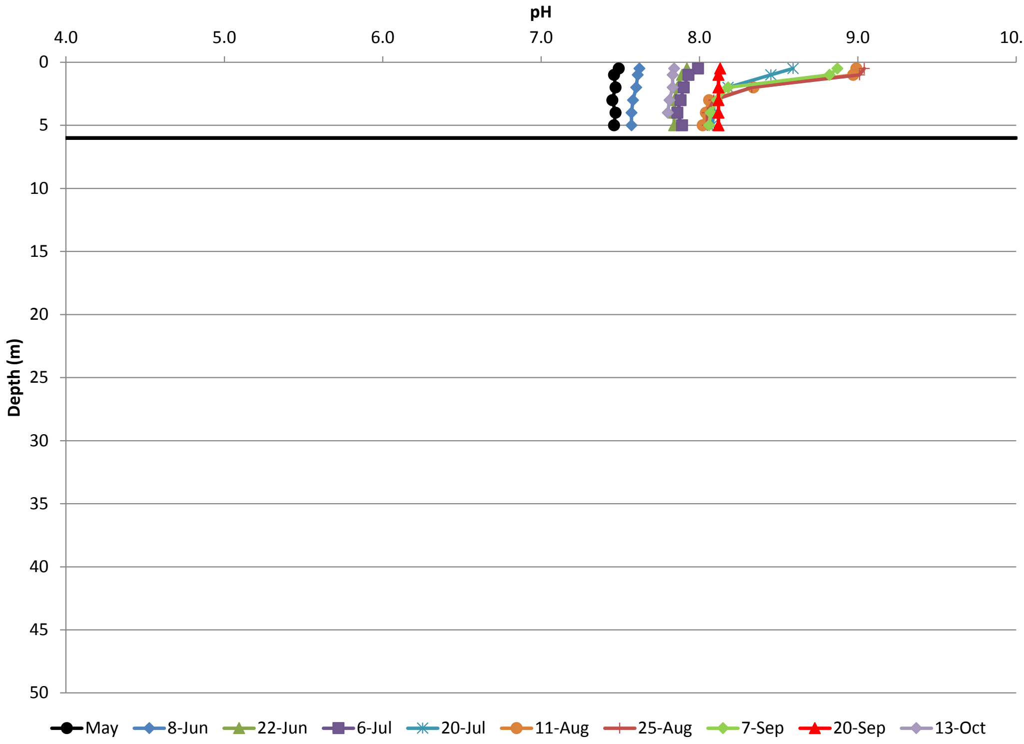

**Figure 32. pH Profiles at Station LL5, May-October 2016**

## 3.2.5 NUTRIENTS

### Phosphorus

Concentrations of TP ranged from about 3 to 122 µg/L over all depths during 2016. Soluble reactive phosphorus (SRP) concentrations ranged from about 1 (non-detect [ND]) to 56 µg/L. Total P and SRP were usually highest in the hypolimnion (15 m and deeper) at LL0, LL1, and LL2 with levels usually increasing in July and decreasing in late August and September (Figures 33 through 38). The highest TP concentration (122 µg/L) was one meter off the bottom at LL0 in early August. Highest TPs at the other lacustrine stations (LL1 and LL2) occurred near the bottom in late July or early August. Total P was consistently higher in bottom waters at the four down reservoir sites, with the exception of one event at LL3 in late July when it was highest at 10 m.

Bottom TP concentrations at stations LL0 and LL1 were higher than in 2015, especially in the spring. Total P near the bottom was consistently higher than at 30 m at LL0, which was opposite to the pattern in 2015. Maximum hypolimnetic TP at LL0 was also much higher than in 2015; 48 vs 40 µg/L at 30 m and 122 vs 32 µg/L near the bottom. Maximum bottom TP at station LL1 was also higher in 2016 than in 2015 (72 vs 59 µg/L) and it occurred earlier in the summer. However, high bottom TPs persisted for most of the summer in both years.

Epilimnetic (0.5 and 5 m) TP at the lacustrine stations was consistently around 10 µg/L or less throughout the monitoring period. Surface TPs were also low – around 10 µg/L – at the transition (LL3) site but slightly higher (near 20 µg/L) at LL4 and riverine (LL5) sites.

The patterns for SRP at stations LL0, LL1, and LL2 were similar to those for TP, although SRP content was much lower than TP in surface waters. Similarly, the highest SRP occurred near the bottom coincident with low DO. In late September, there was a sharp decline in bottom SRP, as well as TP, at station LL1, which was most likely the result of mixing bottom water with more DO enriched metalimnetic water. A peak SRP of 56 µg/L occurred near the bottom at LL1 in early August, and corresponded to a DO of zero mg/L. Minimum bottom DOs ≤ 2 mg/L occurred on numerous occasions in bottom water in 2016; in July through September at LL0 and late July through early September at LL1. Anoxic conditions did not occur at LL2 or in the transition and river sites. The highest SRP concentrations also occurred near the bottom in 2015, and there was a consistent pattern with DO, similar to that in 2016.

Total P and SRP were usually higher near the bottom at LL3, similar to previous years (Figures 39 and 40). A TP of over 40 µg/L occurred at 10 m in July that appeared anomalous, compared to levels at LL2 or LL4, and SRP at 10 m.

Total P was between 20 and 30 µg/L at 4 m several times at LL4 during the summer, and usually higher than at the surface or bottom (Figure 41). Total P was much higher than SRP, which was always less than 5 µg/L (Figure 42). In 2015 TP was higher with a peak TP of 44 µg/L occurring at 0.5 m in late July. Total P at 0.5 and 4 m was usually lower in 2016 than in 2015. Surface TPs in 2016 were below 20 µg/L and TP at all three depths remained below 30 µg/L. Also, TP was not as closely related to chl at LL4 as in 2015.

Surface TP did not exceed 20 µg/L, similar to LL3 and LL4, at station LL5 (Figure 43). Surface TP in 2015 was much higher in July (35 and 42 µg/L) and early September (52 µg/L). Bottom TPs were relatively stable throughout the monitoring period ranging from just under 8 to 19 µg/L (Figure 43). The pattern in 2016 was similar to that in 2014 when both surface and bottom concentrations were stable, with only one relatively low maximum in August at just under 30 µg/L. Maximum TPs in 2015 were 42 and 52 µg/L and in 2013, the maximum was even higher with 65 µg/L in August at 0.5 m.

Volume-weighted whole water column TP concentrations in 2016 ranged from 7 to 19 µg/L at LL5 with a mean of 12 µg/L for the monitoring period (Table 8). Volume-weighted TPs were slightly higher in 2015 at LL5 ranging from 7 to 38 µg/L with a mean of 19 µg/L. In 2013 and 2014, volume-weighted TPs were similar to that in 2016, usually around 15 µg/L or less. Soluble reactive P was less than 5 µg/L at LL5 in 2016 (Figure 44). Also, SRPs were nearly always less than 5 µg/L in 2013, 2014 and 2015 at LL5.

With the exception of May, epilimnetic TPs in the lacustrine zone (LL0, LL1, LL2) were usually less than or equal to about 10 µg/L (Figure 45). The levels were similar in 2015. Seasonal patterns and concentration ranges have been rather consistent over the seven year period averaging a little less than 10 µg/L during June-September. Transition and riverine zone (LL3, LL4, and LL5) TP was often greater than 10 µg/L and once slightly above 20 µg/L at LL5 in 2016. In 2015, transition and riverine zone TPs were also mostly greater than 10 µg/L and above 20 µg/L at 0.5 m on 4 occasions at LL5. Surface TP was not quite as high as in 2015 but was occasionally higher than near bottom concentrations. Soluble reactive P was usually less than 5 µg/L in the epilimnion at all sites.

Volume-weighted water column TPs were usually similar throughout the reservoir in 2016 with the exception of a few slightly higher levels at LL0 and LL4 (Table 8; Figure 46). Total P was higher at LL4 and LL5 than at down-reservoir stations (with the exception of LL0) during late August through September (Figure 46; Table 8). Volume-weighted TP at LL0 was greater due to higher concentrations at 30 m and near the bottom. Volume-weighted TPs at LL0 in 2016 were generally higher than in 2013 – 2015, but similar to those in 2012. Volume-weighted TPs were below 25 µg/L at all stations, ranging from 6 to 24 µg/L. This range is slightly lower than in 2015 which was between 4 and 38 µg/L.

The generally higher water column TPs at LL4 and LL5 during August and September in 2016 were similar to those from 2013 – 2015, but contrasted with the pattern in 2012. In 2016, volume weighted TP concentrations at LL4 were almost always higher than LL5 indicating there is some additional source of phosphorus in these zones.

**Table 8. Volume-Weighted Water Column TP Concentrations for Monitoring Stations in 2016**

| 2016 Sampling Event | Volume Weighted Water Column TP (µg/L) | | | | | |
|---|---|---|---|---|---|---|
| | LL0 | LL1 | LL2 | LL3 | LL4 | LL5 |
| May 17-18 | 18 | 20 | 23 | 19 | 18 | 19 |
| June 7-8 | 13 | 7 | 6 | 9 | 10 | 9 |
| June 21-22 | 9 | 11 | 8 | 9 | 9 | 9 |
| July 5-6 | 11 | 12 | 13 | 14 | 14 | 9 |
| July 19-20 | 19 | 19 | 13 | 23 | 13 | 12 |
| August 10-11 | 24 | 22 | 13 | 12 | 20 | 14 |
| August 24-25 | 20 | 10 | 13 | 13 | 16 | 16 |
| September 6-7 | 21 | 11 | 10 | 12 | 20 | 16 |
| September 19-20 | 18 | 10 | 10 | 10 | 13 | 7 |
| October 12-13 | 17 | 12 | 13 | 21 | 11 | 12 |
| Mean | 17 | 14 | 12 | 14 | 14 | 12 |
| Summer Mean (Jun-Sep) | 17 | 13 | 11 | 13 | 15 | 11 |

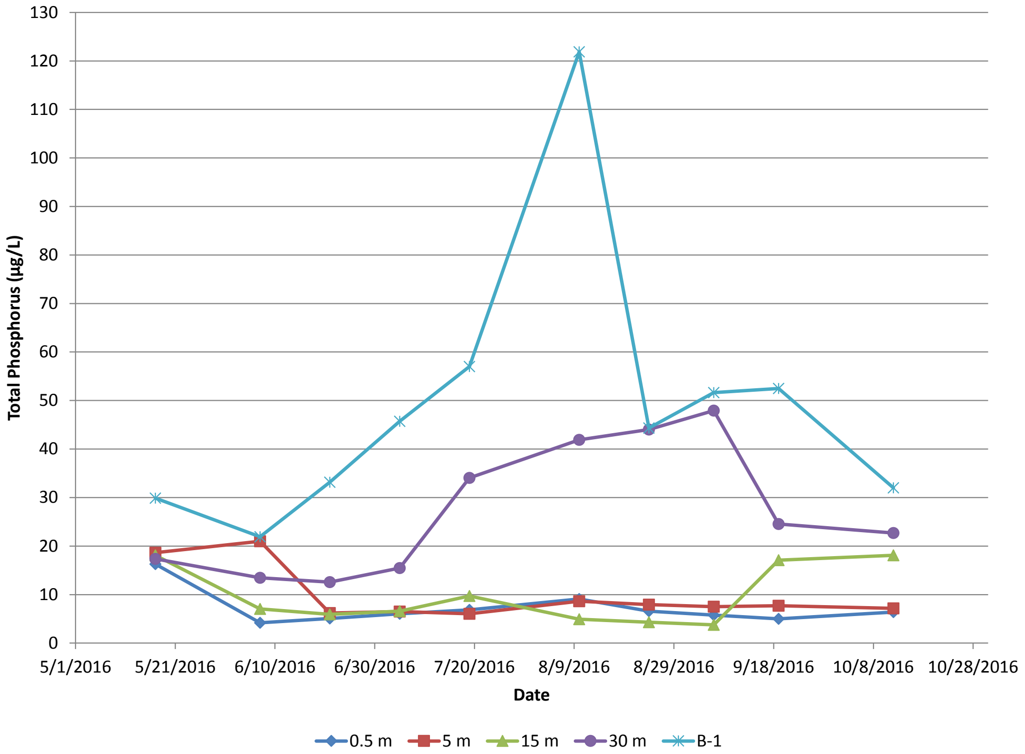

Figure 33. TP Concentrations (µg/L) at Station LL0, May-October 2016

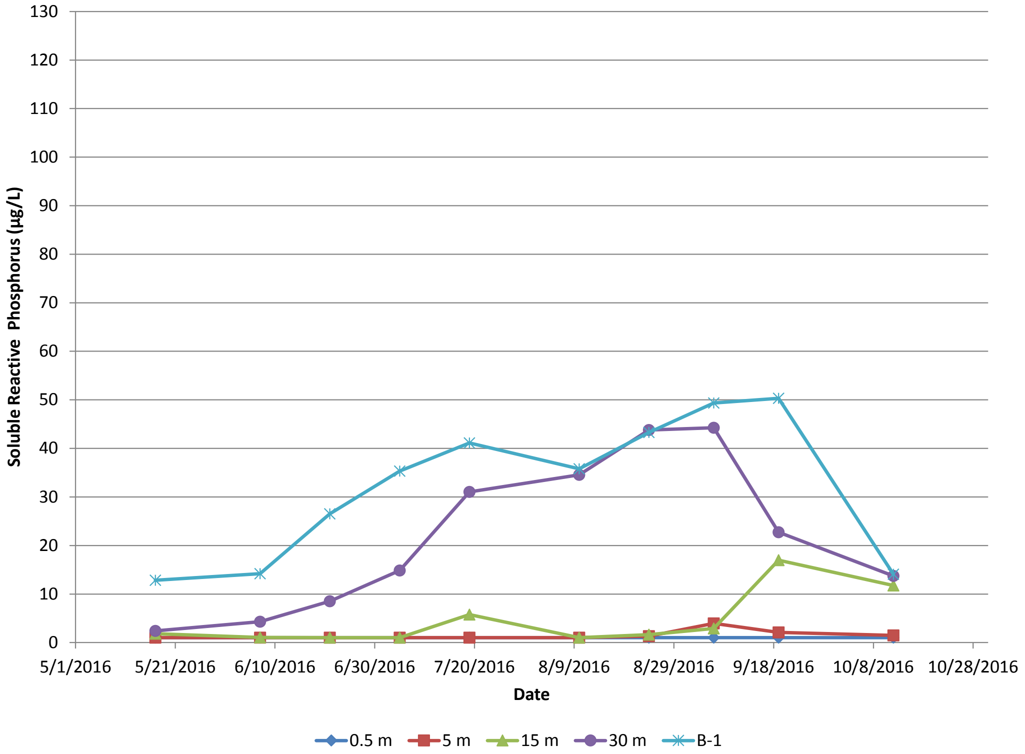

Figure 34. SRP Concentrations (µg/L) at Station LL0, May-October 2016

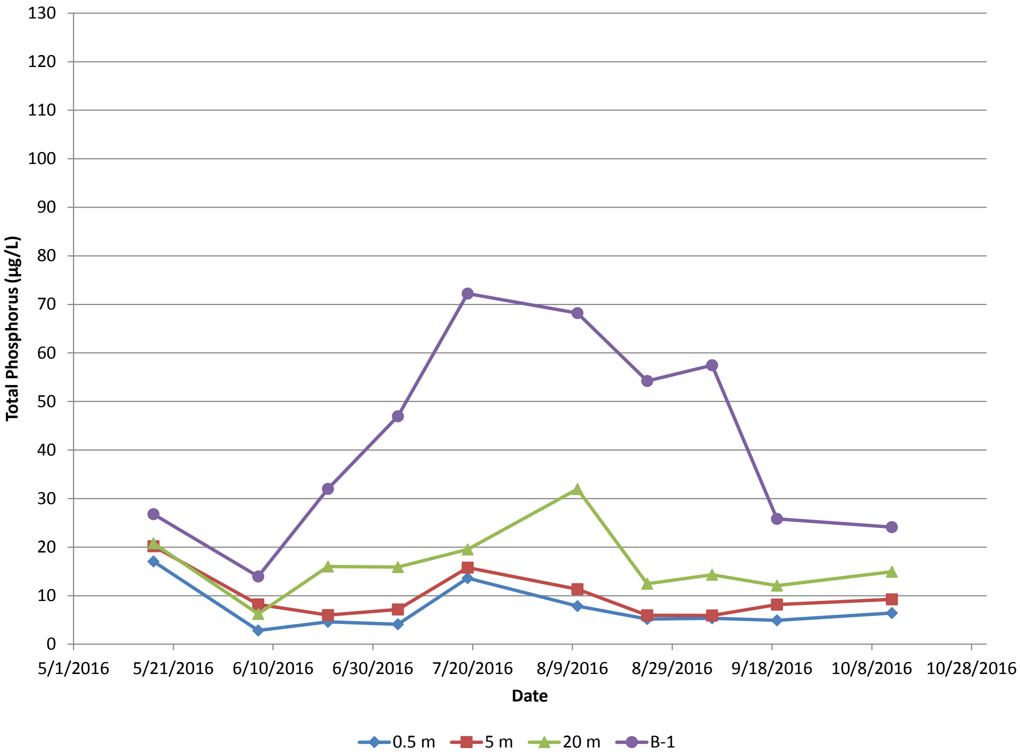

Figure 35. TP Concentrations (µg/L) at Station LL1, May-October 2016

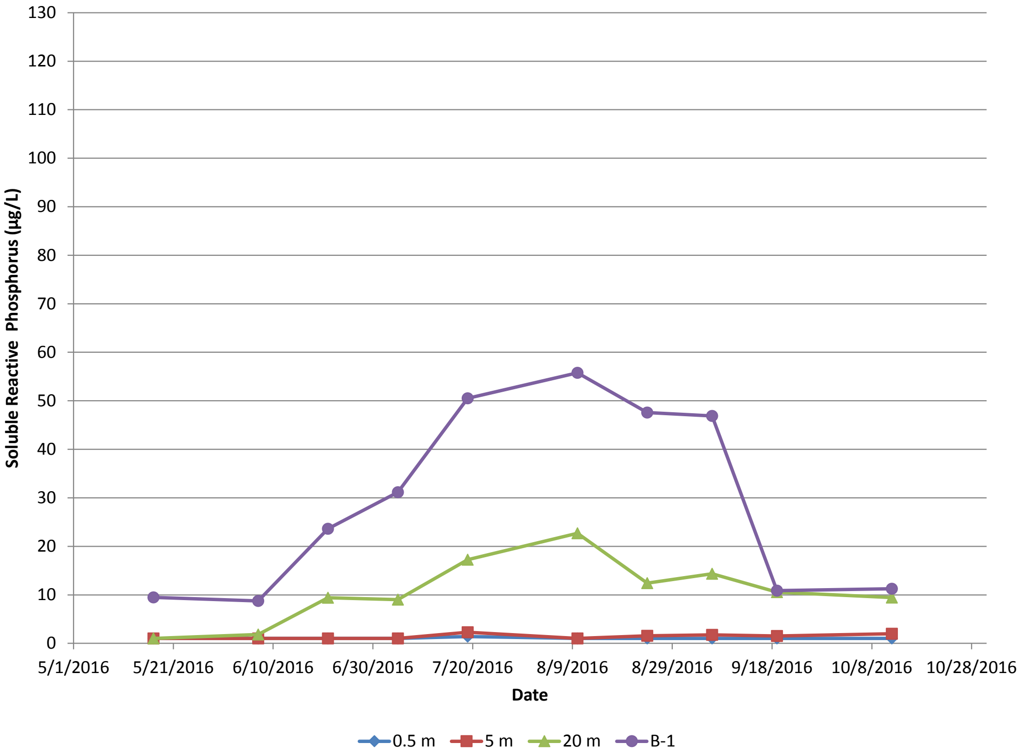

Figure 36. SRP Concentrations (µg/L) at Station LL1, May-October 2016

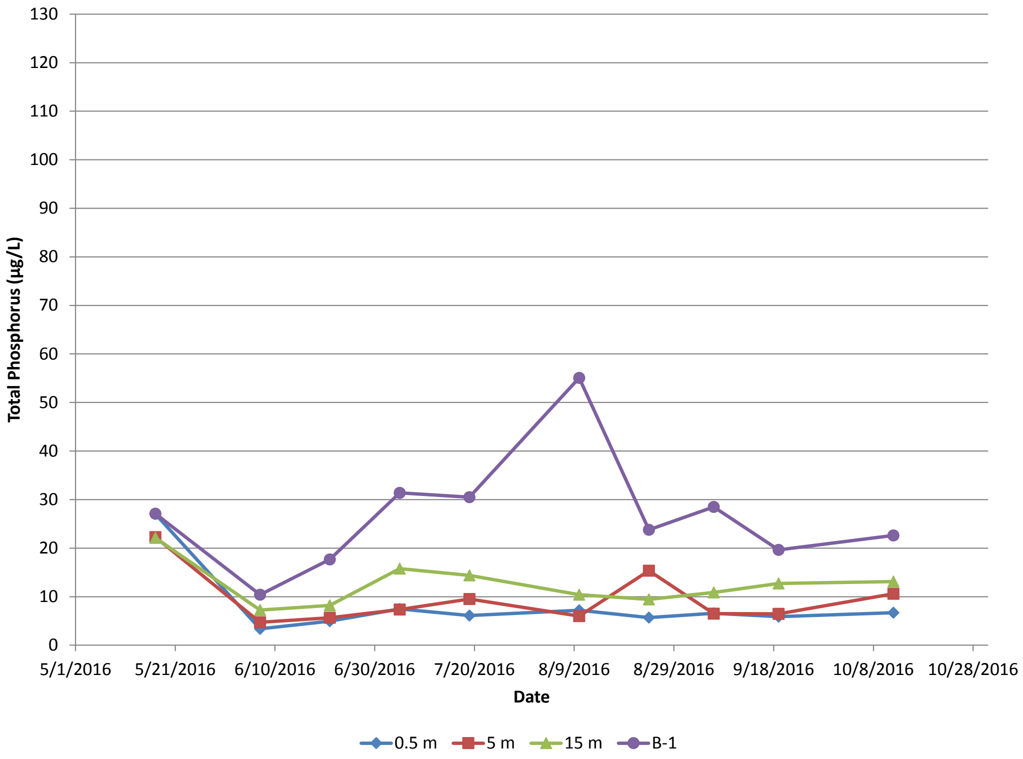

Figure 37. TP Concentrations (µg/L) at Station LL2, May-October 2016

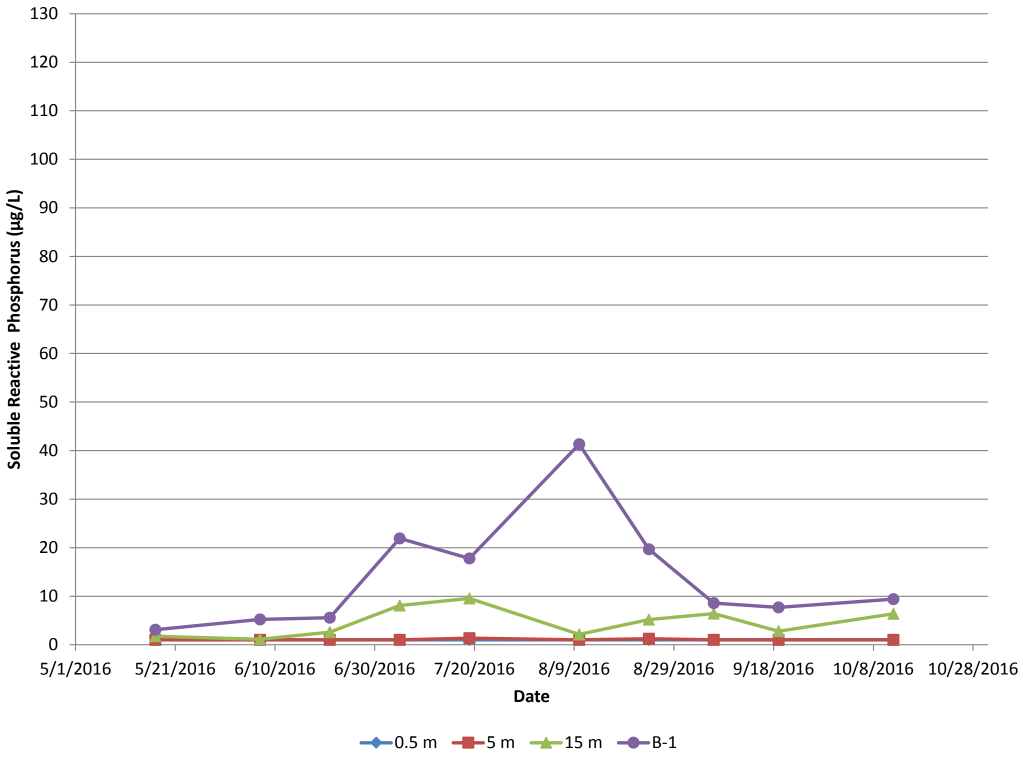

Figure 38. SRP Concentrations (µg/L) at Station LL2, May-October 2016

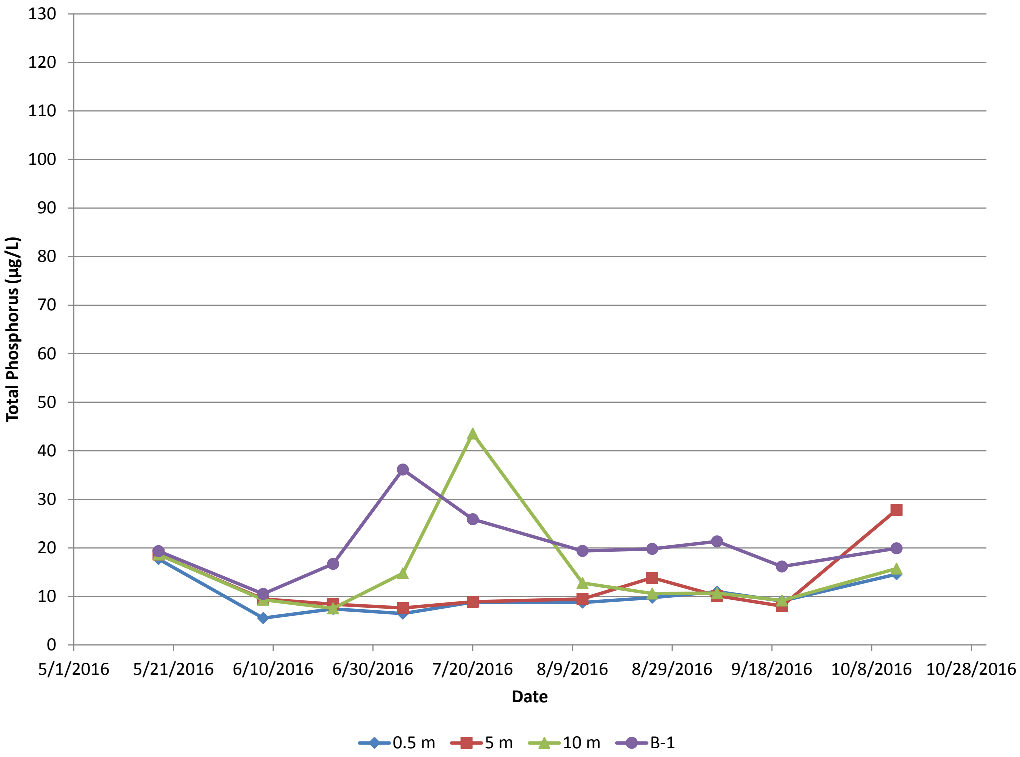

Figure 39. TP Concentrations (µg/L) at Station LL3, May-October 2016

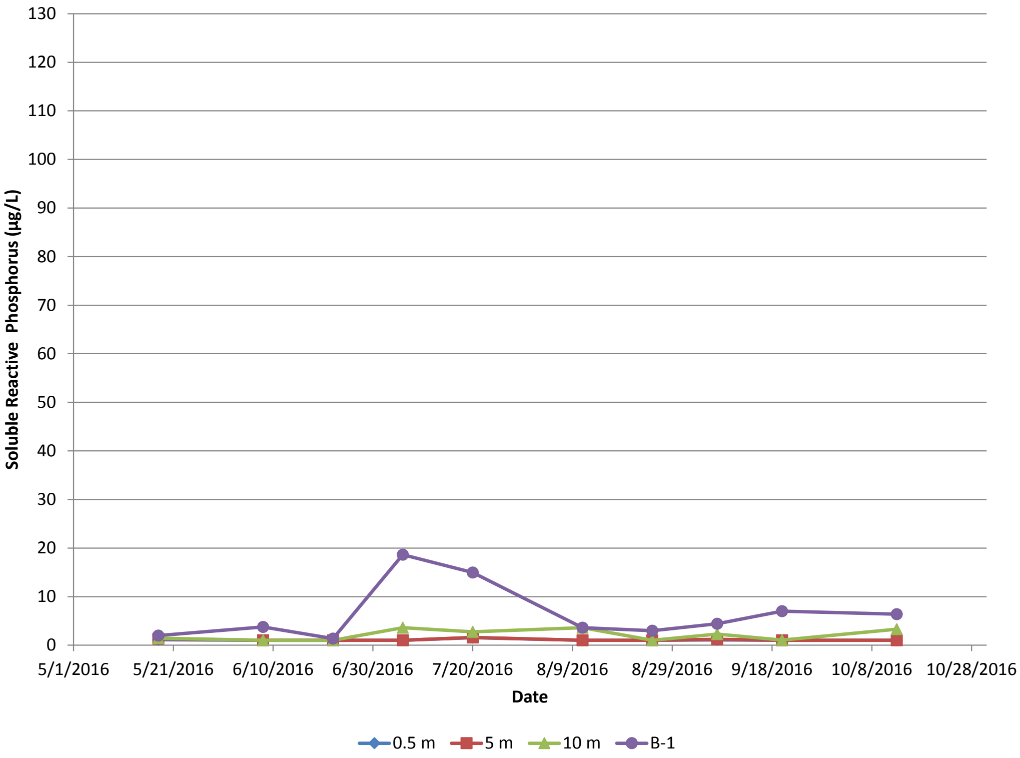

Figure 40. SRP Concentrations (µg/L) at Station LL3, May-October 2016

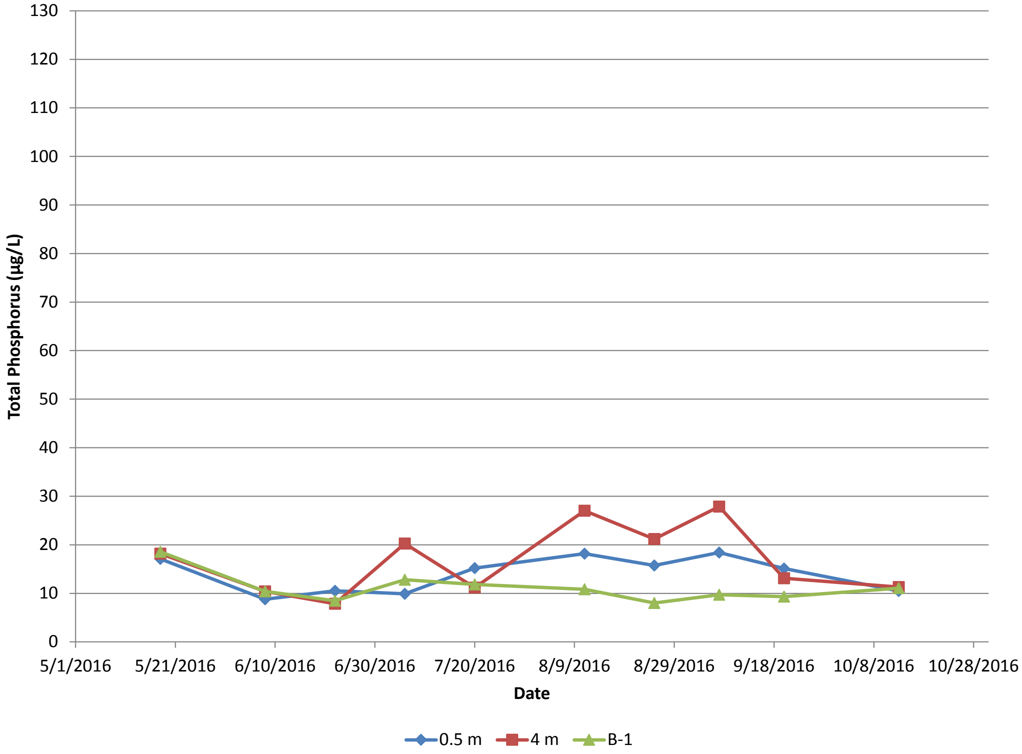

Figure 41. TP Concentrations (µg/L) at Station LL4, May-October 2016

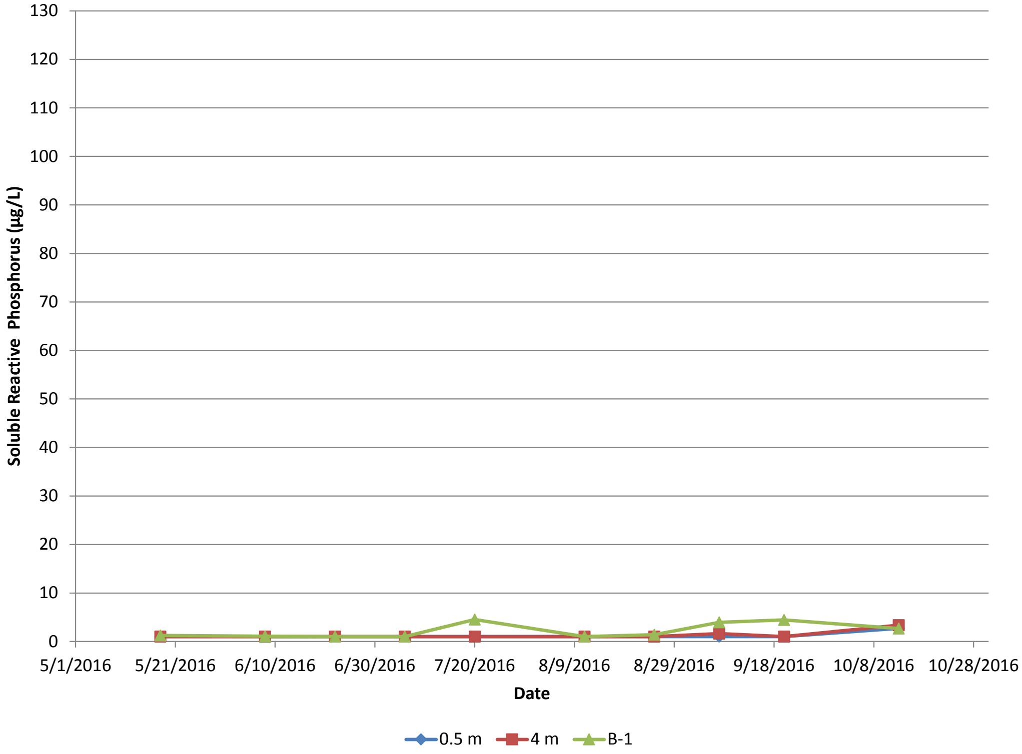

Figure 42. SRP Concentrations (µg/L) at Station LL4, May-October 2016

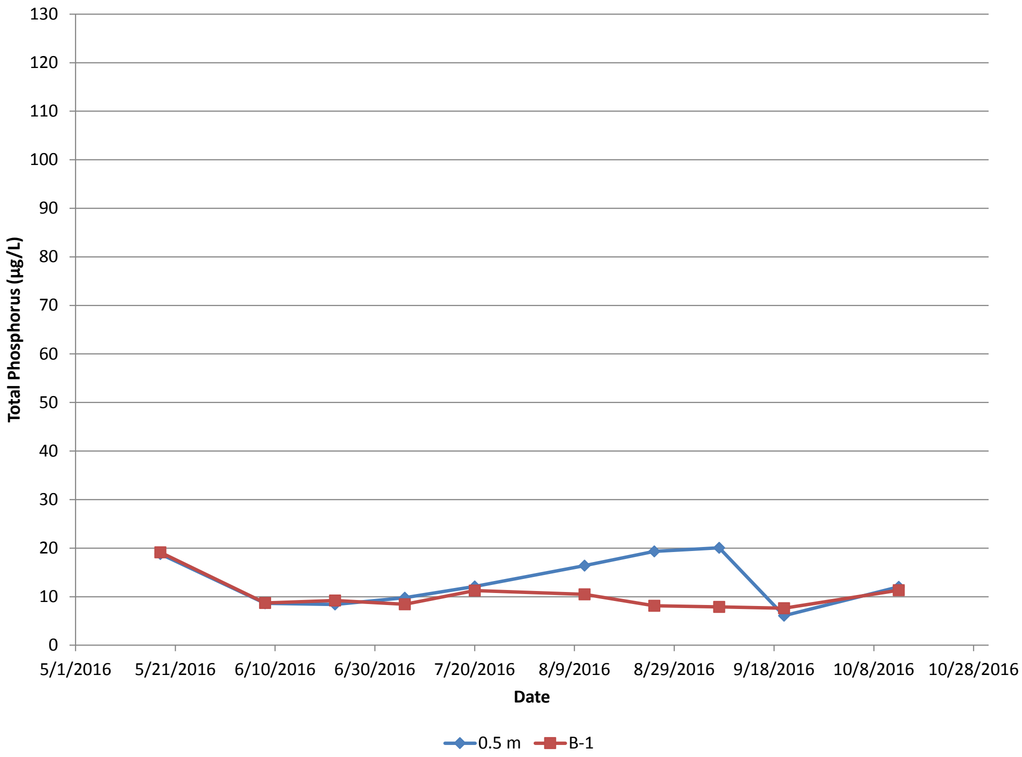

Figure 43. TP Concentrations (µg/L) at Station LL5, May-October 2016

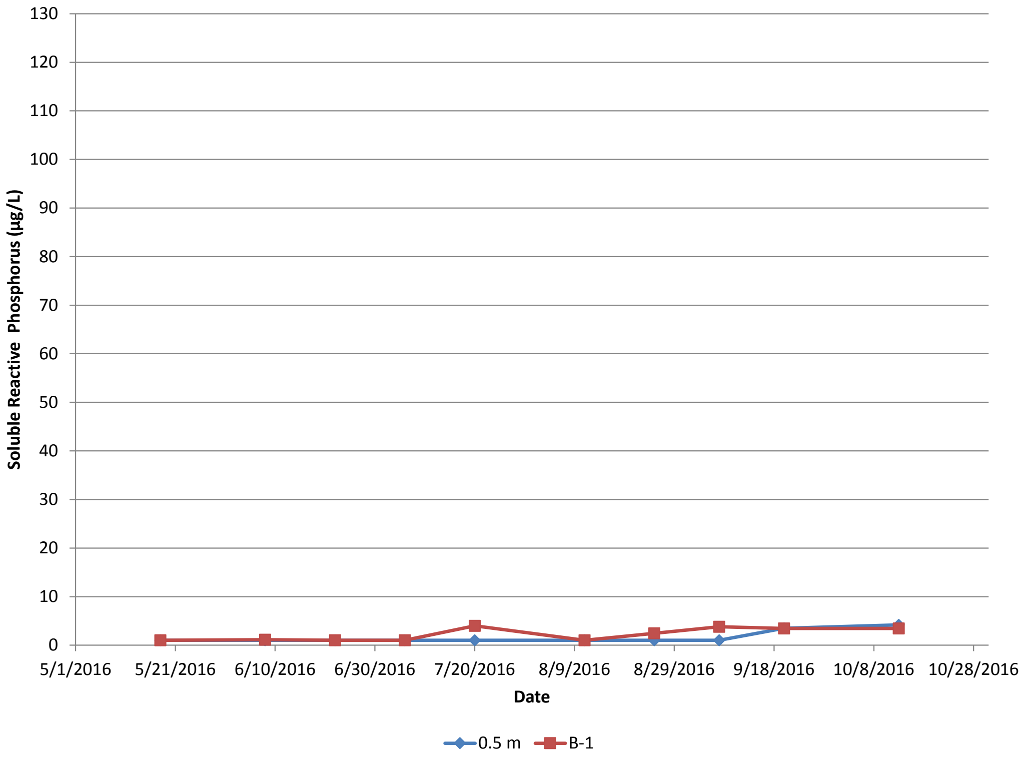

Figure 44. SRP Concentrations (µg/L) at Station LL5, May-October 2016

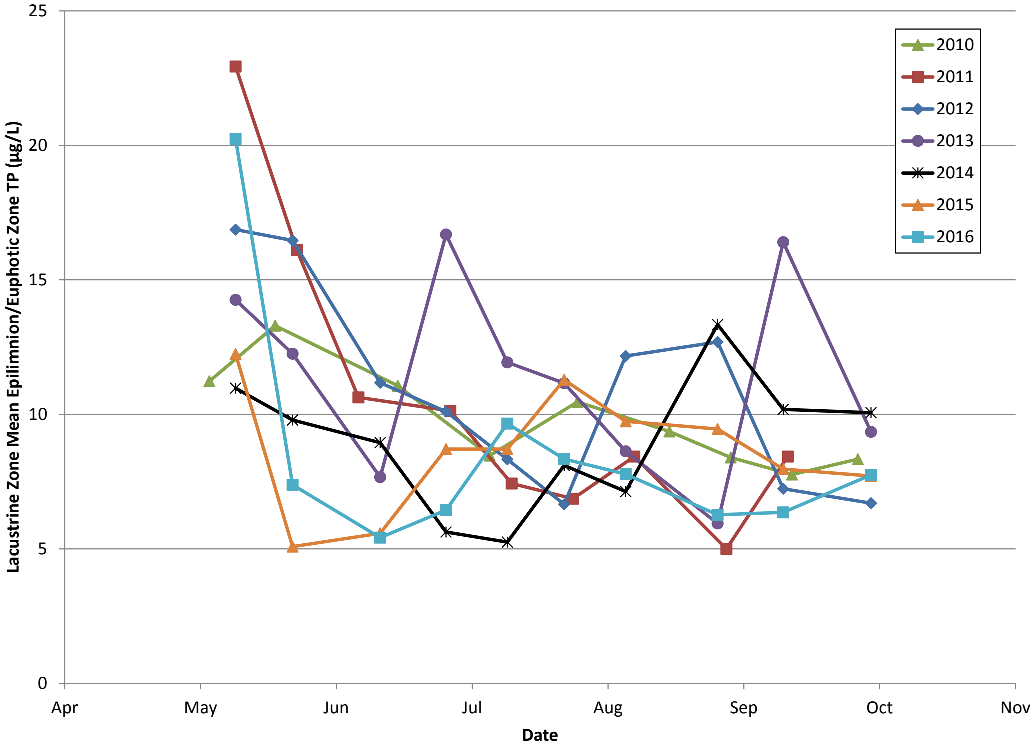

Figure 45. Mean Epilimnion TP Concentrations in the Lacustrine Zone in Lake Spokane, 2010-2016

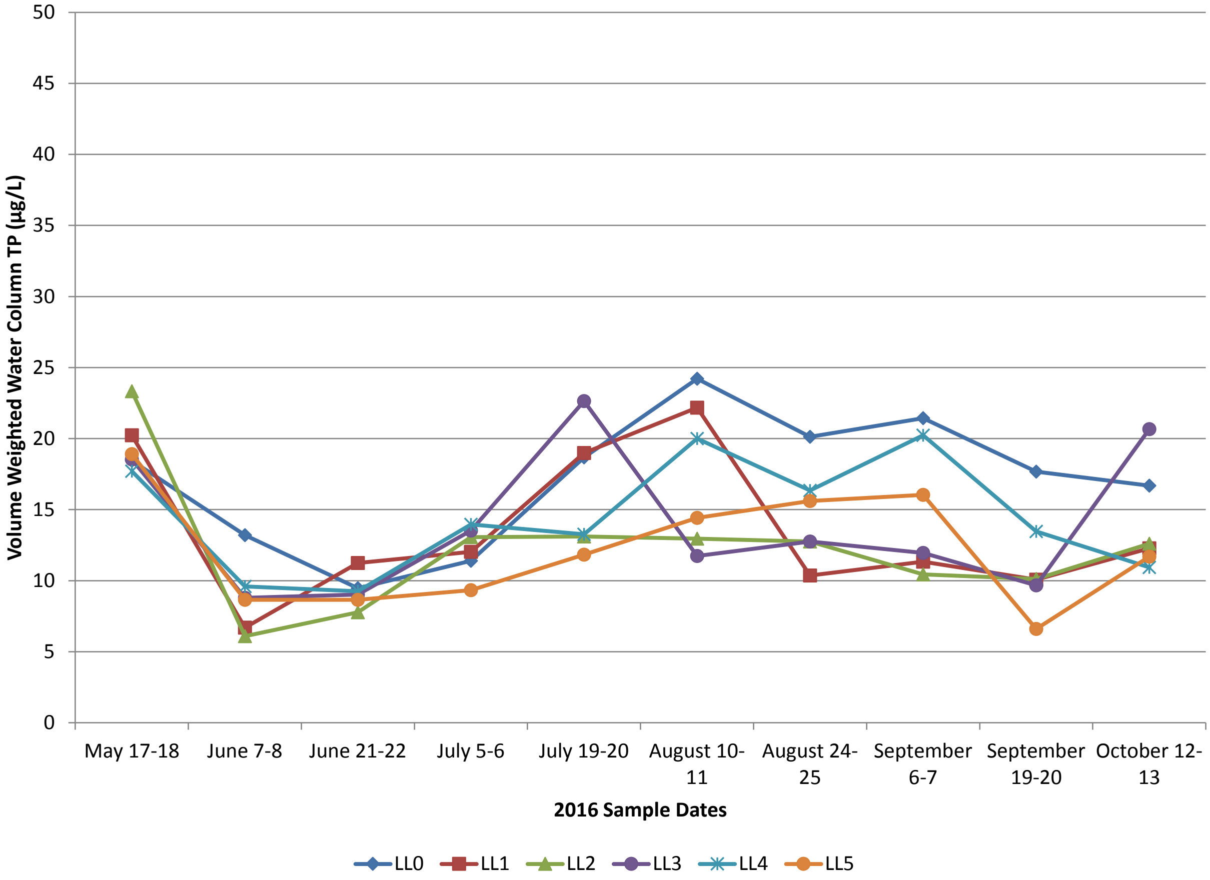

**Figure 46. Volume-Weighted Water Column TP Concentrations, 2016**

## Nitrogen

Total nitrogen (TN) at all six stations ranged from about 450 to 2760 µg/L 2016. Total N was similar or slightly lower in 2015, ranging from 470 to 2300 µg/L. Nitrate+nitrite N ($NO_3$+$NO_2$-N) is largely $NO_3$ which is utilized by algae; ranged from about 290 to 2320 µg/L. Also, most of the TN was nitrate+nitrite. Average lacustrine epilimnetic TN and nitrate-N concentrations during June-September were 912 and 683 µg/L, respectively, and similar to those in 2015 (871 and 686 µg/L). Average lacustrine epilimnetic TN and nitrate-N during June – September were lower in 2014 at 606 and 480 µg/L, respectively.

Both TN and nitrate-N were highest at intermediate depths (15 – 20 m) at LL0 – LL1, and at both intermediate (10 – 15 m) and bottom at LL2 – LL3, but only at the bottom at LL4 – LL5. This pattern indicates that high nitrogen, slightly denser water entered the reservoir near the bottom of the riverine and transition zones, then plunged to the intermediate depths in the lacustrine zone. The same pattern was observed in 2015.

Nitrogen tended to increase at most sites, especially near or at the bottom (Figures 47 through 58) starting in late June, and more in the metalimnion and upper hypolimnion than in the epilimnion at most sites. Higher concentrations were generally observed in the hypolimnion and bottom water at all stations, except at station LL0 where levels at the bottom were much lower than those at 15 and 30 m. Bottom concentrations at LL0 increased in October when the water column began to mix.

Increased hypolimnetic and metalimnetic concentrations during summer were probably due to the plunging inflow containing high N. Late summer hypolimnetic and metalimnetic N concentrations were roughly equal to those at the bottom at LL3 – LL5, which represent the plunging inflow. Groundwater was likely an important source of nitrate-N during late summer low flow when dilution of groundwater decreased (see 3.2.9). The increase in bottom TN to about 2,600 µg/L at LL4 and about 2,800 at LL5 correspond to the increase in river TN at Nine Mile Bridge (see 3.2.9). These higher N concentrations at the bottom of the up-reservoir sites, along with the highest concentrations in the hypolimnion at the lacustrine sites (LL0, LL1, LL2), suggests that plunging river inflow was more likely the main source of hypolimnetic nitrogen.

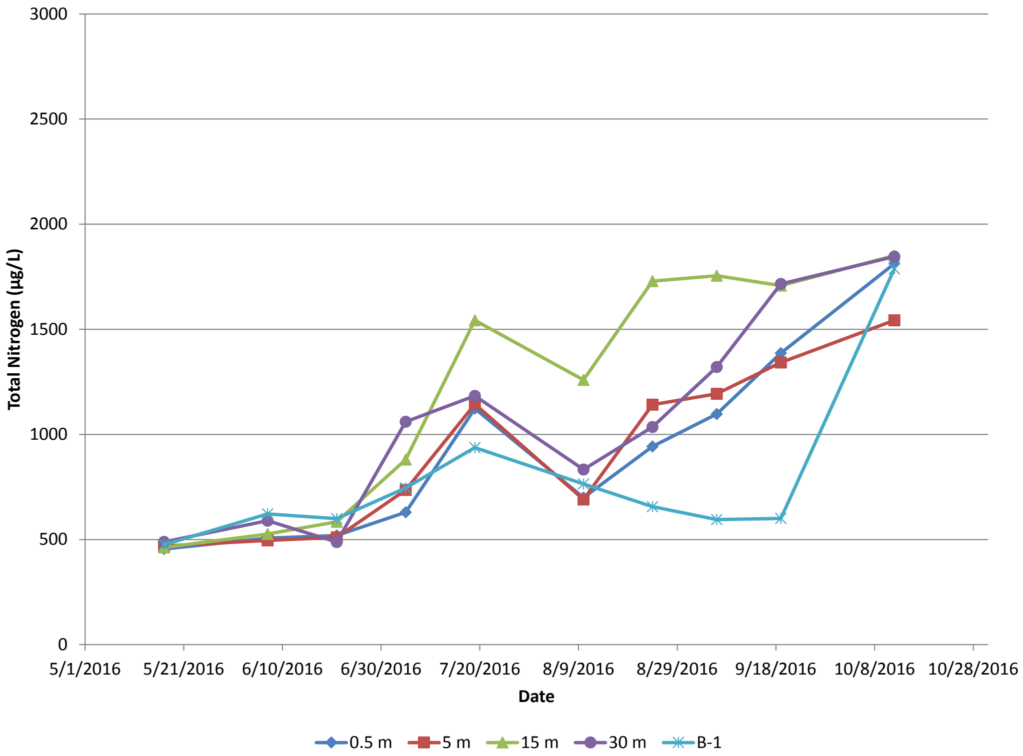

**Figure 47. TN Concentrations (µg/L) at Station LL0, May-October 2016**

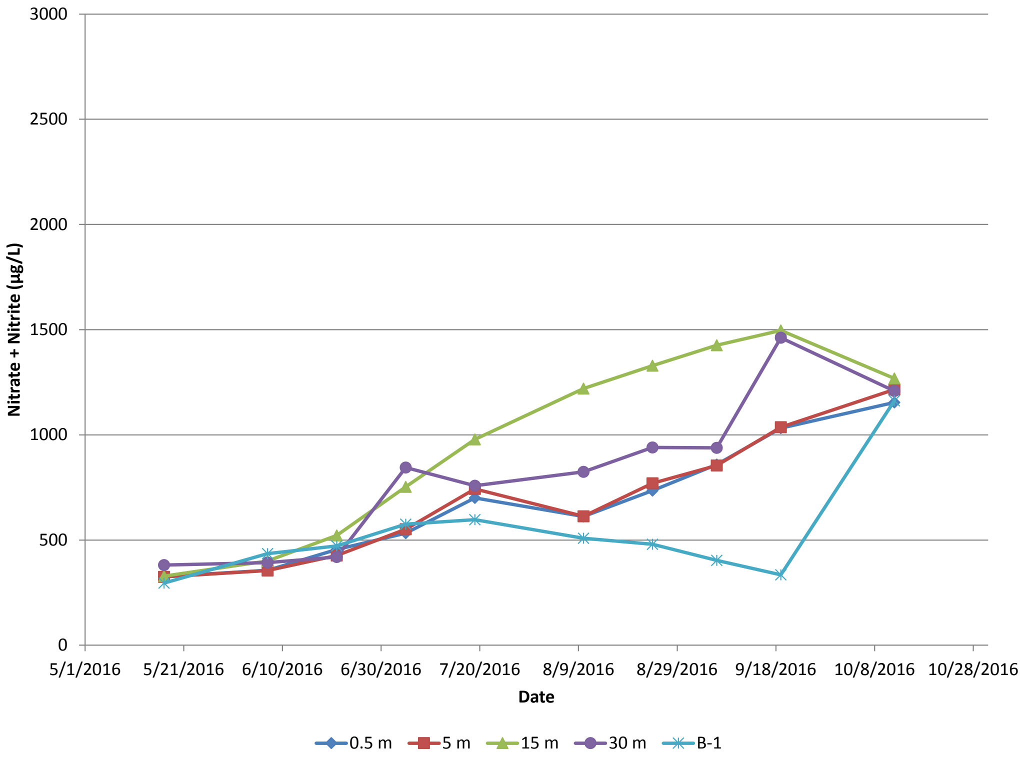

Figure 48. $NO_3$+$NO_2$ Concentrations (µg/L) at Station LL0, May-October 2016

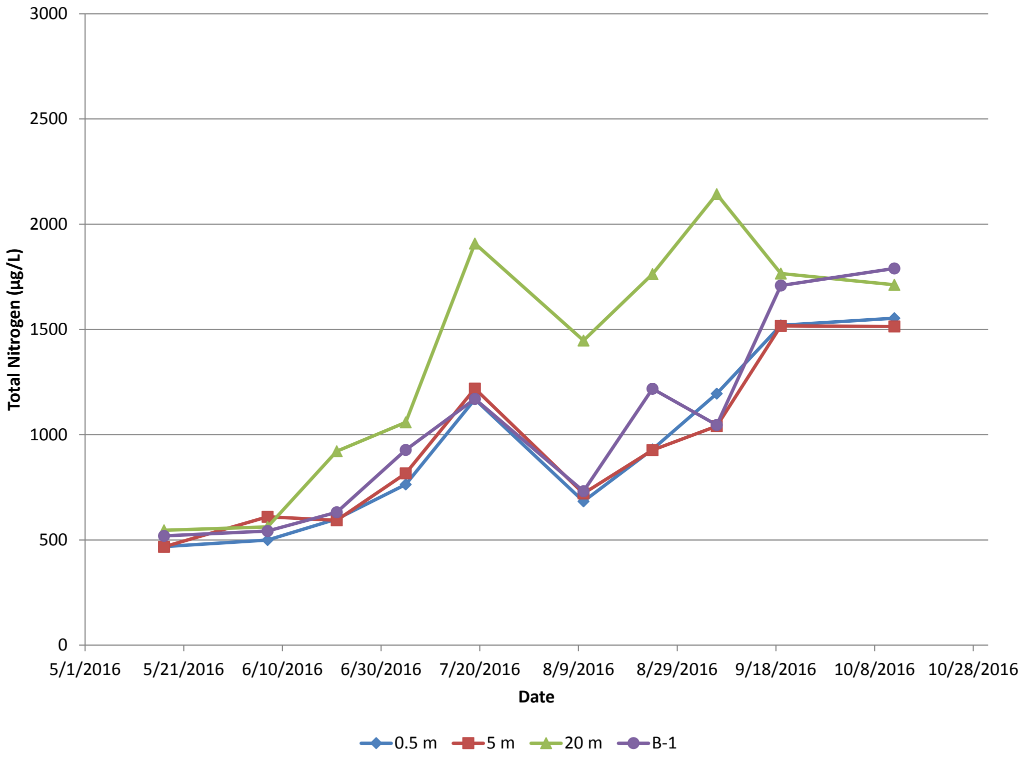

Figure 49. TN Concentrations (µg/L) at Station LL1, May-October 2016

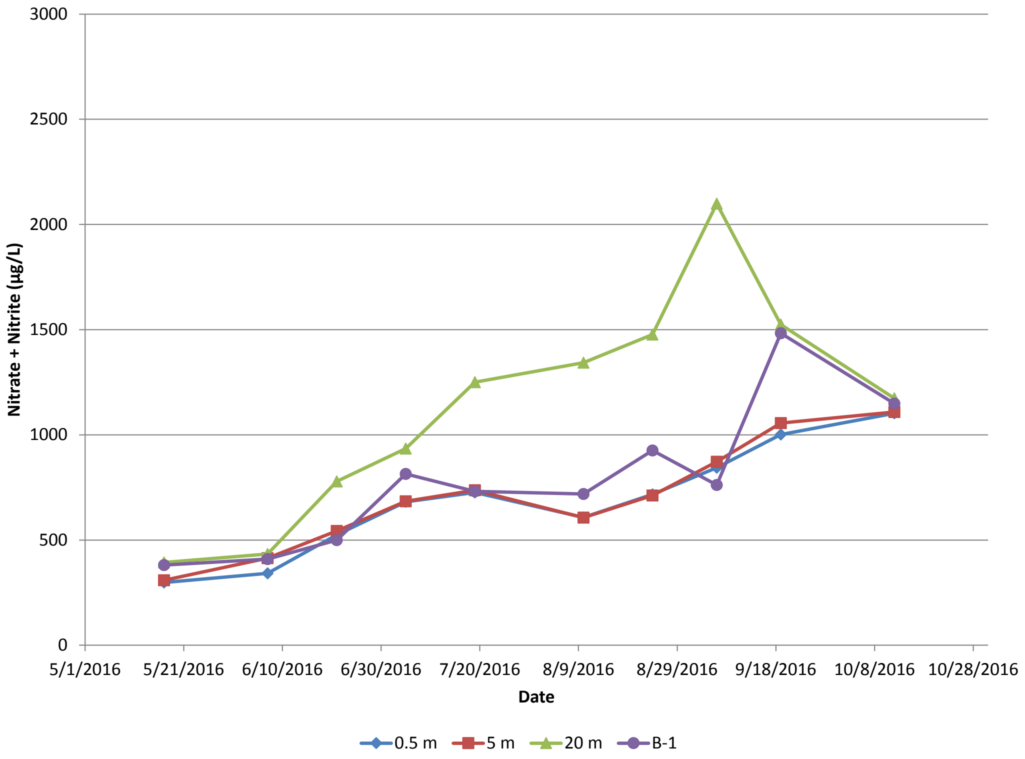

Figure 50. $NO_3$+$NO_2$ Concentrations (µg/L) at Station LL1, May-October 2016

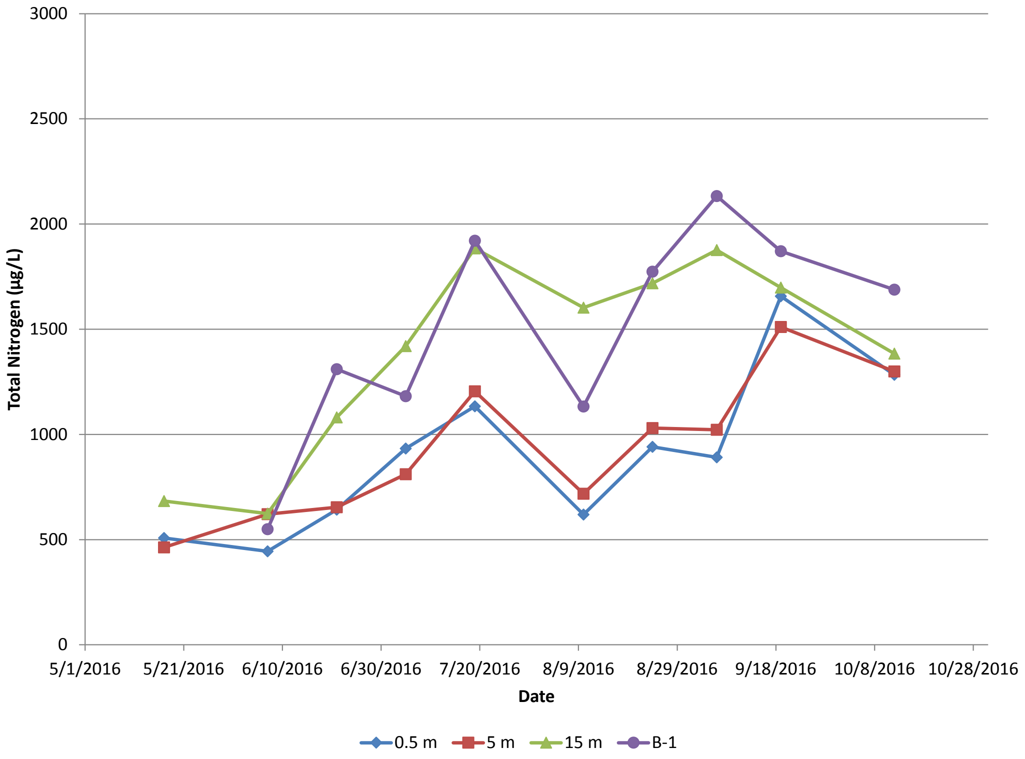

Figure 51. TN Concentrations (µg/L) at Station LL2, May-October 2016

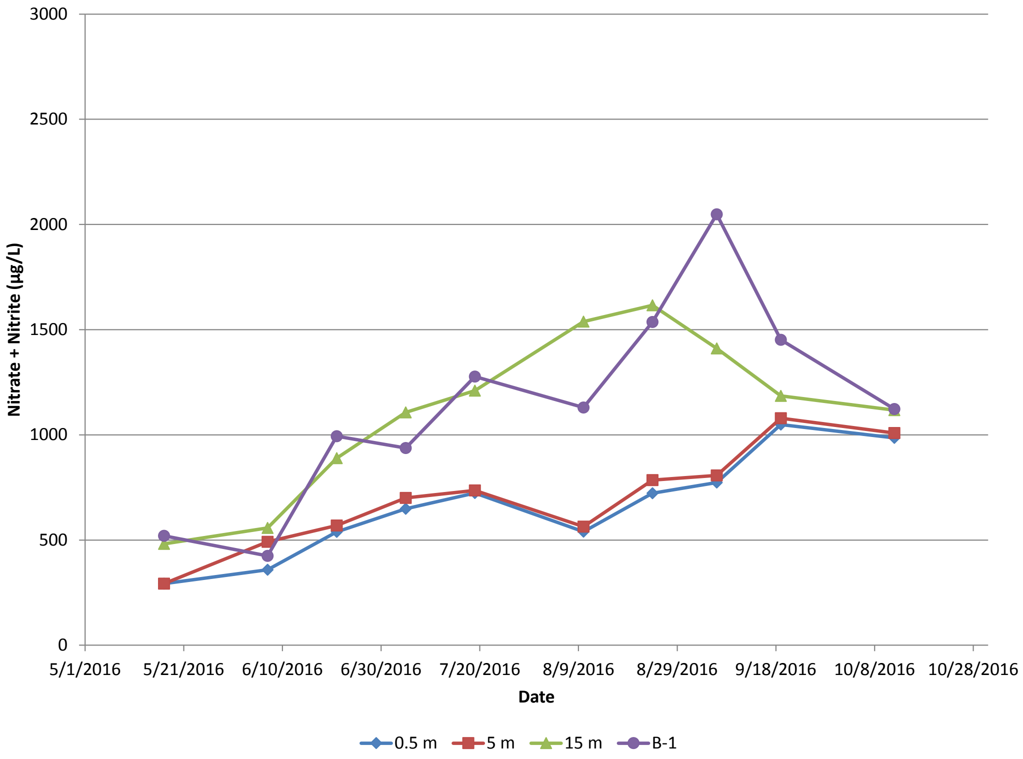

Figure 52. $NO_3$+$NO_2$ Concentrations (µg/L) at Station LL2, May-October 2016

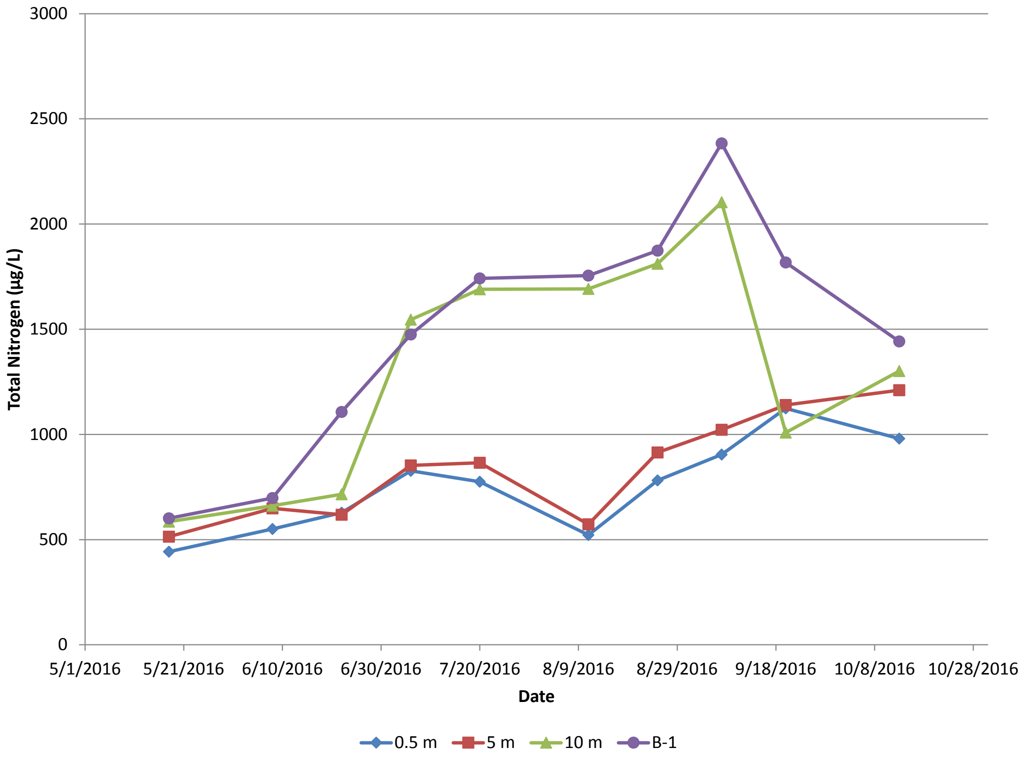

Figure 53. TN Concentrations (µg/L) at Station LL3, May-October 2016

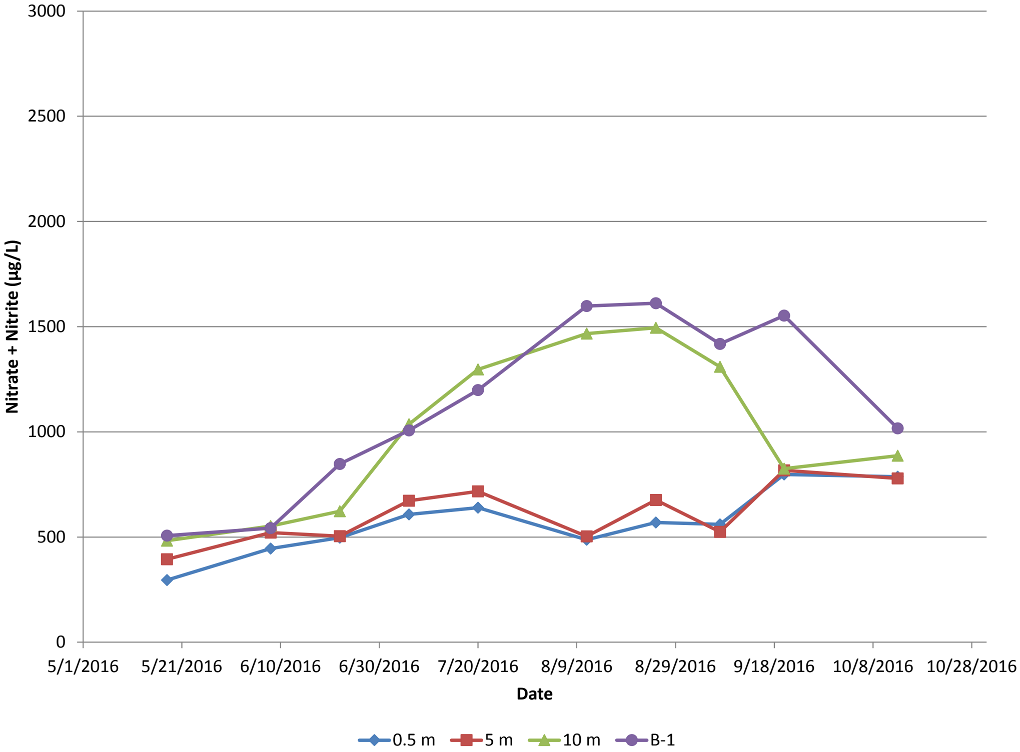

Figure 54. NO3+NO2 Concentrations (µg/L) at Station LL3, May-October 2016

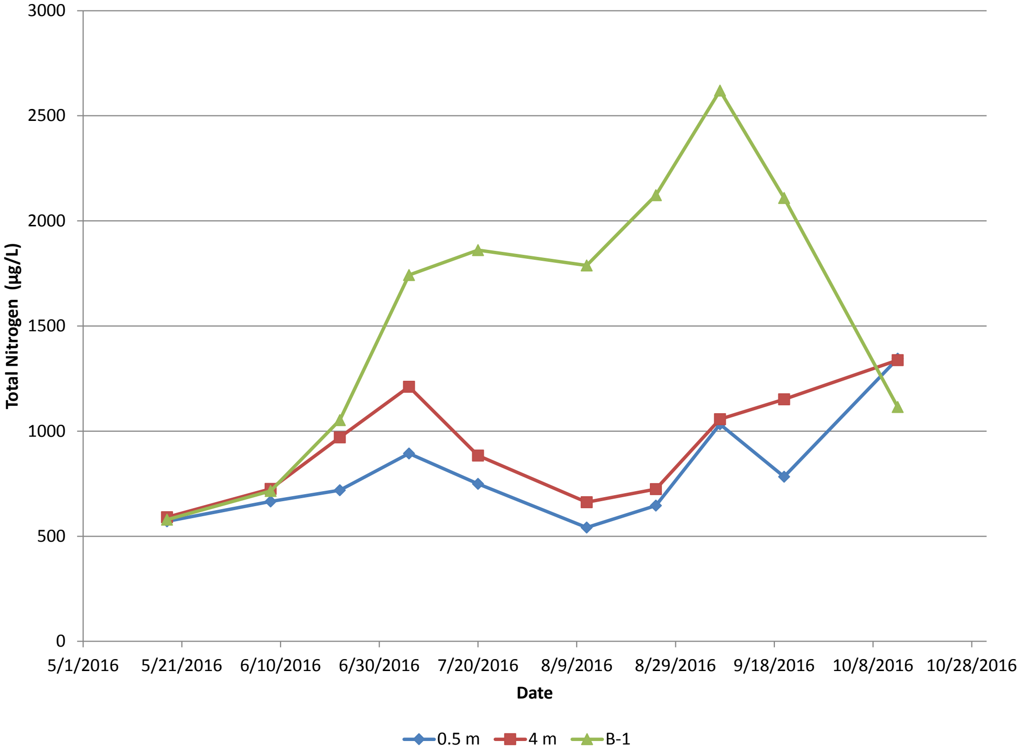

Figure 55. TN Concentrations (µg/L) at Station LL4, May-October 2016

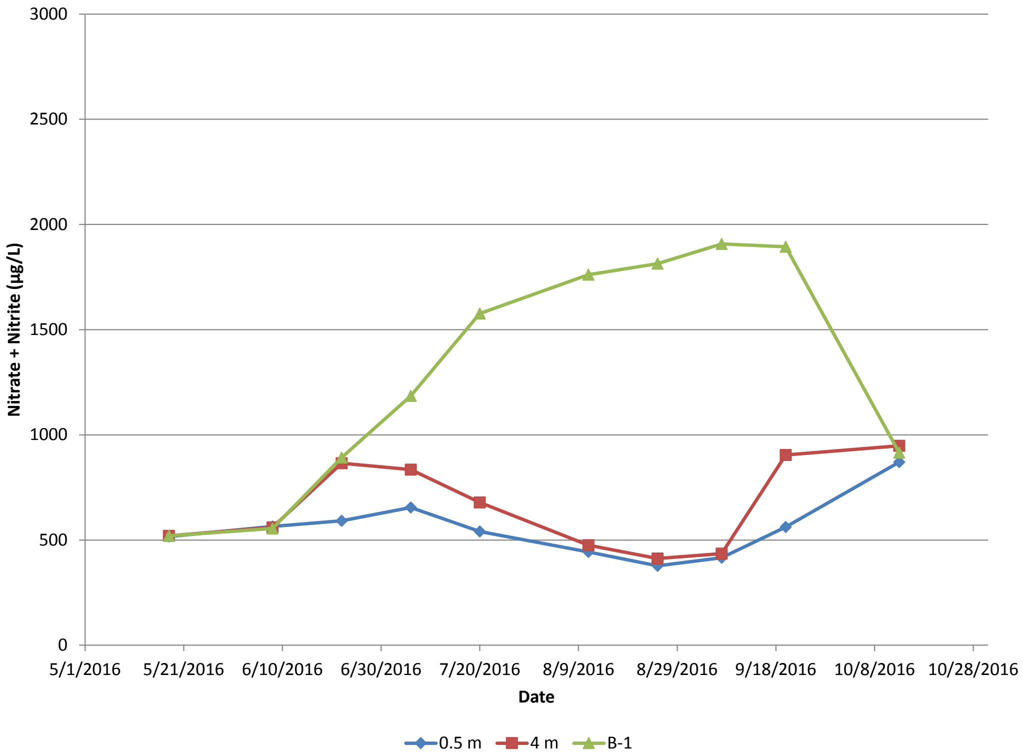

Figure 56. $NO_3$+$NO_2$ Concentrations (µg/L) at Station LL4, May-October 2016

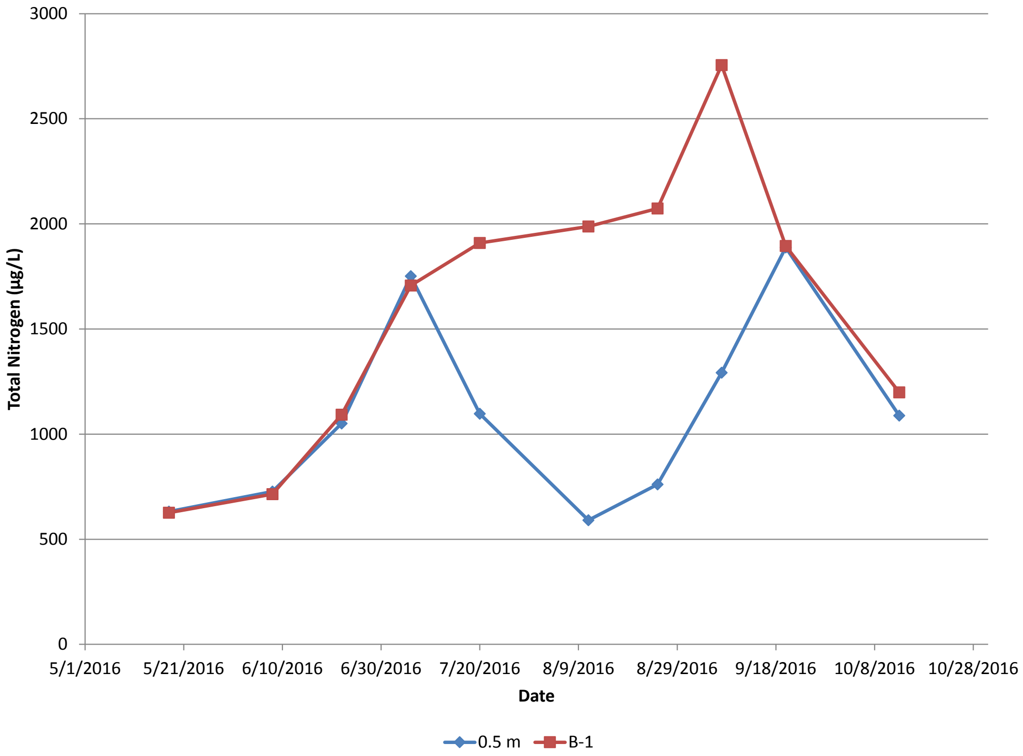

Figure 57. TN Concentrations (µg/L) at Station LL5, May-October 2016

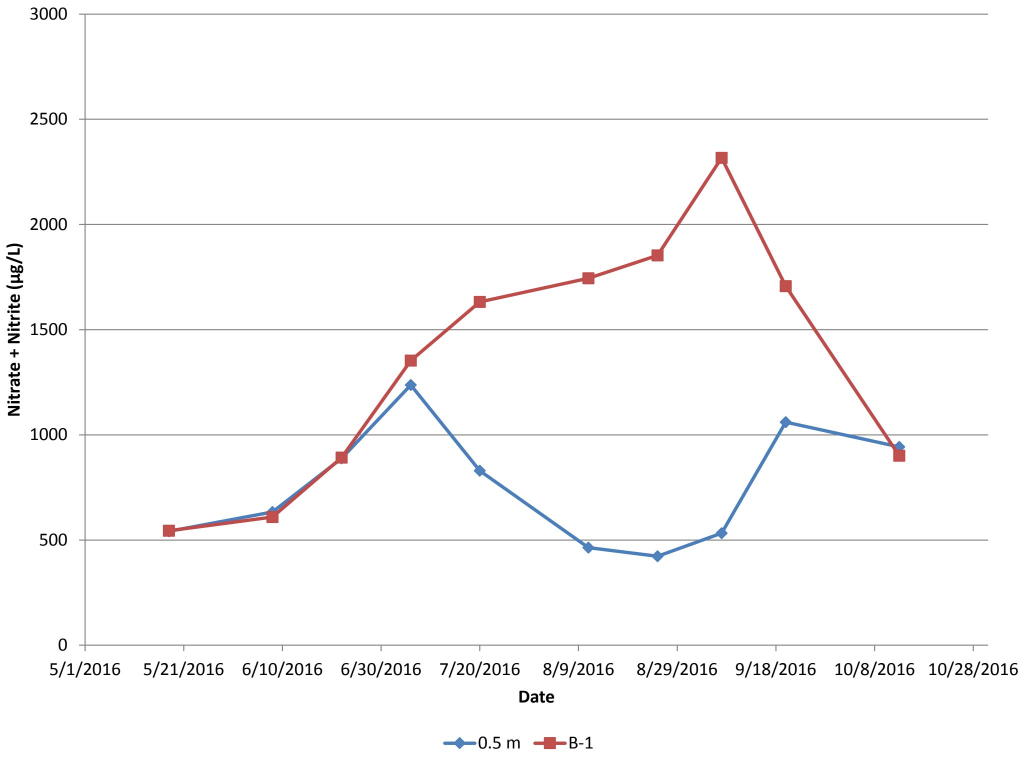

Figure 58. $NO_3$+$NO_2$ Concentrations (µg/L) at Station LL5, May-October 2016

### 3.2.6 PHYTOPLANKTON

Chlorophyll (chl) concentrations at the six stations ranged from 0.5 to 14.4 µg/L in 2016 with a lower maximum than in 2015 (0.2 to 18.2 µg/L) and 2014 (0.5 to 25.4 µg/L). Maximums at lacustrine sites were usually lower than in 2015, as well as at the transition and riverine zone sites. Maximums were observed in May at the lacustrine sites in both 2015 and 2016. The maximum for the whole reservoir, 14.4 µg/L, was observed at LL4 at 4 m in early August. The maximum in 2015 of 18.2 µg/L was also observed at LL4 at 4 m in early September. The seven-year maximum of 25.4 µg/L was determined in 2014.

Chlorophyll was usually highest at the 5 m depth (or 4 m depth at LL4) in 2016 (Figures 59 through 64). That was also the case in 2012 to 2015. However, chl varied more seasonally than with depth at the two up-reservoir sites, where maximums occurred in August and September, similar to conditions during both 2013, 2014, and 2015.

Chlorophyll was relatively high in May at the lacustrine sites, probably reflecting the end of the spring diatom bloom (Figures 59 through 64). Relatively high chl occurred again in August at all sites. This pattern was similar to that observed in 2015. The higher summer levels in 2016 did not correspond with maximum TP concentrations at LL4, as was the case in 2015, but higher chl did correspond to higher surface TP at LL5 in late summer (Figure 43). Chlorophyll at LL4 at 4 m increased sharply in early August to around 14 µg/L before decreasing and peaking again to only 9 µg/L in early September. Surface chl at LL4 rose to almost 11 µg/L in early September. The seasonal pattern of chl at LL4 and LL5 was similar in 2015 and 2016, but maximums were greater and lasted longer in 2015.

The increased chl at LL4 and LL5 in early August was associated with a very green color, clumps of algae on the surface and reduced transparency, which persisted at both sites through early September. This condition also occurred in 2015, as well as in 2014, but in late August. Algal scums were observed just downstream of LL5 and in between LL4 and LL5 starting in early August in 2015. However, there were no observed or reported algal scums in the vicinity of LL4 and LL5 in 2016. Also, there were no scums in 2014 even though there was a large bloom. Conditions in 2015 were similar to those in previous years (2010 and 2012), in which a thick scum of accumulated algae (primarily cyanobacteria) occurred up-reservoir of LL4, just down-reservoir from the Nine Mile Resort boat launch, as well as at LL5. In 2015, samples collected near LL4 (Suncrest Park) were positive for the cyanobacteria toxin microcystin at levels above the state guidelines. No samples were collected for toxicity during 2016 due to the lack of a scum. Scums were absent in 2016 even though residence time was longer (43 days) than in 2010 and 2012.

