



Lake Cyanobacteria Management Plan

Lake Lawrence, Thurston County, Washington

**Prepared for
Thurston County Environmental Health
Lake Lawrence Management District**

**Prepared by
Herrera Environmental Consultants, Inc.**

**Funded by
Washington State Department of Ecology
Freshwater Algae Control Program
Grant Number WQALG-2025-ThCoPH-00042**



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Thurston County

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Joseph Teresi provided review of this plan. The Freshwater Algae Control Grant (WQALG-2025-ThCoPH-00042) partially funded its completion.

Approval Signatures of Key Individuals

Lake Cyanobacteria Management Plan

Lake Lawrence, Thurston County, Washington

Prepared for: Lake Lawrence Management District and Thurston County Environmental Health
Prepared by: Herrera Environmental Consultants, Inc.

Approval signatures indicate that each key project team member has reviewed this Lake Cyanobacteria Management Plan and acknowledged its completion and submittal in fulfillment of the Freshwater Algae Control Grant No. WQALG-2025-ThCoPH-00042, awarded by the Washington State Department of Ecology. Development of this Lake Cyanobacteria Management Plan was funded by the Lake Lawrence Management District, with the supplemental grant support.

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Date: 16 June 2026

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Date: June 8, 2026

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Executive Summary

Lake Lawrence is a historically productive, shallow eutrophic system characterized by high aquatic plant and algae growth that impair beneficial uses. Located south of Yelm in Thurston County, the 327-acre seepage lake has experienced recurring harmful algae blooms (HABs) of cyanobacteria in most years since at least 2010. Lake Lawrence has a long history of study, monitoring, and community engagement, including major restoration investigations conducted in the 1990s. Early studies identified excessive nutrient loading, specifically internal phosphorus release from sediments, as the primary driver of poor water quality and recommended large-scale restoration actions that were largely not implemented due to high costs and feasibility constraints. Past efforts have instead focused on managing excessive aquatic vegetation, while persistent HABs continue to threaten human and wildlife health and limit recreational uses by creating unsafe and undesirable conditions.

In 2024, the Lake Lawrence Management District and Thurston County Environmental Health Division were awarded a grant from the Washington State Department of Ecology Freshwater Algae Control Program (Grant Number WQALG-2025-ThCoPH-00042) to partially fund the development of a lake cyanobacteria management plan (LCMP). Thurston County contracted with Herrera Environmental Consultants to prepare the LCMP and develop a quality assurance project plan (QAPP) to collect additional data to inform LCMP development. This LCMP evaluates current lake conditions, presents water and nutrient budgets, and identifies management strategies to reduce the frequency and duration of HABs, with the goal of improving water quality and enhancing beneficial uses for both people and wildlife.

What Are Cyanobacteria and Why Are They a Problem?

Cyanobacteria (also called “blue-green algae”) are a diverse group of bacteria found in freshwater, saltwater, moist soils, and even within plants and lichen. Cyanobacteria are a normal part of the algae community in lakes, but they can also form unsightly scums under certain conditions. Some cyanobacteria also produce toxins (“cyanotoxins”), like anatoxin-a or microcystin, that are harmful to humans and animals upon contact with skin or when consumed. Cyanobacteria may have several competitive advantages over other algae, including the ability to fix nitrogen and store phosphorus (two crucial nutrients for growth). In addition, they can regulate their buoyancy, moving up and down in the water column; they have low energy demands; and they are generally unpalatable to grazers that eat algae.

Why Does Lake Lawrence Have Toxic Algae Blooms?

Cyanobacteria blooms occur in Lake Lawrence because there is an abundance of nutrients to fuel their growth. The total algae productivity in Lake Lawrence appears to be driven by the availability of phosphorus, based on monitoring data collected from October 2024 to October 2025 and consistent with historical datasets.

Although cyanobacteria species were not directly sampled or enumerated in this study, historical algae data and cyanotoxin analyses provide insight to the bloom dynamics in Lake Lawrence. Cyanobacteria in the lake are persistent and diverse, capitalizing on the abundance of phosphorus. When cyanobacteria populations reach high densities, they often produce cyanotoxins at levels that are harmful to human health. Toxic blooms have occurred in most years since regular cyanotoxin monitoring began in 2010, with high levels of microcystin, a liver toxin, exceeding the guidelines from the Washington State Department of Health in 2010, 2011, 2013, and every year since 2017 (2017–2025), demonstrating that elevated microcystin concentrations are a recurring feature of the lake.

Where is the Excess Phosphorus Coming From?

The project team determined that the primary source of phosphorus to Lake Lawrence is internal release from the lake sediments (81 percent of inputs annually and 97 percent during the summer). Most of the phosphorus entering the lake settles to the lake bottom, with less than 1 percent leaving the lake via the outlet and 9 percent through groundwater outflow. Historical contributions of sediment phosphorus (e.g., diverted Deschutes River sediment) exacerbated the amount of sediment and nutrients that have accumulated in Lake Lawrence. Waterfowl are estimated to be a minor contributor. Due to complexities in monitoring groundwater flows and water quality, groundwater loading was modeled based on the residual in the water budget and regional estimates of groundwater quality.

Sediments in Lake Lawrence are rich in active phosphorus, specifically phosphorus bound to iron and within organic matter (e.g., dead algae and plant material), particularly in the Big Basin (the eastern basin). Due to the biological oxygen demand caused by the microbial decay of excess organic material in the lake sediments, phosphorus bound to iron is released due to anoxic conditions in the sediments. This dissolution occurs within the sediments with diffusion into the overlying water.

Onsite septic systems may have a modest to moderate impact on groundwater loads, but further investigation is needed to confirm their relative contribution. However, groundwater phosphorus loading is a negligible (2 percent) input compared to internal loading (81 percent).

Contemporary phosphorus loads are similar to those measured in the 1990s, so the project team hypothesizes that (1) the surface and groundwater inputs into Lake Lawrence are relatively unchanged; (2) decreased outflow means enhanced sedimentation and phosphorus retention in the lake; and (3) poor water quality conditions are driven by the long-term accumulation of phosphorus within the lake.

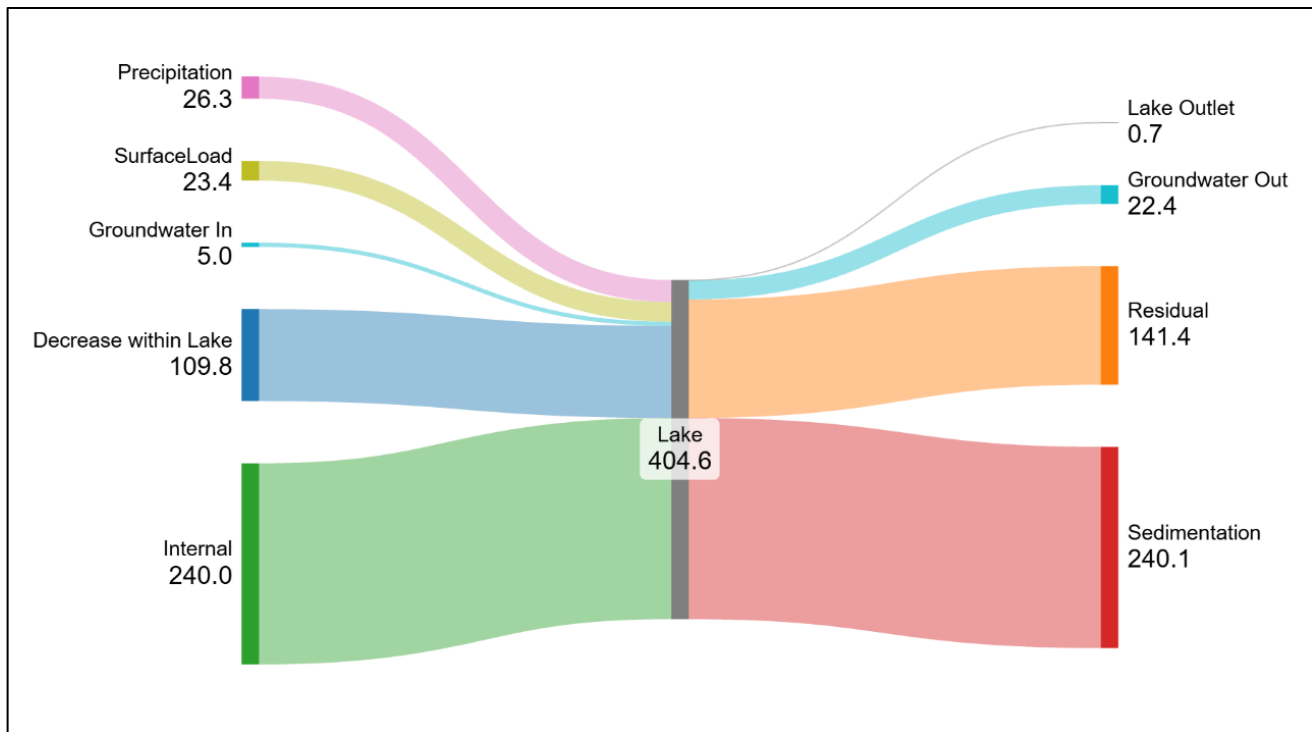


Figure ES 1. Estimated Annual Phosphorus Import and Export (kilograms) to Lake Lawrence for Water Year 2025.

The project team's theory for the eutrophication of Lake Lawrence is summarized as follows:

- In the early 1900s, Lake Lawrence served as a reservoir for the Tumwater Power Plant, for which the lake outlet was dammed and a channel was constructed to divert a portion of the Deschutes River flow into the lake, raising the water level by around 5.5 meters (18 feet). With this diversion of water also came excess river sediment, containing erosion from newly logged forests, which settled to the lake bottom.
- Today, nutrients enter the lake via surface water and groundwater inflows (at rates similar to those measured in the 1990s), very little of which are exported via the lake outlet and groundwater.
- Algae and aquatic plants use available nutrients to grow. When algae and aquatic plants die, they release some of the nutrients to the water column and fall as debris to the lake's bottom. Some amount of the suspended nutrients may be exported via the lake's outlet.
- Settled nutrients and organic matter from the watershed accumulate over time, including those from the historic, diverted Deschutes River sediments. Some of the phosphorus settling into the lake sediments is active and may later be released into the water column.
- Decaying organic matter in the lake's sediments uses up oxygen, which creates conditions where solid iron-phosphorus complexes dissolve, and additional phosphorus may be released. Nitrogen release as ammonia is also enhanced under these conditions. The deepest areas of the lake (>15 feet deep), accounting for over half of the lake area, were found to have low oxygen in the summer months.

- Due in part to the dam at the lake's outlet, there is decreased export of nutrients from the lake. More nutrients are therefore retained within the lake's sediments, which may be recycled for use next season.
- Nutrients released from lake sediments under low oxygen and/or high pH conditions become available again for uptake by algae and may continue to fuel toxic algae blooms year after year

What Do We Do Next?

The project team recommends an adaptive management approach that provides near-term relief from toxic algae blooms through in-lake treatment and long-term prevention through internal phosphorus load reduction and watershed phosphorus control. Ongoing monitoring should be used to monitor the achievement of water quality objectives and to inform adjustments to management techniques.

Establish Algae Management Objectives

To improve and protect lake uses, cyanobacteria blooms and the conditions that support them must be reduced. Water quality objectives to meet this goal are adapted from the Washington State Department of Ecology's criteria for determining lake impairment due to harmful algae blooms. These are objectives to be met and measured against, following the implementation of this management plan.

- During a given 5-year period, there is no more than 1 year with two or more events with cyanotoxins exceeding state recommended guidelines resulting in a public health advisory of *Warning* or *Danger*, and there is no more than 1 year with a public health advisory lasting 3 weeks or longer.

Plus:

- Average summer values of chlorophyll a, total phosphorus, and Secchi depth do not exceed the lowest end of the eutrophic scale (i.e., values occur in the mesotrophic range) of the Trophic State Index (Carlson 1977; see Appendix A). Specifically, average summer (June through September) chlorophyll-a concentration does not exceed 7.2 micrograms per liter ($\mu\text{g/L}$) at 1-meter depth, total phosphorus does not exceed 24 $\mu\text{g/L}$ at 1-meter depth, and Secchi depth is not less than 2.0 meters.

Implement Sediment Phosphorus Inactivation Strategies

It is estimated that reducing 80 percent of the phosphorus released from lake sediments is required to meet water quality objectives for Lake Lawrence and sufficiently control algae growth. Presented here are the most feasible and efficient options for inactivating phosphorus in the lake sediment. Options A, B1, and B2 each rely on chemical treatment to inactivate the phosphorus, using alum, lanthanum, or iron as noted below, while Option C prevents the conditions that allow phosphorus release from iron bonds in the sediment, by oxygenating the bottom waters and sediment. For all options, routine monitoring should continue to inform adaptive management and sediment analysis should be performed again in Year 10 to re-evaluate the phosphorus budget.

Alum and lanthanum treatments have been used successfully in many lakes in Washington, and both would provide satisfactory sediment inactivation. Alum forms flocculants that will pull algae and dissolved phosphorus from the water column, burying it in the sediments. This provides an immediate reduction in algae abundance and improvement in water clarity. However, Lake Lawrence is a soft-water (low hardness) lake and, depending on the alum dose, may require a buffering agent to protect against ecologically damaging decreases in pH. Lanthanum also forms stable, long-lasting bonds but does not form flocculants and will remove only dissolved phosphorus from the water column. Unlike alum, lanthanum does not trap and remove particles in the water column. Lanthanum is applied to lakes as lanthanum-modified bentonite (LMB), commercially available as Phoslock or EutroSORB® G. A new product, EutroSORB® SI, is also available. EutroSORB® SI uses an iron-coated lanthanum rather than the clay bentonite.

Additionally, iron is available as a low-cost yet understudied option to increase the capacity of sediments to bind phosphate. Iron can be applied to lakes as zero-valent iron (ZVI), which binds and precipitates phosphorus out of the water column and is retained in the lake sediments. Application of ZVI in lakes and evidence of successful phosphorus sequestration is limited. Research suggests that treatments with iron are most successful when external loading is low and under oxygenated conditions; however, some studies suggest longer-term phosphorus sequestration with iron may be possible even under anoxic conditions if abundant iron is available and sulfur is low (see Appendix C). Planning for iron amendments should explicitly consider the competing process of iron sulfide formation and may require additional iron to account for it. At this time, ZVI application is best suited for pilot-scale testing, due to lake chemistry constraints, unknown expected effectiveness, and limited previous applications with which to draw insights.

Option A: High Dose, Lake Reset Treatment

For long-term, cost-efficient management, the project team recommends conducting a whole-lake sediment phosphorus inactivation “lake reset” treatment using a high dose of alum or lanthanum. The treatment will inactivate phosphorus in the sediments and provide long-term binding sites for phosphorus released from decaying organic matter and minerals. This treatment will interrupt the positive feedback loop where high nutrient availability fuels algae blooms, increasing the lake’s pH and decreasing oxygen in the bottom waters, which in turn causes release of nutrients from the lake sediments.

Successful application requires regulatory compliance with the Aquatic Plant and Management Permit (APAM), including pre-treatment testing and post-treatment monitoring. Based on Lake Lawrence’s history of internal phosphorus loading and harmful algal blooms, a lake reset treatment offers a high-confidence option for achieving sustained water quality improvements.

Lake reset treatments require higher upfront costs than smaller, repeated applications but provide longer-lasting benefits (approximately 10 years), particularly where external phosphorus inputs are relatively low like at Lake Lawrence. Lake reset treatments have a lower long-term cost than repeated

treatments due to less mobilization and monitoring. Estimated costs for a lake reset treatment at Lake Lawrence range from approximately \$0.85 to \$2.51 million per treatment, depending on product used, and include costs related to required monitoring and implementation. It may take a few years to raise the funds (e.g., LMD dues, grants) for successful implementation, but the project team expects a lake reset treatment could occur by the end of Year 3 (e.g., 2029).

Option B: Repeated Lower Dose Treatment

B.1. With Alum or Lanthanum

Repeated, lower dose applications of alum or lanthanum can effectively reduce phosphorus in the water column and provide ongoing control of algal blooms. These treatments are well-established, widely used in Washington, and promote improved water clarity; though, they require repeated application and long-term commitment. The LMD indicated they were interested in partial treatments targeting between 20 and 25 percent of the phosphorus in the lake sediments. For the purposes of cost estimates, a total four 25 percent treatments were projected over 10 years, occurring in Years 1, 4, 7, and 10. Due to the lower dose of alum, a buffer is not likely to be required, which lowers the cost per treatment; however, a buffering material must be available during alum treatments per permit requirements. Like Option A, repeated treatments require regulatory compliance with the APAM permit, including pre-, post-, and during treatment monitoring. Estimated costs range from approximately \$167,500 to \$418,100 per year, or about \$0.84 to 2.09 million over 10 years, including costs related to required monitoring and implementation.

B.2. Pilot Study with ZVI

A pilot-scale application of zero valent iron (ZVI) is proposed as a lower-cost, exploratory approach to bind sediment phosphorus. While ZVI has been used in limited cases, its effectiveness in lakes is uncertain and highly dependent on site-specific sediment chemistry and oxygen conditions, which could limit its performance in Lake Lawrence. This option would begin with a pilot application in the first 3 years, followed by monitoring and adaptive management to determine feasibility long-term. A single application at 22 parts iron to 1 part phosphorus by weight is estimated at approximately \$170,600. If the treatment is partially effective without adverse effects, a second dose of ZVI could take place at Year 6 for a total project cost \$387,600 (inclusive of the first treatment) . If ZVI application is not effective in the pilot period, the project team recommends adapting the management strategy to Option B1 for following years.

Option C: Hypolimnetic Oxygenation

Hypolimnetic oxygenation systems (HOSs) typically involve the installation of diffuser tubes or plates on the lake bottom to inject air or oxygen into the bottom of the hypolimnion to improve deep-water dissolved oxygen levels, thereby preventing anoxic conditions that allow the release of phosphorus from sediments. This non-chemical approach directly targets internal nutrient loading and is expected to reduce algal blooms, improve water clarity, and enhance fish habitat.

Advanced HOS systems, such as Oxygen Saturation Technology (OST), can efficiently deliver over 20 mg/L of dissolved oxygen to deep lake areas without bubbles, which otherwise could disrupt lake stratification or resuspend sediments. An onshore facility is needed to deliver the oxygen to an in-lake device where water is supersaturated with oxygen and injected back into the deep areas of the lake. While effective, this approach requires significant upfront investment for design, permitting, and construction. HOS systems also require continuous power and maintenance, and may require one-time or ongoing treatments of supplemental iron to the lake to sustain phosphorus binding. Land may need to be acquired for placement and construction of the onshore facility, and/or the parcel may need retrofits to sufficiently and safely power the facility and device.

Implementation would first involve several years of design, planning and funding, followed by installation and long-term monitoring with adaptive management. Estimated costs are approximately \$2.6 million over 10 years, including \$2.2 million for design and construction, and approximately \$22,000 per year of continuous operation, making it a high upfront cost but sustainable, long-term management strategy.

Selected In-lake Phosphorus Management Strategy

On May 14, 2026, the Lake Lawrence Lake Management District Steering Committee selected a preferred management strategy combining options B2 and C. Under this course of action, a single dose of ZVI at an application rate of 22 parts iron to 1 part sediment phosphorus. Over the next 5 years, the LMD will work towards securing funding to install a hypolimnetic oxygenation system (HOS). If this approach is not successful, because the ZVI does not adequately sequester phosphorus in the sediments and/or the LMD is unable to secure funding for an advanced HOS, then the LMD will transition to Option B.1 using either alum or lanthanum to inactivate phosphorus in the lake and sediments.

Continue Water Quality Monitoring and Algae Surveillance

No matter the management objectives or management strategy employed, ongoing monitoring is necessary to evaluate success and allow adaptive management. Long-term routine monitoring conducted by Thurston County Environmental Health Division (TCEH) will provide the information needed to evaluate progress toward achieving management goals and to adjust or augment the lake management measures. During the initiation of management efforts, annual analysis of water quality monitoring and cost/operations data are recommended to inform modification of treatment doses or oxygenation systems. Once management efforts result in consistent and predictable outcomes, reporting may occur at a lower frequency (e.g., every 5 years). Additionally, the project team recommends collecting sediment core samples for phosphorus fraction analysis before each treatment to evaluate sequestration effectiveness and to adjust dosage as needed.

Implement Watershed Source Control Activities

External watershed sources together accounted for less than 20 percent of the total annual phosphorus load to Lake Lawrence, and reducing these sources alone will not achieve lake management objectives.

Thus, watershed approaches to reducing external phosphorus loads are considered supplementary to the recommended in-water actions and are not accounted for in the planning level cost estimates for this LCMP.

Regardless, a key long-term pathway to prevent future cyanobacteria blooms in Lake Lawrence and to enhance the effectiveness of any in-lake management project is to decrease the external loading of nutrients to the lake. This can involve both source control and treatment. Source control is the removal or mitigation of a source, such as reducing phosphorus fertilizer use, installing livestock exclusion fencing where relevant, and fixing failing septic systems. Treatment is the reduction of a nutrient through built and natural infrastructure, such as infiltrating stormwater using low impact design (LID) techniques, filtering stormwater with phosphorus-adsorbing media, or installing vegetative buffers along waterways.

In particular, the project team recommends the LMD and Thurston County pursue the following:

- **Shoreline improvements and program development**, to promote and fund replacement of bulkheads and lawns with native plants and encourage landowners to reduce household sources of phosphorus (e.g., pick up pet waste).
- **Waterfowl management**, to reduce phosphorus loading and deposition of fecal matter in and around the lake shore. This can include posting “do not feed” signs, educating community members, and shoreline plantings.
- **Encouraging routine septic system inspections** throughout the watershed, as required by state law, especially those located immediately around the lake. This may be followed by investigations to identify septic systems that are no longer functioning per their initial design, those that do not have adequate local conditions to remove phosphorus, and/or improperly sited systems and drain fields. Numerous grants and low interest loans are available that may ease the upfront investment for system replacement, including Craft3 Clean Water Loans, a low interest loan program.

Adaptively Manage the Lake Long-Term

To further the long-term water quality and lake use goals for Lake Lawrence, this plan includes the following adaptive lake management framework to regularly reassess and amend LCMP strategies or goals as part of ongoing, adaptive lake management, pursuant to future lake needs, stakeholder values, and funding. This LCMP includes a future monitoring and adaptive management section describing: (1) the decision-making process and adaptation framework by which the LCMP shall be modified, (2) current knowledge gaps and the recommended monitoring plan for continued effectiveness evaluation, and (3) potential future LCMP adaptations to begin considering.

The project team expects that the sediment inactivation treatment will substantially reduce internal phosphorus loading. If effective, it may be adequate to meet the management objective for total phosphorus of less than 24 µg/L as a summer average (Table ES-1), which is the boundary between a mesotrophic state (moderate productivity) and eutrophic state (high productivity). This assumes that a

sediment inactivation approach will provide an 80 percent reduction in internal loading. Therefore, an 80 percent internal load reduction can serve as the measure of success. This objective for total phosphorus is also expected to meet the other established objectives for water clarity (Secchi depth), algae biomass (chlorophyll a) and toxic cyanobacteria blooms (cyanotoxins) (see *Lake Management Objectives* section).

Table ES-1. Observed and Predicted Total Phosphorus Concentrations in Lake Lawrence Following Load Reduction Actions

Scenario	Total Phosphorus (annual volume-weighted average; µg/L)
Current Conditions (2025)	44.4
Predicted Total Phosphorus (TP) (current load)	61.8
Predicted TP if 25% Internal Load Reduction	49.8
Predicted TP if 80% Internal Load Reduction	23.4
Predicted TP if 50% Internal Load Reduction + 50% Watershed Load Reduction	30.9
Predicted TP if 80% Internal Load Reduction + 50% Watershed Load Reduction	16.5

Predicted TP using Brett and Benjamin (2008). $TP = TP_{In} / (1 + 1.12 * T_w^{0.47})$. See Appendix A for more information.

Bold values meet water quality objective of $TP \leq 24 \mu\text{g/L}$.

If sediment inactivation as initially implemented does not meet the total phosphorus or other lake management objectives, then modification of the selected management strategy is needed.

Modifications may include the following:

- Re-evaluation of the internal loading and re-apply alum or lanthanum to inactivate remaining available phosphorus
- Adjusting the dosage or chemical used to improve inactivation of phosphorus
- Pursuing alternate phosphorus inactivation strategies
- Considering iron supplementation, particularly with use of an HOS device

What Will This Plan Cost and How Do We Fund It?

The recommended set of management strategies is estimated to cost between approximately \$170,200 and \$1.41 million in the first year, and between about \$0.32 million and \$2.6 million total over 10 years (in 2026 USD), depending on the strategy selected (Table ES-2). Additional funding sources will be necessary to implement the recommended elements of this plan. A combination of budget allocations, grants, and/or loans should be sought to fund and implement this management plan. The project team recommends considering the following sources:

- Lake Management District Dues
- Thurston County Budget Allocations
- State Legislative Budget Allocations
- Freshwater Algae Control Grants
- Clean Water State Revolving Fund Loans
- Centennial Clean Water Grants
- Section 319(h) Clean Water Grants
- Onsite Sewage Financial Assistance Loans (Craft3) (for individual property owners with septic, only)

Neither the Centennial nor the Section 319(h) Clean Water Grants may presently be used for in-lake treatment, according to current Washington State Department of Ecology policy. However, those grants may be used for watershed source control (including septic system improvements), diagnostic and restoration planning, and lakeshore riparian restoration.

Table ES-2. Recommended Options Implementation & Cost Summary.

Timeframe	Option A – “Lake Reset” Treatment		Option B1 – Repeated Lower Dose Treatment		Option B2 – ZVI Pilot + Repeated Treatment as Needed		Option C: Hypolimnetic Oxygenation System	
	Activity	Cost (2026\$) ^a	Activity	Cost (2026\$) ^a	Activity	Cost (2026\$) ^a	Activity	Cost (2026\$) ^a
Year 1	Secure Funding	–	Plan and Conduct Alum or Lanthanum for 25% of Lake Phosphorus, +Monitoring	\$168 to \$418K	Plan and Conduct ZVI Treatment to target 50% of Lake Phosphorus	\$171K	Secure Funding	–
Year 2	Design and Implement	\$760K to \$1.41M	Routine Monitoring	\$0	Routine Monitoring	\$0	Design, Permitting, & Procurement	\$220K + permitting
Year 3–4	Routine Monitoring	–	Conduct 25%-Dose Alum or Lanthanum, +Monitoring	\$168 to \$418K	Review Pilot Effectiveness & Plan Future Treatment(s)	If effective, \$0. If not effective, plan for Option B1.	Installation	\$2.2M
Year 5–10	Routine Monitoring	–	Conduct 25%-Dose Alum or Lanthanum in Years 7 and 10, +Monitoring ^b	\$168 to \$418K per treatment	TBD, depending on ZVI effectiveness + Monitoring.	If effective, one additional treatment at \$217K If not effective, see Option B1.	System Operations & Maintenance +Monitoring	\$22K per year
Year 10	Re-evaluate P Budget ^c							
Total 10-Year Cost	\$0.85M to \$1.58M		\$0.84M to \$2.08M		If ZVI Effective: \$388K Else: \$0.84M to \$2.08M		\$2.6M	
Annualized 10-Year Cost	\$85K to \$158K		\$84K to \$208K		If ZVI Effective : \$39K Else: \$84K to \$208K		\$260K	

^a There is an assumed cost escalation of 4 percent each year in consideration of wage, utility, and material cost increases. If a loan is obtained to partially fund, additional loan management and interest costs should be considered.

^b Prior to repeated treatments, monitoring should include sediment core analysis for phosphorus fractions.

^c Re-evaluation of the phosphorus budget in Year 10 is not included in overall planning cost estimates.

Background

Lake Lawrence is a 327-acre, shallow eutrophic lake located south of Yelm in Thurston County, Washington. Lake Lawrence is a seepage lake, primarily fed by groundwater and with no year-round surface tributaries. Lake Lawrence is a historically productive system with high plant and algae growth, which inhibit the lake's beneficial uses. The lake has experienced harmful algae (cyanobacteria) blooms (HABs) most years since 2010. Lake Lawrence has a rich history of community engagement and lake monitoring, with efforts to control the excessive aquatic plant and algae growth.

To address poor water quality and aquatic weeds, the Lake Lawrence Lake Management District (LMD) was formed in 1986. It is the oldest LMD in Washington State. The LMD Steering Committee's current goal is to "work in partnership with the County to direct LMD activities to ensure a high-level of lake health while balancing the multi-use, public and private, of the lake." Aquatic weed growth is currently managed following the methods identified in the Integrated Aquatic Vegetation Management Plan (IAVMP) for Lake Lawrence (EnviroVision 2004).

One of the most in-depth studies was performed by Thurston County Department of Public Works and KCM in 1990. This phase I lake restoration study aimed to assess water quality in Lake Lawrence by conducting 1 year of intensive monitoring, literature reviews, and public involvement. Monitoring revealed that Lake Lawrence was a highly productive eutrophic system, characterized by high algae and cyanobacteria densities, low water clarity, oxygen-depleted bottom waters, abundant aquatic macrophyte growth, and a struggling benthic invertebrate community. The primary cause of the observed water quality problems is excessive levels of nutrients, mainly by the internal release of phosphorus from lake sediments in low oxygen conditions and from the decomposition of aquatic macrophytes, followed by groundwater inputs. The study culminated in an analysis of watershed and in-lake alternatives and the development of a lake management plan, which recommended extensive dredging of nutrient-rich lake sediments to reduce internal loading of phosphorus (KCM 1991). In response to this recommendation, Thurston County and Hartman Associates, Inc. (1995) investigated alternative designs for dredging in Lake Lawrence, ultimately finding that it was not possible to remove the necessary amount of sediment to result in meaningful reductions in internal loading.



Cyanobacteria bloom on Lake Lawrence. Photo taken by lake resident.

Unfortunately, HABs remain largely unaddressed, continuing to threaten the health of wildlife and recreators and impeding public uses. Since 2009, annual monitoring by Thurston County Environmental Health Division (TCEH) has shown that Lake Lawrence continues to be eutrophic, with the greatest productivity occurring in September and October of each year. Based on observed trends in nutrients and their relationship to cyanobacteria, toxic blooms may continue to increase in Lake Lawrence unless actions are taken to reduce nutrient sources and change lake conditions.

TCEH, on behalf of the Lake Lawrence LMD, was awarded a grant from the Washington State Department of Ecology (Ecology) Freshwater Algae Control Program (Grant Number WQALG-2025-ThCoPH-00042). This and matching funds from LMD member assessments were used to study the lake and prepare a lake cyanobacteria management plan (LCMP). This LCMP presents the study results and describes a strategy to reduce the frequency and duration of toxigenic algae blooms to restore recreational use. In 2024, on behalf of the Lake Lawrence LMD, Thurston County (the County) contracted with Herrera Environmental Consultants (Herrera) to prepare this LCMP and to develop a quality assurance project plan (QAPP) to guide all study design and methodology for collecting and analyzing additional data to inform LCMP development (Herrera 2024). Herrera developed the QAPP according to Freshwater Algae Grant Funding Guidelines, State Fiscal Year 2024 (Ecology 2022) and Guidelines for Preparing Quality Assurance Project Plans (Ecology 2004, revised 2016; EPA 2002).

Using the scientific data collected in accordance with the QAPP, along with input from the County and the LMD, this LCMP identifies community concerns, defines priorities, outlines goals and objectives, characterizes the lake and watershed, and describes an adaptive lake management strategy. This LCMP will be used as a guideline and tool for allocating resources to implement the recommended management activities, with a framework and decision steps for future management needs.

Study Area

Lake and Watershed

Lake Lawrence is a 327-acre lake located south of Yelm in Thurston County, Washington (Table 1, Figure 1). Lake Lawrence has two basins, the larger east basin and the smaller west basin. The lake is relatively shallow with a mean depth of 13.8 feet (4.2 meters), reaching up to a maximum depth of 26 feet (7.9 meters). The eastern basin is deeper than the western basin (Figure 3). Bathymetric data were collected on June 5, 1951 (Ecology 1976). The maximum depth decreases when the lake level drops throughout the summer and early fall months and may be lower from sediment accumulation over the past 75 years.

Table 1. Morphometric Characteristics of Lake Lawrence.

Characteristic	Combined Basins		West ("Little") Basin		East ("Big") Basin	
	Imperial	Metric	Imperial	Metric	Imperial	Metric
Surface Area	326.5 acres	132.1 ha	52.9 acres	21.4 ha	273.6 acres	110.7 ha
Maximum Depth ^a	26 ft	7.9 m	20 ft	6.1 m	26 ft	7.9 m
Mean Depth ^a	13.8 ft	4.2 m	10.5 ft	3.2 m	14.4 ft	4.4 m
Volume ^a	4,506 acre-ft	5.6 million m ³	559 acre-ft	0.7 million m ³	3,947 acre-ft	4.9 million m ³
Osgood ratio (mean depth [m]/lake area [km ²] ^(1/2))	3.65		6.9		4.2	
Lake Altitude (NAVD88)	429 ft	131 m				
Watershed Drainage Area ^b	1,687 acres 1,360 acres excluding lake surface	683 ha 550 ha excluding lake surface				
Mean Annual Precipitation	55 in	1.40 m				

ha= hectares ft = feet m = meters in = inches

^a Calculated based on bathymetric data digitized from Ecology 1976 –
<https://geo.wa.gov/datasets/waacy::lake-bathymetry-elevation-bands/about>

^b Watershed drainage area based on Thurston County delineation (Thurston Basins –
https://tconline.co.thurston.wa.us/server/rest/services/ThurstonExt/Thurston_Basins/FeatureServer/0)

Note: contemporary bathymetry was surveyed by AquaTechnex in 2024 using BioBase,, the raw data were not provided for use in this study. The results indicate the lake depth decreased by about 2 feet since the Ecology (1976) dataset.

Figure 1.
Lake Lawrence Vicinity.

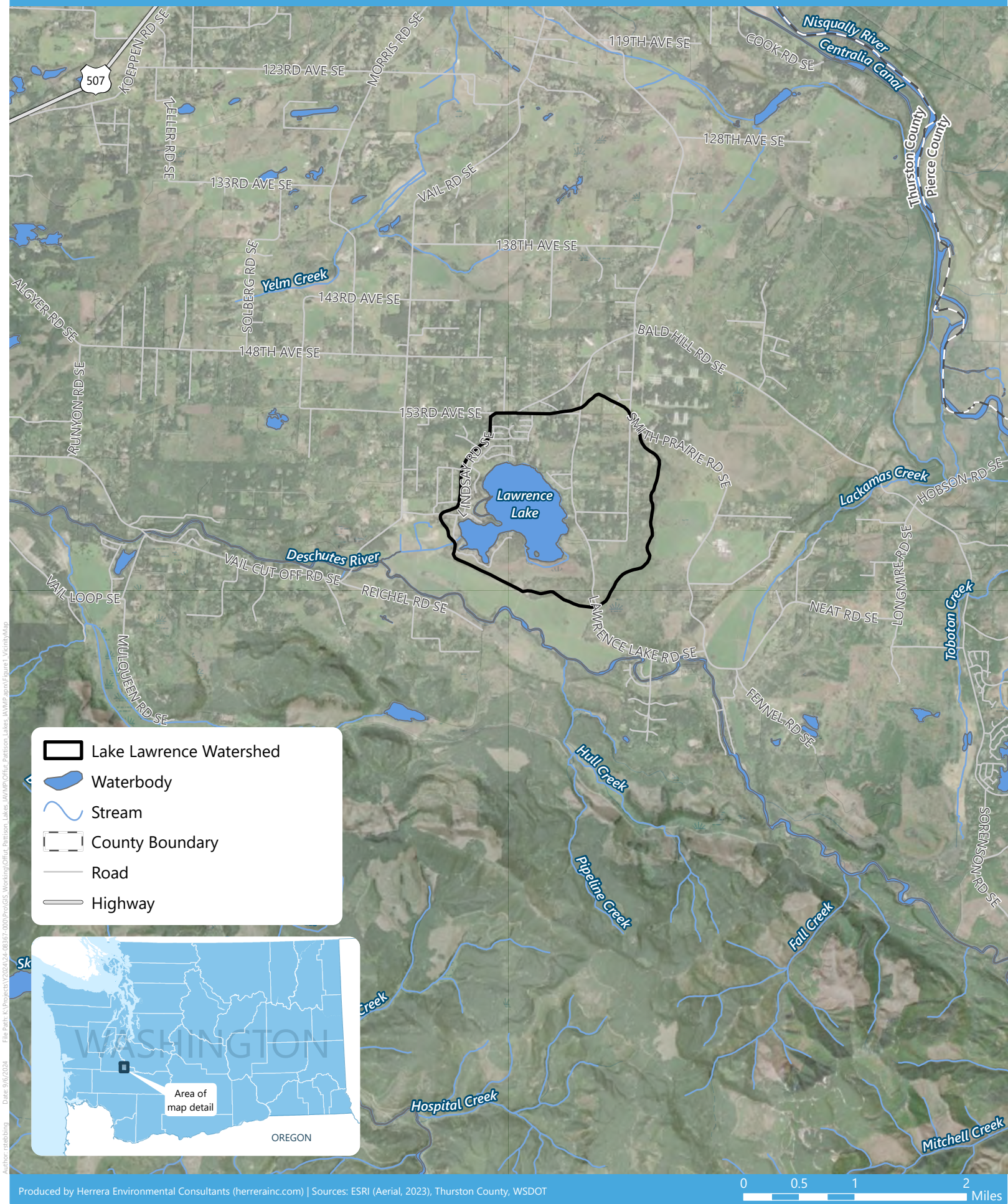


Figure 2.
Lake Lawrence Bathymetry.

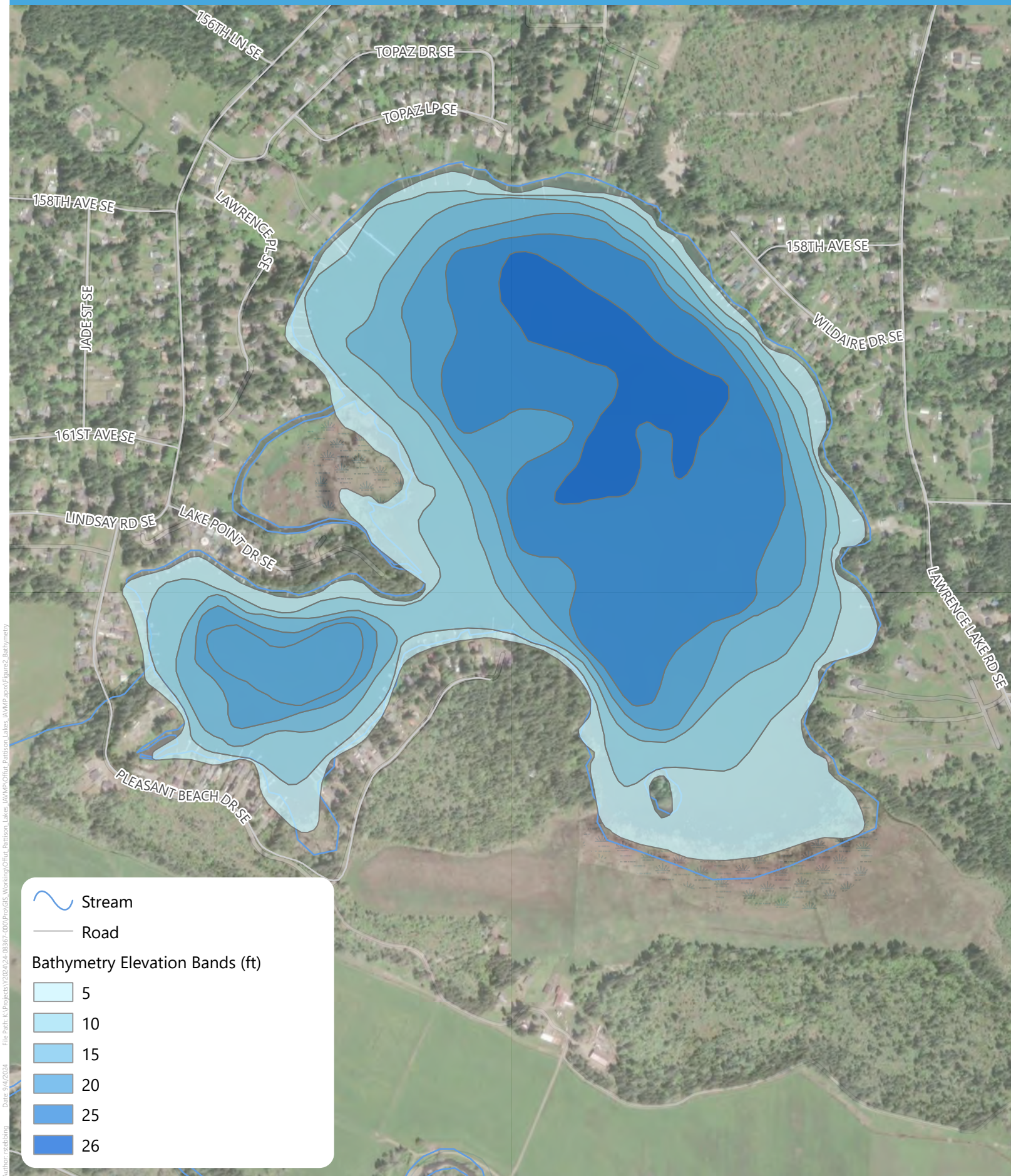


Table 2. Lake Lawrence Depth-Area-Volume.

Basin	Depth		Area		Volume Below	
	Meters	Feet	Hectares	Acres	Cubic Meters	Acre-feet
West	0.0	0.0	21.4	52.9	688,884.7	558.5
	1.5	5.0	16.1	39.8	403,856.9	327.4
	3.0	10.0	10.3	25.4	204,560.3	165.8
	4.6	15.0	6.6	16.2	77,349.8	62.7
	6.1	20.0	3.7	9.2	0.0	0.0
Big	0.0	0.0	110.7	273.6	4,869,017.1	3,947.4
	1.5	5.0	89.7	221.6	3,344,969.1	2,711.8
	3.0	10.0	70.2	173.5	2,129,728.3	1,726.6
	4.6	15.0	57.4	141.8	1,159,209.8	939.8
	6.1	20.0	43.5	107.5	392,858.4	318.5
	7.6	25.0	10.4	25.8	10,591.6	8.6
	7.9	26.0	0.0	0.0	0.0	0.0
Combined	0.0	0.0	132.1	326.5	5,557,901.8	4,505.9
	1.5	5.0	105.8	261.4	3,748,826.1	3,039.2
	3.0	10.0	80.5	198.9	2,334,288.6	1,892.4
	4.6	15.0	63.9	158.0	1,236,559.6	1,002.5
	6.1	20.0	47.2	116.7	392,858.4	318.5
	7.6	25.0	10.4	25.8	10,591.6	8.6
	7.9	26.0	0.0	0.0	0.0	0.0

The lake's drainage includes discharge from intermittent tributaries and is comprised of a mix of low density residential and forested lands with some agriculture (Figure 3, Figure 4, Table 3). There is an intermittent stream that flows into the lake from the southeast side of the lake. Direct runoff from residential neighborhoods and shallow groundwater seepage also drain to the lake.

Analyses by KCM (1991) indicated that groundwater was historically a significant source of nutrients to the lake. The aquifer supplying the lake was enriched with phosphorus and inorganic nitrogen, but it is uncertain whether these high nutrient concentrations in the groundwater were natural conditions or resulting from agricultural activities, as contributions from septic systems were expected to be relatively small.

Water from Lake Lawrence discharges into a stream (Lawrence Creek) along the west shoreline of the West Basin. The stream then flows for approximately 1 mile before discharging into the Deschutes River; then, it flows through Capitol Lake and Budd Inlet into the Salish Sea (Figure 1).

Table 3. Lake Lawrence Watershed Land Cover, Thurston County, Washington.

NLCD 2021 Land Cover	Watershed		
	Area (acres)	%	% (Excluding Lake)
Open Water	305.3	18.1%	0.1%
Developed, Open Space	159.9	9.5%	11.6%
Developed, Low Intensity	198.8	11.8%	14.5%
Developed, Medium Intensity	18.9	1.1%	1.3%
Developed High Intensity	0.9	0.1%	0.1%
Total Developed	683.9	40.5%	27.6%
Barren Land (Rock/Sand/Clay)	1.1	0.1%	0.1%
Deciduous Forest	21.1	1.3%	1.6%
Evergreen Forest	449.7	26.7%	32.7%
Mixed Forest	167.5	9.9%	12.3%
Total Forest	638.3	37.8%	46.6%
Shrub/Scrub	85.0	5.0%	6.2%
Grassland/Herbaceous	33.1	2.0%	2.4%
Pasture/Hay	133.9	7.9%	9.8%
Woody Wetlands	32.2	1.9%	1.9%
Emergent Herbaceous Wetlands	79.6	4.7%	5.4%
Entire Watershed	1687.1	100.0%	100.0%

There are 678 parcels within the LMD boundary, as well as numerous more parcels that are outside of the district but within the lake's watershed. Each of these parcels is assumed to be served by onsite septic systems (OSS). There are no sanitary sewer systems for wastewater treatment in the watershed. Thurston County data regarding septic systems for residences and businesses in the watershed are available that include information such as year installed, system type and size, and inspection and maintenance dates/details. KCM (1991) monitored shallow groundwater up- and down-gradient of septic systems and determined that nutrients in wastewater were effectively attenuated in the drainfields, so nutrient inputs to Lake Lawrence from wastewater were relatively small at the time of that study.

Stormwater conveyance infrastructure draining to Lake Lawrence mostly include roadside ditches, with a few pipes and catch basins mostly in the north half of the watershed. There are also five mapped stormwater outfalls discharging to Lake Lawrence (Figure 4). There are no other regulated point sources discharging into the lake. The potential non-point sources are onsite septic systems, agricultural runoff, residential use of fertilizers, stormwater, and direct and indirect inputs related to fish stocking and aquatic plant control.

Discharge and water quality measurements were collected for this project at four surface drainage inflow monitoring stations (see Figure 1 in Appendix A) to understand nutrient contributions from local roadway and residential runoff, and from the lake outlet downstream of the overflow structure.

Figure 3.
Lake Lawrence Watershed Drainage and Land Cover.

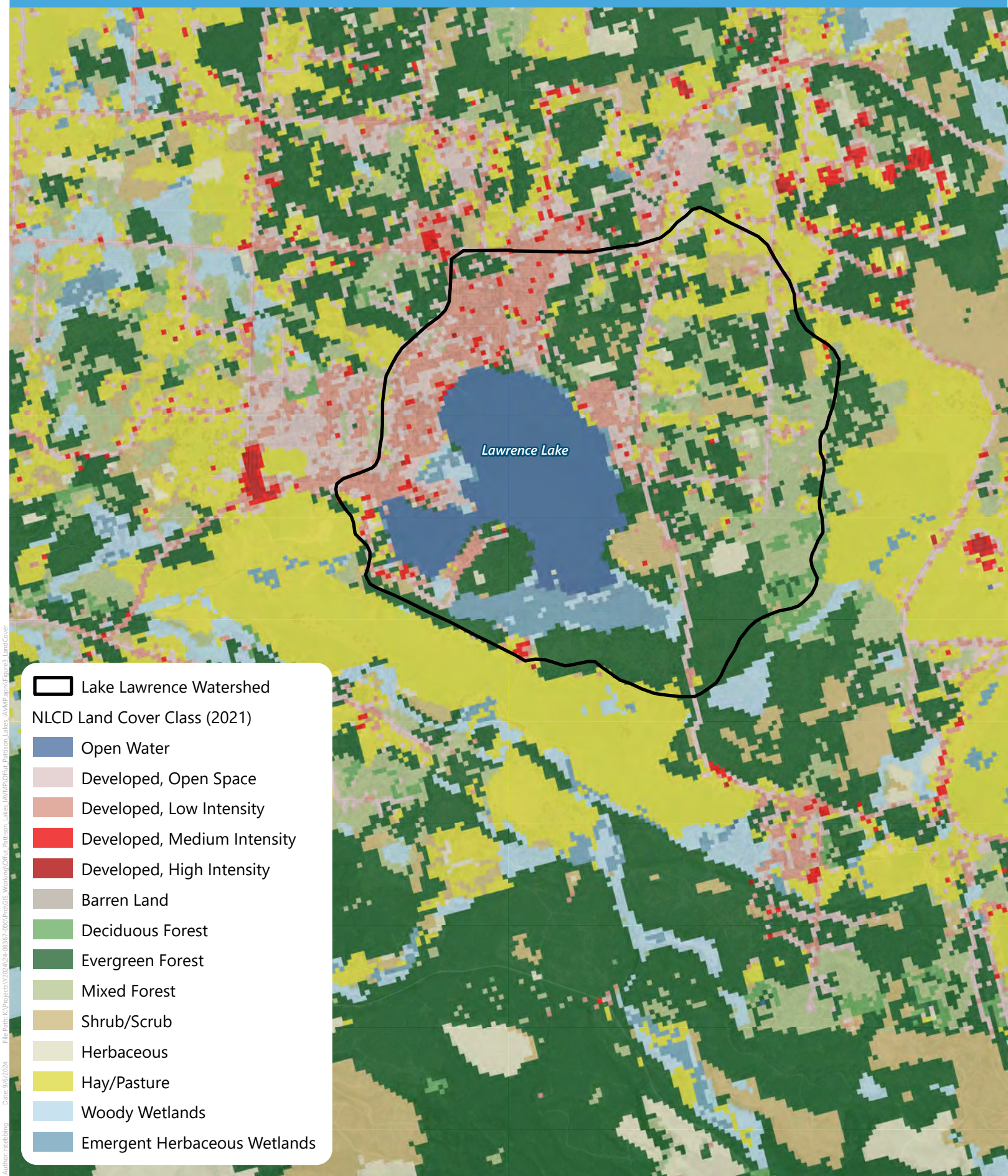


Figure 4.
Lake Lawrence Stormwater System.



- Outfall
- Catch Basin
- Stormwater Pipe
- Stormwater Ditch
- Road
- Highway
- Stream
- Waterbody

Beneficial, Current, and Historical Uses

The study area is within the traditional territories of the Cowlitz, Nisqually, Cayuse, Umatilla, and Walla Walla Native American tribes (<<https://native-land.ca/>>). The ancestral lands ceded to the United States government in the 1854 Treaty of Medicine Creek included millions of acres, which today include the cities of Tacoma, Federal Way, Puyallup, and Olympia, as well as Mount Rainier National Park. Settlers from the United States arrived in the area in the mid-1800s. The first survey of the area was conducted in 1873, at which point there were 25 to 30 settlers. Two small sawmills operated on the lakeshore in the late 1800s, and wood waste from these operations can still be found in the lake.

Perhaps the most influential period of Lake Lawrence's history was 1908 to 1928. During this time, the Olympic Light and Power Company used the lake as a reservoir for its Tumwater Power Plant. The power company dammed the outlet of Lake Lawrence and created a channel to divert a portion of the Deschutes River flow into the lake, raising the water level by around 5.5 meters (18 feet). When river flow was low during the fall, the company released water from the lake to ensure reliable flow to the power plant. The power plant ceased this practice in 1928; however, the river sediment brought into the lake during this period continues to influence the water chemistry of Lake Lawrence to this day.

Edwards Resort, a popular recreational facility, operated from around 1923 to 1973. When it closed, part of the property became private residences, while the resort café, playground, and swimming area, along with Edwards Pavilion, became part of the Lake Lawrence Community Club, which is still maintained today.



--Looking from the Lake--
1926 – Lawrence Lake at the highest level, when the Deschutes was diverted to run into the Lake. Bridge (left side of picture) extended to about where Saxon lot is. High dive was 23 feet high. There was a Lagoon where the Tennis Court is now.”
(Source: unknown contributor; [Lake Lawrence Management District](#)).



Lake Lawrence, opening day of fishing season, circa 1950s.
(Source: [Lake Lawrence Management District](#), courtesy of Lisa Kellejian from the collection of H.A. “Art” Trimble).

Lake Lawrence has always been a popular fishing lake, though fishing success declined in the 1940s. In 1951, the Washington State Game Department, now the Washington Department of Fish and Wildlife (WDFW), instituted a fishery rehabilitation program and began stocking rainbow trout. From 1951 to 1975, several rotenone treatments were applied to the lake to target the warmwater fish population (i.e., bass, perch, and crappie). From the 1980s to the early 2000s, the Lake Lawrence Community Club volunteers, in partnership with WDFW, raised approximately 2,000 rainbow trout each year in a pen at the end of the club dock and released them into the lake upon reaching maturity. Once WDFW began stocking the lake annually (since at least 1995), this program ended.

In 1986, the Lake Lawrence LMD was formed in response to poor water quality and excessive aquatic weed growth, as a governmental jurisdiction and separate from the Lake Lawrence Community Club. The LMD was most recently renewed in April 2026. The LMD continues to advocate for Lake Lawrence in the following ways today:

- Collecting assessments and developing a budget for lake activities
- Managing the lake
- Reviewing surveys and environmental studies
- Managing weed growth and nutrient loading in partnership with the County
- Reducing stormwater inputs
- Addressing emergent issues
- Representing LMD residents
- Promoting educational opportunities related to lake stewardship

The watershed today is used for year-round residential housing and recreation, with mixed rural/residential, agriculture, forest, and low-density residential land cover. The majority of shoreline land use is comprised of low-density residential, followed by emergent herbaceous wetland and forest (Figure 3). Immediate shoreline around Lake Lawrence is naturally vegetated, except near residences where, in many cases, lawns and/or bulkheads extend to the water's edge.

Lake Lawrence provides visitors and residents with recreational opportunities such as birdwatching, boating, fishing, swimming, water skiing, canoeing, kayaking, sailing, and picnicking. The WDFW public boat launch and county-owned park located on the southwest shoreline of the Big Basin offer year-round shoreline fishing access, a concrete boat ramp and dock, and accessible parking and restroom facilities.

Other, private lake access points include the Lake Lawrence Community Club, which offers gathering space, plenty of shoreline, a swimming area, a dock, and boat launch; and the Scenic Shores and Wildaire Community [Homeowners] Association Park, which offers a pavilion, shoreline, swimming area, and a dock. The remaining shoreline consists of open spaces, forest, and/or by year-round residential housing,

with approximately 180 lakefront or canal-front properties, the majority of which feature docks or other in water structures.

Lake Lawrence's designated uses per WAC 173-201A-600 include salmonid habitat (core summer habitat), primary contact recreation, water supply (domestic, industrial, agricultural, and stock), wildlife habitat, harvesting, commerce/navigation, boating, and aesthetics . However, as noted in the next section, salmonids present in Lake Lawrence include only stocked trout, no wild salmonids.

There are two water rights for direct withdrawal from the lake for domestic use (e.g., irrigation) (Record numbers S2-*04589CWRIS and S2-099819CL). The former has a maximum withdrawal of 52 acre-feet per year (64,141 cubic meters/year) from the northwestern corner of the Big Basin. This value is approximately 5 percent of the total estimated inflows to the lake in Water Year (WY) 2025 (see *2024–2025 Monitoring Study Findings* section). The latter water right does not specify volume or use rate. However, these water rights are specific to a surface water diversion or pumping from Lake Lawrence, and currently, there is no known pump or headworks diversion from the lake.

Drinking water wells include four Group A systems include the following:¹

- Lake Lawrence with two active groundwater wells (depths 63 and 97 feet) located near Lindsay Road Southeast and Pleasant Beach Drive Southeast northwest of the West Basin. The system has 340 active connections serving an estimated residential population of 896 and non-residential population of 18. An estimated 21,060,528 gallons (79,723 cubic meters) were produced and purchased in 2024.
- Wildaire Estates with two active groundwater wells located in the Wildaire community on the northeast side of the lake (depths: 74 and 83 feet). The system has 48 active connections serving an estimated residential population of 146. An estimated 4,485,200 gallons (16,978 cubic meters) were produced and purchased in 2024.
- Scenic Shores Water Company with three active groundwater wells on the north end of the lake (depths: 139, 98, and 188 feet). The system has 252 active connections serving an estimated residential population of 750 and non-residential population of 1. An estimated 20,609,333 gallons (78,015 cubic meters) were produced and purchased in 2024.
- The Lake Lawrence Mobile Home Park system is located north of 153rd Avenue Southeast with one permanent groundwater well (depth: 77 feet) and one emergency well (depth: 286 feet). The system has 42 active connections serving an estimated residential population of 80. An estimated 1,761,000 gallons (6,666 cubic meters) were produced and purchased in 2019.

Among these systems, the Lake Lawrence, Wildaire Estates, and Scenic Shores are expected to influence the groundwater inflows and outflows to Lake Lawrence by locally drawing down the water table; the Lake Lawrence Mobile Home Park is a relatively smaller system with greater distance from the lake. For

¹ Drinking water data from Washington State Department of Health Office of Drinking Water Sentry database: <https://fortress.wa.gov/doh/eh/portal/odw/si/Intro.aspx>

example, the three systems closer to the lake collectively drew an estimated 46,155,061 gallons (174,716 cubic meters) in 2024. This value is approximately 13 percent of the total estimated inflows to the lake in WY 2025 (see *2024–2025 Monitoring Study Findings*).

Toxic algae blooms can impair each of Lake Lawrence’s uses. For example, the toxic cyanobacteria warnings have been posted at the lake in 13 of the past 16 years when state guidelines for the cyanotoxin microcystin (12 years) or anatoxin-a (1 year) were exceeded (see Appendix A).

Applicable surface water quality criteria (WAC 173-201A-200) to support aquatic life uses are listed in Table 4 for conventional parameters (temperature, dissolved oxygen, and pH) and *E. coli* bacteria. Criteria have yet to be established for cyanobacteria or cyanotoxins but have been proposed for the next update. State surface water quality standards recommend conducting a lake-specific study to evaluate characteristic uses and impairments if the summer mean total phosphorus concentration exceeds the action value of 20 µg/L in the surface layer (epilimnion) of lakes in the Puget lowlands ecoregion (WAC 173-201A-230). Proposals to adopt appropriate total phosphorus criteria to protect characteristic uses of a lake must be developed by considering technical information and stakeholder input as part of a public involvement process, such as through this LCMP.

Table 4. Lake Lawrence Water Quality Criteria.	
Parameter	Water Quality Criteria
Temperature	Human actions considered cumulatively may not increase the 7-DADMax temperature by more than 0.3°C (0.54°F) above natural conditions (i.e., for waterbodies naturally warmer than 16.0°C).
Dissolved Oxygen	Human actions considered cumulatively may not decrease the dissolved oxygen concentration more than 0.2 mg/L below natural conditions (i.e., for waterbodies naturally less oxygenated than 10 mg/L or 95 percent saturation).
pH	Within the range of 6.5 to 8.5, with a human-caused variation within the above range of less than 0.2 unit
Turbidity	5 NTU over background when the background is 50 NTU or less; or a 10 percent increase in turbidity when the background turbidity is more than 50 NTU
Fecal Bacteria (<i>E. coli</i>)	<i>E. coli</i> organism levels must not exceed a geometric mean value of 100 CFU or MPN per 100 mL, with no more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 320 CFU or MPN per 100 mL

Criteria according to WAC 173-201A-200.

Fisheries

Resident species of Lake Lawrence include rainbow trout, largemouth bass, smallmouth bass, yellow perch, bluegill, pumpkinseed sunfish, channel catfish, and brown bullhead catfish (WDFW 2025a). In the 1990s, the University of Washington performed a feasibility study for using grass carp to control aquatic plants in Lake Lawrence, which ultimately did not recommend use of grass carp due to their unpredictability and expectation that their voracious control of plants would likely accelerate problematic algae growth (Thomas et al. 1990).

In the 1980s and 1990s, in partnership with WDFW, approximately 2,000 rainbow trout were raised by Lake Lawrence Community Club volunteers in a net pen within the lake then released into the lake, a practice that continued until the early 2000s when WDFW began stocking the lake regularly (WDFW 2025b). From 1995 through 2018, WDFW stocked up to three species of fish each year at Lake Lawrence, including rainbow trout, brown trout, coastal cutthroat trout, or channel catfish. Since 2019, only rainbow trout have been stocked (WDFW 2025b). Measured in pounds, most stocked rainbow, cutthroat, and catfish were of legal size, but some were stocked as fingerlings or fry. Brown trout were only stocked as fry. There are no wild salmonid (e.g., trout) populations in Lake Lawrence since the lake's outlet control structure is a barrier to migration.

Waterfowl

Lake Lawrence provides habitat for an abundance of waterfowl, including but not limited to Canada geese, cormorants (which visit the lake between November and March each year), migratory American coots, and several dabbling and diving duck species such as mallards and teals. Canada goose populations have been particularly abundant at the lake, with some years exhibiting more than 250 geese at once, necessitating mitigation efforts. The United States Department of Agriculture (USDA), prompted and paid for by donations from lake residents, captured and removed 153 geese in July 2022 and another 71 geese in July 2024. These removals did not take all geese observed and did not include oiling eggs in nests, because nesting season is in March and is more labor intensive.

Today, lake residents estimate approximately 40 to 50 resident geese at Lake Lawrence. In early 2025, approximately 200 geese were counted, including migratory geese. Populations decreased between May and July to between 24 and 32, representing resident geese, until August when migratory geese increased counts to 158. With low counts persisting through 2025, subsequent removals by USDA will likely be postponed until at least 2027 upon LMD request and funding.

Aquatic Plants

Shortly after the LMD formed in 1986, a quantitative aquatic plant survey was conducted as part of a grass carp feasibility study in 1989 (Thomas et al. 1990). White-stem pondweed (*Potamogeton praelongus*), American waterweed (*Elodea canadensis*), water celery (*Vallisneria americana*), and fragrant waterlily (*Nymphaea odorata*, an invasive noxious weed) were noted as the dominant plants in the lake. Maximum plant biomass during this survey was 1,010 g/m², and plant growth covered 38 percent of the total surface area of the lake (Thomas et al. 1990). By 1996, fragrant waterlily covered almost 80 surface acres (22 percent) of the lake but were nearly eradicated with an herbicide (glyphosate) application.

In 2002, the LMD and Thurston County received a \$30,000 grant from Ecology to support the development of an Integrated Aquatic Vegetation Management Plan (IAVMP) as an update to the applicable sections of the 1995 Lake Lawrence Management Plan (Thurston County 1995). As part of this project, County staff conducted a qualitative vegetation survey in 2003, from which staff found roughly 40 percent of the total surface area of Lake Lawrence was covered with plant growth. Most of this area was colonized by submerged aquatic plants, with only 5 to 7 acres (2 percent) covered with floating-

leaved plants. Submerged aquatic plants were found throughout the littoral zone to a water depth of approximately 15 feet. The floating-leaved plants were found closer to shore in waters less than 10 feet deep. The emergent plants identified in the plant survey were primarily located in waters less than 5 feet deep, along the southern and western shores of the east basin (Envirovision 2004).

The 2003 survey results indicate that a healthy variety of native plants inhabit the lake. All the native aquatic plants found in 1989, along with several other plant species, were documented in the 2003 survey (see Table 7 in the QAPP [Herrera 2024]). Since 1996, the amount of fragrant waterlilies had slowly increased, and approximately 2 acres of these plants were again treated in 2003. Curly leaf pondweed was the only submersed noxious weed observed, and only a few plants were observed in the lake. Two emergent noxious weed species were observed in the lake, including reed canary grass in thick patches and yellow flag iris in low density at scattered locations (Envirovision 2004).

Using the results of the 2003 surveys, the IAVMP was published in 2004 (Envirovision 2004). The goals of the plan are as follows:

- Eradicate all noxious aquatic weeds from the lake and work to prevent future infestations.
- Significantly reduce the amounts of aquatic plants in residential areas.
- Continue lake-wide aquatic plant control measures to maintain beneficial uses while protecting habitat for fish and wildlife.
- Conduct surveys on an annual basis to track the status of the aquatic plants in the lake and monitor for the introduction of new noxious weeds.
- Continue an educational program, which promotes lake and watershed stewardship and provides a greater awareness of the continual threat of noxious weeds and the importance of homeowner Best Management Practices (BMPs) for the long-term protection of Lake Lawrence.

The IAVMP provided the following recommendations:

- Use of a glyphosate herbicide (Rodeo®) for the eradication of fragrant waterlily and yellow flag iris.
- Use of mechanical harvesting (short-term) and grass carp (long-term) for the control of native submerged plants.
- Allow for use of local small-scale plant control efforts in front of residents' homes using hand tools, bottom barriers, etc.
- Conduct surveys to track the status of aquatic plants and monitor for the introduction of new noxious weeds.
- Continue to support the Aquatic Plant Advisory Committee for the lake whose function is to make decisions annually about controls needed and review aquatic plant management goals.
- Promote lake and watershed stewardship education with an emphasis on identifying noxious weeds and protecting habitat for fish and wildlife.
- Enhance water quality in the lake by controlling excessive aquatic vegetation.

Ecology's lakes database also contains plant survey data from 2006 and 2020. Ecology staff conducted the 2006 survey 2 weeks after selective harvesting. The most abundant plants were reed canary grass (*Phalaris arundinacea*), water celery, white-stem pondweed, and stonewort (*Nitella*). The survey in 2020 was conducted by volunteers after an herbicide treatment. The documented species included the noxious weed curly leaf pondweed (*Potamogeton crispus*) and the following native plants: yellow pondlily (or spatterdock, *Nuphar polysepala*), American waterweed, watershield (*Brasneia schereberi*), water celery, white-stem pondweed, bigleaf pondweed (*Potamogeton amplifolius*), and native bladderwort (*Utricularia*). All of these species were observed during the 2003 survey, plus a new emergent noxious weed named lesser cattail (*Typha angustifolia*) (Ecology 2025b), which is difficult to distinguish from than the previously observed native cattail (*Typha latifolia*).

Lake Management District (LMD) volunteers conduct lake surveys during the weed growth cycle, between April and September of each year, to determine location and density of invasive nuisance species and native submersed, floating-leaved, and emergent vegetation. The LMD also regularly manages the aquatic invasive weeds through mechanical harvesting and contracting herbicide treatments. Herbicide treatments are listed by year and target species in Table 5.

Table 5. Herbicide Applications at Lake Lawrence, 2015 to 2025.

Year	Month(s)	Target Species	Product(s)	Acres Treated
2015	NR	Yellow Flag Iris	Imazapyr	NR
2016	April, May, June	Elodea	Sonar Q and Sonar PR	33.31
2017	May	Yellow Flag Iris	Imazapyr	NR
	April, May, June	Elodea	Sonar Q and Sonar PR	30.67
2018	May	Yellow Flag Iris	Imazapyr	NR
	July	Big Leaf Pondweed Curly Leaf Pondweed Narrow Leaf Pondweed	Aquathol K	16.02
2019	May	Yellow Flag Iris	Imazapyr	NR
	July	Spatterdock Fragrant Waterlily Purple Loosestrife	Imazapyr	NR
	July	Big Leaf Pondweed Curly Leaf Pondweed Narrow Leaf Pondweed	Aquathol K	20.92
2020	May	Yellow Flag Iris	Imazapyr	NR
	July	Spatterdock Fragrant Waterlily Purple Loosestrife Narrow Leaf/ Lesser Cattail	Imazapyr	NR
	July	Big Leaf Pondweed Curly Leaf Pondweed Narrow Leaf Pondweed	Aquathol K	18.2

Table 5 (continued). Herbicide Applications at Lake Lawrence, 2015 to 2025.

Year	Month(s)	Target Species	Product(s)	Acres Treated
2021	May, June	Yellow Flag Iris	Imazapyr	NR
	May, June	Elodea Najas	Sonar PR and Sonar ONE	24.9
2022	June, July	Yellow Flag Iris	Imazapyr	NR
	July	Spatterdock Fragrant Waterlily	Imazapyr	NR
	July	Big Leaf Pondweed Curly Leaf Pondweed Narrow Leaf Pondweed	Aquathol K	33.54
2023	June	Yellow Flag Iris	Imazapyr	NR
2024	May	Yellow Flag Iris	Imazapyr	NR
	July	Curly Leaf Pondweed	Galleon SC	26.08
	September	Fragrant Waterlily	ClearCast	2.5
2025	May	Yellow Flag Iris	Imazapyr	NR
	May, June	Curly Leaf Pondweed Najas	Sonar ONE	31.0
	August	Fragrant Waterlily	ClearCast	3.0
2026 ^a	May	Yellow Flag Iris	Imazapyr	NR
	April, May, June	Curly Leaf Pondweed	Sonar ONE	NR

Data provided by Lake Lawrence LMD Steering Committee. NR = value not reported

^a Planned treatments not yet conducted at the time this report was written.

The following plant species reported in Lake Lawrence are considered noxious weeds in Washington state:

- Curly leaf pondweed (submersed, Class C noxious weed)
- Fragrant waterlily (floating-leaved, Class C noxious weed)
- Yellow flag iris (emergent, Class C noxious weed)
- Reed canary grass (emergent, Class C noxious weed)
- Lesser cattail (emergent, Class C noxious weed)

Class C noxious weeds are widespread in Washington and typically not required to be controlled by local weed boards. However, yellow flag iris is designated as a Class C Select species by Thurston County Noxious Weeds that is specifically required to be controlled in Lake Lawrence (TCNW 2026).

Endangered/Rare Species Present

According to WDFW's Priority Habitats and Species (PHS) in Washington State tool (WDFW 2025b), natural habitats in the Lake Lawrence watershed include lakes, freshwater emergent wetland, and freshwater forested/shrub wetland. The PHS tool indicates that none of these habitats within the watershed are sensitive.

The PHS tool additionally identified the three key species present in the watershed. Listed for but not actually present in the lake and Lawrence Creek (draining to the Deschutes River) are West South Sound Coastal Cutthroat (*Oncorhynchus clarki*) and Fall Chinook (*Oncorhynchus tshawytscha*). For wetlands adjacent to the lake and in the watershed, only the great blue heron (*Ardea herodias*) was identified in addition to "other waterfowl." Specifically, a colony of great blue herons was reported in the 1990s within the wooded area upland of the freshwater emergent wetlands on the south side of the lake. No endangered, sensitive, or rare species are present in the Lake Lawrence watershed, according to the PHS tool. However, the watershed represents an important waterfowl wintering area, where lakes provide loafing habitat and food resources for diving species.

WDFW cautions PHS users that these data are not an exhaustive list of all fish and wildlife presence but is for informational purposes only. WDFW strongly recommends users to schedule field visit by a fish and wildlife biologist or habitat expert to make determinations about species presence, absence, or exact location before making any final decisions about a project.

Past Water Quality Conditions and Improvement Efforts

Lake Lawrence has a rich history of community engagement and lake monitoring. Key studies of the lake's water quality are provided in Table 6 and summarized below.

Table 6. Summary of Previous Studies at Lake Lawrence.

Title	Author(s)	Data Year	Year Published	Description
Feasibility of Aquatic Plant Control in Lake Lawrence, Thurston County, Washington, Using Grass Carp	Thomas et al.	1974–1989	1990	Evaluation of aquatic plant and fish communities in Lake Lawrence and potential effects of stocking grass carp
Lake Lawrence Phase I Restoration Analysis Final Report	Kramer, Chin, & Mayo (KCM)	1990	1991	Comprehensive water quality study of Lake Lawrence to identify restoration alternatives
Lake Lawrence Restoration Project Final Dredge and Disposal Design Report	Hartman Associates, Inc.	1990, 1993	1995	Design report for the most effective method of dredging Lake Lawrence
Water Quality Assessments of Selected Lakes within Washington State – 1994	Ecology	1994	1997	Summer water quality monitoring

Table 6 (continued). Summary of Previous Studies at Lake Lawrence.

Title	Author(s)	Data Year	Year Published	Description
Water Quality Assessments of Volunteer-Monitored Lakes Within Washington State, 1998–1999	Ecology	1998, 1999	2002	Summer water quality monitoring
Lake Lawrence Integrated Aquatic Vegetation Management Plan	EnviroVision Corp.	2003	2004	Management plan for aquatic plants
Thurston County Water Quality Monitoring Program	Thurston County Environmental Health	2009–ongoing	Various annual reports	Long-term water quality monitoring

Since at least the early 1980s, Lake Lawrence has suffered from conditions typical of shallow eutrophic lakes, spurring the formation of the LMD in 1986. In 1990, Thurston County Department of Public Works conducted a phase I lake restoration study to assess water quality and limnological conditions in Lake Lawrence. The study included 1 year of intensive monitoring, background information compilation, public involvement, analysis of watershed and in-lake alternatives, and development of a lake management plan.

Ultimately, this restoration plan’s primary recommendation was extensive dredging of nutrient-rich lake sediments from the hypolimnion to greatly reduce internal loading of phosphorus. However, a follow-up study further investigating dredging alternatives found that removing hypolimnetic sediments was not feasible due to the sediments’ unconsolidated structure, and that dredging 49 acres in the Big Basin alone would cost \$47 million (approximately \$113 million in 2025 USD), take 12 years to complete, and not meet the project goal of 50 to 80 percent reduction in internal loading (Hartman Associates 1995). Instead, this follow-up study selected nearshore dredging as the preferred method for reducing sediment resuspension and improving lake access (notably, not for reducing internal loading), at a cost of \$1.85 million at the time of the report (approximately \$4.4 million in 2025 USD). This dredging effort was ultimately not performed.

Less expensive in-lake restoration measures, such as alum treatment, were evaluated by KCM (1991) but were determined to not meet the beneficial use goals², while other commonly used restoration techniques (e.g., hypolimnetic aeration and artificial circulation) were determined to provide limited effectiveness or longevity at reducing the high algal and plant production in the lake. Other techniques, such as dilution, hypolimnetic injection/withdrawal, and lake level drawdown were evaluated to be inappropriate based on Lake Lawrence’s hydrology and geography. Recommended watershed control

² KCM (1991) suggested that alum treatments would be ineffective, citing that groundwater loadings were responsible for ~10 percent of phosphorus loading to the lake and would reduce the longevity of a treatment. While the project team agrees that external loadings reduce longevity, the project team disagrees with this conclusion because (1) alum also provides sequestration sites for incoming groundwater; (2) the groundwater loading estimates by KCM (1991) appear to be overestimates compared to the project team’s conclusions in Appendix C; and (3) the amount of groundwater loading that KCM estimated is far exceeded by the 80percent load attributed to sediments, which alum (or other phosphorus inactivation chemicals) would target.

measures included stream buffer zones, improved forestry and development practices, roadside ditch maintenance, and public awareness programs (KCM 1991).

Since 2009, two monitoring efforts have regularly characterized Lake Lawrence water quality, including (1) surface water sample collection for the analysis of cyanotoxins and phytoplankton identification through the Department of Ecology's Northwest Toxic Algae Program, and (2) monthly summertime (May through October) water quality monitoring through TCEH's Lake Monitoring Program. Water quality reports are available for data collected between 2009 and 2021 at [Thurston County's Water Quality Monitoring / Pollution Identification Correction webpage](#). Water quality data for Lake Lawrence between 1998 and 2024 are publicly available for viewing and download at [Thurston County's Lakes Water Quality Data Dashboard](#). Note that data collected by Ecology in 1994 and 1999 are presently not included in the Thurston County database.

Key water quality and hydrological characteristics of Lake Lawrence, as monitored thus far, include the following:

- The lake is eutrophic, with high summertime algae growth comprised largely of cyanobacteria (KCM 1991). Exceedances of state recreational criteria for cyanotoxins occurred for microcystin in 12 years and for anatoxin-a in 1 year over the past 17 years since cyanotoxin monitoring began in 2009 (see Appendix A), resulting in closures of the lake to recreational use almost every year.
- The lake's water budget is dominated by direct precipitation and groundwater seepage, with overland inputs from intermittent streams. Outflow occurs through the lake's outlet in the west basin, primarily during the winter and spring, until the lake level drops below the outlet's elevation. The export of groundwater from the lake is expected to be minor.
- The lake strongly thermally stratifies from April or May through September. Winter stratification may occur during years with ice-over conditions.
- During the stratification period, there is low dissolved oxygen observed at depth near deep sediments that causes high internal phosphorus loading from redox-driven sediment phosphorus release. In addition, shallow sediments also may release phosphorus from low sediment oxygen by microbial decay and high water pH by algae blooms.
- Phosphorus is the primary limiting nutrient to algae growth, though nitrogen may also limit growth during the summer.
- KCM (1991) identified that internal loading (sediment release) is the primary source of phosphorus in the lake (83 percent), followed by groundwater (10 percent), and overland flow and precipitation (7 percent). As part of this LCMP, Herrera has updated the hydrologic and phosphorus budgets (see 2024-2025 Monitoring Study Findings and Appendix A).

Goals, Objectives, and Success Measures

The overall goals of the Lake Lawrence LCMP project are to assess water quality conditions; identify the causes of the toxic algae blooms in Lake Lawrence; develop water and nutrient budgets; evaluate lake and watershed management options for reducing the occurrence and duration of HABs in the lake; and ultimately support actions to enhance beneficial uses to humans and wildlife.

The goal of the monitoring for this project was to collect data of sufficient quality and quantity to evaluate the effects of environmental conditions and past lake management practices on algae growth and toxin production, to support development of an LCMP for Lake Lawrence. Monitoring project objectives included the following:

- Collecting monthly surface water quality data from both basins of Lake Lawrence from October 2024 through October 2025
- Collecting four wet-weather (storm flow) water quality samples and discharge measurements from four inlet stations and the lake outlet station in November 2024 to October 2025
- Collecting lake level data on at least a weekly frequency from October 2024 to October 2025
- Characterizing the phosphorus fractions in sediment cores collected from each basin on one occasion in summer 2025
- Determining the contribution of nutrients in surface runoff and groundwater inputs to Lake Lawrence
- Obtaining a high-level characterization of lake macroecology through collection of phytoplankton and zooplankton community data during three sampling events (May, July, and September 2025)

Monitoring was performed from October 2024 through October 2025 according to the Quality Assurance Project Plan (QAPP) (Herrera 2024), prepared following Ecology's LCMP template and guidance. Lake inlet/outlet monitoring was extended through October 2025 in attempt to characterize wet-weather surface flows, but only two measurable events throughout the monitoring period were sampled due to overall low and unpredictable surface flow conditions. In addition, no phytoplankton or zooplankton monitoring occurred due to oversight by Thurston County lake monitoring staff. These and other deviations from the QAPP are described in the *Data Quality Assurance* section of Appendix A. Validated data were used to do the following:

- Track changes in the water quality characteristics of Lake Lawrence from October 2024 to October 2025.
- Identify the likely causes of cyanobacteria blooms in Lake Lawrence.
- Quantify the nutrient loading of different sources and inputs of nutrients to Lake Lawrence.
- Develop hydrologic and nutrient budgets for Lake Lawrence.
- Provide recommendations for cyanobacteria management in Lake Lawrence.

Lake Management Objectives

The goal for Lake Lawrence management is to improve and protect lake uses by decreasing cyanobacteria blooms and the conditions that support them. The recommended water quality objectives for Lake Lawrence are adapted from Ecology (2023) criteria for determining lake impairment due to harmful algae blooms:

- During a given 5-year period, there is no more than 1 year with two or more events with cyanotoxins exceeding state recommended guidelines.
- During a given 5-year period, there is no more than 1 year with a public health advisory lasting 3 weeks or longer.
- Average summer values of chlorophyll-a, total phosphorus, and Secchi depth in the lake surface layer do not exceed defined threshold values for the lowest end of the eutrophic scale (i.e., values occur in the mesotrophic range). Average summer (June through September) chlorophyll-a concentration does not exceed 7.2 micrograms per liter (µg/L) at 1 meter depth, total phosphorus does not exceed 24 µg/L at 1 meter depth, and Secchi depth is not less than 2.0 meters.

While not central to this plan, it is desirable that lake management strategies may additionally reduce or prevent flooding and provide co-benefits to fish and wildlife.

Project Schedule

Table 7 summarizes the schedule for the development of this plan.

Table 7. Consultant Tasks and Schedule.	
Task	Schedule
Task C1 QAPP Development	July–October 2024
Task C1 Water Quality Monitoring	October 2024–October 2025
Task C2 Lake Cyanobacteria Management Plan Preparation (includes water and phosphorus budget development)	December 2025–June 2026
Task C3 Stakeholder Engagement	July 2024–June 2026

Data Used for Plan Development

This plan was developed using data collected as part of this LCMP project. A summary of the types of data gathered, methodology used, data quality assurance results, and sources of additional datasets are presented in Appendix A. Field data and laboratory data reports are compiled in Appendix B. Lake and watershed monitoring stations are shown in Figure 1 of Appendix A.

2024–2025 Monitoring Study Findings

Water Quality Conditions

Primary water quality concerns include dense aquatic plant and toxic algae growth, resulting from high nutrient concentrations, and inhibiting recreational uses of Lake Lawrence.

In accordance with the Clean Water Act, Ecology conducts a water quality assessment of Washington state waters approximately every 2 years. The result of these assessments is a database of categorical rankings for each applicable standard in each assessment unit. Those assessment units classified as Category 5 make up the 303(d) list of impaired water bodies of the state. Beginning with the 2022 Water Quality Assessment, Ecology used cyanotoxin data for the first time to identify impairment per policy 1-11. The 2022 Assessment has been published by Ecology, with final Environmental Protection Agency (EPA) approval expected in 2026. In this Assessment, Lake Lawrence is listed as a Category 5 (impaired) waterbody for total phosphorus³ and harmful algae blooms⁴.

Monitoring conducted from June through September 2025 confirms that Lake Lawrence remains eutrophic, consistent with historical findings (KCM 1991). Trophic State Index (TSI) values calculated from Secchi depth, chlorophyll-a, and total phosphorus classify the east and west basins as eutrophic both in 2024 and 2025. Although some nutrient indicators have improved since the early 1990s, water clarity has declined and summer algal biomass remains elevated.

Algal productivity was elevated during summer and early fall, with chlorophyll-a concentrations reaching 100 µg/L in 2025 and Secchi depths commonly reduced to 1 to 2 meters. Seasonal thermal stratification isolated bottom waters for extended periods, leading to frequent hypoxic and anoxic conditions at depth. These low-oxygen conditions promote phosphorus release from deep sediments in the hypolimnion (bottom layer), as the primary source of internal nutrient loading fueling cyanobacteria growth during stratified periods.

Summer median surface total phosphorus concentrations exceeded Washington State's 20 µg/L action level for lakes in this region, and bottom water phosphorus concentrations were substantially higher. Consistent with earlier studies, internal loading remains a dominant driver of nutrient dynamics in Lake Lawrence. Cyanotoxin monitoring since 2010 shows that microcystin remains the primary toxin of concern, with repeated exceedances of Washington State's recreational guideline (8 µg/L). Exceedances most commonly occur during late summer and fall. Historical phytoplankton data document recurrent dominance by filamentous, bloom forming cyanobacteria.

³ [Listing 6348](#)

⁴ [Listing 104788](#)

Overall, Lake Lawrence functions as a seasonally stratified seepage lake in which internal phosphorus loading plays a central role in sustaining eutrophic conditions and recurring harmful algal blooms. Limited flushing, persistent summer stratification, and hypolimnetic oxygen depletion create conditions that favor sediment phosphorus release and late-season blooms. Effective management will require strategies that address internal nutrient cycling alongside continued monitoring to protect recreational use and ecosystem health.

Hydrologic and Phosphorus Budgets

This section summarizes the hydrologic and phosphorus budgets developed for Lake Lawrence to support the LCMP. The budgets integrate lake level observations, meteorological data, watershed runoff estimates, groundwater exchange, and water quality monitoring collected during WY 2025. Additional hydrologic analysis was done for WY 2024, due to unusually low lake level conditions in WY 2025. Together, these analyses provide a planning-level understanding of how water and phosphorus move through the lake system, and they identify the dominant processes sustaining eutrophic conditions and cyanobacteria blooms.

Table 8. Lake Lawrence Updated Hydrologic and Phosphorus Budgets (Water Year 2025).

Pathway	Hydrologic Load (1000s m ³)	%	Phosphorus Load (kg)	%
INFLOWS				
Inlet Streams	0	0%	0	0%
Precipitation	1,097.7	84%	26.3	9%
Groundwater In	80.0	6%	5.0	2%
Overland Flow	130.8	10%	23.4	8%
Internal Loading	--	--	240.0	81%
TOTAL	1,308.5	100%	295.7	100%
OUTFLOWS				
Lake Outlet (Lawrence Creek)	26.7	2%	0.7	0%
Evaporation	929.4	64%	--	--
Groundwater Out	489.9	34%	22.4	8%
Sedimentation	--	--	240.1	92%
TOTAL	1,446.0	100%	263.2	100%
Change in Storage	-137.5 (loss)	--	-109.8 (loss)	--

Hydrologic Budget Summary

Lake Lawrence is a seepage lake with no perennial surface-water tributaries. As a result, its hydrology is dominated by direct precipitation, evaporation, groundwater exchange, and episodic surface runoff, with limited surface outflow through a controlled weir when lake levels exceed the spill elevation.

Key Hydrologic Inputs and Outputs

Due to the abnormally low water level in WY 2025, the hydrologic budget analysis included water year 2024, which had slightly more typical lake level and a similar overall annual rainfall. Major findings include the following:

- **Direct precipitation** was the largest inflow component in both years, accounting for approximately 68 percent of total inflow in WY 2024 and 84 percent in WY 2025. In both WY 2024 and WY 2025, precipitation totals (29.5 and 32.3 inches, respectively) were below the long-term (1994-2025) median (36.5 inches).
- **Surface inflow** from watershed runoff was consistently minor (8–10 percent of inflow), reflecting low watershed imperviousness (~6 percent), highly permeable soils, and the absence of permanent inlet streams.
- **Groundwater exchange** varied seasonally and interannually. Net groundwater inflow accounted for approximately 24 percent of inflow in WY 2024 but only 6 percent in WY 2025, when the lake functioned as a net groundwater exporter during much of the dry season.
- **Evaporation** was the dominant outflow pathway, representing 54 percent of outflow in WY 2024 and 64 percent in WY 2025.
- **Surface outflow** over the outlet weir was limited, particularly in WY 2025 (2 percent of outflow), due to lake levels remaining below or only briefly exceeding the weir crest.

Estimated hydraulic residence times were approximately 3.0 years in WY 2024 and 4.2 years in WY 2025, indicating long water retention and limited flushing. These conditions favor nutrient accumulation and amplify the importance of internal nutrient cycling.

Compared to historical estimates (KCM 1991), the updated hydrologic budget indicates substantially lower surface runoff, groundwater inflow, and lake outflow, largely attributable to improved lake-level-based outflow estimation and recent dry-year conditions. Despite inherent uncertainties, particularly in groundwater estimation, the hydrologic budget provides a reasonable foundation for phosphorus loading analysis and lake management planning.

Phosphorus Budget Summary

The phosphorus budget quantifies all major external and internal phosphorus sources and sinks, including precipitation, surface inflow, groundwater exchange, lake outflow, sedimentation, and internal loading from sediments. Monthly and annual budgets were developed for WY 2025 (Figure 5), supported by the hydrologic budget and lake water quality data.

External Phosphorus Sources

External phosphorus inputs to Lake Lawrence were relatively small and included the following:

- **Direct precipitation**, estimated using regional rainfall phosphorus concentrations, contributing approximately 9 percent of annual phosphorus input
- **Surface inflow**, calculated using measured stormwater phosphorus concentrations (mean of 179 µg/L), contributing approximately 8 percent of annual input
- **Groundwater inflow**, estimated using assumed groundwater phosphorus concentrations consistent with historical studies, contributing less than 2 percent of annual input

Collectively, external sources accounted for less than 20 percent of the total annual phosphorus load.

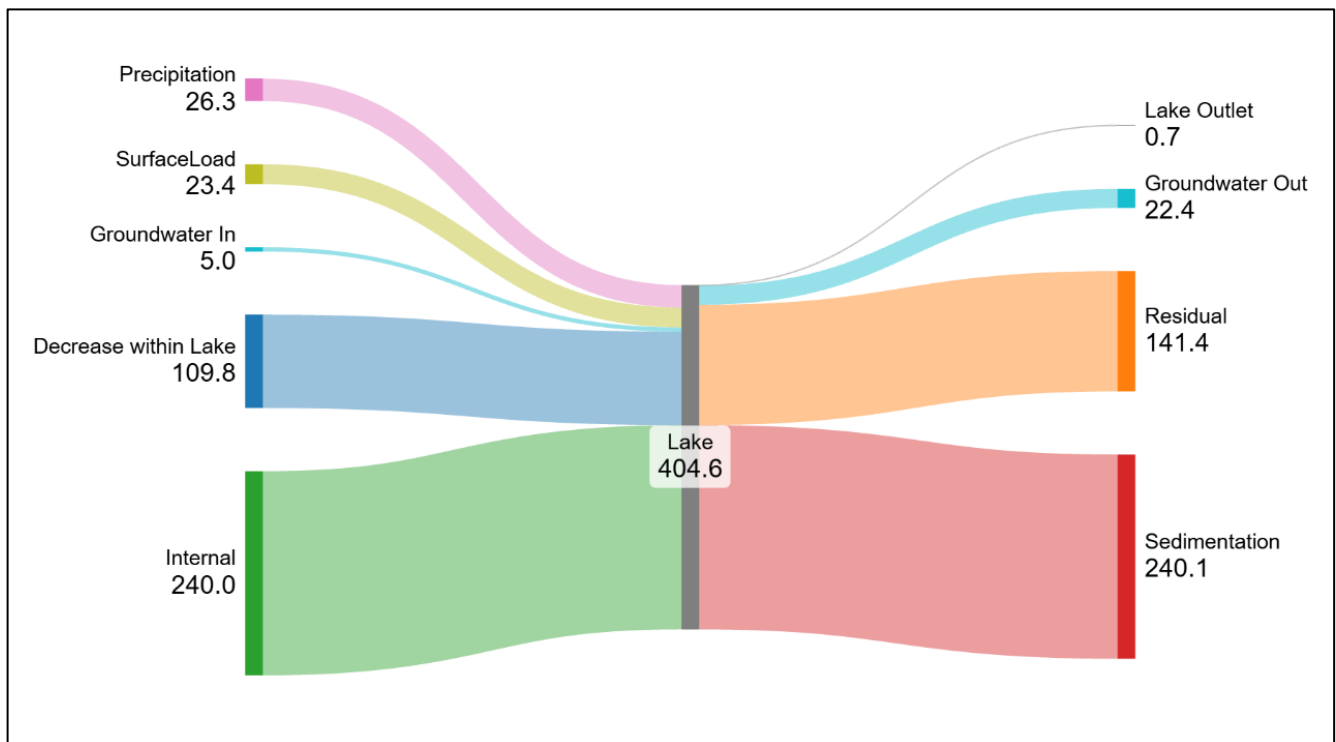


Figure 5. Estimated Annual Phosphorus Import and Export (kilograms) to Lake Lawrence for Water Year 2025.

Internal Phosphorus Loading

Internal phosphorus loading from lake sediments was the dominant phosphorus source. Multiple independent methods were applied, including hypolimnion mass accumulation, mass balance residuals, sediment phosphorus release equations, and back-calculation using a lake phosphorus model. Combined results indicate the following:

- **Internal loading** contributes **approximately 81 percent** of the annual phosphorus load and **97 percent** of the summer (May–September) load.
- Average **internal loading** was estimated at approximately **240 kg per year**, with method-specific estimates ranging from about 180 to 370 kg per year.
- Internal loading was strongly associated with summer stratification and hypolimnetic hypoxia/anoxia, which promote phosphorus release from sediments.
- The vast majority (>95 percent) of internal loading occurs in the east basin due its higher levels of active phosphorous in the sediments and larger sediment area experiencing anoxia.

Sediment chemistry data further support the importance of internal loading, showing that roughly 40 to 60 percent of phosphorus in the biologically active sediment zone (i.e., upper 10 centimeters) is in mobile or biogenic forms capable of release under low-oxygen conditions.

Phosphorus Fate and Retention

Most phosphorus entering the lake was retained internally:

- Approximately 91 percent settled to lake sediments.
- Less than 1 percent exited via surface outflow, and roughly 9 percent was exported via groundwater outflow.

Seasonal mass balance residuals indicate additional uncertainty during summer and fall months, likely reflecting underestimation of sedimentation rates and unquantified biological contributions (e.g., aquatic plant senescence, waterfowl fecal deposits). However, these uncertainties do not alter the conclusion that internal loading overwhelmingly controls phosphorus dynamics.

Management Implications

The combined hydrologic and phosphorus budgets demonstrate that Lake Lawrence is a long-residence-time seepage lake in which internal phosphorus cycling is the primary driver of eutrophic conditions and cyanobacteria blooms. External load reductions alone will not achieve lake management objectives. Model projections indicate that meeting the target total phosphorus concentration ($\leq 24 \mu\text{g/L}$) would require approximately 80 percent reduction in internal loading, either alone or in combination with external controls (Table 9). While this approach is examining whole-lake volume-weighted average total phosphorus concentrations, as opposed to only summer epilimnion values, Nurnberg (1998) argues that, for monomictic lakes with late season algal growth after turnover (such as Lake Lawrence), it is more appropriate to use whole-lake annual model predictions to prevent underestimation of algal biomass in the late summer.

Table 9. Observed and Predicted Total Phosphorus Concentrations in Lake Lawrence Following Load Reduction Actions.

Scenario	Total Phosphorus (annual volume-weighted average; $\mu\text{g/L}$)
Current Conditions (2025)	44.4
Predicted Total Phosphorus (TP) (current load)	61.8
Predicted TP if 25% Internal Load Reduction	49.8
Predicted TP if 80% Internal Load Reduction	23.4
Predicted TP if 50% Internal Load Reduction + 50% Watershed Load Reduction	30.9
Predicted TP if 80% Internal Load Reduction + 50% Watershed Load Reduction	16.5

Predicted TP using Brett and Benjamin (2008). $\text{TP} = \text{TP}_{\text{In}} / (1 + 1.12 * T_w^{0.47})$.

Bold values meet water quality objective of $\text{TP} \leq 24 \mu\text{g/L}$.

These findings support management strategies focused on internal phosphorus inactivation, sediment management, and sustained monitoring of lake stratification, dissolved oxygen, and nutrient dynamics to track effectiveness and adaptively manage cyanobacteria risk.

Recommended Management Plan

The project team recommends an adaptive management approach that provides long-term relief from toxic algae blooms through in-water treatment and phosphorus reduction approaches. The project team's primary recommendations are outlined below. Descriptions of management method alternatives, costs, and timeframes for implementation are further described in the following subsections.

- **Plan for the administration of management activities** to maintain project momentum long-term and ensure accountability. Administration activities include budgeting and grant tracking; oversight of key programming; adaptive management; decision-making; and coordination between LMD and community members, volunteers, County staff, consultants, and contractors. The cost and level of administrative effort will vary each year depending on the management activities planned.
- **Continue water quality monitoring**, which should at least include ongoing algae bloom surveillance, cyanotoxin sampling, and monthly water quality monitoring for tracking lake conditions and inform adaptive management decisions. A QAPP should be occasionally updated to guide the monitoring program, reflect updated goals, and ensure high quality data.
- **Implement in-water actions** for the control of algae and phosphorus in Lake Lawrence. These options consist of various management alternatives for inactivating lake sediment phosphorus, the greatest contributor of phosphorus to Lake Lawrence.
- **Implement watershed actions** for reducing phosphorus inputs to prevent accumulation over time and enhance effectiveness of in-water actions. This may include shoreline management, discouraging waterfowl, and encouraging regular septic system inspections. Stormwater improvement projects for enhanced phosphorus removal are not likely to be cost effective for reducing phosphorus inputs to Lake Lawrence due to low relative contribution and high cost.

Administration of Management Activities

The project team recommends the LMD, in coordination with Thurston County, develop a budget and plan for the administration component of Lake Lawrence management. Key responsibilities will involve finance and grant tracking to manage funding and reporting requirements; adaptive management to respond to monitoring results and adjust management strategies as needed; and coordination with LMD and community members, volunteers, County staff, decision-makers, consultants, and contractors to keep projects aligned and moving forward. This dedicated administrative capacity is strongly recommended to maintain project momentum, ensure accountability, outline clear roles and responsibilities, and leverage external funding opportunities.

Budgeting for this role ensures the LMD and Thurston County can deliver on the plan's goals efficiently and transparently, without overburdening existing staff and volunteers. The cost and level of administrative effort will vary each year depending on the management activities planned. Higher costs and effort are expected in the first 3 years as a Plan is developed and executed, and in the years with many and/or complex projects planned. The project team did not include administrative costs in the presented management plan budget. Generally, the project team assumes a conservative planning level cost estimate at 7 to 10 percent of the selected management alternative, depending on the number and complexity of grant resources to manage. Some of these costs and efforts may be reduced through volunteer time, such as by engaging the LMD Board or other community volunteers.

Sediment Phosphorus Inactivation

Sediment release is the primary source of phosphorus fueling toxic algae growth in the lake. While controlling watershed inputs is important to prevent the accumulation of additional phosphorus in the sediments, managing the existing reservoir of phosphorus in the lake is critical to manage phosphorus and algae abundance. To sufficiently control algae growth in Lake Lawrence, the summer average concentration of total phosphorus should be reduced to 24 µg/L or less, which would require an 80 percent reduction in internal loading from lake sediments. To achieve this water quality objective, the project team recommends at one of the following three feasible lake management options targeting sediment phosphorus inactivation:

1. **A 'lake reset' treatment** using high doses of either alum, lanthanum (e.g., EutroSorb® G), or iron to sequester phosphorus in the lake sediment long-term
2. **Repeated, lower dose sediment treatments** to strip the water column of phosphorus in the near-term and sequester phosphorus in the lake sediment with a lower dose (relative to a 'lake reset' treatment) of alum or lanthanum (e.g., EutroSorb® G), or sequester phosphorus in the sediment by using zero valent iron (ZVI) in an initial pilot study
3. **Install a hypolimnetic oxygenation system (HOS)** to oxygenate the deep waters of the lake, thereby improving fish habitat and preventing the water quality conditions that allow phosphorus to be released from sediment

These alternatives are compared in Table 11 and summarized in the following sections against a no action alternative. Appendix C provides detailed descriptions of these and other inactivation approaches (e.g., calcium-based and proprietary chemicals) and the development of cost estimates.

Appendix C also provides thorough details regarding the permitting and monitoring requirements regulated by Ecology's Aquatic Plant and Algae Management Permit (APAM) for application of phosphorus inactivation chemicals. For Lake Lawrence, permitting and monitoring requirements represent an important consideration in project planning and cost, particularly given the lake's soft water (low hardness) chemistry. If any phosphorus inactivation product is selected, compliance with APAM permit conditions would be required to ensure that treatments are implemented safely and effectively.

Finally, it is important to recognize that any lake management technique aimed at controlling algae, if successful, is likely to impact aquatic macrophyte populations. The clearer water means more sunlight for plant growth. Although phosphorus inactivation methods reduce nutrient availability in sediments where most aquatic macrophytes obtain nutrients, macrophyte roots often penetrate below the inactivation zone (upper 10 centimeters) and therefore may not be directly affected. Lake management should focus on achieving the appropriate ecological balance between algae and plants, since too much or too little of either can be problematic for recreation, fish, and wildlife.

No Action Alternative

A no action alternative includes no additional monitoring or treatment. This means lake conditions and the current level of monitoring and management would continue. The advantage of this approach is that no additional management costs are incurred. The disadvantage of taking no action is that phosphorus will continue to be released from sediments, allowing continued high algal productivity, toxic blooms, poor water quality, and reduced recreational opportunities.

Option A: 10-Year High Dose Lake Reset Treatment

Aluminum sulfate (alum), lanthanum, or iron may be used to inactivate phosphorus in a larger treatment to “reset” the productivity and trophic state of a lake. Each of these phosphorus inactivation chemicals are suitable for use in Lake Lawrence and are summarized in Table 10 (full descriptions in Appendix C).

In a lake reset treatment, a larger dose is applied to the whole lake to remove phosphorus from the water column and lock phosphorus in the lake sediments, thereby making it unavailable for algae. Like repeated treatments (see Option B below), lake reset treatments may offer instantaneous water column control, depending on the product used, but the purpose and advantage of a large dose, whole-lake reset is long-term stable sediment phosphorus control, allowing swift yet sustained improvements to water clarity and quality. The disadvantages to this method of control include the higher upfront costs and lack of fish habitat benefit by oxygenation, relative to HOS implementation (see Option C below).

Table 10. Comparison of Phosphorus Inactivation Chemicals.

Water Column Inactivation Method	Alum	Lanthanum	Iron
Commercial Products	Available from general chemical suppliers	Phoslock, EutroSORB G, or EutroSORB SI	Zero Valent Iron (ZVI) or Iron Salts
Mode of Inactivation	Forms stable complexes with dissolved phosphorus. Forms floccules that pull particulate phosphorus (i.e., algae and sediment) from the water column. Stable at pH 6 to 9.	Forms stable complexes with dissolved phosphorus. Binding efficiency is highest between pH 5 and 7. Dissolution may occur at elevated pH levels (>9). Does not remove particulate phosphorus from the water column.	Ferric iron forms redox-sensitive bond with phosphate. Ferrous iron, under anoxic conditions, may create a stable bond with phosphate to form vivianite. May not occur in the presence of sulfide.
Application Approach	Applied at water surface and settles to the sediment. Alum is denser than water and expected to sink and incorporate into the upper 10 centimeters of lake sediments.	Applied as lanthanum modified bentonite (Phoslock or EutroSORB G) or as iron-bound lanthanum salt (EutroSORB SI) across the water surface. Expected to incorporate into the lake's sediments. May also be injected into the water column or directly to the sediments.	Applied at water surface and settles to the sediment. May also be injected into the water column or directly to the sediments.
Potential Negative Consequences	Aluminum toxicity to aquatic life may occur if inadequate buffer is applied and the pH is outside permitted range of 6-8.5. This can be prevented through rigorous planning and pH monitoring as required by the permit.	Lanthanum concentration immediately following application may exceed estimated toxicity thresholds, particularly for zooplankton, and little study has been done for impacts on benthic organisms. Generally, because lanthanum is applied in phosphorus-rich waters, the amount of free lanthanum ions is low as they bind to phosphate. Jar tests prior to application can be used to ensure proper dosage. Iron-bound lanthanum remains bound to iron until anoxia reduces the iron.	Phosphorus bound to iron may be released under anoxic conditions or where sulfate reduction promotes iron sulfide formation, reducing long term effectiveness. No toxicological impacts expected.
Permitting	Alum is an approved phosphorus inactivation chemical in the APAM permit. Pre- and post-monitoring requirements.	Lanthanum-modified bentonite (EutroSorb G and Phoslock) and iron-bound lanthanum (EutroSorb SI) are an approved phosphorus inactivation chemicals in the APAM permit. Pre- and post-monitoring requirements.	Iron and ZVI are approved phosphorus inactivation chemicals in the APAM permit. Pre- and post-monitoring requirements.
Approach A: Lake Reset Cost (\$M)	\$0.85 million	\$1.23 to \$1.58 million	\$0.32 million

Table 10 (continued). Comparison of Phosphorus Inactivation Chemicals.

Water Column Inactivation Method	Alum	Lanthanum	Iron
Approach B: Repeated Lower Dose – 10-Year Cost (\$M)	\$0.84 million (25% dose in years 1, 4, 7, and 10)	\$1.64 to \$2.09 million (25% dose in years 1, 4, 7, and 10)	\$0.39 million (50% dose in years 1 and 6)
Confidence in Effectiveness	High, established studies.	Moderate-high, growing number of regional treatments with.	Low
Recent Past Applications in Washington	Lacamas Lake, Camas, Washington (2024, 2025); 2025 treatment with lanthanum Lake Ketchum, Snohomish County, Washington (2025, annually [unbuffered]) Blackmans Lake, Snohomish, Washington (2025) Black Lake, Tumwater, Washington (2021) Waughop Lake, Lakewood, Washington (2020) Heart Lake, Anacortes, Washington (2018) Wapato Lake, Tacoma, Washington (2017) Green Lake, Seattle, Washington (2016)	PhosLock: White Lake, Auburn, Washington (2025) EutroSorb G: Lacamas Lake, Camas, Washington (2024, 2025); 2025 treatment with alum Long Lake, Thurston County (2022– [annually]); 2024 treatment with alum Kitsap Lake, Bremerton, Washington (2020 – [annually]) Lake Lorene, Federal Way, Washington (2012)	ZVI: Lake Steilacoom, Lakewood, Washington (2024, 2025) Lake Lorene, Federal Way, Washington (2024, 2025)

Regardless of the product selected, the APAM requires a jar test prior to treatment to identify proper dosing levels. Furthermore, nutrient and water column monitoring is required under S6.B of the permit prior to treatment, the day following the treatment, and monthly for 3 months immediately after treatment.

One example of an effective lake reset treatment is at Green Lake in Seattle, for which buffered alum was used to inactivate sediment phosphorus once in each of the last three decades (Figure 6). Alum is comparable in cost to lanthanum-modified clay for a lake reset treatment and is predicted to have a greater longevity because it is applied at rates with a higher phosphorus binding capacity than lanthanum-modified clay. Given Lake Lawrence’s documented history of internal phosphorus release and recurring harmful algal blooms, alum treatment could provide meaningful reduction in phosphorus availability and bloom intensity if external inputs remain relatively small.



Figure 6. Buffered Alum Treatments in 1991, 2004, and 2016 (left to right) for Sediment Phosphorus Inactivation in Green Lake, Seattle.

One-time lake reset treatments require higher doses and more product, representing greater upfront costs than a repeated treatment option. High dose, reset treatments are less expensive and easier to contract and monitor over the long term than repeated treatments. The timeline for implementing a lake reset treatment for Lake Lawrence would include securing funding during the first 1 to 2 years. During this time, routine lake sampling would continue, and supplemental sediment sampling may be performed to fine-tune the inactivation dose for whichever product is chosen.

Once funding is secured, the lake reset treatment would be implemented alongside APAM-required monitoring. The longevity of sediment inactivation treatments is dependent on the control of external loading and stability of the bonds between the inactivation chemical and sediment phosphorus. Given the relatively low watershed phosphorus loading to Lake Lawrence, a long-term sediment inactivation treatment is likely to last approximately 10 years. Routine annual monitoring is recommended to continually evaluate the effectiveness of the treatment and reveal when follow-up treatment is needed.

Sediment inactivation doses were developed for the Big Basin deep area (deeper than 15 feet), Big Basin shallows (5 to 15 feet), and the West basin (below 5 feet depth). Depending on the product chosen for inactivation, the project team estimates one lake reset treatment will cost approximately \$0.85 million for alum or \$1.23 to \$1.58 million for lanthanum (including costs related to monitoring, oversight, reporting, and sales tax) and last up to 10 years. The alum treatment would be a buffered alum treatment using sodium aluminate in a ratio of 2 parts alum to 1 part sodium aluminate. These products offer the highest confidence in long-term performance and regulatory acceptance compared to proprietary products, or iron- or calcium-based products.

Option B: Repeated Lower Dose Treatments

Phosphorus inactivation can be conducted routinely to strip phosphorus from the water column and settle and even lock it into (inactivate) the lake sediments using applications of alum, lanthanum, or iron. Each of these phosphorus inactivation chemicals are suitable for use in Lake Lawrence and are summarized in Table 10 (full descriptions in Appendix C).

As **“Option B1,”** repeated applications of alum or lanthanum targeted to treat 25 percent of the lake phosphorus are expected to sufficiently control phosphorus in Lake Lawrence. Water column stripping with alum often does not need a buffer because of the low dose and acidity. Sediment inactivation with alum needs to use sodium aluminate as a buffer to the acidic alum (aluminum sulfate) in the soft waters

of Lake Lawrence. Unit product costs for buffered alum treatments are higher than for just alum due to the need for expensive sodium aluminate buffer. Lanthanum products (EutroSORB G or Phoslock) are neutral and do not require a buffer for either water column stripping or higher doses for sediment inactivation, and costs are comparable to buffered alum treatments. These products, particularly alum, have been used successfully in many lakes in Washington (see Appendix C) and are relatively well studied. The advantages of these treatments are long-term stable phosphorus control and promotion of water clarity. Disadvantages include potential impacts of aluminum toxicity (if using alum) and temporary turbidity (if using lanthanum).

Overall, Option B1 would entail the further characterization of lake sediment chemistry and APAM-required jar testing in the first year of implementation to fine-tune dosages, followed by the mobilization of a contractor each spring to apply the selected product(s), plus continued required and routine monitoring. Repeated lower doses are assumed to occur targeting 25 percent of the lake phosphorus in Years 1, 4, 7, and 10, such to reach the amount of chemical as lake reset treatment after 10 years, but ongoing permitting, mobilization, and monitoring needs result in higher long-term costs for repeated treatments. Overall, repeated lower dose alum or lanthanum-based treatments are expected to cost between approximately \$167,500 and \$418,100 per treatment, equating to approximately \$0.84 million to \$2.09 million over 10 years, including costs related to monitoring, contractor oversight, reporting, and sales tax (see Table 11).

As **“Option B2,”** a large application of zero valent iron (ZVI) would be applied for sediment phosphorus sequestration, initially as a pilot study. Iron treatment is a relatively inexpensive control strategy (Matthijs et al., 2016) where iron is added to aquatic systems within the water column or sediment surface. ZVI is a form of iron typically used in soil and groundwater remediation efforts to bind chemical contaminants (e.g., petroleum hydrocarbons, pesticides, and nitrates).

Iron/ZVI application in lakes for managing algae is limited, and there are many unknowns and lake-specific dynamics that may affect ZVI performance. Oxygen and sulfur dynamics at the sediment and sediment–water interface are critical for iron-based phosphorus sequestration. In Lake Lawrence, low oxygen/anoxic conditions develop during the summer, so the long-term success of iron (including ZVI) depends on how much sulfur is available. Abundant sulfur in the sediments may attract the added iron away from sequestering phosphate by instead forming iron sulfides, leaving phosphorus free for algae uptake. Given these uncertainties, iron/ZVI is best characterized as an experimental or pilot scale option for Lake Lawrence unless additional site-specific sediment and sediment-water-interface chemistry and bench/pilot testing indicate favorable sulfur and organic matter controls and a practical pathway to sustain iron-mediated phosphorus retention.

The best example of ZVI use is at Lake Lorene, which is a small lake in Federal Way, Washington that recently has been frequently treated with algaecide followed by ZVI applications to inactivate soluble phosphorus released by dead algae. Most other applications of ZVI have been limited to ponds or wastewater facilities. The benefit of using ZVI as a pilot study in Lake Lawrence is the low materials cost. The main disadvantage of using ZVI is its unknown level effectiveness due to (1) limited previous implementation in lakes, and (2) summertime anoxic conditions and unknown sediment chemistry dynamics at Lake Lawrence’s sediment-water interface.

Like other types of phosphorus inactivation treatments, the APAM permit will require a jar test prior to treatment to identify proper dosing levels, plus nutrient and water column monitoring prior to treatment, the day following the treatment, and monthly for three months immediately after treatment. Once dosing is determined, the strategy for ZVI implementation in Lake Lawrence will begin with a pilot application in the first year. For the purposes of this LCMP, the project team assumes one large application at a dose of 22 parts iron to 1 part phosphorus by weight (targeting approximately 50 percent of the phosphorus in the lake sediments). Monitoring in the years following treatment will be used to evaluate effectiveness, the findings of which should be detailed in a report at the end of the fourth year. The report should recommend whether (a) ZVI was partially effective and a second dose is warranted in Year 6, or (b) ZVI was ineffective and an alternative product should be used in the future. The years following will implement the decisions described in the previous year's report, followed by continued monitoring and annual year-end report evaluating effectiveness and providing recommendations for adaptive management.