Composition of the phytoplankton showed that diatoms (*Chrysophyta*) were dominant at all stations during the spring, based on both abundance (cell counts) and biovolume (Figures 65-76). Cyanobacteria abundance increased at all sites in July and August, but were represented by a relative significant biovolume only in early August and early September at LL5. In 2014 and 2015, cyanobacteria followed a similar pattern but with substantial biovolumes at both LL4 and LL5 in August 2014, but only at LL5 in late July and August. Biovolume of cyanobacteria was much less at LL5 in 2016 than in 2015 (1.3 – 2.0 vs 2.2 – 12 mm$^3$/L). In 2013, cyanobacteria were not strongly represented at any site. The pattern in 2014 and 2015 was similar to that in 2012 when diatoms dominated during the spring at all sites, while cyanobacteria dominated cell counts at all sites in early summer in 2015 and late summer in 2012 – 2014. Cyanobacteria abundance was dominant sporadically in August and September in 2016. Green algae (*Chlorophyta*) abundance was dominant throughout the summer at some locations. At station LL4, diatoms were more abundant in late July and late September than green algae or cyanobacteria. Diatoms and green algae tended to represent the greatest biovolume at most sites in 2016, although *Pyrrhophyta* was also high at stations LL4 and LL5.

The seasonal mean percent of biovolume represented by cyanobacteria at the upper reservoir stations (LL4 and LL5) was lower than in 2014 and 2015 (Table 9). However, the cyanobacteria were a minor fraction of the phytoplankton in all years at all sites. Cyanobacteria were more representative at all stations in 2014 than in previous years, including 2016. Also, mean biovolume varied more among sites in 2016, compared to 2015, but was much greater at all stations than in during 2012 – 2014 (Table 9). There were substantial differences between standard cell biovolumes used by the two laboratories, which may account for some of the higher biovolumes in 2015 and 2016 that do not correspond to higher chl concentrations.

The difference in phytoplankton abundance, biovolume and chl, among the years may also be related to the markedly different water residence times in 2015 and 2016 for the whole reservoir (70 and 43 days) and transition/riverine (13 and 8 days). These times were much greater than in 2013 and 2014 for both whole reservoir (37 and 31 days) and the transition/riverine zones (6.9 and 5.9 days) or in 2012 (19 and 3.6 days). Phytoplankton abundance and biovolume were much greater at all stations in 2015 and 2016 than the other years (Table 9), consistent with the much longer residence times, although differences in laboratory techniques may have accounted for some differences between 2015/2016 and previous years. However, mean summer chl at LL4 and LL5 was related to residence time (Figure 77).

Despite a shorter residence time, cyanobacteria comprised a larger mean and maximum percent of the biovolume in 2014 than in 2015 or 2016 (Table 9). Cyanobacteria were also more abundant at LL4 and LL5 in 2013 and 2014. Cyanobacteria would usually be expected to dominate the algal community with longer residence time, because cyanobacteria are slower growing and less tolerant of short residence times. In general, residence times <10 days begin to limit biomass accumulation (Welch and Jacoby 2004). Residence times longer than the seasonal means likely prevail in late summer when cyanobacteria reach maximums, so other factors than residence may account for their maximum biovolumes than residence time alone.

Table 9. Average summer (June – September) phytoplankton biovolume and percent cyanobacteria at the six stations during 2012-2016. Phytoplankton samples collected in 2012 – 2014 were analyzed by Water Environmental Services, Inc. and samples collected in 2015 and 2016 were analyzed by EcoAnalysts, Inc.

| Station | Mean Summer Phyto (mm$^3$/L) | | | | | | Mean Summer % Cyanos by Volume | | | | | Max Summer % Cyanos by Volume | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2012 | 2013 | 2014 | 2015 | 2016 | 2012 | 2013 | 2014 | 2015 | 2016 |
| LL0 | 0.80 | 0.57 | 1.77 | 1.06 | 2.44 | 5.61 | 0.68 | 0.28 | 8.73 | 1.86 | 0.1 | 1.79 | 1.27 | 24.1 | 10.2 | 0.2 |
| LL1 | 0.40 | 0.69 | 1.13 | 1.07 | 7.33 | 3.33 | 1.56 | 0.67 | 7.62 | 1.27 | 1.2 | 7.76 | 2.48 | 20.8 | 4.44 | 6.0 |
| LL2 | 0.37 | 0.77 | 1.20 | 1.19 | 6.15 | 6.70 | 0.68 | 0.56 | 6.75 | 0.93 | 0.4 | 1.79 | 1.51 | 18.6 | 1.76 | 2.5 |
| LL3 | 0.28 | 0.82 | 2.16 | 1.87 | 8.28 | 3.99 | 1.01 | 0.57 | 7.75 | 1.28 | 1.4 | 4.18 | 2.47 | 37.4 | 4.82 | 7.4 |
| LL4 | 0.39 | 0.93 | 3.07 | 3.73 | 7.44 | 11.5 | 2.80 | 1.24 | 8.72 | 4.44 | 2.7 | 11.9 | 8.62 | 39.5 | 18.5 | 12.4 |
| LL5 | 0.61 | 0.67 | 2.62 | 2.33 | 19.5 | 5.34 | 0.31 | 0.64 | 16.7 | 8.6 | 4.9 | 0.72 | 1.61 | 81.3 | 45 | 15.9 |

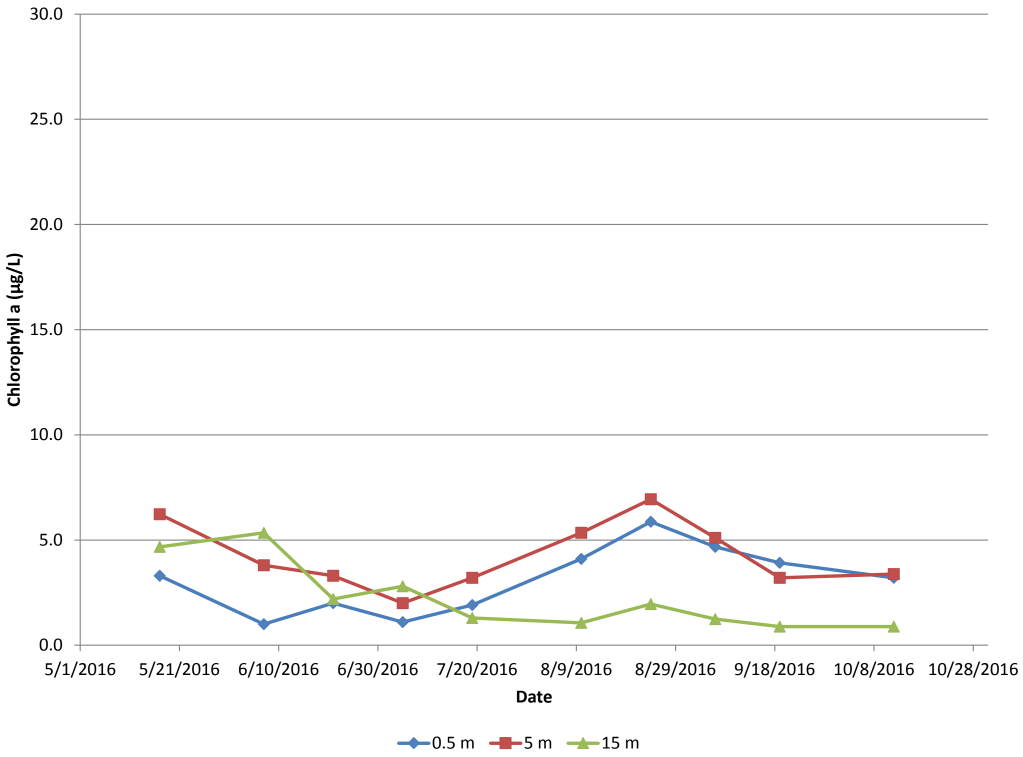

**Figure 59. Chl Concentrations (µg/L) at Station LL0, May-October 2016**

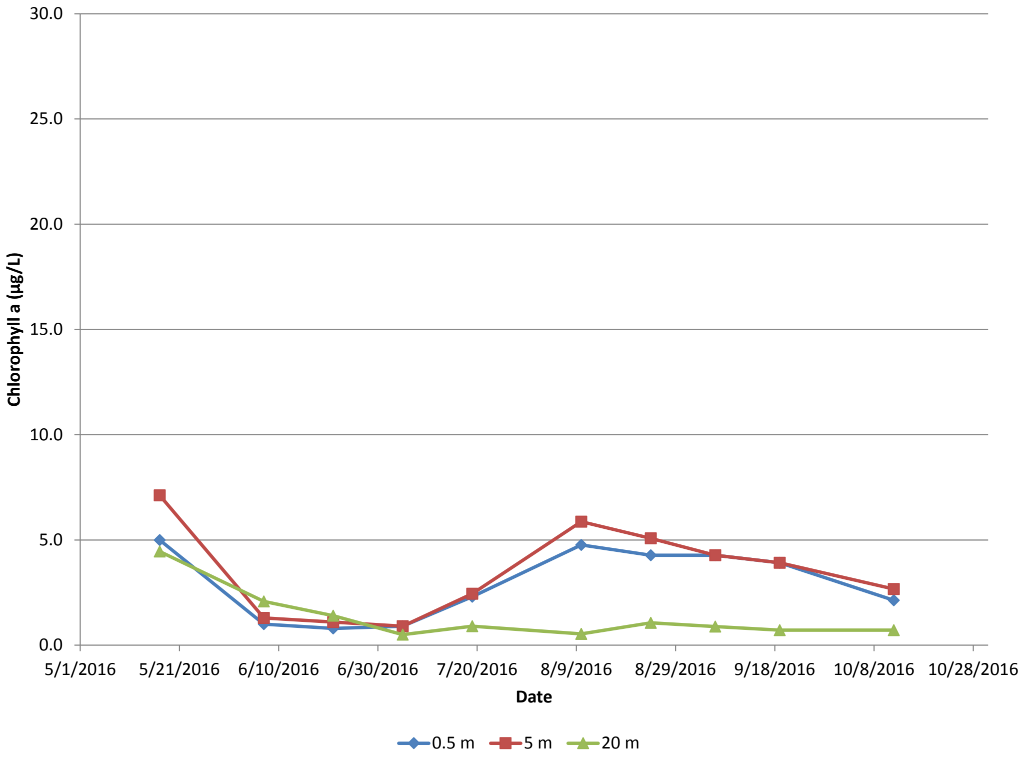

**Figure 60. Chl Concentrations (µg/L) at Station LL1, May-October 2016**

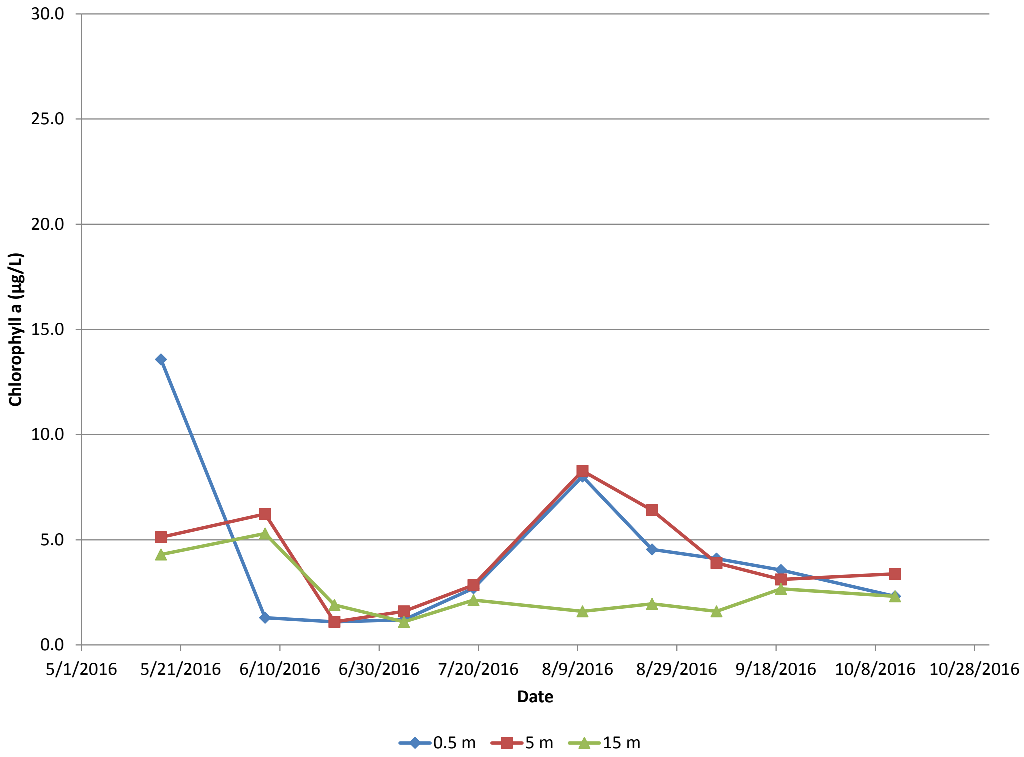

**Figure 61. Chl Concentrations (µg/L) at Station LL2, May-October 2016**

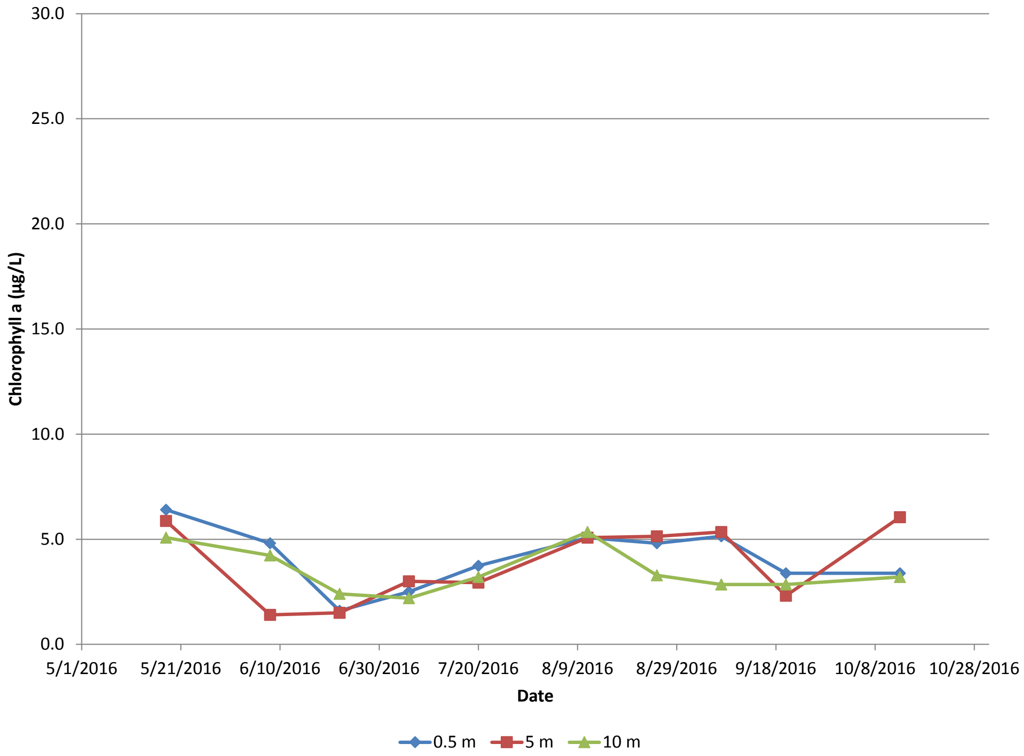

**Figure 62. Chl Concentrations (µg/L) at Station LL3, May-October 2016**

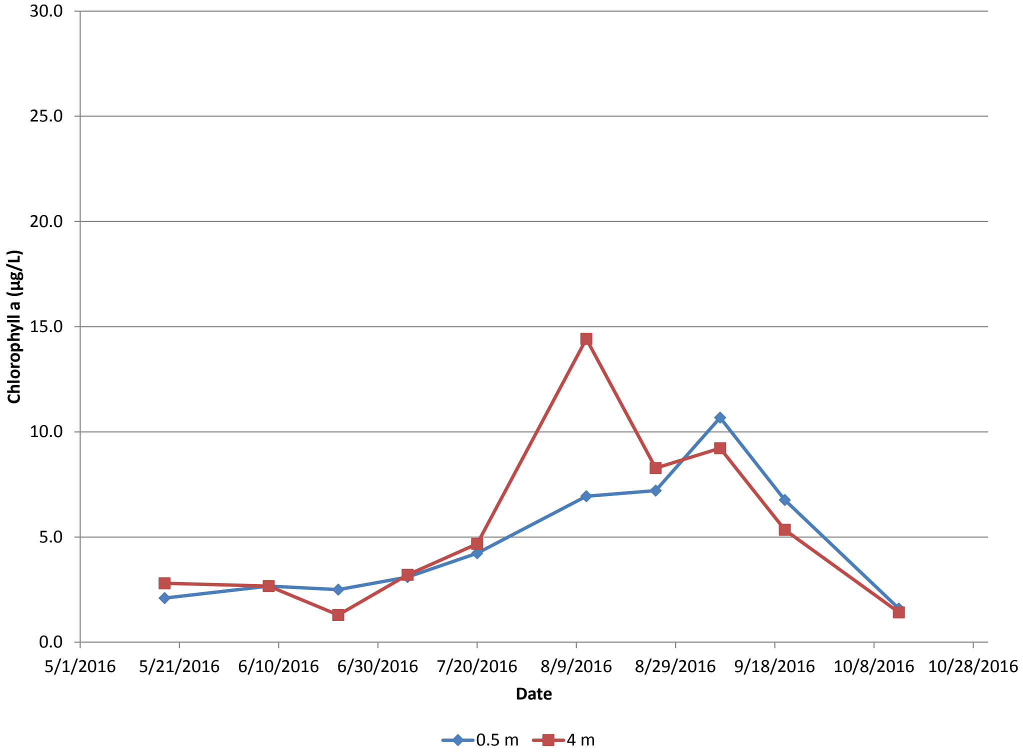

**Figure 63. Chl Concentrations (µg/L) at Station LL4, May-October 2016**

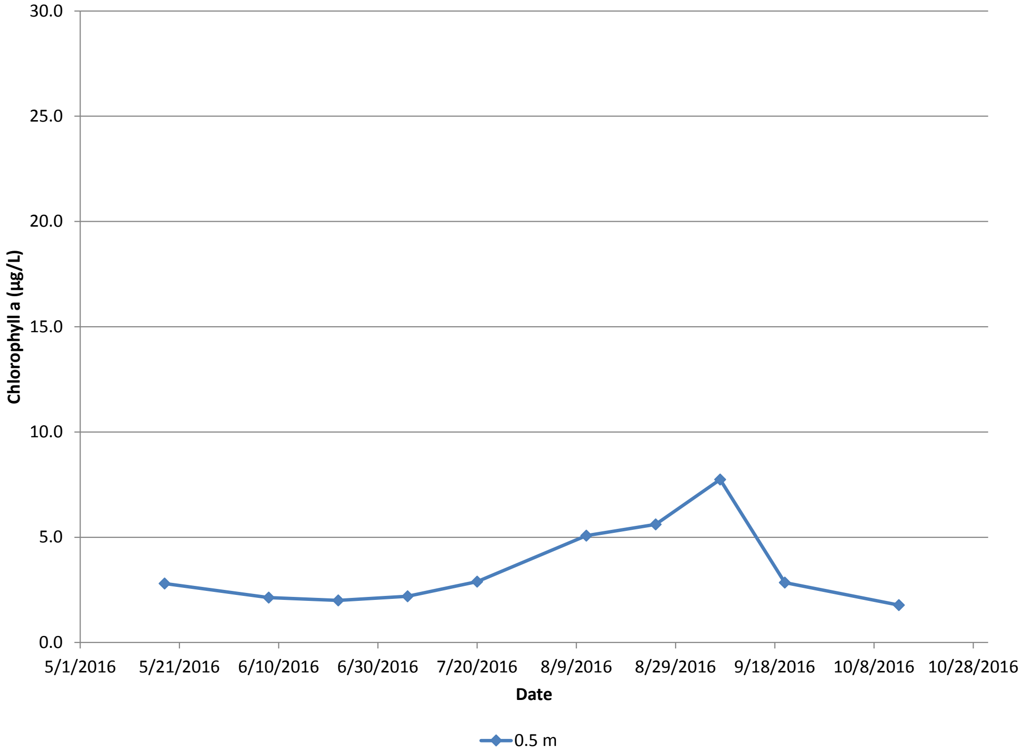

**Figure 64. Chl Concentrations (µg/L) at Station LL5, May-October 2016**

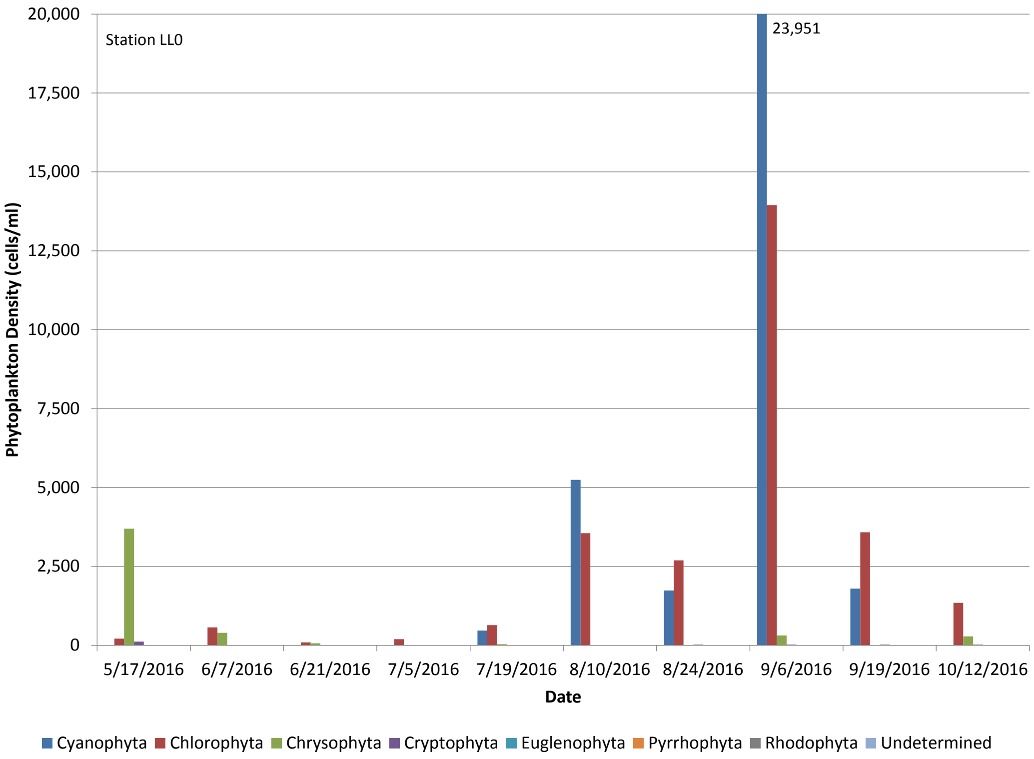

Figure 65. Phytoplankton Density (cells/ml) at Station LL0, May-October 2016

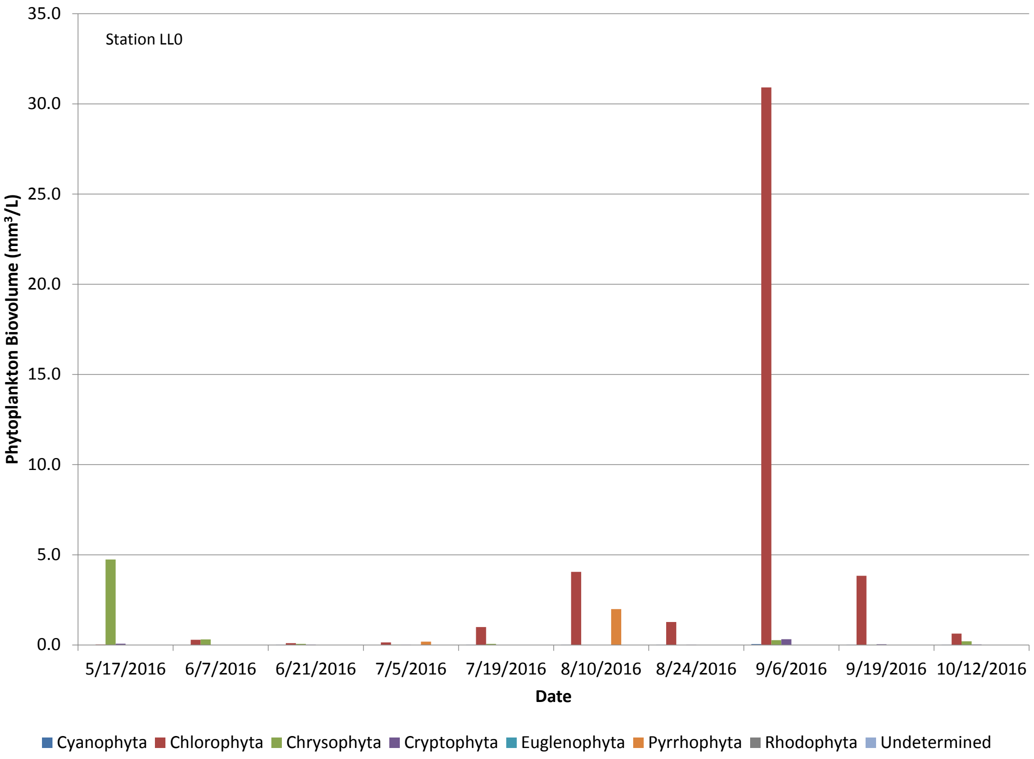

Figure 66. Phytoplankton Volume (mm$^3$/L) at Station LL0, May-October 2016

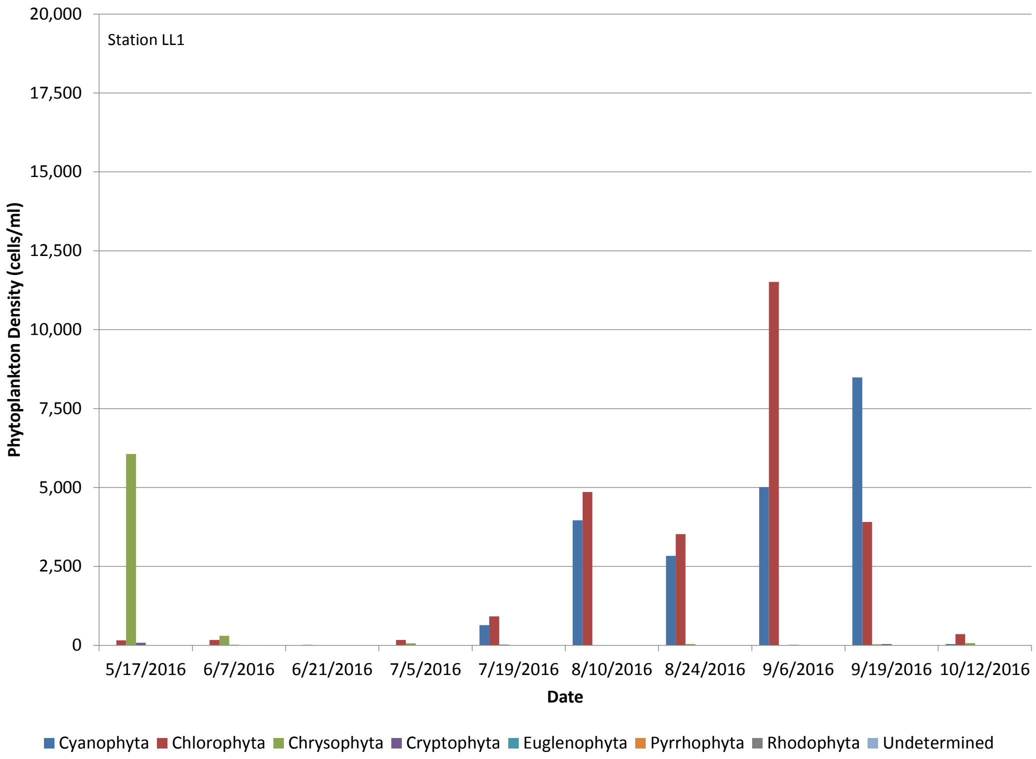

**Figure 67. Phytoplankton Density (cells/ml) at Station LL1, May-October 2016**

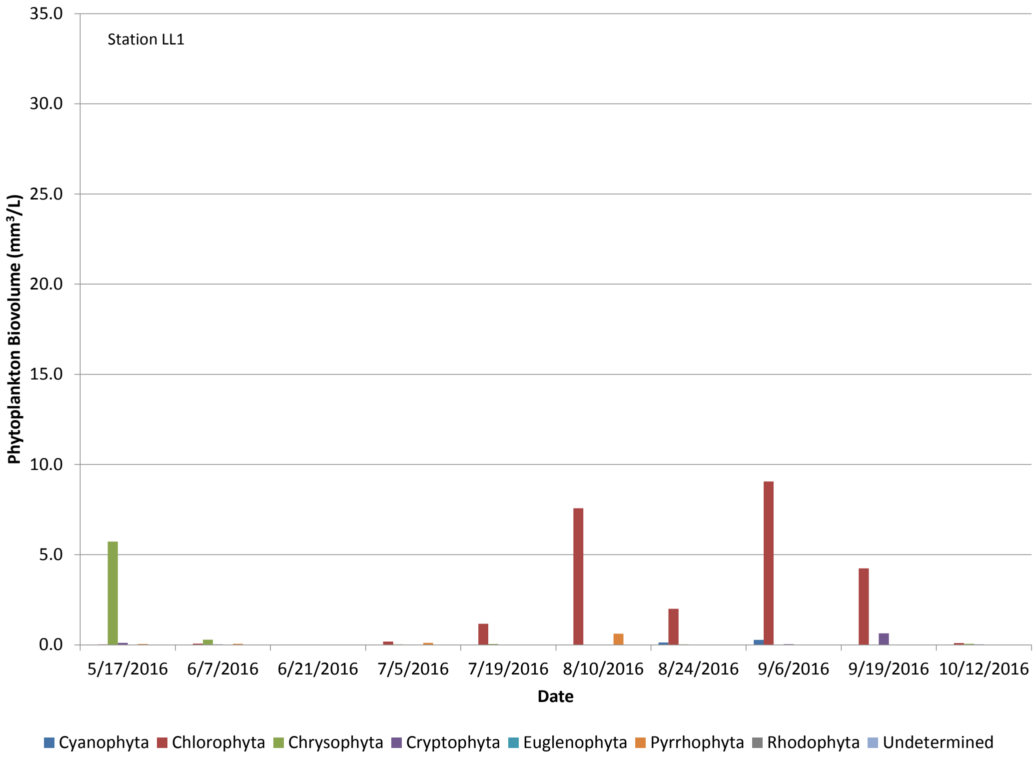

**Figure 68. Phytoplankton Volume (mm$^3$/L) at Station LL1, May-October 2016**

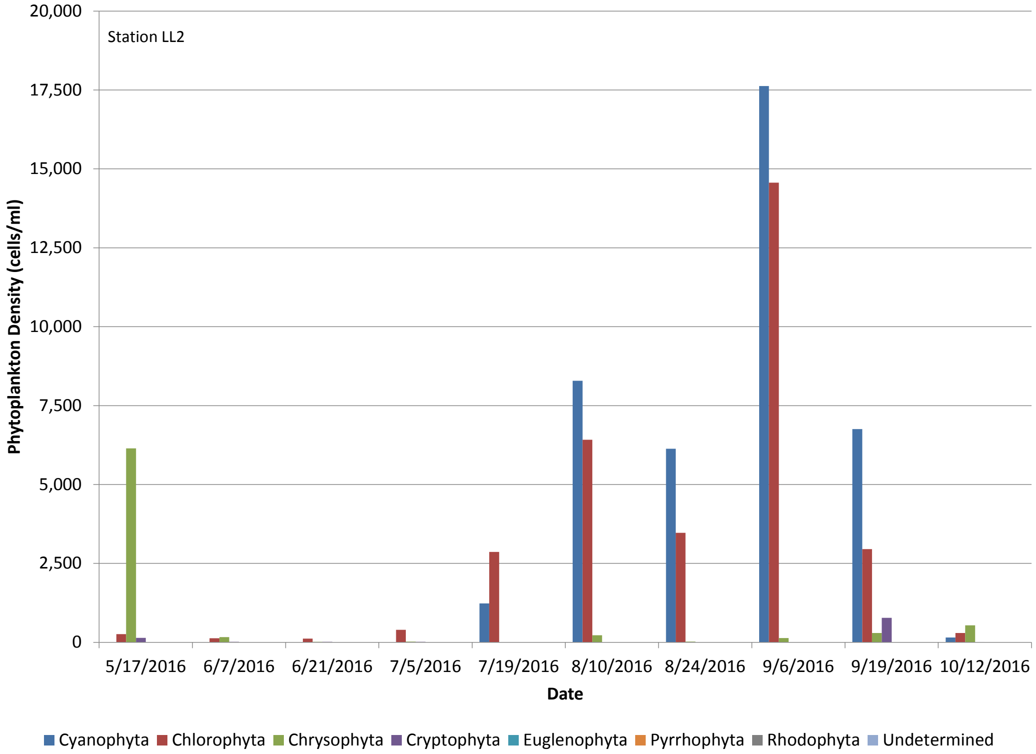

Figure 69. Phytoplankton Density (cells/ml) at Station LL2, May-October 2016

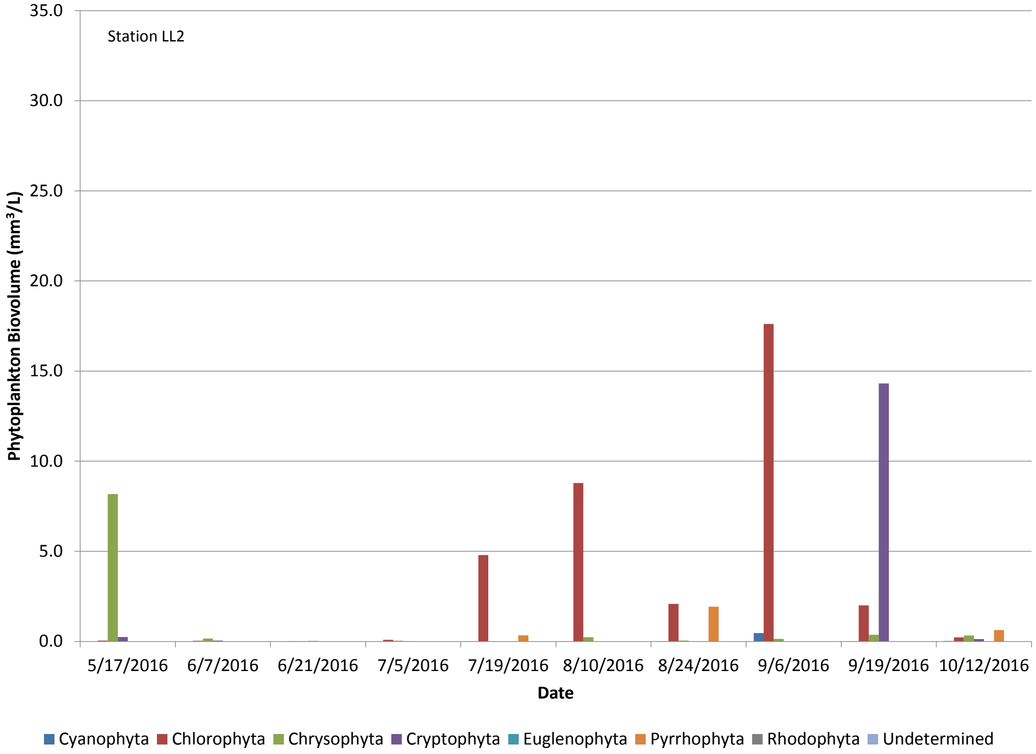

Figure 70. Phytoplankton Volume (mm$^3$/L) at Station LL2, May-October 2016

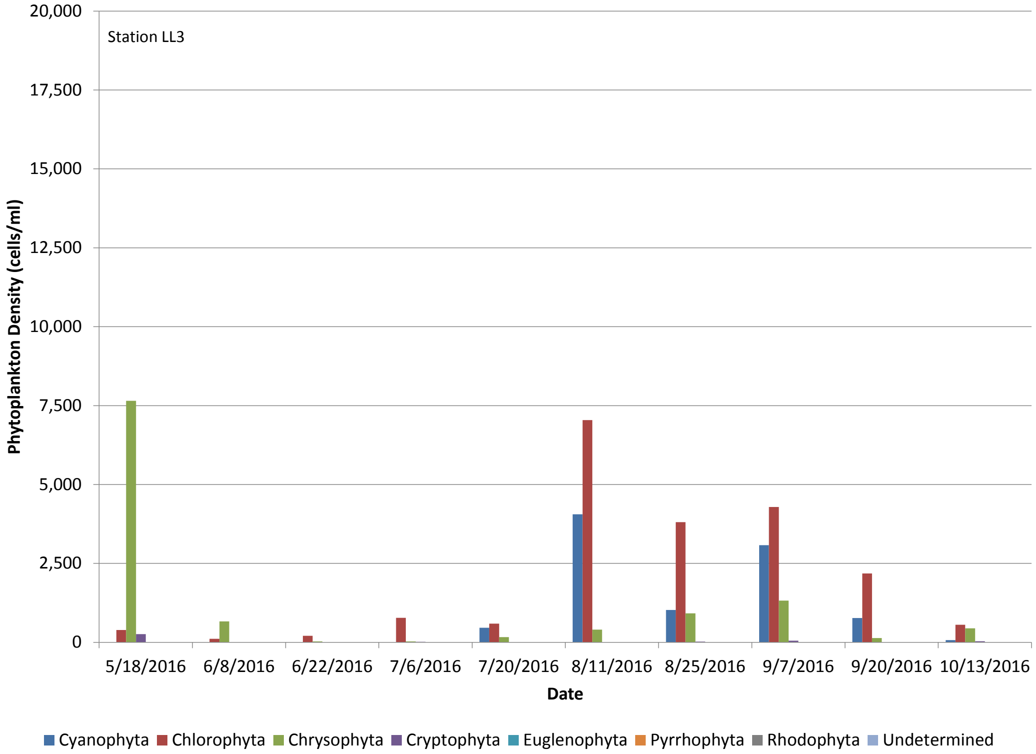

Figure 71. Phytoplankton Density (cells/ml) at Station LL3, May-October 2016

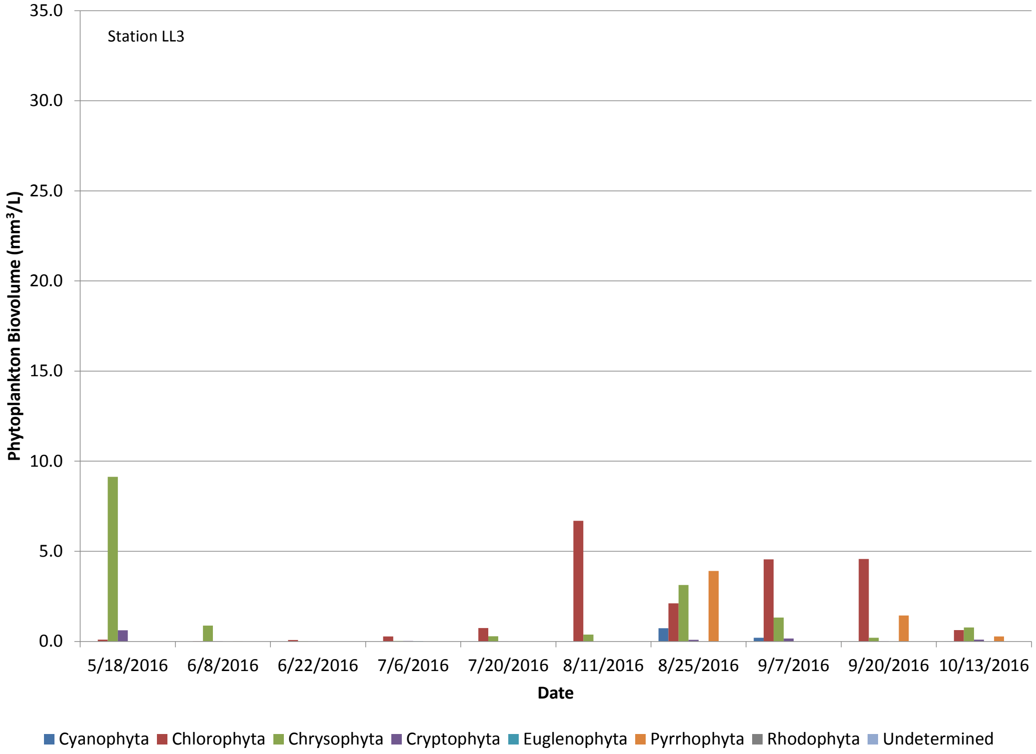

Figure 72. Phytoplankton Volume (mm$^3$/L) at Station LL3, May-October 2016

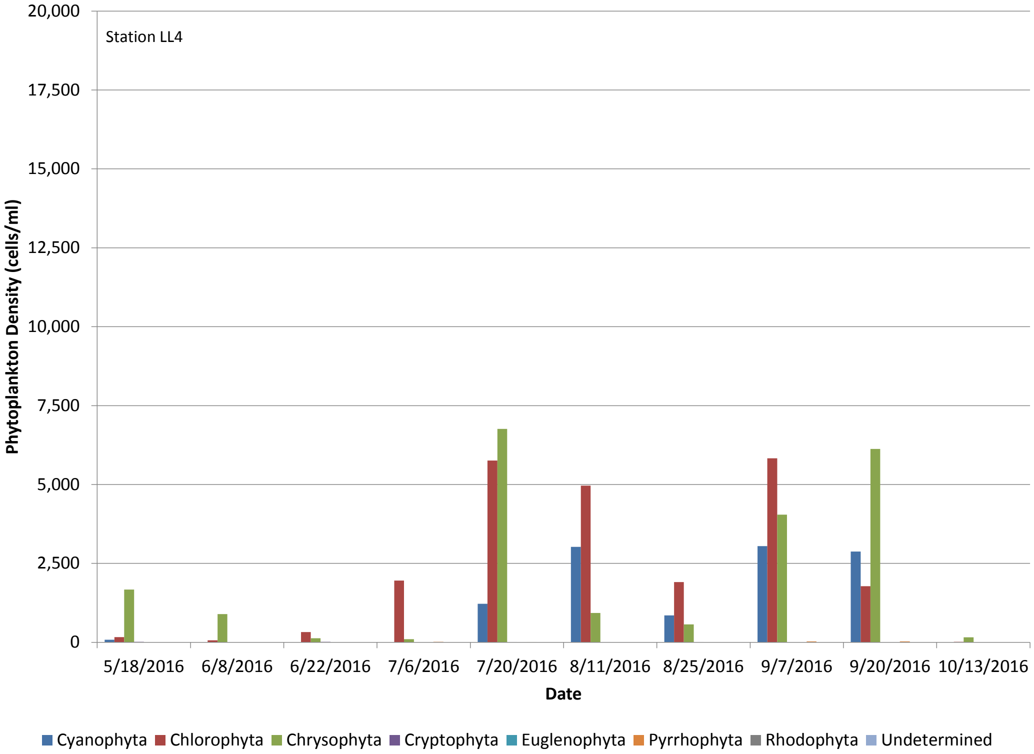

Figure 73. Phytoplankton Density (cells/ml) at Station LL4, May-October 2016

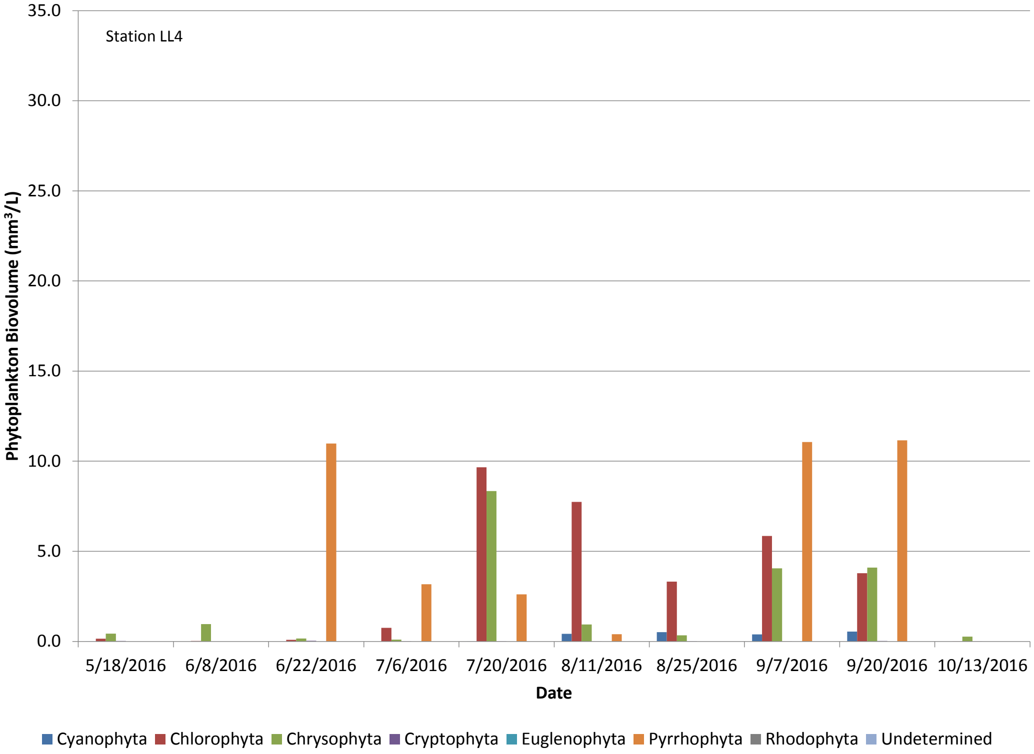

Figure 74. Phytoplankton Volume (mm$^3$/L) at Station LL4, May-October 2016

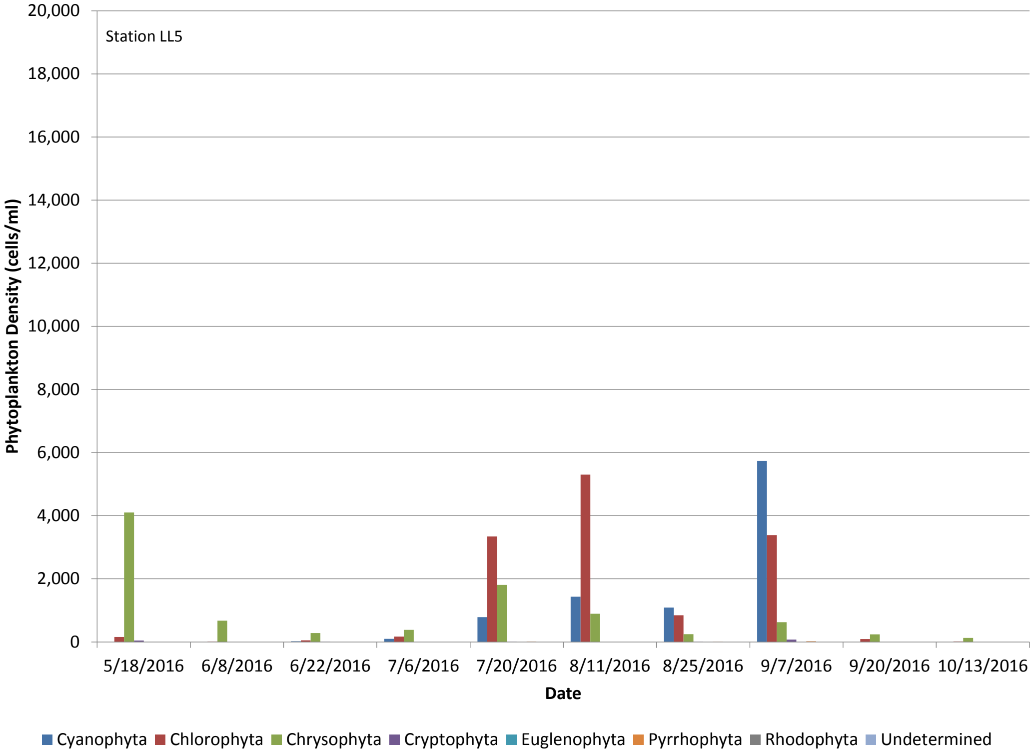

Figure 75. Phytoplankton Density (cells/ml) at Station LL5, May-October 2016

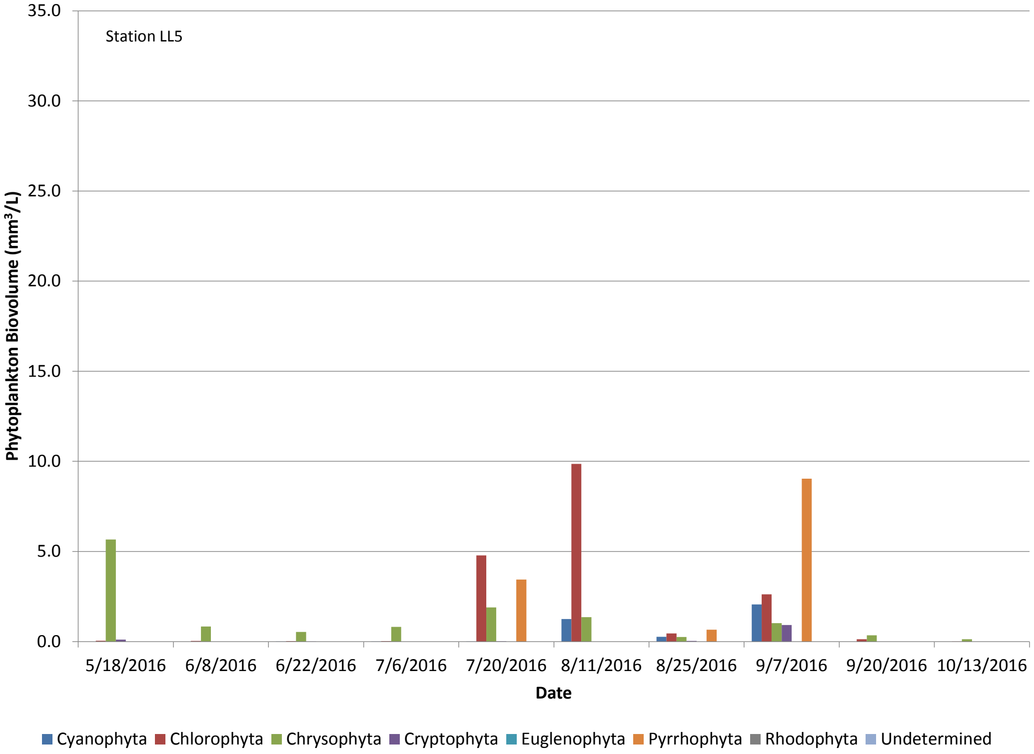

Figure 76. Phytoplankton Volume (mm$^3$/L) at Station LL5, May-October 2016

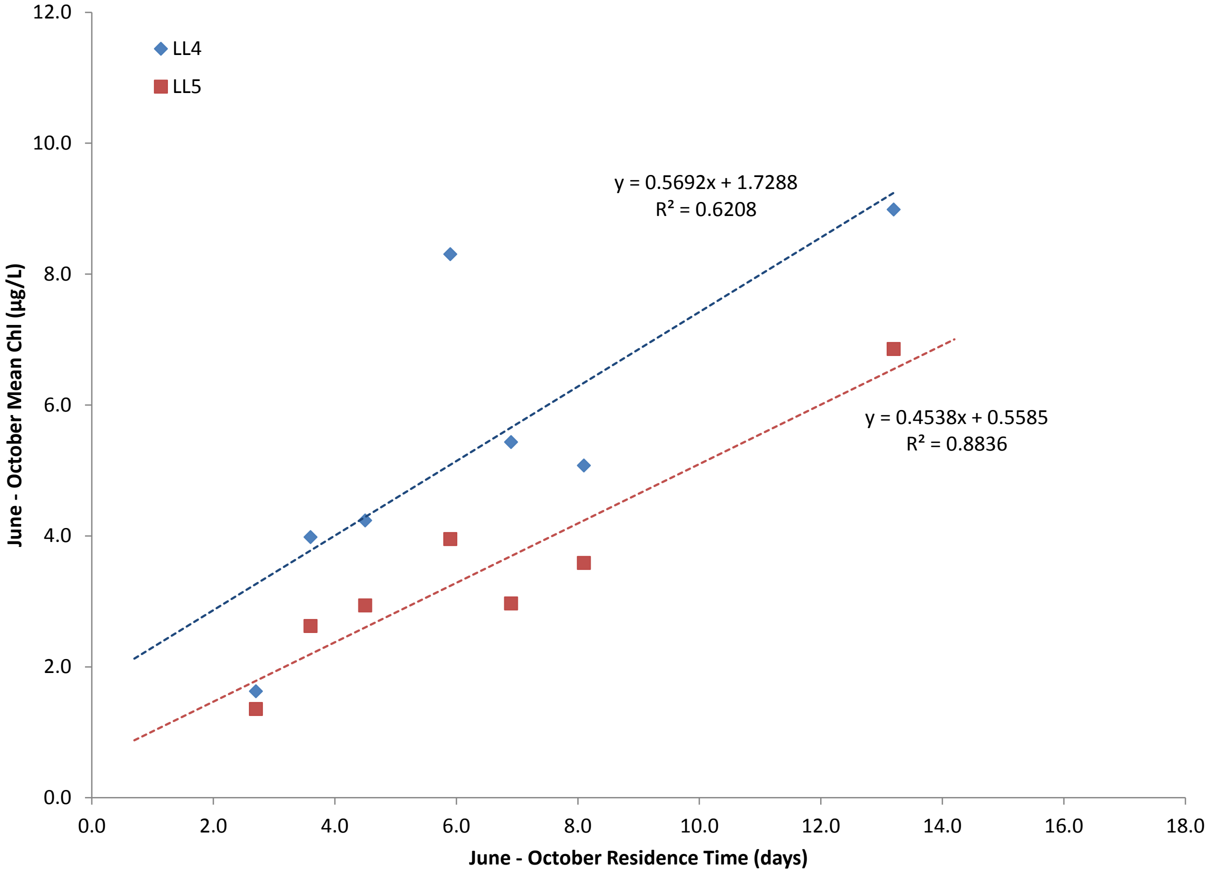

Figure 77. Transition/Riverine Residence Time vs Chl in Lake Spokane, 2010 – 2016.

### 3.2.7 TRANSPARENCY (SECCHI DISK DEPTH)

Transparency ranged from 2.2 to 9.2 m throughout the reservoir during 2016 (Figures 78 through 83). The maximums occurred at different times (mainly late June and early July), depending on the station, but were coincident with low chl concentrations (algae absorb and scatter light). The minimums for most stations were in May when inflow was highest and light attenuation was affected by non-algal particulate matter. Transparency at the deeper stations in May also appear to have been influenced by the spring phytoplankton bloom. Minimums occurred at LL4 during a phytoplankton bloom in August and early September. There were lower transparencies at the other stations during this time as well. Transparency was determined largely by phytoplankton abundance (chl) throughout the reservoir, except during May at Station LL5.

As is the case for most reservoirs with relatively large inflows carrying non-algal suspended matter, transparency increased down-reservoir with greatest transparency occurring in the lacustrine zone. Much of that trend was likely due to longer water retention time that prompts a greater loss of particulate matter through settling, as well as plunging inflows that tend to isolate the lacustrine epilimnion allowing even more settling time from the upper layer.

Whole-reservoir, area-weighted mean transparency during June – October of 2010-2016 was 4.8 ± 0.35 m. In contrast, mean transparency during that period in 1971-1977, before phosphorus reduction, was 2.4 ± 0.44 m, and after reduction, 3.3 ± 0.39 m.

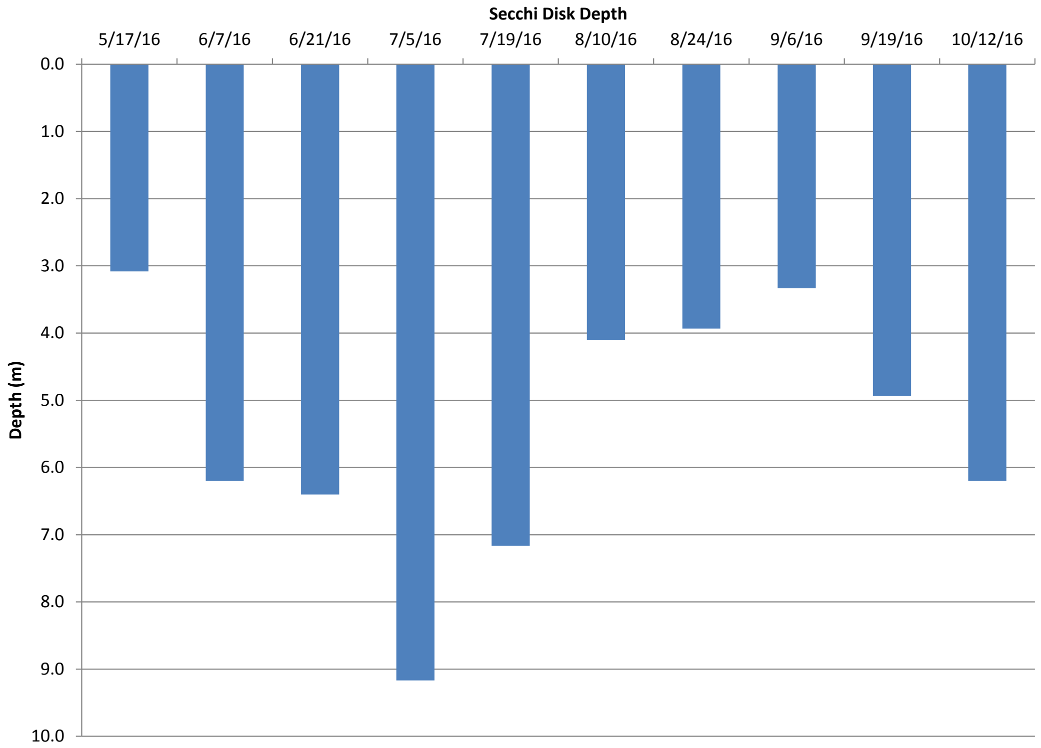

**Figure 78. Secchi Disk Depths (m) for Station LL0, May-October 2016**

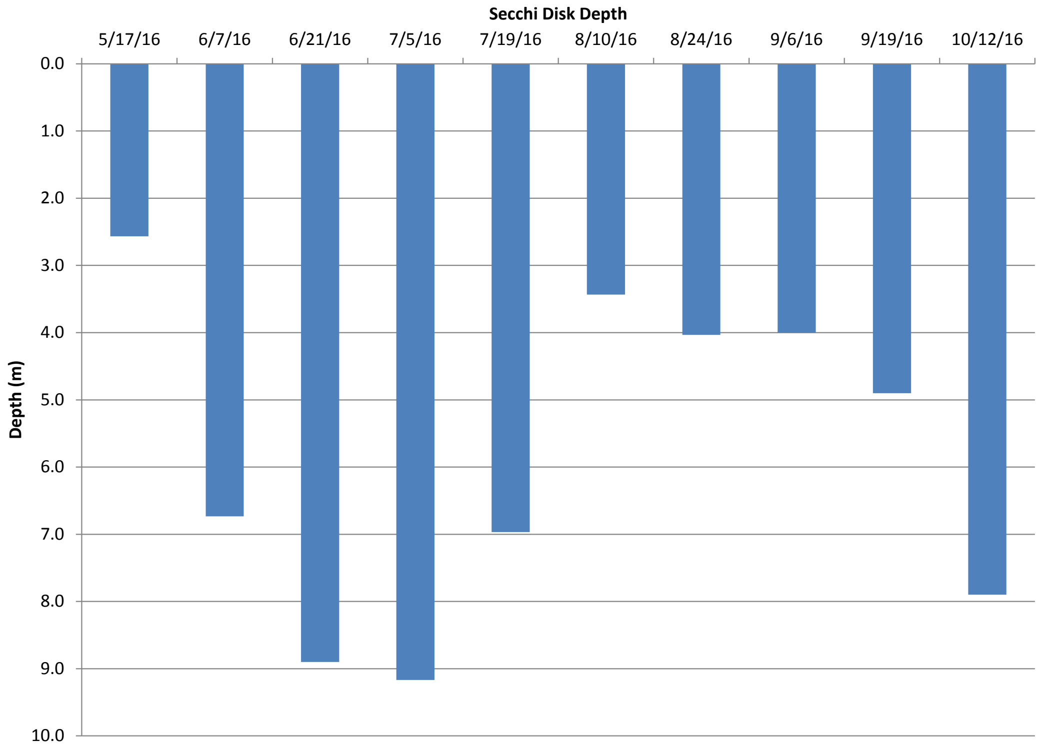

**Figure 79. Secchi Disk Depths (m) at Station LL1, May-October 2016**

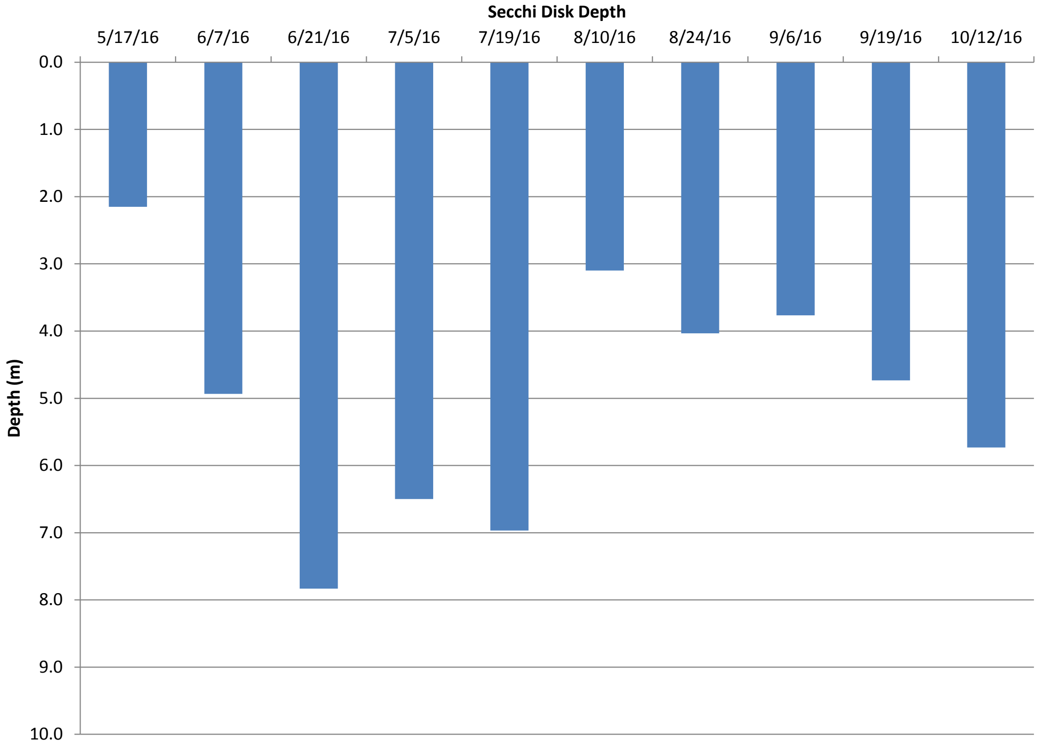

Figure 80. Secchi Disk Depths (m) at Station LL2, May-October 2016

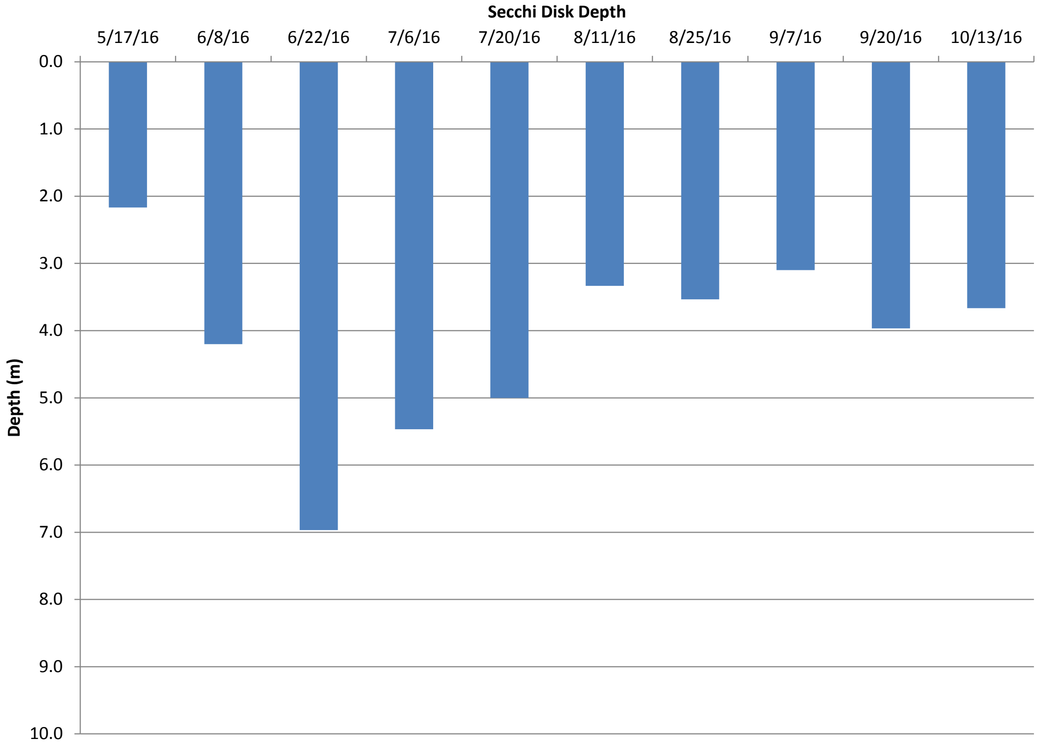

Figure 81. Secchi Disk Depths (m) at Station LL3, May-October 2016

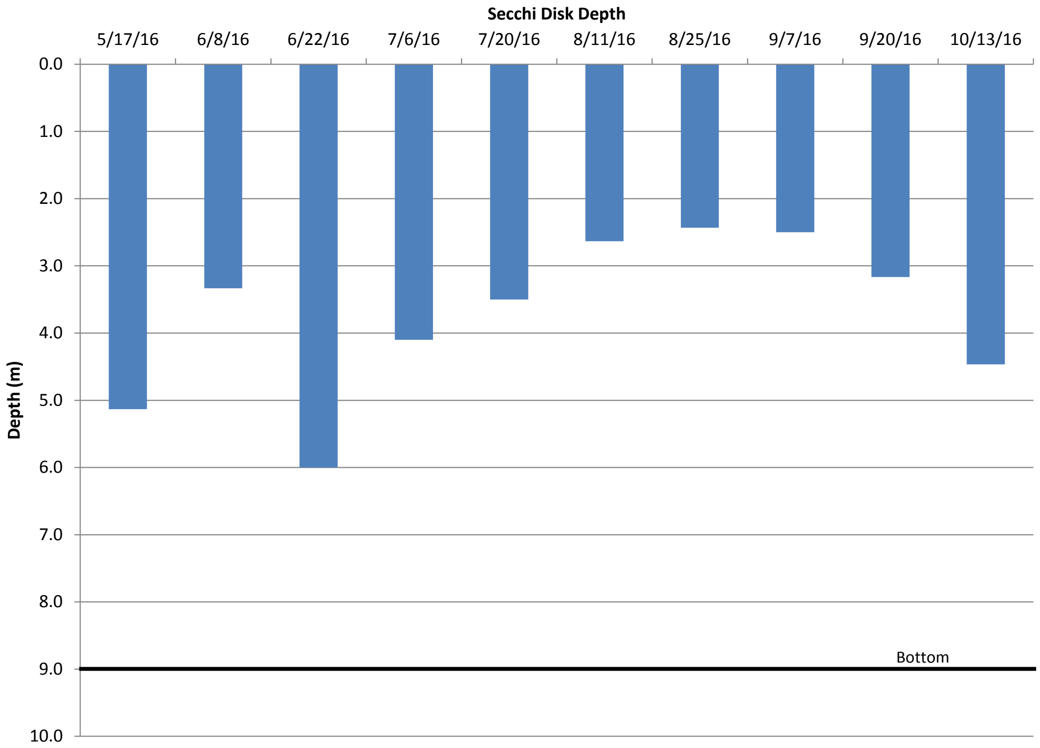

**Figure 82. Secchi Disk Depths (m) at Station LL4, May-October 2016**

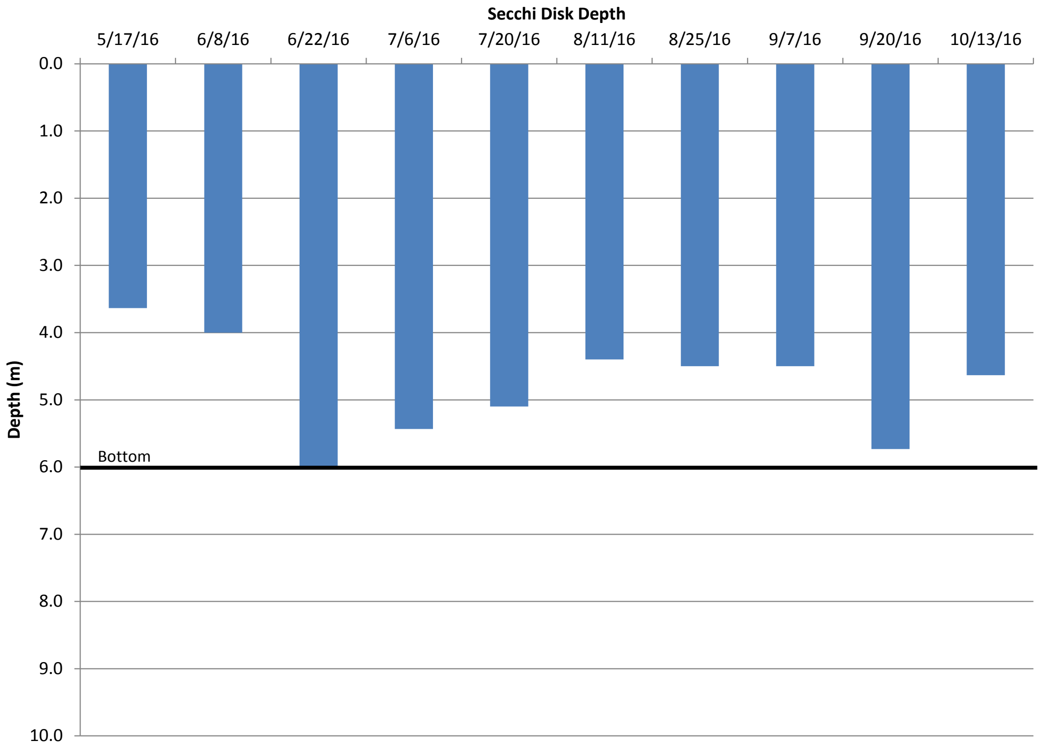

**Figure 83. Secchi Disk Depths (m) at Station LL5, May-October 2016**

### 3.2.8 ZOOPLANKTON

Rotifers and Nauplii usually dominated the zooplankton density (numerical abundance) at most stations in 2016 (Figures 84 through 95). Rotifers were more abundant in May and then again later in August and September, especially in the upper reservoir. However, those animals are relatively small and did not dominate biomass. This pattern is similar to the zooplankton community in 2015, although nauplii were more abundant during the summer and into the fall. Similar to Rotifers, Nauplii did not dominate biomass at any stations during 2016. Rotifer densities were usually higher in spring at the deeper sites, but were greatest at LL3 – LL5 in late summer and fall. This was also the case in 2013 – 2015. That may be due to rotifers being detritus and bacteria feeders; abundance of such organic particles may occur at high concentrations in the upper hypolimnion and lower metalimnion and account for high densities despite the dilution effect of deep net hauls. Rotifer densities were higher at LL4 and LL5 in August and September (21 to 126 #/L) than at any other stations. The rotifer densities were higher at LL4 and LL5 in 2015 during the same time period (75 to 178 #/L). Rotifer density, as well as other zooplankton species, declined dramatically at station LL5 in late September and October, 2016, although densities remained relatively high at LL4 in late September. The decline at LL5 corresponded to destratification of the water column and a decrease in water residence time with the start of higher inflows.

Cladocerans (*Cladocera*) are the largest zooplankters and they dominated biomass at all stations for most of 2016. *Calanoid* copepods were relatively unimportant in contrast to natural lakes in which they usually dominate in the spring. *Calanoid* copepod biomass was high during the summer and into fall at LL4, but declined at LL5 with increased inflow and reduced retention time, similar to 2015. Density and biomass of cladocerans, as well as other groups, were probably artificially reduced at the deeper lacustrine stations because they were sampled by net hauls from approximately 1 m off the reservoir bottom to the surface. Large mobile zooplankton are much less likely to occur in the hypolimnion where food particles, especially phytoplankton, are scarce. That was especially apparent at LL4 and LL5 with very high maximum densities of 10-30/L and much lower densities at LL0 – LL3 with net hauls of 19-47 m. Biomass of cladocerans ranged from 16 to 146 µg/L at LL4 – LL5 during July through September 2016.

Multiplying concentrations by net haul depth, which results in density and biomass per surface area, tends to even out the station differences (Tables 10 – 14). Depth-corrected average seasonal cladoceran concentrations were still higher at LL4 than other sites in 2016 (56 $x10^3/m^2$; Table 10), while concentrations at LL5 were the lowest (11 $x10^3/m^2$; Table 10), although LL5 had the second highest mean density of cladoceran without correcting for depth. Depth-corrected average seasonal cladoceran concentrations in 2016 were lower than in any previous year (Tables 10 – 14). Thus, part of the reason for low cladoceran density and biomass at deep sites is likely a dilution effect with greater net haul depths.

Cladoceran densities and biomass varied among upper reservoir sites (LL4 – LL5) over the past five years. Densities were highest in 2013, averaging 26 and 56/L and over 200 $x10^3/m^2$, but were much lower in other years, usually around 10/L or less (Tables 10 – 14). Mean densities at LL4 – LL5, corrected for net-haul depth (no/$m^2$), were also much lower in 2012, 2014, 2015, and 2016 than in 2013. Season (June-October) average water residence times may explain some of the differences in density among the years; 2012 and 2014 with less density had shorter residence times, at 3.6 and 5.9 days, than 2013 (6.9 days) when densities were highest, although the difference of only 1 day between 2013 and 2014 was probably not significant. Also, water residence times in 2015 and 2016 were the longest out of all years, mean density at LL4 was actually lower than in 2013 (206 x$10^3$/$m^2$), than in 2015 and 2016 (73 and 103 x$10^3$/$m^2$). The lowest mean areal density of any of the five years and sites occurred at LL5 in 2016 with an average residence time of 8.1 days. Thus, water residence time is definitely an important factor to both phytoplankton and zooplankton abundance, and even more so for zooplankton, due to their slower growth rate. However, average seasonal residence time is probably not always a good indicator in the upper reservoir due to variability in hydraulic conditions. For example, all zooplankton populations were thriving well at LL5 during most of the dry, low inflow summer, but were greatly depleted in late September and October when inflows increased.

Cladoceran density was significantly less at all stations in 2016 and similar to those in 2012 and 2015 compared to the high densities in 2013 (Tables 10 – 14). The highest summer mean cladoceran areal density observed in 2016 was at station LL4 with nearly 56 x$10^3$/$m^2$, which was half that in 2015. Mean density was over 254 x$10^3$/$m^2$ at station LL0 in 2013, over 11 times that in 2016, nearly 7 times that in 2015, and 5 times that in 2014. The largest difference among sites and years was at station LL5 where density in 2012 was slightly over 13 x$10^3$/$m^2$ versus nearly 281 x$10^3$/$m^2$ in 2013 (Tables 11 and 12). In 2015, density at the riverine site was second highest of the five years at 51 x$10^3$/$m^2$ (Table 14) but in 2016 cladoceran density at LL5 was the lowest of all years (11,064/$m^2$).

Cladocerans (including *Daphnia*) also had the largest biomasses during summer at all sites, with maximums reaching 146 µg/L at LL5 in 2016, which is slightly less than the maximum of 184 µg/L in 2015 at LL4. Maximum biomass was 150 µg/L, or more at LL3 and LL4 in 2014. These maximums were lower than in 2013 with biomass well over 200 µg/L at LL4 and LL5. In August 2012, biomass maximums averaged only about 80 µg/L. Variability in cladoceran abundance was large from year-to-year. The reason for this variability is unclear, but such is not unusual with dynamic plankton populations responding to sometimes rapidly changing environmental conditions.

Because of their large size, cladocerans are usually the most important grazers, with *Daphnia* being the largest and most efficient. *Daphnia* size at LL4 has ranged from 0.7 to 2.8 mm, but usually between 1.0 to 2.1 mm. At that large size, they are the favorite food for visually-feeding, planktivorous fish. However, *Daphnia* usually had "helmets" throughout the summer in 2014, as well as 2012 and 2013. Helmets usually indicate low predation. Whether *Daphnia* had helmets in 2015 or 2016 is unknown, due to a change in laboratory and counting procedures/reporting. The presence of helmets may not be due to fish predation in this case, because a large number of catchable size trout were stocked in the reservoir beginning in June of 2014 (155,000) as well as in May of 2015 (155,000), with no such intensive stocking in 2012 or 2013 when *Daphnia* were helmeted. Although temperatures in the top 5 m were above optimum for trout during July-August, suitable temperatures for fish predation existed below that depth.

The trophic state of a lake or reservoir can be judged by the amount of zooplankton consumer production relative to that of phytoplankton production. The transfer of food energy from one trophic level (producers) to the next (zooplankton consumers) is nominally 10%. That is, 10% of carbon produced reaches the next trophic level, so the transfer is 10% efficient. If biomass turnover rate were the same at each trophic level, then the ratio of zooplankton dry biomass to phytoplankton dry biomass would be one tenth, assuming all phytoplankton are edible and all zooplankton are eating algae. However, productivity, or turnover rate, of producer levels is usually greater than at consumer levels.

Neverless, cladocerans are large and usually the major consumers, and have averaged 67% of total zooplankton biomass over the past five years. Over 90% of cladocerans have been *Daphnia*, which can have very high growth rates and are capable of consuming all the edible algae produced per day under ideal conditions (Welch and Jacoby 2004). Cyanobacteria are largely inedible, but their maximum percent of the phytoplankton biomass averaged only 4.7 and 3.0 in 2012 and 2013, but increased to 37% in 2014 and decreased again in 2015 at 14% and again in 2016 at 7.4%.

The zooplankton:phytoplankton biomass (dry-weight) ratio in a 15 m water column was determined by converting phytoplankton biovolume to dry weight, assuming cells are 85% water. That ratio ranged from a three-year (2012 – 2014) per site average of 0.3 to 0.59, with an overall mean of 0.44, which would indicate nearly half the phytoplankton were apparently being consumed, assuming biomass turnover rates were the same for each trophic level. In 2015, the average ratio was dramatically lower than in 2012 – 2014, ranging from 0.03 to 0.17. The ratio in 2016 ranged from 0.13 to 0.40. The lower ratios in 2015 and 2016 were likely due to higher reported phytoplankton biovolumes, because of different average cell biovolumes used by the two laboratories (WATER Environmental Services and EcoAnalysts, Inc.), rather than to a large biovolume of inedible cyanobacteria. That is supported by the relatively low contribution from cyanobacteria to overall biovolume throughout the period (see Table 9).

**Table 10. Summer Mean Density of *Cladocera* at the Six Stations in 2016 Corrected for Depth of Net Haul to Aerial Units**

| Station | Net Haul Depth (m) | No./L | No./$m^3$ | No./$m^2$ x$10^3$ |
|---|---|---|---|---|
| LL0 | 47 | 0.47 | 475 | 22 |
| LL1 | 33 | 1.15 | 1,152 | 38 |
| LL2 | 25 | 1.43 | 1,426 | 35 |
| LL3 | 19 | 1.90 | 1,897 | 36 |
| LL4 | 8 | 7.05 | 7,051 | 56 |
| LL5 | 5 | 2.21 | 2,213 | 11 |

**Table 11. Summer Mean Density of *Cladocera* at the Six Stations in 2012 Corrected for Depth of Net Haul to Aerial Units**

| Station | Net Haul Depth (m) | No./L | No./$m^3$ | No./$m^2$ x$10^3$ |
|---|---|---|---|---|
| LL0 | 48 | 1.70 | 1,702 | 81 |
| LL1 | 33 | 1.14 | 1,143 | 37 |

| | | | | |
|---|---|---|---|---|
| LL2 | 25 | 1.86 | 1,861 | 46 |
| LL3 | 18 | 2.98 | 2,984 | 53 |
| LL4 | 8 | 9.97 | 9,967 | 79 |
| LL5 | 5 | 6.22 | 6,223 | 31 |

**Table 12. Summer Mean Density of *Cladocera* at the Six Stations in 2013 Corrected for Depth of Net Haul to Aerial Units**

| Station | Net Haul Depth (m) | No./L | No./$m^3$ | No./$m^2$ x$10^3$ |
|---|---|---|---|---|
| LL0 | 47 | 5.41 | 5,413 | 254 |
| LL1 | 33 | 4.14 | 4,136 | 136 |
| LL2 | 25 | 4.33 | 4,331 | 108 |
| LL3 | 18 | 5.09 | 5,085 | 91 |
| LL4 | 8 | 25.7 | 25,726 | 205 |
| LL5 | 5 | 56.2 | 56,154 | 280 |

**Table 13. Summer Mean Density of *Cladocera* at the Six Stations in 2014 Corrected for Depth of Net Haul to Aerial Units**

| Station | Net Haul Depth (m) | No./L | No./$m^3$ | No./$m^2$ x$10^3$ |
|---|---|---|---|---|
| LL0 | 47 | 1.21 | 1,210 | 56 |
| LL1 | 33 | 2.39 | 2,393 | 78 |
| LL2 | 25 | 2.87 | 2,869 | 71 |
| LL3 | 19 | 6.17 | 6,166 | 117 |
| LL4 | 8 | 9.19 | 9,187 | 73 |
| LL5 | 5 | 2.63 | 2,629 | 13 |

**Table 14. Summer Mean Density of *Cladocera* at the Six Stations in 2015 Corrected for Depth of Net Haul to Aerial Units**

| Station | Net Haul Depth (m) | No./L | No./$m^3$ | No./$m^2$ x$10^3$ |
|---|---|---|---|---|
| LL0 | 47.5 | 0.78 | 781 | 37 |
| LL1 | 33 | 1.00 | 1003 | 33 |
| LL2 | 25 | 1.30 | 1301 | 32 |
| LL3 | 19 | 3.54 | 3544 | 67 |
| LL4 | 8 | 12.98 | 12977 | 103 |
| LL5 | 5 | 10.31 | 10313 | 51 |

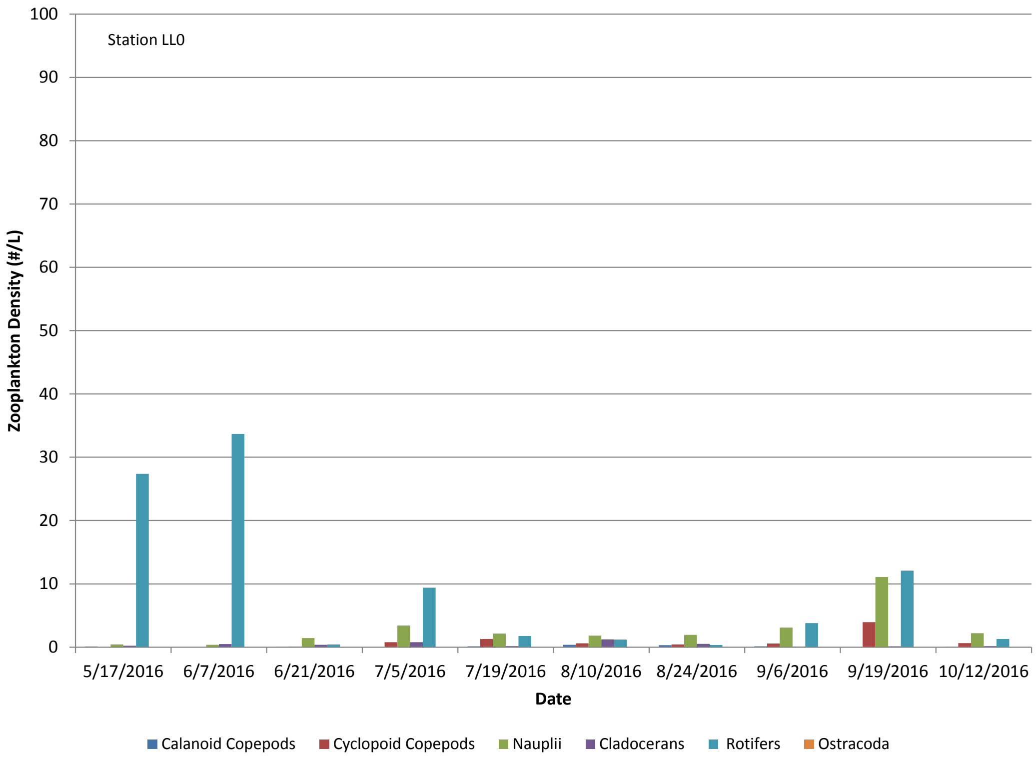

**Figure 84. Zooplankton Density (#/L) at Station LL0, May-October 2016**

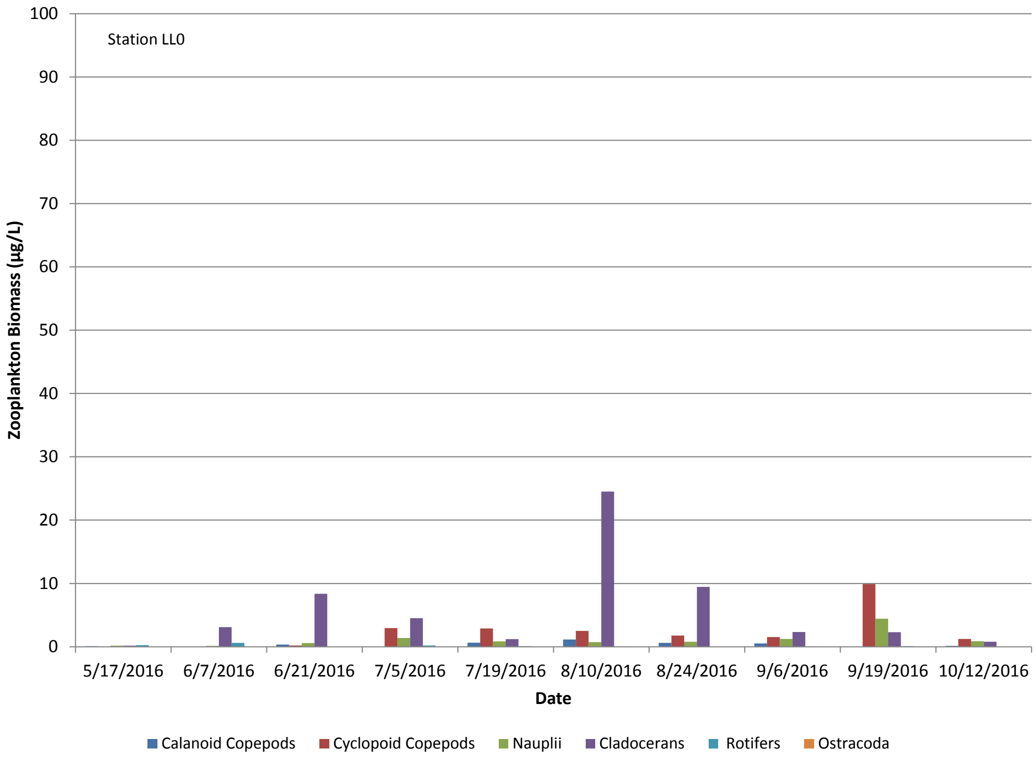

**Figure 85. Zooplankton Biomass (µg/L) at Station LL0, May-October 2016**

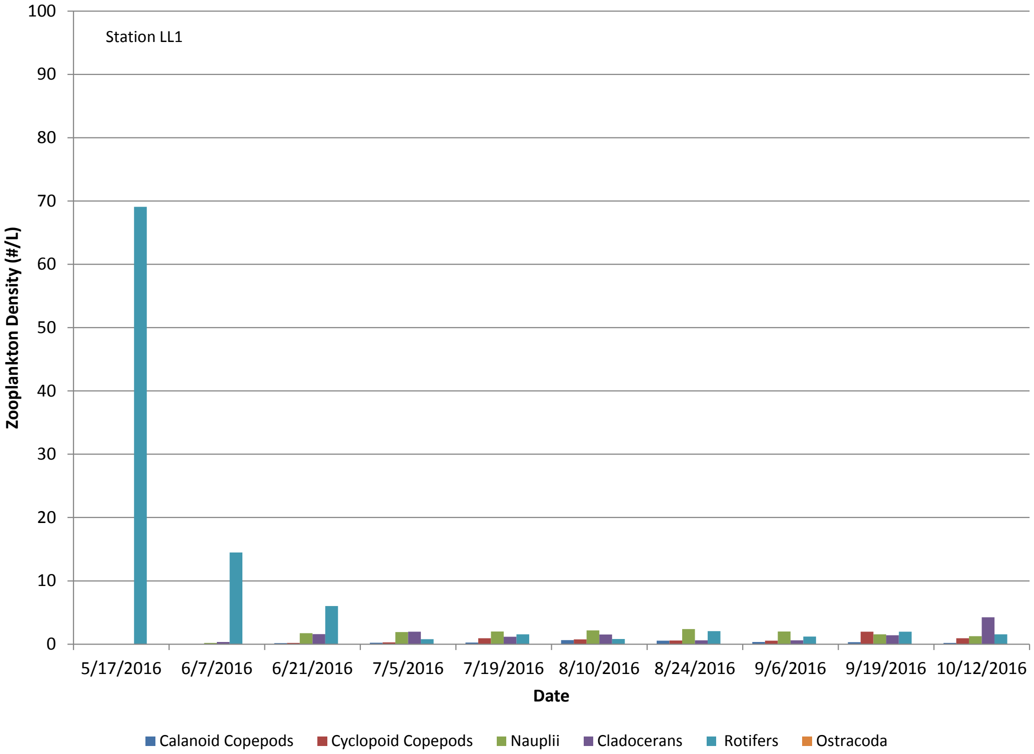

Figure 86. Zooplankton Density (#/L) at Station LL1, May-October 2016

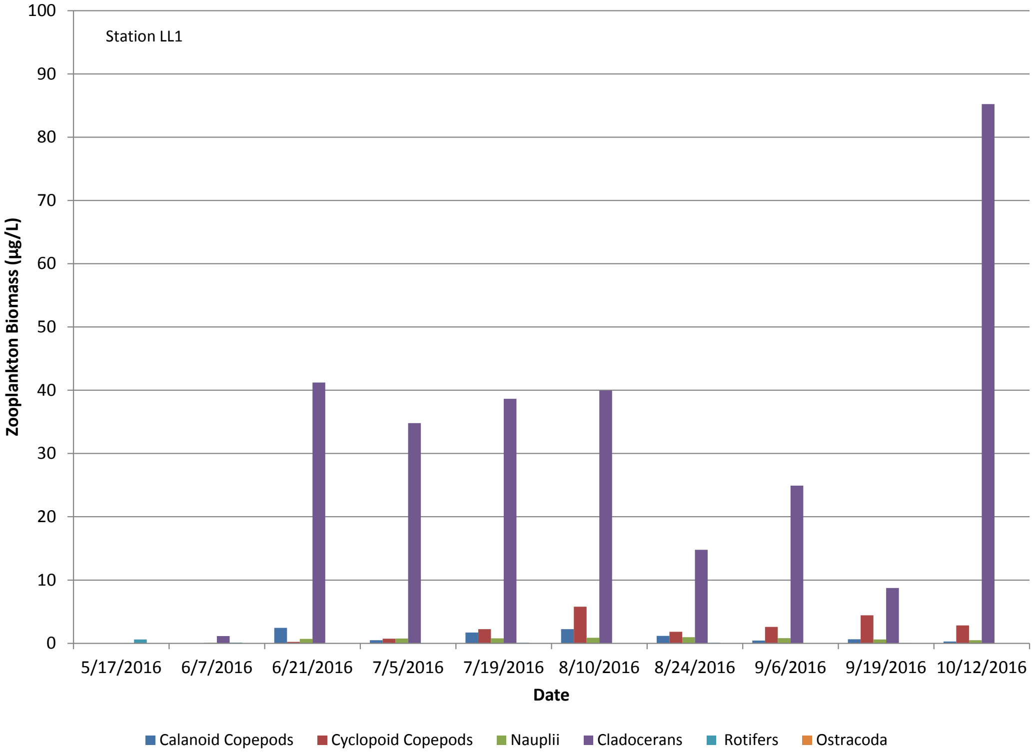

Figure 87. Zooplankton Biomass (µg/L) at Station LL1, May-October 2016

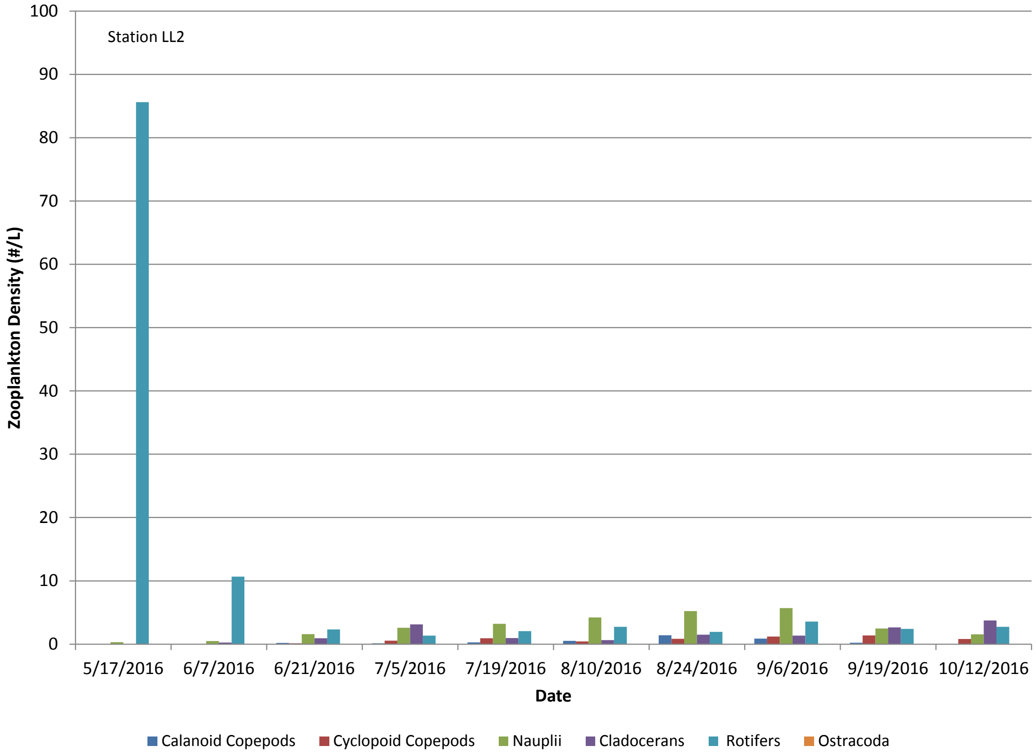

**Figure 88. Zooplankton Density (#/L) at Station LL2, May-October 2016**

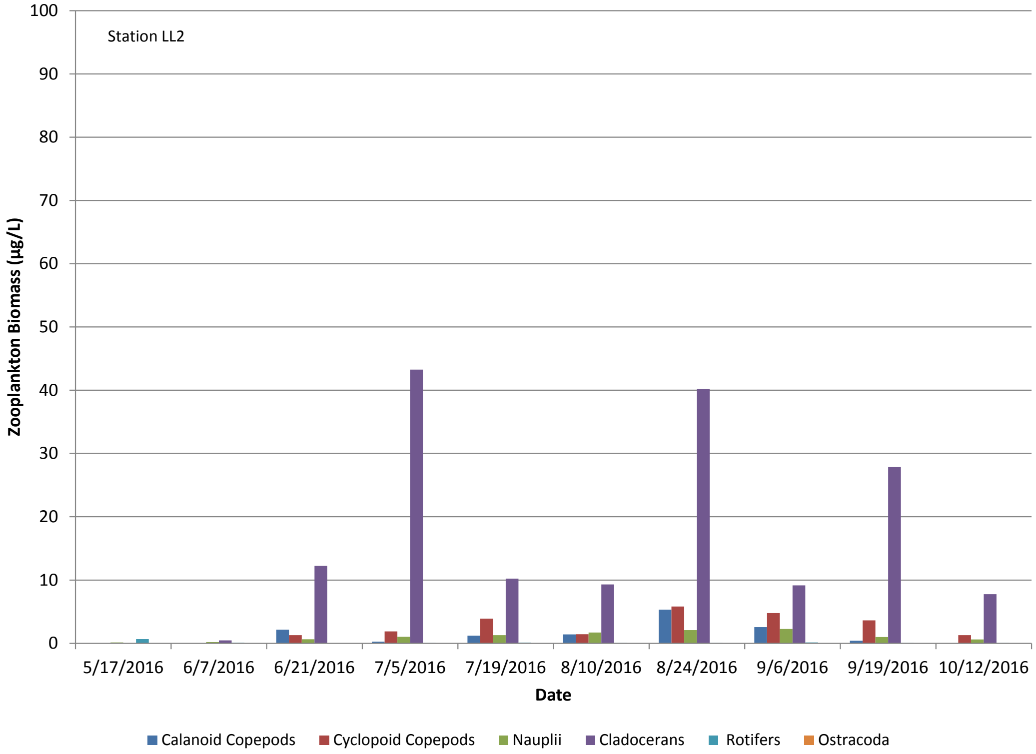

**Figure 89. Zooplankton Biomass (µg/L) at Station LL2, May-October 2016**

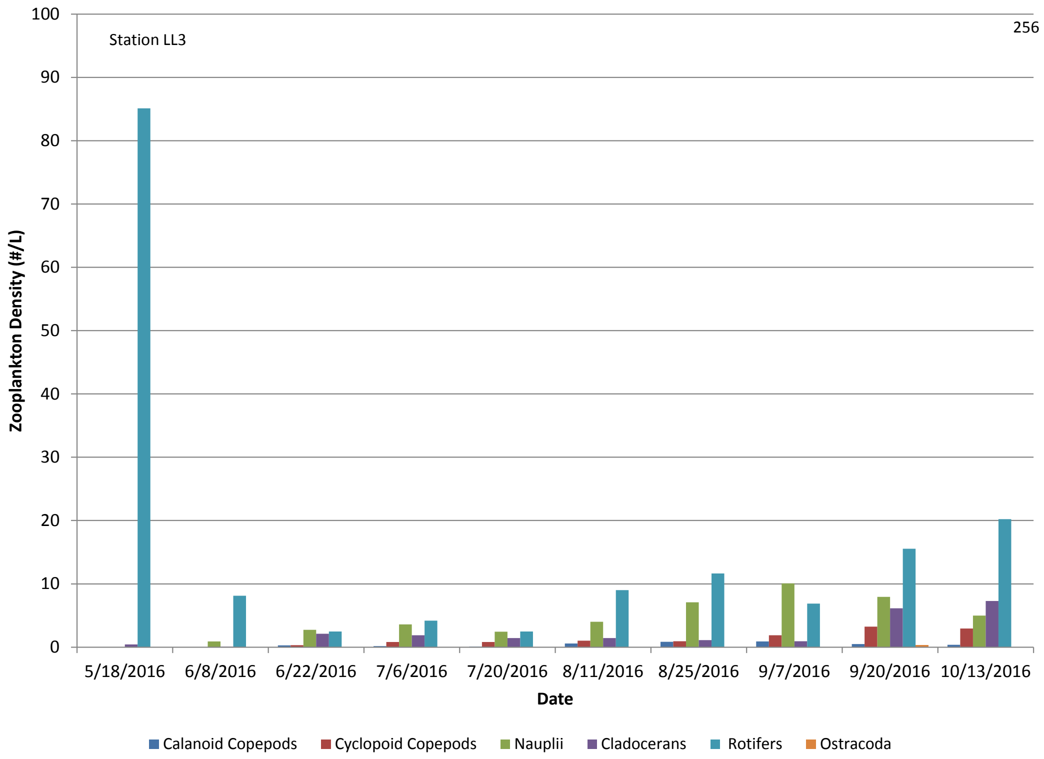

Figure 90. Zooplankton Density (#/L) at Station LL3, May-October 2016

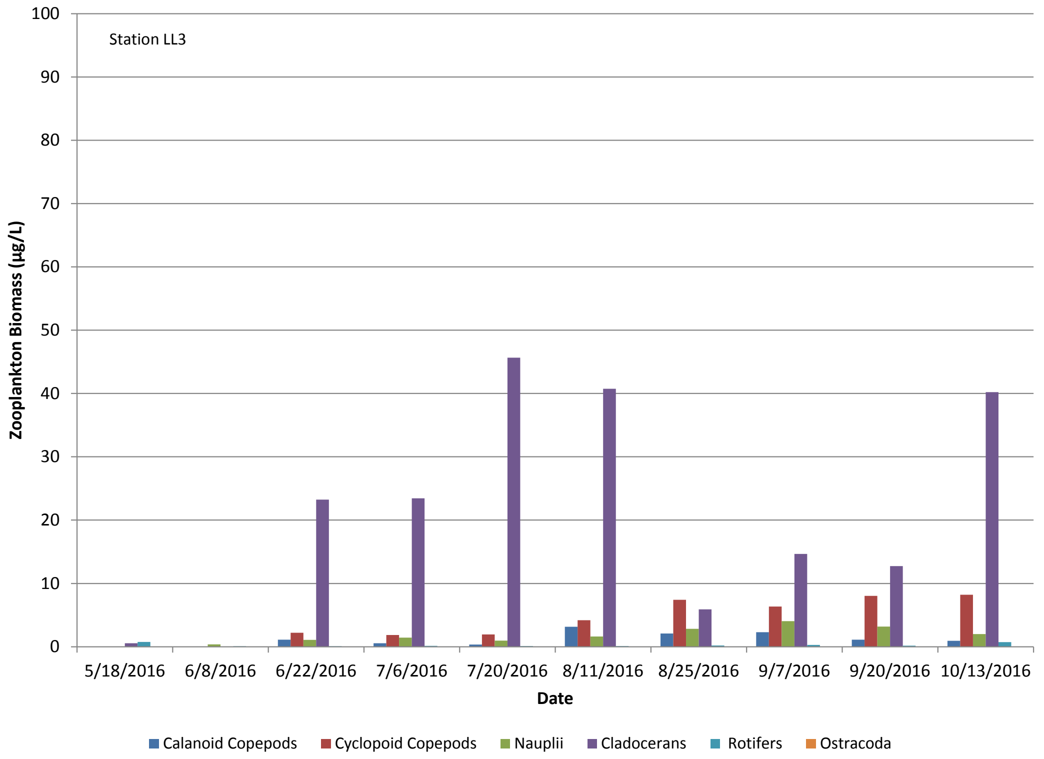

Figure 91. Zooplankton Biomass (µg/L) at Station LL3, May-October 2016

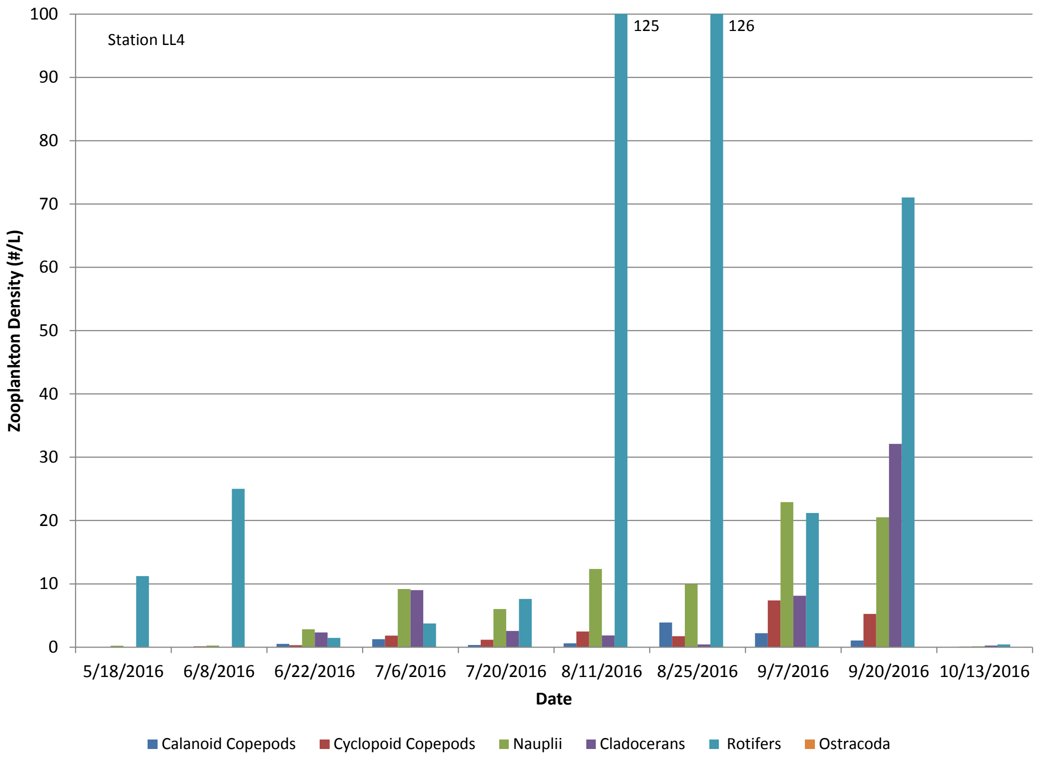

Figure 92. Zooplankton Density (#/L) at Station LL4, May-October 2016

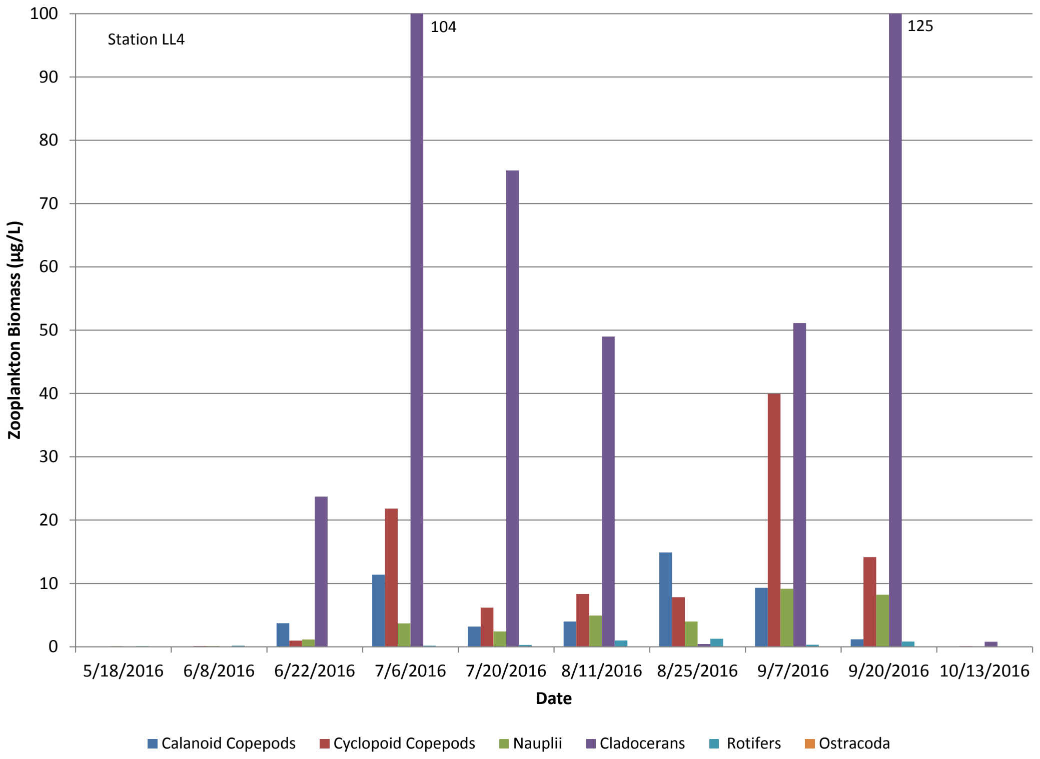

Figure 93. Zooplankton Biomass (µg/L) at Station LL4, May-October 2016

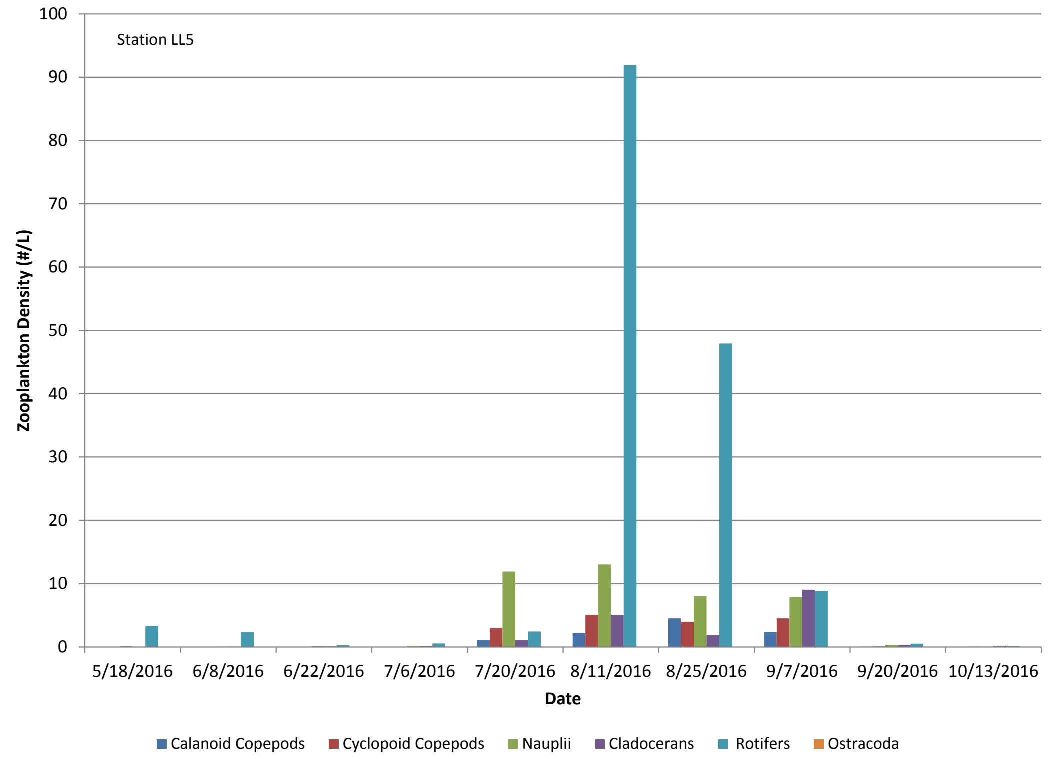

Figure 94. Zooplankton Density (#/L) at Station LL5, May-October 2016

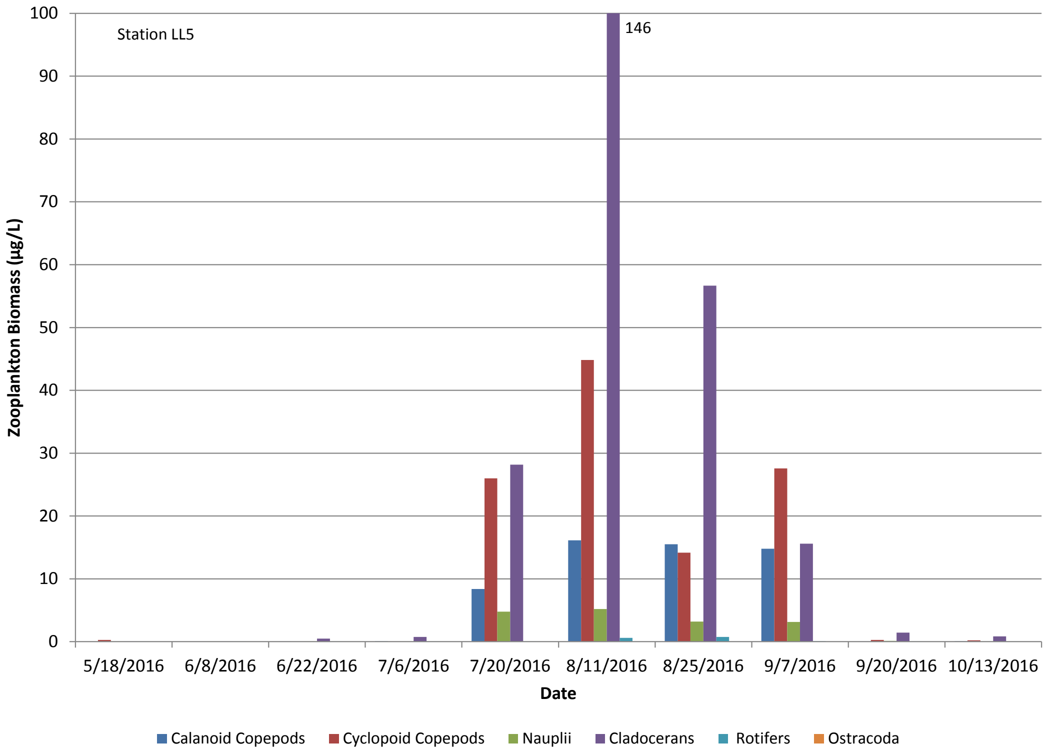

Figure 95. Zooplankton Biomass (µg/L) at Station LL5, May-October 2016

### 3.2.9 SPOKANE RIVER AT NINE MILE BRIDGE AND LITTLE SPOKANE RIVER NEAR MOUTH

Ecology monitored water quality in the Spokane River and Little Spokane River a short distance upstream of its confluence with Lake Spokane. The Spokane River at Nine Mile Bridge station, (54A090) is located approximately 0.1 mile downstream of Nine Mile Dam at River Mile (RM) 58. According to Ecology's River and Stream Water Quality Monitoring website, this station is a "basin" station with data collected during 2016 (January – December data are presented in this report). Sampling at this station was conducted by Ecology in accordance with the Stream Ambient Monitoring QAPP.

Water quality data available for the Spokane River at Nine Mile Bridge for 2016 are summarized below in Tables 15 and 16. The data are preliminary and have not been finalized by Ecology. Shaded values indicate exceedance of water quality standards or represent a strong contrast with historical results, according to Ecology's website.

**Table 15. Water Quality Data from the Spokane River at Nine Mile Bridge during 2016.**

| Date | Temperature (°C) | Dissolved Oxygen (mg/L) | pH | Conductivity (µmhos/cm) |
|---|---|---|---|---|
| 1/5/2016 | 4.9 | 10.6 | **7.36** | 131 |
| 2/2/2016 | 4.6 | 12.3 | **7.19** | 92 |
| 3/8/2016 | 5.2 | 13.2 | -- | 75 |
| 4/5/2016 | 7.3 | 12.9 | 7.42 | 81 |
| 5/3/2016 | 15.6 | 10.4 | 7.95 | 104 |
| 6/7/2016 | 18.5 | 9.2 | 8.02 | 109 |
| 7/19/2016 | 16.3 | **9.4** | 8.36 | 226 |
| 8/9/2016 | 15.2 | -- | 8.33 | 280 |
| 9/13/2016 | 13.8 | 10.9 | 8.45 | 255 |

Note: Shaded values indicate an exceedance of water quality standards or strong contrast to historical results.

**Table 16. Conventional Water Quality Data from the Spokane River at Nine Mile Bridge during 2016.**

| Date | Total Phosphorus (µg/L) | Soluble Reactive Phosphorus (µg/L) | Total Reactive Phosphorus (µg/L) | Total Nitrogen (µg/L) | $NO_3$+$NO_2$ (µg/L) |
|---|---|---|---|---|---|
| 1/5/2016 | 11.2 | 5.7 | 5.9 | 803 | 756 |
| 2/2/2016 | 19 | 9.3 | 11.3 | 841 | 755 |
| 3/8/2016 | 25.5 | 13.6 | 18.4 | 560 | 497 |
| 4/5/2016 | 14.2 | 4.5 | 4.9 | 471 | 387 |
| 5/3/2016 | 14.7 | 3.5 | 3.6 | 484 | 322 |
| 6/7/2016 | 11.3 | 4.3 | 4.3 | 571 | 454 |
| 7/19/2016 | 12.8 | 6.2 | 6.8 | 1,670 | 1,670 |
| 8/9/2016 | 10.9 | 7.8 | -- | 2,200 | 2,120 |
| 9/13/2016 | 9.2 | 5.7 | -- | 1,740 | 1,630 |

Note: Shaded values indicate an exceedance of water quality standards or strong contrast to historical results.

The Little Spokane River station is near its mouth (55B070), which is located at RM 1.1 and is a long-term site, according to the Ecology website. Sampling at this station was conducted by Ecology in accordance with the Stream Ambient Monitoring QAPP.

Water quality data for the Little Spokane River for 2016 are summarized below in Tables 17 and 18. The data are preliminary and have not been finalized by Ecology. Shaded values indicate exceedance of water quality standards or a strong contrast with historical results, according to Ecology's website.

**Table 17. Water Quality Data from the Little Spokane River near Mouth during 2016.**

| Date | Temperature (°C) | Dissolved Oxygen (mg/L) | pH | Conductivity (µmhos/cm) |
|---|---|---|---|---|
| 1/5/2016 | 5.7 | 11.3 | 7.98 | 255 |
| 2/2/2016 | 5.1 | 10.4 | **7.54** | 212 |
| 3/8/2016 | 7.2 | **10.0** | -- | 183 |
| 4/5/2016 | 10.3 | 9.6 | 7.72 | 190 |
| 5/3/2016 | 14.4 | **9.0** | 8.22 | 245 |
| 6/7/2016 | 17.5 | 9.7 | 8.46 | 264 |
| 7/19/2016 | 14 | 9.8 | 8.37 | 275 |
| 8/9/2016 | 13.5 | 9.6 | 8.29 | 2863 |
| 9/13/2016 | 12.1 | 10.1 | 8.36 | 291 |
| 10/4/2016 | 10.3 | 10.0 | 8.25 | 288 |
| 11/15/16 | 9.8 | 9.8 | 8.17 | 265 |

Note: Shaded values indicate an exceedance of water quality standards or strong contrast to historical results.

**Table 18. Conventional Water Quality data from the Little Spokane River near Mouth during 2016.**

| Date | Total Phosphorus (µg/L) | Soluble Reactive Phosphorus (µg/L) | Total Reactive Phosphorus (µg/L) | Total Nitrogen (µg/L) | $NO_3$+$NO_2$ (µg/L) |
|---|---|---|---|---|---|
| 1/5/2016 | 18.3 | 12.4 | 13.5 | 1,300 | 1,260 |
| 2/2/2016 | 39.7 | 26.2 | **26.4** | 1,150 | 973 |
| 3/8/2016 | 44.8 | 23.4 | **23.5** | **786** | **635** |
| 4/5/2016 | 41.3 | 20.1 | 22.8 | 844 | 671 |
| 5/3/2016 | 29.2 | 3.0 | 15.4 | 971 | 753 |
| 6/7/2016 | 16.9 | 7.5 | 7.8 | 1,090 | 909 |
| 7/19/2016 | 12.1 | 5.9 | 6.2 | 1,150 | 1,080 |
| 8/9/2016 | 8.9 | 6.5 | -- | 1,180 | 1,110 |
| 9/13/2016 | 9.5 | 8.0 | -- | 1,300 | 1,230 |
| 10/4/2016 | 11.8 | 7.4 | -- | 1,220 | 1,160 |
| 11/15/16 | 17.5 | 12.0 | -- | 1,130 | 1,160 |

Note: Shaded values indicate an exceedance of water quality standards or strong contrast to historical results.

Total N and nitrate+nitrite-N are high in both the Spokane and Little Spokane Rivers in late summer. That range in concentration of 1,040 to 2,470 TN, with most being nitrate+nitrite, about equals the range in the metalimnion and hypolimnion of the lacustrine zone of Lake Spokane. This suggests that plunging river inflows due to density were the source of the high summer N concentrations in the reservoir, with groundwater also being an important contributor.

### 3.2.10 SPOKANE RIVER DOWNSTREAM OF LONG LAKE DAM

This site is also a “basin” station with data collected during October 2009 through September 2010 (Water Year 2010); however, Ecology did not conduct monitoring during 2016.

### 3.2.11 DO – TEMPERATURE RELATED FISH HABITAT

The following section provides a cursory review of fish habitat in Lake Spokane and how it might be affected by DO and temperature conditions, based upon select literature sources, as well as the data collected at the six lake stations. This section assesses available, cold-water fish habitat in Lake Spokane in 2016 based on DO and temperature criteria and data from the six lake stations. To obtain site specific water quality limitations on fish habitat in Lake Spokane, a more thorough analysis would need to be completed. With six sites, one can assume that conditions throughout the reservoir are represented, at least as far as DO/temperature are concerned and the criteria represent requirements of the local fish.

Fish can be “squeezed” in summer between epilimnetic water that is too warm and deeper layers that are sufficiently cool but with DO that is too low. The threat to cold water species (i.e., trout) can be assessed by determining the depth intervals with temperature and DO that are within the optimum ranges for growth. For rainbow trout, based upon USFWS (1984), the maximum of the optimum temperature range for growth is 18°C and the minimum for the DO range is 6 mg/L. Their preferred temperature is 14°C (Welch and Jacoby 2004). The minimum DO required is usually cited as 5 mg/L, recognizing that higher DO levels also occur (EPA 1986; USFWS 1984).

Using the USFWS criteria, trout probably would have avoided the epilimnion during most of the summer due to temperature that reached 23°C and preferred to seek cooler water deeper than 10 m (Figures 8 to 11). Between 10 and 20 m, DO was usually near or above 6 mg/L during most of the summer at the four deepest stations (LL0, LL1, LL2, and LL3). In late August and September at LL0, DO dropped to near or below the often cited required minimum of 5 mg/L between 10 and 20 m and was even lower at deeper depths (Figure 20). However, at the other deep stations DO remained above 5 mg/L providing refuge during late summer (Figures 21 to 23). These data suggest that rainbow trout are most likely inhabiting cooler water in the metalimnion and upper portions of the hypolimnion where DO is adequate.

The percent of the reservoir volume acceptable for growth were computed for rainbow trout at the six stations for 2016, using the critical maximum temperature (18°C) and minimum DO (6.0 mg/L) (Figures 96-101). Habitat volumes for temperature and DO together, as well as separately, are shown to indicate which factor was most limiting.

Trout were limited earlier in the summer at the deeper stations by temperature and then more so by DO concentrations as the summer progressed in 2016 (Figures 96-98). Trout were limited exclusively by temperature at the shallower stations (Figures 99-101). This was similar to the previous year, with the exception of station LL3, which during 2015 showed a slight limitation by DO in early summer. Total volume of acceptable habitat in 2016 at the deeper stations was larger than that in 2015, most likely due to the lower inflow, longer residence time, and slightly warmer water temperature which occurred in 2015.

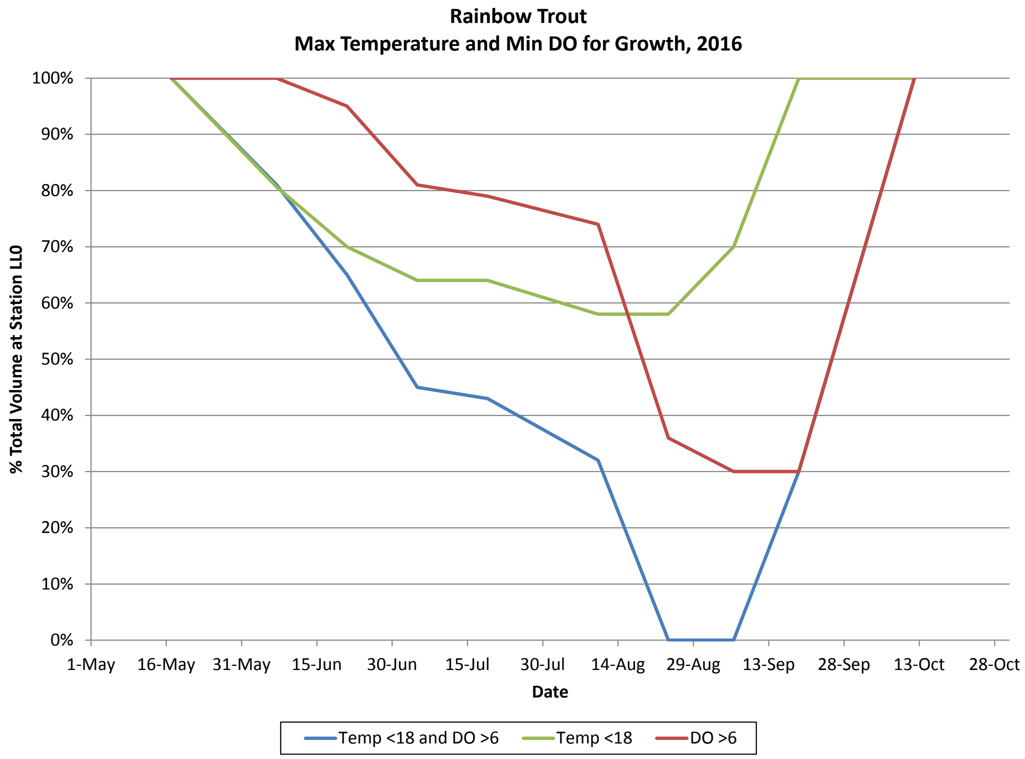

Figure 96. Habitat Conditions at Station LL0 for Rainbow Trout in 2016, Based on Maximum Temperature (18°C) and Minimum DO (6.0 mg/L) for Growth.

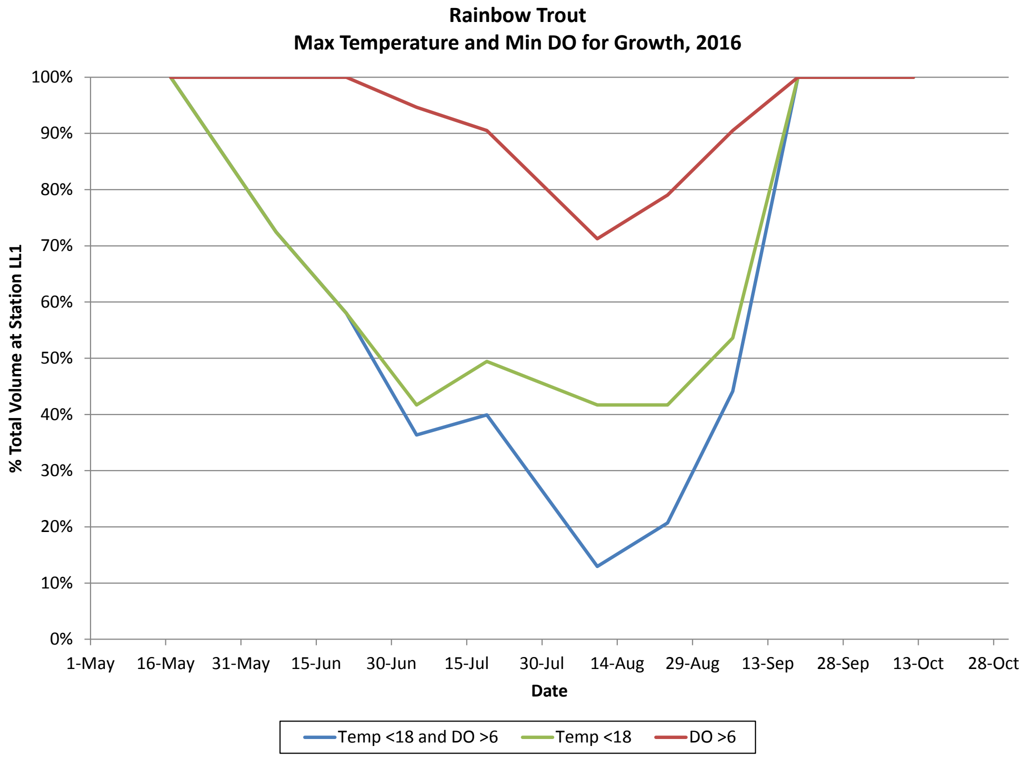

Figure 97. Habitat Conditions at Station LL1 for Rainbow Trout in 2016, Based on Maximum Temperature (18°C) and Minimum DO (6.0 mg/L) for Growth.

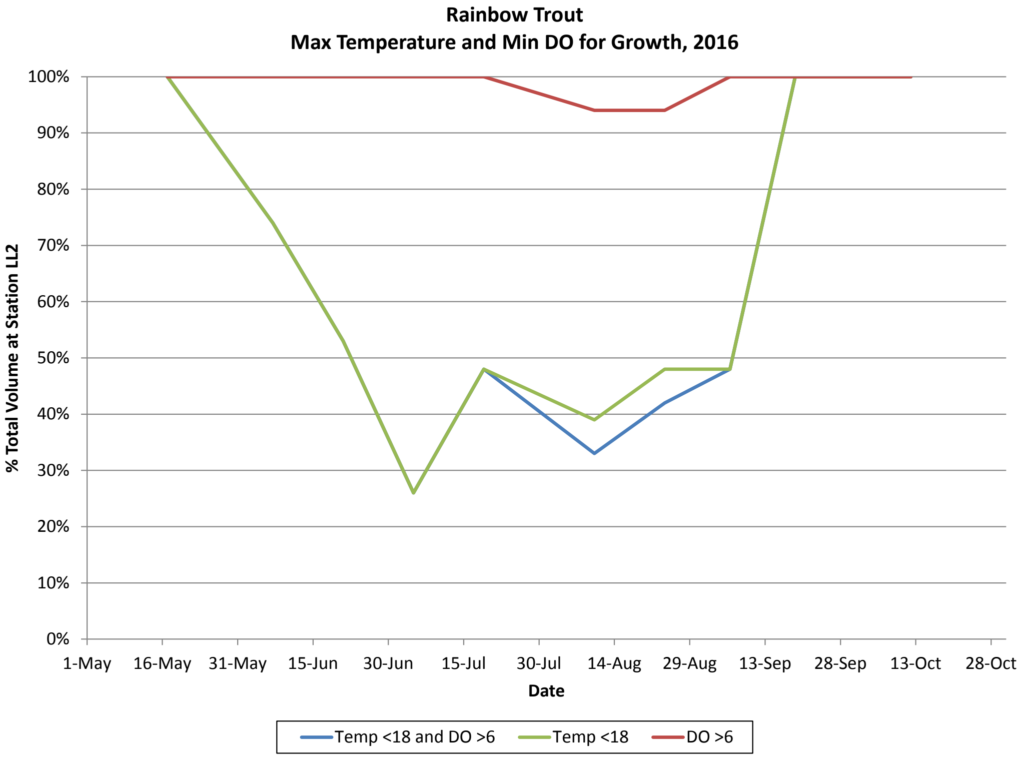

**Figure 98. Habitat Conditions at Station LL2 for Rainbow Trout in 2016, Based on Maximum Temperature (18°C) and Minimum DO (6.0 mg/L) for Growth.**

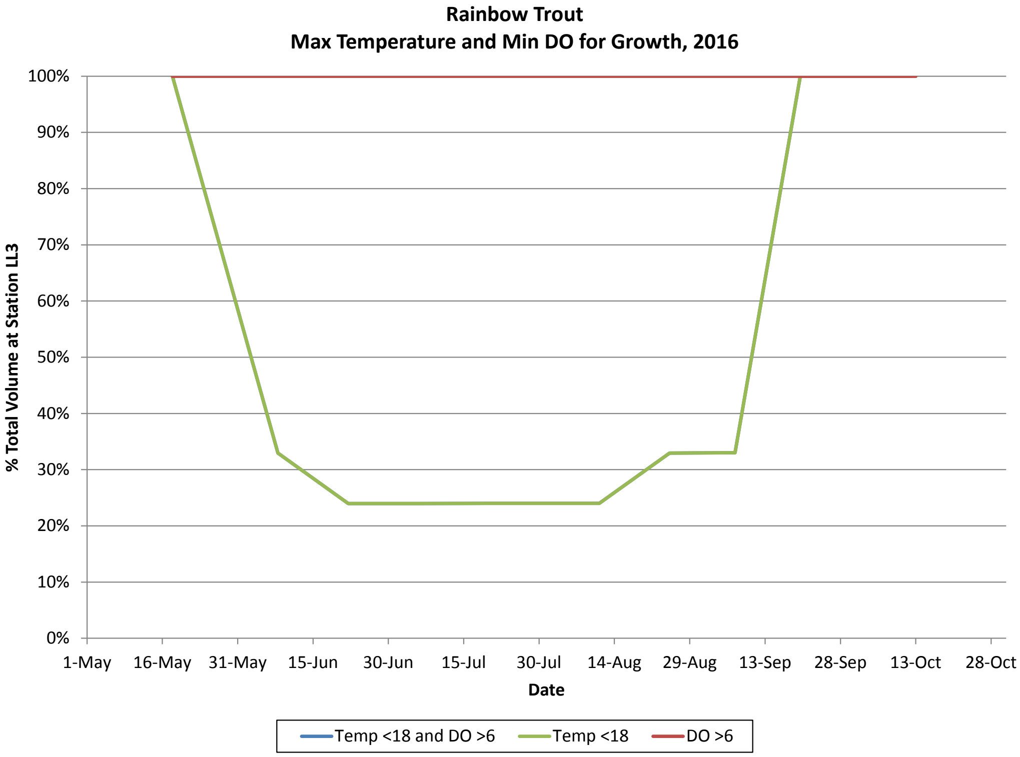

**Figure 99. Habitat Conditions at Station LL3 for Rainbow Trout in 2016, Based on Maximum Temperature (18°C) and Minimum DO (6.0 mg/L) for Growth.**

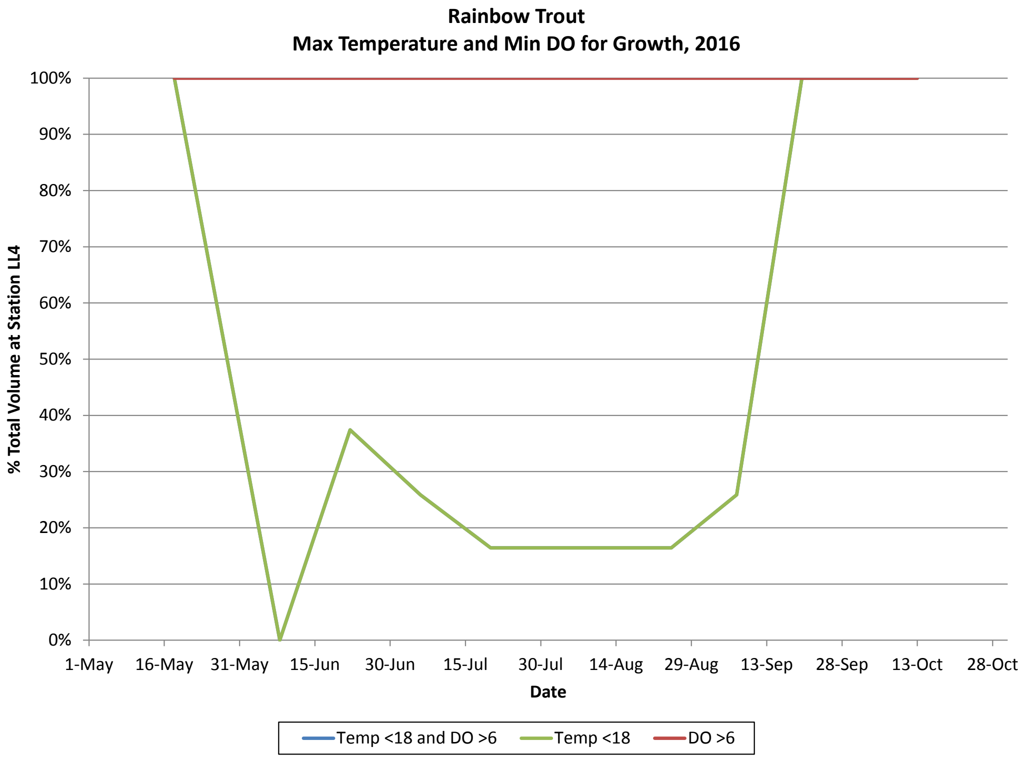

**Figure 100. Habitat Conditions at Station LL4 for Rainbow Trout in 2016, Based on Maximum Temperature (18°C) and Minimum DO (6.0 mg/L) for Growth.**

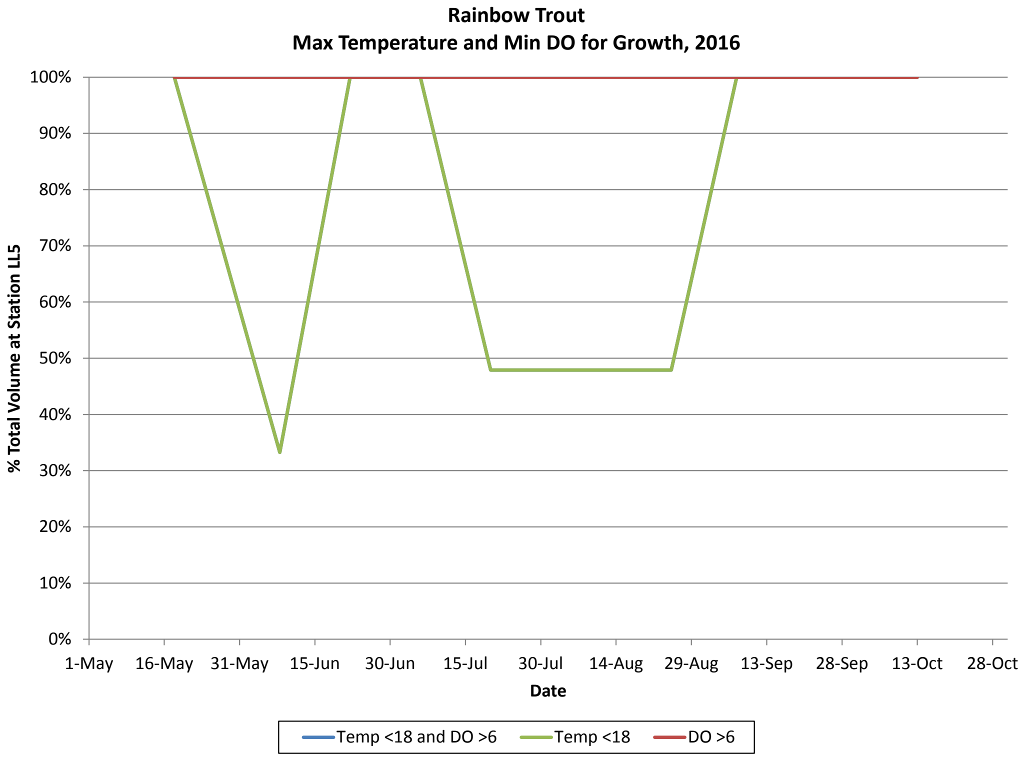

**Figure 101. Habitat Conditions at Station LL5 for Rainbow Trout in 2016 Based on Maximum Temperature (18°C) and Minimum DO (6.0 mg/L) for Growth.**

## 3.3 2016 Quality Assurance

Quality assurance review of field and laboratory data was conducted in accordance with the guidelines and requirements outlined in the *Quality Assurance Project Plan for Lake Spokane Baseline Nutrient Monitoring* (QAPP). Replicate field measurements and laboratory samples as well as field blanks were compared to the measurement quality objectives (MQOs) as stated in the QAPP. If data warranted qualification based on the guidelines in the QAPP, qualifiers such as "J – result is considered an estimate", were assigned to the associated data in the database prepared for Ecology's Environmental Information Management (EIM) along with a comment describing why the data needed qualification.

In 2016 all parent and replicate field measurements met QAPP guidelines for relative percent difference (RPD). Therefore there were no data qualification necessary within the EIM database.

Within the database prepared for EIM, laboratory data was qualified using the following qualifiers; "U, for non-detect", "J, for result is an estimate", or "R, for result is rejected". For 2016, there were 2 TP and 2 SRP samples, which were qualified within the database as "J, estimates". These nutrient samples were qualified within the database as estimates due to field replicate RPDs being outside the acceptable criteria stated in the QAPP. However, the parent sample results for these qualified samples were used in the data analysis since the results were within the expected range of concentrations and in line with other sample results at surrounding depths. In 2016, there was also one TN and nitrate+nitrite-N sample that was qualified within the database as "J, estimates". This qualification was due to the concentration of nitrate+nitrite-N being higher than TN. The data was still used for data analysis since the results were within ± 20% of each other. One TP sample was rejected in the database in 2016. This sample collected on 6/22/2016 at station LL4 at 4 m and had significant higher TP than the replicate sample also collected at that location and depth. The replicate sample TP was much more in line with both upstream and downstream concentrations as well as the two other samples collected at LL4 on that date. Due to this, the parent TP sample was rejected and not used for data analysis and the replicate sample used in its place.

During the 2016 monitoring period, several field blank samples had TN concentrations over the detection limit (4 samples) and TP concentrations over the detection limit (2 samples). The field blank samples were collected using laboratory provided de-ionized water. The concentration of TN found in the field blank samples was just slightly over the method detection limit (MDL) and significantly lower than the TN concentrations found in the reservoir samples. The concentration of TP found in the May field blank sample was 9 µg/L which is significantly higher than the MDL of 2 µg/L. The TP concentration in the late June field blank was just slightly over the MDL at 3 µg/L. After discussion with the lab and running multiple field blanks and straight de-ionized water samples, it was thought that the de-ionized water provided by the laboratory may have picked up trace amounts of nitrogen and phosphorus from their respective bottles after shipment, especially since most of the detections occurred during the second sampling event of the month when the bottles of de-ionized water would have been sitting for several weeks. One sample of just de-ionized water had a slight hit for TN just over the MDL (53 vs 50 µg/L). Another explanation for the field blank detections could have been due to incomplete rinsing of the Van Dorn sampling bottle prior to collection of the field blank. Although field staff thoroughly rinse the Van Dorn bottle with de-ionized water from Culligan both in between stations and prior to collecting the field blank, small particles/algal cells could have remained along the seal of the bottle and contaminated the field blank sample. Reservoir samples would not have been contaminated in this fashion since the Van Dorn bottle is fully open on both sides when it is lowered into the water column, thereby providing a complete rinse of the apparatus. No reservoir TP data were qualified based on the detection of TP in the field blanks due to the reasons stated above. No reservoir TN data were qualified based on the detection of TN in the field blank due to the magnitude difference between the reservoir sample TN concentrations and the very low amount of TN detected in the field blank.

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# 4. ASSESSMENT OF WATER QUALITY IN LAKE SPOKANE (2010 – 2016)

## 4.1 Temperature

Given reservoirs retain heat from the atmosphere, both water and air temperatures were analyzed to evaluate trends in temperature. Air temperature in the Pacific NW has increased over the past several decades. Air temperature during 1952 – 1965 was similar to 1972 – 1985, but increased slightly during 2010 – 2016, by 1°C, on average for June – October (Table 19). Surface water temperatures, especially in reservoirs should have increased also. Not surprisingly, the available data indicate that surface temperatures in Lake Spokane have increased slightly more than 1°C since the 1970s – 1980s. Average temperature with depth throughout the reservoir during June – October are shown for 2010 – 2016, compared with those from Patmont during 1972 – 1985 (1987; Figures 102 and 103). Note that there is only a small area that averaged greater than 19°C during 1972 – 1985, but the 20°C isopleth encompassed nearly the whole reservoir surface during 2010 – 2016. Also, mean lacustrine temperature in the top 5 m, determined from numerical data, averaged 19.8°C during 2010 – 2016, and 20.2°C at the surface – about 1°C warmer than in 1972 – 1985 (Table 20).

**Table 19. Average annual and June – October Air Temperature at Spokane International Airport.**

| Time Period | Annual Average (°C) | June – October Average (°C) |
|---|---|---|
| 1952 - 1965 | 8.6 (±0.9) | 16.4 (±1.0) |
| 1972 - 1985 | 8.3 (±0.6) | 16.1 (±0.6) |
| 2010 - 2016 | 9.0 (±1.0) | 17.1 (±1.0) |

**Table 20. June – October Average Water Temperatures in Lacustrine Zone of Lake Spokane, 2010 – 2016.**

| Year | LL0 | | | LL1 | | | LL2 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Surface | Epi (0-5 m) | Hypo (15 m+) | Surface | Epi (0-5 m) | Hypo (15 m+) | Surface | Epi (0-5 m) | Hypo (15 m+) |
| 2010 | 19.1 | 18.7 | 14.9 | 19.3 | 18.9 | 15.3 | 19.4 | 19.0 | 15.5 |
| 2011 | 18.7 | 18.2 | 14.8 | 19.6 | 19.1 | 15.8 | 19.8 | 19.1 | 15.7 |
| 2012 | 19.9 | 19.4 | 14.7 | 20.0 | 19.7 | 15.3 | 20.0 | 19.5 | 15.8 |
| 2013 | 20.3 | 20.0 | 14.6 | 21.0 | 20.6 | 15.5 | 21.3 | 20.8 | 15.6 |
| 2014 | 20.8 | 20.3 | 15.3 | 21.2 | 20.8 | 15.9 | 21.4 | 20.8 | 16.2 |
| 2015 | 20.8 | 20.5 | 12.5 | 21.2 | 20.9 | 14.5 | 21.3 | 21.1 | 15.5 |
| 2016 | 19.7 | 19.4 | 14.8 | 20.3 | 19.8 | 15.6 | 20.4 | 20.0 | 15.8 |
| **Mean** | 19.9 | 19.5 | 14.5 | 20.4 | 20.0 | 15.4 | 20.5 | 20.0 | 15.7 |
| **STDEV** | 0.8 | 0.8 | 0.9 | 0.8 | 0.8 | 0.5 | 0.8 | 0.8 | 0.2 |

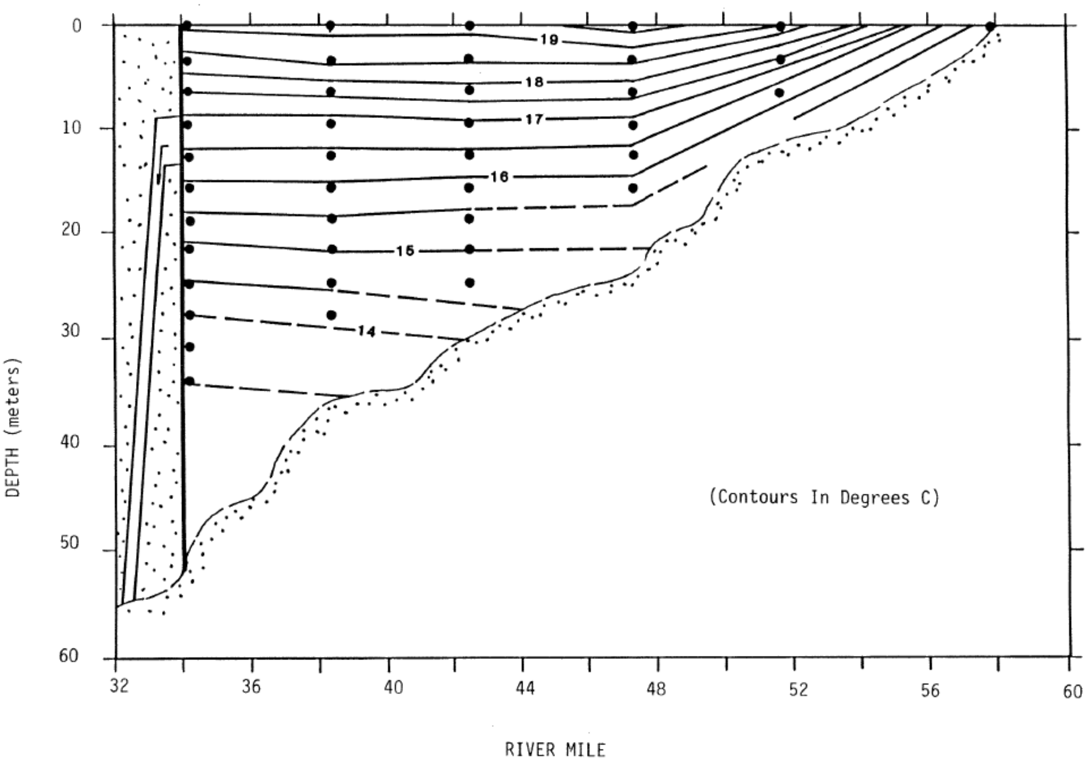

Figure 102. Average June – October temperature contours in Lake Spokane, 1972 – 1985 (Patmont 1987).

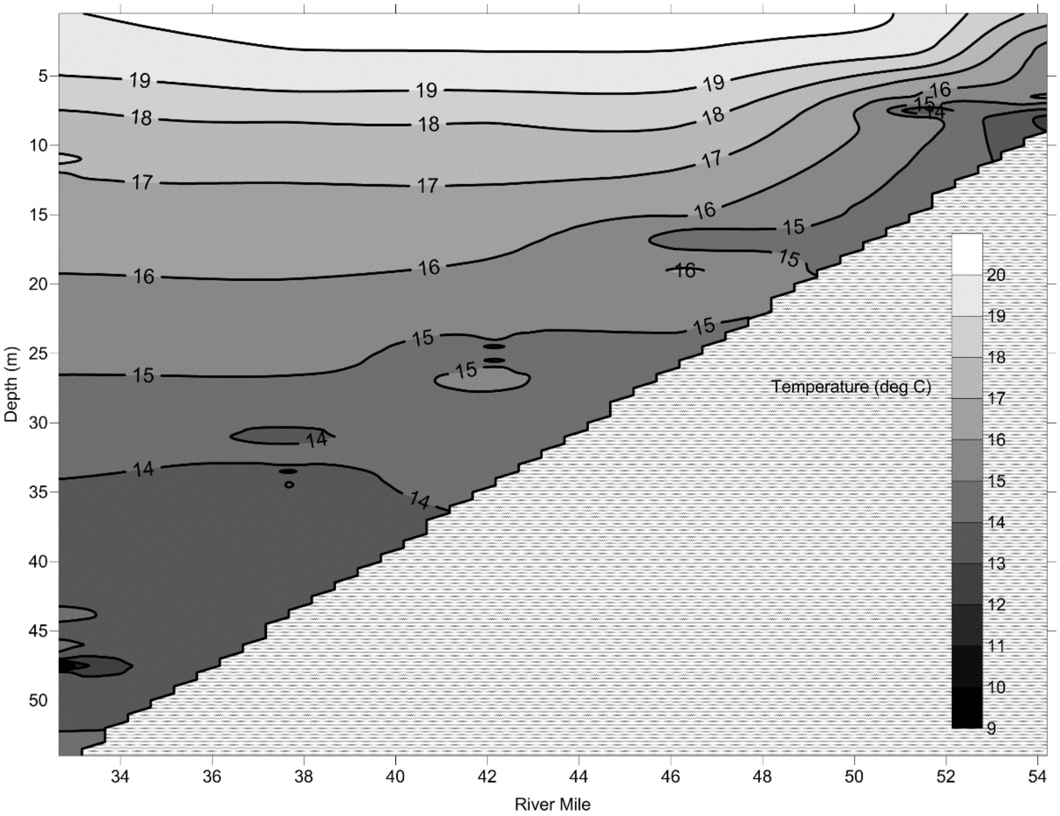

Figure 103. Average June – October temperature contours in Lake Spokane, 2010 – 2016.

## 4.2 Dissolved Oxygen

The past seven years of DO data have consistently shown that the reservoir's DO resource has improved in response to reduced inflow TP. The DO has steadily improved from the reservoir's hypereutrophic state since 85% of point source effluent TP was removed in 1977 (Welch et al. 2015). The dependence of minimum hypolimnetic DO on TP is shown in Figure 105, which was modified from Patmont (1987). During 1972 to 1977, minimum volume-weighted hypolimnetic DO (below 15 m) ranged from 0.2 to 3.4 mg/L, with a mean of 1.4 mg/L. After phosphorus reduction, minimum volume-weighted hypolimnetic DO gradually increased to a mean of 2.5 mg/L during 1978 to 1981, and then to 4.5 mg/L during 1982 to 1985, as inflow TP declined from 85 to 25 µg/L (Patmont 1987). Almost three generations later, minimum volume-weighted hypolimnetic DO (calculated using Patmont 1987 volumes and DO data from the lacustrine zone) averaged 6.2 mg/L during 2010 to 2016 at inflow TPs averaging 14.7 µg/L (riverine zone, volume weighted TP concentration at LL5) during the same period. While the long-term progression is evident there has been variation in minimum DO during the past seven years Figure 104).

The year-to-year variability in minimum DO in Figure 104 was likely due to water inflow and residence time, with higher inflows (shorter residence times) producing higher DO minimums in the 1970s through 1980s (Patmont 1987). Specifically, the high minimum volume-weighted hypolimnetic DOs in 1974 – 1975 had the highest June – October inflows during 1960 to 1985. Nevertheless, the principal control on minimum volume-weighted hypolimnetic DO over the large range in inflow TP, from immediately before to after phosphorus reduction, was inflow TP (Figure 104), with a lesser effect from residence time (Figure 105). However, over the past seven years, with consistently low inflow TP, minimum volume-weighted hypolimnetic DO appears to be more dependent on residence time. Minimum volume-weighted hypolimnetic DO during 2010-2016 ranged from 5.1 mg/L to nearly 8 mg/L, while summer volume-weighted riverine TP (surrogate for flow-weighted inflow TP) ranged from 11.4 to 20 µg/L, and the two variables now appear to be independent of each other ($r^2 = 0.31$). Instead, it appears minimum hypolimnetic DO was more related to June-October water residence time ($r^2 = 0.85$). Residence times ranged from about 24 to 70 days during 2010, 2013, 2014, 2015, and 2016 corresponding with the lowest minimum volume-weighted hypolimnetic DOs, while residence times of about 14 to 19 days in 2011 and 2012 were associated with the highest minimum hypolimnetic DOs (Figures 104 and 105). However, the lowest minimum volume-weighted hypolimnetic DO during recent years was 5.1 mg/L which occurred in 2015, the year with the highest June through October mean inflow TP (20 µg/L), but also the longest June – October water residence time of about 70 days.

Dissolved oxygen conditions have greatly improved in Lake Spokane since 85% of point-source effluent phosphorus was removed in 1977 and water quality data collected in Lake Spokane demonstrates a consistent improvement over the past seven years. That said, recent data indicate that DO concentrations do not meet the surface water quality standard as required by Table 7 in the DO TMDL (Ecology 2010) during portions of the summer critical season.

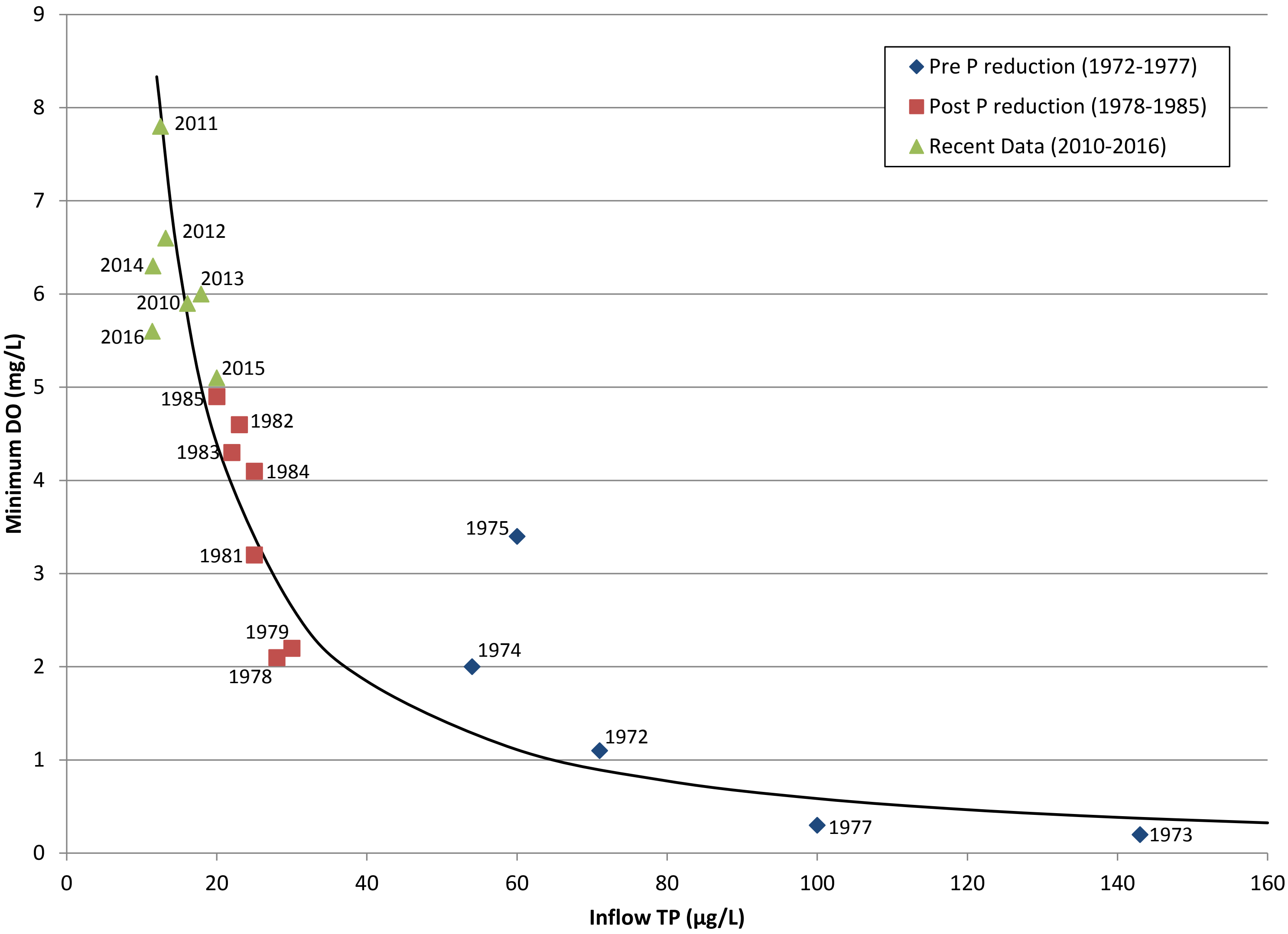

**Figure 104. June-October Volume-Weighted Mean Inflow TP Concentrations related to Minimum Volume-Weighted Hypolimnetic DO Concentrations before and after Advanced Wastewater Treatment. Concentrations from 1972 through 1985 from observed loading at Nine Mile Dam (Patmont 1987). Mean inflow TP Concentrations from 2010-2016 were taken as Volume-Weighted Mean TP Concentrations at Station LL5, in lieu of loading data from Nine Mile Dam. Equation for the line: $y = 187.1592x^{-1.2523}$, $r^2 = 0.84$.**

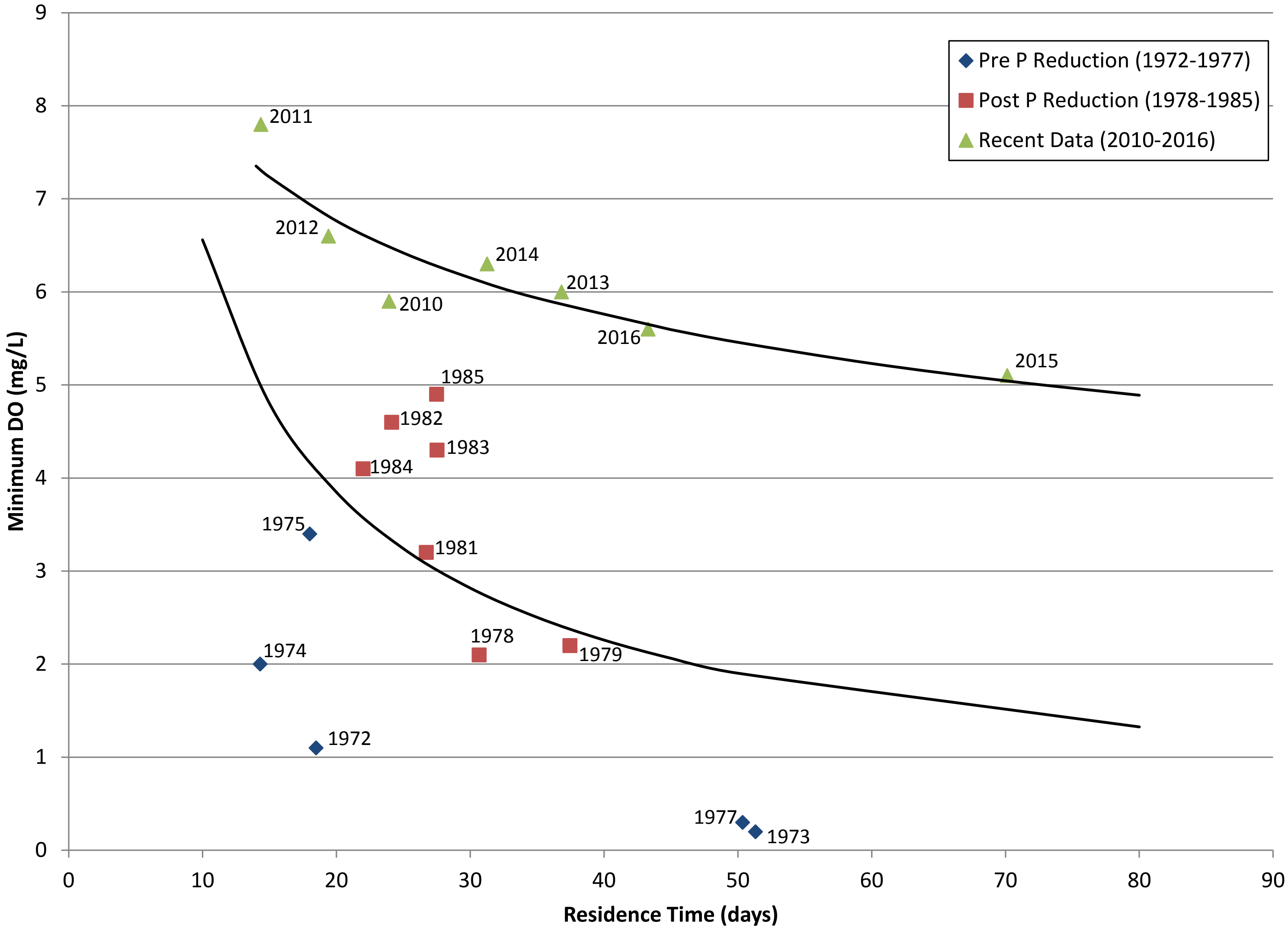

**Figure 105. Mean hydraulic residence time (June-October) related to minimum v-w hypolimnetic (below 15 m) DO before and after advanced TP reduction in 1977. Residence time was calculated using reservoir outflows gaged by USGS (1972-1985) and Avista (2010-2016) at Long Lake Dam. Equation for line for all years: $y = 38.535x^{-0.769}$, $r^2 = 0.11$. Equation for line for 2010-2016: $y = 13.634x^{-0.234}$, $r^2 = 0.85$.**

## 4.3 Phosphorus

Summer (June to September) epilimnetic mean TP concentrations in 2016 were lower than other recent years at LL1, LL2, and LL3 and similar to those in 2014 and 2015 at LL0 (Figure 106). Summer epilimnetic mean TPs at LL4 were lower in 2016 than any other recent year, with the exception of 2011, (Figure 106) and mean epilimnetic TP at LL5 in 2016 was similar to those in 2011 and 2014. However, epilimnetic TPs in 2016 were lower overall than in most other years. Summer mean epilimnetic TPs in 2012 through 2016 were calculated using concentrations at 0.5 and 5 m for stations LL0 to LL2, and concentrations at 0.5 m for stations LL3 to LL5. Summer means for 2010 and 2011 are based on averages from euphotic zone composite samples.