The need for additional treatments are dependent on the effectiveness of the ZVI pilot treatment. Due to the uncertainty in the effectiveness longevity of ZVI treatment, this approach would require additional analysis and interpretation of specific success measures to support deciding if (1) treatment was successful, (2) treatment was partially successful but shows sufficient optimistic results to warrant additional ZVI treatment, (3) treatment was not adequately successful to support further treatment using ZVI. Whether additional treatment is done using ZVI or by alum/lanthanum will be dependent on the relative success of the pilot treatment. If water quality conditions show meaningful improvement following the ZVI treatment, then additional treatment may be supported. However, if water quality conditions following treatment are within the typical range observed in Lake Lawrence, then an alternative chemical is more appropriate.

A ZVI pilot treatment targeting sediment inactivation is expected to cost approximately \$170,600. Future costs are dependent on the success of the pilot treatment and, if needed, what alternative chemical is used.

Option C: Hypolimnetic Oxygenation System

Hypolimnetic oxygenation techniques are implemented to combat anoxia by maintaining or increasing DO levels in the hypolimnion while preserving thermal stratification in the lake. Hypolimnetic oxygenation systems (HOSs) use pure oxygen, in contrast to aeration technologies that use air to maintain oxygen levels. Under anoxic conditions, phosphorus and nitrogen are released due to the weakening of their bonds with other elements like aluminum or iron. Maintaining oxygenated conditions in the hypolimnion transfers oxygen into the underlying surficial lake sediments and therefore suppresses the release of nutrients from sediments, settled particulate matter, and even incoming groundwater inflow. Maintaining stratification reduces the mixing of nutrient-rich hypolimnion water to the epilimnion.

Hypolimnetic oxygenation is a suitable management technique for Lake Lawrence because the lake maintains a strong summer stratification and productivity is driven largely by internal phosphorus loading with minimal external nutrient inputs. HOSs directly target this mechanism of internal loading by maintaining oxygen-rich conditions at the sediment-water interface. As a result, they have strong

potential to reduce nutrient availability in the water column and mitigate cyanobacteria blooms as long as there are enough existing binding sites for phosphorus (i.e., to iron).

There are a few types of HOS devices available, including the classic Speece Cone. Given the size and depth of Lake Lawrence, the new 'Oxygen Saturation Technology' (OST) device is particularly well suited. OST is a recent advancement that addresses the limitations of traditional aeration and oxygenation systems by administering precise concentrations of oxygen to an in-lake device where the water is supersaturated with oxygen. The water is then injected back into deep areas of the lake where it disperses over the sediment surface, without disrupting stratification. This allows the efficient maintenance of high DO levels (up to 20 mg/L) directly over and into the sediments where oxygen is needed most and prevents oxygen-related fish mortality. OST also eliminates bubbles and therefore undesirable mixing or sediment resuspension.

Currently, an OST system is being implemented at Spanaway Lake by Pierce County Surface Water Management, in coordination with Pierce County Parks and Recreation, to address toxic algae events linked to low dissolved oxygen conditions. Construction is anticipated to occur in mid to late 2026 following completion of permitting, equipment fabrication, and contractor procurement. Costs for this implementation are higher than initially anticipated due to the unforeseen need to upgrade existing parcels to support the placement and construction of the onshore facility needed to power and provide oxygen to the in-lake device.

The advantages of oxygenation in Lake Lawrence include long-term, non-chemical reduction of phosphorus loading, improvement of DO for fish habitat and aquatic life uses, and faster degradation of organic matter and cyanotoxins. The disadvantages of oxygenation include high relative costs of installation; costs of a continuous power supply and regular maintenance; potential 24/7 operation; and potential for regular iron supplementation to maintain phosphorus binding capacity. The strategy for OST implementation in Lake Lawrence will begin with securing funding through grants or loans over the first 3 years with pre-installation lake monitoring (per the current monitoring program by Thurston County staff), followed by installation of the device in Year 4 and post-installation Thurston County monitoring. Year-end evaluation of effectiveness and reporting will determine if operational changes and/or iron supplementation are needed. The cycle of adaptive management, monitoring, and year-end reporting and evaluation should continue annually for optimal nutrient and algae control.

Planning level costs are based on the ongoing installation of OST in Spanaway Lake, which has hypolimnetic volume of about 2,500 acre-feet that is very similar to the hypolimnetic volume of the east basin (about 2,700 acre-feet). An HOS device for the east basin of Lake Lawrence is expected to cost approximately \$220,000 to design and \$2.2 million to construct (including taxes and contingency costs). Annual operation and maintenance costs are estimated at approximately \$22,000 per year. Altogether, an HOS will cost approximately \$2.6 million over 10 years, not including permitting costs to be completed by the contractor and Thurston County. Land may need to be acquired for placement and construction of the onshore facility, and/or a parcel may need retrofits to sufficiently and safely power the facility and device. As monitoring prior to and after installation will be conducted through the current Thurston County lake sampling program, no additional monitoring costs are included in this planning level estimate.

Watershed Approaches

Watershed drainage sources accounted for less than 10 percent of the total annual phosphorus load to Lake Lawrence and reducing these sources will not achieve lake management objectives alone. Thus, watershed approaches to reducing phosphorus loading to the lake are considered supplementary to the above recommended in-water actions directly controlling existing phosphorus accumulation, and are not accounted for in the budget for this LCMP.

Typically, a key long-term pathway to prevent algae blooms in lakes is to decrease the loading of nutrients to the lake from the watershed. This involves both source control and treatment. Source control is the removal or mitigation of a source, such as reducing phosphorus fertilizer use, identification and removal of illicit sewage connections, pet waste management, waterfowl management, erosion control, and fixing failing septic systems. Treatment is the reduction of a nutrient through built and natural infrastructure, such as infiltrating stormwater using low impact design (LID), constructing stormwater detention facilities, filtering stormwater with phosphorus-adsorbing media, installing rain gardens, or establishing vegetative buffers along waterways.

External watershed approaches for Lake Lawrence should focus on removing pollutant sources near shorelines, improving shoreline habitat, and reducing stormwater inflow concentrations:

- **Promoting Healthy Shorelines:** Shoreline management includes ways that all landowners along the lakeshore can assist with reduction of nutrient inputs and therefore algae growth. A recommended management action to reduce nutrient inputs is to develop a healthy shoreline program, which educates homeowners, promotes the replacement of any bulkheads and lawns with native plants, and encourages the reduction of residential pollutants. Plants that grow in and along lake shorelines have an important role in protecting water quality and providing habitat for fish and wildlife. Rooted emergent and terrestrial plants can prevent shoreline erosion, while in-water plants can reduce soil erosion and sediment suspension by dampening wave energy. Shoreline plants can also absorb and slow runoff from upslope, removing nutrients, and they are important for fostering native insects that are food for fish and birds. Over the years, people have altered the lakeshore by removing trees and dead wood from the shorelines, by building bulkheads, and by installing lawns instead of native vegetation. A healthy shorelines program should be developed for Lake Lawrence, or Thurston County more broadly, to fund landowner actions, offer outreach and education, and encourage and provide resources to shoreline residents. This program should coordinate with the County's Shoreline Master Program and partner with the County's Healthy Yards and Gardens Program⁵. It could be modelled after Snohomish County's LakeWise⁶ program (Snohomish County 2026) and share many of those resources. A partnership with the Thurston Conservation District, which provides free services to County residents, may also be helpful.

⁵ [Healthy Yards & Gardens | Thurston County](#)

⁶ [LakeWise healthy shorelines | Snohomish County, Washington – Official Website](#)

- **Manage Nuisance Wildlife:** Not only are lawns less efficient at removing pollutants and less desirable habitat for many wildlife, but they may also attract nuisance wildlife (e.g., waterfowl and deer). Though estimated to be only a minor relative contributor of phosphorus to the lake, waterfowl management could be implemented to reduce phosphorus loading from the deposition of fecal matter in the lake and nearshore area. This will reduce both phosphorus loading and potential pathogens related to waterfowl feces. Management can include posting “do not feed” signs at public access points, educating waterways community members, and using ‘no-harm’ waterfowl deterrents. Shoreline planting can also be used to successfully discourage waterfowl access to the shoreline and grassy nearshore areas.
- **Management of Onsite Septic Systems:** KCM (1991) determined that nutrients in wastewater were effectively attenuated in the drainfields, so nutrient inputs to Lake Lawrence from wastewater were relatively small at the time of that study. The project team expects similarly effective attenuation rates today, although the project team recommends encouraging septic system owners throughout the watershed to complete routine inspections as required by state law. Failing systems that are no longer functioning per their initial design or do not have adequate local conditions to remove phosphorus, as well as systems that appear to be working, can both still be contributing phosphorus loading to waterways. Failing systems may be identified via operation and maintenance inspections by certified professionals. Important factors for improperly sited systems and drain fields are distance to a nearby waterbody, depth to the water table, and soil chemistry. Replacing septic systems can be very expensive (e.g., \$20,000 to \$40,000), depending on the location and installation constraints. However, there are numerous grants and low interest loans available that may ease the upfront investment. This includes Craft3 Clean Water Loans, a low interest loan program.
- **Control of Stormwater and Runoff:** Stormwater conveyance infrastructure draining to Lake Lawrence mostly includes roadside ditches, with a few pipes and catch basins mostly in the north half of the watershed, plus six mapped stormwater outfalls discharging to the lake. With the small contribution of stormwater to phosphorus loading and few infrastructure existing in the watershed, it is not likely that stormwater treatment will be cost-effective for reducing phosphorus inputs to the lake. However, stormwater phosphorus removal can be achieved through a wide variety of old and new technologies including infiltration facilities, sand filters, large wet ponds, media filter drains, two-facility treatment trains, bioretention facilities, and manufactured devices. Flood control or management may be incorporated into some designs as a potential co-benefit of these projects. Stormwater bioretention facilities that rely on high performance bioretention soil mixes (HPBSM) can be very effective. In general, any stormwater bioretention designs that use HPBSM without compost, which leaches phosphorus, are likely to provide valuable pollutant reductions. HPBSM is an appropriate choice for roadway median and ditch stormwater removal projects.

Continue Water Quality Monitoring

No matter the management objectives or management strategy employed, ongoing monitoring is necessary to evaluate success and allow adaptive management. The adaptive management approach for Lake Lawrence includes the continuation of the current long-term monitoring program to evaluate progress toward achieving management goals and to adjust or augment the lake management measures. Filling additional identified data gaps (see next section) will further enhance the project team's understanding of nutrient and other pollutant inputs to Lake Lawrence and is recommended as future resources and priorities allow.

The current monitoring program led by Thurston County includes the following:

- Monthly lake monitoring of the following from May to October at the east and west basin stations:
 - Physical profiles of temperature, dissolved oxygen, pH, and conductance at every 1 meter
 - Surface and deep water samples for total phosphorus, total nitrogen
 - Secchi depth
 - Integrated chlorophyll-a samples within the photic zone
- Reactive cyanotoxin samples during bloom events reported by lake residents and collected by Thurston County

The project team recommends the continuation of the routine lake monitoring as is. During the initiation of management efforts, annual analysis of water quality monitoring and cost/operations data are recommended to inform modification of treatment doses or oxygenation systems. Once management efforts result in consistent and predictable outcomes, reporting may occur at a lower frequency, (e.g., every 5 years).

To ensure protection of human and pet health, the project team recommends formalizing HAB surveillance in Lake Lawrence and communication within the Lake Lawrence community. This should include the following:

- Planned routine surveillance sites to be visited as least weekly during peak recreation season (June to September) for the presence of HABs. For example, surveillance sites may include community beaches and boat launches.
- Surveillance protocol for HAB identification (including example photographs) and sampling procedures. Submitting samples to Ecology's Northwest Toxic Algae Program will depend on approval from Thurston County Environmental Health.
- Communications and coordination plan with Thurston County Environmental Health, the LMD, and lake residents for when toxic blooms occur and changes in advisory status.
- Responsible parties of surveillance, monitoring, and communications.
- Guidance for residents to identify toxic blooms near their property.

Routine monitoring costs are not accounted for in the budget for this LCMP because no major changes to the current monitoring program are needed and it is assumed that surveillance will be done by volunteers. The project team also recommends sediment sampling every 5 years to adaptively inform and better estimate ongoing phosphorus inactivation treatment needs, with an expected cost of approximately \$10,000 including sampling, laboratory analysis, and interpretation.

Note that regulatory monitoring may be required for implementation of phosphorus sequestration chemicals; the extra monitoring costs related to these activities are included in the respective planning level cost estimates for those alternatives.

Summary of Costs to Implementation

Altogether, the above recommended strategies are estimated to cost between \$171,000 and \$418,000 in the first year, and between about \$0.39 million and \$2.6 million total over 10 years (in 2026 USD). These costs are summarized in Table 11 and explained in more detail in Appendix C.

The Lake Lawrence LMD renewal (as LMD No. 26) has been approved by Ordinance 16621 to take effect beginning January 1, 2026, with a new duration of 35 years. The LMD currently issues annual assessments for the purpose of lake management activities such as implementing management plans, controlling invasive species, managing plants, enhancing water quality, and ensuring lake safety. During the recent LMD renewal, a rate increase of 130 percent was approved, and is expected to appropriately finance algae bloom management measures, water quality improvements and further monitoring over the next 10 years, as is currently planned and budgeted.⁷

If, at a later date, the funds are found to be insufficient for selected lake management activities, the renewed LMD No. 26 may issue an amended special assessment roll to property owners (pursuant to Revised Code of Washington [RCW] 36.61 and district resolutions) that allows rates to be raised. Rate amendments (i.e., to increase or otherwise modify the amount to be financed) and district boundary updates are made using the same procedure in which a lake or beach management district is created. The process may include but is not limited to (1) an amendment to the resolution of intention on how assessment funds will be used, (2) a public hearing hosted by the County, and (3) landowner approvals consistent with the procedures established in RCW 36.61. Therefore, community engagement is a crucial consideration to garner sufficient landowner support for passing any proposed amendments.

To supplement LMD funds, a combination of budget allocations, grants, and/or loans should be sought to fund and implement any of the selected management plan elements. The project team recommends considering the sources provided in Table 12. Phosphorus inactivation strategies may be eligible for state Freshwater Algae grants. Neither the Centennial and Section 319(h) Clean Water Grants may be used for in-water treatment, according to current Department of Ecology policy⁸. However, those grants may be used for watershed source control, diagnostic and restoration planning, and shoreline riparian restoration. Additional supplementary grants and programs that may provide limited or specialized benefit are summarized in Appendix D.

⁷ [STEP 7 – Resolution No. 16604 – Findings & Determinations Lake Lawrence LMD Renewal.pdf](#)

⁸ [Water quality grants and loans – Washington State Department of Ecology](#)

Table 11. Recommended Options Implementation & Cost Summary.

Timeframe	Option A: "Lake Reset" Treatment		Option B1: Repeated Lower Dose Treatment		Option B2: ZVI Pilot + Repeated Treatment as Needed		Option C: Hypolimnetic Oxygenation System	
	Activity	Cost (2026\$) ^a	Activity	Cost (2026\$) ^a	Activity	Cost (2026\$) ^a	Activity	Cost (2026\$) ^a
Year 1	Secure Funding	–	Plan and Conduct Alum or Lanthanum for 25% of Lake Phosphorus, +Monitoring	\$168 to \$418K	Plan and Conduct ZVI Treatment to target 50% of Lake Phosphorus	\$171K	Secure Funding	–
Year 2	Design and Implement	\$760K to \$1.41M	Routine Monitoring	\$0	Routine Monitoring	\$0	Design, Permitting, & Procurement	\$220K + permitting
Year 3-4	Routine Monitoring	–	Conduct Alum or Lanthanum, +Monitoring	\$168 to \$418K	Review Pilot Effectiveness & Plan Future Treatment(s)	If effective, \$0. If not effective, plan for Option B1.	Installation	\$2.2M
Year 5-10	Routine Monitoring	–	Conduct Alum or Lanthanum, +Monitoring ^b	\$168 to \$418K per treatment	TBD, depending on ZVI effectiveness +Monitoring.	If effective, one additional treatment at \$217K If not effective, see Option B1.	System Operations & Maintenance +Monitoring	\$22K per year
Year 10	Reevaluate P Budget ^c							
Total 10-Year Cost	\$0.85M to \$1.58M		\$0.84M to \$2.08M		If ZVI Effective: \$388K Else: \$0.84M to \$2.08M		\$2.6M	
Annualized 10-Year cost	\$85K to \$158K		\$84K to \$208K		If ZVI Effective : \$39K Else: \$84K to \$208K		\$260K	

^a There is an assumed cost escalation of 4 percent each year in consideration of wage, utility, and material cost increases. If a loan is obtained to partially fund, additional loan management and interest costs should be considered.

^b Year 5 Monitoring should include sediment core analysis for phosphorus fractions for all Options.

^c Re-evaluation of the phosphorus budget in Year 10 is not included in overall planning cost estimates.

Table 12. Funding Sources for Lake Management Actions.

Funding Source	Description	Applicable Activities
Lake Management District Dues	Lake Management District funds may be used to partially fund implementation of this LCMP, if a proposed amendment to intention of fund uses is approved. Renewal of the LMD with inflation-adjusted fee structure is recommended when required to provide ongoing funding as well as continue to serve as a lead decision-making entity.	● Lake Management ● Monitoring ● Outreach and Education
Thurston County Department of Public Health and Social Services – Environmental Health Division (TCEH)	TCEH provides safe drinking water, septic system permitting/care/inspections, water quality testing, algae surveillance and sampling, lake management administration, and stormwater management. Presently, TCEH covers the administrative costs of the LMD, including staff time for project management and community coordination. TCEH has supported development of this LCMP and conducts water quality monitoring of the lake. Additional funding may be allocated through or other capital facilities planning, as approved by the Thurston County Council.	● Water Quality Monitoring ● Watershed Management ● Onsite Septic Permitting and Inspection ● In-Lake Management ● Outreach and Education
Legislative Budget Allocations	The Washington State Legislature has previously allocated funding for management of various lakes in Washington, through approved state budgets (e.g., Spanaway Lake, Vancouver Lake). Pursuant to appropriation purpose, these funds could be used for managing nuisance aquatic vegetation, conducting water quality monitoring, refining nutrient loading estimates, developing this management plan, securing permits, and implementing management strategies.	● Water Quality Monitoring ● Watershed Management ● Onsite Septic Repair and Replacement ● In-Lake Management ● Outreach and Education
Freshwater Algae Control Grants	The Washington State Freshwater Algae Control Program has an annual funding cycle for projects to manage toxic algae (cyanobacteria) blooms. The grant funds up to \$50,000 and no longer requires matching funds. In-lake treatments, such as alum or lanthanum, are eligible for this grant, provided the waterbody has an approved Lake Cyanobacteria Management Plan.	● Water Quality Monitoring ● Watershed Management ● In-Lake Management ● Outreach and Education ● Research Projects
Clean Water State Revolving Fund Loans	The Clean Water State Revolving Fund Loans (CWSRF) program is funded via an annual U.S. Environmental Protection Agency (EPA) capitalization grant, state matching funds, and principal and interest repayments on past CWSRF loans. This program provides low-interest and forgivable principal loan funding for wastewater treatment construction projects, eligible nonpoint source pollution control projects, and eligible green projects. In-lake treatments, such as phosphorus inactivation and oxygenation, are eligible for these loans.	● Water Quality Monitoring ● Watershed Management ● Onsite Septic Repair and Replacement ● In-Lake Treatments (if lake is publicly accessible) ● Outreach and Education
Centennial Clean Water Grants	The Centennial Clean Water Fund is a Washington State-funded grant program administered by Ecology. Local governments, special purpose districts, conservation districts, and federally recognized Tribes are eligible for these funds applicable to water quality infrastructure (e.g., wastewater treatment facilities) and nonpoint source pollution projects to improve and protect water quality. In-lake treatments, including phosphorus inactivation and oxygenation are not eligible for these grants.	● Water Quality Monitoring ● Watershed Management ● Onsite Septic Repair and Replacement ● Outreach and Education

Table 12 (continued). Funding Sources for Lake Management Actions.

Funding Source	Description	Applicable Activities
Section 319(h) Clean Water	EPA provides "Section 319(h)" grant funds to Washington State where the State is required to provide a 40% match in funding. The Section 319(h) program provides grants to eligible nonpoint source pollution control projects, similar to the state Centennial Clean Water Fund. Eligible projects include lake water quality planning, riparian and wetlands habitat restoration and enhancement, and other water quality improvement efforts. Non-profit organizations are also eligible for these funds. A 25% match is required, and grants may be limited to \$250,000 or \$500,000, depending on the match type. In-lake treatments, including phosphorus inactivation and oxygenation are not eligible for these grants.	● Water Quality Monitoring ● Watershed Management ● Onsite Septic Repair and replacement ● Outreach and Education
Onsite Sewage Financial Assistance Loans (Craft3)	Ecology funding for a regional loan program to support the origination and servicing of loans to property owners for the repair and replacement of failing onsite sewage systems (OSS) throughout the marine (Puget Sound and coastal) counties. Ecology also contracted with local lender Craft3, a non-profit Community Development Financial Institution (CDFI), to originate and service loans for the Regional Onsite Sewage System Program. The program may provide lending measures to repair/replace failing OSS.	● Onsite Septic Repair and Replacement

Adaptive Management

To further the long-term water quality and lake use goals for Lake Lawrence, this plan includes the following adaptive lake management framework to regularly reassess and amend LCMP strategies or goals as part of ongoing, adaptive lake management, pursuant to future lake needs, stakeholder values, and funding. This section describes (1) the decision-making process and adaptation framework by which the LCMP shall be modified, (2) current knowledge gaps and the recommended monitoring plan for continued effectiveness evaluation, and (3) potential future LCMP adaptations to begin considering.

Community Involvement and Partnerships

Projects and partnerships succeed when participants share a common understanding of roles and responsibilities. It is important to establish clarity regarding those roles, responsibilities, and expectations for each participating entity at the outset, to ensure the best chance at achieving the project's vision, mission, goals, and objectives. When roles and responsibilities are clearly defined, productivity, respect, communication, value for individual contributions, and shared ownership for success is enhanced throughout the team.

The Lake Lawrence LMD originally formed in 1986 as Washington State's first LMD to control nuisance and invasive aquatic vegetation in Lake Lawrence. Working with Thurston County, the LMD has consistently been renewed and was renewed again in 2026 (as Thurston County Lake Lawrence LMD No. 26) with a proposed 35-year duration from January 1, 2027 through December 31, 2061. As the current lead entity for protecting and advocating for the lake's water quality and beneficial uses and serving the public and property owners' best interests, the LMD provides necessary community leadership and initiative for implementation of this LCMP.

The renewal through 2061, will allow the LMD to continue acting as a lead entity for decision making and fundraising, in partnership with Thurston County, which is important for the long-term implementation of this plan and development of an ongoing, adaptive management plan. Adaptive lake management during this time may require amending the LMD resolution of intention(s), boundaries, and/or assessment rate structure to allow for expanded lake management goals, as necessary.

Lake Management District No. 26 Purpose:



"Protect Lake Lawrence's water quality, fish and wildlife habitat, recreation, and aesthetic values through implementing appropriate lake management activities."

The relevant entities to fulfill the required roles and responsibilities of organizing, governing, and executing the decisions of this LMD, as the lake management structure and primary mechanism for decision making, funding acquisition, and implementation of management activities for Lake Lawrence,

have been defined below in Table 13. Further definition of County and LMD roles are discussed in the Thurston County Lake Management District Standard Operating Procedures (Thurston County 2024).

Table 13. Potential Role and Responsibilities.		
Agency/Group	Role	Responsibilities
Lake Management District Steering Committee	Lead Entity District Operation and Management	• Annually identify lake maintenance issues, recommend management measures • Develops and implements annual workplans and budgets • Raise funds annually through the LMD assessment on properties with shoreline access • Identify and apply for grants and funding partnerships • Work with County to develop Request for Proposals (RFPs), reviewing bids, and selecting contractors • Coordinate work with County, contractors, consultants, volunteers, and other organizations. • Assist in outreach and engagement to LMD landowners
Community Members and Lake Residents	Monitoring Support and Community Engagement	• Assist LMD and Thurston County in lake monitoring and surveillance for toxic algae blooms • Review and comment on annual workplans • Attend LMD meetings • Vote on LMD formation, rate assessments, and other issues • Outreach to elected officials to seek budget allocations through Thurston County Council and Washington State Legislature • Outreach and engagement to advertise lake and septic system stewardship, and control and prevention of invasive species.
Thurston County Environmental Health Division, Public Health & Social Services Department	LMD Administration Stormwater Management and Retrofit Evaluation Watershed Monitoring Pollution Identification and Correction Data Management	• Provides administrative support to the LMD, including invoicing, contracting, permit maintenance, and County coordination. • Operates the County lake monitoring program; including toxic algae sampling • Investigate, eliminate, and/or mitigate pollution sources, particularly animal wastes, septic systems, and illicit discharges • Lead for loan application through CWSRF • Provide supplemental funding through utility fees • Maintenance of existing stormwater infrastructure • Revise stormwater code to require phosphorus treatment • Retrofit of existing stormwater infrastructure

Project Public Comment and Participation

For this LCMP, five public meetings were held on the following occasions:

- Stakeholder kickoff and QAPP meeting on July 24, 2024
- Project check-in and update on May 5, 2025
- Monitoring summary, preliminary water and phosphorus budgets, and management alternatives evaluation on December 11, 2025

- Pre-draft LCMP meeting and presentation to Thurston County and the LMD on April 16, 2025
- Final project meeting and presentation of Final LCMP to Thurston County and the LMD on June 11, 2026

Comments on the draft LCMP were solicited from Thurston County, Ecology, the LMD Steering Committee, and LMD members including but not limited to in-text suggestions and questions on the document or comments voiced during previous public meetings. These questions, comments, and project team responses are considered in this final plan.

Framework and Procedures

Adaptive management is a structured process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. This form of management can improve clarity about key plan elements and focus decision-makers' attention on the *what*, *why*, and *how* of action implementation, and emphasizes accountability and explicitness in decision making (Williams et al. 2009). This is particularly important for resource management, which often entails multiple management objectives, constrained authorities and abilities, dynamic resource systems, and uncertainty in the responses to management actions. According to the Technical Guide for Adaptive Management Plans by the U.S. Department of the Interior (Williams et al. 2009), activities comprising this structural decision-making approach should include the following:

- Engaging stakeholders in the decision-making process
- Identifying the problem(s) to be addressed
- Specifying the objectives and tradeoffs that capture stakeholder values
- Characterizing assumptions about resource structures and functions
- Predicting the consequences of alternative actions
- Identifying key uncertainties
- Measuring risk tolerance for potential consequences of decisions
- Anticipating future impacts of present decisions
- Accounting for legal guidelines and constraints

Under the framework of the existing Lake Management District, this LCMP recommends Thurston County, with consultation from the LMD Steering Committee, to continue management of a formal, science-based adaptive management program. This adaptive management program shall provide science-based recommendations and technical information to assist in the determination of if and when it is necessary or advisable to adjust the goals, objectives, management actions, and/or measures of evaluation set forth in previous versions of the LCMP. Additional LCMP adaptive management participants may include those staff members defined by the County or Steering Committee, independent reviewers, and policy makers.

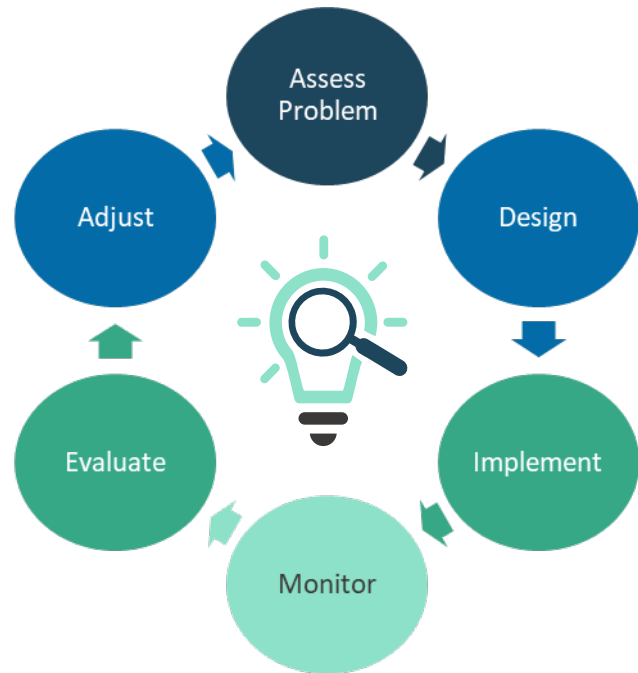
The following generalized procedure may be used for LCMP adaptive management and decision making (see inset graphic):

Assessing the Problem

The County, Steering Committee, and other stakeholders shall provide observations of the system function and identify issues.

Designing a Solution

The LMD Steering Committee, with consultation from TCEH, should establish key questions, and define and prioritize resource objectives. Lake resource objectives may consist of functional objectives, which are broad statements regarding potentially affected major functions, and performance targets, which are measurable criteria defining specific and attainable conditions and processes.



Adaptive Management Cycle. Adapted from Williams et al. (2009)

Implementation

Adaptive management proposals should be submitted to the County Manager by the Steering Committee and/or other relevant participants, or by the general public at public meetings. Proposals should demonstrate how future impacts will address key questions and lake resource objectives/issues. Proposal approval and prioritization will be determined by the LMD Steering Committee. Approved projects are then implemented and/or delegated at the LMD's discretion.

Monitoring

Monitoring is a key component of adaptive management. A basic monitoring program at Lake Lawrence should be conducted by trained staff and/or volunteers and should consist of the minimum elements described in the following section. Independent scientific review may be conducted at identified points of implementation, pursuant to study goals, LMD Steering Committee direction, County consultation, and/or funding resources.

Effectiveness Evaluation

Using monitoring data and observations, project performance and management effectiveness will be evaluated. An evaluation report should outline recommended actions, data gaps, and next steps for LMD Steering Committee review. Relevant reports or petitions for rulemaking shall be shared with the public.

Adjust

Based on the recommendations established in the evaluation report and those provided by technical advisors, and the values of the community and general public, the LMD Steering Committee is responsible for all final decisions regarding LCMP adaptations/adjustments.

Measurable Management Objectives

The project team acknowledges that there is inherent uncertainty to the success of the recommended management actions. Therefore, it is critical to set measurable objectives, maintain monitoring of those objectives, and adjust the management plan if those objectives are not met.

For each recommended management activity, the project team recommends the following measurable objectives and adaptive management actions for when objectives are not met (Table 14).

Table 14. Measurable Management Objectives.		
Activity	Objective	Potential Adaptive Management Action
Sediment Phosphorus Inactivation	Reduce summertime phosphorus available for algae to average concentrations less than 24 µg/L in the water column. Reduce internal phosphorus loading by 80%. Reduce sediment active phosphorus by 80%.	Continue lake monitoring to track effectiveness of inactivation. Adjust dosage or chemical used. For instance, if a large pilot dose of ZVI is ineffective, pursue repeated lower doses of alum or lanthanum. If using HOS, adjust oxygenation rate or consider providing an iron supplement.
Algae Bloom and Cyanotoxin Monitoring	Cyanotoxin samples are collected when a bloom is present and additional samples are collected following state protocol. Warning signs should be posted when there is an exceedance of state recreational and removed after 2 weeks without an exceedance. Advisories should occur no more than twice in a 5-year period, each lasting no longer than 3 weeks.	If weekly samples are not collected or immediate public notification of exceedances is not completed, audit program to understand challenges. If advisory is not achieved, re-evaluate the cause(s) of cyanobacteria blooms in consideration of changes in internal and external loads resulting from management actions.
OSS Inspection and Management	To be determined by Thurston County. LMD to encourage landowners to timely inspect and update their systems.	Survey OSS owners to understand barriers to inspection, repair, and upgrade. Secure additional funding, if needed. Evaluate enforcement-based approach.
Shoreline and Waterfowl Management	Adoption of shoreline and landscaping management practices by at least 50% of private residences along the lake perimeter. AND/OR Development of a Lake Lawrence Healthy Shorelines initiative in which 50% of property owners promise to improve habitat by given date.	Survey property owners to understand barriers to adopting management practices. Secure additional funding, if needed. Appropriate signage at public spaces discouraging waterfowl feeding. Develop and share educational materials (e.g., videos, social media posts, emails, flyers, classes).

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Appendix A

Lake Lawrence Water Quality Report and Hydrologic/Phosphorus Budget for Water Year 2025



Lake Lawrence Water Quality Report and Hydrologic/Phosphorus Budget for Water Year 2025

Lake Lawrence, Thurston County, Washington

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Introduction

Herrera Environmental Consultants (Herrera) contracted with Thurston County Environmental Health Division (TCEH, or the County) and the Lake Lawrence Lake Management District (LMD) to prepare a lake cyanobacteria management plan (LCMP) for Lake Lawrence, which experiences frequent cyanobacteria blooms impairing recreational uses and habitat. To inform the LCMP, Herrera developed a quality assurance project plan (QAPP) (Herrera 2024) to collect a comprehensive set of scientific data from September 2024 through October 2025, including hydrological, chemical, biological information from the lake and watershed. This water quality report summarizes the methods and results of water and sediment quality monitoring conducted for the LCMP. It is included as an appendix to the LCMP.

Monitoring Methods

Lake Lawrence has a rich history of community engagement and lake monitoring as the first LMD in Washington State, originally formed in 1986. Key water quality studies are provided in Table 1. These studies were pivotal in early characterizations of Lake Lawrence and in tracking eutrophication and water quality trends. Detailed summaries of these studies are described in the QAPP (Herrera 2024).

A thorough characterization of the current lake and watershed conditions is necessary to develop water and phosphorus budgets, to understand the dynamics driving cyanobacteria blooms in the lake, and to construct a successful strategy for both short-term and long-term control of toxic cyanobacteria blooms.

To supplement historical datasets, high-quality monitoring data of the lake's water quality and watershed drainage were collected from September 2024 through October 2025 (also referred to as the "monitoring period"). TCEH led monthly lake monitoring, while Herrera staff led watershed monitoring during wet weather, per the QAPP. Table 2 summarizes the types of data gathered, methodology used, and the stations at which those data were collected. Figure 1 and Table 3 show the locations of each station in the Lake Lawrence watershed monitored for the LCMP.

Monitoring objectives and measurement quality objectives are specified in the QAPP. Monitoring procedures were according to procedures specified in the QAPP (Herrera 2024) for field procedures, laboratory procedures, quality control procedures, and data management, analysis, and reporting. The data collected in accordance with the QAPP are used to evaluate whether lake water quality have changed since the previous KCM (1991) study; assess the current relative importance of inputs from streams, the lake sediments, groundwater, and other sources; and evaluate the effectiveness of past management actions. Deviations from the QAPP are described in the following section.

These scientific data, along with input from the County and the Lake Lawrence community, were used to develop an adaptive lake management strategy for the LCMP.

Table 1. Summary of Previous Studies at Lake Lawrence.

Title	Author(s)	Data Year	Year Published	Description
Feasibility of Aquatic Plant Control in Lake Lawrence, Thurston County, Washington, Using Grass Carp	Thomas et al., University of Washington	1974–1989	1990	Evaluation of aquatic plant and fish communities in Lake Lawrence and potential effects of stocking grass carp
Lake Lawrence Phase I Restoration Analysis Final Report	Kramer, Chin, & Mayo (KCM)	1990	1991	Comprehensive water quality study of Lake Lawrence to identify restoration alternatives
Lake Lawrence Restoration Project Final Dredge and Disposal Design Report	Hartman Associates, Inc.	1990, 1993	1995	Design report for the most effective method of dredging Lake Lawrence
Lake Lawrence Integrated Aquatic Vegetation Management Plan	EnviroVision Corp.	2003	2004	Management plan for aquatic plants
Thurston County Water Quality Monitoring Program	Thurston County Environmental Health	2009–2024	Various annual reports	Long-term water quality monitoring

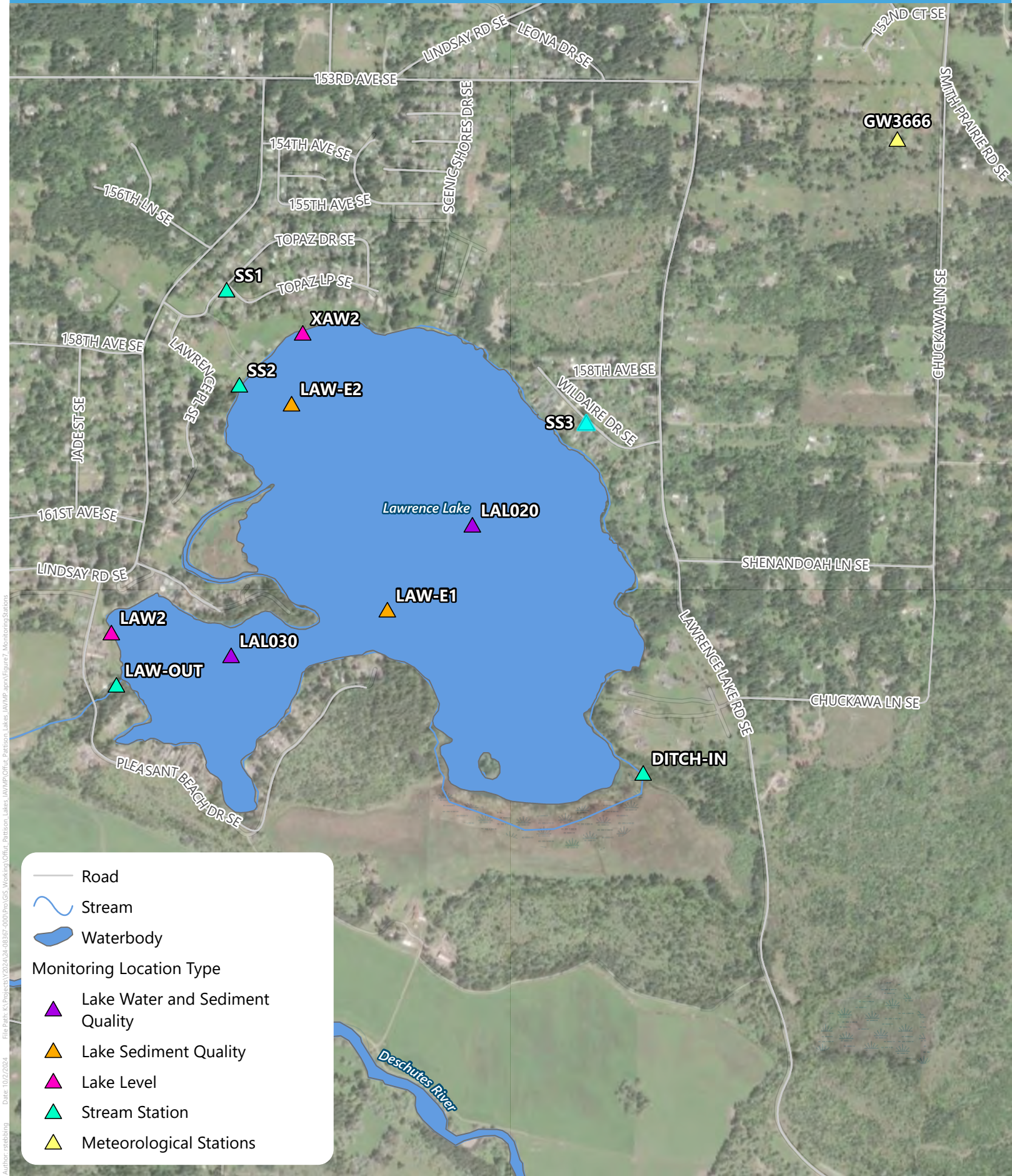
Table 2. Lake Lawrence Monitoring Program from September 2024 to October 2025 for the LCMP.

Component	Element/Parameters	Summary	Station
Hydrological	Precipitation	Citizen Weather Observation Program rain gauge northeast of Lake Lawrence, and at the WA State Dept. of Transportation in Yelm.	GW3666, DW7103
	Lake level	Staff level gauges near the Lake Lawrence Community Club and near the private beach on Pleasant Beach Dr SE	XAW2, LAW2
	Stream discharge	Discrete depth and velocity measurements using a current meter during sampling.	DITCH-IN, SS1, SS2, SS3
	Lake outlet discharge	Lake outlet depth and velocity measurements using a current meter during sampling	LAW-OUT
Inlet Water Quality	Discrete sampling for total phosphorus. Sonde measurements for temperature, dissolved oxygen, conductivity, and pH	Grab samples at four inlet locations. Measurements from a water quality sonde, submerged in flowing inlet drainage.	DITCH-IN, SS1, SS2, SS3
Lake Water Quality	Counts of waterfowl, boats, anglers, and swimmers.	Additional observations about lake use and appearance during lake and canal monitoring events.	Lake-wide
	Water clarity measurements (Secchi depth)	Secchi disk measurement at the lake surface.	LAL020, LAL030
	Water column profiles for temperature, dissolved oxygen, conductivity, and pH	Depth-profiles using a water quality sonde lowered through the water column, with readings at every 1 meter.	
	Integrated photic zone sampling for chlorophyll-a.	Grab samples from the surface, Secchi depth, and twice the Secchi depth.	
	Discrete sampling for total phosphorus, orthophosphate, total Kjeldahl nitrogen, nitrate+nitrite, and ammonia.	Grab samples with a Van Dorn sampler at 0.5 meters from surface, and from 1 meter from the lake bottom.	LAL020, LAL030
	Cyanotoxin sampling for microcystin and anatoxin-a	Grab samples during algae blooms, analyzed through Ecology's Freshwater Algae Control program.	Various
Lake Sediment Quality	Sediment core analysis for phosphorus fractions, total iron, dry weight, and density.	Core collection from shallow and deep locations in both basins, and analysis of discrete sediment intervals in each core.	LAL020, LAL030, LAW-E1, LAW-E2

Table 3. Lake Lawrence Monitoring Locations.

Location ID	Description	Latitude	Longitude	Parameters Measured
Lake Quality Stations				
LAL020	Lawrence east ("big") basin	46.853427	-122.568617	Water and Sediment Quality (see Table 2)
LAL030	Lawrence west ("little") basin	46.849780,	-122.577855	
LAW-E1	Shallow sediment sample in eastern ("big") basin, near connecting channel	46.851106	-122.571833	Sediment Quality (see Table 2)
LAW-E2	Shallow sediment sample eastern ("big") basin, near Community Club	46.856526	-122.575764	
Stream Stations				
DITCH-IN	Ditch inlet	46.846935	-122.56173	Discharge Field Parameters Total Phosphorus
SS1	Ditch monitoring site located at the intersection of Topaz Loop SE and Topaz Dr SE	46.859517	-122.578404	
SS2	Ditch draining on west side of Lake Lawrence Community Club	46.856994	-122.577810	
SS3	Catch basin located on Wildaire Dr SE	46.856225	-122.564285	
LAW-OUT	Lake Lawrence outlet downstream of overflow structure	46.848914	-122.582279	Discharge
Continuous Stage (Level) Stations				
XAW2	Lake level staff gage located in the eastern basin near the Lake Lawrence Community club	46.858410	-122.575392	Lake Level
LAW2	Lake level staff gage located in the western basin near the private beach on Please Beach Dr SE	46.850334	-122.582506	Lake Level
Meteorological Stations				
GW3666	Citizen Weather Observation Program	46.8640	-122.5525	Air Temperature Humidity Dewpoint
DW7103	Washington State Department of Transportation Weather Station - Yelm	46.92050	-122.63700	Wind Speed Wind Direction Precipitation
Tumwater	Tumwater WSU AgWeatherNet Station	46.95066,	-122.96433	Evaporation Potential

Figure 1.
Lake Lawrence Monitoring Stations.



Data Quality Assurance

To guide all study design and methodology for collecting and analyzing surface water data, Herrera developed a quality assurance project plan (QAPP) (Herrera 2024) following guidance from the Washington State Department of Ecology (Ecology), specifically *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (Ecology 2004, revised 2016).

An independent review of the laboratory quality control (QC) data from each sampling event was performed using the measurement quality objectives (MQOs) identified in the QAPP (Herrera 2024). The quality of the data was evaluated by TCEH data managers for precision and completeness. The data quality for all parameters was generally considered acceptable, based on holding time, reporting limit, method blank, spike recoveries, control standard, and laboratory duplicate criteria specified in the QAPP. Acceptable data is either data that passes all QC criteria, or data that may not pass all QC criteria but has appropriate corrective actions taken. Deviations from the QAPP and results from the data QC review are described below.

Planned lake monitoring included 13 water quality sampling events between October 2024 through October 2025. Months where lake monitoring was planned and not performed included December 2024, and both April and June 2025 (due to TCEH boat repairs). Additionally deviating from the planned QAPP schedule, orthophosphate and ammonia were not collected during most lake monitoring events. Nutrient samples (total phosphorus, total nitrogen, total Kjeldahl nitrogen, and nitrate+nitrite) were collected in July 2025 as planned but were not received by the laboratory and therefore not analyzed. Total Kjeldahl nitrogen was also not analyzed in September 2025. Pheophytin-a samples were not analyzed for samples collected from September 2025 and October 2025. Finally, during the three sampling events (May, July, and September 2025) identified in the QAPP for phytoplankton and zooplankton analysis, no samples were collected due to oversight by lake monitoring staff.

Planned field observations during lake sampling events were intended to document general site conditions during each monitoring event, including weather, recreational use, wildlife presence (especially waterfowl abundance), and qualitative descriptions of water appearance (e.g., color, surface conditions). However, aside from measurements associated with water column profile data, no additional qualitative field observations were consistently recorded during the monitoring period.

Planned watershed monitoring included four wet-weather events between November 2024 and October 2025. However, despite targeting many qualifying events in terms of rainfall depth and intensity over this period, only two watershed monitoring events were successfully performed, in February and April 2025. This was due to high infiltration rates in the watershed resulting in generally low surface water flows during wet weather and a lower than typical water table. Monitoring was only performed at select stations where water was sampleable. Due to no flow on April 8, 2025, at site SS1, no monitoring was performed. Discharge was additionally not measured at stations SS2 or DITCH-IN on either February 25 or April 8, 2025, due to low or no flow. Lake levels had not reached the lake outlet at LAW-OUT on February 25, 2025, and outflow discharge was not measured.

Field and laboratory data were validated according to the QAPP. Quality control procedures and criteria defined in the QAPP were generally met, resulting in no data qualification or corrective action, with the following exceptions identified below. Additionally, the laboratory for chlorophyll-a analysis changed part way through the monitoring period, beginning with the July 22, 2025, event, from ALS Kelso to Tshimakain Creek Laboratories (TCL). TCL is accredited for chlorophyll-a analysis by Ecology. TCL did not provide filtration times or other quality assurance data with which to evaluate the quality of chlorophyll-a results.

The following results were qualified as estimated (J):

- Chlorophyll-a from both basins on January 16, 2025, due to results detected below the reporting limit (RL) but greater than or equal to the method detection limit (MDL).
- Chlorophyll-a from both basins on February 26, 2025, due to a field duplicate relative percent difference (RPD) exceedance (greater than 20 percent, at 72 and 115 percent in the Big Basin and West Basin, respectively).
- Nitrate + Nitrite for the surface and bottom samples in the Big Basin on August 21, 2025, due to results detected below the RL but greater than or equal to the MDL.
- Nitrate + Nitrite for the surface sample in the West Basin on August 21, 2025, due to results detected below the RL but greater than or equal to the MDL.
- Total Phosphorus for the surface sample in the Big Basin on March 19, 2025, due to a field duplicate RPD exceedance (greater than 20 percent, at 23 percent).
- Nitrate + Nitrite for the low concentration surface sample in the West Basin on March 19, 2025, due to a field duplicate difference exceedance (greater than twice the RL).

Watershed station SS1 results for February 25, 2025, for temperature, dissolved oxygen, specific conductivity, pH, and total phosphorus were rejected (*R*) due to negligible water flow and sediment within the sample.

Field data sheets and laboratory data reports for each lake and watershed monitoring event are presented in Appendix B of the LCMP.

Lake Monitoring Results

Lake Water Quality

Water quality data was collected at Lake Lawrence from two monitoring stations, one located in the west (“Little”) basin (LAL030) and the other located in the east (“Big”) basin (LAL020). Sampling was conducted approximately monthly, with surface and bottom water column samples collected between October 2024 through October 2025. These data are summarized for all monitoring events in Table 5. Results are presented separately for each parameter in the sections below, with comparison to historical data (1990-1991) presented by KCM (1991), where relevant.

Table 4. Lake Lawrence Annual Water Quality Summary Statistics, by Water Year																									
Parameter (Unit)	Depth	Big Basin												West Basin											
		Water Year 2024 ^a						Water Year 2025 ^b						Water Year 2024 ^a						Water Year 2025 ^b					
		N	% ND	Min.	Median	Mean	Max.	N	% ND	Min.	Median	Mean	Max.	N	% ND	Min.	Median	Mean	Max.	N	% ND	Min.	Median	Mean	Max.
Temperature (deg C)	S	20	–	15.1	20.6	20.2	24.1	40	–	5.9	14.4	14.2	22.9	20	–	14.1	19.8	19.9	24.9	40	–	5.7	13.7	14.0	22.9
	B	13	–	13.5	16.7	16.9	21.9	24	–	5.9	12.0	12.4	21.9	11	–	9.6	14.9	14.6	18.7	18	–	5.7	12.4	12.9	21.3
Dissolved Oxygen (mg/L)	S	20	–	7.7	8.9	9.2	10.9	40.0	–	6.8	9.7	9.6	12.7	20	–	0.41	8.6	7.7	11.2	40	–	2.8	9.5	9.3	12.5
	B	13	–	0.29	0.6	1.8	7.8	24	–	0.22	7.9	7.0	12.5	11	–	0.27	0.33	1.4	7.1	18	–	0.23	6.4	6.1	12.2
pH	S	20	–	7.3	7.9	8.0	9.1	40	–	7.0	7.7	7.7	9.0	20	–	6.8	7.7	7.9	9.1	40	–	6.9	7.7	7.7	9.2
	B	13	–	6.7	6.9	7.0	7.6	24	–	6.4	7.2	7.2	7.8	11	–	6.6	6.8	6.8	7.2	18	–	6.4	7.1	7.2	7.9
Conductivity (µS/cm)	S	20	–	105	112	111	115	40	–	100	110	108	114	20	–	104	113	112	131	40	–	98	109	108	114
	B	13	–	106	117	134	204	24	–	100	111	111	136	11	–	116	139	152	207	18	–	98	113	117	172
Secchi Depth (m)	–	5	0	0.96	2.39	2.03	3.17	10	0	0.67	1.42	1.62	3.22	6	0	0.97	2.32	1.95	2.45	10	0	0.77	1.41	1.69	4.18
Chlorophyll a (µg/L)	S	5	0	2.2	4.5	10.1	35.5	10	0	1.1	19.8	20.2	57.0	6	0	3.4	4.8	6.5	14.4	10	10	<RL	12.2	21.7	100
Total Phosphorus (µg/L)	S	5	0	12.0	18.0	22.4	45.0	9	0	18.0	34.0	35.1	55.0	5	0	11.0	20.0	20.4	34.0	9	0	13.00	31.0	30.9	42
	B	5	0	33	158	158	377	9	0	27	61	89	346	5	0	38.0	90.0	112	261	9	0.0	21.0	40.0	56.6	200
Orthophosphate (µg/L)	S	–	–	–	–	–	–	2	0	6.0	10.5	10.5	15.0	–	–	–	–	–	–	2	50	<RL	5.8	5.8	9.0
	B	–	–	–	–	–	–	2	0	8.0	11.5	11.5	15.0	–	–	–	–	–	–	2	50	<RL	8.3	8.3	14.0
Total Nitrogen (mg/L)	S	5	0	0.73	1.01	0.99	1.19	8	0	0.9	1.5	1.5	1.8	5	0	0.68	1.02	1.01	1.27	8	0	0.83	1.2	1.4	2.2
	B	5	0	1.18	1.57	1.89	2.74	8	0	0.95	1.5	1.5	1.8	5	0	1.27	1.8	2.8	4.6	8	0	1.34	1.4	1.5	1.6
Total Kjeldahl Nitrogen (mg/L)	S	5	0	0.73	1.01	0.99	1.19	8	0	0.91	1.5	1.4	1.8	5	0	0.67	1.0	1.0	1.3	8	0	0.82	1.2	1.3	2.2
	B	5	0	1.18	1.5	1.9	2.7	8	0	0.93	1.5	1.4	1.8	5	0	1.3	1.8	2.7	4.6	8	0	1.2	1.4	1.4	1.6
Nitrate+Nitrite (mg/L)	S	5	100	<RL	<RL	<RL	<RL	9	44	<RL	<RL	0.030	0.112	5	100	<RL	<RL	<RL	<RL	9	56	<RL	<RL	0.037	0.135
	B	5	80	<RL	<RL	<RL	0.036	9	44	<RL	<RL	0.030	0.113	5	60	<RL	<RL	0.023	0.048	9	44	<RL	<RL	0.051	0.139
Ammonia (mg/L)	S	–	–	–	–	–	–	1	0	0.289	0.289	0.289	0.289	–	–	–	–	–	–	1	0	0.247	0.247	0.247	0.247
	B	–	–	–	–	–	–	1	0	0.299	0.299	0.299	0.299	–	–	–	–	–	–	1	0	0.262	0.262	0.262	0.262

^a Data from May through September 2024, collected by TCEH.

^b Data from October 2024 through October 2025. Ammonia sampled once in March, and orthophosphate sampled once in each February and March, collected by TCEH.

Data collected by TCEH.

B= Bottom (hypolimnion; (≥4.0 meters deep) °C = degrees Celsius N= sample size ND = Non-detect mg/L = milligrams per liter RL = reporting limit S = Surface (epilimnion; <4.0 meters deep) µg/L = micrograms per liter

Half of the RL was substituted for all values which were qualified as not detected, and that value was used in the production of these summary statistics.



Table 5. Lake Lawrence Summer (May to October) Water Quality Summary Statistics, by Year

Parameter	Depth	Big Basin												West Basin											
		Summer 2024						Summer 2025						Summer 2024						Summer 2025					
		N	% ND	Min.	Median	Mean	Max.	N	% ND	Min.	Median	Mean	Max.	N	% ND	Min.	Median	Mean	Max.	N	% ND	Min.	Median	Mean	Max.
Temperature (deg C)	S	20	–	15.1	20.6	20.2	24.1	40	–	5.9	14.4	14.2	22.9	20	–	14.1	19.8	19.9	24.9	40	–	5.7	13.7	14.0	22.9
	B	13	–	13.5	16.7	16.9	21.9	24	–	5.9	12.0	12.4	21.9	11	–	9.6	14.9	14.6	18.7	18	–	5.7	12.4	12.9	21.3
Dissolved Oxygen (mg/L)	S	20	–	7.7	8.9	9.2	10.9	40	–	6.8	9.7	9.6	12.7	20	–	0.4	8.6	7.7	11.2	40	–	2.8	9.5	9.3	12.5
	B	13	–	0.3	0.6	1.8	7.8	24	–	0.2	7.9	7.0	12.5	11	–	0.3	0.3	1.4	7.1	18	–	0.2	6.4	6.1	12.2
pH	S	20	–	7.3	7.9	8.0	9.1	40	–	7.0	7.7	7.7	9.0	20	–	6.8	7.7	7.9	9.1	40	–	6.9	7.7	7.7	9.2
	B	13	–	6.7	6.9	7.0	7.6	24	–	6.4	7.2	7.2	7.8	11	–	6.6	6.8	6.8	7.2	18	–	6.4	7.1	7.2	7.9
Conductivity (µS/cm)	S	20	–	105.3	112.1	110.8	115.3	40	–	99.9	110.4	108.1	114.1	20	–	104.4	113.4	112.3	131.3	40	–	98.0	109.0	107.6	114.4
	B	13	–	106.4	117.3	134.5	204.2	24	–	100.0	110.7	111.3	136.1	11	–	115.5	138.5	152.3	206.6	18	–	98.0	112.7	116.8	171.5
Secchi Depth (m)	–	6	0	1.0	1.8	1.9	3.2	5	0	0.7	1.4	1.4	1.8	6	0	1.0	1.8	1.8	2.5	5	0	0.8	1.3	1.2	1.4
Chlorophyll a (µg/L)	S	6	0	2.2	4.7	12.0	35.5	5	0	7.1	18.0	26.0	57.0	7	0	3.4	4.8	9.1	25.1	5	20	<RL	14	32.3	100
Total Phosphorus (µg/L)	S	6	0	12.0	20.0	25.3	45.0	4	0	18.0	20.5	23.3	34.0	6	0	11.0	20.0	23.3	38.0	4	0	13.0	25.0	23.5	31.0
	B	6	0	33.0	114.0	144.0	377.0	4	0	27.0	78.0	132.3	346.0	6	0	38.0	78.0	104.0	261.0	4	0	21.0	40.5	75.5	200.0
Orthophosphate (µg/L)	S	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	B	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Total Nitrogen (mg/L)	S	6	0.0	0.7	1.0	1.1	1.8	3	0.0	0.95	1.38	1.37	1.79	6	0.0	0.68	1.05	1.08	1.44	3	0.0	0.83	1.12	1.05	1.20
	B	6	0.0	1.2	1.6	1.8	2.7	3	0.0	0.95	1.38	1.37	1.79	6	0.0	1.27	1.75	2.53	4.60	3	0.0	1.39	1.56	1.51	1.58
Total Kjeldahl Nitrogen (mg/L)	S	6	0.0	0.7	1.0	1.1	1.8	3	0.0	0.91	1.12	1.13	1.37	6	0.0	0.67	1.05	1.08	1.43	3	0.0	0.82	1.12	1.05	1.20
	B	6	0.0	1.2	1.6	1.8	2.7	3	0.0	0.93	1.38	1.36	1.77	6	0.0	1.27	1.74	2.52	4.55	3	0.0	1.38	1.54	1.49	1.56
Nitrate+Nitrite (mg/L)	S	5	100	<RL	<RL	<RL	<RL	9	44	<RL	<RL	0.030	0.112	5	100	<RL	<RL	<RL	<RL	9	56	<RL	<RL	0.037	0.135
	B	5	80	<RL	<RL	<RL	0.036	9	44	<RL	<RL	0.030	0.113	5	60	<RL	<RL	0.023	0.048	9	44	<RL	<RL	0.051	0.139

Data collected by TCEH.

B= Bottom (hypolimnion; ≥4.0 meters deep) °C = degrees Celsius N= sample size ND = Non-detect mg/L = milligrams per liter RL = reporting limit S = Surface (epilimnion; <4.0 meters deep) µg/L = micrograms per liter

Half of the RL was substituted for all values which were qualified as not detected, and that value was used in the production of these summary statistics.

Water Temperature

Water temperature is critical to the health and survival of fish and other aquatic species in many life stages, including embryonic development, juvenile growth, and adult migration. The relative species composition, metabolism, and reproductive effectiveness of cold-blooded aquatic species are also regulated by water temperature. An increase in water temperature accelerates the biodegradation of organic matter and increases the dissolved oxygen demand as well as decreasing the solubility of oxygen.

Figure 2 presents lake water temperature profiles for Lake Lawrence collected at two monitoring stations located in the Big Basin (LAL020) and the West Basin (LAL030). Water temperatures during the monitoring period ranged from 5.7 to 24.9 degrees Celsius (°C) across both basins and depths (Table 4). Surface waters were consistently warmer than bottom waters, particularly during the warmer months (May through August) when the lake was thermally stratified (Table 4, and Table 5). Stratification was strongest when surface temperatures reached approximately 22 to 25°C, while bottom waters remained cooler, generally between 12 and 16°C (Figure 2). Thermal stratification in the Big Basin and West Basin behaved similarly and developed during the same seasonal period. Lake Lawrence was well mixed during fall and winter, with relatively uniform temperatures throughout the water column.

The observed temperature patterns in Lake Lawrence are characteristic of a temperate, seasonally stratified (dimictic) lake, with winter mixing, summer stratification, and transitional conditions during spring and fall.

Maximum observed surface temperature during the monitoring period reached 24.9°C (Table 4 and Table 5), exceeding the U.S. Environmental Protection Agency (EPA) juvenile salmonid temperature benchmark of 24°C and impacting stocked trout in the lake, but remaining below EPA benchmarks for warmwater species such as largemouth bass (34°C) (EPA 2021).

Temperature patterns observed during the 2024-2025 monitoring period were generally consistent with those reported during the 1990 to 1991 study (KCM 1991), with similar seasonal stratification behavior and temperature gradients between the epilimnion and hypolimnion. However, the duration of stratification was shorter in 2024-2025 than 1990 to 1991. In 1990, stratification began as early as March and persisted through September, whereas in 2025 stratification developed later, in May, and weakened by September. The shorter stratification period observed during the current monitoring period may reflect differences in annual weather conditions, such as cooler spring temperatures, increased wind-driven mixing, or interannual climate variability, rather than long-term changes in lake thermal structure. KCM (1991) noted that weather conditions during summer 1990 were unusually calm, which likely contributed to the earlier onset and longer persistence of stratification during that period.

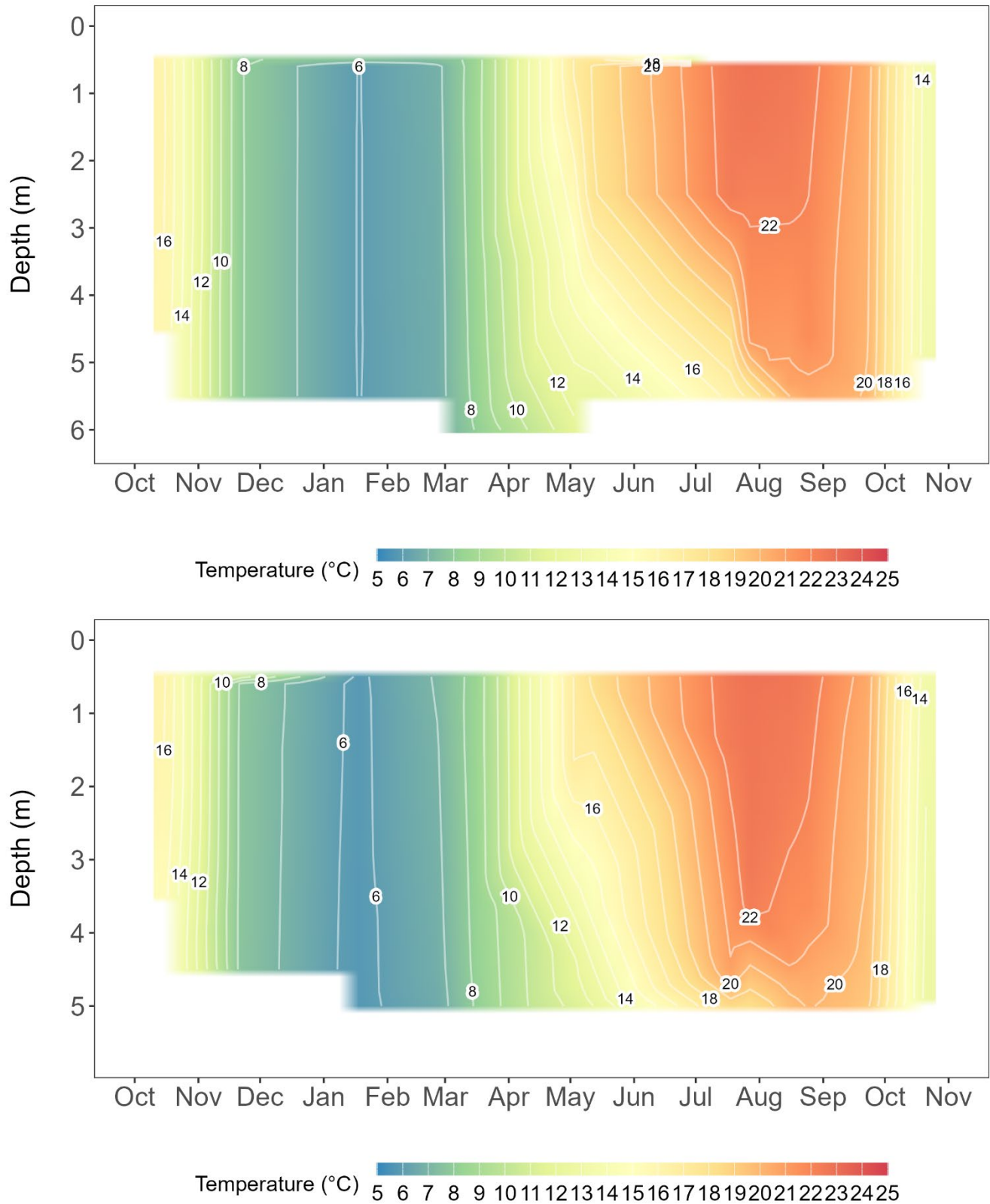


Figure 2. Water Temperature Profiles in Lake Lawrence’s Big Basin (top) and West Basin (bottom).

Table 6. Water Temperature Profiles for Lake Lawrence Big and West Basin (2024-2025).

Depth (m)	2024-05-28		2024-06-27		2024-07-31		2024-08-08		2024-09-26		2024-10-15		2024-11-21		2024-12	2025-01-16	
	Big	West	Big	West	Big	West	Big	West	Big	West	Big	West	Big	West	No Event	Big	West
0.5	16.3	16.7	20.6	20.8	22.5	22.7	24.1	24.9	19.2	18.8	16.2	16.2	8.1	7.8		5.9	5.8
1.5	16.3	16.3	20.6	20.8	22.3	22.5	24.0	24.3	18.9	18.6	16.2	16.1	8.1	7.7		5.9	5.8
2.5	16.1	15.6	20.6	20.4	22.3	22.4	23.9	24.1	18.8	18.5	16.1	15.7	8.1	7.7		5.9	5.8
3.5	15.1	14.1	18.8	17.2	22.2	22.1	23.7	19.2	18.7	18.3	16.0	15.4	8.1	7.7		5.9	5.7
4.5	14.1	11.1	17.0	13.0	21.8	18.4	21.9	18.7	18.6	18.2	15.8	15.3	8.1	7.7		5.9	5.7
5.0	13.5	9.6		11.6		14.9		15.8		17.9							5.7
5.5			15.1	11.1	16.7		17.7		18.5		15.7		8.1			5.9	
6.0			14.4		15.0		15.9						8.1				

Depth (m)	2025-02-26		2025-03-19		2025-04	2025-05-07		2025-06	2025-07-22		2025-08-21		2025-09-22		2025-10-21	
	Big	West	Big	West	No Event	Big	West	No Event	Big	West	Big	West	Big	West	Big	West
0.5	6.8	7.1	8.9	8.6		17.8	17.9		22.9	22.9	22.6	22.7	20.6	20.6	13.6	13.3
1.5	6.8	7.0	8.9	8.6		17.7	17.8		22.7	22.7	22.4	22.4	20.3	20.2	13.5	13.1
2.5	6.7	6.9	8.9	8.6		17.6	16.4		22.7	22.7	22.2	22.3	20.2	20.1	13.5	13.0
3.5	6.7	6.9	8.9	8.5		15.2	14.1		22.6	22.6	22.0	21.9	20.2	19.9	13.5	12.9
4.5	6.7	6.7	8.6	8.4		13.2	12.1		21.3	21.3	21.9	21.1	20.1	19.7	13.4	12.7
5.0		6.6					11.5					20.2		19.5		12.7
5.5	6.6		8.5	8.2		12.0			16.5	16.5	20.7		20.1		13.4	
6.0	6.6		8.4			12.0										

Yellow highlights indicate area of thermal stratification.

Table 7. Dissolved Oxygen Profiles for Lake Lawrence Big and West Basin (2024-2025).

Depth (m)	2024-05-28		2024-06-27		2024-07-31		2024-08-08		2024-09-26		2024-10-15		2024-11-21		2024-12	2025-01-16	
	Big	West	Big	West	Big	West	Big	West	Big	West	Big	West	Big	West	No Event	Big	West
0.5	10.7	10.5	10.9	11.2	7.9	8.0	8.6	8.9	9.3	8.6	10.2	10.4	11.1	11.1		7.9	6.8
1.5	10.4	10.5	10.9	11.1	8.0	7.8	8.5	8.8	9.2	8.7	9.9	9.8	10.8	10.8		7.7	6.6
2.5	10.1	9.8	10.9	10.6	7.8	7.6	8.6	8.2	9.2	8.8	9.2	9.1	10.7	10.7		7.6	6.6
3.5	8.5	2.7	9.1	1.6	7.7	4.8	8.1	0.4	8.8	6.2	8.9	4.8	10.7	10.5		7.6	6.5
4.5	0.6	0.6	1.0	0.4	4.9	0.4	2.7	0.3	7.8	4.7	6.9	4.3	10.6	10.4		7.5	6.5
5.0	0.3	0.3		0.3		0.3		0.3		7.1							6.3
5.5			0.3	0.3	0.6		0.6		3.5		3.6		10.6			7.5	
6.0			0.3		0.4		0.3						10.5				

Depth (m)	2025-02-26		2025-03-19		2025-04	2025-05-07		2025-06	2025-07-22		2025-08-21		2025-09-22		2025-10-21	
	Big	West	Big	West	No Event	Big	West	No Event	Big	West	Big	West	Big	West	Big	West
0.5	12.7	12.5	9.8	9.4					8.2	8.2	9.2	9.7	8.6	8.8	10.4	10.8
1.5	12.7	12.5	9.8	9.4		11.4	11.3		8.1	8.1	9.2	9.5	8.4	8.5	10.1	10.8
2.5	12.6	12.4	9.8	9.3		11.4	11.3		8.1	8.1	8.6	9.5	8.0	8.9	10.0	10.5
3.5	12.5	12.2	9.7	8.9		11.4	12.0		8.0	8.0	7.1	4.2	7.8	9.0	9.8	10.6
4.5	12.5	12.2	9.3	8.3		6.8	2.8		4.6	4.6	5.9	0.7	7.9	8.7	8.9	10.3
5.0		12.1				1.2	0.6					0.3		8.4		10.3
5.5	12.4		9.3	5.9			0.2		0.6	0.6	0.3		7.9		7.9	
6.0	12.3		8.3			0.4										

Yellow highlights indicate areas of anoxia (<2 mg/L)

Dissolved Oxygen

Dissolved oxygen (DO) is a critical water quality parameter for salmonids and other aquatic organisms. Low DO levels can be harmful to the respiration of juvenile and adult fish, particularly during early stages of life. Prolonged oxygen depletion can also alter the composition of aquatic communities. The EPA recommends a 1-day minimum DO concentration of 4.0 mg/L for adult trout and 3.0 mg/L for adult warmwater fish (EPA 2021). Washington state surface water quality standards require that DO concentrations exceed 10.0 milligrams per liter (mg/L) in fresh waters designated for non-core salmonid rearing (WAC 173-201A). DO naturally decreases as waters warm at 100 percent saturation. Low DO also weakens the bonds between phosphorus and other compounds in sediments, allowing the release of phosphorus into the water column for uptake by algae and floating aquatic plants.

Figure 3 shows DO profiles for the two monitoring stations located in the Big Basin and West Basin. DO concentrations during the monitoring period ranged from near anoxic conditions (<0.5 mg/L) to 12.7 mg/L across both basins, depths, and seasons (Table 4). Annual summary statistics indicate that surface waters generally maintained higher DO levels than bottom waters, particularly during the summer months, indicating that thermal stratification limited oxygen mixing to deeper waters (Table 5). DO depletion at depth also suggests oxygen is being consumed through microbial respiration or organic matter decomposition in the sediment.

Seasonal patterns in DO closely followed thermal stratification dynamics. During fall and winter, Lake Lawrence was well mixed, with relatively uniform DO concentrations throughout the water column that commonly exceeded 8 to 10 mg/L at most depths in both basins. As stratification developed in late spring and persisted through summer, oxygen concentrations declined in deeper waters. During summer months (June to August), bottom waters in both basins frequently exhibited hypoxic (<4 mg/L) to anoxic conditions (<2 mg/L) while surface waters remained well oxygenated, typically exceeding 7 to 9 mg/L. The most pronounced oxygen depletion occurred below 4 to 5 meters depth, with concentrations as low as 0.2 to 0.6 mg/L in bottom waters (Table 7). Patterns and seasonal timing of oxygen depletion and recovery were similar between the two basins. By early fall, cooling surface temperatures and weakening stratification corresponded with partial reoxygenation of deeper waters, followed by vertically uniform DO conditions during late fall and winter when the water column was fully mixed.

DO conditions in Lake Lawrence are characteristic of a temperate, seasonally stratified (dimictic) lake, with well-oxygenated conditions during periods of full mixing and periodic hypoxia or anoxia in deeper waters during summer stratification.

DO during the monitoring period was generally consistent with those reported during the 1900 to 1991 study (KCM 1991), with similar seasonal stratification behavior and vertical gradients between surface and bottom waters. However, similar to temperature, the duration of anoxic conditions was shorter in 2024 to 2025 than in 1990 to 1991. In 1990, extended stratification likely contributed to more persistent oxygen depletion in bottom waters, whereas in 2025, the later onset and shorter duration of stratification limited the period of low DO.

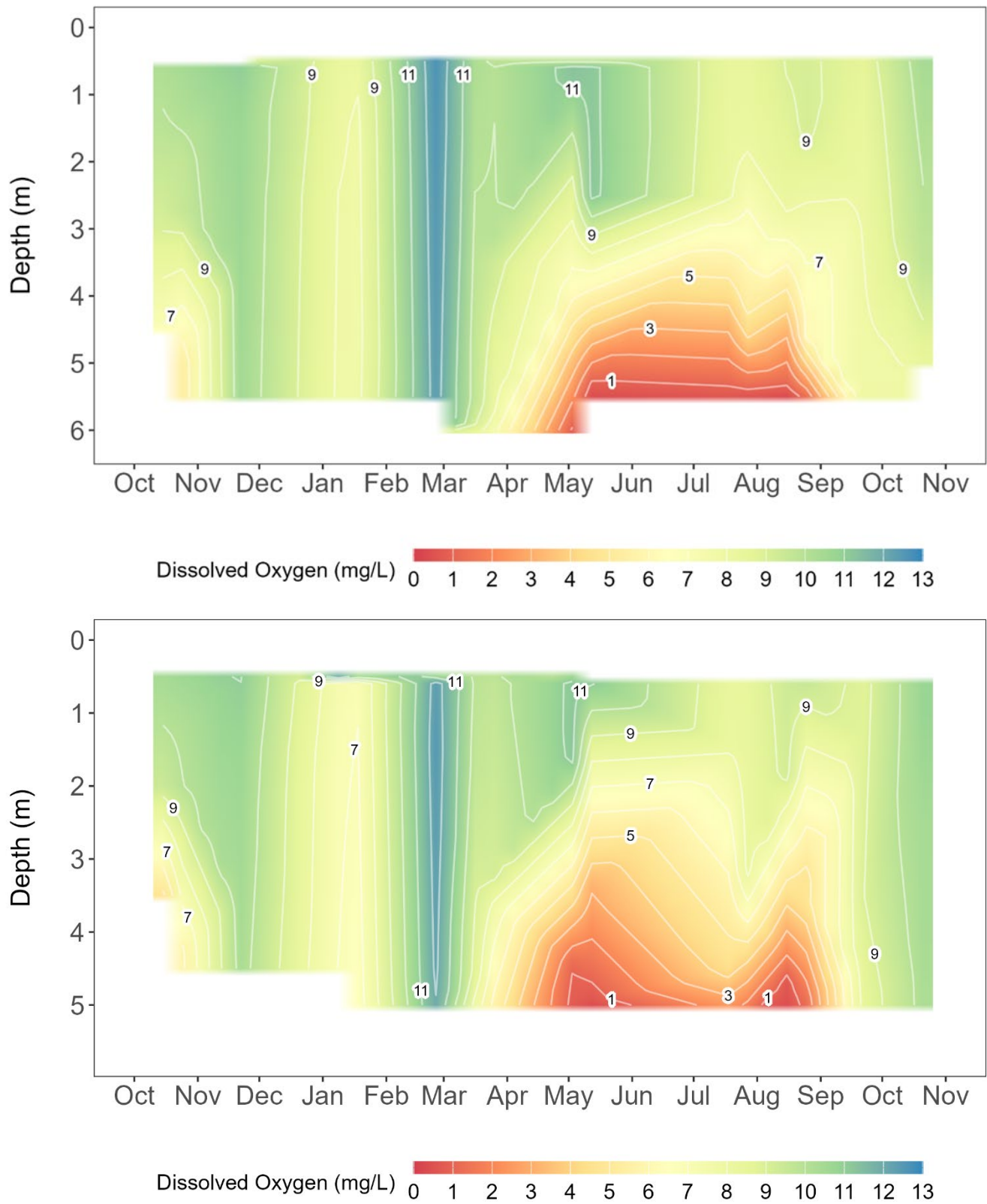


Figure 3. Dissolved Oxygen Profiles in Lake Lawrence's Big Basin (top) and West Basin (bottom).

pH

pH is a measure of the hydrogen ion activity in water and can have a direct effect on aquatic organisms or an indirect effect via altering the toxicity of various common pollutants. In productive lakes, such as Lake Lawrence, increases in pH to above 8 are associated with algae blooms, since photosynthesis consumes dissolved carbon dioxide, a weak acid.

pH in Lake Lawrence exhibited moderate seasonal and vertical variability during the monitoring period, with values generally within the neutral to slightly basic range (Table 4 and Table 5; Figure 4). Across both basins and depths, pH values typically ranged from 6.8 to 9.2. Annual summary statistics show median surface pH values between 7.7 and 7.9, with slightly lower median values observed in bottom waters (Table 4). Summertime (May to October) pH values were generally higher than annual medians, particularly in surface waters, consistent with increased primary productivity during warmer months (Table 5).

Seasonal pH patterns were similar between the two basins and are illustrated in Figure 4. During fall and winter, pH values were relatively uniform throughout the water column, reflecting well-mixed conditions. In contrast, vertical pH gradients developed during spring and summer, with elevated surface pH values (approximately 8.5 to 9.2) observed in both basins during late spring and early summer. These elevated values coincided with periods of thermal stratification and likely reflect enhanced algal photosynthesis. Deeper waters generally exhibited lower pH values (6.8 to 7.5) during summer stratification, reflecting reduced photosynthetic activity and the influence of respiration and organic matter decomposition.

Fall and winter pH values were within the Washington State aquatic life criteria range of 6.5 to 8.5, whereas summer surface pH exceeded this criteria range in both basins during both 2024 and 2025 when algae blooms in May resulted in elevated pH (Table 5). These patterns highlight the combined influence of biological activity and stratification dynamics on pH variability in Lake Lawrence.

pH during the monitoring period was consistent with those observed in 1990 to 1991 (KCM 1991).

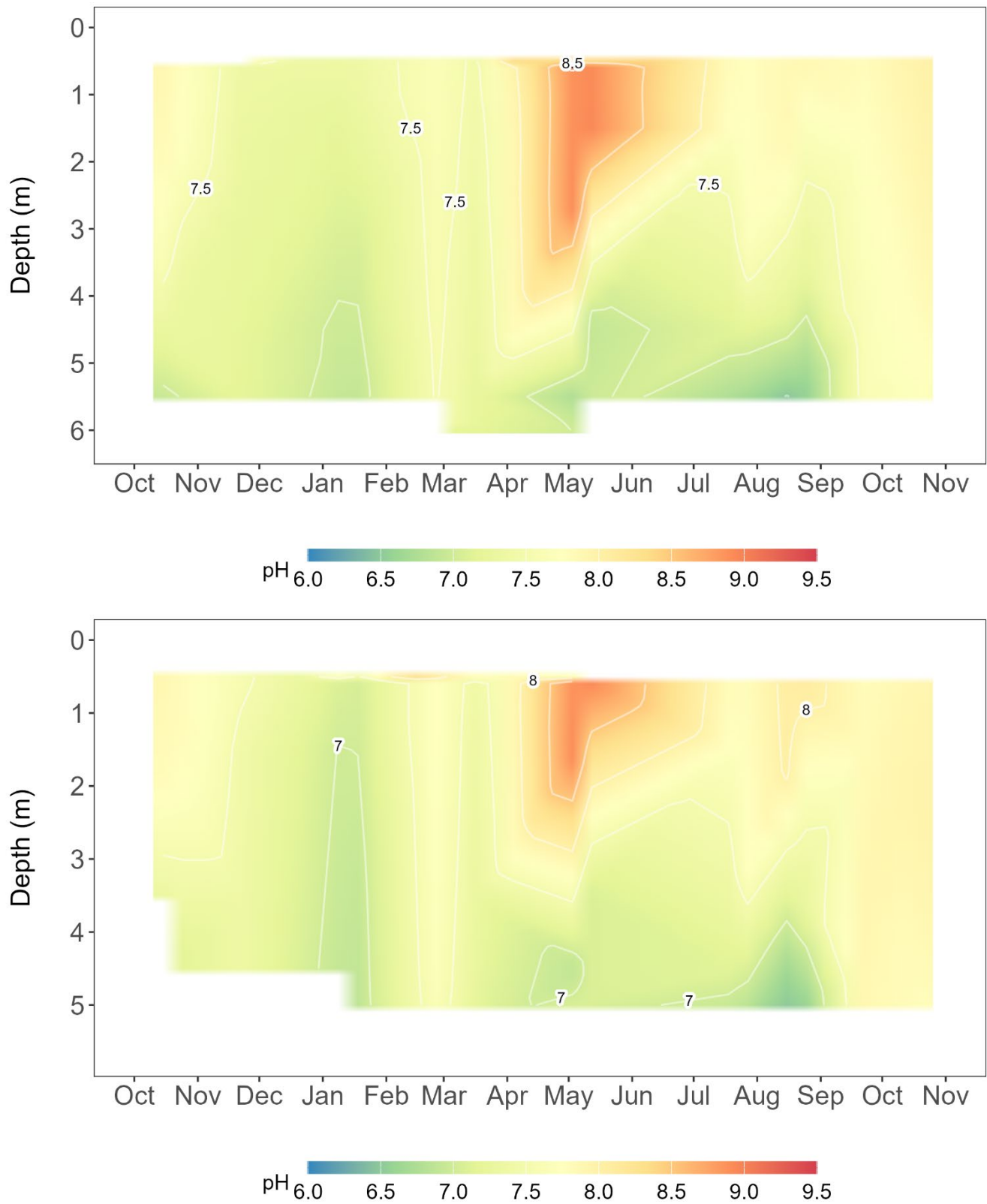


Figure 4. pH Profiles in Lake Lawrence's Big Basin (top) and West Basin (bottom).

Conductivity

Specific conductance (conductivity) measures the ability of water to conduct an electric current, which is directly related to the content of dissolved ions in the water. Conductivity varies with temperature and is typically measured as specific conductance, which is standardized at 25°C to allow for comparisons across water of different temperatures.

Specific conductivity in Lake Lawrence remained relatively stable in the upper water column but exhibited variability at depth and between seasons (Table 4; Figure 5). Annual median surface conductivity values were similar between basins and water years (108 to 113 $\mu\text{S}/\text{cm}$). Median bottom values were higher, particularly during summer stratification (May to October), reaching 111 to 139 $\mu\text{S}/\text{cm}$ (Table 4, Table 5, and Figure 5). Conductivity in both basins was greater overall in the summer compared to fall and winter. This pattern suggests the accumulation of dissolved ions in bottom waters due to sediment release of minerals, influence from groundwater inflows, and/or limited mixing.

Conductivity patterns observed during the 2024 to 2025 monitoring period were consistent with those reported in the 1990 to 1991 study (KCM 199). Historical conductivity values ranged from 62 to 152 $\mu\text{S}/\text{cm}$, with higher values observed at depth (>80 $\mu\text{S}/\text{cm}$) and lower values at the surface (64 to 77 $\mu\text{S}/\text{cm}$).

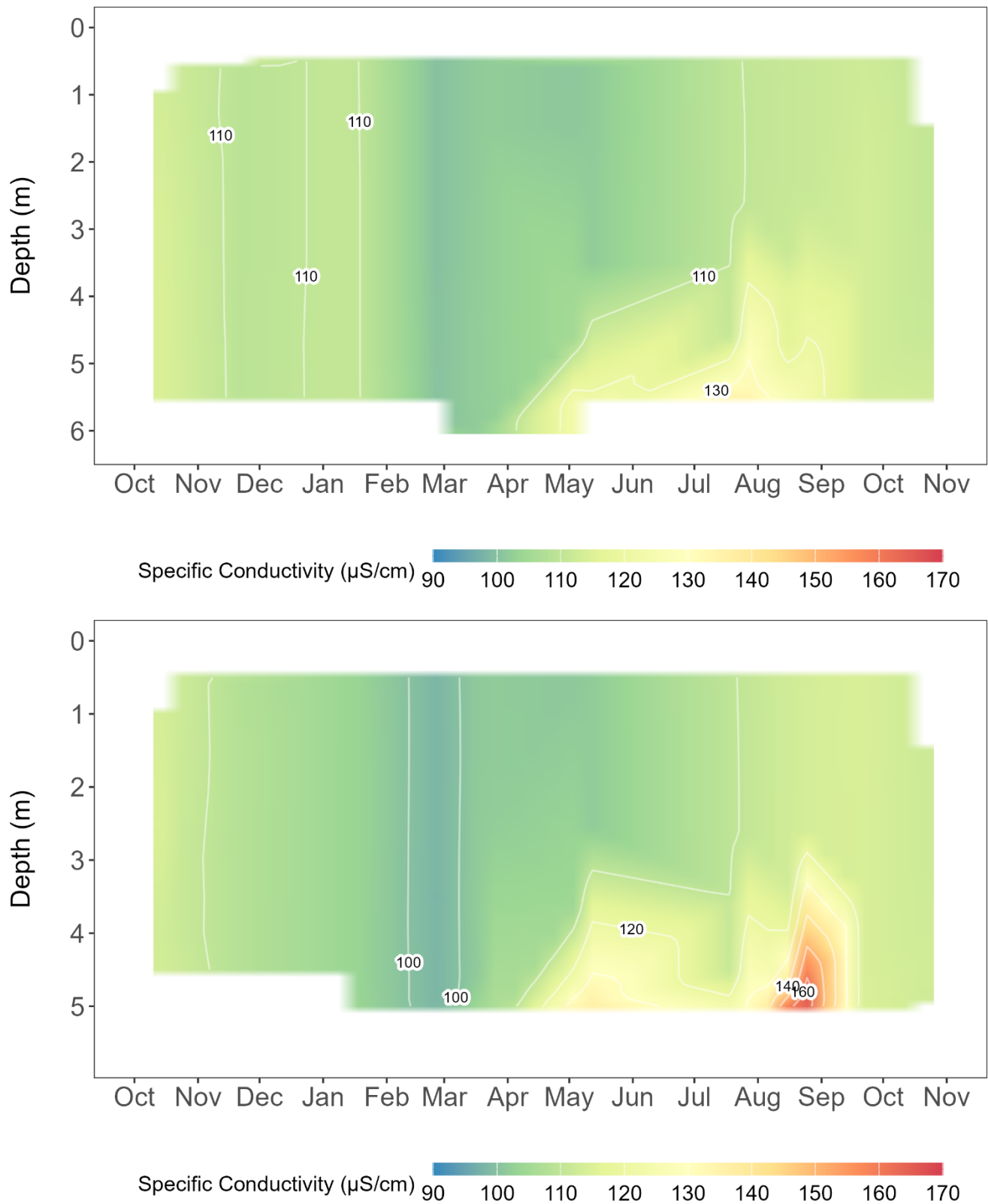


Figure 5. Conductivity Profiles in Lake Lawrence's Big Basin (top) and West Basin (bottom).

Trophic State

The Trophic State Index (TSI) is a common index of a lake's biological productivity, used to classify lakes into four trophic states based on their amount of nutrients and algae. Specifically, TSI is based on chemical and physical conditions measured in the lake surface layer and averaged over the summer months. Lake productivity is scaled between 0 and 100, as a continuum ranging from oligotrophic (e.g., low algae biomass and nutrients), to mesotrophic (e.g., moderate algae biomass and nutrients), to eutrophic (e.g., high algae biomass and nutrients), and to hypereutrophic (very high algae biomass and nutrients) (Table 8). Oligotrophic lakes (TSI <40) are very clear, with low nutrient concentrations and low algal growth. These lakes are often located in mountains or undisturbed forests. Eutrophic lakes (TSI 50-70) have cloudy water with high nutrient concentrations and high algal growth. These lakes can be naturally productive but are often highly altered and may have frequent algal blooms. Mesotrophic lakes (TSI 40-50) are in the middle, with fairly clear water and moderate nutrient concentrations and algal growth. Mesotrophic lakes are common in lowland western Washington, especially in areas with some development along the shoreline and in the watershed.

Lakes often transition between trophic states over time, depending on several factors such as human disturbance or geological origin. Eutrophication is the process of a waterbody becoming more productive due to associated increases in nutrients. This can lead to decreased water clarity, increased occurrence and/or magnitude of harmful algal blooms, and high variation in pH and/or DO, which can further impact public uses and fish and wildlife. Trophic state classifications are commonly used as a general evaluation of lake health.

Table 8. Lake Trophic State Classification System.

Trophic Class	Trophic State Index	Total Phosphorus (µg/L)	Chlorophyll-a (µg/L)	Secchi Depth (m)
Oligotrophic	< 40	< 12	< 2.6	> 4
Mesotrophic	40 to 50	12 to 24	2.6 to 7.2	2 to 4
Eutrophic	50 to 70	24 to 96	7.2 to 56	0.5 to 2
Hypereutrophic	> 70	> 96	> 56	< 0.5

Arithmetic mean values for summer months (typically June through September) in the surface layer of the lake.

Average TSI values for Lake Lawrence, based on Secchi depth, chlorophyll-a, and total phosphorus, are presented in Table 9. Among these metrics, chlorophyll-a TSI is the most direct indicator of lake productivity, while Secchi depth and total phosphorus serve as strong predictors of productivity. The 2024 and 2025 TSI values for all three parameters indicate that both basins of Lake Lawrence are eutrophic, with high nutrient levels and potential for high algal growth.

Historical TSI values from 1990 are also presented in Table 9. Secchi depth TSI values have increased since 1990 due to a long-term decline in water clarity. In contrast, chlorophyll-a and total phosphorus TSI values have decreased relative to historical conditions but remain high overall.

Table 9. Trophic State Index at Lake Lawrence.

Basin	1990s KCM Historical				2024				2025			
	Secchi TSI	Chl-a TSI	TP TSI	Trophic Class	Secchi TSI	Chl-a TSI	TP TSI	Trophic Class	Secchi TSI	Chl-a TSI	TP TSI	Trophic Class
Big	49	64	69	Eutrophic	50.8	55.0	50.8	Eutrophic	55.7	62.6	49.5	Eutrophic
West	47	66	58	Eutrophic	51.0	52.3	49.6	Eutrophic	57.0	64.7	49.7	Eutrophic
Overall	Eutrophic				Eutrophic				Eutrophic			

Summer is defined as May through October, except for:

2025 (both basins) for which chlorophyll-a and Secchi TSIs are calculated from values from May, and July through October only.

2025 (both basins) for which total phosphorus TSI is calculated from values from May, and August through October only.

Abbreviations: Chl-a = chlorophyll-a (algae biomass), TP = total phosphorus, TSI = trophic state index

Data collected by TCEH.

Historical data sourced from KCM (1991) for summer 1990.

Several physical and watershed characteristics of Lake Lawrence help explain its persistently eutrophic condition, including: (1) its classification as a seepage lake with no perennial surface-water tributaries, resulting in limited flushing and strong reliance on groundwater inputs; (2) stable seasonal stratification with recurring low dissolved oxygen in bottom waters, which promotes internal phosphorus release from sediments; and (3) nutrient loading dominated by internal sources, with smaller contributions from groundwater and overland flow. These conditions exacerbate the accumulation of nutrients over time, promoting excessive algal growth conditions.

Secchi Depth

Secchi depth is a measure of water clarity, which is primarily affected by the amount and size of algae and other suspended particles in the water and is directly related to measurements of turbidity. Secchi depth can also be affected by color in tannic waters and waves. In temperate lakes, Secchi depths often decrease (indicating reduced clarity) during spring algae blooms (frequently diatoms), increase to a summer clear water maximum, and then decrease to a minimum in September or October as increased algae growth causes a more turbid state. There are no surface water quality standards in Washington state for Secchi depth measurements.

Secchi depth measurements in Lake Lawrence showed moderate seasonal variability during the monitoring period, with similar patterns between basins (Figure 6), with annual median values ranging from 1.4 to 2.4 meters across water years (Table 4). As shown in Figure 6, the greatest clarity was observed in January 2025, during a period of lower algae productivity. After a drop in clarity in February 2025, clearer conditions were observed in March 2025 before low clarity was observed through the remainder of the study period. In summer, 2024, increased clarity was seen in mid- to late summer relative to the spring and fall.

Secchi depth during the monitoring period was similar to those observed in the 1990 to 1991 study (KCM 1991), with similar ranges in both basins (1.2 to 2.8 m). KCM (1991) suggested that during the summer,

clumped cyanobacterial colonies allowed greater visibility, while during winter, more evenly distributed algae and suspended organic material from turnover reduced clarity.

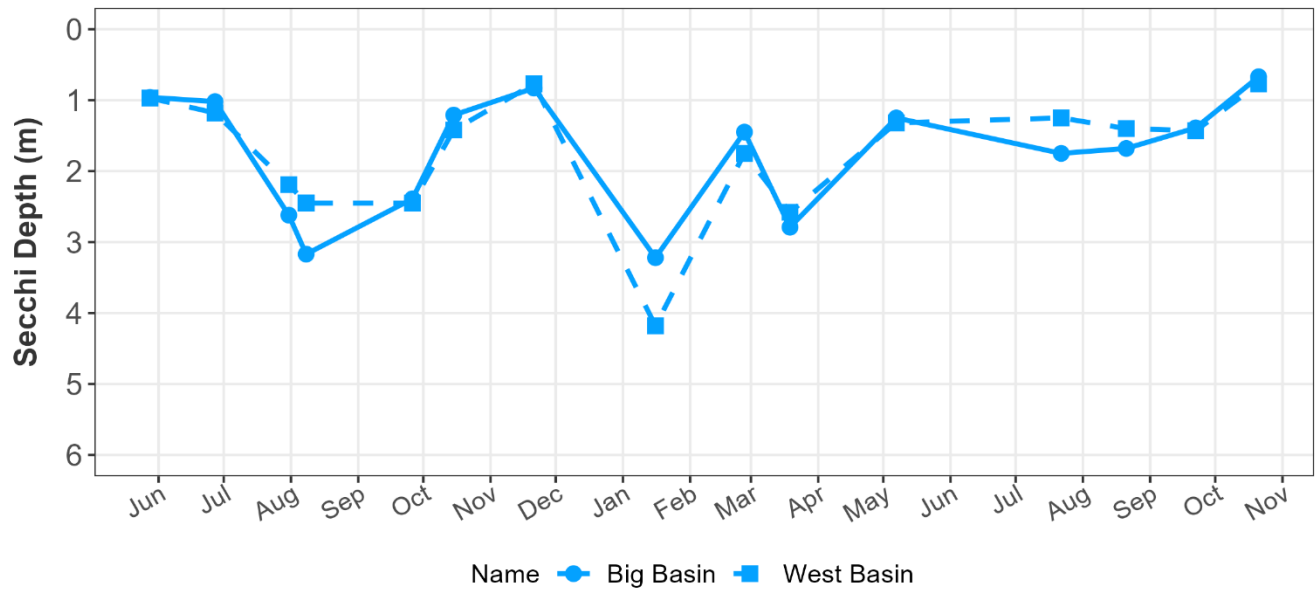


Figure 6. Secchi Depth in Lake Lawrence’s Big Basin and West Basin (June 2024–October 2025).

Chlorophyll-a

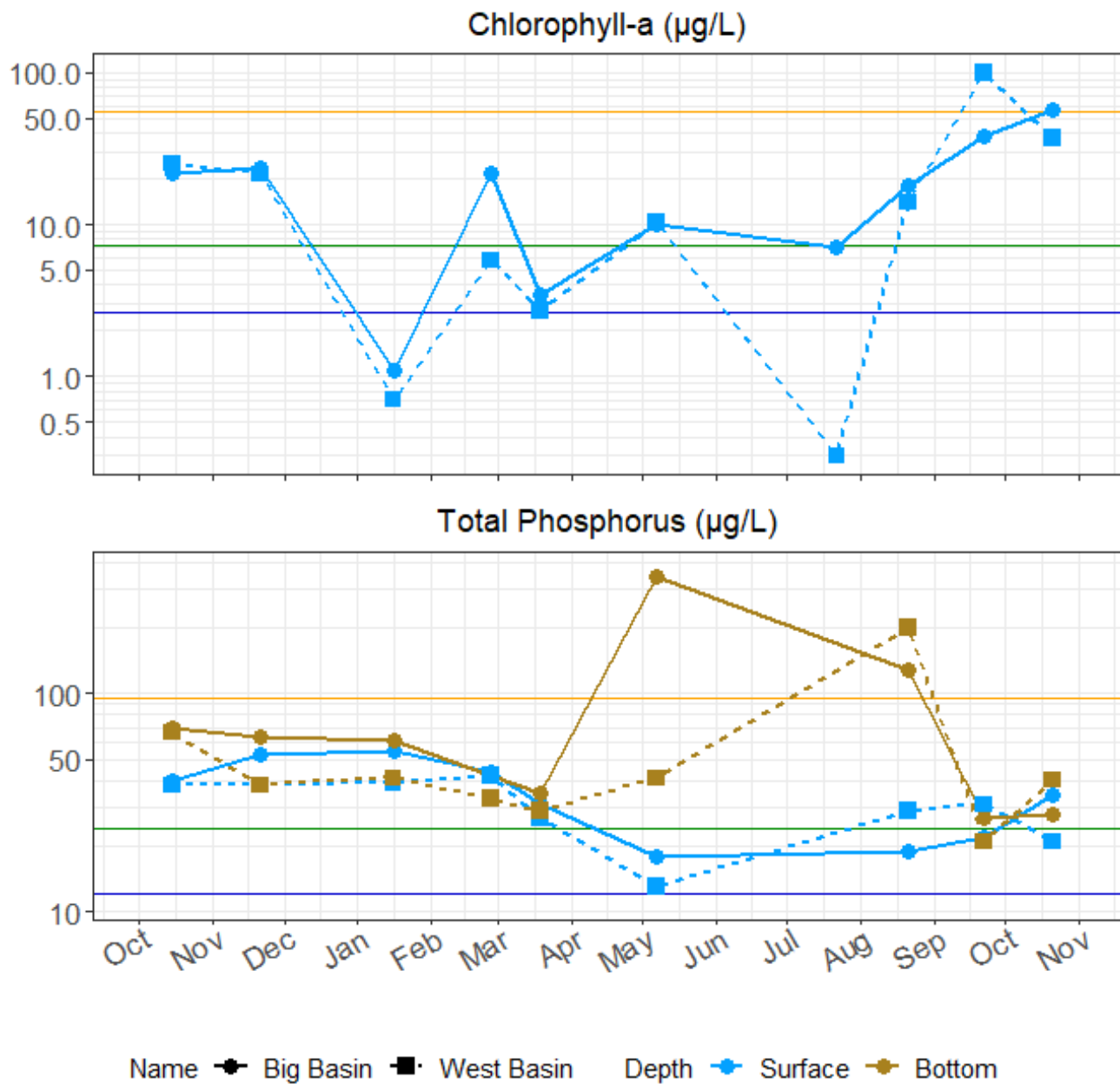
Chlorophyll-a is the primary photosynthetic pigment used by phytoplankton (algae). It is commonly used as a measure of phytoplankton biomass and is a key factor in determining a lake’s trophic state (see the *Trophic State* section below). Mesotrophic systems are characterized by average surface chlorophyll-a concentrations in the epilimnion between 2.6 and 7.2 µg/L while eutrophic systems exhibit chlorophyll-a concentrations between 7.2 and 56 µg/L. However, the amount of chlorophyll-a varies significantly among different phytoplankton species and growth stages, which means it often does not correlate well with other measures of phytoplankton biomass, such as cell biovolume. Typically, chlorophyll-a negatively correlates with Secchi depth (water clarity), unless there are large amounts of suspended inorganic particles causing turbidity in the water.

Chlorophyll-a concentrations in Lake Lawrence showed clear seasonal variability during the monitoring period (October 2024 to October 2025), with surface concentrations ranging from below detection to 100 µg/L in the West basin (Table 4; Figure 7). Annual summary statistics indicate median surface chlorophyll-a concentrations of 4.5 to 4.8 µg/L during Water Year 2024 and higher median values during Water Year 2025 (12.2 to 19.8 µg/L), indicating increased algal biomass (Table 4; Figure 7). Chlorophyll-a concentrations were generally similar between the two basins.

Seasonal patterns of chlorophyll-a are shown in Figure 7 and indicate relatively low (generally <25 µg/L, and often < 10 µg/L) chlorophyll-a concentrations during fall 2024, and winter, spring and early summer 2025. Concentrations began to increase (> 25 µg/L) in late summer (August 2025) and peaked in early

fall 2025 (Table 5). While overall concentrations were comparable between basins, the West Basin exhibited an earlier increase and peaked in September, whereas chlorophyll-a in the Big Basin peaked one month later in October. Overall, elevated chlorophyll-a in Lake Lawrence is consistent with reduced water clarity and stratified conditions, and follow trends commonly observed in other temperate lake systems, where chlorophyll-a levels are typically low in early to mid-summer ($<10 \mu\text{g/L}$) and increase later in the season, often culminating in a late summer bloom.

Chlorophyll-a patterns during the 2024 to 2025 monitoring period differed from those reported in the 1990 to 1991 study (KCM 1991) in terms of seasonal distribution and bloom dynamics. KCM (1991) documented sustained chlorophyll-a concentrations greater than $20 \mu\text{g/L}$ from mid-May through early October, indicating a prolonged period of elevated algal biomass. In contrast, chlorophyll-a concentrations during the current monitoring period remained below $25 \mu\text{g/L}$ through much of the summer, followed by a sharp increase in late summer to early fall, with concentrations peaking at approximately $100 \mu\text{g/L}$ in September to October 2025. This shift from sustained moderate concentrations to shorter-duration, higher-magnitude peaks suggests a change in bloom dynamics. The shorter stratification period observed in 2024 to 2025 may have limited early- and mid-season algal accumulation, while continued development of hypoxic conditions at depth enabled phosphorus accumulation in bottom waters. Subsequent late-season mixing or weakening stratification may have facilitated the rapid transport of nutrients to the surface, resulting in a more intense but shorter-lived bloom.



Note the y-axes are displayed at a log scale. Colored horizontal lines indicate upper trophic state boundaries for oligotrophic (dark blue), mesotrophic (green), and eutrophic (orange).

Figure 7. Total Phosphorus and Chlorophyll-a in Lake Lawrence's Big Basin and West Basin (October 2024 to October 2025).

Phosphorus

Phosphorus and nitrogen are key nutrients that influence algal growth in freshwater environments. While silica plays a crucial role for some algae groups, such as diatoms, it does not typically limit algal growth in lakes. In the Pacific Northwest, phosphorus is generally the most limiting nutrient in freshwater lakes, especially for cyanobacteria. Total phosphorus (TP) consists of both inorganic and organic forms, originating from natural sources such as decaying vegetation, wild animal waste, and sediment resuspension, as well as anthropogenic sources like wastewater treatment plants, septic system failures, animal manure storage, and fertilizer runoff. High phosphorus levels in freshwater ecosystems can accelerate plant growth and algal blooms, leading to oxygen depletion, reduced aquatic diversity, and eutrophication.

Mesotrophic systems are defined by summer average surface TP concentrations between 12 and 24 µg/L while eutrophic systems exhibit average TP concentrations between 24 and 96 µg/L. Systems with TP levels above 96 µg/L are classified as hypereutrophic. The Washington State Surface Water Quality Standards (WAC 173-201A) established an action level of >20 µg/L for summer average surface TP for lakes existing in the Coastal Range, above which an investigation of impairment is recommended.(Figure 7). Summer (May-October) median surface TP concentrations ranged from approximately 20 to 25 µg/L across basins and years (Table 5), placing Lake Lawrence near the upper end of the mesotrophic range and frequently within the eutrophic range. These values also exceed the Washington State summer action level of 20 µg/L in both basins during summer 2024 and summer 2025. Surface TP concentrations were similar between the Big Basin and West Basin.(Figure 7). Elevated bottom-water TP concentrations coincided with periods of thermal stratification and hypoxic or anoxic conditions (see *Dissolved Oxygen* section), indicating phosphorus release from sediments under low-oxygen conditions. These patterns are consistent with internal phosphorus loading from lakebed sediments.

Orthophosphate (also referred to as soluble reactive phosphorus), the most bioavailable form of phosphorus, was sampled only twice during winter 2025. Orthophosphate concentrations in these few winter samples were detectable, ranging from 6 to 15 µg/L in both basins . Phosphorus limitation is more likely to occur in the summer when temperature and light availability are more suitable for algae growth. With two samples per depth and basin, the project team cannot evaluate seasonal or spatial trends, so orthophosphate results are not interpreted further in this assessment.

Phosphorus patterns during the 2024-2025 monitoring period were similar to those reported in the 1990 to 1991 study (KCM 1991). However, the KCM study documented substantially higher maximum TP concentrations near the sediments in both basins (>500 to 1,000 µg/L). This difference may reflect a combination of factors, including interannual variability in stratification strength, potential changes in watershed inputs or land use over time, and differences in sampling design or analytical methods. For example, improvements in watershed management or reductions in external nutrient loading since the early 1990s could contribute to somewhat lower peak concentrations observed in the current dataset. Conversely, differences in sampling frequency, depth resolution, or proximity to sediments may also influence the magnitude of observed bottom-water TP concentrations. Despite these differences, both

datasets indicate that internal phosphorus loading during summer stratification is a key driver of phosphorus dynamics in Lake Lawrence.

Nitrogen

Nitrogen is a key nutrient for algae, existing in both organic (bound to organic matter) and inorganic forms (nitrate, nitrite, and ammonia). Natural sources of nitrogen include atmospheric deposition, wildlife waste, and decay of organic matter, while anthropogenic sources include fertilizers, domesticated animal waste (e.g., pets), septic systems, and combustion. Lakes typically have abundant nitrogen, in part because nitrogen gas readily dissolves into the surface waters from the atmosphere and nitrogen-fixing bacteria and some cyanobacteria species use it. Total Kjeldahl Nitrogen (TKN) measures total organic nitrogen and dissolved ammonia, and total nitrogen (TN) is the sum of TKN and nitrate+nitrite concentrations. Washington State does not have a surface water quality standard for total nitrogen (TN) or nitrate+nitrite nitrogen (N+N).

Seasonal patterns shown in Figure 10 indicate that TN and TKN concentrations in Lake Lawrence were variable throughout the monitoring period (October 2024 to October 2025), with minor reductions observed at the lake surface during summer months. TN and TKN concentrations were similar between the Big Basin and West Basin (Table 4 and Table 5; Figure 8). Annual median surface TN concentrations ranged from approximately 1.0 to 1.8 mg/L across basins and water years, with TKN accounting for the majority of the total nitrogen pool (Table 4). Bottom-water TN and TKN concentrations were generally similar to surface concentrations, with elevated values observed at depth during some periods, particularly during stratified conditions (May–October).

In contrast, N+N concentrations showed strong seasonal variability. Oxidized nitrogen concentrations were highest during the winter and early spring, reaching maximum values of 0.116 mg/L at the surface and 0.138 mg/L at the bottom in late February 2025, and declined to near or below reporting limits during late spring and summer (Table 4 and Table 5; Figure 8). This pattern is consistent with biological uptake by algae and plants during the growing season and reduced nitrification under stratified, low-oxygen conditions.

Ammonia was sampled only once during March 2025 and therefore trends cannot be evaluated. Measured ammonia concentrations were similar between basins and ranged from 0.25 to 0.30 mg/L (Table 4), which was approximately twice the N+N concentrations at that time.

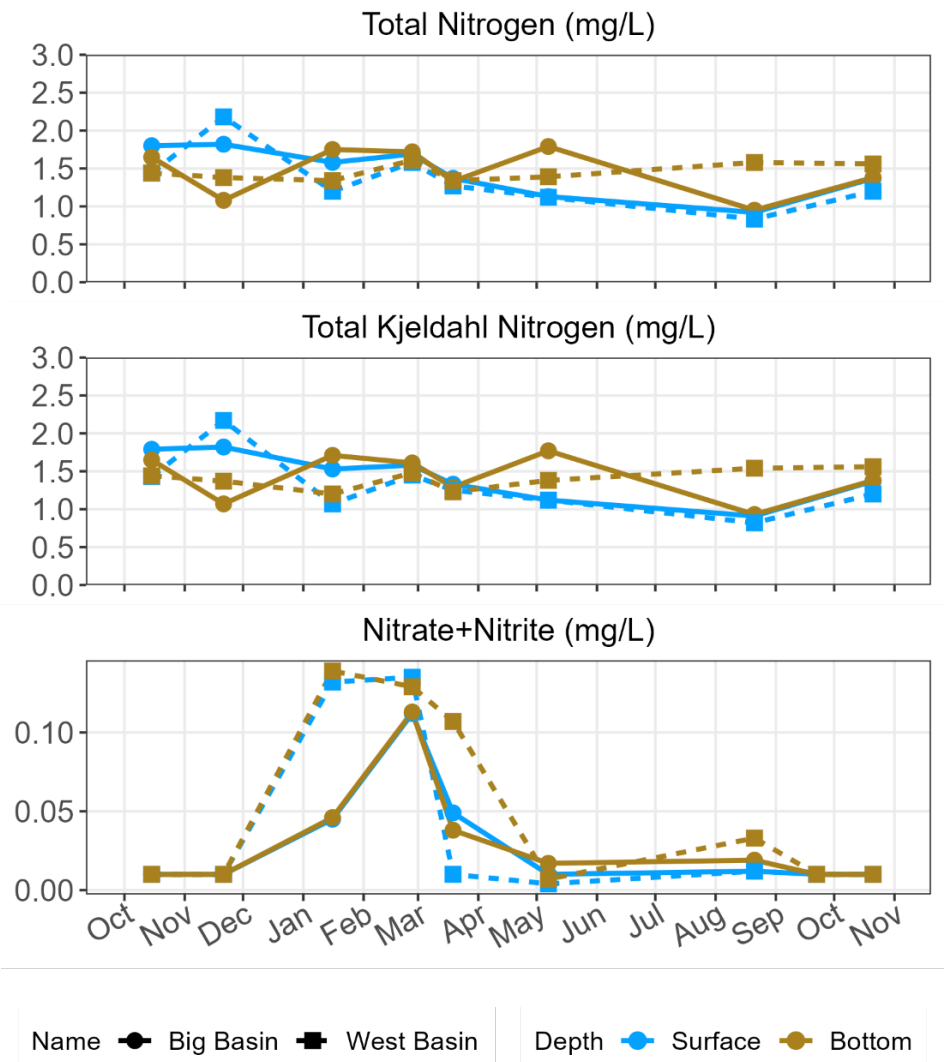
Total nitrogen concentrations observed during the 2024–2025 monitoring period were lower than those recorded during the 1990 to 1991 KCM study. KCM (1991) reported TN concentration ranging from less than 0.10 to 3.07 mg/L, with hypolimnetic concentrations frequently exceeding 1.0 mg/L near the sediment–water interface during summer stratification. During 2024–2025, TN concentrations across both basins remained relatively stable throughout the year, generally ranging between 0.5 and 2.5 mg/L at both surface and bottom depths (Figure 8). Additionally, the dramatic hypolimnetic TN accumulation documented in 1990 to 1991, which KCM (1991) suggests was largely driven by ammonia release from anoxic sediments during summer stratification, was not prominently reflected in the 2024–2025 bottom-water data, which showed only modest elevation relative to surface concentrations. Seasonal patterns in

nitrate+nitrite nitrogen were consistent between the two periods, with concentrations peaking during winter and early spring and declining sharply during the growing season due to algal uptake. The reasons for the differences in TN between periods are unclear; possible explanations include changes in sampling methodology, shifts in external nutrient loading (e.g., septic system improvements), or changes in internal nutrient cycling dynamics (e.g., shifts in algal community composition), though further investigation would be needed to evaluate any of these possibilities.

Figure 8. Nitrogen Fractions in Lake Lawrence’s Big Basin and West Basin (October 2024-October 2025).

Nitrogen: Phosphorus

The ratio of total nitrogen to total phosphorus (TN:TP) is a widely used indicator of nutrient limitation,



with weight-ratios above 22 suggesting phosphorus limitation (molar ratio >50), weight-ratios below 9 indicating nitrogen limitation (molar ratio <20), and weight-ratios between 9 and 22 representing co-limitation (Guildford and Hecky 2000). Although phosphorus is typically the primary limiting nutrient in

lakes and nitrogen is more commonly limiting in marine environments, research indicates that most lakes experience short-term (months) co-limitation by both phosphorus and nitrogen, with potential additional limitations from elements such as iron (Sterner 2008).

Figure 9 presents TN:TP ratios in Lake Lawrence by basin and sampling period from October 2024 through October 2025. Surface-water TN:TP ratios in both basins ranged from 29 to 40, indicating that Lake Lawrence is generally phosphorus-limited at the surface. Since algae generally grow at the lake surface, phosphorus availability is therefore the primary driver of algae growth. Although there was no strong seasonal trend, internal nutrient cycling is important in influencing seasonal water quality conditions and algal productivity. For instance, during algae blooms, cyanobacteria growth may sometimes be limited by the availability of light than by nutrients, particularly when the cyanobacteria species present can fix their own nitrogen (see *Toxic Algae Species* section below).

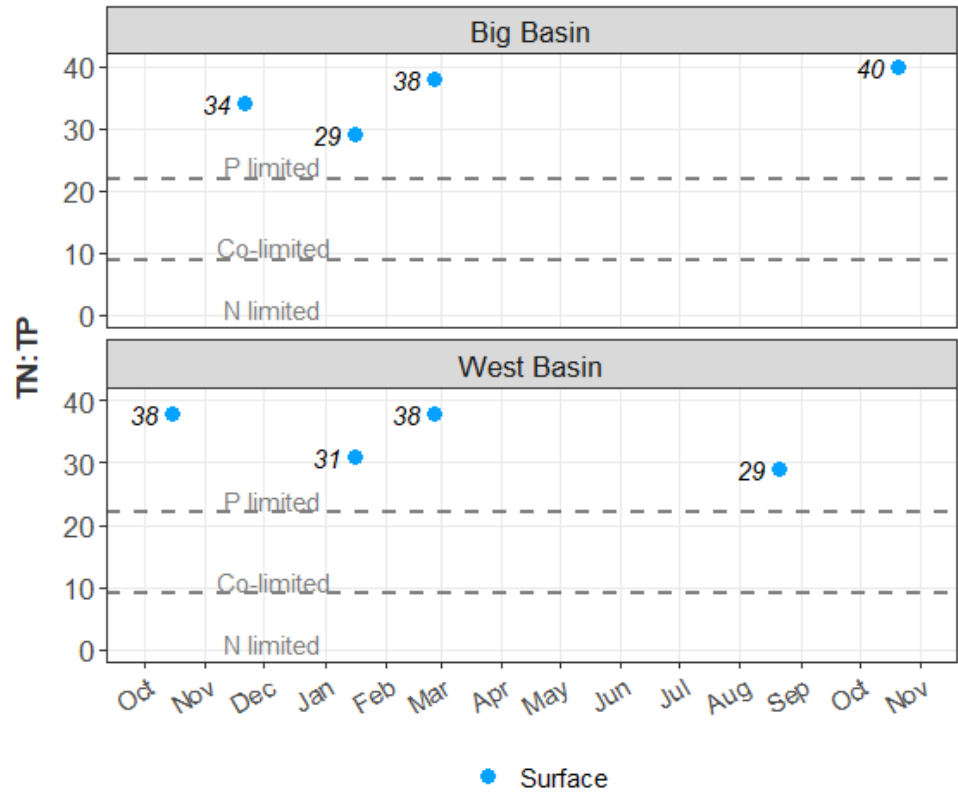


Figure 9. Total Nitrogen to Total Phosphorus in Lake Lawrence’s Big Basin and West Basin (October 2024 to October 2025).

Cyanotoxins

Cyanobacterial blooms have been observed periodically in Lake Lawrence, with surface accumulations and reduced water clarity mostly occurring during late summer and early fall. These conditions have the potential to limit recreational use and increase the risk of human exposure to cyanotoxins during peak bloom periods.

Cyanotoxin monitoring in Lake Lawrence has occurred since 2010 through the Washington State Department of Ecology's toxic algae monitoring program (Figure 10). Cyanotoxin sampling varied by year and location, and typically occurs only when a bloom is visually observed. Although the dataset does not largely include samples between blooms, it does provide a useful record of cyanotoxin occurrence and exceedances over time.

Among the four cyanotoxins analyzed, microcystin, anatoxin-a, cylindrospermopsin, and saxitoxin, microcystin is the dominant toxin of concern in Lake Lawrence. As shown in Figure 10 and summarized in Table 10, exceedances of the Washington State recreational criterion for microcystin ($>8 \mu\text{g/L}$) have occurred repeatedly since 2010. Exceedances were observed in numerous years, including 2010, 2011, 2013, and every year since 2017 (2017-2025), demonstrating that elevated microcystin concentrations are a recurring feature of the lake.

Microcystin exceedances were most frequently observed during late summer and fall, particularly from August through October, although exceedances were also documented during winter months in some years (Table 10). Concentrations varied widely, ranging from just above the state criterion (approximately 8 to 15 $\mu\text{g/L}$) to extreme bloom-related events exceeding 1,000 $\mu\text{g/L}$. The highest reported concentration occurred in October 2024 (2,360 $\mu\text{g/L}$), with additional large exceedances recorded in November 2010 (791 $\mu\text{g/L}$) and November 2024 (1,431 $\mu\text{g/L}$). Exceedances were documented at multiple locations around the lake, including the public boat launch, Lake Lawrence Community Park, and the north shore, indicating that elevated microcystin concentrations can affect broad areas of the lake during bloom events.

Anatoxin-a was detected infrequently, with most samples reported as non-detects due to low concentration results below established limits. Only a small number of samples exhibited anatoxin-a levels above detection limits and only one exceeded the state criterion ($>1 \mu\text{g/L}$) in May 2015 (Figure 10). Cylindrospermopsin was sampled the least frequently and was not detected in any collected samples. Saxitoxin was detected only occasionally at low concentrations and remained well below state recreational criteria in all samples (Figure 10).

The repeated occurrence of microcystin exceedances over more than a decade is consistent with the lake's eutrophic condition, internal phosphorus loading, and history of cyanobacterial dominance. Continued monitoring during periods of elevated algal biomass is warranted to support timely public health advisories and recreational management decisions.

Table 10. Lake Lawrence Cyanotoxin State Criteria Exceedances.

Sample Date	Location	Microcystin (µg/L)^a
10/21/2025	North shore	10.9
6/24/2025	Public boat launch	45.9
1/7/2025	Not specified	14.2
12/17/2024	Not specified	10
12/3/2024	Not specified	238
11/19/2024	Public Boat Launch	1431
11/12/2024	Public Boat Launch	20
11/5/2024	Public Boat Launch	25
10/29/2024	Public boat launch & Lake Lawrence Community Park	105
10/22/2024	Public boat launch & Lake Lawrence Community Park	2360
10/15/2024	Public Boat Launch	262
8/28/2024	Lake Lawrence Community Park	11.3
8/14/2024	Lake Lawrence Community Park	8
6/22/2023	Lake Lawrence	28.2
10/17/2022	Throughout lake	34.4
10/12/2022	WDFW boat launch	36.7
9/13/2021	Community Park	11.6
8/9/2021	Community Park	14.9
8/31/2020	Community Park	21
8/17/2020	WDFW boat launch & community park	15.5
8/10/2020	Not specified	43.5
10/14/2019	Not specified	9.72
10/9/2019	Not specified	17.7
9/25/2018	Not specified	215
9/20/2017	Not specified	8.54
10/22/2013	Not specified	80.5
2/9/2011	Not specified	18.7
1/19/2011	Not specified	29.6
11/29/2010	Not specified	40
11/3/2010	Not specified	791
10/28/2010	Not specified	70
10/19/2010	Not specified	585
10/5/2010	North shore	182

^a State criterion is 8 µg/L (changed in 2019 from 6 µg/L).



Figure 10. Annual Counts of Cyanobacterial Toxin Samples Above and Below State Recreational Criteria in Lake Lawrence.

Toxic Algae Species

Toxic algae species (cyanobacteria) were not directly sampled or enumerated for this study. However, historical phytoplankton data from the Washington State Department of Ecology and previous limnological investigations conducted by KCM (1990 to 1991) provide insight into cyanobacteria community composition and bloom dynamics in Lake Lawrence.

The 1990 to 1991 study (KCM 1991) characterized Lake Lawrence as eutrophic and documented a phytoplankton community frequently dominated by toxic algae. *Oscillatoria* was identified as abundant and persistent in Lake Lawrence relative to other western Washington lakes. Nitrogen-fixing genera, including *Dolichospermum* (formerly *Anabaena*) and *Aphanizomenon*, were also present.

Ecology's historical phytoplankton records (Ecology 2026) similarly suggest a persistent and diverse cyanobacterial community in Lake Lawrence. The genera most frequently reported and/or identified as dominant include *Planktothrix*, *Oscillatoria*, *Dolichospermum*, *Gloeotrichia*, and *Lyngbya*. Among these, *Planktothrix* and *Oscillatoria* were repeatedly identified as dominant taxa during multiple sampling events, while *Dolichospermum* was frequently present and occasionally subdominant. *Microcystis* and *Cuspidothrix* are also present but not consistently dominant.

Several of these frequently observed taxa are well-documented toxin producers. *Planktothrix*, *Oscillatoria*, *Gloeotrichia*, *Microcystis*, and *Dolichospermum* can produce microcystin, while *Dolichospermum*, *Aphanizomenon*, and *Cuspidothrix* that may produce anatoxin-a. Together these records indicate that Lake Lawrence supports a seasonally responsive cyanobacterial community dominated by filamentous, bloom-forming genera well adapted to stratified, nutrient-rich systems with strong internal phosphorus cycling. These long-standing ecological characteristics help explain the repeated occurrence of harmful algal blooms and cyanotoxin exceedances observed in the lake.

Available historical phytoplankton and cyanotoxin data do not indicate consistent differences in toxin-producing cyanobacteria community composition between the Big and West basins. Both basins support similar bloom-forming genera and experience episodic toxin exceedances. While minor differences in stratification dynamics and bottom-water nutrient concentrations may influence the timing or intensity of blooms between basins, available data are insufficient to conclude that the basins function differently with respect to harmful algal bloom development.

Lake Sediment Quality

To inform the LCMP, sediment cores were collected from the bottom of Lake Lawrence at two deep locations (LAL020 in the east basin and LAL030 in the west basin) and two shallow locations (LAW-E1 and LAW-E2 in the east basin) (Figure 1). Each core was processed into five depth intervals and analyzed separately for phosphorus fractions, total iron, and percent solids (Table 11). This information was used to estimate internal phosphorus loading from sediment release into the deep waters under anoxic conditions and to estimate the amount of sequestration chemical (e.g., aluminum or lanthanum) that would be needed to inactivate the forms of phosphorus available for algae uptake.

The total solids content was low (<5 percent) in nearly all cores, especially at the sediment surface but increased with depth. The only exception is the shallow core LAW-E2, collected near the Community Club in the East basin, which had elevated solids at the surface (>16 percent) and varied lower in the core column (between 6.8 and 12.3 percent); this may be due to the presence of macrophytes (see Figure 11).



Figure 11. LAW-E2 Sediment Core Surface and LAL020 Surface Sediment.

LAW-E2 Sediment Core surface shows macrophyte detritus (0-2 cm; top left) with root material at 2-4 cm (top right), reaching 12-16 cm (bottom left). LAL020 surface sediment shown for comparison (bottom right).

Iron concentrations ranged from 4,350 to 18,600 mg/kg and was generally greater in the deep cores. Iron-bound phosphorus concentrations were generally moderate (<40 mg/kg) to low throughout the shallow station cores. In the deep station cores, however, iron-bound phosphorus was elevated, reaching 547 mg/kg and 187 mg/kg near the surface of the East and West deep cores, respectively, declining with depth to 86 and 89 mg/kg, respectively. The iron to phosphorus (Fe:P) ratios were moderate in the East

basin deep core, ranging from 7.3 to 17.8, generally low in the shallow 1 station sediment core (3.1 to 10.2), and high in both the shallow 2 station and West deep cores, (9.6 to 34 and 14.6 to 26, respectively). A total Fe:P ratio of 10 is believed to be the minimum for iron to regulate sediment phosphorus release (Caraco et al. 1993). If the sediment surface has oxygen and the Fe:P ratio is 15 or greater, then it is believed that internal loading may be altogether prevented (Jensen et al. 1992). A Fe:P ratio greater than 10 and moderate to high iron-bound phosphorus in the upper 10 cm of the deep station cores indicate that iron is regulating phosphorus release into hypolimnion of the lake while the sediments are oxygenated to some degree. On the other hand, low Fe:P and reduced iron-bound phosphorus at the LAW-E1 station indicates iron cannot regulate phosphorus release here, even when oxygenated.

Other sediment phosphorus release mechanisms can include resuspension from wave action, bioturbation by benthic invertebrates and fish, decay of aquatic plants, decay of organic matter in sediments by bacteria, acceleration of organic phosphorus release by elevated temperatures, and acceleration of iron phosphorus release by high pH during algae blooms (Sondergaard et al. 2003). The complex mechanisms of internal phosphorus loading and how they vary with sediment and other lake characteristics is not well understood.

Total phosphorus levels varied between the cores. The East basin deep core (LAL020) and LAW-E1 core both exhibited high concentrations of total phosphorus (1,273 and 1,115 mg/kg on average, respectively) and average aluminum-bound phosphorus (305 and 190 mg/kg), compared to the West basin deep core and LAW-E2 shallow core average total phosphorus (675 and 437 mg/kg) and aluminum-bound phosphorus (192 and 82 mg/kg). In all, the stable aluminum-bound phosphorus typically made up about 20 percent of total phosphorus in deep cores and 3 percent in shallow areas, whereas calcium-bound phosphorus varied greatly between cores and depth intervals, ranging from 4 to 36 percent of total phosphorus. Calcium-bound phosphorus is sensitive to pH, with release under acidic (<6) conditions. Organic phosphorus was the most substantial component, comprising 30 to 84 percent of total phosphorus, and was shown to be mostly biogenic in the shallow cores (50 and 26 percent on average), which generally represents dead algae and other organic matter grown in the lake that decays more rapidly than other forms of organic phosphorus. The deep station cores, however, exhibited substantially less biogenic phosphorus (11 and 4 percent on average), indicating the deep station organic phosphorus is mostly non-biogenic and generally originated from the watershed, accumulating over time.

Loosely bound phosphorus (orthophosphate) was below detection in all samples, which is not uncommon in lake sediments because it readily diffuses into the water, but it also may have been due to binding of orthophosphate to iron when samples became oxidized during sample transportation and holding, prior to analysis.

Concentrations of sediment phosphorus fractions available for release are summarized in Table 12. Results are summarized for the top 10 cm depth intervals because this is the zone where the most biological activity and chemical diffusion into the water is occurring and is used as the appropriate target for phosphorus inactivation. Active phosphorus consists of chemically mobile phosphorus (sum of loosely- and iron-bound phosphorus) and biogenic phosphorus (readily degradable organic phosphorus). Active phosphorus represented approximately 26 to 60 percent of the total phosphorus in the biologically active sediment zone.

Table 11. Lake Lawrence Sediment Chemistry (9/25/2024).

Core Sample Site	Depth Interval (cm)	Loosely Bound P (mg/kg-DW)	Iron Bound P (mg/kg-DW)	Aluminum Bound P (mg/kg-DW)	Calcium Bound P (mg/kg-DW)	Biogenic ^a P (mg/kg-DW)	Organic P (mg/kg-DW)	Total P (mg/kg-DW)	Total Fe (mg/kg-DW)	Percent Solids	Percent Organic P	Fe:TP Ratio
LAL030 (deep, West)	0-2	<2	137	166	56.2	21.3	317	676	17,600	3.5%	47%	26.0
	4-6	<2	187	211	104	11.1	287	789	18,600	4.2%	36%	23.6
	8-10	<2	78.2	156	38.0	6.86	436	708	13,700	5.0%	62%	19.4
	12-16	<2	78.4	209	79.7	22.1	219	586	10,900	5.5%	37%	18.6
	20-26	<2	89.4	218	72.3	76.6	234	614	8,960	7.5%	38%	14.6
LAL020 (deep, East)	0-2	<2	467	345	105	29.2	476	1393	14,900	3.5%	34%	10.7
	4-6	<2	547	383	211	311	773	1914	15,800	4.5%	40%	8.3
	8-10	<2	436	229	106	24.2	394	1165	14,500	5.0%	34%	12.4
	12-16	<2	165	341	88.3	371	729	1323	9,610	5.5%	55%	7.3
	20-26	<2	86.3	230	78.0	29.3	173	568	10,100	7.6%	30%	17.8
LAW-E1 (shallow, East)	0-2	<2	36.5	322	70.4	528	973	1402	4,350	3.1%	69%	3.1
	4-6	<2	6.33	142	60.0	906	1103	1312	5,810	3.3%	84%	4.4
	8-10	<2	35.3	243	56.2	1032	1218	1552	5,570	4.2%	78%	3.6
	12-16	<2	39.3	147	65.6	138	295	547	5,470	4.6%	54%	10.0
	20-26	<2	29.9	101	62.3	420	569	762	5,590	5.5%	75%	7.3
LAW-E2 (shallow, East)	0-2	<2	22.9	66.7	94.1	92.2	195	378	9,910	16.4%	51%	26.2
	4-6	<2	37.9	103	120	348	473	734	7,090	10.8%	64%	9.7
	8-10	<2	11.3	113.8	111	54.6	194	430	8,840	6.8%	45%	20.5
	12-16	<2	3.26	61.6	112	137	210	387	9,230	7.6%	54%	23.9
	20-26	<2	3.65	68.3	91.9	23.9	92.9	257	8,680	12.3%	36%	33.8

^a Biogenic P is a fraction of the organic P not included in the calculation of total P.

cm = centimeters

Fe = iron

mg/kg-DW = milligrams per kilogram of dry weight

P = phosphorus

Table 12. Depth Interval Summarized Sediment Phosphorus Fractions.

Basin	Core	Depth Interval (cm)	Mobile P (mg/kg)		Biogenic P (mg/kg)		Active P (mg/kg)		Total P (mg/kg)		% Active P (DW)
			DW	WW	DW	WW	DW	WW	DW	WW	
Big	Deep (LAL020)	0-10	483	21	122	5	605	26	1,491	65	41%
		12-26	126	8	200	11	326	19	945	58	34%
	Shallow 1 (LAW-E1)	0-10	26	1	822	30	848	31	1,422	51	60%
		12-26	35	2	279	15	314	17	655	34	48%
	Shallow 2 (LAW-E2)	0-10	24	3	165	19	189	22	514	57	37%
		12-26	3	0	80	7	84	7	322	31	26%
	Average	0-10	178	8	369	18	547	26	1,142	57	46%
West	Deep (LAL030)	0-10	134	5	13	1	147	6	724	31	20%
		12-26	84	6	49	4	133	9	600	39	23%

Mobile P = Labile P + Iron P

Active P = Mobile P + Biogenic P

DW = dry weight

WW = wet weight

Observations

Planned field observations were intended to document general site conditions during each monitoring event, including weather, recreational use, wildlife presence, and qualitative descriptions of water appearance (e.g., color, surface conditions). However, aside from measurements associated with water column profile data, no field observations (e.g., surface conditions, recreational activity, and wildlife presence) from lake monitoring events were provided by Thurston County staff for evaluation in this report. Instead, the lake condition observations from aquatic plant survey events by LMD volunteers are summarized below in Table 13, including Canada goose counts. Around 40 to 50 resident geese were estimated to live at Lake Lawrence in 2025 (Barry Halverson, pers. comm.).

Other waterfowl were observed but not explicitly counted including between 70 and 80 cormorants which visit Lake Lawrence between mid-November and March each year, plus long visits from American coots and a variety of other waterfowl (Barry Halverson, pers. comm.). Other waterfowl likely include various species of dabbling and diving ducks, teals, gulls, and herons. A higher resolution dataset of more waterfowl species would be necessary to understand the full extent of bird populations and their potential impacts on phosphorus cycling in Lake Lawrence (e.g., P removal through fish predation, P inputs via waste).

Table 13. 2025 Lake Lawrence Survey Observations by LMD Volunteers.

Date	Vessels	Swimmers	Shoreline Anglers	Geese	Ducks	Gulls	Cormorants	Other Birds	Water Color & Algae
April 19	NC	NC	NC	NC	NC	NC	NC	NC	NC
May 13	NC	NC	NC	12 adults; 12 goslings	NC	NC	NC	NC	NC
June 10	NC	NC	NC	21 to 39	NC	NC	NC	NC	NC
July 8	NC	NC	NC	32	NC	NC	NC	NC	NC
August 19	NC	NC	NC	158	NC	NC	NC	NC	Toxic algae present along shoreline to 200 feet into lake along north and east shorelines.

NC = not calculated or recorded

Watershed Monitoring Results

Lake inlet and outlet monitoring was conducted at five stations within the Lake Lawrence watershed, described in Table 3 and displayed in Figure 1. The goal was to characterize inflows to the lake during wet-weather conditions, and to characterize the relationship between lake level and outlet discharge. In addition to the discharge, four inflowing stations were sampled for supplemental water quality parameters, including temperature, specific conductivity, dissolved oxygen, pH, and total phosphorus.

Four wet-weather monitoring events were planned, however only two events (February and April 2025) were successfully completed. High infiltration rates within the watershed limited surface runoff during storm events, resulting in generally low surface water flows. As a result, monitoring was only performed at stations where sufficient flow was present to allow sampling. Summary statistics for discharge and associated water quality parameters are presented in Table 14, with results discussed below.

Table 14. Lake Lawrence Watershed Monitoring Wet Weather Summary Statistics.

Station	Date	Temperature (°C)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH (units)	Discharge (cfs)	Total Phosphorus (µg/L)
SS1	2025-02-25	5.8	9.5	118.4	7.5	-	549 <i>R</i>
	2025-04-08	-	-	-	-	-	-
	Average	-	-	-	-	-	-
SS2	2025-02-25	4.9	10.9	130.1	7.2	-	155
	2025-04-08	9.6	8.1	93.0	6.6	-	102
	Average	7.3	9.5	111.6	6.9	-	129
SS3	2025-02-25	6.2	10.7	51.6	6.9	0.06	147
	2025-04-08	10.0	10.2	123.7	7.0	0.02	235
	Average	8.1	10.4	87.7	6.9	0.04	191
DITCH-IN	2025-02-25	6.4	10.1	60.9	6.5	-	19
	2025-04-08	10.3	7.6	57.3	6.7	-	44
	Average	8.4	8.9	59.1	6.6	-	32
LAW-OUT	2025-02-25	-	-	-	-	-	-
	2025-04-08	-	-	-	-	1.18	-
	Average	-	-	-	-	-	-
All Sites	Average	7.6	9.6	90.7	6.9	0.42	179

°C = degrees Celsius mg/L = milligrams per liter µg/L = micrograms per liter

The TP result for the SS1 February 2025 sample was rejected (R) due to lack of flow conditions and the high likelihood that bottom sediments were inadvertently collected during sampling.

^a arithmetic mean calculated for all parameters.

Water Quality

Wet-weather water quality monitoring was conducted at four watershed stations (SS1, SS2, SS3, and DITCH-IN; Table 14). Only two wet-weather events were captured during the monitoring period, both occurring in late winter and early spring (February and April 2025). Additional wet-weather events were planned for the fall to better characterize seasonal variability in watershed inputs; however, sufficient flow conditions were not present to allow sampling. As a result, the summarized data reflect cool-season conditions and may not fully represent phosphorus concentrations or water quality characteristics during the warmer seasons or when the water table around the lake is elevated.

Water temperatures during the monitoring events ranged from 4.9°C to 10.3°C (Table 14). The lowest temperature was recorded at SS2 in February, while the highest occurred at DITCH-IN in April, reflecting expected seasonal warming between the two sampling events. Average temperature across stations ranged from 7.3°C to 8.4°C, with an overall mean of 7.6°C.

Dissolved oxygen concentrations were consistently elevated, ranging from 7.6 to 10.9 mg/L, with an overall mean of 9.6 mg/L. The highest DO concentration was observed at SS2 in February, while the lowest was measured at DITCH-IN in April. These results indicate well-oxygenated conditions of cool-season runoff. No hypoxic conditions were observed at any station during the monitored events.

Measured pH values ranged from 6.5 to 7.5 standard units, with station averages between 6.6 and 6.9 and an overall mean of 6.9. Variability among the stations was minimal, and pH conditions were generally neutral to slightly acidic. Specific conductivity ranged from 51.6 to 130.1 $\mu\text{S}/\text{cm}$. SS2 exhibited the highest average conductivity (111.6 $\mu\text{S}/\text{cm}$), while DITCH-IN exhibited the lowest (59.1 $\mu\text{S}/\text{cm}$). The overall mean conductivity across sites was 90.7 $\mu\text{S}/\text{cm}$. Differences among stations likely reflect varying degrees of groundwater influence, soil composition, and localized land use within contributing areas. Generally, the results suggest that the sampled water was indicative of surface runoff, rather than surfacing groundwater.

Total phosphorus concentrations varied among stations and sampling events. Excluding the rejected SS1 February 2025 sample (549 $\mu\text{g}/\text{L}$), which was invalidated due to probably entrainment of sediments under low-flow conditions, TP concentrations ranged from 19 to 235 $\mu\text{g}/\text{L}$. The highest TP concentration (235 $\mu\text{g}/\text{L}$) was measured at SS3 in April, while the lowest (19 $\mu\text{g}/\text{L}$) was observed at DITCH-IN in February. Average TP concentrations were 129 $\mu\text{g}/\text{L}$ at SS2, 191 $\mu\text{g}/\text{L}$ at SS3, and 32 $\mu\text{g}/\text{L}$ at DITCH-IN, with an overall mean of 179 $\mu\text{g}/\text{L}$ across sites. Differences in TP concentrations among stations are consistent with surrounding land use patterns. SS1, SS2, and SS3 drain more developed residential areas characterized by low-to medium intensity development, roadways and associated impervious surfaces, which may contribute elevated phosphorus concentrations through lawn fertilizer runoff, septic system leachate, and roadway drainage. In contrast, DITCH-IN drains predominantly forested and wetland areas along the southern shoreline, where vegetative cover and wetland processes can promote nutrient retention and result in lower observed TP concentration.

Although Washington State does not have a surface water quality standard for total phosphorus in streams, the concentrations observed at SS2 and SS3 are elevated relative to typical background surface-

water conditions and indicate that stormwater inflows could contain measurable phosphorus. However, given the limited surface runoff observed during monitoring and the seepage dominated hydrology of Lake Lawrence, watershed derived phosphorus inputs during these events are likely small relative to internal nutrient cycling within the lake.

Discharge

Discharge ('flow') is a measure of water volume flowing through an inlet, as calculated from water depth and velocity. Discharge volume is a function of several other factors, including rain intensity, total precipitation, local geologies, land cover and impervious surface, channel morphology and substrate, biological interference (e.g., plants or wildlife), and size of the contributing area. Measurements of discharge volume are key to calculating pollutant loading from basins and inlets to other surface water bodies and understanding relative impacts.

Discharge measurements were attempted during multiple wet-weather events; however, measurable flow was limited due to the highly permeable soils and seepage-dominated hydrology of the Lake Lawrence watershed. Of the five monitored stations (SS1, SS2, SS3, DITCH-IN, and LAW-OUT), only SS3 and LAW-OUT recorded measurable discharge during the February and April 2025 monitoring events (Table 14). SS1, SS2, and DITCH-IN were either dry or exhibited insufficient flow to allow reliable discharge measurement.

Measured discharge at SS3 ranged from 0.02 to 0.06 cfs, with an average of 0.04 cfs. At LAW-OUT, discharge was recorded only during the April 2025 event at 1.18 cfs. These values indicate very limited surface-water inflow during the monitored storm events. The low discharge observed across watershed stations is consistent with regional geology characterized by highly permeable soils, which promote infiltration and groundwater transport rather than sustained surface runoff.

Because only two wet-weather events were successfully monitored, both occurring during late winter and early spring, the discharge data reflect cool-season conditions and may not represent variability during fall storm events. However, the consistently low measured flows support the conclusion that surface inflows to Lake Lawrence are minimal under most storm conditions and that groundwater and internal lake processes likely dominate hydrological and nutrient dynamics.

Highlighted Data Gaps

This section summarizes the data gaps identified in the characterization of water quality in Lake Lawrence. Collecting data to fill these gaps should be considered to inform continuing adaptive lake cyanobacteria management. Key data gaps include:

- Comprehensive and consistent lake water quality data (including chemistry, biology, and physical data). Specifically:
 - Monthly surface sampling from early summer through fall for orthophosphate, total nitrogen, ammonia nitrogen, and nitrate + nitrite.
 - Regular taxonomic identification of biovolume analysis of phytoplankton and zooplankton.
- Comprehensive and consistent inlet and outlet water quality and flow monitoring (including chemistry and physical data). Specifically:
 - A minimum of six sampling events per year at representative inlet and outlet locations to measure pH, conductivity, temperature, dissolved oxygen, and total phosphorus.
 - Analysis of orthophosphate, total phosphorus, nitrate + nitrite nitrogen, and total nitrogen fractions in the inlet samples.
 - Year-round monthly discharge and/or continuous flow measurements.
 - Discharge and water level monitoring at the outlet to develop and calibrate a discharge rating curve with water levels.
- Enhanced cyanotoxin monitoring and analysis. Specifically:
 - Regular cyanotoxin analysis throughout the year, unrestricted to reported scum or bloom samples, to understand patterns between and leading up to potential blooms.
 - Occasional observation and sampling for benthic cyanobacteria species.
 - Long-term comparative analysis of cyanotoxin concentrations and cyanobacteria compositions.
- If exploring use of zero valent iron as a sediment phosphorus sequestration product, sulfur levels in the sediment.
- Groundwater sampling for flow and nutrient characterization.
- Quantification of annual phosphorus contributions from waterfowl and decaying aquatic plants.

Water Quality Summary and Interpretation

Monitoring conducted from fall 2024 through fall 2025 confirms that Lake Lawrence remains eutrophic and continues to experience seasonal nutrient enrichment and conditions favorable for cyanobacterial bloom development. TSI values calculated from Secchi depth, chlorophyll-a, and TP classify both the Big and West Basins as eutrophic in 2024 and 2025, consistent with historical conditions documented in 1990. Although some nutrient indicators have improved relative to the early 1990s, water clarity has declined, and seasonal algal biomass remains elevated.

Algal biomass, as measured by chlorophyll-a, increased markedly during summer and early fall, with concentrations reaching approximately 100 µg/L in 2025. Summer median chlorophyll-a concentrations in 2025 were higher than in 2024 in both basins, corresponding with reduced Secchi depths (generally 1 to 2 m during summer months; Table 5). These patterns indicate strong seasonal productivity and support observations of late-season bloom development.

Thermal stratification developed in late spring and persisted through summer in both basins, with surface temperatures reaching 24.9°C and cooler bottom waters remaining isolated below 4-5 meters. Dissolved oxygen conditions mirrored this stratification pattern. During summer, bottom waters frequently became hypoxic to anoxic (< 2-4 mg/L), while surface waters remained well oxygenated. These low-oxygen conditions at depth promote the release of phosphorus from sediments, reinforcing internal nutrient loading and sustaining bloom potential later in the season. Fall turnover restored oxygen throughout the water column, resetting conditions prior to winter.

Total phosphorus concentrations further support the lake's eutrophic classification. Summer median surface TP ranged from 20 to 25 µg/L, exceeding Washington State's 20 µg/L action level. Bottom-water TP was substantially higher, with summer medians between 78 and 114 µg/L and maximum values exceeding 300 µg/L. Elevated hypolimnetic phosphorus coincided with low dissolved oxygen, consistent with internal loading processes previously documented by KCM (1991), which estimated that approximately 83 percent of phosphorus inputs originate from internal sources. The 2024-2025 monitoring results suggest that internal loading remains a dominant driver of nutrient dynamics in Lake Lawrence.

Nitrogen concentrations were relatively stable across seasons, with total nitrogen generally between 1.0 and 1.8 mg/L. In contrast, nitrate+nitrite concentrations were highest during winter and early spring and declined to near detection limits during summer, reflecting biological uptake and stratification-driven changes in nitrogen cycling. Surface water TN:TP ratios exceeded 22, indicating phosphorus limitation in the epilimnion for most of the monitoring period.. These nutrient dynamics likely contribute to late-season bloom development, particularly by cyanobacteria taxa capable of atmospheric nitrogen fixation and vertical migration (e.g., to phosphorus-rich bottom waters).

Cyanotoxin monitoring since 2010 demonstrates that microcystin remains the primary toxin of concern in Lake Lawrence. Exceedances of Washington State’s recreational guideline for microcystin (8 µg/L) have occurred repeatedly over the past decade, including extreme events in 2024 when concentrations reached 2,360 µg/L. Exceedances are most common during late summer and fall, corresponding with peak stratification and elevated chlorophyll-a. Historical phytoplankton data indicated recurrent dominance of filamentous, bloom-forming cyanobacteria including *Planktothrix*, *Oscillatoria*, and *Dolichospermum*, taxa well adapted to nutrient rich, stratified systems and capable of producing toxins.

These findings depict a seasonally stratified seepage lake in which internal phosphorus cycling plays a central role in sustaining eutrophic conditions and recurring cyanobacterial blooms. Limited flushing, persistent summer stratification, and hypolimnetic oxygen depletion create conditions that favor sediment phosphorus release and late-season bloom amplification. While watershed inputs may contribute nutrients episodically, internal loading appears to dominate annual nutrient dynamics. Effective algae management will require targeted nutrient inactivation and water quality improvement strategies to prevent cyanobacteria advantages, and sustained monitoring of water chemistry, cyanotoxins, and algal composition to safeguard ecosystem and public health.

Lake Lawrence Hydrologic Budget

Development

A lake's hydrologic budget refers to the quantification and analysis of the various inflows, outflows, and storage changes that contribute to the overall water balance of the lake over a defined period, typically annually. This concept is vital for understanding the hydrological dynamics and sustainability of a lake ecosystem. A comprehensive description of a lake's water budget involves the following components:

- **Precipitation (P):** Precipitation represents the input of water onto the lake surface in the form of direct rain and snowfall.
- **Evaporation (E):** Evaporation refers to the loss of water from the lake surface due to the conversion of liquid water to water vapor, which is driven by solar radiation and atmospheric conditions. Evaporation rates vary based on factors such as air temperature, humidity, wind speed, and lake surface area.
- **Runoff (R):** Runoff includes all surface water inflows to the lake from its watershed. Runoff can result from rainwater and snowmelt onto watershed lands beyond the limits of the lake, and it carries nutrients, sediments, and pollutants into the lake. In Lake Lawrence, Runoff consists of stormwater discharges from outfalls and other areas around the lake. There is no permanent surface inflow into Lake Lawrence.
- **Groundwater Inflow (GW_{In}):** Groundwater inflow represents the subsurface flow of water from aquifers into the lake. This contribution can significantly influence the lake's water budget, particularly in regions with permeable soils and high groundwater recharge.
- **Groundwater Outflow (GW_{Out}):** Groundwater outflow represents the subsurface flow of water from lake into aquifers.
- **Outflow (O):** Outflow consists of water leaving the lake via surface water. Lake Lawrence's outflow is an outlet weir. The outlet ditch is approximately 1.2 km and ultimately discharges to the Deschutes River.
- **Change in Storage (ΔS):** This component accounts for the change in the lake's water volume stored over the defined time period. Positive values indicate an increase in storage (lake level rise), while negative values signify a decrease (lake level decline).

The water budget equation can be expressed as the difference between inflows and outflows:

$$\Delta S = P + R + GW_{In} - (O + E + GW_{Out})$$

Because of the difficulty in measuring groundwater flows, the groundwater component is often expressed as the net (GW_{Net}), calculated as the difference between inflows and outflows plus the change in storage:

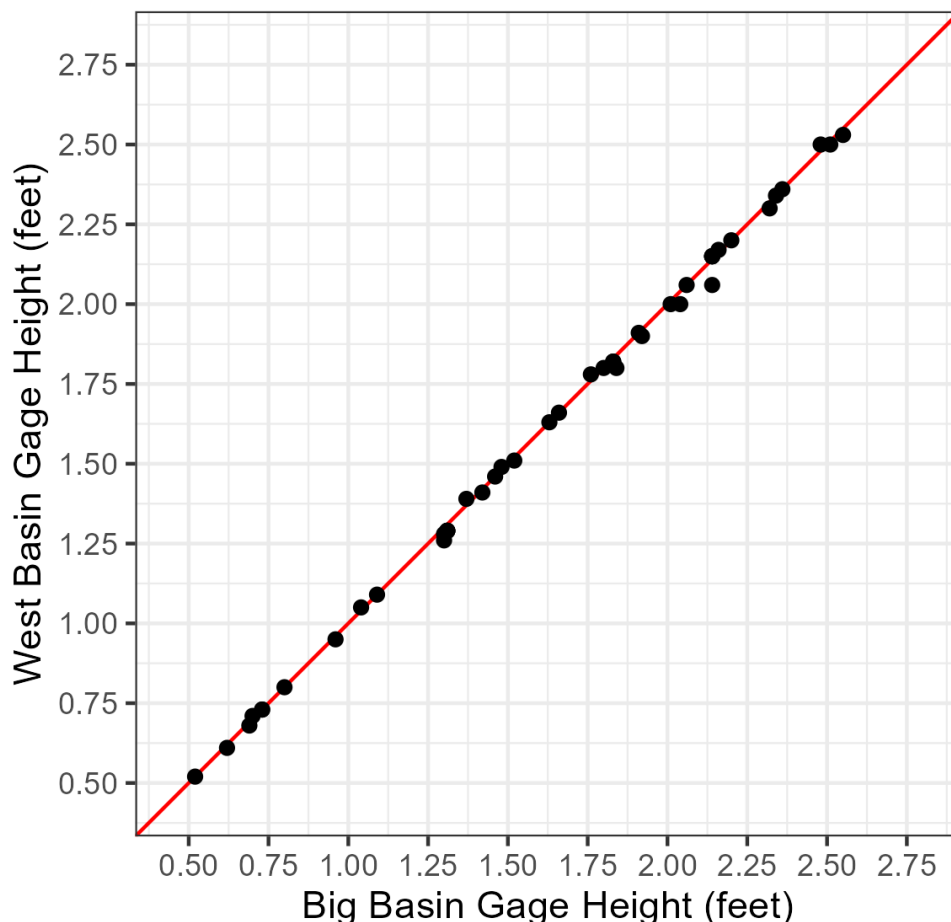
$$GW_{Net} = GW_{In} - GW_{Out} = (Outflows + \Delta S) - Inflow$$

Change in Lake Storage

Lake level measurements were recorded by community residents using lake gages installed in the West Basin and Big Basin of Lake Lawrence (Figure 1). The lake levels are recorded and uploaded to the Lake Observations by Citizen Scientists & Satellites (LOCSS) database. LOCSS is a NASA-funded project and is a collaboration between the Department of Geological Sciences at UNC-Chapel Hill, the UNC Institute for the Environment's Center for Public Engagement with Science, University of Washington Department of Civil and Environmental Engineering, and Tennessee Technological University Department of Computer Science.

The two lake gages share the same datum. That is, the zeros for each gage relate to the same elevation of water. The red line is a one-to-one line representing the same water level in each basin.

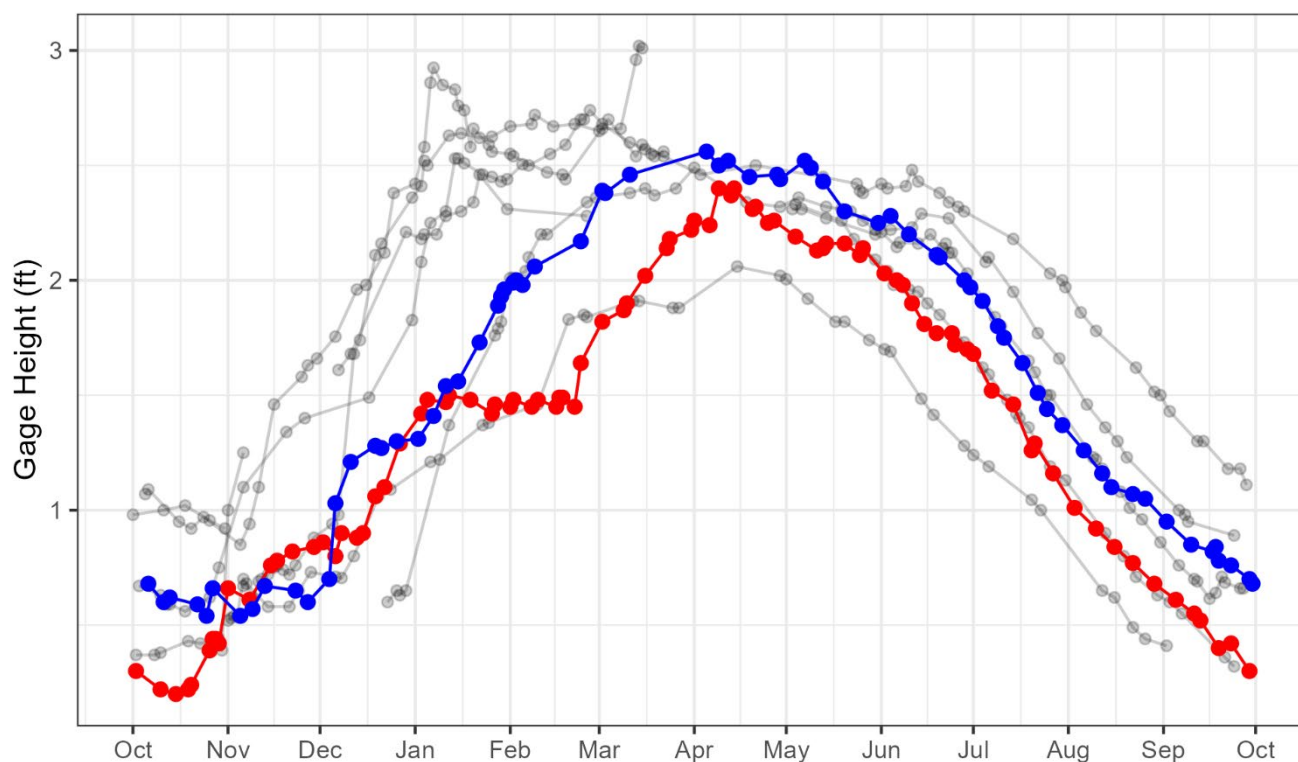
Figure 12 below provides evidence of this wherein the two lake basin levels measured are functionally the same for the same dates (the red line is a one-to-one line). As such, for the purposes of determining lake level the two gage datasets were merged, and when sharing the same date, the levels were averaged.



The red line is a one-to-one line representing the same water level in each basin.

Figure 12. Water Levels for Each Basin of Lake Lawrence (WY 2025).

The frequency of lake level measurements is variable. During the study period of water year 2025, the time between measurements at either gage ranges from 1 to 8 days, with a median of 4 days. This frequency is adequate for estimating lake volume changes over the course of individual months.

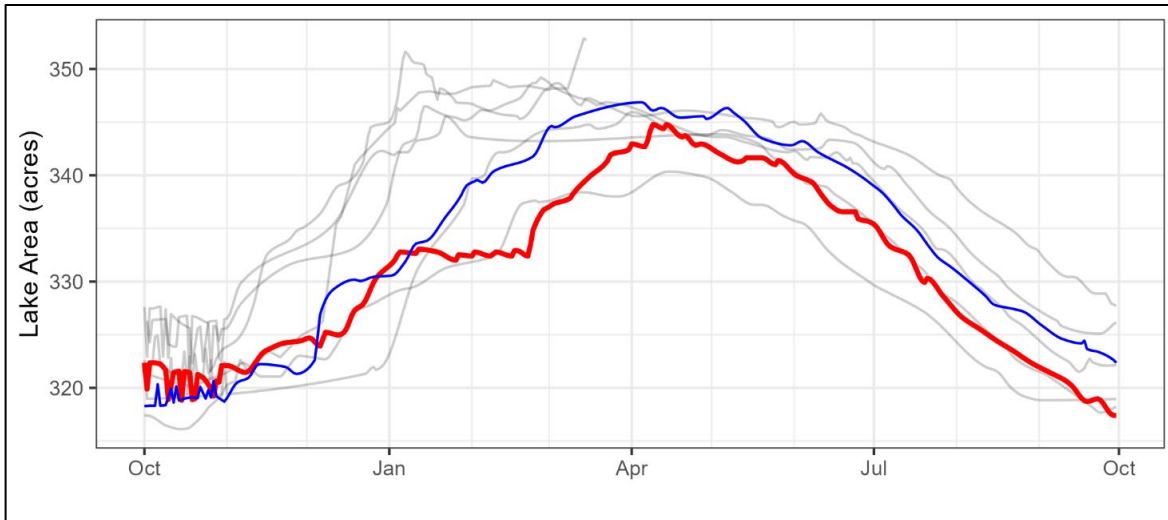


Water years 2024 and 2025 are shown as blue and red line, respectively, 1994 to 2023 shown in grey.

Figure 13. Lake Lawrence Level for Water Years 2024 (blue) and 2025 (red) Compared to Historic Levels (2019 to 2023).

The volume of water in the lake for each day was estimated based on the lake level and lake bathymetry, and the changes in volume were calculated. Volumes were summed at a monthly basis.

Figure 13 presents lake levels during the study period (red line) with a comparison to previous years (grey lines). Lake levels were especially lower than usual in winter and spring 2025 and remained below typical levels through the summer. Figure 14 presents the lake surface area during the study period (red line) that mirrors the lake level. The stagnation of lake levels in winter 2025 is matched with the minor amount of rain during this period compared to other years (Figure 15).

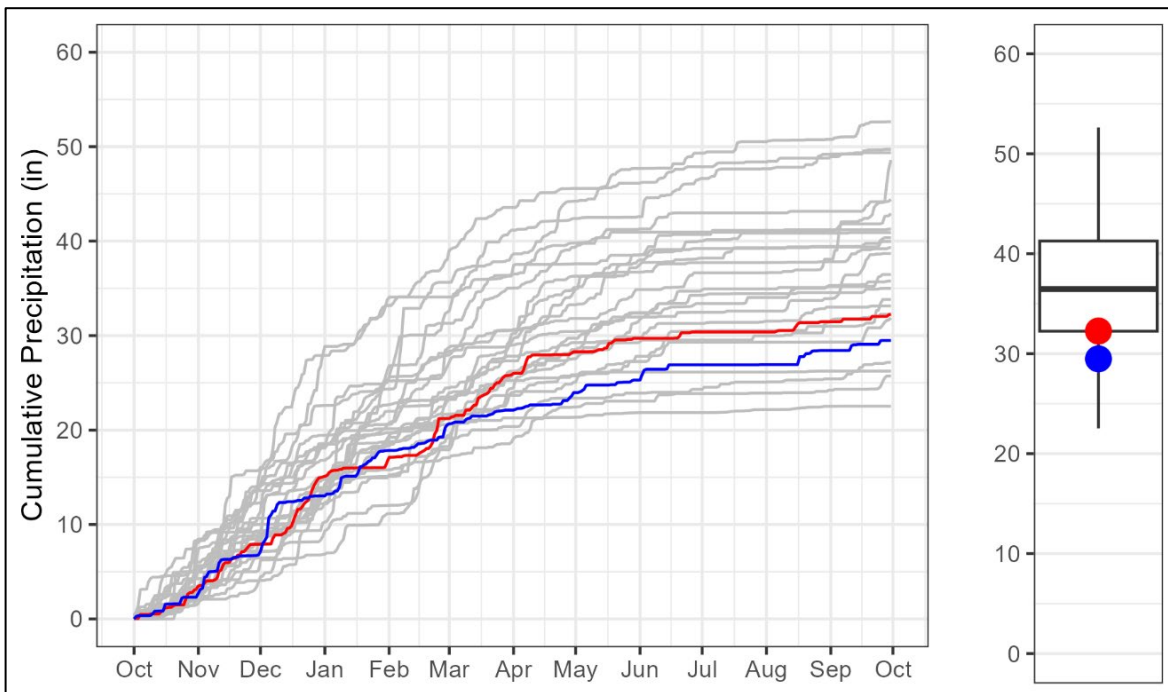


Water years 2024 and 2025 and shown as blue and red line, respectively, 1994 to 2023 shown in grey.

Figure 14. Lake Lawrence Surface Area for Water Year 2025 Compared to Historic Areas (2019 to 2025).

Precipitation

Daily rainfall data from the G3666 and Thurston County precipitation station 13u were used and multiplied by the lake surface area (based on lake level) to calculate the volume of direct precipitation. Water year 2025 has a lower than typical amount of precipitation at 32.3 inches, and the median rainfall between 1994 and 2025 was 36.5 inches (Figure 15).



Water years 2024 and 2025 and shown as blue and red line, respectively, 1994 to 2023 shown in grey (Thurston County rain gage 13u).

Figure 15. Daily Cumulative Rainfall (left) and Annual Water Year Annual Rainfall (right) at Thurston County Precipitation Gage 13u (1994 to 2025).

Surface Inflows

Surface runoff from the contributing drainage area was estimated using the Simple Method (Schueler 1987). Most of the Lake Lawrence basin is undeveloped and vegetated with second growth timber and brush. The relatively low level of development coupled with the high permeability of soils result in very little surface runoff (KCM 1991). The Lawrence basin has an estimated drainage area of approximately 400 acres with no permanent inlet streams. The Simple Method requires only the drainage area, impervious cover fraction, and precipitation depth, using the following equation:

$$V_{S,i} = R_{v,i} * P * A$$

Where

- V is the runoff volume for
- R_v is the runoff coefficient
- P is the precipitation depth (m)
- A is the total watershed area (m²)

The runoff coefficient R_v is calculated using the following equation:

$$R_{v,i} = 0.05 + 0.9 * I_a$$

Where I_a is the impervious fraction, which is 6% for the Lake Lawrence watershed.

Evaporation

Daily lake evaporation was estimated using reference evapotranspiration (ET_o) from the Washington State University AgWeatherNet (AWN) station in Tumwater, Washington. The Penman-Monteith-based ET_o provides a physically grounded estimate of potential evaporation that accounts for temperature, humidity, wind speed, and solar radiation. Daily ET_o values (in inches) were converted to millimeters and multiplied by the time-varying lake surface area (m²) to obtain daily evaporation volumes (m³). For comparison, an empirical temperature- and dew-point-based formula was also evaluated; however, the AWN ET_o approach was adopted because it produced more physically realistic estimates, particularly in fall and winter when the empirical formula tended to overestimate evaporation.

Lake Outflow

Lake Lawrence drains through an overflow weir at the lake outlet. Outflow occurs only when the lake surface exceeds the weir crest elevation. Unfortunately, due to suppressed lake levels in water year 2025, only one direct discharge measurement of outlet discharge was completed during the study period. A direct instantaneous discharge measurement of 1.179 cfs was obtained at a lake level of 2.34 feet on April 8, 2025, and was used as a calibration point for estimating outflow. A second estimate was developed using on a bucket-measurement field survey conducted in January 2026 by Barry Halverson,

corroborated by observations of surface spill beginning near 2.34 feet in spring 2024 and spring 2025. No surface outflow is assumed when the lake level is below 2.34 feet.

Daily outflow was estimated using a linear stage-discharge regression model. The model was developed from periods between consecutive observed lake level measurements during which the lake level was at or above 2.3 feet and the net water balance residual was negative (i.e., the lake was losing water beyond what could be accounted for by evaporation alone). These residuals, expressed as a daily loss rate (m³/day), were regressed against corresponding lake level values to produce a continuous discharge estimate for any day when the lake level meets the spill threshold.

$$Q_{outlet, regression} = \begin{cases} H_{lake} < 2.34 & 0 \\ H_{lake} \geq 2.34 & -21.06 + 9.305 * H_{Lake} \end{cases}$$

Additionally, a broad-crested weir equation was also applied using estimated weir width and head, with separate calculated for the lower and upper weir elevations. Between the elevation of 2.34 and 2.42 feet (the lower weir elevation), the project team assumes a steady outflow of 1.2 cfs for leakage through the weir planks:

$$Q_{outlet, weir} = \begin{cases} H_{lake} < 2.34 & 0 \\ H_{lake} < 2.42 & 1.2 \\ H_{lake} < 2.75 & 1.2 + C_d * L_{Lower} * (H_{lake} - 2.42)^{1.5} \\ H_{lake} \geq 2.75 & 1.2 + C_d * L_{Lower} * (H_{lake} - 2.42)^{1.5} + C_d * L_{upper} * (H_{lake} - 2.75)^{1.5} \end{cases}$$

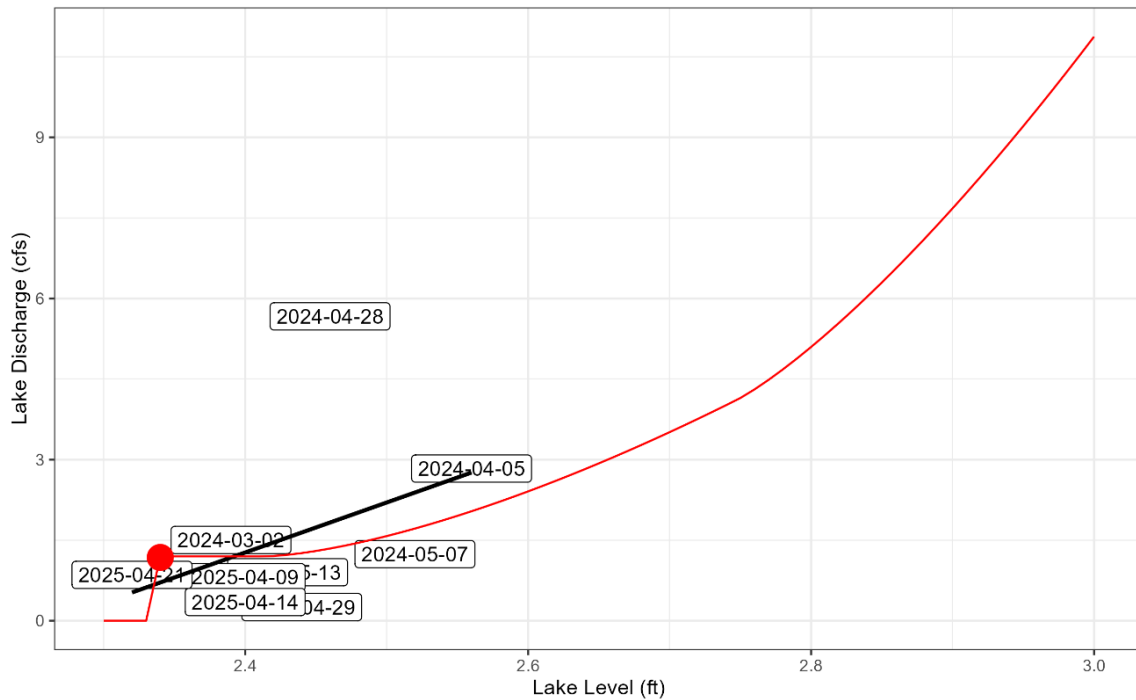
Where

- $Q_{outlet, regression}$ is the estimated lake outlet discharge based on the regression equation, cfs)
- $Q_{outlet, weir}$ is the estimated lake outlet discharge based on the weir equation, cfs)
- H_{lake} is the lake elevation (in feet)
- C_d is the coefficient of discharge, which is assumed at 3.09 (unitless) for a rectangular weir
- L_{lower} and L_{upper} are the length of the lower and upper weir, (4.92 and 7.38 feet, respectively)

The red dot represents the single measured discharge event.

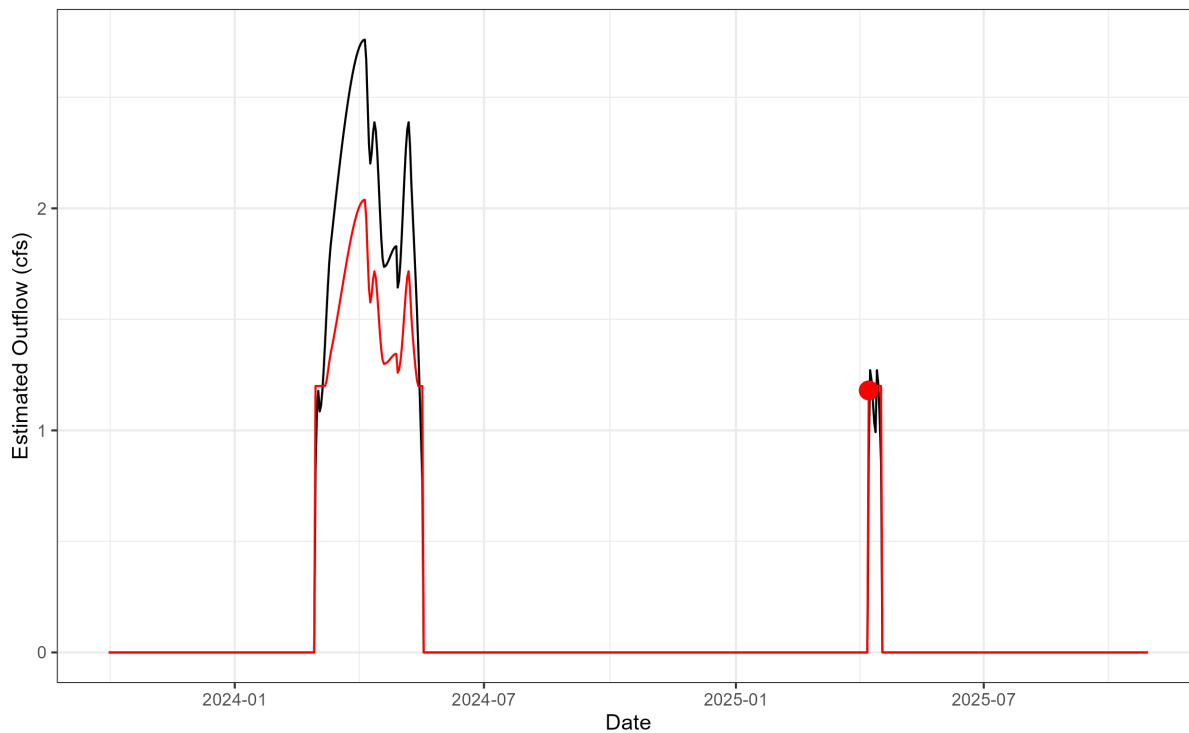
Figure 16 displays the two estimates for lake outlet discharge based on lake elevations. For the purposes of the Lake Lawrence water budget, the weir-based equation was used. However, additional discharge measurements are recommended to provide a more accurate estimate. Measured discharge for 2025-04-08 shown as a red dot.

Figure 17 illustrates that the measurements provide similar estimates for water year 2025, and that in water year 2024, the regression-based equation estimates relatively higher estimates. For water year 2025, the regression-based equation and weir-based equation estimate a total outlet discharge of 26,743 and 29,369 m³, respectively, and for water year 2024, 385,187 and 292,560 m³, respectively.



The red dot represents the single measured discharge event.

Figure 16. Estimated Lake Lawrence Outlet Discharge Based on Assumed Weir Equations (Red) and a Regression Equation Based on Lake Budget Residuals.



Measured discharge for 2025-04-08 shown as a red dot.

Figure 17. Estimated Lake Lawrence Outlet Discharge Based on Assumed Weir Equations (Red) and a Regression Equation for Water Years 2024 and 2025.

Groundwater

Lake Lawrence is underlain by glacial outwash and till deposits. The surrounding geology supports a shallow unconfined aquifer that exchanges water seasonally with the lake. Based on short-period water balance analyses, groundwater inflow to the lake is minimal in fall when the regional water table is at its seasonal low but becomes meaningful in winter and spring as the water table rises following the wet season. Several community water supply wells in the vicinity pump from deeper aquifer zones, and hydraulic connection with the lake is possible.

Groundwater flows into and out of the lake were calculated as the residual difference between total water inputs minus total water outputs described above, and accounting for changes in lake storage volume. Positive net monthly residuals were attributed to groundwater inflow and negative net monthly residuals were attributed to groundwater outflow.

Lake Lawrence Hydrologic Budget

Due to the abnormally low water level in water year 2025, the hydrologic budget analysis included water year 2024, which had slightly more typical lake level and a similar overall annual rainfall. The water year 2024 and 2025 monthly hydrologic budget for Lake Lawrence is presented as annual summary in Table 15 and on a monthly basis in Table 16. The budget had moderate residuals during each month, which are assumed to be groundwater inflow when positive in winter and spring (high water table) and groundwater outflow when negative during dry season months of in summer and fall (low water table).

The annual net groundwater inflow was 436 and 80 thousand cubic meters in water years 2024 and 2025, respectively. In water year 2024, groundwater inflow made up approximately one quarter of all inflow to the lake, whereas in water year 2025, groundwater inflow was estimated to make up 6 percent. In water year 2025, the lake was a net groundwater exporter. During the summer (May to September), the lake level decreased as outputs exceeded input until storms return in October.

Compared to the water budget estimates in KCM 1991, the estimates in this study suggest a much lower inflow from groundwater, lower surface runoff, lower lake outflow, and similar precipitation and evaporation. Both approaches estimated groundwater via the residual method. Thus, because the water year 2024 and 2025 estimates had lower estimates for outflow, there was a decrease in the assumed groundwater inflow. The KCM (1991) outflow estimates were based on single point-in-time discharge measurements that were extrapolated to an entire month and were not related to lake level. For example, KCM estimated that the entire month of February had an average outflow discharge of 10 cfs, based on a single measurement on January 30, 1991, which followed a four-day storm totaling 2.76 inches of rainfall.

Recognizing its limitations, the project team believes the hydrologic budget provides adequate planning level estimates of the volume of water moving through Lake Lawrence for developing the phosphorus budget. The hydrologic budget would benefit from further calibration of the lake outflow estimates, monitoring groundwater levels and modeling flow velocity/direction, and a refined estimate for surface inflow.

Using the total lake inflow for water years 2024 and 2025 (1,837 or 1,309 m³ per year, respectively) and a lake volume of 5,557,902 m³, the project team estimates that the lake residence time was 3.0 and 4.2 years in water years 2024 and 2025, respectively.

Table 15. Lake Lawrence Water Budget Summary for Water Years 2024 and 2025 (1,000 m³).

Pathway		WY2024		WY2025		KCM (1991) "Typical Year"	
		Volume (m ³)	%	Volume (m ³)	%	Volume (m ³)	%
Inflow	Direct Precipitation	1,251.8	68%	1,097.7	84%	1,396.8	55%
	Surface Inflow	149.0	8%	130.8	10%	226.9	9%
	Net Groundwater In	436.4	24%	80.0	6%	894.8	36%
Inflow Total		1,837.2	100%	1,308.5	100%	2,518.5	100%
Outflow	Lake Evaporation	936.9	54%	929.4	64%	834.4	33%
	Lake Outflow	385.2	22%	26.7	2%	1,684.0	67%
	Net Groundwater Out	400.1	23%	489.9	34%	0	0%
Outflow Total		1,722.2	100%	1,446.0	100%	2,518.5	100%
Net Change		115.0	--	-137.5	--	0	--

Table 16. Lake Lawrence Water Budget (1,000 m³).										
Year	Month	Direct Precipitation	Surface Inflow	Net Groundwater In	TOTAL INFLOW	Lake Evaporation	Lake Outflow	Net Groundwater Out	TOTAL OUTFLOW	Change in Lake Volume
2023	10	134.7	16.7	0.0	151.4	34.7	0.0	103.2	137.8	13.5
2023	11	158.9	19.5	0.0	178.4	12.2	0.0	87.8	100.0	78.5
2023	12	271.4	32.9	0.0	304.3	7.0	0.0	47.8	54.7	249.5
2024	1	204.3	24.1	24.5	252.8	11.6	0.0	0.0	11.6	241.2
2024	2	124.9	14.4	20.9	160.2	21.1	2.0	0.0	23.1	137.1
2024	3	70.3	8.0	202.5	280.9	55.4	152.1	0.0	207.5	73.4
2024	4	76.4	8.7	122.6	207.8	91.7	156.3	0.0	247.9	-40.2
2024	5	67.1	7.7	62.8	137.5	132.6	74.8	0.0	207.5	-70.0
2024	6	57.0	6.6	3.1	66.7	168.0	0.0	0.0	168.0	-101.3
2024	7	3.1	0.4	0.0	3.4	191.2	0.0	34.7	225.9	-222.5
2024	8	45.1	5.4	0.0	50.5	129.6	0.0	56.4	186.0	-135.5
2024	9	38.6	4.7	0.0	43.3	81.9	0.0	70.2	152.1	-108.7
WY2024 TOTALS		1251.8	149.0	436.4	1837.2	936.9	385.2	400.1	1722.2	115.0
WY2024 Summer Total (May to Sept)		210.9	24.7	65.8	301.5	703.3	74.8	161.4	939.5	-638.0
2024	10	104.2	12.8	0.0	117.0	40.4	0.0	83.8	124.2	-7.2
2024	11	158.0	19.3	0.0	177.3	15.4	0.0	94.2	109.6	67.7
2024	12	240.1	28.9	0.0	269.0	19.9	0.0	62.1	82.0	187.0
2025	1	53.3	6.3	0.0	59.6	12.7	0.0	15.5	28.1	31.5
2025	2	158.5	18.7	0.0	177.2	19.8	0.0	36.5	56.3	120.9
2025	3	161.5	18.7	23.7	203.9	46.5	0.0	0.0	46.5	157.4
2025	4	86.5	9.9	40.2	136.6	102.9	26.7	0.0	129.6	7.0
2025	5	49.8	5.8	16.1	71.7	135.9	0.0	0.0	135.9	-64.2
2025	6	23.2	2.7	0.0	25.9	151.8	0.0	8.0	159.8	-133.9
2025	7	0.0	0.0	0.0	0.0	158.4	0.0	66.9	225.3	-225.3
2025	8	36.0	4.4	0.0	40.4	138.5	0.0	50.3	188.8	-148.4
2025	9	26.6	3.3	0.0	29.9	87.1	0.0	72.6	159.7	-129.8
WY2025 TOTALS		1097.7	130.8	80.0	1308.5	929.4	26.7	489.9	1446.0	-137.5
WY2025 Summer Total (May to Sept)		135.6	16.1	16.1	167.9	671.8	0.0	197.7	869.5	-701.6

TOTAL INFLOW = Sum of Surface Inflow, Direct Precipitation, and Net Groundwater In, which was calculated as positive residuals from total surface inputs minus outputs, and subtracted from total surface inputs to get TOTAL INFLOW. Similarly, Net Groundwater Out was calculated as negative residuals from total surface inputs minus outputs, and subtracted from total surface outputs (evaporation and outflow) to get TOTAL OUTFLOW.

Lake Lawrence Phosphorus Budget

Development

Using the water budget as a foundation, a phosphorus budget was created for Lake Lawrence that accounts for all movement of phosphorus into and out of the lake and within the lake itself. The difference between the total monthly external phosphorus inputs and outputs plus the change in phosphorus mass within the lake water from the previous month equals the amount of phosphorus retained in the lake for each month, where:

$$Retention (P_{ret}) = Inputs (P_{in}) - Outputs (P_{out}) + Lake Storage Change (\Delta P_{Lake})$$

The lake phosphorus retention amount is calculated as the difference between measured total phosphorus inputs and outputs and adding the change in the amount of phosphorus stored in the lake. The lake phosphorus retention incorporates measurement errors and unmeasured sources and losses, which primarily include internal phosphorus loading and sedimentation, respectively (Steinman and Spears 2020).

Precipitation

The total phosphorus concentration in rainfall is estimated to be 0.024 mg/L. This value is based on the measured values ranging from 0.008 to 0.033 mg/L for five lakes in western Washington, and accounts for all atmospheric deposition (Ecology 2013). The total phosphorus concentration in rain was multiplied by the monthly precipitation volume to estimate phosphorus inputs from direct precipitation and other atmospheric deposition on Lake Lawrence.

Surface Inflow

Surface inflow phosphorus loads were calculated by multiplying the monthly surface runoff volume (from the water budget) by the average total phosphorus concentration measured in stormwater from the Lake Lawrence drainage basin. The mean total phosphorus concentration across these samples was 179 µg/L, which is comparable to the weighted average of 192 to 194 µg/L used by KCM (1991).

Outlet Flow

Outflow phosphorus loads were estimated by multiplying the monthly lake outlet flow volume by the epilimnion total phosphorus concentration. This approach reflects the fact that the outlet weir draws from the lake surface layer. Monthly in-lake TP measurements from field sampling were used as the source concentrations; no separate outlet grab samples were collected.

Lake Storage

The monthly amount of total phosphorus in the lake was calculated by multiplying monthly volume-weighted average total phosphorus concentrations by monthly lake volume calculated as part of the hydrologic budget. Monthly changes in the total amount of phosphorus in the lake were then calculated. Due to missing data for December 2024 and April, June, and July 2025, the concentrations for those months were assumed. For December 2024, the phosphorus concentrations were based on averages of November 2024 and January 2025 samples; similarly for April 2025, the phosphorus concentrations were based on averages of March and May 2025. June and July 2025 concentrations were assumed based on average concentrations for those months from 2021 to 2024.

Groundwater

Groundwater total phosphorus concentrations were not directly measured at Lake Lawrence. The total phosphorus concentration for groundwater entering the lake was assumed to be 63 µg/L, consistent with the estimate used by KCM (1991) for the Lake Lawrence watershed. This value reflects the expected shallow groundwater TP concentration in the glacial outwash and till setting surrounding the lake.

Groundwater phosphorus loading to the lake was calculated by multiplying the monthly volume of groundwater input (if there was a net input) by the estimated groundwater total phosphorus concentration. Groundwater phosphorus export from the lake was calculated by multiplying the monthly volume of groundwater output (if there was a net output) by the lake's monthly volume-weighted average concentration of total phosphorus.

Internal Loading – Sediment Release

Internal phosphorus loading by sediment phosphorus release into the lake was calculated by several methods described by Nurnberg (2009) and Steinman and Spears (2020), which include the hypolimnion mass accumulation, mass balance residual, two sediment phosphorus release rate equations, and via back-calculation from a Vollenweider phosphorus mass loading model.

Hypolimnion Mass Accumulation Method

The hypolimnion mass accumulation method calculates the monthly increase in the amount of phosphorus that accumulates in the hypolimnion (bottom layer) of lake for each summer month when dissolved oxygen concentrations near the sediment surface are low (less than 2 mg/L) and external inputs are low. This method may underestimate internal loading because sediment oxygen concentrations can be much lower than those measured in the water in both the surface and bottom layers (epilimnion and hypolimnion). In addition, the hypolimnion mass accumulation method does not account for potential in sediment release in the surface layer from high pH conditions caused by rapid algae growth and carbon dioxide consumption during summer algae blooms.

The monthly sediment phosphorus release amount was calculated as the monthly increase in the hypolimnetic phosphorus mass in the lake for May to September 2025 when dissolved oxygen

concentrations were less than 2 mg/L near the sediment surface at the deep lake station and external phosphorus inputs were low. The phosphorus mass accumulation data are presented in Table 17 and Table 18. The total gain in hypolimnion phosphorus mass in summer of 2025 in the Big Basin was 36.05 kg and 13.3 kg in the West basin, for a total of 473.8 kg. This approach is likely to be an underestimate because it does not include June and July 2025 gains in total phosphorus due to missing data.

Table 17. Internal Phosphorus Loading by Hypolimnion Mass Accumulation Method – Big Basin.

Sample Date	Depth (m) at DO < 2 mg/L	Bottom Measured DO (mg/L)	Lake Hypo TP (µg/L)	Lake Hypo Mass (kg)	TP Mass Gain (kg)
2025-03-19	NA	8.3	35	40.6	--
April	--	--	--	--	--
2025-05-07	5.0	0.4	346	401.1	360.5
June	--	--	--	--	--
2025-07-22	5.0	0.6	NM	--	--
2026-08-21	5.0	0.3	128	148.4	-252.7
2025-09-22	NA	7.9	27	31.3	-117.1
May to September Hypolimnetic Gain for Total Internal Loading					360.5

NA= not applicable

NM= not measured

^a This value is interpolated between from the May 21 and June 25 samples because the June 4 sample appeared to included lake sediment with measured TP at 4,050 µg/L.

Table 18. Internal Phosphorus Loading by Hypolimnion Mass Accumulation Method – West Basin.

Sample Date	Depth (m) at DO < 2 mg/L	Bottom Measured DO (mg/L)	Lake Hypo TP (µg/L)	Lake Hypo Mass (kg)	TP Mass Gain (kg)
2025-03-19	NA	5.9	29	2.2	--
April	--	--	--	--	--
2025-05-07	5.0	0.2	41	3.2	1.0
June	--	--	--	--	--
2025-07-22	5.0	0.6	NM	--	--
2026-08-21	4.5	0.3	200	15.5	12.3
2025-09-22	NA	8.4	21	1.6	-13.9
May to September Hypolimnetic Gain for Total Internal Loading					13.3

Mass Balance Residual Method

The mass balance residual method uses the phosphorus residual in the mass balance equation (lake phosphorus retention mass calculated as input minus output plus lake storage) as an estimate of net gain from internal loading by accounting for loss by sedimentation. Monthly sedimentation losses during the

summer stratification period were estimated as an average of the mass balance residuals calculated for the winter months when internal loading is assumed to be negligible because the lake was mixed, oxygenated, and neutral pH.

The phosphorus residual during winter months averaged -20.0 kg/month, which was assumed to be the average sedimentation rate for the lake. This rate was added to the summer (May to September 2025) residuals, and the positive values were summed to estimate the internal load via mass balance. This approach combines both basins of Lake Lawrence, and this approach includes the assumed phosphorus concentrations for the months with missing samples. The sum of the net phosphorus gain from May to September 2025 totaled 229 kg (Table 19).

Table 19. Internal Phosphorus Loading by the Mass Balance Residual Method.				
Year	Month	Mass Balance Residual (kg)	Sedimentation Rate Estimate (kg)	Summer Residual + Sedimentation (kg)
2025	5	155	20	175
2025	6	-2	20	18
2025	7	0	20	20
2025	8	-4	20	16
2025	9	-173	20	0
Sum of Positive May-Sept Residuals + Sedimentation				229

Note the residuals presented this table is before applying the estimates for internal cycling (sediment release and sedimentation)

Sediment Release Equations

In warm monomictic lakes, which stratify into two thermal layers during the summer and mix from top to bottom during the winter, summer internal load may be estimated using the following equation:

$$L_{int} = RR * AF$$

Where:

RR = areal release rate of phosphorus in mg/m²/day

AF = anoxic factor represents the number of days that a sediment area, equal to the whole-lake surface area, is overlain by anoxic water

$$AF = \sum (t_i * a_i) / A_0$$

Where:

t_i = period of anoxia in days for each oxycline period

a_i = corresponding sediment area in m² for each oxycline period

(A_0) = lake surface area in m²

Two sediment release equations were used based on the mobile phosphorus concentrations in the upper 10 cm of sediment in Lake Lawrence, including the Nurnberg (1988) and Pilgrim et al. (2007) equations. The Nurnberg (1988) equation ($R^2 = 0.87$ for 14 lakes) is:

$$RR_{Nurnberg} = -1.38 + 0.285 * P_{Sed,Fe,WW}$$

Where:

$RR_{Nurnberg}$ = sediment release rate estimated using the Nurnberg (1988) equation in $\text{mg/m}^2/\text{day}$

$P_{Sed,Fe,WW}$ = wet-weight iron-bound phosphorus sediment concentration in $\mu\text{g/g}$

From the Lake Lawrence sediment samples, the $P_{Sed,Fe,WW}$ were $21.0 \mu\text{g/g}$ at the deep station in the Big Basin as an average of the surface 10 cm and $5.5 \mu\text{g/g}$ in the West Basin deep station. The shallow sediment station in the Big Basin had relatively low levels of iron-bound phosphorus ranging from 0.9 to $2.9 \mu\text{g/g}$. These shallow sites had a higher organic phosphorus fraction compared to the deep sites. Therefore, predicted release rate would be $4.6 \text{ mg/m}^2/\text{day}$ at the deep Big Basin station and $0.2 \text{ mg/m}^2/\text{day}$ in the West Basin station. The shallow Big Basin stations would be predicted to have negligible release via the Nurnberg equation.

The Pilgrim et al. (2007) equation ($R^2 = 0.90$ for 14 lakes) is:

$$RR_{Pilgrim} = 15.1 * P_{Sed,Mobile} - 0.7$$

Where:

$RR_{Pilgrim}$ = sediment release rate estimated using the Pilgrim et al. (2007 equation) in $\text{mg/m}^2/\text{day}$

$P_{Sed,Mobile,WW}$ = wet-weight mobile phosphorus sediment concentration in $\text{g/m}^2/\text{cm}$

Notably, the Pilgrim equation can include the portion of organic phosphorus that may be released as biological material is broken down (e.g., algae and plant detritus that has settled to the lake bottom).

From the Lake Lawrence sediment samples, the $P_{Sed,Mobile,WW}$ was $0.26 \text{ g/m}^2/\text{cm}$ at the deep Big Basin station as an average of the surface 10 cm and $0.06 \text{ g/m}^2/\text{cm}$ at the West Basin station. The shallow Big Basin station had higher levels of biogenic phosphorus compared to iron-bound phosphorus and the mobile concentrations were 0.22 to $0.31 \text{ g/m}^2/\text{cm}$. Therefore, predicted release rate would be $3.3 \text{ mg/m}^2/\text{day}$ at the deep Big Basin station and $0.2 \text{ mg/m}^2/\text{day}$ in the West Basin station. That shallow Big Basin stations' release rates are predicted to range from 2.6 to $3.9 \text{ mg/m}^2/\text{day}$.

AF is the expression of the period of anoxia and the fraction of the sediments experience anoxia:

$$AF = \sum_{i=1}^n t_i * a_i / A_0$$

Hypoxia (dissolved oxygen $< 2 \text{ mg/L}$) was observed below 4.5 m from May 7 to August 21, 2025 in both basins (at least 106 days). The sediment area subject to anoxic conditions was determined by

interpolating the bathymetric area-depth curve at 4.5 m for each basin. The AF factor for the Big Basin is 49.5 days and for the West Basin is 23.2 days.

The phosphorus load estimates based on predicted flux and anoxic factor (i.e., Nurnberg 1988 and Pilgrim et al. 2007), ranged from 188 to 262 kg in the Big Basin and 1.0 kg in the West Basin (Table 23). In-situ or laboratory sediment phosphorus flux monitoring would provide meaningful insight to confirm the sediment release rate.

Back-Calculation via Lake Phosphorus Model

Using the observed lake phosphorus volume-weighted concentration, the estimated external phosphorus load, and the estimated lake inflow, internal loading may be estimated as the “unexplained load” contributing to elevated lake phosphorus that cannot be attributed to the external load alone. This approach is based on the entire lake, rather than on the individual basins.

Brett and Benjamin (2007) updated the Vollenweider (1976) theoretical lake phosphorus retention model through statistical analysis of 305 lakes with phosphorus import and export estimates. The Vollenweider lake mass loading model is an empirical, steady-state formula that predicts a lake's phosphorus concentration by linking phosphorus loading to its physical characteristics and hydraulic residence time. Internal loading may be estimated as shown below.

$$TP_{Lake} = \frac{(L_{ext} + L_{int})/V_{in} * 10^6}{(1 + 1.12 * T_w^{0.53})}$$

$$L_{int} = TP_{Lake} * (1 + 1.12 * T_w^{0.53}) * V_{in} * 10^6 - L_{ext}$$

Where:

TP_{Lake} = observed volume-weighted total phosphorus = 44.4 µg/L

L_{ext} = external phosphorus load (kg)

L_{int} = internal phosphorus load (kg)

V_{in} = total lake inflow (m³)

T_w = hydraulic retention time (years) = V_{Lake} / V_{in}

V_{Lake} = Lake Volume (m³) = 5,557,902 m³

The above equation was used to estimate internal loading for water years 2024 and 2025, and for the “typical year” defined by KCM (1991). Note that the lake total phosphorus concentration was assumed to be the same both years.

Based on the observed values from the study period, the model estimates an internal load between 161.9 and 143.6 kg for water years 2024 and 2025, respectively (Table 20). Notably, this model predicts a much lower internal load using KCM (1991) values for lake TP, external loading, and hydraulic loading. KCM (1991) had calculated an internal load of 1,008.4 kg for a “typical year,” which an order of magnitude great than what would be predicted with the above lake phosphorus model. This is likely due to an overestimation of groundwater inflow and phosphorus load by KCM (1991).

Table 20. Internal Load Estimated based on Brett-Benjamin Model.					
Water Year	TP _{Lake} (ug/L)	L _{ext} (kg)	V _{in} (m ³)	T _w	L _{int} (kg)
2024	44.4	84.2	1,837,204	3.0	161.9
2025	44.4	54.7	1,308,490	4.2	143.6
Average 2024/2025	44.4	69.4	1,572,847	3.5	153.2
KCM 1991 ("Typical Year")	50	211.3	2,518,415	2.2	92.5

Biological Contributions

Waterfowl

Waterfowl data was collected for this project through occasional counts by volunteer residents during LMD aquatic plant surveys, and waterfowl trends shared by residents Barry Halverson and Steve Slater. Counts of Canada geese at Lake Lawrence were taken once per month from April to August 2025, from the survey boat at various times of the day. No other waterfowl (e.g., ducks, grebes, cormorants, coots, gulls, or herons) were counted. Numbers of geese ranged from 21 to 158, with goslings observed in May and migratory geese first appearing in August. Additionally, it is estimated that there are around 40 to 50 resident geese at the lake. Migratory cormorants (estimated at 70 to 80) and coots (uncounted) are also common in the winter months. See the *Observations* section of this report and *Waterfowl* section of the main report for more detail.

Estimation of phosphorus loading from waterfowl was performed following the methods of Boros (2021) using published waterfowl excrement rates and residential time factors (Manny et al. 1994, Marion et al. 1994, and Boros 2021) (Table 21). Loading estimations only considered resident Canada geese, migratory Canada geese, and double crested cormorants, and did not consider species for which counts were not available (e.g., coots, ducks, non-waterfowl species). For double-crested cormorants, the daily P loading rate from excrement was estimated using the same P concentrations reported for great cormorants by Marion et al. (1994) and Boros (2021), adjusted for the smaller body weight of double crested cormorants (about 0.9 kg compared to 3.4 kg for great cormorants).

Table 21. Literature Values for Bird Excrement Loading Rates and Residential Time Factors.			
Bird Type	Residential Time Factor	Excrement Loading Rate (g P/day/individual)	Source(s)
Canada Geese	0.6	0.49	Manny et al. 1994, Boros 2021
Double Crested Cormorants	1.0	1.22	Assumed based on Marion et al. 1994, Boros 2021

Rather than estimate loading using the daily mean abundances of each species per month, which would be multiplied by the days in each month (as in Boros [2021]), the project team calculated annual loading using the following assumptions about waterfowl present at Lake Lawrence: 1) there is a resident goose population of 50 individuals present year-round, 2) 150 migratory geese are present for five months out of the year (e.g., August through December), 3) an average of 75 migratory cormorants are present in four and a half months out of the year (e.g., mid-November through March), and 4) no other birds are

present or contribute phosphorus (due to lack of data available). The project team then calculated annual load using the equation below, modified as noted from Boros (2021):

$$Load = A * E * RTF * D$$

Where:

A – daily abundance of a given species

E – daily net rate of excrement loading (e.g., mass P per individual per day)

RTF – residential time factor (proportion of a day that waterbird spends at lake)

D – number of days a bird is assumed present at the lake, per year

Annual loads for geese and cormorants were then summed together to achieve the estimated annual phosphorus loading by waterfowl in Lake Lawrence. Overall, phosphorus loading from waterfowl was moderate at about 25 kg P per year, largely dependent on the number and duration of migration cormorants, which were estimated to contribute half (12.5 kg) of the annual bird load due to the high concentration of phosphorus in their excrement. This relative contribution is similar to other Puget Sound lowland lakes where cormorants reside or migrate. Since migratory waterfowl are typically most abundant in the winter (e.g., October through March), most of the waterfowl loading would be expected to occur in these months. For Lake Lawrence, the project team estimates approximately 67 percent of the annual load (16.6 kg) from migratory waterfowl alone is provided during these 6 months.

Much of the P contributed by waterfowl likely settles into the lake sediment where it may be released in the next summer for uptake by algae. Noting that Canada geese populations have been reduced due to removals in recent years, it is also likely that historical annual waterfowl loading was greater, accumulating in the sediments over time.

Waterfowl loading estimates would be improved using regular (e.g., daily or weekly) waterfowl count data, for multiple bird types (e.g., ducks, gulls, herons), and collected year-round. With more data, interpolations may be useful to estimate daily counts where absent.

Aquatic Macrophytes

Aquatic macrophytes are aquatic plants in lakes that include floating-leaved plants, submersed plants, and submersed macroalgae but not emergent shoreline plants. Phosphorus release from aquatic macrophytes was not explicitly estimated because macrophyte biomass data were not available. Macrophyte contribution may be evaluated by examining the residual in the phosphorus budget in the late fall, when the macrophytes undergo senescence, and is typically small unless a lake is covered by dense invasive species.

Fish Stocking

Introducing fish into lakes through stocking programs indirectly contributes to increased phosphorus loading. Fish excrete waste containing phosphorus into the water; specifically, they excrete dissolved nitrogen and phosphorus through their urine or gills, which are readily available to algae and aquatic plants, while egestion releases nutrients more slowly through microbial decomposition (Verant et al. 2007). Fish with long lifespans and high biomass store nutrients in their tissues, slowing nutrient cycling,

acting as sinks (Nobre et al. 2019). When fish die and decompose, short-term bursts of nutrients are then also released into the water column (Nobre et al. 2019). The impact of fish stocking on nutrient contribution can depend on species, size, density, diet, and lake characteristics (Verant et al. 2007).

The Washington Department of Fish and Wildlife (WDFW) (2025) records document fish stocking in Lake Lawrence since 1995. Within the last 10 years (water years 2016-2025), between 11,572 to 13,726 pounds of fish were stocked annually. Rainbow trout dominate these stocking events, although some years include brown trout. In water year (WY) 2025 (October 2024-September 2025), a total of 13,332 pounds (6,043 kg) of only rainbow trout were stocked, similar to the annual average of 12,518 pounds (5,678 kg) for all trout species stocked during the 10-year period.

Historical studies of Lake Lawrence did not specifically estimate phosphorus contribution from fish stocking. In WY 2025 13,332 pounds (6,043 kg) of rainbow trout were stocked. A whole-body phosphorus content of 0.36 percent was applied for this analysis. The regression reported in Bureau et al. (2003) is:

$$P = 0.0173g\ P + 0.0036\ g\ P\ per\ g\ fish$$
$$P = 0.0173\ g\ P + 3.6\ g\ P\ per\ kg\ fish$$

If the project team assumes the fish stocked are each 1 kilogram, this will predict 3.6173 g of phosphorus for a 1-kilogram fish, which is essentially 3.6 grams per kilogram and supports the use of a whole-body phosphorus concentration of 0.36 percent. Using this value, the estimated phosphorus load introduced into the lake is approximately 21.75 kg per year. Fishing activity will remove some of the phosphorus from the lake. Assuming 10, 50, or 90 percent of stocked fish (biomass) are caught and removed, the net phosphorus remaining in the lake would be 19.58 kg per year, 10.88 kg per year, or 2.18 kg per year, respectively, similar to the 10-year average loading calculations (Table 22). These calculations indicate that the estimated annual phosphorus contributions from stocked trout have been consistent over time.

The exact impact to phosphorus concentrations and algae from fish trophic dynamics (e.g., the effect on other fish and zooplankton, and those cascading effects on phytoplankton, etc.) are difficult to model, and not feasible to quantify even when high frequency datasets of fish populations, planting communities, and nutrients are available, and thus were not considered here. Quantitative evaluation of future trout stocking on nutrient concentrations and frequency/timing of algae blooms could be performed by statistically comparing conditions before and after trout stocking, and/or conditions between the years when trout were stocked, and years when trout were not stocked.

Table 22. Estimated Phosphorus Load from Fish Stocking.		
% Fish Biomass Removed	Phosphorus Load (kg) WY 2025 -(6,043 kg trout stocked)	Phosphorus Load (kg) Average Stocking - (5,678 kg; WY2016-2025)
0	21.8	20.4
10	19.6	18.4
50	10.9	10.2
90	2.2	2.0

Assumed phosphorus content of 0.36 percent wet-weight

kg = kg

WY = water year



Results

Internal Loading Estimate Summary

Table 23 summarizes multiple independent estimates of internal phosphorus loading to Lake Lawrence developed to characterize the magnitude and seasonal importance of sediment-derived phosphorus. Because internal loading cannot be directly measured, a range of complementary methods was applied to bracket plausible loading rates and reduce reliance on any single set of assumptions. Together, these approaches provide a robust basis for evaluating the relative importance of internal loading and its implications for lake management.

The methods summarized in Table 23 include: (1) estimation of hypolimnetic phosphorus mass accumulation during periods of summer stratification, (2) whole-lake phosphorus mass balance residuals, (3) sediment phosphorus release rate equations applied under site-specific temperature and oxygen conditions, and (4) back-calculation of internal loading using a steady-state lake phosphorus response model. Each method draws on different datasets and assumptions, resulting in a range of estimated loading rates rather than a single deterministic value.

Annual internal loading estimates generally ranged from approximately 180 to 370 kg per year, with a central tendency near 240 kg per year. The vast majority (>95 percent) of internal loading occurs in the Big Basin (eastern basin) due its higher levels of active phosphorous in the sediments and larger sediment area experiencing anoxia.

Table 23. Internal Loading Estimates.

Internal Load Estimate Method	Flux Estimate (mg/m ² /day)	Anoxic Factor (days)	L _{int} (mg/m ² /year)	Load (kg/year)
Big Basin				
Nurnberg 1988 Iron-bound Phosphorus Sediment	4.6	49.5	227.6	262.1
Pilgrim 2007 Mobile (Iron-bound + Biogenic) Phosphorus in Sediment	3.3	49.5	163.3	180.8
Summer Hypolimnetic Phosphorus Mass Accumulation	6.6	49.5	325.6	360.5
West Basin				
Nurnberg 1988 Iron-bound Phosphorus Sediment	0.2	23.2	4.6	1.0
Pilgrim 2007 Mobile (Iron-bound + Labile) Phosphorus in Sediment	0.2	23.2	4.6	1.0
Summer Hypolimnetic Phosphorus Mass Accumulation	2.7	23.2	62.1	13.3
Combined				
Sum – Nurnberg 1988	4.0	49.5	198.4	262.2
Sum – Pilgrim 1987	2.8	49.5	137.6	181.8
Sum – Summer Hypolimnetic Phosphorus Mass Accumulation	5.7	49.5	282.9	373.8
Summer Mass Balance Residual (mean summer residual [sediment release – sedimentation] – mean winter residual [sedimentation]) (combined with West Basin)	3.5	49.5	173.3	229.0
Lake Phosphorus Model Back-calculation	2.3	49.5	115.9	153.2
Average	3.7	49.5	181.6	240.0

Flux estimates for the Summer Mass Accumulation and Mass Balance Residual methods and the Combined totals are back-calculated based on the average anoxic factor. For the combined basin, the Big Basin AF was used.

Lake Lawrence Phosphorus Budget

The Lake Lawrence phosphorus budget is presented on a monthly basis in Table 24, and graphically presented for the entire year in Figure 18 and for the summer only in Figure 19, where inputs are on the left and outputs are on the right of the graphs. Internal loading dominates phosphorus loading to Lake Lawrence. Annually, the internal loading contributes 81 percent of all phosphorus loads to the lake, and internal loading contributes 97 percent of the loads during the summer (Table 24). There is a substantial net negative residual in the annual budget (140 kg), indicating an unquantified output or overestimation of phosphorus import, and a larger negative residual in the summer budget (162 kg). The sedimentation rate appears reasonable but may have been underestimated for the summer months because they are based on residuals for winter months when waters were likely more turbulent, which could account for some of the negative summer residuals.

Some of the positive residual in the fall may have been from waterfowl fecal deposits and aquatic plant decay that were not included in the annual phosphorus budget. The annual phosphorus load from waterfowl was estimated at about 25 kg and most of that (19 kg) occurred during the winter months when waterfowl were most abundant. Phosphorus loads were not estimated for aquatic plant decay but would be expected to occur primarily during the early winter plant senescence period (e.g., October through December). The highest positive residuals were observed in November, December, and May (see Table 24). Thus, much of the winter positive residual may have been from waterfowl (goose and cormorant) fecal deposits and aquatic plant decay.

Most of the phosphorus entering the lake settles to the lake bottom (91 percent) (Table 24), whereas less than 1 percent leaves via the lake outlet and 9 percent is exported via groundwater outflow. Some of the phosphorus settling to the lake sediments is active and may later be released into the water column. The sediment samples indicated that about 40 to 60 percent of phosphorus in the biologically active zone (0 to 10 cm) was active and can be released from iron or labile organic matter.

The groundwater load estimates are based on the residual in the water budget, presented in the previous chapter. These estimates are very sensitive to the accuracy of the water budget estimates and the assumed groundwater phosphorus concentrations. Furthermore, a net negative groundwater residual (i.e., where there is more volume leaving than entering the lake as groundwater) does not mean there is no groundwater inflow to the lake. In this way, these groundwater load estimates are only a partial picture.

During the summer (May to September) period (Figure 19), it is estimated that most of the phosphorus load came from internal loading (240 kg [97 percent]). The next sources were distant: surface runoff and precipitation (each 1 percent). There was a negative residual of (-162 kg) is driven by the drop in TP concentrations in the hypolimnion from the September sample, causing loss in estimated lake storage. The September 2025 event showed the lake was isothermal and oxygenated.

During the May to September period, incoming phosphorus either settled to the lake bottom or remained in the surface water. A small amount left via the lake's outlet and groundwater outflow. The decrease in surface outflow was primarily driven by limited lake discharge, in balance with decreased inflow to the lake.

Table 24. Water Year 2025 Monthly Phosphorus Loads to Lake Lawrence.

Year	Month	Surface Input Mass (kg)		Internal Load (kg)	Groundwater Mass (kg)		Surface Output (kg)	Mass Balance (kg)		
		Precipitation	Surface Inflow	Sediment Release	Inflow	Outflow	Lake Outflow	Change in Storage	Sediment-ation*	Residual*
2024	10	2.5	2.3	0.0	0.0	3.8	0.0	0.0	20.0	19.1
2024	11	3.8	3.5	0.0	0.0	4.4	0.0	6.1	20.0	23.3
2024	12	5.8	5.2	0.0	0.0	2.9	0.0	8.2	20.0	20.2
2025	1	1.3	1.1	0.0	0.0	0.7	0.0	11.0	20.0	29.4
2025	2	3.8	3.4	0.0	0.0	1.5	0.0	-34.3	20.0	-19.9
2025	3	3.9	3.4	0.0	1.5	0.0	0.0	-64.2	20.0	-52.9
2025	4	2.1	1.8	0.0	2.5	0.0	0.7	-12.3	20.0	2.0
2025	5	1.2	1.0	48	1.0	0.0	0.0	158.6	20.0	127.3
2025	6	0.6	0.5	48	0.0	0.5	0.0	-1.2	20.0	-29.8
2025	7	0.0	0.0	48	0.0	3.8	0.0	-3.4	20.0	-27.6
2025	8	0.9	0.8	48	0.0	2.8	0.0	-4.9	20.0	-31.7
2025	9	0.6	0.6	48	0.0	1.9	0.0	-173.4	20.0	-200.7
Annual Totals										
Mass (kg)		26.3	23.4	240.0	5.0	22.4	0.7	-109.8	240.1	-141.4
Percent		8.9%	7.9%	81.4%	1.7%	8.5%	0.3%	--	91.2%	--
Summer (May to September) Totals										
Mass (kg)		3.3	2.9	240.0	1.0	9.0	0.0	-24.3	100.1	-162.4
Percent		1.2%	1.2%	97.1%	0.4%	8.2%	0.0%	--	91.8%	--

* Sedimentation rate is based on the average winter (November to March) residual.

* Residual = (Lake Outflow + Sedimentation + Change in Storage + Groundwater Outflow) – (Surface Input + Internal Loading + Groundwater Inflow).

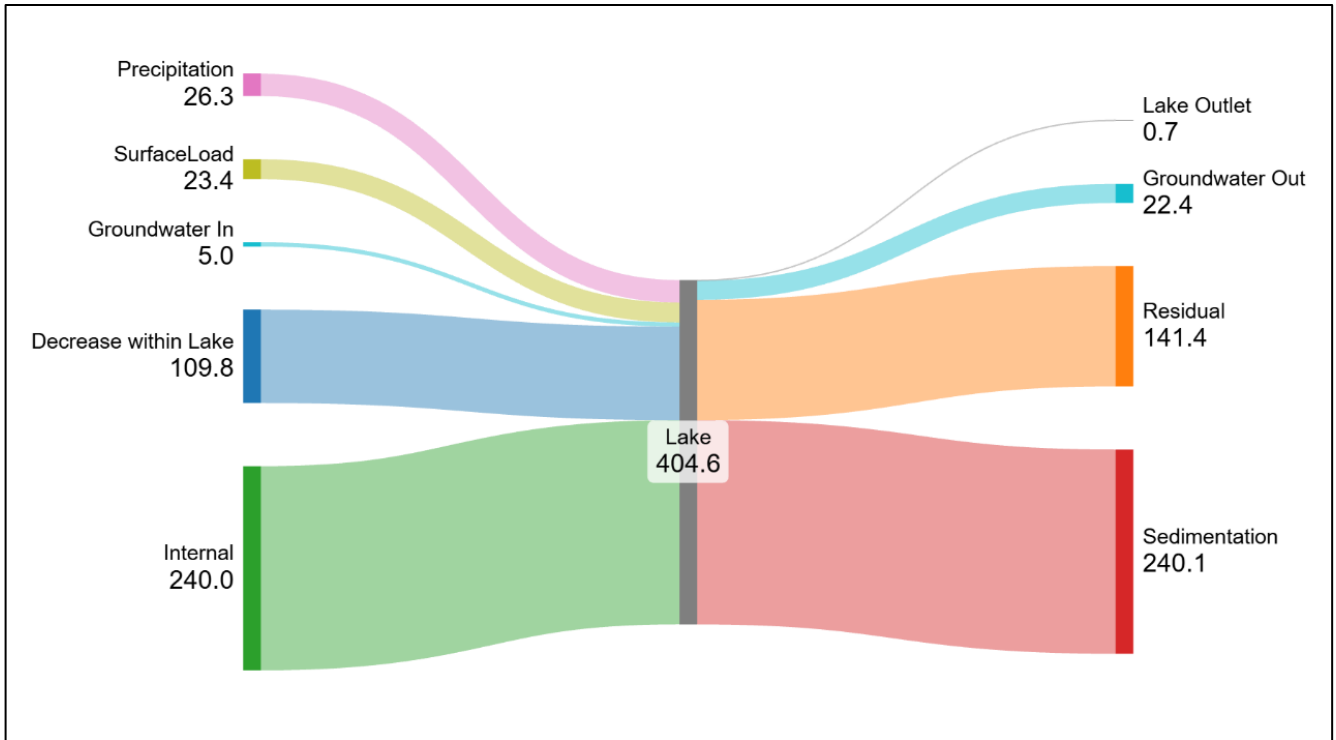


Figure 18. Annual Phosphorus Budget (kg) for Lake Lawrence.

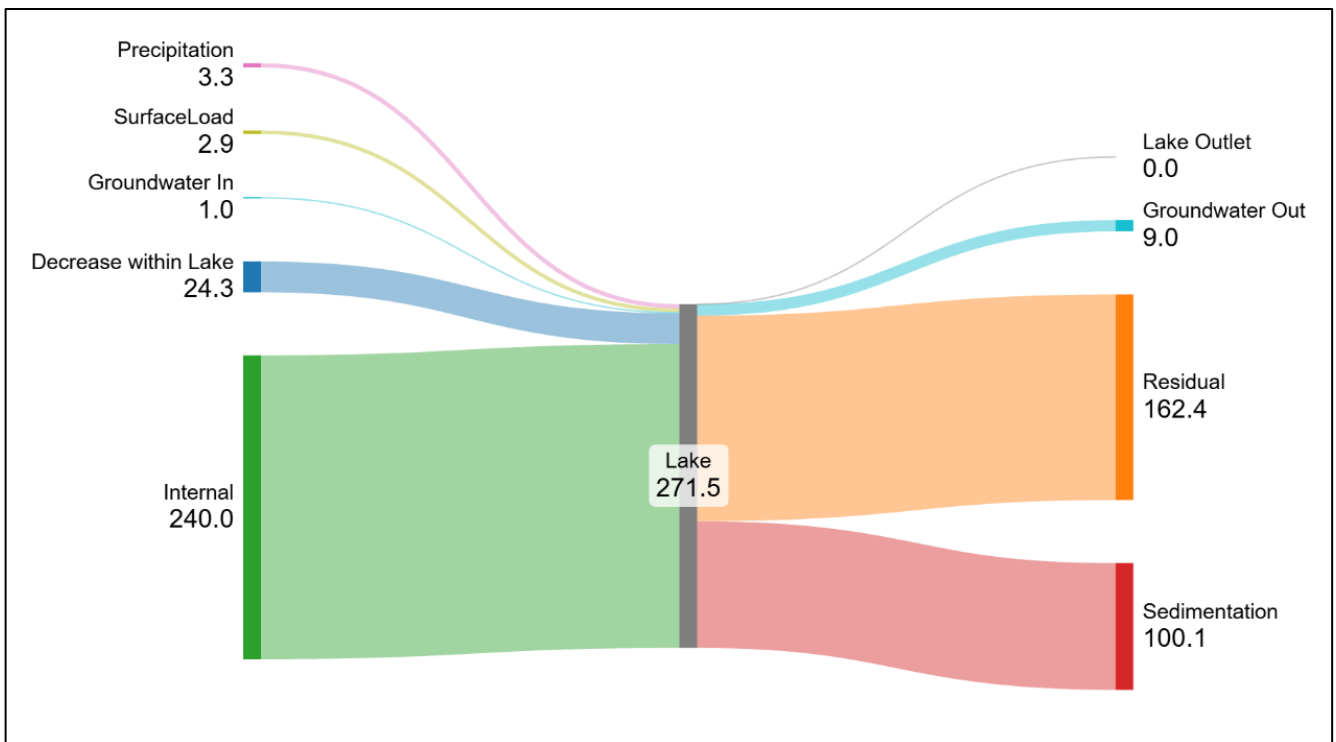


Figure 19. Summer (May to September) Phosphorus Budget (kg) for Lake Lawrence.

Predicted Lake Phosphorus Following Load Reduction

Using the lake phosphorus mass loading model described previously, the project team may predict the in-lake phosphorus concentrations following reductions of internal or external loads (Table 25). Under baseline conditions, this study's loading estimates predict an in-lake total phosphorus concentration of 61.8 µg/L, a 40 percent overestimate compared to the 2025 volume-weighted concentration of 44.4 µg/L, whereas the KCM (1991) loading estimates grossly overestimate in-lake total phosphorus at 178.9 µg/L (approximately four-times observed levels).

The Lake Lawrence total phosphorus management objective is less than or equal to 24 µg/L. To achieve this level, the total loading to the lake must be 120 kg or less. This is not plausible with external load reduction alone but may be accomplished in combination with or solely by internal load reduction (i.e., an 80 percent reduction in internal loading).

Table 25. Predicted Lake TP With Loading Reductions.

Conditions	Data Source for Loading Estimates	External Load (kg)	Internal Load (kg)	Predicted Lake TP (µg/L)
Baseline	This Study	69.5	240.0	61.8
	KCM 1991	210	1,008.4	178.9
50% <u>Internal</u> Load Reduction	This Study	69.5	120.0	37.8
	KCM 1991	210	504.2	104.9
80% <u>Internal</u> Load Reduction	This Study	69.5	48.0	23.4
	KCM 1991	210	201.7	60.5
90% <u>Internal</u> Load Reduction	This Study	69.5	24.0	18.7
	KCM 1991	210	100.8	45.6
50% <u>External</u> Load Reduction	This Study	34.8	240.0	54.8
	KCM 1991	105	1,008.4	163.5
50% <u>External</u> and 50% <u>Internal</u> Load Reduction	This Study	34.8	120.0	30.9
	KCM 1991	105	504.2	89.4
50% <u>External</u> and 80% <u>Internal</u> Load Reduction	This Study	34.8	48.0	16.5
	KCM 1991	105	201.7	45.1
50% <u>External</u> and 90% <u>Internal</u> Load Reduction	This Study	34.8	24.0	11.7
	KCM 1991	105	100.8	30.3

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Appendix B

Laboratory Data Reports

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com



***Professional
Analytical
Services***

November 14, 2024

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN

Project: Lakes
Project Number: 40667
COC Number: A24J0490

JOHN HABERLIN:

Enclosed please find the analytical data for your Lakes project.

Your sample(s) were received on Friday, October 25, 2024 and properly maintained prior to the subsequent analysis. The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA, Standard Methods or the Army Corps of Engineers.

Following the analytical results you will find the Quality Control (QA/QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Practical Quantitation Limits (PQL's), as opposed to the Method Detection Limits (MDL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Aaron Young". The signature is fluid and cursive, with the first name "Aaron" and last name "Young" clearly distinguishable.