Summer mean TP decreased slightly through the reservoir in all seven years with the lowest TP usually at station LL0. Area-weighted, whole-reservoir epilimnetic TPs averaged 11.3 ± 1.6 µg/L for the seven years, a variation of only 14% and with no evident trend. Area-weighted whole-reservoir epilimnetic TP was lowest in 2016 with 8.9 µg/L and highest in 2013 with 13.4 µg/L. The seven-year mean puts the reservoir at the meso-oligotrophic state boundary, and is lower than epilimnetic TP observed in Lake Washington (14 µg/L, King County 2003) and Lake Sammamish (12 µg/L, Welch and Bouchard 2014).

Summer (June to September) hypolimnetic TPs also have been rather consistent the past seven years – mean 24.8 ± 16%. Hypolimnetic TP was determined in the lacustrine zone for stations LL0, LL1, and LL2 for all seven years (Figure 107). Hypolimnetic TP was calculated using samples collected at 20 m and deeper in 2012 through 2016. This excludes the top 5 m of the hypolimnion, which is necessary in order to compare 2012-2016 data with those based on composite samples collected in 2010 and 2011 at various depths from 21 m and deeper. Hypolimnetic TPs calculated for stations LL0 and LL1 were volume-weighted while concentrations for station LL2 were from 1 m meter off the bottom only.

Maximum hypolimnetic TPs have been relatively low the past seven years usually less than 35 µg/L, and the average volume-weighted hypolimnetic TP was only 23.4 µg/L (May-October). The lowest concentrations were in 2011 while the highest were in 2016. The peak volume-weighted hypolimnetic TP was in early August 2016 at just over 55 µg/L (Figure 107). The lowest volume-weighted epilimnetic TP concentrations also occurred in 2016.

Table 21 summarizes the mean summer TP from 2010 through 2016 in both the Spokane River (two Ecology monitoring stations upstream of Lake Spokane) and Little Spokane River as well as LL4 and LL5. There was no apparent trend at any site during the seven years. Also, TP at LL5 was about equal to that in the river inflow at Nine Mile. Separating out the July – September low flow period shows that TPs in the riverine and transition area (LL5 and LL4) contained double the down-reservoir concentrations and higher than the average inflow TP (Table 22).

**Table 21. Summer (June – September) mean TP concentrations (µg/L) in the Spokane River compared to summer mean volume-weighted TP concentrations in Lake Spokane at LL4 and LL5. Volume weighted TPs for 2010 and 2011 at LL4 and LL5 are based on composite samples.**

| Year | Spokane River @ Riverside State Park | Spokane River @ Nine Mile | Little Spokane River near Mouth | Lake Spokane @ LL5 | Lake Spokane @ LL4 |
|---|---|---|---|---|---|
| 2010 | 24 | 18.1 | 19.3 | 15.9 | 15.9 |
| 2011 | 15.4 | -- | 21.6 | 12.5 | 11.9 |
| 2012 | 10.6 | -- | 19.6 | 13.4 | 18.0 |
| 2013 | 14.3 | 12.9 | 17.5 | 19.0 | 19.9 |
| 2014 | 11.9 | 12.6 | 14.6 | 11.9 | 16.1 |
| 2015 | 21.3 | 15.4 | 107[1] | 21.1 | 22.1 |
| 2016 | 15.5 | 11.1 | 11.9 | 11.4 | 14.5 |
| **Mean** | 16.1 | 14.0 | 30.2 | 15.0 | 16.9 |
| **STDEV** | 4.9 | 2.8 | 34.0 | 3.8 | 3.4 |

[1] June – September average for 2015 includes a very high value, 397 µg/L, which was measured on June 2nd, 2015. This value corresponds with an extreme precipitation and runoff event in the Little Spokane River watershed. The summer average for the Little Spokane River without this value is 10.0 µg/L.

**Table 22. Mean Epilimnetic/Euphotic Zone TP Concentrations for Lake Spokane for 2010 – 2016.**

| Lake Station | Mean Epilimnion/Euphotic Zone TP (µg/L) | | | |
|---|---|---|---|---|
| | May | June | July – Sept. | Oct. |
| LL5 | 16.3 | 11.9 | 18.0 | 11.6 |
| LL4 | 16.1 | 11.1 | 18.9 | 14.0 |
| LL3 | 17.6 | 10.9 | 10.3 | 12.8 |
| LL2 | 16.2 | 9.7 | 9.7 | 9.0 |
| LL1 | 15.3 | 9.0 | 9.4 | 9.1 |
| LL0 | 14.3 | 9.6 | 8.2 | 6.9 |

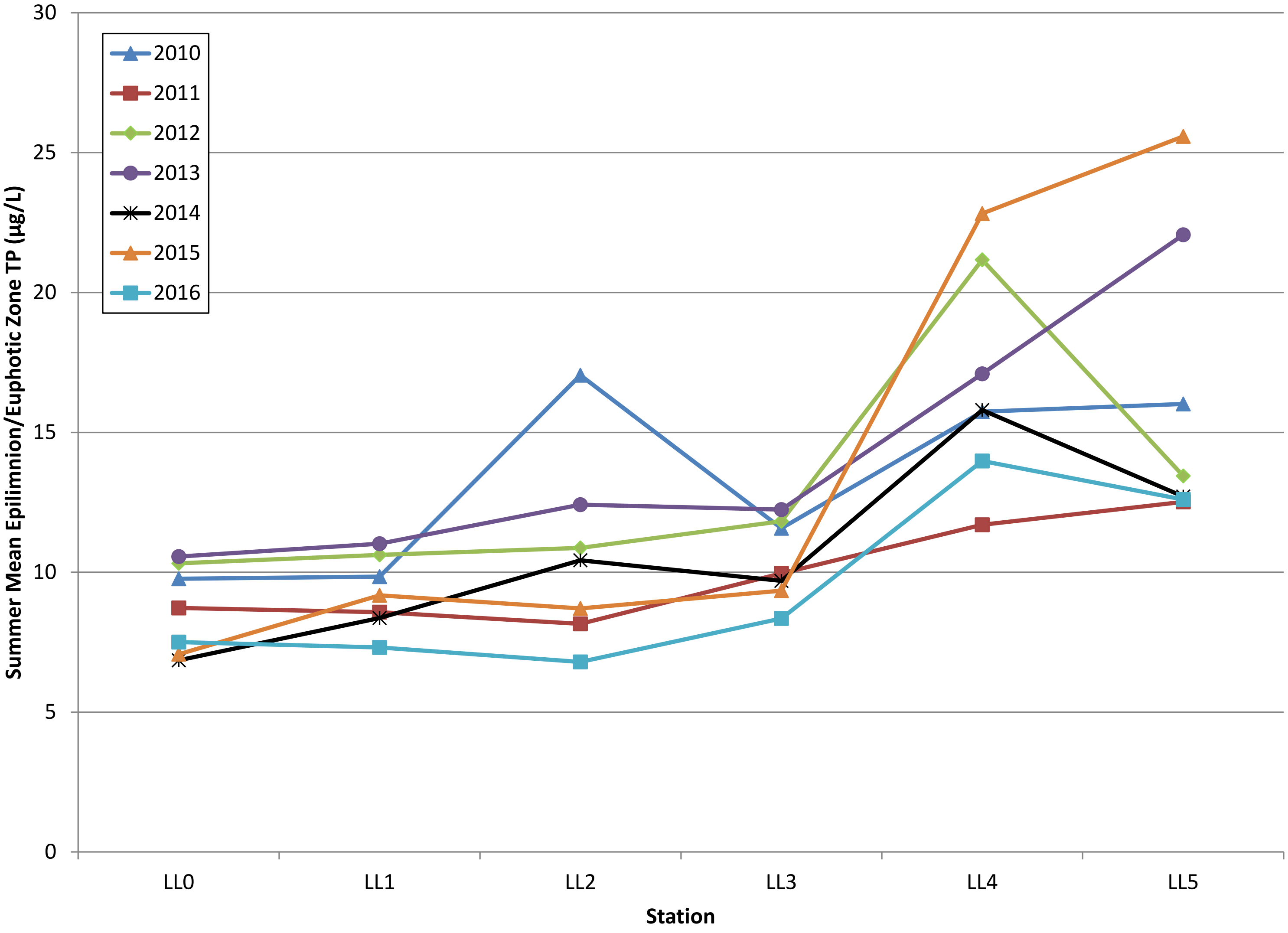

**Figure 106. Summer (June-September) Mean Epilimnion/Euphotic Zone TP Concentrations, 2010-2016 (Data is presented from down-reservoir to up-reservoir, left to right.)**

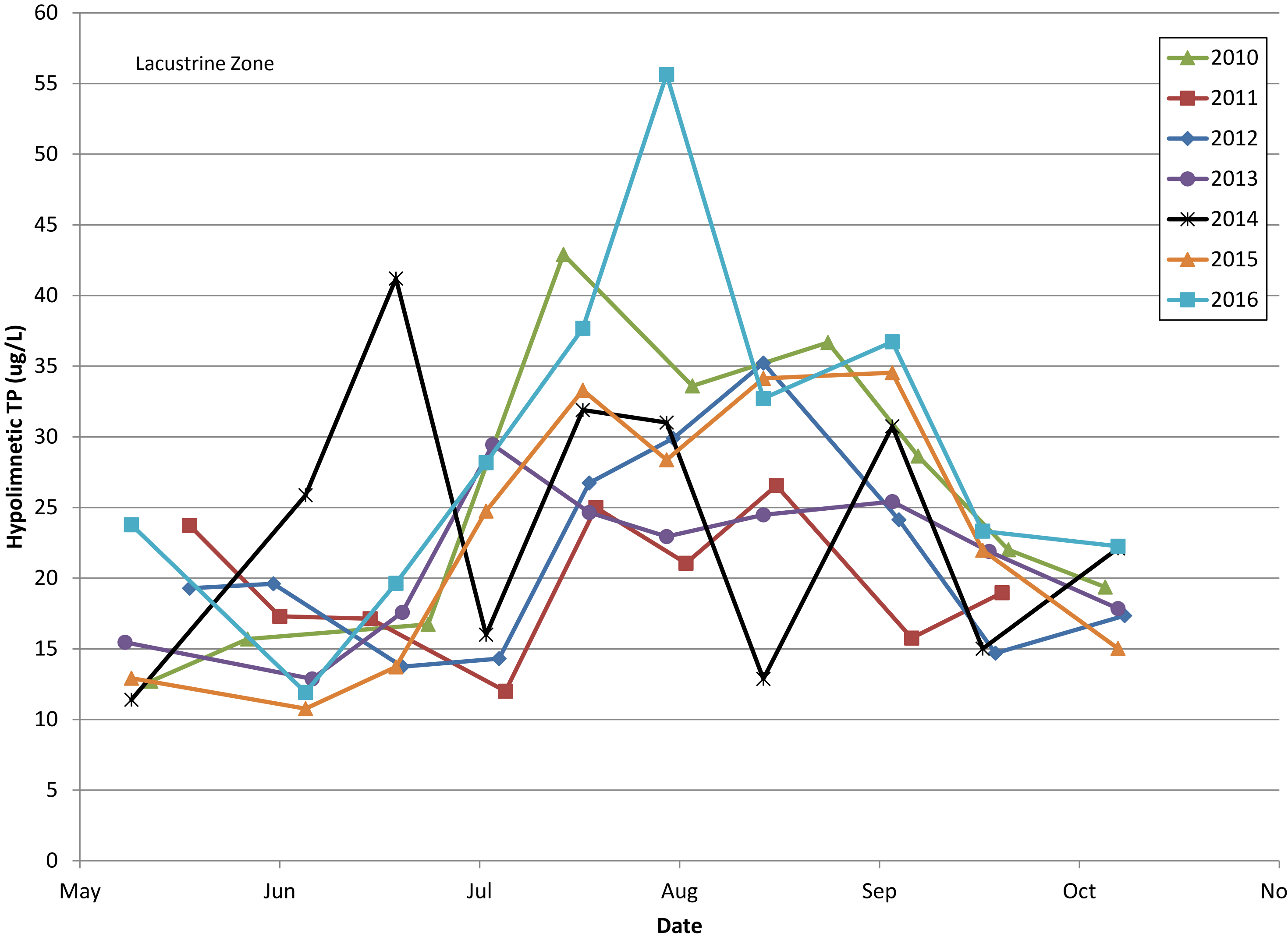

Figure 107. Lacustrine Zone Mean Hypolimnetic TP Concentrations, 2010-2016

## 4.4 Nitrogen

Epilimnetic mean TN concentrations in summer (June to September) 2015 and 2016 were higher at LL0, LL1, LL2, and LL3 than the previous five years (Figure 108). Summer epilimnetic mean TN concentrations at LL4 were lowest in 2012 through 2015 and highest in 2010, while near the opposite occurred at LL5, with lowest concentrations occurring in 2010 and highest in 2014 and 2016 (Figure 108). Epilimnetic TN was generally higher in 2016 than in other years. Summer mean epilimnetic TNs in 2012 through 2016 were calculated using concentrations at 0.5 and 5 m for stations LL0 to LL2, and concentrations at 0.5 m for stations LL3 to LL5. Summer means for 2010 and 2011 are based on averages from euphotic zone composite samples.

Total N concentrations have been increasing in the Spokane River for several decades (Figure 109). Mean (June – October) TN in the Spokane River at Riverside State Park, just downstream of the City of Spokane WWTP effluent discharge, have increased from 697 in 1997 to a peak of 2,293 µg/L in 2015 while dissolved inorganic nitrogen (DIN) has increased from 420 µg/L in 1978 to a peak of 2,130 µg/L in 2015. The high TN and DIN concentrations in 2015 and 2016 may be due to the low river flows and greater influence of groundwater. Increased N has occurred while TP concentrations in the river steadily decreased following wastewater phosphorus reduction, reaching a rather stable level since the 1990s, ranging between about 15 – 20 µg/L, except for a couple years , 1997 and 1998 (Figure 109).

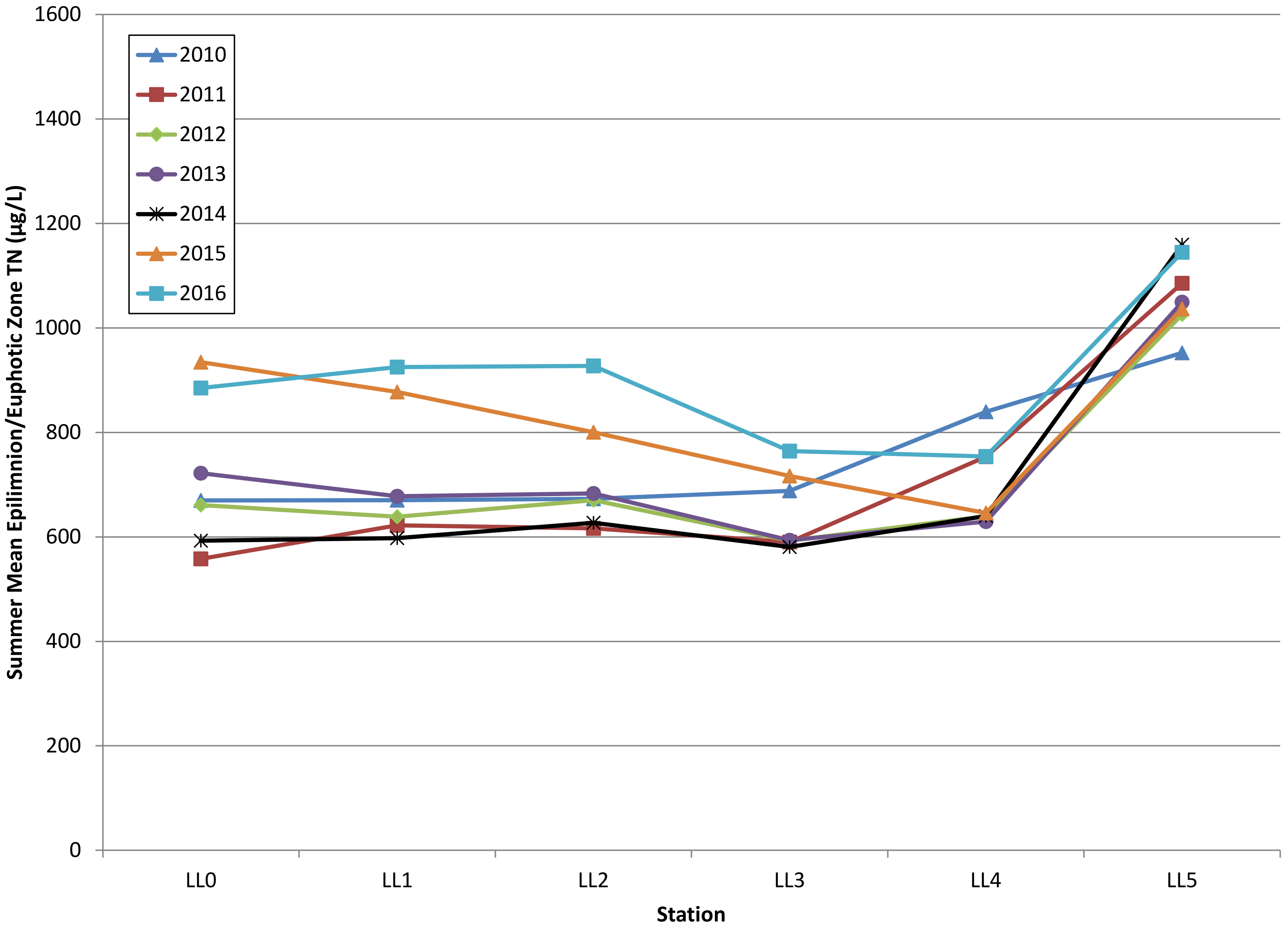

**Figure 108. Summer (June-September) Mean Epilimnion/Euphotic Zone TN Concentrations, 2010-2016 (Data is presented from down-reservoir to up-reservoir, left to right.)**

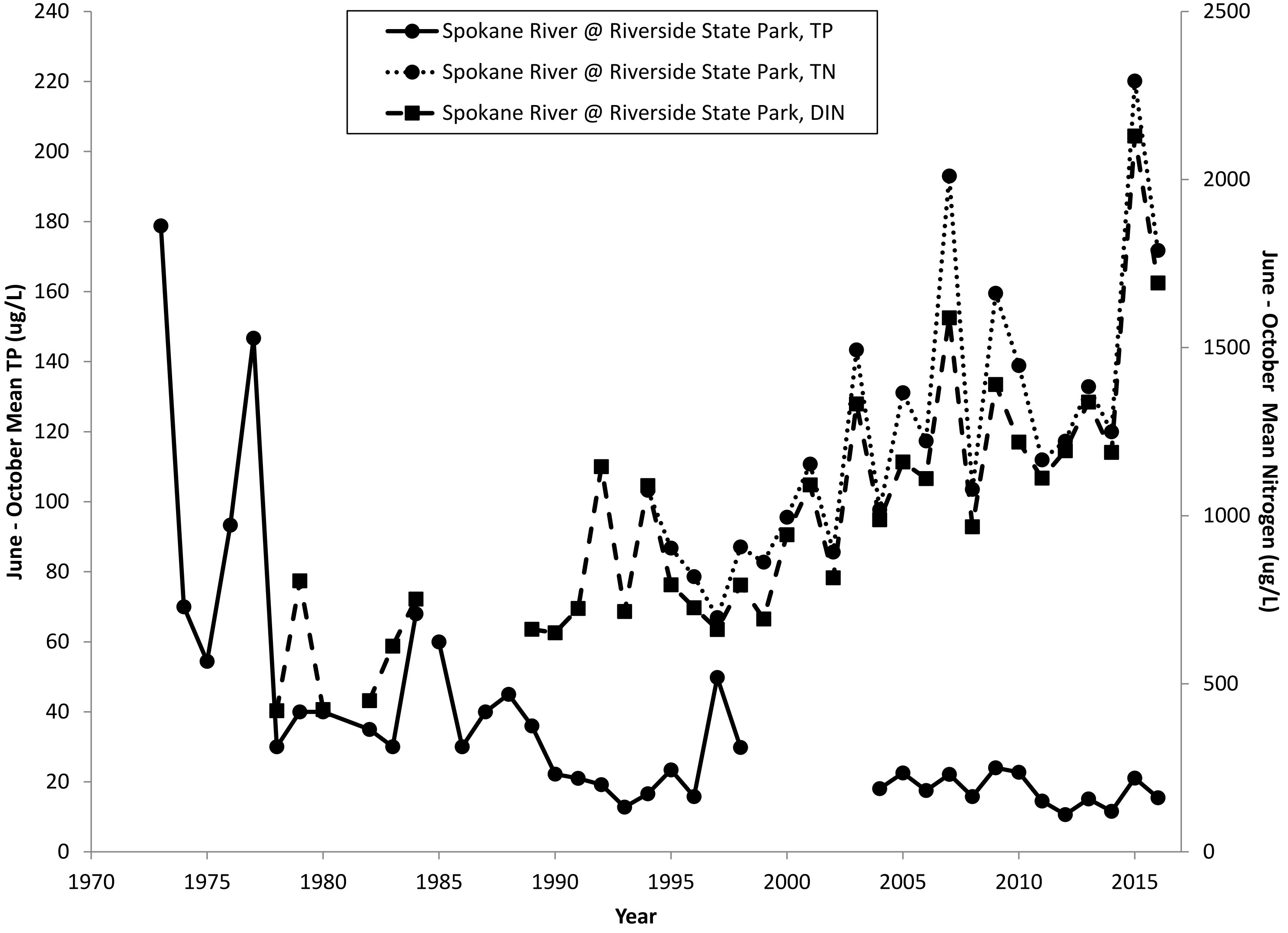

Figure 109. Mean (June – October) TN, DIN, and TP in the Spokane River at Riverside State Park.

## 4.5 Trophic State/Production

Lake Spokane was at or near the borderline oligotrophic-mesotrophic state on average in all zones for the last seven years, except for TP in the transition and riverine zones that averaged slightly greater than 10 µg/L, the oligotrophic-mesotrophic boundary (Tables 23 and 24). Higher average chl and TP in the transition and riverine zones in 2015 resulted in slightly higher 7-year averages for chl and TP.

**Table 23. 2012-2016 Summer (June to September) Epilimnetic Means Compared to 2010 and 2011 Summer Euphotic Zone Means in Lacustrine, Transition, and Riverine Zones in Lake Spokane. Whole reservoir means are area weighted; Lacustrine 61%, Transition 29%, and Riverine 11% of the total reservoir area.**

| Year | Lacustrine (0.5, 5 m) | | | Transition (0.5 m) | | | Riverine Zone (0.5 m) | | | Whole Reservoir | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TP (µg/L) | Chl (µg/L) | Secchi (m) | TP (µg/L) | Chl (µg/L) | Secchi (m) | TP (µg/L) | Chl (µg/L) | Secchi (m) | TP (µg/L) | Chl (µg/L) | Secchi (m) |
| 2010 | 9.8 | 5.1 | 5.1 | 13.7 | 4.7 | 3.7 | 16.0 | 3.2 | 3.6 | 11.6 | 4.7 | 4.5 |
| 2011 | 9.1 | 3.3 | 5.8 | 10.8 | 1.9 | 4.7 | 12.5 | 1.4 | 4.8 | 10.0 | 2.7 | 5.4 |
| 2012 | 10.6 | 4.8 | 4.4 | 16.5 | 4.0 | 3.9 | 13.4 | 2.7 | 4.7 | 12.6 | 4.3 | 4.3 |
| 2013 | 11.3 | 3.0 | 5.7 | 14.7 | 5.5 | 3.9 | 22.1 | 3.2 | 4.1 | 13.4 | 3.7 | 5.0 |
| 2014 | 8.5 | 3.8 | 5.0 | 12.7 | 5.9 | 3.6 | 12.7 | 4.2 | 4.0 | 10.2 | 4.4 | 4.5 |
| 2015 | 8.3 | 3.8 | 5.3 | 16.1 | 7.2 | 3.3 | 25.6 | 7.4 | 2.9 | 12.4 | 5.1 | 4.5 |
| 2016 | 7.2 | 3.4 | 5.6 | 11.2 | 4.7 | 4.0 | 12.6 | 3.8 | 5.0 | 8.9 | 3.8 | 5.1 |
| **Average** | 9.3 | 3.9 | 5.3 | 13.7 | 4.8 | 3.9 | 16.4 | 3.7 | 4.2 | 11.3 | 4.1 | 4.8 |

**Table 24. Trophic State Boundaries (Nurnberg 1996).**

| Parameter | Oligo-Mesotrophic | Meso-Eutrophic |
|---|---|---|
| **TP (µg/L)** | 10 | 30 |
| **Chl (µg/L)** | 3 | 9 |
| **Secchi (m)** | 4 | 2 |

Source: Nurnberg 1996

Average trophic state indices (TSI) in the upper reservoir zones in 2016 were at or slightly over a TSI of 40 - the oligo-mesotrophic boundary (Table 25). In the transition and riverine zones, TSIs for chl indicated mesotrophy throughout the reservoir, while those for TP were near or slightly over the oligotrophic-mesotrophic boundary. Average TSIs, did not indicate a eutrophic state at any site in 2016.

Average TSIs for chl, TP and Secchi depth for each zone over the seven year period are shown in Figures 110 through 112. Indices in the lacustrine zone have been fairly consistent over the seven year period with a slight decreasing trend for TP (Figure 110). TSIs for TP and Secchi disk depth were all lower than the oligotrophic-mesotrophic boundary while those for chl varied from just above the boundary to halfway to eutrophy.

Average TSIs were slightly higher in the transition and riverine zones, with near borderline meso-eutrophy reached a couple years, but were usually around the meso-oligotrophic boundary. The higher chl TSIs in 2013 – 2015 in the transition zone and 2015 in the riverine zone were not that much above the respective average chl TSIs for all years, which varied by only 9% and 12%, respectively, among the years. Such variation is well within the variability of climatic conditions.

**Table 25. Trophic State Indices for Lacustrine, Transition, and Riverine Zones in Lake Spokane, 2016 (Carlson 1974). Shaded indices (≥40) indicate mesotrophy and unshaded oligotrophy.**

| 2016 | Lacustrine | Transition | Riverine |
|---|---|---|---|
| **TSI-TP** | 33 | 39 | 41 |
| **TSI-Chl** | 43 | 46 | 44 |
| **TSI-Secchi** | 35 | 40 | 37 |
| **TSI-Average** | 37 | 42 | 40 |

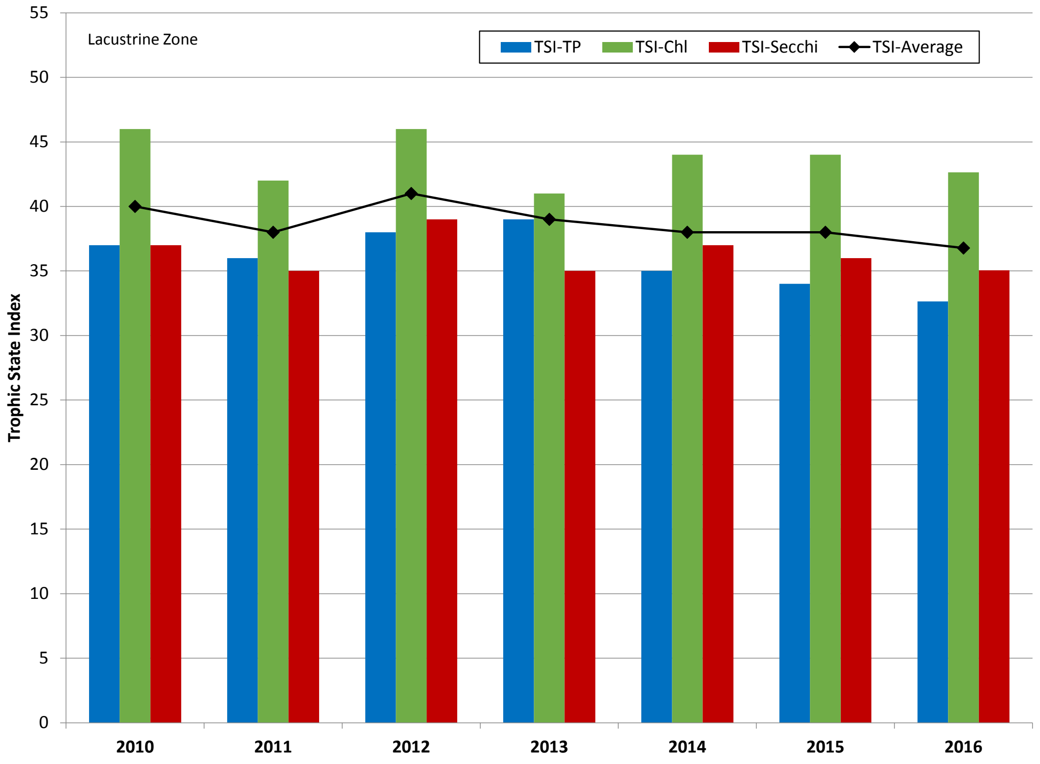

Figure 110. Average TSI Indices for the Lacustrine Zone in Lake Spokane, 2010 – 2016.

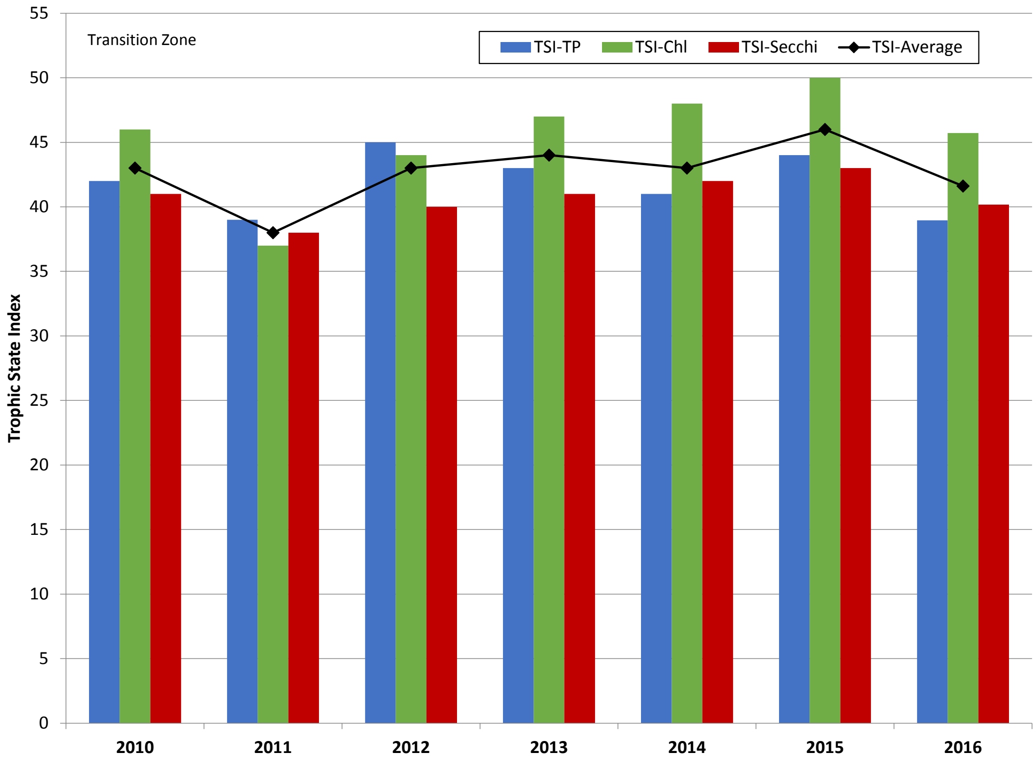

Figure 111. Average TSI Indices for the Transition Zone in Lake Spokane, 2010 – 2016.

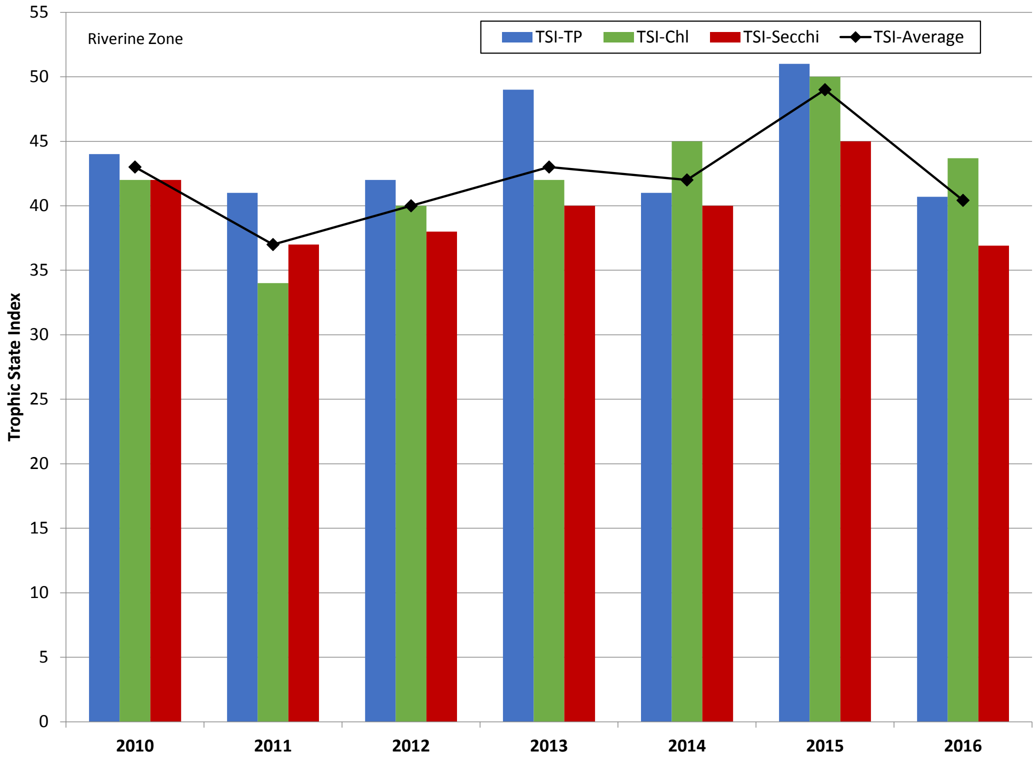

Figure 112. Average TSI Indices for the Riverine Zone in Lake Spokane, 2010 – 2016.

Total N:TP ratios were higher in 2016 than any other of the recent years (Table 26). There has been a tendency for higher ratios down reservoir, probably due to relatively greater removal of the most limiting nutrient, phosphorus, through uptake and settling of phytoplankton. However, ratios throughout the reservoir during 2010 – 2016 were all very high. The lowest ratio observed at the six stations during 2010 through 2016, was at LL4 in 2015 and mostly due to higher epilimnetic TP. The reservoir inflow TN:TP during 1974 to 1978 before effluent phosphorus reduction averaged 15 and algal growth potential bioassays indicated that N alone, or N+P, limited algal growth 60% of the time on average (Patmont 1987). Reducing phosphorus alone has greatly improved water quality of the reservoir, as well as increasing the inflow TN:TP ratio (LL5) three to almost six fold in recent years, compared to pre-phosphorus reduction inflow ratios. The increased ratio was also due partly to increased river N. Removing phosphorus alone has dramatically improved the trophic state of Lake Spokane.

The progression of trophic state improvement is illustrated in Figure 113. The reservoir was near hypereutrophy in chl and TP before wastewater phosphorus reduction with excess phosphorus, compared to chl, because TN:TP was low and nitrogen was usually limiting. After phosphorus reduction, phosphorus became the most limiting nutrient, since then chl has been directly related to TP, as inflow TP continued to decline, moving the reservoir from borderline meso-eutrophic in 1982 – 1985 to borderline meso-oligotrophic during 2010 – 2016.

**Table 26. Summer mean epilimnetic TN:TP ratios.**

| Station | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|
| LL0 | 68.5 | 64.0 | 64.0 | 68.3 | 86.5 | 132 | 118 |
| LL1 | 68.1 | 72.5 | 60.2 | 61.5 | 71.4 | 95.7 | 127 |
| LL2 | 39.5 | 75.5 | 61.6 | 55.0 | 60.1 | 91.9 | 136 |
| LL3 | 59.4 | 59.3 | 50.1 | 48.5 | 59.9 | 76.7 | 91.5 |
| LL4 | 53.3 | 64.4 | 30.2 | 36.8 | 40.5 | 28.3 | 53.9 |
| LL5 | 59.5 | 86.7 | 76.3 | 47.5 | 91.2 | 40.5 | 90.8 |

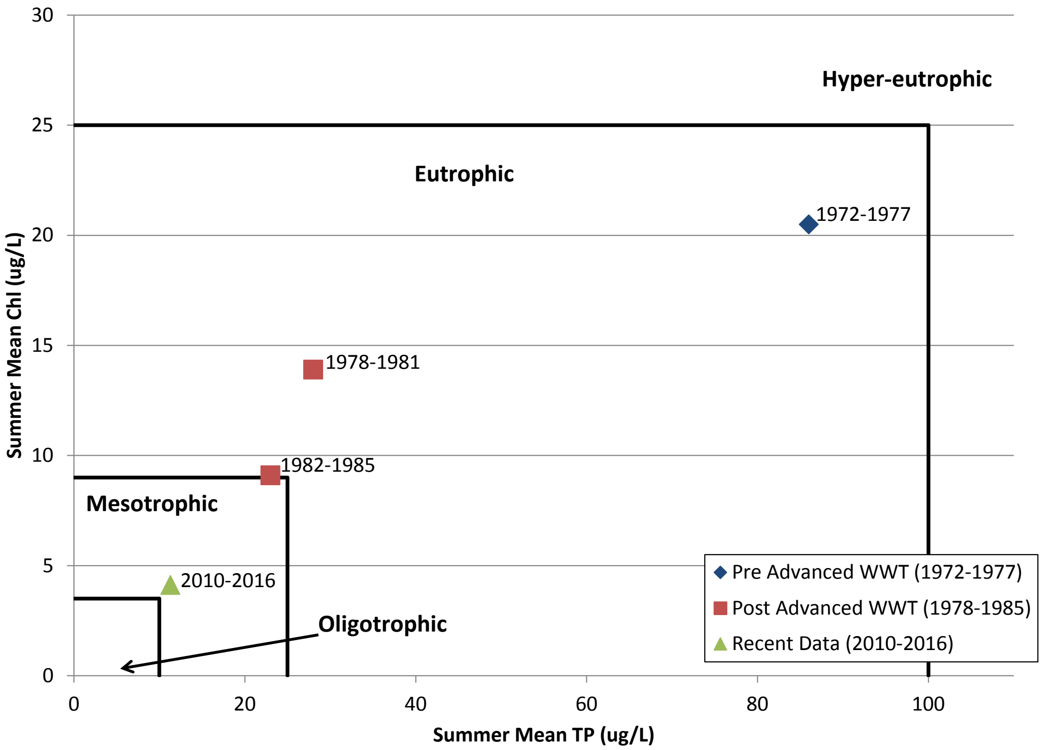

**Figure 113. Transition of Lake Spokane from borderline hypereutrophy to meso-oligotrophy over a period of 44 years.**

## 4.6 DO, Temperature and Fish Habitat

The percent of reservoir volume acceptable for growth of rainbow trout due to temperature and DO are shown for each station from 2010 through 2016 (Figures 114 through 119). The USFW temperature (≤ 18°C) and DO (≥ 6.0 mg/L) criterion for rainbow trout were used to construct the habitat volume diagrams.

The lowest average inflow and longest water residence time (70 days) was in 2015, which was also the year with the least volume of acceptable trout habitat in the reservoir (Table 4 and Figures 114-119). On the other hand, available habitat was greatest during 2011, which had the shortest residence time (14 days). That was consistent with the current dependence of minimum hypolimnetic DO on water residence time. Available habitat volumes during other years with residence times in between those years (~20 – 40) tended to be intermediate.

The data suggest that temperature restricted habitat for rainbow trout during spring and early summer far more than did DO at all sites and that temperature continued to be more limiting than DO for the rest of much of the year at the shallower sites. While DO was restrictive at LL0 later in the summer, there was little restriction from DO at other sites. Habitat became very restrictive for trout at LL0 during late July, August and early September when there were either no depths in the water column with temperatures less than 18°C and DO greater than 6 mg/L or only a very small percent of favorable habitat volume. The greater restriction by DO at LL0 than at other sites was due to DO reaching very low concentrations at depth, which in turn probably resulted to much longer residence times of bottom water, given the much longer water residence times in 2016 as well as in 2015. The data suggests that more acceptable habitat was available further upstream at LL1, LL2, and LL3.

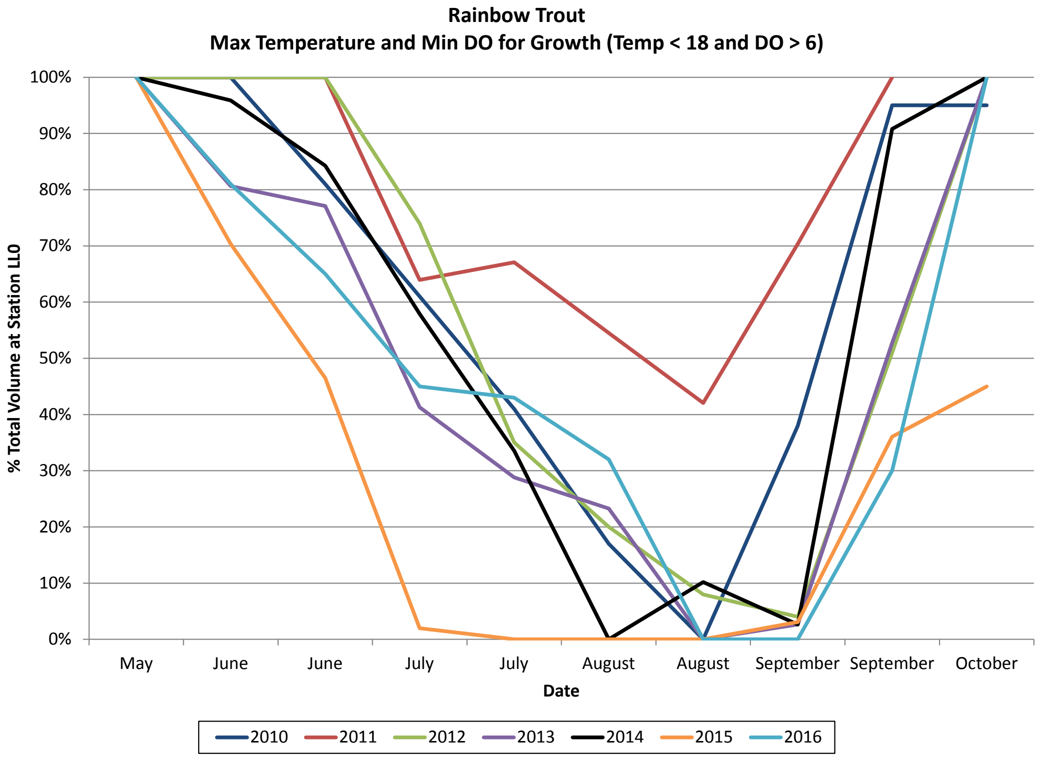

Figure 114. Habitat Conditions at Station LL0 for Rainbow Trout in 2010 – 2016, Based on Maximum Temperature (18°C) and Minimum DO (6.0 mg/L) for Growth.

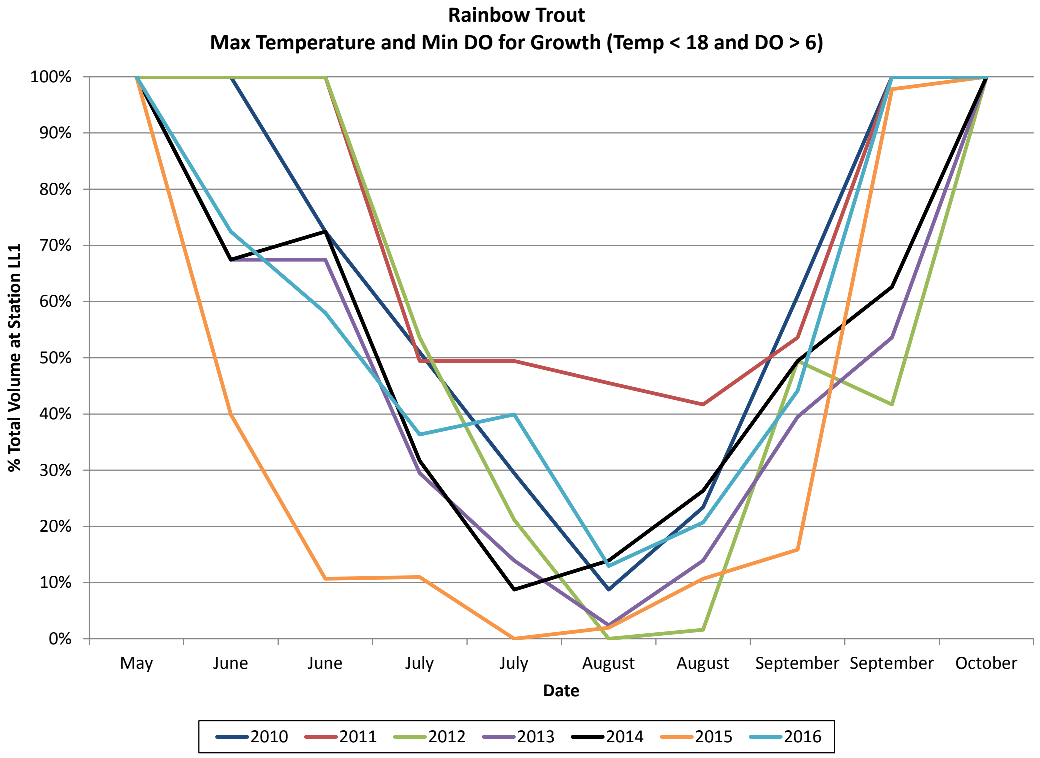

Figure 115. Habitat Conditions at Station LL1 for Rainbow Trout in 2010 – 2016, Based on Maximum Temperature (18°C) and Minimum DO (6.0 mg/L) for Growth.

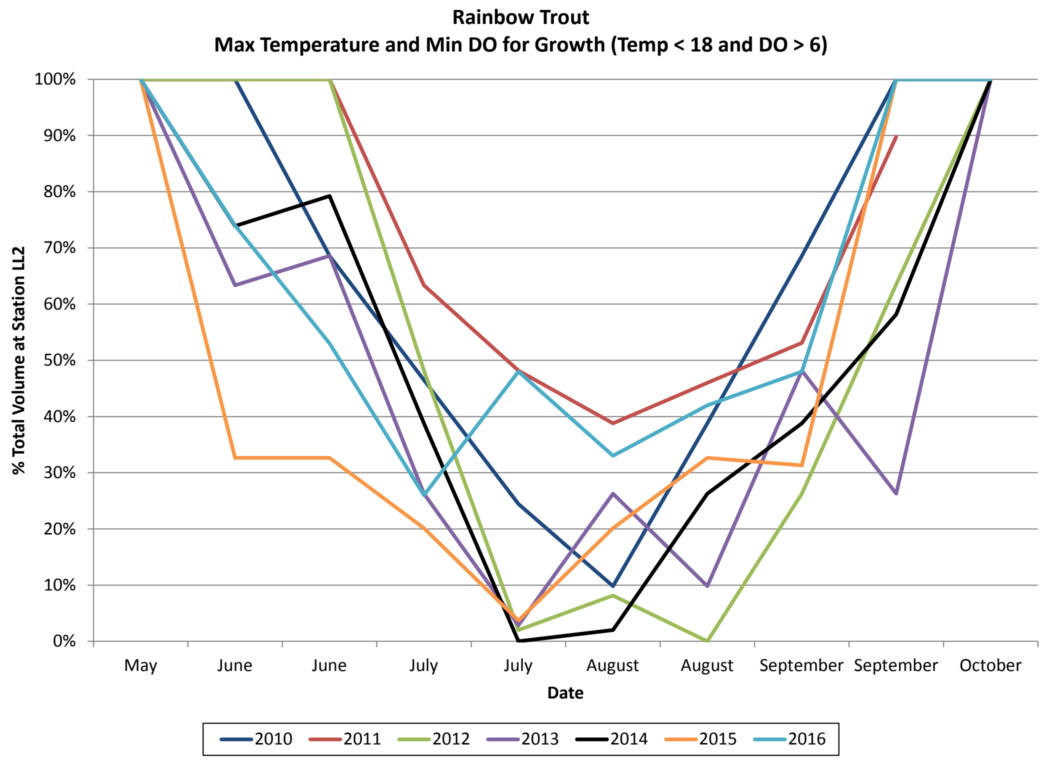

Figure 116. Habitat Conditions at Station LL2 for Rainbow Trout in 2010 – 2016, Based on Maximum Temperature (18°C) and Minimum DO (6.0 mg/L) for Growth.

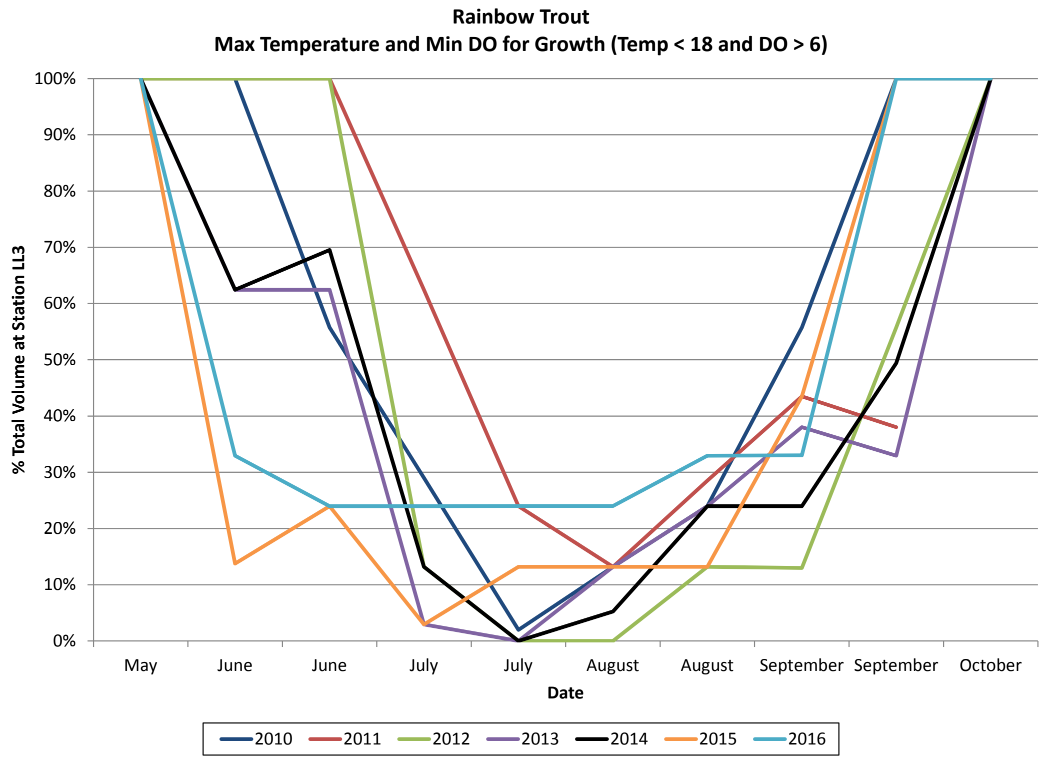

Figure 117. Habitat Conditions at Station LL3 for Rainbow Trout in 2010 – 2016, Based on Maximum Temperature (18°C) and Minimum DO (6.0 mg/L) for Growth.

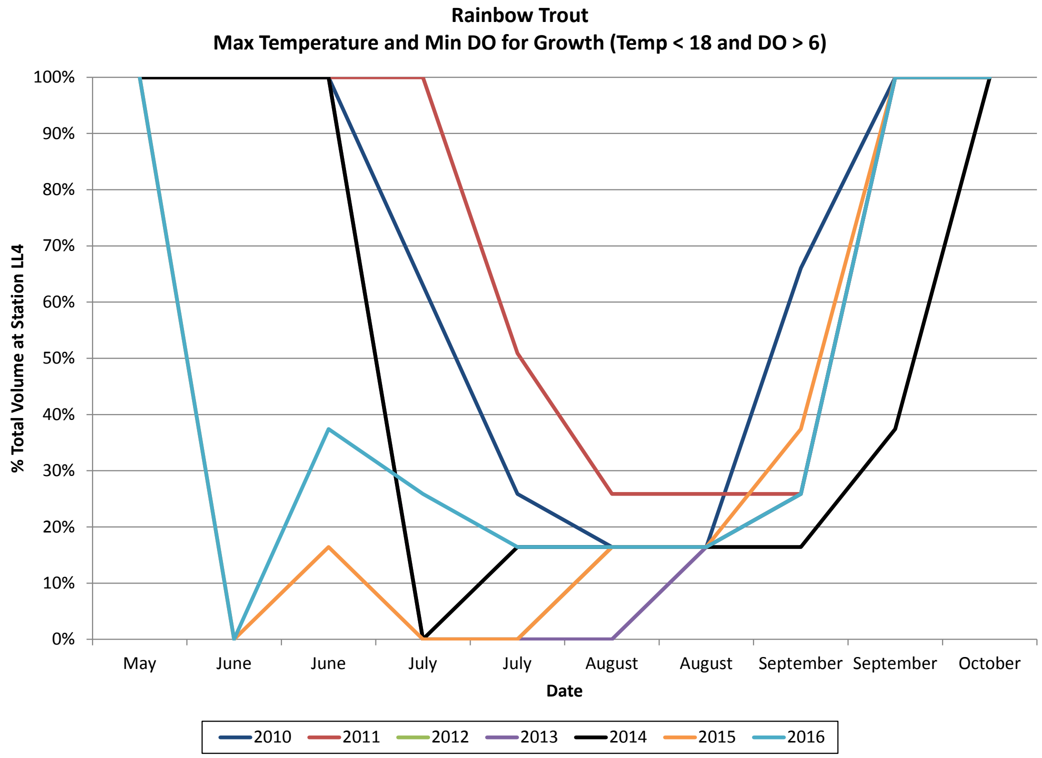

**Figure 118. Habitat Conditions at Station LL4 for Rainbow Trout in 2010 – 2016, Based on Maximum Temperature (18°C) and Minimum DO (6.0 mg/L) for Growth.**

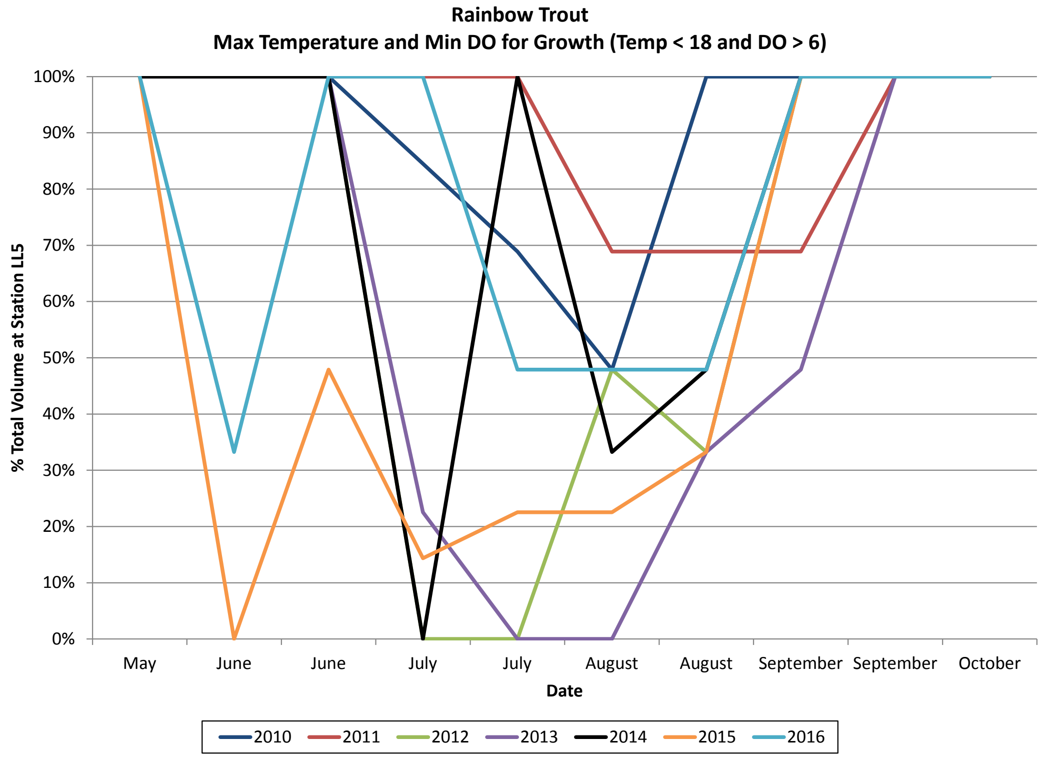

**Figure 119. Habitat Conditions at Station LL5 for Rainbow Trout in 2010 – 2016, Based on Maximum Temperature (18°C) and Minimum DO (6.0 mg/L) for Growth.**

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# APPENDIX I – Lake Spokane *In Situ* Monitoring Data

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## Table A-1. Station LL0 *In Situ* Water Quality Data, 2016

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 5/17/2016 | 0.5 | 17.21 | 7.76 | 99.8 | 10.34 | 112.4 | | 3.1 |
| 5/17/2016 | 1 | 16.98 | 7.76 | 99.8 | 10.38 | 112.3 | | |
| 5/17/2016 | 2 | 16.77 | 7.87 | 100.3 | 10.54 | 113.6 | | |
| 5/17/2016 | 3 | 16.43 | 7.88 | 99.9 | 10.56 | 113 | | |
| 5/17/2016 | 4 | 15.97 | 7.63 | 98.5 | 10.28 | 109 | | |
| 5/17/2016 | 5 | 15.71 | 7.34 | 97.4 | 9.83 | 103.6 | 9.91 | |
| 5/17/2016 | 6 | 15.56 | 7.37 | 96 | 9.75 | 102.4 | | |
| 5/17/2016 | 7 | 15.42 | 7.33 | 95.3 | 9.83 | 102.9 | | |
| 5/17/2016 | 8 | 15.33 | 7.33 | 94.5 | 9.86 | 103.1 | | |
| 5/17/2016 | 9 | 15.32 | 7.32 | 94.4 | 9.84 | 102.8 | | |
| 5/17/2016 | 9* | 15.32 | 7.3 | 94.2 | 9.86 | 103 | | |
| 5/17/2016 | 10 | 15.28 | 7.3 | 94.5 | 9.84 | 102.7 | | |
| 5/17/2016 | 12 | 15.08 | 7.25 | 94.5 | 9.83 | 102.2 | | |
| 5/17/2016 | 15 | 15.03 | 7.25 | 95.3 | 9.79 | 101.7 | 9.83 | |
| 5/17/2016 | 18 | 14.79 | 7.22 | 95.8 | 9.69 | 100.1 | | |
| 5/17/2016 | 21 | 14.64 | 7.17 | 95.3 | 9.67 | 99.6 | | |
| 5/17/2016 | 24 | 14.31 | 7.15 | 97.9 | 9.44 | 96.5 | | |
| 5/17/2016 | 27 | 14.17 | 7.11 | 99.5 | 9.32 | 95 | | |
| 5/17/2016 | 30 | 13.42 | 7.06 | 99.3 | 9.43 | 94.5 | | |
| 5/17/2016 | 33 | 12.8 | 7.02 | 96.4 | 9.08 | 89.7 | | |
| 5/17/2016 | 33* | 12.82 | 7 | 96.5 | 9.1 | 90 | | |
| 5/17/2016 | 36 | 12.5 | 6.98 | 93 | 8.94 | 87.8 | | |
| 5/17/2016 | 39 | 12.15 | 6.92 | 89.9 | 8.52 | 83 | | |
| 5/17/2016 | 42 | 11.97 | 6.87 | 88.1 | 8.24 | 79.9 | | |
| 5/17/2016 | 45 | 11.95 | 6.84 | 87.3 | 8.2 | 79.5 | | |
| 5/17/2016 | 47 | 11.89 | 6.81 | 87.6 | 8.08 | 78.3 | | |
| 6/7/2016 | 0.5 | 21.8 | 7.75 | 107.6 | 9.32 | 113.1 | | 6.2 |
| 6/7/2016 | 1 | 21.6 | 7.75 | 107.8 | 9.39 | 113.5 | | |
| 6/7/2016 | 2 | 19.97 | 7.9 | 107.1 | 10.02 | 117.2 | | |
| 6/7/2016 | 3 | 18.92 | 8.01 | 107.2 | 10.39 | 119 | | |
| 6/7/2016 | 4 | 18.06 | 8.05 | 106.1 | 10.54 | 118.7 | | |
| 6/7/2016 | 5 | 17.64 | 8.09 | 105.9 | 10.62 | 118.5 | 11 | |
| 6/7/2016 | 6 | 17.33 | 8.06 | 105.8 | 10.56 | 117.1 | | |
| 6/7/2016 | 7 | 17.02 | 8.03 | 105.8 | 10.51 | 115.8 | | |
| 6/7/2016 | 8 | 16.61 | 7.94 | 104.4 | 10.32 | 112.7 | | |
| 6/7/2016 | 9 | 16.44 | 7.84 | 104.6 | 10.13 | 110.3 | | |
| 6/7/2016 | 9* | 16.46 | 7.84 | 104.6 | 10.18 | 110.9 | | |
| 6/7/2016 | 10 | 16.37 | 7.78 | 104 | 10.04 | 109.2 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 6/7/2016 | 12 | 16.2 | 7.67 | 109.3 | 9.8 | 106.2 | | |
| 6/7/2016 | 15 | 15.79 | 7.54 | 105.6 | 9.53 | 102.3 | 10.1 | |
| 6/7/2016 | 18 | 15.24 | 7.43 | 101.1 | 9.37 | 99.4 | | |
| 6/7/2016 | 21 | 14.81 | 7.37 | 98.2 | 9.3 | 97.8 | | |
| 6/7/2016 | 24 | 14.67 | 7.31 | 98.6 | 9.18 | 96.2 | | |
| 6/7/2016 | 27 | 14.51 | 7.25 | 100.2 | 9.02 | 94.2 | | |
| 6/7/2016 | 30 | 14.43 | 7.23 | 101.5 | 8.88 | 92.6 | | |
| 6/7/2016 | 33 | 14.34 | 7.19 | 102.6 | 8.73 | 90.9 | | |
| 6/7/2016 | 33* | 14.35 | 7.17 | 103 | 8.77 | 91.3 | | |
| 6/7/2016 | 36 | 14.14 | 7.14 | 107.4 | 8.45 | 87.6 | | |
| 6/7/2016 | 39 | 14.03 | 7.12 | 109 | 8.18 | 84.5 | | |
| 6/7/2016 | 42 | 13.88 | 7.08 | 112.3 | 7.67 | 79 | | |
| 6/7/2016 | 45 | 13.81 | 7.05 | 113.1 | 7.49 | 77 | | |
| 6/7/2016 | 47 | 13.75 | 7.05 | 113.4 | 7.39 | 75.9 | | |
| 6/21/2016 | 0.5 | 19.03 | 7.85 | 122.8 | 9.6 | 108.8 | | 6.4 |
| 6/21/2016 | 1 | 19.01 | 7.9 | 122.8 | 9.57 | 108.5 | | |
| 6/21/2016 | 2 | 18.85 | 7.98 | 122.9 | 9.74 | 110 | | |
| 6/21/2016 | 3 | 18.62 | 7.99 | 122.5 | 9.79 | 110.1 | | |
| 6/21/2016 | 4 | 18.57 | 8.06 | 122.8 | 9.92 | 111.4 | | |
| 6/21/2016 | 5 | 18.39 | 8.03 | 122.9 | 9.85 | 110.2 | 10.8 | |
| 6/21/2016 | 6 | 18.29 | 7.95 | 124.2 | 9.68 | 108.2 | | |
| 6/21/2016 | 7 | 18.09 | 7.86 | 125.2 | 9.45 | 105.2 | | |
| 6/21/2016 | 8 | 17.89 | 7.75 | 129.5 | 9.12 | 101.1 | | |
| 6/21/2016 | 9 | 17.85 | 7.71 | 128.9 | 9.05 | 100.2 | | |
| 6/21/2016 | 9* | 17.85 | 7.7 | 129 | 9.06 | 100.3 | | |
| 6/21/2016 | 10 | 17.78 | 7.66 | 132 | 8.96 | 99.1 | | |
| 6/21/2016 | 12 | 17.11 | 7.49 | 132.7 | 8.44 | 92 | | |
| 6/21/2016 | 15 | 16.4 | 7.41 | 126.9 | 8.26 | 88.7 | 9.13 | |
| 6/21/2016 | 18 | 16.12 | 7.34 | 127.7 | 8.09 | 86.4 | | |
| 6/21/2016 | 21 | 15.79 | 7.34 | 121 | 8.24 | 87.4 | | |
| 6/21/2016 | 24 | 15.21 | 7.27 | 112.3 | 8.23 | 86.2 | | |
| 6/21/2016 | 27 | 14.94 | 7.24 | 109 | 8.03 | 83.6 | | |
| 6/21/2016 | 30 | 14.73 | 7.17 | 107.3 | 7.77 | 80.5 | | |
| 6/21/2016 | 33 | 14.53 | 7.16 | 105.9 | 7.57 | 78.1 | | |
| 6/21/2016 | 33* | 14.5 | 7.13 | 106 | 7.57 | 78 | | |
| 6/21/2016 | 36 | 14.28 | 7.09 | 106.5 | 7.26 | 74.5 | | |
| 6/21/2016 | 39 | 13.96 | 7.02 | 109.6 | 6.08 | 61.9 | | |
| 6/21/2016 | 42 | 13.78 | 6.97 | 110.6 | 5.48 | 55.6 | | |
| 6/21/2016 | 45 | 13.7 | 6.94 | 111 | 5.16 | 52.2 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 6/21/2016 | 47 | 13.57 | 6.89 | 111.5 | 4.63 | 46.8 | | |
| 7/5/2016 | 0.5 | 19.83 | 8.17 | 138.6 | 9.83 | 113.6 | | 9.2 |
| 7/5/2016 | 1 | 19.75 | 8.18 | 138.5 | 9.85 | 113.7 | | |
| 7/5/2016 | 2 | 19.69 | 8.2 | 138.1 | 9.87 | 113.8 | | |
| 7/5/2016 | 3 | 19.67 | 8.19 | 138.3 | 9.91 | 114.1 | | |
| 7/5/2016 | 4 | 19.6 | 8.16 | 138.8 | 9.99 | 114.9 | | |
| 7/5/2016 | 5 | 19.58 | 8.17 | 139.7 | 10.05 | 115.5 | 10.8 | |
| 7/5/2016 | 6 | 19.52 | 8.18 | 140.2 | 10.12 | 116.2 | | |
| 7/5/2016 | 7 | 19.48 | 8.21 | 139.9 | 10.23 | 117.4 | | |
| 7/5/2016 | 8 | 19.07 | 8.13 | 143.7 | 10.21 | 116.2 | | |
| 7/5/2016 | 9 | 18.57 | 7.92 | 155.7 | 9.47 | 106.6 | | |
| 7/5/2016 | 9* | 18.58 | 7.9 | 155.4 | 9.44 | 106.4 | | |
| 7/5/2016 | 10 | 18.03 | 7.91 | 155 | 9.66 | 107.6 | | |
| 7/5/2016 | 12 | 17.55 | 7.76 | 157.6 | 9.22 | 101.7 | | |
| 7/5/2016 | 15 | 16.98 | 7.52 | 162.1 | 8.11 | 88.5 | | |
| 7/5/2016 | 18 | 16.66 | 7.45 | 164.1 | 7.69 | 83.2 | | |
| 7/5/2016 | 21 | 16.24 | 7.38 | 160.9 | 7.38 | 79.3 | | |
| 7/5/2016 | 24 | 15.93 | 7.36 | 165.3 | 7.39 | 78.8 | | |
| 7/5/2016 | 27 | 15.64 | 7.3 | 157 | 6.94 | 73.5 | | |
| 7/5/2016 | 30 | 15.21 | 7.19 | 134.4 | 5.83 | 61.3 | | |
| 7/5/2016 | 33 | 14.59 | 7.15 | 109.6 | 5.99 | 62 | 6.49 | |
| 7/5/2016 | 33* | 14.59 | 7.09 | 109.8 | 5.97 | 61.8 | | |
| 7/5/2016 | 36 | 14.35 | 7.04 | 107.6 | 5.76 | 59.3 | | |
| 7/5/2016 | 39 | 13.96 | 6.95 | 109.2 | 4.36 | 44.5 | | |
| 7/5/2016 | 42 | 13.71 | 6.88 | 109.9 | 3.24 | 32.9 | | |
| 7/5/2016 | 45 | 13.49 | 6.81 | 111.1 | 2.48 | 25.1 | | |
| 7/5/2016 | 47 | 13.37 | 6.77 | 111.5 | 2.05 | 20.7 | | |
| 7/19/2016 | 0.5 | 21.01 | 8.25 | 160.8 | 9.6 | 113.4 | | 7.2 |
| 7/19/2016 | 1 | 20.79 | 8.23 | 160.7 | 9.59 | 112.9 | | |
| 7/19/2016 | 2 | 20.73 | 8.23 | 160.5 | 9.59 | 112.6 | | |
| 7/19/2016 | 3 | 20.64 | 8.22 | 160.7 | 9.56 | 112.1 | | |
| 7/19/2016 | 4 | 20.55 | 8.19 | 160.9 | 9.53 | 111.6 | | |
| 7/19/2016 | 5 | 20.28 | 8.12 | 163.3 | 9.46 | 110.1 | 10.5 | |
| 7/19/2016 | 6 | 19.76 | 7.94 | 181.7 | 9.18 | 105.8 | | |
| 7/19/2016 | 7 | 19.11 | 7.8 | 189.8 | 8.8 | 100.2 | | |
| 7/19/2016 | 8 | 18.69 | 7.73 | 190.4 | 8.64 | 97.5 | | |
| 7/19/2016 | 9 | 18.33 | 7.64 | 185.9 | 8.29 | 92.8 | | |
| 7/19/2016 | 9* | 18.35 | 7.61 | 186.3 | 8.27 | 92.6 | | |
| 7/19/2016 | 10 | 17.89 | 7.55 | 185.6 | 7.9 | 87.2 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 7/19/2016 | 12 | 17.32 | 7.5 | 178.5 | 7.71 | 84.6 | | |
| 7/19/2016 | 15 | 16.84 | 7.4 | 186.2 | 7.06 | 76.6 | 7.62 | |
| 7/19/2016 | 18 | 16.57 | 7.37 | 181.7 | 6.95 | 75 | | |
| 7/19/2016 | 21 | 16.33 | 7.34 | 176.3 | 6.96 | 74.8 | | |
| 7/19/2016 | 24 | 16.13 | 7.32 | 175.6 | 6.77 | 72.4 | | |
| 7/19/2016 | 27 | 15.8 | 7.25 | 170.8 | 6.28 | 66.7 | | |
| 7/19/2016 | 30 | 15.22 | 7.14 | 142.8 | 4.81 | 50.5 | | |
| 7/19/2016 | 33 | 14.82 | 7.05 | 120.8 | 4.92 | 51.1 | | |
| 7/19/2016 | 33* | 14.81 | 7.01 | 121.5 | 4.91 | 51.1 | | |
| 7/19/2016 | 36 | 14.4 | 6.97 | 111.1 | 4.65 | 47.9 | | |
| 7/19/2016 | 39 | 13.96 | 6.87 | 109 | 3.27 | 33.4 | | |
| 7/19/2016 | 42 | 13.74 | 6.81 | 109.4 | 2.32 | 23.6 | | |
| 7/19/2016 | 45 | 13.5 | 6.74 | 110.2 | 1.22 | 12.3 | | |
| 7/19/2016 | 46.5 | 13.38 | 6.71 | 111.4 | 1 | 10 | | |
| 8/10/2016 | 0.5 | 22.5 | 8.94 | 180.7 | 11 | 134.1 | | 4.1 |
| 8/10/2016 | 1 | 22.44 | 8.95 | 180.6 | 11.01 | 134.2 | | |
| 8/10/2016 | 2 | 22.34 | 8.95 | 180.5 | 11.08 | 134.7 | | |
| 8/10/2016 | 3 | 22.33 | 8.95 | 181 | 11.11 | 135 | | |
| 8/10/2016 | 4 | 22.31 | 8.96 | 180.9 | 11.09 | 134.8 | | |
| 8/10/2016 | 5 | 22.29 | 8.96 | 180.7 | 11.14 | 135.3 | 12.2 | |
| 8/10/2016 | 6 | 22.27 | 8.96 | 171.4 | 11.13 | 135.1 | | |
| 8/10/2016 | 7 | 20.63 | 8.6 | 198.1 | 11.89 | 139.8 | | |
| 8/10/2016 | 8 | 19.33 | 8.07 | 204.4 | 9.33 | 106.9 | | |
| 8/10/2016 | 9 | 18.54 | 7.78 | 209.4 | 7.66 | 86.4 | | |
| 8/10/2016 | 9* | 18.57 | 7.71 | 210.1 | 7.76 | 87.6 | | |
| 8/10/2016 | 10 | 18.12 | 7.6 | 214 | 7.04 | 78.7 | | |
| 8/10/2016 | 12 | 17.72 | 7.5 | 218.9 | 6.5 | 72.1 | | |
| 8/10/2016 | 15 | 17.27 | 7.47 | 219.3 | 6.39 | 70.2 | | |
| 8/10/2016 | 18 | 16.97 | 7.47 | 226.3 | 6.52 | 71.2 | | |
| 8/10/2016 | 21 | 16.74 | 7.42 | 215.6 | 6.04 | 65.6 | | |
| 8/10/2016 | 24 | 16.5 | 7.4 | 214.2 | 6.03 | 65.2 | | |
| 8/10/2016 | 27 | 16.05 | 7.29 | 193.5 | 4.81 | 51.5 | | |
| 8/10/2016 | 30 | 15.51 | 7.2 | 160.8 | 3.84 | 40.6 | 4.37 | |
| 8/10/2016 | 33 | 14.92 | 7.14 | 133.2 | 4.03 | 42.1 | | |
| 8/10/2016 | 33* | 14.91 | 7.1 | 134.8 | 3.95 | 41.3 | | |
| 8/10/2016 | 36 | 14.4 | 7.03 | 116 | 3.08 | 31.9 | | |
| 8/10/2016 | 39 | 13.88 | 6.96 | 112.4 | 1.57 | 16.1 | | |
| 8/10/2016 | 42 | 13.71 | 6.9 | 112 | 0.66 | 6.7 | | |
| 8/10/2016 | 45 | 13.57 | 6.86 | 112.4 | 0 | 0 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 8/10/2016 | 47 | 13.38 | 6.83 | 113.6 | 0 | 0 | | |
| 8/24/2016 | 0.5 | 21.51 | 8.8 | 205.7 | 10.35 | 122.8 | | 3.9 |
| 8/24/2016 | 1 | 21.51 | 8.8 | 205.6 | 10.37 | 123 | | |
| 8/24/2016 | 2 | 21.46 | 8.79 | 205.8 | 10.37 | 123 | | |
| 8/24/2016 | 3 | 21.45 | 8.79 | 205.9 | 10.34 | 122.5 | | |
| 8/24/2016 | 4 | 21.43 | 8.78 | 205.9 | 10.34 | 122.5 | | |
| 8/24/2016 | 5 | 21.36 | 8.79 | 207 | 10.64 | 125.8 | 12.1 | |
| 8/24/2016 | 6 | 21.27 | 8.73 | 208 | 10.41 | 122.9 | | |
| 8/24/2016 | 7 | 21.02 | 8.54 | 215.4 | 9.75 | 114.6 | | |
| 8/24/2016 | 8 | 20.29 | 8.16 | 223.4 | 8.84 | 102.4 | | |
| 8/24/2016 | 9 | 19.08 | 7.78 | 222.9 | 7.07 | 79.9 | | |
| 8/24/2016 | 9* | 18.87 | 7.65 | 225.6 | 6.91 | 77.8 | | |
| 8/24/2016 | 10 | 18.29 | 7.5 | 231.4 | 5.88 | 65.5 | | |
| 8/24/2016 | 12 | 17.69 | 7.44 | 237.6 | 5.82 | 64 | | |
| 8/24/2016 | 15 | 17.31 | 7.4 | 241.5 | 5.46 | 59.5 | | |
| 8/24/2016 | 18 | 16.96 | 7.34 | 239.9 | 4.99 | 54 | | |
| 8/24/2016 | 21 | 16.66 | 7.3 | 230.1 | 4.79 | 51.6 | | |
| 8/24/2016 | 24 | 16.37 | 7.23 | 220.4 | 4.07 | 43.6 | | |
| 8/24/2016 | 27 | 15.92 | 7.15 | 201.1 | 2.96 | 31.3 | 3.63 | |
| 8/24/2016 | 30 | 15.57 | 7.1 | 180.8 | 2.35 | 24.7 | | |
| 8/24/2016 | 33 | 15.05 | 7.07 | 150.1 | 2.76 | 28.7 | | |
| 8/24/2016 | 33* | 15.06 | 7.02 | 151.6 | 2.8 | 29.1 | | |
| 8/24/2016 | 36 | 14.47 | 7 | 125.4 | 2.51 | 25.8 | | |
| 8/24/2016 | 39 | 13.94 | 6.96 | 115.7 | 0.91 | 9.2 | | |
| 8/24/2016 | 42 | 13.67 | 6.89 | 115.9 | 0 | 0 | | |
| 8/24/2016 | 45 | 13.47 | 6.84 | 116.8 | 0 | 0 | | |
| 8/24/2016 | 47 | 13.41 | 6.81 | 117.5 | 0 | 0 | | |
| 9/6/2016 | 0.5 | 19.47 | 8.72 | 221 | 9.95 | 114.5 | | 3.3 |
| 9/6/2016 | 1 | 19.46 | 8.73 | 221.1 | 9.97 | 114.7 | | |
| 9/6/2016 | 2 | 19.5 | 8.74 | 220.7 | 9.98 | 114.9 | | |
| 9/6/2016 | 3 | 19.5 | 8.75 | 220.9 | 9.98 | 115 | | |
| 9/6/2016 | 4 | 19.51 | 8.75 | 220.7 | 9.97 | 114.8 | | |
| 9/6/2016 | 5 | 19.5 | 8.75 | 221 | 9.94 | 114.5 | 10.6 | |
| 9/6/2016 | 6 | 19.49 | 8.74 | 221.2 | 9.92 | 114.2 | | |
| 9/6/2016 | 7 | 18.73 | 7.67 | 250.9 | 6.11 | 69.3 | | |
| 9/6/2016 | 8 | 17.96 | 7.55 | 258 | 5.67 | 63.3 | | |
| 9/6/2016 | 9 | 17.56 | 7.52 | 263.2 | 5.69 | 63 | | |
| 9/6/2016 | 9* | 17.58 | 7.51 | 262.6 | 5.65 | 62.5 | | |
| 9/6/2016 | 10 | 17.39 | 7.48 | 266.1 | 5.65 | 62.3 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 9/6/2016 | 12 | 17.19 | 7.44 | 265.5 | 5.34 | 58.7 | | |
| 9/6/2016 | 15 | 16.95 | 7.38 | 263 | 5 | 54.6 | 5.65 | |
| 9/6/2016 | 18 | 16.78 | 7.36 | 260 | 4.78 | 52.1 | | |
| 9/6/2016 | 21 | 16.64 | 7.32 | 260.8 | 4.7 | 51 | | |
| 9/6/2016 | 24 | 16.52 | 7.29 | 253.8 | 4.19 | 45.4 | | |
| 9/6/2016 | 27 | 16.21 | 7.2 | 233.1 | 3.1 | 33.4 | | |
| 9/6/2016 | 30 | 15.78 | 7.1 | 208.3 | 1.33 | 14.2 | | |
| 9/6/2016 | 33 | 15.29 | 7.04 | 173.7 | 1.54 | 16.2 | | |
| 9/6/2016 | 33* | 15.28 | 7.02 | 172.4 | 1.52 | 16 | | |
| 9/6/2016 | 36 | 14.63 | 7.02 | 137 | 1.99 | 20.7 | | |
| 9/6/2016 | 39 | 13.95 | 6.96 | 120.1 | 0 | 0 | | |
| 9/6/2016 | 42 | 13.73 | 6.89 | 119.6 | 0 | 0 | | |
| 9/6/2016 | 45 | 13.53 | 6.84 | 120.6 | 0 | 0 | | |
| 9/6/2016 | 47 | 13.47 | 6.81 | 121.7 | 0 | 0 | | |
| 9/19/2016 | 0.5 | 17.82 | 8.5 | 236.9 | 9.46 | 104.7 | | 4.9 |
| 9/19/2016 | 1 | 17.86 | 8.52 | 236.6 | 9.46 | 104.8 | | |
| 9/19/2016 | 2 | 17.79 | 8.53 | 237.1 | 9.44 | 104.4 | | |
| 9/19/2016 | 3 | 17.8 | 8.5 | 237.4 | 9.35 | 103.5 | | |
| 9/19/2016 | 4 | 17.76 | 8.48 | 237.8 | 9.33 | 103.1 | | |
| 9/19/2016 | 5 | 17.71 | 8.5 | 238.3 | 9.15 | 101 | | |
| 9/19/2016 | 6 | 17.45 | 7.76 | 260 | 6 | 65.9 | | |
| 9/19/2016 | 7 | 17.11 | 7.56 | 265.4 | 5.1 | 55.7 | | |
| 9/19/2016 | 8 | 16.94 | 7.45 | 265.1 | 4.83 | 52.5 | | |
| 9/19/2016 | 9 | 16.92 | 7.43 | 265.4 | 4.78 | 51.9 | | |
| 9/19/2016 | 9* | 16.92 | 7.41 | 265.3 | 4.82 | 52.3 | | |
| 9/19/2016 | 10 | 16.78 | 7.41 | 266.4 | 4.71 | 51 | | |
| 9/19/2016 | 12 | 16.62 | 7.4 | 267.8 | 4.72 | 51 | | |
| 9/19/2016 | 15 | 16.3 | 7.35 | 260.8 | 4.15 | 44.5 | 4.79 | |
| 9/19/2016 | 18 | 15.98 | 7.27 | 247.8 | 3.5 | 37.3 | | |
| 9/19/2016 | 21 | 15.56 | 7.32 | 252.6 | 4.44 | 46.8 | | |
| 9/19/2016 | 24 | 15.45 | 7.34 | 257.9 | 4.97 | 52.3 | | |
| 9/19/2016 | 27 | 15.24 | 7.38 | 257 | 5.35 | 56.1 | | |
| 9/19/2016 | 30 | 15.11 | 7.42 | 259.8 | 5.69 | 59.5 | 6.62 | |
| 9/19/2016 | 33 | 14.99 | 7.36 | 245.9 | 4.92 | 51.3 | | |
| 9/19/2016 | 33* | 14.99 | 7.34 | 245.6 | 4.9 | 51.1 | | |
| 9/19/2016 | 36 | 14.84 | 7.27 | 229.4 | 3.91 | 40.6 | | |
| 9/19/2016 | 39 | 14.44 | 7.15 | 176.4 | 1.75 | 18.1 | | |
| 9/19/2016 | 42 | 13.74 | 7.07 | 122.8 | 0 | 0 | | |
| 9/19/2016 | 45 | 13.53 | 6.98 | 122.6 | 0 | 0 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 9/19/2016 | 47 | 13.43 | 6.94 | 123.3 | 0 | 0 | | |
| 10/12/2016 | 0.5 | 14.74 | 8.04 | 249 | 8.9 | 91.9 | | 6.2 |
| 10/12/2016 | 1 | 14.72 | 8.06 | 249.3 | 8.93 | 92 | | |
| 10/12/2016 | 2 | 14.73 | 8.05 | 248.9 | 8.88 | 91.6 | | |
| 10/12/2016 | 3 | 14.74 | 8.06 | 248.9 | 8.91 | 91.8 | | |
| 10/12/2016 | 4 | 14.73 | 8.05 | 248.9 | 8.9 | 91.7 | | |
| 10/12/2016 | 5 | 14.74 | 8.06 | 249 | 8.89 | 91.7 | 9.76 | |
| 10/12/2016 | 6 | 14.75 | 8.06 | 248.9 | 8.89 | 91.6 | | |
| 10/12/2016 | 7 | 14.74 | 8.07 | 248.8 | 8.9 | 91.7 | | |
| 10/12/2016 | 8 | 14.74 | 8.07 | 249.1 | 8.87 | 91.5 | | |
| 10/12/2016 | 9 | 14.73 | 8.07 | 248 | 8.88 | 91.5 | | |
| 10/12/2016 | 9* | 14.73 | 8.05 | 249.1 | 8.88 | 91.5 | | |
| 10/12/2016 | 10 | 14.72 | 8.07 | 249.3 | 8.9 | 91.7 | | |
| 10/12/2016 | 12 | 14.71 | 8.08 | 249 | 8.93 | 92 | | |
| 10/12/2016 | 15 | 14.51 | 7.77 | 244.2 | 7.67 | 78.6 | 7.86 | |
| 10/12/2016 | 18 | 14.4 | 7.66 | 241 | 7.35 | 75.2 | | |
| 10/12/2016 | 21 | 13.95 | 7.65 | 238.9 | 7.6 | 77 | | |
| 10/12/2016 | 24 | 13.44 | 7.75 | 237.2 | 8.32 | 83.4 | | |
| 10/12/2016 | 27 | 13.27 | 7.76 | 236.8 | 8.46 | 84.4 | | |
| 10/12/2016 | 30 | 13.23 | 7.75 | 236.9 | 8.51 | 84.8 | | |
| 10/12/2016 | 33 | 13.18 | 7.75 | 236.6 | 8.5 | 84.6 | | |
| 10/12/2016 | 33* | 13.17 | 7.77 | 236.9 | 8.5 | 84.6 | | |
| 10/12/2016 | 36 | 13.16 | 7.76 | 236.8 | 8.5 | 84.6 | | |
| 10/12/2016 | 39 | 13.13 | 7.72 | 236.9 | 8.53 | 84.9 | | |
| 10/12/2016 | 42 | 13.12 | 7.75 | 236.7 | 8.51 | 84.7 | | |
| 10/12/2016 | 45 | 13.11 | 7.74 | 236.4 | 8.49 | 84.5 | | |