ElementStationManager For Aaron Young

President

aarony@amtestlab.com



ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Date Received: 10/25/24

Date Reported: 11/14/24

Reported Samples

Lab ID	Sample	Matrix	Qualifiers	Date Sampled	Date Received
A24J0490-01	Schneider T	Water		10/01/2024	10/25/2024
A24J0490-02	Schneider T QA	Water		10/01/2024	10/25/2024
A24J0490-03	Kennedy	Water		10/01/2024	10/25/2024
A24J0490-04	Kennedy QA	Water		10/01/2024	10/25/2024
A24J0490-05	McLane	Water		10/01/2024	10/25/2024
A24J0490-06	Black Lake Ditch	Water		10/01/2024	10/25/2024
A24J0490-07	Deschutes Falls	Water		10/02/2024	10/25/2024
A24J0490-08	Deschutes Falls QA	Water		10/02/2024	10/25/2024
A24J0490-09	Deschutes @Vail LP	Water		10/02/2024	10/25/2024
A24J0490-10	Deschutes @Vail LP QA	Water		10/25/2024	10/25/2024
A24J0490-11	Deschutes @Tumwater	Water		10/02/2024	10/25/2024
A24J0490-12	Spurgeon @ Rich	Water		10/02/2024	10/25/2024
A24J0490-13	Indian Mouth	Water		10/02/2024	10/25/2024
A24J0490-14	Deschutes @Waldrick	Water		10/02/2024	10/25/2024
A24J0490-15	Eaton	Water		10/08/2024	10/25/2024
A24J0490-16	Eaton QA	Water		10/08/2024	10/25/2024
A24J0490-17	Thompson	Water		10/08/2024	10/25/2024
A24J0490-18	Thompson QA	Water		10/08/2024	10/25/2024
A24J0490-19	McAllister @ I-5	Water		10/08/2024	10/25/2024
A24J0490-20	Woodland @ Draham	Water		10/08/2024	10/25/2024
A24J0490-21	Woodland @ PG	Water		10/08/2024	10/25/2024
A24J0490-22	Woodard @Libby	Water		10/08/2024	10/25/2024
A24J0490-23	Moxlie @ Union	Water		10/08/2024	10/25/2024
A24J0490-24	Salmon @ LR	Water		10/09/2024	10/25/2024
A24J0490-25	Salmon @ LR QA	Water		10/09/2024	10/25/2024
A24J0490-26	Blooms Ditch @ 110th	Water		10/09/2024	10/25/2024
A24J0490-27	Blooms Ditch @ 110th QA	Water		10/09/2024	10/25/2024
A24J0490-28	Black @ 128th	Water		10/09/2024	10/25/2024
A24J0490-29	Beaver @ LR	Water		10/09/2024	10/25/2024
A24J0490-30	Black @ Moon	Water		10/09/2024	10/25/2024
A24J0490-31	Chehalis	Water		10/09/2024	10/25/2024
A24J0490-32	Skookemchuck	Water		10/09/2024	10/25/2024
A24J0490-33	Summit-Surface	Water		10/03/2024	10/25/2024
A24J0490-34	Summit-Bottom	Water		10/03/2024	10/25/2024
A24J0490-35	Black Lake-Surface	Water		10/03/2024	10/25/2024



ANALYSIS REPORT

Date Received: 10/25/24

Date Reported: 11/14/24

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

A24J0490-36	Black Lake-Bottom	Water	10/03/2024	10/25/2024
A24J0490-37	Long 3-Surface	Water	10/03/2024	10/25/2024
A24J0490-38	Long 3-Bottom	Water	10/03/2024	10/25/2024
A24J0490-39	Long 4-Surface	Water	10/03/2024	10/25/2024
A24J0490-40	Long 4-Bottom	Water	10/03/2024	10/25/2024
A24J0490-41	Clear-Surface	Water	10/15/2024	10/25/2024
A24J0490-42	Clear-Bottom	Water	10/15/2024	10/25/2024
A24J0490-43	Lawrence 1-Surface	Water	10/15/2024	10/25/2024
A24J0490-44	Lawrence 1-Bottom	Water	10/15/2024	10/25/2024
A24J0490-45	Lawrence 2-Surface	Water	10/15/2024	10/25/2024
A24J0490-46	Lawrence 2-Bottom	Water	10/15/2024	10/25/2024
A24J0490-47	Tempo-Surface	Water	10/17/2024	10/25/2024
A24J0490-48	Tempo-Bottom	Water	10/17/2024	10/25/2024
A24J0490-49	Offutt-Surface	Water	10/17/2024	10/25/2024
A24J0490-50	Offutt-Bottom	Water	10/17/2024	10/25/2024
A24J0490-51	Pattison N-Surface	Water	10/22/2024	10/25/2024
A24J0490-52	Pattison N-Bottom	Water	10/22/2024	10/25/2024
A24J0490-53	Pattison S-Surface	Water	10/22/2024	10/25/2024
A24J0490-54	Pattison S-Bottom	Water	10/22/2024	10/25/2024
A24J0490-55	Hicks-Surface	Water	10/22/2024	10/25/2024
A24J0490-56	Hicks-Bottom	Water	10/22/2024	10/25/2024

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Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A24J0490-01
Client Identification: Schneider T
Sampling Date: 10/01/24 10:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.037	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.029	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-02
Client Identification: Schneider T QA
Sampling Date: 10/01/24 10:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.036	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.029	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-03
Client Identification: Kennedy
Sampling Date: 10/01/24 11:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.132	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.018	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-04
Client Identification: Kennedy QA
Sampling Date: 10/01/24 11:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.134	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.017	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

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Thurston County Environmental Health
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Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A24J0490-05
Client Identification: McLane
Sampling Date: 10/01/24 12:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.135	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.027	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-06
Client Identification: Black Lake Ditch
Sampling Date: 10/01/24 13:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.018	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-07
Client Identification: Deschutes Falls
Sampling Date: 10/02/24 10:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.142	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.017	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-08
Client Identification: Deschutes Falls QA
Sampling Date: 10/02/24 10:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.149	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.013	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

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Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A24J0490-09
Client Identification: Deschutes @Vail LP
Sampling Date: 10/02/24 10:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.511	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.017	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-10
Client Identification: Deschutes @Vail LP QA
Sampling Date: 10/25/24 10:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.502	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.017	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-11
Client Identification: Deschutes @Tumwater
Sampling Date: 10/02/24 11:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.696	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.027	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-12
Client Identification: Spurgeon @ Rich
Sampling Date: 10/02/24 11:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.024	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

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Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A24J0490-13
Client Identification: Indian Mouth
Sampling Date: 10/02/24 12:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.788	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.046	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-14
Client Identification: Deschutes @Waldrick
Sampling Date: 10/02/24 11:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.876	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.017	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-15
Client Identification: Eaton
Sampling Date: 10/08/24 10:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.790	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.042	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-16
Client Identification: Eaton QA
Sampling Date: 10/08/24 10:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.798	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.041	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

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AMTEST Identification Number: A24J0490-17
Client Identification: Thompson
Sampling Date: 10/08/24 11:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	2.44	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.021	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-18
Client Identification: Thompson QA
Sampling Date: 10/08/24 11:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	2.36	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.021	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-19
Client Identification: McAllister @ I-5
Sampling Date: 10/08/24 11:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.953	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.134	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-20
Client Identification: Woodland @ Draham
Sampling Date: 10/08/24 12:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.53	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.095	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

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AMTEST Identification Number: A24J0490-21
Client Identification: Woodland @ PG
Sampling Date: 10/08/24 13:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.44	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.085	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-22
Client Identification: Woodard @Libby
Sampling Date: 10/08/24 14:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.393	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.050	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-23
Client Identification: Moxlie @ Union
Sampling Date: 10/08/24 14:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.540	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.073	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-24
Client Identification: Salmon @ LR
Sampling Date: 10/09/24 10:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.030	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.034	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

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Thurston County Environmental Health
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AMTEST Identification Number: A24J0490-25
Client Identification: Salmon @ LR QA
Sampling Date: 10/09/24 10:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.029	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.067	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-26
Client Identification: Blooms Ditch @ 110th
Sampling Date: 10/09/24 11:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.411	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.032	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-27
Client Identification: Blooms Ditch @ 110th QA
Sampling Date: 10/09/24 11:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.416	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.029	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-28
Client Identification: Black @ 128th
Sampling Date: 10/09/24 11:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.048	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.027	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

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Thurston County Environmental Health
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Project Name: Lakes
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AMTEST Identification Number: A24J0490-29
Client Identification: Beaver @ LR
Sampling Date: 10/09/24 11:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.823	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.025	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-30
Client Identification: Black @ Moon
Sampling Date: 10/09/24 12:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.814	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.024	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-31
Client Identification: Chehalis
Sampling Date: 10/09/24 12:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.438	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.052	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-32
Client Identification: Skookemchuck
Sampling Date: 10/09/24 14:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.197	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Phosphorus (TP)	0.023	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

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Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A24J0490-33
Client Identification: Summit-Surface
Sampling Date: 10/03/24 09:35

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	0.41	mg/L		0.25	EPA 351.2_2_1993	LF	11/07/2024
Total Nitrogen	0.411	mg/L			Calculated	LF	11/07/2024
Total Phosphorus (TP)	0.008	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-34
Client Identification: Summit-Bottom
Sampling Date: 10/03/24 09:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.057	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	0.48	mg/L		0.25	EPA 351.2_2_1993	LF	11/07/2024
Total Nitrogen	0.534	mg/L			Calculated	LF	11/07/2024
Total Phosphorus (TP)	0.056	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-35
Client Identification: Black Lake-Surface
Sampling Date: 10/03/24 11:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	0.63	mg/L		0.25	EPA 351.2_2_1993	LF	11/07/2024
Total Nitrogen	0.637	mg/L			Calculated	LF	11/07/2024
Total Phosphorus (TP)	0.016	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

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Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A24J0490-36
Client Identification: Black Lake-Bottom
Sampling Date: 10/03/24 11:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	0.69	mg/L		0.25	EPA 351.2_2_1993	LF	11/07/2024
Total Nitrogen	0.695	mg/L			Calculated	LF	11/07/2024
Total Phosphorus (TP)	0.015	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-37
Client Identification: Long 3-Surface
Sampling Date: 10/03/24 12:35

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	0.84	mg/L		0.25	EPA 351.2_2_1993	LF	11/07/2024
Total Nitrogen	0.849	mg/L			Calculated	LF	11/07/2024
Total Phosphorus (TP)	0.028	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-38
Client Identification: Long 3-Bottom
Sampling Date: 10/03/24 12:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	0.83	mg/L		0.25	EPA 351.2_2_1993	LF	11/07/2024
Total Nitrogen	0.835	mg/L			Calculated	LF	11/07/2024
Total Phosphorus (TP)	0.032	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

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ANALYSIS REPORT

Date Received: 10/25/24
Date Reported: 11/14/24

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A24J0490-39
Client Identification: Long 4-Surface
Sampling Date: 10/03/24 12:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	0.68	mg/L		0.25	EPA 351.2_2_1993	LF	11/07/2024
Total Nitrogen	0.685	mg/L			Calculated	LF	11/07/2024
Total Phosphorus (TP)	0.023	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-40
Client Identification: Long 4-Bottom
Sampling Date: 10/03/24 12:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	0.74	mg/L		0.25	EPA 351.2_2_1993	LF	11/07/2024
Total Nitrogen	0.743	mg/L			Calculated	LF	11/07/2024
Total Phosphorus (TP)	0.024	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-41
Client Identification: Clear-Surface
Sampling Date: 10/15/24 10:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	1.09	mg/L		0.25	EPA 351.2_2_1993	LF	11/07/2024
Total Nitrogen	1.09	mg/L			Calculated	LF	11/07/2024
Total Phosphorus (TP)	0.049	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

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Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A24J0490-42
Client Identification: Clear-Bottom
Sampling Date: 10/15/24 10:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.022	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	0.69	mg/L		0.25	EPA 351.2_2_1993	LF	11/07/2024
Total Nitrogen	0.709	mg/L			Calculated	LF	11/07/2024
Total Phosphorus (TP)	0.038	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-43
Client Identification: Lawrence 1-Surface
Sampling Date: 10/15/24 11:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	1.79	mg/L		0.25	EPA 351.2_2_1993	LF	11/07/2024
Total Nitrogen	1.80	mg/L			Calculated	LF	11/07/2024
Total Phosphorus (TP)	0.040	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-44
Client Identification: Lawrence 1-Bottom
Sampling Date: 10/15/24 11:35

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	1.65	mg/L		0.25	EPA 351.2_2_1993	LF	11/07/2024
Total Nitrogen	1.65	mg/L			Calculated	LF	11/07/2024
Total Phosphorus (TP)	0.070	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

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Thurston County Environmental Health
412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A24J0490-45
Client Identification: Lawrence 2-Surface
Sampling Date: 10/15/24 12:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	1.43	mg/L		0.25	EPA 351.2_2_1993	LF	11/07/2024
Total Nitrogen	1.44	mg/L			Calculated	LF	11/07/2024
Total Phosphorus (TP)	0.038	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-46
Client Identification: Lawrence 2-Bottom
Sampling Date: 10/15/24 12:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	1.44	mg/L		0.25	EPA 351.2_2_1993	LF	11/07/2024
Total Nitrogen	1.44	mg/L			Calculated	LF	11/07/2024
Total Phosphorus (TP)	0.066	mg/L		0.005	SM 4500-P F_2011	LF	11/08/2024

AMTEST Identification Number: A24J0490-47
Client Identification: Tempo-Surface
Sampling Date: 10/17/24 09:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	0.68	mg/L		0.25	EPA 351.2_2_1993	LF	11/14/2024
Total Nitrogen	0.686	mg/L			Calculated	LF	11/14/2024
Total Phosphorus (TP)	0.016	mg/L		0.005	SM 4500-P F_2011	LF	11/12/2024

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Thurston County Environmental Health
412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A24J0490-48
Client Identification: Tempo-Bottom
Sampling Date: 10/17/24 09:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.021	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	1.47	mg/L		0.25	EPA 351.2_2_1993	LF	11/14/2024
Total Nitrogen	1.49	mg/L			Calculated	LF	11/14/2024
Total Phosphorus (TP)	0.255	mg/L		0.005	SM 4500-P F_2011	LF	11/12/2024

AMTEST Identification Number: A24J0490-49
Client Identification: Offutt-Surface
Sampling Date: 10/17/24 10:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	1.25	mg/L		0.25	EPA 351.2_2_1993	LF	11/14/2024
Total Nitrogen	1.27	mg/L			Calculated	LF	11/14/2024
Total Phosphorus (TP)	0.077	mg/L		0.005	SM 4500-P F_2011	LF	11/12/2024

AMTEST Identification Number: A24J0490-50
Client Identification: Offutt-Bottom
Sampling Date: 10/17/24 10:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	1.18	mg/L		0.25	EPA 351.2_2_1993	LF	11/14/2024
Total Nitrogen	1.20	mg/L			Calculated	LF	11/14/2024
Total Phosphorus (TP)	0.078	mg/L		0.005	SM 4500-P F_2011	LF	11/12/2024



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Thurston County Environmental Health
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Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A24J0490-51
Client Identification: Pattison N-Surface
Sampling Date: 10/22/24 10:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Ammonia	0.232	mg/L		0.020	EPA 350.1_2_1993	LF	11/06/2024
Total Nitrate + Nitrite	0.073	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	0.96	mg/L		0.25	EPA 351.2_2_1993	LF	11/14/2024
Total Nitrogen	1.03	mg/L			Calculated	LF	11/14/2024
Total Phosphorus (TP)	0.060	mg/L		0.005	SM 4500-P F_2011	LF	11/12/2024

AMTEST Identification Number: A24J0490-52
Client Identification: Pattison N-Bottom
Sampling Date: 10/22/24 11:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Ammonia	0.229	mg/L		0.020	EPA 350.1_2_1993	LF	11/06/2024
Total Nitrate + Nitrite	0.071	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	0.98	mg/L		0.25	EPA 351.2_2_1993	LF	11/14/2024
Total Nitrogen	1.05	mg/L			Calculated	LF	11/14/2024
Total Phosphorus (TP)	0.065	mg/L		0.005	SM 4500-P F_2011	LF	11/12/2024

AMTEST Identification Number: A24J0490-53
Client Identification: Pattison S-Surface
Sampling Date: 10/22/24 11:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Ammonia	0.127	mg/L		0.020	EPA 350.1_2_1993	LF	11/06/2024
Total Nitrate + Nitrite	0.053	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	0.93	mg/L		0.25	EPA 351.2_2_1993	LF	11/14/2024
Total Nitrogen	0.980	mg/L			Calculated	LF	11/14/2024
Total Phosphorus (TP)	0.039	mg/L		0.005	SM 4500-P F_2011	LF	11/12/2024

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ANALYSIS REPORT

Date Received: 10/25/24
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Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A24J0490-54
Client Identification: Pattison S-Bottom
Sampling Date: 10/22/24 11:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Ammonia	0.130	mg/L		0.020	EPA 350.1_2_1993	LF	11/06/2024
Total Nitrate + Nitrite	0.056	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	0.93	mg/L		0.25	EPA 351.2_2_1993	LF	11/14/2024
Total Nitrogen	0.985	mg/L			Calculated	LF	11/14/2024
Total Phosphorus (TP)	0.043	mg/L		0.005	SM 4500-P F_2011	LF	11/12/2024

AMTEST Identification Number: A24J0490-55
Client Identification: Hicks-Surface
Sampling Date: 10/22/24 12:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	0.74	mg/L		0.25	EPA 351.2_2_1993	LF	11/14/2024
Total Nitrogen	0.752	mg/L			Calculated	LF	11/14/2024
Total Phosphorus (TP)	0.015	mg/L		0.005	SM 4500-P F_2011	LF	11/12/2024

AMTEST Identification Number: A24J0490-56
Client Identification: Hicks-Bottom
Sampling Date: 10/22/24 12:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.077	mg/L		0.020	EPA 353.2_2_1993	LF	11/04/2024
Total Kjeldahl Nitrogen	3.30	mg/L		0.25	EPA 351.2_2_1993	LF	11/14/2024
Total Nitrogen	3.38	mg/L			Calculated	LF	11/14/2024
Total Phosphorus (TP)	0.825	mg/L		0.050	SM 4500-P F_2011	LF	11/12/2024

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Date Received: 10/25/24

Date Reported: 11/14/24

Quality Control

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BBJ0485 - No Prep - WetChem

Blank (BBJ0485-BLK1)

Prepared: 11/07/24 Analyzed: 11/08/24

Total Phosphorus (TP) ND U 0.005 mg/L

Blank (BBJ0485-BLK2)

Prepared: 11/07/24 Analyzed: 11/08/24

Total Phosphorus (TP) ND U 0.005 mg/L

Blank (BBJ0485-BLK3)

Prepared: 11/07/24 Analyzed: 11/08/24

Total Phosphorus (TP) ND U 0.005 mg/L

Blank (BBJ0485-BLK4)

Prepared: 11/07/24 Analyzed: 11/08/24

Total Phosphorus (TP) ND U 0.005 mg/L

LCS (BBJ0485-BS1)

Prepared: 11/07/24 Analyzed: 11/08/24

Total Phosphorus (TP) 0.109 0.005 mg/L 0.1000 109% 90-110%

LCS (BBJ0485-BS2)

Prepared: 11/07/24 Analyzed: 11/08/24

Total Phosphorus (TP) 0.106 0.005 mg/L 0.1000 106% 90-110%

LCS (BBJ0485-BS3)

Prepared: 11/07/24 Analyzed: 11/08/24

Total Phosphorus (TP) 0.108 0.005 mg/L 0.1000 108% 90-110%

LCS (BBJ0485-BS4)

Prepared: 11/07/24 Analyzed: 11/08/24

Total Phosphorus (TP) 0.092 0.005 mg/L 0.1000 92% 90-110%

Calibration Blank (BBJ0485-CCB1)

Prepared: 11/07/24 Analyzed: 11/08/24

Total Phosphorus (TP) 0.004 mg/L

Calibration Blank (BBJ0485-CCB2)

Prepared: 11/07/24 Analyzed: 11/08/24

Total Phosphorus (TP) 0.004 mg/L

Calibration Blank (BBJ0485-CCB3)

Prepared: 11/07/24 Analyzed: 11/08/24

Total Phosphorus (TP) 0.004 mg/L

Calibration Blank (BBJ0485-CCB4)

Prepared: 11/07/24 Analyzed: 11/08/24

Total Phosphorus (TP) 0.004 mg/L

Calibration Blank (BBJ0485-CCB5)

Prepared: 11/07/24 Analyzed: 11/08/24

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Date Received: 10/25/24

Date Reported: 11/14/24

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBJ0485 - No Prep - WetChem (Continued)										
Calibration Blank (BBJ0485-CCB5)					Prepared: 11/07/24 Analyzed: 11/08/24					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BBJ0485-CCB6)					Prepared: 11/07/24 Analyzed: 11/08/24					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BBJ0485-CCB7)					Prepared: 11/07/24 Analyzed: 11/08/24					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Check (BBJ0485-CCV1)					Prepared: 11/07/24 Analyzed: 11/08/24					
Total Phosphorus (TP)	0.208		0.005	mg/L	0.2000		104%	85-115%		
Calibration Check (BBJ0485-CCV2)					Prepared: 11/07/24 Analyzed: 11/08/24					
Total Phosphorus (TP)	0.209		0.005	mg/L	0.2000		105%	85-115%		
Calibration Check (BBJ0485-CCV3)					Prepared: 11/07/24 Analyzed: 11/08/24					
Total Phosphorus (TP)	0.209		0.005	mg/L	0.2000		105%	85-115%		
Calibration Check (BBJ0485-CCV4)					Prepared: 11/07/24 Analyzed: 11/08/24					
Total Phosphorus (TP)	0.209		0.005	mg/L	0.2000		105%	85-115%		
Calibration Check (BBJ0485-CCV5)					Prepared: 11/07/24 Analyzed: 11/08/24					
Total Phosphorus (TP)	0.209		0.005	mg/L	0.2000		105%	85-115%		
Calibration Check (BBJ0485-CCV6)					Prepared: 11/07/24 Analyzed: 11/08/24					
Total Phosphorus (TP)	0.210		0.005	mg/L	0.2000		105%	85-115%		
Calibration Check (BBJ0485-CCV7)					Prepared: 11/07/24 Analyzed: 11/08/24					
Total Phosphorus (TP)	0.210		0.005	mg/L	0.2000		105%	85-115%		
Duplicate (BBJ0485-DUP1)					Prepared: 11/07/24 Analyzed: 11/08/24					
Total Phosphorus (TP)	0.028		0.005	mg/L		0.028			1	22.3
Duplicate (BBJ0485-DUP2)					Prepared: 11/07/24 Analyzed: 11/08/24					
Total Phosphorus (TP)	0.022		0.005	mg/L		0.021			4	22.3
Duplicate (BBJ0485-DUP3)					Prepared: 11/07/24 Analyzed: 11/08/24					
					Source: A24J0431-03					
					Source: A24J0432-06					
					Source: A24J0490-06					

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Date Received: 10/25/24

Date Reported: 11/14/24

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBJ0485 - No Prep - WetChem (Continued)										
Duplicate (BBJ0485-DUP3)			Source: A24J0490-06			Prepared: 11/07/24 Analyzed: 11/08/24				
Total Phosphorus (TP)	0.016		0.005	mg/L		0.018			13	22.3
Duplicate (BBJ0485-DUP4)			Source: A24J0490-16			Prepared: 11/07/24 Analyzed: 11/08/24				
Total Phosphorus (TP)	0.041		0.005	mg/L		0.041			1	22.3
Duplicate (BBJ0485-DUP5)			Source: A24J0490-26			Prepared: 11/07/24 Analyzed: 11/08/24				
Total Phosphorus (TP)	0.032		0.005	mg/L		0.032			2	22.3
Duplicate (BBJ0485-DUP6)			Source: A24J0490-36			Prepared: 11/07/24 Analyzed: 11/08/24				
Total Phosphorus (TP)	0.014		0.005	mg/L		0.015			9	22.3
Duplicate (BBJ0485-DUP7)			Source: A24J0490-46			Prepared: 11/07/24 Analyzed: 11/08/24				
Total Phosphorus (TP)	0.069		0.005	mg/L		0.066			4	22.3
Matrix Spike (BBJ0485-MS1)			Source: A24J0431-03			Prepared: 11/07/24 Analyzed: 11/08/24				
Total Phosphorus (TP)	0.239		0.005	mg/L	0.2000	0.028	105%	85-115%		
Matrix Spike (BBJ0485-MS2)			Source: A24J0432-06			Prepared: 11/07/24 Analyzed: 11/08/24				
Total Phosphorus (TP)	0.235		0.005	mg/L	0.2000	0.021	107%	85-115%		
Matrix Spike (BBJ0485-MS3)			Source: A24J0490-06			Prepared: 11/07/24 Analyzed: 11/08/24				
Total Phosphorus (TP)	0.232		0.005	mg/L	0.2000	0.018	107%	85-115%		
Matrix Spike (BBJ0485-MS4)			Source: A24J0490-16			Prepared: 11/07/24 Analyzed: 11/08/24				
Total Phosphorus (TP)	0.259		0.005	mg/L	0.2000	0.041	109%	85-115%		
Matrix Spike (BBJ0485-MS5)			Source: A24J0490-26			Prepared: 11/07/24 Analyzed: 11/08/24				
Total Phosphorus (TP)	0.249		0.005	mg/L	0.2000	0.032	109%	85-115%		
Matrix Spike (BBJ0485-MS6)			Source: A24J0490-36			Prepared: 11/07/24 Analyzed: 11/08/24				
Total Phosphorus (TP)	0.228		0.005	mg/L	0.2000	0.015	106%	85-115%		
Matrix Spike (BBJ0485-MS7)			Source: A24J0490-46			Prepared: 11/07/24 Analyzed: 11/08/24				
Total Phosphorus (TP)	0.286		0.005	mg/L	0.2000	0.066	110%	85-115%		

Batch: BBJ0528 - No Prep - WetChem

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Date Received: 10/25/24

Date Reported: 11/14/24

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBJ0528 - No Prep - WetChem (Continued)										
Blank (BBJ0528-BLK1)					Prepared: 11/06/24 Analyzed: 11/07/24					
Total Kjeldahl Nitrogen	ND	U	0.25	mg/L						
Blank (BBJ0528-BLK2)					Prepared: 11/06/24 Analyzed: 11/07/24					
Total Kjeldahl Nitrogen	ND	U	0.25	mg/L						
LCS (BBJ0528-BS1)					Prepared: 11/06/24 Analyzed: 11/07/24					
Total Kjeldahl Nitrogen	0.49		0.25	mg/L	0.5000		99%	85-115%		
LCS (BBJ0528-BS2)					Prepared: 11/06/24 Analyzed: 11/07/24					
Total Kjeldahl Nitrogen	0.49		0.25	mg/L	0.5000		98%	85-115%		
Calibration Blank (BBJ0528-CCB1)					Prepared: 11/06/24 Analyzed: 11/07/24					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Blank (BBJ0528-CCB2)					Prepared: 11/06/24 Analyzed: 11/07/24					
Total Kjeldahl Nitrogen	0.002			mg/L						
Calibration Blank (BBJ0528-CCB3)					Prepared: 11/06/24 Analyzed: 11/07/24					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Blank (BBJ0528-CCB4)					Prepared: 11/06/24 Analyzed: 11/07/24					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Check (BBJ0528-CCV1)					Prepared: 11/06/24 Analyzed: 11/07/24					
Total Kjeldahl Nitrogen	1.00		0.25	mg/L	1.000		100%	85-115%		
Calibration Check (BBJ0528-CCV2)					Prepared: 11/06/24 Analyzed: 11/07/24					
Total Kjeldahl Nitrogen	0.99		0.25	mg/L	1.000		99%	85-115%		
Calibration Check (BBJ0528-CCV3)					Prepared: 11/06/24 Analyzed: 11/07/24					
Total Kjeldahl Nitrogen	1.00		0.25	mg/L	1.000		100%	85-115%		
Calibration Check (BBJ0528-CCV4)					Prepared: 11/06/24 Analyzed: 11/07/24					
Total Kjeldahl Nitrogen	1.00		0.25	mg/L	1.000		100%	85-115%		
Duplicate (BBJ0528-DUP1)			Source: A24J0356-01		Prepared: 11/06/24 Analyzed: 11/07/24					

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Project Name: Lakes
Project #: 40667

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBJ0528 - No Prep - WetChem (Continued)										
Duplicate (BBJ0528-DUP1)			Source: A24J0356-01	Prepared: 11/06/24 Analyzed: 11/07/24						
Total Kjeldahl Nitrogen	0.72		0.25	mg/L		0.66			9	25
Duplicate (BBJ0528-DUP2)			Source: A24J0426-03	Prepared: 11/06/24 Analyzed: 11/07/24						
Total Kjeldahl Nitrogen	0.72		0.25	mg/L		0.71			1	25
Duplicate (BBJ0528-DUP3)			Source: A24J0490-36	Prepared: 11/06/24 Analyzed: 11/07/24						
Total Kjeldahl Nitrogen	0.65		0.25	mg/L		0.69			6	25
Duplicate (BBJ0528-DUP4)			Source: A24J0490-46	Prepared: 11/06/24 Analyzed: 11/07/24						
Total Kjeldahl Nitrogen	1.55		0.25	mg/L		1.44			7	25
Matrix Spike (BBJ0528-MS1)			Source: A24J0356-01	Prepared: 11/06/24 Analyzed: 11/07/24						
Total Kjeldahl Nitrogen	2.68		0.25	mg/L	2.000	0.66	101%	80-120%		
Matrix Spike (BBJ0528-MS2)			Source: A24J0426-03	Prepared: 11/06/24 Analyzed: 11/07/24						
Total Kjeldahl Nitrogen	2.72		0.25	mg/L	2.000	0.71	101%	80-120%		
Matrix Spike (BBJ0528-MS3)			Source: A24J0490-36	Prepared: 11/06/24 Analyzed: 11/07/24						
Total Kjeldahl Nitrogen	2.73		0.25	mg/L	2.000	0.69	102%	80-120%		
Matrix Spike (BBJ0528-MS4)			Source: A24J0490-46	Prepared: 11/06/24 Analyzed: 11/07/24						
Total Kjeldahl Nitrogen	3.43		0.25	mg/L	2.000	1.44	100%	80-120%		
Batch: BBK0012 - No Prep - WetChem										
Blank (BBK0012-BLK1)			Prepared & Analyzed: 11/04/24							
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BBK0012-BLK2)			Prepared & Analyzed: 11/04/24							
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BBK0012-BLK3)			Prepared & Analyzed: 11/04/24							
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BBK0012-BLK4)			Prepared & Analyzed: 11/04/24							
Total Nitrate + Nitrite	ND	U	0.020	mg/L						

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BBK0012 - No Prep - WetChem (Continued)

Blank (BBK0012-BLK5)

Prepared & Analyzed: 11/04/24

Total Nitrate + Nitrite ND U 0.020 mg/L

LCS (BBK0012-BS1)

Prepared & Analyzed: 11/04/24

Total Nitrate + Nitrite 0.504 0.020 mg/L 0.5000 101% 90-110%

LCS (BBK0012-BS2)

Prepared & Analyzed: 11/04/24

Total Nitrate + Nitrite 0.490 0.020 mg/L 0.5000 98% 90-110%

LCS (BBK0012-BS3)

Prepared & Analyzed: 11/04/24

Total Nitrate + Nitrite 0.519 0.020 mg/L 0.5000 104% 90-110%

LCS (BBK0012-BS4)

Prepared & Analyzed: 11/04/24

Total Nitrate + Nitrite 0.508 0.020 mg/L 0.5000 102% 90-110%

LCS (BBK0012-BS5)

Prepared & Analyzed: 11/04/24

Total Nitrate + Nitrite 0.512 0.020 mg/L 0.5000 102% 90-110%

Calibration Blank (BBK0012-CCB1)

Prepared & Analyzed: 11/04/24

Total Nitrate + Nitrite 0.004 mg/L

Calibration Blank (BBK0012-CCB2)

Prepared & Analyzed: 11/04/24

Total Nitrate + Nitrite 0.007 mg/L

Calibration Blank (BBK0012-CCB3)

Prepared & Analyzed: 11/04/24

Total Nitrate + Nitrite 0.009 mg/L

Calibration Blank (BBK0012-CCB4)

Prepared & Analyzed: 11/04/24

Total Nitrate + Nitrite 0.007 mg/L

Calibration Blank (BBK0012-CCB5)

Prepared & Analyzed: 11/04/24

Total Nitrate + Nitrite 0.006 mg/L

Calibration Blank (BBK0012-CCB6)

Prepared & Analyzed: 11/04/24

Total Nitrate + Nitrite 0.008 mg/L

Calibration Blank (BBK0012-CCB7)

Prepared & Analyzed: 11/04/24

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Quality Control

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Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBK0012 - No Prep - WetChem (Continued)										
Calibration Blank (BBK0012-CCB7)					Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	0.009			mg/L						
Calibration Blank (BBK0012-CCB8)					Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	0.008			mg/L						
Calibration Blank (BBK0012-CCB9)					Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	0.007			mg/L						
Calibration Check (BBK0012-CCV1)					Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	1.01		0.020	mg/L	1.000		101%	85-115%		
Calibration Check (BBK0012-CCV2)					Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	1.03		0.020	mg/L	1.000		103%	85-115%		
Calibration Check (BBK0012-CCV3)					Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	1.01		0.020	mg/L	1.000		101%	85-115%		
Calibration Check (BBK0012-CCV4)					Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	1.02		0.020	mg/L	1.000		102%	85-115%		
Calibration Check (BBK0012-CCV5)					Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	0.996		0.020	mg/L	1.000		100%	85-115%		
Calibration Check (BBK0012-CCV6)					Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	0.975		0.020	mg/L	1.000		98%	85-115%		
Calibration Check (BBK0012-CCV7)					Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	1.01		0.020	mg/L	1.000		101%	85-115%		
Calibration Check (BBK0012-CCV8)					Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	0.993		0.020	mg/L	1.000		99%	85-115%		
Calibration Check (BBK0012-CCV9)					Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	1.03		0.020	mg/L	1.000		103%	85-115%		
Duplicate (BBK0012-DUP1)					Source: A24J0490-10 Prepared & Analyzed: 11/04/24					

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Quality Control

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Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBK0012 - No Prep - WetChem (Continued)										
Duplicate (BBK0012-DUP1)	Source: A24J0490-10				Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	0.500		0.020	mg/L		0.502			0.4	20
Duplicate (BBK0012-DUP2)	Source: A24J0490-20				Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	1.51		0.020	mg/L		1.53			1	20
Duplicate (BBK0012-DUP3)	Source: A24J0490-30				Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	0.830		0.020	mg/L		0.814			2	20
Duplicate (BBK0012-DUP4)	Source: A24J0490-40				Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	ND	U	0.020	mg/L		ND				20
Duplicate (BBK0012-DUP5)	Source: A24J0490-50				Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	ND	U	0.020	mg/L		ND				20
Duplicate (BBK0012-DUP6)	Source: A24J0513-03				Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	0.462		0.020	mg/L		0.475			3	20
Duplicate (BBK0012-DUP7)	Source: A24J0520-02				Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	1.73		0.020	mg/L		1.68			3	20
Duplicate (BBK0012-DUP8)	Source: A24J0534-03				Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	5.35		0.200	mg/L		5.58			4	20
Matrix Spike (BBK0012-MS1)	Source: A24J0490-10				Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	1.52		0.020	mg/L	1.000	0.502	102%	85-115%		
Matrix Spike (BBK0012-MS2)	Source: A24J0490-20				Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	2.50		0.020	mg/L	1.000	1.53	97%	85-115%		
Matrix Spike (BBK0012-MS3)	Source: A24J0490-30				Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	1.84		0.020	mg/L	1.000	0.814	103%	85-115%		
Matrix Spike (BBK0012-MS4)	Source: A24J0490-40				Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	0.987		0.020	mg/L	1.000	ND	99%	85-115%		
Matrix Spike (BBK0012-MS5)	Source: A24J0490-50				Prepared & Analyzed: 11/04/24					

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Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBK0012 - No Prep - WetChem (Continued)										
Matrix Spike (BBK0012-MS5)		Source: A24J0490-50			Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	0.997		0.020	mg/L	1.000	ND	100%	85-115%		
Matrix Spike (BBK0012-MS6)		Source: A24J0513-03			Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	1.49		0.020	mg/L	1.000	0.475	101%	85-115%		
Matrix Spike (BBK0012-MS7)		Source: A24J0520-02			Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	2.76		0.020	mg/L	1.000	1.68	108%	85-115%		
Matrix Spike (BBK0012-MS8)		Source: A24J0534-03			Prepared & Analyzed: 11/04/24					
Total Nitrate + Nitrite	15.2		0.200	mg/L	10.00	5.58	96%	85-115%		
Batch: BBK0047 - No Prep - WetChem										
Blank (BBK0047-BLK1)					Prepared & Analyzed: 11/06/24					
Ammonia	ND	U	0.020	mg/L						
Blank (BBK0047-BLK2)					Prepared & Analyzed: 11/06/24					
Ammonia	ND	U	0.020	mg/L						
Blank (BBK0047-BLK3)					Prepared & Analyzed: 11/06/24					
Ammonia	ND	U	0.020	mg/L						
LCS (BBK0047-BS1)					Prepared & Analyzed: 11/06/24					
Ammonia	0.487		0.020	mg/L	0.5000		97%	80-120%		
LCS (BBK0047-BS2)					Prepared & Analyzed: 11/06/24					
Ammonia	0.497		0.020	mg/L	0.5000		99%	80-120%		
LCS (BBK0047-BS3)					Prepared & Analyzed: 11/06/24					
Ammonia	0.503		0.020	mg/L	0.5000		101%	80-120%		
Calibration Blank (BBK0047-CCB1)					Prepared & Analyzed: 11/06/24					
Ammonia	ND	U		mg/L						
Calibration Blank (BBK0047-CCB2)					Prepared & Analyzed: 11/06/24					
Ammonia	0.012			mg/L						

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Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBK0047 - No Prep - WetChem (Continued)										
Calibration Blank (BBK0047-CCB3)					Prepared & Analyzed: 11/06/24					
Ammonia	0.018			mg/L						
Calibration Blank (BBK0047-CCB4)					Prepared & Analyzed: 11/06/24					
Ammonia	0.015			mg/L						
Calibration Blank (BBK0047-CCB5)					Prepared & Analyzed: 11/06/24					
Ammonia	0.009			mg/L						
Calibration Blank (BBK0047-CCB6)					Prepared & Analyzed: 11/06/24					
Ammonia	0.012			mg/L						
Calibration Blank (BBK0047-CCB7)					Prepared & Analyzed: 11/06/24					
Ammonia	0.014			mg/L						
Calibration Check (BBK0047-CCV1)					Prepared & Analyzed: 11/06/24					
Ammonia	0.974		0.020	mg/L	1.000		97%	85-115%		
Calibration Check (BBK0047-CCV2)					Prepared & Analyzed: 11/06/24					
Ammonia	0.961		0.020	mg/L	1.000		96%	85-115%		
Calibration Check (BBK0047-CCV3)					Prepared & Analyzed: 11/06/24					
Ammonia	0.972		0.020	mg/L	1.000		97%	85-115%		
Calibration Check (BBK0047-CCV4)					Prepared & Analyzed: 11/06/24					
Ammonia	1.00		0.020	mg/L	1.000		100%	85-115%		
Calibration Check (BBK0047-CCV5)					Prepared & Analyzed: 11/06/24					
Ammonia	0.979		0.020	mg/L	1.000		98%	85-115%		
Calibration Check (BBK0047-CCV6)					Prepared & Analyzed: 11/06/24					
Ammonia	0.977		0.020	mg/L	1.000		98%	85-115%		
Calibration Check (BBK0047-CCV7)					Prepared & Analyzed: 11/06/24					
Ammonia	0.973		0.020	mg/L	1.000		97%	85-115%		
Duplicate (BBK0047-DUP1)					Prepared & Analyzed: 11/06/24					
					Source: A24J0446-02					

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(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBK0047 - No Prep - WetChem (Continued)										
Duplicate (BBK0047-DUP1)			Source: A24J0446-02		Prepared & Analyzed: 11/06/24					
Ammonia	0.101		0.020	mg/L		0.103			2	20
Duplicate (BBK0047-DUP2)			Source: A24J0477-02		Prepared & Analyzed: 11/06/24					
Ammonia	0.129		0.020	mg/L		0.127			2	20
Duplicate (BBK0047-DUP3)			Source: A24J0513-02		Prepared & Analyzed: 11/06/24					
Ammonia	ND	U	0.020	mg/L		ND				20
Duplicate (BBK0047-DUP4)			Source: A24J0520-01		Prepared & Analyzed: 11/06/24					
Ammonia	0.110		0.020	mg/L		0.109			1	20
Duplicate (BBK0047-DUP5)			Source: A24J0550-01		Prepared & Analyzed: 11/06/24					
Ammonia	0.077		0.020	mg/L		0.075			2	20
Duplicate (BBK0047-DUP6)			Source: A24J0568-01		Prepared & Analyzed: 11/06/24					
Ammonia	32.3		0.400	mg/L		32.1			0.4	20
Duplicate (BBK0047-DUP7)			Source: A24J0569-02		Prepared & Analyzed: 11/06/24					
Ammonia	28.4		0.400	mg/L		26.6			7	20
Matrix Spike (BBK0047-MS1)			Source: A24J0446-02		Prepared & Analyzed: 11/06/24					
Ammonia	1.04		0.020	mg/L	1.000	0.103	94%	80-120%		
Matrix Spike (BBK0047-MS2)			Source: A24J0477-02		Prepared & Analyzed: 11/06/24					
Ammonia	1.13		0.020	mg/L	1.000	0.127	100%	80-120%		
Matrix Spike (BBK0047-MS3)			Source: A24J0513-02		Prepared & Analyzed: 11/06/24					
Ammonia	0.944		0.020	mg/L	1.000	ND	94%	80-120%		
Matrix Spike (BBK0047-MS4)			Source: A24J0520-01		Prepared & Analyzed: 11/06/24					
Ammonia	1.10		0.020	mg/L	1.000	0.109	99%	80-120%		
Matrix Spike (BBK0047-MS5)			Source: A24J0550-01		Prepared & Analyzed: 11/06/24					
Ammonia	1.07		0.020	mg/L	1.000	0.075	100%	80-120%		
Matrix Spike (BBK0047-MS6)			Source: A24J0568-01		Prepared & Analyzed: 11/06/24					

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(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBK0047 - No Prep - WetChem (Continued)										
Matrix Spike (BBK0047-MS6)			Source: A24J0568-01			Prepared & Analyzed: 11/06/24				
Ammonia	52.4		0.400	mg/L	20.00	32.1	101%	80-120%		
Matrix Spike (BBK0047-MS7)			Source: A24J0569-02			Prepared & Analyzed: 11/06/24				
Ammonia	48.2		0.400	mg/L	20.00	26.6	108%	80-120%		
Batch: BBK0088 - No Prep - WetChem										
Blank (BBK0088-BLK1)			Prepared: 11/11/24 Analyzed: 11/12/24							
Total Phosphorus (TP)	ND	U	0.005	mg/L						
Blank (BBK0088-BLK2)			Prepared: 11/11/24 Analyzed: 11/12/24							
Total Phosphorus (TP)	ND	U	0.005	mg/L						
Blank (BBK0088-BLK3)			Prepared: 11/11/24 Analyzed: 11/12/24							
Total Phosphorus (TP)	ND	U	0.005	mg/L						
Blank (BBK0088-BLK4)			Prepared: 11/11/24 Analyzed: 11/12/24							
Total Phosphorus (TP)	ND	U	0.005	mg/L						
LCS (BBK0088-BS1)			Prepared: 11/11/24 Analyzed: 11/12/24							
Total Phosphorus (TP)	0.105		0.005	mg/L	0.1000		105%	90-110%		
LCS (BBK0088-BS2)			Prepared: 11/11/24 Analyzed: 11/12/24							
Total Phosphorus (TP)	0.104		0.005	mg/L	0.1000		104%	90-110%		
LCS (BBK0088-BS3)			Prepared: 11/11/24 Analyzed: 11/12/24							
Total Phosphorus (TP)	0.107		0.005	mg/L	0.1000		107%	90-110%		
LCS (BBK0088-BS4)			Prepared: 11/11/24 Analyzed: 11/12/24							
Total Phosphorus (TP)	0.106		0.005	mg/L	0.1000		106%	90-110%		
Calibration Blank (BBK0088-CCB1)			Prepared: 11/11/24 Analyzed: 11/12/24							
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BBK0088-CCB2)			Prepared: 11/11/24 Analyzed: 11/12/24							
Total Phosphorus (TP)	0.004			mg/L						

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Date Received: 10/25/24

Date Reported: 11/14/24

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBK0088 - No Prep - WetChem (Continued)										
Calibration Blank (BBK0088-CCB3)					Prepared: 11/11/24 Analyzed: 11/12/24					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BBK0088-CCB4)					Prepared: 11/11/24 Analyzed: 11/12/24					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BBK0088-CCB5)					Prepared: 11/11/24 Analyzed: 11/12/24					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BBK0088-CCB6)					Prepared: 11/11/24 Analyzed: 11/12/24					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BBK0088-CCB7)					Prepared: 11/11/24 Analyzed: 11/12/24					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Check (BBK0088-CCV1)					Prepared: 11/11/24 Analyzed: 11/12/24					
Total Phosphorus (TP)	0.212		0.005	mg/L	0.2000		106%	85-115%		
Calibration Check (BBK0088-CCV2)					Prepared: 11/11/24 Analyzed: 11/12/24					
Total Phosphorus (TP)	0.207		0.005	mg/L	0.2000		103%	85-115%		
Calibration Check (BBK0088-CCV3)					Prepared: 11/11/24 Analyzed: 11/12/24					
Total Phosphorus (TP)	0.208		0.005	mg/L	0.2000		104%	85-115%		
Calibration Check (BBK0088-CCV4)					Prepared: 11/11/24 Analyzed: 11/12/24					
Total Phosphorus (TP)	0.207		0.005	mg/L	0.2000		103%	85-115%		
Calibration Check (BBK0088-CCV5)					Prepared: 11/11/24 Analyzed: 11/12/24					
Total Phosphorus (TP)	0.210		0.005	mg/L	0.2000		105%	85-115%		
Calibration Check (BBK0088-CCV6)					Prepared: 11/11/24 Analyzed: 11/12/24					
Total Phosphorus (TP)	0.209		0.005	mg/L	0.2000		105%	85-115%		
Calibration Check (BBK0088-CCV7)					Prepared: 11/11/24 Analyzed: 11/12/24					
Total Phosphorus (TP)	0.209		0.005	mg/L	0.2000		105%	85-115%		
Duplicate (BBK0088-DUP1)			Source: A24J0490-56		Prepared: 11/11/24 Analyzed: 11/12/24					

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Date Received: 10/25/24

Date Reported: 11/14/24

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBK0088 - No Prep - WetChem (Continued)										
Duplicate (BBK0088-DUP1)			Source: A24J0490-56	Prepared: 11/11/24 Analyzed: 11/12/24						
Total Phosphorus (TP)	0.869		0.050	mg/L		0.825			5	22.3
Duplicate (BBK0088-DUP2)			Source: A24J0513-04	Prepared: 11/11/24 Analyzed: 11/12/24						
Total Phosphorus (TP)	0.011		0.005	mg/L		0.012			9	22.3
Duplicate (BBK0088-DUP3)			Source: A24J0520-03	Prepared: 11/11/24 Analyzed: 11/12/24						
Total Phosphorus (TP)	0.031		0.005	mg/L		0.033			5	22.3
Duplicate (BBK0088-DUP4)			Source: A24J0527-09	Prepared: 11/11/24 Analyzed: 11/12/24						
Total Phosphorus (TP)	0.005		0.005	mg/L		0.005			0.1	22.3
Duplicate (BBK0088-DUP5)			Source: A24J0546-08	Prepared: 11/11/24 Analyzed: 11/12/24						
Total Phosphorus (TP)	ND	U	0.005	mg/L		ND				22.3
Duplicate (BBK0088-DUP6)			Source: A24K0056-02	Prepared: 11/11/24 Analyzed: 11/12/24						
Total Phosphorus (TP)	0.041		0.005	mg/L		0.040			2	22.3
Duplicate (BBK0088-DUP7)			Source: A24K0056-10	Prepared: 11/11/24 Analyzed: 11/12/24						
Total Phosphorus (TP)	ND	U	0.005	mg/L		ND				22.3
Matrix Spike (BBK0088-MS1)			Source: A24J0490-56	Prepared: 11/11/24 Analyzed: 11/12/24						
Total Phosphorus (TP)	3.02		0.050	mg/L	2.000	0.825	110%	85-115%		
Matrix Spike (BBK0088-MS2)			Source: A24J0513-04	Prepared: 11/11/24 Analyzed: 11/12/24						
Total Phosphorus (TP)	0.214		0.005	mg/L	0.2000	0.012	101%	85-115%		
Matrix Spike (BBK0088-MS3)			Source: A24J0520-03	Prepared: 11/11/24 Analyzed: 11/12/24						
Total Phosphorus (TP)	0.249		0.005	mg/L	0.2000	0.033	108%	85-115%		
Matrix Spike (BBK0088-MS4)			Source: A24J0527-09	Prepared: 11/11/24 Analyzed: 11/12/24						
Total Phosphorus (TP)	0.206		0.005	mg/L	0.2000	0.005	101%	85-115%		
Matrix Spike (BBK0088-MS5)			Source: A24J0546-08	Prepared: 11/11/24 Analyzed: 11/12/24						
Total Phosphorus (TP)	0.207		0.005	mg/L	0.2000	ND	103%	85-115%		
Matrix Spike (BBK0088-MS6)			Source: A24K0056-02	Prepared: 11/11/24 Analyzed: 11/12/24						

ANALYSIS REPORT

Date Received: 10/25/24

Date Reported: 11/14/24

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BBK0088 - No Prep - WetChem (Continued)

Matrix Spike (BBK0088-MS6)

Source: A24K0056-02

Prepared: 11/11/24 Analyzed: 11/12/24

Total Phosphorus (TP)	0.256		0.005	mg/L	0.2000	0.040	108%	85-115%

Matrix Spike (BBK0088-MS7)

Source: A24K0056-10

Prepared: 11/11/24 Analyzed: 11/12/24

Total Phosphorus (TP)	0.209		0.005	mg/L	0.2000	ND	105%	85-115%

Batch: BBK0089 - No Prep - WetChem

Blank (BBK0089-BLK1)

Prepared: 11/13/24 Analyzed: 11/14/24

Total Kjeldahl Nitrogen	ND	U	0.25	mg/L

Blank (BBK0089-BLK2)

Prepared: 11/13/24 Analyzed: 11/14/24

Total Kjeldahl Nitrogen	ND	U	0.25	mg/L

Blank (BBK0089-BLK3)

Prepared: 11/13/24 Analyzed: 11/14/24

Total Kjeldahl Nitrogen	ND	U	0.25	mg/L

LCS (BBK0089-BS1)

Prepared: 11/13/24 Analyzed: 11/14/24

Total Kjeldahl Nitrogen	0.51		0.25	mg/L	0.5000		101%	85-115%

LCS (BBK0089-BS2)

Prepared: 11/13/24 Analyzed: 11/14/24

Total Kjeldahl Nitrogen	0.51		0.25	mg/L	0.5000		103%	85-115%

LCS (BBK0089-BS3)

Prepared: 11/13/24 Analyzed: 11/14/24

Total Kjeldahl Nitrogen	0.51		0.25	mg/L	0.5000		102%	85-115%

Calibration Blank (BBK0089-CCB1)

Prepared: 11/13/24 Analyzed: 11/14/24

Total Kjeldahl Nitrogen	ND	U		mg/L

Calibration Blank (BBK0089-CCB2)

Prepared: 11/13/24 Analyzed: 11/14/24

Total Kjeldahl Nitrogen	ND	U		mg/L

Calibration Blank (BBK0089-CCB3)

Prepared: 11/13/24 Analyzed: 11/14/24

Total Kjeldahl Nitrogen	ND	U		mg/L

Calibration Blank (BBK0089-CCB4)

Prepared: 11/13/24 Analyzed: 11/14/24

Total Kjeldahl Nitrogen	ND	U		mg/L



ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Date Received: 10/25/24

Date Reported: 11/14/24

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBK0089 - No Prep - WetChem (Continued)										
Calibration Blank (BBK0089-CCB5)					Prepared: 11/13/24 Analyzed: 11/14/24					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Check (BBK0089-CCV1)					Prepared: 11/13/24 Analyzed: 11/14/24					
Total Kjeldahl Nitrogen	1.03		0.25	mg/L	1.000		103%	85-115%		
Calibration Check (BBK0089-CCV2)					Prepared: 11/13/24 Analyzed: 11/14/24					
Total Kjeldahl Nitrogen	1.02		0.25	mg/L	1.000		102%	85-115%		
Calibration Check (BBK0089-CCV3)					Prepared: 11/13/24 Analyzed: 11/14/24					
Total Kjeldahl Nitrogen	1.02		0.25	mg/L	1.000		102%	85-115%		
Calibration Check (BBK0089-CCV4)					Prepared: 11/13/24 Analyzed: 11/14/24					
Total Kjeldahl Nitrogen	1.02		0.25	mg/L	1.000		102%	85-115%		
Calibration Check (BBK0089-CCV5)					Prepared: 11/13/24 Analyzed: 11/14/24					
Total Kjeldahl Nitrogen	1.00		0.25	mg/L	1.000		100%	85-115%		
Duplicate (BBK0089-DUP1)					Source: A24J0490-56 Prepared: 11/13/24 Analyzed: 11/14/24					
Total Kjeldahl Nitrogen	3.47		0.25	mg/L		3.30			5	25
Duplicate (BBK0089-DUP2)					Source: A24J0555-04 Prepared: 11/13/24 Analyzed: 11/14/24					
Total Kjeldahl Nitrogen	1.23		0.25	mg/L		1.42			14	25
Duplicate (BBK0089-DUP3)					Source: A24J0556-01 Prepared: 11/13/24 Analyzed: 11/14/24					
Total Kjeldahl Nitrogen	0.54		0.25	mg/L		0.54			0.4	25
Duplicate (BBK0089-DUP4)					Source: A24K0012-04 Prepared: 11/13/24 Analyzed: 11/14/24					
Total Kjeldahl Nitrogen	18.8		5.00	mg/L		20.3			8	25
Duplicate (BBK0089-DUP5)					Source: A24K0012-06 Prepared: 11/13/24 Analyzed: 11/14/24					
Total Kjeldahl Nitrogen	5.19		5.00	mg/L		5.80			11	25
Matrix Spike (BBK0089-MS1)					Source: A24J0490-56 Prepared: 11/13/24 Analyzed: 11/14/24					
Total Kjeldahl Nitrogen	5.31		0.25	mg/L	2.000	3.30	100%	80-120%		
Matrix Spike (BBK0089-MS2)					Source: A24J0555-04 Prepared: 11/13/24 Analyzed: 11/14/24					



ANALYSIS REPORT

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Date Received: 10/25/24
Date Reported: 11/14/24

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BBK0089 - No Prep - WetChem (Continued)

Matrix Spike (BBK0089-MS2)		Source: A24J0555-04		Prepared: 11/13/24 Analyzed: 11/14/24						
Total Kjeldahl Nitrogen	3.45		0.25	mg/L	2.000	1.42	102%	80-120%		
Matrix Spike (BBK0089-MS3)		Source: A24J0556-01		Prepared: 11/13/24 Analyzed: 11/14/24						
Total Kjeldahl Nitrogen	2.61		0.25	mg/L	2.000	0.54	103%	80-120%		
Matrix Spike (BBK0089-MS4)		Source: A24K0012-04		Prepared: 11/13/24 Analyzed: 11/14/24						
Total Kjeldahl Nitrogen	40.3		5.00	mg/L	20.00	20.3	100%	80-120%		
Matrix Spike (BBK0089-MS5)		Source: A24K0012-06		Prepared: 11/13/24 Analyzed: 11/14/24						
Total Kjeldahl Nitrogen	26.3		5.00	mg/L	20.00	5.80	102%	80-120%		

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com



**Professional
Analytical
Services**

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Date Received: 10/25/24
Date Reported: 11/14/24

Notes and Definitions

Item	Definition
U	The compound was analyzed for but was not detected (Non-detect) at or above the MRL/MDL.
Dry	Sample results reported on a dry weight basis.
ND	Analyte NOT DETECTED at or above the reporting limit.
RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was matrix spiked or duplicated.

AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

Ph (425) 885-1664 Fx (425) 820-0245

www.amtestlab.com

A24J0490

Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801				Invoice To: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801											
Contact Person: John Haberlin				Invoice Contact: John Haberlin											
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young											
Fax No:				Invoice Ph/Fax:											
E-mail: tc_lakes@co.thurston.wa.us				Invoice E-mail: tc_lakes@co.thurston.wa.us											
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:											
Special Instructions: Please report to detection limit for all results.															
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)						Temperature upon Receipt: 1,2°C									
Project Name: Lakes		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested									
Project Number: 40667						Total Phosphate	Total Nitrogen	NOX	Orthophosphate						QA/QC
AmTest ID	Client ID (35 characters max)														
01 02	Schneider T	10/1/2024	10:00	H2O	1	X		X							X
03 0304	Kennedy	10/1/2024	11:15	H2O	1	X		X							X
05	McLane	10/1/2024	12:50	H2O	1	X		X							
06	Black Lake Ditch	10/1/2024	13:55	H2O	1	X		X							
07 08	Deschutes Falls	10/2/2024	10:00	H2O	1	X		X							x
09 10	Deschutes @ Vail LP	10/2/2024	10:50	H2O	1	X		X							x
11	Deschutes @ Tumwater	10/2/2024	11:15	H2O	1	X		X							
12	Spurgeon @ Rich	10/2/2024	11:50	H2O	1	X		X							
13	Indian mouth	10/2/2024	12:50	H2O	1	X		X							
14	Deschutes @ Waldrick	10/2/2024	11:15	H2O	1	X		X							
Relinquished By: Josh Eckerle		Date 10/24/2024	Time 15:00	Received By: KH				Date 10/25/24				Time 940			
Relinquished By:		Date	Time	Received By:				Date				Time			
Relinquished By:		Date	Time	Received By:				Date				Time			

COMMENTS:

Page 1 of 5

① Wrong #
KH 10/25/24

Fed Ex

AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

Ph (425) 885-1664 Fx (425) 820-0245

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Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801				Invoice To: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801												
Contact Person: John Haberlin				Invoice Contact: John Haberlin												
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young												
Fax No:				Invoice Ph/Fax:												
E-mail: tc_lakes@co.thurston.wa.us				Invoice E-mail: tc_lakes@co.thurston.wa.us												
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:												
Special Instructions: Please report to detection limit for all results.																
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)				Temperature upon Receipt: 1.2 ^g												
Project Name: Lakes		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested										
Project Number: 40667						Total Phosphate	Total Nitrogen	NOx	Orthophosphate							QA/QC
AmTest ID	Client ID (35 characters max)															
15 16	Eaton	10/8/2024	10:50	H2O	1	X		X								X
17 18	Thompson	10/8/2024	11:15	H2O	1	X		X								X
19	McAllister @ I-5	10/8/2024	11:55	H2O	1	X		X								
20	Woodland @ Draham	10/8/2024	12:25	H2O	1	X		X								
21	Woodland @ PG	10/8/2024	13:15	H2O	1	X		X								
22	Woodard @ Libby	10/8/2024	14:00	H2O	1	X		X								
23	Moxlie @ Union	10/8/2024	14:30	H2O	1	X		X								
24 25	Salmon @ LR	10/9/2024	10:45	H2O	1	X		X								
26 27	Blooms Ditch @ 110 th	10/9/2024	11:05	H2O	1	X		X								X
28	Black @ 128th	10/9/2024	11:30	H2O	1	X		X								X
Relinquished By: Josh Eckerle		Date 10/24/2024	Time 15:00	Received By: KLL				Date 10/25/24				Time 9:40				
Relinquished By:		Date	Time	Received By:				Date				Time				
Relinquished By:		Date	Time	Received By:				Date				Time				

COMMENTS:

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Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801					Invoice To: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801										
Contact Person: John Haberlin					Invoice Contact: John Haberlin										
Phone No: 360-867-2626					PO Number: Credit Card upon report per Aaron Young										
Fax No:					Invoice Ph/Fax:										
E-mail: tc_lakes@co.thurston.wa.us					Invoice E-mail: tc_lakes@co.thurston.wa.us										
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online					Data posted to online account: YES / NO Web Login ID:										
Special Instructions: Please report to detection limit for all results.															
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)					Temperature upon Receipt:										
Project Name: Lakes		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested									
Project Number: 40667						Total Phosphate	Total Nitrogen	NOx	Orthophosphate					OA/OC	
AmTest ID	Client ID (35 characters max)														
29	Beaver @ LR	10/9/2024	11:45	H2O	1	X		X							
30	Black @ Moon	10/9/2024	12:25	H2O	1	X		X							
31	Chehalis	10/9/2024	12:55	H2O	1	X		X							
32	Skookumchuck	10/9/2024	14:05	H2O	1	X		X							
33	Summit – Surface	10/3/2024	9:35	H2O	1	X	X								
34	Summit – Bottom	10/3/2024	9:40	H2O	1	X	X								
35	Black Lake – Surface	10/3/2024	11:00	H2O	1	X	X								
36	Black Lake – Bottom	10/3/2024	11:10	H2O	1	X	X								
37	Long 3 – Surface	10/3/2024	12:35	H2O	1	X	X								
38	Long 3 - Bottom	10/3/2024	12:40	H2O	1	X	X								
Relinquished By: Josh Eckerle		Date 10/24/2024	Time 15:00	Received By: KH			Date 10/25/24			Time 940					
Relinquished By:		Date	Time	Received By:			Date			Time					
Relinquished By:		Date	Time	Received By:			Date			Time					

COMMENTS:

AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

Ph (425) 885-1664 Fx (425) 820-0245

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Chain of Custody No. _____

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801					Invoice To: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801									
Contact Person: John Haberlin					Invoice Contact: John Haberlin									
Phone No: 360-867-2626					PO Number: Credit Card upon report per Aaron Young									
Fax No:					Invoice Ph/Fax:									
E-mail: tc_lakes@co.thurston.wa.us					Invoice E-mail: tc_lakes@co.thurston.wa.us									
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online					Data posted to online account: YES / NO Web Login ID:									
Special Instructions: Please report to detection limit for all results.														
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)					Temperature upon Receipt: 1,2°C									
Project Name: Lakes		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested								
Project Number: 40667						Total Phosphate	Total Nitrogen	NOX	Orthophosphate					
AmTest ID	Client ID (35 characters max)													
39	Long 4 – Surface	10/3/2024	12:20	H2O	1	X	X							
40	Long 4 – Bottom	10/3/2024	12:25	H2O	1	X	X							
41	Clear – Surface	10/15/2024	10:15	H2O	1	X	X							
42	Clear – Bottom	10/15/2024	10:20	H2O	1	X	X							
43	Lawrence 1 – Surface	10/15/2024	11:30	H2O	1	X	X							
44	Lawrence 1 – Bottom	10/15/2024	11:35	H2O	1	X	X							
45	Lawrence 2 – Surface	10/15/2024	12:00	H2O	1	X	X							
46	Lawrence 2 – Bottom	10/15/2024	12:05	H2O	1	X	X							
47	Tempo – Surface	10/17/2024	9:20	H2O	1	X	X							
48	Tempo – Bottom	10/17/2024	9:25	H2O	1	X	X							
Relinquished By: Josh Eckerle		Date 10/24/2024	Time 15:00	Received By: KHA			Date 10/25/25			Time 940				
Relinquished By:		Date	Time	Received By:			Date			Time				
Relinquished By:		Date	Time	Received By:			Date			Time				

COMMENTS:

www.amtestlab.com

Chain of Custody No. _____

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801					Invoice To: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801											
Contact Person: John Haberlin					Invoice Contact: John Haberlin											
Phone No: 360-867-2626					PO Number: Credit Card upon report per Aaron Young											
Fax No:					Invoice Ph/Fax:											
E-mail: tc_lakes@co.thurston.wa.us					Invoice E-mail: tc_lakes@co.thurston.wa.us											
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online					Data posted to online account: YES / NO Web Login ID:											
Special Instructions: Please report to detection limit for all results.																
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)					Temperature upon Receipt: 1, 2°C											
Project Name: Lakes		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested										
Project Number: 40667						Total Phosphate	Total Nitrogen	NH3							QA/QC	
AmTest ID	Client ID (35 characters max)															
49	Offutt – Surface	10/17/2024	10:15	H2O	1	X	X									
50	Offutt – Bottom	10/17/2024	10:20	H2O	1	X	X									
51	Pattison N – Surface	10/22/2024	10:55	H2O	1	X	X	X								
52	Pattison N – Bottom	10/22/2024	11:00	H2O	1	X	X	X								
53	Pattison S – Surface	10/22/2024	11:20	H2O	1	X	X	X								
54	Pattison S – Bottom	10/22/2024	11:25	H2O	1	X	X	X								
55	Hicks – Surface	10/22/2024	12:25	H2O	1	X	X									
56	Hicks – Bottom	10/22/2024	12:30	H2O	1	X	X									
Relinquished By: Josh Eckerle		Date 10/24/2024	Time 15:00	Received By: K11				Date 10/25/24	Time 940							
Relinquished By:		Date	Time	Received By:				Date	Time							
Relinquished By:		Date	Time	Received By:				Date	Time							

COMMENTS:

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com



***Professional
Analytical
Services***

January 07, 2025

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN

Project: STREAMS
Project Number: 40644
COC Number: A24L0255

JOHN HABERLIN:

Enclosed please find the analytical data for your STREAMS project.

Your sample(s) were received on Friday, December 13, 2024 and properly maintained prior to the subsequent analysis. The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA, Standard Methods or the Army Corps of Engineers.

Following the analytical results you will find the Quality Control (QA/QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Practical Quantitation Limits (PQL's), as opposed to the Method Detection Limits (MDL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Aaron Young". The signature is written in a cursive, flowing style.

Aaron Young
President
aarony@amtestlab.com



ANALYSIS REPORT

Date Received: 12/13/24
Date Reported: 01/07/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Reported Samples

Lab ID	Sample	Matrix	Qualifiers	Date Sampled	Date Received
A24L0255-01	IAWRENCE 1 - SURFACE	Water		11/21/2024	12/13/2024
A24L0255-02	LAWRENCE 1 - BOTTOM	Water		11/21/2024	12/13/2024
A24L0255-03	IAWRENCE 2 - SURFACE	Water		12/04/2024	12/13/2024
A24L0255-04	LAWRENCE 2 - BOTTOM	Water		12/04/2024	12/13/2024
A24L0255-05	SALMON	Water		12/04/2024	12/13/2024
A24L0255-06	BLOOMS DITCH @110TH	Water		12/04/2024	12/13/2024
A24L0255-07	BLACK @ 128TH	Water		12/04/2024	12/13/2024
A24L0255-08	BEAVER @ LR	Water		12/10/2024	12/13/2024
A24L0255-09	BLACK @ MOON	Water		12/11/2024	12/13/2024
A24L0255-10	CHEHALIS AMB	Water		12/11/2024	12/13/2024
A24L0255-11	PRAIRIE	Water		12/11/2024	12/13/2024
A24L0255-12	SKOOKUMCHUCK	Water		12/11/2024	12/13/2024
A24L0255-13	DESCHUTES FALLS	Water		12/04/2024	12/13/2024
A24L0255-14	REICHEL	Water		12/04/2024	12/13/2024
A24L0255-15	DESCHUTES @ VAIL	Water		12/04/2024	12/13/2024
A24L0255-16	DESCHUTES @ WALDRICK	Water		12/04/2024	12/13/2024
A24L0255-17	SPURGEON @ RICH	Water		11/21/2024	12/13/2024
A24L0255-18	CHAMBERS	Water		11/21/2024	12/13/2024
A24L0255-19	DESCHUTES @ TUMWATER	Water		12/04/2024	12/13/2024
A24L0255-20	INDIAN MOUTH	Water		12/04/2024	12/13/2024
A24L0255-21	SCHNEIDER T	Water		12/04/2024	12/13/2024
A24L0255-22	KENNEDY	Water		12/04/2024	12/13/2024
A24L0255-23	SCHNEIDER HEAD	Water		12/04/2024	12/13/2024
A24L0255-24	McLANE	Water		12/04/2024	12/13/2024
A24L0255-25	BLACK LAKE DITCH	Water		12/11/2024	12/13/2024



ANALYSIS REPORT

Date Received: 12/13/24
Date Reported: 01/07/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A24L0255-01
Client Identification: LAWRENCE 1 - SURFACE
Sampling Date: 11/21/24 10:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Kjeldahl Nitrogen	1.82	mg/L		0.25	EPA 351.2_2_1993	LF	01/02/2025
Total Nitrogen	1.82	mg/L			Calculated	LF	01/02/2025
Total Phosphorus (TP)	0.053	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-02
Client Identification: LAWRENCE 1 - BOTTOM
Sampling Date: 11/21/24 10:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Kjeldahl Nitrogen	1.07	mg/L		0.25	EPA 351.2_2_1993	LF	01/02/2025
Total Nitrogen	1.08	mg/L			Calculated	LF	01/02/2025
Total Phosphorus (TP)	0.063	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-03
Client Identification: LAWRENCE 2 - SURFACE
Sampling Date: 12/04/24 11:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Kjeldahl Nitrogen	2.17	mg/L		0.25	EPA 351.2_2_1993	LF	01/02/2025
Total Nitrogen	2.18	mg/L			Calculated	LF	01/02/2025
Total Phosphorus (TP)	0.038	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025



ANALYSIS REPORT

Date Received: 12/13/24
Date Reported: 01/07/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A24L0255-04
Client Identification: LAWRENCE 2 - BOTTOM
Sampling Date: 12/04/24 11:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Kjeldahl Nitrogen	1.37	mg/L		0.25	EPA 351.2_2_1993	LF	01/02/2025
Total Nitrogen	1.38	mg/L			Calculated	LF	01/02/2025
Total Phosphorus (TP)	0.038	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-05
Client Identification: SALMON
Sampling Date: 12/04/24 09:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.020	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.024	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-06
Client Identification: BLOOMS DITCH @110TH
Sampling Date: 12/04/24 09:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.220	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.043	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-07
Client Identification: BLACK @ 128TH
Sampling Date: 12/04/24 09:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.227	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.016	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025



ANALYSIS REPORT

Date Received: 12/13/24
Date Reported: 01/07/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A24L0255-08
Client Identification: BEAVER @ LR
Sampling Date: 12/10/24 09:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.544	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.040	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-09
Client Identification: BLACK @ MOON
Sampling Date: 12/11/24 10:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.575	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.029	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-10
Client Identification: CHEHALIS AMB
Sampling Date: 12/11/24 10:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.516	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.030	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-11
Client Identification: PRAIRIE
Sampling Date: 12/11/24 11:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.591	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.063	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025



ANALYSIS REPORT

Date Received: 12/13/24
Date Reported: 01/07/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A24L0255-12
Client Identification: SKOOKUMCHUCK
Sampling Date: 12/11/24 11:35

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.389	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.024	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-13
Client Identification: DESCHUTES FALLS
Sampling Date: 12/04/24 10:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.312	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.013	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-14
Client Identification: REICHEL
Sampling Date: 12/04/24 11:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.676	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.036	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-15
Client Identification: DESCHUTES @ VAIL
Sampling Date: 12/04/24 11:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.433	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.020	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025



ANALYSIS REPORT

Date Received: 12/13/24
Date Reported: 01/07/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A24L0255-16
Client Identification: DESCHUTES @ WALDRICK
Sampling Date: 12/04/24 11:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.545	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.024	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-17
Client Identification: SPURGEON @ RICH
Sampling Date: 11/21/24 12:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.124	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.016	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-18
Client Identification: CHAMBERS
Sampling Date: 11/21/24 12:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.33	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.025	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-19
Client Identification: DESCHUTES @ TUMWATER
Sampling Date: 12/04/24 13:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.577	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.026	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025



ANALYSIS REPORT

Date Received: 12/13/24
Date Reported: 01/07/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A24L0255-20
Client Identification: INDIAN MOUTH
Sampling Date: 12/04/24 13:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.563	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.051	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-21
Client Identification: SCHNEIDER T
Sampling Date: 12/04/24 10:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.377	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.123	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-22
Client Identification: KENNEDY
Sampling Date: 12/04/24 10:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.115	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.024	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-23
Client Identification: SCHNEIDER HEAD
Sampling Date: 12/04/24 10:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.096	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.019	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com



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ANALYSIS REPORT

Date Received: 12/13/24
Date Reported: 01/07/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A24L0255-24
Client Identification: McLANE
Sampling Date: 12/04/24 11:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.446	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.352	mg/L		0.025	SM 4500-P F_2011	LF	01/03/2025

AMTEST Identification Number: A24L0255-25
Client Identification: BLACK LAKE DITCH
Sampling Date: 12/11/24 12:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.036	mg/L		0.020	EPA 353.2_2_1993	LF	12/23/2024
Total Phosphorus (TP)	0.012	mg/L		0.005	SM 4500-P F_2011	LF	01/03/2025



ANALYSIS REPORT

Date Received: 12/13/24
Date Reported: 01/07/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Quality Control

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBL0244 - No Prep - WetChem										
Blank (BBL0244-BLK1)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BBL0244-BLK2)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BBL0244-BLK3)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BBL0244-BLK4)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
LCS (BBL0244-BS1)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	0.516		0.020	mg/L	0.5000		103%	90-110%		
LCS (BBL0244-BS2)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	0.518		0.020	mg/L	0.5000		104%	90-110%		
LCS (BBL0244-BS3)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	0.503		0.020	mg/L	0.5000		101%	90-110%		
LCS (BBL0244-BS4)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	0.513		0.020	mg/L	0.5000		103%	90-110%		
Calibration Blank (BBL0244-CCB1)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	ND	U		mg/L						
Calibration Blank (BBL0244-CCB2)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	0.003			mg/L						
Calibration Blank (BBL0244-CCB3)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	0.003			mg/L						
Calibration Blank (BBL0244-CCB4)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	0.002			mg/L						
Calibration Blank (BBL0244-CCB5)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	0.002			mg/L						



ANALYSIS REPORT

Date Received: 12/13/24
Date Reported: 01/07/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBL0244 - No Prep - WetChem (Continued)										
Calibration Blank (BBL0244-CCB6)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	0.0009			mg/L						
Calibration Blank (BBL0244-CCB7)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	0.0006			mg/L						
Calibration Blank (BBL0244-CCB8)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	0.002			mg/L						
Calibration Check (BBL0244-CCV1)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	1.04		0.020	mg/L	1.000		104%	85-115%		
Calibration Check (BBL0244-CCV2)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	1.05		0.020	mg/L	1.000		105%	85-115%		
Calibration Check (BBL0244-CCV3)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	1.00		0.020	mg/L	1.000		100%	85-115%		
Calibration Check (BBL0244-CCV4)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	1.01		0.020	mg/L	1.000		101%	85-115%		
Calibration Check (BBL0244-CCV5)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	1.00		0.020	mg/L	1.000		100%	85-115%		
Calibration Check (BBL0244-CCV6)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	1.00		0.020	mg/L	1.000		100%	85-115%		
Calibration Check (BBL0244-CCV7)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	1.01		0.020	mg/L	1.000		101%	85-115%		
Calibration Check (BBL0244-CCV8)					Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	1.00		0.020	mg/L	1.000		100%	85-115%		
Duplicate (BBL0244-DUP1)					Source: A24L0161-10 Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	2.07		0.020	mg/L		2.10			2	20
Duplicate (BBL0244-DUP10)					Source: A24L0255-08 Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	0.555		0.020	mg/L		0.544			2	20



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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBL0244 - No Prep - WetChem (Continued)										
Duplicate (BBL0244-DUP11)	Source: A24L0255-13		Prepared & Analyzed: 12/23/24							
Total Nitrate + Nitrite	0.327		0.020	mg/L		0.312			5	20
Duplicate (BBL0244-DUP12)	Source: A24L0255-15		Prepared & Analyzed: 12/23/24							
Total Nitrate + Nitrite	0.474		0.020	mg/L		0.433			9	20
Duplicate (BBL0244-DUP13)	Source: A24L0255-24		Prepared & Analyzed: 12/23/24							
Total Nitrate + Nitrite	0.447		0.020	mg/L		0.446			0.3	20
Duplicate (BBL0244-DUP14)	Source: A24L0255-25		Prepared & Analyzed: 12/23/24							
Total Nitrate + Nitrite	0.036		0.020	mg/L		0.036			0.4	20
Duplicate (BBL0244-DUP2)	Source: A24L0182-03		Prepared & Analyzed: 12/23/24							
Total Nitrate + Nitrite	0.684		0.020	mg/L		0.710			4	20
Duplicate (BBL0244-DUP3)	Source: A24L0195-06		Prepared & Analyzed: 12/23/24							
Total Nitrate + Nitrite	0.641		0.020	mg/L		0.631			2	20
Duplicate (BBL0244-DUP4)	Source: A24L0202-04		Prepared & Analyzed: 12/23/24							
Total Nitrate + Nitrite	0.565		0.020	mg/L		0.536			5	20
Duplicate (BBL0244-DUP5)	Source: A24L0218-04		Prepared & Analyzed: 12/23/24							
Total Nitrate + Nitrite	3.78		0.100	mg/L		3.79			0.2	20
Duplicate (BBL0244-DUP6)	Source: A24L0255-06		Prepared & Analyzed: 12/23/24							
Total Nitrate + Nitrite	0.213		0.020	mg/L		0.220			3	20
Duplicate (BBL0244-DUP7)	Source: A24L0255-16		Prepared & Analyzed: 12/23/24							
Total Nitrate + Nitrite	0.513		0.020	mg/L		0.545			6	20
Duplicate (BBL0244-DUP8)	Source: A24L0257-01		Prepared & Analyzed: 12/23/24							
Total Nitrate + Nitrite	ND	U	0.020	mg/L		ND				20
Duplicate (BBL0244-DUP9)	Source: A24L0255-07		Prepared & Analyzed: 12/23/24							
Total Nitrate + Nitrite	0.232		0.020	mg/L		0.227			2	20
Matrix Spike (BBL0244-MS1)	Source: A24L0161-10		Prepared & Analyzed: 12/23/24							
Total Nitrate + Nitrite	3.12		0.020	mg/L	1.000	2.10	102%	85-115%		



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Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BBL0244 - No Prep - WetChem (Continued)

Matrix Spike (BBL0244-MS2)		Source: A24L0182-03			Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	1.67		0.020	mg/L	1.000	0.710	96%	85-115%		
Matrix Spike (BBL0244-MS3)		Source: A24L0195-06			Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	1.62		0.020	mg/L	1.000	0.631	99%	85-115%		
Matrix Spike (BBL0244-MS4)		Source: A24L0202-04			Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	1.52		0.020	mg/L	1.000	0.536	98%	85-115%		
Matrix Spike (BBL0244-MS5)		Source: A24L0218-04			Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	8.60		0.100	mg/L	5.000	3.79	96%	85-115%		
Matrix Spike (BBL0244-MS6)		Source: A24L0255-06			Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	1.19		0.020	mg/L	1.000	0.220	97%	85-115%		
Matrix Spike (BBL0244-MS7)		Source: A24L0255-16			Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	1.50		0.020	mg/L	1.000	0.545	95%	85-115%		
Matrix Spike (BBL0244-MS8)		Source: A24L0257-01			Prepared & Analyzed: 12/23/24					
Total Nitrate + Nitrite	0.954		0.020	mg/L	1.000	ND	95%	85-115%		

Batch: BBL0352 - No Prep - WetChem

Blank (BBL0352-BLK1)		Prepared: 12/31/24 Analyzed: 01/02/25								
Total Kjeldahl Nitrogen	ND	U	0.25	mg/L						
Blank (BBL0352-BLK2)		Prepared: 12/31/24 Analyzed: 01/02/25								
Total Kjeldahl Nitrogen	ND	U	0.25	mg/L						
LCS (BBL0352-BS1)		Prepared: 12/31/24 Analyzed: 01/02/25								
Total Kjeldahl Nitrogen	0.49		0.25	mg/L	0.5000		98%	85-115%		
LCS (BBL0352-BS2)		Prepared: 12/31/24 Analyzed: 01/02/25								
Total Kjeldahl Nitrogen	0.49		0.25	mg/L	0.5000		99%	85-115%		
Calibration Blank (BBL0352-CCB1)		Prepared: 12/31/24 Analyzed: 01/02/25								
Total Kjeldahl Nitrogen	0.02			mg/L						



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Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBL0352 - No Prep - WetChem (Continued)										
Calibration Blank (BBL0352-CCB2)					Prepared: 12/31/24 Analyzed: 01/02/25					
Total Kjeldahl Nitrogen	0.02			mg/L						
Calibration Blank (BBL0352-CCB3)					Prepared: 12/31/24 Analyzed: 01/02/25					
Total Kjeldahl Nitrogen	0.02			mg/L						
Calibration Blank (BBL0352-CCB4)					Prepared: 12/31/24 Analyzed: 01/02/25					
Total Kjeldahl Nitrogen	0.02			mg/L						
Calibration Check (BBL0352-CCV1)					Prepared: 12/31/24 Analyzed: 01/02/25					
Total Kjeldahl Nitrogen	0.99		0.25	mg/L	1.000		99%	85-115%		
Calibration Check (BBL0352-CCV2)					Prepared: 12/31/24 Analyzed: 01/02/25					
Total Kjeldahl Nitrogen	0.98		0.25	mg/L	1.000		98%	85-115%		
Calibration Check (BBL0352-CCV3)					Prepared: 12/31/24 Analyzed: 01/02/25					
Total Kjeldahl Nitrogen	0.98		0.25	mg/L	1.000		98%	85-115%		
Calibration Check (BBL0352-CCV4)					Prepared: 12/31/24 Analyzed: 01/02/25					
Total Kjeldahl Nitrogen	0.99		0.25	mg/L	1.000		99%	85-115%		
Duplicate (BBL0352-DUP1)					Source: A24L0255-04 Prepared: 12/31/24 Analyzed: 01/02/25					
Total Kjeldahl Nitrogen	1.30		0.25	mg/L		1.37			5	25
Duplicate (BBL0352-DUP2)					Source: A24L0302-04 Prepared: 12/31/24 Analyzed: 01/02/25					
Total Kjeldahl Nitrogen	0.76		0.25	mg/L		0.76			0.09	25
Duplicate (BBL0352-DUP3)					Source: A24L0310-02 Prepared: 12/31/24 Analyzed: 01/02/25					
Total Kjeldahl Nitrogen	0.47		0.25	mg/L		0.47			1	25
Duplicate (BBL0352-DUP4)					Source: A24L0346-01 Prepared: 12/31/24 Analyzed: 01/02/25					
Total Kjeldahl Nitrogen	0.62		0.25	mg/L		0.63			2	25
Matrix Spike (BBL0352-MS1)					Source: A24L0255-04 Prepared: 12/31/24 Analyzed: 01/02/25					
Total Kjeldahl Nitrogen	3.20		0.25	mg/L	2.000	1.37	92%	80-120%		
Matrix Spike (BBL0352-MS2)					Source: A24L0302-04 Prepared: 12/31/24 Analyzed: 01/02/25					
Total Kjeldahl Nitrogen	2.76		0.25	mg/L	2.000	0.76	100%	80-120%		



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Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBL0352 - No Prep - WetChem (Continued)										
Matrix Spike (BBL0352-MS3)		Source: A24L0310-02			Prepared: 12/31/24 Analyzed: 01/02/25					
Total Kjeldahl Nitrogen	2.46		0.25	mg/L	2.000	0.47	99%	80-120%		
Matrix Spike (BBL0352-MS4)		Source: A24L0346-01			Prepared: 12/31/24 Analyzed: 01/02/25					
Total Kjeldahl Nitrogen	2.71		0.25	mg/L	2.000	0.63	104%	80-120%		
Batch: BBL0423 - No Prep - WetChem										
Blank (BBL0423-BLK1)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	ND	U	0.005	mg/L						
Blank (BBL0423-BLK2)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	ND	U	0.005	mg/L						
Blank (BBL0423-BLK3)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	ND	U	0.005	mg/L						
Blank (BBL0423-BLK4)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	ND	U	0.005	mg/L						
Blank (BBL0423-BLK5)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	ND	U	0.005	mg/L						
Blank (BBL0423-BLK6)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	ND	U	0.005	mg/L						
Blank (BBL0423-BLK7)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	ND	U	0.005	mg/L						
LCS (BBL0423-BS1)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.100		0.005	mg/L	0.1000		100%	90-110%		
LCS (BBL0423-BS2)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.104		0.005	mg/L	0.1000		104%	90-110%		
LCS (BBL0423-BS3)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.105		0.005	mg/L	0.1000		105%	90-110%		



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Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BBL0423 - No Prep - WetChem (Continued)

LCS (BBL0423-BS4)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.106		0.005	mg/L	0.1000		106%	90-110%		
LCS (BBL0423-BS5)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.107		0.005	mg/L	0.1000		107%	90-110%		
LCS (BBL0423-BS6)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.107		0.005	mg/L	0.1000		107%	90-110%		
LCS (BBL0423-BS7)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.108		0.005	mg/L	0.1000		108%	90-110%		
Calibration Blank (BBL0423-CCB1)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BBL0423-CCB10)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BBL0423-CCB11)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BBL0423-CCB12)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.003			mg/L						
Calibration Blank (BBL0423-CCB13)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BBL0423-CCB2)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BBL0423-CCB3)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BBL0423-CCB4)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.003			mg/L						
Calibration Blank (BBL0423-CCB5)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.004			mg/L						



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Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBL0423 - No Prep - WetChem (Continued)										
Calibration Blank (BBL0423-CCB6)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BBL0423-CCB7)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BBL0423-CCB8)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BBL0423-CCB9)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.003			mg/L						
Calibration Check (BBL0423-CCV1)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.207		0.005	mg/L	0.2000		104%	85-115%		
Calibration Check (BBL0423-CCV10)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.207		0.005	mg/L	0.2000		103%	85-115%		
Calibration Check (BBL0423-CCV11)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.206		0.005	mg/L	0.2000		103%	85-115%		
Calibration Check (BBL0423-CCV12)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.211		0.005	mg/L	0.2000		105%	85-115%		
Calibration Check (BBL0423-CCV13)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.206		0.005	mg/L	0.2000		103%	85-115%		
Calibration Check (BBL0423-CCV2)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.208		0.005	mg/L	0.2000		104%	85-115%		
Calibration Check (BBL0423-CCV3)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.208		0.005	mg/L	0.2000		104%	85-115%		
Calibration Check (BBL0423-CCV4)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.210		0.005	mg/L	0.2000		105%	85-115%		
Calibration Check (BBL0423-CCV5)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.210		0.005	mg/L	0.2000		105%	85-115%		



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Quality Control
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Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBL0423 - No Prep - WetChem (Continued)										
Calibration Check (BBL0423-CCV6)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.208		0.005	mg/L	0.2000		104%	85-115%		
Calibration Check (BBL0423-CCV7)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.208		0.005	mg/L	0.2000		104%	85-115%		
Calibration Check (BBL0423-CCV8)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.208		0.005	mg/L	0.2000		104%	85-115%		
Calibration Check (BBL0423-CCV9)					Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.206		0.005	mg/L	0.2000		103%	85-115%		
Duplicate (BBL0423-DUP1)		Source: A24L0255-10			Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.029		0.005	mg/L		0.030			2	22.3
Duplicate (BBL0423-DUP10)		Source: A24L0404-02			Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.009		0.005	mg/L		0.009			0.6	22.3
Duplicate (BBL0423-DUP11)		Source: A24L0412-04			Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.010		0.005	mg/L		0.009			7	22.3
Duplicate (BBL0423-DUP12)		Source: A24L0440-03			Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.685		0.050	mg/L		0.689			0.5	22.3
Duplicate (BBL0423-DUP13)		Source: A24L0440-08			Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.034		0.005	mg/L		0.032			6	22.3
Duplicate (BBL0423-DUP2)		Source: A24L0255-20			Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.053		0.005	mg/L		0.051			3	22.3
Duplicate (BBL0423-DUP3)		Source: A24L0276-03			Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.024		0.005	mg/L		0.024			2	22.3
Duplicate (BBL0423-DUP4)		Source: A24L0302-08			Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.160		0.005	mg/L		0.160			0.3	22.3
Duplicate (BBL0423-DUP5)		Source: A24L0310-02			Prepared: 01/02/25 Analyzed: 01/03/25					
Total Phosphorus (TP)	0.013		0.005	mg/L		0.014			9	22.3



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Quality Control
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Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBL0423 - No Prep - WetChem (Continued)										
Duplicate (BBL0423-DUP6)	Source: A24L0319-03		Prepared: 01/02/25 Analyzed: 01/03/25							
Total Phosphorus (TP)	0.031		0.005	mg/L		0.029			6	22.3
Duplicate (BBL0423-DUP7)	Source: A24L0352-03		Prepared: 01/02/25 Analyzed: 01/03/25							
Total Phosphorus (TP)	0.003	U	0.005	mg/L		0.003			2	22.3
Duplicate (BBL0423-DUP8)	Source: A24L0361-04		Prepared: 01/02/25 Analyzed: 01/03/25							
Total Phosphorus (TP)	0.068		0.005	mg/L		0.067			1	22.3
Duplicate (BBL0423-DUP9)	Source: A24L0372-01		Prepared: 01/02/25 Analyzed: 01/03/25							
Total Phosphorus (TP)	0.075		0.005	mg/L		0.073			3	22.3
Matrix Spike (BBL0423-MS1)	Source: A24L0255-10		Prepared: 01/02/25 Analyzed: 01/03/25							
Total Phosphorus (TP)	0.242		0.005	mg/L	0.2000	0.030	106%	85-115%		
Matrix Spike (BBL0423-MS10)	Source: A24L0404-02		Prepared: 01/02/25 Analyzed: 01/03/25							
Total Phosphorus (TP)	0.218		0.005	mg/L	0.2000	0.009	105%	85-115%		
Matrix Spike (BBL0423-MS11)	Source: A24L0412-04		Prepared: 01/02/25 Analyzed: 01/03/25							
Total Phosphorus (TP)	0.222		0.005	mg/L	0.2000	0.009	106%	85-115%		
Matrix Spike (BBL0423-MS12)	Source: A24L0440-03		Prepared: 01/02/25 Analyzed: 01/03/25							
Total Phosphorus (TP)	2.91		0.050	mg/L	2.000	0.689	111%	85-115%		
Matrix Spike (BBL0423-MS13)	Source: A24L0440-08		Prepared: 01/02/25 Analyzed: 01/03/25							
Total Phosphorus (TP)	0.250		0.005	mg/L	0.2000	0.032	109%	85-115%		
Matrix Spike (BBL0423-MS2)	Source: A24L0255-20		Prepared: 01/02/25 Analyzed: 01/03/25							
Total Phosphorus (TP)	0.264		0.005	mg/L	0.2000	0.051	107%	85-115%		
Matrix Spike (BBL0423-MS3)	Source: A24L0276-03		Prepared: 01/02/25 Analyzed: 01/03/25							
Total Phosphorus (TP)	0.234		0.005	mg/L	0.2000	0.024	105%	85-115%		
Matrix Spike (BBL0423-MS4)	Source: A24L0302-08		Prepared: 01/02/25 Analyzed: 01/03/25							
Total Phosphorus (TP)	0.374		0.005	mg/L	0.2000	0.160	107%	85-115%		
Matrix Spike (BBL0423-MS5)	Source: A24L0310-02		Prepared: 01/02/25 Analyzed: 01/03/25							
Total Phosphorus (TP)	0.224		0.005	mg/L	0.2000	0.014	105%	85-115%		



ANALYSIS REPORT

Date Received: 12/13/24
Date Reported: 01/07/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BBL0423 - No Prep - WetChem (Continued)

Matrix Spike (BBL0423-MS6)		Source: A24L0319-03		Prepared: 01/02/25 Analyzed: 01/03/25						
Total Phosphorus (TP)	0.243		0.005	mg/L	0.2000	0.029	107%	85-115%		
Matrix Spike (BBL0423-MS7)		Source: A24L0352-03		Prepared: 01/02/25 Analyzed: 01/03/25						
Total Phosphorus (TP)	0.208		0.005	mg/L	0.2000	0.003	102%	85-115%		
Matrix Spike (BBL0423-MS8)		Source: A24L0361-04		Prepared: 01/02/25 Analyzed: 01/03/25						
Total Phosphorus (TP)	0.284		0.005	mg/L	0.2000	0.067	109%	85-115%		
Matrix Spike (BBL0423-MS9)		Source: A24L0372-01		Prepared: 01/02/25 Analyzed: 01/03/25						
Total Phosphorus (TP)	0.293		0.005	mg/L	0.2000	0.073	110%	85-115%		

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com



Professional
Analytical
Services

ANALYSIS REPORT

Date Received: 12/13/24
Date Reported: 01/07/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Notes and Definitions

Item	Definition
U	The compound was analyzed for but was not detected (Non-detect) at or above the MRL/MDL.
Dry	Sample results reported on a dry weight basis.
ND	Analyte NOT DETECTED at or above the reporting limit.
RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was matrix spiked or duplicated.

AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

Ph (425) 885-1664 Fx (425) 820-0245

www.amtestlab.com

A24L0255

Chain of Custody No. _____

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506					Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506										
Contact Person: John Haberlin					Invoice Contact: John Haberlin										
Phone No: 360-867-2626					PO Number: Credit Card upon report per Aaron Young										
Fax No:					Invoice Ph/Fax:										
E-mail: john.haberlin@co.thurston.wa.us					Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us										
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online					Data posted to online account: YES / NO Web Login ID:										
Special Instructions: Please report to detection limit for all results.															
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)					Temperature upon Receipt:										
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested 1.0°C									
Project Number: 40644						Total Phosphate	NOx	Total Nitrogen						QA/QC	
AmTest ID	Client ID (35 characters max)														
01	Lawrence 1 – Surface	11/21/2024	10:40	H2O	1	X		X							
02	Lawrence 1 – Bottom	11/21/2024	10:45	H2O	1	X		X							
03	Lawrence 2 – Surface	11/21/2024	11:05	H2O	1	X		X							
04	Lawrence 2 - Bottom	11/21/2024	11:10	H2O	1	X		X							
05	Salmon	12/04/2024	9:25	H2O	1	X	X								
06	Blooms Ditch @ 110th	12/04/2024	9:30	H2O	1	X	X								
07	Black @ 128th	12/04/2024	9:45	H2O	1	X	X								X
08	Beaver @ LR	12/04/2024	9:50	H2O	1	X	X								X
09	Black @ moon	12/04/2024	10:15	H2O	1	X	X								
10	Chehalis Amb	12/04/2024	10:45	H2O	1	X	X								
11	Prairie	12/04/2024	11:05	H2O	1	X	X								
Collected/Relinquished By: Josh Eckerle		Date 12/12/2024	Time 15:00	Received By: <u>OA</u>				Date 12/13/24		Time 10:46					
Relinquished By:		Date	Time	Received By:				Date		Time					
Relinquished By:		Date	Time	Received By:				Date		Time					

COMMENTS:

www.amtestlab.com

Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506					Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506											
Contact Person: John Haberlin					Invoice Contact: John Haberlin											
Phone No: 360-867-2626					PO Number: Credit Card upon report per Aaron Young											
Fax No:					Invoice Ph/Fax:											
E-mail: john.haberlin@co.thurston.wa.us					Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us											
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online					Data posted to online account: YES / NO Web Login ID:											
Special Instructions: Please report to detection limit for all results.																
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)					Temperature upon Receipt:											
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested										
Project Number: 40644						Total Phosphate	NOx							OA/OC		
AmTest ID	Client ID (35 characters max)															
12	Skookumchuck	12/04/2024	11:35	H2O	1	X	X									
13	Deschutes Falls	12/04/2024	10:00	H2O	1	X	X									X
14	Reichel	12/04/2024	11:00	H2O	1	X	X									
15	Deschutes @ Vail	12/04/2024	11:15	H2O	1	X	X									X
16	Deschutes @ Waldrick	12/04/2024	11:45	H2O	1	X	X									
17	Spurgeon @ Rich	12/04/2024	12:10	H2O	1	X	X									
18	Chambers	12/04/2024	12:40	H2O	1	X	X									
19	Deschutes @ Tumwater	12/04/2024	13:00	H2O	1	X	X									
20	Indian Mouth	12/10/2024	13:25	H2O	1	X	X									
21	Schneider T	12/11/2024	10:00	H2O	1	X	X									
Collected/Relinquished By:		Date	Time	Received By:				Date	Time							
Josh Eckerle		12/12/2024	15:00													
Relinquished By:		Date	Time	Received By:				Date	Time							
Relinquished By:		Date	Time	Received By:				Date	Time							

COMMENTS:

AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

Ph (425) 885-1664 Fx (425) 820-0245

www.amtestlab.com

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Fax No:				Invoice Ph/Fax:													
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us													
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:													
Special Instructions: Please report to detection limit for all results.																	
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)						Temperature upon Receipt:											
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested											
Project Number: 40644						Total Phosphate	NOx										
AmTest ID	Client ID (35 characters max)																QA/QC
22	Kennedy	12/11/2024	10:25	H2O	1	X	X										
23	Schneider Head	12/11/2024	10:55	H2O	1	X	X										
24	McLane	12/11/2024	11:25	H2O	1	X	X										X
25	Black Lake Ditch	12/11/2024	12:05	H2O	1	X	X										X
				H2O	1	X	X										
				H2O	1	X	X										
				H2O	1	X	X										
				H2O	1	X	X										
				H2O	1	X	X										
				H2O	1	X	X										
Collected/Relinquished By: Josh Eckerle		Date 12/12/2024	Time 15:00	Received By:				Date				Time					
Relinquished By:		Date	Time	Received By:				Date				Time					
Relinquished By:		Date	Time	Received By:				Date				Time					



ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
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F : +1 360 636 1068
www.alsglobal.com

January 31, 2025

Analytical Report for Service Request No: K2500553

John Haberlin
Thurston County Health Department
3000 Pacific Ave. SE
Room 225
Olympia, WA 98501

RE: Lakes / 4520D260 40667

Dear John,

Enclosed are the results of the sample(s) submitted to our laboratory January 17, 2025
For your reference, these analyses have been assigned our service request number **K2500553**.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3363. You may also contact me via email at karen.melerine@ALSGlobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Karen Melerine
Project Manager



ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
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www.alsglobal.com

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 General Chemistry

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated value.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.
- H The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

- # The control limit criteria is not applicable.
- J The result is an estimated value.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- + The correlation coefficient for the MSA is less than 0.995.
- Q See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- A A tentatively identified compound, a suspected aldol-condensation product.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
- D The reported result is from a dilution.
- E The result is an estimated value.
- J The result is an estimated value.
- N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
- P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
- L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
- H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
- O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
- Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
- Z The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjllabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdwlabservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/analyte is offered by that state.



Case Narrative

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Client: Thurston County Health Department
Project: Lakes
Sample Matrix: Water

Service Request: K2500553
Date Received: 01/17/2025

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples for the Tier level IV requested by the client.

Sample Receipt:

Five water samples were received for analysis at ALS Environmental on 01/17/2025. Any discrepancies upon initial sample inspection are annotated on the sample receipt and preservation form included within this report. The samples were stored at minimum in accordance with the analytical method requirements.

General Chemistry:

No significant anomalies were noted with this analysis.

Approved by Karen Melorine

Date 01/31/2025



Chain of Custody

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

PM VM

Cooler Receipt and Preservation Form

Client Thurston County Service Request K25 00553
Received: 11/7/25 Opened: 11/7/25 By: VM Unloaded: 11/7/25 By: VM

1. Samples were received via? USPS Fed Ex UPS DHL PDX Courier Hand Delivered
2. Samples were received in: (circle) Cooler Box Envelope Other NA
3. Were custody seals on coolers? NA Y N If yes, how many and where? 1 FCOH
If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Temp Blank	Sample Temp	IR Gun	Cooler #COC ID / NA	Out of Temp Indicate with "X"	PM Notified If out of temp	Tracking Number NA	Filed
<u>5.5</u>		<u>AHO2</u>				<u>771486083336</u>	

4. Was a Temperature Blank present in cooler? NA Y N If yes, note the temperature in the appropriate column above:

If no, take the temperature of a representative sample bottle contained within the cooler; note in the column "Sample Temp":

5. Were samples received within the method specified temperature ranges? NA Y N

If no, were they received on ice and same day as collected? If not, note the cooler # above and notify the PM. NA Y N

If applicable, tissue samples were received: Frozen Partially Thawed Thawed

6. Packing material: Inserts Baggies Bubble Wrap Gel Packs Wet Ice Dry Ice Sleeves

7. Were custody papers properly filled out (ink, signed, etc.)? NA Y N

8. Were samples received in good condition (unbroken) NA Y N

9. Were all sample labels complete (ie, analysis, preservation, etc.)? NA Y N

10. Did all sample labels and tags agree with custody papers? NA Y N

11. Were appropriate bottles/containers and volumes received for the tests indicated? NA Y N

12. Were the pH-preserved bottles (see SMO GEN SOP) received at the appropriate pH? Indicate in the table below NA Y N

13. Were VOA vials received without headspace? Indicate in the table below. NA Y N

14. Was C12/Res negative? NA Y N

15. Were samples received within the method specified time limit? If not, note the error below and notify the PM NA Y N

16. Were 100ml sterile microbiology bottles filled exactly to the 100ml mark? NA Y N Underfilled Overfilled

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Head- space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, Resolutions: _____



General Chemistry

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Thurston County Health Department
Project: Lakes/4520D260 40667
Sample Matrix: Water
Analysis Method: SM 10200 H
Prep Method: Method

Service Request: K2500553
Date Collected: 01/16/25
Date Received: 01/17/25
Units: mg/m3
Basis: NA

Chlorophyll A

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Lawrence 1	K2500553-001	1.1 J	1.5	0.6	1	01/24/25 15:54	1/24/25	
Lawrence 1 QA	K2500553-002	1.0 J	1.5	0.6	1	01/24/25 15:54	1/24/25	
Lawrence 2	K2500553-003	0.7 J	1.5	0.6	1	01/24/25 15:54	1/24/25	
Pattison N	K2500553-004	0.6 J	1.5	0.6	1	01/24/25 15:54	1/24/25	
Pattison S	K2500553-005	1.1 J	1.5	0.6	1	01/24/25 15:54	1/24/25	
Method Blank	K2500553-MB1	ND U	0.80	0.30	1	01/24/25 15:54	1/24/25	
Method Blank	K2500553-MB2	ND U	0.80	0.30	1	01/24/25 15:54	1/24/25	
Method Blank	K2500553-MB3	ND U	0.80	0.30	1	01/24/25 15:54	1/24/25	
Method Blank	K2500553-MB4	ND U	0.80	0.30	1	01/24/25 15:54	1/24/25	
Method Blank	K2500553-MB5	ND U	0.80	0.30	1	01/24/25 15:54	1/24/25	
Method Blank	K2500553-MB6	ND U	0.80	0.30	1	01/24/25 15:54	1/24/25	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Thurston County Health Department
Project: Lakes/4520D260 40667
Sample Matrix: Water

Service Request: K2500553
Date Analyzed: 01/24/25
Date Extracted: 01/24/25

Duplicate Lab Control Sample Summary
General Chemistry Parameters

Analysis Method: SM 10200 H
Prep Method: Method

Units: mg/m3
Basis: NA
Analysis Lot: 868554

Lab Control Sample
K2500553-LCS

Duplicate Lab Control Sample
K2500553-DLCS

Analyte Name	Result	Spike Amount	% Rec	Result	Spike Amount	% Rec	% Rec Limits	RPD	RPD Limit
Chlorophyll A	5.29	5.26	101	5.18	5.26	98	88-113	2	20

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Thurston County Health Department
Project: Lakes/4520D260 40667
Sample Matrix: Water
Analysis Method: SM 10200 H
Prep Method: Method

Service Request: K2500553
Date Collected: 01/16/25
Date Received: 01/17/25
Units: mg/m3
Basis: NA

Pheophytin A

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Lawrence 1	K2500553-001	ND U	1.5	-	1	01/24/25 15:54	1/24/25	
Lawrence 1 QA	K2500553-002	1.6	1.5	-	1	01/24/25 15:54	1/24/25	
Lawrence 2	K2500553-003	ND U	1.5	-	1	01/24/25 15:54	1/24/25	
Pattison N	K2500553-004	ND U	1.5	-	1	01/24/25 15:54	1/24/25	
Pattison S	K2500553-005	1.6	1.5	-	1	01/24/25 15:54	1/24/25	
Method Blank	K2500553-MB1	ND U	0.80	-	1	01/24/25 15:54	1/24/25	
Method Blank	K2500553-MB2	ND U	0.80	-	1	01/24/25 15:54	1/24/25	
Method Blank	K2500553-MB3	ND U	0.80	-	1	01/24/25 15:54	1/24/25	
Method Blank	K2500553-MB4	ND U	0.80	-	1	01/24/25 15:54	1/24/25	
Method Blank	K2500553-MB5	ND U	0.80	-	1	01/24/25 15:54	1/24/25	
Method Blank	K2500553-MB6	ND U	0.80	-	1	01/24/25 15:54	1/24/25	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Thurston County Health Department
Project: Lakes/4520D260 40667
Sample Matrix: Water

Service Request: K2500553
Date Analyzed: 01/24/25
Date Extracted: 01/24/25

Duplicate Lab Control Sample Summary
General Chemistry Parameters

Analysis Method: SM 10200 H
Prep Method: Method

Units: mg/m3
Basis: NA
Analysis Lot: 868554

Lab Control Sample
K2500553-LCS

Duplicate Lab Control Sample
K2500553-DLCS

Analyte Name	Result	Spike Amount	% Rec	Result	Spike Amount	% Rec	% Rec Limits	RPD	RPD Limit
Pheophytin A	529	526	101	518	526	98	88-113	2	20



Raw Data

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com



General Chemistry

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Work Request # K2500223 K2500601
K2500553 K2500650
Date Analyzed: 1/24/25
Analyst: JS Run # 868554
Analysis: Chlorophyll A

**DATA QUALITY REPORT
INORGANICS**

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

1.	Is the method name and number correct and appropriate?	yes/no/NA
2.	Holding times met for all analyses and for all samples?	yes/no/NA
3.	Are calculations correct?	yes/no/NA
4.	Is the reporting basis correct? (Dry Weight)	yes/no/NA
5.	All quality control criteria met?	yes/no
6.	Is the calibration curve correlation coefficient ≥ 0.995 ?	yes/no/NA
7.	MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency?	yes/no/NA
8.	Are ICVs, CCVs, and CCBs all within acceptance limits?	yes/no/NA
9.	Are results for methods blanks all ND?	yes/no/NA
10.	Are all QC samples within acceptance criteria? (LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.)	yes/no/NA
11.	Are all exceptions explained?	yes/no/NA
12.	Have all applicable service requests been reviewed?	yes/no/NA
13.	Are all samples labeled correctly?	yes/no/NA
14.	Have all instructions on the service request been followed? (e.g. Special MRLs, QC on a specific sample, Form V)	yes/no/NA
15.	Are detection limits and units reported correctly?	yes/no/NA
16.	Is the unused space on the bench sheet crossed out?	yes/no/NA
17.	Was analysis turned in by the data due date? (If not record SR#)	yes/no/NA

COMMENTS: 1/15/25 K2500223
1/27/25 K2500553

Secondary Approved by: MRL Date: 01/30/25
DQREPORT

Analytical Results Summary

Instrument Name: K-UV-VIS-05

Analyst: JSANCHEZ

Analysis Lot:

868554

Method/Testcode: SM 10200 H/ChlorophyllA PF

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
K2500223-002	Chlorophyll A	N/A		Wastewater	42.72 mg/m³	093.0000 mL	0.76 mg/m³ U	1	0.30	0.76			1/24/25 15:54:00	N	II
K2500223-003	Chlorophyll A	N/A		Wastewater	42.72 mg/m³	100.0000 mL	0.76 mg/m³ U	1	0.30	0.76			1/24/25 15:54:00	N	II
K2500553-001	Chlorophyll A	N/A		Water	58.74 mg/m³	048.0000 mL	1.1 mg/m³ J	1	0.6	1.5			1/24/25 15:54:00	N	IV
K2500553-001	Pheophytin A	N/A		Water	1.40 mg/m³	048.0000 mL	1.5 mg/m³ U	1		1.5			1/24/25 15:54:00	N	IV
K2500553-002	Chlorophyll A	N/A		Water	53.40 mg/m³	054.0000 mL	1.0 mg/m³ J	1	0.6	1.5			1/24/25 15:54:00	N	IV
K2500553-002	Pheophytin A	N/A		Water	1.60 mg/m³	054.0000 mL	1.6 mg/m³	1		1.5			1/24/25 15:54:00	N	IV
K2500553-003	Chlorophyll A	N/A		Water	37.38 mg/m³	053.0000 mL	0.7 mg/m³ J	1	0.6	1.5			1/24/25 15:54:00	N	IV
K2500553-003	Pheophytin A	N/A		Water	0.40 mg/m³	053.0000 mL	1.5 mg/m³ U	1		1.5			1/24/25 15:54:00	N	IV
K2500553-004	Chlorophyll A	N/A		Water	32.04 mg/m³	056.0000 mL	0.6 mg/m³ J	1	0.6	1.5			1/24/25 15:54:00	N	IV
K2500553-004	Pheophytin A	N/A		Water	0.80 mg/m³	056.0000 mL	1.5 mg/m³ U	1		1.5			1/24/25 15:54:00	N	IV
K2500553-005	Chlorophyll A	N/A		Water	58.74 mg/m³	059.0000 mL	1.1 mg/m³ J	1	0.6	1.5			1/24/25 15:54:00	N	IV
K2500553-005	Pheophytin A	N/A		Water	1.60 mg/m³	059.0000 mL	1.6 mg/m³	1		1.5			1/24/25 15:54:00	N	IV
K2500680-001	Chlorophyll A	N/A		Water	96.12 mg/m³	118.0000 mL	0.91 mg/m³	1	0.30	0.76			1/24/25 15:54:00	N	IV
K2500680-001	Pheophytin A	N/A		Water	1.70 mg/m³	118.0000 mL	1.70 mg/m³	1		0.76			1/24/25 15:54:00	N	IV
K2500681-001	Chlorophyll A	N/A		Storm Water	16.02 mg/m³	511.0000 mL	1.1 mg/m³ U	1	0.4	1.1			1/24/25 15:54:00	N	II
KQ2501489-01	Chlorophyll A	MB		Wastewater	10.68 mg/m³	2000 mL	0.80 mg/m³ U	1	0.30	0.80			1/24/25 15:54:00	N	II
KQ2501489-02	Chlorophyll A	MB		Wastewater	10.68 mg/m³	2000 mL	0.80 mg/m³ U	1	0.30	0.80			1/24/25 15:54:00	N	II
KQ2501489-03	Chlorophyll A	MB		Wastewater	10.68 mg/m³	2000 mL	0.80 mg/m³ U	1	0.30	0.80			1/24/25 15:54:00	N	II
KQ2501489-04	Chlorophyll A	MB		Wastewater	5.34 mg/m³	2000 mL	0.80 mg/m³ U	1	0.30	0.80			1/24/25 15:54:00	N	II
KQ2501489-05	Chlorophyll A	MB		Wastewater	0.00 mg/m³	2000 mL	0.80 mg/m³ U	1	0.30	0.80			1/24/25 15:54:00	N	II
KQ2501489-06	Chlorophyll A	MB		Wastewater	5.34 mg/m³	2000 mL	0.80 mg/m³ U	1	0.30	0.80			1/24/25 15:54:00	N	II
KQ2501489-07	Chlorophyll A	LCS		Wastewater	528.66 mg/m³	2000 mL	5.29 mg/m³	1	0.30	0.80	101		1/24/25 15:54:00	N	II
KQ2501489-08	Chlorophyll A	DLCS		Wastewater	517.98 mg/m³	2000 mL	5.18 mg/m³	1	0.30	0.80	98	2	1/24/25 15:54:00	N	II
KQ2501490-01	Chlorophyll A	LCS		Water	528.66 mg/m³	2000 mL	5.29 mg/m³	1	0.30	0.80	101		1/24/25 15:54:00	N	IV
KQ2501490-02	Chlorophyll A	DLCS		Water	517.98 mg/m³	2000 mL	5.18 mg/m³	1	0.30	0.80	98	2	1/24/25 15:54:00	N	IV
KQ2501490-03	Chlorophyll A	MB		Water	10.68 mg/m³	2000 mL	0.80 mg/m³ U	1	0.30	0.80			1/24/25 15:54:00	N	IV
KQ2501490-04	Chlorophyll A	MB		Water	10.68 mg/m³	2000 mL	0.80 mg/m³ U	1	0.30	0.80			1/24/25 15:54:00	N	IV
KQ2501490-05	Chlorophyll A	MB		Water	10.68 mg/m³	2000 mL	0.80 mg/m³ U	1	0.30	0.80			1/24/25 15:54:00	N	IV

indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

JS 1/30/25

Analytical Results Summary

Instrument Name: K-UV-VIS-05

Analyst: JSANCHEZ

Analysis Lot: 868554 **Method/Testcode:** SM 10200 H/Chlorophylla UF

<u>Lab Code</u>	<u>Target Analytes</u>	<u>QC</u>	<u>Parent Sample</u>	<u>Matrix</u>	<u>Raw Result</u>	<u>Sample Amt.</u>	<u>Final Result</u>	<u>Dil</u>	<u>MDL</u>	<u>PQL</u>	<u>% Rec</u>	<u>% RSD</u>	<u>Date Analyzed</u>	<u>QC?</u>	<u>Tier</u>
KQ2501490-06	Chlorophyll A	MB		Water	5.34 mg/m ³	2000 mL	0.80 mg/m ³ U	1	0.30	0.80			1/24/25 15:54:00	N	IV
KQ2501490-07	Chlorophyll A	MB		Water	0.00 mg/m ³	2000 mL	0.80 mg/m ³ U	1	0.30	0.80			1/24/25 15:54:00	N	IV
KQ2501490-08	Chlorophyll A	MB		Water	5.34 mg/m ³	2000 mL	0.80 mg/m ³ U	1	0.30	0.80			1/24/25 15:54:00	N	IV
KQ2501491-01	Pheophytin A	LCS		Water	528.66 mg/m ³	2000 mL	529 mg/m ³	1		0.80	101		1/24/25 15:54:00	N	IV
KQ2501491-02	Pheophytin A	DLCS		Water	517.98 mg/m ³	2000 mL	518 mg/m ³	1		0.80	98	2	1/24/25 15:54:00	N	IV
KQ2501491-03	Pheophytin A	MB		Water	-0.48 mg/m ³	2000 mL	0.80 mg/m ³ U	1		0.80			1/24/25 15:54:00	N	IV
KQ2501491-04	Pheophytin A	MB		Water	-0.52 mg/m ³	2000 mL	0.80 mg/m ³ U	1		0.80			1/24/25 15:54:00	N	IV
KQ2501491-05	Pheophytin A	MB		Water	-0.52 mg/m ³	2000 mL	0.80 mg/m ³ U	1		0.80			1/24/25 15:54:00	N	IV
KQ2501491-06	Pheophytin A	MB		Water	-0.43 mg/m ³	2000 mL	0.80 mg/m ³ U	1		0.80			1/24/25 15:54:00	N	IV
KQ2501491-07	Pheophytin A	MB		Water	-0.37 mg/m ³	2000 mL	0.80 mg/m ³ U	1		0.80			1/24/25 15:54:00	N	IV
KQ2501491-08	Pheophytin A	MB		Water	-0.46 mg/m ³	2000 mL	0.80 mg/m ³ U	1		0.80			1/24/25 15:54:00	N	IV

indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

TS 1/30/25

ALS ENVIRONMENTAL

Run# 868554

Service Request #: K2500: 223, 681, 680, 553

Method: SM 10200 H (spectrophotometric)

Inst. Tape

Analysis For: Chlorophyll-a

Sample Number	Sample Volume	664 nm	750 nm	Acidified 665 nm	750 nm	Ext. Vol. mls	In solution mg/m ³ Chl-a	Reported mg/m ³ Chl-a	Reported mg/m ³ Pheo-a
LCS	-	0.2000	-0.0010	0.1030	0.0010	-	528.66	529	
DLCS	-	0.2000	-0.0010	0.1030	-0.0010	-	517.98	518	
MB 1	2000	-0.0010	0.0070	-0.0020	0.0080	20	10.68	0.11	-0.48
MB 2	2000	-0.0020	0.0070	-0.0030	0.0080	20	10.68	0.11	-0.52
MB 3	2000	-0.0020	0.0070	-0.0030	0.0080	20	10.68	0.11	-0.52
MB 4	2000	-0.0020	0.0070	-0.0030	0.0070	20	5.34	0.05	-0.43
MB 5	2000	-0.0020	0.0080	-0.0020	0.0080	20	0.00	0.00	-0.37
MB 6	2000	-0.0020	0.0080	-0.0030	0.0080	20	5.34	0.05	-0.46
K2500223-2	2093	0.0310	0.0080	0.0240	0.0090	20	42.72	0.41	0.13
K2500223-3	2100	0.0380	0.0080	0.0300	0.0080	20	42.72	0.41	0.38
K2500553-1	1048	0.0540	0.0080	0.0440	0.0090	20	58.740	1.1	1.4
K2500553-2	1054	0.055	0.008	0.045	0.008	20	53.400	1.0	1.6
K2500553-3	1053	0.030	0.008	0.024	0.009	20	37.380	0.7	0.4
K2500553-4	1056	0.034	0.008	0.028	0.008	20	32.040	0.6	0.8
K2500553-5	1059	0.059	0.009	0.048	0.009	20	58.740	1.1	1.6
K2500681-1	1511	0.012	0.011	0.009	0.011	20	16.020	0.2	-0.3
K2500680-1	2118	0.099	0.008	0.082	0.009	20	96.120	0.9	1.7

$$\text{Chlorophyll-a} = \frac{26,700 ((\text{OD } 664b - \text{OD } 750b) - (\text{OD } 665a - \text{OD } 750a)) \times V_1}{L \times V_2}$$

$$\text{Pheophytin-a} = \frac{26,700 [(1.7(\text{OD } 665a - \text{OD } 750a) - (\text{OD } 664b - \text{OD } 750b))] \times V_1}{L \times V_2}$$

V₁ = Volume of extract (ml)

V₂ = Volume of sample (ml)

L = Length of lightpath or width of cuvette (5 cm)

$$\text{LCS} = 26700 ((\text{OD } 664b - \text{OD } 750b) - (\text{OD } 665a - \text{OD } 750a)) = 491.28$$

ID #: 24-GEN-04-18-L TV= 525.99 mg/m³ AVG= 525.99 mg/m³

Comments:

Pipette ID#: 124276B, H35458H

Equip.ID#:K-UV-VIS-05

Analyzed By: JS	Date: 1/4/2025 15:54
Reviewed By: MRL	Date: 01/30/25

ALS Environmental

Kelso

Chlorophyll_1_24_2025_15:54:50_PM

1 / 3

24-Jan-2025 05:03 PM

Instrument Serial #: 9A5Y164011

Method name: Chlorophyll a 29-Oct-2020

Instrument model: GENESYS 150

Method created: 29-Oct-2020 10:15 PM

Software Package Version: 2.5

Signature: JS

Method updated: 29-Oct-2020 10:17 PM

Multi-Wavelength method parameters

Result: ABS

Wavelength table

$\lambda 1$	$\lambda 2$	$\lambda 3$			
750.0	664.0	665.0			

LCS 1

ABS(750.0)	ABS(664.0)	ABS(665.0)			
-0.001	0.200	0.192			

LCS A 1

ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.001	0.103	0.103			

DLCS 1

ABS(750.0)	ABS(664.0)	ABS(665.0)			
-0.001	0.200	0.192			

DLCS A 1

ABS(750.0)	ABS(664.0)	ABS(665.0)			
-0.001	0.103	0.103			

MB 1 1

ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.007	-0.001	-0.001			

MB 1 A 1

ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	-0.001	-0.002			

MB 2 1

ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.007	-0.002	-0.002			

MB 2 A 1

ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	-0.002	-0.003			

MB 3 1

Run#868554

Chlorophyll_1_24_2025_15:54:00_PM

TS

2/3

ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.007	-0.002	-0.002			
MB 3 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	-0.002	-0.003			
MB 4 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.007	-0.002	-0.003			
MB 4 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.007	-0.003	-0.003			
MB 5 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	-0.002	-0.003			
MB 5 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	-0.002	-0.002			
MB 6 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	-0.002	-0.002			
MB 6 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	-0.002	-0.003			
K2500223-2 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	0.031	0.030			
K2500223-2 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.009	0.024	0.024			
K2500223-3 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	0.038	0.037			
K2500223-3 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	0.031	0.030			
K2500553-1 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	0.054	0.053			
K2500553-1 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			

Run 868554

Chlorophyll_1_24_2025_15:54:00_PM

TS

3/3

0.009	0.045	0.044			
K2500553-2 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	0.055	0.054			
K2500553-2 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	0.045	0.045			
K2500553-3 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	0.030	0.029			
K2500553-3 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.009	0.025	0.024			
K2500553-4 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	0.034	0.033			
K2500553-4 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	0.029	0.028			
K2500553-5 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.009	0.059	0.058			
K2500553-5 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.009	0.050	0.048			
K2500681-1 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.011	0.012	0.011			
K2500681-1 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.011	0.010	0.009			
K2500680-1 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	0.099	0.097			
K2500680-1 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.009	0.082	0.082			

Method:

Matrix:

(D) Err 1.8.25 1EV

* Samples were logged in incorrectly - Original SR* K2506191, now changed to SR* K2500223

Whatman GF/C micro fiber filters 42.5mm Lot #18172299

Date Reviewed: 01/30/25

Work Order #: K2500553 Method: Analysis: Chlorophyll A Matrix:

Sample Name Lab Code	Total Vol.	TIME
MB 3	2000	1121
K553-1	1048	1128
↓ -2	1054	1135
↓ -3	1053	1145
↓ -4	1054	1153
↓ -5	1059	1158
MB 4	2000	1204

Extraction: 1156-1521

Centrifuge: 1523-1546

Whatman GF/C micro fiber filters 42.5mm Lot # 10172299

Prepared By: <u>A. Chao</u>	Date Prepared: <u>1-17-25</u>
Analyzed By: <u>JS</u>	Date Analyzed: <u>1-24-25</u>
Reviewed By: <u>MRL</u>	Date Reviewed: <u>01/30/25</u>

Method: .

Matrix:

Extraction: 1156-1521
Centrifuge: 1523-1546

Whatman GF/C micro Fiber Filters 42.5mm Lot # 17041894

Page 27 of 32

Preparation Information Benchsheet

Run# 868554

Prep Run#: 451466

Team: GenChem/JSANCHEZ

Prep WorkFlow: GenExtChIA28Day

Prep Method: Method

Status: Prepped

Prep Date/Time: 1/24/25 11:56

Number of Copies to make: 2

#	Lab Code	Client ID	B#	Method /Test	pH	Matrix	Amt. Ext.	Final Vol	Sample Description
1	KQ2501489-07	LCS		SM 10200 H/ChlorophyllA PF		Liquid	2000mL	20.00mL	
2	KQ2501489-08	DLCS		SM 10200 H/ChlorophyllA PF		Liquid	2000mL	20.00mL	
3	KQ2501489-01	MB		SM 10200 H/ChlorophyllA PF		Liquid	2000mL	20.00mL	
4	KQ2501489-02	MB		SM 10200 H/ChlorophyllA PF		Liquid	2000mL	20.00mL	
5	KQ2501489-03	MB		SM 10200 H/ChlorophyllA PF		Liquid	2000mL	20.00mL	
6	KQ2501489-04	MB		SM 10200 H/ChlorophyllA PF		Liquid	2000mL	20.00mL	
7	KQ2501489-05	MB		SM 10200 H/ChlorophyllA PF		Liquid	2000mL	20.00mL	
8	KQ2501489-06	MB		SM 10200 H/ChlorophyllA PF		Liquid	2000mL	20.00mL	
9	K2500223-002	80453_OS001_MS2	.01	SM 10200 H/ChlorophyllA PF		Wastewater	2093.0000mL	20.00mL	
10	K2500223-003	80453_OS001_MS3	.01	SM 10200 H/ChlorophyllA PF		Wastewater	2100.0000mL	20.00mL	
11	K2500681-001	NPDES_25_IW_OF5	.01	SM 10200 H/ChlorophyllA PF		Storm Water	1511.0000mL	20.00mL	

Spiking Solutions

Name: Chlorophyll-a LCS	Inventory ID 239292	Logbook Ref: 24-GEN-04-18-L	Expires On: 01/30/2025

KQ2501489-07 20.00mL

KQ2501489-08 20.00mL

Preparation Steps

Step: Extraction	Step: Filter
Started: 1/24/25 11:56	Started: 1/8/25 13:44
Finished: 1/24/25 15:21	Finished: 1/23/25 13:47
By: JSANCHEZ	By: JSANCHEZ
Comments	Comments

Comments: Filtering for this run began on 1/8/25 with samples K2500223-1+2. Sample K25000681 was filtered on 1/23/25. See attached benchsheet.

Reviewed By: MRL Date: 01/30/25

Chain of Custody

Relinquished By: _____	Date: _____	<u>Extracts Examined</u>
Received By: _____	Date: _____	Yes No

Preparation Information Benchsheet

Prep Run#: 451467

Team: GenChem/JSANCHEZ

Number of Copies to make: 2

Prep WorkFlow: GenExtChIA48Hrs

Prep Method: Method

Run # 868554

Status: Prepped

Prep Date/Time: 1/24/25 15:23

#	Lab Code	Client ID	B#	Method /Test	pH	Matrix	Amt. Ext.	Final Vol	Sample Description
1	KQ2501490-01	LCS		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
2	KQ2501490-02	DLCS		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
3	KQ2501490-03	MB		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
4	KQ2501490-04	MB		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
5	KQ2501490-05	MB		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
6	KQ2501490-06	MB		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
7	KQ2501490-07	MB		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
8	KQ2501490-08	MB		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
9	K2500553-001	Lawrence 1	.01	SM 10200 H/Chlorophylla UF		Water	1048.0000mL	20.00mL	
10	K2500553-002	Lawrence 1 QA	.01	SM 10200 H/Chlorophylla UF		Water	1054.0000mL	20.00mL	
11	K2500553-003	Lawrence 2	.01	SM 10200 H/Chlorophylla UF		Water	1053.0000mL	20.00mL	
12	K2500553-004	Pattison N	.01	SM 10200 H/Chlorophylla UF		Water	1056.0000mL	20.00mL	
13	K2500553-005	Pattison S	.01	SM 10200 H/Chlorophylla UF		Water	1059.0000mL	20.00mL	
14	K2500680-001	Summit/Summit QA	.01	SM 10200 H/Chlorophylla UF		Water	2118.0000mL	20.00mL	

Spiking Solutions

Name: Chlorophyll-a LCS	Inventory ID 239292	Logbook Ref: 24-GEN-04-18-L	Expires On: 01/30/2025

KQ2501490-01 20.00mL

KQ2501490-02 20.00mL

Preparation Steps

Step: Centrifuge

Started: 1/24/25 15:23

Finished: 1/24/25 15:46

By: JSANCHEZ

Comments

Step: Extraction

Started: 1/24/25 11:56

Finished: 1/24/25 15:21

By: JSANCHEZ

Comments

Step: Filter

Started: 1/17/25 11:21

Finished: 1/23/25 13:47

By: JSANCHEZ

Comments

Comments: See attached benchsheet.

Reviewed By: MRL Date: 01/30/25

Preparation Information Benchsheet

Prep Run#: 451467
Team: GenChem/JSANCHEZ

Prep WorkFlow: GenExtChlA48Hrs
Prep Method: Method

Run# 868554
Status: Prepped
Prep Date/Time: 1/24/25 15:23

Chain of Custody

Relinquished By: _____	Date: _____	<u>Extracts Examined</u>
Received By: _____	Date: _____	Yes No

Preparation Information Benchsheet

Run# 868554

Prep Run#: 451468

Team: GenChem/JSANCHEZ

Prep Workflow: GenExtChIA8Hrec

Prep Method: Method

Status: Prepped

Prep Date/Time: 1/24/25 15:23

Number of Copies to make: 2

#	Lab Code	Client ID	B#	Method /Test	pH	Matrix	Amt. Ext.	Final Vol	Sample Description
1	KQ2501491-01	LCS		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
2	KQ2501491-02	DLCS		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
3	KQ2501491-03	MB		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
4	KQ2501491-04	MB		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
5	KQ2501491-05	MB		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
6	KQ2501491-06	MB		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
7	KQ2501491-07	MB		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
8	KQ2501491-08	MB		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
9	K2500553-001	Lawrence 1	.01	SM 10200 H/Pheophytin A NF		Water	1048.0000mL	20.00mL	
10	K2500553-002	Lawrence 1 QA	.01	SM 10200 H/Pheophytin A NF		Water	1054.0000mL	20.00mL	
11	K2500553-003	Lawrence 2	.01	SM 10200 H/Pheophytin A NF		Water	1053.0000mL	20.00mL	
12	K2500553-004	Pattison N	.01	SM 10200 H/Pheophytin A NF		Water	1056.0000mL	20.00mL	
13	K2500553-005	Pattison S	.01	SM 10200 H/Pheophytin A NF		Water	1059.0000mL	20.00mL	
14	K2500680-001	Summit/Summit QA	.01	SM 10200 H/Pheophytin A NF		Water	2118.0000mL	20.00mL	

Spiking Solutions

Name: Chlorophyll-a LCS	Inventory ID 239294	Logbook Ref: 24-GEN-04-18-L	Expires On: 01/30/2025

KQ2501491-01 20.00mL

KQ2501491-02 20.00mL

Preparation Steps

Step: Centrifuge

Started: 1/24/25 15:23

Finished: 1/24/25 15:46

By: JSANCHEZ

Comments

Step: Extraction

Started: 1/24/25 11:56

Finished: 1/24/25 15:21

By: JSANCHEZ

Comments

Step: Filter

Started: 1/17/25 11:21

Finished: 1/23/25 13:47

By: JSANCHEZ

Comments

Comments: See attached benchsheet.

Reviewed By: MRL Date: 01/30/25

Preparation Information Benchsheet

Run# 868554

Prep Run#: 451468
Team: GenChem/JSANCHEZ

Prep Workflow: GenExtChlA8Hrec
Prep Method: Method

Status: Prepped
Prep Date/Time: 1/24/25 15:23

Chain of Custody

Relinquished By: _____	Date: _____	<u>Extracts Examined</u> Yes No
Received By: _____	Date: _____	

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***Professional
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February 24, 2025

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN

Project: STREAMS

Project Number: 40644

COC Number:

JOHN HABERLIN:

Enclosed please find the analytical data for your STREAMS project.

Your sample(s) were received on Wednesday, February 5, 2025 and properly maintained prior to the subsequent analysis. The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA, Standard Methods or the Army Corps of Engineers.

Following the analytical results you will find the Quality Control (QA/QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Practical Quantitation Limits (PQL's), as opposed to the Method Detection Limits (MDL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Aaron Young". The signature is fluid and cursive, with the first name "Aaron" and last name "Young" clearly distinguishable.

ElementStationManager For Aaron Young

President

aarony@amtestlab.com



ANALYSIS REPORT

Date Received: 02/05/25

Date Reported: 02/24/25

Thurston County Environmental Health

412 LILLY RD NE

OLYMPIA, WA 98506

Attention: JOHN HABERLIN

Project Name: STREAMS

Project #: 40644

Reported Samples

Lab ID	Sample	Matrix	Qualifiers	Date Sampled	Date Received
A25B0069-01	Eaton	Water		01/28/2025	02/05/2025
A25B0069-02	Thompson	Water		01/28/2025	02/05/2025
A25B0069-03	McAllister @ I-5	Water		01/28/2025	02/05/2025
A25B0069-04	Dobbs @ Cross Creek	Water		01/28/2025	02/05/2025
A25B0069-05	Woodland @ Draham	Water		01/28/2025	02/05/2025
A25B0069-06	Woodland @ PG	Water		01/28/2025	02/05/2025
A25B0069-07	Flemming @ JP	Water		01/28/2025	02/05/2025
A25B0069-08	Flemming @ JP - QA	Water		01/28/2025	02/05/2025
A25B0069-09	Woodward @ Libby	Water		01/28/2025	02/05/2025
A25B0069-10	Woodward @ Libby - QA	Water		01/28/2025	02/05/2025
A25B0069-11	Moxlie @ Union	Water		01/28/2025	02/05/2025
A25B0069-12	Schneider T	Water		01/13/2025	02/05/2025
A25B0069-13	Schneider T - QA	Water		01/13/2025	02/05/2025
A25B0069-14	Kennedy	Water		01/13/2025	02/05/2025
A25B0069-15	Kennedy - QA	Water		01/13/2025	02/05/2025
A25B0069-16	Schneider Head	Water		01/13/2025	02/05/2025
A25B0069-17	McLane	Water		01/13/2025	02/05/2025
A25B0069-18	Black Lake Ditch	Water		01/13/2025	02/05/2025
A25B0069-19	SMT 002	Water		01/27/2025	02/05/2025
A25B0069-20	SMT 008	Water		01/27/2025	02/05/2025
A25B0069-21	SMT 009	Water		01/27/2025	02/05/2025
A25B0069-22	SMT 021	Water		01/27/2025	02/05/2025
A25B0069-23	SMT 028	Water		01/27/2025	02/05/2025
A25B0069-24	SMT 028 - QA	Water		01/27/2025	02/05/2025
A25B0069-25	SMT 027	Water		01/27/2025	02/05/2025
A25B0069-26	Lawrence 1 Surface	Water		01/16/2025	02/05/2025
A25B0069-27	Lawrence 1 Surface - QA	Water		01/16/2025	02/05/2025
A25B0069-28	Lawrence 1 Bottom	Water		01/16/2025	02/05/2025
A25B0069-29	Lawrence 1 Bottom - QA	Water		01/16/2025	02/05/2025
A25B0069-30	Lawrence 2 Surface	Water		01/16/2025	02/05/2025
A25B0069-31	Lawrence 2 Bottom	Water		01/16/2025	02/05/2025
A25B0069-32	Pattison N - Surface	Water		01/16/2025	02/05/2025
A25B0069-33	Pattison N - Bottom	Water		01/16/2025	02/05/2025
A25B0069-34	Pattison S - Surface	Water		01/16/2025	02/05/2025
A25B0069-35	Pattison S - Bottom	Water		01/16/2025	02/05/2025

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ANALYSIS REPORT

Date Received: 02/05/25
Date Reported: 02/24/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

A25B0069-36	Summit - Surface	Water	01/16/2025	02/05/2025
A25B0069-37	Summit - Surface - QA	Water	01/16/2025	02/05/2025
A25B0069-38	Summit - Bottom	Water	01/16/2025	02/05/2025
A25B0069-39	Summit - Bottom - QA	Water	01/16/2025	02/05/2025

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ANALYSIS REPORT

Date Received: 02/05/25

Date Reported: 02/24/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25B0069-01

Client Identification: Eaton

Sampling Date: 01/28/25 09:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.833	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.049	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-02

Client Identification: Thompson

Sampling Date: 01/28/25 10:22

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	2.44	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.020	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-03

Client Identification: McAllister @ I-5

Sampling Date: 01/28/25 11:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.35	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.146	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-04

Client Identification: Dobbs @ Cross Creek

Sampling Date: 01/28/25 11:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.851	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.048	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

ANALYSIS REPORT

Date Received: 02/05/25

Date Reported: 02/24/25

Thurston County Environmental Health

412 LILLY RD NE

OLYMPIA, WA 98506

Attention: JOHN HABERLIN

Project Name: STREAMS

Project #: 40644

AMTEST Identification Number: A25B0069-05

Client Identification: Woodland @ Draham

Sampling Date: 01/28/25 12:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.44	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.091	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-06

Client Identification: Woodland @ PG

Sampling Date: 01/28/25 13:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.44	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.074	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-07

Client Identification: Flemming @ JP

Sampling Date: 01/28/25 13:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.145	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.063	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-08

Client Identification: Flemming @ JP - QA

Sampling Date: 01/28/25 13:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.146	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.063	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

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ANALYSIS REPORT

Date Received: 02/05/25

Date Reported: 02/24/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25B0069-09

Client Identification: Woodward @ Libby

Sampling Date: 01/28/25 14:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.567	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.042	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-10

Client Identification: Woodward @ Libby - QA

Sampling Date: 01/28/25 14:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.573	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.037	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-11

Client Identification: Moxlie @ Union

Sampling Date: 01/28/25 14:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.542	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.080	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-12

Client Identification: Schneider T

Sampling Date: 01/13/25 11:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.299	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.034	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

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ANALYSIS REPORT

Date Received: 02/05/25

Date Reported: 02/24/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25B0069-13

Client Identification: Schneider T - QA

Sampling Date: 01/13/25 11:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.297	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.033	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-14

Client Identification: Kennedy

Sampling Date: 01/13/25 11:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.415	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.022	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-15

Client Identification: Kennedy - QA

Sampling Date: 01/13/25 11:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.409	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.019	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-16

Client Identification: Schneider Head

Sampling Date: 01/13/25 13:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.098	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.017	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

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ANALYSIS REPORT

Date Received: 02/05/25
Date Reported: 02/24/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25B0069-17
Client Identification: McLane
Sampling Date: 01/13/25 13:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.415	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.036	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-18
Client Identification: Black Lake Ditch
Sampling Date: 01/13/25 14:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.126	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Phosphorus (TP)	0.018	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-19
Client Identification: SMT 002
Sampling Date: 01/27/25 09:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Ammonia	0.024	mg/L		0.020	EPA 350.1_2_1993	LF	02/13/2025
Total Nitrate + Nitrite	0.382	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Kjeldahl Nitrogen	0.30	mg/L		0.25	EPA 351.2_2_1993	LF	02/14/2025
Total Phosphorus (TP)	0.008	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

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Date Received: 02/05/25

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Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25B0069-20

Client Identification: SMT 008

Sampling Date: 01/27/25 09:35

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Ammonia	0.020	mg/L		0.020	EPA 350.1_2_1993	LF	02/13/2025
Total Nitrate + Nitrite	1.13	mg/L		0.020	EPA 353.2_2_1993	LF	02/10/2025
Total Kjeldahl Nitrogen	0.37	mg/L		0.25	EPA 351.2_2_1993	LF	02/14/2025
Total Phosphorus (TP)	0.012	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-21

Client Identification: SMT 009

Sampling Date: 01/27/25 09:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Ammonia	0.027	mg/L		0.020	EPA 350.1_2_1993	LF	02/13/2025
Total Nitrate + Nitrite	0.742	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	0.31	mg/L		0.25	EPA 351.2_2_1993	LF	02/14/2025
Total Phosphorus (TP)	0.008	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-22

Client Identification: SMT 021

Sampling Date: 01/27/25 10:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Ammonia	0.023	mg/L		0.020	EPA 350.1_2_1993	LF	02/13/2025
Total Nitrate + Nitrite	0.255	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	0.27	mg/L		0.25	EPA 351.2_2_1993	LF	02/14/2025
Total Phosphorus (TP)	0.007	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

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Project #: 40644

Date Received: 02/05/25

Date Reported: 02/24/25

AMTEST Identification Number: A25B0069-23

Client Identification: SMT 028

Sampling Date: 01/27/25 10:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Ammonia	0.036	mg/L		0.020	EPA 350.1_2_1993	LF	02/13/2025
Total Nitrate + Nitrite	0.068	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	0.35	mg/L		0.25	EPA 351.2_2_1993	LF	02/14/2025
Total Phosphorus (TP)	0.008	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-24

Client Identification: SMT 028 - QA

Sampling Date: 01/27/25 10:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Ammonia	0.026	mg/L		0.020	EPA 350.1_2_1993	LF	02/13/2025
Total Nitrate + Nitrite	0.070	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	0.41	mg/L		0.25	EPA 351.2_2_1993	LF	02/14/2025
Total Phosphorus (TP)	0.009	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-25

Client Identification: SMT 027

Sampling Date: 01/27/25 10:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Ammonia	0.025	mg/L		0.020	EPA 350.1_2_1993	LF	02/13/2025
Total Nitrate + Nitrite	0.061	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	0.32	mg/L		0.25	EPA 351.2_2_1993	LF	02/14/2025
Total Phosphorus (TP)	0.007	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

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Thurston County Environmental Health

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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25B0069-26

Client Identification: Lawrence 1 Surface

Sampling Date: 01/16/25 09:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.045	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	1.53	mg/L		0.25	EPA 351.2_2_1993	LF	02/14/2025
Total Nitrogen	1.58	mg/L			Calculated	LF	02/14/2025
Total Phosphorus (TP)	0.055	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-27

Client Identification: Lawrence 1 Surface - QA

Sampling Date: 01/16/25 09:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.050	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	1.50	mg/L		0.25	EPA 351.2_2_1993	LF	02/14/2025
Total Nitrogen	1.55	mg/L			Calculated	LF	02/14/2025
Total Phosphorus (TP)	0.062	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-28

Client Identification: Lawrence 1 Bottom

Sampling Date: 01/16/25 10:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.046	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	1.71	mg/L		0.25	EPA 351.2_2_1993	LF	02/14/2025
Total Nitrogen	1.75	mg/L			Calculated	LF	02/14/2025
Total Phosphorus (TP)	0.061	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

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Thurston County Environmental Health

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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25B0069-29

Client Identification: Lawrence 1 Bottom - QA

Sampling Date: 01/16/25 10:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.046	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	1.56	mg/L		0.25	EPA 351.2_2_1993	LF	02/14/2025
Total Nitrogen	1.60	mg/L			Calculated	LF	02/14/2025
Total Phosphorus (TP)	0.061	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-30

Client Identification: Lawrence 2 Surface

Sampling Date: 01/16/25 10:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.132	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	1.07	mg/L		0.25	EPA 351.2_2_1993	LF	02/14/2025
Total Nitrogen	1.20	mg/L			Calculated	LF	02/19/2025
Total Phosphorus (TP)	0.039	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-31

Client Identification: Lawrence 2 Bottom

Sampling Date: 01/16/25 10:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.139	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	1.20	mg/L		0.25	EPA 351.2_2_1993	LF	02/14/2025
Total Nitrogen	1.34	mg/L			Calculated	LF	02/19/2025
Total Phosphorus (TP)	0.041	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

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Thurston County Environmental Health

412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25B0069-32

Client Identification: Pattison N - Surface

Sampling Date: 01/16/25 11:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.732	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	0.61	mg/L		0.25	EPA 351.2_2_1993	LF	02/14/2025
Total Nitrogen	1.34	mg/L			Calculated	LF	02/19/2025
Total Phosphorus (TP)	0.065	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-33

Client Identification: Pattison N - Bottom

Sampling Date: 01/16/25 11:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.725	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	0.72	mg/L		0.25	EPA 351.2_2_1993	LF	02/14/2025
Total Nitrogen	1.45	mg/L			Calculated	LF	02/19/2025
Total Phosphorus (TP)	0.064	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-34

Client Identification: Pattison S - Surface

Sampling Date: 01/16/25 12:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.480	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	0.63	mg/L		0.25	EPA 351.2_2_1993	LF	02/19/2025
Total Nitrogen	1.11	mg/L			Calculated	LF	02/19/2025
Total Phosphorus (TP)	0.042	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25B0069-35
Client Identification: Pattison S - Bottom
Sampling Date: 01/16/25 12:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.482	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	0.69	mg/L		0.25	EPA 351.2_2_1993	LF	02/19/2025
Total Nitrogen	1.18	mg/L			Calculated	LF	02/19/2025
Total Phosphorus (TP)	0.042	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-36
Client Identification: Summit - Surface
Sampling Date: 01/16/25 10:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.078	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	0.45	mg/L		0.25	EPA 351.2_2_1993	LF	02/19/2025
Total Nitrogen	0.525	mg/L			Calculated	LF	02/19/2025
Total Phosphorus (TP)	0.008	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-37
Client Identification: Summit - Surface - QA
Sampling Date: 01/16/25 10:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.079	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	0.39	mg/L		0.25	EPA 351.2_2_1993	LF	02/19/2025
Total Nitrogen	0.471	mg/L			Calculated	LF	02/19/2025
Total Phosphorus (TP)	0.008	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

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Date Reported: 02/24/25

Thurston County Environmental Health
412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25B0069-38
Client Identification: Summit - Bottom
Sampling Date: 01/16/25 10:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.078	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	0.51	mg/L		0.25	EPA 351.2_2_1993	LF	02/19/2025
Total Nitrogen	0.584	mg/L			Calculated	LF	02/19/2025
Total Phosphorus (TP)	0.008	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025

AMTEST Identification Number: A25B0069-39
Client Identification: Summit - Bottom - QA
Sampling Date: 01/16/25 10:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.077	mg/L		0.020	EPA 353.2_2_1993	LF	02/18/2025
Total Kjeldahl Nitrogen	0.46	mg/L		0.25	EPA 351.2_2_1993	LF	02/19/2025
Total Nitrogen	0.533	mg/L			Calculated	LF	02/19/2025
Total Phosphorus (TP)	0.016	mg/L		0.005	SM 4500-P F_2011	LF	02/11/2025



ANALYSIS REPORT

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Thurston County Environmental Health
412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Quality Control

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0054 - No Prep - WetChem										
Blank (BCB0054-BLK1)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BCB0054-BLK2)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BCB0054-BLK3)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BCB0054-BLK4)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
LCS (BCB0054-BS1)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.488		0.020	mg/L	0.5000		98%	90-110%		
LCS (BCB0054-BS2)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.502		0.020	mg/L	0.5000		100%	90-110%		
LCS (BCB0054-BS3)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.497		0.020	mg/L	0.5000		99%	90-110%		
LCS (BCB0054-BS4)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.494		0.020	mg/L	0.5000		99%	90-110%		
Calibration Blank (BCB0054-CCB1)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.0007			mg/L						
Calibration Blank (BCB0054-CCB2)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	ND	U		mg/L						
Calibration Blank (BCB0054-CCB3)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	ND	U		mg/L						
Calibration Blank (BCB0054-CCB4)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.0006			mg/L						
Calibration Blank (BCB0054-CCB5)					Prepared & Analyzed: 02/10/25					

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 02/05/25

Date Reported: 02/24/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0054 - No Prep - WetChem (Continued)										
Calibration Blank (BCB0054-CCB5)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.003			mg/L						
Calibration Blank (BCB0054-CCB6)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.0004			mg/L						
Calibration Blank (BCB0054-CCB7)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.001			mg/L						
Calibration Blank (BCB0054-CCB8)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.0005			mg/L						
Calibration Check (BCB0054-CCV1)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	1.01		0.020	mg/L	1.000		101%	85-115%		
Calibration Check (BCB0054-CCV2)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	1.00		0.020	mg/L	1.000		100%	85-115%		
Calibration Check (BCB0054-CCV3)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.979		0.020	mg/L	1.000		98%	85-115%		
Calibration Check (BCB0054-CCV4)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.999		0.020	mg/L	1.000		100%	85-115%		
Calibration Check (BCB0054-CCV5)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.969		0.020	mg/L	1.000		97%	85-115%		
Calibration Check (BCB0054-CCV6)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.985		0.020	mg/L	1.000		98%	85-115%		
Calibration Check (BCB0054-CCV7)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.962		0.020	mg/L	1.000		96%	85-115%		
Calibration Check (BCB0054-CCV8)					Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.975		0.020	mg/L	1.000		98%	85-115%		
Duplicate (BCB0054-DUP1)					Prepared & Analyzed: 02/10/25					
					Source: A25A0551-01					



ANALYSIS REPORT

Thurston County Environmental Health

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Project Name: STREAMS
Project #: 40644

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Date Reported: 02/24/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0054 - No Prep - WetChem (Continued)										
Duplicate (BCB0054-DUP1)			Source: A25A0551-01		Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.521		0.020	mg/L		0.518			0.6	20
Duplicate (BCB0054-DUP2)			Source: A25A0562-02		Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.906		0.020	mg/L		0.897			0.9	20
Duplicate (BCB0054-DUP3)			Source: A25A0564-02		Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.266		0.020	mg/L		0.268			0.6	20
Duplicate (BCB0054-DUP4)			Source: A25A0564-12		Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.284		0.020	mg/L		0.284			0.08	20
Duplicate (BCB0054-DUP5)			Source: A25B0041-04		Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	2.82	D	0.200	mg/L		2.86			1	20
Duplicate (BCB0054-DUP6)			Source: A25B0069-06		Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	1.42		0.020	mg/L		1.44			2	20
Duplicate (BCB0054-DUP7)			Source: A25B0069-16		Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	0.098		0.020	mg/L		0.098			0.5	20
Duplicate (BCB0054-DUP8)			Source: A25B0069-20		Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	1.14		0.020	mg/L		1.13			0.8	20
Matrix Spike (BCB0054-MS1)			Source: A25A0551-01		Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	1.47		0.020	mg/L	1.000	0.518	95%	85-115%		
Matrix Spike (BCB0054-MS2)			Source: A25A0562-02		Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	1.87		0.020	mg/L	1.000	0.897	97%	85-115%		
Matrix Spike (BCB0054-MS3)			Source: A25A0564-02		Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	1.23		0.020	mg/L	1.000	0.268	96%	85-115%		
Matrix Spike (BCB0054-MS4)			Source: A25A0564-12		Prepared & Analyzed: 02/10/25					
Total Nitrate + Nitrite	1.23		0.020	mg/L	1.000	0.284	95%	85-115%		
Matrix Spike (BCB0054-MS5)			Source: A25B0041-04		Prepared & Analyzed: 02/10/25					

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Project Name: STREAMS
Project #: 40644

Date Received: 02/05/25

Date Reported: 02/24/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCB0054 - No Prep - WetChem (Continued)

Matrix Spike (BCB0054-MS5)

Source: A25B0041-04

Prepared & Analyzed: 02/10/25

Total Nitrate + Nitrite	12.3	D	0.200	mg/L	10.00	2.86	95%	85-115%

Matrix Spike (BCB0054-MS6)

Source: A25B0069-06

Prepared & Analyzed: 02/10/25

Total Nitrate + Nitrite	2.39		0.020	mg/L	1.000	1.44	94%	85-115%

Matrix Spike (BCB0054-MS7)

Source: A25B0069-16

Prepared & Analyzed: 02/10/25

Total Nitrate + Nitrite	1.04		0.020	mg/L	1.000	0.098	95%	85-115%

Matrix Spike (BCB0054-MS8)

Source: A25B0069-20

Prepared & Analyzed: 02/10/25

Total Nitrate + Nitrite	2.09		0.020	mg/L	1.000	1.13	95%	85-115%

Batch: BCB0055 - No Prep - WetChem

Blank (BCB0055-BLK1)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	ND	U, J	0.005	mg/L

Blank (BCB0055-BLK2)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	ND	U, J	0.005	mg/L

Blank (BCB0055-BLK3)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	ND	U, J	0.005	mg/L

Blank (BCB0055-BLK4)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	ND	U, J	0.005	mg/L

Blank (BCB0055-BLK5)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	ND	U, J	0.005	mg/L

LCS (BCB0055-BS1)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	0.100		0.005	mg/L	0.1000		100%	90-110%

LCS (BCB0055-BS2)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	0.102		0.005	mg/L	0.1000		102%	90-110%

LCS (BCB0055-BS3)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	0.103		0.005	mg/L	0.1000		103%	90-110%

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCB0055 - No Prep - WetChem (Continued)

LCS (BCB0055-BS4)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	0.103		0.005	mg/L	0.1000		103%	90-110%

LCS (BCB0055-BS5)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	0.104		0.005	mg/L	0.1000		104%	90-110%

Calibration Blank (BCB0055-CCB1)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	0.003			mg/L				

Calibration Blank (BCB0055-CCB10)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	0.002			mg/L				

Calibration Blank (BCB0055-CCB2)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	0.002			mg/L				

Calibration Blank (BCB0055-CCB3)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	0.002			mg/L				

Calibration Blank (BCB0055-CCB4)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	0.003			mg/L				

Calibration Blank (BCB0055-CCB5)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	0.002			mg/L				

Calibration Blank (BCB0055-CCB6)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	0.002			mg/L				

Calibration Blank (BCB0055-CCB7)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	0.002			mg/L				

Calibration Blank (BCB0055-CCB8)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	0.002			mg/L				

Calibration Blank (BCB0055-CCB9)

Prepared: 02/10/25 Analyzed: 02/11/25

Total Phosphorus (TP)	0.003			mg/L				

Calibration Check (BCB0055-CCV1)

Prepared: 02/10/25 Analyzed: 02/11/25

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Attention: JOHN HABERLIN

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0055 - No Prep - WetChem (Continued)										
Calibration Check (BCB0055-CCV1)					Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.204		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCB0055-CCV10)					Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.204		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCB0055-CCV2)					Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.204		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCB0055-CCV3)					Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.206		0.005	mg/L	0.2000		103%	85-115%		
Calibration Check (BCB0055-CCV4)					Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.205		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCB0055-CCV5)					Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.204		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCB0055-CCV6)					Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.206		0.005	mg/L	0.2000		103%	85-115%		
Calibration Check (BCB0055-CCV7)					Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.204		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCB0055-CCV8)					Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.202		0.005	mg/L	0.2000		101%	85-115%		
Calibration Check (BCB0055-CCV9)					Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.205		0.005	mg/L	0.2000		103%	85-115%		
Duplicate (BCB0055-DUP1)					Source: A25A0517-05 Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.040		0.005	mg/L		0.040			1	22.3
Duplicate (BCB0055-DUP10)					Source: A25B0069-39 Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.015		0.005	mg/L		0.016			8	22.3
Duplicate (BCB0055-DUP2)					Source: A25A0542-04 Prepared: 02/10/25 Analyzed: 02/11/25					



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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0055 - No Prep - WetChem (Continued)										
Duplicate (BCB0055-DUP2)			Source: A25A0542-04	Prepared: 02/10/25 Analyzed: 02/11/25						
Total Phosphorus (TP)	0.006		0.005	mg/L		0.007			7	22.3
Duplicate (BCB0055-DUP3)			Source: A25A0550-01	Prepared: 02/10/25 Analyzed: 02/11/25						
Total Phosphorus (TP)	9.99	D	0.500	mg/L		10.2			3	22.3
Duplicate (BCB0055-DUP4)			Source: A25A0562-10	Prepared: 02/10/25 Analyzed: 02/11/25						
Total Phosphorus (TP)	ND	U, J	0.005	mg/L		ND				22.3
Duplicate (BCB0055-DUP5)			Source: A25B0005-04	Prepared: 02/10/25 Analyzed: 02/11/25						
Total Phosphorus (TP)	0.004	U, J	0.005	mg/L		0.004			8	22.3
Duplicate (BCB0055-DUP6)			Source: A25B0069-04	Prepared: 02/10/25 Analyzed: 02/11/25						
Total Phosphorus (TP)	0.047		0.005	mg/L		0.048			2	22.3
Duplicate (BCB0055-DUP7)			Source: A25B0069-14	Prepared: 02/10/25 Analyzed: 02/11/25						
Total Phosphorus (TP)	0.021		0.005	mg/L		0.022			1	22.3
Duplicate (BCB0055-DUP8)			Source: A25B0069-24	Prepared: 02/10/25 Analyzed: 02/11/25						
Total Phosphorus (TP)	0.009		0.005	mg/L		0.009			1	22.3
Duplicate (BCB0055-DUP9)			Source: A25B0069-34	Prepared: 02/10/25 Analyzed: 02/11/25						
Total Phosphorus (TP)	0.041		0.005	mg/L		0.042			3	22.3
Matrix Spike (BCB0055-MS1)			Source: A25A0517-05	Prepared: 02/10/25 Analyzed: 02/11/25						
Total Phosphorus (TP)	0.248		0.005	mg/L	0.2000	0.040	104%	85-115%		
Matrix Spike (BCB0055-MS10)			Source: A25B0069-39	Prepared: 02/10/25 Analyzed: 02/11/25						
Total Phosphorus (TP)	0.213		0.005	mg/L	0.2000	0.016	98%	85-115%		
Matrix Spike (BCB0055-MS2)			Source: A25A0542-04	Prepared: 02/10/25 Analyzed: 02/11/25						
Total Phosphorus (TP)	0.209		0.005	mg/L	0.2000	0.007	101%	85-115%		
Matrix Spike (BCB0055-MS3)			Source: A25A0550-01	Prepared: 02/10/25 Analyzed: 02/11/25						
Total Phosphorus (TP)	30.8	D	0.500	mg/L	20.00	10.2	103%	85-115%		
Matrix Spike (BCB0055-MS4)			Source: A25A0562-10	Prepared: 02/10/25 Analyzed: 02/11/25						

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0055 - No Prep - WetChem (Continued)										
Matrix Spike (BCB0055-MS4)			Source: A25A0562-10		Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.197		0.005	mg/L	0.2000	ND	99%	85-115%		
Matrix Spike (BCB0055-MS5)			Source: A25B0005-04		Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.202		0.005	mg/L	0.2000	0.004	99%	85-115%		
Matrix Spike (BCB0055-MS6)			Source: A25B0069-04		Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.258		0.005	mg/L	0.2000	0.048	105%	85-115%		
Matrix Spike (BCB0055-MS7)			Source: A25B0069-14		Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.231		0.005	mg/L	0.2000	0.022	105%	85-115%		
Matrix Spike (BCB0055-MS8)			Source: A25B0069-24		Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.210		0.005	mg/L	0.2000	0.009	101%	85-115%		
Matrix Spike (BCB0055-MS9)			Source: A25B0069-34		Prepared: 02/10/25 Analyzed: 02/11/25					
Total Phosphorus (TP)	0.250		0.005	mg/L	0.2000	0.042	104%	85-115%		
Batch: BCB0056 - No Prep - WetChem										
Blank (BCB0056-BLK1)			Prepared: 02/12/25 Analyzed: 02/14/25							
Total Kjeldahl Nitrogen	ND	U	0.25	mg/L						
Blank (BCB0056-BLK2)			Prepared: 02/12/25 Analyzed: 02/14/25							
Total Kjeldahl Nitrogen	ND	U	0.25	mg/L						
Blank (BCB0056-BLK3)			Prepared: 02/12/25 Analyzed: 02/14/25							
Total Kjeldahl Nitrogen	ND	U	0.25	mg/L						
LCS (BCB0056-BS1)			Prepared: 02/12/25 Analyzed: 02/14/25							
Total Kjeldahl Nitrogen	0.46		0.25	mg/L	0.5000		93%	85-115%		
LCS (BCB0056-BS2)			Prepared: 02/12/25 Analyzed: 02/14/25							
Total Kjeldahl Nitrogen	0.47		0.25	mg/L	0.5000		94%	85-115%		
LCS (BCB0056-BS3)			Prepared: 02/12/25 Analyzed: 02/14/25							
Total Kjeldahl Nitrogen	0.47		0.25	mg/L	0.5000		94%	85-115%		

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0056 - No Prep - WetChem (Continued)										
Calibration Blank (BCB0056-CCB1)					Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Blank (BCB0056-CCB2)					Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Blank (BCB0056-CCB3)					Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Blank (BCB0056-CCB4)					Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Blank (BCB0056-CCB5)					Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Check (BCB0056-CCV1)					Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	1.09		0.25	mg/L	1.000		109%	85-115%		
Calibration Check (BCB0056-CCV2)					Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	1.08		0.25	mg/L	1.000		108%	85-115%		
Calibration Check (BCB0056-CCV3)					Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	1.10		0.25	mg/L	1.000		110%	85-115%		
Calibration Check (BCB0056-CCV4)					Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	1.06		0.25	mg/L	1.000		106%	85-115%		
Calibration Check (BCB0056-CCV5)					Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	1.10		0.25	mg/L	1.000		110%	85-115%		
Duplicate (BCB0056-DUP1)					Source: A25A0564-10 Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	0.63		0.25	mg/L		0.63			0.7	25
Duplicate (BCB0056-DUP2)					Source: A25B0041-02 Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	3.03		0.25	mg/L		3.08			2	25
Duplicate (BCB0056-DUP3)					Source: A25B0058-05 Prepared: 02/12/25 Analyzed: 02/14/25					

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0056 - No Prep - WetChem (Continued)										
Duplicate (BCB0056-DUP3)			Source: A25B0058-05		Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	15.9		5.00	mg/L		16.2			2	25
Duplicate (BCB0056-DUP4)			Source: A25B0069-27		Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	1.51		0.25	mg/L		1.50			0.8	25
Duplicate (BCB0056-DUP5)			Source: A25B0069-33		Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	0.68		0.25	mg/L		0.72			6	25
Matrix Spike (BCB0056-MS1)			Source: A25A0564-10		Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	2.78		0.25	mg/L	2.000	0.63	107%	80-120%		
Matrix Spike (BCB0056-MS2)			Source: A25B0041-02		Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	5.49		0.25	mg/L	2.000	3.08	121%	80-120%		
Matrix Spike (BCB0056-MS3)			Source: A25B0058-05		Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	37.8		5.00	mg/L	20.00	16.2	108%	80-120%		
Matrix Spike (BCB0056-MS4)			Source: A25B0069-27		Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	3.56		0.25	mg/L	2.000	1.50	103%	80-120%		
Matrix Spike (BCB0056-MS5)			Source: A25B0069-33		Prepared: 02/12/25 Analyzed: 02/14/25					
Total Kjeldahl Nitrogen	2.81		0.25	mg/L	2.000	0.72	104%	80-120%		
Batch: BCB0128 - No Prep - WetChem										
Blank (BCB0128-BLK1)					Prepared & Analyzed: 02/13/25					
Ammonia	ND	U	0.020	mg/L						
Blank (BCB0128-BLK2)					Prepared & Analyzed: 02/13/25					
Ammonia	ND	U	0.020	mg/L						
Blank (BCB0128-BLK3)					Prepared & Analyzed: 02/13/25					
Ammonia	ND	U	0.020	mg/L						
Blank (BCB0128-BLK4)					Prepared & Analyzed: 02/13/25					
Ammonia	ND	U	0.020	mg/L						

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Quality Control

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Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0128 - No Prep - WetChem (Continued)										
LCS (BCB0128-BS1)					Prepared & Analyzed: 02/13/25					
Ammonia	0.495		0.020	mg/L	0.5000		99%	80-120%		
LCS (BCB0128-BS2)					Prepared & Analyzed: 02/13/25					
Ammonia	0.498		0.020	mg/L	0.5000		100%	80-120%		
LCS (BCB0128-BS3)					Prepared & Analyzed: 02/13/25					
Ammonia	0.504		0.020	mg/L	0.5000		101%	80-120%		
LCS (BCB0128-BS4)					Prepared & Analyzed: 02/13/25					
Ammonia	0.508		0.020	mg/L	0.5000		102%	80-120%		
Calibration Blank (BCB0128-CCB1)					Prepared & Analyzed: 02/13/25					
Ammonia	0.014			mg/L						
Calibration Blank (BCB0128-CCB2)					Prepared & Analyzed: 02/13/25					
Ammonia	0.018			mg/L						
Calibration Blank (BCB0128-CCB3)					Prepared & Analyzed: 02/13/25					
Ammonia	0.016			mg/L						
Calibration Blank (BCB0128-CCB4)					Prepared & Analyzed: 02/13/25					
Ammonia	0.017			mg/L						
Calibration Blank (BCB0128-CCB5)					Prepared & Analyzed: 02/13/25					
Ammonia	0.018			mg/L						
Calibration Blank (BCB0128-CCB6)					Prepared & Analyzed: 02/13/25					
Ammonia	0.013			mg/L						
Calibration Blank (BCB0128-CCB7)					Prepared & Analyzed: 02/13/25					
Ammonia	0.018			mg/L						
Calibration Blank (BCB0128-CCB8)					Prepared & Analyzed: 02/13/25					
Ammonia	0.019			mg/L						
Calibration Check (BCB0128-CCV1)					Prepared & Analyzed: 02/13/25					

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 02/05/25

Date Reported: 02/24/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0128 - No Prep - WetChem (Continued)										
Calibration Check (BCB0128-CCV1)					Prepared & Analyzed: 02/13/25					
Ammonia	1.01		0.020	mg/L	1.000		101%	85-115%		
Calibration Check (BCB0128-CCV2)					Prepared & Analyzed: 02/13/25					
Ammonia	1.00		0.020	mg/L	1.000		100%	85-115%		
Calibration Check (BCB0128-CCV3)					Prepared & Analyzed: 02/13/25					
Ammonia	1.03		0.020	mg/L	1.000		103%	85-115%		
Calibration Check (BCB0128-CCV4)					Prepared & Analyzed: 02/13/25					
Ammonia	1.04		0.020	mg/L	1.000		104%	85-115%		
Calibration Check (BCB0128-CCV5)					Prepared & Analyzed: 02/13/25					
Ammonia	1.03		0.020	mg/L	1.000		103%	85-115%		
Calibration Check (BCB0128-CCV6)					Prepared & Analyzed: 02/13/25					
Ammonia	1.02		0.020	mg/L	1.000		102%	85-115%		
Calibration Check (BCB0128-CCV7)					Prepared & Analyzed: 02/13/25					
Ammonia	1.05		0.020	mg/L	1.000		105%	85-115%		
Calibration Check (BCB0128-CCV8)					Prepared & Analyzed: 02/13/25					
Ammonia	1.02		0.020	mg/L	1.000		102%	85-115%		
Duplicate (BCB0128-DUP1)					Prepared & Analyzed: 02/13/25					
Ammonia	23.4	D	0.400	mg/L		23.3			0.7	20
Duplicate (BCB0128-DUP2)					Prepared & Analyzed: 02/13/25					
Ammonia	0.034		0.020	mg/L		0.036			7	20
Duplicate (BCB0128-DUP3)					Prepared & Analyzed: 02/13/25					
Ammonia	0.066		0.020	mg/L		0.066			1	20
Duplicate (BCB0128-DUP4)					Prepared & Analyzed: 02/13/25					
Ammonia	0.064		0.020	mg/L		0.067			5	20
Duplicate (BCB0128-DUP5)					Prepared & Analyzed: 02/13/25					



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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0128 - No Prep - WetChem (Continued)										
Duplicate (BCB0128-DUP5) Source: A25B0113-07 Prepared & Analyzed: 02/13/25										
Ammonia	0.024		0.020	mg/L		0.027			13	20
Duplicate (BCB0128-DUP6) Source: A25B0122-01 Prepared & Analyzed: 02/13/25										
Ammonia	26.3	D	0.400	mg/L		27.2			4	20
Duplicate (BCB0128-DUP7) Source: A25B0146-02 Prepared & Analyzed: 02/13/25										
Ammonia	13.3	D	0.400	mg/L		14.8			10	20
Duplicate (BCB0128-DUP8) Source: A25B0156-01 Prepared & Analyzed: 02/13/25										
Ammonia	60.4	D	0.800	mg/L		60.1			0.6	20
Matrix Spike (BCB0128-MS1) Source: A25B0047-02 Prepared & Analyzed: 02/13/25										
Ammonia	44.7	D	0.400	mg/L	20.00	23.3	107%	80-120%		
Matrix Spike (BCB0128-MS2) Source: A25B0069-23 Prepared & Analyzed: 02/13/25										
Ammonia	1.06		0.020	mg/L	1.000	0.036	102%	80-120%		
Matrix Spike (BCB0128-MS3) Source: A25B0081-01 Prepared & Analyzed: 02/13/25										
Ammonia	1.11		0.020	mg/L	1.000	0.066	105%	80-120%		
Matrix Spike (BCB0128-MS4) Source: A25B0093-06 Prepared & Analyzed: 02/13/25										
Ammonia	1.09		0.020	mg/L	1.000	0.067	102%	80-120%		
Matrix Spike (BCB0128-MS5) Source: A25B0113-07 Prepared & Analyzed: 02/13/25										
Ammonia	1.07		0.020	mg/L	1.000	0.027	104%	80-120%		
Matrix Spike (BCB0128-MS6) Source: A25B0122-01 Prepared & Analyzed: 02/13/25										
Ammonia	48.8	D	0.400	mg/L	20.00	27.2	108%	80-120%		
Matrix Spike (BCB0128-MS7) Source: A25B0146-02 Prepared & Analyzed: 02/13/25										
Ammonia	36.0	D	0.400	mg/L	20.00	14.8	106%	80-120%		
Matrix Spike (BCB0128-MS8) Source: A25B0156-01 Prepared & Analyzed: 02/13/25										
Ammonia	104	D	0.800	mg/L	40.00	60.1	109%	80-120%		

Batch: BCB0144 - No Prep - WetChem

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Thurston County Environmental Health

412 LILLY RD NE
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Attention: JOHN HABERLIN
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Project #: 40644

Date Received: 02/05/25

Date Reported: 02/24/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0144 - No Prep - WetChem (Continued)										
Blank (BCB0144-BLK1)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BCB0144-BLK2)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BCB0144-BLK3)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BCB0144-BLK4)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
LCS (BCB0144-BS1)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	0.498		0.020	mg/L	0.5000		100%	90-110%		
LCS (BCB0144-BS2)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	0.517		0.020	mg/L	0.5000		103%	90-110%		
LCS (BCB0144-BS3)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	0.507		0.020	mg/L	0.5000		101%	90-110%		
LCS (BCB0144-BS4)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	0.502		0.020	mg/L	0.5000		100%	90-110%		
Calibration Blank (BCB0144-CCB1)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	0.005			mg/L						
Calibration Blank (BCB0144-CCB2)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	0.006			mg/L						
Calibration Blank (BCB0144-CCB3)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	0.005			mg/L						
Calibration Blank (BCB0144-CCB4)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	0.005			mg/L						
Calibration Blank (BCB0144-CCB5)					Prepared: 02/13/25 Analyzed: 02/18/25					



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Thurston County Environmental Health

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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0144 - No Prep - WetChem (Continued)										
Calibration Blank (BCB0144-CCB5)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	0.005			mg/L						
Calibration Blank (BCB0144-CCB6)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	0.006			mg/L						
Calibration Blank (BCB0144-CCB7)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	0.005			mg/L						
Calibration Blank (BCB0144-CCB8)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	0.006			mg/L						
Calibration Check (BCB0144-CCV1)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	1.04		0.020	mg/L	1.000		104%	85-115%		
Calibration Check (BCB0144-CCV2)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	1.04		0.020	mg/L	1.000		104%	85-115%		
Calibration Check (BCB0144-CCV3)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	1.03		0.020	mg/L	1.000		103%	85-115%		
Calibration Check (BCB0144-CCV4)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	0.997		0.020	mg/L	1.000		100%	85-115%		
Calibration Check (BCB0144-CCV5)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	1.04		0.020	mg/L	1.000		104%	85-115%		
Calibration Check (BCB0144-CCV6)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	0.991		0.020	mg/L	1.000		99%	85-115%		
Calibration Check (BCB0144-CCV7)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	0.999		0.020	mg/L	1.000		100%	85-115%		
Calibration Check (BCB0144-CCV8)					Prepared: 02/13/25 Analyzed: 02/18/25					
Total Nitrate + Nitrite	0.983		0.020	mg/L	1.000		98%	85-115%		
Duplicate (BCB0144-DUP1)					Source: A25B0069-30 Prepared: 02/13/25 Analyzed: 02/18/25					

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Thurston County Environmental Health

412 LILLY RD NE
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Attention: JOHN HABERLIN
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Date Received: 02/05/25

Date Reported: 02/24/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0144 - No Prep - WetChem (Continued)										
Duplicate (BCB0144-DUP1)			Source: A25B0069-30	Prepared: 02/13/25 Analyzed: 02/18/25						
Total Nitrate + Nitrite	0.132		0.020	mg/L		0.132			0.07	20
Duplicate (BCB0144-DUP2)			Source: A25B0071-01	Prepared: 02/13/25 Analyzed: 02/18/25						
Total Nitrate + Nitrite	0.140		0.020	mg/L		0.141			1	20
Duplicate (BCB0144-DUP3)			Source: A25B0093-01	Prepared: 02/13/25 Analyzed: 02/18/25						
Total Nitrate + Nitrite	1.97		0.020	mg/L		1.96			0.4	20
Duplicate (BCB0144-DUP4)			Source: A25B0113-02	Prepared: 02/13/25 Analyzed: 02/18/25						
Total Nitrate + Nitrite	0.543		0.020	mg/L		0.561			3	20
Duplicate (BCB0144-DUP5)			Source: A25B0114-04	Prepared: 02/13/25 Analyzed: 02/18/25						
Total Nitrate + Nitrite	0.644		0.020	mg/L		0.640			0.7	20
Duplicate (BCB0144-DUP6)			Source: A25B0142-03	Prepared: 02/13/25 Analyzed: 02/18/25						
Total Nitrate + Nitrite	0.284		0.020	mg/L		0.284			0.2	20
Duplicate (BCB0144-DUP7)			Source: A25B0165-04	Prepared: 02/13/25 Analyzed: 02/18/25						
Total Nitrate + Nitrite	6.82	D	0.200	mg/L		6.76			0.9	20
Duplicate (BCB0144-DUP8)			Source: A25B0176-01	Prepared: 02/13/25 Analyzed: 02/18/25						
Total Nitrate + Nitrite	0.961		0.020	mg/L		0.948			1	20
Matrix Spike (BCB0144-MS1)			Source: A25B0069-30	Prepared: 02/13/25 Analyzed: 02/18/25						
Total Nitrate + Nitrite	1.12		0.020	mg/L	1.000	0.132	98%	85-115%		
Matrix Spike (BCB0144-MS2)			Source: A25B0071-01	Prepared: 02/13/25 Analyzed: 02/18/25						
Total Nitrate + Nitrite	1.12		0.020	mg/L	1.000	0.141	98%	85-115%		
Matrix Spike (BCB0144-MS3)			Source: A25B0093-01	Prepared: 02/13/25 Analyzed: 02/18/25						
Total Nitrate + Nitrite	2.92		0.020	mg/L	1.000	1.96	96%	85-115%		
Matrix Spike (BCB0144-MS4)			Source: A25B0113-02	Prepared: 02/13/25 Analyzed: 02/18/25						
Total Nitrate + Nitrite	1.52		0.020	mg/L	1.000	0.561	96%	85-115%		
Matrix Spike (BCB0144-MS5)			Source: A25B0114-04	Prepared: 02/13/25 Analyzed: 02/18/25						

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCB0144 - No Prep - WetChem (Continued)

Matrix Spike (BCB0144-MS5)

Source: A25B0114-04

Prepared: 02/13/25 Analyzed: 02/18/25

Total Nitrate + Nitrite	1.62		0.020	mg/L	1.000	0.640	98%	85-115%

Matrix Spike (BCB0144-MS6)

Source: A25B0142-03

Prepared: 02/13/25 Analyzed: 02/18/25

Total Nitrate + Nitrite	1.25		0.020	mg/L	1.000	0.284	97%	85-115%

Matrix Spike (BCB0144-MS7)

Source: A25B0165-04

Prepared: 02/13/25 Analyzed: 02/18/25

Total Nitrate + Nitrite	16.4	D	0.200	mg/L	10.00	6.76	97%	85-115%

Matrix Spike (BCB0144-MS8)

Source: A25B0176-01

Prepared: 02/13/25 Analyzed: 02/18/25

Total Nitrate + Nitrite	1.95		0.020	mg/L	1.000	0.948	100%	85-115%

Batch: BCB0146 - No Prep - WetChem

Blank (BCB0146-BLK1)

Prepared: 02/18/25 Analyzed: 02/19/25

Total Kjeldahl Nitrogen	ND	U	0.25	mg/L				

Blank (BCB0146-BLK2)

Prepared: 02/18/25 Analyzed: 02/19/25

Total Kjeldahl Nitrogen	ND	U	0.25	mg/L				

Blank (BCB0146-BLK3)

Prepared: 02/18/25 Analyzed: 02/19/25

Total Kjeldahl Nitrogen	ND	U	0.25	mg/L				

LCS (BCB0146-BS1)

Prepared: 02/18/25 Analyzed: 02/19/25

Total Kjeldahl Nitrogen	0.50		0.25	mg/L	0.5000		99%	85-115%

LCS (BCB0146-BS2)

Prepared: 02/18/25 Analyzed: 02/19/25

Total Kjeldahl Nitrogen	0.51		0.25	mg/L	0.5000		101%	85-115%

LCS (BCB0146-BS3)

Prepared: 02/18/25 Analyzed: 02/19/25

Total Kjeldahl Nitrogen	0.51		0.25	mg/L	0.5000		102%	85-115%

Calibration Blank (BCB0146-CCB1)

Prepared: 02/18/25 Analyzed: 02/19/25

Total Kjeldahl Nitrogen	ND	U		mg/L				

Calibration Blank (BCB0146-CCB2)

Prepared: 02/18/25 Analyzed: 02/19/25

Total Kjeldahl Nitrogen	ND	U		mg/L				

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Thurston County Environmental Health

412 LILLY RD NE
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Attention: JOHN HABERLIN
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Date Received: 02/05/25

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0146 - No Prep - WetChem (Continued)										
Calibration Blank (BCB0146-CCB3)					Prepared: 02/18/25 Analyzed: 02/19/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Blank (BCB0146-CCB4)					Prepared: 02/18/25 Analyzed: 02/19/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Blank (BCB0146-CCB5)					Prepared: 02/18/25 Analyzed: 02/19/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Check (BCB0146-CCV1)					Prepared: 02/18/25 Analyzed: 02/19/25					
Total Kjeldahl Nitrogen	0.98		0.25	mg/L	1.000		98%	85-115%		
Calibration Check (BCB0146-CCV2)					Prepared: 02/18/25 Analyzed: 02/19/25					
Total Kjeldahl Nitrogen	1.00		0.25	mg/L	1.000		100%	85-115%		
Calibration Check (BCB0146-CCV3)					Prepared: 02/18/25 Analyzed: 02/19/25					
Total Kjeldahl Nitrogen	1.00		0.25	mg/L	1.000		100%	85-115%		
Calibration Check (BCB0146-CCV4)					Prepared: 02/18/25 Analyzed: 02/19/25					
Total Kjeldahl Nitrogen	0.99		0.25	mg/L	1.000		99%	85-115%		
Calibration Check (BCB0146-CCV5)					Prepared: 02/18/25 Analyzed: 02/19/25					
Total Kjeldahl Nitrogen	1.03		0.25	mg/L	1.000		103%	85-115%		
Duplicate (BCB0146-DUP1)					Source: A25B0071-04 Prepared: 02/18/25 Analyzed: 02/19/25					
Total Kjeldahl Nitrogen	0.41		0.25	mg/L		0.41			0.4	25
Duplicate (BCB0146-DUP2)					Source: A25B0086-03 Prepared: 02/18/25 Analyzed: 02/19/25					
Total Kjeldahl Nitrogen	1.67		0.25	mg/L		1.68			0.9	25
Duplicate (BCB0146-DUP3)					Source: A25B0115-02 Prepared: 02/18/25 Analyzed: 02/19/25					
Total Kjeldahl Nitrogen	46.3		12.5	mg/L		46.3			0.07	25
Duplicate (BCB0146-DUP4)					Source: A25B0146-01 Prepared: 02/18/25 Analyzed: 02/19/25					
Total Kjeldahl Nitrogen	45.3		12.5	mg/L		47.1			4	25
Duplicate (BCB0146-DUP5)					Source: A25B0165-04 Prepared: 02/18/25 Analyzed: 02/19/25					

Am Test Inc.
13600 NE 126th Place Suite C
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ANALYSIS REPORT

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Thurston County Environmental Health
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OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0146 - No Prep - WetChem (Continued)										
Duplicate (BCB0146-DUP5)		Source: A25B0165-04		Prepared: 02/18/25 Analyzed: 02/19/25						
Total Kjeldahl Nitrogen	2.05		0.25	mg/L		2.03			1	25
Matrix Spike (BCB0146-MS1)		Source: A25B0071-04		Prepared: 02/18/25 Analyzed: 02/19/25						
Total Kjeldahl Nitrogen	2.38		0.25	mg/L	2.000	0.41	98%	80-120%		
Matrix Spike (BCB0146-MS2)		Source: A25B0086-03		Prepared: 02/18/25 Analyzed: 02/19/25						
Total Kjeldahl Nitrogen	3.52		0.25	mg/L	2.000	1.68	92%	80-120%		
Matrix Spike (BCB0146-MS3)		Source: A25B0115-02		Prepared: 02/18/25 Analyzed: 02/19/25						
Total Kjeldahl Nitrogen	94.9		12.5	mg/L	50.00	46.3	97%	80-120%		
Matrix Spike (BCB0146-MS4)		Source: A25B0146-01		Prepared: 02/18/25 Analyzed: 02/19/25						
Total Kjeldahl Nitrogen	95.1		12.5	mg/L	50.00	47.1	96%	80-120%		
Matrix Spike (BCB0146-MS5)		Source: A25B0165-04		Prepared: 02/18/25 Analyzed: 02/19/25						
Total Kjeldahl Nitrogen	4.13		0.25	mg/L	2.000	2.03	105%	80-120%		

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Kirkland, WA
(425) 885-1664
www.amtestlab.com



**Professional
Analytical
Services**

ANALYSIS REPORT

Date Received: 02/05/25
Date Reported: 02/24/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Notes and Definitions

Item	Definition
Dry	Sample results reported on a dry weight basis.
ND	Analyte NOT DETECTED at or above the reporting limit.
RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was matrix spiked or duplicated.

AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

Ph (425) 885-1664 Fx (425) 820-0245

www.amtestlab.com

A25B0069

Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506				Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506													
Contact Person: John Haberlin				Invoice Contact: John Haberlin													
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young													
Fax No:				Invoice Ph/Fax:													
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us													
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:													
Special Instructions: Please report to detection limit for all results.																	
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)				Temperature upon Receipt: 0.2 °C													
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested											
Project Number: 40644						Total Phosphate	NOx										
AmTest ID	Client ID (35 characters max)																
01	Eaton	1/28/2025	9:55	H2O	1	X	X										
02	Thompson	1/28/2025	10:22	H2O	1	X	X										
03	McAllister @ I-5	1/28/2025	11:05	H2O	1	X	X										
04	Dobbs @ Cross Creek	1/28/2025	11:30	H2O	1	X	X										
05	Woodland @ Draham	1/28/2025	12:40	H2O	1	X	X										
06	Woodland @ PG	1/28/2025	13:00	H2O	1	X	X										
07	Flemming @ JP	1/28/2025	13:20	H2O	1	X	X										
08	Flemming @ JP - QA	1/28/2025	13:20	H2O	1	X	X										X
09	Woodward @ Libby	1/28/2025	14:10	H2O	1	X	X										
10	Woodward @ Libby - QA	1/28/2025	14:10	H2O	1	X	X										X
11	Moxlie @ Union	1/28/2025	14:55	H2O	1	X	X										
Collected/Relinquished By: Josh Eckerle		Date 2/4/2025	Time 1500	Received By: 				Date 2/5/25				Time 10:18					
Relinquished By:		Date	Time	Received By:				Date				Time					
Relinquished By:		Date	Time	Received By:				Date				Time					

COMMENTS:

fedex

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E-mail: john.haberlin@co.thurston.wa.us					Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us										
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online					Data posted to online account: YES / NO Web Login ID:										
Special Instructions: Please report to detection limit for all results.															
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)										Temperature upon Receipt:					
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested									
Project Number: 40644						Total Phosphate	NOx	NH3	TKN						QA/QC
AmTest ID	Client ID (35 characters max)														
12	Schneider T	1/13/2025	11:25	H2O	1	X	X								
13	Schneider T - QA	1/13/2025	11:25	H2O	1	X	X								X
14	Kennedy	1/13/2025	11:55	H2O	1	X	X								
15	Kennedy - QA	1/13/2025	11:55	H2O	1	X	X								X
16	Schneider Head	1/13/2025	13:05	H2O	1	X	X								
17	McLane	1/13/2025	13:30	H2O	1	X	X								
18	Black Lake Ditch	1/13/2025	14:15	H2O	1	X	X								
19	SMT 002	1/27/2025	9:15	H2O	1	X	X	X	X						
20	SMT 008	1/27/2025	9:35	H2O	1	X	X	X	X						
21	SMT 009	1/27/2025	9:45	H2O	1	X	X	X	X						
Collected/Relinquished By: Josh Eckerle		Date 2/4/2025	Time 1500	Received By:						Date	Time				
Relinquished By:		Date	Time	Received By:						Date	Time				
Relinquished By:		Date	Time	Received By:						Date	Time				

COMMENTS:

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Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online					Data posted to online account: YES / NO Web Login ID:									
Special Instructions: Please report to detection limit for all results.														
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)					Temperature upon Receipt:									
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested								
Project Number: 40644						Total Phosphate	NOx	NH3	TKN	Total Nitrogen				
AmTest ID	Client ID (35 characters max)													
22	SMT 021	1/27/2025	10:05	H2O	1	X	X	X	X					
23	SMT 028	1/27/2025	10:30	H2O	1	X	X	X	X					
24	SMT 028 - QA	1/27/2025	10:30	H2O	1	X	X	X	X					X
25	SMT 027	1/27/2025	10:55	H2O	1	X	X	X	X					
26	Lawrence 1 Surface	1/16/2025	9:50	H2O	1	X				X				
27	Lawrence 1 Surface - QA	1/16/2025	9:50	H2O	1	X				X				X
28	Lawrence 1 Bottom	1/16/2025	10:05	H2O	1	X				X				
29	Lawrence 1 Bottom QA	1/16/2025	10:05	H2O	1	X				X				X
30	Lawrence 2 Surface	1/16/2025	10:20	H2O	1	X				X				
31	Lawrence 2 Bottom	1/16/2025	10:25	H2O	1	X				X				
Collected/Relinquished By: Josh Eckerle		Date 2/4/2025	Time 1500	Received By:				Date		Time				
Relinquished By:		Date	Time	Received By:				Date		Time				
Relinquished By:		Date	Time	Received By:				Date		Time				

COMMENTS:

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Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online	Data posted to online account: YES / NO Web Login ID:

Special Instructions:

Please report to **detection** limit for all results.

Requested TAT: (Rush must be pre-approved by lab)

Standard RUSH (5 Day / 3 Day / 48 HR / 24 HR)

Temperature upon Receipt:

Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested										
Project Number: 40644						Total Phosphate	Total Nitrogen									
AmTest ID	Client ID (35 characters max)															
32	Pattison N- Surface	1/16/2025	11:40	H2O	1	X	X									
33	Pattison N – Bottom	1/16/2025	11:45	H2O	1	X	X									
34	Pattison S – Surface	1/16/2025	12:05	H2O	1	X	X									
35	Pattison S – Bottom	1/16/2025	12:10	H2O	1	X	X									
36	Summit – Surface	1/16/2025	10:00	H2O	1	X	X									
37	Summit – Surface - QA	1/16/2025	10:00	H2O	1	X	X							X		
38	Summit – Bottom	1/16/2025	10:10	H2O	1	X	X									
39	Summit – Bottom - QA	1/16/2025	10:10	H2O	1	X	X							X		

Collected/Relinquished By: Josh Eckerle	Date 2/4/2025	Time 1500	Received By:	Date	Time
Relinquished By:	Date	Time	Received By:	Date	Time
Relinquished By:	Date	Time	Received By:	Date	Time

COMMENTS:



ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
T : +1 360 577 7222
F : +1 360 636 1068
www.alsglobal.com

March 14, 2025

Analytical Report for Service Request No: K2502039

John Haberlin
Thurston County Health Department
3000 Pacific Ave. SE
Room 225
Olympia, WA 98501

RE: Lakes / 4520D260 40667

Dear John,

Enclosed are the results of the sample(s) submitted to our laboratory February 27, 2025
For your reference, these analyses have been assigned our service request number **K2502039**.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3363. You may also contact me via email at karen.melerine@ALSGlobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Karen Melerine
Project Manager



ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
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Acronyms

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General Chemistry

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 General Chemistry

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated value.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.
- H The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

- # The control limit criteria is not applicable.
- J The result is an estimated value.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- + The correlation coefficient for the MSA is less than 0.995.
- Q See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- A A tentatively identified compound, a suspected aldol-condensation product.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
- D The reported result is from a dilution.
- E The result is an estimated value.
- J The result is an estimated value.
- N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
- P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
- L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
- H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
- O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
- Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
- Z The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjllabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdwlabservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/analyte is offered by that state.



Case Narrative

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Client: Thurston County Health Department
Project: Lakes
Sample Matrix: Water

Service Request: K2502039
Date Received: 02/27/2025

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples for the Tier level IV requested by the client.

Sample Receipt:

Six water samples were received for analysis at ALS Environmental on 02/27/2025. Any discrepancies upon initial sample inspection are annotated on the sample receipt and preservation form included within this report. The samples were stored at minimum in accordance with the analytical method requirements.

General Chemistry:

No significant anomalies were noted with this analysis.

Approved by Karen Melerine

Date 03/14/2025



Chain of Custody

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Chain of Custody

ADDRESS 1317 South 13th Ave., Kelso, WA 98626

PHONE 1 360 577 7222 FAX 1 360 636 1068

Work Order No.:

Part of the ALS Group A Campbell Brothers Limited Company

K2502039

[illegible]

PM Kalen

Cooler Receipt and Preservation Form

Client Thurston County Service Request K25 02039
Received: 2/27/25 Opened: 2/27/25 By: VM Unloaded: 2/27/25 By: VM

1. Samples were received via? ☐ USPS ☒ Fed Ex ☐ UPS ☐ DHL ☐ PDX ☐ Courier ☐ Hand Delivered
2. Samples were received in: (circle) ☒ Cooler ☐ Box ☐ Envelope ☐ Other ☐ NA
3. Were custody seals on coolers? ☐ NA ☒ Y ☐ N If yes, how many and where? 1 Front
- If present, were custody seals intact? ☒ Y ☐ N If present, were they signed and dated? ☒ Y ☐ N

Temp Blank	Sample Temp	IR Gun	Cooler WCOG ID / NA	Out of Temp Indicate with X	PM Notified If out of temp	Tracking Number NA	Filed
	<u>5.8</u>	<u>7602</u>				<u>772346291400</u>	

4. Was a Temperature Blank present in cooler?
- ☐
- NA
- ☒
- Y
- ☐
- N If yes, note the temperature in the appropriate column above:

If no, take the temperature of a representative sample bottle contained within the cooler; note in the column "Sample Temp":

5. Were samples received within the method specified temperature ranges?
- ☐
- NA
- ☒
- Y
- ☐
- N
-
- If no, were they received on ice and same day as collected? If not, note the cooler # above and notify the PM.
- ☐
- NA
- ☒
- Y
- ☐
- N
-
- If applicable, tissue samples were received:
- Frozen
- Partially Thawed
- Thawed

5. Packing material:
- Inserts
- Baggies
- Bubble Wrap
- Gel Packs
- Wet Ice
- Dry Ice
- Sleeves

7. Were custody papers properly filled out (ink, signed, etc.)?
- ☐
- NA
- ☒
- Y
- ☐
- N

8. Were samples received in good condition (unbroken)
- ☐
- NA
- ☒
- Y
- ☐
- N

9. Were all sample labels complete (ie, analysis, preservation, etc.)?
- ☐
- NA
- ☒
- Y
- ☐
- N

10. Did all sample labels and tags agree with custody papers?
- ☐
- NA
- ☒
- Y
- ☐
- N

1. Were appropriate bottles/containers and volumes received for the tests indicated?
- ☐
- NA
- ☒
- Y
- ☐
- N

2. Were the pH-preserved bottles (see SMO GEN SOP) received at the appropriate pH? Indicate in the table below
- ☐
- NA
- ☒
- Y
- ☐
- N

3. Were VOA vials received without headspace? Indicate in the table below
- ☐
- NA
- ☒
- Y
- ☐
- N

4. Was C12/Res negative?
- ☐
- NA
- ☒
- Y
- ☐
- N

5. Were samples received within the method specified time limit? If not, note the error below and notify the PM
- ☐
- NA
- ☒
- Y
- ☐
- N

6. Were 100ml sterile microbiology bottles filled exactly to the 100ml mark?
- ☐
- NA
- ☒
- Y
- ☐
- N Underfilled Overfilled

Sample ID on Bottle	Sample ID on COG	Identified by:

Sample ID	Bottle Count	Bottle Type	Head-space	Broken	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, Resolutions:



General Chemistry

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Thurston County Health Department
Project: Lakes/4520D260 40667
Sample Matrix: Water
Analysis Method: SM 10200 H
Prep Method: Method

Service Request: K2502039
Date Collected: 02/26/25
Date Received: 02/27/25
Units: mg/m3
Basis: NA

Chlorophyll A

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Lawrence 1	K2502039-001	21.9	1.5	0.6	1	03/05/25 13:42	3/5/25	
Lawrence 1 QA	K2502039-002	10.3	1.5	0.6	1	03/05/25 13:42	3/5/25	
Lawrence 2	K2502039-003	5.8	1.5	0.6	1	03/05/25 13:42	3/5/25	
Lawrence 2 QA	K2502039-004	21.4	1.6	0.6	1	03/05/25 13:42	3/5/25	
Pattison N	K2502039-005	1.6 J	1.6	0.6	1	03/05/25 13:42	3/5/25	
Pattison S	K2502039-006	3.9	1.5	0.6	1	03/05/25 13:42	3/5/25	
Method Blank	K2502039-MB1	ND U	0.80	0.30	1	03/05/25 13:42	3/5/25	
Method Blank	K2502039-MB2	ND U	0.80	0.30	1	03/05/25 13:42	3/5/25	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Thurston County Health Department
Project: Lakes/4520D260 40667
Sample Matrix: Water

Service Request: K2502039
Date Analyzed: 03/05/25
Date Extracted: 03/05/25

Duplicate Lab Control Sample Summary
General Chemistry Parameters

Analysis Method: SM 10200 H
Prep Method: Method

Units: mg/m3
Basis: NA
Analysis Lot: 872433

Lab Control Sample
K2502039-LCS

Duplicate Lab Control Sample
K2502039-DLCS

Analyte Name	Result	Spike Amount	% Rec	Result	Spike Amount	% Rec	% Rec Limits	RPD	RPD Limit
Chlorophyll A	5.50	5.23	105	5.45	5.23	104	88-113	<1	20

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Thurston County Health Department
Project: Lakes/4520D260 40667
Sample Matrix: Water
Analysis Method: SM 10200 H
Prep Method: Method

Service Request: K2502039
Date Collected: 02/26/25
Date Received: 02/27/25
Units: mg/m3
Basis: NA

Pheophytin A

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Lawrence 1	K2502039-001	69.8	1.5	-	1	03/05/25 13:42	3/5/25	
Lawrence 1 QA	K2502039-002	24.0	1.5	-	1	03/05/25 13:42	3/5/25	
Lawrence 2	K2502039-003	13.6	1.5	-	1	03/05/25 13:42	3/5/25	
Lawrence 2 QA	K2502039-004	41.5	1.6	-	1	03/05/25 13:42	3/5/25	
Pattison N	K2502039-005	2.6	1.6	-	1	03/05/25 13:42	3/5/25	
Pattison S	K2502039-006	9.0	1.5	-	1	03/05/25 13:42	3/5/25	
Method Blank	K2502039-MB1	ND U	0.80	-	1	03/05/25 13:42	3/5/25	
Method Blank	K2502039-MB2	ND U	0.80	-	1	03/05/25 13:42	3/5/25	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Thurston County Health Department
Project: Lakes/4520D260 40667
Sample Matrix: Water

Service Request: K2502039
Date Analyzed: 03/05/25
Date Extracted: 03/05/25

Duplicate Lab Control Sample Summary
General Chemistry Parameters

Analysis Method: SM 10200 H
Prep Method: Method

Units: mg/m3
Basis: NA
Analysis Lot: 872433

Lab Control Sample
K2502039-LCS

Duplicate Lab Control Sample
K2502039-DLCS

Analyte Name	Result	Spike Amount	% Rec	Result	Spike Amount	% Rec	% Rec Limits	RPD	RPD Limit
Pheophytin A	550	523	105	545	523	104	88-113	<1	20



Raw Data

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com



General Chemistry

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Work Request # K2562039

Date Analyzed: 3/5/25

Analyst: JS

Run # 872433

Analysis: Chlorophyll A

DATA QUALITY REPORT INORGANICS

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

1.	Is the method name and number correct and appropriate?	<u>yes</u> /no/NA
2.	Holding times met for all analyses and for all samples?	<u>yes</u> /no/NA
3.	Are calculations correct?	<u>yes</u> /no/NA
4.	Is the reporting basis correct? (Dry Weight)	yes/ <u>no</u> /NA
5.	All quality control criteria met?	<u>yes</u> /no
6.	Is the calibration curve correlation coefficient ≥ 0.995 ?	<u>yes</u> /no/NA
7.	MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency?	<u>yes</u> /no/NA
8.	Are ICVs, CCVs, and CCBs all within acceptance limits?	<u>yes</u> /no/NA
9.	Are results for methods blanks all ND?	<u>yes</u> /no/NA
10.	Are all QC samples within acceptance criteria? (LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.)	<u>yes</u> /no/NA
11.	Are all exceptions explained?	yes/ <u>no</u> /NA
12.	Have all applicable service requests been reviewed?	<u>yes</u> /no/NA
13.	Are all samples labeled correctly?	<u>yes</u> /no/NA
14.	Have all instructions on the service request been followed? (e.g. Special MRLs, QC on a specific sample, Form V)	<u>yes</u> /no/NA
15.	Are detection limits and units reported correctly?	<u>yes</u> /no/NA
16.	Is the unused space on the bench sheet crossed out?	<u>yes</u> /no/NA
17.	☒ Was analysis turned in by the data due date? (If not record SR#)	yes/ <u>no</u> /NA

COMMENTS:

OK 3/1/25

Secondary Approved by: MRL Date: 03/13/25

DQREPORT

Analytical Results Summary

Instrument Name: K-UV-VIS-05

Analyst: JSANCHEZ

Analysis Lot: 872433 Method/Testcode: SM 10200 H/Chlorophylla UF

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
K2502039-001	Chlorophyll A	N/A		Water	1148.10 mg/m ³	050.0000 mL	21.9 mg/m ³	1	0.6	1.5			3/5/25 13:42:01	N	IV
K2502039-001	Pheophytin A	N/A		Water	69.84 mg/m ³	050.0000 mL	69.8 mg/m ³	1		1.5			3/5/25 13:42:01	N	IV
K2502039-002	Chlorophyll A	N/A		Water	544.68 mg/m ³	053.0000 mL	10.3 mg/m ³	1	0.6	1.5			3/5/25 13:42:01	N	IV
K2502039-002	Pheophytin A	N/A		Water	23.95 mg/m ³	053.0000 mL	24.0 mg/m ³	1		1.5			3/5/25 13:42:01	N	IV
K2502039-003	Chlorophyll A	N/A		Water	299.04 mg/m ³	040.0000 mL	5.8 mg/m ³	1	0.6	1.5			3/5/25 13:42:01	N	IV
K2502039-003	Pheophytin A	N/A		Water	13.59 mg/m ³	040.0000 mL	13.6 mg/m ³	1		1.5			3/5/25 13:42:01	N	IV
K2502039-004	Chlorophyll A	N/A		Water	1100.04 mg/m ³	029.0000 mL	21.4 mg/m ³	1	0.6	1.6			3/5/25 13:42:01	N	IV
K2502039-004	Pheophytin A	N/A		Water	41.46 mg/m ³	029.0000 mL	41.5 mg/m ³	1		1.6			3/5/25 13:42:01	N	IV
K2502039-005	Chlorophyll A	N/A		Water	80.10 mg/m ³	009.0000 mL	1.6 mg/m ³	J 1	0.6	1.6			3/5/25 13:42:01	N	IV
K2502039-005	Pheophytin A	N/A		Water	2.64 mg/m ³	009.0000 mL	2.6 mg/m ³	1		1.6			3/5/25 13:42:01	N	IV
K2502039-006	Chlorophyll A	N/A		Water	202.92 mg/m ³	052.0000 mL	3.9 mg/m ³	1	0.6	1.5			3/5/25 13:42:01	N	IV
K2502039-006	Pheophytin A	N/A		Water	9.00 mg/m ³	052.0000 mL	9.0 mg/m ³	1		1.5			3/5/25 13:42:01	N	IV
KQ2503971-01	Pheophytin A	MB		Water	-0.48 mg/m ³	2000 mL	0.80 mg/m ³	U 1		0.80			3/5/25 13:42:01	N	IV
KQ2503971-02	Pheophytin A	MB		Water	-0.34 mg/m ³	2000 mL	0.80 mg/m ³	U 1		0.80			3/5/25 13:42:01	N	IV
KQ2503971-03	Pheophytin A	LCS		Water	550.02 mg/m ³	2000 mL	550 mg/m ³	1		0.80	105		3/5/25 13:42:01	N	IV
KQ2503971-04	Pheophytin A	DLCS		Water	544.68 mg/m ³	2000 mL	545 mg/m ³	1		0.80	104	<1	3/5/25 13:42:01	N	IV
KQ2503973-01	Chlorophyll A	MB		Water	10.68 mg/m ³	2000 mL	0.80 mg/m ³	U 1	0.30	0.80			3/5/25 13:42:01	N	IV
KQ2503973-02	Chlorophyll A	MB		Water	0.00 mg/m ³	2000 mL	0.80 mg/m ³	U 1	0.30	0.80			3/5/25 13:42:01	N	IV
KQ2503973-03	Chlorophyll A	LCS		Water	550.02 mg/m ³	2000 mL	5.50 mg/m ³	1	0.30	0.80	105		3/5/25 13:42:01	N	IV
KQ2503973-04	Chlorophyll A	DLCS		Water	544.68 mg/m ³	2000 mL	5.45 mg/m ³	1	0.30	0.80	104	<1	3/5/25 13:42:01	N	IV

indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

Printed 3/12/25 10:32

JS 3/12/25

Results Summary

Page 19 of 25

Page 1 of 1

Service Request #: K2502039

Method: SM 10200 H (spectrophotometric)

Inst. Tape

Analysis For: Chlorophyll-a

Sample Number	Sample Volume			Acidified		Ext. Vol. mls	In solution mg/m ³ Chl-a	Reported mg/m ³ Chl-a	Reported mg/m ³ Pheo-a
		664 nm	750 nm	665 nm	750 nm				
LCS	-	0.2090	-0.0010	0.1080	0.0010	-	550.02	550	
DLCS	-	0.2180	0.0060	0.1170	0.0070	-	544.68	545	
MB 1	2000	0.0010	0.0090	0.0000	0.0100	20	10.68	0.11	-0.48
MB 2	2000	0.0000	0.0090	0.0000	0.0090	20	0.00	0.00	-0.34
K2502039-1	1050	1.5220	0.0190	1.3060	0.0180	20	1148.10	21.87	69.84
K2502039-2	1053	0.6020	0.0170	0.4970	0.0140	20	544.68	10.35	23.95
K2502039-3	1040	0.3340	0.0090	0.2800	0.0110	20	299.04	5.75	13.59
K2502039-4	1029	1.0840	0.0130	0.8770	0.0120	20	1100.04	21.38	41.46
K2502039-5	1009	0.0810	0.0090	0.0670	0.0100	20	80.10	1.59	2.64
K2502039-6	1052	0.2300	0.0110	0.1920	0.0110	20	202.92	3.86	9.00
						20	0.000	#DIV/0!	#DIV/0!
						20	0.000	#DIV/0!	#DIV/0!
						20	0.000	#DIV/0!	#DIV/0!
						20	0.000	#DIV/0!	#DIV/0!
						20	0.000	#DIV/0!	#DIV/0!
						20	0.000	#DIV/0!	#DIV/0!
						20	0.000	#DIV/0!	#DIV/0!
						20	0.000	#DIV/0!	#DIV/0!

$$\text{Chlorophyll-a} = \frac{26,700 ((\text{OD } 664\text{b} - \text{OD } 750\text{b}) - (\text{OD } 665\text{a} - \text{OD } 750\text{a})) \times V_1}{L \times V_2}$$

$$\text{Pheophytin-a} = \frac{26,700 [(1.7(\text{OD } 665\text{a} - \text{OD } 750\text{a}) - (\text{OD } 664\text{b} - \text{OD } 750\text{b}))] \times V_1}{L \times V_2}$$

V₁ = Volume of extract (ml)V₂ = Volume of sample (ml)

L = Length of lightpath or width of cuvette (5 cm)

$$\text{LCS} = 26700 ((\text{OD } 664\text{b} - \text{OD } 750\text{b}) - (\text{OD } 665\text{a} - \text{OD } 750\text{a})) = 523.32$$

ID #: 24-GEN-04-22-M TV= 523.32 mg/m³ AVG= 523.32 mg/m³

Comments:

Pipette ID#: H35458H, TOC-124276B

Equip.ID#:K-UV-VIS-05

Analyzed By: JS	Date: 3/5/2025	13:42
Reviewed By: MRL	Date: 03/13/25	

ALS Environmental
Kelso

ChlorophyllA_3_5_2025_13:42:01_PM

1 / 2

05-Mar-2025 02:38 PM

Instrument Serial #: 9A5Y164011

Method name: Chlorophyll a 29-Oct-2020

Instrument model: GENESYS 150

Method created: 29-Oct-2020 10:25 PM

Software Package Version: 2.5

Signature: *TS*

Method updated: 29-Oct-2020 10:27 PM

Multi-Wavelength: method parameters						
Result: ABS						
Wavelength table						
$\lambda 1$	$\lambda 2$	$\lambda 3$				
750.0	664.0	665.0				

LCS 1						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
-0.001	0.209	0.201				
LCS A 1						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.001	0.109	0.108				
DLCS 1						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.006	0.215	0.207				
DLCS A 1						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.007	0.115	0.117				
DLCS A 2 <i>H.T measure twice on VV-Vis TS 3/5/15</i>						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.007	0.115	0.116				
MB 1 1						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.009	0.001	0.000				
MB 1 A 1						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.010	0.001	0.000				
MB 2 1						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.009	0.000	-0.001				
MB 2 A 1						

ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.009	0.000	0.000			
2039-1 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.019	1.522	1.504			
2039-1 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.018	1.318	1.306			
2039-2 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.017	0.602	0.592			
2039-2 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.014	0.502	0.497			
2039-3 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.009	0.334	0.326			
2039-3 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.011	0.283	0.280			
2039-4 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.013	1.084	1.066			
2039-4 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.012	0.853	0.877			
2039-5 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.009	0.081	0.080			
2039-5 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.010	0.063	0.067			
2039-6 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.011	0.230	0.227			
2039-6 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.011	0.193	0.192			

Method: _____

Sample Name	Total Vol.	TIME
MB	2000	1144
K2039-1	1050	1149
-2	1053	1210
-3	1040	1217
-4	1029	1231
-5	1009	1430
✓ -6	1052	1439
MB	2000	① +052 1439

Extraction : 1100-1313
Centrifuge : 1314-1339

Whatman GF/C micro Fiber Filters 42.5mm Lot # 17047894

Prepared By: A. Chastity
Analyzed By: J. Sanchez
Reviewed By: MRL

Date Prepared:	2-27-25
Date Analyzed:	3/5/25
Date Reviewed:	03/13/25

① EE
2-27-25
AL

Preparation Information Benchsheet

Run # 872433

Prep Run#: 453387

Team: GenChem/JSANCHEZ

Prep WorkFlow: GenExtChIA8Hrec

Prep Method: Method

Status: Prepped

Prep Date/Time: 3/5/25 13:14

Number of Copies to make: 1

#	Lab Code	Client ID	B#	Method /Test	pH	Matrix	Amt. Ext.	Final Vol	Sample Description
1	KQ2503971-01	MB		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
2	KQ2503971-02	MB		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
3	KQ2503971-03	LCS		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
4	KQ2503971-04	DLCS		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
5	K2502039-001	Lawrence 1	.01	SM 10200 H/Pheophytin A NF		Water	1050.0000mL	20.00mL	
6	K2502039-002	Lawrence 1 QA	.01	SM 10200 H/Pheophytin A NF		Water	1053.0000mL	20.00mL	
7	K2502039-003	Lawrence 2	.01	SM 10200 H/Pheophytin A NF		Water	1040.0000mL	20.00mL	
8	K2502039-004	Lawrence 2 QA	.01	SM 10200 H/Pheophytin A NF		Water	1029.0000mL	20.00mL	
9	K2502039-005	Pattison N	.01	SM 10200 H/Pheophytin A NF		Water	1009.0000mL	20.00mL	
10	K2502039-006	Pattison S	.01	SM 10200 H/Pheophytin A NF		Water	1052.0000mL	20.00mL	

Spiking Solutions

Name: Chlorophyll-a LCS	Inventory ID 240356	Logbook Ref: 24-GEN-04-18-L	Expires On: 03/12/2025

KQ2503971-03 20.00mL

KQ2503971-04 20.00mL

Preparation Steps

Step: Centrifuge
 Started: 3/5/25 13:14
 Finished: 3/5/25 13:39
 By: JSANCHEZ
 Comments

Step: Extraction
 Started: 3/5/25 11:00
 Finished: 3/5/25 13:13
 By: JSANCHEZ
 Comments

Step: Filter
 Started: 2/27/25 11:44
 Finished: 2/27/25 14:39
 By: JSANCHEZ
 Comments

Comments: _____

Reviewed By: MRL Date: 03/13/25

Chain of Custody

Relinquished By: _____	Date: _____	<u>Extracts Examined</u>
Received By: _____	Date: _____	Yes No

Preparation Information Benchsheet

Prep Run#: 453386

Team: GenChem/JSANCHEZ

Prep Workflow: GenExtChlA48Hrs

Prep Method: Method

Run# 872433

Status: Prepped

Prep Date/Time: 3/5/25 13:14

Number of Copies to make: 1

#	Lab Code	Client ID	B#	Method /Test	pH	Matrix	Amt. Ext.	Final Vol	Sample Description
1	KQ2503973-01	MB		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
2	KQ2503973-02	MB		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
3	KQ2503973-03	LCS		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
4	KQ2503973-04	DLCS		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
5	K2502039-001	Lawrence 1	.01	SM 10200 H/Chlorophylla UF		Water	1050.0000mL	20.00mL	
6	K2502039-002	Lawrence 1 QA	.01	SM 10200 H/Chlorophylla UF		Water	1053.0000mL	20.00mL	
7	K2502039-003	Lawrence 2	.01	SM 10200 H/Chlorophylla UF		Water	1040.0000mL	20.00mL	
8	K2502039-004	Lawrence 2 QA	.01	SM 10200 H/Chlorophylla UF		Water	1029.0000mL	20.00mL	
9	K2502039-005	Pattison N	.01	SM 10200 H/Chlorophylla UF		Water	1009.0000mL	20.00mL	
10	K2502039-006	Pattison S	.01	SM 10200 H/Chlorophylla UF		Water	1052.0000mL	20.00mL	

Spiking Solutions

Name: Chlorophyll-a LCS	Inventory ID 240101	Logbook Ref: 24-GEN-04-22-M	Expires On: 03/12/2025

KQ2503973-03 20.00mL KQ2503973-04 20.00mL

Preparation Steps

Step: Centrifuge	Step: Extraction	Step: Filter
Started: 3/5/25 13:14	Started: 3/5/25 11:00	Started: 2/27/25 11:44
Finished: 3/5/25 13:39	Finished: 3/5/25 13:13	Finished: 2/27/25 14:39
By: JSANCHEZ	By: JSANCHEZ	By: JSANCHEZ
Comments	Comments	Comments

Comments: _____

Reviewed By: MRL Date: 03/13/25

Chain of Custody

Relinquished By: _____	Date: _____	Extracts Examined
Received By: _____	Date: _____	Yes No

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com



***Professional
Analytical
Services***

March 13, 2025

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN

Project: STREAMS
Project Number: 40644
COC Number: A25C0030

JOHN HABERLIN:

Enclosed please find the analytical data for your STREAMS project.

Your sample(s) were received on Monday, March 3, 2025 and properly maintained prior to the subsequent analysis. The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA, Standard Methods or the Army Corps of Engineers.

Following the analytical results you will find the Quality Control (QA/QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Practical Quantitation Limits (PQL's), as opposed to the Method Detection Limits (MDL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Aaron Young". The signature is fluid and cursive, with the first name "Aaron" and last name "Young" clearly distinguishable.