*QA/QC measurement for Hydrolab
**Secchi disk depths average of 3 measurements

**Table A-2. Station LL1 *In Situ* Water Quality Data, 2016**

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 5/17/2016 | 0.5 | 17.49 | 8.43 | 102 | 11.28 | 123.4 | | 2.6 |
| 5/17/2016 | 1 | 17.28 | 8.38 | 102 | 11.34 | 123.6 | | |
| 5/17/2016 | 2 | 16.92 | 8.45 | 101.2 | 11.39 | 123.2 | | |
| 5/17/2016 | 3 | 16.89 | 8.35 | 101.6 | 11.36 | 122.8 | | |
| 5/17/2016 | 4 | 16.32 | 8.22 | 99.2 | 10.93 | 116.7 | | |
| 5/17/2016 | 4* | 16.22 | 8.13 | 98.3 | 10.86 | 115.6 | | |
| 5/17/2016 | 5 | 16.01 | 7.93 | 97.8 | 10.46 | 110.9 | 10.5 | |
| 5/17/2016 | 6 | 15.97 | 7.85 | 97.2 | 10.33 | 106.2 | | |
| 5/17/2016 | 7 | 15.65 | 7.68 | 96 | 10.09 | 107.5 | | |
| 5/17/2016 | 8 | 15.57 | 7.66 | 95.2 | 10.23 | 109.2 | | |
| 5/17/2016 | 9 | 15.4 | 7.71 | 94.7 | 10.43 | 109.3 | | |
| 5/17/2016 | 10 | 15.39 | 7.71 | 94.3 | 10.44 | 107 | | |
| 5/17/2016 | 12 | 15.2 | 7.59 | 95.4 | 10.26 | 103.5 | | |
| 5/17/2016 | 15 | 14.79 | 7.48 | 100.3 | 10.01 | 101.4 | | |
| 5/17/2016 | 18 | 14.62 | 7.37 | 102.4 | 9.85 | 99.1 | | |
| 5/17/2016 | 21 | 14.42 | 7.35 | 100.2 | 9.67 | 98.6 | 9.83 | |
| 5/17/2016 | 21* | 14.42 | 7.32 | 100.2 | 9.62 | 96.2 | | |
| 5/17/2016 | 24 | 14.16 | 7.23 | 98.1 | 9.44 | 87.6 | | |
| 5/17/2016 | 27 | 13.56 | 7.16 | 97.3 | 8.71 | 83.1 | | |
| 5/17/2016 | 30 | 12.83 | 7.09 | 97.9 | 8.4 | 79.5 | | |
| 5/17/2016 | 33 | 12.61 | 7.03 | 97.1 | 8.07 | | | |
| 6/7/2016 | 0.5 | 23.4 | 7.87 | 109.2 | 8.98 | 112.5 | | 6.7 |
| 6/7/2016 | 1 | 22.95 | 7.83 | 109.6 | 9.1 | 112.9 | | |
| 6/7/2016 | 2 | 21.08 | 7.8 | 109.6 | 9.35 | 111.9 | | |
| 6/7/2016 | 3 | 18.82 | 8.04 | 111.3 | 10.35 | 118.3 | | |
| 6/7/2016 | 4 | 18.45 | 8.02 | 111.9 | 10.34 | 117.4 | | |
| 6/7/2016 | 4* | 18.44 | 8.01 | 111 | 10.31 | 117 | | |
| 6/7/2016 | 5 | 17.95 | 8.22 | 117.1 | 11.19 | 125.7 | 11.1 | |
| 6/7/2016 | 6 | 17.69 | 8.13 | 115.3 | 10.71 | 119.7 | | |
| 6/7/2016 | 7 | 17.46 | 8.24 | 117.7 | 11.09 | 123.3 | | |
| 6/7/2016 | 8 | 17.29 | 8.18 | 117.9 | 10.98 | 121.7 | | |
| 6/7/2016 | 9 | 17.1 | 8.22 | 118.6 | 10.97 | 121.1 | | |
| 6/7/2016 | 10 | 16.94 | 8.15 | 118 | 10.78 | 118.6 | | |
| 6/7/2016 | 12 | 16.42 | 7.92 | 121.3 | 10.07 | 109.6 | | |
| 6/7/2016 | 15 | 15.79 | 7.65 | 120.5 | 9.3 | 99.8 | | |
| 6/7/2016 | 18 | 15.08 | 7.58 | 105.7 | 9.32 | 98.5 | | |
| 6/7/2016 | 21 | 14.75 | 7.46 | 103.4 | 9.14 | 95.9 | 9.84 | |
| 6/7/2016 | 21* | 14.7 | 7.4 | 103.2 | 9.16 | 96 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 6/7/2016 | 24 | 14.52 | 7.35 | 103.3 | 8.91 | 93 | | |
| 6/7/2016 | 27 | 14.43 | 7.31 | 103.5 | 8.76 | 91.3 | | |
| 6/7/2016 | 30 | 14.3 | 7.26 | 105 | 8.39 | 87.2 | | |
| 6/7/2016 | 33 | 14.14 | 7.16 | 107.8 | 7.17 | 74.2 | | |
| 6/21/2016 | 0.5 | 19.31 | 7.82 | 131 | 9.11 | 103.9 | | 8.9 |
| 6/21/2016 | 1 | 19.35 | 7.78 | 131.1 | 9.05 | 102.3 | | |
| 6/21/2016 | 2 | 19.01 | 7.82 | 130.2 | 9.14 | 103.8 | | |
| 6/21/2016 | 3 | 18.84 | 7.76 | 130.1 | 9.17 | 103.6 | | |
| 6/21/2016 | 4 | 18.7 | 7.8 | 132.4 | 9.09 | 102.4 | | |
| 6/21/2016 | 4* | 18.7 | 7.78 | 132.4 | 9.08 | 102.3 | | |
| 6/21/2016 | 5 | 18.39 | 7.74 | 131.8 | 9.11 | 101.9 | 8.41 | |
| 6/21/2016 | 6 | 18.22 | 7.77 | 131.4 | 9.13 | 101.9 | | |
| 6/21/2016 | 7 | 18.13 | 7.75 | 131.4 | 9.07 | 100.9 | | |
| 6/21/2016 | 8 | 18.03 | 7.7 | 131.9 | 8.97 | 99.7 | | |
| 6/21/2016 | 9 | 17.88 | 7.67 | 135.2 | 8.81 | 97.6 | | |
| 6/21/2016 | 10 | 17.73 | 7.61 | 139.4 | 8.67 | 95.8 | | |
| 6/21/2016 | 12 | 17.12 | 7.51 | 145.7 | 8.27 | 90.2 | | |
| 6/21/2016 | 15 | 16.57 | 7.43 | 153.4 | 8.18 | 88.1 | | |
| 6/21/2016 | 18 | 15.94 | 7.42 | 166.3 | 8.2 | 87.2 | | |
| 6/21/2016 | 21 | 15.83 | 7.49 | 171.2 | 8.25 | 87.6 | 8.65 | |
| 6/21/2016 | 21* | 15.84 | 7.52 | 172.5 | 8.35 | 88.7 | | |
| 6/21/2016 | 24 | 15.71 | 7.51 | 171 | 8.37 | 88.6 | | |
| 6/21/2016 | 27 | 15.65 | 7.47 | 167.7 | 8.14 | 86 | | |
| 6/21/2016 | 30 | 14.98 | 7.18 | 122.5 | 6.61 | 68.9 | | |
| 6/21/2016 | 33 | 14.62 | 7.04 | 113.3 | 6.01 | 62.1 | | |
| 7/5/2016 | 0.5 | 20.59 | 8.01 | 155.5 | 8.94 | 104.9 | | 9.2 |
| 7/5/2016 | 1 | 20.54 | 7.99 | 155 | 8.92 | 104.6 | | |
| 7/5/2016 | 2 | 20.53 | 7.98 | 155.3 | 8.94 | 104.7 | | |
| 7/5/2016 | 3 | 20.43 | 7.96 | 155.4 | 8.93 | 104.4 | | |
| 7/5/2016 | 4 | 20.35 | 7.95 | 154.1 | 8.89 | 103.8 | | |
| 7/5/2016 | 4* | 20.37 | 7.95 | 154 | 8.91 | 104.1 | | |
| 7/5/2016 | 5 | 20.31 | 7.95 | 153.6 | 8.91 | 103.9 | 9.02 | |
| 7/5/2016 | 6 | 20.2 | 7.96 | 153.8 | 8.96 | 104.3 | | |
| 7/5/2016 | 7 | 20.15 | 7.94 | 156.5 | 8.94 | 104 | | |
| 7/5/2016 | 8 | 19.77 | 7.89 | 176.7 | 8.91 | 102.9 | | |
| 7/5/2016 | 9 | 18.89 | 7.83 | 187.7 | 8.82 | 100 | | |
| 7/5/2016 | 10 | 18.16 | 7.76 | 182.8 | 8.72 | 97.4 | | |
| 7/5/2016 | 12 | 17.64 | 7.69 | 185.8 | 8.59 | 95 | | |
| 7/5/2016 | 15 | 17.08 | 7.63 | 178.3 | 8.38 | 91.5 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 7/5/2016 | 18 | 16.68 | 7.56 | 177.5 | 8.17 | 88.5 | | |
| 7/5/2016 | 21 | 16.22 | 7.49 | 180.7 | 7.71 | 82.7 | 8.54 | |
| 7/5/2016 | 21* | 16.21 | 7.47 | 180.1 | 7.71 | 82.7 | | |
| 7/5/2016 | 24 | 16.02 | 7.4 | 179.4 | 7.27 | 77.7 | | |
| 7/5/2016 | 27 | 15.5 | 7.24 | 161.8 | 6 | 63.4 | | |
| 7/5/2016 | 30 | 15.22 | 7.13 | 148 | 4.84 | 50.8 | | |
| 7/5/2016 | 33 | 14.92 | 7.05 | 138.9 | 3.75 | 39.1 | | |
| 7/19/2016 | 0.5 | 22 | 8.31 | 164.8 | 9.56 | 115.1 | | 7.0 |
| 7/19/2016 | 1 | 21.78 | 8.31 | 164.8 | 9.6 | 115.1 | | |
| 7/19/2016 | 2 | 21.68 | 8.3 | 164.6 | 9.58 | 114.7 | | |
| 7/19/2016 | 3 | 21.62 | 8.3 | 164.8 | 9.59 | 114.7 | | |
| 7/19/2016 | 4 | 21.58 | 8.3 | 165.5 | 9.55 | 114.1 | | |
| 7/19/2016 | 4* | 21.6 | 8.3 | 165.4 | 9.58 | 114.5 | | |
| 7/19/2016 | 5 | 21.49 | 8.28 | 165.9 | 9.57 | 114.1 | 10.4 | |
| 7/19/2016 | 6 | 20.84 | 8.17 | 172.1 | 9.44 | 111.2 | | |
| 7/19/2016 | 7 | 19.07 | 7.82 | 196.3 | 8.3 | 94.3 | | |
| 7/19/2016 | 8 | 18.56 | 7.73 | 199.9 | 8.08 | 90.9 | | |
| 7/19/2016 | 9 | 18.23 | 7.67 | 205.2 | 7.95 | 88.8 | | |
| 7/19/2016 | 10 | 17.85 | 7.62 | 206.3 | 7.67 | 85 | | |
| 7/19/2016 | 12 | 17.4 | 7.57 | 208.8 | 7.46 | 82 | | |
| 7/19/2016 | 15 | 16.84 | 7.57 | 224.3 | 7.59 | 82.4 | | |
| 7/19/2016 | 18 | 16.68 | 7.54 | 225.2 | 7.42 | 80.2 | | |
| 7/19/2016 | 21 | 16.49 | 7.47 | 223 | 7.02 | 75.6 | | |
| 7/19/2016 | 21* | 16.5 | 7.45 | 223.1 | 7.04 | 75.9 | | |
| 7/19/2016 | 24 | 16.28 | 7.35 | 210.2 | 6.24 | 66.9 | | |
| 7/19/2016 | 27 | 15.63 | 7.17 | 169.8 | 4.41 | 46.6 | 4.08 | |
| 7/19/2016 | 30 | 15.1 | 7.02 | 148.9 | 2.36 | 24.7 | | |
| 7/19/2016 | 33 | 14.98 | 6.92 | 143.1 | 1.76 | 18.4 | | |
| 8/10/2016 | 0.5 | 22.43 | 8.99 | 183.4 | 11.34 | 138.1 | | 3.4 |
| 8/10/2016 | 1 | 22.33 | 9 | 183.2 | 11.4 | 138.5 | | |
| 8/10/2016 | 2 | 22.24 | 8.98 | 183.2 | 11.4 | 138.3 | | |
| 8/10/2016 | 3 | 22.21 | 8.99 | 183.4 | 11.39 | 138.1 | | |
| 8/10/2016 | 4 | 22.2 | 8.99 | 183.4 | 11.41 | 138.3 | | |
| 8/10/2016 | 4* | 22.18 | 8.99 | 183.3 | 11.41 | 138.3 | | |
| 8/10/2016 | 5 | 22.09 | 8.99 | 183.7 | 11.38 | 137.7 | 12.9 | |
| 8/10/2016 | 6 | 21.83 | 8.85 | 190.5 | 10.93 | 131.6 | | |
| 8/10/2016 | 7 | 20.35 | 8.25 | 221.5 | 9.06 | 106 | | |
| 8/10/2016 | 8 | 19.3 | 7.92 | 231.8 | 7.9 | 90.5 | | |
| 8/10/2016 | 9 | 18.71 | 7.79 | 245.5 | 7.45 | 84.3 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 8/10/2016 | 10 | 18.4 | 7.69 | 247.8 | 7.13 | 80.2 | | |
| 8/10/2016 | 12 | 17.9 | 7.6 | 253 | 6.73 | 74.9 | | |
| 8/10/2016 | 15 | 17.43 | 7.49 | 248.9 | 6.17 | 68 | | |
| 8/10/2016 | 18 | 17.06 | 7.41 | 249.4 | 5.18 | 56.7 | | |
| 8/10/2016 | 21 | 16.84 | 7.34 | 241.6 | 4.75 | 51.8 | 5.18 | |
| 8/10/2016 | 21* | 16.84 | 7.3 | 241.2 | 4.7 | 51.2 | | |
| 8/10/2016 | 24 | 16.57 | 7.28 | 227.5 | 4.61 | 49.9 | | |
| 8/10/2016 | 27 | 16.21 | 7.23 | 211.7 | 3.86 | 41.5 | | |
| 8/10/2016 | 30 | 15.67 | 7.15 | 186.1 | 2.3 | 24.5 | | |
| 8/10/2016 | 33 | 15.08 | 7.07 | 161.9 | 0 | 0 | | |
| 8/24/2016 | 0.5 | 21.96 | 8.82 | 204.5 | 9.93 | 118.9 | | 4.0 |
| 8/24/2016 | 1 | 21.92 | 8.81 | 204.5 | 9.96 | 119.1 | | |
| 8/24/2016 | 2 | 21.86 | 8.8 | 204.1 | 9.92 | 118.5 | | |
| 8/24/2016 | 3 | 21.68 | 8.75 | 207.7 | 9.79 | 116.6 | | |
| 8/24/2016 | 4 | 21.62 | 8.76 | 207.4 | 9.86 | 117.2 | | |
| 8/24/2016 | 4* | 21.6 | 8.77 | 207 | 9.81 | 116.8 | | |
| 8/24/2016 | 5 | 21.54 | 8.79 | 205.6 | 9.81 | 116.5 | 10.1 | |
| 8/24/2016 | 6 | 21.49 | 8.74 | 207.1 | 9.71 | 115.1 | | |
| 8/24/2016 | 7 | 21.35 | 8.64 | 213.1 | 9.2 | 108.8 | | |
| 8/24/2016 | 8 | 19.98 | 8.06 | 240.1 | 7.93 | 91.3 | | |
| 8/24/2016 | 9 | 19.01 | 7.69 | 239.7 | 7.12 | 80.4 | | |
| 8/24/2016 | 10 | 18.55 | 7.67 | 257.1 | 6.94 | 77.7 | | |
| 8/24/2016 | 12 | 17.92 | 7.58 | 265.9 | 6.75 | 74.5 | | |
| 8/24/2016 | 15 | 17.44 | 7.55 | 268.6 | 6.71 | 73.4 | | |
| 8/24/2016 | 18 | 17.14 | 7.5 | 269.5 | 6.54 | 71 | | |
| 8/24/2016 | 21 | 16.81 | 7.41 | 267.4 | 5.9 | 63.6 | 6.77 | |
| 8/24/2016 | 21* | 16.83 | 7.41 | 267.5 | 5.95 | 64.2 | | |
| 8/24/2016 | 24 | 16.58 | 7.33 | 261.3 | 5.3 | 56.9 | | |
| 8/24/2016 | 27 | 16.18 | 7.26 | 248 | 4.39 | 46.7 | | |
| 8/24/2016 | 30 | 15.83 | 7.12 | 228.5 | 2.6 | 27.5 | | |
| 8/24/2016 | 33 | 15.36 | 7.03 | 195.8 | 0.48 | 5 | | |
| 9/6/2016 | 0.5 | 19.86 | 8.72 | 226 | 9.76 | 113.2 | | 4.0 |
| 9/6/2016 | 1 | 19.86 | 8.73 | 225.8 | 9.73 | 112.8 | | |
| 9/6/2016 | 2 | 19.87 | 8.73 | 225.7 | 9.75 | 13.1 | | |
| 9/6/2016 | 3 | 19.86 | 8.74 | 226.1 | 9.74 | 113 | | |
| 9/6/2016 | 4 | 19.87 | 8.74 | 225.7 | 9.72 | 112.7 | | |
| 9/6/2016 | 4* | 19.86 | 8.74 | 225.7 | 9.76 | 113.3 | | |
| 9/6/2016 | 5 | 19.86 | 8.74 | 226.7 | 9.74 | 112.9 | 10 | |
| 9/6/2016 | 6 | 19.85 | 8.74 | 225.2 | 9.71 | 112.6 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 9/6/2016 | 7 | 19.81 | 8.75 | 224.8 | 9.72 | 112.6 | | |
| 9/6/2016 | 8 | 18.83 | 7.9 | 267.3 | 7.07 | 80.3 | | |
| 9/6/2016 | 9 | 17.94 | 7.7 | 275.8 | 6.45 | 72 | | |
| 9/6/2016 | 10 | 17.6 | 7.64 | 277.9 | 6.32 | 70 | | |
| 9/6/2016 | 12 | 17.3 | 7.6 | 279.4 | 6.21 | 68.4 | | |
| 9/6/2016 | 15 | 17.01 | 7.61 | 280.9 | 6.47 | 70.8 | | |
| 9/6/2016 | 18 | 16.85 | 7.69 | 282.9 | 7.27 | 79.3 | | |
| 9/6/2016 | 21 | 16.66 | 7.69 | 282.8 | 7.09 | 77 | 7.74 | |
| 9/6/2016 | 21* | 16.66 | 7.68 | 282.7 | 7.08 | 76.9 | | |
| 9/6/2016 | 24 | 16.5 | 7.7 | 284.6 | 7.22 | 78.2 | | |
| 9/6/2016 | 27 | 16.36 | 7.5 | 273.4 | 5.45 | 58.8 | | |
| 9/6/2016 | 30 | 16.11 | 7.3 | 250.2 | 2.78 | 29.9 | | |
| 9/6/2016 | 33 | 15.32 | 7.22 | 195.9 | 0 | 0 | | |
| 9/19/2016 | 0.5 | 17.95 | 8.47 | 241.7 | 9.13 | 101.3 | | 4.9 |
| 9/19/2016 | 1 | 17.91 | 8.47 | 241.8 | 9.16 | 101.5 | | |
| 9/19/2016 | 2 | 17.89 | 8.46 | 241.5 | 9.13 | 101.2 | | |
| 9/19/2016 | 3 | 17.84 | 8.46 | 241.7 | 9.15 | 101.2 | | |
| 9/19/2016 | 4 | 17.81 | 8.46 | 241.6 | 9.13 | 101 | | |
| 9/19/2016 | 4* | 17.81 | 8.45 | 241.7 | 9.16 | 101.3 | | |
| 9/19/2016 | 5 | 17.79 | 8.44 | 241.6 | 9.12 | 100.9 | 9.48 | |
| 9/19/2016 | 6 | 17.79 | 8.43 | 241.6 | 9.1 | 100.7 | | |
| 9/19/2016 | 7 | 17.78 | 8.42 | 241.8 | 9.03 | 99.9 | | |
| 9/19/2016 | 8 | 17.73 | 8.42 | 242.4 | 8.95 | 98.9 | | |
| 9/19/2016 | 9 | 17.7 | 8.43 | 241 | 9.09 | 100.4 | | |
| 9/19/2016 | 10 | 17.65 | 8.4 | 242.7 | 8.91 | 98.3 | | |
| 9/19/2016 | 12 | 17 | 7.79 | 266.5 | 6.75 | 73.3 | | |
| 9/19/2016 | 15 | 16.21 | 7.72 | 275.3 | 7.07 | 75.6 | | |
| 9/19/2016 | 18 | 15.79 | 7.73 | 275.4 | 7.4 | 78.5 | | |
| 9/19/2016 | 21 | 15.42 | 7.73 | 275.9 | 7.66 | 80.6 | 7.56 | |
| 9/19/2016 | 21* | 15.43 | 7.74 | 275.6 | 7.65 | 80.5 | | |
| 9/19/2016 | 24 | 15.16 | 7.84 | 266.9 | 8.46 | 88.5 | | |
| 9/19/2016 | 27 | 14.84 | 7.93 | 261.4 | 8.92 | 92.7 | | |
| 9/19/2016 | 30 | 14.71 | 7.91 | 260.7 | 8.87 | 91.9 | | |
| 9/19/2016 | 33 | 14.65 | 7.89 | 260.7 | 8.87 | 91.8 | | |
| 10/12/2016 | 0.5 | 15 | 8.09 | 244.9 | 8.98 | 93.1 | | 7.9 |
| 10/12/2016 | 1 | 14.98 | 8.09 | 244.7 | 8.97 | 93 | | |
| 10/12/2016 | 2 | 14.96 | 8.11 | 244.6 | 9.03 | 93.5 | | |
| 10/12/2016 | 3 | 14.96 | 8.11 | 244.5 | 9.03 | 93.5 | | |
| 10/12/2016 | 4 | 14.94 | 8.11 | 244.7 | 9.03 | 93.5 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 10/12/2016 | 4* | 14.94 | 8.11 | 244.5 | 9.03 | 93.5 | | |
| 10/12/2016 | 5 | 14.94 | 8.11 | 244.5 | 9.01 | 93.3 | 10 | |
| 10/12/2016 | 6 | 14.93 | 8.11 | 244.6 | 9.03 | 93.3 | | |
| 10/12/2016 | 7 | 14.92 | 8.1 | 244.7 | 9.02 | 93.4 | | |
| 10/12/2016 | 8 | 14.91 | 8.09 | 244.7 | 8.99 | 93 | | |
| 10/12/2016 | 9 | 14.91 | 8.09 | 244.7 | 8.95 | 92.7 | | |
| 10/12/2016 | 10 | 14.89 | 8.07 | 244.5 | 8.86 | 91.7 | | |
| 10/12/2016 | 12 | 14.79 | 7.92 | 242.4 | 8.45 | 87.2 | | |
| 10/12/2016 | 15 | 14.48 | 7.72 | 241.4 | 7.67 | 78.5 | | |
| 10/12/2016 | 18 | 14.17 | 7.83 | 237.3 | 8.52 | 86.7 | | |
| 10/12/2016 | 21 | 13.69 | 7.88 | 231 | 8.91 | 897 | 9.73 | |
| 10/12/2016 | 21* | 13.69 | 7.88 | 231.1 | 8.94 | 90 | | |
| 10/12/2016 | 24 | 13.16 | 7.82 | 228.5 | 9 | 89.6 | | |
| 10/12/2016 | 27 | 12.97 | 7.79 | 230.5 | 8.82 | 87.5 | | |
| 10/12/2016 | 30 | 12.96 | 7.75 | 231 | 8.71 | 86.4 | | |
| 10/12/2016 | 31 | 12.95 | 7.75 | 230.7 | 8.73 | 86.5 | | |

*QA/QC measurement for Hydrolab
**Secchi disk depths average of 3 measurements

## Table A-3. Station LL2 *In Situ* Water Quality Data, 2016

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 5/17/2016 | 0.5 | 17.59 | 8.41 | 100.2 | 11.27 | 123.6 | | 2.2 |
| 5/17/2016 | 1 | 17.44 | 8.42 | 100.6 | 11.34 | 123.9 | | |
| 5/17/2016 | 2 | 16.8 | 8.45 | 100.6 | 11.58 | 124.9 | | |
| 5/17/2016 | 3 | 16.25 | 8.51 | 98.7 | 12.01 | 128 | | |
| 5/17/2016 | 4 | 15.71 | 8.29 | 97.9 | 11.72 | 123.4 | | |
| 5/17/2016 | 5 | 15.52 | 8.12 | 98.5 | 11.31 | 118.7 | 11.3 | |
| 5/17/2016 | 5* | 15.45 | 8.1 | 98.9 | 11.33 | 118.7 | | |
| 5/17/2016 | 6 | 15.36 | 8.01 | 99.7 | 11.12 | 116.3 | | |
| 5/17/2016 | 7 | 15.33 | 8.03 | 99.5 | 11.2 | 117 | | |
| 5/17/2016 | 8 | 15.19 | 7.85 | 101.7 | 10.77 | 112.2 | | |
| 5/17/2016 | 9 | 15.11 | 7.75 | 103.9 | 10.53 | 109.5 | | |
| 5/17/2016 | 10 | 14.99 | 7.62 | 106.4 | 10.32 | 107.1 | | |
| 5/17/2016 | 12 | 14.53 | 7.46 | 111.9 | 9.78 | 100.5 | | |
| 5/17/2016 | 15 | 14.44 | 7.38 | 109.8 | 9.57 | 98.1 | 9.94 | |
| 5/17/2016 | 18 | 14.07 | 7.35 | 113.3 | 9.62 | 97.8 | | |
| 5/17/2016 | 21 | 14.04 | 7.41 | 116.1 | 9.8 | 99.6 | | |
| 5/17/2016 | 24 | 13.79 | 7.43 | 117.5 | 9.91 | 100.2 | | |
| 5/17/2016 | 24* | 13.79 | 7.43 | 117.2 | 9.87 | 99.7 | | |
| 5/17/2016 | 25 | 13.78 | 7.45 | 116.9 | 9.9 | 100 | | |
| 6/7/2016 | 0.5 | 22.66 | 7.91 | 110.9 | 9.18 | 113.2 | | 4.9 |
| 6/7/2016 | 1 | 22.4 | 7.88 | 111.8 | 9.32 | 114.4 | | |
| 6/7/2016 | 2 | 21.4 | 7.93 | 112.9 | 9.73 | 117.2 | | |
| 6/7/2016 | 3 | 19.75 | 8.17 | 119 | 10.8 | 125.8 | | |
| 6/7/2016 | 4 | 18.29 | 8.28 | 122.2 | 11.15 | 126.1 | | |
| 6/7/2016 | 5 | 17.93 | 8.25 | 122.3 | 11.12 | 124.9 | 12.1 | |
| 6/7/2016 | 5* | 17.92 | 8.24 | 122.6 | 11.12 | 124.9 | | |
| 6/7/2016 | 6 | 17.65 | 8.16 | 122.5 | 10.77 | 120.2 | | |
| 6/7/2016 | 7 | 17.48 | 8.16 | 121.6 | 10.83 | 120.6 | | |
| 6/7/2016 | 8 | 17.4 | 8.1 | 122.8 | 10.62 | 118 | | |
| 6/7/2016 | 9 | 17.28 | 8.03 | 123.3 | 10.48 | 116 | | |
| 6/7/2016 | 10 | 16.87 | 7.96 | 122.8 | 10.4 | 114.2 | | |
| 6/7/2016 | 12 | 16.22 | 7.72 | 123 | 9.6 | 104 | | |
| 6/7/2016 | 15 | 15.65 | 7.6 | 120.4 | 9.33 | 99.9 | 9.88 | |
| 6/7/2016 | 18 | 14.92 | 7.44 | 110.7 | 9.17 | 96.6 | | |
| 6/7/2016 | 21 | 14.67 | 7.39 | 106.9 | 8.94 | 93.7 | | |
| 6/7/2016 | 24 | 14.43 | 7.31 | 106.2 | 8.22 | 85.7 | | |
| 6/7/2016 | 24* | 14.42 | 7.27 | 106.2 | 8.22 | 85.7 | | |
| 6/7/2016 | 25 | 14.4 | 7.23 | 106.3 | 8.03 | 83.7 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 6/21/2016 | 0.5 | 19.22 | 7.91 | 136.2 | 9.04 | 102.9 | | 7.8 |
| 6/21/2016 | 1 | 19.16 | 7.89 | 136.7 | 9.03 | 102.7 | | |
| 6/21/2016 | 2 | 19.09 | 7.87 | 136.3 | 9.05 | 102.7 | | |
| 6/21/2016 | 3 | 18.83 | 7.84 | 137 | 9.1 | 101.8 | | |
| 6/21/2016 | 4 | 18.8 | 7.84 | 136.8 | 8.96 | 101.1 | | |
| 6/21/2016 | 5 | 18.73 | 7.8 | 137.2 | 8.91 | 100.5 | 9.75 | |
| 6/21/2016 | 5* | 18.79 | 7.81 | 137.2 | 8.92 | 100.7 | | |
| 6/21/2016 | 6 | 18.42 | 7.72 | 139.4 | 8.73 | 97.7 | | |
| 6/21/2016 | 7 | 18.18 | 7.72 | 139.3 | 8.75 | 97.5 | | |
| 6/21/2016 | 8 | 18.09 | 7.7 | 138.7 | 8.71 | 96.9 | | |
| 6/21/2016 | 9 | 18.03 | 7.69 | 139.7 | 8.7 | 96.7 | | |
| 6/21/2016 | 10 | 17.75 | 7.71 | 147.9 | 8.79 | 97.1 | | |
| 6/21/2016 | 12 | 16.98 | 7.79 | 171.1 | 9.12 | 99.1 | | |
| 6/21/2016 | 15 | 16.1 | 7.82 | 187.6 | 9.3 | 99.3 | 9.88 | |
| 6/21/2016 | 18 | 15.92 | 7.81 | 190.7 | 9.28 | 98.7 | | |
| 6/21/2016 | 21 | 15.83 | 7.76 | 193 | 9.13 | 96.9 | | |
| 6/21/2016 | 24 | 15.74 | 7.71 | 193.9 | 8.94 | 94.7 | | |
| 6/21/2016 | 24* | 15.75 | 7.71 | 193.9 | 8.95 | 94.8 | | |
| 6/21/2016 | 25 | 15.71 | 7.67 | 194.1 | 8.78 | 92.9 | | |
| 7/5/2016 | 0.5 | 21.6 | 8.07 | 155 | 9.05 | 108.3 | | 6.5 |
| 7/5/2016 | 1 | 21.48 | 8.03 | 155.1 | 9.08 | 108.5 | | |
| 7/5/2016 | 2 | 21.3 | 8.01 | 156.5 | 9.03 | 107.4 | | |
| 7/5/2016 | 3 | 21.19 | 7.98 | 156.7 | 8.99 | 106.8 | | |
| 7/5/2016 | 4 | 21.17 | 7.95 | 157.3 | 8.98 | 106.6 | | |
| 7/5/2016 | 5 | 21.12 | 7.99 | 156.2 | 9 | 106.7 | 9.53 | |
| 7/5/2016 | 5* | 21.12 | 7.98 | 156.5 | 8.99 | 106.6 | | |
| 7/5/2016 | 6 | 21.1 | 7.98 | 156.5 | 9.01 | 106.8 | | |
| 7/5/2016 | 7 | 21.05 | 7.96 | 157.7 | 8.94 | 105.8 | | |
| 7/5/2016 | 8 | 20.97 | 7.95 | 160.3 | 8.89 | 105.1 | | |
| 7/5/2016 | 9 | 19.34 | 7.89 | 198.5 | 9.03 | 103.4 | | |
| 7/5/2016 | 10 | 18.85 | 7.87 | 204.5 | 8.86 | 100.4 | | |
| 7/5/2016 | 12 | 18.14 | 7.76 | 207.1 | 8.55 | 95.5 | | |
| 7/5/2016 | 15 | 16.88 | 7.64 | 199.4 | 8.36 | 91 | 8.5 | |
| 7/5/2016 | 18 | 16.37 | 7.54 | 192.3 | 7.84 | 84.4 | | |
| 7/5/2016 | 21 | 16.02 | 7.4 | 187.4 | 7.03 | 75.2 | | |
| 7/5/2016 | 24 | 15.82 | 7.3 | 182.8 | 6.25 | 66.5 | | |
| 7/5/2016 | 24* | 15.82 | 7.27 | 182.8 | 6.27 | 66.7 | | |
| 7/5/2016 | 25 | 15.79 | 7.25 | 182.3 | 6.08 | 64.6 | | |
| 7/19/2016 | 0.5 | 21.95 | 8.33 | 166.4 | 9.6 | 115.5 | | 7.0 |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 7/19/2016 | 1 | 21.8 | 8.31 | 166.2 | 9.58 | 114.8 | | |
| 7/19/2016 | 2 | 21.67 | 8.31 | 166.9 | 9.58 | 114.7 | | |
| 7/19/2016 | 3 | 21.49 | 8.3 | 166.8 | 9.53 | 113.6 | | |
| 7/19/2016 | 4 | 21.37 | 8.26 | 167.6 | 9.4 | 111.9 | | |
| 7/19/2016 | 5 | 21.36 | 8.26 | 167.3 | 9.42 | 112 | 10.4 | |
| 7/19/2016 | 5* | 21.34 | 8.22 | 167.2 | 9.39 | 111.6 | | |
| 7/19/2016 | 6 | 21.28 | 8.21 | 169.8 | 9.3 | 112.4 | | |
| 7/19/2016 | 7 | 20.71 | 8.11 | 179.4 | 9.19 | 107.2 | | |
| 7/19/2016 | 8 | 19.2 | 7.92 | 199.4 | 8.73 | 99.5 | | |
| 7/19/2016 | 9 | 18.37 | 7.82 | 207.9 | 8.46 | 94.8 | | |
| 7/19/2016 | 10 | 18.02 | 7.78 | 210.5 | 8.43 | 93.8 | | |
| 7/19/2016 | 12 | 17.77 | 7.75 | 213.6 | 8.41 | 93.1 | | |
| 7/19/2016 | 15 | 17.22 | 7.72 | 219.8 | 8.38 | 91.7 | 9.04 | |
| 7/19/2016 | 18 | 16.86 | 7.65 | 225.3 | 8.1 | 88 | | |
| 7/19/2016 | 21 | 16.57 | 7.62 | 231 | 7.78 | 84.1 | | |
| 7/19/2016 | 24 | 16.55 | 7.58 | 231.2 | 7.61 | 82.2 | | |
| 7/19/2016 | 24* | 16.53 | 7.57 | 231.3 | 7.6 | 82 | | |
| 7/19/2016 | 25 | 16.45 | 7.53 | 232.3 | 7.3 | 78.6 | | |
| 8/10/2016 | 0.5 | 22.75 | 8.93 | 184 | 11.44 | 140.2 | | 3.1 |
| 8/10/2016 | 1 | 22.71 | 8.94 | 183.8 | 11.43 | 140 | | |
| 8/10/2016 | 2 | 22.49 | 8.95 | 183.2 | 11.62 | 141.7 | | |
| 8/10/2016 | 3 | 22.41 | 8.95 | 183.4 | 11.66 | 142 | | |
| 8/10/2016 | 4 | 22.36 | 8.95 | 183.3 | 11.68 | 142.1 | | |
| 8/10/2016 | 5 | 22.3 | 8.94 | 183.5 | 11.54 | 140 | 12.2 | |
| 8/10/2016 | 5* | 22.29 | 8.95 | 183 | 11.5 | 139.7 | | |
| 8/10/2016 | 6 | 21.08 | 8.27 | 222.9 | 9.27 | 110 | | |
| 8/10/2016 | 7 | 19.58 | 7.88 | 250.9 | 7.92 | 91.2 | | |
| 8/10/2016 | 8 | 18.93 | 7.75 | 259.6 | 7.39 | 84 | | |
| 8/10/2016 | 9 | 18.46 | 7.71 | 265 | 7.32 | 82.4 | | |
| 8/10/2016 | 10 | 18.05 | 7.63 | 264.7 | 6.92 | 77.3 | | |
| 8/10/2016 | 12 | 17.75 | 7.6 | 263.6 | 7.05 | 78.2 | | |
| 8/10/2016 | 15 | 17.47 | 7.77 | 269.4 | 8.03 | 88.6 | 8.41 | |
| 8/10/2016 | 18 | 17.17 | 7.82 | 272.3 | 8.42 | 92.3 | | |
| 8/10/2016 | 21 | 16.97 | 7.67 | 269.5 | 7.48 | 81.7 | | |
| 8/10/2016 | 24 | 16.48 | 7.26 | 236.8 | 3.08 | 33.3 | | |
| 8/10/2016 | 24* | 16.48 | 7.21 | 236.2 | 3 | 32.4 | | |
| 8/10/2016 | 25 | 16.22 | 7.13 | 220.3 | 2.16 | 23.2 | | |
| 8/24/2016 | 0.5 | 21.98 | 8.79 | 210.9 | 9.7 | 116.1 | | 4.0 |
| 8/24/2016 | 1 | 21.99 | 8.78 | 210.5 | 9.69 | 116.1 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 8/24/2016 | 2 | 21.95 | 8.77 | 210.8 | 9.71 | 116.2 | | |
| 8/24/2016 | 3 | 21.92 | 8.77 | 211.3 | 9.74 | 116.5 | | |
| 8/24/2016 | 4 | 21.76 | 8.76 | 211.4 | 9.75 | 116.2 | | |
| 8/24/2016 | 5 | 21.62 | 8.73 | 212.7 | 9.66 | 114.9 | 10.5 | |
| 8/24/2016 | 5* | 21.65 | 8.72 | 211.9 | 9.69 | 115.3 | | |
| 8/24/2016 | 6 | 21.44 | 8.66 | 216.1 | 9.33 | 110.5 | | |
| 8/24/2016 | 7 | 20.65 | 8.32 | 236.8 | 8.62 | 100.6 | | |
| 8/24/2016 | 8 | 19.37 | 8.01 | 258.1 | 8.11 | 92.1 | | |
| 8/24/2016 | 9 | 18.19 | 7.86 | 274.8 | 7.78 | 86.4 | | |
| 8/24/2016 | 10 | 17.99 | 7.8 | 276.2 | 7.71 | 85.2 | | |
| 8/24/2016 | 12 | 17.62 | 7.71 | 279 | 7.44 | 81.7 | | |
| 8/24/2016 | 15 | 17.28 | 7.66 | 276.8 | 7.14 | 77.8 | 7.98 | |
| 8/24/2016 | 18 | 16.96 | 7.57 | 274.5 | 6.65 | 72 | | |
| 8/24/2016 | 21 | 16.75 | 7.52 | 273.2 | 6.37 | 68.7 | | |
| 8/24/2016 | 24 | 16.54 | 7.46 | 273.1 | 5.86 | 62.9 | | |
| 8/24/2016 | 24* | 16.53 | 7.45 | 273.4 | 5.87 | 63 | | |
| 8/24/2016 | 25 | 16.48 | 7.42 | 272.5 | 5.7 | 61.1 | | |
| 9/6/2016 | 0.5 | 20.19 | 8.71 | 225 | 9.65 | 112.7 | | 3.8 |
| 9/6/2016 | 1 | 20.16 | 8.72 | 224.8 | 9.65 | 112.6 | | |
| 9/6/2016 | 2 | 20.19 | 8.73 | 224.6 | 9.6 | 112 | | |
| 9/6/2016 | 3 | 20.2 | 8.73 | 224.9 | 9.64 | 112.6 | | |
| 9/6/2016 | 4 | 20.19 | 8.73 | 224.6 | 9.64 | 112.6 | | |
| 9/6/2016 | 5 | 20.18 | 8.73 | 224.9 | 9.63 | 112.4 | 10.3 | |
| 9/6/2016 | 5* | 20.2 | 8.73 | 224.6 | 9.62 | 112.3 | | |
| 9/6/2016 | 6 | 20.19 | 8.72 | 224.9 | 9.64 | 112.6 | | |
| 9/6/2016 | 7 | 20.18 | 8.72 | 224.7 | 9.63 | 112.4 | | |
| 9/6/2016 | 8 | 19.21 | 8.12 | 252.3 | 7.54 | 86.3 | | |
| 9/6/2016 | 9 | 18.39 | 7.91 | 268.9 | 7.18 | 80.8 | | |
| 9/6/2016 | 10 | 17.83 | 7.77 | 277.9 | 6.9 | 76.8 | | |
| 9/6/2016 | 12 | 17.57 | 7.7 | 278.8 | 6.85 | 75.8 | | |
| 9/6/2016 | 15 | 16.96 | 7.85 | 281.7 | 7.9 | 86.4 | 8.36 | |
| 9/6/2016 | 18 | 16.48 | 7.92 | 285.1 | 8.32 | 90 | | |
| 9/6/2016 | 21 | 16.15 | 7.98 | 286.3 | 8.59 | 92.3 | | |
| 9/6/2016 | 24 | 16.02 | 7.99 | 286.7 | 8.65 | 92.7 | | |
| 9/6/2016 | 24* | 16 | 7.99 | 286.6 | 8.65 | 92.6 | | |
| 9/6/2016 | 25 | 15.98 | 7.98 | 286.8 | 8.57 | 91.7 | | |
| 9/19/2016 | 0.5 | 17.95 | 8.34 | 244.6 | 8.83 | 97.9 | | 4.733333333 |
| 9/19/2016 | 1 | 17.96 | 8.35 | 244.9 | 8.84 | 98.1 | | |
| 9/19/2016 | 2 | 17.91 | 8.34 | 244.8 | 8.82 | 97.8 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 9/19/2016 | 3 | 17.87 | 8.34 | 244.4 | 8.77 | 97.1 | | |
| 9/19/2016 | 4 | 17.86 | 8.33 | 244.6 | 8.71 | 96.5 | | |
| 9/19/2016 | 5 | 17.86 | 8.32 | 245 | 8.67 | 96 | 9.23 | |
| 9/19/2016 | 5* | 17.85 | 8.32 | 245 | 8.69 | 96.3 | | |
| 9/19/2016 | 6 | 17.85 | 8.32 | 244.7 | 8.69 | 96.2 | | |
| 9/19/2016 | 7 | 17.84 | 8.32 | 244.6 | 8.72 | 96.6 | | |
| 9/19/2016 | 8 | 17.83 | 8.33 | 244.6 | 8.77 | 97.1 | | |
| 9/19/2016 | 9 | 17.83 | 8.33 | 244.5 | 8.77 | 97 | | |
| 9/19/2016 | 10 | 17.82 | 8.34 | 244.3 | 8.76 | 96.9 | | |
| 9/19/2016 | 12 | 17.72 | 8.23 | 247.1 | 8.36 | 92.3 | | |
| 9/19/2016 | 15 | 16.25 | 8.13 | 250.5 | 8.71 | 93.3 | 9.42 | |
| 9/19/2016 | 18 | 15.12 | 8.09 | 255.8 | 9.37 | 98 | | |
| 9/19/2016 | 21 | 14.61 | 8.04 | 258.5 | 9.53 | 98.5 | | |
| 9/19/2016 | 24 | 14.59 | 8.03 | 258.9 | 9.5 | 98.2 | | |
| 9/19/2016 | 24* | 14.59 | 8.03 | 258.9 | 9.53 | 98.5 | | |
| 9/19/2016 | 25 | 14.59 | 8.03 | 258.9 | 9.5 | 98.2 | | |
| 10/12/2016 | 0.5 | 15.2 | 8.16 | 237.6 | 9.39 | 97.8 | | 5.7 |
| 10/12/2016 | 1 | 15.11 | 8.17 | 237.6 | 9.4 | 97.7 | | |
| 10/12/2016 | 2 | 15.05 | 8.18 | 237.1 | 9.45 | 98 | | |
| 10/12/2016 | 3 | 15 | 8.16 | 237.3 | 9.47 | 98.1 | | |
| 10/12/2016 | 4 | 14.98 | 8.18 | 237.4 | 9.41 | 97.5 | | |
| 10/12/2016 | 5 | 14.97 | 8.17 | 237.3 | 9.4 | 97.5 | 10 | |
| 10/12/2016 | 5* | 14.97 | 8.17 | 237.6 | 9.42 | 97.6 | | |
| 10/12/2016 | 6 | 14.96 | 8.17 | 237.6 | 9.38 | 97.2 | | |
| 10/12/2016 | 7 | 14.96 | 8.17 | 237.6 | 9.36 | 96.9 | | |
| 10/12/2016 | 8 | 14.95 | 8.17 | 237.5 | 9.37 | 97.1 | | |
| 10/12/2016 | 9 | 14.94 | 8.16 | 237.5 | 9.35 | 96.8 | | |
| 10/12/2016 | 10 | 14.94 | 8.16 | 237.3 | 9.35 | 96.8 | | |
| 10/12/2016 | 12 | 14.92 | 8.16 | 237 | 9.31 | 96.4 | | |
| 10/12/2016 | 15 | 13.96 | 7.95 | 212.9 | 9.12 | 92.4 | 9.97 | |
| 10/12/2016 | 18 | 13.58 | 7.85 | 203.1 | 9.14 | 91.9 | | |
| 10/12/2016 | 21 | 13.44 | 7.78 | 202.1 | 9.05 | 90.7 | | |
| 10/12/2016 | 24 | 13.38 | 7.72 | 206.4 | 8.87 | 88.7 | | |
| 10/12/2016 | 24.5 | 13.35 | 7.71 | 208 | 8.85 | 88.5 | | |

*QA/QC measurement for Hydrolab
**Secchi disk depths average of 3 measurements

## Table A-4. Station LL3 *In Situ* Water Quality Data, 2016

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 5/18/2016 | 0.5 | 17.73 | 8.27 | 103.9 | 11.85 | 131.4 |  | 2.2 |
| 5/18/2016 | 1 | 17.55 | 8.34 | 101.5 | 11.72 | 129.5 |  |  |
| 5/18/2016 | 2 | 17.42 | 8.31 | 101.7 | 11.82 | 130.2 |  |  |
| 5/18/2016 | 3 | 17.05 | 8.33 | 103.9 | 12.22 | 133.6 |  |  |
| 5/18/2016 | 4 | 16.08 | 8.07 | 111.5 | 11.63 | 124.6 |  |  |
| 5/18/2016 | 5 | 15.8 | 7.98 | 113.5 | 11.41 | 121.5 | 12.3 |  |
| 5/18/2016 | 6 | 15.56 | 7.95 | 115.7 | 11.42 | 121 |  |  |
| 5/18/2016 | 7 | 15.1 | 7.81 | 116.4 | 11.07 | 116.1 |  |  |
| 5/18/2016 | 8 | 14.54 | 7.76 | 117.4 | 11.06 | 114.7 |  |  |
| 5/18/2016 | 9 | 14.31 | 7.66 | 118.1 | 10.81 | 111.5 |  |  |
| 5/18/2016 | 9* | 14.31 | 7.62 | 118.1 | 10.82 | 111.6 |  |  |
| 5/18/2016 | 10 | 14.19 | 7.58 | 118.3 | 10.68 | 109.8 | 11.3 |  |
| 5/18/2016 | 12 | 13.95 | 7.55 | 118.8 | 10.61 | 108.5 |  |  |
| 5/18/2016 | 15 | 13.87 | 7.53 | 119 | 10.57 | 107.9 |  |  |
| 5/18/2016 | 18 | 13.41 | 7.46 | 119.4 | 10.51 | 106.3 |  |  |
| 5/18/2016 | 18.5 | 13.38 | 7.43 | 119.4 | 10.45 | 105.6 |  |  |
| 6/8/2016 | 0.5 | 22.28 | 7.83 | 120.9 | 9.56 | 117.6 |  | 4.2 |
| 6/8/2016 | 1 | 22.28 | 7.85 | 121.2 | 9.59 | 117.8 |  |  |
| 6/8/2016 | 2 | 22.26 | 7.86 | 121.3 | 9.6 | 117.8 |  |  |
| 6/8/2016 | 3 | 21.69 | 7.92 | 122.1 | 9.91 | 120.4 |  |  |
| 6/8/2016 | 4 | 20.56 | 7.98 | 124.2 | 10.22 | 121.3 |  |  |
| 6/8/2016 | 5 | 19.31 | 7.95 | 124.4 | 10.14 | 117.4 |  |  |
| 6/8/2016 | 6 | 18.75 | 7.83 | 125.1 | 9.83 | 112.6 |  |  |
| 6/8/2016 | 7 | 18.67 | 7.81 | 124.7 | 9.82 | 112.3 |  |  |
| 6/8/2016 | 8 | 18.34 | 7.75 | 124.7 | 9.94 | 112.8 |  |  |
| 6/8/2016 | 9 | 18.32 | 7.79 | 125 | 9.89 | 112.3 |  |  |
| 6/8/2016 | 9* | 18.32 | 7.77 | 125.2 | 9.89 | 112.2 |  |  |
| 6/8/2016 | 10 | 18.04 | 7.69 | 124.7 | 9.8 | 110.6 |  |  |
| 6/8/2016 | 12 | 17.56 | 7.63 | 125.1 | 9.58 | 107.1 |  |  |
| 6/8/2016 | 15 | 15.96 | 7.49 | 123.6 | 9.2 | 99.4 |  |  |
| 6/8/2016 | 18 | 15.22 | 7.28 | 118.1 | 8.02 | 85.3 |  |  |
| 6/8/2016 | 18.5 | 15.16 | 7.24 | 117.8 | 7.93 | 84.2 |  |  |
| 6/22/2016 | 0.5 | 19.45 | 7.94 | 134 | 9.07 | 103.8 |  | 7.0 |
| 6/22/2016 | 1 | 19.42 | 7.9 | 133.8 | 9.06 | 103.7 |  |  |
| 6/22/2016 | 2 | 19.38 | 7.9 | 134.4 | 9.1 | 104.1 |  |  |
| 6/22/2016 | 3 | 19.36 | 7.86 | 134.7 | 9.1 | 104.1 |  |  |
| 6/22/2016 | 4 | 19.34 | 7.9 | 134.7 | 9.11 | 104.1 |  |  |
| 6/22/2016 | 5 | 19.29 | 7.85 | 134.6 | 9.13 | 104.2 | 9.82 |  |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 6/22/2016 | 6 | 19.19 | 7.87 | 134.8 | 9.03 | 102.9 | | |
| 6/22/2016 | 7 | 19.01 | 7.84 | 135.1 | 8.99 | 102.1 | | |
| 6/22/2016 | 8 | 18.4 | 7.83 | 143.4 | 9.02 | 101.2 | | |
| 6/22/2016 | 9 | 18.28 | 7.87 | 151.4 | 9.26 | 103.5 | | |
| 6/22/2016 | 9* | 18.29 | 7.87 | 150.7 | 9.28 | 103.8 | | |
| 6/22/2016 | 10 | 18.11 | 7.93 | 155 | 9.48 | 105.7 | 10 | |
| 6/22/2016 | 12 | 17.34 | 7.86 | 161.9 | 9.62 | 105.6 | | |
| 6/22/2016 | 15 | 16.57 | 7.92 | 165.4 | 9.72 | 104.9 | | |
| 6/22/2016 | 18 | 16.41 | 7.87 | 165.5 | 9.5 | 102.3 | | |
| 6/22/2016 | 18.5 | 16.36 | 7.86 | 165.2 | 9.51 | 102.2 | | |
| 7/6/2016 | 0.5 | 21.66 | 8.06 | 151.9 | 9.17 | 110 | | 5.5 |
| 7/6/2016 | 1 | 21.65 | 8.06 | 152 | 9.15 | 109.8 | | |
| 7/6/2016 | 2 | 21.64 | 8.06 | 152 | 9.17 | 109.9 | | |
| 7/6/2016 | 3 | 21.64 | 8.06 | 152.5 | 9.18 | 110.1 | | |
| 7/6/2016 | 4 | 21.59 | 8.03 | 154.4 | 9.18 | 110 | | |
| 7/6/2016 | 5 | 21.13 | 7.98 | 174.1 | 9.07 | 107.7 | 9.62 | |
| 7/6/2016 | 6 | 20.75 | 8.02 | 178.4 | 9 | 106.1 | | |
| 7/6/2016 | 7 | 19.32 | 8 | 193 | 8.94 | 102.4 | | |
| 7/6/2016 | 8 | 18.73 | 7.93 | 197.7 | 8.76 | 99.2 | | |
| 7/6/2016 | 9 | 18.67 | 7.92 | 197.8 | 8.72 | 98.6 | | |
| 7/6/2016 | 9* | 18.67 | 7.91 | 197.8 | 8.73 | 98.7 | | |
| 7/6/2016 | 10 | 18.44 | 7.88 | 199 | 8.59 | 96.6 | | |
| 7/6/2016 | 12 | 17.2 | 7.6 | 205.6 | 7.42 | 81.4 | | |
| 7/6/2016 | 15 | 16.48 | 7.48 | 203.9 | 7.14 | 77.1 | 7.82 | |
| 7/6/2016 | 18 | 16.27 | 7.43 | 201.6 | 6.97 | 74.9 | | |
| 7/6/2016 | 18.5 | 16.26 | 7.41 | 201.5 | 6.92 | 74.5 | | |
| 7/20/2016 | 0.5 | 21.77 | 8.38 | 167.4 | 10.06 | 120.2 | | 5.0 |
| 7/20/2016 | 1 | 21.77 | 8.37 | 167.1 | 9.98 | 119.4 | | |
| 7/20/2016 | 2 | 21.7 | 8.36 | 167.1 | 9.93 | 118.6 | | |
| 7/20/2016 | 3 | 21.66 | 8.35 | 167.9 | 9.91 | 118.3 | | |
| 7/20/2016 | 4 | 21.57 | 8.29 | 169.6 | 9.76 | 116.2 | | |
| 7/20/2016 | 5 | 21.43 | 8.25 | 173.6 | 9.57 | 113.7 | 10.1 | |
| 7/20/2016 | 6 | 21.31 | 8.24 | 176.3 | 9.76 | 115.7 | | |
| 7/20/2016 | 7 | 20.94 | 8.23 | 181.3 | 9.79 | 115.1 | | |
| 7/20/2016 | 8 | 19.94 | 8.07 | 199.6 | 9.14 | 105.4 | | |
| 7/20/2016 | 9 | 18.76 | 7.97 | 217.1 | 8.89 | 100.1 | | |
| 7/20/2016 | 9* | 18.79 | 7.97 | 216.9 | 8.98 | 101.2 | | |
| 7/20/2016 | 10 | 18.15 | 7.91 | 226.7 | 8.81 | 98 | 9.35 | |
| 7/20/2016 | 12 | 17.74 | 7.86 | 229.3 | 8.61 | 95 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 7/20/2016 | 15 | 17.43 | 7.74 | 226.6 | 8.06 | 88.3 | | |
| 7/20/2016 | 18 | 16.94 | 7.61 | 226.5 | 7.32 | 79.4 | | |
| 7/20/2016 | 19.5 | 16.77 | 7.53 | 228.5 | 6.9 | 74.6 | | |
| 8/11/2016 | 0.5 | 22.62 | 8.88 | 186.9 | 11.07 | 134.5 | | 3.3 |
| 8/11/2016 | 1 | 22.62 | 8.88 | 186.9 | 11.11 | 135 | | |
| 8/11/2016 | 2 | 22.57 | 8.89 | 186.7 | 11.2 | 136 | | |
| 8/11/2016 | 3 | 22.55 | 8.89 | 186.2 | 11.17 | 135.5 | | |
| 8/11/2016 | 4 | 22.53 | 8.88 | 186.3 | 11.12 | 134.9 | | |
| 8/11/2016 | 5 | 22.48 | 8.89 | 185.6 | 10.94 | 132.6 | 11.3 | |
| 8/11/2016 | 6 | 21.48 | 8.37 | 221.3 | 9.51 | 113.1 | | |
| 8/11/2016 | 7 | 20.06 | 8.33 | 236.8 | 9.16 | 105.9 | | |
| 8/11/2016 | 8 | 19.01 | 8.13 | 252.6 | 8.53 | 96.8 | | |
| 8/11/2016 | 9 | 18.52 | 8 | 260.7 | 8.3 | 93 | | |
| 8/11/2016 | 9* | 18.57 | 8 | 259.5 | 8.26 | 92.7 | | |
| 8/11/2016 | 10 | 18.1 | 8.01 | 264 | 8.69 | 96.6 | 9.52 | |
| 8/11/2016 | 12 | 17.18 | 8.03 | 270.6 | 8.93 | 97.4 | | |
| 8/11/2016 | 15 | 16.69 | 8.02 | 273.2 | 8.98 | 97 | | |
| 8/11/2016 | 18 | 16.46 | 8 | 273.9 | 8.94 | 96 | | |
| 8/11/2016 | 19.5 | 16.44 | 7.99 | 274.1 | 8.92 | 95.8 | | |
| 8/25/2016 | 0.5 | 22.08 | 8.86 | 206.1 | 10.51 | 126.2 | | 3.5 |
| 8/25/2016 | 1 | 22.06 | 8.86 | 206.1 | 10.53 | 126.4 | | |
| 8/25/2016 | 2 | 22.05 | 8.85 | 206.2 | 10.49 | 125.8 | | |
| 8/25/2016 | 3 | 22.03 | 8.84 | 206.3 | 10.45 | 125.3 | | |
| 8/25/2016 | 4 | 21.99 | 8.83 | 206.6 | 10.39 | 124.5 | | |
| 8/25/2016 | 5 | 21.82 | 8.59 | 214.4 | 9.21 | 110 | 10.4 | |
| 8/25/2016 | 6 | 20.99 | 8.53 | 225.4 | 9.3 | 109.3 | | |
| 8/25/2016 | 7 | 20.35 | 8.6 | 229.6 | 9.86 | 114.4 | | |
| 8/25/2016 | 8 | 19.98 | 8.45 | 239.7 | 9.29 | 107 | | |
| 8/25/2016 | 9 | 18.53 | 8.21 | 262.5 | 8.99 | 100.6 | | |
| 8/25/2016 | 9* | 18.51 | 8.17 | 261.7 | 8.92 | 99.8 | | |
| 8/25/2016 | 10 | 17.84 | 8.03 | 272.9 | 8.64 | 95.3 | 8.35 | |
| 8/25/2016 | 12 | 17.39 | 8.01 | 276.4 | 8.78 | 95.9 | | |
| 8/25/2016 | 15 | 17.05 | 8.04 | 276.6 | 9.03 | 98 | | |
| 8/25/2016 | 18 | 16.9 | 8.05 | 277.2 | 9.13 | 98.8 | | |
| 8/25/2016 | 19.5 | 16.89 | 8.02 | 277.1 | 9.08 | 98.2 | | |
| 9/7/2016 | 0.5 | 20.21 | 8.77 | 215.6 | 9.44 | 109.7 | | 3.1 |
| 9/7/2016 | 1 | 20.22 | 8.77 | 215.6 | 9.45 | 109.8 | | |
| 9/7/2016 | 2 | 20.23 | 8.78 | 215.5 | 9.41 | 109.4 | | |
| 9/7/2016 | 3 | 20.22 | 8.78 | 215.7 | 9.42 | 109.5 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 9/7/2016 | 4 | 20.2 | 8.78 | 215.8 | 9.42 | 109.5 | | |
| 9/7/2016 | 5 | 20.23 | 8.78 | 215.7 | 9.4 | 109.2 | 9.87 | |
| 9/7/2016 | 6 | 20.23 | 8.79 | 215.5 | 9.39 | 109.1 | | |
| 9/7/2016 | 7 | 19.69 | 8.67 | 222.1 | 9.02 | 103.7 | | |
| 9/7/2016 | 8 | 19.08 | 8.6 | 232.4 | 8.86 | 100.7 | | |
| 9/7/2016 | 9 | 18.32 | 8.52 | 244.2 | 9.02 | 100.9 | | |
| 9/7/2016 | 9* | 18.29 | 8.51 | 244.5 | 9 | 100.7 | | |
| 9/7/2016 | 10 | 17.71 | 8.1 | 268.8 | 8.01 | 88.5 | 8.68 | |
| 9/7/2016 | 12 | 17.09 | 8.32 | 263.9 | 9.05 | 98.7 | | |
| 9/7/2016 | 15 | 15.64 | 8.22 | 282.9 | 9.5 | 100.4 | | |
| 9/7/2016 | 18 | 15.4 | 8.16 | 285.3 | 9.39 | 98.8 | | |
| 9/7/2016 | 19.5 | 15.32 | 8.15 | 286.7 | 9.44 | 99.2 | | |
| 9/20/2016 | 0.5 | 17.82 | 8.53 | 234.8 | 9.12 | 100.6 | | 4.0 |
| 9/20/2016 | 1 | 17.82 | 8.53 | 234.7 | 9.14 | 100.8 | | |
| 9/20/2016 | 2 | 17.82 | 8.54 | 234.8 | 9.15 | 100.9 | | |
| 9/20/2016 | 3 | 17.82 | 8.53 | 234.4 | 9.14 | 100.8 | | |
| 9/20/2016 | 4 | 17.83 | 8.53 | 234.9 | 9.11 | 100.6 | | |
| 9/20/2016 | 5 | 17.83 | 8.53 | 235 | 9.12 | 100.6 | 9.86 | |
| 9/20/2016 | 6 | 17.82 | 8.55 | 234.4 | 9.18 | 101.3 | | |
| 9/20/2016 | 7 | 17.81 | 8.55 | 234.3 | 9.21 | 101.6 | | |
| 9/20/2016 | 8 | 17.8 | 8.55 | 234.2 | 9.17 | 101.1 | | |
| 9/20/2016 | 9 | 17.74 | 8.53 | 234.6 | 9.08 | 100.1 | | |
| 9/20/2016 | 9* | 17.76 | 8.54 | 234.6 | 9.15 | 100.7 | | |
| 9/20/2016 | 10 | 17.72 | 8.53 | 234.7 | 9.09 | 100.1 | 9.89 | |
| 9/20/2016 | 12 | 17.29 | 8.51 | 235.9 | 9.2 | 100.4 | | |
| 9/20/2016 | 15 | 15.88 | 8.38 | 245.9 | 9.62 | 101.9 | | |
| 9/20/2016 | 18 | 14.48 | 8.16 | 259.1 | 9.6 | 98.7 | | |
| 9/20/2016 | 19.5 | 14.46 | 8.14 | 259 | 9.63 | 99 | | |
| 10/13/2016 | 0.5 | 14.42 | 8.19 | 231.8 | 9.51 | 98.5 | | 3.7 |
| 10/13/2016 | 1 | 14.37 | 8.21 | 232.1 | 9.53 | 98.7 | | |
| 10/13/2016 | 2 | 14.43 | 8.22 | 231.6 | 9.51 | 98.6 | | |
| 10/13/2016 | 3 | 14.43 | 8.23 | 231.8 | 9.49 | 98.4 | | |
| 10/13/2016 | 4 | 14.41 | 8.23 | 231.4 | 9.51 | 98.6 | | |
| 10/13/2016 | 5 | 14.41 | 8.23 | 231.9 | 9.48 | 98.3 | 10.5 | |
| 10/13/2016 | 6 | 14.43 | 8.24 | 231.7 | 9.49 | 98.4 | | |
| 10/13/2016 | 7 | 13.77 | 8.15 | 217 | 9.6 | 98.1 | | |
| 10/13/2016 | 8 | 13.74 | 8.13 | 216.2 | 9.57 | 97.7 | | |
| 10/13/2016 | 9 | 13.63 | 8.12 | 213.9 | 9.63 | 98.1 | | |
| 10/13/2016 | 9* | 13.62 | 8.12 | 213.9 | 9.64 | 98.2 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 10/13/2016 | 10 | 13.41 | 8.08 | 209.5 | 9.68 | 98.1 | 10.6 | |
| 10/13/2016 | 12 | 13.04 | 8.02 | 201.6 | 9.75 | 98 | | |
| 10/13/2016 | 15 | 12.89 | 7.97 | 196.9 | 9.66 | 96.8 | | |
| 10/13/2016 | 18 | 12.52 | 7.93 | 192.1 | 9.74 | 96.8 | | |
| 10/13/2016 | 18.5 | 12.51 | 7.91 | 192.3 | 9.74 | 96.8 | | |

*QA/QC measurement for Hydrolab

**Secchi disk depths average of 3 measurements

**Table A-5. Station LL4 *In Situ* Water Quality Data, 2016**

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 5/18/2016 | 0.5 | 15.18 | 7.9 | 118.9 | 10.33 | 108.6 | | 5.1 |
| 5/18/2016 | 1 | 15.03 | 7.77 | 119.2 | 10.37 | 108.6 | | |
| 5/18/2016 | 2 | 14.91 | 7.68 | 119 | 10.29 | 107.4 | | |
| 5/18/2016 | 3 | 14.92 | 7.65 | 119.4 | 10.28 | 107.4 | | |
| 5/18/2016 | 4 | 14.91 | 7.64 | 119.2 | 10.28 | 107.4 | | |
| 5/18/2016 | 4* | 14.9 | 7.64 | 119.7 | 10.29 | 107.5 | | |
| 5/18/2016 | 5 | 14.9 | 7.65 | 119.2 | 10.21 | 106.7 | | |
| 5/18/2016 | 6 | 14.9 | 7.65 | 119.3 | 10.27 | 107.2 | | |
| 5/18/2016 | 7 | 14.9 | 7.61 | 119.3 | 10.25 | 107.1 | | |
| 5/18/2016 | 8 | 14.9 | 7.65 | 119.3 | 10.24 | 106.9 | | |
| 6/8/2016 | 0.5 | 19.18 | 7.84 | 124.9 | 9.37 | 108.2 | | 3.3 |
| 6/8/2016 | 1 | 19.17 | 7.83 | 124.1 | 9.37 | 108.3 | | |
| 6/8/2016 | 2 | 19.17 | 7.83 | 124.4 | 9.36 | 108.1 | | |
| 6/8/2016 | 3 | 19.14 | 7.83 | 124.1 | 9.36 | 108 | | |
| 6/8/2016 | 4 | 19.11 | 7.82 | 124.1 | 9.43 | 108.8 | | |
| 6/8/2016 | 4* | 19.08 | 7.83 | 124.2 | 9.46 | 109 | | |
| 6/8/2016 | 5 | 19.06 | 7.82 | 124 | 9.5 | 109.5 | | |
| 6/8/2016 | 6 | 19.01 | 7.84 | 124.3 | 9.54 | 109.8 | | |
| 6/8/2016 | 7 | 18.74 | 7.73 | 124 | 9.35 | 107.1 | | |
| 6/8/2016 | 8 | 18.38 | 7.67 | 124.1 | 9.26 | 105.3 | | |
| 6/22/2016 | 0.5 | 19.67 | 8.1 | 147.4 | 9.56 | 109.9 | | 6.0 |
| 6/22/2016 | 1 | 19.59 | 8.07 | 147.3 | 9.42 | 108.2 | | |
| 6/22/2016 | 2 | 19.49 | 8.05 | 147.2 | 9.38 | 107.5 | | |
| 6/22/2016 | 3 | 18.19 | 8.06 | 160.7 | 9.68 | 108.1 | | |
| 6/22/2016 | 4 | 17.47 | 8.11 | 166.7 | 9.81 | 107.9 | | |
| 6/22/2016 | 4* | 17.46 | 8.11 | 166.6 | 9.79 | 107.6 | | |
| 6/22/2016 | 5 | 17.28 | 8.08 | 167.4 | 9.69 | 106.2 | | |
| 6/22/2016 | 6 | 17.25 | 8.05 | 167.2 | 9.65 | 105.7 | | |
| 6/22/2016 | 7 | 17.25 | 8.05 | 167.4 | 9.64 | 105.6 | | |
| 6/22/2016 | 8 | 17.22 | 8.04 | 167.5 | 9.64 | 105.5 | | |
| 7/6/2016 | 0.5 | 21.47 | 8.2 | 165.6 | 9.14 | 109.3 | | 4.1 |
| 7/6/2016 | 1 | 21.47 | 8.19 | 165.6 | 9.1 | 1808.8 | | |
| 7/6/2016 | 2 | 21.36 | 8.18 | 168.5 | 9.12 | 108.9 | | |
| 7/6/2016 | 3 | 21.02 | 8.22 | 175.1 | 9.26 | 109.8 | | |
| 7/6/2016 | 4 | 19.8 | 8.25 | 186.5 | 9.5 | 109.9 | | |
| 7/6/2016 | 4* | 19.62 | 8.25 | 187.8 | 9.57 | 110.3 | | |
| 7/6/2016 | 5 | 17.39 | 8.15 | 204.4 | 9.66 | 106.4 | | |
| 7/6/2016 | 6 | 17.28 | 8.12 | 205 | 9.65 | 106.1 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 7/6/2016 | 7 | 17.27 | 8.13 | 205.1 | 9.65 | 106 | | |
| 7/6/2016 | 8 | 17.26 | 8.12 | 204.9 | 9.65 | 106 | | |
| 7/20/2016 | 0.5 | 22.44 | 8.56 | 168.6 | 10.63 | 128.8 | | 3.5 |
| 7/20/2016 | 1 | 22.35 | 8.56 | 168.8 | 10.65 | 128.7 | | |
| 7/20/2016 | 2 | 22.26 | 8.55 | 168.8 | 10.6 | 128 | | |
| 7/20/2016 | 3 | 22.13 | 8.53 | 171.9 | 10.54 | 126.9 | | |
| 7/20/2016 | 4 | 21.89 | 8.52 | 176.6 | 10.55 | 126.4 | | |
| 7/20/2016 | 4* | 21.87 | 8.52 | 176.9 | 10.6 | 126.9 | | |
| 7/20/2016 | 5 | 20.15 | 8.34 | 209.7 | 10.2 | 118.1 | | |
| 7/20/2016 | 6 | 17.41 | 8.04 | 250.9 | 9.48 | 103.8 | | |
| 7/20/2016 | 7 | 17.37 | 8.02 | 251.3 | 9.44 | 103.3 | | |
| 7/20/2016 | 8 | 17.37 | 8.02 | 251.4 | 9.43 | 103.3 | | |
| 8/11/2016 | 0.5 | 22.33 | 8.83 | 191.9 | 10.71 | 129.5 | | 2.6 |
| 8/11/2016 | 1 | 22.28 | 8.82 | 191.8 | 10.75 | 129.9 | | |
| 8/11/2016 | 2 | 22.23 | 8.82 | 191.9 | 10.74 | 129.6 | | |
| 8/11/2016 | 3 | 22.15 | 8.8 | 192.4 | 10.62 | 127.9 | | |
| 8/11/2016 | 4 | 21.81 | 8.85 | 195.6 | 10.82 | 129.6 | | |
| 8/11/2016 | 4* | 21.84 | 8.87 | 195.7 | 10.87 | 130.2 | | |
| 8/11/2016 | 5 | 20.51 | 8.72 | 216 | 10.78 | 125.6 | | |
| 8/11/2016 | 6 | 15.75 | 8.14 | 277.9 | 9.84 | 104.2 | | |
| 8/11/2016 | 7 | 15.67 | 8.1 | 278.2 | 9.79 | 103.4 | | |
| 8/11/2016 | 8 | 15.66 | 8.07 | 278.6 | 9.78 | 103.3 | | |
| 8/25/2016 | 0.5 | 22.24 | 9.03 | 198.6 | 11.64 | 140.2 | | 2.4 |
| 8/25/2016 | 1 | 22.27 | 9.02 | 198.4 | 11.63 | 140.1 | | |
| 8/25/2016 | 2 | 22.23 | 9.03 | 198.4 | 11.65 | 140.2 | | |
| 8/25/2016 | 3 | 22.14 | 9.03 | 198.1 | 11.72 | 140.9 | | |
| 8/25/2016 | 4 | 21.99 | 8.99 | 199.1 | 11.4 | 136.7 | | |
| 8/25/2016 | 4* | 22 | 8.98 | 200.1 | 11.21 | 134.3 | | |
| 8/25/2016 | 5 | 20.72 | 8.81 | 222.7 | 11.32 | 132.3 | | |
| 8/25/2016 | 6 | 16.17 | 8.18 | 281.7 | 10.08 | 107.4 | | |
| 8/25/2016 | 7 | 16.13 | 8.15 | 282.3 | 10.02 | 106.7 | | |
| 8/25/2016 | 8 | 16.13 | 8.14 | 282.4 | 10.01 | 106.6 | | |
| 9/7/2016 | 0.5 | 19.64 | 8.87 | 213.4 | 10.23 | 117.4 | | 2.5 |
| 9/7/2016 | 1 | 19.64 | 8.88 | 213.7 | 10.23 | 117.4 | | |
| 9/7/2016 | 2 | 19.65 | 8.88 | 213.5 | 10.22 | 117.4 | | |
| 9/7/2016 | 3 | 19.66 | 8.89 | 213.4 | 10.2 | 117.1 | | |
| 9/7/2016 | 4 | 19.59 | 8.89 | 213.8 | 10.24 | 117.5 | | |
| 9/7/2016 | 4* | 19.64 | 8.89 | 213.6 | 10.2 | 117.2 | | |
| 9/7/2016 | 5 | 17.78 | 8.71 | 236.2 | 10.17 | 112.5 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 9/7/2016 | 6 | 14.2 | 8.15 | 294.7 | 9.6 | 98.4 | | |
| 9/7/2016 | 7 | 13.95 | 8.11 | 294.3 | 9.62 | 98 | | |
| 9/7/2016 | 8 | 13.93 | 8.09 | 294.1 | 9.66 | 98.5 | | |
| 9/20/2016 | 0.5 | 17.28 | 8.83 | 221.4 | 10.77 | 117.5 | | 3.2 |
| 9/20/2016 | 1 | 17.28 | 8.84 | 221.6 | 10.77 | 117.5 | | |
| 9/20/2016 | 2 | 17.28 | 8.84 | 221.7 | 10.78 | 117.6 | | |
| 9/20/2016 | 3 | 17.24 | 8.83 | 222.5 | 10.73 | 116.9 | | |
| 9/20/2016 | 4 | 16.6 | 8.77 | 230.6 | 10.89 | 117.2 | | |
| 9/20/2016 | 4* | 16.44 | 8.74 | 232.9 | 10.87 | 116.5 | | |
| 9/20/2016 | 5 | 14.14 | 8.16 | 263.3 | 9.91 | 101.1 | | |
| 9/20/2016 | 6 | 14.11 | 8.14 | 263.5 | 9.92 | 101.2 | | |
| 9/20/2016 | 7 | 14.1 | 8.1 | 263.5 | 9.89 | 100.9 | | |
| 9/20/2016 | 8 | 14.11 | 8.11 | 263.5 | 9.91 | 101 | | |
| 10/13/2016 | 0.5 | 11.83 | 8.02 | 176 | 10.62 | 103.9 | | 4.5 |
| 10/13/2016 | 1 | 11.82 | 8.01 | 176.7 | 10.65 | 104.2 | | |
| 10/13/2016 | 2 | 11.82 | 8.02 | 176.2 | 10.69 | 104.5 | | |
| 10/13/2016 | 3 | 11.79 | 8.03 | 176.9 | 10.66 | 104.2 | | |
| 10/13/2016 | 4 | 11.72 | 8.07 | 177.8 | 10.81 | 105.5 | | |
| 10/13/2016 | 4* | 11.75 | 8.06 | 177.3 | 10.8 | 105.4 | | |
| 10/13/2016 | 5 | 11.7 | 8.07 | 178.2 | 10.83 | 105.6 | | |
| 10/13/2016 | 6 | 11.7 | 8.08 | 178.6 | 10.81 | 105.5 | | |
| 10/13/2016 | 7 | 11.67 | 8.09 | 179.7 | 10.86 | 105.8 | | |
| 10/13/2016 | 7.5 | 11.64 | 8.11 | 180.1 | 10.86 | 105.8 | | |

*QA/QC measurement for Hydrolab

**Secchi disk depths average of 3 measurements

**Table A-6. Station LL5 *In Situ* Water Quality Data, 2016**

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 5/18/2016 | 0.5 | 14.85 | 7.49 | 121.3 | 10.27 | 107.1 | | 3.6 |
| 5/18/2016 | 1 | 14.84 | 7.46 | 120.9 | 10.23 | 106.7 | | |
| 5/18/2016 | 2 | 14.83 | 7.47 | 121.3 | 10.24 | 106.8 | | |
| 5/18/2016 | 3 | 14.81 | 7.45 | 121.5 | 10.26 | 107 | | |
| 5/18/2016 | 4 | 14.81 | 7.47 | 120.9 | 10.21 | 106.4 | | |
| 5/18/2016 | 5 | 14.8 | 7.46 | 121.7 | 10.23 | 106.6 | | |
| 6/8/2016 | 0.5 | 18.17 | 7.62 | 124.6 | 8.82 | 99.8 | | 4.0 |
| 6/8/2016 | 1 | 18.12 | 7.61 | 124.7 | 8.83 | 99.9 | | |
| 6/8/2016 | 2 | 18.06 | 7.6 | 124.5 | 8.83 | 99.7 | | |
| 6/8/2016 | 3 | 18.03 | 7.58 | 124.5 | 8.84 | 99.8 | | |
| 6/8/2016 | 4 | 18.01 | 7.57 | 124.8 | 8.83 | 99.6 | | |
| 6/8/2016 | 5 | 18 | 7.57 | 124.8 | 8.87 | 100 | | |
| 6/22/2016 | 0.5 | 16.1 | 7.92 | 169.7 | 9.7 | 103.6 | | 6.0 |
| 6/22/2016 | 1 | 15.87 | 7.89 | 169.9 | 9.67 | 102.9 | | |
| 6/22/2016 | 2 | 15.8 | 7.86 | 169.9 | 9.66 | 102.6 | | |
| 6/22/2016 | 3 | 15.76 | 7.84 | 170.2 | 9.69 | 102.8 | | |
| 6/22/2016 | 4 | 15.74 | 7.84 | 169.9 | 9.66 | 102.4 | | |
| 6/22/2016 | 5 | 15.77 | 7.84 | 169.8 | 9.67 | 102.6 | | |
| 7/6/2016 | 0.5 | 17.12 | 7.99 | 213.3 | 9.11 | 99.8 | | 5.4 |
| 7/6/2016 | 1 | 16.94 | 7.93 | 212.4 | 9.05 | 98.8 | | |
| 7/6/2016 | 2 | 16.84 | 7.9 | 210.8 | 8.96 | 97.4 | | |
| 7/6/2016 | 3 | 16.83 | 7.88 | 210.9 | 8.92 | 97.1 | | |
| 7/6/2016 | 4 | 16.8 | 7.86 | 210.4 | 8.92 | 97 | | |
| 7/6/2016 | 5 | 16.81 | 7.89 | 210.3 | 8.88 | 96.6 | | |
| 7/20/2016 | 0.5 | 20.78 | 8.59 | 193.4 | 10.32 | 121.1 | | 5.1 |
| 7/20/2016 | 1 | 19.44 | 8.45 | 209.9 | 10.33 | 118 | | |
| 7/20/2016 | 2 | 16.6 | 8.18 | 254.9 | 9.91 | 106.8 | | |
| 7/20/2016 | 3 | 16.47 | 8.09 | 255.7 | 9.88 | 106.1 | | |
| 7/20/2016 | 4 | 16.47 | 8.09 | 256 | 9.84 | 105.7 | | |
| 7/20/2016 | 5 | 16.45 | 8.08 | 255.7 | 9.86 | 105.9 | | |
| 8/11/2016 | 0.5 | 21.71 | 8.99 | 197.9 | 11.25 | 134.4 | | 4.4 |
| 8/11/2016 | 1 | 21.21 | 8.97 | 198.6 | 11.09 | 131.3 | | |
| 8/11/2016 | 2 | 16.97 | 8.34 | 259.7 | 9.86 | 107 | | |
| 8/11/2016 | 3 | 15.31 | 8.06 | 282.2 | 9.63 | 101 | | |
| 8/11/2016 | 4 | 15.37 | 8.04 | 281.3 | 9.58 | 100.5 | | |
| 8/11/2016 | 5 | 15.29 | 8.02 | 281.6 | 9.58 | 100.4 | | |
| 8/25/2016 | 0.5 | 21.88 | 9.04 | 201.7 | 11.69 | 139.8 | | 4.5 |
| 8/25/2016 | 1 | 21.43 | 9.01 | 204.1 | 11.52 | 136.6 | | |

| Date | Depth (m) | Temperature (°C) | pH | Cond (µS/cm) | DO (mg/l) | DO Sat. (%) | Winkler DO (mg/L) | Secchi Disk Depth (m)** |
|---|---|---|---|---|---|---|---|---|
| 8/25/2016 | 2 | 17.45 | 8.33 | 264.4 | 9.89 | 108.2 | | |
| 8/25/2016 | 3 | 15.79 | 8.09 | 284.1 | 9.8 | 103.6 | | |
| 8/25/2016 | 4 | 15.65 | 8.05 | 285.5 | 9.79 | 103.2 | | |
| 8/25/2016 | 5 | 15.62 | 8.05 | 285.8 | 9.79 | 103.1 | | |
| 9/7/2016 | 0.5 | 17.61 | 8.87 | 220 | 10.44 | 115.1 | | 4.5 |
| 9/7/2016 | 1 | 17.34 | 8.82 | 224.4 | 10.4 | 114 | | |
| 9/7/2016 | 2 | 13.67 | 8.18 | 293.9 | 9.81 | 99.4 | | |
| 9/7/2016 | 3 | 13.43 | 8.11 | 296.7 | 9.7 | 97.8 | | |
| 9/7/2016 | 4 | 13.35 | 8.07 | 296.6 | 9.68 | 97.4 | | |
| 9/7/2016 | 5 | 13.35 | 8.06 | 296.9 | 9.67 | 97.2 | | |
| 9/20/2016 | 0.5 | 13.48 | 8.13 | 263.4 | 10.15 | 102.1 | | 5.7 |
| 9/20/2016 | 1 | 13.45 | 8.12 | 263 | 10.19 | 102.4 | | |
| 9/20/2016 | 2 | 13.42 | 8.12 | 263.1 | 10.21 | 102.5 | | |
| 9/20/2016 | 3 | 13.4 | 8.12 | 262.8 | 10.19 | 102.3 | | |
| 9/20/2016 | 4 | 13.38 | 8.12 | 262.7 | 10.19 | 102.2 | | |
| 9/20/2016 | 5 | 13.36 | 8.12 | 262.5 | 10.21 | 102.4 | | |
| 10/13/2016 | 0.5 | 11.46 | 7.84 | 172.6 | 10.06 | 97.6 | | 4.6 |
| 10/13/2016 | 1 | 11.45 | 7.83 | 172.2 | 10.02 | 97.2 | | |
| 10/13/2016 | 2 | 11.45 | 7.83 | 172 | 10 | 97 | | |
| 10/13/2016 | 3 | 11.4 | 7.81 | 171.1 | 9.96 | 96.5 | | |
| 10/13/2016 | 4 | 11.4 | 7.8 | 171.2 | 9.98 | 96.7 | | |

*QA/QC measurement for Hydrolab
**Secchi disk depths average of 3 measurements

# APPENDIX II – Lake Spokane Laboratory Monitoring Data

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## Table B-1. Lake Spokane Lab Data, 2016

### Station LL0

| Date | TP (µg/L) | | | | |
|---|---|---|---|---|---|
| | 0.5 m | 5 m | 15 m | 30 m | B-1 |
| 5/17/2016 | 16.3 | 18.6 | 18.1 | 17.4 | 29.9 |
| 6/7/2016 | 4.2 | 21.0 | 7.0 | 13.5 | 21.9 |
| 6/21/2016 | 5.1 | 6.2 | 5.9 | 12.6 | 33.2 |
| 7/5/2016 | 6.0 | 6.5 | 6.6 | 15.5 | 45.7 |
| 7/19/2016 | 6.9 | 6.1 | 9.7 | 34.0 | 57.0 |
| 8/10/2016 | 9.1 | 8.6 | 4.9 | 41.9 | 121.9 |
| 8/24/2016 | 6.6 | 7.9 | 4.3 | 44.0 | 44.3 |
| 9/6/2016 | 5.8 | 7.5 | 3.8 | 47.9 | 51.6 |
| 9/19/2016 | 5.0 | 7.7 | 17.1 | 24.5 | 52.5 |
| 10/12/2016 | 6.4 | 7.2 | 18.1 | 22.7 | 32.0 |

| Date | SRP (µg/L) | | | | |
|---|---|---|---|---|---|
| | 0.5 m | 5 m | 15 m | 30 m | B-1 |
| 5/17/2016 | 1.0 | 1.0 | 1.8 | 2.4 | 12.8 |
| 6/7/2016 | 1.0 | 1.0 | 1.0 | 4.3 | 14.2 |
| 6/21/2016 | 1.0 | 1.0 | 1.0 | 8.5 | 26.5 |
| 7/5/2016 | 1.0 | 1.0 | 1.0 | 14.9 | 35.3 |
| 7/19/2016 | 1.0 | 1.0 | 5.8 | 31.0 | 41.1 |
| 8/10/2016 | 1.0 | 1.0 | 1.0 | 34.6 | 35.8 |
| 8/24/2016 | 1.0 | 1.3 | 1.6 | 43.8 | 43.3 |
| 9/6/2016 | 1.0 | 4.0 | 2.9 | 44.3 | 49.3 |
| 9/19/2016 | 1.0 | 2.1 | 17.0 | 22.7 | 50.3 |
| 10/12/2016 | 1.0 | 1.5 | 11.7 | 13.7 | 14.1 |

| Date | Chl (µg/L) | | |
|---|---|---|---|
| | 0.5 m | 5 m | 15 m |
| 5/17/2016 | 3.3 | 6.2 | 4.7 |
| 6/7/2016 | 1.0 | 3.8 | 5.3 |
| 6/21/2016 | 2.0 | 3.3 | 2.2 |
| 7/5/2016 | 1.1 | 2.0 | 2.8 |
| 7/19/2016 | 1.9 | 3.2 | 1.3 |
| 8/10/2016 | 4.1 | 5.3 | 1.1 |
| 8/24/2016 | 5.9 | 6.9 | 2.0 |
| 9/6/2016 | 4.7 | 5.1 | 1.2 |
| 9/19/2016 | 3.9 | 3.2 | 0.9 |
| 10/12/2016 | 3.2 | 3.4 | 0.9 |

| Date | TPN (µg/L) | | | | |
|---|---|---|---|---|---|
| | 0.5 m | 5 m | 15 m | 30 m | B-1 |
| 5/17/2016 | 455 | 469 | 462 | 489 | 476 |
| 6/7/2016 | 507 | 496 | 526 | 590 | 622 |
| 6/21/2016 | 519 | 510 | 584 | 488 | 599 |
| 7/5/2016 | 630 | 736 | 880 | 1061 | 746 |
| 7/19/2016 | 1123 | 1144 | 1543 | 1184 | 938 |
| 8/10/2016 | 699 | 690 | 1259 | 833 | 765 |
| 8/24/2016 | 943 | 1141 | 1730 | 1035 | 657 |
| 9/6/2016 | 1097 | 1193 | 1755 | 1321 | 595 |
| 9/19/2016 | 1387 | 1343 | 1707 | 1716 | 600 |
| 10/12/2016 | 1812 | 1543 | 1850 | 1846 | 1788 |

| Date | NO3+NO2 (µg/L) | | | | |
|---|---|---|---|---|---|
| | 0.5 m | 5 m | 15 m | 30 m | B-1 |
| 5/17/2016 | 327 | 325 | 328 | 381 | 296 |
| 6/7/2016 | 356 | 355 | 401 | 393 | 435 |
| 6/21/2016 | 455 | 426 | 522 | 419 | 472 |
| 7/5/2016 | 533 | 552 | 753 | 845 | 575 |
| 7/19/2016 | 700 | 743 | 978 | 758 | 597 |
| 8/10/2016 | 612 | 613 | 1220 | 824 | 508 |
| 8/24/2016 | 735 | 770 | 1329 | 940 | 480 |
| 9/6/2016 | 859 | 854 | 1426 | 938 | 403 |
| 9/19/2016 | 1032 | 1036 | 1497 | 1462 | 334 |
| 10/12/2016 | 1154 | 1215 | 1268 | 1208 | 1162 |

## Station LL1

| Date | TP (µg/L) | | | |
|---|---|---|---|---|
| | 0.5 m | 5 m | 20 m | B-1 |
| 5/17/2016 | 17.1 | 20.2 | 20.8 | 26.8 |
| 6/7/2016 | 2.8 | 8.2 | 6.2 | 14.0 |
| 6/21/2016 | 4.6 | 6.0 | 16.0 | 32.0 |
| 7/5/2016 | 4.1 | 7.2 | 15.9 | 47.0 |
| 7/19/2016 | 13.6 | 15.8 | 19.5 | 72.2 |
| 8/10/2016 | 7.9 | 11.3 | 32.0 | 68.2 |
| 8/24/2016 | 5.2 | 5.9 | 12.5 | 54.2 |
| 9/6/2016 | 5.3 | 5.9 | 14.3 | 57.5 |
| 9/19/2016 | 4.9 | 8.2 | 12.1 | 25.8 |
| 10/12/2016 | 6.4 | 9.3 | 14.9 | 24.1 |

| Date | SRP (µg/L) | | | |
|---|---|---|---|---|
| | 0.5 m | 5 m | 20 m | B-1 |
| 5/17/2016 | 1.0 | 1.0 | 1.0 | 9.5 |
| 6/7/2016 | 1.0 | 1.0 | 1.8 | 8.8 |
| 6/21/2016 | 1.0 | 1.0 | 9.4 | 23.6 |
| 7/5/2016 | 1.0 | 1.0 | 9.0 | 31.1 |
| 7/19/2016 | 1.4 | 2.3 | 17.2 | 50.5 |
| 8/10/2016 | 1.0 | 1.0 | 22.7 | 55.8 |
| 8/24/2016 | 1.0 | 1.5 | 12.4 | 47.6 |
| 9/6/2016 | 1.0 | 1.7 | 14.4 | 46.9 |
| 9/19/2016 | 1.0 | 1.5 | 10.6 | 10.9 |
| 10/12/2016 | 1.0 | 2.0 | 9.4 | 11.3 |

| Date | Chl (µg/L) | | |
|---|---|---|---|
| | 0.5 m | 5 m | 20 m |
| 5/17/2016 | 5.0 | 7.1 | 4.5 |
| 6/7/2016 | 1.0 | 1.3 | 2.1 |
| 6/21/2016 | 0.8 | 1.1 | 1.4 |
| 7/5/2016 | 0.9 | 0.9 | 0.5 |
| 7/19/2016 | 2.3 | 2.4 | 0.9 |
| 8/10/2016 | 4.8 | 5.9 | 0.5 |
| 8/24/2016 | 4.3 | 5.1 | 1.1 |
| 9/6/2016 | 4.3 | 4.3 | 0.9 |
| 9/19/2016 | 3.9 | 3.9 | 0.7 |
| 10/12/2016 | 2.1 | 2.7 | 0.7 |

| Date | TPN (µg/L) | | | |
|---|---|---|---|---|
| | 0.5 m | 5 m | 20 m | B-1 |
| 5/17/2016 | 469 | 468 | 546 | 519 |
| 6/7/2016 | 499 | 610 | 562 | 542 |
| 6/21/2016 | 600 | 593 | 922 | 632 |
| 7/5/2016 | 763 | 816 | 1059 | 927 |
| 7/19/2016 | 1168 | 1219 | 1908 | 1170 |
| 8/10/2016 | 684 | 721 | 1447 | 731 |
| 8/24/2016 | 931 | 926 | 1763 | 1218 |
| 9/6/2016 | 1195 | 1041 | 2143 | 1046 |
| 9/19/2016 | 1519 | 1517 | 1766 | 1709 |
| 10/12/2016 | 1554 | 1514 | 1712 | 1790 |

| Date | NO3+NO2 (µg/L) | | | |
|---|---|---|---|---|
| | 0.5 m | 5 m | 20 m | B-1 |
| 5/17/2016 | 298 | 309 | 394 | 381 |
| 6/7/2016 | 342 | 414 | 434 | 410 |
| 6/21/2016 | 525 | 543 | 779 | 499 |
| 7/5/2016 | 681 | 684 | 934 | 815 |
| 7/19/2016 | 726 | 737 | 1251 | 731 |
| 8/10/2016 | 607 | 606 | 1343 | 719 |
| 8/24/2016 | 717 | 712 | 1477 | 926 |
| 9/6/2016 | 844 | 872 | 2099 | 762 |
| 9/19/2016 | 1002 | 1056 | 1524 | 1483 |
| 10/12/2016 | 1102 | 1109 | 1174 | 1148 |

## Station LL2

| Date | TP (µg/L) | | | |
|---|---|---|---|---|
| | 0.5 m | 5 m | 15 m | B-1 |
| 5/17/2016 | 27.0 | 22.3 | 22.1 | 27.1 |
| 6/7/2016 | 3.4 | 4.7 | 7.2 | 10.4 |
| 6/21/2016 | 5.0 | 5.6 | 8.2 | 17.7 |
| 7/5/2016 | 7.5 | 7.3 | 15.8 | 31.4 |
| 7/19/2016 | 6.1 | 9.5 | 14.4 | 30.5 |
| 8/10/2016 | 7.2 | 6.0 | 10.4 | 55.1 |
| 8/24/2016 | 5.7 | 15.3 | 9.4 | 23.8 |
| 9/6/2016 | 6.6 | 6.5 | 10.9 | 28.5 |
| 9/19/2016 | 5.9 | 6.4 | 12.7 | 19.6 |
| 10/12/2016 | 6.7 | 10.6 | 13.1 | 22.6 |

| Date | SRP (µg/L) | | | |
|---|---|---|---|---|
| | 0.5 m | 5 m | 15 m | B-1 |
| 5/17/2016 | 1.0 | 1.0 | 1.7 | 3.1 |
| 6/7/2016 | 1.0 | 1.0 | 1.1 | 5.2 |
| 6/21/2016 | 1.0 | 1.0 | 2.6 | 5.6 |
| 7/5/2016 | 1.0 | 1.0 | 8.1 | 21.9 |
| 7/19/2016 | 1.0 | 1.4 | 9.5 | 17.8 |
| 8/10/2016 | 1.0 | 1.0 | 2.1 | 41.3 |
| 8/24/2016 | 1.0 | 1.2 | 5.2 | 19.7 |
| 9/6/2016 | 1.0 | 1.0 | 6.4 | 8.6 |
| 9/19/2016 | 1.0 | 1.0 | 2.8 | 7.7 |
| 10/12/2016 | 1.0 | 1.0 | 6.4 | 9.4 |

| Date | Chl (µg/L) | | |
|---|---|---|---|
| | 0.5 m | 5 m | 15 m |
| 5/17/2016 | 13.6 | 5.1 | 4.3 |
| 6/7/2016 | 1.3 | 6.2 | 5.3 |
| 6/21/2016 | 1.1 | 1.1 | 1.9 |
| 7/5/2016 | 1.2 | 1.6 | 1.1 |
| 7/19/2016 | 2.7 | 2.8 | 2.1 |
| 8/10/2016 | 8.0 | 8.3 | 1.6 |
| 8/24/2016 | 4.5 | 6.4 | 2.0 |
| 9/6/2016 | 4.1 | 3.9 | 1.6 |
| 9/19/2016 | 3.6 | 3.1 | 2.7 |
| 10/12/2016 | 2.3 | 3.4 | 2.3 |

| Date | TPN (µg/L) | | | |
|---|---|---|---|---|
| | 0.5 m | 5 m | 15 m | B-1 |
| 5/17/2016 | 508 | 463 | 683 | 458 |
| 6/7/2016 | 445 | 621 | 624 | 549 |
| 6/21/2016 | 643 | 654 | 1081 | 1310 |
| 7/5/2016 | 933 | 811 | 1420 | 1182 |
| 7/19/2016 | 1133 | 1205 | 1884 | 1921 |
| 8/10/2016 | 619 | 718 | 1603 | 1133 |
| 8/24/2016 | 941 | 1030 | 1719 | 1774 |
| 9/6/2016 | 891 | 1022 | 1877 | 2133 |
| 9/19/2016 | 1657 | 1511 | 1698 | 1870 |
| 10/12/2016 | 1283 | 1300 | 1384 | 1688 |

| Date | NO3+NO2 (µg/L) | | | |
|---|---|---|---|---|
| | 0.5 m | 5 m | 15 m | B-1 |
| 5/17/2016 | 293 | 293 | 482 | 520 |
| 6/7/2016 | 359 | 492 | 557 | 425 |
| 6/21/2016 | 539 | 569 | 889 | 993 |
| 7/5/2016 | 648 | 701 | 1107 | 938 |
| 7/19/2016 | 723 | 736 | 1210 | 1277 |
| 8/10/2016 | 540 | 564 | 1538 | 1130 |
| 8/24/2016 | 722 | 785 | 1616 | 1536 |
| 9/6/2016 | 773 | 807 | 1411 | 2048 |
| 9/19/2016 | 1049 | 1079 | 1185 | 1452 |
| 10/12/2016 | 985 | 1009 | 1118 | 1123 |

## Station LL3

| Date | TP (µg/L) | | | |
|---|---|---|---|---|
| | 0.5 m | 5 m | 10 m | B-1 |
| 5/18/2016 | 17.7 | 18.6 | 18.6 | 19.3 |
| 6/8/2016 | 5.5 | 9.5 | 9.3 | 10.5 |
| 6/22/2016 | 7.4 | 8.4 | 7.5 | 16.7 |
| 7/6/2016 | 6.5 | 7.6 | 14.8 | 36.1 |
| 7/20/2016 | 8.8 | 8.9 | 43.5 | 25.9 |
| 8/11/2016 | 8.7 | 9.5 | 12.8 | 19.4 |
| 8/25/2016 | 9.7 | 13.8 | 10.6 | 19.8 |
| 9/7/2016 | 11.0 | 10.1 | 10.7 | 21.3 |
| 9/20/2016 | 9.1 | 8.0 | 9.2 | 16.2 |
| 10/13/2016 | 14.6 | 27.8 | 15.7 | 19.9 |

| Date | SRP (µg/L) | | | |
|---|---|---|---|---|
| | 0.5 m | 5 m | 10 m | B-1 |
| 5/18/2016 | 1.1 | 1.3 | 1.5 | 2.0 |
| 6/8/2016 | 1.0 | 1.0 | 1.0 | 3.8 |
| 6/22/2016 | 1.0 | 1.0 | 1.0 | 1.4 |
| 7/6/2016 | 1.0 | 1.0 | 3.6 | 18.6 |
| 7/20/2016 | 1.5 | 1.6 | 2.7 | 15.0 |
| 8/11/2016 | 1.0 | 1.0 | 3.6 | 3.6 |
| 8/25/2016 | 1.0 | 1.0 | 1.0 | 3.0 |
| 9/7/2016 | 1.1 | 1.2 | 2.3 | 4.4 |
| 9/20/2016 | 1.0 | 1.0 | 1.1 | 7.0 |
| 10/13/2016 | 1.0 | 1.0 | 3.3 | 6.4 |

| Date | Chl (µg/L) | | |
|---|---|---|---|
| | 0.5 m | 5 m | 10 m |
| 5/18/2016 | 6.4 | 5.9 | 5.1 |
| 6/8/2016 | 4.8 | 1.4 | 4.2 |
| 6/22/2016 | 1.6 | 1.5 | 2.4 |
| 7/6/2016 | 2.5 | 3.0 | 2.2 |
| 7/20/2016 | 3.7 | 2.9 | 3.2 |
| 8/11/2016 | 5.1 | 5.1 | 5.3 |
| 8/25/2016 | 4.8 | 5.1 | 3.3 |
| 9/7/2016 | 5.1 | 5.3 | 2.8 |
| 9/20/2016 | 3.4 | 2.3 | 2.8 |
| 10/13/2016 | 3.4 | 6.1 | 3.2 |

| Date | TPN (µg/L) | | | |
|---|---|---|---|---|
| | 0.5 m | 5 m | 10 m | B-1 |
| 5/18/2016 | 442 | 514 | 585 | 601 |
| 6/8/2016 | 550 | 648 | 661 | 697 |
| 6/22/2016 | 628 | 619 | 715 | 1107 |
| 7/6/2016 | 827 | 853 | 1545 | 1475 |
| 7/20/2016 | 775 | 865 | 1690 | 1742 |
| 8/11/2016 | 522 | 573 | 1692 | 1755 |
| 8/25/2016 | 781 | 914 | 1811 | 1874 |
| 9/7/2016 | 904 | 1022 | 2103 | 2384 |
| 9/20/2016 | 1124 | 1140 | 1009 | 1817 |
| 10/13/2016 | 980 | 1210 | 1302 | 1442 |

| Date | NO3+NO2 (µg/L) | | | |
|---|---|---|---|---|
| | 0.5 m | 5 m | 10 m | B-1 |
| 5/18/2016 | 296 | 395 | 483 | 507 |
| 6/8/2016 | 445 | 521 | 552 | 543 |
| 6/22/2016 | 497 | 504 | 623 | 847 |
| 7/6/2016 | 607 | 672 | 1037 | 1007 |
| 7/20/2016 | 640 | 718 | 1297 | 1199 |
| 8/11/2016 | 487 | 503 | 1467 | 1598 |
| 8/25/2016 | 569 | 676 | 1494 | 1612 |
| 9/7/2016 | 561 | 525 | 1309 | 1418 |
| 9/20/2016 | 797 | 817 | 825 | 1552 |
| 10/13/2016 | 786 | 779 | 887 | 1017 |

## Station LL4

| Date | TP (µg/L) | | |
|---|---|---|---|
| | 0.5 m | 4 m | B-1 |
| 5/18/2016 | 17.1 | 18.2 | 18.6 |
| 6/8/2016 | 8.8 | 10.4 | 10.4 |
| 6/22/2016 | 10.5 | 7.8 | 8.5 |
| 7/6/2016 | 9.9 | 20.3 | 12.8 |
| 7/20/2016 | 15.2 | 11.2 | 11.8 |
| 8/11/2016 | 18.2 | 27.0 | 10.8 |
| 8/25/2016 | 15.7 | 21.2 | 8.0 |
| 9/7/2016 | 18.4 | 27.9 | 9.7 |
| 9/20/2016 | 15.1 | 13.1 | 9.3 |
| 10/13/2016 | 10.5 | 11.3 | 11.1 |

| Date | SRP (µg/L) | | |
|---|---|---|---|
| | 0.5 m | 4 m | B-1 |
| 5/18/2016 | 1.0 | 1.0 | 1.2 |
| 6/8/2016 | 1.0 | 1.0 | 1.1 |
| 6/22/2016 | 1.0 | 1.0 | 1.0 |
| 7/6/2016 | 1.0 | 1.0 | 1.0 |
| 7/20/2016 | 1.0 | 1.0 | 4.5 |
| 8/11/2016 | 1.0 | 1.0 | 1.0 |
| 8/25/2016 | 1.0 | 1.0 | 1.4 |
| 9/7/2016 | 1.0 | 1.6 | 3.9 |
| 9/20/2016 | 1.0 | 1.0 | 4.5 |
| 10/13/2016 | 2.7 | 3.4 | 2.7 |

| Date | Chl (µg/L) | |
|---|---|---|
| | 0.5 m | 4 m |
| 5/18/2016 | 2.1 | 2.8 |
| 6/8/2016 | 2.7 | 2.7 |
| 6/22/2016 | 2.5 | 1.3 |
| 7/6/2016 | 3.1 | 3.2 |
| 7/20/2016 | 4.2 | 4.7 |
| 8/11/2016 | 6.9 | 14.4 |
| 8/25/2016 | 7.2 | 8.3 |
| 9/7/2016 | 10.7 | 9.2 |
| 9/20/2016 | 6.8 | 5.3 |
| 10/13/2016 | 1.6 | 1.4 |

| Date | TPN (µg/L) | | |
|---|---|---|---|
| | 0.5 m | 4 m | B-1 |
| 5/18/2016 | 571 | 590 | 579 |
| 6/8/2016 | 665 | 725 | 715 |
| 6/22/2016 | 719 | 970 | 1053 |
| 7/6/2016 | 894 | 1211 | 1743 |
| 7/20/2016 | 749 | 884 | 1861 |
| 8/11/2016 | 541 | 662 | 1788 |
| 8/25/2016 | 646 | 725 | 2122 |
| 9/7/2016 | 1033 | 1057 | 2620 |
| 9/20/2016 | 783 | 1151 | 2109 |
| 10/13/2016 | 1345 | 1338 | 1115 |

| Date | NO3+NO2 (µg/L) | | |
|---|---|---|---|
| | 0.5 m | 4 m | B-1 |
| 5/18/2016 | 517 | 520 | 521 |
| 6/8/2016 | 564 | 560 | 555 |
| 6/22/2016 | 592 | 865 | 892 |
| 7/6/2016 | 655 | 835 | 1186 |
| 7/20/2016 | 541 | 679 | 1576 |
| 8/11/2016 | 443 | 475 | 1762 |
| 8/25/2016 | 377 | 412 | 1814 |
| 9/7/2016 | 416 | 436 | 1907 |
| 9/20/2016 | 562 | 904 | 1894 |
| 10/13/2016 | 871 | 948 | 916 |

## Station LL5

| Date | TP (µg/L) | |
|---|---|---|
| | 0.5 m | B-1 |
| 5/18/2016 | 18.8 | 19.2 |
| 6/8/2016 | 8.6 | 8.7 |
| 6/22/2016 | 8.4 | 9.2 |
| 7/6/2016 | 9.8 | 8.5 |
| 7/20/2016 | 12.1 | 11.3 |
| 8/11/2016 | 16.4 | 10.5 |
| 8/25/2016 | 19.3 | 8.1 |
| 9/7/2016 | 20.1 | 7.9 |
| 9/20/2016 | 6.1 | 7.6 |
| 10/13/2016 | 12.0 | 11.3 |

| Date | SRP (µg/L) | |
|---|---|---|
| | 0.5 m | B-1 |
| 5/18/2016 | 1.0 | 1.0 |
| 6/8/2016 | 1.0 | 1.1 |
| 6/22/2016 | 1.0 | 1.0 |
| 7/6/2016 | 1.0 | 1.0 |
| 7/20/2016 | 1.0 | 4.0 |
| 8/11/2016 | 1.0 | 1.0 |
| 8/25/2016 | 1.0 | 2.4 |
| 9/7/2016 | 1.0 | 3.8 |
| 9/20/2016 | 3.5 | 3.4 |
| 10/13/2016 | 4.2 | 3.4 |

| Date | Chl (µg/L) |
|---|---|
| | 0.5 m |
| 5/18/2016 | 2.8 |
| 6/8/2016 | 2.1 |
| 6/22/2016 | 2.0 |
| 7/6/2016 | 2.2 |
| 7/20/2016 | 2.9 |
| 8/11/2016 | 5.1 |
| 8/25/2016 | 5.6 |
| 9/7/2016 | 7.7 |
| 9/20/2016 | 2.8 |
| 10/13/2016 | 1.8 |

| Date | TPN (µg/L) | |
|---|---|---|
| | 0.5 m | B-1 |
| 5/18/2016 | 632 | 626 |
| 6/8/2016 | 727 | 715 |
| 6/22/2016 | 1051 | 1092 |
| 7/6/2016 | 1751 | 1706 |
| 7/20/2016 | 1097 | 1910 |
| 8/11/2016 | 590 | 1988 |
| 8/25/2016 | 761 | 2074 |
| 9/7/2016 | 1292 | 2755 |
| 9/20/2016 | 1888 | 1895 |
| 10/13/2016 | 1088 | 1199 |

| Date | NO3+NO2 (µg/L) | |
|---|---|---|
| | 0.5 m | B-1 |
| 5/18/2016 | 542 | 544 |
| 6/8/2016 | 633 | 609 |
| 6/22/2016 | 888 | 892 |
| 7/6/2016 | 1237 | 1353 |
| 7/20/2016 | 830 | 1632 |
| 8/11/2016 | 464 | 1745 |
| 8/25/2016 | 423 | 1853 |
| 9/7/2016 | 533 | 2317 |
| 9/20/2016 | 1061 | 1706 |
| 10/13/2016 | 943 | 901 |

# APPENDIX III – Lake Spokane Phytoplankton Data

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**Avista Phytoplankton 2016 (Batch 1)**
**Taxa Report with Biovolumes**

| EcoAnalysts Sample ID | Site ID | Collection Date | Volume Received (mL) | Percent Counted | Taxon | Division | Class | Order | Family | Genus | Species | Number of Natural Units | Cells per Natural Unit | Number of Cells | Units / Sample | Cells/ sample | mL (in sample received) | Cells per mL (in sample received) | AVG_BV (µ³) | Biovolume (µ³/mL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7475.01-01 | LL0-0.5M | 5/17/2016 | 475 | 0.0463% | Asterionella formosa | Bacillariophyta | Bacillariophyceae | Pennales | Fragilariaceae | Asterionella | formosa | 170 | 4.00 | 680 | 367473 | 1469894 | 774 | 3095 | 1413.72 | 4374766.60 |
| 7475.01-01 | LL0-0.5M | 5/17/2016 | 475 | 0.0463% | Aulacoseira sp. | Bacillariophyta | Bacillariophyceae | Centrales | Aulacoseiraceae | Aulacoseira | sp. | 7 | 5.00 | 35 | 15131 | 75656 | 32 | 159 | 431.97 | 68802.48 |
| 7475.01-01 | LL0-0.5M | 5/17/2016 | 475 | 0.0463% | Chroomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Chroomonas | spp. | 5 | 1.00 | 5 | 10808 | 10808 | 23 | 23 | 207.35 | 4717.88 |
| 7475.01-01 | LL0-0.5M | 5/17/2016 | 475 | 0.0463% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Pennales | Achnanthaceae | Cocconeis | sp. | 1 | 1.00 | 1 | 2162 | 2162 | 5 | 5 | 1347.74 | 6133.25 |
| 7475.01-01 | LL0-0.5M | 5/17/2016 | 475 | 0.0463% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 20 | 1.00 | 20 | 43232 | 43232 | 91 | 91 | 636.17 | 57901.35 |
| 7475.01-01 | LL0-0.5M | 5/17/2016 | 475 | 0.0463% | Dinobryon spp. | Chrysophyta | Chrysophyceae | Chrysomonadales | Dinobryaceae | Dinobryon | spp. | 6 | 1.00 | 6 | 12970 | 12970 | 27 | 27 | 3804.99 | 103893.53 |
| 7475.01-01 | LL0-0.5M | 5/17/2016 | 475 | 0.0463% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Pennales | Fragilariaceae | Fragilaria | spp. | 38 | 1.26 | 48 | 82141 | 103757 | 173 | 218 | 439.82 | 96073.29 |
| 7475.01-01 | LL0-0.5M | 5/17/2016 | 475 | 0.0463% | Monoraphidium spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Selenastraceae | Monoraphidium | spp. | 10 | 1.00 | 10 | 21616 | 21616 | 46 | 46 | 143.99 | 6552.63 |
| 7475.01-01 | LL0-0.5M | 5/17/2016 | 475 | 0.0463% | Pseudokephyrion spp. | Chrysophyta | Chrysophyceae | Chrysomonadales | Dinobryaceae | Pseudokephyrion | spp. | 7 | 1.00 | 7 | 15131 | 15131 | 32 | 32 | 335.10 | 10674.80 |
| 7475.01-01 | LL0-0.5M | 5/17/2016 | 475 | 0.0463% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Chlorococcales | Scenedesmaceae | Scenedesmus | sp. | 9 | 4.00 | 36 | 19454 | 77818 | 41 | 164 | 117.81 | 19300.48 |
| 7475.01-01 | LL0-0.5M | 5/17/2016 | 475 | 0.0463% | Unknown centrales spp. | Bacillariophyta | Bacillariophyceae | Centrales |  |  |  | 35 | 1.00 | 35 | 75656 | 75656 | 159 | 159 | 475.17 | 75682.75 |
| 7475.01-02 | LL1-0.5M | 5/17/2016 | 525 | 0.0483% | Achnanthes spp. | Bacillariophyta | Bacillariophyceae | Pennales | Achnanthaceae | Achnanthes | spp. | 5 | 1.00 | 5 | 10353 | 10353 | 20 | 20 | 235.62 | 4646.39 |
| 7475.01-02 | LL1-0.5M | 5/17/2016 | 525 | 0.0483% | Amphora sp. | Bacillariophyta | Bacillariophyceae | Pennales | Catenulaceae | Amphora | sp. | 3 | 1.00 | 3 | 6212 | 6212 | 12 | 12 | 1792.00 | 21202.87 |
| 7475.01-02 | LL1-0.5M | 5/17/2016 | 525 | 0.0483% | Asterionella formosa | Bacillariophyta | Bacillariophyceae | Pennales | Fragilariaceae | Asterionella | formosa | 218 | 6.42 | 1400 | 451389 | 2898830 | 860 | 5522 | 973.89 | 5377435.13 |
| 7475.01-02 | LL1-0.5M | 5/17/2016 | 525 | 0.0483% | Aulacoseira sp. | Bacillariophyta | Bacillariophyceae | Centrales | Aulacoseiraceae | Aulacoseira | sp. | 8 | 8.00 | 64 | 16565 | 132518 | 32 | 252 | 480.66 | 121326.88 |
| 7475.01-02 | LL1-0.5M | 5/17/2016 | 525 | 0.0483% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 21 | 1.00 | 21 | 43482 | 43482 | 83 | 83 | 1357.17 | 112405.71 |
| 7475.01-02 | LL1-0.5M | 5/17/2016 | 525 | 0.0483% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Pennales | Fragilariaceae | Fragilaria | spp. | 16 | 2.44 | 39 | 33129 | 80753 | 63 | 154 | 999.03 | 153665.67 |
| 7475.01-02 | LL1-0.5M | 5/17/2016 | 525 | 0.0483% | Pseudokephyrion spp. | Chrysophyta | Chrysophyceae | Chrysomonadales | Dinobryaceae | Pseudokephyrion | spp. | 10 | 1.00 | 10 | 20706 | 20706 | 39 | 39 | 301.59 | 11894.79 |
| 7475.01-02 | LL1-0.5M | 5/17/2016 | 525 | 0.0483% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Chlorococcales | Scenedesmaceae | Scenedesmus | sp. | 9 | 4.44 | 40 | 18635 | 82824 | 35 | 158 | 158.39 | 24987.37 |
| 7475.01-02 | LL1-0.5M | 5/17/2016 | 525 | 0.0483% | Unknown centrales spp. | Bacillariophyta | Bacillariophyceae | Centrales |  |  |  | 16 | 1.00 | 16 | 33129 | 33129 | 63 | 63 | 565.49 | 35684.37 |
| 7475.01-02 | LL1-0.5M | 5/17/2016 | 525 | 0.0483% | Unknown Dinoflagellate sp. | Pyrrhophyta | Dinophyceae |  |  |  |  | 1 | 1.00 | 1 | 2071 | 2071 | 4 | 4 | 12770.05 | 50364.91 |
| 7475.01-03 | LL2-0.5M | 5/17/2016 | 475 | 0.0555% | Asterionella formosa | Bacillariophyta | Bacillariophyceae | Pennales | Fragilariaceae | Asterionella | formosa | 215 | 6.98 | 1500 | 387288 | 2702011 | 815 | 5688 | 1376.02 | 7827401.71 |
| 7475.01-03 | LL2-0.5M | 5/17/2016 | 475 | 0.0555% | Aulacoseira sp. | Bacillariophyta | Bacillariophyceae | Centrales | Aulacoseiraceae | Aulacoseira | sp. | 9 | 7.22 | 65 | 16212 | 117087 | 34 | 246 | 923.63 | 227673.61 |
| 7475.01-03 | LL2-0.5M | 5/17/2016 | 475 | 0.0555% | Chroomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Chroomonas | spp. | 10 | 1.00 | 10 | 18013 | 18013 | 38 | 38 | 158.39 | 6006.58 |
| 7475.01-03 | LL2-0.5M | 5/17/2016 | 475 | 0.0555% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 27 | 1.00 | 27 | 48636 | 48636 | 102 | 102 | 2360.38 | 241684.33 |
| 7475.01-03 | LL2-0.5M | 5/17/2016 | 475 | 0.0555% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Pennales | Fragilariaceae | Fragilaria | spp. | 21 | 1.81 | 38 | 37828 | 68451 | 80 | 144 | 691.15 | 99599.73 |
| 7475.01-03 | LL2-0.5M | 5/17/2016 | 475 | 0.0555% | Nitzschia spp. | Bacillariophyta | Bacillariophyceae | Pennales | Bacillariaceae | Nitzschia | spp. | 8 | 1.00 | 8 | 14411 | 14411 | 30 | 30 | 578.05 | 17537.19 |
| 7475.01-03 | LL2-0.5M | 5/17/2016 | 475 | 0.0555% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Chlorococcales | Hydrodictyaceae | Pediastrum | sp. | 1 | 24.00 | 24 | 1801 | 43232 | 4 | 91 | 396.00 | 36041.98 |
| 7475.01-03 | LL2-0.5M | 5/17/2016 | 475 | 0.0555% | Pseudokephyrion spp. | Chrysophyta | Chrysophyceae | Chrysomonadales | Dinobryaceae | Pseudokephyrion | spp. | 9 | 1.00 | 9 | 16212 | 16212 | 34 | 34 | 150.80 | 5146.77 |
| 7475.01-03 | LL2-0.5M | 5/17/2016 | 475 | 0.0555% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Chlorococcales | Scenedesmaceae | Scenedesmus | sp. | 9 | 4.89 | 44 | 16212 | 79259 | 34 | 167 | 95.43 | 15922.88 |
| 7475.01-04 | LL3-0.5M | 5/18/2016 | 490 | 0.0375% | Achnanthes spp. | Bacillariophyta | Bacillariophyceae | Pennales | Achnanthaceae | Achnanthes | spp. | 4 | 1.00 | 4 | 10657 | 10657 | 22 | 22 | 204.20 | 4441.42 |
| 7475.01-04 | LL3-0.5M | 5/18/2016 | 490 | 0.0375% | Asterionella formosa | Bacillariophyta | Bacillariophyceae | Pennales | Fragilariaceae | Asterionella | formosa | 208 | 6.49 | 1350 | 554188 | 3596895 | 1131 | 7341 | 1217.37 | 8936207.39 |
| 7475.01-04 | LL3-0.5M | 5/18/2016 | 490 | 0.0375% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Pennales | Achnanthaceae | Cocconeis | sp. | 3 | 1.00 | 3 | 7993 | 7993 | 16 | 16 | 1470.27 | 23983.62 |
| 7475.01-04 | LL3-0.5M | 5/18/2016 | 490 | 0.0375% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 48 | 1.00 | 48 | 127890 | 127890 | 261 | 261 | 2360.38 | 616058.08 |
| 7475.01-04 | LL3-0.5M | 5/18/2016 | 490 | 0.0375% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Pennales | Fragilariaceae | Fragilaria | spp. | 21 | 1.57 | 33 | 55952 | 87924 | 114 | 179 | 772.83 | 138674.62 |
| 7475.01-04 | LL3-0.5M | 5/18/2016 | 490 | 0.0375% | Pseudokephyrion spp. | Chrysophyta | Chrysophyceae | Chrysomonadales | Dinobryaceae | Pseudokephyrion | spp. | 17 | 1.00 | 17 | 45294 | 45294 | 92 | 92 | 335.10 | 30975.99 |
| 7475.01-04 | LL3-0.5M | 5/18/2016 | 490 | 0.0375% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Chlorococcales | Scenedesmaceae | Scenedesmus | sp. | 14 | 5.14 | 72 | 37301 | 191834 | 76 | 391 | 254.40 | 99598.86 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Achnanthes spp. | Bacillariophyta | Bacillariophyceae | Pennales | Achnanthaceae | Achnanthes | spp. | 3 | 1.00 | 3 | 3111 | 3111 | 6 | 6 | 226.20 | 1407.58 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Amphora sp. | Bacillariophyta | Bacillariophyceae | Pennales | Catenulaceae | Amphora | sp. | 10 | 1.00 | 10 | 10371 | 10371 | 21 | 21 | 975.00 | 20224.28 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Asterionella formosa | Bacillariophyta | Bacillariophyceae | Pennales | Fragilariaceae | Asterionella | formosa | 167 | 3.89 | 650 | 173203 | 674143 | 346 | 1348 | 0.00 | 0.00 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Aulacoseira sp. | Bacillariophyta | Bacillariophyceae | Centrales | Aulacoseiraceae | Aulacoseira | sp. | 4 | 6.25 | 25 | 4149 | 25929 | 8 | 52 | 763.21 | 39577.93 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Botryococcus sp. | Chlorophyta | Chlorophyceae | Chlorococcales | Oocystaceae | Botryococcus | sp. | 2 | 14.00 | 28 | 2074 | 29040 | 4 | 58 | 50.27 | 2919.39 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Closterium sp. | Chlorophyta | Chlorophyceae | Zygnematales | Desmidiaceae | Closterium | sp. | 1 | 1.00 | 1 | 1037 | 1037 | 2 | 2 | 31299.16 | 64923.39 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 6 | 1.00 | 6 | 6223 | 6223 | 12 | 12 | 1960.35 | 24398.00 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Cymbella sp. | Bacillariophyta | Bacillariophyceae | Pennales | Cymbellaceae | Cymbella | sp. | 1 | 1.00 | 1 | 1037 | 1037 | 2 | 2 | 720.00 | 1493.49 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Dinobryon spp. | Chrysophyta | Chrysophyceae | Chrysomonadales | Dinobryaceae | Dinobryon | spp. | 16 | 1.00 | 16 | 16594 | 16594 | 33 | 33 | 1738.87 | 57710.66 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Pennales | Fragilariaceae | Fragilaria | spp. | 17 | 1.94 | 33 | 17631 | 34226 | 35 | 68 | 942.48 | 64513.95 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Pennales | Gomphonemataceae | Gomphonema | spp. | 16 | 1.00 | 16 | 16594 | 16594 | 33 | 33 | 1960.35 | 65061.33 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Monoraphidium spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Selenastraceae | Monoraphidium | spp. | 6 | 1.00 | 6 | 6223 | 6223 | 12 | 12 | 127.63 | 1588.41 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Nitzschia spp. | Bacillariophyta | Bacillariophyceae | Pennales | Bacillariaceae | Nitzschia | spp. | 24 | 1.00 | 24 | 24891 | 24891 | 50 | 50 | 486.95 | 24241.61 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Chlorococcales | Hydrodictyaceae | Pediastrum | sp. | 1 | 32.00 | 32 | 1037 | 33189 | 2 | 66 | 1152.00 | 76466.45 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Planktolyngbya spp. | Cyanophyta | Myxophyceae | Oscillatoriales | Pseudanabaenaceae | Planktolyngbya | spp. | 4 | 10.00 | 40 | 4149 | 41486 | 8 | 83 | 9.43 | 782.01 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Pseudokephyrion spp. | Chrysophyta | Chrysophyceae | Chrysomonadales | Dinobryaceae | Pseudokephyrion | spp. | 8 | 1.00 | 8 | 8297 | 8297 | 17 | 17 | 150.80 | 2502.35 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Rhoicosphenia spp. | Bacillariophyta | Bacillariophyceae | Pennales | Rhoicospheniaceae | Rhoicosphenia | spp. | 2 | 1.00 | 2 | 2074 | 2074 | 4 | 4 | 903.21 | 3747.02 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Chlorococcales | Scenedesmaceae | Scenedesmus | sp. | 3 | 4.00 | 12 | 3111 | 12446 | 6 | 25 | 44.90 | 1117.60 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Synedra sp. | Bacillariophyta | Bacillariophyceae | Pennales | Fragilariaceae | Synedra | sp. | 3 | 1.00 | 3 | 3111 | 3111 | 6 | 6 | 7657.63 | 47652.34 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Tabellaria spp. | Bacillariophyta | Bacillariophyceae | Pennales | Tabellariaceae | Tabellaria | sp. | 3 | 2.00 | 6 | 3111 | 6223 | 6 | 12 | 8064.00 | 100362.21 |
| 7475.01-05 | LL4-0.5M | 5/18/2016 | 500 | 0.0964% | Unknown centrales spp. | Bacillariophyta | Bacillariophyceae | Centrales |  |  |  | 7 | 1.00 | 7 | 7260 | 7260 | 15 | 15 | 314.16 | 4561.59 |
| 7475.01-06 | LL5-0.5M | 5/18/2016 | 500 | 0.0603% | Amphora sp. | Bacillariophyta | Bacillariophyceae | Pennales | Catenulaceae | Amphora | sp. | 16 | 1.00 | 16 | 26551 | 26551 | 53 | 53 | 480.00 | 25488.82 |
| 7475.01-06 | LL5-0.5M | 5/18/2016 | 500 | 0.0603% | Asterionella formosa | Bacillariophyta | Bacillariophyceae | Pennales | Fragilariaceae | Asterionella | formosa | 121 | 8.26 | 1000 | 200791 | 1659428 | 402 | 3319 | 1162.39 | 3857801.93 |
| 7475.01-06 | LL5-0.5M | 5/18/2016 | 500 | 0.0603% | Aulacoseira sp. | Bacillariophyta | Bacillariophyceae | Centrales | Aulacoseiraceae | Aulacoseira | sp. | 5 | 6.20 | 31 | 8297 | 51442 | 17 | 103 | 1193.02 | 122743.32 |
| 7475.01-06 | LL5-0.5M | 5/18/2016 | 500 | 0.0603% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Pennales | Achnanthaceae | Cocconeis | sp. | 15 | 1.00 | 15 | 24891 | 24891 | 50 | 50 | 1347.74 | 67094.48 |
| 7475.01-06 | LL5-0.5M | 5/18/2016 | 500 | 0.0603% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 13 | 1.00 | 13 | 21573 | 21573 | 43 | 43 | 2566.16 | 110717.22 |
| 7475.01-06 | LL5-0.5M | 5/18/2016 | 500 | 0.0603% | Dinobryon spp. | Chrysophyta | Chrysophyceae | Chrysomonadales | Dinobryaceae | Dinobryon | spp. | 11 | 1.00 | 11 | 18254 | 18254 | 37 | 37 | 1541.48 | 56275.27 |
| 7475.01-06 | LL5-0.5M | 5/18/2016 | 500 | 0.0603% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Pennales | Fragilariaceae | Fragilaria | spp. | 47 | 1.66 | 78 | 77993 | 129435 | 156 | 259 | 1036.73 | 268378.07 |
| 7475.01-06 | LL5-0.5M | 5/18/2016 | 500 | 0.0603% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Pennales | Gomphonemataceae | Gomphonema | spp. | 22 | 1.00 | 22 | 36507 | 36507 | 73 | 73 | 714.71 | 52184.58 |
| 7475.01-06 | LL5-0.5M | 5/18/2016 | 500 | 0.0603% | Melosira sp. | Bacillariophyta | Bacillariophyceae | Centrales | Melosiraceae | Melosira | sp. | 8 | 4.00 | 32 | 13275 | 53102 | 27 | 106 | 10386.89 | 1103123.12 |
| 7475.01-06 | LL5-0.5M | 5/18/2016 | 500 | 0.0603% | Nitzschia spp. | Bacillariophyta | Bacillariophyceae | Pennales | Bacillariaceae | Nitzschia | spp. | 17 | 1.00 | 17 | 28210 | 28210 | 56 | 56 | 769.69 | 43426.34 |
| 7475.01-06 | LL5-0.5M | 5/18/2016 | 500 | 0.0603% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Chlorococcales | Scenedesmaceae | Scenedesmus | sp. | 12 | 4.00 | 48 | 19913 | 79653 | 40 | 159 | 307.88 | 49046.22 |
| 7475.01-06 | LL5-0.5M | 5/18/2016 | 500 | 0.0603% | Synedra sp. | Bacillariophyta | Bacillariophyceae | Pennales | Fragilariaceae | Synedra | sp. | 2 | 1.00 | 2 | 3319 | 3319 | 7 | 7 | 4594.58 | 30497.49 |
| 7475.01-06 | LL5-0.5M | 5/18/2016 | 500 | 0.0603% | Tabellaria spp. | Bacillariophyta | Bacillariophyceae | Pennales | Tabellariaceae | Tabellaria | sp. | 4 | 1.00 | 4 | 6638 | 6638 | 13 | 13 | 1872.00 | 24851.60 |
| 7475.01-06 | LL5-0.5M | 5/18/2016 | 500 | 0.0603% | Unknown centrales spp. | Bacillariophyta | Bacillariophyceae | Centrales |  |  |  | 8 | 1.00 | 8 | 13275 | 13275 | 27 | 27 | 519.35 | 13789.05 |

**Avista Phytoplankton 2016 (Batch2)**
**Taxa Report with Biovolumes**

EcoAnalysts, Inc.

| EcoAnalysts Sample ID | Site ID | Collection Date | Volume Received (mL) | Percent Counted | Taxon | Division | Class | Order | Family | Genus | Species | Number of Natural Units | Cells per Natural Unit | Number of Cells | Units / Sample | Cells/ sample | Units per mL (in sample received) | Cells per mL (in sample received) | AVG_BV (µ³) | Biovolume (µ³/mL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7475.03-01 | LL0-0.5M | 6/7/2016 | 560 | 0.23% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 85 | 4.235294118 | 360 | 36861.44 | 156119.04 | 65.824 | 278.784 | 989.602 | 275885.204 |
| 7475.03-01 | LL0-0.5M | 6/7/2016 | 560 | 0.23% | Coelastrum sp. | Chlorophyta | Chlorophyceae | Scenedesmaceae | Coelastroideae | Coelastrum | sp. | 1 | 16 | 16 | 433.664 | 6938.624 | 0.7744 | 12.3904 | 113.097 | 1401.317069 |
| 7475.03-01 | LL0-0.5M | 6/7/2016 | 560 | 0.23% | Elakatothrix sp. | Charophyta | Klebsormidiophyceae | Klebsormidiales | Elakatotrichaceae | Elakatothrix | sp. | 24 | 4 | 96 | 10407.936 | 41631.744 | 18.5856 | 74.3424 | 2042.035 | 151809.7828 |
| 7475.03-01 | LL0-0.5M | 6/7/2016 | 560 | 0.23% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 112 | 1.267857143 | 142 | 48570.368 | 61580.288 | 86.7328 | 109.9648 | 282.743 | 31091.77745 |
| 7475.03-01 | LL0-0.5M | 6/7/2016 | 560 | 0.23% | Monoraphidium spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Selenastraceae | Monoraphidium | spp. | 10 | 1 | 10 | 4336.64 | 4336.64 | 7.744 | 7.744 | 146.084 | 1131.274496 |
| 7475.03-01 | LL0-0.5M | 6/7/2016 | 560 | 0.23% | Pandorina sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Volvocaceae | Pandorina | sp. | 7 | 12 | 84 | 3035.648 | 36427.776 | 5.4208 | 65.0496 | 245.044 | 15940.01418 |
| 7475.03-01 | LL0-0.5M | 6/7/2016 | 560 | 0.23% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 3 | 16 | 48 | 1300.992 | 20815.872 | 2.3232 | 37.1712 | 143.99 | 5352.281088 |
| 7475.03-01 | LL0-0.5M | 6/7/2016 | 560 | 0.23% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 9 | 12 | 108 | 3902.976 | 46835.712 | 6.9696 | 83.6352 | 381.704 | 31923.89038 |
| 7475.03-01 | LL0-0.5M | 6/7/2016 | 560 | 0.23% | Unknown centrales spp. | Bacillariophyta | Bacillariophyceae | Centrales |  |  |  | 6 | 1 | 6 | 2601.984 | 2601.984 | 4.6464 | 4.6464 | 201.062 | 934.2144768 |
| 7475.03-01 | LL0-0.5M | 6/7/2016 | 560 | 0.23% | Unknown Chlorophyte sp. | Chlorophyta | Chlorophyceae |  |  |  |  | 46 | 8 | 368 | 19948.544 | 159588.352 | 35.6224 | 284.9792 | 268.083 | 76398.07887 |
| 7475.03-02 | LL1-0.5M | 6/7/2016 | 580 | 0.38% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 141 | 4 | 564 | 37498.28586 | 149993.1434 | 64.65221699 | 258.608868 | 1005.31 | 259982.0811 |
| 7475.03-02 | LL1-0.5M | 6/7/2016 | 580 | 0.38% | Botryococcus sp. | Chlorophyta | Trebouxiophyceae | Trebouxiales | Botryococcaceae | Botryococcus | sp. | 4 | 15 | 60 | 1063.781159 | 15956.71739 | 1.834105447 | 27.5115817 | 117.81 | 3241.13944 |
| 7475.03-02 | LL1-0.5M | 6/7/2016 | 580 | 0.38% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 30 | 1 | 30 | 7978.358693 | 7978.358693 | 13.75579085 | 13.75579085 | 2123.717 | 29213.40688 |
| 7475.03-02 | LL1-0.5M | 6/7/2016 | 580 | 0.38% | Elakatothrix sp. | Charophyta | Klebsormidiophyceae | Klebsormidiales | Elakatotrichaceae | Elakatothrix | sp. | 14 | 4 | 56 | 3723.234057 | 14892.93623 | 6.419369063 | 25.67747625 | 1654.049 | 42471.80392 |
| 7475.03-02 | LL1-0.5M | 6/7/2016 | 580 | 0.38% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 59 | 1.338983051 | 79 | 15690.7721 | 21009.67789 | 27.05305534 | 36.22358257 | 659.734 | 23897.92902 |
| 7475.03-02 | LL1-0.5M | 6/7/2016 | 580 | 0.38% | Gymnodinium sp. | Miozoa | Dinophyceae | Gymnodiniales | Gymnodiniaceae | Gymnodinium | sp. | 15 | 1 | 15 | 3989.179346 | 3989.179346 | 6.877895425 | 6.877895425 | 8143.008 | 56006.75747 |
| 7475.03-02 | LL1-0.5M | 6/7/2016 | 580 | 0.38% | Monoraphidium spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Selenastraceae | Monoraphidium | spp. | 2 | 1 | 2 | 531.8905795 | 531.8905795 | 0.917052723 | 0.917052723 | 131.947 | 121.0023557 |
| 7475.03-02 | LL1-0.5M | 6/7/2016 | 580 | 0.38% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 32 | 8 | 256 | 8510.249272 | 68081.99418 | 14.67284357 | 117.3827486 | 174.227 | 20451.24414 |
| 7475.03-02 | LL1-0.5M | 6/7/2016 | 580 | 0.38% | Tetraëdron sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Tetraëdron | sp. | 1 | 1 | 1 | 265.9452898 | 265.9452898 | 0.458526362 | 0.458526362 | 845 | 387.4547756 |
| 7475.03-02 | LL1-0.5M | 6/7/2016 | 580 | 0.38% | Unknown centrales spp. | Bacillariophyta | Bacillariophyceae | Centrales |  |  |  | 6 | 1 | 6 | 1595.671739 | 1595.671739 | 2.75115817 | 2.75115817 | 115.454 | 317.6322153 |
| 7475.03-03 | LL2-0.5M | 6/7/2016 | 550 | 0.65% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 134 | 3.701492537 | 496 | 20579.31284 | 76174.17289 | 37.41693243 | 138.4984962 | 967.611 | 134012.6684 |
| 7475.03-03 | LL2-0.5M | 6/7/2016 | 550 | 0.65% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 1 | 12 | 12 | 153.5769615 | 1842.923538 | 0.279230839 | 3.350770068 | 1193.02 | 3997.535707 |
| 7475.03-03 | LL2-0.5M | 6/7/2016 | 550 | 0.65% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 57 | 1 | 57 | 8753.886804 | 8753.886804 | 15.91615783 | 15.91615783 | 3063.053 | 48752.03497 |
| 7475.03-03 | LL2-0.5M | 6/7/2016 | 550 | 0.65% | Dinobryon spp. | Ochrophyta | Chrysophyceae | Chromulinales | Dinobryaceae | Dinobryon | spp. | 3 | 6 | 18 | 460.7308844 | 2764.385306 | 0.837692517 | 5.026155103 | 1273.392 | 6400.265699 |
| 7475.03-03 | LL2-0.5M | 6/7/2016 | 550 | 0.65% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 37 | 1.405405405 | 52 | 5682.347574 | 7986.001997 | 10.33154104 | 14.52000363 | 816.814 | 11860.14225 |
| 7475.03-03 | LL2-0.5M | 6/7/2016 | 550 | 0.65% | Monoraphidium spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Selenastraceae | Monoraphidium | spp. | 5 | 1 | 5 | 767.8848074 | 767.8848074 | 1.396154195 | 1.396154195 | 134.696 | 188.0563855 |
| 7475.03-03 | LL2-0.5M | 6/7/2016 | 550 | 0.65% | Pandorina sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Volvocaceae | Pandorina | sp. | 3 | 16 | 48 | 460.7308844 | 7371.694151 | 0.837692517 | 13.40308027 | 720.996 | 9663.567265 |
| 7475.03-03 | LL2-0.5M | 6/7/2016 | 550 | 0.65% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 49 | 8 | 392 | 7525.271112 | 60202.1689 | 13.68231111 | 109.4584889 | 245.044 | 26822.14595 |
| 7475.03-03 | LL2-0.5M | 6/7/2016 | 550 | 0.65% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 1 | 18 | 18 | 153.5769615 | 2764.385306 | 0.279230839 | 5.026155103 | 220.893 | 1110.242479 |
| 7475.03-03 | LL2-0.5M | 6/7/2016 | 550 | 0.65% | Unknown centrales spp. | Bacillariophyta | Bacillariophyceae | Centrales |  |  |  | 11 | 1 | 11 | 1689.346576 | 1689.346576 | 3.071539229 | 3.071539229 | 254.469 | 781.6115162 |
| 7475.03-04 | LL3-0.5M | 6/8/2016 | 520 | 0.36% | Achnanthes spp. | Bacillariophyta | Bacillariophyceae | Mastogloiales | Achnanthaceae | Achnanthes | spp. | 3 | 1 | 3 | 823.6798353 | 823.6798353 | 1.583999683 | 1.583999683 | 212.058 | 335.8998048 |
| 7475.03-04 | LL3-0.5M | 6/8/2016 | 520 | 0.36% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 167 | 6.586826347 | 1100 | 45851.51083 | 302015.9396 | 88.17598236 | 580.7998838 | 1240.929 | 720731.4191 |
| 7475.03-04 | LL3-0.5M | 6/8/2016 | 520 | 0.36% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 6 | 10 | 60 | 1647.359671 | 16473.59671 | 3.167999366 | 31.67999366 | 2162.987 | 68523.41446 |
| 7475.03-04 | LL3-0.5M | 6/8/2016 | 520 | 0.36% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Cocconeidaceae | Cocconeis | sp. | 3 | 1 | 3 | 823.6798353 | 823.6798353 | 1.583999683 | 1.583999683 | 452.389 | 716.5840327 |
| 7475.03-04 | LL3-0.5M | 6/8/2016 | 520 | 0.36% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 9 | 1 | 9 | 2471.039506 | 2471.039506 | 4.75199905 | 4.75199905 | 3298.672 | 15675.28621 |
| 7475.03-04 | LL3-0.5M | 6/8/2016 | 520 | 0.36% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 2 | 16 | 32 | 549.1198902 | 8785.918243 | 1.055999789 | 16.89599662 | 30.206 | 510.3604739 |
| 7475.03-04 | LL3-0.5M | 6/8/2016 | 520 | 0.36% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 50 | 1.5 | 75 | 13727.99725 | 20591.99588 | 26.39999472 | 39.59999208 | 829.38 | 32843.44143 |
| 7475.03-04 | LL3-0.5M | 6/8/2016 | 520 | 0.36% | Gymnodinium spp. | Miozoa | Dinophyceae | Gymnodiniales | Gymnodiniaceae | Gymnodinium | spp. | 2 | 1 | 2 | 549.1198902 | 549.1198902 | 1.055999789 | 1.055999789 | 2002.765 | 2114.919417 |
| 7475.03-04 | LL3-0.5M | 6/8/2016 | 520 | 0.36% | Monoraphidium spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Selenastraceae | Monoraphidium | spp. | 4 | 1 | 4 | 1098.23978 | 1098.23978 | 2.111999578 | 2.111999578 | 85.085 | 179.6994841 |
| 7475.03-04 | LL3-0.5M | 6/8/2016 | 520 | 0.36% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 1 | 8 | 8 | 274.5599451 | 2196.479561 | 0.527999894 | 4.223999155 | 504 | 2128.895574 |
| 7475.03-04 | LL3-0.5M | 6/8/2016 | 520 | 0.36% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 36 | 4.555555556 | 164 | 9884.158023 | 45027.83099 | 19.0079962 | 86.59198268 | 130.9 | 11334.89053 |
| 7475.03-04 | LL3-0.5M | 6/8/2016 | 520 | 0.36% | Synedra sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Synedra | sp. | 12 | 1 | 12 | 3294.719341 | 3294.719341 | 6.335998733 | 6.335998733 | 8933.904 | 56605.20442 |
| 7475.03-04 | LL3-0.5M | 6/8/2016 | 520 | 0.36% | Unknown centrales spp. | Bacillariophyta | Bacillariophyceae | Centrales |  |  |  | 6 | 1 | 6 | 1647.359671 | 1647.359671 | 3.167999366 | 3.167999366 | 198.804 | 629.810946 |
| 7475.03-05 | LL4-0.5M | 6/8/2016 | 550 | 0.20% | Achnanthes spp. | Bacillariophyta | Bacillariophyceae | Mastogloiales | Achnanthaceae | Achnanthes | spp. | 18 | 1 | 18 | 8984.252246 | 8984.252246 | 16.33500408 | 16.33500408 | 414.69 | 6773.962843 |
| 7475.03-05 | LL4-0.5M | 6/8/2016 | 550 | 0.20% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 134 | 6 | 804 | 66882.76672 | 401296.6003 | 121.6050304 | 729.6301824 | 741.416 | 540959.4913 |
| 7475.03-05 | LL4-0.5M | 6/8/2016 | 550 | 0.20% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Cocconeidaceae | Cocconeis | sp. | 1 | 1 | 1 | 499.1251248 | 499.1251248 | 0.907500227 | 0.907500227 | 477.522 | 433.3513233 |
| 7475.03-05 | LL4-0.5M | 6/8/2016 | 550 | 0.20% | Cymbella sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Cymbellaceae | Cymbella | sp. | 32 | 1 | 32 | 15972.00399 | 15972.00399 | 29.04000726 | 29.04000726 | 1326 | 38507.04963 |
| 7475.03-05 | LL4-0.5M | 6/8/2016 | 550 | 0.20% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 45 | 1.4 | 63 | 22460.63062 | 31444.88286 | 40.83751021 | 57.17251429 | 1149.823 | 65738.2719 |
| 7475.03-05 | LL4-0.5M | 6/8/2016 | 550 | 0.20% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | spp. | 11 | 1 | 11 | 5490.376373 | 5490.376373 | 9.982502496 | 9.982502496 | 1229.934 | 12277.81922 |
| 7475.03-05 | LL4-0.5M | 6/8/2016 | 550 | 0.20% | Melosira sp. | Bacillariophyta | Coscinodiscophyceae | Melosirales | Melosiraceae | Melosira | sp. | 8 | 1 | 8 | 3993.000998 | 3993.000998 | 7.260001815 | 7.260001815 | 9110.619 | 66143.11048 |
| 7475.03-05 | LL4-0.5M | 6/8/2016 | 550 | 0.20% | Navicula spp. | Bacillariophyta | Bacillariophyceae | Naviculales | Naviculaceae | Navicula | spp. | 8 | 1 | 8 | 3993.000998 | 3993.000998 | 7.260001815 | 7.260001815 | 628.319 | 4561.59708 |
| 7475.03-05 | LL4-0.5M | 6/8/2016 | 550 | 0.20% | Nitzschia spp. | Bacillariophyta | Bacillariophyceae | Bacillariales | Bacillariaceae | Nitzschia | spp. | 6 | 1 | 6 | 2994.750749 | 2994.750749 | 5.445001361 | 5.445001361 | 12440.707 | 67739.66655 |
| 7475.03-05 | LL4-0.5M | 6/8/2016 | 550 | 0.20% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 6 | 8 | 48 | 2994.750749 | 23958.00599 | 5.445001361 | 43.56001089 | 672 | 29272.32732 |
| 7475.03-05 | LL4-0.5M | 6/8/2016 | 550 | 0.20% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 5 | 4 | 20 | 2495.625624 | 9982.502496 | 4.537501134 | 18.15000454 | 142.55 | 2587.283147 |
| 7475.03-05 | LL4-0.5M | 6/8/2016 | 550 | 0.20% | Synedra sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Synedra | sp. | 18 | 1 | 18 | 8984.252246 | 8984.252246 | 16.33500408 | 16.33500408 | 8293.805 | 135479.3385 |
| 7475.03-05 | LL4-0.5M | 6/8/2016 | 550 | 0.20% | Tabellaria sp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Tabellaria | sp. | 2 | 1 | 2 | 998.2502496 | 998.2502496 | 1.815000454 | 1.815000454 | 7700 | 13975.50349 |
| 7475.03-05 | LL4-0.5M | 6/8/2016 | 550 | 0.20% | Unknown centrales spp. | Bacillariophyta | Bacillariophyceae | Centrales |  |  |  | 13 | 1 | 13 | 6488.626622 | 6488.626622 | 11.79750295 | 11.79750295 | 475.166 | 5605.772286 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Achnanthes spp. | Bacillariophyta | Bacillariophyceae | Mastogloiales | Achnanthaceae | Achnanthes | spp. | 10 | 1 | 10 | 3025 | 3025 | 6.05 | 6.05 | 301.593 | 1824.63765 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Amphora sp. | Bacillariophyta | Bacillariophyceae | Thalassiophysales | Catenulaceae | Amphora | sp. | 23 | 1 | 23 | 6957.5 | 6957.5 | 13.915 | 13.915 | 567 | 7889.805 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 153 | 6 | 918 | 46282.5 | 277695 | 92.565 | 555.39 | 942.478 | 523442.8564 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 5 | 6 | 30 | 1512.5 | 9075 | 3.025 | 18.15 | 424.115 | 7697.68725 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Cocconeidaceae | Cocconeis | sp. | 5 | 1 | 5 | 1512.5 | 1512.5 | 3.025 | 3.025 | 1693.318 | 5122.28695 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Cymbella sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Cymbellaceae | Cymbella | sp. | 4 | 1 | 4 | 1210 | 1210 | 2.42 | 2.42 | 400 | 968 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Dinobryon spp. | Ochrophyta | Chrysophyceae | Chromulinales | Dinobryaceae | Dinobryon | spp. | 3 | 5 | 15 | 907.5 | 4537.5 | 1.815 | 9.075 | 3920.708 | 35580.4251 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 34 | 1.588235294 | 54 | 10285 | 16335 | 20.57 | 32.67 | 973.894 | 31817.11698 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | spp. | 7 | 1 | 7 | 2117.5 | 2117.5 | 4.235 | 4.235 | 1781.283 | 7543.733505 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Melosira sp. | Bacillariophyta | Coscinodiscophyceae | Melosirales | Melosiraceae | Melosira | sp. | 4 | 3 | 12 | 1210 | 3630 | 2.42 | 7.26 | 18653.206 | 135422.2756 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Monoraphidium spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Selenastraceae | Monoraphidium | spp. | 2 | 1 | 2 | 605 | 605 | 1.21 | 1.21 | 146.084 | 176.76164 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Navicula spp. | Bacillariophyta | Bacillariophyceae | Naviculales | Naviculaceae | Navicula | spp. | 6 | 1 | 6 | 1815 | 1815 | 3.63 | 3.63 | 1083.849 | 3934.37187 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Roya spp. | Charophyta | Conjugatophyceae | Zygnematales | Mesotaeniaceae | Roya | spp. | 5 | 1 | 5 | 1512.5 | 1512.5 | 3.025 | 3.025 | 9954.922 | 30113.63905 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Synedra sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Synedra | sp. | 10 | 1 | 10 | 3025 | 3025 | 6.05 | 6.05 | 11506.868 | 69616.5514 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Tabellaria spp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Tabellaria | sp. | 2 | 1 | 2 | 605 | 605 | 1.21 | 1.21 | 880 | 1064.8 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Teilingia sp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Teilingia | sp. | 4 | 2 | 8 | 1210 | 2420 | 2.42 | 4.84 | 1884.956 | 9123.18704 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Tetraëdron sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Tetraëdron | sp. | 1 | 1 | 1 | 302.5 | 302.5 | 0.605 | 0.605 | 400 | 242 |
| 7475.03-06 | LL5-0.5M | 6/8/2016 | 500 | 0.33% | Unknown centrales spp. | Bacillariophyta | Bacillariophyceae | Centrales |  |  |  | 22 | 1 | 22 | 6655 | 6655 | 13.31 | 13.31 | 622.035 | 8279.28585 |