ElementStationManager For Aaron Young

President

aarony@amtestlab.com



ANALYSIS REPORT

Date Received: 03/03/25

Date Reported: 03/13/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Reported Samples

Lab ID	Sample	Matrix	Qualifiers	Date Sampled	Date Received
A25C0030-01	Salmon	Water		02/05/2025	03/03/2025
A25C0030-02	Blooms Ditch @ 110th	Water		02/05/2025	03/03/2025
A25C0030-03	Black @128th	Water		02/05/2025	03/03/2025
A25C0030-04	Black @ LR	Water		02/05/2025	03/03/2025
A25C0030-05	Black @ Moon	Water		02/05/2025	03/03/2025
A25C0030-06	Black @ Moon QC	Water		02/05/2025	03/03/2025
A25C0030-07	Chehalis	Water		02/05/2025	03/03/2025
A25C0030-08	Chehalis QC	Water		02/05/2025	03/03/2025
A25C0030-09	Scatter @ James	Water		02/05/2025	03/03/2025
A25C0030-10	Prairie	Water		02/05/2025	03/03/2025
A25C0030-11	Skookumchuck	Water		02/05/2025	03/03/2025
A25C0030-12	Scatter @ Gibson	Water		02/05/2025	03/03/2025
A25C0030-13	Deschutes Falls	Water		02/11/2025	03/03/2025
A25C0030-14	Reichel	Water		02/11/2025	03/03/2025
A25C0030-15	Deschutes @ Vail	Water		02/11/2025	03/03/2025
A25C0030-16	Deschutes @ Waldrick	Water		02/11/2025	03/03/2025
A25C0030-17	Spurgeon @ Rich	Water		02/11/2025	03/03/2025
A25C0030-18	Spurgeon @ Rich QA	Water		02/11/2025	03/03/2025
A25C0030-19	Chambers	Water		02/11/2025	03/03/2025
A25C0030-20	Chambers QA	Water		02/11/2025	03/03/2025
A25C0030-21	Deschutes @Tumwater	Water		02/11/2025	03/03/2025
A25C0030-22	Indian Mouth	Water		02/11/2025	03/03/2025
A25C0030-23	Schneider T	Water		02/12/2025	03/03/2025
A25C0030-24	Kennedy	Water		02/12/2025	03/03/2025
A25C0030-25	Schneider Head	Water		02/12/2025	03/03/2025
A25C0030-26	Schneider Head QA	Water		02/12/2025	03/03/2025
A25C0030-27	McLane	Water		02/12/2025	03/03/2025
A25C0030-28	Mclane QA	Water		02/12/2025	03/03/2025
A25C0030-29	Black Lake Ditch	Water		02/12/2025	03/03/2025
A25C0030-30	Eaton	Water		02/19/2025	03/03/2025
A25C0030-31	Eaton QA	Water		02/19/2025	03/03/2025
A25C0030-32	Thompson	Water		02/19/2025	03/03/2025
A25C0030-33	McAlliser @ I-5	Water		02/19/2025	03/03/2025
A25C0030-34	Dobbs @ Cross Creek	Water		02/19/2025	03/03/2025
A25C0030-35	Fleming @ JP	Water		02/19/2025	03/03/2025



ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 03/03/25

Date Reported: 03/13/25

A25C0030-36	Woodland @ Draham	Water	02/19/2025	03/03/2025
A25C0030-37	Woodland @ PG	Water	02/19/2025	03/03/2025
A25C0030-38	Moxlie @ Union	Water	02/19/2025	03/03/2025
A25C0030-39	Moxlie @ Union QA	Water	02/19/2025	03/03/2025
A25C0030-40	Woodward @ Libby	Water	02/27/2025	03/03/2025
A25C0030-41	Summit Surface	Water	02/20/2025	03/03/2025
A25C0030-42	Summit Botom	Water	02/20/2025	03/03/2025
A25C0030-43	Lawrence 1 Surface	Water	02/26/2025	03/03/2025
A25C0030-44	Lawrence 1 Surface QA	Water	02/26/2025	03/03/2025
A25C0030-45	Lawrence 1 Bottom	Water	02/26/2025	03/03/2025
A25C0030-46	Lawrence 1 Bottom QA	Water	02/26/2025	03/03/2025
A25C0030-47	Lawrence 2 Surface	Water	02/26/2025	03/03/2025
A25C0030-48	Lawrence 2 Surface QA	Water	02/26/2025	03/03/2025
A25C0030-49	Lawrence 2 Bottom	Water	02/26/2025	03/03/2025
A25C0030-50	Lawrence 2 Bottom QA	Water	02/26/2025	03/03/2025
A25C0030-51	Pattison N Surface	Water	02/26/2025	03/03/2025
A25C0030-52	Pattison N Bottom	Water	02/26/2025	03/03/2025
A25C0030-53	Pattison S Surface	Water	02/26/2025	03/03/2025
A25C0030-54	Pattison S Bottom	Water	02/26/2025	03/03/2025

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Thurston County Environmental Health

412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25C0030-01

Client Identification: Salmon

Sampling Date: 02/05/25 09:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.196	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.014	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-02

Client Identification: Blooms Ditch @ 110th

Sampling Date: 02/05/25 10:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.138	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.028	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-03

Client Identification: Black @128th

Sampling Date: 02/05/25 10:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.249	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.013	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-04

Client Identification: Black @ LR

Sampling Date: 02/05/25 10:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.512	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.018	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

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Thurston County Environmental Health

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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25C0030-05

Client Identification: Black @ Moon

Sampling Date: 02/05/25 11:35

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.674	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.020	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-06

Client Identification: Black @ Moon QC

Sampling Date: 02/05/25 11:35

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.668	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.027	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-07

Client Identification: Chehalis

Sampling Date: 02/05/25 12:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.556	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.025	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-08

Client Identification: Chehalis QC

Sampling Date: 02/05/25 12:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.569	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.025	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

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Thurston County Environmental Health

412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25C0030-09

Client Identification: Scatter @ James

Sampling Date: 02/05/25 12:35

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.873	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.012	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-10

Client Identification: Prairie

Sampling Date: 02/05/25 12:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.273	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.020	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-11

Client Identification: Skookumchuck

Sampling Date: 02/05/25 13:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.481	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.021	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-12

Client Identification: Scatter @ Gibson

Sampling Date: 02/05/25 14:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.660	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.018	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

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Thurston County Environmental Health

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Attention: JOHN HABERLIN

Project Name: STREAMS

Project #: 40644

AMTEST Identification Number: A25C0030-13

Client Identification: Deschutes Falls

Sampling Date: 02/11/25 09:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.227	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.013	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-14

Client Identification: Reichel

Sampling Date: 02/11/25 10:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.534	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.035	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-15

Client Identification: Deschutes @ Vail

Sampling Date: 02/11/25 11:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.484	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.017	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-16

Client Identification: Deschutes @ Waldrick

Sampling Date: 02/11/25 11:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.672	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.016	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

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Thurston County Environmental Health

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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25C0030-17

Client Identification: Spurgeon @ Rich

Sampling Date: 02/11/25 12:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.343	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.017	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-18

Client Identification: Spurgeon @ Rich QA

Sampling Date: 02/11/25 12:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.346	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.014	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-19

Client Identification: Chambers

Sampling Date: 02/11/25 12:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.32	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.025	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-20

Client Identification: Chambers QA

Sampling Date: 02/11/25 12:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.42	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.023	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

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Thurston County Environmental Health

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Attention: JOHN HABERLIN
Project Name: STREAMS
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AMTEST Identification Number: A25C0030-21

Client Identification: Deschutes @Tumwater

Sampling Date: 02/11/25 13:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.759	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.022	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-22

Client Identification: Indian Mouth

Sampling Date: 02/11/25 12:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.957	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.036	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-23

Client Identification: Schneider T

Sampling Date: 02/12/25 09:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.281	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.025	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-24

Client Identification: Kennedy

Sampling Date: 02/12/25 09:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.452	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.018	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

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Thurston County Environmental Health
412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25C0030-25
Client Identification: Schneider Head
Sampling Date: 02/12/25 10:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.134	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.013	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-26
Client Identification: Schneider Head QA
Sampling Date: 02/12/25 10:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.125	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.013	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-27
Client Identification: McLane
Sampling Date: 02/12/25 10:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.434	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.029	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-28
Client Identification: Mclane QA
Sampling Date: 02/12/25 10:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.435	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.030	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

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ANALYSIS REPORT

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Thurston County Environmental Health
412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25C0030-29
Client Identification: Black Lake Ditch
Sampling Date: 02/12/25 11:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.209	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.019	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-30
Client Identification: Eaton
Sampling Date: 02/19/25 09:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.583	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.045	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-31
Client Identification: Eaton QA
Sampling Date: 02/19/25 09:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.600	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.044	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-32
Client Identification: Thompson
Sampling Date: 02/19/25 09:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	2.56	mg/L	D	0.100	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.019	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

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ANALYSIS REPORT

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Thurston County Environmental Health

412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25C0030-33

Client Identification: McAlliser @ I-5

Sampling Date: 02/19/25 10:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.524	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.081	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-34

Client Identification: Dobbs @ Cross Creek

Sampling Date: 02/19/25 10:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.258	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.041	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-35

Client Identification: Fleming @ JP

Sampling Date: 02/19/25 10:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.103	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.040	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-36

Client Identification: Woodland @ Draham

Sampling Date: 02/19/25 11:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.37	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.074	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

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Date Received: 03/03/25

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Thurston County Environmental Health

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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25C0030-37

Client Identification: Woodland @ PG

Sampling Date: 02/19/25 11:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.24	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.074	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-38

Client Identification: Moxlie @ Union

Sampling Date: 02/19/25 12:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.539	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.075	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-39

Client Identification: Moxlie @ Union QA

Sampling Date: 02/19/25 12:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.531	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.076	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-40

Client Identification: Woodward @ Libby

Sampling Date: 02/27/25 10:35

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.371	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Phosphorus (TP)	0.027	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

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Thurston County Environmental Health
412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25C0030-41
Client Identification: Summit Surface
Sampling Date: 02/20/25 11:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.048	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Kjeldahl Nitrogen	0.48	mg/L		0.25	EPA 351.2_2_1993	LF	03/06/2025
Total Nitrogen	0.525	mg/L			Calculated	LF	03/06/2025
Total Phosphorus (TP)	0.007	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-42
Client Identification: Summit Botom
Sampling Date: 02/20/25 11:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.046	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Kjeldahl Nitrogen	0.48	mg/L		0.25	EPA 351.2_2_1993	LF	03/06/2025
Total Nitrogen	0.526	mg/L			Calculated	LF	03/06/2025
Total Phosphorus (TP)	0.006	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-43
Client Identification: Lawrence 1 Surface
Sampling Date: 02/26/25 09:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.112	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Kjeldahl Nitrogen	1.58	mg/L		0.25	EPA 351.2_2_1993	LF	03/06/2025
Total Nitrogen	1.69	mg/L			Calculated	LF	03/06/2025
Total Phosphorus (TP)	0.044	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

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Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25C0030-44

Client Identification: Lawrence 1 Surface QA

Sampling Date: 02/26/25 09:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.111	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Kjeldahl Nitrogen	1.83	mg/L		0.25	EPA 351.2_2_1993	LF	03/06/2025
Total Nitrogen	1.94	mg/L			Calculated	LF	03/06/2025
Total Phosphorus (TP)	0.040	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-45

Client Identification: Lawrence 1 Bottom

Sampling Date: 02/26/25 09:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.113	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Kjeldahl Nitrogen	1.61	mg/L		0.25	EPA 351.2_2_1993	LF	03/06/2025
Total Nitrogen	1.72	mg/L			Calculated	LF	03/06/2025
Total Phosphorus (TP)	0.042	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-46

Client Identification: Lawrence 1 Bottom QA

Sampling Date: 02/26/25 09:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.116	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Kjeldahl Nitrogen	1.75	mg/L		0.25	EPA 351.2_2_1993	LF	03/06/2025
Total Nitrogen	1.87	mg/L			Calculated	LF	03/06/2025
Total Phosphorus (TP)	0.042	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25C0030-47

Client Identification: Lawrence 2 Surface

Sampling Date: 02/26/25 10:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.135	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Kjeldahl Nitrogen	1.45	mg/L		0.25	EPA 351.2_2_1993	LF	03/06/2025
Total Nitrogen	1.58	mg/L			Calculated	LF	03/06/2025
Total Phosphorus (TP)	0.042	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-48

Client Identification: Lawrence 2 Surface QA

Sampling Date: 02/26/25 10:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.135	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Kjeldahl Nitrogen	1.62	mg/L		0.25	EPA 351.2_2_1993	LF	03/06/2025
Total Nitrogen	1.75	mg/L			Calculated	LF	03/06/2025
Total Phosphorus (TP)	0.039	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-49

Client Identification: Lawrence 2 Bottom

Sampling Date: 02/26/25 10:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.129	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Kjeldahl Nitrogen	1.48	mg/L		0.25	EPA 351.2_2_1993	LF	03/06/2025
Total Nitrogen	1.61	mg/L			Calculated	LF	03/06/2025
Total Phosphorus (TP)	0.033	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

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Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25C0030-50

Client Identification: Lawrence 2 Bottom QA

Sampling Date: 02/26/25 10:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.138	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Kjeldahl Nitrogen	1.52	mg/L		0.25	EPA 351.2_2_1993	LF	03/06/2025
Total Nitrogen	1.66	mg/L			Calculated	LF	03/06/2025
Total Phosphorus (TP)	0.037	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-51

Client Identification: Pattison N Surface

Sampling Date: 02/26/25 11:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.949	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Kjeldahl Nitrogen	0.72	mg/L		0.25	EPA 351.2_2_1993	LF	03/06/2025
Total Nitrogen	1.67	mg/L			Calculated	LF	03/06/2025
Total Phosphorus (TP)	0.040	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-52

Client Identification: Pattison N Bottom

Sampling Date: 02/26/25 11:35

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.958	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Kjeldahl Nitrogen	0.82	mg/L		0.25	EPA 351.2_2_1993	LF	03/06/2025
Total Nitrogen	1.78	mg/L			Calculated	LF	03/06/2025
Total Phosphorus (TP)	0.044	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

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ANALYSIS REPORT

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Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25C0030-53
Client Identification: Pattison S Surface
Sampling Date: 02/26/25 12:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.722	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Kjeldahl Nitrogen	0.69	mg/L		0.25	EPA 351.2_2_1993	LF	03/06/2025
Total Nitrogen	1.41	mg/L			Calculated	LF	03/06/2025
Total Phosphorus (TP)	0.027	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

AMTEST Identification Number: A25C0030-54
Client Identification: Pattison S Bottom
Sampling Date: 02/26/25 12:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.686	mg/L		0.020	EPA 353.2_2_1993	LF	03/10/2025
Total Kjeldahl Nitrogen	0.67	mg/L		0.25	EPA 351.2_2_1993	LF	03/06/2025
Total Nitrogen	1.35	mg/L			Calculated	LF	03/06/2025
Total Phosphorus (TP)	0.028	mg/L		0.005	SM 4500-P F_2011	LF	03/12/2025

ANALYSIS REPORT

Date Received: 03/03/25

Date Reported: 03/13/25

Thurston County Environmental Health

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Project #: 40644

Quality Control

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCC0029 - No Prep - WetChem

Blank (BCC0029-BLK1)

Prepared: 03/04/25 Analyzed: 03/06/25

Total Kjeldahl Nitrogen ND U 0.25 mg/L

Blank (BCC0029-BLK2)

Prepared: 03/04/25 Analyzed: 03/06/25

Total Kjeldahl Nitrogen ND U 0.25 mg/L

Blank (BCC0029-BLK3)

Prepared: 03/04/25 Analyzed: 03/06/25

Total Kjeldahl Nitrogen ND U 0.25 mg/L

LCS (BCC0029-BS1)

Prepared: 03/04/25 Analyzed: 03/06/25

Total Kjeldahl Nitrogen 0.50 0.25 mg/L 0.5000 101% 85-115%

LCS (BCC0029-BS2)

Prepared: 03/04/25 Analyzed: 03/06/25

Total Kjeldahl Nitrogen 0.52 0.25 mg/L 0.5000 104% 85-115%

LCS (BCC0029-BS3)

Prepared: 03/04/25 Analyzed: 03/06/25

Total Kjeldahl Nitrogen 0.52 0.25 mg/L 0.5000 103% 85-115%

Calibration Blank (BCC0029-CCB1)

Prepared: 03/04/25 Analyzed: 03/06/25

Total Kjeldahl Nitrogen 0.007 mg/L

Calibration Blank (BCC0029-CCB2)

Prepared: 03/04/25 Analyzed: 03/06/25

Total Kjeldahl Nitrogen 0.003 mg/L

Calibration Blank (BCC0029-CCB3)

Prepared: 03/04/25 Analyzed: 03/06/25

Total Kjeldahl Nitrogen 0.007 mg/L

Calibration Blank (BCC0029-CCB4)

Prepared: 03/04/25 Analyzed: 03/06/25

Total Kjeldahl Nitrogen 0.003 mg/L

Calibration Blank (BCC0029-CCB5)

Prepared: 03/04/25 Analyzed: 03/06/25

Total Kjeldahl Nitrogen 0.004 mg/L

Calibration Check (BCC0029-CCV1)

Prepared: 03/04/25 Analyzed: 03/06/25

Total Kjeldahl Nitrogen 1.00 0.25 mg/L 1.000 100% 85-115%

Calibration Check (BCC0029-CCV2)

Prepared: 03/04/25 Analyzed: 03/06/25

ANALYSIS REPORT

Date Received: 03/03/25

Date Reported: 03/13/25

Thurston County Environmental Health

412 LILLY RD NE

OLYMPIA, WA 98506

Attention: JOHN HABERLIN

Project Name: STREAMS

Project #: 40644

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCC0029 - No Prep - WetChem (Continued)										
Calibration Check (BCC0029-CCV2)					Prepared: 03/04/25 Analyzed: 03/06/25					
Total Kjeldahl Nitrogen	1.04		0.25	mg/L	1.000		104%	85-115%		
Calibration Check (BCC0029-CCV3)					Prepared: 03/04/25 Analyzed: 03/06/25					
Total Kjeldahl Nitrogen	1.03		0.25	mg/L	1.000		103%	85-115%		
Calibration Check (BCC0029-CCV4)					Prepared: 03/04/25 Analyzed: 03/06/25					
Total Kjeldahl Nitrogen	1.02		0.25	mg/L	1.000		102%	85-115%		
Calibration Check (BCC0029-CCV5)					Prepared: 03/04/25 Analyzed: 03/06/25					
Total Kjeldahl Nitrogen	1.02		0.25	mg/L	1.000		102%	85-115%		
Duplicate (BCC0029-DUP1)					Prepared: 03/04/25 Analyzed: 03/06/25					
Total Kjeldahl Nitrogen	0.33		0.25	mg/L		0.33			0.03	25
Duplicate (BCC0029-DUP2)					Prepared: 03/04/25 Analyzed: 03/06/25					
Total Kjeldahl Nitrogen	0.95		0.25	mg/L		0.94			0.7	25
Duplicate (BCC0029-DUP3)					Prepared: 03/04/25 Analyzed: 03/06/25					
Total Kjeldahl Nitrogen	0.48		0.25	mg/L		0.48			0.4	25
Duplicate (BCC0029-DUP4)					Prepared: 03/04/25 Analyzed: 03/06/25					
Total Kjeldahl Nitrogen	0.83		0.25	mg/L		0.82			0.5	25
Duplicate (BCC0029-DUP5)					Prepared: 03/04/25 Analyzed: 03/06/25					
Total Kjeldahl Nitrogen	0.66		0.25	mg/L		0.67			0.3	25
Matrix Spike (BCC0029-MS1)					Prepared: 03/04/25 Analyzed: 03/06/25					
Total Kjeldahl Nitrogen	2.37		0.25	mg/L	2.000	0.33	102%	80-120%		
Matrix Spike (BCC0029-MS2)					Prepared: 03/04/25 Analyzed: 03/06/25					
Total Kjeldahl Nitrogen	3.08		0.25	mg/L	2.000	0.94	107%	80-120%		
Matrix Spike (BCC0029-MS3)					Prepared: 03/04/25 Analyzed: 03/06/25					
Total Kjeldahl Nitrogen	2.58		0.25	mg/L	2.000	0.48	105%	80-120%		
Matrix Spike (BCC0029-MS4)					Prepared: 03/04/25 Analyzed: 03/06/25					

ANALYSIS REPORT

Thurston County Environmental Health

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Date Received: 03/03/25

Date Reported: 03/13/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCC0029 - No Prep - WetChem (Continued)										
Matrix Spike (BCC0029-MS4)		Source: A25C0030-52		Prepared: 03/04/25 Analyzed: 03/06/25						
Total Kjeldahl Nitrogen	2.88		0.25	mg/L	2.000	0.82	103%	80-120%		
Matrix Spike (BCC0029-MS5)		Source: A25C0030-54		Prepared: 03/04/25 Analyzed: 03/06/25						
Total Kjeldahl Nitrogen	2.75		0.25	mg/L	2.000	0.67	104%	80-120%		
Batch: BCC0076 - No Prep - WetChem										
Blank (BCC0076-BLK1)		Prepared & Analyzed: 03/10/25								
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BCC0076-BLK2)		Prepared & Analyzed: 03/10/25								
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BCC0076-BLK3)		Prepared & Analyzed: 03/10/25								
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BCC0076-BLK4)		Prepared & Analyzed: 03/10/25								
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
LCS (BCC0076-BS1)		Prepared & Analyzed: 03/10/25								
Total Nitrate + Nitrite	0.507		0.020	mg/L	0.5000		101%	90-110%		
LCS (BCC0076-BS2)		Prepared & Analyzed: 03/10/25								
Total Nitrate + Nitrite	0.538		0.020	mg/L	0.5000		108%	90-110%		
LCS (BCC0076-BS3)		Prepared & Analyzed: 03/10/25								
Total Nitrate + Nitrite	0.515		0.020	mg/L	0.5000		103%	90-110%		
LCS (BCC0076-BS4)		Prepared & Analyzed: 03/10/25								
Total Nitrate + Nitrite	0.516		0.020	mg/L	0.5000		103%	90-110%		
Calibration Blank (BCC0076-CCB1)		Prepared & Analyzed: 03/10/25								
Total Nitrate + Nitrite	0.003			mg/L						
Calibration Blank (BCC0076-CCB2)		Prepared & Analyzed: 03/10/25								
Total Nitrate + Nitrite	0.001			mg/L						

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 03/03/25

Date Reported: 03/13/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCC0076 - No Prep - WetChem (Continued)										
Calibration Blank (BCC0076-CCB3)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	0.004			mg/L						
Calibration Blank (BCC0076-CCB4)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	0.0004			mg/L						
Calibration Blank (BCC0076-CCB5)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	0.001			mg/L						
Calibration Blank (BCC0076-CCB6)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	0.002			mg/L						
Calibration Blank (BCC0076-CCB7)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	0.004			mg/L						
Calibration Blank (BCC0076-CCB8)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	0.002			mg/L						
Calibration Check (BCC0076-CCV1)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	0.999		0.020	mg/L	1.000		100%	85-115%		
Calibration Check (BCC0076-CCV2)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	1.01		0.020	mg/L	1.000		101%	85-115%		
Calibration Check (BCC0076-CCV3)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	1.07		0.020	mg/L	1.000		107%	85-115%		
Calibration Check (BCC0076-CCV4)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	1.04		0.020	mg/L	1.000		104%	85-115%		
Calibration Check (BCC0076-CCV5)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	1.02		0.020	mg/L	1.000		102%	85-115%		
Calibration Check (BCC0076-CCV6)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	1.07		0.020	mg/L	1.000		107%	85-115%		
Calibration Check (BCC0076-CCV7)					Prepared & Analyzed: 03/10/25					

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 03/03/25

Date Reported: 03/13/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCC0076 - No Prep - WetChem (Continued)										
Calibration Check (BCC0076-CCV7)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	0.918		0.020	mg/L	1.000		92%	85-115%		
Calibration Check (BCC0076-CCV8)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	0.982		0.020	mg/L	1.000		98%	85-115%		
Duplicate (BCC0076-DUP1)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	0.004	U, J	0.020	mg/L		0.006				20
Duplicate (BCC0076-DUP2)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	0.270		0.020	mg/L		0.273			1	20
Duplicate (BCC0076-DUP3)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	1.44		0.020	mg/L		1.42			1	20
Duplicate (BCC0076-DUP4)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	0.581		0.020	mg/L		0.583			0.4	20
Duplicate (BCC0076-DUP5)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	0.368		0.020	mg/L		0.371			0.7	20
Duplicate (BCC0076-DUP6)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	0.129		0.020	mg/L		0.138			6	20
Duplicate (BCC0076-DUP7)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	1.90		0.020	mg/L		1.90			0.07	20
Duplicate (BCC0076-DUP8)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	0.682		0.020	mg/L		0.718			5	20
Matrix Spike (BCC0076-MS1)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	0.972		0.020	mg/L	1.000	0.006	97%	85-115%		
Matrix Spike (BCC0076-MS2)					Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	1.33		0.020	mg/L	1.000	0.273	106%	85-115%		
Matrix Spike (BCC0076-MS3)					Prepared & Analyzed: 03/10/25					

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 03/03/25

Date Reported: 03/13/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCC0076 - No Prep - WetChem (Continued)										
Matrix Spike (BCC0076-MS3)		Source: A25C0030-20			Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	2.49		0.020	mg/L	1.000	1.42	107%	85-115%		
Matrix Spike (BCC0076-MS4)		Source: A25C0030-30			Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	1.58		0.020	mg/L	1.000	0.583	100%	85-115%		
Matrix Spike (BCC0076-MS5)		Source: A25C0030-40			Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	1.39		0.020	mg/L	1.000	0.371	102%	85-115%		
Matrix Spike (BCC0076-MS6)		Source: A25C0030-50			Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	1.13		0.020	mg/L	1.000	0.138	99%	85-115%		
Matrix Spike (BCC0076-MS7)		Source: A25C0064-01			Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	2.81		0.020	mg/L	1.000	1.90	91%	85-115%		
Matrix Spike (BCC0076-MS8)		Source: A25C0066-02			Prepared & Analyzed: 03/10/25					
Total Nitrate + Nitrite	1.68		0.020	mg/L	1.000	0.718	97%	85-115%		
Batch: BCC0092 - No Prep - WetChem										
Blank (BCC0092-BLK1)		Prepared: 03/11/25 Analyzed: 03/12/25								
Total Phosphorus (TP)	ND	U, J	0.005	mg/L						
Blank (BCC0092-BLK2)		Prepared: 03/11/25 Analyzed: 03/12/25								
Total Phosphorus (TP)	ND	U, J	0.005	mg/L						
Blank (BCC0092-BLK3)		Prepared: 03/11/25 Analyzed: 03/12/25								
Total Phosphorus (TP)	ND	U, J	0.005	mg/L						
Blank (BCC0092-BLK4)		Prepared: 03/11/25 Analyzed: 03/12/25								
Total Phosphorus (TP)	ND	U, J	0.005	mg/L						
Blank (BCC0092-BLK5)		Prepared: 03/11/25 Analyzed: 03/12/25								
Total Phosphorus (TP)	ND	U, J	0.005	mg/L						
LCS (BCC0092-BS1)		Prepared: 03/11/25 Analyzed: 03/12/25								
Total Phosphorus (TP)	0.098		0.005	mg/L	0.1000		98%	90-110%		

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 03/03/25

Date Reported: 03/13/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCC0092 - No Prep - WetChem (Continued)

LCS (BCC0092-BS2)

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.102		0.005	mg/L	0.1000		102%	90-110%

LCS (BCC0092-BS3)

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.102		0.005	mg/L	0.1000		102%	90-110%

LCS (BCC0092-BS4)

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.102		0.005	mg/L	0.1000		102%	90-110%

LCS (BCC0092-BS5)

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.102		0.005	mg/L	0.1000		102%	90-110%

Calibration Blank (BCC0092-CCB1)

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.004			mg/L				

Calibration Blank (BCC0092-CCB10)

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.003			mg/L				

Calibration Blank (BCC0092-CCB2)

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.003			mg/L				

Calibration Blank (BCC0092-CCB3)

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.003			mg/L				

Calibration Blank (BCC0092-CCB4)

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.003			mg/L				

Calibration Blank (BCC0092-CCB5)

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.003			mg/L				

Calibration Blank (BCC0092-CCB6)

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.003			mg/L				

Calibration Blank (BCC0092-CCB7)

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.003			mg/L				

Calibration Blank (BCC0092-CCB8)

Prepared: 03/11/25 Analyzed: 03/12/25

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 03/03/25

Date Reported: 03/13/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCC0092 - No Prep - WetChem (Continued)										
Calibration Blank (BCC0092-CCB8)					Prepared: 03/11/25 Analyzed: 03/12/25					
Total Phosphorus (TP)	0.003			mg/L						
Calibration Blank (BCC0092-CCB9)					Prepared: 03/11/25 Analyzed: 03/12/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Check (BCC0092-CCV1)					Prepared: 03/11/25 Analyzed: 03/12/25					
Total Phosphorus (TP)	0.203		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCC0092-CCV10)					Prepared: 03/11/25 Analyzed: 03/12/25					
Total Phosphorus (TP)	0.205		0.005	mg/L	0.2000		103%	85-115%		
Calibration Check (BCC0092-CCV2)					Prepared: 03/11/25 Analyzed: 03/12/25					
Total Phosphorus (TP)	0.208		0.005	mg/L	0.2000		104%	85-115%		
Calibration Check (BCC0092-CCV3)					Prepared: 03/11/25 Analyzed: 03/12/25					
Total Phosphorus (TP)	0.205		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCC0092-CCV4)					Prepared: 03/11/25 Analyzed: 03/12/25					
Total Phosphorus (TP)	0.204		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCC0092-CCV5)					Prepared: 03/11/25 Analyzed: 03/12/25					
Total Phosphorus (TP)	0.205		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCC0092-CCV6)					Prepared: 03/11/25 Analyzed: 03/12/25					
Total Phosphorus (TP)	0.206		0.005	mg/L	0.2000		103%	85-115%		
Calibration Check (BCC0092-CCV7)					Prepared: 03/11/25 Analyzed: 03/12/25					
Total Phosphorus (TP)	0.205		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCC0092-CCV8)					Prepared: 03/11/25 Analyzed: 03/12/25					
Total Phosphorus (TP)	0.205		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCC0092-CCV9)					Prepared: 03/11/25 Analyzed: 03/12/25					
Total Phosphorus (TP)	0.203		0.005	mg/L	0.2000		102%	85-115%		
Duplicate (BCC0092-DUP1)			Source: A25B0480-02		Prepared: 03/11/25 Analyzed: 03/12/25					



ANALYSIS REPORT

Date Received: 03/03/25

Date Reported: 03/13/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCC0092 - No Prep - WetChem (Continued)										
Duplicate (BCC0092-DUP1)			Source: A25B0480-02	Prepared: 03/11/25 Analyzed: 03/12/25						
Total Phosphorus (TP)	0.054		0.005	mg/L		0.050			8	22.3
Duplicate (BCC0092-DUP10)			Source: A25C0064-09	Prepared: 03/11/25 Analyzed: 03/12/25						
Total Phosphorus (TP)	0.030		0.005	mg/L		0.030			0.7	22.3
Duplicate (BCC0092-DUP2)			Source: A25B0489-02	Prepared: 03/11/25 Analyzed: 03/12/25						
Total Phosphorus (TP)	3.41	D	0.200	mg/L		3.30			3	22.3
Duplicate (BCC0092-DUP3)			Source: A25B0496-10	Prepared: 03/11/25 Analyzed: 03/12/25						
Total Phosphorus (TP)	0.004	U, J, DUP	0.005	mg/L		0.003			27	22.3
Duplicate (BCC0092-DUP4)			Source: A25C0030-10	Prepared: 03/11/25 Analyzed: 03/12/25						
Total Phosphorus (TP)	0.020		0.005	mg/L		0.020			1	22.3
Duplicate (BCC0092-DUP5)			Source: A25C0030-20	Prepared: 03/11/25 Analyzed: 03/12/25						
Total Phosphorus (TP)	0.023		0.005	mg/L		0.023			0.1	22.3
Duplicate (BCC0092-DUP6)			Source: A25C0030-30	Prepared: 03/11/25 Analyzed: 03/12/25						
Total Phosphorus (TP)	0.045		0.005	mg/L		0.045			1	22.3
Duplicate (BCC0092-DUP7)			Source: A25C0030-40	Prepared: 03/11/25 Analyzed: 03/12/25						
Total Phosphorus (TP)	0.027		0.005	mg/L		0.027			2	22.3
Duplicate (BCC0092-DUP8)			Source: A25C0030-50	Prepared: 03/11/25 Analyzed: 03/12/25						
Total Phosphorus (TP)	0.038		0.005	mg/L		0.037			3	22.3
Duplicate (BCC0092-DUP9)			Source: A25C0064-01	Prepared: 03/11/25 Analyzed: 03/12/25						
Total Phosphorus (TP)	0.014		0.005	mg/L		0.015			6	22.3
Matrix Spike (BCC0092-MS1)			Source: A25B0480-02	Prepared: 03/11/25 Analyzed: 03/12/25						
Total Phosphorus (TP)	0.259		0.005	mg/L	0.2000	0.050	105%	85-115%		
Matrix Spike (BCC0092-MS10)			Source: A25C0064-09	Prepared: 03/11/25 Analyzed: 03/12/25						
Total Phosphorus (TP)	0.234		0.005	mg/L	0.2000	0.030	102%	85-115%		
Matrix Spike (BCC0092-MS2)			Source: A25B0489-02	Prepared: 03/11/25 Analyzed: 03/12/25						

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 03/03/25

Date Reported: 03/13/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCC0092 - No Prep - WetChem (Continued)

Matrix Spike (BCC0092-MS2)

Source: A25B0489-02

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	10.7	D	0.200	mg/L	8.000	3.30	93%	85-115%

Matrix Spike (BCC0092-MS3)

Source: A25B0496-10

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.197		0.005	mg/L	0.2000	0.003	97%	85-115%

Matrix Spike (BCC0092-MS4)

Source: A25C0030-10

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.225		0.005	mg/L	0.2000	0.020	103%	85-115%

Matrix Spike (BCC0092-MS5)

Source: A25C0030-20

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.228		0.005	mg/L	0.2000	0.023	103%	85-115%

Matrix Spike (BCC0092-MS6)

Source: A25C0030-30

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.255		0.005	mg/L	0.2000	0.045	105%	85-115%

Matrix Spike (BCC0092-MS7)

Source: A25C0030-40

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.233		0.005	mg/L	0.2000	0.027	103%	85-115%

Matrix Spike (BCC0092-MS8)

Source: A25C0030-50

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.245		0.005	mg/L	0.2000	0.037	104%	85-115%

Matrix Spike (BCC0092-MS9)

Source: A25C0064-01

Prepared: 03/11/25 Analyzed: 03/12/25

Total Phosphorus (TP)	0.215		0.005	mg/L	0.2000	0.015	100%	85-115%

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com



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ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 03/03/25

Date Reported: 03/13/25

Notes and Definitions

Item	Definition
DUP	The duplicate precision was not met. The sample results were within five times the detection limit, therefore the control limits are not applicable.
D	The reported value is from a dilution.
Dry	Sample results reported on a dry weight basis.
ND	Analyte NOT DETECTED at or above the reporting limit.
RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was matrix spiked or duplicated.

AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

Ph (425) 885-1664 Fx (425) 820-0245

www.amtestlab.com

A25C0030

Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506				Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506												
Contact Person: John Haberlin				Invoice Contact: John Haberlin												
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young												
Fax No:				Invoice Ph/Fax:												
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: john.haberlin@co.thurston.wa.us , tc_lakes@co.thurston.wa.us												
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:												
Special Instructions: Please report to detection limit for all results.																
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)				Temperature upon Receipt: 7.0°C												
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested										
Project Number: 40644						Total Phosphate	NOX									QA/QC
AmTest ID	Client ID (35 characters max)															
01	Salmon	2/5/2025	9:55	H2O	1	X	X									
02	Blooms Ditch @ 110th	2/5/2025	10:15	H2O	1	X	X									
03	Black @ 128 th	2/5/2025	10:30	H2O	1	X	X									
04	Beaver @ LR	2/5/2025	10:45	H2O	1	X	X									
05	Black @ Moon	2/5/2025	11:35	H2O	1	X	X									
06	Black @ Moon QC	2/5/2025	11:35	H2O	1	X	X									X
07	Chehalis	2/5/2025	12:10	H2O	1	X	X									
08	Chehalis QC	2/5/2025	12:10	H2O	1	X	X									X
09	Scatter @ James	2/5/2025	12:35	H2O	1	X	X									
10	Prairie	2/5/2025	12:55	H2O	1	X	X									
Collected/Relinquished By: Josh Eckerle		Date 2/27/2025	Time 1500	Received By: SF				Date 3/3/25	Time 1015							
Relinquished By:		Date	Time	Received By:				Date	Time							
Relinquished By:		Date	Time	Received By:				Date	Time							

COMMENTS:

Page 1 of 6

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AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

Ph (425) 885-1664 Fx (425) 820-0245

www.amtestlab.com

A2560030

Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506				Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506													
Contact Person: John Haberlin				Invoice Contact: John Haberlin													
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young													
Fax No:				Invoice Ph/Fax:													
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us													
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:													
Special Instructions: Please report to detection limit for all results.																	
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)				Temperature upon Receipt: 7.0°C													
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested											
Project Number: 40644						Total Phosphate	NOx										
AmTest ID	Client ID (35 characters max)																QA/QC
11	Skookumchuck	2/5/2025	13:25	H2O	1	X	X										
12	Scatter @ Gibson	2/5/2025	14:00	H2O	1	X	X										
13	Deschutes Falls	2/11/2025	9:50	H2O	1	X	X										
14	Reichel	2/11/2025	10:40	H2O	1	X	X										
15	Deschutes @ Vail	2/11/2025	11:25	H2O	1	X	X										
16	Deschutes @ Waldrick	2/11/2025	11:55	H2O	1	X	X										
17	Spurgeon @ Rich	2/11/2025	12:15	H2O	1	X	X										
18	Spurgeon @ Rich QA	2/11/2025	12:15	H2O	1	X	X										X
19	Chambers	2/11/2025	12:40	H2O	1	X	X										
20	Chambers QA	2/11/2025	12:40	H2O	1	X	X										X
Collected/Relinquished By: Josh Eckerle		Date 2/27/2025	Time 1500	Received By: SE				Date 3/3/25				Time 1615					
Relinquished By:		Date	Time	Received By:				Date				Time					
Relinquished By:		Date	Time	Received By:				Date				Time					

COMMENTS:
Page 2 of 6

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AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

Ph (425) 885-1664 Fx (425) 820-0245

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A2500030

Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506				Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506												
Contact Person: John Haberlin				Invoice Contact: John Haberlin												
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young												
Fax No:				Invoice Ph/Fax:												
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us												
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:												
Special Instructions: Please report to detection limit for all results.																
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)				Temperature upon Receipt: 7.0°C												
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested										
Project Number: 40644						Total Phosphate	NOx									QA/QC
AmTest ID	Client ID (35 characters max)															
21	Deschutes @ Tumwater	2/11/2025	13:00	H2O	1	X	X									
22	Indian Mouth	2/11/2025	12:30	H2O	1	X	X									
23	Schneider T	2/12/2025	9:10	H2O	1	X	X									
24	Kennedy	2/12/2025	9:25	H2O	1	X	X									
25	Schneider Head	2/12/2025	10:30	H2O	1	X	X									
26	Schneider Head QA	2/12/2025	10:30	H2O	1	X	X									X
27	McLane	2/12/2025	10:45	H2O	1	X	X									
28	McLane QA	2/12/2025	10:45	H2O	1	X	X									X
29	Black Lake Ditch	2/12/2025	11:45	H2O	1	X	X									
30	Eaton	2/19/2025	9:15	H2O	1	X	X									
Collected/Relinquished By: Josh Eckerle		Date 2/27/2025	Time 1500	Received By: SF				Date 3/3/25				Time 1615				
Relinquished By:		Date	Time	Received By:				Date				Time				
Relinquished By:		Date	Time	Received By:				Date				Time				

COMMENTS:
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AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

Ph (425) 885-1664 Fx (425) 820-0245

www.amtestlab.com

A25C0030

Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506	Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506
Contact Person: John Haberlin	Invoice Contact: John Haberlin
Phone No: 360-867-2626	PO Number: Credit Card upon report per Aaron Young
Fax No:	Invoice Ph/Fax:
E-mail: john.haberlin@co.thurston.wa.us	Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online	Data posted to online account: YES / NO Web Login ID:

Special Instructions:

Please report to **detection** limit for all results.

Requested TAT: (Rush must be pre-approved by lab)

Standard RUSH (5 Day / 3 Day / 48 HR / 24 HR)

Temperature upon Receipt: 7.0°C

Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested										QA/QC
AmTest ID	Client ID (35 characters max)					Total Phosphate	NOx									
31	Eaton QA	2/19/2025	9:15	H2O	1	X	X									
32	Thompson	2/19/2025	9:15	H2O	1	X	X									
33	McAllister @ I-5	2/19/2025	10:10	H2O	1	X	X									
34	Dobbs @ Cross Creek	2/19/2025	10:30	H2O	1	X	X									
35	Fleming @ JP	2/19/2025	10:50	H2O	1	X	X									
36	Woodland @ Draham	2/19/2025	11:15	H2O	1	X	X									
37	Woodland @ PG	2/19/2025	11:30	H2O	1	X	X									
38	Moxlie @ Union	2/19/2025	12:20	H2O	1	X	X									
39	Moxlie @ Union QA	2/19/2025	12:20	H2O	1	X	X									X
40	Woodard @ Libby	2/27/2025	10:35	H2O	1	X	X									

Collected/Relinquished By: John Haberlin	Date 2/2/2025	Time 1500	Received By: SF	Date 2/3/25	Time 1015
Relinquished By:	Date	Time	Received By:	Date	Time
Relinquished By:	Date	Time	Received By:	Date	Time

COMMENTS:

Page 4 of 6

* client did not include time sampled on COC form for samples 31-40. Time Sampled is found on bottles for samples 31-40, copied over to COC by Login from bottles

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AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

Ph (425) 885-1664 Fx (425) 820-0245

www.amtestlab.com

A2560030

Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506				Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506													
Contact Person: John Haberlin				Invoice Contact: John Haberlin													
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young													
Fax No:				Invoice Ph/Fax:													
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us													
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:													
Special Instructions: Please report to detection limit for all results.																	
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)						Temperature upon Receipt: 7.0°C											
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested											
Project Number: 40644						Total Phosphate	Total Nitrogen										
AmTest ID	Client ID (35 characters max)																QA/QC
41	Summit Surface	2/20/2025	11:15	H2O	1	X	X										
42	Summit Bottom	2/20/2025	11:20	H2O	1	X	X										
43	Lawrence 1 Surface	2/26/2025	9:40	H2O	1	X	X										
44	Lawrence 1 Surface QA	2/26/2025	9:40	H2O	1	X	X										X
45	Lawrence 1 Bottom	2/26/2025	9:45	H2O	1	X	X										
46	Lawrence 1 Bottom QA	2/26/2025	9:45	H2O	1	X	X										X
47	Lawrence 2 Surface	2/26/2025	10:05	H2O	1	X	X										
48	Lawrence 2 Surface QA	2/26/2025	10:05	H2O	1	X	X										X
49	Lawrence 2 Bottom	2/26/2025	10:10	H2O	1	X	X										
50	Lawrence 2 Bottom QA	2/26/2025	10:10	H2O	1	X	X										X
Collected/Relinquished By: John Haberlin		Date 2/27/2025	Time 1500	Received By: SF				Date 3/3/25		Time 10/5							
Relinquished By:		Date	Time	Received By:				Date		Time							
Relinquished By:		Date	Time	Received By:				Date		Time							

COMMENTS:

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A25C0030
~~A25C00E~~
error EJ 3/3/25
Chain of Custody No.

Fadox

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***Professional
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March 12, 2025

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN

Project: Lakes
Project Number: Lake Lawrence 40667
COC Number: A25B0461

JOHN HABERLIN:

Enclosed please find the analytical data for your Lakes project.

Your sample(s) were received on Thursday, February 27, 2025 and properly maintained prior to the subsequent analysis. The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA, Standard Methods or the Army Corps of Engineers.

Following the analytical results you will find the Quality Control (QA/QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Practical Quantitation Limits (PQL's), as opposed to the Method Detection Limits (MDL's).

If you should have any questions pertaining to the data package, please feel free to contact me.
Sincerely,

A handwritten signature in black ink that reads "Aaron Young". The signature is written in a cursive, flowing style.

Aaron Young
President
aarony@amtestlab.com

Am Test Inc.
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Kirkland, WA
(425) 885-1664
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ANALYSIS REPORT

Date Received: 02/27/25
Date Reported: 03/12/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: Lake Lawrence 40667

Reported Samples

Lab ID	Sample	Matrix	Qualifiers	Date Sampled	Date Received
A25B0461-01	Lawrence 1 Surface	Water		02/26/2025	02/27/2025
A25B0461-02	Lawrence 1 Surface QA	Water		02/26/2025	02/27/2025
A25B0461-03	Lawrence 1 Bottom	Water		02/26/2025	02/27/2025
A25B0461-04	Lawrence 1 Bottom QA	Water		02/26/2025	02/27/2025
A25B0461-05	Lawrence 2 Surface	Water		02/26/2025	02/27/2025
A25B0461-06	Lawrence 2 Bottom	Water		02/26/2025	02/27/2025

ANALYSIS REPORT

Date Received: 02/27/25
Date Reported: 03/12/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: Lake Lawrence 40667

AMTEST Identification Number: A25B0461-01

Client Identification: Lawrence 1 Surface

Sampling Date: 02/26/25 09:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Orthophosphate	0.006	mg/L		0.005	SM 4500-P E_2011	AY	02/27/2025

AMTEST Identification Number: A25B0461-02

Client Identification: Lawrence 1 Surface QA

Sampling Date: 02/26/25 09:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Orthophosphate	0.006	mg/L		0.005	SM 4500-P E_2011	AY	02/27/2025

AMTEST Identification Number: A25B0461-03

Client Identification: Lawrence 1 Bottom

Sampling Date: 02/26/25 09:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Orthophosphate	0.015	mg/L		0.005	SM 4500-P E_2011	AY	02/27/2025

AMTEST Identification Number: A25B0461-04

Client Identification: Lawrence 1 Bottom QA

Sampling Date: 02/26/25 09:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Orthophosphate	0.006	mg/L		0.005	SM 4500-P E_2011	AY	02/27/2025

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Kirkland, WA
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ANALYSIS REPORT

Date Received: 02/27/25
Date Reported: 03/12/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: Lake Lawrence 40667

AMTEST Identification Number: A25B0461-05

Client Identification: Lawrence 2 Surface

Sampling Date: 02/26/25 10:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Orthophosphate	ND	mg/L	U	0.005	SM 4500-P E_2011	AY	02/27/2025

AMTEST Identification Number: A25B0461-06

Client Identification: Lawrence 2 Bottom

Sampling Date: 02/26/25 10:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Orthophosphate	ND	mg/L	U	0.005	SM 4500-P E_2011	AY	02/27/2025



ANALYSIS REPORT

Date Received: 02/27/25
Date Reported: 03/12/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: Lake Lawrence 40667

Quality Control

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0322 - No Prep - WetChem										
Blank (BCB0322-BLK1)					Prepared & Analyzed: 02/27/25					
Orthophosphate	ND	U	0.005	mg/L						
Blank (BCB0322-BLK2)					Prepared & Analyzed: 02/27/25					
Orthophosphate	ND	U	0.005	mg/L						
LCS (BCB0322-BS1)					Prepared & Analyzed: 02/27/25					
Orthophosphate	0.112		0.005	mg/L	0.1000		112%	84.9-118%		
LCS (BCB0322-BS2)					Prepared & Analyzed: 02/27/25					
Orthophosphate	0.113		0.005	mg/L	0.1000		113%	84.9-118%		
Calibration Blank (BCB0322-CCB1)					Prepared & Analyzed: 02/27/25					
Orthophosphate	0.003			mg/L						
Calibration Blank (BCB0322-CCB2)					Prepared & Analyzed: 02/27/25					
Orthophosphate	ND	U		mg/L						
Calibration Blank (BCB0322-CCB3)					Prepared & Analyzed: 02/27/25					
Orthophosphate	ND	U		mg/L						
Calibration Check (BCB0322-CCV1)					Prepared & Analyzed: 02/27/25					
Orthophosphate	0.219		0.005	mg/L	0.2000		109%	85-115%		
Calibration Check (BCB0322-CCV2)					Prepared & Analyzed: 02/27/25					
Orthophosphate	0.216		0.005	mg/L	0.2000		108%	85-115%		
Calibration Check (BCB0322-CCV3)					Prepared & Analyzed: 02/27/25					
Orthophosphate	0.217		0.005	mg/L	0.2000		109%	85-115%		
Matrix Spike (BCB0322-MS2)		Source: A25B0460-09			Prepared & Analyzed: 02/27/25					
Orthophosphate	0.132		0.005	mg/L	0.1000	ND	132%	75-125%		
Matrix Spike (BCB0322-MS3)		Source: A25B0461-02			Prepared & Analyzed: 02/27/25					
Orthophosphate	0.170		0.005	mg/L	0.2000	0.006	82%	75-125%		
Matrix Spike Dup (BCB0322-MSD2)		Source: A25B0460-09			Prepared & Analyzed: 02/27/25					
Orthophosphate	0.115		0.005	mg/L	0.1000	ND	115%	75-125%	14	20

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ANALYSIS REPORT

Date Received: 02/27/25
Date Reported: 03/12/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: Lake Lawrence 40667

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCB0322 - No Prep - WetChem (Continued)

Matrix Spike Dup (BCB0322-MSD3)		Source: A25B0461-02			Prepared & Analyzed: 02/27/25					
Orthophosphate	0.194		0.005	mg/L	0.2000	0.006	94%	75-125%	14	20

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ANALYSIS REPORT

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Date Received: 02/27/25
Date Reported: 03/12/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: Lake Lawrence 40667

Notes and Definitions

Item	Definition
U	The compound was analyzed for but was not detected (Non-detect) at or above the MRL/MDL.
Dry	Sample results reported on a dry weight basis.
ND	Analyte NOT DETECTED at or above the reporting limit.
RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was matrix spiked or duplicated.

A25B0461

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506				Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506												
Contact Person: Tristen Payne				Invoice Contact: Tristen Payne												
Phone No: 360-968-4346				PO Number: Credit Card upon report per Aaron Young												
Fax No:				Invoice Ph/Fax:												
E-mail: tristen.payne@co.thurston.wa.us				Invoice E-mail: tristen.payne@co.thurston.wa.us												
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:												
Special Instructions: Please report to detection limit for all results.																
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)				Temperature upon Receipt: 1.9°C												
Project Name: Lake Lawrence		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested										
Project Number: 40667						Total Phosphate	NOx	Ammonia (NH3)	TKN	Orthophosphate						QA/QC
AmTest ID	Client ID (35 characters max)															
01	Lawrence 1 Surface	2/26/2025	9:40	H2O						X						
02	Lawrence 1 Surface QA	2/26/2025	9:40	H2O						X					X	
03	Lawrence 1 Bottom	2/26/2025	9:45	H2O						X						
04	Lawrence 1 Bottom QA	2/26/2025	9:45	H2O						X					X	
05	Lawrence 2 Surface	2/26/2025	10:05	H2O						X						
06	Lawrence 2 Bottom	2/26/2025	10:10	H2O						X						
Collected/Relinquished By: Katherine Hackney		Date 2/26/2024	Time 1500	Received By: SF				Date 2/27/25	Time 1140							
Relinquished By:		Date	Time	Received By:				Date	Time							
Relinquished By:		Date	Time	Received By:				Date	Time							

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ALS Environmental
ALS Group USA, Corp
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Kelso, WA 98626
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F : +1 360 636 1068
www.alsglobal.com

March 27, 2025

Analytical Report for Service Request No: K2502908

John Haberlin
Thurston County Health Department
3000 Pacific Ave. SE
Room 225
Olympia, WA 98501

RE: Lakes / 4520D260 40667

Dear John,

Enclosed are the results of the sample(s) submitted to our laboratory March 20, 2025
For your reference, these analyses have been assigned our service request number **K2502908**.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3363. You may also contact me via email at karen.melerine@ALSGlobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Karen Melerine
Project Manager



ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
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Table of Contents

Acronyms

Qualifiers

State Certifications, Accreditations, And Licenses

Case Narrative

Chain of Custody

General Chemistry

Raw Data

 General Chemistry

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated value.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.
- H The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

- # The control limit criteria is not applicable.
- J The result is an estimated value.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- + The correlation coefficient for the MSA is less than 0.995.
- Q See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- A A tentatively identified compound, a suspected aldol-condensation product.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
- D The reported result is from a dilution.
- E The result is an estimated value.
- J The result is an estimated value.
- N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
- P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
- L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
- H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
- O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
- Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
- Z The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjllabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdwlabservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/analyte is offered by that state.



Case Narrative

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Client: Thurston County Health Department
Project: Lakes
Sample Matrix: Water

Service Request: K2502908
Date Received: 03/20/2025

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples for the Tier level IV requested by the client.

Sample Receipt:

Five water samples were received for analysis at ALS Environmental on 03/20/2025. Any discrepancies upon initial sample inspection are annotated on the sample receipt and preservation form included within this report. The samples were stored at minimum in accordance with the analytical method requirements.

General Chemistry:

No significant anomalies were noted with this analysis.

Approved by Karen Melerune

Date 03/26/2025



Chain of Custody

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Cooler Receipt and Preservation Form

Client Thurston County Service Request K25 02908 PM Karen
Received: 3/20/25 Opened: 3/20/25 By: HM Unloaded: 3/20/25 By: HM

1. Samples were received via? USPS Fed Ex UPS DHL PDX Courier Hand Delivered
2. Samples were received in: (circle) Cooler Box Envelope Other NA
3. Were custody seals on coolers? NA Y N If yes, how many and where? 1 Front
If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Temp Blank	Sample Temp	IR Gun	Cooler #/COC ID / NA	Out of temp indicate with "X"	PM Notified If out of temp	Tracking Number NA	Filed
	<u>5.8</u>	<u>IR206</u>				<u>7728 39021281</u>	

4. Was a Temperature Blank present in cooler? NA Y N If yes, notate the temperature in the appropriate column below:

If no, take the temperature of a representative sample bottle contained within the cooler; notate in the column "Sample Temp":

5. Were samples received within the method specified temperature ranges?

NA Y N

If no, were they received on ice and same day as collected? If not, notate the cooler # below and notify the PM.

NA Y N

If applicable, tissue samples were received: Frozen Partially Thawed Thawed

6. Packing material: Inserts Baggies Bubble Wrap Gel Packs Wet Ice Dry Ice Sleeves

7. Were custody papers properly filled out (ink, signed, etc.)?

NA Y N

8. Were samples received in good condition (unbroken)

NA Y N

9. Were all sample labels complete (ie, analysis, preservation, etc.)?

NA Y N

10. Did all sample labels and tags agree with custody papers?

NA Y N

11. Were appropriate bottles/containers and volumes received for the tests indicated?

NA Y N

12. Were the pH-preserved bottles (see SMO GEN SOP) received at the appropriate pH? Indicate in the table below

NA Y N

13. Were VOA vials received without headspace? Indicate in the table below.

NA Y N

14. Was C12/Res negative?

NA Y N

15. Were samples received within method specified time limit? If not, notate the error below and notify the PM.

NA Y N

16. Were 100mL sterile microbiology bottles filled exactly to the 100mL mark? NA Y N Underfilled Overfilled

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Head- space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, Resolutions: _____



General Chemistry

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Thurston County Health Department
Project: Lakes/4520D260 40667
Sample Matrix: Water
Analysis Method: SM 10200 H
Prep Method: Method

Service Request: K2502908
Date Collected: 03/19/25
Date Received: 03/20/25
Units: mg/m3
Basis: NA

Chlorophyll A

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Lawrence 1	K2502908-001	3.4	1.5	0.6	1	03/22/25 13:38	3/22/25	
Lawrence 1 QA	K2502908-002	2.9	1.5	0.6	1	03/22/25 13:38	3/22/25	
Lawrence 2	K2502908-003	2.7	1.5	0.6	1	03/22/25 13:38	3/22/25	
Lawrence 2 QA	K2502908-004	1.6	1.5	0.6	1	03/22/25 13:38	3/22/25	
Summit	K2502908-005	1.0 J	1.5	0.6	1	03/22/25 13:38	3/22/25	
Method Blank	K2502908-MB1	ND U	0.80	0.30	1	03/22/25 13:38	3/22/25	
Method Blank	K2502908-MB2	ND U	0.80	0.30	1	03/22/25 13:38	3/22/25	
Method Blank	K2502908-MB3	ND U	0.80	0.30	1	03/22/25 13:38	3/22/25	
Method Blank	K2502908-MB4	ND U	0.80	0.30	1	03/22/25 13:38	3/22/25	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Thurston County Health Department
Project: Lakes/4520D260 40667
Sample Matrix: Water

Service Request: K2502908
Date Analyzed: 03/22/25
Date Extracted: 03/22/25

Duplicate Lab Control Sample Summary
General Chemistry Parameters

Analysis Method: SM 10200 H
Prep Method: Method

Units: mg/m3
Basis: NA
Analysis Lot: 873868

Lab Control Sample
K2502908-LCS

Duplicate Lab Control Sample
K2502908-DLCS

Analyte Name	Result	Spike Amount	% Rec	Result	Spike Amount	% Rec	% Rec Limits	RPD	RPD Limit
Chlorophyll A	5.13	5.09	101	5.13	5.09	101	88-113	<1	20

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Thurston County Health Department
Project: Lakes/4520D260 40667
Sample Matrix: Water
Analysis Method: SM 10200 H
Prep Method: Method

Service Request: K2502908
Date Collected: 03/19/25
Date Received: 03/20/25
Units: mg/m3
Basis: NA

Pheophytin A

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Lawrence 1	K2502908-001	8.7	1.5	-	1	03/22/25 13:38	3/22/25	
Lawrence 1 QA	K2502908-002	8.1	1.5	-	1	03/22/25 13:38	3/22/25	
Lawrence 2	K2502908-003	7.9	1.5	-	1	03/22/25 13:38	3/22/25	
Lawrence 2 QA	K2502908-004	3.9	1.5	-	1	03/22/25 13:38	3/22/25	
Summit	K2502908-005	ND U	1.5	-	1	03/22/25 13:38	3/22/25	
Method Blank	K2502908-MB1	ND U	0.80	-	1	03/22/25 13:38	3/22/25	
Method Blank	K2502908-MB2	ND U	0.80	-	1	03/22/25 13:38	3/22/25	
Method Blank	K2502908-MB3	ND U	0.80	-	1	03/22/25 13:38	3/22/25	
Method Blank	K2502908-MB4	ND U	0.80	-	1	03/22/25 13:38	3/22/25	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Thurston County Health Department
Project: Lakes/4520D260 40667
Sample Matrix: Water

Service Request: K2502908
Date Analyzed: 03/22/25
Date Extracted: 03/22/25

Duplicate Lab Control Sample Summary
General Chemistry Parameters

Analysis Method: SM 10200 H
Prep Method: Method

Units: mg/m3
Basis: NA
Analysis Lot: 873868

Lab Control Sample
K2502908-LCS

Duplicate Lab Control Sample
K2502908-DLCS

Analyte Name	Result	Spike Amount	% Rec	Result	Spike Amount	% Rec	% Rec Limits	RPD	RPD Limit
Pheophytin A	513	509	101	513	509	101	88-113	<1	20



Raw Data

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General Chemistry

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Phone (360)577-7222 Fax (360)636-1068
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Work Request # K2502739
K2502908
Date Analyzed: 3/22/25
Analyst: JS Run # 873868
Analysis: Chlorophyll

**DATA QUALITY REPORT
INORGANICS**

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

1.	Is the method name and number correct and appropriate?	<u>yes</u> /no/NA
2.	Holding times met for all analyses and for all samples?	<u>yes</u> /no/NA
3.	Are calculations correct?	<u>yes</u> /no/NA
4.	Is the reporting basis correct? (Dry Weight)	yes/ <u>no</u> /NA
5.	All quality control criteria met?	<u>yes</u> /no
6.	Is the calibration curve correlation coefficient ≥ 0.995 ?	<u>yes</u> /no/NA
7.	MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency?	<u>yes</u> /no/NA
8.	Are ICVs, CCVs, and CCBs all within acceptance limits?	yes/no/ <u>NA</u>
9.	Are results for methods blanks all ND?	<u>yes</u> /no/NA
10.	Are all QC samples within acceptance criteria? (LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.)	<u>yes</u> /no/NA
11.	Are all exceptions explained?	yes/no/ <u>NA</u>
12.	Have all applicable service requests been reviewed?	<u>yes</u> /no/NA
13.	Are all samples labeled correctly?	<u>yes</u> /no/NA
14.	Have all instructions on the service request been followed? (e.g. Special MRLs, QC on a specific sample, Form V)	<u>yes</u> /no/NA
15.	Are detection limits and units reported correctly?	<u>yes</u> /no/NA
16.	Is the unused space on the bench sheet crossed out?	<u>yes</u> /no/NA
17.	Was analysis turned in by the data due date? (If not record SR#)	yes/ <u>no</u> /NA

COMMENTS: & 3/24/25 K2502739

Secondary Approved by: MRL Date: 03/26/25
DQREPORT

Analytical Results Summary

Instrument Name: K-UV-VIS-06

Analyst: JSANCHEZ

Analysis Lot: 873868 Method/Testcode: SM 10200 H/Chlorophylla UF

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
K2502739-001	Chlorophyll A	N/A		Water	90.78 mg/m ³	057.0000 mL	1.7 mg/m ³	1	0.6	1.5			3/22/25 13:38:00	N	IV
K2502739-001	Pheophytin A	N/A		Water	3.94 mg/m ³	057.0000 mL	3.9 mg/m ³	1		1.5			3/22/25 13:38:00	N	IV
K2502739-002	Chlorophyll A	N/A		Water	352.44 mg/m ³	053.0000 mL	6.7 mg/m ³	1	0.6	1.5			3/22/25 13:38:00	N	IV
K2502739-002	Pheophytin A	N/A		Water	17.52 mg/m ³	053.0000 mL	17.5 mg/m ³	1		1.5			3/22/25 13:38:00	N	IV
K2502908-001	Chlorophyll A	N/A		Water	181.56 mg/m ³	056.0000 mL	3.4 mg/m ³	1	0.6	1.5			3/22/25 13:38:00	N	IV
K2502908-001	Pheophytin A	N/A		Water	8.67 mg/m ³	056.0000 mL	8.7 mg/m ³	1		1.5			3/22/25 13:38:00	N	IV
K2502908-002	Chlorophyll A	N/A		Water	149.52 mg/m ³	035.0000 mL	2.9 mg/m ³	1	0.6	1.5			3/22/25 13:38:00	N	IV
K2502908-002	Pheophytin A	N/A		Water	8.09 mg/m ³	035.0000 mL	8.1 mg/m ³	1		1.5			3/22/25 13:38:00	N	IV
K2502908-003	Chlorophyll A	N/A		Water	144.18 mg/m ³	059.0000 mL	2.7 mg/m ³	1	0.6	1.5			3/22/25 13:38:00	N	IV
K2502908-003	Pheophytin A	N/A		Water	7.90 mg/m ³	059.0000 mL	7.9 mg/m ³	1		1.5			3/22/25 13:38:00	N	IV
K2502908-004	Chlorophyll A	N/A		Water	85.44 mg/m ³	056.0000 mL	1.6 mg/m ³	1	0.6	1.5			3/22/25 13:38:00	N	IV
K2502908-004	Pheophytin A	N/A		Water	3.90 mg/m ³	056.0000 mL	3.9 mg/m ³	1		1.5			3/22/25 13:38:00	N	IV
K2502908-005	Chlorophyll A	N/A		Water	53.40 mg/m ³	042.0000 mL	1.0 mg/m ³	J 1	0.6	1.5			3/22/25 13:38:00	N	IV
K2502908-005	Pheophytin A	N/A		Water	1.40 mg/m ³	042.0000 mL	1.5 mg/m ³	U 1		1.5			3/22/25 13:38:00	N	IV
KQ2504696-01	Chlorophyll A	LCS		Water	513.00 mg/m ³	2000 mL	5.13 mg/m ³	1	0.30	0.80	101		3/22/25 13:38:00	N	IV
KQ2504696-02	Chlorophyll A	DLCS		Water	513.00 mg/m ³	2000 mL	5.13 mg/m ³	1	0.30	0.80	101	<1	3/22/25 13:38:00	N	IV
KQ2504696-03	Chlorophyll A	MB		Water	10.68 mg/m ³	2000 mL	0.80 mg/m ³	U 1	0.30	0.80			3/22/25 13:38:00	N	IV
KQ2504696-04	Chlorophyll A	MB		Water	0.00 mg/m ³	2000 mL	0.80 mg/m ³	U 1	0.30	0.80			3/22/25 13:38:00	N	IV
KQ2504696-05	Chlorophyll A	MB		Water	10.68 mg/m ³	2000 mL	0.80 mg/m ³	U 1	0.30	0.80			3/22/25 13:38:00	N	IV
KQ2504696-06	Chlorophyll A	MB		Water	5.34 mg/m ³	2000 mL	0.80 mg/m ³	U 1	0.30	0.80			3/22/25 13:38:00	N	IV
KQ2504697-01	Pheophytin A	LCS		Water	513.00 mg/m ³	2000 mL	513 mg/m ³	1		0.80	101		3/22/25 13:38:00	N	IV
KQ2504697-02	Pheophytin A	DLCS		Water	513.00 mg/m ³	2000 mL	513 mg/m ³	1		0.80	101	<1	3/22/25 13:38:00	N	IV
KQ2504697-03	Pheophytin A	MB		Water	-0.44 mg/m ³	2000 mL	0.80 mg/m ³	U 1		0.80			3/22/25 13:38:00	N	IV
KQ2504697-04	Pheophytin A	MB		Water	-0.30 mg/m ³	2000 mL	0.80 mg/m ³	U 1		0.80			3/22/25 13:38:00	N	IV
KQ2504697-05	Pheophytin A	MB		Water	-0.48 mg/m ³	2000 mL	0.80 mg/m ³	U 1		0.80			3/22/25 13:38:00	N	IV
KQ2504697-06	Pheophytin A	MB		Water	-0.39 mg/m ³	2000 mL	0.80 mg/m ³	U 1		0.80			3/22/25 13:38:00	N	IV

indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

Printed 3/25/25 15:25 3/25/25 JS

Results Summary

Page 1 of 1

Service Request #: K2502739 & K2502908

Method: SM 10200 H (spectrophotometric)

Inst. Tape

Analysis For: Chlorophyll-a

Sample Number	Sample Volume			Acidified		Ext. Vol. mls	In solution mg/m ³ Chl-a	Reported mg/m ³ Chl-a	Reported mg/m ³ Pheo-a
		664 nm	750 nm	665 nm	750 nm				
LCS	-	0.2000	0.0010	0.1050	0.0020	-	512.64	513	
DLCS	-	0.2010	0.0010	0.1050	0.0010	-	512.64	513	
MB 1	2000	0.0010	0.0080	0.0000	0.0090	20	10.68	0.11	-0.44
MB 2	2000	0.0000	0.0080	0.0000	0.0080	20	0.00	0.00	-0.30
MB 3	2000	0.0000	0.0080	-0.0010	0.0090	20	10.68	0.11	-0.48
MB 4	2000	0.0000	0.0080	-0.0010	0.0080	20	5.34	0.05	-0.39
K2502739-1	1057	0.1060	0.0090	0.0900	0.0100	20	90.78	1.72	3.94
K2502739-2	1053	0.4170	0.0100	0.3520	0.0110	20	352.44	6.69	17.52
K2502908-1	1056	0.2140	0.0090	0.1810	0.0100	20	181.56	3.44	8.67
K2502908-2	1035	0.1900	0.0100	0.1620	0.0100	20	149.52	2.89	8.09
K2502908-3	1059	0.1880	0.0100	0.1610	0.0100	20	144.180	2.7	7.9
K2502908-4	1056	0.104	0.010	0.088	0.010	20	85.440	1.6	3.9
K2502908-5	1042	0.054	0.010	0.044	0.010	20	53.400	1.0	1.4
						20	0.000	#DIV/0!	#DIV/0!
						20	0.000	#DIV/0!	#DIV/0!
						20	0.000	#DIV/0!	#DIV/0!
						20	0.000	#DIV/0!	#DIV/0!

$$\text{Chlorophyll-a} = \frac{26,700 ((\text{OD } 664\text{b} - \text{OD } 750\text{b}) - (\text{OD } 665\text{a} - \text{OD } 750\text{a})) \times V_1}{L \times V_2}$$

$$\text{Pheophytin-a} = \frac{26,700 [(1.7(\text{OD } 665\text{a} - \text{OD } 750\text{a}) - (\text{OD } 664\text{b} - \text{OD } 750\text{b}))] \times V_1}{L \times V_2}$$

 V_1 = Volume of extract (ml) V_2 = Volume of sample (ml) L = Length of lightpath or width of cuvette (5 cm)

$$\text{LCS} = 26700 ((\text{OD } 664\text{b} - \text{OD } 750\text{b}) - (\text{OD } 665\text{a} - \text{OD } 750\text{a})) = 508.635$$

$$\text{ID \# : 24-GEN-04-24-I} \quad \text{TV} = 508.635 \text{ mg/m}^3 \quad \text{AVG} = 508.635 \text{ mg/m}^3$$

Run# 873868

Pipette ID#: Tealy, TOC-Morpheus

Equip.ID#:K-UV-VIS-06

Analyzed By: JS	Date: 3/22/2025	13:38
Reviewed By: MRL	Date: 03/26/25	

ALS Environmental

Kelso

Run# 873868

ChlorophyllA_3_22_2025_1:15PM

1 / 3

22-Mar-2025 01:57 PM

Instrument Serial #: 9A5A166041

Method name: Chlorophyll a

Instrument model: GENESYS 150

Method created: 13-May-2023 06:14 AM

Software Package Version: 2.6

Signature: JS

Method updated: 13-May-2023 06:14 AM

Multi-Wavelength: method parameters						
Result: ABS						
Wavelength table						
$\lambda 1$	$\lambda 2$	$\lambda 3$				
750.0	664.0	665.0				
LCS 1 1						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.001	0.200	0.190				
LCS 1 A 1						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.002	0.106	0.105				
LCS 2 1 DUS 1 JS 3/25/25						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.001	0.201	0.191				
LCS 2 A 1 DUS A 1 3/25/25						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.001	0.106	0.105				
MB 1 1						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.008	0.001	0.000				
MB 1 A 1						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.009	0.000	0.000				
MB 2 1						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.008	0.000	0.000				
MB 2 A 1						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.008	0.000	0.000				
MB 3 1						

ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	0.000	-0.001			
MB 3 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.009	0.000	-0.001			
MB 4 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	0.000	-0.001			
MB 4 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	0.000	-0.001			
2739-1 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.009	0.106	0.104			
2739-1 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.010	0.092	0.090			
2739-2 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.010	0.417	0.407			
2739-2 2 2739-2 A 1 to 2/18/18					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.011	0.358	0.352			
2908-1 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.009	0.214	0.211			
2908-1 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.010	0.183	0.181			
2908-2 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.010	0.190	0.187			
2908-2 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.010	0.164	0.162			
2908-3 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.010	0.188	0.186			
2908-3 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			

0.010	0.162	0.161				
2908-4 1						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.010	0.104	0.102				
2908-4 A 1						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.010	0.089	0.088				
2908-5 1						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.010	0.054	0.053				
2908-5 A 1						
ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.010	0.045	0.044				

Work Order #: _____ Method: _____

Analysis: _____ Matrix: _____

Sample Name Lab Code	Total Vol.	TIME
MB 1	2000	1016
K2739-1	1057	1020
✓ -2	1053	1025
MB 2	2000	1036

Extraction: 1058 - 1259
Centrifuge 1301 - 1332

#1 acid past hold

Whatman GF/C micro fiber filters 42.5mm Lot # 17047894

Prepared By: A Cheater	Date Prepared: 3-15-25
Analyzed By: J-S	Date Analyzed: 3-22-25
Reviewed By: MRL	Date Reviewed: 03/26/25

Work Order #: _____ Method: _____

Analysis: _____ Matrix: _____

Sample Name Lab Code	Total Vol.	TIME
MB 8	2000	1146
K2908-1	1054	1149
-2	1035	1203
-3	1059	1213
-4	1056	1222
-5	1042	1231
MB 9	2000	1240

Extraction: 1058-1259

Centrifuge: 1301-1332

Whatman GF/C micro fiber filters 42.5mm Lot #17047894

Prepared By: A Chatley	Date Prepared: 3-20-25
Analyzed By: JS	Date Analyzed: 3-22-25
Reviewed By: MRL	Date Reviewed: 03/26/25

Preparation Information Benchsheet

Run# 873868

Prep Run#: 454263

Team: GenChem/JSANCHEZ

Prep Workflow: GenExtChlA48Hrs

Prep Method:

Status: Prepped

Prep Date/Time: 3/15/25 10:16

Number of Copies to make: 2

#	Lab Code	Client ID	B#	Method /Test	pH	Matrix	Amt. Ext.	Final Vol	Sample Description
1	KQ2504696-01	LCS		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
2	KQ2504696-02	DLCS		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
3	KQ2504696-03	MB		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
4	KQ2504696-04	MB		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
5	KQ2504696-05	MB		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
6	KQ2504696-06	MB		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
7	K2502739-001	Pattinson N	.01	SM 10200 H/Chlorophylla UF		Water	1057.0000mL	20.00mL	
8	K2502739-002	Pattinson S	.01	SM 10200 H/Chlorophylla UF		Water	1053.0000mL	20.00mL	
9	K2502908-001	Lawrence 1	.01	SM 10200 H/Chlorophylla UF		Water	1056.0000mL	20.00mL	
10	K2502908-002	Lawrence 1 QA	.01	SM 10200 H/Chlorophylla UF		Water	1035.0000mL	20.00mL	
11	K2502908-003	Lawrence 2	.01	SM 10200 H/Chlorophylla UF		Water	1059.0000mL	20.00mL	
12	K2502908-004	Lawrence 2 QA	.01	SM 10200 H/Chlorophylla UF		Water	1056.0000mL	20.00mL	
13	K2502908-005	Summit	.01	SM 10200 H/Chlorophylla UF		Water	1042.0000mL	20.00mL	

Spiking Solutions

Name: Chlorophyll-a LCS	Inventory ID 240605	Logbook Ref: 24-GEN-04-24-I	Expires On: 04/05/2025

KQ2504696-01 20.00mL

KQ2504696-02 20.00mL

Preparation Steps

Step: Centrifuge

Step: Extraction

Step: Filter

Started: 3/15/25 10:16

Started: 3/22/25 10:58

Started: 3/15/25 10:16

Finished: 3/20/25 12:31

Finished: 3/22/25 12:59

Finished: 3/20/25 12:31

By: JSANCHEZ

By: JSANCHEZ

By: JSANCHEZ

Comments

Filter time was inputted as centrifuge time

Comments

Comments:

Reviewed By:

MEL

Date:

03/26/25

Chain of Custody

Relinquished By:

Date:

Extracts Examined

Received By:

Date:

Yes No

Preparation Information Benchsheet

Prep Run#: 454264

Team: GenChem/JSANCHEZ

Number of Copies to make: 2

Prep Workflow: GenExtChlA8Hrec

Prep Method: Method

Run# 873868

Status: Prepped

Prep Date/Time: 3/22/25 13:01

#	Lab Code	Client ID	B#	Method /Test	pH	Matrix	Amt. Ext.	Final Vol	Sample Description
1	KQ2504697-01	LCS		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
2	KQ2504697-02	DLCS		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
3	KQ2504697-03	MB		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
4	KQ2504697-04	MB		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
5	KQ2504697-05	MB		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
6	KQ2504697-06	MB		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
7	K2502739-001	Pattinson N	.01	SM 10200 H/Pheophytin A NF		Water	1057.0000mL	20.00mL	
8	K2502739-002	Pattinson S	.01	SM 10200 H/Pheophytin A NF		Water	1053.0000mL	20.00mL	
9	K2502908-001	Lawrence 1	.01	SM 10200 H/Pheophytin A NF		Water	1056.0000mL	20.00mL	
10	K2502908-002	Lawrence 1 QA	.01	SM 10200 H/Pheophytin A NF		Water	1035.0000mL	20.00mL	
11	K2502908-003	Lawrence 2	.01	SM 10200 H/Pheophytin A NF		Water	1059.0000mL	20.00mL	
12	K2502908-004	Lawrence 2 QA	.01	SM 10200 H/Pheophytin A NF		Water	1056.0000mL	20.00mL	
13	K2502908-005	Summit	.01	SM 10200 H/Pheophytin A NF		Water	1042.0000mL	20.00mL	

Spiking Solutions

Name: Chlorophyll-a LCS Pheophytin	Inventory ID 240606	Logbook Ref: 24-GEN-04-24-I	Expires On: 04/05/2025

KQ2504697-01 20.00mL

KQ2504697-02 20.00mL

Preparation Steps

Step: Centrifuge

Started: 3/22/25 13:01

Finished: 3/22/25 13:32

By: JSANCHEZ

Comments

Step: Extraction

Started: 3/22/25 10:58

Finished: 3/22/25 12:59

By: JSANCHEZ

Comments

Step: Filter

Started: 3/15/25 10:16

Finished: 3/20/25 12:40

By: JSANCHEZ

Comments

Comments:

Reviewed By: MRL Date: 03/26/25

Chain of Custody

Relinquished By: _____	Date: _____	Extracts Examined
Received By: _____	Date: _____	Yes No

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com



***Professional
Analytical
Services***

April 16, 2025

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN

Project: Lakes
Project Number: 40667
COC Number: A25C0622

JOHN HABERLIN:

Enclosed please find the analytical data for your Lakes project.

Your sample(s) were received on Friday, March 28, 2025 and properly maintained prior to the subsequent analysis. The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA, Standard Methods or the Army Corps of Engineers.

Following the analytical results you will find the Quality Control (QA/QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Practical Quantitation Limits (PQL's), as opposed to the Method Detection Limits (MDL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Aaron Young". The signature is written in a cursive, flowing style.

Aaron Young
President
aarony@amtestlab.com

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Date Received: 03/28/25
Date Reported: 04/16/25

Reported Samples

Lab ID	Sample	Matrix	Qualifiers	Date Sampled	Date Received
A25C0622-01	Schneider T	Water		03/03/2025	03/28/2025
A25C0622-02	Schneider T QA	Water		03/03/2025	03/28/2025
A25C0622-03	Kennedy	Water		03/03/2025	03/28/2025
A25C0622-04	Schneider Head	Water		03/03/2025	03/28/2025
A25C0622-05	McLane	Water		03/03/2025	03/28/2025
A25C0622-06	Black Lake Ditch	Water		03/03/2025	03/28/2025
A25C0622-07	Black Lake Ditch QA	Water		03/03/2025	03/28/2025
A25C0622-08	Yelm Creek @ 123rd	Water		03/04/2025	03/28/2025
A25C0622-09	Deschutes Falls	Water		03/04/2025	03/28/2025
A25C0622-10	Tobolton @ Peissner	Water		03/04/2025	03/28/2025
A25C0622-11	Lackamas @ Bald Hill	Water		03/04/2025	03/28/2025
A25C0622-12	Lackamas @ Bald Hill QA	Water		03/04/2025	03/28/2025
A25C0622-13	Deschutes @ Vail	Water		03/04/2025	03/28/2025
A25C0622-14	Reichel	Water		03/04/2025	03/28/2025
A25C0622-15	Deschutes @ Waldrick	Water		03/04/2025	03/28/2025
A25C0622-16	Spurgeon @ Rich	Water		03/04/2025	03/28/2025
A25C0622-17	Spurgeon @ Rich QA	Water		03/04/2025	03/28/2025
A25C0622-18	Deschutes @ Tumwater	Water		03/04/2025	03/28/2025
A25C0622-19	Indian Mouth	Water		03/04/2025	03/28/2025
A25C0622-20	Salmon	Water		03/18/2025	03/28/2025
A25C0622-21	Bloom Ditch @ 110th	Water		03/18/2025	03/28/2025
A25C0622-22	Black @ 128th	Water		03/18/2025	03/28/2025
A25C0622-23	Beaver @ LR	Water		03/18/2025	03/28/2025
A25C0622-24	Black @ Moon	Water		03/18/2025	03/28/2025
A25C0622-25	Chehalis	Water		03/18/2025	03/28/2025
A25C0622-26	Scatter @ James	Water		03/18/2025	03/28/2025
A25C0622-27	Scatter @ James QA	Water		03/18/2025	03/28/2025
A25C0622-28	Prairie	Water		03/18/2025	03/28/2025
A25C0622-29	Skookumchuck	Water		03/18/2025	03/28/2025
A25C0622-30	Scatter @ Gibson	Water		03/18/2025	03/28/2025
A25C0622-31	Scatter @ Churchill	Water		03/18/2025	03/28/2025
A25C0622-32	Allen @ Maytown	Water		03/18/2025	03/28/2025
A25C0622-33	Allen @ Scott	Water		03/18/2025	03/28/2025
A25C0622-34	Salmon @ Case	Water		03/18/2025	03/28/2025
A25C0622-35	Salmon @ Case QA	Water		03/18/2025	03/28/2025
A25C0622-36	Eaton	Water		03/26/2025	03/28/2025



ANALYSIS REPORT

Date Received: 03/28/25
Date Reported: 04/16/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

A25C0622-37	Thompson	Water	03/26/2025	03/28/2025
A25C0622-38	McAllister @ 1-5	Water	03/26/2025	03/28/2025
A25C0622-39	Moxlie @ Union	Water	03/26/2025	03/28/2025
A25C0622-40	Woodland @ Draham	Water	03/27/2025	03/28/2025
A25C0622-41	Woodland @ PG	Water	03/27/2025	03/28/2025
A25C0622-42	Dobbs @ CC	Water	03/27/2025	03/28/2025
A25C0622-43	Woodard @Libby	Water	03/27/2025	03/28/2025
A25C0622-44	Pattison N Surface	Water	03/13/2025	03/28/2025
A25C0622-45	Pattison N Bottom	Water	03/13/2025	03/28/2025
A25C0622-46	Pattison S Surface	Water	03/13/2025	03/28/2025
A25C0622-47	Pattison S Bottom	Water	03/13/2025	03/28/2025
A25C0622-48	Lawrence 1 Surface	Water	03/19/2025	03/28/2025
A25C0622-49	Lawrence 1 Surface QA	Water	03/19/2025	03/28/2025
A25C0622-50	Lawrence 1 Bottom	Water	03/19/2025	03/28/2025
A25C0622-51	Lawrence 1 Bottom QA	Water	03/19/2025	03/28/2025
A25C0622-52	Lawrence 2 Surface	Water	03/19/2025	03/28/2025
A25C0622-53	Lawrence 2 Surface QA	Water	03/19/2025	03/28/2025
A25C0622-54	Lawrence 2 Bottom	Water	03/19/2025	03/28/2025
A25C0622-55	Lawrence 2 Bottom QA	Water	03/19/2025	03/28/2025
A25C0622-56	Summit Surface	Water	03/19/2025	03/28/2025
A25C0622-57	Summit Bottom	Water	03/19/2025	03/28/2025

ANALYSIS REPORT

Date Received: 03/28/25
Date Reported: 04/16/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0622-01

Client Identification: Schneider T

Sampling Date: 03/03/25 10:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.213	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.026	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-02

Client Identification: Schneider T QA

Sampling Date: 03/03/25 10:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.213	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.027	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-03

Client Identification: Kennedy

Sampling Date: 03/03/25 11:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.436	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.021	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-04

Client Identification: Schneider Head

Sampling Date: 03/03/25 12:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.061	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.018	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025



ANALYSIS REPORT

Date Received: 03/28/25
Date Reported: 04/16/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0622-05
Client Identification: McLane
Sampling Date: 03/03/25 12:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.366	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.021	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-06
Client Identification: Black Lake Ditch
Sampling Date: 03/03/25 14:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.224	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.031	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-07
Client Identification: Black Lake Ditch QA
Sampling Date: 03/03/25 14:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.221	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.019	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-08
Client Identification: Yelm Creek @ 123rd
Sampling Date: 03/04/25 09:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.242	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.075	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

ANALYSIS REPORT

Date Received: 03/28/25
Date Reported: 04/16/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0622-09

Client Identification: Deschutes Falls

Sampling Date: 03/04/25 10:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.195	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.018	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-10

Client Identification: Tobolton @ Peissner

Sampling Date: 03/04/25 10:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.046	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.041	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-11

Client Identification: Lackamas @ Bald Hill

Sampling Date: 03/04/25 11:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.39	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.166	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-12

Client Identification: Lackamas @ Bald Hill QA

Sampling Date: 03/04/25 11:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.39	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.161	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

ANALYSIS REPORT

Date Received: 03/28/25
Date Reported: 04/16/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0622-13

Client Identification: Deschutes @ Vail

Sampling Date: 03/04/25 11:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.460	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.037	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-14

Client Identification: Reichel

Sampling Date: 03/04/25 12:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.487	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.040	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-15

Client Identification: Deschutes @ Waldrick

Sampling Date: 03/04/25 13:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.613	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.031	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-16

Client Identification: Spurgeon @ Rich

Sampling Date: 03/04/25 13:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.217	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.030	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

ANALYSIS REPORT

Date Received: 03/28/25
Date Reported: 04/16/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0622-17

Client Identification: Spurgeon @ Rich QA

Sampling Date: 03/04/25 13:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.213	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.026	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-18

Client Identification: Deschutes @ Tumwater

Sampling Date: 03/04/25 13:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.660	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.034	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-19

Client Identification: Indian Mouth

Sampling Date: 03/04/25 14:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.726	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.077	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-20

Client Identification: Salmon

Sampling Date: 03/18/25 08:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.084	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.018	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

ANALYSIS REPORT

Date Received: 03/28/25
Date Reported: 04/16/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0622-21

Client Identification: Bloom Ditch @ 110th

Sampling Date: 03/18/25 08:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.074	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.033	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-22

Client Identification: Black @ 128th

Sampling Date: 03/18/25 08:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.185	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.019	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-23

Client Identification: Beaver @ LR

Sampling Date: 03/18/25 09:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.329	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.025	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-24

Client Identification: Black @ Moon

Sampling Date: 03/18/25 09:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.461	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.026	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025



ANALYSIS REPORT

Date Received: 03/28/25
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Thurston County Environmental Health
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Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0622-25
Client Identification: Chehalis
Sampling Date: 03/18/25 10:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.539	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.035	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-26
Client Identification: Scatter @ James
Sampling Date: 03/18/25 10:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.603	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.024	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-27
Client Identification: Scatter @ James QA
Sampling Date: 03/18/25 10:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.601	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.024	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-28
Client Identification: Prairie
Sampling Date: 03/18/25 10:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.448	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.020	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025



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Date Received: 03/28/25
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Thurston County Environmental Health
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Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0622-29
Client Identification: Skookumchuck
Sampling Date: 03/18/25 12:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.683	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.029	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-30
Client Identification: Scatter @ Gibson
Sampling Date: 03/18/25 12:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.497	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.029	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-31
Client Identification: Scatter @ Churchill
Sampling Date: 03/18/25 13:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.546	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.039	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-32
Client Identification: Allen @ Maytown
Sampling Date: 03/18/25 13:35

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.152	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.028	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025



ANALYSIS REPORT

Date Received: 03/28/25
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Thurston County Environmental Health
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Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0622-33
Client Identification: Allen @ Scott
Sampling Date: 03/18/25 13:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.273	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.022	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-34
Client Identification: Salmon @ Case
Sampling Date: 03/18/25 13:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.395	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.027	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-35
Client Identification: Salmon @ Case QA
Sampling Date: 03/18/25 13:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.397	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.023	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-36
Client Identification: Eaton
Sampling Date: 03/26/25 10:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.402	mg/L	D	0.200	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.057	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

ANALYSIS REPORT

Date Received: 03/28/25
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Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0622-37

Client Identification: Thompson

Sampling Date: 03/26/25 10:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	2.40	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.028	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-38

Client Identification: McAllister @ 1-5

Sampling Date: 03/26/25 11:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.34	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.176	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-39

Client Identification: Moxlie @ Union

Sampling Date: 03/26/25 12:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.536	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.101	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-40

Client Identification: Woodland @ Draham

Sampling Date: 03/27/25 10:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.963	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.057	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

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Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0622-41
Client Identification: Woodland @ PG
Sampling Date: 03/27/25 10:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.880	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.059	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-42
Client Identification: Dobbs @ CC
Sampling Date: 03/27/25 10:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.110	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.044	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-43
Client Identification: Woodard @Libby
Sampling Date: 03/27/25 11:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.295	mg/L		0.020	EPA 353.2_2_1993	MF	04/07/2025
Total Phosphorus (TP)	0.038	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

ANALYSIS REPORT

Date Received: 03/28/25
Date Reported: 04/16/25

Thurston County Environmental Health

412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0622-44

Client Identification: Pattison N Surface

Sampling Date: 03/13/25 10:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Ammonia	0.023	mg/L		0.020	EPA 350.1_2_1993	MF	04/09/2025
Total Nitrate + Nitrite	1.10	mg/L		0.020	EPA 353.2_2_1993	MF	04/08/2025
Total Kjeldahl Nitrogen	0.65	mg/L		0.25	EPA 351.2_2_1993	AE	04/14/2025
Total Nitrogen	1.75	mg/L			Calculated	LF	04/14/2025
Total Phosphorus (TP)	0.041	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-45

Client Identification: Pattison N Bottom

Sampling Date: 03/13/25 10:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Ammonia	0.075	mg/L		0.020	EPA 350.1_2_1993	MF	04/09/2025
Total Nitrate + Nitrite	0.974	mg/L		0.020	EPA 353.2_2_1993	MF	04/08/2025
Total Kjeldahl Nitrogen	0.74	mg/L		0.25	EPA 351.2_2_1993	AE	04/14/2025
Total Nitrogen	1.71	mg/L			Calculated	LF	04/14/2025
Total Phosphorus (TP)	0.053	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-46

Client Identification: Pattison S Surface

Sampling Date: 03/13/25 10:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Ammonia	0.025	mg/L		0.020	EPA 350.1_2_1993	MF	04/09/2025
Total Nitrate + Nitrite	0.354	mg/L		0.020	EPA 353.2_2_1993	MF	04/08/2025
Total Kjeldahl Nitrogen	0.63	mg/L		0.25	EPA 351.2_2_1993	AE	04/14/2025
Total Nitrogen	0.988	mg/L			Calculated	LF	04/14/2025
Total Phosphorus (TP)	0.026	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

ANALYSIS REPORT

Date Received: 03/28/25
Date Reported: 04/16/25

Thurston County Environmental Health

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Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0622-47

Client Identification: Pattison S Bottom

Sampling Date: 03/13/25 10:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Ammonia	0.040	mg/L		0.020	EPA 350.1_2_1993	MF	04/09/2025
Total Nitrate + Nitrite	0.518	mg/L		0.020	EPA 353.2_2_1993	MF	04/08/2025
Total Kjeldahl Nitrogen	0.73	mg/L		0.25	EPA 351.2_2_1993	AE	04/14/2025
Total Nitrogen	1.25	mg/L			Calculated	LF	04/14/2025
Total Phosphorus (TP)	0.027	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-48

Client Identification: Lawrence 1 Surface

Sampling Date: 03/19/25 09:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Ammonia	0.289	mg/L		0.020	EPA 350.1_2_1993	MF	04/09/2025
Total Nitrate + Nitrite	0.049	mg/L		0.020	EPA 353.2_2_1993	MF	04/08/2025
Total Kjeldahl Nitrogen	1.33	mg/L		0.25	EPA 351.2_2_1993	AE	04/14/2025
Total Nitrogen	1.37	mg/L			Calculated	LF	04/14/2025
Total Phosphorus (TP)	0.031	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-49

Client Identification: Lawrence 1 Surface QA

Sampling Date: 03/19/25 09:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Ammonia	0.287	mg/L		0.020	EPA 350.1_2_1993	MF	04/09/2025
Total Nitrate + Nitrite	0.046	mg/L		0.020	EPA 353.2_2_1993	MF	04/08/2025
Total Kjeldahl Nitrogen	1.52	mg/L		0.25	EPA 351.2_2_1993	AE	04/14/2025
Total Nitrogen	1.56	mg/L			Calculated	LF	04/14/2025
Total Phosphorus (TP)	0.039	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

ANALYSIS REPORT

Date Received: 03/28/25
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Thurston County Environmental Health

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Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0622-50

Client Identification: Lawrence 1 Bottom

Sampling Date: 03/19/25 09:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Ammonia	0.299	mg/L		0.020	EPA 350.1_2_1993	MF	04/09/2025
Total Nitrate + Nitrite	0.038	mg/L		0.020	EPA 353.2_2_1993	MF	04/08/2025
Total Kjeldahl Nitrogen	1.29	mg/L		0.25	EPA 351.2_2_1993	AE	04/14/2025
Total Nitrogen	1.33	mg/L			Calculated	LF	04/14/2025
Total Phosphorus (TP)	0.035	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-51

Client Identification: Lawrence 1 Bottom QA

Sampling Date: 03/19/25 09:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Ammonia	0.301	mg/L		0.020	EPA 350.1_2_1993	MF	04/09/2025
Total Nitrate + Nitrite	0.037	mg/L		0.020	EPA 353.2_2_1993	MF	04/08/2025
Total Kjeldahl Nitrogen	1.28	mg/L		0.25	EPA 351.2_2_1993	AE	04/14/2025
Total Nitrogen	1.31	mg/L			Calculated	LF	04/14/2025
Total Phosphorus (TP)	0.033	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-52

Client Identification: Lawrence 2 Surface

Sampling Date: 03/19/25 09:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Ammonia	0.247	mg/L		0.020	EPA 350.1_2_1993	MF	04/09/2025
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	MF	04/08/2025
Total Kjeldahl Nitrogen	1.25	mg/L		0.25	EPA 351.2_2_1993	AE	04/14/2025
Total Nitrogen	1.27	mg/L			Calculated	LF	04/14/2025
Total Phosphorus (TP)	0.027	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025



ANALYSIS REPORT

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Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0622-53
Client Identification: Lawrence 2 Surface QA
Sampling Date: 03/19/25 09:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Ammonia	0.256	mg/L		0.020	EPA 350.1_2_1993	MF	04/09/2025
Total Nitrate + Nitrite	0.101	mg/L		0.020	EPA 353.2_2_1993	MF	04/08/2025
Total Kjeldahl Nitrogen	1.36	mg/L		0.25	EPA 351.2_2_1993	AE	04/14/2025
Total Nitrogen	1.46	mg/L			Calculated	LF	04/14/2025
Total Phosphorus (TP)	0.027	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-54
Client Identification: Lawrence 2 Bottom
Sampling Date: 03/19/25 09:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Ammonia	0.262	mg/L		0.020	EPA 350.1_2_1993	MF	04/09/2025
Total Nitrate + Nitrite	0.107	mg/L		0.020	EPA 353.2_2_1993	MF	04/08/2025
Total Kjeldahl Nitrogen	1.23	mg/L		0.25	EPA 351.2_2_1993	AE	04/14/2025
Total Nitrogen	1.34	mg/L			Calculated	LF	04/14/2025
Total Phosphorus (TP)	0.029	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-55
Client Identification: Lawrence 2 Bottom QA
Sampling Date: 03/19/25 09:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Ammonia	0.258	mg/L		0.020	EPA 350.1_2_1993	MF	04/09/2025
Total Nitrate + Nitrite	0.097	mg/L		0.020	EPA 353.2_2_1993	MF	04/08/2025
Total Kjeldahl Nitrogen	1.31	mg/L		0.25	EPA 351.2_2_1993	AE	04/14/2025
Total Nitrogen	1.40	mg/L			Calculated	LF	04/14/2025
Total Phosphorus (TP)	0.028	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

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Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0622-56
Client Identification: Summit Surface
Sampling Date: 03/19/25 11:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Ammonia	ND	mg/L	U	0.020	EPA 350.1_2_1993	MF	04/09/2025
Total Nitrate + Nitrite	0.023	mg/L		0.020	EPA 353.2_2_1993	MF	04/08/2025
Total Kjeldahl Nitrogen	0.62	mg/L		0.25	EPA 351.2_2_1993	AE	04/14/2025
Total Nitrogen	0.646	mg/L			Calculated	LF	04/14/2025
Total Phosphorus (TP)	0.009	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025

AMTEST Identification Number: A25C0622-57
Client Identification: Summit Bottom
Sampling Date: 03/19/25 11:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Ammonia	0.021	mg/L		0.020	EPA 350.1_2_1993	MF	04/09/2025
Total Nitrate + Nitrite	0.060	mg/L		0.020	EPA 353.2_2_1993	LF	04/15/2025
Total Kjeldahl Nitrogen	0.61	mg/L		0.25	EPA 351.2_2_1993	AE	04/14/2025
Total Nitrogen	0.672	mg/L			Calculated	LF	04/14/2025
Total Phosphorus (TP)	0.009	mg/L		0.005	SM 4500-P F_2011	MF	04/04/2025



ANALYSIS REPORT

Date Received: 03/28/25
Date Reported: 04/16/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Quality Control

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCC0486 - No Prep - WetChem										
Blank (BCC0486-BLK1)					Prepared: 04/03/25 Analyzed: 04/04/25					
Total Phosphorus (TP)	ND	U, J	0.005	mg/L						
Blank (BCC0486-BLK2)					Prepared: 04/03/25 Analyzed: 04/04/25					
Total Phosphorus (TP)	ND	U, J	0.005	mg/L						
Blank (BCC0486-BLK3)					Prepared: 04/03/25 Analyzed: 04/04/25					
Total Phosphorus (TP)	ND	U, J	0.005	mg/L						
Blank (BCC0486-BLK4)					Prepared: 04/03/25 Analyzed: 04/04/25					
Total Phosphorus (TP)	ND	U, J	0.005	mg/L						
LCS (BCC0486-BS1)					Prepared: 04/03/25 Analyzed: 04/04/25					
Total Phosphorus (TP)	0.102		0.005	mg/L	0.1000		102%	90-110%		
LCS (BCC0486-BS2)					Prepared: 04/03/25 Analyzed: 04/04/25					
Total Phosphorus (TP)	0.105		0.005	mg/L	0.1000		105%	90-110%		
LCS (BCC0486-BS3)					Prepared: 04/03/25 Analyzed: 04/04/25					
Total Phosphorus (TP)	0.104		0.005	mg/L	0.1000		104%	90-110%		
LCS (BCC0486-BS4)					Prepared: 04/03/25 Analyzed: 04/04/25					
Total Phosphorus (TP)	0.105		0.005	mg/L	0.1000		105%	90-110%		
Calibration Blank (BCC0486-CCB1)					Prepared: 04/03/25 Analyzed: 04/04/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BCC0486-CCB2)					Prepared: 04/03/25 Analyzed: 04/04/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BCC0486-CCB3)					Prepared: 04/03/25 Analyzed: 04/04/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BCC0486-CCB4)					Prepared: 04/03/25 Analyzed: 04/04/25					
Total Phosphorus (TP)	0.003			mg/L						
Calibration Blank (BCC0486-CCB5)					Prepared: 04/03/25 Analyzed: 04/04/25					
Total Phosphorus (TP)	0.004			mg/L						

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
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Date Received: 03/28/25
Date Reported: 04/16/25

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCC0486 - No Prep - WetChem (Continued)

Calibration Blank (BCC0486-CCB6)

Prepared: 04/03/25 Analyzed: 04/04/25

Total Phosphorus (TP) 0.004 mg/L

Calibration Blank (BCC0486-CCB7)

Prepared: 04/03/25 Analyzed: 04/04/25

Total Phosphorus (TP) 0.004 mg/L

Calibration Blank (BCC0486-CCB8)

Prepared: 04/03/25 Analyzed: 04/04/25

Total Phosphorus (TP) 0.003 mg/L

Calibration Check (BCC0486-CCV1)

Prepared: 04/03/25 Analyzed: 04/04/25

Total Phosphorus (TP) 0.204 0.005 mg/L 0.2000 102% 85-115%

Calibration Check (BCC0486-CCV2)

Prepared: 04/03/25 Analyzed: 04/04/25

Total Phosphorus (TP) 0.207 0.005 mg/L 0.2000 104% 85-115%

Calibration Check (BCC0486-CCV3)

Prepared: 04/03/25 Analyzed: 04/04/25

Total Phosphorus (TP) 0.206 0.005 mg/L 0.2000 103% 85-115%

Calibration Check (BCC0486-CCV4)

Prepared: 04/03/25 Analyzed: 04/04/25

Total Phosphorus (TP) 0.207 0.005 mg/L 0.2000 103% 85-115%

Calibration Check (BCC0486-CCV5)

Prepared: 04/03/25 Analyzed: 04/04/25

Total Phosphorus (TP) 0.207 0.005 mg/L 0.2000 103% 85-115%

Calibration Check (BCC0486-CCV6)

Prepared: 04/03/25 Analyzed: 04/04/25

Total Phosphorus (TP) 0.208 0.005 mg/L 0.2000 104% 85-115%

Calibration Check (BCC0486-CCV7)

Prepared: 04/03/25 Analyzed: 04/04/25

Total Phosphorus (TP) 0.208 0.005 mg/L 0.2000 104% 85-115%

Calibration Check (BCC0486-CCV8)

Prepared: 04/03/25 Analyzed: 04/04/25

Total Phosphorus (TP) 0.210 0.005 mg/L 0.2000 105% 85-115%

Duplicate (BCC0486-DUP1)

Source: A25C0595-10

Prepared: 04/03/25 Analyzed: 04/04/25

Total Phosphorus (TP) 0.044 0.005 mg/L 0.044 0.4 22.3

Duplicate (BCC0486-DUP2)

Source: A25C0609-04

Prepared: 04/03/25 Analyzed: 04/04/25

Total Phosphorus (TP) 0.020 0.005 mg/L 0.021 4 22.3



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Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCC0486 - No Prep - WetChem (Continued)										
Duplicate (BCC0486-DUP3)	Source: A25C0622-09		Prepared: 04/03/25 Analyzed: 04/04/25							
Total Phosphorus (TP)	0.018		0.005	mg/L		0.018			2	22.3
Duplicate (BCC0486-DUP4)	Source: A25C0622-19		Prepared: 04/03/25 Analyzed: 04/04/25							
Total Phosphorus (TP)	0.080		0.005	mg/L		0.077			4	22.3
Duplicate (BCC0486-DUP5)	Source: A25C0622-29		Prepared: 04/03/25 Analyzed: 04/04/25							
Total Phosphorus (TP)	0.030		0.005	mg/L		0.029			3	22.3
Duplicate (BCC0486-DUP6)	Source: A25C0622-39		Prepared: 04/03/25 Analyzed: 04/04/25							
Total Phosphorus (TP)	0.103		0.005	mg/L		0.101			1	22.3
Duplicate (BCC0486-DUP7)	Source: A25C0622-49		Prepared: 04/03/25 Analyzed: 04/04/25							
Total Phosphorus (TP)	0.043		0.005	mg/L		0.039			9	22.3
Duplicate (BCC0486-DUP8)	Source: A25C0622-57		Prepared: 04/03/25 Analyzed: 04/04/25							
Total Phosphorus (TP)	0.010		0.005	mg/L		0.009			2	22.3
Matrix Spike (BCC0486-MS1)	Source: A25C0595-10		Prepared: 04/03/25 Analyzed: 04/04/25							
Total Phosphorus (TP)	0.250		0.005	mg/L	0.2000	0.044	103%	85-115%		
Matrix Spike (BCC0486-MS2)	Source: A25C0609-04		Prepared: 04/03/25 Analyzed: 04/04/25							
Total Phosphorus (TP)	0.227		0.005	mg/L	0.2000	0.021	103%	85-115%		
Matrix Spike (BCC0486-MS3)	Source: A25C0622-09		Prepared: 04/03/25 Analyzed: 04/04/25							
Total Phosphorus (TP)	0.220		0.005	mg/L	0.2000	0.018	101%	85-115%		
Matrix Spike (BCC0486-MS4)	Source: A25C0622-19		Prepared: 04/03/25 Analyzed: 04/04/25							
Total Phosphorus (TP)	0.292		0.005	mg/L	0.2000	0.077	107%	85-115%		
Matrix Spike (BCC0486-MS5)	Source: A25C0622-29		Prepared: 04/03/25 Analyzed: 04/04/25							
Total Phosphorus (TP)	0.239		0.005	mg/L	0.2000	0.029	105%	85-115%		
Matrix Spike (BCC0486-MS6)	Source: A25C0622-39		Prepared: 04/03/25 Analyzed: 04/04/25							
Total Phosphorus (TP)	0.318		0.005	mg/L	0.2000	0.101	108%	85-115%		
Matrix Spike (BCC0486-MS7)	Source: A25C0622-49		Prepared: 04/03/25 Analyzed: 04/04/25							
Total Phosphorus (TP)	0.253		0.005	mg/L	0.2000	0.039	107%	85-115%		



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Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCC0486 - No Prep - WetChem (Continued)

Matrix Spike (BCC0486-MS8)	Source: A25C0622-57		Prepared: 04/03/25 Analyzed: 04/04/25							
Total Phosphorus (TP)	0.217		0.005	mg/L	0.2000	0.009	104%	85-115%		

Batch: BCC0491 - No Prep - WetChem

Blank (BCC0491-BLK1)	Prepared: 03/31/25 Analyzed: 04/07/25									
Total Nitrate + Nitrite	ND	U	0.020	mg/L						

Blank (BCC0491-BLK2)	Prepared: 03/31/25 Analyzed: 04/07/25									
Total Nitrate + Nitrite	ND	U	0.020	mg/L						

Blank (BCC0491-BLK3)	Prepared: 03/31/25 Analyzed: 04/07/25									
Total Nitrate + Nitrite	ND	U	0.020	mg/L						

LCS (BCC0491-BS1)	Prepared: 03/31/25 Analyzed: 04/07/25									
Total Nitrate + Nitrite	0.516		0.020	mg/L	0.5000		103%	90-110%		

LCS (BCC0491-BS2)	Prepared: 03/31/25 Analyzed: 04/07/25									
Total Nitrate + Nitrite	0.519		0.020	mg/L	0.5000		104%	90-110%		

LCS (BCC0491-BS3)	Prepared: 03/31/25 Analyzed: 04/07/25									
Total Nitrate + Nitrite	0.523		0.020	mg/L	0.5000		105%	90-110%		

Calibration Blank (BCC0491-CCB1)	Prepared: 03/31/25 Analyzed: 04/07/25									
Total Nitrate + Nitrite	ND	U		mg/L						

Calibration Blank (BCC0491-CCB2)	Prepared: 03/31/25 Analyzed: 04/07/25									
Total Nitrate + Nitrite	ND	U		mg/L						

Calibration Blank (BCC0491-CCB3)	Prepared: 03/31/25 Analyzed: 04/07/25									
Total Nitrate + Nitrite	ND	U		mg/L						

Calibration Blank (BCC0491-CCB4)	Prepared: 03/31/25 Analyzed: 04/07/25									
Total Nitrate + Nitrite	ND	U		mg/L						

Calibration Blank (BCC0491-CCB5)	Prepared: 03/31/25 Analyzed: 04/07/25									
Total Nitrate + Nitrite	ND	U		mg/L						

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Thurston County Environmental Health

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Date Received: 03/28/25
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Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCC0491 - No Prep - WetChem (Continued)

Calibration Check (BCC0491-CCV1)

Prepared: 03/31/25 Analyzed: 04/07/25

Total Nitrate + Nitrite	1.01		0.020	mg/L	1.000		101%	85-115%		

Calibration Check (BCC0491-CCV2)

Prepared: 03/31/25 Analyzed: 04/07/25

Total Nitrate + Nitrite	0.981		0.020	mg/L	1.000		98%	85-115%		

Calibration Check (BCC0491-CCV3)

Prepared: 03/31/25 Analyzed: 04/07/25

Total Nitrate + Nitrite	0.992		0.020	mg/L	1.000		99%	85-115%		

Calibration Check (BCC0491-CCV4)

Prepared: 03/31/25 Analyzed: 04/07/25

Total Nitrate + Nitrite	0.971		0.020	mg/L	1.000		97%	85-115%		

Calibration Check (BCC0491-CCV5)

Prepared: 03/31/25 Analyzed: 04/07/25

Total Nitrate + Nitrite	1.00		0.020	mg/L	1.000		100%	85-115%		

Duplicate (BCC0491-DUP1)

Source: A25C0558-05

Prepared: 03/31/25 Analyzed: 04/07/25

Total Nitrate + Nitrite	0.353		0.020	mg/L		0.352			0.2	20

Duplicate (BCC0491-DUP2)

Source: A25C0559-07

Prepared: 03/31/25 Analyzed: 04/07/25

Total Nitrate + Nitrite	0.574		0.020	mg/L		0.573			0.2	20

Duplicate (BCC0491-DUP3)

Source: A25C0595-03

Prepared: 03/31/25 Analyzed: 04/07/25

Total Nitrate + Nitrite	4.29	D	0.200	mg/L		4.30			0.2	20

Duplicate (BCC0491-DUP4)

Source: A25C0622-02

Prepared: 03/31/25 Analyzed: 04/07/25

Total Nitrate + Nitrite	0.213		0.020	mg/L		0.213			0.1	20

Duplicate (BCC0491-DUP5)

Source: A25C0622-03

Prepared: 03/31/25 Analyzed: 04/07/25

Total Nitrate + Nitrite	0.441		0.020	mg/L		0.436			1	20

Matrix Spike (BCC0491-MS1)

Source: A25C0558-05

Prepared: 03/31/25 Analyzed: 04/07/25

Total Nitrate + Nitrite	1.32		0.020	mg/L	1.000	0.352	97%	85-115%		

Matrix Spike (BCC0491-MS2)

Source: A25C0559-07

Prepared: 03/31/25 Analyzed: 04/07/25

Total Nitrate + Nitrite	1.55		0.020	mg/L	1.000	0.573	98%	85-115%		

Matrix Spike (BCC0491-MS3)

Source: A25C0595-03

Prepared: 03/31/25 Analyzed: 04/07/25

Total Nitrate + Nitrite	14.4	D	0.200	mg/L	10.00	4.30	101%	85-115%		



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Project #: 40667

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCC0491 - No Prep - WetChem (Continued)

Matrix Spike (BCC0491-MS4)		Source: A25C0622-02		Prepared: 03/31/25 Analyzed: 04/07/25						
Total Nitrate + Nitrite	1.18		0.020	mg/L	1.000	0.213	96%	85-115%		
Matrix Spike (BCC0491-MS5)		Source: A25C0622-03		Prepared: 03/31/25 Analyzed: 04/07/25						
Total Nitrate + Nitrite	1.42		0.020	mg/L	1.000	0.436	98%	85-115%		

Batch: BCD0019 - No Prep - WetChem

Blank (BCD0019-BLK1)				Prepared: 04/11/25 Analyzed: 04/14/25						
Total Kjeldahl Nitrogen	ND	U	0.25	mg/L						
Blank (BCD0019-BLK2)				Prepared: 04/11/25 Analyzed: 04/14/25						
Total Kjeldahl Nitrogen	ND	U	0.25	mg/L						
LCS (BCD0019-BS1)				Prepared: 04/11/25 Analyzed: 04/14/25						
Total Kjeldahl Nitrogen	0.52		0.25	mg/L	0.5000		104%	85-115%		
LCS (BCD0019-BS2)				Prepared: 04/11/25 Analyzed: 04/14/25						
Total Kjeldahl Nitrogen	0.53		0.25	mg/L	0.5000		107%	85-115%		
Calibration Blank (BCD0019-CCB1)				Prepared: 04/11/25 Analyzed: 04/14/25						
Total Kjeldahl Nitrogen	0.01			mg/L						
Calibration Blank (BCD0019-CCB2)				Prepared: 04/11/25 Analyzed: 04/14/25						
Total Kjeldahl Nitrogen	0.01			mg/L						
Calibration Blank (BCD0019-CCB3)				Prepared: 04/11/25 Analyzed: 04/14/25						
Total Kjeldahl Nitrogen	0.01			mg/L						
Calibration Blank (BCD0019-CCB4)				Prepared: 04/11/25 Analyzed: 04/14/25						
Total Kjeldahl Nitrogen	0.009			mg/L						
Calibration Check (BCD0019-CCV1)				Prepared: 04/11/25 Analyzed: 04/14/25						
Total Kjeldahl Nitrogen	1.13		0.25	mg/L	1.000		113%	85-115%		
Calibration Check (BCD0019-CCV2)				Prepared: 04/11/25 Analyzed: 04/14/25						
Total Kjeldahl Nitrogen	1.12		0.25	mg/L	1.000		112%	85-115%		

ANALYSIS REPORT

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Thurston County Environmental Health
412 LILLY RD NE
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Project Name: Lakes
Project #: 40667

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCD0019 - No Prep - WetChem (Continued)

Calibration Check (BCD0019-CCV3)

Prepared: 04/11/25 Analyzed: 04/14/25

Total Kjeldahl Nitrogen	1.08		0.25	mg/L	1.000		108%	85-115%		

Calibration Check (BCD0019-CCV4)

Prepared: 04/11/25 Analyzed: 04/14/25

Total Kjeldahl Nitrogen	1.11		0.25	mg/L	1.000		111%	85-115%		

Duplicate (BCD0019-DUP1)

Source: A25C0622-49

Prepared: 04/11/25 Analyzed: 04/14/25

Total Kjeldahl Nitrogen	1.57		0.25	mg/L		1.52			3	25

Duplicate (BCD0019-DUP2)

Source: A25C0649-02

Prepared: 04/11/25 Analyzed: 04/14/25

Total Kjeldahl Nitrogen	0.65		0.25	mg/L		0.65			0.007	25

Duplicate (BCD0019-DUP3)

Source: A25D0020-07

Prepared: 04/11/25 Analyzed: 04/14/25

Total Kjeldahl Nitrogen	0.38		0.25	mg/L		0.35			7	25

Duplicate (BCD0019-DUP4)

Source: A25D0046-02

Prepared: 04/11/25 Analyzed: 04/14/25

Total Kjeldahl Nitrogen	27.6	D	5.00	mg/L		25.3			9	25

Matrix Spike (BCD0019-MS1)

Source: A25C0622-49

Prepared: 04/11/25 Analyzed: 04/14/25

Total Kjeldahl Nitrogen	3.76		0.25	mg/L	2.000	1.52	112%	80-120%		

Matrix Spike (BCD0019-MS2)

Source: A25C0649-02

Prepared: 04/11/25 Analyzed: 04/14/25

Total Kjeldahl Nitrogen	2.92		0.25	mg/L	2.000	0.65	113%	80-120%		

Matrix Spike (BCD0019-MS3)

Source: A25D0020-07

Prepared: 04/11/25 Analyzed: 04/14/25

Total Kjeldahl Nitrogen	2.59		0.25	mg/L	2.000	0.35	112%	80-120%		

Matrix Spike (BCD0019-MS4)

Source: A25D0046-02

Prepared: 04/11/25 Analyzed: 04/14/25

Total Kjeldahl Nitrogen	49.3	D	5.00	mg/L	20.00	25.3	120%	80-120%		

Batch: BCD0082 - No Prep - WetChem

Blank (BCD0082-BLK1)

Prepared: 04/04/25 Analyzed: 04/07/25

Total Nitrate + Nitrite	ND	U	0.020	mg/L						

Blank (BCD0082-BLK2)

Prepared: 04/04/25 Analyzed: 04/07/25

Total Nitrate + Nitrite	ND	U	0.020	mg/L						



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Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCD0082 - No Prep - WetChem (Continued)										
LCS (BCD0082-BS1)					Prepared: 04/04/25 Analyzed: 04/07/25					
Total Nitrate + Nitrite	0.523		0.020	mg/L	0.5000		105%	90-110%		
LCS (BCD0082-BS2)					Prepared: 04/04/25 Analyzed: 04/07/25					
Total Nitrate + Nitrite	0.517		0.020	mg/L	0.5000		103%	90-110%		
Calibration Blank (BCD0082-CCB1)					Prepared: 04/04/25 Analyzed: 04/07/25					
Total Nitrate + Nitrite	ND	U		mg/L						
Calibration Blank (BCD0082-CCB2)					Prepared: 04/04/25 Analyzed: 04/07/25					
Total Nitrate + Nitrite	ND	U		mg/L						
Calibration Blank (BCD0082-CCB3)					Prepared: 04/04/25 Analyzed: 04/07/25					
Total Nitrate + Nitrite	ND	U		mg/L						
Calibration Blank (BCD0082-CCB4)					Prepared: 04/04/25 Analyzed: 04/07/25					
Total Nitrate + Nitrite	ND	U		mg/L						
Calibration Check (BCD0082-CCV1)					Prepared: 04/04/25 Analyzed: 04/07/25					
Total Nitrate + Nitrite	1.00		0.020	mg/L	1.000		100%	85-115%		
Calibration Check (BCD0082-CCV2)					Prepared: 04/04/25 Analyzed: 04/07/25					
Total Nitrate + Nitrite	0.986		0.020	mg/L	1.000		99%	85-115%		
Calibration Check (BCD0082-CCV3)					Prepared: 04/04/25 Analyzed: 04/07/25					
Total Nitrate + Nitrite	0.961		0.020	mg/L	1.000		96%	85-115%		
Calibration Check (BCD0082-CCV4)					Prepared: 04/04/25 Analyzed: 04/07/25					
Total Nitrate + Nitrite	0.991		0.020	mg/L	1.000		99%	85-115%		
Duplicate (BCD0082-DUP1)					Source: A25C0622-13 Prepared: 04/04/25 Analyzed: 04/07/25					
Total Nitrate + Nitrite	0.469		0.020	mg/L		0.460			2	20
Duplicate (BCD0082-DUP2)					Source: A25C0622-23 Prepared: 04/04/25 Analyzed: 04/07/25					
Total Nitrate + Nitrite	0.333		0.020	mg/L		0.329			1	20
Duplicate (BCD0082-DUP3)					Source: A25C0622-33 Prepared: 04/04/25 Analyzed: 04/07/25					
Total Nitrate + Nitrite	0.272		0.020	mg/L		0.273			0.2	20

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Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCD0082 - No Prep - WetChem (Continued)

Duplicate (BCD0082-DUP4)		Source: A25C0622-43		Prepared: 04/04/25 Analyzed: 04/07/25						
Total Nitrate + Nitrite	0.295		0.020	mg/L		0.295			0.02	20
Matrix Spike (BCD0082-MS1)		Source: A25C0622-13		Prepared: 04/04/25 Analyzed: 04/07/25						
Total Nitrate + Nitrite	1.46		0.020	mg/L	1.000	0.460	100%	85-115%		
Matrix Spike (BCD0082-MS2)		Source: A25C0622-23		Prepared: 04/04/25 Analyzed: 04/07/25						
Total Nitrate + Nitrite	1.31		0.020	mg/L	1.000	0.329	98%	85-115%		
Matrix Spike (BCD0082-MS3)		Source: A25C0622-33		Prepared: 04/04/25 Analyzed: 04/07/25						
Total Nitrate + Nitrite	1.26		0.020	mg/L	1.000	0.273	99%	85-115%		
Matrix Spike (BCD0082-MS4)		Source: A25C0622-43		Prepared: 04/04/25 Analyzed: 04/07/25						
Total Nitrate + Nitrite	1.28		0.020	mg/L	1.000	0.295	99%	85-115%		

Batch: BCD0116 - No Prep - WetChem

Blank (BCD0116-BLK1)				Prepared: 04/08/25 Analyzed: 04/09/25						
Ammonia	ND	U	0.020	mg/L						
Blank (BCD0116-BLK2)				Prepared: 04/08/25 Analyzed: 04/09/25						
Ammonia	ND	U	0.020	mg/L						
Blank (BCD0116-BLK3)				Prepared: 04/08/25 Analyzed: 04/09/25						
Ammonia	ND	U	0.020	mg/L						
Blank (BCD0116-BLK4)				Prepared: 04/08/25 Analyzed: 04/09/25						
Ammonia	ND	U	0.020	mg/L						
LCS (BCD0116-BS1)				Prepared: 04/08/25 Analyzed: 04/09/25						
Ammonia	0.510		0.020	mg/L	0.5000		102%	80-120%		
LCS (BCD0116-BS2)				Prepared: 04/08/25 Analyzed: 04/09/25						
Ammonia	0.527		0.020	mg/L	0.5000		105%	80-120%		
LCS (BCD0116-BS3)				Prepared: 04/08/25 Analyzed: 04/09/25						
Ammonia	0.523		0.020	mg/L	0.5000		105%	80-120%		

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Thurston County Environmental Health
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Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCD0116 - No Prep - WetChem (Continued)

LCS (BCD0116-BS4)

Prepared: 04/08/25 Analyzed: 04/09/25

Ammonia	0.536		0.020	mg/L	0.5000		107%	80-120%		

Calibration Blank (BCD0116-CCB1)

Prepared: 04/08/25 Analyzed: 04/09/25

Ammonia	0.007			mg/L						

Calibration Blank (BCD0116-CCB2)

Prepared: 04/08/25 Analyzed: 04/09/25

Ammonia	0.009			mg/L						

Calibration Blank (BCD0116-CCB3)

Prepared: 04/08/25 Analyzed: 04/09/25

Ammonia	0.008			mg/L						

Calibration Blank (BCD0116-CCB4)

Prepared: 04/08/25 Analyzed: 04/09/25

Ammonia	0.009			mg/L						

Calibration Blank (BCD0116-CCB5)

Prepared: 04/08/25 Analyzed: 04/09/25

Ammonia	0.007			mg/L						

Calibration Blank (BCD0116-CCB6)

Prepared: 04/08/25 Analyzed: 04/09/25

Ammonia	0.009			mg/L						

Calibration Blank (BCD0116-CCB7)

Prepared: 04/08/25 Analyzed: 04/09/25

Ammonia	0.009			mg/L						

Calibration Blank (BCD0116-CCB8)

Prepared: 04/08/25 Analyzed: 04/09/25

Ammonia	0.011			mg/L						

Calibration Check (BCD0116-CCV1)

Prepared: 04/08/25 Analyzed: 04/09/25

Ammonia	1.02		0.020	mg/L	1.000		102%	85-115%		

Calibration Check (BCD0116-CCV2)

Prepared: 04/08/25 Analyzed: 04/09/25

Ammonia	1.03		0.020	mg/L	1.000		103%	85-115%		

Calibration Check (BCD0116-CCV3)

Prepared: 04/08/25 Analyzed: 04/09/25

Ammonia	1.04		0.020	mg/L	1.000		104%	85-115%		

Calibration Check (BCD0116-CCV4)

Prepared: 04/08/25 Analyzed: 04/09/25

Ammonia	1.05		0.020	mg/L	1.000		105%	85-115%		

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Quality Control (Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCD0116 - No Prep - WetChem (Continued)										
Calibration Check (BCD0116-CCV5)					Prepared: 04/08/25 Analyzed: 04/09/25					
Ammonia	1.05		0.020	mg/L	1.000		105%	85-115%		
Calibration Check (BCD0116-CCV6)					Prepared: 04/08/25 Analyzed: 04/09/25					
Ammonia	1.03		0.020	mg/L	1.000		103%	85-115%		
Calibration Check (BCD0116-CCV7)					Prepared: 04/08/25 Analyzed: 04/09/25					
Ammonia	1.05		0.020	mg/L	1.000		105%	85-115%		
Calibration Check (BCD0116-CCV8)					Prepared: 04/08/25 Analyzed: 04/09/25					
Ammonia	1.06		0.020	mg/L	1.000		106%	85-115%		
Duplicate (BCD0116-DUP1)					Source: A25C0596-03 Prepared: 04/08/25 Analyzed: 04/09/25					
Ammonia	0.016	U, J	0.020	mg/L		0.017			3	20
Duplicate (BCD0116-DUP2)					Source: A25C0622-49 Prepared: 04/08/25 Analyzed: 04/09/25					
Ammonia	0.285		0.020	mg/L		0.287			0.7	20
Duplicate (BCD0116-DUP3)					Source: A25C0630-02 Prepared: 04/08/25 Analyzed: 04/09/25					
Ammonia	27.1	D	0.400	mg/L		27.2			0.2	20
Duplicate (BCD0116-DUP4)					Source: A25D0020-03 Prepared: 04/08/25 Analyzed: 04/09/25					
Ammonia	0.011	U, J	0.020	mg/L		0.011			3	20
Duplicate (BCD0116-DUP5)					Source: A25D0026-02 Prepared: 04/08/25 Analyzed: 04/09/25					
Ammonia	0.116		0.020	mg/L		0.118			2	20
Duplicate (BCD0116-DUP6)					Source: A25D0038-02 Prepared: 04/08/25 Analyzed: 04/09/25					
Ammonia	28.4	D	0.400	mg/L		28.3			0.3	20
Duplicate (BCD0116-DUP7)					Source: A25D0057-07 Prepared: 04/08/25 Analyzed: 04/09/25					
Ammonia	0.038		0.020	mg/L		0.043			13	20
Duplicate (BCD0116-DUP8)					Source: A25D0061-04 Prepared: 04/08/25 Analyzed: 04/09/25					
Ammonia	0.015	U, J	0.020	mg/L		0.016			8	20
Matrix Spike (BCD0116-MS1)					Source: A25C0596-03 Prepared: 04/08/25 Analyzed: 04/09/25					
Ammonia	1.05		0.020	mg/L	1.000	0.017	103%	80-120%		

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Project Name: Lakes
Project #: 40667

Quality Control (Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCD0116 - No Prep - WetChem (Continued)

Matrix Spike (BCD0116-MS2)		Source: A25C0622-49		Prepared: 04/08/25 Analyzed: 04/09/25						
Ammonia	1.34		0.020	mg/L	1.000	0.287	106%	80-120%		
Matrix Spike (BCD0116-MS3)		Source: A25C0630-02		Prepared: 04/08/25 Analyzed: 04/09/25						
Ammonia	48.7	D	0.400	mg/L	20.00	27.2	107%	80-120%		
Matrix Spike (BCD0116-MS4)		Source: A25D0020-03		Prepared: 04/08/25 Analyzed: 04/09/25						
Ammonia	1.14		0.020	mg/L	1.000	0.011	113%	80-120%		
Matrix Spike (BCD0116-MS5)		Source: A25D0026-02		Prepared: 04/08/25 Analyzed: 04/09/25						
Ammonia	1.25		0.020	mg/L	1.000	0.118	114%	80-120%		
Matrix Spike (BCD0116-MS6)		Source: A25D0038-02		Prepared: 04/08/25 Analyzed: 04/09/25						
Ammonia	50.3	D	0.400	mg/L	20.00	28.3	110%	80-120%		
Matrix Spike (BCD0116-MS7)		Source: A25D0057-07		Prepared: 04/08/25 Analyzed: 04/09/25						
Ammonia	1.16		0.020	mg/L	1.000	0.043	112%	80-120%		
Matrix Spike (BCD0116-MS8)		Source: A25D0061-04		Prepared: 04/08/25 Analyzed: 04/09/25						
Ammonia	1.14		0.020	mg/L	1.000	0.016	112%	80-120%		

Batch: BCD0130 - No Prep - WetChem

Blank (BCD0130-BLK1)		Prepared & Analyzed: 04/08/25								
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BCD0130-BLK2)		Prepared & Analyzed: 04/08/25								
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
LCS (BCD0130-BS1)		Prepared & Analyzed: 04/08/25								
Total Nitrate + Nitrite	0.466		0.020	mg/L	0.5000		93%	90-110%		
LCS (BCD0130-BS2)		Prepared & Analyzed: 04/08/25								
Total Nitrate + Nitrite	0.458		0.020	mg/L	0.5000		92%	90-110%		
Calibration Blank (BCD0130-CCB1)		Prepared & Analyzed: 04/08/25								
Total Nitrate + Nitrite	0.005			mg/L						



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Project Name: Lakes
Project #: 40667

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCD0130 - No Prep - WetChem (Continued)										
Calibration Blank (BCD0130-CCB2)					Prepared & Analyzed: 04/08/25					
Total Nitrate + Nitrite	ND	U		mg/L						
Calibration Blank (BCD0130-CCB3)					Prepared & Analyzed: 04/08/25					
Total Nitrate + Nitrite	0.019			mg/L						
Calibration Check (BCD0130-CCV1)					Prepared & Analyzed: 04/08/25					
Total Nitrate + Nitrite	1.02		0.020	mg/L	1.000		102%	85-115%		
Calibration Check (BCD0130-CCV2)					Prepared & Analyzed: 04/08/25					
Total Nitrate + Nitrite	1.12		0.020	mg/L	1.000		112%	85-115%		
Calibration Check (BCD0130-CCV3)					Prepared & Analyzed: 04/08/25					
Total Nitrate + Nitrite	1.05		0.020	mg/L	1.000		105%	85-115%		
Duplicate (BCD0130-DUP1)		Source: A25C0622-53			Prepared & Analyzed: 04/08/25					
Total Nitrate + Nitrite	0.107		0.020	mg/L		0.101			6	20
Duplicate (BCD0130-DUP2)		Source: A25D0020-01			Prepared & Analyzed: 04/08/25					
Total Nitrate + Nitrite	0.263		0.020	mg/L		0.284			8	20
Duplicate (BCD0130-DUP3)		Source: A25D0020-09			Prepared & Analyzed: 04/08/25					
Total Nitrate + Nitrite	0.184		0.020	mg/L		0.183			0.3	20
Matrix Spike (BCD0130-MS1)		Source: A25C0622-53			Prepared & Analyzed: 04/08/25					
Total Nitrate + Nitrite	1.17		0.020	mg/L	1.000	0.101	107%	85-115%		
Matrix Spike (BCD0130-MS2)		Source: A25D0020-01			Prepared & Analyzed: 04/08/25					
Total Nitrate + Nitrite	1.32		0.020	mg/L	1.000	0.284	103%	85-115%		
Matrix Spike (BCD0130-MS3)		Source: A25D0020-09			Prepared & Analyzed: 04/08/25					
Total Nitrate + Nitrite	1.13		0.020	mg/L	1.000	0.183	94%	85-115%		
Batch: BCD0204 - No Prep - WetChem										
Blank (BCD0204-BLK1)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						



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Project Name: Lakes
Project #: 40667

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCD0204 - No Prep - WetChem (Continued)										
Blank (BCD0204-BLK2)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BCD0204-BLK3)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BCD0204-BLK4)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BCD0204-BLK5)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
LCS (BCD0204-BS1)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.517		0.020	mg/L	0.5000		103%	90-110%		
LCS (BCD0204-BS2)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.519		0.020	mg/L	0.5000		104%	90-110%		
LCS (BCD0204-BS3)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.510		0.020	mg/L	0.5000		102%	90-110%		
LCS (BCD0204-BS4)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.519		0.020	mg/L	0.5000		104%	90-110%		
LCS (BCD0204-BS5)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.528		0.020	mg/L	0.5000		106%	90-110%		
Calibration Blank (BCD0204-CCB1)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.009			mg/L						
Calibration Blank (BCD0204-CCB10)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.007			mg/L						
Calibration Blank (BCD0204-CCB2)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.009			mg/L						
Calibration Blank (BCD0204-CCB3)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.007			mg/L						



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Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCD0204 - No Prep - WetChem (Continued)										
Calibration Blank (BCD0204-CCB4)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.009			mg/L						
Calibration Blank (BCD0204-CCB5)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.008			mg/L						
Calibration Blank (BCD0204-CCB6)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.007			mg/L						
Calibration Blank (BCD0204-CCB7)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.010			mg/L						
Calibration Blank (BCD0204-CCB8)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.007			mg/L						
Calibration Blank (BCD0204-CCB9)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.007			mg/L						
Calibration Check (BCD0204-CCV1)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	1.01		0.020	mg/L	1.000		101%	85-115%		
Calibration Check (BCD0204-CCV10)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	1.02		0.020	mg/L	1.000		102%	85-115%		
Calibration Check (BCD0204-CCV2)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	1.02		0.020	mg/L	1.000		102%	85-115%		
Calibration Check (BCD0204-CCV3)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	1.03		0.020	mg/L	1.000		103%	85-115%		
Calibration Check (BCD0204-CCV4)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	1.01		0.020	mg/L	1.000		101%	85-115%		
Calibration Check (BCD0204-CCV5)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	1.02		0.020	mg/L	1.000		102%	85-115%		
Calibration Check (BCD0204-CCV6)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	1.01		0.020	mg/L	1.000		101%	85-115%		



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Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCD0204 - No Prep - WetChem (Continued)										
Calibration Check (BCD0204-CCV7)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	1.03		0.020	mg/L	1.000		103%	85-115%		
Calibration Check (BCD0204-CCV8)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	1.02		0.020	mg/L	1.000		102%	85-115%		
Calibration Check (BCD0204-CCV9)					Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	1.01		0.020	mg/L	1.000		101%	85-115%		
Duplicate (BCD0204-DUP1)		Source: A25D0026-07			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.007	U, J	0.020	mg/L		0.008			11	20
Duplicate (BCD0204-DUP10)		Source: A25D0205-13			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.251		0.020	mg/L		0.247			2	20
Duplicate (BCD0204-DUP2)		Source: A25D0057-02			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.456		0.020	mg/L		0.462			1	20
Duplicate (BCD0204-DUP3)		Source: A25D0069-07			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.046		0.020	mg/L		0.048			3	20
Duplicate (BCD0204-DUP4)		Source: A25D0077-01			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	9.15	D	0.200	mg/L		9.02			1	20
Duplicate (BCD0204-DUP5)		Source: A25D0114-03			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	2.70	D	0.100	mg/L		2.71			0.6	20
Duplicate (BCD0204-DUP6)		Source: A25D0116-06			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.128		0.020	mg/L		0.132			3	20
Duplicate (BCD0204-DUP7)		Source: A25D0169-02			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	16.7	D	0.200	mg/L		17.0			2	20
Duplicate (BCD0204-DUP8)		Source: A25D0183-03			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.270		0.020	mg/L		0.271			0.4	20
Duplicate (BCD0204-DUP9)		Source: A25D0205-03			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.269		0.020	mg/L		0.271			0.6	20



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Project Name: Lakes
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Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCD0204 - No Prep - WetChem (Continued)

Matrix Spike (BCD0204-MS1)		Source: A25D0026-07			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	0.986		0.020	mg/L	1.000	0.008	98%	85-115%		
Matrix Spike (BCD0204-MS10)		Source: A25D0205-13			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	1.25		0.020	mg/L	1.000	0.247	100%	85-115%		
Matrix Spike (BCD0204-MS2)		Source: A25D0057-02			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	1.46		0.020	mg/L	1.000	0.462	100%	85-115%		
Matrix Spike (BCD0204-MS3)		Source: A25D0069-07			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	1.01		0.020	mg/L	1.000	0.048	96%	85-115%		
Matrix Spike (BCD0204-MS4)		Source: A25D0077-01			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	19.0	D	0.200	mg/L	10.00	9.02	99%	85-115%		
Matrix Spike (BCD0204-MS5)		Source: A25D0114-03			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	7.68	D	0.100	mg/L	5.000	2.71	99%	85-115%		
Matrix Spike (BCD0204-MS6)		Source: A25D0116-06			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	1.12		0.020	mg/L	1.000	0.132	99%	85-115%		
Matrix Spike (BCD0204-MS7)		Source: A25D0169-02			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	27.0	D	0.200	mg/L	10.00	17.0	100%	85-115%		
Matrix Spike (BCD0204-MS8)		Source: A25D0183-03			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	1.27		0.020	mg/L	1.000	0.271	100%	85-115%		
Matrix Spike (BCD0204-MS9)		Source: A25D0205-03			Prepared & Analyzed: 04/15/25					
Total Nitrate + Nitrite	1.26		0.020	mg/L	1.000	0.271	99%	85-115%		

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ANALYSIS REPORT

Date Received: 03/28/25
Date Reported: 04/16/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Notes and Definitions

Item	Definition
U	The compound was analyzed for but was not detected (Non-detect) at or above the MRL/MDL.
D	The reported value is from a dilution.
Dry	Sample results reported on a dry weight basis.
ND	Analyte NOT DETECTED at or above the reporting limit.
RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was matrix spiked or duplicated.