**Avista Phytoplankton 2016 (Batch3)**
**Taxa Report with Biovolumes**

| EcoAnalysts Sample ID | Site ID | Collection Date | Volume Received (mL) | Percent Counted | Taxon | Division | Class | Order | Family | Genus | Species | Number of Natural Units | Cells per Natural Unit | Number of Cells | Units / Sample | Cells/ sample | Units per mL (in sample received) | Cells per mL (in sample received) | AVG_BV (µ³) | Biovolume (µ³/mL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7475.05-01 | LL0-0.5M | 6/21/2016 | 542 | 1.18% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 28 | 4.00 | 112 | 2370 | 9482 | 4 | 17 | 816.81 | 14289.67 |
| 7475.05-01 | LL0-0.5M | 6/21/2016 | 542 | 1.18% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 4 | 7.75 | 31 | 339 | 2624 | 1 | 5 | 1357.17 | 6571.68 |
| 7475.05-01 | LL0-0.5M | 6/21/2016 | 542 | 1.18% | Botryococcus sp. | Chlorophyta | Trebouxiophyceae | Trebouxiales | Botryococcaceae | Botryococcus | sp. | 4 | 17.00 | 68 | 339 | 5757 | 1 | 11 | 67.02 | 711.87 |
| 7475.05-01 | LL0-0.5M | 6/21/2016 | 542 | 1.18% | Chroomonas spp. | Cryptophyta | Cryptophyceae | Pyrenomonadales | Chroomonadaceae | Chroomonas | spp. | 7 | 1.00 | 7 | 593 | 593 | 1 | 1 | 188.50 | 206.10 |
| 7475.05-01 | LL0-0.5M | 6/21/2016 | 542 | 1.18% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 41 | 1.00 | 41 | 3471 | 3471 | 6 | 6 | 2212.21 | 14167.40 |
| 7475.05-01 | LL0-0.5M | 6/21/2016 | 542 | 1.18% | Elakatothrix sp. | Charophyta | Klebsormidiophyceae | Klebsormidiales | Elakatotrichaceae | Elakatothrix | sp. | 1 | 32.00 | 32 | 85 | 2709 | 0 | 5 | 2748.89 | 13740.07 |
| 7475.05-01 | LL0-0.5M | 6/21/2016 | 542 | 1.18% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 116 | 2.21 | 256 | 9821 | 21673 | 18 | 40 | 980.18 | 39194.53 |
| 7475.05-01 | LL0-0.5M | 6/21/2016 | 542 | 1.18% | Planktolyngbya spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Leptolyngbyaceae | Planktolyngbya | spp. | 10 | 7.50 | 75 | 847 | 6350 | 2 | 12 | 12.27 | 143.77 |
| 7475.05-01 | LL0-0.5M | 6/21/2016 | 542 | 1.18% | Pseudokephyrion spp. | Ochrophyta | Chrysophyceae | Chromulinales | Dinobryaceae | Pseudokephyrion | spp. | 3 | 1.00 | 3 | 254 | 254 | 0 | 0 | 58.64 | 27.48 |
| 7475.05-01 | LL0-0.5M | 6/21/2016 | 542 | 1.18% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 68 | 6.24 | 424 | 5757 | 35896 | 11 | 66 | 1204.28 | 79757.80 |
| 7475.05-01 | LL0-0.5M | 6/21/2016 | 542 | 1.18% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 10 | 7.20 | 72 | 847 | 6096 | 2 | 11 | 65.45 | 736.08 |
| 7475.05-01 | LL0-0.5M | 6/21/2016 | 542 | 1.18% | Tetraëdron sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Tetraëdron | sp. | 3 | 1.00 | 3 | 254 | 254 | 0 | 0 | 283.50 | 132.85 |
| 7475.05-01 | LL0-0.5M | 6/21/2016 | 542 | 1.18% | Unknown centrales spp. | Bacillariophyta | Bacillariophyceae | Centrales | | | | 7 | 1.00 | 7 | 593 | 593 | 1 | 1 | 1060.29 | 1159.32 |
| 7475.05-02 | LL1-0.5M | 6/21/2016 | 548 | 5.60% | Amphora sp. | Bacillariophyta | Bacillariophyceae | Thalassiophysales | Catenulaceae | Amphora | sp. | 3 | 1.00 | 3 | 54 | 54 | 0 | 0 | 10296.00 | 1005.71 |
| 7475.05-02 | LL1-0.5M | 6/21/2016 | 548 | 5.60% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 18 | 4.00 | 72 | 321 | 1285 | 1 | 2 | 541.93 | 1270.45 |
| 7475.05-02 | LL1-0.5M | 6/21/2016 | 548 | 5.60% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 4 | 6.25 | 25 | 71 | 446 | 0 | 1 | 730.03 | 594.24 |
| 7475.05-02 | LL1-0.5M | 6/21/2016 | 548 | 5.60% | Chroomonas spp. | Cryptophyta | Cryptophyceae | Pyrenomonadales | Chroomonadaceae | Chroomonas | spp. | 7 | 1.00 | 7 | 125 | 125 | 0 | 0 | 169.65 | 38.67 |
| 7475.05-02 | LL1-0.5M | 6/21/2016 | 548 | 5.60% | Cosmarium spp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Cosmarium | spp. | 3 | 1.00 | 3 | 54 | 54 | 0 | 0 | 13940.29 | 1361.69 |
| 7475.05-02 | LL1-0.5M | 6/21/2016 | 548 | 5.60% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 51 | 1.00 | 51 | 910 | 910 | 2 | 2 | 3298.67 | 5477.64 |
| 7475.05-02 | LL1-0.5M | 6/21/2016 | 548 | 5.60% | Cymbella sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Cymbellaceae | Cymbella | sp. | 3 | 1.00 | 3 | 54 | 54 | 0 | 0 | 2816.00 | 275.07 |
| 7475.05-02 | LL1-0.5M | 6/21/2016 | 548 | 5.60% | Dinobryon spp. | Ochrophyta | Chrysophyceae | Chromulinales | Dinobryaceae | Dinobryon | spp. | 2 | 1.00 | 2 | 36 | 36 | 0 | 0 | 4155.28 | 270.59 |
| 7475.05-02 | LL1-0.5M | 6/21/2016 | 548 | 5.60% | Elakatothrix sp. | Charophyta | Klebsormidiophyceae | Klebsormidiales | Elakatotrichaceae | Elakatothrix | sp. | 6 | 4.00 | 24 | 107 | 428 | 0 | 1 | 1507.96 | 1178.38 |
| 7475.05-02 | LL1-0.5M | 6/21/2016 | 548 | 5.60% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 123 | 1.00 | 123 | 2195 | 2195 | 4 | 4 | 433.54 | 1736.28 |
| 7475.05-02 | LL1-0.5M | 6/21/2016 | 548 | 5.60% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | spp. | 2 | 1.00 | 2 | 36 | 36 | 0 | 0 | 835.66 | 54.42 |
| 7475.05-02 | LL1-0.5M | 6/21/2016 | 548 | 5.60% | Planktolyngbya spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Leptolyngbyaceae | Planktolyngbya | spp. | 14 | 7.00 | 98 | 250 | 1749 | 0 | 3 | 6.28 | 20.05 |
| 7475.05-02 | LL1-0.5M | 6/21/2016 | 548 | 5.60% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 48 | 6.42 | 308 | 856 | 5496 | 2 | 10 | 174.23 | 1747.23 |
| 7475.05-02 | LL1-0.5M | 6/21/2016 | 548 | 5.60% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 23 | 8.00 | 184 | 410 | 3283 | 1 | 6 | 179.59 | 1075.96 |
| 7475.05-02 | LL1-0.5M | 6/21/2016 | 548 | 5.60% | Staurosira sp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Staurosira | sp. | 2 | 12.50 | 25 | 36 | 446 | 0 | 1 | 129.59 | 105.49 |
| 7475.05-02 | LL1-0.5M | 6/21/2016 | 548 | 5.60% | Unknown centrales spp. | Bacillariophyta | Bacillariophyceae | Centrales | | | | 2 | 1.00 | 2 | 36 | 36 | 0 | 0 | 730.03 | 47.54 |
| 7475.05-03 | LL2-0.5M | 6/21/2016 | 560 | 1.15% | Achnanthes spp. | Bacillariophyta | Bacillariophyceae | Mastogloiales | Achnanthaceae | Achnanthes | spp. | 7 | 1.00 | 7 | 607 | 607 | 1 | 1 | 245.04 | 265.67 |
| 7475.05-03 | LL2-0.5M | 6/21/2016 | 560 | 1.15% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 12 | 3.00 | 36 | 1041 | 3122 | 2 | 6 | 615.75 | 3433.24 |
| 7475.05-03 | LL2-0.5M | 6/21/2016 | 560 | 1.15% | Chroomonas spp. | Cryptophyta | Cryptophyceae | Pyrenomonadales | Chroomonadaceae | Chroomonas | spp. | 17 | 1.00 | 17 | 1474 | 1474 | 3 | 3 | 169.65 | 446.67 |
| 7475.05-03 | LL2-0.5M | 6/21/2016 | 560 | 1.15% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 73 | 1.00 | 73 | 6331 | 6331 | 11 | 11 | 2770.89 | 31328.29 |
| 7475.05-03 | LL2-0.5M | 6/21/2016 | 560 | 1.15% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 63 | 1.00 | 63 | 5464 | 5464 | 10 | 10 | 1074.43 | 10483.64 |
| 7475.05-03 | LL2-0.5M | 6/21/2016 | 560 | 1.15% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | spp. | 5 | 1.00 | 5 | 434 | 434 | 1 | 1 | 1451.42 | 1123.98 |
| 7475.05-03 | LL2-0.5M | 6/21/2016 | 560 | 1.15% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 1 | 4.00 | 4 | 87 | 347 | 0 | 1 | 1206.37 | 747.37 |
| 7475.05-03 | LL2-0.5M | 6/21/2016 | 560 | 1.15% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 101 | 6.00 | 606 | 8760 | 52560 | 16 | 94 | 158.39 | 14865.96 |
| 7475.05-03 | LL2-0.5M | 6/21/2016 | 560 | 1.15% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 17 | 8.00 | 136 | 1474 | 11796 | 3 | 21 | 143.79 | 3028.81 |
| 7475.05-03 | LL2-0.5M | 6/21/2016 | 560 | 1.15% | Synedra sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Synedra | sp. | 4 | 1.00 | 4 | 347 | 347 | 1 | 1 | 7181.68 | 4449.20 |
| 7475.05-03 | LL2-0.5M | 6/21/2016 | 560 | 1.15% | Unknown centrales spp. | Bacillariophyta | Bacillariophyceae | Centrales | | | | 2 | 1.00 | 2 | 173 | 173 | 0 | 0 | 1407.43 | 435.97 |
| 7475.05-04 | LL3-0.5M | 6/22/2016 | 550 | 1.23% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 7 | 6.00 | 42 | 570 | 3423 | 1 | 6 | 766.55 | 4770.13 |
| 7475.05-04 | LL3-0.5M | 6/22/2016 | 550 | 1.23% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 7 | 5.00 | 35 | 570 | 2852 | 1 | 5 | 510.51 | 2647.35 |
| 7475.05-04 | LL3-0.5M | 6/22/2016 | 550 | 1.23% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 32 | 1.00 | 32 | 2608 | 2608 | 5 | 5 | 2300.69 | 10908.10 |
| 7475.05-04 | LL3-0.5M | 6/22/2016 | 550 | 1.23% | Elakatothrix sp. | Charophyta | Klebsormidiophyceae | Klebsormidiales | Elakatotrichaceae | Elakatothrix | sp. | 3 | 8.00 | 24 | 244 | 1956 | 0 | 4 | 3506.02 | 12467.11 |
| 7475.05-04 | LL3-0.5M | 6/22/2016 | 550 | 1.23% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 52 | 1.96 | 102 | 4237 | 8312 | 8 | 15 | 659.73 | 9970.33 |
| 7475.05-04 | LL3-0.5M | 6/22/2016 | 550 | 1.23% | Monoraphidium spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Selenastraceae | Monoraphidium | spp. | 5 | 1.00 | 5 | 407 | 407 | 1 | 1 | 192.42 | 142.55 |
| 7475.05-04 | LL3-0.5M | 6/22/2016 | 550 | 1.23% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 6 | 1.00 | 6 | 489 | 489 | 1 | 1 | 3180.86 | 2827.72 |
| 7475.05-04 | LL3-0.5M | 6/22/2016 | 550 | 1.23% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 125 | 8.00 | 1000 | 10186 | 81490 | 19 | 148 | 359.19 | 53218.63 |
| 7475.05-04 | LL3-0.5M | 6/22/2016 | 550 | 1.23% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 65 | 5.54 | 360 | 5297 | 29336 | 10 | 53 | 199.53 | 10642.80 |
| 7475.05-04 | LL3-0.5M | 6/22/2016 | 550 | 1.23% | Unknown centrales spp. | Bacillariophyta | Bacillariophyceae | Centrales | | | | 5 | 1.00 | 5 | 407 | 407 | 1 | 1 | 565.49 | 418.92 |
| 7475.05-05 | LL4-0.5M | 6/22/2016 | 565 | 0.44% | Achnanthidium sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Achnanthidiaceae | Achnanthidium | sp. | 16 | 1.00 | 16 | 3610 | 3610 | 6 | 6 | 129.59 | 827.93 |
| 7475.05-05 | LL4-0.5M | 6/22/2016 | 565 | 0.44% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 12 | 4.00 | 48 | 2707 | 10829 | 5 | 19 | 973.89 | 18666.05 |
| 7475.05-05 | LL4-0.5M | 6/22/2016 | 565 | 0.44% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 4 | 3.00 | 12 | 902 | 2707 | 2 | 5 | 1046.15 | 5012.73 |
| 7475.05-05 | LL4-0.5M | 6/22/2016 | 565 | 0.44% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 10 | 1.00 | 10 | 2256 | 2256 | 4 | 4 | 2748893.57 | 10976333.95 |
| 7475.05-05 | LL4-0.5M | 6/22/2016 | 565 | 0.44% | Chroomonas spp. | Cryptophyta | Cryptophyceae | Pyrenomonadales | Chroomonadaceae | Chroomonas | spp. | 2 | 1.00 | 2 | 451 | 451 | 1 | 1 | 232.28 | 185.50 |
| 7475.05-05 | LL4-0.5M | 6/22/2016 | 565 | 0.44% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Cocconeidaceae | Cocconeis | sp. | 25 | 1.00 | 25 | 5640 | 5640 | 10 | 10 | 2078.16 | 20745.28 |
| 7475.05-05 | LL4-0.5M | 6/22/2016 | 565 | 0.44% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 32 | 1.00 | 32 | 7219 | 7219 | 13 | 13 | 2668.26 | 34093.95 |
| 7475.05-05 | LL4-0.5M | 6/22/2016 | 565 | 0.44% | Cymbella sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Cymbellaceae | Cymbella | sp. | 10 | 1.00 | 10 | 2256 | 2256 | 4 | 4 | 1456.00 | 5813.81 |
| 7475.05-05 | LL4-0.5M | 6/22/2016 | 565 | 0.44% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 2 | 32.00 | 64 | 451 | 14439 | 1 | 26 | 39.21 | 1001.92 |
| 7475.05-05 | LL4-0.5M | 6/22/2016 | 565 | 0.44% | Dinobryon spp. | Ochrophyta | Chrysophyceae | Chromulinales | Dinobryaceae | Dinobryon | spp. | 2 | 1.00 | 2 | 451 | 451 | 1 | 1 | 1399.58 | 1117.70 |
| 7475.05-05 | LL4-0.5M | 6/22/2016 | 565 | 0.44% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 45 | 3.00 | 135 | 10152 | 30457 | 18 | 54 | 724.31 | 39044.46 |
| 7475.05-05 | LL4-0.5M | 6/22/2016 | 565 | 0.44% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | spp. | 5 | 1.00 | 5 | 1128 | 1128 | 2 | 2 | 890.64 | 1778.17 |
| 7475.05-05 | LL4-0.5M | 6/22/2016 | 565 | 0.44% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 59 | 5.66 | 334 | 13311 | 75352 | 24 | 133 | 343.60 | 45824.50 |
| 7475.05-05 | LL4-0.5M | 6/22/2016 | 565 | 0.44% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 52 | 8.00 | 416 | 11731 | 93851 | 21 | 166 | 268.08 | 44530.95 |
| 7475.05-05 | LL4-0.5M | 6/22/2016 | 565 | 0.44% | Staurosira sp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Staurosira | sp. | 2 | 22.00 | 44 | 451 | 9927 | 1 | 18 | 56.55 | 993.52 |
| 7475.05-05 | LL4-0.5M | 6/22/2016 | 565 | 0.44% | Synedra sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Synedra | sp. | 17 | 1.00 | 17 | 3835 | 3835 | 7 | 7 | 9217.43 | 62568.87 |
| 7475.05-05 | LL4-0.5M | 6/22/2016 | 565 | 0.44% | Unknown centrales spp. | Bacillariophyta | Bacillariophyceae | Centrales | | | | 14 | 1.00 | 14 | 3158 | 3158 | 6 | 6 | 923.63 | 5163.27 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Amphora sp. | Bacillariophyta | Bacillariophyceae | Thalassiophysales | Catenulaceae | Amphora | sp. | 3 | 1.00 | 3 | 647 | 647 | 1 | 1 | 1732.50 | 2156.22 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 61 | 4.00 | 244 | 13159 | 52637 | 25 | 101 | 1178.10 | 119253.01 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 3 | 7.33 | 22 | 647 | 4746 | 1 | 9 | 608.68 | 5555.37 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Cocconeidaceae | Cocconeis | sp. | 12 | 1.00 | 12 | 2589 | 2589 | 5 | 5 | 6272.19 | 31224.75 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 3 | 1.00 | 3 | 647 | 647 | 1 | 1 | 2389.18 | 2973.51 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Cymbella sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Cymbellaceae | Cymbella | sp. | 3 | 1.00 | 3 | 647 | 647 | 1 | 1 | 10237.50 | 12741.30 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Diatoma spp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Diatoma | sp. | 4 | 1.00 | 4 | 863 | 863 | 2 | 2 | 12723.45 | 21113.65 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 60 | 1.58 | 95 | 12944 | 20494 | 25 | 39 | 603.19 | 23772.42 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | spp. | 2 | 1.00 | 2 | 431 | 431 | 1 | 1 | 6503.10 | 5395.71 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Melosira sp. | Bacillariophyta | Coscinodiscophyceae | Melosirales | Melosiraceae | Melosira | sp. | 13 | 3.00 | 39 | 2804 | 8413 | 5 | 16 | 8482.30 | 137238.74 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Monoraphidium spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Selenastraceae | Monoraphidium | spp. | 6 | 1.00 | 6 | 1294 | 1294 | 2 | 2 | 85.09 | 211.79 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Navicula spp. | Bacillariophyta | Bacillariophyceae | Naviculales | Naviculaceae | Navicula | spp. | 8 | 1.00 | 8 | 1726 | 1726 | 3 | 3 | 16587.61 | 55051.89 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Planktolyngbya spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Leptolyngbyaceae | Planktolyngbya | spp. | 4 | 12.00 | 48 | 863 | 10355 | 2 | 20 | 14.73 | 293.24 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 20 | 6.00 | 120 | 4315 | 25887 | 8 | 50 | 143.99 | 7168.23 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Staurodesmus sp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Staurodesmus | sp. | 1 | 1.00 | 1 | 216 | 216 | 0 | 0 | 37531.56 | 15570.23 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Staurosira sp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Staurosira | sp. | 12 | 14.00 | 168 | 2589 | 36242 | 5 | 70 | 141.37 | 9853.06 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Surirella sp. | Bacillariophyta | Bacillariophyceae | Surirellales | Surirellaceae | Surirella | spp. | 2 | 1.00 | 2 | 431 | 431 | 1 | 1 | 2309.07 | 1915.87 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Synedra sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Synedra | sp. | 64 | 1.00 | 64 | 13806 | 13806 | 27 | 27 | 4005.53 | 106350.26 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Tetraëdron sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Tetraëdron | sp. | 1 | 1.00 | 1 | 216 | 216 | 0 | 0 | 256.00 | 106.20 |
| 7475.05-06 | LL5-0.5M | 6/22/2016 | 520 | 0.46% | Unknown centrales spp. | Bacillariophyta | Bacillariophyceae | Centrales | | | | 21 | 1.00 | 21 | 4530 | 4530 | 9 | 9 | 314.16 | 2736.95 |

**Avista Phytoplankton 2016 (Batch4)**
**Taxa Report with Biovolumes**

EcoAnalysts, Inc.
LIFE IN WATER

| EcoAnalysts Sample ID | Site ID | Collection Date | Volume Received (mL) | Percent Counted | Taxon | Division | Class | Order | Family | Genus | Species | Number of Natural Units | Cells per Natural Unit | Number of Cells | Units / Sample | Cells/ sample | Units per mL (in sample received) | Cells per mL (in sample received) | AVG_BV (µ³) | Biovolume (µ³/mL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7475.07-01 | LL0-0.5M | 7/5/2016 | 530 | 1.50% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 11 | 1.00 | 11 | 734 | 734 | 1.38 | 1.38 | 584.34 | 808.86 |
| 7475.07-01 | LL0-0.5M | 7/5/2016 | 530 | 1.50% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 5 | 9.00 | 45 | 333 | 3001 | 0.63 | 5.66 | 895.94 | 5073.54 |
| 7475.07-01 | LL0-0.5M | 7/5/2016 | 530 | 1.50% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 9 | 1.00 | 9 | 600 | 600 | 1.13 | 1.13 | 163362.82 | 185018.14 |
| 7475.07-01 | LL0-0.5M | 7/5/2016 | 530 | 1.50% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 13 | 1.00 | 13 | 867 | 867 | 1.64 | 1.64 | 1507.96 | 2466.91 |
| 7475.07-01 | LL0-0.5M | 7/5/2016 | 530 | 1.50% | Cyclotella spp. | Bacillariophyta | Mediophyceae | Stephanodiscales | Stephanodiscaceae | Cyclotella | spp. | 23 | 1.00 | 23 | 1534 | 1534 | 2.89 | 2.89 | 254.47 | 736.51 |
| 7475.07-01 | LL0-0.5M | 7/5/2016 | 530 | 1.50% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 4 | 12.00 | 48 | 267 | 3201 | 0.50 | 6.04 | 34.71 | 209.64 |
| 7475.07-01 | LL0-0.5M | 7/5/2016 | 530 | 1.50% | Dinobryon spp. | Ochrophyta | Chrysophyceae | Chromulinales | Dinobryaceae | Dinobryon | spp. | 3 | 1.00 | 3 | 200 | 200 | 0.38 | 0.38 | 1837.31 | 693.62 |
| 7475.07-01 | LL0-0.5M | 7/5/2016 | 530 | 1.50% | Elakatothrix sp. | Charophyta | Klebsormidiophyceae | Klebsormidiales | Elakatotrichaceae | Elakatothrix | sp. | 1 | 12.00 | 12 | 67 | 800 | 0.13 | 1.51 | 2748.89 | 4151.05 |
| 7475.07-01 | LL0-0.5M | 7/5/2016 | 530 | 1.50% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 3 | 1.00 | 3 | 200 | 200 | 0.38 | 0.38 | 1030.44 | 389.01 |
| 7475.07-01 | LL0-0.5M | 7/5/2016 | 530 | 1.50% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | spp. | 3 | 1.00 | 3 | 200 | 200 | 0.38 | 0.38 | 433.54 | 163.67 |
| 7475.07-01 | LL0-0.5M | 7/5/2016 | 530 | 1.50% | Oocystis spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | spp. | 46 | 1.00 | 46 | 3068 | 3068 | 5.79 | 5.79 | 2212.21 | 12805.65 |
| 7475.07-01 | LL0-0.5M | 7/5/2016 | 530 | 1.50% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 169 | 7.41 | 1252 | 11271 | 83502 | 21.27 | 157.55 | 804.25 | 126710.59 |
| 7475.07-01 | LL0-0.5M | 7/5/2016 | 530 | 1.50% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 17 | 9.18 | 156 | 1134 | 10404 | 2.14 | 19.63 | 47.71 | 936.66 |
| 7475.07-02 | LL1-0.5M | 7/5/2016 | 545 | 1.20% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 2 | 1.00 | 2 | 166 | 166 | 0.31 | 0.31 | 172.79 | 52.72 |
| 7475.07-02 | LL1-0.5M | 7/5/2016 | 545 | 1.20% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 3 | 1.00 | 3 | 249 | 249 | 0.46 | 0.46 | 735.13 | 336.47 |
| 7475.07-02 | LL1-0.5M | 7/5/2016 | 545 | 1.20% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 3 | 1.00 | 3 | 249 | 249 | 0.46 | 0.46 | 238564.69 | 109190.05 |
| 7475.07-02 | LL1-0.5M | 7/5/2016 | 545 | 1.20% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 6 | 1.00 | 6 | 499 | 499 | 0.92 | 0.92 | 1583.89 | 1449.88 |
| 7475.07-02 | LL1-0.5M | 7/5/2016 | 545 | 1.20% | Cyclotella spp. | Bacillariophyta | Mediophyceae | Stephanodiscales | Stephanodiscaceae | Cyclotella | spp. | 7 | 1.00 | 7 | 582 | 582 | 1.07 | 1.07 | 565.49 | 603.92 |
| 7475.07-02 | LL1-0.5M | 7/5/2016 | 545 | 1.20% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 4 | 1.00 | 4 | 333 | 333 | 0.61 | 0.61 | 10.28 | 6.28 |
| 7475.07-02 | LL1-0.5M | 7/5/2016 | 545 | 1.20% | Elakatothrix sp. | Charophyta | Klebsormidiophyceae | Klebsormidiales | Elakatotrichaceae | Elakatothrix | sp. | 1 | 2.00 | 2 | 83 | 166 | 0.15 | 0.31 | 1910.09 | 582.83 |
| 7475.07-02 | LL1-0.5M | 7/5/2016 | 545 | 1.20% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 20 | 20.00 | 400 | 1663 | 33259 | 3.05 | 61.03 | 464.96 | 28374.45 |
| 7475.07-02 | LL1-0.5M | 7/5/2016 | 545 | 1.20% | Monoraphidium spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Selenastraceae | Monoraphidium | spp. | 3 | 1.00 | 3 | 249 | 249 | 0.46 | 0.46 | 101.45 | 46.43 |
| 7475.07-02 | LL1-0.5M | 7/5/2016 | 545 | 1.20% | Oocystis spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | spp. | 63 | 1.00 | 63 | 5238 | 5238 | 9.61 | 9.61 | 9952.57 | 95660.19 |
| 7475.07-02 | LL1-0.5M | 7/5/2016 | 545 | 1.20% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 167 | 6.00 | 1002 | 13886 | 83314 | 25.48 | 152.87 | 530.93 | 81163.32 |
| 7475.07-02 | LL1-0.5M | 7/5/2016 | 545 | 1.20% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 22 | 1.00 | 22 | 1829 | 1829 | 3.36 | 3.36 | 65.45 | 219.68 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Achnanthidium sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Achnanthidiaceae | Achnanthidium | sp. | 6 | 1.00 | 6 | 839 | 839 | 1.57 | 1.57 | 103.67 | 162.58 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 4 | 1.00 | 4 | 559 | 559 | 1.05 | 1.05 | 480.66 | 502.51 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Chroomonas spp. | Cryptophyta | Cryptophyceae | Pyrenomonadales | Chroomonadaceae | Chroomonas | spp. | 10 | 1.00 | 10 | 1398 | 1398 | 2.61 | 2.61 | 142.55 | 372.57 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Coelastrum sp. | Chlorophyta | Chlorophyceae | Scenedesmaceae | Coelastroideae | Coelastrum | sp. | 2 | 24.00 | 48 | 280 | 6712 | 0.52 | 12.55 | 904.78 | 11350.71 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 39 | 1.00 | 39 | 5453 | 5453 | 10.19 | 10.19 | 1457.18 | 14853.05 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Cyclotella spp. | Bacillariophyta | Mediophyceae | Stephanodiscales | Stephanodiscaceae | Cyclotella | spp. | 26 | 1.00 | 26 | 3636 | 3636 | 6.80 | 6.80 | 1781.28 | 12104.46 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Cymbella sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Cymbellaceae | Cymbella | sp. | 8 | 1.00 | 8 | 1119 | 1119 | 2.09 | 2.09 | 580.00 | 1212.71 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 4 | 12.00 | 48 | 559 | 6712 | 1.05 | 12.55 | 30.21 | 378.94 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Elakatothrix sp. | Charophyta | Klebsormidiophyceae | Klebsormidiales | Elakatotrichaceae | Elakatothrix | sp. | 1 | 2.00 | 2 | 140 | 280 | 0.26 | 0.52 | 2513.27 | 1313.74 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 13 | 1.00 | 13 | 1818 | 1818 | 3.40 | 3.40 | 640.89 | 2177.52 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | spp. | 11 | 1.00 | 11 | 1538 | 1538 | 2.87 | 2.87 | 505.80 | 1454.14 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Monoraphidium spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Selenastraceae | Monoraphidium | spp. | 9 | 1.00 | 9 | 1258 | 1258 | 2.35 | 2.35 | 54.45 | 128.09 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Nitzschia spp. | Bacillariophyta | Bacillariophyceae | Bacillariales | Bacillariaceae | Nitzschia | spp. | 3 | 1.00 | 3 | 419 | 419 | 0.78 | 0.78 | 2615.38 | 2050.66 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Oocystis spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | spp. | 10 | 1.00 | 10 | 1398 | 1398 | 2.61 | 2.61 | 2591.81 | 6773.97 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 1 | 32.00 | 32 | 140 | 4474 | 0.26 | 8.36 | 128.00 | 1070.53 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 142 | 8.00 | 1136 | 19856 | 158844 | 37.11 | 296.91 | 235.62 | 69956.47 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 25 | 8.80 | 220 | 3496 | 30762 | 6.53 | 57.50 | 33.51 | 1926.80 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Synedra sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Synedra | sp. | 7 | 1.00 | 7 | 979 | 979 | 1.83 | 1.83 | 5497.79 | 10058.31 |
| 7475.07-03 | LL2-0.5M | 7/5/2016 | 535 | 0.72% | Tabellaria spp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Tabellaria | sp. | 5 | 1.00 | 5 | 699 | 699 | 1.31 | 1.31 | 2464.00 | 3219.96 |
| 7475.07-04 | LL3-0.5M | 7/6/2016 | 550 | 0.43% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 6 | 1.00 | 6 | 1409 | 1409 | 2.56 | 2.56 | 738.27 | 1891.72 |
| 7475.07-04 | LL3-0.5M | 7/6/2016 | 550 | 0.43% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 2 | 4.00 | 8 | 470 | 1879 | 0.85 | 3.42 | 510.51 | 1744.14 |
| 7475.07-04 | LL3-0.5M | 7/6/2016 | 550 | 0.43% | Chroomonas spp. | Cryptophyta | Cryptophyceae | Pyrenomonadales | Chroomonadaceae | Chroomonas | spp. | 3 | 1.00 | 3 | 705 | 705 | 1.28 | 1.28 | 134.63 | 172.48 |
| 7475.07-04 | LL3-0.5M | 7/6/2016 | 550 | 0.43% | Coelastrum sp. | Chlorophyta | Chlorophyceae | Scenedesmaceae | Coelastroideae | Coelastrum | sp. | 2 | 18.00 | 36 | 470 | 8456 | 0.85 | 15.37 | 113.10 | 1738.77 |
| 7475.07-04 | LL3-0.5M | 7/6/2016 | 550 | 0.43% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 28 | 1.00 | 28 | 6577 | 6577 | 11.96 | 11.96 | 2477.67 | 29627.10 |
| 7475.07-04 | LL3-0.5M | 7/6/2016 | 550 | 0.43% | Cyclotella spp. | Bacillariophyta | Mediophyceae | Stephanodiscales | Stephanodiscaceae | Cyclotella | spp. | 20 | 1.00 | 20 | 4698 | 4698 | 8.54 | 8.54 | 2035.75 | 17387.72 |
| 7475.07-04 | LL3-0.5M | 7/6/2016 | 550 | 0.43% | Cymbella sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Cymbellaceae | Cymbella | sp. | 5 | 1.00 | 5 | 1174 | 1174 | 2.14 | 2.14 | 828.00 | 1768.02 |
| 7475.07-04 | LL3-0.5M | 7/6/2016 | 550 | 0.43% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 41 | 8.00 | 328 | 9630 | 77041 | 17.51 | 140.08 | 61.70 | 8642.51 |
| 7475.07-04 | LL3-0.5M | 7/6/2016 | 550 | 0.43% | Elakatothrix sp. | Charophyta | Klebsormidiophyceae | Klebsormidiales | Elakatotrichaceae | Elakatothrix | sp. | 1 | 2.00 | 2 | 235 | 470 | 0.43 | 0.85 | 12566.37 | 10733.16 |
| 7475.07-04 | LL3-0.5M | 7/6/2016 | 550 | 0.43% | Euglena sp. | Euglenophyta | Euglenophyceae | Euglenales | Euglenaceae | Euglena | sp. | 1 | 1.00 | 1 | 235 | 235 | 0.43 | 0.43 | 12741.59 | 5441.41 |
| 7475.07-04 | LL3-0.5M | 7/6/2016 | 550 | 0.43% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 7 | 1.86 | 13 | 1644 | 3053 | 2.99 | 5.55 | 791.68 | 4395.23 |
| 7475.07-04 | LL3-0.5M | 7/6/2016 | 550 | 0.43% | Navicula spp. | Bacillariophyta | Bacillariophyceae | Naviculales | Naviculaceae | Navicula | spp. | 8 | 1.00 | 8 | 1879 | 1879 | 3.42 | 3.42 | 993.53 | 3394.36 |
| 7475.07-04 | LL3-0.5M | 7/6/2016 | 550 | 0.43% | Oocystis spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | spp. | 11 | 2.00 | 22 | 2584 | 5167 | 4.70 | 9.40 | 1013.69 | 9523.89 |
| 7475.07-04 | LL3-0.5M | 7/6/2016 | 550 | 0.43% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 2 | 32.00 | 64 | 470 | 15032 | 0.85 | 27.33 | 432.00 | 11807.33 |
| 7475.07-04 | LL3-0.5M | 7/6/2016 | 550 | 0.43% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 171 | 7.94 | 1358 | 40165 | 318970 | 73.03 | 579.95 | 395.84 | 229566.42 |
| 7475.07-05 | LL4-0.5M | 7/6/2016 | 550 | 0.18% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 2 | 1.00 | 2 | 1141 | 1141 | 2.07 | 2.07 | 405.27 | 840.64 |
| 7475.07-05 | LL4-0.5M | 7/6/2016 | 550 | 0.18% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 3 | 5.00 | 15 | 1711 | 8556 | 3.11 | 15.56 | 2226.60 | 34639.61 |
| 7475.07-05 | LL4-0.5M | 7/6/2016 | 550 | 0.18% | Botryococcus sp. | Chlorophyta | Trebouxiophyceae | Trebouxiales | Botryococcaceae | Botryococcus | sp. | 1 | 16.00 | 16 | 570 | 9127 | 1.04 | 16.59 | 28.27 | 469.19 |
| 7475.07-05 | LL4-0.5M | 7/6/2016 | 550 | 0.18% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 12 | 1.00 | 12 | 6845 | 6845 | 12.45 | 12.45 | 255254.40 | 3176824.16 |
| 7475.07-05 | LL4-0.5M | 7/6/2016 | 550 | 0.18% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Cocconeidaceae | Cocconeis | sp. | 5 | 1.00 | 5 | 2852 | 2852 | 5.19 | 5.19 | 969.97 | 5029.97 |
| 7475.07-05 | LL4-0.5M | 7/6/2016 | 550 | 0.18% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 2 | 16.00 | 32 | 1141 | 18254 | 2.07 | 33.19 | 91.13 | 3024.31 |
| 7475.07-05 | LL4-0.5M | 7/6/2016 | 550 | 0.18% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 5 | 1.00 | 5 | 2852 | 2852 | 5.19 | 5.19 | 3619.12 | 18767.70 |
| 7475.07-05 | LL4-0.5M | 7/6/2016 | 550 | 0.18% | Cyclotella spp. | Bacillariophyta | Mediophyceae | Stephanodiscales | Stephanodiscaceae | Cyclotella | spp. | 20 | 1.00 | 20 | 11409 | 11409 | 20.74 | 20.74 | 663.66 | 13766.23 |
| 7475.07-05 | LL4-0.5M | 7/6/2016 | 550 | 0.18% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 12 | 8.00 | 96 | 6845 | 54761 | 12.45 | 99.57 | 39.36 | 3919.21 |
| 7475.07-05 | LL4-0.5M | 7/6/2016 | 550 | 0.18% | Dinobryon spp. | Ochrophyta | Chrysophyceae | Chromulinales | Dinobryaceae | Dinobryon | spp. | 9 | 1.00 | 9 | 5134 | 5134 | 9.33 | 9.33 | 1832.60 | 17105.98 |
| 7475.07-05 | LL4-0.5M | 7/6/2016 | 550 | 0.18% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 9 | 4.89 | 44 | 5134 | 25099 | 9.33 | 45.63 | 565.49 | 25805.60 |
| 7475.07-05 | LL4-0.5M | 7/6/2016 | 550 | 0.18% | Oocystis spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | spp. | 11 | 1.64 | 18 | 6275 | 10268 | 11.41 | 18.67 | 2463.01 | 45980.87 |
| 7475.07-05 | LL4-0.5M | 7/6/2016 | 550 | 0.18% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 2 | 24.00 | 48 | 1141 | 27381 | 2.07 | 49.78 | 243.00 | 12097.24 |
| 7475.07-05 | LL4-0.5M | 7/6/2016 | 550 | 0.18% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 209 | 8.00 | 1672 | 119220 | 953757 | 216.76 | 1734.10 | 395.84 | 686429.18 |
| 7475.07-05 | LL4-0.5M | 7/6/2016 | 550 | 0.18% | Tetraëdron sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Tetraëdron | sp. | 1 | 1.00 | 1 | 570 | 570 | 1.04 | 1.04 | 845.00 | 876.39 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Achnanthidium sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Achnanthidiaceae | Achnanthidium | sp. | 71 | 1.00 | 71 | 47354 | 47354 | 89.35 | 89.35 | 141.37 | 12631.08 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Amphora sp. | Bacillariophyta | Bacillariophyceae | Thalassiophysales | Catenulaceae | Amphora | sp. | 7 | 1.00 | 7 | 4669 | 4669 | 8.81 | 8.81 | 957.00 | 8430.02 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Asterionella formosa | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | formosa | 6 | 1.00 | 6 | 4002 | 4002 | 7.55 | 7.55 | 977.82 | 7382.94 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Cocconeidaceae | Cocconeis | sp. | 16 | 1.00 | 16 | 10671 | 10671 | 20.13 | 20.13 | 2049.89 | 41273.27 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Cymbella sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Cymbellaceae | Cymbella | sp. | 2 | 1.00 | 2 | 1334 | 1334 | 2.52 | 2.52 | 4290.00 | 10797.07 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Diatoma spp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Diatoma | sp. | 1 | 1.00 | 1 | 667 | 667 | 1.26 | 1.26 | 6361.73 | 8005.59 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 98 | 1.00 | 98 | 65361 | 65361 | 123.32 | 123.32 | 1731.80 | 213571.42 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | spp. | 17 | 1.00 | 17 | 11338 | 11338 | 21.39 | 21.39 | 2287.08 | 48927.01 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Melosira sp. | Bacillariophyta | Coscinodiscophyceae | Melosirales | Melosiraceae | Melosira | sp. | 13 | 2.00 | 26 | 8670 | 17341 | 16.36 | 32.72 | 4825.49 | 157882.13 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Monoraphidium spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Selenastraceae | Monoraphidium | spp. | 13 | 1.00 | 13 | 8670 | 8670 | 16.36 | 16.36 | 107.99 | 1766.66 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Navicula spp. | Bacillariophyta | Bacillariophyceae | Naviculales | Naviculaceae | Navicula | spp. | 17 | 1.00 | 17 | 11338 | 11338 | 21.39 | 21.39 | 1272.35 | 27219.01 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Oocystis spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | spp. | 2 | 8.00 | 16 | 1334 | 10671 | 2.52 | 20.13 | 226.20 | 4554.30 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 2 | 16.00 | 32 | 1334 | 21342 | 2.52 | 40.27 | 300.00 | 12080.64 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Planktolyngbya sp. | Cyanobacteria | Cyanophyceae | Synechococcales | Leptolyngbyaceae | Planktolyngbya | sp. | 1 | 13.00 | 13 | 667 | 8670 | 1.26 | 16.36 | 6.28 | 102.78 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 18 | 4.00 | 72 | 12005 | 48021 | 22.65 | 90.60 | 106.81 | 9677.86 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Staurosira sp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Staurosira | sp. | 3 | 8.00 | 24 | 2001 | 16007 | 3.78 | 30.20 | 28.27 | 853.92 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Synedra sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Synedra | sp. | 18 | 1.00 | 18 | 12005 | 12005 | 22.65 | 22.65 | 12440.71 | 281796.86 |
| 7475.07-06 | LL5-0.5M | 7/6/2016 | 530 | 0.15% | Woronichinia spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Coelosphaeriaceae | Woronichinia | spp. | 2 | 32.00 | 64 | 1334 | 42685 | 2.52 | 80.54 | 6.28 | 506.02 |

**Avista Phytoplankton 2016 (Batch5)**
**Taxa Report with Biovolumes**

EcoAnalysts, Inc.
LIFE IN WATER

| EcoAnalysts Sample ID | Site ID | Collection Date | Volume Received (mL) | Percent Counted | Taxon | Division | Class | Order | Family | Genus | Species | Number of Natural Units | Cells per Natural Unit | Number of Cells | Units / Sample | Cells/ sample | Units per mL (in sample received) | Cells per mL (in sample received) | AVG_BV ($\mu^3$) | Biovolume ($\mu^3$/mL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Achnanthidium sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Achnanthidiaceae | Achnanthidium | sp. | 1 | 1.00 | 1 | 204 | 204 | 0.41 | 0.41 | 153.15 | 62.40 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 46 | 25.00 | 1150 | 9370 | 234259 | 18.74 | 468.52 | 1.77 | 827.87 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Asterionella sp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | sp. | 6 | 1.00 | 6 | 1222 | 1222 | 2.44 | 2.44 | 501.87 | 1226.79 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 4 | 4.00 | 16 | 815 | 3259 | 1.63 | 6.52 | 384.85 | 2508.62 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Botryococcus sp. | Chlorophyta | Trebouxiophyceae | Trebouxiales | Botryococcaceae | Botryococcus | sp. | 1 | 24.00 | 24 | 204 | 4889 | 0.41 | 9.78 | 101.94 | 996.73 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Cocconeidaceae | Cocconeis | sp. | 1 | 1.00 | 1 | 204 | 204 | 0.41 | 0.41 | 2940.53 | 1197.99 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Cyclotella spp. | Bacillariophyta | Mediophyceae | Stephanodiscales | Stephanodiscaceae | Cyclotella | spp. | 11 | 1.00 | 11 | 2241 | 2241 | 4.48 | 4.48 | 3463.61 | 15522.09 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 2 | 8.00 | 16 | 407 | 3259 | 0.81 | 6.52 | 46.21 | 301.20 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Dinobryon spp. | Ochrophyta | Chrysophyceae | Chromulinales | Dinobryaceae | Dinobryon | spp. | 1 | 1.00 | 1 | 204 | 204 | 0.41 | 0.41 | 2787.64 | 1135.71 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 20 | 1.00 | 20 | 4074 | 4074 | 8.15 | 8.15 | 1256.64 | 10239.26 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | spp. | 6 | 1.00 | 6 | 1222 | 1222 | 2.44 | 2.44 | 742.20 | 1814.27 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Hannaea sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Hannaea | sp. | 13 | 1.00 | 13 | 2648 | 2648 | 5.30 | 5.30 | 1759.29 | 9317.73 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Monoraphidium sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Selenastraceae | Monoraphidium | sp. | 1 | 1.00 | 1 | 204 | 204 | 0.41 | 0.41 | 254.51 | 103.69 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Navicula spp. | Bacillariophyta | Bacillariophyceae | Naviculales | Naviculaceae | Navicula | spp. | 4 | 1.00 | 4 | 815 | 815 | 1.63 | 1.63 | 1061.86 | 1730.44 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Nitzschia spp. | Bacillariophyta | Bacillariophyceae | Bacillariales | Bacillariaceae | Nitzschia | spp. | 4 | 1.00 | 4 | 815 | 815 | 1.63 | 1.63 | 6146.53 | 10016.56 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 40 | 4.00 | 160 | 8148 | 32593 | 16.30 | 65.19 | 5445.43 | 354961.17 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 5 | 24.00 | 120 | 1019 | 24444 | 2.04 | 48.89 | 363.00 | 17746.67 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 107 | 8.00 | 856 | 21796 | 174370 | 43.59 | 348.74 | 1649.34 | 575190.66 |
| 7475.09-01 | LL0-0.5M | 7/19/2016 | 500 | 0.49% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 33 | 12.00 | 396 | 6722 | 80667 | 13.44 | 161.33 | 268.08 | 43250.72 |
| 7475.09-02 | LL1-0.5M | 7/19/2016 | 515 | 0.34% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 37 | 30.00 | 1110 | 10912 | 327346 | 21.19 | 635.62 | 1.20 | 765.29 |
| 7475.09-02 | LL1-0.5M | 7/19/2016 | 515 | 0.34% | Botryococcus sp. | Chlorophyta | Trebouxiophyceae | Trebouxiales | Botryococcaceae | Botryococcus | sp. | 1 | 18.00 | 18 | 295 | 5308 | 0.57 | 10.31 | 47.31 | 487.63 |
| 7475.09-02 | LL1-0.5M | 7/19/2016 | 515 | 0.34% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 5 | 8.00 | 40 | 1475 | 11796 | 2.86 | 22.91 | 64.00 | 1465.94 |
| 7475.09-02 | LL1-0.5M | 7/19/2016 | 515 | 0.34% | Cyclotella spp. | Bacillariophyta | Mediophyceae | Stephanodiscales | Stephanodiscaceae | Cyclotella | spp. | 2 | 1.00 | 2 | 590 | 590 | 1.15 | 1.15 | 2268.23 | 2597.73 |
| 7475.09-02 | LL1-0.5M | 7/19/2016 | 515 | 0.34% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 3 | 18.00 | 54 | 885 | 15925 | 1.72 | 30.92 | 58.89 | 1821.07 |
| 7475.09-02 | LL1-0.5M | 7/19/2016 | 515 | 0.34% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 4 | 10.75 | 43 | 1180 | 12681 | 2.29 | 24.62 | 1523.67 | 37517.77 |
| 7475.09-02 | LL1-0.5M | 7/19/2016 | 515 | 0.34% | Hannaea sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Hannaea | sp. | 6 | 1.00 | 6 | 1769 | 1769 | 3.44 | 3.44 | 995.26 | 3419.51 |
| 7475.09-02 | LL1-0.5M | 7/19/2016 | 515 | 0.34% | Navicula spp. | Bacillariophyta | Bacillariophyceae | Naviculales | Naviculaceae | Navicula | spp. | 1 | 1.00 | 1 | 295 | 295 | 0.57 | 0.57 | 1809.56 | 1036.21 |
| 7475.09-02 | LL1-0.5M | 7/19/2016 | 515 | 0.34% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 106 | 2.00 | 212 | 31260 | 62520 | 60.70 | 121.40 | 4208.35 | 510887.13 |
| 7475.09-02 | LL1-0.5M | 7/19/2016 | 515 | 0.34% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 6 | 24.00 | 144 | 1769 | 42467 | 3.44 | 82.46 | 157.68 | 13002.18 |
| 7475.09-02 | LL1-0.5M | 7/19/2016 | 515 | 0.34% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 82 | 8.00 | 656 | 24182 | 193459 | 46.96 | 375.65 | 1503.52 | 564792.52 |
| 7475.09-02 | LL1-0.5M | 7/19/2016 | 515 | 0.34% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 60 | 8.00 | 480 | 17694 | 141555 | 34.36 | 274.86 | 294.01 | 80812.57 |
| 7475.09-03 | LL2-0.5M | 7/19/2016 | 560 | 0.17% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 39 | 30.77 | 1200 | 22372 | 688356 | 39.95 | 1229.21 | 1.23 | 1514.38 |
| 7475.09-03 | LL2-0.5M | 7/19/2016 | 560 | 0.17% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 1 | 1.00 | 1 | 574 | 574 | 1.02 | 1.02 | 333794.22 | 341918.31 |
| 7475.09-03 | LL2-0.5M | 7/19/2016 | 560 | 0.17% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 4 | 12.00 | 48 | 2295 | 27534 | 4.10 | 49.17 | 58.38 | 2870.30 |
| 7475.09-03 | LL2-0.5M | 7/19/2016 | 560 | 0.17% | Hannaea sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Hannaea | sp. | 3 | 1.00 | 3 | 1721 | 1721 | 3.07 | 3.07 | 1169.93 | 3595.21 |
| 7475.09-03 | LL2-0.5M | 7/19/2016 | 560 | 0.17% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 65 | 3.00 | 195 | 37286 | 111858 | 66.58 | 199.75 | 2123.72 | 424204.04 |
| 7475.09-03 | LL2-0.5M | 7/19/2016 | 560 | 0.17% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 2 | 24.00 | 48 | 1147 | 27534 | 2.05 | 49.17 | 1152.00 | 56641.83 |
| 7475.09-03 | LL2-0.5M | 7/19/2016 | 560 | 0.17% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 118 | 16.00 | 1888 | 67688 | 1083013 | 120.87 | 1933.95 | 2088.63 | 4039310.69 |
| 7475.09-03 | LL2-0.5M | 7/19/2016 | 560 | 0.17% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 77 | 8.00 | 616 | 44169 | 353356 | 78.87 | 630.99 | 421.16 | 265748.84 |
| 7475.09-04 | LL3-0.5M | 7/20/2016 | 520 | 0.54% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 64 | 20.00 | 1280 | 11931 | 238630 | 22.95 | 458.90 | 1.18 | 541.74 |
| 7475.09-04 | LL3-0.5M | 7/20/2016 | 520 | 0.54% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 5 | 16.00 | 80 | 932 | 14914 | 1.79 | 28.68 | 343.00 | 9837.75 |
| 7475.09-04 | LL3-0.5M | 7/20/2016 | 520 | 0.54% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 3 | 1.00 | 3 | 559 | 559 | 1.08 | 1.08 | 2389.18 | 2569.70 |
| 7475.09-04 | LL3-0.5M | 7/20/2016 | 520 | 0.54% | Dinobryon sp. | Ochrophyta | Chrysophyceae | Chromulinales | Dinobryaceae | Dinobryon | sp. | 2 | 1.00 | 2 | 373 | 373 | 0.72 | 0.72 | 1911.19 | 1370.39 |
| 7475.09-04 | LL3-0.5M | 7/20/2016 | 520 | 0.54% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 45 | 10.00 | 450 | 8389 | 83893 | 16.13 | 161.33 | 1771.86 | 285859.70 |
| 7475.09-04 | LL3-0.5M | 7/20/2016 | 520 | 0.54% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | spp. | 6 | 1.00 | 6 | 1119 | 1119 | 2.15 | 2.15 | 785.40 | 1689.48 |
| 7475.09-04 | LL3-0.5M | 7/20/2016 | 520 | 0.54% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 21 | 4.00 | 84 | 3915 | 15660 | 7.53 | 30.12 | 1357.17 | 40871.86 |
| 7475.09-04 | LL3-0.5M | 7/20/2016 | 520 | 0.54% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 1 | 32.00 | 32 | 186 | 5966 | 0.36 | 11.47 | 360.00 | 4130.13 |
| 7475.09-04 | LL3-0.5M | 7/20/2016 | 520 | 0.54% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 120 | 8.00 | 960 | 22372 | 178972 | 43.02 | 344.18 | 1710.60 | 588749.36 |
| 7475.09-04 | LL3-0.5M | 7/20/2016 | 520 | 0.54% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 61 | 8.00 | 488 | 11372 | 90978 | 21.87 | 174.96 | 394.57 | 69032.61 |
| 7475.09-04 | LL3-0.5M | 7/20/2016 | 520 | 0.54% | Staurastrum sp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Staurastrum | sp. | 3 | 1.00 | 3 | 559 | 559 | 1.08 | 1.08 | 28352.87 | 30495.09 |
| 7475.09-05 | LL4-0.5M | 7/20/2016 | 565 | 0.06% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 21 | 20.00 | 420 | 34478 | 689554 | 61.02 | 1220.45 | 1.50 | 1829.45 |
| 7475.09-05 | LL4-0.5M | 7/20/2016 | 565 | 0.06% | Asterionella sp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | sp. | 3 | 8.00 | 24 | 4925 | 39403 | 8.72 | 69.74 | 855.52 | 59663.90 |
| 7475.09-05 | LL4-0.5M | 7/20/2016 | 565 | 0.06% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 1 | 22.00 | 22 | 1642 | 36120 | 2.91 | 63.93 | 962.11 | 61506.29 |
| 7475.09-05 | LL4-0.5M | 7/20/2016 | 565 | 0.06% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 3 | 1.00 | 3 | 4925 | 4925 | 8.72 | 8.72 | 296978.68 | 2588911.85 |
| 7475.09-05 | LL4-0.5M | 7/20/2016 | 565 | 0.06% | Cosmarium spp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Cosmarium | spp. | 2 | 1.00 | 2 | 3284 | 3284 | 5.81 | 5.81 | 6335.55 | 36820.08 |
| 7475.09-05 | LL4-0.5M | 7/20/2016 | 565 | 0.06% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 7 | 4.00 | 28 | 11493 | 45970 | 20.34 | 81.36 | 512.00 | 41658.03 |
| 7475.09-05 | LL4-0.5M | 7/20/2016 | 565 | 0.06% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 3 | 1.00 | 3 | 4925 | 4925 | 8.72 | 8.72 | 1432.57 | 12488.40 |
| 7475.09-05 | LL4-0.5M | 7/20/2016 | 565 | 0.06% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 114 | 20.00 | 2280 | 187165 | 3743295 | 331.27 | 6625.30 | 1240.93 | 8221527.54 |
| 7475.09-05 | LL4-0.5M | 7/20/2016 | 565 | 0.06% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 26 | 4.00 | 104 | 42687 | 170747 | 75.55 | 302.21 | 2035.23 | 615059.52 |
| 7475.09-05 | LL4-0.5M | 7/20/2016 | 565 | 0.06% | Peridinium sp. | Miozoa | Dinophyceae | Peridiniales | Peridiniaceae | Peridinium | sp. | 1 | 1.00 | 1 | 1642 | 1642 | 2.91 | 2.91 | 6924.59 | 20121.72 |
| 7475.09-05 | LL4-0.5M | 7/20/2016 | 565 | 0.06% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 95 | 16.00 | 1520 | 155971 | 2495530 | 276.05 | 4416.87 | 1963.50 | 8672496.28 |
| 7475.09-05 | LL4-0.5M | 7/20/2016 | 565 | 0.06% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 41 | 8.00 | 328 | 67314 | 538509 | 119.14 | 953.11 | 316.25 | 301423.07 |
| 7475.09-06 | LL5-0.5M | 7/20/2016 | 560 | 0.12% | Achnanthes sp. | Bacillariophyta | Bacillariophyceae | Mastogloiales | Achnanthaceae | Achnanthes | sp. | 3 | 1.00 | 3 | 2582 | 2582 | 4.61 | 4.61 | 247.40 | 1140.74 |
| 7475.09-06 | LL5-0.5M | 7/20/2016 | 560 | 0.12% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 17 | 30.00 | 510 | 14632 | 438959 | 26.13 | 783.85 | 3.27 | 2564.77 |
| 7475.09-06 | LL5-0.5M | 7/20/2016 | 560 | 0.12% | Asterionella sp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | sp. | 6 | 8.00 | 48 | 5164 | 41314 | 9.22 | 73.77 | 744.93 | 54957.16 |
| 7475.09-06 | LL5-0.5M | 7/20/2016 | 560 | 0.12% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 9 | 8.00 | 72 | 7746 | 61971 | 13.83 | 110.66 | 1095.04 | 121179.22 |
| 7475.09-06 | LL5-0.5M | 7/20/2016 | 560 | 0.12% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 7 | 1.00 | 7 | 6025 | 6025 | 10.76 | 10.76 | 319896.60 | 3441699.31 |
| 7475.09-06 | LL5-0.5M | 7/20/2016 | 560 | 0.12% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 3 | 1.00 | 3 | 2582 | 2582 | 4.61 | 4.61 | 2709.62 | 12493.83 |
| 7475.09-06 | LL5-0.5M | 7/20/2016 | 560 | 0.12% | Dinobryon sp. | Ochrophyta | Chrysophyceae | Chromulinales | Dinobryaceae | Dinobryon | sp. | 3 | 1.00 | 3 | 2582 | 2582 | 4.61 | 4.61 | 2743.13 | 12648.34 |
| 7475.09-06 | LL5-0.5M | 7/20/2016 | 560 | 0.12% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 93 | 11.29 | 1050 | 80045 | 903738 | 142.94 | 1613.82 | 1054.79 | 1702239.11 |
| 7475.09-06 | LL5-0.5M | 7/20/2016 | 560 | 0.12% | Monoraphidium sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Selenastraceae | Monoraphidium | sp. | 15 | 1.00 | 15 | 12911 | 12911 | 23.05 | 23.05 | 96.54 | 2225.65 |
| 7475.09-06 | LL5-0.5M | 7/20/2016 | 560 | 0.12% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 16 | 4.00 | 64 | 13771 | 55085 | 24.59 | 98.37 | 1946.74 | 191493.13 |
| 7475.09-06 | LL5-0.5M | 7/20/2016 | 560 | 0.12% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 5 | 24.00 | 120 | 4304 | 103284 | 7.68 | 184.44 | 360.00 | 66397.08 |
| 7475.09-06 | LL5-0.5M | 7/20/2016 | 560 | 0.12% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 123 | 16.00 | 1968 | 105866 | 1693863 | 189.05 | 3024.76 | 1492.26 | 4513713.41 |
| 7475.09-06 | LL5-0.5M | 7/20/2016 | 560 | 0.12% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 8 | 1.00 | 8 | 6886 | 6886 | 12.30 | 12.30 | 295.40 | 3632.18 |

**Avista Phytoplankton 2016 (Batches 6&7)**
Taxa Report with Biovolumes

EcoAnalysts, Inc.
LIFE IN WATER

| EcoAnalysts Sample ID | Site ID | Collection Date | Volume Received (mL) | Percent Counted | Taxon | Division | Class | Order | Family | Genus | Species | Number of Natural Units | Cells per Natural Unit | Number of Cells | Units / Sample | Cells/ sample | Units per mL (in sample received) | Cells per mL (in sample received) | AVG_BV (µ³) | Biovolume (µ³/mL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7475.11-01 | LL0-0.5M | 8/10/2016 | 555 | 0.11% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 79 | 40.51 | 3200 | 71810.77 | 2908790.77 | 129.39 | 5241.06 | 1.84 | 9638.32 |
| 7475.11-01 | LL0-0.5M | 8/10/2016 | 555 | 0.11% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 1 | 1.00 | 1 | 909.00 | 909.00 | 1.64 | 1.64 | 1214912.78 | 1989823.81 |
| 7475.11-01 | LL0-0.5M | 8/10/2016 | 555 | 0.11% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 52 | 4.15 | 216 | 47267.85 | 196343.38 | 85.17 | 353.77 | 426.96 | 151045.72 |
| 7475.11-01 | LL0-0.5M | 8/10/2016 | 555 | 0.11% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 5 | 8.00 | 40 | 4544.99 | 36359.88 | 8.19 | 65.51 | 25.79 | 1689.39 |
| 7475.11-01 | LL0-0.5M | 8/10/2016 | 555 | 0.11% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 13 | 2.00 | 26 | 11816.96 | 23633.93 | 21.29 | 42.58 | 1809.56 | 77057.54 |
| 7475.11-01 | LL0-0.5M | 8/10/2016 | 555 | 0.11% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 1 | 24.00 | 24 | 909.00 | 21815.93 | 1.64 | 39.31 | 84.00 | 3301.87 |
| 7475.11-01 | LL0-0.5M | 8/10/2016 | 555 | 0.11% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 144 | 12.00 | 1728 | 130895.58 | 1570747.02 | 235.85 | 2830.17 | 1309.00 | 3704690.33 |
| 7475.11-01 | LL0-0.5M | 8/10/2016 | 555 | 0.11% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 15 | 8.00 | 120 | 13634.96 | 109079.65 | 24.57 | 196.54 | 200.36 | 39378.54 |
| 7475.11-01 | LL0-0.5M | 8/10/2016 | 555 | 0.11% | Staurastrum sp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Staurastrum | sp. | 1 | 1.00 | 1 | 909.00 | 909.00 | 1.64 | 1.64 | 40463.71 | 66272.79 |
| 7475.11-01 | LL0-0.5M | 8/10/2016 | 555 | 0.11% | Tetrastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Tetrastrum | sp. | 3 | 4.00 | 12 | 2726.99 | 10907.97 | 4.91 | 19.65 | 381.70 | 7502.01 |
| 7475.11-02 | LL1-0.5M | 8/10/2016 | 550 | 0.09% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 49 | 40.82 | 2000 | 53394.70 | 2179375.33 | 97.08 | 3962.50 | 1.70 | 6724.36 |
| 7475.11-02 | LL1-0.5M | 8/10/2016 | 550 | 0.09% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 1 | 1.00 | 1 | 1089.69 | 1089.69 | 1.98 | 1.98 | 311724.53 | 617604.32 |
| 7475.11-02 | LL1-0.5M | 8/10/2016 | 550 | 0.09% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 75 | 4.00 | 300 | 81726.57 | 326906.30 | 148.59 | 594.38 | 614.13 | 365020.60 |
| 7475.11-02 | LL1-0.5M | 8/10/2016 | 550 | 0.09% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 35 | 10.00 | 350 | 38139.07 | 381390.68 | 69.34 | 693.44 | 43.91 | 30445.38 |
| 7475.11-02 | LL1-0.5M | 8/10/2016 | 550 | 0.09% | Fragilaria sp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | sp. | 6 | 1.00 | 6 | 6538.13 | 6538.13 | 11.89 | 11.89 | 1209.51 | 14378.09 |
| 7475.11-02 | LL1-0.5M | 8/10/2016 | 550 | 0.09% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 12 | 2.00 | 24 | 13076.25 | 26152.50 | 23.78 | 47.55 | 2300.69 | 109397.97 |
| 7475.11-02 | LL1-0.5M | 8/10/2016 | 550 | 0.09% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 125 | 14.00 | 1750 | 136210.96 | 1906953.41 | 247.66 | 3467.19 | 2035.23 | 7056518.15 |
| 7475.11-02 | LL1-0.5M | 8/10/2016 | 550 | 0.09% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 3 | 8.00 | 24 | 3269.06 | 26152.50 | 5.94 | 47.55 | 278.26 | 13231.36 |
| 7475.11-02 | LL1-0.5M | 8/10/2016 | 550 | 0.09% | Tetrastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Tetrastrum | sp. | 1 | 4.00 | 4 | 1089.69 | 4358.75 | 1.98 | 7.93 | 113.10 | 896.29 |
| 7475.11-03 | LL2-0.5M | 8/10/2016 | 540 | 0.06% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 78 | 35.90 | 2800 | 124619.07 | 4473504.90 | 230.78 | 8284.27 | 2.23 | 18473.92 |
| 7475.11-03 | LL2-0.5M | 8/10/2016 | 540 | 0.06% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 38 | 4.00 | 152 | 60711.85 | 242847.41 | 112.43 | 449.72 | 470.91 | 211776.88 |
| 7475.11-03 | LL2-0.5M | 8/10/2016 | 540 | 0.06% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 38 | 8.00 | 304 | 60711.85 | 485694.82 | 112.43 | 899.43 | 17.86 | 16063.91 |
| 7475.11-03 | LL2-0.5M | 8/10/2016 | 540 | 0.06% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 15 | 5.00 | 75 | 23965.20 | 119826.02 | 44.38 | 221.90 | 1036.73 | 230049.55 |
| 7475.11-03 | LL2-0.5M | 8/10/2016 | 540 | 0.06% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 10 | 2.00 | 20 | 15976.80 | 31953.61 | 29.59 | 59.17 | 1681.28 | 99486.73 |
| 7475.11-03 | LL2-0.5M | 8/10/2016 | 540 | 0.06% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 141 | 12.00 | 1692 | 225272.93 | 2703275.11 | 417.17 | 5006.07 | 1690.93 | 8464910.52 |
| 7475.11-04 | LL3-0.5M | 8/11/2016 | 560 | 0.06% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 26 | 46.15 | 1200 | 41026.84 | 1893546.48 | 73.26 | 3381.33 | 1.93 | 6525.97 |
| 7475.11-04 | LL3-0.5M | 8/11/2016 | 560 | 0.06% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 10 | 12.50 | 125 | 15779.55 | 197244.43 | 28.18 | 352.22 | 929.13 | 327258.79 |
| 7475.11-04 | LL3-0.5M | 8/11/2016 | 560 | 0.06% | Carteria sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Chlamydomonadaceae | Carteria | sp. | 1 | 1.00 | 1 | 1577.96 | 1577.96 | 2.82 | 2.82 | 2120.58 | 5975.31 |
| 7475.11-04 | LL3-0.5M | 8/11/2016 | 560 | 0.06% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 71 | 4.00 | 284 | 112034.83 | 448139.33 | 200.06 | 800.25 | 453.67 | 363049.68 |
| 7475.11-04 | LL3-0.5M | 8/11/2016 | 560 | 0.06% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 47 | 8.00 | 376 | 74163.90 | 593311.23 | 132.44 | 1059.48 | 26.13 | 27686.44 |
| 7475.11-04 | LL3-0.5M | 8/11/2016 | 560 | 0.06% | Fragilaria sp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | sp. | 5 | 3.00 | 15 | 7889.78 | 23669.33 | 14.09 | 42.27 | 1009.99 | 42688.78 |
| 7475.11-04 | LL3-0.5M | 8/11/2016 | 560 | 0.06% | Gomphonema sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | sp. | 1 | 1.00 | 1 | 1577.96 | 1577.96 | 2.82 | 2.82 | 904.78 | 2549.47 |
| 7475.11-04 | LL3-0.5M | 8/11/2016 | 560 | 0.06% | Navicula spp. | Bacillariophyta | Bacillariophyceae | Naviculales | Naviculaceae | Navicula | spp. | 1 | 1.00 | 1 | 1577.96 | 1577.96 | 2.82 | 2.82 | 3534.29 | 9958.85 |
| 7475.11-04 | LL3-0.5M | 8/11/2016 | 560 | 0.06% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 24 | 3.00 | 72 | 37870.93 | 113612.79 | 67.63 | 202.88 | 2106.87 | 427442.56 |
| 7475.11-04 | LL3-0.5M | 8/11/2016 | 560 | 0.06% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 145 | 12.00 | 1740 | 228803.53 | 2745642.40 | 408.58 | 4902.93 | 1164.59 | 5709911.47 |
| 7475.11-04 | LL3-0.5M | 8/11/2016 | 560 | 0.06% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 3 | 8.00 | 24 | 4733.87 | 37870.93 | 8.45 | 67.63 | 292.59 | 19786.95 |
| 7475.11-04 | LL3-0.5M | 8/11/2016 | 560 | 0.06% | Staurastrum sp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Staurastrum | sp. | 1 | 1.00 | 1 | 1577.96 | 1577.96 | 2.82 | 2.82 | 49709.16 | 140069.35 |
| 7475.11-04 | LL3-0.5M | 8/11/2016 | 560 | 0.06% | Woronichinia sp. | Cyanobacteria | Cyanophyceae | Synechococcales | Coelosphaeriaceae | Woronichinia | sp. | 3 | 80.00 | 240 | 4733.87 | 378709.30 | 8.45 | 676.27 | 5.24 | 3540.93 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Achnanthes sp. | Bacillariophyta | Bacillariophyceae | Mastogloiales | Achnanthaceae | Achnanthes | sp. | 1 | 1.00 | 1 | 1040.06 | 1040.06 | 1.96 | 1.96 | 325.16 | 638.08 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Anabaena sp. | Cyanobacteria | Cyanophyceae | Nostocales | Nostocaceae | Anabaena | sp. | 2 | 115.00 | 230 | 2080.12 | 239214.14 | 3.92 | 451.35 | 904.78 | 408369.68 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 20 | 50.00 | 1000 | 20801.23 | 1040061.49 | 39.25 | 1962.38 | 1.60 | 3131.96 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 9 | 10.00 | 90 | 9360.55 | 93605.53 | 17.66 | 176.61 | 1073.35 | 189567.99 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 1 | 1.00 | 1 | 1040.06 | 1040.06 | 1.96 | 1.96 | 203418.12 | 399183.69 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Cocconeidaceae | Cocconeis | sp. | 1 | 1.00 | 1 | 1040.06 | 1040.06 | 1.96 | 1.96 | 1592.79 | 3125.65 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 5 | 4.00 | 20 | 5200.31 | 20801.23 | 9.81 | 39.25 | 321.42 | 12614.93 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 43 | 8.37 | 360 | 44722.64 | 374422.14 | 84.38 | 706.46 | 23.76 | 16788.24 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Fragilaria sp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | sp. | 25 | 15.00 | 375 | 26001.54 | 390023.06 | 49.06 | 735.89 | 791.68 | 582592.16 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | spp. | 5 | 1.00 | 5 | 5200.31 | 5200.31 | 9.81 | 9.81 | 6440.27 | 63191.24 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Komma sp. | Cryptophyta | Cryptophyceae | Pyrenomonadales | Chroomonadaceae | Komma | sp. | 5 | 1.00 | 5 | 5200.31 | 5200.31 | 9.81 | 9.81 | 150.43 | 1476.01 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Monoraphidium sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Selenastraceae | Monoraphidium | sp. | 4 | 1.00 | 4 | 4160.25 | 4160.25 | 7.85 | 7.85 | 206.17 | 1618.31 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Nitzschia spp. | Bacillariophyta | Bacillariophyceae | Bacillariales | Bacillariaceae | Nitzschia | spp. | 2 | 1.00 | 2 | 2080.12 | 2080.12 | 3.92 | 3.92 | 25289.82 | 99256.49 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 18 | 4.00 | 72 | 18721.11 | 74884.43 | 35.32 | 141.29 | 2155.13 | 304501.70 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 1 | 24.00 | 24 | 1040.06 | 24961.48 | 1.96 | 47.10 | 240.00 | 11303.31 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Planktolyngbya sp. | Cyanobacteria | Cyanophyceae | Synechococcales | Leptolyngbyaceae | Planktolyngbya | sp. | 28 | 10.00 | 280 | 29121.72 | 291217.22 | 54.95 | 549.47 | 13.50 | 7417.25 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 165 | 12.12 | 2000 | 171610.15 | 2080122.98 | 323.79 | 3924.76 | 1881.68 | 7385154.82 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Snowella sp. | Cyanobacteria | Cyanophyceae | Synechococcales | Coelosphaeriaceae | Snowella | sp. | 1 | 30.00 | 30 | 1040.06 | 31201.84 | 1.96 | 58.87 | 5.96 | 351.11 |
| 7475.11-05 | LL4-0.5M | 8/11/2016 | 530 | 0.10% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 3 | 16.00 | 48 | 3120.18 | 49922.95 | 5.89 | 94.19 | 103.75 | 9773.03 |
| 7475.11-06 | LL5-0.5M | 8/11/2016 | 510 | 0.10% | Anabaena sp. | Cyanobacteria | Cyanophyceae | Nostocales | Nostocaceae | Anabaena | sp. | 7 | 80.00 | 560 | 6915.88 | 553270.56 | 13.56 | 1084.84 | 1150.35 | 1247947.31 |
| 7475.11-06 | LL5-0.5M | 8/11/2016 | 510 | 0.10% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 6 | 30.00 | 180 | 5927.90 | 177836.96 | 11.62 | 348.70 | 2.11 | 734.01 |
| 7475.11-06 | LL5-0.5M | 8/11/2016 | 510 | 0.10% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 20 | 10.00 | 200 | 19759.66 | 197596.63 | 38.74 | 387.44 | 1507.96 | 584252.16 |
| 7475.11-06 | LL5-0.5M | 8/11/2016 | 510 | 0.10% | Carteria sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Chlamydomonadaceae | Carteria | sp. | 7 | 1.00 | 7 | 6915.88 | 6915.88 | 13.56 | 13.56 | 1206.37 | 16359.07 |
| 7475.11-06 | LL5-0.5M | 8/11/2016 | 510 | 0.10% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 52 | 4.00 | 208 | 51375.12 | 205500.49 | 100.74 | 402.94 | 531.44 | 214139.98 |
| 7475.11-06 | LL5-0.5M | 8/11/2016 | 510 | 0.10% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 31 | 8.00 | 248 | 30627.48 | 245019.82 | 60.05 | 480.43 | 20.39 | 9795.51 |
| 7475.11-06 | LL5-0.5M | 8/11/2016 | 510 | 0.10% | Fragilaria sp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | sp. | 13 | 20.00 | 260 | 12843.78 | 256875.62 | 25.18 | 503.68 | 1526.81 | 769022.13 |
| 7475.11-06 | LL5-0.5M | 8/11/2016 | 510 | 0.10% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 6 | 4.00 | 24 | 5927.90 | 23711.60 | 11.62 | 46.49 | 3216.99 | 149568.61 |
| 7475.11-06 | LL5-0.5M | 8/11/2016 | 510 | 0.10% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 2 | 24.00 | 48 | 1975.97 | 47423.19 | 3.87 | 92.99 | 429.00 | 39891.27 |
| 7475.11-06 | LL5-0.5M | 8/11/2016 | 510 | 0.10% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 164 | 13.41 | 2200 | 162029.23 | 2173562.90 | 317.70 | 4261.89 | 2212.21 | 9428170.04 |
| 7475.11-06 | LL5-0.5M | 8/11/2016 | 510 | 0.10% | Tetraëdron sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Tetraëdron | sp. | 1 | 1.00 | 1 | 987.98 | 987.98 | 1.94 | 1.94 | 364.50 | 706.12 |

**Avista Phytoplankton 2016 (Batches 6&7)**
Taxa Report with Biovolumes

EcoAnalysts, Inc.
LIFE IN WATER

| EcoAnalysts Sample ID | Site ID | Collection Date | Volume Received (mL) | Percent Counted | Taxon | Division | Class | Order | Family | Genus | Species | Number of Natural Units | Cells per Natural Unit | Number of Cells | Units / Sample | Cells/ sample | Units per mL (in sample received) | Cells per mL (in sample received) | AVG_BV (µ³) | Biovolume (µ³/mL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7475.13-01 | LL0-0.5M | 8/24/2016 | 555 | 0.10% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 25 | 40.00 | 1000 | 24095 | 963798 | 43 | 1737 | 1.77 | 3068.53 |
| 7475.13-01 | LL0-0.5M | 8/24/2016 | 555 | 0.10% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 142 | 4.00 | 568 | 136859 | 547437 | 247 | 986 | 343.00 | 338326.20 |
| 7475.13-01 | LL0-0.5M | 8/24/2016 | 555 | 0.10% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 8 | 1.00 | 8 | 7710 | 7710 | 14 | 14 | 502.66 | 6983.18 |
| 7475.13-01 | LL0-0.5M | 8/24/2016 | 555 | 0.10% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 15 | 6.00 | 90 | 14457 | 86742 | 26 | 156 | 44.56 | 6964.35 |
| 7475.13-01 | LL0-0.5M | 8/24/2016 | 555 | 0.10% | Komma sp. | Cryptophyta | Cryptophyceae | Pyrenomonadales | Chroomonadaceae | Komma | sp. | 3 | 1.00 | 3 | 2891 | 2891 | 5 | 5 | 139.57 | 727.12 |
| 7475.13-01 | LL0-0.5M | 8/24/2016 | 555 | 0.10% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 5 | 1.00 | 5 | 4819 | 4819 | 9 | 9 | 5026.55 | 43644.85 |
| 7475.13-01 | LL0-0.5M | 8/24/2016 | 555 | 0.10% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 106 | 8.00 | 848 | 102163 | 817301 | 184 | 1473 | 590.10 | 868983.83 |
| 7475.13-01 | LL0-0.5M | 8/24/2016 | 555 | 0.10% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 5 | 8.00 | 40 | 4819 | 38552 | 9 | 69 | 245.62 | 17061.42 |
| 7475.13-02 | LL1-0.5M | 8/24/2016 | 560 | 0.11% | Anabaena sp. | Cyanobacteria | Cyanophyceae | Nostocales | Nostocaceae | Anabaena | sp. | 2 | 90.00 | 180 | 1785 | 160616 | 3 | 287 | 440.47 | 126332.75 |
| 7475.13-02 | LL1-0.5M | 8/24/2016 | 560 | 0.11% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 32 | 50.00 | 1600 | 28554 | 1427700 | 51 | 2549 | 1.23 | 3140.94 |
| 7475.13-02 | LL1-0.5M | 8/24/2016 | 560 | 0.11% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 1 | 8.00 | 8 | 892 | 7139 | 2 | 13 | 735.13 | 9370.98 |
| 7475.13-02 | LL1-0.5M | 8/24/2016 | 560 | 0.11% | Carteria sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Chlamydomonadaceae | Carteria | sp. | 7 | 1.00 | 7 | 6246 | 6246 | 11 | 11 | 4347.44 | 48490.96 |
| 7475.13-02 | LL1-0.5M | 8/24/2016 | 560 | 0.11% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 116 | 4.00 | 464 | 103508 | 414033 | 185 | 739 | 551.37 | 407651.09 |
| 7475.13-02 | LL1-0.5M | 8/24/2016 | 560 | 0.11% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 32 | 10.00 | 320 | 28554 | 285540 | 51 | 510 | 53.27 | 27164.04 |
| 7475.13-02 | LL1-0.5M | 8/24/2016 | 560 | 0.11% | Fragilaria sp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | sp. | 2 | 9.00 | 18 | 1785 | 16062 | 3 | 29 | 590.62 | 16939.83 |
| 7475.13-02 | LL1-0.5M | 8/24/2016 | 560 | 0.11% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 3 | 1.00 | 3 | 2677 | 2677 | 5 | 5 | 6588.97 | 31496.89 |
| 7475.13-02 | LL1-0.5M | 8/24/2016 | 560 | 0.11% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 114 | 12.00 | 1368 | 101724 | 1220684 | 182 | 2180 | 670.21 | 1460910.07 |
| 7475.13-02 | LL1-0.5M | 8/24/2016 | 560 | 0.11% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 6 | 8.00 | 48 | 5354 | 42831 | 10 | 76 | 268.08 | 20504.05 |
| 7475.13-03 | LL2-0.5M | 8/24/2016 | 560 | 0.11% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 44 | 81.82 | 3600 | 41658 | 3408384 | 74 | 6086 | 1.12 | 6841.11 |
| 7475.13-03 | LL2-0.5M | 8/24/2016 | 560 | 0.11% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 1 | 13.00 | 13 | 947 | 12308 | 2 | 22 | 2060.89 | 45295.50 |
| 7475.13-03 | LL2-0.5M | 8/24/2016 | 560 | 0.11% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 3 | 1.00 | 3 | 2840 | 2840 | 5 | 5 | 380007.05 | 1927395.55 |
| 7475.13-03 | LL2-0.5M | 8/24/2016 | 560 | 0.11% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 96 | 4.00 | 384 | 90890 | 363561 | 162 | 649 | 274.63 | 178290.93 |
| 7475.13-03 | LL2-0.5M | 8/24/2016 | 560 | 0.11% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 3 | 1.00 | 3 | 2840 | 2840 | 5 | 5 | 2212.21 | 11220.30 |
| 7475.13-03 | LL2-0.5M | 8/24/2016 | 560 | 0.11% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 26 | 10.00 | 260 | 24616 | 246161 | 44 | 440 | 67.21 | 29541.96 |
| 7475.13-03 | LL2-0.5M | 8/24/2016 | 560 | 0.11% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 17 | 3.00 | 51 | 16095 | 48285 | 29 | 86 | 8444.60 | 728127.21 |
| 7475.13-03 | LL2-0.5M | 8/24/2016 | 560 | 0.11% | Planktolyngbya sp. | Cyanobacteria | Cyanophyceae | Synechococcales | Leptolyngbyaceae | Planktolyngbya | sp. | 1 | 28.00 | 28 | 947 | 26510 | 2 | 47 | 14.53 | 687.83 |
| 7475.13-03 | LL2-0.5M | 8/24/2016 | 560 | 0.11% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 113 | 12.00 | 1356 | 106985 | 1283825 | 191 | 2293 | 499.71 | 1145597.88 |
| 7475.13-03 | LL2-0.5M | 8/24/2016 | 560 | 0.11% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 6 | 0.33 | 2 | 5681 | 1894 | 10 | 3 | 166.83 | 564.09 |
| 7475.13-04 | LL3-0.5M | 8/25/2016 | 560 | 0.10% | Anabaena sp. | Cyanobacteria | Cyanophyceae | Nostocales | Nostocaceae | Anabaena | sp. | 11 | 49.09 | 540 | 10517 | 516267 | 19 | 922 | 796.33 | 734138.58 |
| 7475.13-04 | LL3-0.5M | 8/25/2016 | 560 | 0.10% | Asterionella sp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | sp. | 6 | 4.00 | 24 | 5736 | 22945 | 10 | 41 | 556.06 | 22783.83 |
| 7475.13-04 | LL3-0.5M | 8/25/2016 | 560 | 0.10% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 30 | 7.00 | 210 | 28681 | 200770 | 51 | 359 | 569.41 | 204145.46 |
| 7475.13-04 | LL3-0.5M | 8/25/2016 | 560 | 0.10% | Carteria sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Chlamydomonadaceae | Carteria | sp. | 3 | 1.00 | 3 | 2868 | 2868 | 5 | 5 | 1077.04 | 5516.28 |
| 7475.13-04 | LL3-0.5M | 8/25/2016 | 560 | 0.10% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 3 | 1.00 | 3 | 2868 | 2868 | 5 | 5 | 763210.67 | 3908930.81 |
| 7475.13-04 | LL3-0.5M | 8/25/2016 | 560 | 0.10% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Cocconeidaceae | Cocconeis | sp. | 3 | 1.00 | 3 | 2868 | 2868 | 5 | 5 | 1123.12 | 5752.27 |
| 7475.13-04 | LL3-0.5M | 8/25/2016 | 560 | 0.10% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 70 | 4.00 | 280 | 66923 | 267694 | 120 | 478 | 669.92 | 320239.26 |
| 7475.13-04 | LL3-0.5M | 8/25/2016 | 560 | 0.10% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 14 | 1.00 | 14 | 13385 | 13385 | 24 | 24 | 3934.32 | 94035.13 |
| 7475.13-04 | LL3-0.5M | 8/25/2016 | 560 | 0.10% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 52 | 10.00 | 520 | 49715 | 497146 | 89 | 888 | 58.37 | 51822.11 |
| 7475.13-04 | LL3-0.5M | 8/25/2016 | 560 | 0.10% | Fragilaria sp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | sp. | 15 | 20.00 | 300 | 14341 | 286815 | 26 | 512 | 5654.87 | 2896249.34 |
| 7475.13-04 | LL3-0.5M | 8/25/2016 | 560 | 0.10% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 10 | 2.00 | 20 | 9560 | 19121 | 17 | 34 | 9490.23 | 324040.24 |
| 7475.13-04 | LL3-0.5M | 8/25/2016 | 560 | 0.10% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 111 | 12.00 | 1332 | 106121 | 1273458 | 190 | 2274 | 590.10 | 1341897.04 |
| 7475.13-04 | LL3-0.5M | 8/25/2016 | 560 | 0.10% | Snowella sp. | Cyanobacteria | Cyanophyceae | Synechococcales | Coelosphaeriaceae | Snowella | sp. | 2 | 30.00 | 60 | 1912 | 57363 | 3 | 102 | 6.80 | 696.04 |
| 7475.13-04 | LL3-0.5M | 8/25/2016 | 560 | 0.10% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 7 | 10.00 | 70 | 6692 | 66923 | 12 | 120 | 179.59 | 21462.59 |
| 7475.13-04 | LL3-0.5M | 8/25/2016 | 560 | 0.10% | Staurastrum sp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Staurastrum | sp. | 3 | 1.00 | 3 | 2868 | 2868 | 5 | 5 | 10308.35 | 52796.21 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Achnanthes spp. | Bacillariophyta | Bacillariophyceae | Mastogloiales | Achnanthaceae | Achnanthes | spp. | 5 | 1.00 | 5 | 2785 | 2785 | 5 | 5 | 339.29 | 1687.15 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Anabaena sp. | Cyanobacteria | Cyanophyceae | Nostocales | Nostocaceae | Anabaena | sp. | 11 | 40.00 | 440 | 6126 | 245047 | 11 | 438 | 1150.35 | 503373.75 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 4 | 40.00 | 160 | 2228 | 89108 | 4 | 159 | 0.91 | 144.01 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Asterionella sp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | sp. | 1 | 8.00 | 8 | 557 | 4455 | 1 | 8 | 1303.76 | 10372.82 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 29 | 6.00 | 174 | 16151 | 96905 | 29 | 173 | 641.47 | 111003.67 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Carteria sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Chlamydomonadaceae | Carteria | sp. | 5 | 1.00 | 5 | 2785 | 2785 | 5 | 5 | 628.32 | 3124.35 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Chroococcus sp. | Cyanobacteria | Cyanophyceae | Chroococcales | Chroococcaceae | Chroococcus | sp. | 1 | 8.00 | 8 | 557 | 4455 | 1 | 8 | 65.45 | 520.73 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Coelastrum sp. | Chlorophyta | Chlorophyceae | Scenedesmaceae | Coelastroideae | Coelastrum | sp. | 1 | 8.00 | 8 | 557 | 4455 | 1 | 8 | 268.08 | 2132.89 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 23 | 4.00 | 92 | 12809 | 51237 | 23 | 91 | 166.38 | 15222.46 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 7 | 1.00 | 7 | 3898 | 3898 | 7 | 7 | 2127.12 | 14808.09 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Cymbella sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Cymbellaceae | Cymbella | sp. | 1 | 1.00 | 1 | 557 | 557 | 1 | 1 | 1190.00 | 1183.47 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Fragilaria sp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | sp. | 38 | 10.00 | 380 | 21163 | 211632 | 38 | 378 | 553.71 | 209253.08 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Microcystis sp. | Cyanobacteria | Cyanophyceae | Chroococcales | Microcystaceae | Microcystis | sp. | 2 | 30.00 | 60 | 1114 | 33416 | 2 | 60 | 220.89 | 13180.81 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 11 | 2.00 | 22 | 6126 | 12252 | 11 | 22 | 593.76 | 12991.02 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Planktolyngbya sp. | Cyanobacteria | Cyanophyceae | Synechococcales | Leptolyngbyaceae | Planktolyngbya | sp. | 7 | 20.00 | 140 | 3898 | 77970 | 7 | 139 | 16.33 | 2274.21 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 149 | 12.00 | 1788 | 82982 | 995783 | 148 | 1778 | 1809.56 | 3217724.14 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Staurastrum sp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Staurastrum | sp. | 5 | 1.00 | 5 | 2785 | 2785 | 5 | 5 | 13135.78 | 65318.32 |
| 7475.13-05 | LL4-0.5M | 8/25/2016 | 560 | 0.18% | Woronichinia sp. | Cyanobacteria | Cyanophyceae | Synechococcales | Coelosphaeriaceae | Woronichinia | sp. | 1 | 50.00 | 50 | 557 | 27846 | 1 | 50 | 6.28 | 312.43 |
| 7475.13-06 | LL5-0.5M | 8/25/2016 | 560 | 0.17% | Anabaena sp. | Cyanobacteria | Cyanophyceae | Nostocales | Nostocaceae | Anabaena | sp. | 5 | 40.00 | 200 | 2959 | 118347 | 5 | 211 | 817.28 | 172719.12 |
| 7475.13-06 | LL5-0.5M | 8/25/2016 | 560 | 0.17% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 1 | 13.00 | 13 | 592 | 7693 | 1 | 14 | 461.23 | 6335.69 |
| 7475.13-06 | LL5-0.5M | 8/25/2016 | 560 | 0.17% | Botryococcus sp. | Chlorophyta | Trebouxiophyceae | Trebouxiales | Botryococcaceae | Botryococcus | sp. | 2 | 1.00 | 2 | 1183 | 1183 | 2 | 2 | 74.22 | 156.85 |
| 7475.13-06 | LL5-0.5M | 8/25/2016 | 560 | 0.17% | Carteria sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Chlamydomonadaceae | Carteria | sp. | 5 | 1.00 | 5 | 2959 | 2959 | 5 | 5 | 2120.58 | 11203.70 |
| 7475.13-06 | LL5-0.5M | 8/25/2016 | 560 | 0.17% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 3 | 1.00 | 3 | 1775 | 1775 | 3 | 3 | 208677.15 | 661506.50 |
| 7475.13-06 | LL5-0.5M | 8/25/2016 | 560 | 0.17% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 6 | 1.00 | 6 | 3550 | 3550 | 6 | 6 | 5598.32 | 35493.33 |
| 7475.13-06 | LL5-0.5M | 8/25/2016 | 560 | 0.17% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 8 | 12.00 | 96 | 4734 | 56806 | 8 | 101 | 30.21 | 3064.10 |
| 7475.13-06 | LL5-0.5M | 8/25/2016 | 560 | 0.17% | Fragilaria sp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | sp. | 11 | 20.00 | 220 | 6509 | 130181 | 12 | 232 | 967.61 | 224937.28 |
| 7475.13-06 | LL5-0.5M | 8/25/2016 | 560 | 0.17% | Gomphonema sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | sp. | 1 | 1.00 | 1 | 592 | 592 | 1 | 1 | 640.89 | 677.20 |
| 7475.13-06 | LL5-0.5M | 8/25/2016 | 560 | 0.17% | Melosira sp. | Bacillariophyta | Coscinodiscophyceae | Melosirales | Melosiraceae | Melosira | sp. | 1 | 1.00 | 1 | 592 | 592 | 1 | 1 | 25446.90 | 26888.89 |
| 7475.13-06 | LL5-0.5M | 8/25/2016 | 560 | 0.17% | Microcystis sp. | Cyanobacteria | Cyanophyceae | Chroococcales | Microcystaceae | Microcystis | sp. | 226 | 3.45 | 780 | 133732 | 461552 | 239 | 824 | 113.10 | 93214.54 |
| 7475.13-06 | LL5-0.5M | 8/25/2016 | 560 | 0.17% | Monoraphidium sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Selenastraceae | Monoraphidium | sp. | 1 | 1.00 | 1 | 592 | 592 | 1 | 1 | 32.99 | 34.86 |
| 7475.13-06 | LL5-0.5M | 8/25/2016 | 560 | 0.17% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 6 | 4.00 | 24 | 3550 | 14202 | 6 | 25 | 1206.37 | 30593.59 |
| 7475.13-06 | LL5-0.5M | 8/25/2016 | 560 | 0.17% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 56 | 0.02 | 672 | 33137 | 397645 | 59 | 710 | 519.54 | 368915.64 |
| 7475.13-06 | LL5-0.5M | 8/25/2016 | 560 | 0.17% | Snowella sp. | Cyanobacteria | Cyanophyceae | Synechococcales | Coelosphaeriaceae | Snowella | sp. | 1 | 1.00 | 50 | 592 | 29587 | 1 | 53 | 7.51 | 396.94 |
| 7475.13-06 | LL5-0.5M | 8/25/2016 | 560 | 0.17% | Staurastrum sp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Staurastrum | sp. | 3 | 1.00 | 3 | 1775 | 1775 | 3 | 3 | 11384.35 | 36088.37 |