AmTest Chain of Custody Record

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A25C0622

Chain of Custody No. 1 of 6

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801					Invoice To: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801										
Contact Person: John Haberlin					Invoice Contact: John Haberlin										
Phone No: 360-867-2626					PO Number: Credit Card upon report per Aaron Young										
Fax No:					Invoice Ph/Fax:										
E-mail: tc_lakes@co.thurston.wa.us					Invoice E-mail: tc_lakes@co.thurston.wa.us										
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online					Data posted to online account: YES / NO Web Login ID:										
Special Instructions: Please report to detection limit for all results.															
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)										Temperature upon Receipt: 39°					
Project Name: Lakes		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested									
Project Number: 40667						Total Phosphate	Total Nitrogen	NOX	Orthophosphate						
AmTest ID	Client ID (35 characters max)														
01	Schneider T	3/3/2025	10:15	H ₂ O	1	X		X							
02	Schneider T QA	3/3/2025	10:15	H ₂ O	1	X		X						X	
03	Kennedy	3/3/2025	11:15	H ₂ O	1	X		X							
04	Schneider Head	3/3/2025	12:30	H ₂ O	1	X		X							
05	McLane	3/3/2025	12:50	H ₂ O	1	X		X							
06	Black Lake Ditch	3/3/2025	14:15	H ₂ O	1	X		X							
07	Black Lake Ditch QA	3/3/2025	14:15	H ₂ O	1	X		X						X	
08	Yelm Creek @ 123 rd	3/4/2025	09:30	H ₂ O	1	X		X							
09	Deschutes Falls	3/4/2025	10:25	H ₂ O	1	X		X							
10	Tobolton @ Peissner	3/4/2025	10:55	H ₂ O	1	X		X							
Relinquished By: John Haberlin 		Date 3/26/2025	Time 1500	Received By: NR						Date 3/28/25	Time 1020				
Relinquished By:		Date	Time	Received By:						Date	Time				
Relinquished By:		Date	Time	Received By:						Date	Time				

COMMENTS:

FedEx

AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

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Chain of Custody No. 2 of 6

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801				Invoice To: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801									
Contact Person: John Haberlin				Invoice Contact: John Haberlin									
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young									
Fax No:				Invoice Ph/Fax:									
E-mail: tc_lakes@co.thurston.wa.us				Invoice E-mail: tc_lakes@co.thurston.wa.us									
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:									
Special Instructions: Please report to detection limit for all results.													
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)						Temperature upon Receipt: 3.9°							
Project Name: Lakes		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested							
Project Number: 40667						Total Phosphate	Total Nitrogen	NOX	Orthophosphate				
AmTest ID	Client ID (35 characters max)												
11	Lackamas @ Bald Hill	3/4/2025	11:15	H ₂ O	1	X		X					
12	Lackamas @ Bald Hill QA	3/4/2025	11:15	H ₂ O	1	X		X					X
13	Deschutes @ Vail	3/4/2025	11:45	H ₂ O	1	X		X					
14	Reichel	3/4/2025	12:10	H ₂ O	1	X		X					
15	Deschutes @ Waldrick	3/4/2025	13:00	H ₂ O	1	X		X					
16	Spurgeon @ Rich	3/4/2025	13:20	H ₂ O	1	X		X					
17	Spurgeon @ Rich QA	3/4/2025	13:20	H ₂ O	1	X		X					X
18	Deschutes @ Tumwater	3/4/2025	13:55	H ₂ O	1	X		X					
19	Indian Mouth	3/4/2025	14:10	H ₂ O	1	X		X					
20	Salmon	3/18/2025	08:25	H ₂ O	1	X		X					
Relinquished By: John Haberlin 		Date 3/26/2025	Time 1500	Received By: NR				Date 3/28/25	Time 1020				
Relinquished By:		Date	Time	Received By:				Date	Time				
Relinquished By:		Date	Time	Received By:				Date	Time				

COMMENTS:

AmTest Chain of Custody Record

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Chain of Custody No. 3 of 6

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801				Invoice To: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801										
Contact Person: John Haberlin				Invoice Contact: John Haberlin										
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young										
Fax No:				Invoice Ph/Fax:										
E-mail: tc_lakes@co.thurston.wa.us				Invoice E-mail: tc_lakes@co.thurston.wa.us										
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:										
Special Instructions: Please report to detection limit for all results.														
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)						Temperature upon Receipt: 3-9								
Project Name: Lakes		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested								
Project Number: 40667						Total Phosphate	Total Nitrogen	NOX	Orthophosphate					
AmTest ID	Client ID (35 characters max)													
21	Bloom Ditch @ 110 th	3/18/2025	08:40	H ₂ O	1	X		X						
22	Black @ 128 th	3/18/2025	08:55	H ₂ O	1	X		X						
23	Beaver @ LR	3/18/2025	09:05	H ₂ O	1	X		X						
24	Black @ Moon	3/18/2025	09:30	H ₂ O	1	X		X						
25	Chehalis	3/18/2025	10:00	H ₂ O	1	X		X						
26	Scatter @ James	3/18/2025	10:20	H ₂ O	1	X		X						
27	Scatter @ James QA	3/18/2025	10:20	H ₂ O	1	X		X						X
28	Prairie	3/18/2025	10:40	H ₂ O	1	X		X						
29	Skookumchuck	3/18/2025	12:10	H ₂ O	1	X		X						
30	Scatter @ Gibson	3/18/2025	12:40	H ₂ O	1	X		X						
Relinquished By: John Haberlin		Date 3/26/2025	Time 1500	Received By: NR				Date 3/28/25	Time 1020					
Relinquished By:		Date	Time	Received By:				Date	Time					
Relinquished By:		Date	Time	Received By:				Date	Time					

COMMENTS:

AmTest Chain of Custody Record

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Chain of Custody No. 4 of 6

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801					Invoice To: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801									
Contact Person: John Haberlin					Invoice Contact: John Haberlin									
Phone No: 360-867-2626					PO Number: Credit Card upon report per Aaron Young									
Fax No:					Invoice Ph/Fax:									
E-mail: tc_lakes@co.thurston.wa.us					Invoice E-mail: tc_lakes@co.thurston.wa.us									
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online					Data posted to online account: YES / NO Web Login ID:									
Special Instructions: Please report to detection limit for all results.														
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)														
Project Name: Lakes					Temperature upon Receipt: 3.9									
Project Number: 40667					Analysis Requested									
AmTest ID	Client ID (35 characters max)	Date Sampled	Time Sampled	Matrix	No. of containers	Total Phosphate	Total Nitrogen	NOx	Orthophosphate					QA/QC
31	Scatter @ Churchill	3/18/2025	13:05	H ₂ O	1	X		X						
32	Allen @ Maytown	3/18/2025	13:35	H ₂ O	1	X		X						
33	Allen @ Scott	3/18/2025	13:50	H ₂ O	1	X		X						
34	Salmon @ Case	3/18/2025	13:55	H ₂ O	1	X		X						
35	Salmon @ Case QA	3/18/2025	13:55	H ₂ O	1	X		X						X
36	Eaton	3/26/2025	10:20	H ₂ O	1	X		X						
37	Thompson	3/26/2025	10:40	H ₂ O	1	X		X						
38	McAllister @ I-5	3/26/2025	11:25	H ₂ O	1	X		X						
39	Moxlie @ Union	3/26/2025	12:05	H ₂ O	1	X		X						
40	Woodland @ Draham	3/27/2025	10:25	H ₂ O	1	X		X						
Relinquished By: John Haberlin 		Date 3/26/2025	Time 1500	Received By: NR						Date 3/28/25	Time 1020			
Relinquished By:		Date	Time	Received By:						Date	Time			
Relinquished By:		Date	Time	Received By:						Date	Time			

COMMENTS:

AmTest Chain of Custody Record

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Chain of Custody No. 5 of 6

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801						Invoice To: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801										
Contact Person: John Haberlin						Invoice Contact: John Haberlin										
Phone No: 360-867-2626						PO Number: Credit Card upon report per Aaron Young										
Fax No:						Invoice Ph/Fax:										
E-mail: tc_lakes@co.thurston.wa.us						Invoice E-mail: tc_lakes@co.thurston.wa.us										
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online						Data posted to online account: YES / NO Web Login ID:										
Special Instructions: Please report to detection limit for all results.																
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)																
Project Name: Lakes						Temperature upon Receipt: 39										
Project Number: 40667						Analysis Requested										
AmTest ID	Client ID (35 characters max)	Date Sampled	Time Sampled	Matrix	No. of containers	Total Phosphate	Total Nitrogen	NOx	Orthophosphate	Ammonia					QA/QC	
41	Woodland @ PG	3/27/2025	10:45	H ₂ O	1	X		X								
42	Dobbs @ CC	3/27/2025	10:05	H ₂ O	1	X		X								
43	Woodard @ Libby	3/27/2025	11:05	H ₂ O	1	X		X								
44	Pattison N Surface	3/13/2025	10:05	H ₂ O	1	X	X	X		X						
45	Pattison N Bottom	3/13/2025	10:10	H ₂ O	1	X	X	X		X						
46	Pattison S Surface	3/13/2025	10:45	H ₂ O	1	X	X	X		X						
47	Pattison S Bottom	3/13/2025	10:50	H ₂ O	1	X	X	X		X						
48	Lawrence 1 Surface	3/19/2025	09:20	H ₂ O	1	X	X	X		X						
49	Lawrence 1 Surface QA	3/19/2025	09:20	H ₂ O	1	X	X	X		X						
50	Lawrence 1 Bottom	3/19/2025	09:25	H ₂ O	1	X	X	X		X						
Relinquished By: John Haberlin 		Date 3/26/2025	Time 1500	Received By: 						Date 3/28/25	Time 1020					
Relinquished By:		Date	Time	Received By:						Date	Time					
Relinquished By:		Date	Time	Received By:						Date	Time					

COMMENTS:

AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

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A25C0622

Chain of Custody No. 6 of 6

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801				Invoice To: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801											
Contact Person: John Haberlin				Invoice Contact: John Haberlin											
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young											
Fax No:				Invoice Ph/Fax:											
E-mail: tc_lakes@co.thurston.wa.us				Invoice E-mail: tc_lakes@co.thurston.wa.us											
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:											
Special Instructions: Please report to detection limit for all results.															
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)						Temperature upon Receipt: 3.9									
Project Name: Lakes		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested									
Project Number: 40667						Total Phosphate	Total Nitrogen	NOx	Orthophosphate	Ammonia					QA/QC
AmTest ID	Client ID (35 characters max)														
51	Lawrence 1 Bottom QA	3/19/2025	09:25	H ₂ O	1	X	X	X		X					
52	Lawrence 2 Surface	3/19/2025	09:45	H ₂ O	1	X	X	X		X					
53	Lawrence 2 Surface QA	3/19/2025	09:45	H ₂ O	1	X	X	X		X					
54	Lawrence 2 Bottom	3/19/2025	09:50	H ₂ O	1	X	X	X		X					
55	Lawrence 2 Bottom QA	3/19/2025	09:50	H ₂ O	1	X	X	X		X					
56	Summit Surface	3/19/2025	11:25	H ₂ O	1	X	X	X		X					
57	Summit Bottom	3/19/2025	11:30	H ₂ O	1	X	X	X		X					
Relinquished By: John Haberlin 		Date 3/26/2025	Time 1500	Received By: 				Date 3/28/25	Time 1020						
Relinquished By:		Date	Time	Received By:				Date	Time						
Relinquished By:		Date	Time	Received By:				Date	Time						

COMMENTS:

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March 26, 2025

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN

Project: Lakes
Project Number: 40667
COC Number: A25C0446

JOHN HABERLIN:

Enclosed please find the analytical data for your Lakes project.

Your sample(s) were received on Thursday, March 20, 2025 and properly maintained prior to the subsequent analysis. The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA, Standard Methods or the Army Corps of Engineers.

Following the analytical results you will find the Quality Control (QA/QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Practical Quantitation Limits (PQL's), as opposed to the Method Detection Limits (MDL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Aaron Young". The signature is fluid and cursive, with the first name "Aaron" and last name "Young" clearly distinguishable.

ElementStationManager For Aaron Young

President

aarony@amtestlab.com

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Kirkland, WA
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ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Date Received: 03/20/25
Date Reported: 03/26/25

Reported Samples

Lab ID	Sample	Matrix	Qualifiers	Date Sampled	Date Received
A25C0446-01	Lawrence 1 Surface	Water		03/19/2025	03/20/2025
A25C0446-02	Lawrence 1 Surface QA	Water		03/19/2025	03/20/2025
A25C0446-03	Lawrence 1 Bottom	Water		03/19/2025	03/20/2025
A25C0446-04	Lawrence 1 Bottom QA	Water		03/19/2025	03/20/2025
A25C0446-05	Lawrence 2 Surface	Water		03/19/2025	03/20/2025
A25C0446-06	Lawrence 2 Surface QA	Water		03/19/2025	03/20/2025
A25C0446-07	Lawrence 2 Bottom	Water		03/19/2025	03/20/2025
A25C0446-08	Lawrence 2 Bottom QA	Water		03/19/2025	03/20/2025
A25C0446-09	Summit Surface	Water		03/19/2025	03/20/2025
A25C0446-10	Summit Bottom	Water		03/19/2025	03/20/2025

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Kirkland, WA
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ANALYSIS REPORT

Date Received: 03/20/25

Date Reported: 03/26/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0446-01

Client Identification: Lawrence 1 Surface

Sampling Date: 03/19/25 09:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Orthophosphate	0.015	mg/L		0.005	SM 4500-P E_2011	KH	03/20/2025

AMTEST Identification Number: A25C0446-02

Client Identification: Lawrence 1 Surface QA

Sampling Date: 03/19/25 09:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Orthophosphate	0.024	mg/L		0.005	SM 4500-P E_2011	KH	03/20/2025

AMTEST Identification Number: A25C0446-03

Client Identification: Lawrence 1 Bottom

Sampling Date: 03/19/25 09:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Orthophosphate	0.008	mg/L		0.005	SM 4500-P E_2011	KH	03/20/2025

AMTEST Identification Number: A25C0446-04

Client Identification: Lawrence 1 Bottom QA

Sampling Date: 03/19/25 09:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Orthophosphate	0.007	mg/L		0.005	SM 4500-P E_2011	KH	03/20/2025

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Kirkland, WA
(425) 885-1664
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ANALYSIS REPORT

Date Received: 03/20/25
Date Reported: 03/26/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0446-05
Client Identification: Lawrence 2 Surface
Sampling Date: 03/19/25 09:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Orthophosphate	0.009	mg/L		0.005	SM 4500-P E_2011	KH	03/20/2025

AMTEST Identification Number: A25C0446-06
Client Identification: Lawrence 2 Surface QA
Sampling Date: 03/19/25 09:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Orthophosphate	0.012	mg/L		0.005	SM 4500-P E_2011	KH	03/20/2025

AMTEST Identification Number: A25C0446-07
Client Identification: Lawrence 2 Bottom
Sampling Date: 03/19/25 09:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Orthophosphate	0.014	mg/L		0.005	SM 4500-P E_2011	KH	03/20/2025

AMTEST Identification Number: A25C0446-08
Client Identification: Lawrence 2 Bottom QA
Sampling Date: 03/19/25 09:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Orthophosphate	0.017	mg/L		0.005	SM 4500-P E_2011	KH	03/20/2025

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**Professional
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ANALYSIS REPORT

Date Received: 03/20/25
Date Reported: 03/26/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

AMTEST Identification Number: A25C0446-09
Client Identification: Summit Surface
Sampling Date: 03/19/25 11:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Orthophosphate	0.036	mg/L		0.005	SM 4500-P E_2011	KH	03/20/2025

AMTEST Identification Number: A25C0446-10
Client Identification: Summit Bottom
Sampling Date: 03/19/25 11:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	RL	METHOD	ANALYST	DATE
Orthophosphate	0.011	mg/L		0.005	SM 4500-P E_2011	KH	03/20/2025

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com



**Professional
Analytical
Services**

ANALYSIS REPORT

Date Received: 03/20/25
Date Reported: 03/26/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Quality Control

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCC0334 - No Prep - WetChem										
LCS (BCC0334-BS1)					Prepared & Analyzed: 03/20/25					
Orthophosphate	0.119		0.005	mg/L	0.1000		119%	84.9-118%		
Calibration Blank (BCC0334-CCB1)					Prepared & Analyzed: 03/20/25					
Orthophosphate	0.003			mg/L						
Calibration Check (BCC0334-CCV1)					Prepared & Analyzed: 03/20/25					
Orthophosphate	0.192		0.005	mg/L	0.2000		96%	85-115%		
Matrix Spike (BCC0334-MS1)					Prepared & Analyzed: 03/20/25					
Orthophosphate	0.111		0.005	mg/L	0.1000	0.011	100%	75-125%		
Matrix Spike Dup (BCC0334-MSD1)					Prepared & Analyzed: 03/20/25					
Orthophosphate	0.109		0.005	mg/L	0.1000	0.011	98%	75-125%	2	20

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(425) 885-1664
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**Professional
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ANALYSIS REPORT

Date Received: 03/20/25
Date Reported: 03/26/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: Lakes
Project #: 40667

Notes and Definitions

Item	Definition
Dry	Sample results reported on a dry weight basis.
ND	Analyte NOT DETECTED at or above the reporting limit.
RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was matrix spiked or duplicated.

AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

Ph (425) 885-1664 Fx (425) 820-0245

www.amtestlab.com

A25C0446

Chain of Custody No. 1 of 1

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801					Invoice To: Thurston County Environmental Health 3000 Pacific Ave SE Olympia, WA 95801										
Contact Person: John Haberlin					Invoice Contact: John Haberlin										
Phone No: 360-867-2626					PO Number: Credit Card upon report per Aaron Young										
Fax No:					Invoice Ph/Fax:										
E-mail: tc_lakes@co.thurston.wa.us					Invoice E-mail: tc_lakes@co.thurston.wa.us										
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online					Data posted to online account: YES / NO Web Login ID:										
Special Instructions: Please report to detection limit for all results.															
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)															
Temperature upon Receipt: <u>1.7°C</u>															
Project Name: Lakes			Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested								QA/QC
Project Number: 40667							Total Phosphate	Total Nitrogen	NOx	Orthophosphate					
AmTest ID	Client ID (35 characters max)														
<u>01</u>	Lawrence 1 Surface		3/19/2025	0920	H2O					X					
<u>02</u>	Lawrence 1 Surface QA		3/19/2025	0920	H2O					X					X
<u>03</u>	Lawrence 1 Bottom		3/19/2025	0925	H2O					X					
<u>04</u>	Lawrence 1 Bottom QA		3/19/2025	0925	H2O					X					X
<u>05</u>	Lawrence 2 Surface		3/19/2025	0945	H2O					X					
<u>06</u>	Lawrence 2 Surface QA		3/19/2025	0945	H2O					X					X
<u>07</u>	Lawrence 2 Bottom		3/19/2025	0950	H2O					X					
<u>08</u>	Lawrence 2 Bottom QA		3/19/2025	0950	H2O					X					X
<u>09</u>	Summit Surface		3/19/2025	1125	H2O					X					
<u>10</u>	Summit Bottom		3/19/2025	1125	H2O					X					
Relinquished By: John Haberlin <u>[Signature]</u>			Date 3/19/2025	Time 1500	Received By: <u>[Signature]</u>						Date 3/20/25	Time 1000			
Relinquished By:			Date	Time	Received By:						Date	Time			
Relinquished By:			Date	Time	Received By:						Date	Time			

COMMENTS:



ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
T : +1 360 577 7222
F : +1 360 636 1068
www.alsglobal.com

May 16, 2025

Analytical Report for Service Request No: K2504671

John Haberlin
Thurston County Health Department
3000 Pacific Ave. SE
Room 225
Olympia, WA 98501

RE: Lakes / 40667

Dear John,

Enclosed are the results of the sample(s) submitted to our laboratory May 08, 2025
For your reference, these analyses have been assigned our service request number **K2504671**.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3363. You may also contact me via email at karen.melerine@ALSGlobal.com.

Respectfully submitted,

ALS Group USA, Corp, dba ALS Environmental

Karen Melerine
Project Manager



ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
T : +1 360 577 7222
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www.alsglobal.com

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Acronyms

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General Chemistry

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 General Chemistry

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated value.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.
- H The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

- # The control limit criteria is not applicable.
- J The result is an estimated value.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- + The correlation coefficient for the MSA is less than 0.995.
- Q See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- A A tentatively identified compound, a suspected aldol-condensation product.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
- D The reported result is from a dilution.
- E The result is an estimated value.
- J The result is an estimated value.
- N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
- P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
- L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
- H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
- O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
- Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
- Z The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjllabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdwlabservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/analyte is offered by that state.



Case Narrative

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Client: Thurston County Health Department
Project: Lakes
Sample Matrix: Water

Service Request: K2504671
Date Received: 05/08/2025

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples for the Tier level IV requested by the client.

Sample Receipt:

Seven water samples were received for analysis at ALS Environmental on 05/08/2025. Any discrepancies upon initial sample inspection are annotated on the sample receipt and preservation form included within this report. The samples were stored at minimum in accordance with the analytical method requirements.

General Chemistry:

No significant anomalies were noted with this analysis.

Approved by Karen Melorine

Date 05/16/2025



Chain of Custody

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com



ADDRESS 1317 South 13th Ave., Kelso, WA 98626
PHONE 1 360 577 7222 FAX 1 360 636 1068

Chain of Custody

Work Order No.:

K2554621

Part of the ALS Group A Campbell Brothers Limited Company

Project Manager: Karen Melerine		Bill to:																				
Client Name: Thurston County Environmental Health		Company:																				
Address: 3000 Pacific Ave SE		Address:																				
City, State ZIP: Olympia, WA 98501		City, State ZIP:																				
Email: tc_lakes@co.thurston.wa.us	Phone: 360.867.2626	Email:	po#																			
Project Name: Lakes		REQUESTED ANALYSIS												TAT								
Project Number: 40667														Routine 21day								
P.O. Number:														Same Day 100%								
Sampler's Name: John Haberlin														Next Day ***								
SAMPLE RECEIPT														3 Day								
Temperature (°C):		Temp Blank Present														5 Day 50%						
Received Intact:		Yes	No	N/A	Wet Ice / Blue Ice														Surcharges.			
Cooler Custody Seals:		Yes	No	N/A	Total Containers:														Please call for availability			
Sample Custody Seals:		Yes	No	N/A															Due Date:			
Sample Identification		Matrix	Date Sampled	Time Sampled	Lab ID	No. of Containers	SM 10200 H / Pheophytin A NP	SM 10200 H / Chlorophylla UF													Comments	
Clear	W	5/7/2024	9:15 AM		1	X	X															
Lawrence 1	W	5/7/2024	10:45 AM		1	X	X															
Lawrence 1 QA	W	5/7/2024	10:45 AM		1	X	X															
Lawrence 2	W	5/7/2024	11:05 AM		1	X	X															
Lawrence 2 QA	W	5/7/2024	11:05 AM		1	X	X															
Long 4	W	5/7/2024	12:40 PM		1	X	X															
Long 3	W	5/7/2024	1:10 PM		1	X	X															
Dissolved		Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Se, Si, Sn, Sr, Tl, V, Zn, Zr												Additional Methods								
Total		Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Se, Si, Sn, Sr, Tl, V, Zn, Zr												Available Upon Request								
RELINQUISHED BY						RECEIVED BY																
Print Name		Signature		Date/Time		Print Name		Signature		Date/Time												
John Haberlin				5/7/2025 1500		Kathryn Mitolo				5/8/25 1005												

Cooler Receipt and Preservation Form

Client Thurston County Environmental Service Request K25 04671 PM Karen
 Received: 5/8/25 Opened: 5/8/25 By: HM Unloaded: 5/8/25 By: HM

1. Samples were received via? USPS Red Ex UPS DHL PDX Courier Hand Delivered
 2. Samples were received in: (circle) Cooler Box Envelope Other NA
 3. Were custody seals on coolers? NA Y N If yes, how many and where? 1 Front
 If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Temp Blank	Sample Temp	IR Gun	Cooler #/COC ID / NA	Out of temp Indicate with "X"	PM Notified If out of temp	Tracking Number NA	Filed
	<u>5.7</u>	<u>12000</u>				<u>881095754071</u>	

4. Was a Temperature Blank present in cooler? NA Y N If yes, note the temperature in the appropriate column below:

If no, take the temperature of a representative sample bottle contained within the cooler; note in the column "Sample Temp":

5. Were samples received within the method specified temperature ranges?

NA Y N

If no, were they received on ice and same day as collected? If not, note the cooler # below and notify the PM.

NA Y N

If applicable, tissue samples were received: Frozen Partially Thawed Thawed

6. Packing material: Inserts Baggies Bubble Wrap Gel Packs Wet Ice Dry Ice Sleeves

7. Were custody papers properly filled out (ink, signed, etc.)?

NA Y N

8. Were samples received in good condition (unbroken)

NA Y N

9. Were all sample labels complete (ie, analysis, preservation, etc.)?

NA Y N

10. Did all sample labels and tags agree with custody papers?

NA Y N

11. Were appropriate bottles/containers and volumes received for the tests indicated?

NA Y N

12. Were the pH-preserved bottles (see SMO GEN SOP) received at the appropriate pH? Indicate in the table below

NA Y N

13. Were VOA vials received without headspace? Indicate in the table below.

NA Y N

14. Was C12/Res negative?

NA Y N

15. Were samples received within method specified time limit? If not, note the error below and notify the PM.

NA Y N

16. Were 100mL sterile microbiology bottles filled exactly to the 100mL mark? NA Y N Underfilled Overfilled

Sample ID on Bottle	Sample ID on COC	Identified by:

SHORT HOLD

Sample ID	Bottle Count Bottle Type	Head- space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, Resolutions: _____



General Chemistry

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Thurston County Health Department
Project: Lakes/40667
Sample Matrix: Water
Analysis Method: SM 10200 H
Prep Method: Method

Service Request: K2504671
Date Collected: 05/7/25
Date Received: 05/8/25
Units: mg/m3
Basis: NA

Chlorophyll A

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Clear	K2504671-001	1.0 J	1.5	0.6	1	05/15/25 16:33	5/15/25	
Lawrence 1	K2504671-002	10.0	1.5	0.6	1	05/15/25 16:33	5/15/25	
Lawrence 1 QA	K2504671-003	6.8	1.5	0.6	1	05/15/25 16:33	5/15/25	
Lawrence 2	K2504671-004	10.3	1.6	0.6	1	05/15/25 16:33	5/15/25	
Lawrence 2 QA	K2504671-005	10.0	1.5	0.6	1	05/15/25 16:33	5/15/25	
Long 4	K2504671-006	2.1	1.5	0.6	1	05/15/25 16:33	5/15/25	
Long 3	K2504671-007	3.1	1.5	0.6	1	05/15/25 16:33	5/15/25	
Method Blank	K2504671-MB1	ND U	0.80	0.30	1	05/15/25 16:33	5/15/25	
Method Blank	K2504671-MB2	ND U	0.80	0.30	1	05/15/25 16:33	5/15/25	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Thurston County Health Department
Project: Lakes/40667
Sample Matrix: Water

Service Request: K2504671
Date Analyzed: 05/15/25
Date Extracted: 05/15/25

Duplicate Lab Control Sample Summary
General Chemistry Parameters

Analysis Method: SM 10200 H
Prep Method: Method

Units: mg/m3
Basis: NA
Analysis Lot: 879388

Lab Control Sample
K2504671-LCS

Duplicate Lab Control Sample
K2504671-DLCS

Analyte Name	Result	Spike Amount	% Rec	Result	Spike Amount	% Rec	% Rec Limits	RPD	RPD Limit
Chlorophyll A	5.45	5.10	107	5.34	5.10	105	88-113	2	20

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Thurston County Health Department
Project: Lakes/40667
Sample Matrix: Water
Analysis Method: SM 10200 H
Prep Method: Method

Service Request: K2504671
Date Collected: 05/7/25
Date Received: 05/8/25
Units: mg/m3
Basis: NA

Pheophytin A

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Clear	K2504671-001	ND U	1.5	-	1	05/15/25 16:33	5/15/25	
Lawrence 1	K2504671-002	16.1	1.5	-	1	05/15/25 16:33	5/15/25	
Lawrence 1 QA	K2504671-003	11.7	1.5	-	1	05/15/25 16:33	5/15/25	
Lawrence 2	K2504671-004	17.8	1.6	-	1	05/15/25 16:33	5/15/25	
Lawrence 2 QA	K2504671-005	19.0	1.5	-	1	05/15/25 16:33	5/15/25	
Long 4	K2504671-006	3.5	1.5	-	1	05/15/25 16:33	5/15/25	
Long 3	K2504671-007	4.4	1.5	-	1	05/15/25 16:33	5/15/25	
Method Blank	K2504671-MB1	ND U	0.80	-	1	05/15/25 16:33	5/15/25	
Method Blank	K2504671-MB2	ND U	0.80	-	1	05/15/25 16:33	5/15/25	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Thurston County Health Department
Project: Lakes/40667
Sample Matrix: Water

Service Request: K2504671
Date Analyzed: 05/15/25
Date Extracted: 05/15/25

Duplicate Lab Control Sample Summary
General Chemistry Parameters

Analysis Method: SM 10200 H
Prep Method: Method

Units: mg/m3
Basis: NA
Analysis Lot: 879388

Lab Control Sample
K2504671-LCS

Duplicate Lab Control Sample
K2504671-DLCS

Analyte Name	Result	Spike Amount	% Rec	Result	Spike Amount	% Rec	% Rec Limits	RPD	RPD Limit
Pheophytin A	545	510	107	534	510	105	88-113	2	20



Raw Data

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com



General Chemistry

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Work Request # K2504671

Date Analyzed: 5/15/25

Analyst: JS Run # 879388

Analysis: Chlorophyll / Pheophytin

**DATA QUALITY REPORT
INORGANICS**

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

1.	Is the method name and number correct and appropriate?	<u>yes</u> /no/NA
2.	Holding times met for all analyses and for all samples?	<u>yes</u> /no/NA
3.	Are calculations correct?	<u>yes</u> /no/NA
4.	Is the reporting basis correct? (Dry Weight)	yes/no/ <u>NA</u>
5.	All quality control criteria met?	<u>yes</u> /no
6.	Is the calibration curve correlation coefficient ≥ 0.995 ?	<u>yes</u> /no/NA
7.	MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency?	<u>yes</u> /no/NA
8.	Are ICVs, CCVs, and CCBs all within acceptance limits?	<u>yes</u> /no/NA
9.	Are results for methods blanks all ND?	<u>yes</u> /no/NA
10.	Are all QC samples within acceptance criteria? (LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.)	<u>yes</u> /no/NA
11.	Are all exceptions explained?	yes/no/ <u>NA</u>
12.	Have all applicable service requests been reviewed?	<u>yes</u> /no/NA
13.	Are all samples labeled correctly?	<u>yes</u> /no/NA
14.	Have all instructions on the service request been followed? (e.g. Special MRLs, QC on a specific sample, Form V)	<u>yes</u> /no/NA
15.	Are detection limits and units reported correctly?	<u>yes</u> /no/NA
16.	Is the unused space on the bench sheet crossed out?	<u>yes</u> /no/NA
17.	Was analysis turned in by the data due date? (If not record SR#)	<u>yes</u> /no/NA

COMMENTS:

Secondary Approved by: MEL Date: 05/16/25

DQREPORT

Analytical Results Summary

Instrument Name: K-UV-VIS-05

Analyst: JSANCHEZ

Analysis Lot: 879388 Method/Testcode: SM 10200 H/Chlorophylla UF

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
K2504671-001	Chlorophyll A	N/A		Water	53.40 mg/m ³	048.0000 mL	1.0 mg/m ³ J	1	0.6	1.5			5/15/25 16:33:51	N	IV
K2504671-001	Pheophytin A	N/A		Water	0.76 mg/m ³	048.0000 mL	1.5 mg/m ³ U	1		1.5			5/15/25 16:33:51	N	IV
K2504671-002	Chlorophyll A	N/A		Water	523.32 mg/m ³	045.0000 mL	10.0 mg/m ³	1	0.6	1.5			5/15/25 16:33:51	N	IV
K2504671-002	Pheophytin A	N/A		Water	16.10 mg/m ³	045.0000 mL	16.1 mg/m ³	1		1.5			5/15/25 16:33:51	N	IV
K2504671-003	Chlorophyll A	N/A		Water	357.78 mg/m ³	060.0000 mL	6.8 mg/m ³	1	0.6	1.5			5/15/25 16:33:51	N	IV
K2504671-003	Pheophytin A	N/A		Water	11.66 mg/m ³	060.0000 mL	11.7 mg/m ³	1		1.5			5/15/25 16:33:51	N	IV
K2504671-004	Chlorophyll A	N/A		Water	523.32 mg/m ³	019.0000 mL	10.3 mg/m ³	1	0.6	1.6			5/15/25 16:33:51	N	IV
K2504671-004	Pheophytin A	N/A		Water	17.75 mg/m ³	019.0000 mL	17.8 mg/m ³	1		1.6			5/15/25 16:33:51	N	IV
K2504671-005	Chlorophyll A	N/A		Water	517.98 mg/m ³	041.0000 mL	10.0 mg/m ³	1	0.6	1.5			5/15/25 16:33:51	N	IV
K2504671-005	Pheophytin A	N/A		Water	18.99 mg/m ³	041.0000 mL	19.0 mg/m ³	1		1.5			5/15/25 16:33:51	N	IV
K2504671-006	Chlorophyll A	N/A		Water	112.14 mg/m ³	054.0000 mL	2.1 mg/m ³	1	0.6	1.5			5/15/25 16:33:51	N	IV
K2504671-006	Pheophytin A	N/A		Water	3.48 mg/m ³	054.0000 mL	3.5 mg/m ³	1		1.5			5/15/25 16:33:51	N	IV
K2504671-007	Chlorophyll A	N/A		Water	160.20 mg/m ³	049.0000 mL	3.1 mg/m ³	1	0.6	1.5			5/15/25 16:33:51	N	IV
K2504671-007	Pheophytin A	N/A		Water	4.40 mg/m ³	049.0000 mL	4.4 mg/m ³	1		1.5			5/15/25 16:33:51	N	IV
KQ2508239-01	Chlorophyll A	LCS		Water	544.68 mg/m ³	2000 mL	5.45 mg/m ³	1	0.30	0.80	107		5/15/25 16:33:51	N	IV
KQ2508239-02	Chlorophyll A	DLCS		Water	534.00 mg/m ³	2000 mL	5.34 mg/m ³	1	0.30	0.80	105	2	5/15/25 16:33:51	N	IV
KQ2508239-03	Chlorophyll A	MB		Water	5.34 mg/m ³	2000 mL	0.80 mg/m ³ U	1	0.30	0.80			5/15/25 16:33:51	N	IV
KQ2508239-04	Chlorophyll A	MB		Water	10.68 mg/m ³	2000 mL	0.80 mg/m ³ U	1	0.30	0.80			5/15/25 16:33:51	N	IV
KQ2508240-01	Pheophytin A	LCS		Water	544.68 mg/m ³	2000 mL	545 mg/m ³	1		0.80	107		5/15/25 16:33:51	N	IV
KQ2508240-02	Pheophytin A	DLCS		Water	534.00 mg/m ³	2000 mL	534 mg/m ³	1		0.80	105	2	5/15/25 16:33:51	N	IV
KQ2508240-03	Pheophytin A	MB		Water	-0.39 mg/m ³	2000 mL	0.80 mg/m ³ U	1		0.80			5/15/25 16:33:51	N	IV
KQ2508240-04	Pheophytin A	MB		Water	-0.52 mg/m ³	2000 mL	0.80 mg/m ³ U	1		0.80			5/15/25 16:33:51	N	IV

indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

Printed 5/15/25 19:08 5/15/25 JS

Results Summary

Page 1 of 1

Service Request #: K2504671

Method: SM 10200 H (spectrophotometric)

Inst. Tape

Analysis For: Chlorophyll-a

Sample Number	Sample Volume	664 nm	750 nm	Acidified 665 nm	750 nm	Ext. Vol. mls	In solution mg/m ³ Chl-a	Reported mg/m ³ Chl-a	Reported mg/m ³ Pheo-a
LCS	-	0.2120	0.0060	0.1120	0.0080	-	544.68	545	
DLCS	-	0.2100	0.0050	0.1110	0.0060	-	534.00	534	
MB 1	2000	0.0000	0.0080	0.0000	0.0090	20	5.34	0.05	-0.39
MB 2	2000	0.0000	0.0090	-0.0010	0.0100	20	10.68	0.11	-0.52
K2504671-1	1048	0.0430	0.0080	0.0340	0.0090	20	53.40	1.02	0.76
K2504671-2	1045	0.4750	0.0120	0.3760	0.0110	20	523.32	10.02	16.10
K2504671-3	1060	0.3410	0.0130	0.2730	0.0120	20	357.78	6.75	11.66
K2504671-4	1019	0.4900	0.0100	0.3930	0.0110	20	523.32	10.27	17.75
K2504671-5	1041	0.5120	0.0120	0.4150	0.0120	20	517.98	9.95	18.99
K2504671-6	1054	0.1090	0.0090	0.0890	0.0100	20	112.14	2.13	3.48
K2504671-7	1049	0.1450	0.0100	0.1150	0.0100	20	160.200	3.1	4.4
							0.000	#DIV/0!	#DIV/0!
							0.000	#DIV/0!	#DIV/0!
							0.000	#DIV/0!	#DIV/0!
							0.000	#DIV/0!	#DIV/0!
							0.000	#DIV/0!	#DIV/0!
							0.000	#DIV/0!	#DIV/0!

$$\text{Chlorophyll-a} = \frac{26,700 ((\text{OD } 664\text{b} - \text{OD } 750\text{b}) - (\text{OD } 665\text{a} - \text{OD } 750\text{a})) \times V_1}{L \times V_2}$$

$$\text{Pheophytin-a} = \frac{26,700 [(1.7(\text{OD } 665\text{a} - \text{OD } 750\text{a}) - (\text{OD } 664\text{b} - \text{OD } 750\text{b}))] \times V_1}{L \times V_2}$$

V₁ = Volume of extract (ml)

V₂ = Volume of sample (ml)

L = Length of lightpath or width of cuvette (5 cm)

$$\text{LCS} = 26700 ((\text{OD } 664\text{b} - \text{OD } 750\text{b}) - (\text{OD } 665\text{a} - \text{OD } 750\text{a})) = 509.97$$

ID #: 24-GEN-04-30-L TV= 509.970 mg/m³ AVG= 509.970 mg/m³

Run# 879388

Pipette ID#: Ophos H35458H, TOC 124276B MgCO₃ Reagent ID#: 24-GEN-04-26-H Exp: 9/22/25

Equip.ID#:K-UV-VIS-05

Analyzed By: JS	Date: 5/15/2025 16:33
Reviewed By: MRL	Date: 05/16/25

ALS Environmental

Kelso

ChlorophyllA_5_15_2025_16:33:51_PM

1 / 3

15-May-2025 05:33 PM

Instrument Serial #: 9A5Y164011

Method name: Chlorophyll a 29-Oct-2020

Instrument model: GENESYS 150

Method created: 29-Oct-2020 10:25 PM

Software Package Version: 2.5

Signature: 

Method updated: 29-Oct-2020 10:27 PM

Multi-Wavelength: method parameters**Result: ABS****Wavelength table**

$\lambda 1$	$\lambda 2$	$\lambda 3$				
750.0	664.0	665.0				

LCS 1

ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.006	0.212	0.202				

LCS A 1

ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.008	0.112	0.112				

DLCS 1

ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.005	0.210	0.201				

DLCS A 1

ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.006	0.111	0.111				

MB 1 1

ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.008	0.000	-0.001				

MB 1 A 1

ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.009	0.000	0.000				

MB 2 1

ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.009	0.000	0.000				

MB 2 A 1

ABS(750.0)	ABS(664.0)	ABS(665.0)				
0.010	0.000	-0.001				

4671-1 1

ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.008	0.043	0.042			
4671-1 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.009	0.035	0.034			
4671-2 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.012	0.475	0.467			
4671-2 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.011	0.378	0.376			
4671-3 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.013	0.341	0.336			
4671-3 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.012	0.274	0.273			
4671-4 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.010	0.490	0.484			
4671-4 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.011	0.396	0.393			
4671-5 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.012	0.512	0.504			
4671-5 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.012	0.417	0.415			
4671-6 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.009	0.109	0.107			
4671-6 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.010	0.090	0.089			
4671-7 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			
0.010	0.145	0.142			
4671-7 A 1					
ABS(750.0)	ABS(664.0)	ABS(665.0)			

0.010	0.116	0.115				

Preparation Information Benchsheet

Rm# 879388

Prep Run#: 457213

Prep Workflow: GenExtChlA48Hrs

Status: Prepped

Team: GenChem/JSANCHEZ

Prep Method:

Prep Date/Time: 5/15/25 15:53

Number of Copies to make: 1

#	Lab Code	Client ID	B#	Method /Test	pH	Matrix	Amt. Ext.	Final Vol	Sample Description
1	KQ2508239-01	LCS		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
2	KQ2508239-02	DLCS		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
3	KQ2508239-03	MB		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
4	KQ2508239-04	MB		SM 10200 H/Chlorophylla UF		Liquid	2000mL	20.00mL	
5	K2504671-001	Clear	.01	SM 10200 H/Chlorophylla UF		Water	1048.0000mL	20.00mL	
6	K2504671-002	Lawrence 1	.01	SM 10200 H/Chlorophylla UF		Water	1045.0000mL	20.00mL	
7	K2504671-003	Lawrence 1 QA	.01	SM 10200 H/Chlorophylla UF		Water	1060.0000mL	20.00mL	
8	K2504671-004	Lawrence 2	.01	SM 10200 H/Chlorophylla UF		Water	1019.0000mL	20.00mL	
9	K2504671-005	Lawrence 2 QA	.01	SM 10200 H/Chlorophylla UF		Water	1041.0000mL	20.00mL	
10	K2504671-006	Long 4	.01	SM 10200 H/Chlorophylla UF		Water	1054.0000mL	20.00mL	
11	K2504671-007	Long 3	.01	SM 10200 H/Chlorophylla UF		Water	1049.0000mL	20.00mL	

Spiking Solutions

Name: Chlorophyll-a LCS	Inventory ID: 241685	Logbook Ref: 24-GEN-04-30-L	Expires On: 06/12/2025

KQ2508239-01 20.00mL

KQ2508239-02 20.00mL

Preparation Steps

Step: Centrifuge
 Started: 5/15/25 15:53
 Finished: 5/15/25 16:17
 By: JSANCHEZ
 Comments

Step: Extraction
 Started: 5/15/25 13:02
 Finished: 5/15/25 15:52
 By: JSANCHEZ
 Comments

Step: Filter
 Started: 5/8/25 13:02
 Finished: 5/8/25 14:32
 By: JSANCHEZ
 Comments

Comments:

Reviewed By: MRL Date: 05/16/25

Chain of Custody

Relinquished By: _____	Date: _____	Extracts Examined
Received By: _____	Date: _____	Yes No

Preparation Information Benchsheet

Run# 879388

Prep Run#: 457252
Team: GenChem/JSANCHEZ

Prep Workflow: GenExtChIA8Hrec
Prep Method:

Status: Prepped
Prep Date/Time: 5/15/25 15:53

Number of Copies to make: 1

#	Lab Code	Client ID	B#	Method /Test	pH	Matrix	Amt. Ext.	Final Vol	Sample Description
1	KQ2508240-01	LCS		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
2	KQ2508240-02	DLCS		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
3	KQ2508240-03	MB		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
4	KQ2508240-04	MB		SM 10200 H/Pheophytin A NF		Liquid	2000mL	20.00mL	
5	K2504671-001	Clear	.01	SM 10200 H/Pheophytin A NF		Water	1048.0000mL	20.00mL	
6	K2504671-002	Lawrence 1	.01	SM 10200 H/Pheophytin A NF		Water	1045.0000mL	20.00mL	
7	K2504671-003	Lawrence 1 QA	.01	SM 10200 H/Pheophytin A NF		Water	1060.0000mL	20.00mL	
8	K2504671-004	Lawrence 2	.01	SM 10200 H/Pheophytin A NF		Water	1019.0000mL	20.00mL	
9	K2504671-005	Lawrence 2 QA	.01	SM 10200 H/Pheophytin A NF		Water	1041.0000mL	20.00mL	
10	K2504671-006	Long 4	.01	SM 10200 H/Pheophytin A NF		Water	1054.0000mL	20.00mL	
11	K2504671-007	Long 3	.01	SM 10200 H/Pheophytin A NF		Water	1049.0000mL	20.00mL	

Spiking Solutions

Name: Chlorophyll-a LCS	Inventory ID: 241685	Logbook Ref: 24-GEN-04-30-L	Expires On: 06/12/2025

KQ2508240-01 20.00mL KQ2508240-02 20.00mL

Preparation Steps

Step: Centrifuge	Step: Extraction	Step: Filter
Started: 5/15/25 15:53	Started: 5/15/25 13:02	Started: 5/8/25 13:02
Finished: 5/15/25 16:17	Finished: 5/15/25 15:52	Finished: 5/8/25 14:32
By: JSANCHEZ	By: JSANCHEZ	By: JSANCHEZ
Comments	Comments	Comments

Comments: _____

Reviewed By: MEL Date: 05/16/25

Chain of Custody

Relinquished By: _____	Date: _____	Extracts Examined Yes No
Received By: _____	Date: _____	

Method: _____

Matrix:

Extraction: 1302-1552
Centrifuge: 1553-1617

Whatman GF/C micro fiber filters 42.5mm lot # 17047894

Page 26 of 26

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com



***Professional
Analytical
Services***

June 20, 2025

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN

Project: STREAMS
Project Number: 40644
COC Number: A25E0588

JOHN HABERLIN:

Enclosed please find the analytical data for your STREAMS project.

Your sample(s) were received on Friday, May 30, 2025 and properly maintained prior to the subsequent analysis. The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA, Standard Methods or the Army Corps of Engineers.

Following the analytical results you will find the Quality Control (QA/QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Practical Quantitation Limits (PQL's), as opposed to the Method Detection Limits (MDL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Aaron Young". The signature is fluid and cursive, with the first name "Aaron" and last name "Young" clearly distinguishable.

ElementStationManager For Aaron Young

President

aarony@amtestlab.com



ANALYSIS REPORT

Date Received: 05/30/25

Date Reported: 06/20/25

Thurston County Environmental Health

412 LILLY RD NE

OLYMPIA, WA 98506

Attention: JOHN HABERLIN

Project Name: STREAMS

Project #: 40644

Reported Samples

Lab ID	Sample	Matrix	Qualifiers	Date Sampled	Date Received
A25E0588-01	Clear Surface	Water		05/07/2025	05/30/2025
A25E0588-02	Clear Bottom	Water		05/07/2025	05/30/2025
A25E0588-03	Lawrence 1 Surface	Water		05/07/2025	05/30/2025
A25E0588-04	Lawrence 1 Surface QA	Water		05/07/2025	05/30/2025
A25E0588-05	Lawrence 1 Bottom	Water		05/07/2025	05/30/2025
A25E0588-06	Lawrence 1 Bottom QA	Water		05/07/2025	05/30/2025
A25E0588-07	Lawrence 2 Surface	Water		05/07/2025	05/30/2025
A25E0588-08	Lawrence 2 Surface QA	Water		05/07/2025	05/30/2025
A25E0588-09	Lawrence 2 Bottom	Water		05/07/2025	05/30/2025
A25E0588-10	Lawrence 2 Bottom QA	Water		05/07/2025	05/30/2025
A25E0588-11	Long 4 Surface	Water		05/07/2025	05/30/2025
A25E0588-12	Long 4 Surface QA	Water		05/07/2025	05/30/2025
A25E0588-13	Long 4 Bottom	Water		05/07/2025	05/30/2025
A25E0588-14	Long 3 Surface	Water		05/07/2025	05/30/2025
A25E0588-15	Long 3 Bottom	Water		05/07/2025	05/30/2025
A25E0588-16	Schneider T	Water		05/13/2025	05/30/2025
A25E0588-17	Kennedy	Water		05/13/2025	05/30/2025
A25E0588-18	Schneider Head	Water		05/13/2025	05/30/2025
A25E0588-19	McLane	Water		05/13/2025	05/30/2025
A25E0588-20	McLane QA	Water		05/13/2025	05/30/2025
A25E0588-21	Black Lake Ditch	Water		05/13/2025	05/30/2025
A25E0588-22	Moxley Mouth	Water		05/13/2025	05/30/2025
A25E0588-23	Moxlie @ Plum	Water		05/13/2025	05/30/2025
A25E0588-24	Pattison N Surface	Water		05/14/2025	05/30/2025
A25E0588-25	Pattison N Surface QA	Water		05/14/2025	05/30/2025
A25E0588-26	Pattison N Bottom	Water		05/14/2025	05/30/2025
A25E0588-27	Pattison N Bottom QA	Water		05/14/2025	05/30/2025
A25E0588-28	Pattison S Surface	Water		05/14/2025	05/30/2025
A25E0588-29	Pattison S Surface QA	Water		05/14/2025	05/30/2025
A25E0588-30	Pattison S Bottom	Water		05/14/2025	05/30/2025
A25E0588-31	Pattison S Bottom QA	Water		05/14/2025	05/30/2025
A25E0588-32	Black Surface	Water		05/14/2025	05/30/2025
A25E0588-33	Black Bottom	Water		05/14/2025	05/30/2025
A25E0588-34	Summit Surface	Water		05/14/2025	05/30/2025
A25E0588-35	Summit Bottom	Water		05/14/2025	05/30/2025

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com



**Professional
Analytical
Services**

ANALYSIS REPORT

Date Received: 05/30/25

Date Reported: 06/20/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25E0588-01

Client Identification: Clear Surface

Sampling Date: 05/07/25 09:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.010	mg/L	J	0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	0.61	mg/L		0.25	EPA 351.2_2_1993	MF	06/05/2025
Total Nitrogen	0.620	mg/L			Calculated	MF	06/05/2025
Total Phosphorus (TP)	0.041	mg/L		0.005	SM 4500-P_F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-02

Client Identification: Clear Bottom

Sampling Date: 05/07/25 09:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.009	mg/L	J	0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	0.78	mg/L		0.25	EPA 351.2_2_1993	MF	06/05/2025
Total Nitrogen	0.791	mg/L			Calculated	MF	06/05/2025
Total Phosphorus (TP)	0.043	mg/L		0.005	SM 4500-P_F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-03

Client Identification: Lawrence 1 Surface

Sampling Date: 05/07/25 10:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.010	mg/L	J	0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	1.12	mg/L		0.25	EPA 351.2_2_1993	MF	06/05/2025
Total Nitrogen	1.13	mg/L			Calculated	MF	06/05/2025
Total Phosphorus (TP)	0.018	mg/L		0.005	SM 4500-P_F_2011	MF	06/06/2025

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Thurston County Environmental Health

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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25E0588-04

Client Identification: Lawrence 1 Surface QA

Sampling Date: 05/07/25 10:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.011	mg/L	J	0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	1.21	mg/L		0.25	EPA 351.2_2_1993	MF	06/05/2025
Total Nitrogen	1.22	mg/L			Calculated	MF	06/05/2025
Total Phosphorus (TP)	0.019	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-05

Client Identification: Lawrence 1 Bottom

Sampling Date: 05/07/25 10:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.017	mg/L	J	0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	1.77	mg/L		0.25	EPA 351.2_2_1993	MF	06/05/2025
Total Nitrogen	1.79	mg/L			Calculated	MF	06/05/2025
Total Phosphorus (TP)	0.346	mg/L	D	0.050	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-06

Client Identification: Lawrence 1 Bottom QA

Sampling Date: 05/07/25 10:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.023	mg/L		0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	1.79	mg/L		0.25	EPA 351.2_2_1993	MF	06/05/2025
Total Nitrogen	1.81	mg/L			Calculated	MF	06/05/2025
Total Phosphorus (TP)	0.358	mg/L	D	0.050	SM 4500-P F_2011	MF	06/06/2025

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Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25E0588-07

Client Identification: Lawrence 2 Surface

Sampling Date: 05/07/25 11:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.004	mg/L	J	0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	1.12	mg/L		0.25	EPA 351.2_2_1993	MF	06/05/2025
Total Nitrogen	1.12	mg/L			Calculated	MF	06/05/2025
Total Phosphorus (TP)	0.013	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-08

Client Identification: Lawrence 2 Surface QA

Sampling Date: 05/07/25 11:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.005	mg/L	J	0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	1.09	mg/L		0.25	EPA 351.2_2_1993	MF	06/05/2025
Total Nitrogen	1.09	mg/L			Calculated	MF	06/05/2025
Total Phosphorus (TP)	0.015	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-09

Client Identification: Lawrence 2 Bottom

Sampling Date: 05/07/25 11:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.007	mg/L	J	0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	1.38	mg/L		0.25	EPA 351.2_2_1993	MF	06/05/2025
Total Nitrogen	1.39	mg/L			Calculated	MF	06/05/2025
Total Phosphorus (TP)	0.041	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

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Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25E0588-10

Client Identification: Lawrence 2 Bottom QA

Sampling Date: 05/07/25 11:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.007	mg/L	J	0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	1.42	mg/L		0.25	EPA 351.2_2_1993	MF	06/05/2025
Total Nitrogen	1.43	mg/L			Calculated	MF	06/05/2025
Total Phosphorus (TP)	0.044	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-11

Client Identification: Long 4 Surface

Sampling Date: 05/07/25 12:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.006	mg/L	J	0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	0.63	mg/L		0.25	EPA 351.2_2_1993	MF	06/10/2025
Total Nitrogen	0.638	mg/L			Calculated	MF	06/06/2025
Total Phosphorus (TP)	0.016	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-12

Client Identification: Long 4 Surface QA

Sampling Date: 05/07/25 12:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.007	mg/L	J	0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	0.63	mg/L		0.25	EPA 351.2_2_1993	MF	06/10/2025
Total Nitrogen	0.633	mg/L			Calculated	MF	06/06/2025
Total Phosphorus (TP)	0.008	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

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AMTEST Identification Number: A25E0588-13

Client Identification: Long 4 Bottom

Sampling Date: 05/07/25 12:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.014	mg/L	J	0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	0.67	mg/L		0.25	EPA 351.2_2_1993	MF	06/10/2025
Total Nitrogen	0.683	mg/L			Calculated	MF	06/06/2025
Total Phosphorus (TP)	0.027	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-14

Client Identification: Long 3 Surface

Sampling Date: 05/07/25 13:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.017	mg/L	J	0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	0.54	mg/L		0.25	EPA 351.2_2_1993	MF	06/10/2025
Total Nitrogen	0.556	mg/L			Calculated	MF	06/06/2025
Total Phosphorus (TP)	0.012	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-15

Client Identification: Long 3 Bottom

Sampling Date: 05/07/25 13:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.035	mg/L		0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	0.62	mg/L		0.25	EPA 351.2_2_1993	MF	06/10/2025
Total Nitrogen	0.654	mg/L			Calculated	MF	06/06/2025
Total Phosphorus (TP)	0.015	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

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Project #: 40644

AMTEST Identification Number: A25E0588-16

Client Identification: Schneider T

Sampling Date: 05/13/25 09:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.294	mg/L		0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Phosphorus (TP)	0.031	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-17

Client Identification: Kennedy

Sampling Date: 05/13/25 10:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.291	mg/L		0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Phosphorus (TP)	0.020	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-18

Client Identification: Schneider Head

Sampling Date: 05/13/25 10:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.066	mg/L		0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Phosphorus (TP)	0.031	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-19

Client Identification: McLane

Sampling Date: 05/13/25 11:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.313	mg/L		0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Phosphorus (TP)	0.038	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

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AMTEST Identification Number: A25E0588-20

Client Identification: McLane QA

Sampling Date: 05/13/25 11:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.296	mg/L		0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Phosphorus (TP)	0.034	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-21

Client Identification: Black Lake Ditch

Sampling Date: 05/13/25 12:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.102	mg/L		0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Phosphorus (TP)	0.039	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-22

Client Identification: Moxley Mouth

Sampling Date: 05/13/25 13:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.665	mg/L		0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Phosphorus (TP)	0.069	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-23

Client Identification: Moxlie @ Plum

Sampling Date: 05/13/25 13:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.576	mg/L		0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Phosphorus (TP)	0.096	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

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Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25E0588-24

Client Identification: Pattison N Surface

Sampling Date: 05/14/25 09:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.08	mg/L		0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	0.66	mg/L		0.25	EPA 351.2_2_1993	MF	06/10/2025
Total Nitrogen	1.74	mg/L			Calculated	MF	06/06/2025
Total Phosphorus (TP)	0.015	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-25

Client Identification: Pattison N Surface QA

Sampling Date: 05/14/25 09:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.09	mg/L		0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	0.62	mg/L		0.25	EPA 351.2_2_1993	MF	06/10/2025
Total Nitrogen	1.71	mg/L			Calculated	MF	06/06/2025
Total Phosphorus (TP)	0.013	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-26

Client Identification: Pattison N Bottom

Sampling Date: 05/14/25 09:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.652	mg/L		0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	0.55	mg/L		0.25	EPA 351.2_2_1993	MF	06/10/2025
Total Nitrogen	1.20	mg/L			Calculated	MF	06/06/2025
Total Phosphorus (TP)	0.027	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

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Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25E0588-27

Client Identification: Pattison N Bottom QA

Sampling Date: 05/14/25 09:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.650	mg/L		0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	0.64	mg/L		0.25	EPA 351.2_2_1993	MF	06/10/2025
Total Nitrogen	1.29	mg/L			Calculated	MF	06/06/2025
Total Phosphorus (TP)	0.058	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-28

Client Identification: Pattison S Surface

Sampling Date: 05/14/25 09:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.531	mg/L		0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	0.62	mg/L		0.25	EPA 351.2_2_1993	MF	06/10/2025
Total Nitrogen	1.15	mg/L			Calculated	MF	06/06/2025
Total Phosphorus (TP)	0.017	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-29

Client Identification: Pattison S Surface QA

Sampling Date: 05/14/25 09:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.546	mg/L		0.020	EPA 353.2_2_1993	MF	06/03/2025
Total Kjeldahl Nitrogen	0.66	mg/L		0.25	EPA 351.2_2_1993	MF	06/10/2025
Total Nitrogen	1.21	mg/L			Calculated	MF	06/06/2025
Total Phosphorus (TP)	0.021	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

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Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25E0588-30
Client Identification: Pattison S Bottom
Sampling Date: 05/14/25 09:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Phosphorus (TP)	0.053	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-31
Client Identification: Pattison S Bottom QA
Sampling Date: 05/14/25 09:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Phosphorus (TP)	0.063	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-32
Client Identification: Black Surface
Sampling Date: 05/14/25 11:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Phosphorus (TP)	0.010	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-33
Client Identification: Black Bottom
Sampling Date: 05/14/25 11:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Phosphorus (TP)	0.011	mg/L		0.005	SM 4500-P F_2011	MF	06/06/2025

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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25E0588-34
Client Identification: Summit Surface
Sampling Date: 05/14/25 12:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Phosphorus (TP)	ND	mg/L	U, J	0.005	SM 4500-P F_2011	MF	06/06/2025

AMTEST Identification Number: A25E0588-35
Client Identification: Summit Bottom
Sampling Date: 05/14/25 12:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Phosphorus (TP)	ND	mg/L	U, J	0.005	SM 4500-P F_2011	MF	06/06/2025

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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 05/30/25

Date Reported: 06/20/25

Quality Control

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCF0010 - No Prep - WetChem										
Blank (BCF0010-BLK1)					Prepared: 06/02/25 Analyzed: 06/05/25					
Total Kjeldahl Nitrogen	ND	U	0.25	mg/L						
Blank (BCF0010-BLK2)					Prepared: 06/02/25 Analyzed: 06/05/25					
Total Kjeldahl Nitrogen	ND	U	0.25	mg/L						
LCS (BCF0010-BS1)					Prepared: 06/02/25 Analyzed: 06/05/25					
Total Kjeldahl Nitrogen	0.53		0.25	mg/L	0.5000		107%	85-115%		
LCS (BCF0010-BS2)					Prepared: 06/02/25 Analyzed: 06/05/25					
Total Kjeldahl Nitrogen	0.53		0.25	mg/L	0.5000		107%	85-115%		
Calibration Blank (BCF0010-CCB1)					Prepared: 06/02/25 Analyzed: 06/05/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Blank (BCF0010-CCB2)					Prepared: 06/02/25 Analyzed: 06/05/25					
Total Kjeldahl Nitrogen	0.0002			mg/L						
Calibration Blank (BCF0010-CCB3)					Prepared: 06/02/25 Analyzed: 06/05/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Blank (BCF0010-CCB4)					Prepared: 06/02/25 Analyzed: 06/05/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Check (BCF0010-CCV1)					Prepared: 06/02/25 Analyzed: 06/05/25					
Total Kjeldahl Nitrogen	1.03		0.25	mg/L	1.000		103%	85-115%		
Calibration Check (BCF0010-CCV2)					Prepared: 06/02/25 Analyzed: 06/05/25					
Total Kjeldahl Nitrogen	1.03		0.25	mg/L	1.000		103%	85-115%		
Calibration Check (BCF0010-CCV3)					Prepared: 06/02/25 Analyzed: 06/05/25					
Total Kjeldahl Nitrogen	1.02		0.25	mg/L	1.000		102%	85-115%		
Calibration Check (BCF0010-CCV4)					Prepared: 06/02/25 Analyzed: 06/05/25					
Total Kjeldahl Nitrogen	1.04		0.25	mg/L	1.000		104%	85-115%		
Duplicate (BCF0010-DUP1)					Prepared: 06/02/25 Analyzed: 06/05/25					
					Source: A25E0446-01					

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Date Received: 05/30/25

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Thurston County Environmental Health

412 LILLY RD NE

OLYMPIA, WA 98506

Attention: JOHN HABERLIN

Project Name: STREAMS

Project #: 40644

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCF0010 - No Prep - WetChem (Continued)

Duplicate (BCF0010-DUP1)

Source: A25E0446-01

Prepared: 06/02/25 Analyzed: 06/05/25

Total Kjeldahl Nitrogen	5.13	D	5.00	mg/L		5.27			3	30

Duplicate (BCF0010-DUP2)

Source: A25E0483-06

Prepared: 06/02/25 Analyzed: 06/05/25

Total Kjeldahl Nitrogen	0.64		0.25	mg/L		0.66			2	30

Duplicate (BCF0010-DUP3)

Source: A25E0588-04

Prepared: 06/02/25 Analyzed: 06/05/25

Total Kjeldahl Nitrogen	1.09		0.25	mg/L		1.21			11	30

Duplicate (BCF0010-DUP4)

Source: A25E0588-10

Prepared: 06/02/25 Analyzed: 06/05/25

Total Kjeldahl Nitrogen	1.56		0.25	mg/L		1.42			9	30

Matrix Spike (BCF0010-MS1)

Source: A25E0446-01

Prepared: 06/02/25 Analyzed: 06/05/25

Total Kjeldahl Nitrogen	26.6	D	5.00	mg/L	20.00	5.27	107%	80-120%		

Matrix Spike (BCF0010-MS2)

Source: A25E0483-06

Prepared: 06/02/25 Analyzed: 06/05/25

Total Kjeldahl Nitrogen	2.81		0.25	mg/L	2.000	0.66	107%	80-120%		

Matrix Spike (BCF0010-MS3)

Source: A25E0588-04

Prepared: 06/02/25 Analyzed: 06/05/25

Total Kjeldahl Nitrogen	3.50		0.25	mg/L	2.000	1.21	115%	80-120%		

Matrix Spike (BCF0010-MS4)

Source: A25E0588-10

Prepared: 06/02/25 Analyzed: 06/05/25

Total Kjeldahl Nitrogen	3.59		0.25	mg/L	2.000	1.42	109%	80-120%		

Batch: BCF0026 - No Prep - WetChem

Blank (BCF0026-BLK1)

Prepared: 06/02/25 Analyzed: 06/06/25

Total Phosphorus (TP)	ND	U, J	0.005	mg/L						

Blank (BCF0026-BLK2)

Prepared: 06/02/25 Analyzed: 06/06/25

Total Phosphorus (TP)	ND	U, J	0.005	mg/L						

Blank (BCF0026-BLK3)

Prepared: 06/02/25 Analyzed: 06/06/25

Total Phosphorus (TP)	ND	U, J	0.005	mg/L						

Blank (BCF0026-BLK4)

Prepared: 06/02/25 Analyzed: 06/06/25

Total Phosphorus (TP)	ND	U, J	0.005	mg/L						

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Attention: JOHN HABERLIN
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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCF0026 - No Prep - WetChem (Continued)										
Blank (BCF0026-BLK5)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	ND	U, J	0.005	mg/L						
LCS (BCF0026-BS1)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.100		0.005	mg/L	0.1000		100%	85-115%		
LCS (BCF0026-BS2)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.104		0.005	mg/L	0.1000		104%	85-115%		
LCS (BCF0026-BS3)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.106		0.005	mg/L	0.1000		106%	85-115%		
LCS (BCF0026-BS4)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.106		0.005	mg/L	0.1000		106%	85-115%		
LCS (BCF0026-BS5)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.103		0.005	mg/L	0.1000		103%	85-115%		
Calibration Blank (BCF0026-CCB1)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.005			mg/L						
Calibration Blank (BCF0026-CCB2)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.005			mg/L						
Calibration Blank (BCF0026-CCB3)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BCF0026-CCB4)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.003			mg/L						
Calibration Blank (BCF0026-CCB5)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.003			mg/L						
Calibration Blank (BCF0026-CCB6)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.005			mg/L						
Calibration Blank (BCF0026-CCB7)					Prepared: 06/02/25 Analyzed: 06/06/25					

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Attention: JOHN HABERLIN
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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCF0026 - No Prep - WetChem (Continued)										
Calibration Blank (BCF0026-CCB7)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.005			mg/L						
Calibration Blank (BCF0026-CCB8)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BCF0026-CCB9)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.005			mg/L						
Calibration Check (BCF0026-CCV1)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.205		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCF0026-CCV2)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.206		0.005	mg/L	0.2000		103%	85-115%		
Calibration Check (BCF0026-CCV3)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.208		0.005	mg/L	0.2000		104%	85-115%		
Calibration Check (BCF0026-CCV4)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.208		0.005	mg/L	0.2000		104%	85-115%		
Calibration Check (BCF0026-CCV5)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.208		0.005	mg/L	0.2000		104%	85-115%		
Calibration Check (BCF0026-CCV6)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.214		0.005	mg/L	0.2000		107%	85-115%		
Calibration Check (BCF0026-CCV7)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.208		0.005	mg/L	0.2000		104%	85-115%		
Calibration Check (BCF0026-CCV8)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.205		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCF0026-CCV9)					Prepared: 06/02/25 Analyzed: 06/06/25					
Total Phosphorus (TP)	0.205		0.005	mg/L	0.2000		102%	85-115%		
Duplicate (BCF0026-DUP1)			Source: A25E0483-10		Prepared: 06/02/25 Analyzed: 06/06/25					

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCF0026 - No Prep - WetChem (Continued)										
Duplicate (BCF0026-DUP1)			Source: A25E0483-10	Prepared: 06/02/25 Analyzed: 06/06/25						
Total Phosphorus (TP)	0.045		0.005	mg/L		0.056			22	25
Duplicate (BCF0026-DUP2)			Source: A25E0518-01	Prepared: 06/02/25 Analyzed: 06/06/25						
Total Phosphorus (TP)	ND	U, J	0.005	mg/L		0.006				25
Duplicate (BCF0026-DUP3)			Source: A25E0537-07	Prepared: 06/02/25 Analyzed: 06/06/25						
Total Phosphorus (TP)	0.033		0.005	mg/L		0.028			16	25
Duplicate (BCF0026-DUP4)			Source: A25E0576-02	Prepared: 06/02/25 Analyzed: 06/06/25						
Total Phosphorus (TP)	3.15	D	0.100	mg/L		3.00			5	25
Duplicate (BCF0026-DUP5)			Source: A25E0588-10	Prepared: 06/02/25 Analyzed: 06/06/25						
Total Phosphorus (TP)	0.044		0.005	mg/L		0.044			2	25
Duplicate (BCF0026-DUP6)			Source: A25E0588-20	Prepared: 06/02/25 Analyzed: 06/06/25						
Total Phosphorus (TP)	0.036		0.005	mg/L		0.034			5	25
Duplicate (BCF0026-DUP7)			Source: A25E0588-30	Prepared: 06/02/25 Analyzed: 06/06/25						
Total Phosphorus (TP)	0.050		0.005	mg/L		0.053			6	25
Duplicate (BCF0026-DUP8)			Source: A25E0591-05	Prepared: 06/02/25 Analyzed: 06/06/25						
Total Phosphorus (TP)	0.009		0.005	mg/L		0.008			11	25
Duplicate (BCF0026-DUP9)			Source: A25E0591-11	Prepared: 06/02/25 Analyzed: 06/06/25						
Total Phosphorus (TP)	ND	U, J	0.005	mg/L		ND				25
Matrix Spike (BCF0026-MS1)			Source: A25E0483-10	Prepared: 06/02/25 Analyzed: 06/06/25						
Total Phosphorus (TP)	0.242		0.005	mg/L	0.2000	0.056	93%	85-115%		
Matrix Spike (BCF0026-MS2)			Source: A25E0518-01	Prepared: 06/02/25 Analyzed: 06/06/25						
Total Phosphorus (TP)	0.198		0.005	mg/L	0.2000	0.006	96%	85-115%		
Matrix Spike (BCF0026-MS3)			Source: A25E0537-07	Prepared: 06/02/25 Analyzed: 06/06/25						
Total Phosphorus (TP)	0.238		0.005	mg/L	0.2000	0.028	105%	85-115%		
Matrix Spike (BCF0026-MS4)			Source: A25E0576-02	Prepared: 06/02/25 Analyzed: 06/06/25						

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Attention: JOHN HABERLIN
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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCF0026 - No Prep - WetChem (Continued)

Matrix Spike (BCF0026-MS4)

Source: A25E0576-02

Prepared: 06/02/25 Analyzed: 06/06/25

Total Phosphorus (TP)	6.55	D	0.100	mg/L	4.000	3.00	89%	85-115%

Matrix Spike (BCF0026-MS5)

Source: A25E0588-10

Prepared: 06/02/25 Analyzed: 06/06/25

Total Phosphorus (TP)	0.256		0.005	mg/L	0.2000	0.044	106%	85-115%

Matrix Spike (BCF0026-MS6)

Source: A25E0588-20

Prepared: 06/02/25 Analyzed: 06/06/25

Total Phosphorus (TP)	0.245		0.005	mg/L	0.2000	0.034	105%	85-115%

Matrix Spike (BCF0026-MS7)

Source: A25E0588-30

Prepared: 06/02/25 Analyzed: 06/06/25

Total Phosphorus (TP)	0.267		0.005	mg/L	0.2000	0.053	107%	85-115%

Matrix Spike (BCF0026-MS8)

Source: A25E0591-05

Prepared: 06/02/25 Analyzed: 06/06/25

Total Phosphorus (TP)	0.215		0.005	mg/L	0.2000	0.008	104%	85-115%

Matrix Spike (BCF0026-MS9)

Source: A25E0591-11

Prepared: 06/02/25 Analyzed: 06/06/25

Total Phosphorus (TP)	0.198		0.005	mg/L	0.2000	ND	99%	85-115%

Batch: BCF0035 - No Prep - WetChem

Blank (BCF0035-BLK1)

Prepared & Analyzed: 06/03/25

Total Nitrate + Nitrite	ND	U	0.020	mg/L

Blank (BCF0035-BLK2)

Prepared & Analyzed: 06/03/25

Total Nitrate + Nitrite	0.009	J	0.020	mg/L

Blank (BCF0035-BLK3)

Prepared & Analyzed: 06/03/25

Total Nitrate + Nitrite	0.006	J	0.020	mg/L

Blank (BCF0035-BLK4)

Prepared & Analyzed: 06/03/25

Total Nitrate + Nitrite	0.006	J	0.020	mg/L

LCS (BCF0035-BS1)

Prepared & Analyzed: 06/03/25

Total Nitrate + Nitrite	0.504		0.020	mg/L	0.5000		101%	90-110%

LCS (BCF0035-BS2)

Prepared & Analyzed: 06/03/25

Total Nitrate + Nitrite	0.508		0.020	mg/L	0.5000		102%	90-110%

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Attention: JOHN HABERLIN
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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCF0035 - No Prep - WetChem (Continued)										
LCS (BCF0035-BS3)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	0.520		0.020	mg/L	0.5000		104%	90-110%		
LCS (BCF0035-BS4)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	0.511		0.020	mg/L	0.5000		102%	90-110%		
Calibration Blank (BCF0035-CCB1)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	0.008			mg/L						
Calibration Blank (BCF0035-CCB2)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	0.006			mg/L						
Calibration Blank (BCF0035-CCB3)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	0.008			mg/L						
Calibration Blank (BCF0035-CCB4)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	0.008			mg/L						
Calibration Blank (BCF0035-CCB5)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	0.007			mg/L						
Calibration Blank (BCF0035-CCB6)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	0.009			mg/L						
Calibration Blank (BCF0035-CCB7)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	0.007			mg/L						
Calibration Check (BCF0035-CCV1)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	1.00		0.020	mg/L	1.000		100%	85-115%		
Calibration Check (BCF0035-CCV2)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	1.00		0.020	mg/L	1.000		100%	85-115%		
Calibration Check (BCF0035-CCV3)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	1.01		0.020	mg/L	1.000		101%	85-115%		
Calibration Check (BCF0035-CCV4)					Prepared & Analyzed: 06/03/25					

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCF0035 - No Prep - WetChem (Continued)										
Calibration Check (BCF0035-CCV4)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	1.02		0.020	mg/L	1.000		102%	85-115%		
Calibration Check (BCF0035-CCV5)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	1.01		0.020	mg/L	1.000		101%	85-115%		
Calibration Check (BCF0035-CCV6)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	1.00		0.020	mg/L	1.000		100%	85-115%		
Calibration Check (BCF0035-CCV7)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	0.999		0.020	mg/L	1.000		100%	85-115%		
Duplicate (BCF0035-DUP1)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	0.318		0.020	mg/L		0.323			2	20
Duplicate (BCF0035-DUP2)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	0.688		0.020	mg/L		0.679			1	20
Duplicate (BCF0035-DUP3)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	0.017	J	0.020	mg/L		0.017			2	20
Duplicate (BCF0035-DUP4)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	0.034		0.020	mg/L		0.035			4	20
Duplicate (BCF0035-DUP5)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	1.09		0.020	mg/L		1.09			0.5	20
Duplicate (BCF0035-DUP6)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	1.61		0.020	mg/L		1.63			1	20
Duplicate (BCF0035-DUP7)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	0.007	J	0.020	mg/L		0.008			19	20
Matrix Spike (BCF0035-MS1)					Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	1.30		0.020	mg/L	1.000	0.323	98%	85-115%		
Matrix Spike (BCF0035-MS2)					Prepared & Analyzed: 06/03/25					

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCF0035 - No Prep - WetChem (Continued)										
Matrix Spike (BCF0035-MS2)		Source: A25E0532-01			Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	1.69		0.020	mg/L	1.000	0.679	101%	85-115%		
Matrix Spike (BCF0035-MS3)		Source: A25E0588-05			Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	0.979		0.020	mg/L	1.000	0.017	96%	85-115%		
Matrix Spike (BCF0035-MS4)		Source: A25E0588-15			Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	1.02		0.020	mg/L	1.000	0.035	98%	85-115%		
Matrix Spike (BCF0035-MS5)		Source: A25E0588-25			Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	2.08		0.020	mg/L	1.000	1.09	99%	85-115%		
Matrix Spike (BCF0035-MS6)		Source: A25E0591-06			Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	2.64		0.020	mg/L	1.000	1.63	100%	85-115%		
Matrix Spike (BCF0035-MS7)		Source: A25E0591-11			Prepared & Analyzed: 06/03/25					
Total Nitrate + Nitrite	1.01		0.020	mg/L	1.000	0.008	101%	85-115%		
Batch: BCF0102 - No Prep - WetChem										
Blank (BCF0102-BLK1)		Prepared: 06/06/25 Analyzed: 06/10/25								
Total Kjeldahl Nitrogen	ND	U	0.25	mg/L						
Blank (BCF0102-BLK2)		Prepared: 06/06/25 Analyzed: 06/10/25								
Total Kjeldahl Nitrogen	ND	U	0.25	mg/L						
Blank (BCF0102-BLK3)		Prepared: 06/06/25 Analyzed: 06/10/25								
Total Kjeldahl Nitrogen	ND	U	0.25	mg/L						
LCS (BCF0102-BS1)		Prepared: 06/06/25 Analyzed: 06/10/25								
Total Kjeldahl Nitrogen	0.52		0.25	mg/L	0.5000		104%	85-115%		
LCS (BCF0102-BS2)		Prepared: 06/06/25 Analyzed: 06/10/25								
Total Kjeldahl Nitrogen	0.49		0.25	mg/L	0.5000		99%	85-115%		
LCS (BCF0102-BS3)		Prepared: 06/06/25 Analyzed: 06/10/25								
Total Kjeldahl Nitrogen	0.49		0.25	mg/L	0.5000		98%	85-115%		

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 05/30/25

Date Reported: 06/20/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCF0102 - No Prep - WetChem (Continued)										
Calibration Blank (BCF0102-CCB1)					Prepared: 06/06/25 Analyzed: 06/10/25					
Total Kjeldahl Nitrogen	0.004			mg/L						
Calibration Blank (BCF0102-CCB2)					Prepared: 06/06/25 Analyzed: 06/10/25					
Total Kjeldahl Nitrogen	0.009			mg/L						
Calibration Blank (BCF0102-CCB3)					Prepared: 06/06/25 Analyzed: 06/10/25					
Total Kjeldahl Nitrogen	0.01			mg/L						
Calibration Blank (BCF0102-CCB4)					Prepared: 06/06/25 Analyzed: 06/10/25					
Total Kjeldahl Nitrogen	0.006			mg/L						
Calibration Blank (BCF0102-CCB5)					Prepared: 06/06/25 Analyzed: 06/10/25					
Total Kjeldahl Nitrogen	0.004			mg/L						
Calibration Check (BCF0102-CCV1)					Prepared: 06/06/25 Analyzed: 06/10/25					
Total Kjeldahl Nitrogen	1.00		0.25	mg/L	1.000		100%	85-115%		
Calibration Check (BCF0102-CCV2)					Prepared: 06/06/25 Analyzed: 06/10/25					
Total Kjeldahl Nitrogen	1.02		0.25	mg/L	1.000		102%	85-115%		
Calibration Check (BCF0102-CCV3)					Prepared: 06/06/25 Analyzed: 06/10/25					
Total Kjeldahl Nitrogen	0.97		0.25	mg/L	1.000		97%	85-115%		
Calibration Check (BCF0102-CCV4)					Prepared: 06/06/25 Analyzed: 06/10/25					
Total Kjeldahl Nitrogen	1.00		0.25	mg/L	1.000		100%	85-115%		
Calibration Check (BCF0102-CCV5)					Prepared: 06/06/25 Analyzed: 06/10/25					
Total Kjeldahl Nitrogen	1.02		0.25	mg/L	1.000		102%	85-115%		
Duplicate (BCF0102-DUP1)					Prepared: 06/06/25 Analyzed: 06/10/25					
Total Kjeldahl Nitrogen	0.61		0.25	mg/L		0.62			1	30
Duplicate (BCF0102-DUP2)					Prepared: 06/06/25 Analyzed: 06/10/25					
Total Kjeldahl Nitrogen	42.0	D	5.00	mg/L		42.9			2	30
Duplicate (BCF0102-DUP3)					Prepared: 06/06/25 Analyzed: 06/10/25					
					Source: A25E0588-28					
					Source: A25F0075-02					
					Source: A25F0081-02					



ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 05/30/25

Date Reported: 06/20/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCF0102 - No Prep - WetChem (Continued)										
Duplicate (BCF0102-DUP3)		Source: A25F0081-02		Prepared: 06/06/25 Analyzed: 06/10/25						
Total Kjeldahl Nitrogen	0.52		0.25	mg/L		0.50			3	30
Duplicate (BCF0102-DUP4)		Source: A25F0093-04		Prepared: 06/06/25 Analyzed: 06/10/25						
Total Kjeldahl Nitrogen	71.3	D	12.5	mg/L		63.7			11	30
Duplicate (BCF0102-DUP5)		Source: A25F0110-02		Prepared: 06/06/25 Analyzed: 06/10/25						
Total Kjeldahl Nitrogen	3.23		0.25	mg/L		3.90			19	30
Matrix Spike (BCF0102-MS1)		Source: A25E0588-28		Prepared: 06/06/25 Analyzed: 06/10/25						
Total Kjeldahl Nitrogen	2.66		0.25	mg/L	2.000	0.62	102%	80-120%		
Matrix Spike (BCF0102-MS2)		Source: A25F0075-02		Prepared: 06/06/25 Analyzed: 06/10/25						
Total Kjeldahl Nitrogen	62.6	D	5.00	mg/L	20.00	42.9	98%	80-120%		
Matrix Spike (BCF0102-MS3)		Source: A25F0081-02		Prepared: 06/06/25 Analyzed: 06/10/25						
Total Kjeldahl Nitrogen	2.51		0.25	mg/L	2.000	0.50	100%	80-120%		
Matrix Spike (BCF0102-MS4)		Source: A25F0093-04		Prepared: 06/06/25 Analyzed: 06/10/25						
Total Kjeldahl Nitrogen	114	D	12.5	mg/L	50.00	63.7	100%	80-120%		
Matrix Spike (BCF0102-MS5)		Source: A25F0110-02		Prepared: 06/06/25 Analyzed: 06/10/25						
Total Kjeldahl Nitrogen	5.77		0.25	mg/L	2.000	3.90	93%	80-120%		

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com



**Professional
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ANALYSIS REPORT

Date Received: 05/30/25
Date Reported: 06/20/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Notes and Definitions

Item	Definition
U	The compound was analyzed for but was not detected (Non-detect) at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
D	The reported value is from a dilution.
Dry	Sample results reported on a dry weight basis.
ND	Analyte NOT DETECTED at or above the reporting limit.
RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was matrix spiked or duplicated.

A25E0588

Ph (425) 885-1664 Fx (425) 820-0245

Chain of Custody No. _____

Felix

AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

Ph (425) 885-1664 Fx (425) 820-0245

www.amtestlab.com

A25E0588

Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506				Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506										
Contact Person: John Haberlin				Invoice Contact: John Haberlin										
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young										
Fax No:				Invoice Ph/Fax:										
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us										
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:										
Special Instructions: Please report to detection limit for all results.														
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)				Temperature upon Receipt: 2.8°C										
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested								
Project Number: 40644						Total Phosphate	Total Nitrogen	NOx						
AmTest ID	Client ID (35 characters max)													
11	Long 4 Surface	5/7/2025	1240	H2O	1	X	X							
12	Long 4 Surface QA	5/7/2025	1240	H2O	1	X	X							X
13	Long 4 Bottom	5/7/2025	1245	H2O	1	X	X							
1	Long 4 Bottom QA	5/7/2025	1245	H2O	1	X	X							X
14	Long 3 Surface	5/7/2025	1310	H2O	1	X	X							
15	Long 3 Bottom	5/7/2025	1315	H2O	1	X	X							
16	Schneider T	5/13/2025	0925	H2O	1	X		X						
17	Kennedy	5/13/2025	1010	H2O	1	X		X						
18	Schneider Head	5/13/2025	1030	H2O	1	X		X						
19	McLane	5/13/2025	1130	H2O	1	X		X						
Collected/Relinquished By: John Haberlin		Date 5/29/2025	Time 1500	Received By: SF				Date 5/30/25	Time 1005					
Relinquished By:		Date	Time	Received By:				Date	Time					
Relinquished By:		Date	Time	Received By:				Date	Time					

COMMENTS:

Page 2 of 4

① Long 4 Bottom QA not in cooler. Removed from COC due to non-receipt of this sample. SF 5/30/25
SF 5/30/25

AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

Ph (425) 885-1664 Fx (425) 820-0245

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A25E0588

Chain of Custody No. _____

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506				Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506												
Contact Person: John Haberlin				Invoice Contact: John Haberlin												
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young												
Fax No:				Invoice Ph/Fax:												
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us												
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:												
Special Instructions: Please report to detection limit for all results.																
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)				Temperature upon Receipt: 2.8°C												
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested										
Project Number: 40644						Total Phosphate	Total Nitrogen	NOx								QA/QC
AmTest ID	Client ID (35 characters max)															
20	McLane QA	5/13/2025	1130	H2O	1	X		X								X
21	Black Lake Ditch	5/13/2025	1210	H2O	1	X		X								
22	Moxley Mouth	5/13/2025	1305	H2O	1	X		X								
23	Moxlie @ Plum	5/13/2025	1320	H2O	1	X		X								
24	Pattison N Surface	5/14/2025	0915	H2O	1	X	X									
25	Pattison N Surface QA	5/14/2025	0915	H2O	1	X	X									X
26	Pattison N Bottom	5/14/2025	0920	H2O	1	X	X									
27	Pattison N Bottom QA	5/14/2025	0920	H2O	1	X	X									X
28	Pattison S Surface	5/14/2025	0950	H2O	1	X	X									
29	Pattison S Surface QA	5/14/2025	0950	H2O	1	X	X									X
Collected/Relinquished By: John Haberlin		Date 5/29/2025	Time 1500	Received By: SF				Date 5/30/25	Time 1005							
Relinquished By:		Date	Time	Received By:				Date	Time							
Relinquished By:		Date	Time	Received By:				Date	Time							

COMMENTS:

AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

Ph (425) 885-1664 Fx (425) 820-0245

www.amtestlab.com

A25E0588

Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506				Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506												
Contact Person: John Haberlin				Invoice Contact: John Haberlin												
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young												
Fax No:				Invoice Ph/Fax:												
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us												
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:												
Special Instructions: Please report to detection limit for all results.																
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)				Temperature upon Receipt: 2.8°C												
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested										
Project Number: 40644						Total Phosphate	Total Nitrogen	NOx								QA/QC
AmTest ID	Client ID (35 characters max)															
30	Pattison S Bottom	5/14/2025	0955	H2O	1	X										X
31	Pattison S Bottom QA	5/14/2025	0955	H2O	1	X										
32	Black Surface	5/14/2025	1115	H2O	1	X										
33	Black Bottom	5/14/2025	1120	H2O	1	X										
34	Summit Surface	5/14/2025	1245	H2O	1	X										
35	Summit Bottom	5/14/2025	1245	H2O	1	X										
Collected/Relinquished By: John Haberlin		Date 5/29/2025	Time 1500	Received By: SF				Date 5/30/25	Time 1005							
Relinquished By:		Date	Time	Received By:				Date	Time							
Relinquished By:		Date	Time	Received By:				Date	Time							

COMMENTS:

TSHIMAKAIN CREEK LABORATORIES, LLC

August 11, 2025

Stuart Whitford

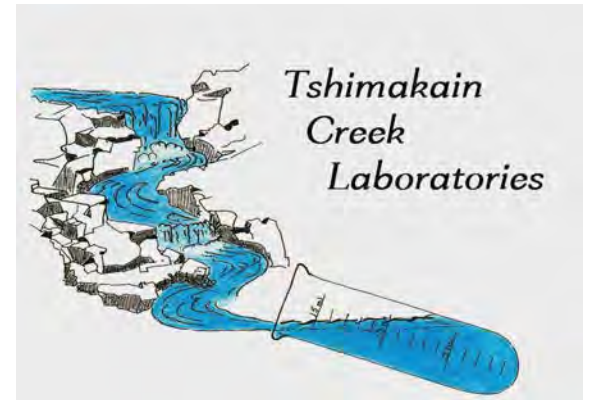
Thurston County Environmental Health

3000 Pacific Ave SE

Olympia, WA 98501

Project Name: Chlorophyll a Project 2025

Report No.: 25G2401



Dear Stuart Whitford,

This Report contains the analytical result for the sample(s) received under chain of custody(s) by Tshimakain Creek Laboratories on July 24, 2025.

The test result in this report are in compliance with Washington State Department of Ecology laboratory accreditation requirements for the certified parameters. Any anomalies are noted in the case narrative and this cover page are an integral part of this report. The Laboratory report may not be produced, exempt in full, without the written approval of the laboratory.

The issuance of the final Certificate of Analysis takes precedence over any previous Preliminary Report. Preliminary Data should not be used for regular purposes. Authorized signature(s) is provided on final report only.

If you have any questions in reference to this report, please contact your Tshimakain Creek Laboratories coordinator.

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

Page 2 of 6

CLIENT: Thurston County Environmental Health
ATTENTION: Stuart Whitford
ADDRESS: 3000 Pacific Ave SE
Olympia WA, 98501
PHONE: (360) 463-8323

JOB NO: 25G2401
PROJECT NAME: Chlorophyll a Project 2025
REPORTED: 11-Aug-25 12:52
SUBMITTED: 24-Jul-25
PROJECT NUMBER [none]

TCL ID#	25G2401-01	25G2401-02	25G2401-03	25G2401-04
MATRIX	Water	Water	Water	Water
SAMPLED DATE	22-Jul-25 10:20	22-Jul-25 10:20	22-Jul-25 12:00	22-Jul-25 12:00
CLIENT SAMPLE ID	Clear	Clear QA	Lawrence 1	Lawrence 1 QA

ANALYSIS PARAMETERS	METHOD	MRL	UNITS	ANALYZED				
PHYSICAL PROPERTIES								
Chlorophyll-a	SM 10200H	1.0	ug/L	31-Jul-25	5.3	5.3	7.1	7.0



Reviewed By _____
Elida Madera
Lab Manager

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

Page 3 of 6

CLIENT: Thurston County Environmental Health
ATTENTION: Stuart Whitford
ADDRESS: 3000 Pacific Ave SE
Olympia WA, 98501
PHONE: (360) 463-8323

JOB NO: 25G2401
PROJECT NAME: Chlorophyll a Project 2025
REPORTED: 11-Aug-25 12:52
SUBMITTED: 24-Jul-25
PROJECT NUMBER [none]

TCL ID#	25G2401-05	25G2401-06	25G2401-07	25G2401-08
MATRIX	Water	Water	Water	Water
SAMPLED DATE	22-Jul-25 12:30	23-Jul-25 09:00	23-Jul-25 09:50	23-Jul-25 11:10
CLIENT SAMPLE ID	Lawrence 2	St Clair 1	St Clair 2	Offutt

ANALYSIS PARAMETERS	METHOD	MRL	UNITS	ANALYZED				
PHYSICAL PROPERTIES								
Chlorophyll-a	SM 10200H	1.0	ug/L	31-Jul-25	<0.60	6.2	1.1	8.0



Reviewed By _____
Elida Madera
Lab Manager

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

Page 4 of 6

CLIENT: Thurston County Environmental Health
ATTENTION: Stuart Whitford
ADDRESS: 3000 Pacific Ave SE
Olympia WA, 98501
PHONE: (360) 463-8323

JOB NO: 25G2401
PROJECT NAME: Chlorophyll a Project 2025
REPORTED: 11-Aug-25 12:52
SUBMITTED: 24-Jul-25
PROJECT NUMBER [none]

TCL ID #	25G2401-09	25G2401-10	25G2401-11	-
MATRIX	Water	Water	Water	-
SAMPLED DATE	23-Jul-25 11:10	23-Jul-25 12:20	23-Jul-25 12:20	-
CLIENT SAMPLE ID	Offutt QA	Munn	Munn QA	-
ANALYSIS PARAMETERS	METHOD	MRL	UNITS	ANALYZED
PHYSICAL PROPERTIES				
Chlorophyll-a	SM 10200H	1.0	ug/L	31-Jul-25
				6.8
				6.3
				7.4
				-



Reviewed By _____
Elida Madera
Lab Manager

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

Page 5 of 6

CLIENT: Thurston County Environmental Health

JOB NO: 25G2401

ATTENTION: Stuart Whitford

PROJECT NAME: Chlorophyll a Project 2025

ADDRESS: 3000 Pacific Ave SE

REPORTED: 11-Aug-25 12:52

Olympia WA, 98501

SUBMITTED: 24-Jul-25

PHONE: (360) 463-8323

PROJECT NUMBER [none]

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes

Reviewed By_____

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

Page 6 of 6

CLIENT: Thurston County Environmental Health
ATTENTION: Stuart Whitford
ADDRESS: 3000 Pacific Ave SE
Olympia WA, 98501
PHONE: (360) 463-8323

JOB NO: 25G2401
PROJECT NAME: Chlorophyll a Project 2025
REPORTED: 11-Aug-25 12:52
SUBMITTED: 24-Jul-25
PROJECT NUMBER [none]

Notes and Definitions

MRL = MINIMUM REPORTING LIMIT

NC = NON-CALCULABLE

%RPD = RELATIVE PERCENT DIFFERENCE

%REC = PERCENT RECOVERY

LCS = LABORATORY CONTROL SAMPLE

NR = NEGATIVE RESULT

TSHIMAKAIN CREEK LABORATORIES, LLC

September 12, 2025

Stuart Whitford

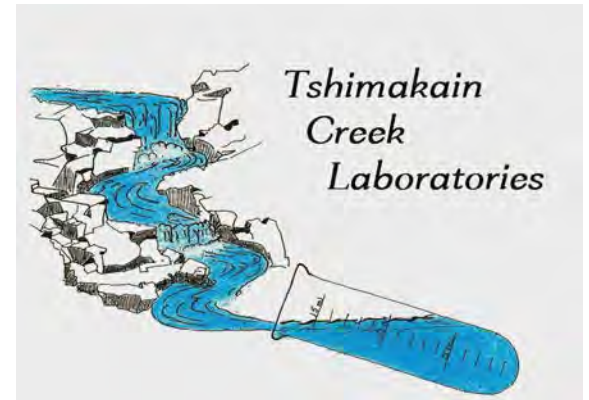
Thurston County Environmental Health

3000 Pacific Ave SE

Olympia, WA 98501

Project Name: Chlorophyll a Project 2025

Report No.: 25H2601



Dear Stuart Whitford,

This Report contains the analytical result for the sample(s) received under chain of custody(s) by Tshimakain Creek Laboratories on August 26, 2025.

The test result in this report are in compliance with Washington State Department of Ecology laboratory accreditation requirements for the certified parameters. Any anomalies are noted in the case narrative and this cover page are an integral part of this report. The Laboratory report may not be produced, exempt in full, without the written approval of the laboratory.

The issuance of the final Certificate of Analysis takes precedence over any previous Preliminary Report. Preliminary Data should not be used for regular purposes. Authorized signature(s) is provided on final report only.

If you have any questions in reference to this report, please contact your Tshimakain Creek Laboratories coordinator.

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

Page 2 of 5

CLIENT: Thurston County Environmental Health
ATTENTION: Stuart Whitford
ADDRESS: 3000 Pacific Ave SE
Olympia WA, 98501
PHONE: (360) 463-8323

JOB NO: 25H2601
PROJECT NAME: Chlorophyll a Project 2025
REPORTED: 12-Sep-25 10:03
SUBMITTED: 26-Aug-25
PROJECT NUMBER [none]

TCL ID#	25H2601-01	25H2601-02	25H2601-03	25H2601-04
MATRIX	Water	Water	Water	Water
SAMPLED DATE	21-Aug-25 09:50	21-Aug-25 11:35	21-Aug-25 12:05	26-Aug-25 09:05
CLIENT SAMPLE ID	Clear	Lawrence 1	Lawrence 2	St Clair 1

ANALYSIS PARAMETERS	METHOD	MRL	UNITS	ANALYZED				
Chlorophyll-a	SM 10200H	1.0	ug/L	26-Aug-25	65	18	14	3.0



Reviewed By _____
Elida Madera
Lab Manager

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

Page 3 of 5

CLIENT: Thurston County Environmental Health
ATTENTION: Stuart Whitford
ADDRESS: 3000 Pacific Ave SE
Olympia WA, 98501
PHONE: (360) 463-8323

JOB NO: 25H2601
PROJECT NAME: Chlorophyll a Project 2025
REPORTED: 12-Sep-25 10:03
SUBMITTED: 26-Aug-25
PROJECT NUMBER [none]

TCL ID#	25H2601-05	25H2601-06	25H2601-07	25H2601-08
MATRIX	Water	Water	Water	Water
SAMPLED DATE	26-Aug-25 10:15	26-Aug-25 11:50	26-Aug-25 12:50	28-Aug-25 11:25
CLIENT SAMPLE ID	St Clair 2	Offutt	Munn	Long 3

ANALYSIS PARAMETERS	METHOD	MRL	UNITS	ANALYZED				
PHYSICAL PROPERTIES								
Chlorophyll-a	SM 10200H	1.0	ug/L	26-Aug-25	2.2	6.4	8.9	6.0



Reviewed By _____
Elida Madera
Lab Manager

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

CLIENT: Thurston County Environmental Health
ATTENTION: Stuart Whitford
ADDRESS: 3000 Pacific Ave SE
Olympia WA, 98501
PHONE: (360) 463-8323

JOB NO: 25H2601
PROJECT NAME: Chlorophyll a Project 2025
REPORTED: 12-Sep-25 10:03
SUBMITTED: 26-Aug-25
PROJECT NUMBER [none]

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes

Reviewed By_____

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

Page 5 of 5

CLIENT: Thurston County Environmental Health
ATTENTION: Stuart Whitford
ADDRESS: 3000 Pacific Ave SE
Olympia WA, 98501
PHONE: (360) 463-8323

JOB NO: 25H2601
PROJECT NAME: Chlorophyll a Project 2025
REPORTED: 12-Sep-25 10:03
SUBMITTED: 26-Aug-25
PROJECT NUMBER [none]

Notes and Definitions

MRL = MINIMUM REPORTING LIMIT

NC = NON-CALCULABLE

%RPD = RELATIVE PERCENT DIFFERENCE

%REC = PERCENT RECOVERY

LCS = LABORATORY CONTROL SAMPLE

NR = NEGATIVE RESULT

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com



***Professional
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Services***

September 17, 2025

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN

Project: STREAMS
Project Number: 40644
COC Number: A25H0548

JOHN HABERLIN:

Enclosed please find the analytical data for your STREAMS project.

Your sample(s) were received on Wednesday, August 27, 2025 and properly maintained prior to the subsequent analysis. The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA, Standard Methods or the Army Corps of Engineers.

Following the analytical results you will find the Quality Control (QA/QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Practical Quantitation Limits (PQL's), as opposed to the Method Detection Limits (MDL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Aaron Young". The signature is fluid and cursive, with the first name "Aaron" and last name "Young" clearly distinguishable.