**Avista Phytoplankton 2016 (Batches 8&9)**
Taxa Report with Biovolumes

EcoAnalysts, Inc.
LIFE IN WATER

| EcoAnalysts Sample ID | Site ID | Collection Date | Volume Received (mL) | Percent Counted | Taxon | Division | Class | Order | Family | Genus | Species | Number of Natural Units | Cells per Natural Unit | Number of Cells | Units / Sample | Cells/ sample | Units per mL (in sample received) | Cells per mL (in sample received) | AVG_BV (μ³) | Biovolume (μ³/mL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7475.15-01 | LL0-0.5M | 9/6/2016 | 515 | 0.03% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 39 | 3200.00 | 82.05128205 | 141487.65 | 11609243.31 | 274.73 | 22542.22 | 1.77 | 39832.10 |
| 7475.15-01 | LL0-0.5M | 9/6/2016 | 515 | 0.03% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 5 | 35.00 | 7 | 18139.44 | 126976.10 | 35.22 | 246.56 | 819.96 | 202164.69 |
| 7475.15-01 | LL0-0.5M | 9/6/2016 | 515 | 0.03% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 98 | 392.00 | 4 | 355533.08 | 1422132.31 | 690.36 | 2761.42 | 512.00 | 1413848.04 |
| 7475.15-01 | LL0-0.5M | 9/6/2016 | 515 | 0.03% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 3 | 3.00 | 1 | 10883.67 | 10883.67 | 21.13 | 21.13 | 15219.97 | 321648.65 |
| 7475.15-01 | LL0-0.5M | 9/6/2016 | 515 | 0.03% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 14 | 140.00 | 10 | 50790.44 | 507904.39 | 98.62 | 986.22 | 14.17 | 13975.75 |
| 7475.15-01 | LL0-0.5M | 9/6/2016 | 515 | 0.03% | Fragilaria sp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | sp. | 5 | 9.00 | 1.8 | 18139.44 | 32651.00 | 35.22 | 63.40 | 907.14 | 57512.35 |
| 7475.15-01 | LL0-0.5M | 9/6/2016 | 515 | 0.03% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 15 | 60.00 | 4 | 54418.33 | 217673.31 | 105.67 | 422.67 | 333.53 | 140972.84 |
| 7475.15-01 | LL0-0.5M | 9/6/2016 | 515 | 0.03% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 113 | 1356.00 | 12 | 409951.40 | 4919416.85 | 796.02 | 9552.27 | 3067.96 | 29305988.28 |
| 7475.15-01 | LL0-0.5M | 9/6/2016 | 515 | 0.03% | Snowella sp. | Cyanobacteria | Cyanophyceae | Synechococcales | Coelosphaeriaceae | Snowella | sp. | 5 | 200.00 | 40 | 18139.44 | 725577.71 | 35.22 | 1408.89 | 4.19 | 5901.83 |
| 7475.15-01 | LL0-0.5M | 9/6/2016 | 515 | 0.03% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 4 | 32.00 | 8 | 14511.55 | 116092.43 | 28.18 | 225.42 | 143.79 | 32414.13 |
| 7475.15-02 | LL1-0.5M | 9/6/2016 | 520 | 0.04% | Achnanthidium sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Achnanthidiaceae | Achnanthidium | sp. | 1 | 1.00 | 1 | 2747.33 | 2747.33 | 5.28 | 5.28 | 117.81 | 622.43 |
| 7475.15-02 | LL1-0.5M | 9/6/2016 | 520 | 0.04% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 43 | 258.00 | 6 | 118135.32 | 708811.93 | 227.18 | 1363.10 | 1.05 | 1427.17 |
| 7475.15-02 | LL1-0.5M | 9/6/2016 | 520 | 0.04% | Carteria sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Chlamydomonadaceae | Carteria | sp. | 5 | 5.00 | 1 | 13736.67 | 13736.67 | 26.42 | 26.42 | 628.32 | 16598.09 |
| 7475.15-02 | LL1-0.5M | 9/6/2016 | 520 | 0.04% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 139 | 556.00 | 4 | 381879.30 | 1527517.18 | 734.38 | 2937.53 | 274.63 | 806720.01 |
| 7475.15-02 | LL1-0.5M | 9/6/2016 | 520 | 0.04% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 3 | 3.00 | 1 | 8242.00 | 8242.00 | 15.85 | 15.85 | 2389.18 | 37868.52 |
| 7475.15-02 | LL1-0.5M | 9/6/2016 | 520 | 0.04% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 5 | 78.00 | 15.6 | 13736.67 | 214291.98 | 26.42 | 412.10 | 30.21 | 12447.89 |
| 7475.15-02 | LL1-0.5M | 9/6/2016 | 520 | 0.04% | Microcystis sp. | Cyanobacteria | Cyanophyceae | Chroococcales | Microcystaceae | Microcystis | sp. | 3 | 580.00 | 193.3333333 | 8242.00 | 1593453.18 | 15.85 | 3064.33 | 87.11 | 266946.31 |
| 7475.15-02 | LL1-0.5M | 9/6/2016 | 520 | 0.04% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 9 | 36.00 | 4 | 24726.00 | 98903.99 | 47.55 | 190.20 | 1592.79 | 302948.06 |
| 7475.15-02 | LL1-0.5M | 9/6/2016 | 520 | 0.04% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 124 | 1488.00 | 12 | 340669.30 | 4088031.60 | 655.13 | 7861.60 | 1005.31 | 7903344.32 |
| 7475.15-02 | LL1-0.5M | 9/6/2016 | 520 | 0.04% | Snowella sp. | Cyanobacteria | Cyanophyceae | Synechococcales | Coelosphaeriaceae | Snowella | sp. | 2 | 110.00 | 55 | 5494.67 | 302206.64 | 10.57 | 581.17 | 5.96 | 3466.08 |
| 7475.15-02 | LL1-0.5M | 9/6/2016 | 520 | 0.04% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 2 | 16.00 | 8 | 5494.67 | 43957.33 | 10.57 | 84.53 | 243.73 | 20603.05 |
| 7475.15-03 | LL2-0.5M | 9/6/2016 | 540 | 0.03% | Amphora sp. | Bacillariophyta | Bacillariophyceae | Thalassiophysales | Catenulaceae | Amphora | sp. | 1 | 1.00 | 1 | 3804.00 | 3804.00 | 7.04 | 7.04 | 9072.00 | 63907.19 |
| 7475.15-03 | LL2-0.5M | 9/6/2016 | 540 | 0.03% | Anabaena sp. | Cyanobacteria | Cyanophyceae | Nostocales | Nostocaceae | Anabaena | sp. | 1 | 112.00 | 112 | 3804.00 | 426047.96 | 7.04 | 788.98 | 523.60 | 413107.94 |
| 7475.15-03 | LL2-0.5M | 9/6/2016 | 540 | 0.03% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 75 | 2250.00 | 30 | 285299.97 | 8558999.16 | 528.33 | 15850.00 | 1.29 | 20414.80 |
| 7475.15-03 | LL2-0.5M | 9/6/2016 | 540 | 0.03% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 1 | 18.00 | 18 | 3804.00 | 68471.99 | 7.04 | 126.80 | 569.41 | 72201.69 |
| 7475.15-03 | LL2-0.5M | 9/6/2016 | 540 | 0.03% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 53 | 212.00 | 4 | 201611.98 | 806447.92 | 373.36 | 1493.42 | 381.08 | 569110.30 |
| 7475.15-03 | LL2-0.5M | 9/6/2016 | 540 | 0.03% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 3 | 3.00 | 1 | 11412.00 | 11412.00 | 21.13 | 21.13 | 27.57 | 582.54 |
| 7475.15-03 | LL2-0.5M | 9/6/2016 | 540 | 0.03% | Microcystis sp. | Cyanobacteria | Cyanophyceae | Chroococcales | Microcystaceae | Microcystis | sp. | 1 | 40.00 | 40 | 3804.00 | 152159.99 | 7.04 | 281.78 | 83.83 | 23621.43 |
| 7475.15-03 | LL2-0.5M | 9/6/2016 | 540 | 0.03% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 20 | 40.00 | 2 | 76079.99 | 152159.99 | 140.89 | 281.78 | 2948.91 | 830936.66 |
| 7475.15-03 | LL2-0.5M | 9/6/2016 | 540 | 0.03% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 141 | 1692.00 | 12 | 536363.95 | 6436367.37 | 993.27 | 11919.20 | 1336.40 | 15928865.00 |
| 7475.15-03 | LL2-0.5M | 9/6/2016 | 540 | 0.03% | Snowella sp. | Cyanobacteria | Cyanophyceae | Synechococcales | Coelosphaeriaceae | Snowella | sp. | 2 | 100.00 | 50 | 7608.00 | 380399.96 | 14.09 | 704.44 | 3.59 | 2529.66 |
| 7475.15-03 | LL2-0.5M | 9/6/2016 | 540 | 0.03% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 15 | 120.00 | 8 | 57059.99 | 456479.96 | 105.67 | 845.33 | 337.71 | 285474.96 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Achnanthidium sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Achnanthidiaceae | Achnanthidium | sp. | 1 | 1.00 | 1 | 1690.67 | 1690.67 | 3.02 | 3.02 | 62.83 | 189.69 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 18 | 500.00 | 27.77777778 | 30432.00 | 845333.25 | 54.34 | 1509.52 | 0.88 | 1331.40 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 15 | 150.00 | 10 | 25360.00 | 253599.98 | 45.29 | 452.86 | 1077.57 | 487983.41 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Botryococcus sp. | Chlorophyta | Trebouxiophyceae | Trebouxiales | Botryococcaceae | Botryococcus | sp. | 1 | 27.00 | 27 | 1690.67 | 45648.00 | 3.02 | 81.51 | 75.74 | 6173.73 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Chlamydomonas sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Chlamydomonadaceae | Chlamydomonas | sp. | 15 | 15.00 | 1 | 25360.00 | 25360.00 | 45.29 | 45.29 | 143.79 | 6511.77 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Cocconeidaceae | Cocconeis | sp. | 11 | 11.00 | 1 | 18597.33 | 18597.33 | 33.21 | 33.21 | 2572.96 | 85446.90 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 70 | 280.00 | 4 | 118346.66 | 473386.62 | 211.33 | 845.33 | 343.00 | 289949.30 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 17 | 17.00 | 1 | 28741.33 | 28741.33 | 51.32 | 51.32 | 3177.72 | 163092.73 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Cymbella sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Cymbellaceae | Cymbella | sp. | 6 | 6.00 | 1 | 10144.00 | 10144.00 | 18.11 | 18.11 | 393.75 | 7132.50 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 3 | 36.00 | 12 | 5072.00 | 60863.99 | 9.06 | 108.69 | 11.55 | 1254.99 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 17 | 255.00 | 15 | 28741.33 | 431119.96 | 51.32 | 769.86 | 579.62 | 446227.63 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Gomphonema sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | sp. | 5 | 5.00 | 1 | 8453.33 | 8453.33 | 15.10 | 15.10 | 486.95 | 7350.58 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Melosira sp. | Bacillariophyta | Coscinodiscophyceae | Melosirales | Melosiraceae | Melosira | sp. | 3 | 6.00 | 2 | 5072.00 | 10144.00 | 9.06 | 18.11 | 12048.79 | 218255.26 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Microcystis sp. | Cyanobacteria | Cyanophyceae | Chroococcales | Microcystaceae | Microcystis | sp. | 1 | 400.00 | 400 | 1690.67 | 676266.60 | 3.02 | 1207.62 | 161.35 | 194844.24 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 14 | 56.00 | 4 | 23669.33 | 94677.32 | 42.27 | 169.07 | 1099.56 | 185898.42 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 3 | 96.00 | 32 | 5072.00 | 162303.98 | 9.06 | 289.83 | 144.00 | 41735.31 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Planktolyngbya spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Leptolyngbyaceae | Planktolyngbya | spp. | 6 | 120.00 | 20 | 10144.00 | 202879.98 | 18.11 | 362.29 | 6.28 | 2276.24 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 91 | 910.00 | 10 | 153850.65 | 1538506.52 | 274.73 | 2747.33 | 1463.20 | 4019889.50 |
| 7475.15-04 | LL3-0.5M | 9/6/2016 | 560 | 0.06% | Synedra sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Synedra | sp. | 3 | 3.00 | 1 | 5072.00 | 5072.00 | 9.06 | 9.06 | 8256.11 | 74776.72 |
| 7475.15-05 | LL4-0.5M | 9/6/2016 | 480 | 0.04% | Anabaena sp. | Cyanobacteria | Cyanophyceae | Nostocales | Nostocaceae | Anabaena | sp. | 9 | 63.00 | 7 | 20288.00 | 142015.99 | 42.27 | 295.87 | 523.60 | 154915.48 |
| 7475.15-05 | LL4-0.5M | 9/6/2016 | 480 | 0.04% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 6 | 6.00 | 1 | 13525.33 | 13525.33 | 28.18 | 28.18 | 0.91 | 25.50 |
| 7475.15-05 | LL4-0.5M | 9/6/2016 | 480 | 0.04% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 61 | 610.00 | 10 | 137507.54 | 1375075.42 | 286.47 | 2864.74 | 933.05 | 2672954.68 |
| 7475.15-05 | LL4-0.5M | 9/6/2016 | 480 | 0.04% | Carteria sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Chlamydomonadaceae | Carteria | sp. | 3 | 3.00 | 1 | 6762.67 | 6762.67 | 14.09 | 14.09 | 628.32 | 8852.32 |
| 7475.15-05 | LL4-0.5M | 9/6/2016 | 480 | 0.04% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 6 | 6.00 | 1 | 13525.33 | 13525.33 | 28.18 | 28.18 | 392699.08 | 11065386.38 |
| 7475.15-05 | LL4-0.5M | 9/6/2016 | 480 | 0.04% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Cocconeidaceae | Cocconeis | sp. | 1 | 1.00 | 1 | 2254.22 | 2254.22 | 4.70 | 4.70 | 4099.78 | 19253.77 |
| 7475.15-05 | LL4-0.5M | 9/6/2016 | 480 | 0.04% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 13 | 42.00 | 3.230769231 | 29304.89 | 94677.32 | 61.05 | 197.24 | 343.00 | 67654.84 |
| 7475.15-05 | LL4-0.5M | 9/6/2016 | 480 | 0.04% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 1 | 1.00 | 1 | 2254.22 | 2254.22 | 4.70 | 4.70 | 2389.18 | 11220.30 |
| 7475.15-05 | LL4-0.5M | 9/6/2016 | 480 | 0.04% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 4 | 32.00 | 8 | 9016.89 | 72135.10 | 18.79 | 150.28 | 12.20 | 1833.58 |
| 7475.15-05 | LL4-0.5M | 9/6/2016 | 480 | 0.04% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 25 | 250.00 | 10 | 56355.55 | 563555.50 | 117.41 | 1174.07 | 1162.39 | 1364730.66 |
| 7475.15-05 | LL4-0.5M | 9/6/2016 | 480 | 0.04% | Microcystis sp. | Cyanobacteria | Cyanophyceae | Chroococcales | Microcystaceae | Microcystis | sp. | 87 | 580.00 | 6.666666667 | 196117.31 | 1307448.76 | 408.58 | 2723.85 | 84.76 | 230870.94 |
| 7475.15-05 | LL4-0.5M | 9/6/2016 | 480 | 0.04% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 6 | 24.00 | 4 | 13525.33 | 54101.33 | 28.18 | 112.71 | 1240.02 | 139763.57 |
| 7475.15-05 | LL4-0.5M | 9/6/2016 | 480 | 0.04% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 3 | 128.00 | 42.66666667 | 6762.67 | 288540.42 | 14.09 | 601.13 | 468.00 | 281326.91 |
| 7475.15-05 | LL4-0.5M | 9/6/2016 | 480 | 0.04% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 77 | 924.00 | 12 | 173575.09 | 2082901.13 | 361.61 | 4339.38 | 1208.73 | 5245126.91 |
| 7475.15-05 | LL4-0.5M | 9/6/2016 | 480 | 0.04% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 11 | 88.00 | 8 | 24796.44 | 198371.54 | 51.66 | 413.27 | 143.79 | 59425.91 |
| 7475.15-05 | LL4-0.5M | 9/6/2016 | 480 | 0.04% | Staurastrum sp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Staurastrum | sp. | 1 | 1.00 | 1 | 2254.22 | 2254.22 | 4.70 | 4.70 | 10917.03 | 51269.62 |
| 7475.15-06 | LL5-0.5M | 9/6/2016 | 480 | 0.03% | Anabaena sp. | Cyanobacteria | Cyanophyceae | Nostocales | Nostocaceae | Anabaena | sp. | 5 | 300.00 | 60 | 14340.74 | 860444.44 | 29.88 | 1792.59 | 1022.65 | 1833201.99 |
| 7475.15-06 | LL5-0.5M | 9/6/2016 | 480 | 0.03% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 3 | 45.00 | 15 | 8604.44 | 129066.67 | 17.93 | 268.89 | 2199.12 | 591317.59 |
| 7475.15-06 | LL5-0.5M | 9/6/2016 | 480 | 0.03% | Botryococcus sp. | Chlorophyta | Trebouxiophyceae | Trebouxiales | Botryococcaceae | Botryococcus | sp. | 1 | 16.00 | 16 | 2868.15 | 45890.37 | 5.98 | 95.60 | 72.10 | 6893.12 |
| 7475.15-06 | LL5-0.5M | 9/6/2016 | 480 | 0.03% | Carteria sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Chlamydomonadaceae | Carteria | sp. | 1 | 1.00 | 1 | 2868.15 | 2868.15 | 5.98 | 5.98 | 1734.55 | 10364.45 |
| 7475.15-06 | LL5-0.5M | 9/6/2016 | 480 | 0.03% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 4 | 4.00 | 1 | 11472.59 | 11472.59 | 23.90 | 23.90 | 378021.56 | 9035182.00 |
| 7475.15-06 | LL5-0.5M | 9/6/2016 | 480 | 0.03% | Cosmarium sp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Cosmarium | sp. | 1 | 1.00 | 1 | 2868.15 | 2868.15 | 5.98 | 5.98 | 6870.66 | 41054.33 |
| 7475.15-06 | LL5-0.5M | 9/6/2016 | 480 | 0.03% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 12 | 12.00 | 1 | 34417.78 | 34417.78 | 71.70 | 71.70 | 12762.72 | 915134.29 |
| 7475.15-06 | LL5-0.5M | 9/6/2016 | 480 | 0.03% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 2 | 72.00 | 36 | 5736.30 | 206506.67 | 11.95 | 430.22 | 16.62 | 7149.00 |
| 7475.15-06 | LL5-0.5M | 9/6/2016 | 480 | 0.03% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 2 | 60.00 | 30 | 5736.30 | 172088.89 | 11.95 | 358.52 | 1218.94 | 437011.85 |
| 7475.15-06 | LL5-0.5M | 9/6/2016 | 480 | 0.03% | Microcystis sp. | Cyanobacteria | Cyanophyceae | Chroococcales | Microcystaceae | Microcystis | sp. | 260 | 660.00 | 2.538461538 | 745718.52 | 1892977.78 | 1553.58 | 3943.70 | 57.91 | 228364.11 |
| 7475.15-06 | LL5-0.5M | 9/6/2016 | 480 | 0.03% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 3 | 12.00 | 4 | 8604.44 | 34417.78 | 17.93 | 71.70 | 1096.48 | 78621.46 |
| 7475.15-06 | LL5-0.5M | 9/6/2016 | 480 | 0.03% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 1 | 64.00 | 64 | 2868.15 | 183561.48 | 5.98 | 382.42 | 969.00 | 370564.74 |
| 7475.15-06 | LL5-0.5M | 9/6/2016 | 480 | 0.03% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 23 | 368.00 | 16 | 65967.41 | 1055478.52 | 137.43 | 2198.91 | 930.63 | 2046363.95 |
| 7475.15-06 | LL5-0.5M | 9/6/2016 | 480 | 0.03% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 4 | 32.00 | 8 | 11472.59 | 91780.74 | 23.90 | 191.21 | 127.83 | 24442.74 |
| 7475.15-06 | LL5-0.5M | 9/6/2016 | 480 | 0.03% | Staurastrum sp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Staurastrum | sp. | 1 | 1.00 | 1 | 2868.15 | 2868.15 | 5.98 | 5.98 | 6211.19 | 37113.78 |

**Avista Phytoplankton 2016 (Batches 8&9)**
Taxa Report with Biovolumes

| EcoAnalysts Sample ID | Site ID | Collection Date | Volume Received (mL) | Percent Counted | Taxon | Division | Class | Order | Family | Genus | Species | Number of Natural Units | Cells per Natural Unit | Number of Cells | Units / Sample | Cells/ sample | Units per mL (in sample received) | Cells per mL (in sample received) | AVG_BV (µ³) | Biovolume (µ³/mL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7475.17-01 | LL0-0.5M | 9/19/2016 | 560 | 0.12% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 38 | 1140.00 | 30 | 31788.64 | 953659.26 | 56.77 | 1702.96 | 0.88 | 1502.01 |
| 7475.17-01 | LL0-0.5M | 9/19/2016 | 560 | 0.12% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 1 | 5.00 | 5 | 836.54 | 4182.72 | 1.49 | 7.47 | 962.31 | 7187.62 |
| 7475.17-01 | LL0-0.5M | 9/19/2016 | 560 | 0.12% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 19 | 76.00 | 4 | 15894.32 | 63577.28 | 28.38 | 113.53 | 161.88 | 18378.26 |
| 7475.17-01 | LL0-0.5M | 9/19/2016 | 560 | 0.12% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 13 | 13.00 | 1 | 10875.06 | 10875.06 | 19.42 | 19.42 | 2123.72 | 41242.06 |
| 7475.17-01 | LL0-0.5M | 9/19/2016 | 560 | 0.12% | Elakatothrix sp. | Charophyta | Klebsormidiophyceae | Klebsormidiales | Elakatotrichaceae | Elakatothrix | sp. | 4 | 8.00 | 2 | 3346.17 | 6692.35 | 5.98 | 11.95 | 4926.02 | 58868.94 |
| 7475.17-01 | LL0-0.5M | 9/19/2016 | 560 | 0.12% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 49 | 74.00 | 1.510204082 | 40990.62 | 61904.20 | 73.20 | 110.54 | 10264.63 | 1134685.15 |
| 7475.17-01 | LL0-0.5M | 9/19/2016 | 560 | 0.12% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 3 | 48.00 | 16 | 2509.63 | 40154.07 | 4.48 | 71.70 | 585.00 | 41946.67 |
| 7475.17-01 | LL0-0.5M | 9/19/2016 | 560 | 0.12% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 174 | 2088.00 | 12 | 145558.52 | 1746702.22 | 259.93 | 3119.11 | 812.43 | 2534043.84 |
| 7475.17-01 | LL0-0.5M | 9/19/2016 | 560 | 0.12% | Snowella sp. | Cyanobacteria | Cyanophyceae | Synechococcales | Coelosphaeriaceae | Snowella | sp. | 1 | 60.00 | 60 | 836.54 | 50192.59 | 1.49 | 89.63 | 3.32 | 297.12 |
| 7475.17-01 | LL0-0.5M | 9/19/2016 | 560 | 0.12% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 13 | 104.00 | 8 | 10875.06 | 87000.49 | 19.42 | 155.36 | 304.83 | 47357.79 |
| 7475.17-02 | LL1-0.5M | 9/19/2016 | 540 | 0.09% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 71 | 4260.00 | 60 | 76364.44 | 4581866.67 | 141.42 | 8484.94 | 1.23 | 10453.44 |
| 7475.17-02 | LL1-0.5M | 9/19/2016 | 540 | 0.09% | Asterionella sp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | sp. | 1 | 16.00 | 16 | 1075.56 | 17208.89 | 1.99 | 31.87 | 480.66 | 15317.95 |
| 7475.17-02 | LL1-0.5M | 9/19/2016 | 540 | 0.09% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 39 | 156.00 | 4 | 41946.67 | 167786.67 | 77.68 | 310.72 | 445.94 | 138561.96 |
| 7475.17-02 | LL1-0.5M | 9/19/2016 | 540 | 0.09% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 21 | 21.00 | 1 | 22586.67 | 22586.67 | 41.83 | 41.83 | 15381.24 | 643353.51 |
| 7475.17-02 | LL1-0.5M | 9/19/2016 | 540 | 0.09% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 12 | 144.00 | 12 | 12906.67 | 154880.00 | 23.90 | 286.81 | 15.64 | 4485.21 |
| 7475.17-02 | LL1-0.5M | 9/19/2016 | 540 | 0.09% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 45 | 65.00 | 1.444444444 | 48400.00 | 69911.11 | 89.63 | 129.47 | 9114.42 | 1179997.93 |
| 7475.17-02 | LL1-0.5M | 9/19/2016 | 540 | 0.09% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 133 | 1596.00 | 12 | 143048.89 | 1716586.67 | 264.91 | 3178.86 | 917.88 | 2917822.23 |
| 7475.17-03 | LL2-0.5M | 9/19/2016 | 530 | 0.10% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 61 | 3500.00 | 57.37704918 | 61004.76 | 3500272.90 | 115.10 | 6604.29 | 0.86 | 5679.69 |
| 7475.17-03 | LL2-0.5M | 9/19/2016 | 530 | 0.10% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 22 | 132.00 | 6 | 22001.72 | 132010.29 | 41.51 | 249.08 | 1357.17 | 338038.01 |
| 7475.17-03 | LL2-0.5M | 9/19/2016 | 530 | 0.10% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 23 | 92.00 | 4 | 23001.79 | 92007.17 | 43.40 | 173.60 | 327.08 | 56781.10 |
| 7475.17-03 | LL2-0.5M | 9/19/2016 | 530 | 0.10% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 41 | 410.00 | 10 | 41003.20 | 410031.97 | 77.36 | 773.65 | 18498.67 | 14311410.02 |
| 7475.17-03 | LL2-0.5M | 9/19/2016 | 530 | 0.10% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 4 | 48.00 | 12 | 4000.31 | 48003.74 | 7.55 | 90.57 | 29.55 | 2676.71 |
| 7475.17-03 | LL2-0.5M | 9/19/2016 | 530 | 0.10% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 4 | 24.00 | 6 | 4000.31 | 24001.87 | 7.55 | 45.29 | 439.82 | 19918.07 |
| 7475.17-03 | LL2-0.5M | 9/19/2016 | 530 | 0.10% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 35 | 70.00 | 2 | 35002.73 | 70005.46 | 66.04 | 132.09 | 3063.05 | 404585.71 |
| 7475.17-03 | LL2-0.5M | 9/19/2016 | 530 | 0.10% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 103 | 1236.00 | 12 | 103008.03 | 1236096.37 | 194.35 | 2332.26 | 654.24 | 1525849.03 |
| 7475.17-03 | LL2-0.5M | 9/19/2016 | 530 | 0.10% | Snowella sp. | Cyanobacteria | Cyanophyceae | Synechococcales | Coelosphaeriaceae | Snowella | sp. | 2 | 80.00 | 40 | 2000.16 | 80006.24 | 3.77 | 150.96 | 4.85 | 731.98 |
| 7475.17-03 | LL2-0.5M | 9/19/2016 | 530 | 0.10% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 15 | 120.00 | 8 | 15001.17 | 120009.36 | 28.30 | 226.43 | 57.91 | 13111.81 |
| 7475.17-03 | LL2-0.5M | 9/19/2016 | 530 | 0.10% | Tetraëdriella sp. | Ochrophyta | Xanthophyceae | Mischococcales | Pleurochloridaceae | Tetraëdriella | sp. | 1 | 1.00 | 1 | 1000.08 | 1000.08 | 1.89 | 1.89 | 3435.33 | 6482.26 |
| 7475.17-04 | LL3-0.5M | 9/19/2016 | 520 | 0.21% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 12 | 720.00 | 60 | 5592.89 | 335573.33 | 10.76 | 645.33 | 1.10 | 708.58 |
| 7475.17-04 | LL3-0.5M | 9/19/2016 | 520 | 0.21% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 12 | 72.00 | 6 | 5592.89 | 33557.33 | 10.76 | 64.53 | 1859.82 | 120020.58 |
| 7475.17-04 | LL3-0.5M | 9/19/2016 | 520 | 0.21% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 2 | 2.00 | 1 | 932.15 | 932.15 | 1.79 | 1.79 | 804247.72 | 1441688.50 |
| 7475.17-04 | LL3-0.5M | 9/19/2016 | 520 | 0.21% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 7 | 7.00 | 1 | 3262.52 | 3262.52 | 6.27 | 6.27 | 1809.56 | 11353.29 |
| 7475.17-04 | LL3-0.5M | 9/19/2016 | 520 | 0.21% | Cymbella sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Cymbellaceae | Cymbella | sp. | 8 | 8.00 | 1 | 3728.59 | 3728.59 | 7.17 | 7.17 | 700.00 | 5019.26 |
| 7475.17-04 | LL3-0.5M | 9/19/2016 | 520 | 0.21% | Dictyosphaerium spp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Chlorellaceae | Dictyosphaerium | spp. | 4 | 15.00 | 3.75 | 1864.30 | 6991.11 | 3.59 | 13.44 | 26.14 | 351.40 |
| 7475.17-04 | LL3-0.5M | 9/19/2016 | 520 | 0.21% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 18 | 54.00 | 3 | 8389.33 | 25168.00 | 16.13 | 48.40 | 1398.01 | 67663.64 |
| 7475.17-04 | LL3-0.5M | 9/19/2016 | 520 | 0.21% | Gomphonema sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | sp. | 14 | 14.00 | 1 | 6525.04 | 6525.04 | 12.55 | 12.55 | 358.14 | 4494.02 |
| 7475.17-04 | LL3-0.5M | 9/19/2016 | 520 | 0.21% | Microcystis sp. | Cyanobacteria | Cyanophyceae | Chroococcales | Microcystaceae | Microcystis | sp. | 1 | 60.00 | 60 | 466.07 | 27964.44 | 0.90 | 53.78 | 164.64 | 8853.76 |
| 7475.17-04 | LL3-0.5M | 9/19/2016 | 520 | 0.21% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 32 | 42.00 | 1.3125 | 14914.37 | 19575.11 | 28.68 | 37.64 | 8746.19 | 329245.61 |
| 7475.17-04 | LL3-0.5M | 9/19/2016 | 520 | 0.21% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 2 | 48.00 | 24 | 932.15 | 22371.56 | 1.79 | 43.02 | 90.00 | 3872.00 |
| 7475.17-04 | LL3-0.5M | 9/19/2016 | 520 | 0.21% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 192 | 2304.00 | 12 | 89486.22 | 1073834.67 | 172.09 | 2065.07 | 2042.04 | 4216938.41 |
| 7475.17-04 | LL3-0.5M | 9/19/2016 | 520 | 0.21% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 3 | 24.00 | 8 | 1398.22 | 11185.78 | 2.69 | 21.51 | 96.97 | 2085.87 |
| 7475.17-04 | LL3-0.5M | 9/19/2016 | 520 | 0.21% | Staurastrum sp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Staurastrum | sp. | 3 | 3.00 | 1 | 1398.22 | 1398.22 | 2.69 | 2.69 | 7598.73 | 20432.13 |
| 7475.17-04 | LL3-0.5M | 9/19/2016 | 520 | 0.21% | Tetraëdriella sp. | Ochrophyta | Xanthophyceae | Mischococcales | Pleurochloridaceae | Tetraëdriella | sp. | 1 | 1.00 | 1 | 466.07 | 466.07 | 0.90 | 0.90 | 1570.80 | 1407.90 |
| 7475.17-04 | LL3-0.5M | 9/19/2016 | 520 | 0.21% | Woronichinia sp. | Cyanobacteria | Cyanophyceae | Synechococcales | Coelosphaeriaceae | Woronichinia | sp. | 1 | 80.00 | 80 | 466.07 | 37285.93 | 0.90 | 71.70 | 7.54 | 540.86 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Anabaena sp. | Cyanobacteria | Cyanophyceae | Nostocales | Nostocaceae | Anabaena | sp. | 1 | 44.00 | 44 | 810.56 | 35664.80 | 1.56 | 68.59 | 310.34 | 21284.96 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 23 | 800.00 | 34.7826087 | 18642.96 | 648450.89 | 35.85 | 1247.02 | 0.70 | 869.17 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Asterionella sp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | sp. | 5 | 40.00 | 8 | 4052.82 | 32422.54 | 7.79 | 62.35 | 374.64 | 23358.88 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 12 | 108.00 | 9 | 9726.76 | 87540.87 | 18.71 | 168.35 | 1590.43 | 267745.60 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 16 | 16.00 | 1 | 12969.02 | 12969.02 | 24.94 | 24.94 | 447377.72 | 11157787.54 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Cocconeidaceae | Cocconeis | sp. | 1 | 1.00 | 1 | 810.56 | 810.56 | 1.56 | 1.56 | 565.49 | 881.47 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Cosmarium sp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Cosmarium | sp. | 1 | 1.00 | 1 | 810.56 | 810.56 | 1.56 | 1.56 | 29466.57 | 45931.78 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 3 | 12.00 | 4 | 2431.69 | 9726.76 | 4.68 | 18.71 | 512.00 | 9577.12 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 3 | 3.00 | 1 | 2431.69 | 2431.69 | 4.68 | 4.68 | 5750.16 | 26889.65 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Cymbella sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Cymbellaceae | Cymbella | sp. | 1 | 1.00 | 1 | 810.56 | 810.56 | 1.56 | 1.56 | 700.00 | 1091.14 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 126 | 3780.00 | 30 | 102131.01 | 3063930.43 | 196.41 | 5892.17 | 634.60 | 3739185.35 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Microcystis sp. | Cyanobacteria | Cyanophyceae | Chroococcales | Microcystaceae | Microcystis | sp. | 5 | 1000.00 | 200 | 4052.82 | 810563.61 | 7.79 | 1558.78 | 337.71 | 526409.62 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Navicula spp. | Bacillariophyta | Bacillariophyceae | Naviculales | Naviculaceae | Navicula | spp. | 1 | 1.00 | 1 | 810.56 | 810.56 | 1.56 | 1.56 | 42609.42 | 66418.55 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 10 | 20.00 | 2 | 8105.64 | 16211.27 | 15.59 | 31.18 | 9817.48 | 306064.98 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 1 | 10.00 | 10 | 810.56 | 8105.64 | 1.56 | 15.59 | 240.00 | 3741.06 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 80 | 960.00 | 12 | 64845.09 | 778141.06 | 124.70 | 1496.43 | 2233.28 | 3341936.29 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 17 | 136.00 | 8 | 13779.58 | 110236.65 | 26.50 | 211.99 | 344.79 | 73093.47 |
| 7475.17-05 | LL4-0.5M | 9/19/2016 | 520 | 0.12% | Staurastrum sp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Staurastrum | sp. | 1 | 1.00 | 1 | 810.56 | 810.56 | 1.56 | 1.56 | 2869.85 | 4473.45 |
| 7475.17-06 | LL5-0.5M | 9/19/2016 | 550 | 0.23% | Achnanthes spp. | Bacillariophyta | Bacillariophyceae | Mastogloiales | Achnanthaceae | Achnanthes | spp. | 9 | 9.00 | 1 | 3857.97 | 3857.97 | 7.01 | 7.01 | 294.52 | 2065.94 |
| 7475.17-06 | LL5-0.5M | 9/19/2016 | 550 | 0.23% | Amphora sp. | Bacillariophyta | Bacillariophyceae | Thalassiophysales | Catenulaceae | Amphora | sp. | 5 | 5.00 | 1 | 2143.32 | 2143.32 | 3.90 | 3.90 | 6708.00 | 26140.68 |
| 7475.17-06 | LL5-0.5M | 9/19/2016 | 550 | 0.23% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Cocconeidaceae | Cocconeis | sp. | 61 | 61.00 | 1 | 26148.47 | 26148.47 | 47.54 | 47.54 | 2023.19 | 96187.67 |
| 7475.17-06 | LL5-0.5M | 9/19/2016 | 550 | 0.23% | Cosmarium sp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Cosmarium | sp. | 3 | 3.00 | 1 | 1285.99 | 1285.99 | 2.34 | 2.34 | 24429.02 | 57119.07 |
| 7475.17-06 | LL5-0.5M | 9/19/2016 | 550 | 0.23% | Cymbella sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Cymbellaceae | Cymbella | sp. | 57 | 57.00 | 1 | 24433.82 | 24433.82 | 44.43 | 44.43 | 682.50 | 30320.14 |
| 7475.17-06 | LL5-0.5M | 9/19/2016 | 550 | 0.23% | Diatoma sp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Diatoma | sp. | 2 | 2.00 | 1 | 857.33 | 857.33 | 1.56 | 1.56 | 113.10 | 176.29 |
| 7475.17-06 | LL5-0.5M | 9/19/2016 | 550 | 0.23% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 95 | 95.00 | 1 | 40723.03 | 40723.03 | 74.04 | 74.04 | 389.56 | 28843.53 |
| 7475.17-06 | LL5-0.5M | 9/19/2016 | 550 | 0.23% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | spp. | 51 | 51.00 | 1 | 21861.84 | 21861.84 | 39.75 | 39.75 | 1130.97 | 44954.81 |
| 7475.17-06 | LL5-0.5M | 9/19/2016 | 550 | 0.23% | Melosira sp. | Bacillariophyta | Coscinodiscophyceae | Melosirales | Melosiraceae | Melosira | sp. | 6 | 6.00 | 1 | 2571.98 | 2571.98 | 4.68 | 4.68 | 2261.95 | 10577.61 |
| 7475.17-06 | LL5-0.5M | 9/19/2016 | 550 | 0.23% | Monoraphidium sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Selenastraceae | Monoraphidium | sp. | 2 | 2.00 | 1 | 857.33 | 857.33 | 1.56 | 1.56 | 28.27 | 44.07 |
| 7475.17-06 | LL5-0.5M | 9/19/2016 | 550 | 0.23% | Navicula spp. | Bacillariophyta | Bacillariophyceae | Naviculales | Naviculaceae | Navicula | spp. | 8 | 8.00 | 1 | 3429.31 | 3429.31 | 6.24 | 6.24 | 954.26 | 5949.90 |
| 7475.17-06 | LL5-0.5M | 9/19/2016 | 550 | 0.23% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 3 | 72.00 | 24 | 1285.99 | 30863.77 | 2.34 | 56.12 | 1197.00 | 67170.78 |
| 7475.17-06 | LL5-0.5M | 9/19/2016 | 550 | 0.23% | Pinnularia sp. | Bacillariophyta | Bacillariophyceae | Naviculales | Pinnulariaceae | Pinnularia | sp. | 4 | 4.00 | 1 | 1714.65 | 1714.65 | 3.12 | 3.12 | 4288.27 | 13368.92 |
| 7475.17-06 | LL5-0.5M | 9/19/2016 | 550 | 0.23% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 7 | 28.00 | 4 | 3000.64 | 12002.58 | 5.46 | 21.82 | 130.70 | 2852.20 |
| 7475.17-06 | LL5-0.5M | 9/19/2016 | 550 | 0.23% | Sorastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Sorastrum | sp. | 1 | 12.00 | 12 | 428.66 | 5143.96 | 0.78 | 9.35 | 73.50 | 687.42 |
| 7475.17-06 | LL5-0.5M | 9/19/2016 | 550 | 0.23% | Synedra sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Synedra | sp. | 8 | 8.00 | 1 | 3429.31 | 3429.31 | 6.24 | 6.24 | 14646.11 | 91320.00 |
| 7475.17-06 | LL5-0.5M | 9/19/2016 | 550 | 0.23% | Tetraëdron sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Tetraëdron | sp. | 2 | 2.00 | 1 | 857.33 | 857.33 | 1.56 | 1.56 | 108.00 | 168.35 |

**Avista Phytoplankton 2016 (Batch10)**
Taxa Report with Biovolumes

| EcoAnalysts Sample ID | Site ID | Collection Date | Volume Received (mL) | Percent Counted | Taxon | Division | Class | Order | Family | Genus | Species | Number of Natural Units | Number of Cells | Cells per Natural Unit | Units / Sample | Cells/ sample | Units per mL (in sample received) | Cells per mL (in sample received) | AVG_BV (µ³) | Biovolume (µ³/mL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7475.19-01 | LL0-0.5M | 10/12/2016 | 550 | 0.32% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 11 | 11.00 | 1 | 3389.12 | 3389.12 | 6.16 | 6.16 | 0.91 | 5.58 |
| 7475.19-01 | LL0-0.5M | 10/12/2016 | 550 | 0.32% | Asterionella sp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | sp. | 9 | 9.00 | 1 | 2772.92 | 2772.92 | 5.04 | 5.04 | 452.39 | 2280.80 |
| 7475.19-01 | LL0-0.5M | 10/12/2016 | 550 | 0.32% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 60 | 240.00 | 4 | 18486.12 | 73944.46 | 33.61 | 134.44 | 216.00 | 29040.01 |
| 7475.19-01 | LL0-0.5M | 10/12/2016 | 550 | 0.32% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 25 | 25.00 | 1 | 7702.55 | 7702.55 | 14.00 | 14.00 | 942.48 | 13199.06 |
| 7475.19-01 | LL0-0.5M | 10/12/2016 | 550 | 0.32% | Dinobryon spp. | Ochrophyta | Chrysophyceae | Chromulinales | Dinobryaceae | Dinobryon | spp. | 11 | 11.00 | 1 | 3389.12 | 3389.12 | 6.16 | 6.16 | 1072.33 | 6607.74 |
| 7475.19-01 | LL0-0.5M | 10/12/2016 | 550 | 0.32% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 20 | 480.00 | 24 | 6162.04 | 147888.93 | 11.20 | 268.89 | 703.72 | 189221.73 |
| 7475.19-01 | LL0-0.5M | 10/12/2016 | 550 | 0.32% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 9 | 36.00 | 4 | 2772.92 | 11091.67 | 5.04 | 20.17 | 469.15 | 9461.09 |
| 7475.19-01 | LL0-0.5M | 10/12/2016 | 550 | 0.32% | Rhodomonas sp. | Cryptophyta | Cryptophyceae | Pyrenomonadales | Pyrenomonadaceae | Rhodomonas | sp. | 11 | 11.00 | 1 | 3389.12 | 3389.12 | 6.16 | 6.16 | 1642.01 | 10118.10 |
| 7475.19-01 | LL0-0.5M | 10/12/2016 | 550 | 0.32% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 113 | 1808.00 | 16 | 34815.52 | 557048.29 | 63.30 | 1012.82 | 538.78 | 545687.54 |
| 7475.19-01 | LL0-0.5M | 10/12/2016 | 550 | 0.32% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 39 | 312.00 | 8 | 12015.98 | 96127.80 | 21.85 | 174.78 | 268.08 | 46854.96 |
| 7475.19-02 | LL1-0.5M | 10/12/2016 | 520 | 1.14% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 8 | 240.00 | 30 | 699.11 | 20973.33 | 1.34 | 40.33 | 1.29 | 51.95 |
| 7475.19-02 | LL1-0.5M | 10/12/2016 | 520 | 1.14% | Asterionella sp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | sp. | 25 | 200.00 | 8 | 2184.72 | 17477.77 | 4.20 | 33.61 | 763.41 | 25658.95 |
| 7475.19-02 | LL1-0.5M | 10/12/2016 | 520 | 1.14% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 2 | 25.00 | 12.5 | 174.78 | 2184.72 | 0.34 | 4.20 | 508.94 | 2138.25 |
| 7475.19-02 | LL1-0.5M | 10/12/2016 | 520 | 1.14% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 21 | 84.00 | 4 | 1835.17 | 7340.67 | 3.53 | 14.12 | 531.44 | 7502.17 |
| 7475.19-02 | LL1-0.5M | 10/12/2016 | 520 | 1.14% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 28 | 28.00 | 1 | 2446.89 | 2446.89 | 4.71 | 4.71 | 6492.63 | 30551.40 |
| 7475.19-02 | LL1-0.5M | 10/12/2016 | 520 | 1.14% | Diatoma spp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Diatoma | sp. | 1 | 1.00 | 1 | 87.39 | 87.39 | 0.17 | 0.17 | 763.41 | 128.29 |
| 7475.19-02 | LL1-0.5M | 10/12/2016 | 520 | 1.14% | Dinobryon spp. | Ochrophyta | Chrysophyceae | Chromulinales | Dinobryaceae | Dinobryon | spp. | 19 | 9.00 | 0.47368421 | 1660.39 | 786.50 | 3.19 | 1.51 | 971.80 | 1469.85 |
| 7475.19-02 | LL1-0.5M | 10/12/2016 | 520 | 1.14% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 15 | 150.00 | 10 | 1310.83 | 13108.33 | 2.52 | 25.21 | 879.65 | 22174.41 |
| 7475.19-02 | LL1-0.5M | 10/12/2016 | 520 | 1.14% | Hannaea sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Hannaea | sp. | 16 | 16.00 | 1 | 1398.22 | 1398.22 | 2.69 | 2.69 | 829.38 | 2230.11 |
| 7475.19-02 | LL1-0.5M | 10/12/2016 | 520 | 1.14% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 5 | 20.00 | 4 | 436.94 | 1747.78 | 0.84 | 3.36 | 2052.51 | 6898.70 |
| 7475.19-02 | LL1-0.5M | 10/12/2016 | 520 | 1.14% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 5 | 120.00 | 24 | 436.94 | 10486.66 | 0.84 | 20.17 | 168.00 | 3388.00 |
| 7475.19-02 | LL1-0.5M | 10/12/2016 | 520 | 1.14% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 153 | 1836.00 | 12 | 13370.50 | 160445.97 | 25.71 | 308.55 | 248.71 | 76739.15 |
| 7475.19-02 | LL1-0.5M | 10/12/2016 | 520 | 1.14% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 6 | 48.00 | 8 | 524.33 | 4194.67 | 1.01 | 8.07 | 220.89 | 1781.87 |
| 7475.19-03 | LL2-0.5M | 10/12/2016 | 500 | 1.03% | Anabaena sp. | Cyanobacteria | Cyanophyceae | Nostocales | Nostocaceae | Anabaena | sp. | 1 | 17.00 | 17 | 97.42 | 1656.20 | 0.19 | 3.31 | 523.60 | 1734.37 |
| 7475.19-03 | LL2-0.5M | 10/12/2016 | 500 | 1.03% | Aphanocapsa spp. | Cyanobacteria | Cyanophyceae | Synechococcales | Merismopediaceae | Aphanocapsa | spp. | 9 | 360.00 | 40 | 876.81 | 35072.46 | 1.75 | 70.14 | 1.51 | 105.85 |
| 7475.19-03 | LL2-0.5M | 10/12/2016 | 500 | 1.03% | Asterionella sp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | sp. | 29 | 116.00 | 4 | 2825.28 | 11301.13 | 5.65 | 22.60 | 718.64 | 16242.86 |
| 7475.19-03 | LL2-0.5M | 10/12/2016 | 500 | 1.03% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 7 | 42.00 | 6 | 681.96 | 4091.79 | 1.36 | 8.18 | 1095.04 | 8961.35 |
| 7475.19-03 | LL2-0.5M | 10/12/2016 | 500 | 1.03% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 4 | 4.00 | 1 | 389.69 | 389.69 | 0.78 | 0.78 | 812985.27 | 633631.03 |
| 7475.19-03 | LL2-0.5M | 10/12/2016 | 500 | 1.03% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 7 | 28.00 | 4 | 681.96 | 2727.86 | 1.36 | 5.46 | 480.05 | 2619.01 |
| 7475.19-03 | LL2-0.5M | 10/12/2016 | 500 | 1.03% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 39 | 39.00 | 1 | 3799.52 | 3799.52 | 7.60 | 7.60 | 17344.21 | 131799.23 |
| 7475.19-03 | LL2-0.5M | 10/12/2016 | 500 | 1.03% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 79 | 2600.00 | 32.9113924 | 7696.46 | 253301.13 | 15.39 | 506.60 | 565.49 | 286476.99 |
| 7475.19-03 | LL2-0.5M | 10/12/2016 | 500 | 1.03% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | spp. | 5 | 5.00 | 1 | 487.12 | 487.12 | 0.97 | 0.97 | 18378.32 | 17904.80 |
| 7475.19-03 | LL2-0.5M | 10/12/2016 | 500 | 1.03% | Hannaea sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Hannaea | sp. | 3 | 3.00 | 1 | 292.27 | 292.27 | 0.58 | 0.58 | 4241.15 | 2479.13 |
| 7475.19-03 | LL2-0.5M | 10/12/2016 | 500 | 1.03% | Microcystis sp. | Cyanobacteria | Cyanophyceae | Chroococcales | Microcystaceae | Microcystis | sp. | 2 | 400.00 | 200 | 194.85 | 38969.40 | 0.39 | 77.94 | 321.56 | 25061.61 |
| 7475.19-03 | LL2-0.5M | 10/12/2016 | 500 | 1.03% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 1 | 24.00 | 24 | 97.42 | 2338.16 | 0.19 | 4.68 | 360.00 | 1683.48 |
| 7475.19-03 | LL2-0.5M | 10/12/2016 | 500 | 1.03% | Scenedesmus sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | sp. | 109 | 1308.00 | 12 | 10619.16 | 127429.95 | 21.24 | 254.86 | 837.76 | 213510.92 |
| 7475.19-03 | LL2-0.5M | 10/12/2016 | 500 | 1.03% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 16 | 148.00 | 9.25 | 1558.78 | 14418.68 | 3.12 | 28.84 | 161.03 | 4643.71 |
| 7475.19-04 | LL3-0.5M | 10/13/2016 | 515 | 0.49% | Asterionella sp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | sp. | 7 | 42.00 | 6 | 1429.16 | 8574.97 | 2.78 | 16.65 | 1472.62 | 24519.79 |
| 7475.19-04 | LL3-0.5M | 10/13/2016 | 515 | 0.49% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 3 | 28.00 | 9.33333333 | 612.50 | 5716.65 | 1.19 | 11.10 | 735.13 | 8160.19 |
| 7475.19-04 | LL3-0.5M | 10/13/2016 | 515 | 0.49% | Ceratium sp. | Miozoa | Dinophyceae | Gonyaulacales | Ceratiaceae | Ceratium | sp. | 1 | 1.00 | 1 | 204.17 | 204.17 | 0.40 | 0.40 | 704030.91 | 279105.20 |
| 7475.19-04 | LL3-0.5M | 10/13/2016 | 515 | 0.49% | Crucigeniella sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Crucigeniella | sp. | 10 | 40.00 | 4 | 2041.66 | 8166.64 | 3.96 | 15.86 | 551.37 | 8743.35 |
| 7475.19-04 | LL3-0.5M | 10/13/2016 | 515 | 0.49% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 79 | 79.00 | 1 | 16129.11 | 16129.11 | 31.32 | 31.32 | 3180.86 | 99620.39 |
| 7475.19-04 | LL3-0.5M | 10/13/2016 | 515 | 0.49% | Dinobryon sp. | Ochrophyta | Chrysophyceae | Chromulinales | Dinobryaceae | Dinobryon | sp. | 1 | 1.00 | 1 | 204.17 | 204.17 | 0.40 | 0.40 | 3769.91 | 1494.54 |
| 7475.19-04 | LL3-0.5M | 10/13/2016 | 515 | 0.49% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 40 | 1000.00 | 25 | 8166.64 | 204166.01 | 15.86 | 396.44 | 1786.78 | 708349.40 |
| 7475.19-04 | LL3-0.5M | 10/13/2016 | 515 | 0.49% | Hannaea sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Hannaea | sp. | 39 | 39.00 | 1 | 7962.47 | 7962.47 | 15.46 | 15.46 | 2199.12 | 34000.77 |
| 7475.19-04 | LL3-0.5M | 10/13/2016 | 515 | 0.49% | Microcystis sp. | Cyanobacteria | Cyanophyceae | Chroococcales | Microcystaceae | Microcystis | sp. | 1 | 180.00 | 180 | 204.17 | 36749.88 | 0.40 | 71.36 | 113.10 | 8070.49 |
| 7475.19-04 | LL3-0.5M | 10/13/2016 | 515 | 0.49% | Oocystis sp. | Chlorophyta | Trebouxiophyceae | Chlorellales | Oocystaceae | Oocystis | sp. | 10 | 20.00 | 2 | 2041.66 | 4083.32 | 3.96 | 7.93 | 1432.57 | 11358.50 |
| 7475.19-04 | LL3-0.5M | 10/13/2016 | 515 | 0.49% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 3 | 72.00 | 24 | 612.50 | 14699.95 | 1.19 | 28.54 | 1386.00 | 39561.43 |
| 7475.19-04 | LL3-0.5M | 10/13/2016 | 515 | 0.49% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 103 | 1236.00 | 12 | 21029.10 | 252349.18 | 40.83 | 490.00 | 1156.11 | 566490.11 |
| 7475.19-04 | LL3-0.5M | 10/13/2016 | 515 | 0.49% | Sphaerocystis sp. | Chlorophyta | Chlorophyceae | Chlamydomonadales | Sphaerocystidaceae | Sphaerocystis | sp. | 5 | 40.00 | 8 | 1020.83 | 8166.64 | 1.98 | 15.86 | 172.01 | 2727.61 |
| 7475.19-05 | LL4-0.5M | 10/13/2016 | 500 | 0.40% | Achnanthidium sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Achnanthidiaceae | Achnanthidium | sp. | 23 | 23.00 | 1 | 5726.34 | 5726.34 | 11.45 | 11.45 | 603.19 | 6908.09 |
| 7475.19-05 | LL4-0.5M | 10/13/2016 | 500 | 0.40% | Amphora sp. | Bacillariophyta | Bacillariophyceae | Thalassiophysales | Catenulaceae | Amphora | sp. | 45 | 45.00 | 1 | 11203.70 | 11203.70 | 22.41 | 22.41 | 5544.00 | 124226.67 |
| 7475.19-05 | LL4-0.5M | 10/13/2016 | 500 | 0.40% | Asterionella sp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | sp. | 7 | 28.00 | 4 | 1742.80 | 6971.19 | 3.49 | 13.94 | 388.77 | 5420.41 |
| 7475.19-05 | LL4-0.5M | 10/13/2016 | 500 | 0.40% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 1 | 1.00 | 1 | 248.97 | 248.97 | 0.50 | 0.50 | 549.78 | 273.76 |
| 7475.19-05 | LL4-0.5M | 10/13/2016 | 500 | 0.40% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Cocconeidaceae | Cocconeis | sp. | 33 | 33.00 | 1 | 8216.05 | 8216.05 | 16.43 | 16.43 | 1451.42 | 23849.81 |
| 7475.19-05 | LL4-0.5M | 10/13/2016 | 500 | 0.40% | Cryptomonas spp. | Cryptophyta | Cryptophyceae | Cryptomonadales | Cryptomonadaceae | Cryptomonas | spp. | 2 | 2.00 | 1 | 497.94 | 497.94 | 1.00 | 1.00 | 1393.82 | 1388.08 |
| 7475.19-05 | LL4-0.5M | 10/13/2016 | 500 | 0.40% | Cymbella sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Cymbellaceae | Cymbella | sp. | 11 | 11.00 | 1 | 2738.68 | 2738.68 | 5.48 | 5.48 | 168.00 | 920.20 |
| 7475.19-05 | LL4-0.5M | 10/13/2016 | 500 | 0.40% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 96 | 96.00 | 1 | 23901.23 | 23901.23 | 47.80 | 47.80 | 779.12 | 37243.62 |
| 7475.19-05 | LL4-0.5M | 10/13/2016 | 500 | 0.40% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | spp. | 55 | 55.00 | 1 | 13693.42 | 13693.42 | 27.39 | 27.39 | 981.75 | 26886.97 |
| 7475.19-05 | LL4-0.5M | 10/13/2016 | 500 | 0.40% | Hannaea sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Hannaea | sp. | 15 | 15.00 | 1 | 3734.57 | 3734.57 | 7.47 | 7.47 | 1781.28 | 13304.64 |
| 7475.19-05 | LL4-0.5M | 10/13/2016 | 500 | 0.40% | Navicula spp. | Bacillariophyta | Bacillariophyceae | Naviculales | Naviculaceae | Navicula | spp. | 7 | 7.00 | 1 | 1742.80 | 1742.80 | 3.49 | 3.49 | 3694.51 | 12877.58 |
| 7475.19-05 | LL4-0.5M | 10/13/2016 | 500 | 0.40% | Nitzschia spp. | Bacillariophyta | Bacillariophyceae | Bacillariales | Bacillariaceae | Nitzschia | spp. | 2 | 2.00 | 1 | 497.94 | 497.94 | 1.00 | 1.00 | 8620.53 | 8585.05 |
| 7475.19-05 | LL4-0.5M | 10/13/2016 | 500 | 0.40% | Pediastrum sp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Hydrodictyaceae | Pediastrum | sp. | 1 | 12.00 | 12 | 248.97 | 2987.65 | 0.50 | 5.98 | 60.00 | 358.52 |
| 7475.19-05 | LL4-0.5M | 10/13/2016 | 500 | 0.40% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 4 | 16.00 | 4 | 995.88 | 3983.54 | 1.99 | 7.97 | 42.41 | 337.90 |
| 7475.19-05 | LL4-0.5M | 10/13/2016 | 500 | 0.40% | Synedra sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Synedra | sp. | 3 | 3.00 | 1 | 746.91 | 746.91 | 1.49 | 1.49 | 3711.01 | 5543.60 |
| 7475.19-06 | LL5-0.5M | 10/13/2016 | 515 | 0.53% | Achnanthidium sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Achnanthidiaceae | Achnanthidium | sp. | 17 | 17.00 | 1 | 3222.91 | 3222.91 | 6.26 | 6.26 | 373.85 | 2339.58 |
| 7475.19-06 | LL5-0.5M | 10/13/2016 | 515 | 0.53% | Amphora sp. | Bacillariophyta | Bacillariophyceae | Thalassiophysales | Catenulaceae | Amphora | sp. | 31 | 31.00 | 1 | 5877.06 | 5877.06 | 11.41 | 11.41 | 780.00 | 8901.18 |
| 7475.19-06 | LL5-0.5M | 10/13/2016 | 515 | 0.53% | Asterionella sp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Asterionella | sp. | 3 | 24.00 | 8 | 568.75 | 4549.99 | 1.10 | 8.83 | 360.50 | 3184.97 |
| 7475.19-06 | LL5-0.5M | 10/13/2016 | 515 | 0.53% | Aulacoseira sp. | Bacillariophyta | Coscinodiscophyceae | Aulacoseirales | Aulacoseiraceae | Aulacoseira | sp. | 2 | 2.00 | 1 | 379 | 379 | 1 | 1 | 150.80 | 111.02 |
| 7475.19-06 | LL5-0.5M | 10/13/2016 | 515 | 0.53% | Cocconeis sp. | Bacillariophyta | Bacillariophyceae | Cocconeidales | Cocconeidaceae | Cocconeis | sp. | 45 | 45.00 | 1 | 8531 | 8531 | 17 | 17 | 1470.27 | 24355.65 |
| 7475.19-06 | LL5-0.5M | 10/13/2016 | 515 | 0.53% | Cosmarium spp. | Charophyta | Conjugatophyceae | Desmidiales | Desmidiaceae | Cosmarium | spp. | 2 | 2.00 | 1 | 379 | 379 | 1 | 1 | 829.38 | 610.63 |
| 7475.19-06 | LL5-0.5M | 10/13/2016 | 515 | 0.53% | Cyclotella spp. | Bacillariophyta | Mediophyceae | Stephanodiscales | Stephanodiscaceae | Cyclotella | spp. | 5 | 5.00 | 1 | 948 | 948 | 2 | 2 | 254.47 | 468.38 |
| 7475.19-06 | LL5-0.5M | 10/13/2016 | 515 | 0.53% | Cymbella sp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Cymbellaceae | Cymbella | sp. | 22 | 22.00 | 1 | 4171 | 4171 | 8 | 8 | 157.50 | 1275.54 |
| 7475.19-06 | LL5-0.5M | 10/13/2016 | 515 | 0.53% | Diatoma spp. | Bacillariophyta | Fragilariophyceae | Tabellariales | Tabellariaceae | Diatoma | sp. | 2 | 2.00 | 1 | 379 | 379 | 1 | 1 | 176.72 | 130.11 |
| 7475.19-06 | LL5-0.5M | 10/13/2016 | 515 | 0.53% | Fragilaria spp. | Bacillariophyta | Bacillariophyceae | Fragilariales | Fragilariaceae | Fragilaria | spp. | 90 | 120.00 | 1.33333333 | 17062 | 22750 | 33 | 44 | 439.82 | 19429.01 |
| 7475.19-06 | LL5-0.5M | 10/13/2016 | 515 | 0.53% | Gomphonema spp. | Bacillariophyta | Bacillariophyceae | Cymbellales | Gomphonemataceae | Gomphonema | spp. | 46 | 46.00 | 1 | 8721 | 8721 | 17 | 17 | 1526.81 | 25854.46 |
| 7475.19-06 | LL5-0.5M | 10/13/2016 | 515 | 0.53% | Hannaea sp. | Bacillariophyta | Fragilariophyceae | Licmophorales | Ulnariaceae | Hannaea | sp. | 37 | 37.00 | 1 | 7015 | 7015 | 14 | 14 | 2657.79 | 36200.40 |
| 7475.19-06 | LL5-0.5M | 10/13/2016 | 515 | 0.53% | Melosira sp. | Bacillariophyta | Coscinodiscophyceae | Melosirales | Melosiraceae | Melosira | sp. | 1 | 1.00 | 1 | 190 | 190 | 0 | 0 | 4002.39 | 1473.37 |
| 7475.19-06 | LL5-0.5M | 10/13/2016 | 515 | 0.53% | Navicula spp. | Bacillariophyta | Bacillariophyceae | Naviculales | Naviculaceae | Navicula | spp. | 2 | 2.00 | 1 | 379 | 379 | 1 | 1 | 1166.32 | 858.69 |
| 7475.19-06 | LL5-0.5M | 10/13/2016 | 515 | 0.53% | Nitzschia spp. | Bacillariophyta | Bacillariophyceae | Bacillariales | Bacillariaceae | Nitzschia | spp. | 1 | 1.00 | 1 | 190 | 190 | 0 | 0 | 28509.95 | 10495.13 |
| 7475.19-06 | LL5-0.5M | 10/13/2016 | 515 | 0.53% | Scenedesmus spp. | Chlorophyta | Chlorophyceae | Sphaeropleales | Scenedesmaceae | Scenedesmus | spp. | 8 | 32.00 | 4 | 1517 | 6067 | 3 | 12 | 29.45 | 346.94 |

# APPENDIX IV – Lake Spokane Zooplankton Data

(See Excel Spreadsheet of Laboratory Data)

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# APPENDIX B

## Agency Consultation

AVISTA

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

January 31, 2017

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

**Subject: Lake Spokane Dissolved Oxygen Water Quality Attainment Plan, Five Year Report**

Dear Pat:

I have enclosed the Lake Spokane Dissolved Oxygen Water Quality Attainment Plan Five Year Report (Five Year Report) for your review and approval. The Five Year Report was completed in accordance with the Lake Spokane Dissolved Oxygen Water Quality Attainment Plan (DO WQAP), required by the Spokane River Hydroelectric Project License (License) Appendix B, Section 5.6.C of the Washington Department of Ecology (Ecology) Section 401 Water Quality Certification.

The Five Year Report assesses the progress made towards improving Lake Spokane's water quality through the implementation of the selected reasonable and feasible measures and includes monitoring results which address year to year variability and trend analyses. In addition, the Five Year Report also includes the 2016 baseline monitoring, implementation activities, effectiveness of the implementation activities, and proposed actions for 2017.

In accordance with the DO WQAP, following completion of the 2016 nutrient monitoring season, Avista and Ecology evaluated the results and success of monitoring baseline nutrient conditions in Lake Spokane. As discussed in the Five Year Report, in order to gain a better understanding of core summer salmonid habitat in Lake Spokane, Avista proposes to modify the 2017 and 2018 sampling program. This would include a multi-year fish population and habitat assessment in Lake Spokane to gain an understanding of the status of the rainbow trout population in the lake and determine habitat utilization.

As you're aware, Avista has been working with the Washington Department of Fish and Wildlife (WDFW) to implement a carp removal effort in Lake Spokane this winter (February) as well as during spring spawning (May/June), when carp are congregated and in shallow areas. Avista will continue to keep Ecology updated as we implement this project.

We would appreciate your review of the Annual Report by **March 6, 2017**. This will allow us time to incorporate your comments and recommendations, if you have any, and submit it to the Federal Energy Regulatory Commission by **April 1, 2017**.

Please feel free to call me at (509) 495-4643 if you have any questions about the Five Year Report.

Sincerely,

Meghan Lunney

Meghan Lunney
Aquatic Resource Specialist

Enclosure (1)

cc: Dave Knight, Ecology
Jim Ross, Ecology
Karin Baldwin, Ecology
Chad Brown, Ecology
Speed Fitzhugh, Avista
Chris Moan, Avista

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
*4601 N Monroe Street • Spokane, Washington 99205-1295 • (509)329-3400*

March 6, 2017

Ms. Meghan Lunney
Aquatic Resource Specialist
Avista Corporation
1411 East Mission Avenue, MSC-1
Spokane, WA 99220-3727

RE: Request for Ecology Review and Comments –*Lake Spokane Dissolved Oxygen Water Quality Attainment Plan, Five Year Report.*
Spokane River Hydroelectric Project, No. P-2545

Dear Ms. Lunney:

The Department of Ecology (Ecology) has reviewed the *Lake Spokane Dissolved Oxygen Water Quality Attainment Plan, Five Year Report* sent to Ecology on January 31, 2017. The Annual Summary Report is a requirement of Section 5.6.C, Appendix B of the 401 Certification.

Ecology offers the following comments:

1. The units are missing on page 7, Section 2.2, second bullet, in the sentence "Summer "June to September) hypolimnetic…a mean of 24.8± 16%.".
2. In section 2.3, page 8, in the second paragraph it would be helpful to give an explanation for why Avista plans to exclude the free flowing areas from assessments.
3. On page 9, second paragraph, the Report mentions that Avista would suspend the nutrient, chlorophyll, phytoplankton and zooplankton components of the baseline monitoring program. Ecology is concerned about suspending the nutrient data collection for the following reasons:
    a. The USGS will be monitoring the groundwater for nutrients in 2017 and 2018, Ecology feels it would be beneficial to have the nutrient data from the lake area for comparison and to see if there is any connection.
    b. Liberty Lake wastewater treatment plant tertiary treatment should be operating this fall. Nutrient data from downstream may be used to detect changes associated with the enhanced treatment.
4. On page 9, second paragraph, last sentence. Avista anticipates the *in situ* data will be incorporated into the CE-QUAL-W2 model as a means to extrapolate the point data. The model does not extrapolate data, rather the additional *in situ* data could be used to assess the model output data.
5. On page 9, second to last paragraph. Does Avista plan to monitor in 2019 or any of the following years, or is that to be determined at a later date?

6. On page 13, section 3.2.3, Native Tree Planting. Avista did a great job to plant all those trees.
7. On page 15, section 4.0 Effectiveness of Implementation Activities, wetlands bullet. Avista stated it is unable to quantify a TP load reduction for these properties due to a lack of WQ trading ratios associated with the TMDL. However, they could use the STEPL model that was discussed in the Nonpoint Source Workgroup meetings to estimate the reduction. If Avista does not want to use STEPL, they could provide other information on how the wetlands are doing, such as plant survival, growth, or mortality.
8. Related to wetlands, Ecology would appreciate an update on the FERC license requirement that Avista is to "acquire, restore and/or enhance a minimum of about 43 acres of wetlands downstream of Nine Mile Dam. Was the wetland purchase in the Little Spokane watershed included or done as part of this requirement?
9. On page 16, first bullet, carp section. It is important that any landfill waste disposal option be checked for ability to accept PCB contaminated waste. Also, Ecology has concerns about future disposal options that might re-introduce PCBs to the environment.
10. On page 17, Wetlands bullet. Is there any timeline for the floating wetland project or proposed monitoring scheme that is appropriate for this?
11. On page 18, section 6.0, Schedule, last sentence – see also page 20, third bullet from the top. Ecology asked Avista to develop a quality assurance/quality control plan for running the CE-QUAL-W2 model, which is slightly different than described in this sentence. The QA/QC plan can include the conditions in which running the model makes sense, but it includes far more information. Karin Baldwin sent Meghan the EPA guidance to develop the QA/QC plan that Cusimano sent me, but can resend if need be. Ecology Environmental Assessment Program (EAP) uses EPA's guidelines.

Please contact me at (509) 329-3567 or pmcg461@ecy.wa.gov if you have any questions.

Sincerely,

Pat McGuire

Patrick McGuire
Eastern Region FERC License Coordinator
Water Quality Program

PDM:jab

cc: Elvin "Speed" Fitzhugh, Avista

**From:** Lunney, Meghan
**To:** Pat McGuire (Pmcg461@ecy.wa.gov)
**Cc:** Fitzhugh, Speed (Elvin); Knight, David T. (ECY); Moan, Chris; Baldwin, Karin K. (ECY); Ross, James D. (ECY)
**Subject:** Lake Spokane DO WQAP, Five Year Report_REVISIONS
**Date:** Friday, March 24, 2017 5:51:00 PM
**Attachments:** Avista_LakeSpokaneDOWQAP_Five Year Rpt_Revised_March 24 2017_with red-lines.pdf
Avista_LakeSpokaneDOWQAP_Five Year Rpt_Revised_March 24 2017_clean.pdf
Avista Response to Ecology Comments_DO_3-24-17.pdf
**Importance:** High

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Pat,
We have revised the Lake Spokane Dissolved Oxygen Water Quality Attainment Plan Five Year Report (Five Year Report) to address the comments you provided on March 6, 2017. The revisions include modifications to the main body of the report. To help expedite your review, I have included a version showing the red-lined revisions as well as a clean version. I've also provided a response to comments document.

We would greatly appreciate your expedited review of the revised Five Year Report by **March 28** in order to meet our FERC submittal date of March 31. Upon your approval, we will submit the report to FERC.

Please feel free to give me a call at 509-495-4643 if you have any questions.

Thanks!!
-Meghan.

**Meghan Lunney**
Aquatic Resource Specialist

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Spokane, WA 99202
**P** 509.495.4643
**C** 509.842.6133
meghan.lunney@avistacorp.com
http://www.avistautilities.com/environment/spokaneriver/resources/Pages/default.aspx

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**From:** McGuire, Patrick D. (ECY) [mailto:PMCG461@ECY.WA.GOV]
**Sent:** Monday, March 06, 2017 3:33 PM
**To:** Lunney, Meghan <Meghan.Lunney@avistacorp.com>; Fitzhugh, Speed (Elvin) <SpeedElvin.Fitzhugh@avistacorp.com>
**Subject:** [External] Ecology Comment Letter for D.O. WQ Attainment Plan Five Year Report

Speed and Meghan – I have attached the Ecology response and comments for the D.O. WQ Attainment Plan Five Year Report.

Let me know if you have any questions or would like to discuss the Report. Thanks for the opportunity to comment.

Patrick McGuire
Hydropower Projects 401 Certification Manager
Water Quality Program
Eastern Regional Office
(509) 329-3567
e-mail: pmcg461@ecy.wa.gov

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# ECOLOGY COMMENTS AND AVISTA RESPONSES

**On March 6, 2017, Ecology provided comments on the Lake Spokane Dissolved Oxygen Water Quality Attainment Plan Five Year Report (Five Year Report), dated January 31, 2017. Avista subsequently modified the Five Year Report to incorporate these comments, and resubmitted it to Ecology on March 24th. Avista's responses to Ecology's comments are provided as follows.**

**Ecology Comment 1:**
The units are missing on page 7, Section 2.2, second bullet, in the sentence "Summer (June to September) hypolimnetic…a mean of 24.8 ± 16%".

**Avista Response**
Section 2.2 was revised to correct the missing unit.

**Ecology Comment 2:**
In Section 2.3, page 8, in the second paragraph it would be helpful to give an explanation for why Avista plans to exclude the free flowing areas from assessments.

**Avista Response**
Section 2.3, page 8, was revised to clarify the multi-year fish population and habitat assessment is specific to Lake Spokane, the area impounded by Long Lake Dam.

**Ecology Comment 3:**
On page 9, second paragraph, the Report mentions that Avista would suspend the nutrient, chlorophyll, phytoplankton and zooplankton components of the baseline monitoring program. Ecology is concerned about suspending the nutrient data collection for the following reasons:

a. The USGS will be monitoring the groundwater for nutrients in 2017 and 2018, Ecology feels it would be beneficial to have the nutrient data from the lake area for comparison and to see if there is any connection.
b. Liberty Lake wastewater treatment plant tertiary treatment should be operating this fall. Nutrient data from downstream may be used to detect changes associated with the enhanced treatment.

**Avista Response**
Section 2.3 was modified to indicate that Avista will continue the baseline nutrient monitoring during 2017. Section 6.0 (Schedule) was also modified to incorporate this modification.

**Ecology Comment 4:**
On page 9, second paragraph, last sentence. Avista anticipates the *in situ* data will be incorporated into the CE-QUAL-W2 model as a means to extrapolate the point data. The model does not extrapolate data, rather the additional *in situ* data could be used to assess the model output data.

**Avista Response:**
Section 2.3 was revised to clarify the reference to the CE-QUAL-W2 model output data.

# ECOLOGY COMMENTS AND AVISTA RESPONSES

**Ecology Comment 5:**
On page 9, second to last paragraph. Does Avista plan to monitor in 2019 or any of the following years, or is that to be determined at a later date?

**Avista Response:**
To address Ecology's comment Section 2.3 was revised as follows:

- Baseline nutrient monitoring will continue through 2017, with Avista and Ecology working together to determine whether or not to continue baseline nutrient monitoring during 2018, following the 2017 monitoring season.
- The multi-year fish population and habitat assessment in Lake Spokane is a two year study (conducted in 2017 and 2018) with results compiled and presented in 2019.

**Ecology Comment 6:**
On page 13, section 3.2.3, Native Tree Planting. Avista did a great job to plant all those trees.

**Avista Response:**
Avista partnered with the Stevens County Conservation District to plant these trees.

**Ecology Comment 7:**
On page 15, section 4.0 Effectiveness of Implementation Activities, wetlands bullet. Avista stated it is unable to quantify a TP load reduction for these properties due to a lack of WQ trading ratios associated with the TMDL. However, they could use the STEPL model that was discussed in the Nonpoint Source Workgroup meetings to estimate the reduction. If Avista does not want to use STEPL, they could provide other information on how the wetlands are doing, such as plant survival, growth, or mortality.

**Avista Response:**
Section 4.0 was modified to indicate that Avista plans to work with Ecology to explore appropriate total phosphorus load reduction quantification tools as the wetland management plans are implemented.

**Ecology Comment 8:**
Related to wetlands, Ecology would appreciate an update on the FERC License requirement that Avista is to "acquire, restore and/or enhance a minimum of about 43 acres of wetlands downstream of Nine Mile Dam. Was the wetland purchase in the Little Spokane watershed included or done as part of this requirement?

**Avista Response:**
Yes, as indicated in Ecology's May 20, 2014 letter to Avista and FERC's September 30, 2014 Order, the 109-acre Sacheen Springs Wetland Complex in the Little Spokane Watershed (which includes more than 43-acres of wetlands), fulfills the requirements of the Washington 401 Certification Section 5.3(G).

**Ecology Comment 9:**
On page 16, first bullet, carp section. It is important that any landfill waste disposal options be checked for ability to accept PCB contaminated waste. Also, Ecology has concerns about future disposal options that might re-introduce PCBs to the environment.

**Avista Response:**
Avista provided Waste Management with Ecology's **Lake Spokane: PCBs in Carp** (July 2015, Publication No. 15-03-022) which contained the PCB fish tissue concentrations for carp collected from Lake Spokane. Concentrations of PCBs in the fish tissue, as indicated in the Report, were far below any applicable regulatory limit and the carp were approved for disposal in Waste Management's Wenatchee and Arlington landfills. Avista clarified Section 5.0 to indicate that it will dispose of the carp removed from Lake Spokane at one of these two landfills.

**Ecology Comment 10:**
On page 17, Wetlands bullet. Is there any timeline for the floating wetland project or proposed monitoring scheme that is appropriate for this?

**Avista Response:**
Section 5.0 was revised to indicate the floating wetland project is planned for 2017, pending permits.

**Ecology Comment 11:**
On page 18, Section 6.0, Schedule, last sentence – see also page 20, third bullet from the top. Ecology asked Avista to develop a quality assurance/quality control plan for running the CE-QUAL-W2 model, which is slightly different than described in this sentence. The QA/QC plan can include the conditions in which running the model makes sense, but it includes far more information. Karin Baldwin sent Meghan the EPA guidance to develop the QA/QC plan that Cusimano sent me, but can resend if need be. Ecology Environmental Assessment Program (EAP) uses EPA's guidelines.

**Avista Response:**
Section 6.0 was revised to clarify that Avista will continue to work with Ecology during 2017 in regard to developing a plan to run the CE-QUAL-W2 model. This may include timing, objectives, data input, and a QA/QC plan for potential future model runs.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
*4601 N Monroe Street • Spokane, Washington 99205-1295 • (509)329-3400*

March 27, 2017

Ms. Meghan Lunney
Aquatic Resource Specialist
Avista Corporation
1411 East Mission Avenue, MSC-1
Spokane, WA 99220-3727

RE: Request for Ecology Review and Comments – *Lake Spokane Dissolved Oxygen Water Quality Attainment Plan, Five Year Report*
Spokane River Hydroelectric Project, No. P-2545

Dear Ms. Lunney:

The Department of Ecology (Ecology) has reviewed the *Lake Spokane Dissolved Oxygen Water Quality Attainment Plan, Five Year Report* sent to Ecology on March 24, 2017. The Annual Summary Report is a requirement of Section 5.6.C, Appendix B of the 401 Certification. Thank you for addressing Ecology's concerns and comments.

Ecology approves the *Lake Spokane Dissolved Oxygen Water Quality Attainment Plan, Five Year Report* as submitted.

Please contact me at (509) 329-3567 or pmcg461@ecy.wa.gov if you have any questions.

Sincerely,

Pat McGuire

Patrick McGuire
Eastern Region FERC License Coordinator
Water Quality Program

PDM:red

cc: Elvin "Speed" Fitzhugh, Avista
Dave Knight, Ecology