ElementStationManager For Aaron Young

President

aarony@amtestlab.com



ANALYSIS REPORT

Date Received: 08/27/25

Date Reported: 09/17/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Reported Samples

Lab ID	Sample	Matrix	Qualifiers	Date Sampled	Date Received
A25H0548-01	Schneider T	Water		08/05/2025	08/27/2025
A25H0548-02	Kennedy	Water		08/05/2025	08/27/2025
A25H0548-03	Mclane	Water		08/05/2025	08/27/2025
A25H0548-04	Mclane QC	Water		08/05/2025	08/27/2025
A25H0548-05	Black Lake Ditch	Water		08/05/2025	08/27/2025
A25H0548-06	Deschutes Falls	Water		08/12/2025	08/27/2025
A25H0548-07	Deschutes @ Vail	Water		08/12/2025	08/27/2025
A25H0548-08	Deschutes @ Vail QC	Water		08/12/2025	08/27/2025
A25H0548-09	Deschutes @ Waldrick	Water		08/12/2025	08/27/2025
A25H0548-10	Deschutes @ Waldrick QC	Water		08/12/2025	08/27/2025
A25H0548-11	Spurgeon @ Rich	Water		08/12/2025	08/27/2025
A25H0548-12	Deschutes @ Tumwater	Water		08/12/2025	08/27/2025
A25H0548-13	Indian Mouth	Water		08/12/2025	08/27/2025
A25H0548-14	Thompson	Water		08/13/2025	08/27/2025
A25H0548-15	McAllister @ I-5	Water		08/13/2025	08/27/2025
A25H0548-16	McAllister @ I-5 QC	Water		08/13/2025	08/27/2025
A25H0548-17	Eaton	Water		08/13/2025	08/27/2025
A25H0548-18	Woodland @ Draham	Water		08/13/2025	08/27/2025
A25H0548-19	Woodland @ PG	Water		08/13/2025	08/27/2025
A25H0548-20	Woodland @ Libby	Water		08/13/2025	08/27/2025
A25H0548-21	Clear Surface	Water		08/21/2025	08/27/2025
A25H0548-22	Clear Bottom	Water		08/21/2025	08/27/2025
A25H0548-23	Lawrence 1 Surface	Water		08/21/2025	08/27/2025
A25H0548-24	Lawrence 1 Bottom	Water		08/21/2025	08/27/2025
A25H0548-25	Lawrence 2 Surface	Water		08/21/2025	08/27/2025
A25H0548-26	Lawrence 2 Bottom	Water		08/21/2025	08/27/2025
A25H0548-27	Salmon @ LR	Water		08/25/2025	08/27/2025
A25H0548-28	Blooms Ditch @ 110th	Water		08/25/2025	08/27/2025
A25H0548-29	Black @ 128th	Water		08/25/2025	08/27/2025
A25H0548-30	Beaver @ LR	Water		08/25/2025	08/27/2025
A25H0548-31	Black@ Moon	Water		08/25/2025	08/27/2025
A25H0548-32	Chehalis	Water		08/25/2025	08/27/2025
A25H0548-33	Skookumchuck	Water		08/25/2025	08/27/2025

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Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25H0548-01

Client Identification: Schneider T

Sampling Date: 08/05/25 09:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.106	mg/L	B	0.020	EPA 353.2_2_1993	CC	09/03/2025
Total Kjeldahl Nitrogen	0.43	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	0.540	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.044	mg/L		0.005	SM 4500-P_F_2011	CC	09/04/2025

AMTEST Identification Number: A25H0548-02

Client Identification: Kennedy

Sampling Date: 08/05/25 10:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.138	mg/L	B	0.020	EPA 353.2_2_1993	CC	09/03/2025
Total Kjeldahl Nitrogen	0.36	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	0.500	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.021	mg/L		0.005	SM 4500-P_F_2011	CC	09/04/2025

AMTEST Identification Number: A25H0548-03

Client Identification: Mclane

Sampling Date: 08/05/25 11:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.244	mg/L	B	0.020	EPA 353.2_2_1993	CC	09/03/2025
Total Kjeldahl Nitrogen	0.46	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	0.704	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.090	mg/L		0.005	SM 4500-P_F_2011	CC	09/04/2025

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Thurston County Environmental Health

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OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25H0548-04

Client Identification: Mclane QC

Sampling Date: 08/05/25 11:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.246	mg/L	B	0.020	EPA 353.2_2_1993	CC	09/03/2025
Total Kjeldahl Nitrogen	0.50	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	0.741	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.068	mg/L		0.005	SM 4500-P F_2011	CC	09/04/2025

AMTEST Identification Number: A25H0548-05

Client Identification: Black Lake Ditch

Sampling Date: 08/05/25 12:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.020	mg/L	B	0.020	EPA 353.2_2_1993	CC	09/03/2025
Total Kjeldahl Nitrogen	0.61	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	0.626	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.019	mg/L		0.005	SM 4500-P F_2011	CC	09/04/2025

AMTEST Identification Number: A25H0548-06

Client Identification: Deschutes Falls

Sampling Date: 08/12/25 09:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.205	mg/L	B	0.020	EPA 353.2_2_1993	CC	09/03/2025
Total Kjeldahl Nitrogen	0.36	mg/L		0.25	EPA 351.2_2_1993	CC	09/12/2025
Total Nitrogen	0.568	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.019	mg/L		0.005	SM 4500-P F_2011	CC	09/04/2025

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Thurston County Environmental Health

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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25H0548-07

Client Identification: Deschutes @ Vail

Sampling Date: 08/12/25 10:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.640	mg/L	B	0.020	EPA 353.2_2_1993	CC	09/03/2025
Total Kjeldahl Nitrogen	0.38	mg/L		0.25	EPA 351.2_2_1993	CC	09/12/2025
Total Nitrogen	1.02	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.025	mg/L		0.005	SM 4500-P F_2011	CC	09/04/2025

AMTEST Identification Number: A25H0548-08

Client Identification: Deschutes @ Vail QC

Sampling Date: 08/12/25 10:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.638	mg/L	B	0.020	EPA 353.2_2_1993	CC	09/03/2025
Total Kjeldahl Nitrogen	0.40	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	1.04	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.023	mg/L		0.005	SM 4500-P F_2011	CC	09/04/2025

AMTEST Identification Number: A25H0548-09

Client Identification: Deschutes @ Waldrick

Sampling Date: 08/12/25 11:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.02	mg/L	B	0.020	EPA 353.2_2_1993	CC	09/03/2025
Total Kjeldahl Nitrogen	0.50	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	1.52	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.023	mg/L		0.005	SM 4500-P F_2011	CC	09/04/2025

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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25H0548-10
Client Identification: Deschutes @ Waldrick QC
Sampling Date: 08/12/25 11:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.08	mg/L		0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.47	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	1.55	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.024	mg/L		0.005	SM 4500-P F_2011	CC	09/04/2025

AMTEST Identification Number: A25H0548-11
Client Identification: Spurgeon @ Rich
Sampling Date: 08/12/25 11:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.008	mg/L	J	0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.50	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	0.505	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.032	mg/L		0.005	SM 4500-P F_2011	CC	09/04/2025

AMTEST Identification Number: A25H0548-12
Client Identification: Deschutes @ Tumwater
Sampling Date: 08/12/25 12:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.760	mg/L		0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.47	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	1.23	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.037	mg/L		0.005	SM 4500-P F_2011	CC	09/04/2025

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Thurston County Environmental Health

412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25H0548-13

Client Identification: Indian Mouth

Sampling Date: 08/12/25 12:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.943	mg/L		0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.47	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	1.41	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.055	mg/L		0.005	SM 4500-P F_2011	CC	09/04/2025

AMTEST Identification Number: A25H0548-14

Client Identification: Thompson

Sampling Date: 08/13/25 08:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	2.87	mg/L	D	0.100	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.41	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	3.28	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.021	mg/L		0.005	SM 4500-P F_2011	CC	09/04/2025

AMTEST Identification Number: A25H0548-15

Client Identification: McAllister @ I-5

Sampling Date: 08/13/25 08:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.713	mg/L		0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.66	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	1.37	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.155	mg/L		0.005	SM 4500-P F_2011	CC	09/04/2025

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Thurston County Environmental Health

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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25H0548-16

Client Identification: McAllister @ I-5 QC

Sampling Date: 08/13/25 08:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.738	mg/L		0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.62	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	1.36	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.155	mg/L		0.005	SM 4500-P F_2011	CC	09/04/2025

AMTEST Identification Number: A25H0548-17

Client Identification: Eaton

Sampling Date: 08/13/25 09:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.803	mg/L		0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.41	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	1.22	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.046	mg/L		0.005	SM 4500-P F_2011	CC	09/04/2025

AMTEST Identification Number: A25H0548-18

Client Identification: Woodland @ Draham

Sampling Date: 08/13/25 10:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.77	mg/L		0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.54	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	2.31	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.079	mg/L		0.005	SM 4500-P F_2011	CC	09/04/2025

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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25H0548-19

Client Identification: Woodland @ PG

Sampling Date: 08/13/25 10:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.72	mg/L		0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.39	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	2.11	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.074	mg/L		0.005	SM 4500-P F_2011	CC	09/09/2025

AMTEST Identification Number: A25H0548-20

Client Identification: Woodland @ Libby

Sampling Date: 08/13/25 11:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.33	mg/L		0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.40	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	1.72	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.061	mg/L		0.005	SM 4500-P F_2011	CC	09/09/2025

AMTEST Identification Number: A25H0548-21

Client Identification: Clear Surface

Sampling Date: 08/21/25 09:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.008	mg/L	J	0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.79	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	0.801	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.044	mg/L		0.005	SM 4500-P F_2011	CC	09/09/2025

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Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25H0548-22

Client Identification: Clear Bottom

Sampling Date: 08/21/25 09:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.017	mg/L	J	0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	1.20	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	1.21	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.503	mg/L	D	0.025	SM 4500-P F_2011	CC	09/09/2025

AMTEST Identification Number: A25H0548-23

Client Identification: Lawrence 1 Surface

Sampling Date: 08/21/25 11:35

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.012	mg/L	J	0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.91	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	0.921	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.019	mg/L		0.005	SM 4500-P F_2011	CC	09/09/2025

AMTEST Identification Number: A25H0548-24

Client Identification: Lawrence 1 Bottom

Sampling Date: 08/21/25 11:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.019	mg/L	J	0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.93	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	0.950	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.128	mg/L		0.005	SM 4500-P F_2011	CC	09/09/2025



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Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25H0548-25
Client Identification: Lawrence 2 Surface
Sampling Date: 08/21/25 12:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.012	mg/L	J	0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.82	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	0.833	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.029	mg/L		0.005	SM 4500-P F_2011	CC	09/09/2025

AMTEST Identification Number: A25H0548-26
Client Identification: Lawrence 2 Bottom
Sampling Date: 08/21/25 12:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.033	mg/L		0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	1.54	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	1.58	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.200	mg/L		0.005	SM 4500-P F_2011	CC	09/09/2025

AMTEST Identification Number: A25H0548-27
Client Identification: Salmon @ LR
Sampling Date: 08/25/25 09:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.096	mg/L		0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.75	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	0.846	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.086	mg/L		0.005	SM 4500-P F_2011	CC	09/09/2025

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com



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ANALYSIS REPORT

Date Received: 08/27/25

Date Reported: 09/17/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25H0548-28

Client Identification: Blooms Ditch @ 110th

Sampling Date: 08/25/25 09:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.346	mg/L		0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.37	mg/L		0.25	EPA 351.2_2_1993	CC	09/05/2025
Total Nitrogen	0.721	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.034	mg/L		0.005	SM 4500-P F_2011	CC	09/09/2025

AMTEST Identification Number: A25H0548-29

Client Identification: Black @ 128th

Sampling Date: 08/25/25 10:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.034	mg/L		0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.49	mg/L		0.25	EPA 351.2_2_1993	CC	09/08/2025
Total Nitrogen	0.519	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.048	mg/L		0.005	SM 4500-P F_2011	CC	09/09/2025

AMTEST Identification Number: A25H0548-30

Client Identification: Beaver @ LR

Sampling Date: 08/25/25 10:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.495	mg/L		0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.56	mg/L		0.25	EPA 351.2_2_1993	CC	09/08/2025
Total Nitrogen	1.06	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.053	mg/L		0.005	SM 4500-P F_2011	CC	09/09/2025

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ANALYSIS REPORT

Date Received: 08/27/25

Date Reported: 09/17/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25H0548-31

Client Identification: Black@ Moon

Sampling Date: 08/25/25 10:35

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.426	mg/L		0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.55	mg/L		0.25	EPA 351.2_2_1993	CC	09/08/2025
Total Nitrogen	0.973	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.021	mg/L		0.005	SM 4500-P F_2011	CC	09/09/2025

AMTEST Identification Number: A25H0548-32

Client Identification: Chehalis

Sampling Date: 08/25/25 11:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.365	mg/L		0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.45	mg/L		0.25	EPA 351.2_2_1993	CC	09/08/2025
Total Nitrogen	0.814	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.069	mg/L		0.005	SM 4500-P F_2011	CC	09/09/2025

AMTEST Identification Number: A25H0548-33

Client Identification: Skookumchuck

Sampling Date: 08/25/25 11:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.147	mg/L		0.020	EPA 353.2_2_1993	CC	09/10/2025
Total Kjeldahl Nitrogen	0.40	mg/L		0.25	EPA 351.2_2_1993	CC	09/08/2025
Total Nitrogen	0.549	mg/L			Calculated	CC	09/10/2025
Total Phosphorus (TP)	0.018	mg/L		0.005	SM 4500-P F_2011	CC	09/09/2025

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 08/27/25

Date Reported: 09/17/25

Quality Control

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCH0484 - No Prep - WetChem										
Blank (BCH0484-BLK1)					Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	0.005	J	0.020	mg/L						
Blank (BCH0484-BLK2)					Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	0.062		0.020	mg/L						
Blank (BCH0484-BLK3)					Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	0.006	J	0.020	mg/L						
LCS (BCH0484-BS1)					Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	0.506	B	0.020	mg/L	0.5000		101%	90-110%		
LCS (BCH0484-BS2)					Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	0.520	B	0.020	mg/L	0.5000		104%	90-110%		
LCS (BCH0484-BS3)					Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	0.507	B	0.020	mg/L	0.5000		101%	90-110%		
Calibration Blank (BCH0484-CCB1)					Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	0.005	B		mg/L						
Calibration Blank (BCH0484-CCB2)					Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	0.005	B		mg/L						
Calibration Blank (BCH0484-CCB3)					Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	0.005	B		mg/L						
Calibration Blank (BCH0484-CCB4)					Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	0.007	B		mg/L						
Calibration Blank (BCH0484-CCB5)					Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	0.006	B		mg/L						
Calibration Check (BCH0484-CCV1)					Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	1.05	B	0.020	mg/L	1.000		105%	85-115%		
Calibration Check (BCH0484-CCV2)					Prepared: 08/29/25 Analyzed: 09/03/25					

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
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Project #: 40644

Date Received: 08/27/25

Date Reported: 09/17/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCH0484 - No Prep - WetChem (Continued)										
Calibration Check (BCH0484-CCV2)					Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	1.03	B	0.020	mg/L	1.000		103%	85-115%		
Calibration Check (BCH0484-CCV3)					Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	1.05	B	0.020	mg/L	1.000		105%	85-115%		
Calibration Check (BCH0484-CCV4)					Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	1.03	B	0.020	mg/L	1.000		103%	85-115%		
Calibration Check (BCH0484-CCV5)					Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	0.992	B	0.020	mg/L	1.000		99%	85-115%		
Duplicate (BCH0484-DUP1)					Source: A25H0454-14 Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	0.007	J, B	0.020	mg/L		0.008			2	20
Duplicate (BCH0484-DUP2)					Source: A25H0515-01 Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	0.261	B	0.020	mg/L		0.263			0.6	20
Duplicate (BCH0484-DUP3)					Source: A25H0539-08 Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	0.192	B	0.020	mg/L		0.188			2	20
Duplicate (BCH0484-DUP4)					Source: A25H0548-09 Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	1.04	B	0.020	mg/L		1.02			2	20
Matrix Spike (BCH0484-MS1)					Source: A25H0454-14 Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	0.997	B	0.020	mg/L	1.000	0.008	99%	85-115%		
Matrix Spike (BCH0484-MS2)					Source: A25H0515-01 Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	1.27	B	0.020	mg/L	1.000	0.263	101%	85-115%		
Matrix Spike (BCH0484-MS3)					Source: A25H0539-08 Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	1.18	B	0.020	mg/L	1.000	0.188	99%	85-115%		
Matrix Spike (BCH0484-MS4)					Source: A25H0548-09 Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	2.02	B	0.020	mg/L	1.000	1.02	101%	85-115%		
Reference (BCH0484-SRM1)					Prepared: 08/29/25 Analyzed: 09/03/25					

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
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Date Received: 08/27/25

Date Reported: 09/17/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCH0484 - No Prep - WetChem (Continued)										
Reference (BCH0484-SRM1)					Prepared: 08/29/25 Analyzed: 09/03/25					
Total Nitrate + Nitrite	1.18	B	0.020	mg/L	1.190		99%	0-200%		
Batch: BCI0041 - No Prep - WetChem										
Blank (BCI0041-BLK1)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.003	J	0.005	mg/L						
Blank (BCI0041-BLK2)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.003	J	0.005	mg/L						
Blank (BCI0041-BLK3)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.004	J	0.005	mg/L						
Blank (BCI0041-BLK4)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.003	J	0.005	mg/L						
LCS (BCI0041-BS1)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.109		0.005	mg/L	0.1000		109%	85-115%		
LCS (BCI0041-BS2)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.109		0.005	mg/L	0.1000		109%	85-115%		
LCS (BCI0041-BS3)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.110		0.005	mg/L	0.1000		110%	85-115%		
LCS (BCI0041-BS4)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.111		0.005	mg/L	0.1000		111%	85-115%		
Calibration Blank (BCI0041-CCB1)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.005			mg/L						
Calibration Blank (BCI0041-CCB2)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BCI0041-CCB3)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.004			mg/L						

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
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Attention: JOHN HABERLIN
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Date Received: 08/27/25

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCI0041 - No Prep - WetChem (Continued)										
Calibration Blank (BCI0041-CCB4)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BCI0041-CCB5)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BCI0041-CCB6)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BCI0041-CCB7)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Blank (BCI0041-CCB8)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.004			mg/L						
Calibration Check (BCI0041-CCV1)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.209		0.005	mg/L	0.2000		105%	85-115%		
Calibration Check (BCI0041-CCV2)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.213		0.005	mg/L	0.2000		106%	85-115%		
Calibration Check (BCI0041-CCV3)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.211		0.005	mg/L	0.2000		106%	85-115%		
Calibration Check (BCI0041-CCV4)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.216		0.005	mg/L	0.2000		108%	85-115%		
Calibration Check (BCI0041-CCV5)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.211		0.005	mg/L	0.2000		106%	85-115%		
Calibration Check (BCI0041-CCV6)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.216		0.005	mg/L	0.2000		108%	85-115%		
Calibration Check (BCI0041-CCV7)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.211		0.005	mg/L	0.2000		106%	85-115%		
Calibration Check (BCI0041-CCV8)					Prepared: 09/03/25 Analyzed: 09/04/25					



ANALYSIS REPORT

Thurston County Environmental Health

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Date Received: 08/27/25

Date Reported: 09/17/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCI0041 - No Prep - WetChem (Continued)										
Calibration Check (BCI0041-CCV8)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.212		0.005	mg/L	0.2000		106%	85-115%		
Duplicate (BCI0041-DUP1)					Source: A25H0548-18 Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.079		0.005	mg/L		0.079			0.2	25
Duplicate (BCI0041-DUP2)					Source: A25H0454-07 Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.005	J	0.005	mg/L		0.005			4	25
Duplicate (BCI0041-DUP3)					Source: A25H0454-17 Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.005		0.005	mg/L		0.004			18	25
Duplicate (BCI0041-DUP4)					Source: A25H0485-03 Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.027		0.005	mg/L		0.025			7	25
Duplicate (BCI0041-DUP5)					Source: A25H0506-08 Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.190		0.005	mg/L		0.189			0.1	25
Duplicate (BCI0041-DUP6)					Source: A25H0517-03 Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.023		0.005	mg/L		0.023			0.7	25
Duplicate (BCI0041-DUP7)					Source: A25H0548-01 Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.043		0.005	mg/L		0.044			4	25
Duplicate (BCI0041-DUP8)					Source: A25H0548-11 Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.029		0.005	mg/L		0.032			7	25
Matrix Spike (BCI0041-MS1)					Source: A25H0548-18 Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.295		0.005	mg/L	0.2000	0.079	108%	85-115%		
Matrix Spike (BCI0041-MS2)					Source: A25H0454-07 Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.207		0.005	mg/L	0.2000	0.005	101%	85-115%		
Matrix Spike (BCI0041-MS3)					Source: A25H0454-17 Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.204		0.005	mg/L	0.2000	0.004	100%	85-115%		
Matrix Spike (BCI0041-MS4)					Source: A25H0485-03 Prepared: 09/03/25 Analyzed: 09/04/25					

ANALYSIS REPORT

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Thurston County Environmental Health

412 LILLY RD NE

OLYMPIA, WA 98506

Attention: JOHN HABERLIN

Project Name: STREAMS

Project #: 40644

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCI0041 - No Prep - WetChem (Continued)										
Matrix Spike (BCI0041-MS4)			Source: A25H0485-03		Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.238		0.005	mg/L	0.2000	0.025	106%	85-115%		
Matrix Spike (BCI0041-MS5)			Source: A25H0506-08		Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.406		0.005	mg/L	0.2000	0.189	108%	85-115%		
Matrix Spike (BCI0041-MS6)			Source: A25H0517-03		Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.238		0.005	mg/L	0.2000	0.023	107%	85-115%		
Matrix Spike (BCI0041-MS7)			Source: A25H0548-01		Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.262		0.005	mg/L	0.2000	0.044	109%	85-115%		
Matrix Spike (BCI0041-MS8)			Source: A25H0548-11		Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.249		0.005	mg/L	0.2000	0.032	109%	85-115%		
Reference (BCI0041-SRM1)					Prepared: 09/03/25 Analyzed: 09/04/25					
Total Phosphorus (TP)	0.130		0.005	mg/L	0.1280		101%	0-200%		
Batch: BCI0059 - No Prep - WetChem										
Blank (BCI0059-BLK1)					Prepared: 09/04/25 Analyzed: 09/05/25					
Total Kjeldahl Nitrogen	0.17	J	0.25	mg/L						
Blank (BCI0059-BLK2)					Prepared: 09/04/25 Analyzed: 09/05/25					
Total Kjeldahl Nitrogen	0.16	J	0.25	mg/L						
LCS (BCI0059-BS1)					Prepared: 09/04/25 Analyzed: 09/05/25					
Total Kjeldahl Nitrogen	0.48		0.25	mg/L	0.5000		96%	85-115%		
LCS (BCI0059-BS2)					Prepared: 09/04/25 Analyzed: 09/05/25					
Total Kjeldahl Nitrogen	0.44		0.25	mg/L	0.5000		88%	85-115%		
Calibration Blank (BCI0059-CCB1)					Prepared: 09/04/25 Analyzed: 09/05/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Blank (BCI0059-CCB2)					Prepared: 09/04/25 Analyzed: 09/05/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 08/27/25

Date Reported: 09/17/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCI0059 - No Prep - WetChem (Continued)										
Calibration Blank (BCI0059-CCB3)					Prepared: 09/04/25 Analyzed: 09/05/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Check (BCI0059-CCV1)					Prepared: 09/04/25 Analyzed: 09/05/25					
Total Kjeldahl Nitrogen	0.97		0.25	mg/L	1.000		97%	85-115%		
Calibration Check (BCI0059-CCV2)					Prepared: 09/04/25 Analyzed: 09/05/25					
Total Kjeldahl Nitrogen	0.93		0.25	mg/L	1.000		93%	85-115%		
Calibration Check (BCI0059-CCV3)					Prepared: 09/04/25 Analyzed: 09/05/25					
Total Kjeldahl Nitrogen	0.92		0.25	mg/L	1.000		92%	85-115%		
Duplicate (BCI0059-DUP1)					Source: A25H0548-18 Prepared: 09/04/25 Analyzed: 09/05/25					
Total Kjeldahl Nitrogen	0.57		0.25	mg/L		0.54			6	30
Duplicate (BCI0059-DUP2)					Source: A25H0548-28 Prepared: 09/04/25 Analyzed: 09/05/25					
Total Kjeldahl Nitrogen	0.44		0.25	mg/L		0.37			17	30
Matrix Spike (BCI0059-MS1)					Source: A25H0548-18 Prepared: 09/04/25 Analyzed: 09/05/25					
Total Kjeldahl Nitrogen	2.50		0.25	mg/L	2.000	0.54	98%	80-120%		
Matrix Spike (BCI0059-MS2)					Source: A25H0548-28 Prepared: 09/04/25 Analyzed: 09/05/25					
Total Kjeldahl Nitrogen	2.24		0.25	mg/L	2.000	0.37	93%	80-120%		
Reference (BCI0059-SRM1)					Prepared: 09/04/25 Analyzed: 09/05/25					
Total Kjeldahl Nitrogen	1.07		0.25	mg/L	1.120		96%	0-200%		
Batch: BCI0072 - No Prep - WetChem										
Blank (BCI0072-BLK1)					Prepared: 09/04/25 Analyzed: 09/08/25					
Total Kjeldahl Nitrogen	0.12	J	0.25	mg/L						
Blank (BCI0072-BLK2)					Prepared: 09/04/25 Analyzed: 09/08/25					
Total Kjeldahl Nitrogen	0.12	J	0.25	mg/L						
LCS (BCI0072-BS1)					Prepared: 09/04/25 Analyzed: 09/08/25					
Total Kjeldahl Nitrogen	0.49		0.25	mg/L	0.5000		97%	85-115%		

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Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 08/27/25

Date Reported: 09/17/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCI0072 - No Prep - WetChem (Continued)										
LCS (BCI0072-BS2)					Prepared: 09/04/25 Analyzed: 09/08/25					
Total Kjeldahl Nitrogen	0.50		0.25	mg/L	0.5000		100%	85-115%		
Calibration Blank (BCI0072-CCB1)					Prepared: 09/04/25 Analyzed: 09/08/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Blank (BCI0072-CCB2)					Prepared: 09/04/25 Analyzed: 09/08/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Blank (BCI0072-CCB3)					Prepared: 09/04/25 Analyzed: 09/08/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Check (BCI0072-CCV1)					Prepared: 09/04/25 Analyzed: 09/08/25					
Total Kjeldahl Nitrogen	0.98		0.25	mg/L	1.000		98%	85-115%		
Calibration Check (BCI0072-CCV2)					Prepared: 09/04/25 Analyzed: 09/08/25					
Total Kjeldahl Nitrogen	0.98		0.25	mg/L	1.000		98%	85-115%		
Calibration Check (BCI0072-CCV3)					Prepared: 09/04/25 Analyzed: 09/08/25					
Total Kjeldahl Nitrogen	0.99		0.25	mg/L	1.000		99%	85-115%		
Duplicate (BCI0072-DUP1)					Source: A25H0562-11 Prepared: 09/04/25 Analyzed: 09/08/25					
Total Kjeldahl Nitrogen	0.28		0.25	mg/L		0.28			0.3	30
Duplicate (BCI0072-DUP2)					Source: A25I0063-01 Prepared: 09/04/25 Analyzed: 09/08/25					
Total Kjeldahl Nitrogen	0.32		0.25	mg/L		0.25			23	30
Duplicate (BCI0072-DUP3)					Source: A25H0334-04 Prepared: 09/04/25 Analyzed: 09/08/25					
Total Kjeldahl Nitrogen	9.09		0.25	mg/L		5.21			54	30
Matrix Spike (BCI0072-MS1)					Source: A25H0562-11 Prepared: 09/04/25 Analyzed: 09/08/25					
Total Kjeldahl Nitrogen	2.34		0.25	mg/L	2.000	0.28	103%	80-120%		
Matrix Spike (BCI0072-MS2)					Source: A25I0063-01 Prepared: 09/04/25 Analyzed: 09/08/25					
Total Kjeldahl Nitrogen	2.19		0.25	mg/L	2.000	0.25	97%	80-120%		
Matrix Spike (BCI0072-MS3)					Source: A25H0334-04 Prepared: 09/04/25 Analyzed: 09/08/25					



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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCI0072 - No Prep - WetChem (Continued)

Matrix Spike (BCI0072-MS3)

Source: A25H0334-04

Prepared: 09/04/25 Analyzed: 09/08/25

Total Kjeldahl Nitrogen	17.9		0.25	mg/L	10.00	5.21	127%	80-120%

Reference (BCI0072-SRM1)

Prepared: 09/04/25 Analyzed: 09/08/25

Total Kjeldahl Nitrogen	1.17		0.25	mg/L	1.120		104%	0-200%

Batch: BCI0104 - No Prep - WetChem

Blank (BCI0104-BLK1)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP)	ND	J	0.005	mg/L				

Blank (BCI0104-BLK2)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP)	ND	J	0.005	mg/L				

Blank (BCI0104-BLK3)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP)	ND	J	0.005	mg/L				

Blank (BCI0104-BLK4)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP)	ND	J	0.005	mg/L				

Blank (BCI0104-BLK5)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP)	ND	J	0.005	mg/L				

LCS (BCI0104-BS1)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP)	0.102		0.005	mg/L	0.1000		102%	85-115%

LCS (BCI0104-BS2)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP)	0.102		0.005	mg/L	0.1000		102%	85-115%

LCS (BCI0104-BS3)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP)	0.102		0.005	mg/L	0.1000		102%	85-115%

LCS (BCI0104-BS4)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP)	0.103		0.005	mg/L	0.1000		103%	85-115%

LCS (BCI0104-BS5)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP)	0.103		0.005	mg/L	0.1000		103%	85-115%

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCI0104 - No Prep - WetChem (Continued)

Calibration Blank (BCI0104-CCB1)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP) 0.003 mg/L

Calibration Blank (BCI0104-CCB2)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP) 0.003 mg/L

Calibration Blank (BCI0104-CCB3)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP) 0.003 mg/L

Calibration Blank (BCI0104-CCB4)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP) 0.003 mg/L

Calibration Blank (BCI0104-CCB5)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP) 0.003 mg/L

Calibration Blank (BCI0104-CCB6)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP) 0.003 mg/L

Calibration Blank (BCI0104-CCB7)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP) 0.003 mg/L

Calibration Blank (BCI0104-CCB8)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP) 0.003 mg/L

Calibration Blank (BCI0104-CCB9)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP) 0.003 mg/L

Calibration Check (BCI0104-CCV1)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP) 0.206 0.005 mg/L 0.2000 103% 85-115%

Calibration Check (BCI0104-CCV2)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP) 0.206 0.005 mg/L 0.2000 103% 85-115%

Calibration Check (BCI0104-CCV3)

Prepared: 09/08/25 Analyzed: 09/09/25

Total Phosphorus (TP) 0.206 0.005 mg/L 0.2000 103% 85-115%

Calibration Check (BCI0104-CCV4)

Prepared: 09/08/25 Analyzed: 09/09/25

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCI0104 - No Prep - WetChem (Continued)										
Calibration Check (BCI0104-CCV4)					Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.205		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCI0104-CCV5)					Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.205		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCI0104-CCV6)					Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.205		0.005	mg/L	0.2000		103%	85-115%		
Calibration Check (BCI0104-CCV7)					Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.203		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCI0104-CCV8)					Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.205		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCI0104-CCV9)					Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.204		0.005	mg/L	0.2000		102%	85-115%		
Duplicate (BCI0104-DUP1)					Source: A25H0562-01 Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.011		0.005	mg/L		0.010			6	25
Duplicate (BCI0104-DUP2)					Source: A25H0562-11 Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	ND	J	0.005	mg/L		0.003				25
Duplicate (BCI0104-DUP3)					Source: A25H0596-03 Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.070		0.005	mg/L		0.069			1	25
Duplicate (BCI0104-DUP4)					Source: A25H0597-06 Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	ND	J	0.005	mg/L		ND				25
Duplicate (BCI0104-DUP5)					Source: A25H0615-02 Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.034		0.005	mg/L		0.034			0.5	25
Duplicate (BCI0104-DUP6)					Source: A25I0063-03 Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.019		0.005	mg/L		0.019			0.5	25
Duplicate (BCI0104-DUP7)					Source: A25I0068-04 Prepared: 09/08/25 Analyzed: 09/09/25					

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCI0104 - No Prep - WetChem (Continued)										
Duplicate (BCI0104-DUP7)			Source: A25I0068-04		Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.042		0.005	mg/L		0.042			1	25
Duplicate (BCI0104-DUP8)			Source: A25I0072-08		Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.013		0.005	mg/L		0.013			3	25
Matrix Spike (BCI0104-MS1)			Source: A25H0562-01		Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.209		0.005	mg/L	0.2000	0.010	99%	85-115%		
Matrix Spike (BCI0104-MS2)			Source: A25H0562-11		Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.199		0.005	mg/L	0.2000	0.003	98%	85-115%		
Matrix Spike (BCI0104-MS3)			Source: A25H0596-03		Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.277		0.005	mg/L	0.2000	0.069	104%	85-115%		
Matrix Spike (BCI0104-MS4)			Source: A25H0597-06		Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.200		0.005	mg/L	0.2000	ND	100%	85-115%		
Matrix Spike (BCI0104-MS5)			Source: A25H0615-02		Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.241		0.005	mg/L	0.2000	0.034	103%	85-115%		
Matrix Spike (BCI0104-MS6)			Source: A25I0063-03		Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.222		0.005	mg/L	0.2000	0.019	101%	85-115%		
Matrix Spike (BCI0104-MS7)			Source: A25I0068-04		Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.251		0.005	mg/L	0.2000	0.042	104%	85-115%		
Matrix Spike (BCI0104-MS8)			Source: A25I0072-08		Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.220		0.005	mg/L	0.2000	0.013	103%	85-115%		
Reference (BCI0104-SRM1)					Prepared: 09/08/25 Analyzed: 09/09/25					
Total Phosphorus (TP)	0.124		0.005	mg/L	0.1280		97%	0-200%		

Batch: BCI0107 - No Prep - WetChem

Blank (BCI0107-BLK1)

Prepared: 09/08/25 Analyzed: 09/12/25

Total Kjeldahl Nitrogen 0.13 J 0.25 mg/L



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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCI0107 - No Prep - WetChem (Continued)										
Blank (BCI0107-BLK2)					Prepared: 09/08/25 Analyzed: 09/12/25					
Total Kjeldahl Nitrogen	0.13	J	0.25	mg/L						
LCS (BCI0107-BS1)					Prepared: 09/08/25 Analyzed: 09/12/25					
Total Kjeldahl Nitrogen	0.45		0.25	mg/L	0.5000		89%	85-115%		
LCS (BCI0107-BS2)					Prepared: 09/08/25 Analyzed: 09/12/25					
Total Kjeldahl Nitrogen	0.45		0.25	mg/L	0.5000		89%	85-115%		
Calibration Blank (BCI0107-CCB1)					Prepared: 09/08/25 Analyzed: 09/12/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Blank (BCI0107-CCB2)					Prepared: 09/08/25 Analyzed: 09/12/25					
Total Kjeldahl Nitrogen	ND	U		mg/L						
Calibration Blank (BCI0107-CCB3)					Prepared: 09/08/25 Analyzed: 09/12/25					
Total Kjeldahl Nitrogen	0.0006			mg/L						
Calibration Check (BCI0107-CCV1)					Prepared: 09/08/25 Analyzed: 09/12/25					
Total Kjeldahl Nitrogen	0.89		0.25	mg/L	1.000		89%	85-115%		
Calibration Check (BCI0107-CCV2)					Prepared: 09/08/25 Analyzed: 09/12/25					
Total Kjeldahl Nitrogen	0.86		0.25	mg/L	1.000		86%	85-115%		
Calibration Check (BCI0107-CCV3)					Prepared: 09/08/25 Analyzed: 09/12/25					
Total Kjeldahl Nitrogen	0.89		0.25	mg/L	1.000		89%	85-115%		
Duplicate (BCI0107-DUP1)					Source: A25H0548-07 Prepared: 09/08/25 Analyzed: 09/12/25					
Total Kjeldahl Nitrogen	0.41		0.25	mg/L		0.38			5	30
Duplicate (BCI0107-DUP2)					Source: A25I0069-02 Prepared: 09/08/25 Analyzed: 09/12/25					
Total Kjeldahl Nitrogen	3.56		0.25	mg/L		3.34			6	30
Duplicate (BCI0107-DUP3)					Source: A25I0091-01 Prepared: 09/08/25 Analyzed: 09/12/25					
Total Kjeldahl Nitrogen	0.68		0.25	mg/L		0.65			5	30
Matrix Spike (BCI0107-MS1)					Source: A25H0548-07 Prepared: 09/08/25 Analyzed: 09/12/25					

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Attention: JOHN HABERLIN
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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCI0107 - No Prep - WetChem (Continued)										
Matrix Spike (BCI0107-MS1)		Source: A25H0548-07			Prepared: 09/08/25 Analyzed: 09/12/25					
Total Kjeldahl Nitrogen	2.21		0.25	mg/L	2.000	0.38	91%	80-120%		
Matrix Spike (BCI0107-MS2)		Source: A25I0069-02			Prepared: 09/08/25 Analyzed: 09/12/25					
Total Kjeldahl Nitrogen	5.12		0.25	mg/L	2.000	3.34	89%	80-120%		
Matrix Spike (BCI0107-MS3)		Source: A25I0091-01			Prepared: 09/08/25 Analyzed: 09/12/25					
Total Kjeldahl Nitrogen	2.53		0.25	mg/L	2.000	0.65	94%	80-120%		
Reference (BCI0107-SRM1)					Prepared: 09/08/25 Analyzed: 09/12/25					
Total Kjeldahl Nitrogen	1.05		0.25	mg/L	1.120		94%	90-110%		
Batch: BCI0126 - No Prep - WetChem										
Blank (BCI0126-BLK1)					Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	ND	U	0.020	mg/L						
Blank (BCI0126-BLK2)					Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	0.007	J	0.020	mg/L						
Blank (BCI0126-BLK3)					Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	0.009	J	0.020	mg/L						
LCS (BCI0126-BS1)					Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	0.499		0.020	mg/L	0.5000		100%	90-110%		
LCS (BCI0126-BS2)					Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	0.525		0.020	mg/L	0.5000		105%	90-110%		
LCS (BCI0126-BS3)					Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	0.532		0.020	mg/L	0.5000		106%	90-110%		
Calibration Blank (BCI0126-CCB1)					Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	0.007			mg/L						
Calibration Blank (BCI0126-CCB2)					Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	0.008			mg/L						

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCI0126 - No Prep - WetChem (Continued)										
Calibration Blank (BCI0126-CCB3)					Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	0.008			mg/L						
Calibration Blank (BCI0126-CCB4)					Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	0.008			mg/L						
Calibration Blank (BCI0126-CCB5)					Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	0.009			mg/L						
Calibration Check (BCI0126-CCV1)					Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	1.03		0.020	mg/L	1.000		103%	85-115%		
Calibration Check (BCI0126-CCV2)					Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	1.04		0.020	mg/L	1.000		104%	85-115%		
Calibration Check (BCI0126-CCV3)					Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	1.03		0.020	mg/L	1.000		103%	85-115%		
Calibration Check (BCI0126-CCV4)					Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	1.04		0.020	mg/L	1.000		104%	85-115%		
Calibration Check (BCI0126-CCV5)					Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	1.04		0.020	mg/L	1.000		104%	85-115%		
Duplicate (BCI0126-DUP1)					Source: A25H0548-19 Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	1.72		0.020	mg/L		1.72			0.5	20
Duplicate (BCI0126-DUP2)					Source: A25H0548-29 Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	0.030		0.020	mg/L		0.034			12	20
Duplicate (BCI0126-DUP3)					Source: A25H0615-01 Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	0.154		0.020	mg/L		0.152			1	20
Duplicate (BCI0126-DUP4)					Source: A25I0063-08 Prepared: 09/09/25 Analyzed: 09/10/25					
Total Nitrate + Nitrite	0.115		0.020	mg/L		0.113			2	20
Matrix Spike (BCI0126-MS1)					Source: A25H0548-19 Prepared: 09/09/25 Analyzed: 09/10/25					

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ANALYSIS REPORT

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 08/27/25
Date Reported: 09/17/25

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCI0126 - No Prep - WetChem (Continued)										
Matrix Spike (BCI0126-MS1)		Source: A25H0548-19		Prepared: 09/09/25 Analyzed: 09/10/25						
Total Nitrate + Nitrite	2.73		0.020	mg/L	1.000	1.72	102%	85-115%		
Matrix Spike (BCI0126-MS2)		Source: A25H0548-29		Prepared: 09/09/25 Analyzed: 09/10/25						
Total Nitrate + Nitrite	1.03		0.020	mg/L	1.000	0.034	99%	85-115%		
Matrix Spike (BCI0126-MS3)		Source: A25H0615-01		Prepared: 09/09/25 Analyzed: 09/10/25						
Total Nitrate + Nitrite	1.15		0.020	mg/L	1.000	0.152	100%	85-115%		
Matrix Spike (BCI0126-MS4)		Source: A25I0063-08		Prepared: 09/09/25 Analyzed: 09/10/25						
Total Nitrate + Nitrite	1.11		0.020	mg/L	1.000	0.113	99%	85-115%		
Reference (BCI0126-SRM1)				Prepared: 09/09/25 Analyzed: 09/10/25						
Total Nitrate + Nitrite	1.16		0.020	mg/L	1.190		98%	90-110%		

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ANALYSIS REPORT

Date Received: 08/27/25
Date Reported: 09/17/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Notes and Definitions

Item	Definition
J	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
D	The reported value is from a dilution.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result.
Dry	Sample results reported on a dry weight basis.
ND	Analyte NOT DETECTED at or above the reporting limit.
RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was matrix spiked or duplicated.

AmTest Chain of Custody Record

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Chain of Custody No. _____

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506				Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506											
Contact Person: John Haberlin				Invoice Contact: John Haberlin											
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young											
Fax No:				Invoice Ph/Fax:											
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us											
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:											
Special Instructions: Please report to detection limit for all results.															
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)				Temperature upon Receipt: <u>HS 8/27/25</u> <u>1.8</u> 2.5°											
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested									
Project Number: 40644						Total Phosphate	Total Nitrogen	NOx							QA/QC
AmTest ID	Client ID (35 characters max)														
01	Schneider T	8/05/2025	0955	H2O	1	X	X								
02	Kennedy	8/05/2025	1010	H2O	1	X	X								
03	Mclane	8/05/2025	1130	H2O	1	X	X								
04	Mclane	8/05/2025	1130	H2O	1	X	X								X
05	Black Lake Ditch	8/05/2025	1200	H2O	1	X	X								
06	Deschutes Falls	8/12/2025	0915	H2O	1	X	X								
07	Deschutes @ Vail	8/12/2025	1030	H2O	1	X	X								
08	Deschutes @ Vail	8/12/2025	1030	H2O	1	X	X								X
09	Deschutes @ Waldrick	8/12/2025	1105	H2O	1	X	X								
10	Deschutes @ Waldrick	8/12/2025	1105	H2O	1	X	X								X
Collected/Relinquished By: John Haberlin		Date 8/26/2025	Time 1400	Received By: 				Date 8/27/25				Time 1010			
Relinquished By:		Date	Time	Received By:				Date				Time			
Relinquished By:		Date	Time	Received By:				Date				Time			

COMMENTS:

Page 1 of 4

Fedex

AmTest Chain of Custody Record

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A25H0548

Chain of Custody No. _____

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506	Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506
Contact Person: John Haberlin	Invoice Contact: John Haberlin
Phone No: 360-867-2626	PO Number: Credit Card upon report per Aaron Young
Fax No:	Invoice Ph/Fax:
E-mail: john.haberlin@co.thurston.wa.us	Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online	Data posted to online account: YES / NO Web Login ID:

Special Instructions:

Please report to **detection** limit for all results.

Requested TAT: (Rush must be pre-approved by lab)

Standard RUSH (5 Day / 3 Day / 48 HR / 24 HR)

Temperature upon Receipt: 2.5°

Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested										QA/QC
AmTest ID	Client ID (35 characters max)					Total Phosphate	Total Nitrogen	NOx								
11	Spurgeon @ Rich	8/12/2025	1130	H2O	1	X	X									
12	Deschutes @ Tumwater	8/12/2025	1200	H2O	1	X	X									
13	Indian Mouth	8/12/2025	1215	H2O	1	X	X									
14	Thompson	8/13/2025	0810	H2O	1	X	X									
15	McAllister @ I-5	8/13/2025	0845	H2O	1	X	X									
16	McAllister @ I-5	8/13/2025	0845	H2O	1	X	X									X
17	Eaton	8/13/2025	0930	H2O	1	X	X									
18	Woodland @ Draham	8/13/2025	1010	H2O	1	X	X									
19	Woodland @ PG	8/13/2025	1050	H2O	1	X	X									
20	Woodard @ Libby	8/13/2025	1115	H2O	1	X	X									

Collected/Relinquished By: John Haberlin	Date 8/26/2025	Time 1400	Received By: <i>Wendy Shupe</i>	Date 8/27/25	Time 1010
Relinquished By:	Date	Time	Received By:	Date	Time
Relinquished By:	Date	Time	Received By:	Date	Time

COMMENTS:

AmTest Chain of Custody Record

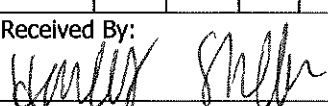
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A2540548

Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506				Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506											
Contact Person: John Haberlin				Invoice Contact: John Haberlin											
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young											
Fax No:				Invoice Ph/Fax:											
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us											
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:											
Special Instructions: Please report to detection limit for all results.															
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)										Temperature upon Receipt: 2.5°					
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested									
Project Number: 40644						Total Phosphate	Total Nitrogen	NOx							
AmTest ID	Client ID (35 characters max)														QA/QC
21	Clear Surface	8/21/2025	0950	H2O	1	X	X								
22	Clear Bottom	8/21/2025	0955	H2O	1	X	X								
23	Lawrence 1 Surface	8/21/2025	1135	H2O	1	X	X								
24	Lawrence 1 Bottom	8/21/2025	1140	H2O	1	X	X								
25	Lawrence 2 Surface	8/21/2025	1205	H2O	1	X	X								
26	Lawrence 2 Bottom	8/21/2025	1210	H2O	1	X	X								
27	Salmon @ LR	8/25/2025	0925	H2O	1	X	X								
28	Blooms Ditch @ 110 th	8/25/2025	0945	H2O	1	X	X								
29	Black @ 128 th	8/25/2025	1000	H2O	1	X	X								
30	Beaver @ LR	8/25/2025	1010	H2O	1	X	X								
Collected/Relinquished By: John Haberlin		Date 8/26/2025	Time 1400	Received By: 						Date 8/27/25		Time 1010			
Relinquished By:		Date	Time	Received By:						Date		Time			
Relinquished By:		Date	Time	Received By:						Date		Time			

COMMENTS:

A25H0548

Ph (425) 885-1664 Fx (425) 820-0245

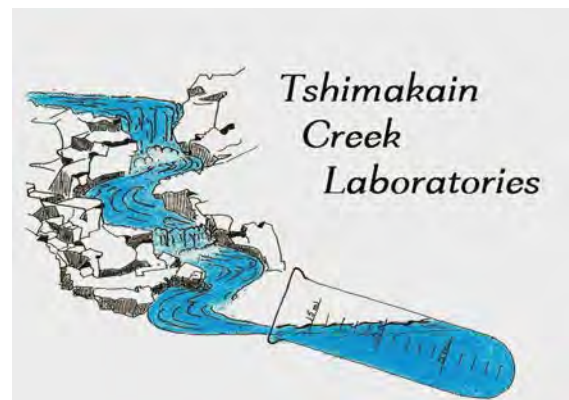
Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506						Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506										
Contact Person: John Haberlin						Invoice Contact: John Haberlin										
Phone No: 360-867-2626						PO Number: Credit Card upon report per Aaron Young										
Fax No:						Invoice Ph/Fax:										
E-mail: john.haberlin@co.thurston.wa.us						Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us										
Report Delivery: (Choose all that apply) Mail / Fax / Email / Posted Online						Data posted to online account: YES / NO Web Login ID:										
Special Instructions: Please report to detection limit for all results.																
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)																
Project Name: Streams						Temperature upon Receipt: 2.6°										
Project Number: 40644																
AmTest ID	Client ID (35 characters max)	Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested										
						Total Phosphate	Total Nitrogen	NOx								QA/QC
31	Black @ Moon	8/25/2025	1035	H2O	1	X	X									
32	Chehalis	8/25/2025	1100	H2O	1	X	X									
33	Skookumchuck	8/25/2025	1140	H2O	1	X	X									
Collected/Relinquished By: John Haberlin		Date 8/26/2025	Time 1400	Received By: 				Date 8/27/25	Time 1010							
Relinquished By:		Date	Time	Received By:				Date	Time							
Relinquished By:		Date	Time	Received By:				Date	Time							

Page 4 of 4

TSHIMAKAIN CREEK LABORATORIES, LLC

October 24, 2025
Stuart Whitford
Thurston County Environmental Health
3000 Pacific Ave SE
Olympia, WA 98501
Project Name: Chlorophyll a Project 2025
Report No.: 25I2404



Dear Stuart Whitford,

This Report contains the analytical result for the sample(s) received under chain of custody(s) by Tshimakain Creek Laboratories on September 24, 2025.

The test result in this report are in compliance with Washington State Department of Ecology laboratory accreditation requirements for the certified parameters. Any anomalies are noted in the case narrative and this cover page are an integral part of this report. The Laboratory report may not be produced, exempt in full, without the written approval of the laboratory.

The issuance of the final Certificate of Analysis takes precedence over any previous Preliminary Report. Preliminary Data should not be used for regular purposes. Authorized signature(s) is provided on final report only.

If you have any questions in reference to this report, please contact your Tshimakain Creek Laboratories coordinator.

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

Page 2 of 6

CLIENT: Thurston County Environmental Health
ATTENTION: Stuart Whitford
ADDRESS: 3000 Pacific Ave SE
Olympia WA, 98501
PHONE: (360) 463-8323

JOB NO: 25I2404
PROJECT NAME: Chlorophyll a Project 2025
REPORTED: 24-Oct-25 14:59
SUBMITTED: 24-Sep-25
PROJECT NUMBER [none]

TCL ID#	25I2404-01	25I2404-02	25I2404-03	25I2404-04
MATRIX	Water	Water	Water	Water
SAMPLED DATE	22-Sep-25 09:35	22-Sep-25 11:00	22-Sep-25 11:25	22-Sep-25 13:00
CLIENT SAMPLE ID	Clear	Lawrence 1	Lawrence 2	Long 4

ANALYSIS PARAMETERS	METHOD	MRL	UNITS	ANALYZED				
PHYSICAL PROPERTIES								
Chlorophyll-a	SM 10200H	1.0	ug/L	21-Oct-25	34	38	100	16



Reviewed By _____
Elida Madera
Lab Manager

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

Page 3 of 6

CLIENT: Thurston County Environmental Health
ATTENTION: Stuart Whitford
ADDRESS: 3000 Pacific Ave SE
Olympia WA, 98501
PHONE: (360) 463-8323

JOB NO: 25I2404
PROJECT NAME: Chlorophyll a Project 2025
REPORTED: 24-Oct-25 14:59
SUBMITTED: 24-Sep-25
PROJECT NUMBER [none]

TCL ID#	25I2404-05	25I2404-06	25I2404-07	25I2404-08
MATRIX	Water	Water	Water	Water
SAMPLED DATE	22-Sep-25 13:20	23-Sep-25 09:15	23-Sep-25 10:25	23-Sep-25 11:45
CLIENT SAMPLE ID	Long 3	St Clair 1	St Clair 2	Offutt

ANALYSIS PARAMETERS	METHOD	MRL	UNITS	ANALYZED
PHYSICAL PROPERTIES				
Chlorophyll-a	SM 10200H	1.0	ug/L	21-Oct-25

13	5.6	2.1	18



Reviewed By _____
Elida Madera
Lab Manager

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

Page 4 of 6

CLIENT: Thurston County Environmental Health
ATTENTION: Stuart Whitford
ADDRESS: 3000 Pacific Ave SE
Olympia WA, 98501
PHONE: (360) 463-8323

JOB NO: 25I2404
PROJECT NAME: Chlorophyll a Project 2025
REPORTED: 24-Oct-25 14:59
SUBMITTED: 24-Sep-25
PROJECT NUMBER [none]

TCL ID #	25I2404-09	-	-	-
MATRIX	Water	-	-	-
SAMPLED DATE	23-Sep-25 12:45	-	-	-
CLIENT SAMPLE ID	Munn	-	-	-
ANALYSIS PARAMETERS	METHOD	MRL	UNITS	ANALYZED
PHYSICAL PROPERTIES				
Chlorophyll-a	SM 10200H	1.0	ug/L	21-Oct-25 9.7 - - -



Reviewed By _____
Elida Madera
Lab Manager

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

Page 5 of 6

CLIENT: Thurston County Environmental Health
ATTENTION: Stuart Whitford
ADDRESS: 3000 Pacific Ave SE
Olympia WA, 98501
PHONE: (360) 463-8323

JOB NO: 25I2404
PROJECT NAME: Chlorophyll a Project 2025
REPORTED: 24-Oct-25 14:59
SUBMITTED: 24-Sep-25
PROJECT NUMBER [none]

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes

Reviewed By_____

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

Page 6 of 6

CLIENT: Thurston County Environmental Health
ATTENTION: Stuart Whitford
ADDRESS: 3000 Pacific Ave SE
Olympia WA, 98501
PHONE: (360) 463-8323

JOB NO: 25I2404
PROJECT NAME: Chlorophyll a Project 2025
REPORTED: 24-Oct-25 14:59
SUBMITTED: 24-Sep-25
PROJECT NUMBER [none]

Notes and Definitions

MRL = MINIMUM REPORTING LIMIT

NC = NON-CALCULABLE

%RPD = RELATIVE PERCENT DIFFERENCE

%REC = PERCENT RECOVERY

LCS = LABORATORY CONTROL SAMPLE

NR = NEGATIVE RESULT

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Kirkland, WA
(425) 885-1664
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***Professional
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October 17, 2025

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN

Project: STREAMS
Project Number: 40644
COC Number: A25I0669

JOHN HABERLIN:

Enclosed please find the analytical data for your STREAMS project.

Your sample(s) were received on Tuesday, September 30, 2025 and properly maintained prior to the subsequent analysis. The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA, Standard Methods or the Army Corps of Engineers.

Following the analytical results you will find the Quality Control (QA/QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Practical Quantitation Limits (PQL's), as opposed to the Method Detection Limits (MDL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Aaron Young". The signature is written in a cursive, flowing style.

ElementStationManager For Aaron Young

President

aarony@amtestlab.com



ANALYSIS REPORT

Date Received: 09/30/25

Date Reported: 10/17/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Reported Samples

Lab ID	Sample	Matrix	Qualifiers	Date Sampled	Date Received
A25I0669-01	Schneider T	Water		09/16/2025	09/30/2025
A25I0669-02	Schneider T	Water		09/16/2025	09/30/2025
A25I0669-03	Kennedy	Water		09/16/2025	09/30/2025
A25I0669-04	McLane	Water		09/16/2025	09/30/2025
A25I0669-05	Black Lake Ditch	Water		09/16/2025	09/30/2025
A25I0669-06	Black Lake Ditch	Water		09/16/2025	09/30/2025
A25I0669-07	Moxlie Mouth	Water		09/17/2025	09/30/2025
A25I0669-08	Moxlie @ Union	Water		09/17/2025	09/30/2025
A25I0669-09	Woodard @ 36th	Water		09/17/2025	09/30/2025
A25I0669-10	Woodland @ PG	Water		09/17/2025	09/30/2025
A25I0669-11	Woodland @ Draham	Water		09/17/2025	09/30/2025
A25I0669-12	Woodland @ Draham	Water		09/17/2025	09/30/2025
A25I0669-13	Thompson	Water		09/17/2025	09/30/2025
A25I0669-14	Thompson QA	Water		09/17/2025	09/30/2025
A25I0669-15	Eaton	Water		09/17/2025	09/30/2025
A25I0669-16	McAllister @I-5	Water		09/17/2025	09/30/2025
A25I0669-17	Clear Surface	Water		09/22/2025	09/30/2025
A25I0669-18	Clear Bottom	Water		09/22/2025	09/30/2025
A25I0669-19	Lawrence 1 Surface	Water		09/22/2025	09/30/2025
A25I0669-20	Lawrence 1 Bottom	Water		09/22/2025	09/30/2025
A25I0669-21	Lawrence 2 Surface	Water		09/22/2025	09/30/2025
A25I0669-22	Lawrence 2 Bottom	Water		09/22/2025	09/30/2025
A25I0669-23	Long 4 Surface	Water		09/22/2025	09/30/2025
A25I0669-24	Long 4 Bottom	Water		09/22/2025	09/30/2025
A25I0669-25	Long 3 Surface	Water		09/22/2025	09/30/2025
A25I0669-26	Long 3 Bottom	Water		09/22/2025	09/30/2025
A25I0669-27	St. Clair 1 Surface	Water		09/23/2025	09/30/2025
A25I0669-28	St Clair 1 Bottom	Water		09/23/2025	09/30/2025
A25I0669-29	St Clair 2 Surface	Water		09/23/2025	09/30/2025
A25I0669-30	St Clair 2 Bottom	Water		09/23/2025	09/30/2025
A25I0669-31	Offutt Surface	Water		09/23/2025	09/30/2025
A25I0669-32	Offutt Bottom	Water		09/23/2025	09/30/2025
A25I0669-33	Munn Surface	Water		09/23/2025	09/30/2025
A25I0669-34	Munn Bottom	Water		09/23/2025	09/30/2025

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**Professional
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ANALYSIS REPORT

Date Received: 09/30/25

Date Reported: 10/17/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25I0669-01

Client Identification: Schneider T

Sampling Date: 09/16/25 09:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.087	mg/L		0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.053	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-02

Client Identification: Schneider T

Sampling Date: 09/16/25 09:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.087	mg/L		0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.053	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-03

Client Identification: Kennedy

Sampling Date: 09/16/25 09:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.164	mg/L		0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.028	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-04

Client Identification: McLane

Sampling Date: 09/16/25 11:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.189	mg/L		0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.057	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

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ANALYSIS REPORT

Date Received: 09/30/25

Date Reported: 10/17/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25I0669-05

Client Identification: Black Lake Ditch

Sampling Date: 09/16/25 11:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.025	mg/L		0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.016	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-06

Client Identification: Black Lake Ditch

Sampling Date: 09/16/25 11:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.025	mg/L		0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.018	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-07

Client Identification: Moxlie Mouth

Sampling Date: 09/17/25 09:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.556	mg/L		0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.083	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-08

Client Identification: Moxlie @ Union

Sampling Date: 09/17/25 09:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.574	mg/L		0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.075	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

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ANALYSIS REPORT

Date Received: 09/30/25

Date Reported: 10/17/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25I0669-09

Client Identification: Woodard @ 36th

Sampling Date: 09/17/25 10:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.311	mg/L		0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.123	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-10

Client Identification: Woodland @ PG

Sampling Date: 09/17/25 10:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.55	mg/L		0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.075	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-11

Client Identification: Woodland @ Draham

Sampling Date: 09/17/25 10:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.67	mg/L		0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.089	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-12

Client Identification: Woodland @ Draham

Sampling Date: 09/17/25 10:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.67	mg/L		0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.090	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

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ANALYSIS REPORT

Date Received: 09/30/25

Date Reported: 10/17/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25I0669-13

Client Identification: Thompson

Sampling Date: 09/17/25 12:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	2.81	mg/L	D	0.100	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.019	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-14

Client Identification: Thompson QA

Sampling Date: 09/17/25 12:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	2.83	mg/L	D	0.100	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.017	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-15

Client Identification: Eaton

Sampling Date: 09/17/25 12:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.834	mg/L		0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.044	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-16

Client Identification: McAllister @I-5

Sampling Date: 09/17/25 13:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.36	mg/L		0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.166	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

ANALYSIS REPORT

Date Received: 09/30/25

Date Reported: 10/17/25

Thurston County Environmental Health

412 LILLY RD NE

OLYMPIA, WA 98506

Attention: JOHN HABERLIN

Project Name: STREAMS

Project #: 40644

AMTEST Identification Number: A25I0669-17

Client Identification: Clear Surface

Sampling Date: 09/22/25 09:35

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.004	mg/L	J	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.156	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-18

Client Identification: Clear Bottom

Sampling Date: 09/22/25 09:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.006	mg/L	J	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.170	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-19

Client Identification: Lawrence 1 Surface

Sampling Date: 09/22/25 11:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.022	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-20

Client Identification: Lawrence 1 Bottom

Sampling Date: 09/22/25 11:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.027	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

ANALYSIS REPORT

Date Received: 09/30/25

Date Reported: 10/17/25

Thurston County Environmental Health

412 LILLY RD NE

OLYMPIA, WA 98506

Attention: JOHN HABERLIN

Project Name: STREAMS

Project #: 40644

AMTEST Identification Number: A25I0669-21

Client Identification: Lawrence 2 Surface

Sampling Date: 09/22/25 11:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.031	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-22

Client Identification: Lawrence 2 Bottom

Sampling Date: 09/22/25 11:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.021	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-23

Client Identification: Long 4 Surface

Sampling Date: 09/22/25 13:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.013	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-24

Client Identification: Long 4 Bottom

Sampling Date: 09/22/25 13:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.017	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 09/30/25

Date Reported: 10/17/25

AMTEST Identification Number: A25I0669-25

Client Identification: Long 3 Surface

Sampling Date: 09/22/25 13:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.019	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-26

Client Identification: Long 3 Bottom

Sampling Date: 09/22/25 13:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.019	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-27

Client Identification: St. Clair 1 Surface

Sampling Date: 09/23/25 09:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.011	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-28

Client Identification: St Clair 1 Bottom

Sampling Date: 09/23/25 09:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.009	mg/L	J	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.211	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

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ANALYSIS REPORT

Date Received: 09/30/25

Date Reported: 10/17/25

Thurston County Environmental Health

412 LILLY RD NE

OLYMPIA, WA 98506

Attention: JOHN HABERLIN

Project Name: STREAMS

Project #: 40644

AMTEST Identification Number: A25I0669-29

Client Identification: St Clair 2 Surface

Sampling Date: 09/23/25 10:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.008	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-30

Client Identification: St Clair 2 Bottom

Sampling Date: 09/23/25 10:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.559	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-31

Client Identification: Offutt Surface

Sampling Date: 09/23/25 11:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.028	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-32

Client Identification: Offutt Bottom

Sampling Date: 09/23/25 11:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.004	mg/L	J	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	1.78	mg/L	D	0.050	SM 4500-P F_2011	CC	10/09/2025

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ANALYSIS REPORT

Date Received: 09/30/25
Date Reported: 10/17/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25I0669-33
Client Identification: Munn Surface
Sampling Date: 09/23/25 12:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.011	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

AMTEST Identification Number: A25I0669-34
Client Identification: Munn Bottom
Sampling Date: 09/23/25 12:50

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	10/16/2025
Total Phosphorus (TP)	0.059	mg/L		0.005	SM 4500-P F_2011	CC	10/09/2025

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 09/30/25

Date Reported: 10/17/25

Quality Control

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCJ0096 - No Prep - WetChem

Blank (BCJ0096-BLK1)

Prepared: 10/07/25 Analyzed: 10/09/25

Total Phosphorus (TP) ND U 0.005 mg/L

Blank (BCJ0096-BLK2)

Prepared: 10/07/25 Analyzed: 10/09/25

Total Phosphorus (TP) ND U 0.005 mg/L

Blank (BCJ0096-BLK3)

Prepared: 10/07/25 Analyzed: 10/09/25

Total Phosphorus (TP) ND U 0.005 mg/L

Blank (BCJ0096-BLK4)

Prepared: 10/07/25 Analyzed: 10/09/25

Total Phosphorus (TP) ND U 0.005 mg/L

LCS (BCJ0096-BS1)

Prepared: 10/07/25 Analyzed: 10/09/25

Total Phosphorus (TP) 0.102 0.005 mg/L 0.1000 102% 85-115%

LCS (BCJ0096-BS2)

Prepared: 10/07/25 Analyzed: 10/09/25

Total Phosphorus (TP) 0.102 0.005 mg/L 0.1000 102% 85-115%

LCS (BCJ0096-BS3)

Prepared: 10/07/25 Analyzed: 10/09/25

Total Phosphorus (TP) 0.102 0.005 mg/L 0.1000 102% 85-115%

LCS (BCJ0096-BS4)

Prepared: 10/07/25 Analyzed: 10/09/25

Total Phosphorus (TP) 0.102 0.005 mg/L 0.1000 102% 85-115%

Calibration Blank (BCJ0096-CCB1)

Prepared: 10/07/25 Analyzed: 10/09/25

Total Phosphorus (TP) 0.002 mg/L

Calibration Blank (BCJ0096-CCB2)

Prepared: 10/07/25 Analyzed: 10/09/25

Total Phosphorus (TP) 0.001 mg/L

Calibration Blank (BCJ0096-CCB3)

Prepared: 10/07/25 Analyzed: 10/09/25

Total Phosphorus (TP) 0.001 mg/L

Calibration Blank (BCJ0096-CCB4)

Prepared: 10/07/25 Analyzed: 10/09/25

Total Phosphorus (TP) 0.001 mg/L

Calibration Blank (BCJ0096-CCB5)

Prepared: 10/07/25 Analyzed: 10/09/25

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 09/30/25

Date Reported: 10/17/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCJ0096 - No Prep - WetChem (Continued)										
Calibration Blank (BCJ0096-CCB5)					Prepared: 10/07/25 Analyzed: 10/09/25					
Total Phosphorus (TP)	0.002			mg/L						
Calibration Blank (BCJ0096-CCB6)					Prepared: 10/07/25 Analyzed: 10/09/25					
Total Phosphorus (TP)	0.001			mg/L						
Calibration Blank (BCJ0096-CCB7)					Prepared: 10/07/25 Analyzed: 10/09/25					
Total Phosphorus (TP)	0.001			mg/L						
Calibration Blank (BCJ0096-CCB8)					Prepared: 10/07/25 Analyzed: 10/09/25					
Total Phosphorus (TP)	0.001			mg/L						
Calibration Check (BCJ0096-CCV1)					Prepared: 10/07/25 Analyzed: 10/09/25					
Total Phosphorus (TP)	0.205		0.005	mg/L	0.2000		103%	85-115%		
Calibration Check (BCJ0096-CCV2)					Prepared: 10/07/25 Analyzed: 10/09/25					
Total Phosphorus (TP)	0.204		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCJ0096-CCV3)					Prepared: 10/07/25 Analyzed: 10/09/25					
Total Phosphorus (TP)	0.204		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCJ0096-CCV4)					Prepared: 10/07/25 Analyzed: 10/09/25					
Total Phosphorus (TP)	0.203		0.005	mg/L	0.2000		101%	85-115%		
Calibration Check (BCJ0096-CCV5)					Prepared: 10/07/25 Analyzed: 10/09/25					
Total Phosphorus (TP)	0.203		0.005	mg/L	0.2000		102%	85-115%		
Calibration Check (BCJ0096-CCV6)					Prepared: 10/07/25 Analyzed: 10/09/25					
Total Phosphorus (TP)	0.202		0.005	mg/L	0.2000		101%	85-115%		
Calibration Check (BCJ0096-CCV7)					Prepared: 10/07/25 Analyzed: 10/09/25					
Total Phosphorus (TP)	0.202		0.005	mg/L	0.2000		101%	85-115%		
Calibration Check (BCJ0096-CCV8)					Prepared: 10/07/25 Analyzed: 10/09/25					
Total Phosphorus (TP)	0.202		0.005	mg/L	0.2000		101%	85-115%		
Duplicate (BCJ0096-DUP1)			Source: A25I0546-06		Prepared: 10/07/25 Analyzed: 10/09/25					

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 09/30/25

Date Reported: 10/17/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCJ0096 - No Prep - WetChem (Continued)										
Duplicate (BCJ0096-DUP1)			Source: A25I0546-06	Prepared: 10/07/25 Analyzed: 10/09/25						
Total Phosphorus (TP)	0.027		0.005	mg/L		0.025			6	25
Duplicate (BCJ0096-DUP2)			Source: A25I0588-08	Prepared: 10/07/25 Analyzed: 10/09/25						
Total Phosphorus (TP)	0.047		0.005	mg/L		0.046			2	25
Duplicate (BCJ0096-DUP3)			Source: A25I0588-09	Prepared: 10/07/25 Analyzed: 10/09/25						
Total Phosphorus (TP)	ND	U	0.005	mg/L		ND				25
Duplicate (BCJ0096-DUP4)			Source: A25I0615-01	Prepared: 10/07/25 Analyzed: 10/09/25						
Total Phosphorus (TP)	0.026		0.005	mg/L		0.027			0.7	25
Duplicate (BCJ0096-DUP5)			Source: A25I0669-07	Prepared: 10/07/25 Analyzed: 10/09/25						
Total Phosphorus (TP)	0.083		0.005	mg/L		0.083			0.3	25
Duplicate (BCJ0096-DUP6)			Source: A25I0669-17	Prepared: 10/07/25 Analyzed: 10/09/25						
Total Phosphorus (TP)	0.155		0.005	mg/L		0.156			0.6	25
Duplicate (BCJ0096-DUP7)			Source: A25I0669-27	Prepared: 10/07/25 Analyzed: 10/09/25						
Total Phosphorus (TP)	0.009		0.005	mg/L		0.011			21	25
Duplicate (BCJ0096-DUP8)			Source: A25J0026-03	Prepared: 10/07/25 Analyzed: 10/09/25						
Total Phosphorus (TP)	0.024		0.005	mg/L		0.024			1	25
Matrix Spike (BCJ0096-MS1)			Source: A25I0546-06	Prepared: 10/07/25 Analyzed: 10/09/25						
Total Phosphorus (TP)	0.230		0.005	mg/L	0.2000	0.025	102%	85-115%		
Matrix Spike (BCJ0096-MS2)			Source: A25I0588-08	Prepared: 10/07/25 Analyzed: 10/09/25						
Total Phosphorus (TP)	0.253		0.005	mg/L	0.2000	0.046	104%	85-115%		
Matrix Spike (BCJ0096-MS3)			Source: A25I0588-09	Prepared: 10/07/25 Analyzed: 10/09/25						
Total Phosphorus (TP)	0.203		0.005	mg/L	0.2000	ND	101%	85-115%		
Matrix Spike (BCJ0096-MS4)			Source: A25I0615-01	Prepared: 10/07/25 Analyzed: 10/09/25						
Total Phosphorus (TP)	0.236		0.005	mg/L	0.2000	0.027	105%	85-115%		
Matrix Spike (BCJ0096-MS5)			Source: A25I0669-07	Prepared: 10/07/25 Analyzed: 10/09/25						

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 09/30/25

Date Reported: 10/17/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCJ0096 - No Prep - WetChem (Continued)

Matrix Spike (BCJ0096-MS5)

Source: A25I0669-07

Prepared: 10/07/25 Analyzed: 10/09/25

Total Phosphorus (TP)	0.294		0.005	mg/L	0.2000	0.083	106%	85-115%

Matrix Spike (BCJ0096-MS6)

Source: A25I0669-17

Prepared: 10/07/25 Analyzed: 10/09/25

Total Phosphorus (TP)	0.365		0.005	mg/L	0.2000	0.156	104%	85-115%

Matrix Spike (BCJ0096-MS7)

Source: A25I0669-27

Prepared: 10/07/25 Analyzed: 10/09/25

Total Phosphorus (TP)	0.216		0.005	mg/L	0.2000	0.011	103%	85-115%

Matrix Spike (BCJ0096-MS8)

Source: A25J0026-03

Prepared: 10/07/25 Analyzed: 10/09/25

Total Phosphorus (TP)	0.231		0.005	mg/L	0.2000	0.024	104%	85-115%

Reference (BCJ0096-SRM1)

Prepared: 10/07/25 Analyzed: 10/09/25

Total Phosphorus (TP)	0.130		0.005	mg/L	0.1280		102%	90-110%

Batch: BCJ0187 - No Prep - WetChem

Blank (BCJ0187-BLK1)

Prepared: 10/13/25 Analyzed: 10/16/25

Total Nitrate + Nitrite	ND	U	0.020	mg/L				

Blank (BCJ0187-BLK2)

Prepared: 10/13/25 Analyzed: 10/16/25

Total Nitrate + Nitrite	ND	U	0.020	mg/L				

Blank (BCJ0187-BLK3)

Prepared: 10/13/25 Analyzed: 10/16/25

Total Nitrate + Nitrite	ND	U	0.020	mg/L				

LCS (BCJ0187-BS1)

Prepared: 10/13/25 Analyzed: 10/16/25

Total Nitrate + Nitrite	0.494		0.020	mg/L	0.5000		99%	90-110%

LCS (BCJ0187-BS2)

Prepared: 10/13/25 Analyzed: 10/16/25

Total Nitrate + Nitrite	0.491		0.020	mg/L	0.5000		98%	90-110%

LCS (BCJ0187-BS3)

Prepared: 10/13/25 Analyzed: 10/16/25

Total Nitrate + Nitrite	0.492		0.020	mg/L	0.5000		98%	90-110%

Calibration Blank (BCJ0187-CCB1)

Prepared: 10/13/25 Analyzed: 10/16/25

Total Nitrate + Nitrite	0.0005			mg/L				

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 09/30/25

Date Reported: 10/17/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCJ0187 - No Prep - WetChem (Continued)										
Calibration Blank (BCJ0187-CCB2)					Prepared: 10/13/25 Analyzed: 10/16/25					
Total Nitrate + Nitrite	0.0003			mg/L						
Calibration Blank (BCJ0187-CCB3)					Prepared: 10/13/25 Analyzed: 10/16/25					
Total Nitrate + Nitrite	0.000008			mg/L						
Calibration Blank (BCJ0187-CCB4)					Prepared: 10/13/25 Analyzed: 10/16/25					
Total Nitrate + Nitrite	0.0002			mg/L						
Calibration Blank (BCJ0187-CCB5)					Prepared: 10/13/25 Analyzed: 10/16/25					
Total Nitrate + Nitrite	0.0005			mg/L						
Calibration Blank (BCJ0187-CCB6)					Prepared: 10/13/25 Analyzed: 10/16/25					
Total Nitrate + Nitrite	0.0005			mg/L						
Calibration Check (BCJ0187-CCV1)					Prepared: 10/13/25 Analyzed: 10/16/25					
Total Nitrate + Nitrite	0.989		0.020	mg/L	1.000		99%	85-115%		
Calibration Check (BCJ0187-CCV2)					Prepared: 10/13/25 Analyzed: 10/16/25					
Total Nitrate + Nitrite	0.983		0.020	mg/L	1.000		98%	85-115%		
Calibration Check (BCJ0187-CCV3)					Prepared: 10/13/25 Analyzed: 10/16/25					
Total Nitrate + Nitrite	0.985		0.020	mg/L	1.000		98%	85-115%		
Calibration Check (BCJ0187-CCV4)					Prepared: 10/13/25 Analyzed: 10/16/25					
Total Nitrate + Nitrite	0.983		0.020	mg/L	1.000		98%	85-115%		
Calibration Check (BCJ0187-CCV5)					Prepared: 10/13/25 Analyzed: 10/16/25					
Total Nitrate + Nitrite	0.986		0.020	mg/L	1.000		99%	85-115%		
Calibration Check (BCJ0187-CCV6)					Prepared: 10/13/25 Analyzed: 10/16/25					
Total Nitrate + Nitrite	0.985		0.020	mg/L	1.000		98%	85-115%		
Duplicate (BCJ0187-DUP1)					Prepared: 10/13/25 Analyzed: 10/16/25					
Total Nitrate + Nitrite	0.081		0.020	mg/L		0.082			0.9	20
Duplicate (BCJ0187-DUP2)					Prepared: 10/13/25 Analyzed: 10/16/25					
					Source: A25I0607-01					
					Source: A25I0615-08					

ANALYSIS REPORT

Date Received: 09/30/25

Date Reported: 10/17/25

Thurston County Environmental Health

412 LILLY RD NE

OLYMPIA, WA 98506

Attention: JOHN HABERLIN

Project Name: STREAMS

Project #: 40644

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCJ0187 - No Prep - WetChem (Continued)										
Duplicate (BCJ0187-DUP2)			Source: A25I0615-08			Prepared: 10/13/25 Analyzed: 10/16/25				
Total Nitrate + Nitrite	0.192		0.020	mg/L		0.192			0.2	20
Duplicate (BCJ0187-DUP3)			Source: A25I0669-05			Prepared: 10/13/25 Analyzed: 10/16/25				
Total Nitrate + Nitrite	0.025		0.020	mg/L		0.025			1	20
Duplicate (BCJ0187-DUP4)			Source: A25I0669-15			Prepared: 10/13/25 Analyzed: 10/16/25				
Total Nitrate + Nitrite	0.833		0.020	mg/L		0.834			0.1	20
Duplicate (BCJ0187-DUP5)			Source: A25I0669-25			Prepared: 10/13/25 Analyzed: 10/16/25				
Total Nitrate + Nitrite	ND	U	0.020	mg/L		ND				20
Duplicate (BCJ0187-DUP6)			Source: A25J0026-01			Prepared: 10/13/25 Analyzed: 10/16/25				
Total Nitrate + Nitrite	0.016	J	0.020	mg/L		0.016			0.7	20
Matrix Spike (BCJ0187-MS1)			Source: A25I0607-01			Prepared: 10/13/25 Analyzed: 10/16/25				
Total Nitrate + Nitrite	1.07		0.020	mg/L	1.000	0.082	98%	85-115%		
Matrix Spike (BCJ0187-MS2)			Source: A25I0615-08			Prepared: 10/13/25 Analyzed: 10/16/25				
Total Nitrate + Nitrite	1.21		0.020	mg/L	1.000	0.192	102%	85-115%		
Matrix Spike (BCJ0187-MS3)			Source: A25I0669-05			Prepared: 10/13/25 Analyzed: 10/16/25				
Total Nitrate + Nitrite	1.04		0.020	mg/L	1.000	0.025	102%	85-115%		
Matrix Spike (BCJ0187-MS4)			Source: A25I0669-15			Prepared: 10/13/25 Analyzed: 10/16/25				
Total Nitrate + Nitrite	1.86		0.020	mg/L	1.000	0.834	103%	85-115%		
Matrix Spike (BCJ0187-MS5)			Source: A25I0669-25			Prepared: 10/13/25 Analyzed: 10/16/25				
Total Nitrate + Nitrite	1.02		0.020	mg/L	1.000	ND	102%	85-115%		
Matrix Spike (BCJ0187-MS6)			Source: A25J0026-01			Prepared: 10/13/25 Analyzed: 10/16/25				
Total Nitrate + Nitrite	1.03		0.020	mg/L	1.000	0.016	102%	85-115%		
Reference (BCJ0187-SRM1)						Prepared: 10/13/25 Analyzed: 10/16/25				
Total Nitrate + Nitrite	1.17		0.020	mg/L	1.190		98%	90-110%		

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com



**Professional
Analytical
Services**

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 09/30/25

Date Reported: 10/17/25

Notes and Definitions

Item	Definition
U	The compound was analyzed for but was not detected (Non-detect) at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
D	The reported value is from a dilution.
Dry	Sample results reported on a dry weight basis.
ND	Analyte NOT DETECTED at or above the reporting limit.
RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was matrix spiked or duplicated.

AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

Ph (425) 885-1664 Fx (425) 820-0245

www.amtestlab.com

A2510669

Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506				Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506											
Contact Person: John Haberlin				Invoice Contact: John Haberlin											
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young											
Fax No:				Invoice Ph/Fax:											
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us											
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:											
Special Instructions: Please report to detection limit for all results.															
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)						Temperature upon Receipt: 1.9 °									
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested									
Project Number: 40644						Total Phosphate	Total Nitrogen	NOX	Ammonia	Orthophosphate					QA/QC
AmTest ID	Client ID (35 characters max)														
01	Schneider T	9/16/25	0940	H2O	1	X		X							
02	Schneider T	9/16/25	0940	H2O	1	X		X							X
03	Kennedy	9/16/25	0955	H2O	1	X		X							
04	McLane	9/16/25	1100	H2O	1	X		X							
05	Black Lake Ditch	9/16/25	1155	H2O	1	X		X							
06	Black Lake Ditch	9/16/25	1155	H2O	1	X		X							X
07	Moxlie Mouth	9/17/25	0930	H2O	1	X		X							
08	Moxlie @ Union	9/17/25	0945	H2O	1	X		X							
09	Woodard @ 36 th	9/17/25	1010	H2O	1	X		X							
10	Woodland @ PG	9/17/25	1030	H2O	1	X		X							
Collected/Relinquished By: John Haberlin		Date 9/29/2025	Time 1400	Received By: <i>[Signature]</i>				Date 9/30/25	Time 12:00						
Relinquished By:		Date	Time	Received By:				Date	Time						
Relinquished By:		Date	Time	Received By:				Date	Time						

COMMENTS:

Page 1 of 4

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AmTest Chain of Custody Record

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Ph (425) 885-1664 Fx (425) 820-0245

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A25I0669

Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506				Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506										
Contact Person: John Haberlin				Invoice Contact: John Haberlin										
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young										
Fax No:				Invoice Ph/Fax:										
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us										
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:										
Special Instructions: Please report to detection limit for all results.														
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)				Temperature upon Receipt: 1.9°										
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested								
Project Number: 40644						Total Phosphate	Total Nitrogen	NOx	Ammonia	Orthophosphate				
AmTest ID	Client ID (35 characters max)													
11	Woodland @ Draham	9/17/25	1055	H2O	1	X		X						
12	Woodland @ Draham	9/17/25	1055	H2O	1	X		X						X
13	Thompson	9/17/25	1220	H2O	1	X		X						
14	Thompson QA	9/17/25	1220	H2O	1	X		X						X
15	Eaton	9/17/25	1240	H2O	1	X		X						
16	McAllister @I-5	9/17/25	1310	H2O	1	X		X						
17	Clear Surface	9/22/25	0935	H2O	1	X		X						
18	Clear Bottom	9/22/25	0940	H2O	1	X		X						
19	Lawrence 1 Surface	9/22/25	1100	H2O	1	X		X						
20	Lawrence 1 Bottom	9/22/25	1105	H2O	1	X		X						
Collected/Relinquished By: John Haberlin		Date 9/29/2025	Time 1400	Received By: HS				Date 9/30/25	Time 12:00					
Relinquished By:		Date	Time	Received By:				Date	Time					
Relinquished By:		Date	Time	Received By:				Date	Time					

COMMENTS:

Page 2 of 4

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AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034

Ph (425) 885-1664 Fx (425) 820-0245

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25 ID 669

Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506				Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506											
Contact Person: John Haberlin				Invoice Contact: John Haberlin											
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young											
Fax No:				Invoice Ph/Fax:											
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us											
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:											
Special Instructions: Please report to detection limit for all results.															
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)						Temperature upon Receipt: 1.9°									
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested									
Project Number: 40644						Total Phosphate	Total Nitrogen	NOx	Ammonia	Orthophosphate					QA/QC
AmTest ID	Client ID (35 characters max)														
21	Lawrence 2 Surface	9/22/25	1125	H2O	1	X		X							
22	Lawrence 2 Bottom	9/22/25	1130	H2O	1	X		X							
23	Long 4 Surface	9/22/25	1300	H2O	1	X		X							
24	Long 4 Bottom	9/22/25	1305	H2O	1	X		X							
25	Long 3 Surface	9/22/25	1320	H2O	1	X		X							
26	Long 3 Bottom	9/22/25	1325	H2O	1	X		X							
27	St. Clair 1 Surface	9/23/25	0915	H2O	1	X		X							
28	St Clair 1 Bottom	9/23/25	0920	H2O	1	X		X							
29	St Clair 2 Surface	9/23/25	1025	H2O	1	X		X							
30	St Clair 2 Bottom	9/23/25	1030	H2O	1	X		X							
Collected/Relinquished By: John Haberlin		Date 9/29/2025	Time 1400	Received By: HS				Date 9/30/25	Time 12:00						
Relinquished By:		Date	Time	Received By:				Date	Time						
Relinquished By:		Date	Time	Received By:				Date	Time						

COMMENTS:

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AmTest Chain of Custody Record

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Ph (425) 885-1664 Fx (425) 820-0245

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A25I0669

Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506				Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506											
Contact Person: John Haberlin				Invoice Contact: John Haberlin											
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young											
Fax No:				Invoice Ph/Fax:											
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us											
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:											
Special Instructions: Please report to detection limit for all results.															
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)						Temperature upon Receipt: 1.9°									
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested									
Project Number: 40644						Total Phosphate	Total Nitrogen	NOx	Ammonia	Orthophosphate					QA/QC
AmTest ID	Client ID (35 characters max)														
31	Offutt Surface	9/23/25	1145	H2O	1	X		X							
32	Offutt Bottom	9/23/25	1150	H2O	1	X		X							
33	Munn Surface	9/23/25	1245	H2O	1	X		X							
34	Munn Bottom	9/23/25	1250	H2O	1	X		X							
Collected/Relinquished By: John Haberlin		Date 9/29/2025	Time 1400	Received By: HS				Date 9/30/25	Time 12:00						
Relinquished By:		Date	Time	Received By:				Date	Time						
Relinquished By:		Date	Time	Received By:				Date	Time						

COMMENTS:

Page 4 of 4

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TSHIMAKAIN CREEK LABORATORIES, LLC

November 13, 2025

Stuart Whitford

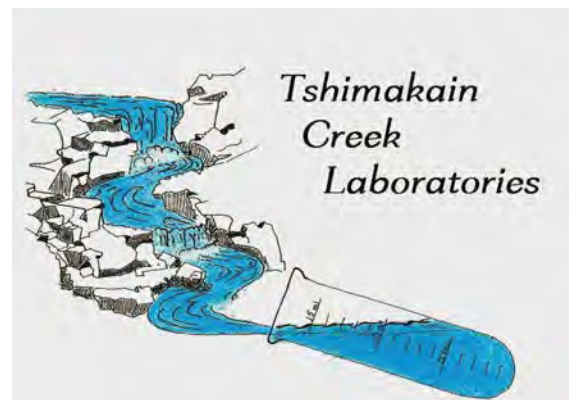
Thurston County Environmental Health

3000 Pacific Ave SE

Olympia, WA 98501

Project Name: Chlorophyll a Project 2025

Report No.: 25J2302



Dear Stuart Whitford,

This Report contains the analytical result for the sample(s) received under chain of custody(s) by Tshimakain Creek Laboratories on October 23, 2025.

The test result in this report are in compliance with Washington State Department of Ecology laboratory accreditation requirements for the certified parameters. Any anomalies are noted in the case narrative and this cover page are an integral part of this report. The Laboratory report may not be produced, exempt in full, without the written approval of the laboratory.

The issuance of the final Certificate of Analysis takes precedence over any previous Preliminary Report. Preliminary Data should not be used for regular purposes. Authorized signature(s) is provided on final report only.

If you have any questions in reference to this report, please contact your Tshimakain Creek Laboratories coordinator.

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

Page 2 of 5

CLIENT: Thurston County Environmental Health
ATTENTION: Stuart Whitford
ADDRESS: 3000 Pacific Ave SE
Olympia WA, 98501
PHONE: (360) 463-8323

JOB NO: 25J2302
PROJECT NAME: Chlorophyll a Project 2025
REPORTED: 13-Nov-25 08:52
SUBMITTED: 23-Oct-25
PROJECT NUMBER [none]

TCL ID#	25J2302-01	25J2302-02	25J2302-03	25J2302-04
MATRIX	Water	Water	Water	Water
SAMPLED DATE	21-Oct-25 09:20	21-Oct-25 10:30	21-Oct-25 11:05	21-Oct-25 12:40
CLIENT SAMPLE ID	Clear	Lawrence 1	Lawrence 2	Long 4

ANALYSIS PARAMETERS	METHOD	MRL	UNITS	ANALYZED				
Chlorophyll-a	SM 10200H	1.0	ug/L	06-Nov-25	70	57	37	11



Reviewed By _____
Elida Madera
Lab Manager

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

Page 3 of 5

CLIENT: Thurston County Environmental Health
ATTENTION: Stuart Whitford
ADDRESS: 3000 Pacific Ave SE
Olympia WA, 98501
PHONE: (360) 463-8323

JOB NO: 25J2302
PROJECT NAME: Chlorophyll a Project 2025
REPORTED: 13-Nov-25 08:52
SUBMITTED: 23-Oct-25
PROJECT NUMBER [none]

TCL ID#	25J2302-05	25J2302-06	25J2302-07	25J2302-08
MATRIX	Water	Water	Water	Water
SAMPLED DATE	21-Oct-25 13:00	22-Oct-25 09:05	22-Oct-25 10:05	22-Oct-25 11:40
CLIENT SAMPLE ID	Long 3	St Clair 1	St Clair 2	Offutt

ANALYSIS PARAMETERS	METHOD	MRL	UNITS	ANALYZED
PHYSICAL PROPERTIES				
Chlorophyll-a	SM 10200H	1.0	ug/L	06-Nov-25

15

2.4

2.9

16

Reviewed By _____
Elida Madera
Lab Manager

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

Page 4 of 5

CLIENT: Thurston County Environmental Health

JOB NO: 25J2302

ATTENTION: Stuart Whitford

PROJECT NAME: Chlorophyll a Project 2025

ADDRESS: 3000 Pacific Ave SE

REPORTED: 13-Nov-25 08:52

Olympia WA, 98501

SUBMITTED: 23-Oct-25

PHONE: (360) 463-8323

PROJECT NUMBER [none]

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes

Reviewed By_____

TSHIMAKAIN CREEK LABORATORIES, LLC

CERTIFICATE OF ANALYSIS

Page 5 of 5

CLIENT: Thurston County Environmental Health
ATTENTION: Stuart Whitford
ADDRESS: 3000 Pacific Ave SE
Olympia WA, 98501
PHONE: (360) 463-8323

JOB NO: 25J2302
PROJECT NAME: Chlorophyll a Project 2025
REPORTED: 13-Nov-25 08:52
SUBMITTED: 23-Oct-25
PROJECT NUMBER [none]

Notes and Definitions

MRL = MINIMUM REPORTING LIMIT

NC = NON-CALCULABLE

%RPD = RELATIVE PERCENT DIFFERENCE

%REC = PERCENT RECOVERY

LCS = LABORATORY CONTROL SAMPLE

NR = NEGATIVE RESULT

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
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***Professional
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November 26, 2025

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN

Project: STREAMS
Project Number: 40644
COC Number: A25J0717

JOHN HABERLIN:

Enclosed please find the analytical data for your STREAMS project.

Your sample(s) were received on Tuesday, October 28, 2025 and properly maintained prior to the subsequent analysis. The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA, Standard Methods or the Army Corps of Engineers.

Following the analytical results you will find the Quality Control (QA/QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Practical Quantitation Limits (PQL's), as opposed to the Method Detection Limits (MDL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Aaron Young". The signature is fluid and cursive, with the first name "Aaron" and last name "Young" clearly distinguishable.

ElementStationManager For Aaron Young

President

aarony@amtestlab.com



ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 10/28/25

Date Reported: 11/26/25

Reported Samples

Lab ID	Sample	Matrix	Qualifiers	Date Sampled	Date Received
A25J0717-01	Eaton	Water		10/14/2025	10/28/2025
A25J0717-02	Thompson	Water		10/14/2025	10/28/2025
A25J0717-03	Thompson QA	Water		10/14/2025	10/28/2025
A25J0717-04	Mcallister @ I5	Water		10/14/2025	10/28/2025
A25J0717-05	Woodland @ PG	Water		10/14/2025	10/28/2025
A25J0717-06	Woodland @ Draham	Water		10/14/2025	10/28/2025
A25J0717-07	Woodard @ Libby	Water		10/14/2025	10/28/2025
A25J0717-08	Woodard @ Libby QA	Water		10/14/2025	10/28/2025
A25J0717-09	Clear Surface	Water		10/21/2025	10/28/2025
A25J0717-10	Clear Bottom	Water		10/21/2025	10/28/2025
A25J0717-11	Lawrence 1 Surface	Water		10/21/2025	10/28/2025
A25J0717-12	Lawrence 1 Bottom	Water		10/21/2025	10/28/2025
A25J0717-13	Lawrence 2 Surface	Water		10/21/2025	10/28/2025
A25J0717-14	Lawrence 2 Bottom	Water		10/21/2025	10/28/2025
A25J0717-15	Long 4 Surface	Water		10/21/2025	10/28/2025
A25J0717-16	Long 4 Bottom	Water		10/21/2025	10/28/2025
A25J0717-17	Long 3 Surface	Water		10/21/2025	10/28/2025
A25J0717-18	Long 3 Bottom	Water		10/21/2025	10/28/2025
A25J0717-19	St. Clair 1 Surface	Water		10/22/2025	10/28/2025
A25J0717-20	St. Clair 1 Bottom	Water		10/22/2025	10/28/2025
A25J0717-21	St. Clair 2 Surface	Water		10/22/2025	10/28/2025
A25J0717-22	St. Clair 2 Bottom	Water		10/22/2025	10/28/2025
A25J0717-23	Offutt Surface	Water		10/22/2025	10/28/2025
A25J0717-24	Offutt Bottom	Water		10/22/2025	10/28/2025

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ANALYSIS REPORT

Date Received: 10/28/25

Date Reported: 11/26/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25J0717-01

Client Identification: Eaton

Sampling Date: 10/14/25 10:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.851	mg/L		0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	0.41	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	1.26	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.037	mg/L		0.005	SM 4500-P_F_2011	CC	11/12/2025

AMTEST Identification Number: A25J0717-02

Client Identification: Thompson

Sampling Date: 10/14/25 10:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	2.92	mg/L	D	0.100	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	0.47	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	3.39	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.016	mg/L		0.005	SM 4500-P_F_2011	CC	11/12/2025

AMTEST Identification Number: A25J0717-03

Client Identification: Thompson QA

Sampling Date: 10/14/25 10:55

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	2.93	mg/L	D	0.100	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	0.46	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	3.38	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.015	mg/L		0.005	SM 4500-P_F_2011	CC	11/12/2025

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ANALYSIS REPORT

Date Received: 10/28/25

Date Reported: 11/26/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25J0717-04

Client Identification: Mcallister @ I5

Sampling Date: 10/14/25 11:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.16	mg/L		0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	0.80	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	1.96	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.177	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

AMTEST Identification Number: A25J0717-05

Client Identification: Woodland @ PG

Sampling Date: 10/14/25 12:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.58	mg/L		0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	0.41	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	1.99	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.073	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

AMTEST Identification Number: A25J0717-06

Client Identification: Woodland @ Draham

Sampling Date: 10/14/25 12:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	1.70	mg/L		0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	0.56	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	2.26	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.079	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

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ANALYSIS REPORT

Date Received: 10/28/25

Date Reported: 11/26/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25J0717-07

Client Identification: Woodard @ Libby

Sampling Date: 10/14/25 13:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.242	mg/L		0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	0.56	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	0.799	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.049	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

AMTEST Identification Number: A25J0717-08

Client Identification: Woodard @ Libby QA

Sampling Date: 10/14/25 13:15

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.241	mg/L		0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	0.63	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	0.873	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.050	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

AMTEST Identification Number: A25J0717-09

Client Identification: Clear Surface

Sampling Date: 10/21/25 09:20

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.025	mg/L		0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	1.06	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	1.09	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.081	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

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ANALYSIS REPORT

Date Received: 10/28/25

Date Reported: 11/26/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25J0717-10

Client Identification: Clear Bottom

Sampling Date: 10/21/25 09:25

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.029	mg/L		0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	1.04	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	1.07	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.076	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

AMTEST Identification Number: A25J0717-11

Client Identification: Lawrence 1 Surface

Sampling Date: 10/21/25 10:30

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	1.37	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	1.37	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.034	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

AMTEST Identification Number: A25J0717-12

Client Identification: Lawrence 1 Bottom

Sampling Date: 10/21/25 10:35

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	1.38	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	1.38	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.028	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

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ANALYSIS REPORT

Date Received: 10/28/25

Date Reported: 11/26/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25J0717-13

Client Identification: Lawrence 2 Surface

Sampling Date: 10/21/25 11:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	1.20	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	1.20	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.021	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

AMTEST Identification Number: A25J0717-14

Client Identification: Lawrence 2 Bottom

Sampling Date: 10/21/25 11:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	1.56	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	1.56	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.040	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

AMTEST Identification Number: A25J0717-15

Client Identification: Long 4 Surface

Sampling Date: 10/21/25 12:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	0.71	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	0.705	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.013	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

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ANALYSIS REPORT

Date Received: 10/28/25
Date Reported: 11/26/25

Thurston County Environmental Health
412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25J0717-16
Client Identification: Long 4 Bottom
Sampling Date: 10/21/25 12:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	0.77	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	0.766	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.017	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

AMTEST Identification Number: A25J0717-17
Client Identification: Long 3 Surface
Sampling Date: 10/21/25 13:00

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	0.63	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	0.629	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.019	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

AMTEST Identification Number: A25J0717-18
Client Identification: Long 3 Bottom
Sampling Date: 10/21/25 13:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	0.65	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	0.649	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.019	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 10/28/25

Date Reported: 11/26/25

AMTEST Identification Number: A25J0717-19

Client Identification: St. Clair 1 Surface

Sampling Date: 10/22/25 09:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.040	mg/L		0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	0.66	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	0.697	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.007	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

AMTEST Identification Number: A25J0717-20

Client Identification: St. Clair 1 Bottom

Sampling Date: 10/22/25 09:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.028	mg/L		0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	8.68	mg/L	D	2.50	EPA 351.2_2_1993	CC	11/21/2025
Total Nitrogen	8.71	mg/L			Calculated	CC	11/21/2025
Total Phosphorus (TP)	2.13	mg/L	D	0.200	SM 4500-P F_2011	CC	11/12/2025

AMTEST Identification Number: A25J0717-21

Client Identification: St. Clair 2 Surface

Sampling Date: 10/22/25 10:05

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	0.73	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	0.726	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.004	mg/L	J	0.005	SM 4500-P F_2011	CC	11/12/2025

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ANALYSIS REPORT

Date Received: 10/28/25

Date Reported: 11/26/25

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

AMTEST Identification Number: A25J0717-22

Client Identification: St. Clair 2 Bottom

Sampling Date: 10/22/25 10:10

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	0.061	mg/L		0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	1.17	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	1.23	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.278	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

AMTEST Identification Number: A25J0717-23

Client Identification: Offutt Surface

Sampling Date: 10/22/25 11:40

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	1.06	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	1.06	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.033	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

AMTEST Identification Number: A25J0717-24

Client Identification: Offutt Bottom

Sampling Date: 10/22/25 11:45

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Nitrate + Nitrite	ND	mg/L	U	0.020	EPA 353.2_2_1993	CC	11/11/2025
Total Kjeldahl Nitrogen	0.91	mg/L		0.25	EPA 351.2_2_1993	CC	11/14/2025
Total Nitrogen	0.912	mg/L			Calculated	CC	11/14/2025
Total Phosphorus (TP)	0.035	mg/L		0.005	SM 4500-P F_2011	CC	11/12/2025

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 10/28/25

Date Reported: 11/26/25

Quality Control

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCK0133 - No Prep - WetChem

Blank (BCK0133-BLK1)

Prepared: 11/07/25 Analyzed: 11/12/25

Total Phosphorus (TP) ND U 0.005 mg/L

Blank (BCK0133-BLK2)

Prepared: 11/07/25 Analyzed: 11/12/25

Total Phosphorus (TP) ND U 0.005 mg/L

Blank (BCK0133-BLK3)

Prepared: 11/07/25 Analyzed: 11/12/25

Total Phosphorus (TP) ND U 0.005 mg/L

Blank (BCK0133-BLK4)

Prepared: 11/07/25 Analyzed: 11/12/25

Total Phosphorus (TP) ND U 0.005 mg/L

LCS (BCK0133-BS1)

Prepared: 11/07/25 Analyzed: 11/12/25

Total Phosphorus (TP) 0.100 0.005 mg/L 0.1000 100% 85-115%

LCS (BCK0133-BS2)

Prepared: 11/07/25 Analyzed: 11/12/25

Total Phosphorus (TP) 0.100 0.005 mg/L 0.1000 100% 85-115%

LCS (BCK0133-BS3)

Prepared: 11/07/25 Analyzed: 11/12/25

Total Phosphorus (TP) 0.100 0.005 mg/L 0.1000 100% 85-115%

LCS (BCK0133-BS4)

Prepared: 11/07/25 Analyzed: 11/12/25

Total Phosphorus (TP) 0.100 0.005 mg/L 0.1000 100% 85-115%

Calibration Blank (BCK0133-CCB1)

Prepared: 11/07/25 Analyzed: 11/12/25

Total Phosphorus (TP) ND U mg/L

Calibration Blank (BCK0133-CCB2)

Prepared: 11/07/25 Analyzed: 11/12/25

Total Phosphorus (TP) ND U mg/L

Calibration Blank (BCK0133-CCB3)

Prepared: 11/07/25 Analyzed: 11/12/25

Total Phosphorus (TP) ND U mg/L

Calibration Blank (BCK0133-CCB4)

Prepared: 11/07/25 Analyzed: 11/12/25

Total Phosphorus (TP) ND U mg/L

Calibration Blank (BCK0133-CCB5)

Prepared: 11/07/25 Analyzed: 11/12/25

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 10/28/25

Date Reported: 11/26/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCK0133 - No Prep - WetChem (Continued)										
Calibration Blank (BCK0133-CCB5)					Prepared: 11/07/25 Analyzed: 11/12/25					
Total Phosphorus (TP)	ND	U		mg/L						
Calibration Blank (BCK0133-CCB6)					Prepared: 11/07/25 Analyzed: 11/12/25					
Total Phosphorus (TP)	ND	U		mg/L						
Calibration Blank (BCK0133-CCB7)					Prepared: 11/07/25 Analyzed: 11/12/25					
Total Phosphorus (TP)	ND	U		mg/L						
Calibration Blank (BCK0133-CCB8)					Prepared: 11/07/25 Analyzed: 11/12/25					
Total Phosphorus (TP)	ND	U		mg/L						
Calibration Check (BCK0133-CCV1)					Prepared: 11/07/25 Analyzed: 11/12/25					
Total Phosphorus (TP)	0.202		0.005	mg/L	0.2000		101%	85-115%		
Calibration Check (BCK0133-CCV2)					Prepared: 11/07/25 Analyzed: 11/12/25					
Total Phosphorus (TP)	0.201		0.005	mg/L	0.2000		101%	85-115%		
Calibration Check (BCK0133-CCV3)					Prepared: 11/07/25 Analyzed: 11/12/25					
Total Phosphorus (TP)	0.200		0.005	mg/L	0.2000		100%	85-115%		
Calibration Check (BCK0133-CCV4)					Prepared: 11/07/25 Analyzed: 11/12/25					
Total Phosphorus (TP)	0.200		0.005	mg/L	0.2000		100%	85-115%		
Calibration Check (BCK0133-CCV5)					Prepared: 11/07/25 Analyzed: 11/12/25					
Total Phosphorus (TP)	0.200		0.005	mg/L	0.2000		100%	85-115%		
Calibration Check (BCK0133-CCV6)					Prepared: 11/07/25 Analyzed: 11/12/25					
Total Phosphorus (TP)	0.202		0.005	mg/L	0.2000		101%	85-115%		
Calibration Check (BCK0133-CCV7)					Prepared: 11/07/25 Analyzed: 11/12/25					
Total Phosphorus (TP)	0.201		0.005	mg/L	0.2000		101%	85-115%		
Calibration Check (BCK0133-CCV8)					Prepared: 11/07/25 Analyzed: 11/12/25					
Total Phosphorus (TP)	0.200		0.005	mg/L	0.2000		100%	85-115%		
Duplicate (BCK0133-DUP1)			Source: A25J0559-04		Prepared: 11/07/25 Analyzed: 11/12/25					

ANALYSIS REPORT

Date Received: 10/28/25

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Thurston County Environmental Health

412 LILLY RD NE

OLYMPIA, WA 98506

Attention: JOHN HABERLIN

Project Name: STREAMS

Project #: 40644

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCK0133 - No Prep - WetChem (Continued)										
Duplicate (BCK0133-DUP1)			Source: A25J0559-04	Prepared: 11/07/25 Analyzed: 11/12/25						
Total Phosphorus (TP)	0.073		0.005	mg/L		0.073			0.1	25
Duplicate (BCK0133-DUP2)			Source: A25J0671-01	Prepared: 11/07/25 Analyzed: 11/12/25						
Total Phosphorus (TP)	0.052		0.005	mg/L		0.045			15	25
Duplicate (BCK0133-DUP3)			Source: A25J0671-10	Prepared: 11/07/25 Analyzed: 11/12/25						
Total Phosphorus (TP)	ND	J	0.005	mg/L		ND				25
Duplicate (BCK0133-DUP4)			Source: A25J0717-02	Prepared: 11/07/25 Analyzed: 11/12/25						
Total Phosphorus (TP)	0.015		0.005	mg/L		0.016			10	25
Duplicate (BCK0133-DUP5)			Source: A25J0717-12	Prepared: 11/07/25 Analyzed: 11/12/25						
Total Phosphorus (TP)	0.035		0.005	mg/L		0.028			21	25
Duplicate (BCK0133-DUP6)			Source: A25J0717-22	Prepared: 11/07/25 Analyzed: 11/12/25						
Total Phosphorus (TP)	0.280		0.005	mg/L		0.278			0.4	25
Duplicate (BCK0133-DUP7)			Source: A25J0798-03	Prepared: 11/07/25 Analyzed: 11/12/25						
Total Phosphorus (TP)	0.039	DUP, DUP1	0.005	mg/L		0.016			83	25
Duplicate (BCK0133-DUP8)			Source: A25J0798-09	Prepared: 11/07/25 Analyzed: 11/12/25						
Total Phosphorus (TP)	ND	J	0.005	mg/L		ND				25
Matrix Spike (BCK0133-MS1)			Source: A25J0559-04	Prepared: 11/07/25 Analyzed: 11/12/25						
Total Phosphorus (TP)	0.279		0.005	mg/L	0.2000	0.073	103%	85-115%		
Matrix Spike (BCK0133-MS2)			Source: A25J0671-01	Prepared: 11/07/25 Analyzed: 11/12/25						
Total Phosphorus (TP)	0.257		0.005	mg/L	0.2000	0.045	106%	85-115%		
Matrix Spike (BCK0133-MS3)			Source: A25J0671-10	Prepared: 11/07/25 Analyzed: 11/12/25						
Total Phosphorus (TP)	0.199		0.005	mg/L	0.2000	ND	100%	85-115%		
Matrix Spike (BCK0133-MS4)			Source: A25J0717-02	Prepared: 11/07/25 Analyzed: 11/12/25						
Total Phosphorus (TP)	0.218		0.005	mg/L	0.2000	0.016	101%	85-115%		

ANALYSIS REPORT

Date Received: 10/28/25

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Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCK0133 - No Prep - WetChem (Continued)

Matrix Spike (BCK0133-MS5)

Source: A25J0717-12

Prepared: 11/07/25 Analyzed: 11/12/25

Total Phosphorus (TP)	0.233		0.005	mg/L	0.2000	0.028	102%	85-115%

Matrix Spike (BCK0133-MS6)

Source: A25J0717-22

Prepared: 11/07/25 Analyzed: 11/12/25

Total Phosphorus (TP)	0.484		0.005	mg/L	0.2000	0.278	103%	85-115%

Matrix Spike (BCK0133-MS7)

Source: A25J0798-03

Prepared: 11/07/25 Analyzed: 11/12/25

Total Phosphorus (TP)	0.220		0.005	mg/L	0.2000	0.016	102%	85-115%

Matrix Spike (BCK0133-MS8)

Source: A25J0798-09

Prepared: 11/07/25 Analyzed: 11/12/25

Total Phosphorus (TP)	0.200		0.005	mg/L	0.2000	ND	100%	85-115%

Reference (BCK0133-SRM1)

Prepared: 11/07/25 Analyzed: 11/12/25

Total Phosphorus (TP)	0.125		0.005	mg/L	0.1280		98%	90-110%

Batch: BCK0163 - No Prep - WetChem

Blank (BCK0163-BLK1)

Prepared: 11/11/25 Analyzed: 11/14/25

Total Kjeldahl Nitrogen	0.20	J	0.25	mg/L

Blank (BCK0163-BLK2)

Prepared: 11/11/25 Analyzed: 11/14/25

Total Kjeldahl Nitrogen	0.21	J	0.25	mg/L

Blank (BCK0163-BLK3)

Prepared: 11/11/25 Analyzed: 11/14/25

Total Kjeldahl Nitrogen	0.20	J	0.25	mg/L

LCS (BCK0163-BS1)

Prepared: 11/11/25 Analyzed: 11/14/25

Total Kjeldahl Nitrogen	0.51		0.25	mg/L	0.5000		102%	85-115%

LCS (BCK0163-BS2)

Prepared: 11/11/25 Analyzed: 11/14/25

Total Kjeldahl Nitrogen	0.50		0.25	mg/L	0.5000		101%	85-115%

LCS (BCK0163-BS3)

Prepared: 11/11/25 Analyzed: 11/14/25

Total Kjeldahl Nitrogen	0.49		0.25	mg/L	0.5000		99%	85-115%

Calibration Blank (BCK0163-CCB1)

Prepared: 11/11/25 Analyzed: 11/14/25

Total Kjeldahl Nitrogen	0.02			mg/L

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 10/28/25

Date Reported: 11/26/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCK0163 - No Prep - WetChem (Continued)										
Calibration Blank (BCK0163-CCB2)					Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	0.02			mg/L						
Calibration Blank (BCK0163-CCB3)					Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	0.07			mg/L						
Calibration Blank (BCK0163-CCB4)					Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	0.12			mg/L						
Calibration Blank (BCK0163-CCB5)					Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	0.12			mg/L						
Calibration Check (BCK0163-CCV1)					Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	1.00		0.25	mg/L	1.000		100%	85-115%		
Calibration Check (BCK0163-CCV2)					Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	1.06		0.25	mg/L	1.000		106%	85-115%		
Calibration Check (BCK0163-CCV3)					Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	1.00		0.25	mg/L	1.000		100%	85-115%		
Calibration Check (BCK0163-CCV4)					Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	0.98		0.25	mg/L	1.000		98%	85-115%		
Calibration Check (BCK0163-CCV5)					Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	1.01		0.25	mg/L	1.000		101%	85-115%		
Duplicate (BCK0163-DUP1)					Source: A25J0406-02 Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	0.40		0.25	mg/L		0.41			4	30
Duplicate (BCK0163-DUP2)					Source: A25J0407-01 Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	0.35		0.25	mg/L		0.38			9	30
Duplicate (BCK0163-DUP3)					Source: A25J0513-03 Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	0.67		0.25	mg/L		0.62			7	30
Duplicate (BCK0163-DUP4)					Source: A25J0589-03 Prepared: 11/11/25 Analyzed: 11/14/25					

ANALYSIS REPORT

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Thurston County Environmental Health

412 LILLY RD NE

OLYMPIA, WA 98506

Attention: JOHN HABERLIN

Project Name: STREAMS

Project #: 40644

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCK0163 - No Prep - WetChem (Continued)										
Duplicate (BCK0163-DUP4)			Source: A25J0589-03							
					Prepared: 11/11/25	Analyzed: 11/14/25				
Total Kjeldahl Nitrogen	0.33		0.25	mg/L		0.38			15	30
Duplicate (BCK0163-DUP5)			Source: A25J0717-06							
					Prepared: 11/11/25	Analyzed: 11/14/25				
Total Kjeldahl Nitrogen	0.49		0.25	mg/L		0.56			13	30
Matrix Spike (BCK0163-MS1)			Source: A25J0406-02							
					Prepared: 11/11/25	Analyzed: 11/14/25				
Total Kjeldahl Nitrogen	2.41		0.25	mg/L	2.000	0.41	100%	80-120%		
Matrix Spike (BCK0163-MS2)			Source: A25J0407-01							
					Prepared: 11/11/25	Analyzed: 11/14/25				
Total Kjeldahl Nitrogen	2.39		0.25	mg/L	2.000	0.38	100%	80-120%		
Matrix Spike (BCK0163-MS3)			Source: A25J0513-03							
					Prepared: 11/11/25	Analyzed: 11/14/25				
Total Kjeldahl Nitrogen	2.61		0.25	mg/L	2.000	0.62	100%	80-120%		
Matrix Spike (BCK0163-MS4)			Source: A25J0589-03							
					Prepared: 11/11/25	Analyzed: 11/14/25				
Total Kjeldahl Nitrogen	2.39		0.25	mg/L	2.000	0.38	100%	80-120%		
Matrix Spike (BCK0163-MS5)			Source: A25J0717-06							
					Prepared: 11/11/25	Analyzed: 11/14/25				
Total Kjeldahl Nitrogen	2.57		0.25	mg/L	2.000	0.56	101%	80-120%		
Reference (BCK0163-SRM1)										
					Prepared: 11/11/25	Analyzed: 11/14/25				
Total Kjeldahl Nitrogen	1.11		0.25	mg/L	1.120		99%	90-110%		
Batch: BCK0165 - No Prep - WetChem										
Blank (BCK0165-BLK1)										
					Prepared: 11/11/25	Analyzed: 11/14/25				
Total Kjeldahl Nitrogen	0.22	J	0.25	mg/L						
Blank (BCK0165-BLK2)										
					Prepared: 11/11/25	Analyzed: 11/14/25				
Total Kjeldahl Nitrogen	0.22	J	0.25	mg/L						
LCS (BCK0165-BS1)										
					Prepared: 11/11/25	Analyzed: 11/14/25				
Total Kjeldahl Nitrogen	0.52		0.25	mg/L	0.5000		105%	85-115%		
LCS (BCK0165-BS2)										
					Prepared: 11/11/25	Analyzed: 11/14/25				
Total Kjeldahl Nitrogen	0.53		0.25	mg/L	0.5000		106%	85-115%		

ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
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Date Received: 10/28/25

Date Reported: 11/26/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCK0165 - No Prep - WetChem (Continued)										
Calibration Blank (BCK0165-CCB1)					Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	0.12			mg/L						
Calibration Blank (BCK0165-CCB2)					Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	0.07			mg/L						
Calibration Blank (BCK0165-CCB3)					Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	0.08			mg/L						
Calibration Blank (BCK0165-CCB4)					Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	0.07			mg/L						
Calibration Check (BCK0165-CCV1)					Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	1.01		0.25	mg/L	1.000		101%	85-115%		
Calibration Check (BCK0165-CCV2)					Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	1.03		0.25	mg/L	1.000		103%	85-115%		
Calibration Check (BCK0165-CCV3)					Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	1.01		0.25	mg/L	1.000		101%	85-115%		
Calibration Check (BCK0165-CCV4)					Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	0.98		0.25	mg/L	1.000		98%	85-115%		
Duplicate (BCK0165-DUP1)					Source: A25J0717-12 Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	1.50		0.25	mg/L		1.38			8	30
Duplicate (BCK0165-DUP2)					Source: A25J0717-24 Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	0.95		0.25	mg/L		0.91			4	30
Duplicate (BCK0165-DUP3)					Source: A25K0006-01 Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	0.60		0.25	mg/L		0.58			3	30
Matrix Spike (BCK0165-MS1)					Source: A25J0717-12 Prepared: 11/11/25 Analyzed: 11/14/25					
Total Kjeldahl Nitrogen	3.43		0.25	mg/L	2.000	1.38	102%	80-120%		
Matrix Spike (BCK0165-MS2)					Source: A25J0717-24 Prepared: 11/11/25 Analyzed: 11/14/25					



ANALYSIS REPORT

Thurston County Environmental Health

412 LILLY RD NE
OLYMPIA, WA 98506
Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Date Received: 10/28/25

Date Reported: 11/26/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCK0165 - No Prep - WetChem (Continued)

Matrix Spike (BCK0165-MS2)

Source: A25J0717-24

Prepared: 11/11/25 Analyzed: 11/14/25

Total Kjeldahl Nitrogen	3.02		0.25	mg/L	2.000	0.91	105%	80-120%

Matrix Spike (BCK0165-MS3)

Source: A25K0006-01

Prepared: 11/11/25 Analyzed: 11/14/25

Total Kjeldahl Nitrogen	2.68		0.25	mg/L	2.000	0.58	105%	80-120%

Reference (BCK0165-SRM1)

Prepared: 11/11/25 Analyzed: 11/14/25

Total Kjeldahl Nitrogen	1.11		0.25	mg/L	1.120		99%	90-110%

Batch: BCK0186 - No Prep - WetChem

Blank (BCK0186-BLK1)

Prepared & Analyzed: 11/11/25

Total Nitrate + Nitrite	ND	U	0.020	mg/L

Blank (BCK0186-BLK2)

Prepared & Analyzed: 11/11/25

Total Nitrate + Nitrite	ND	U	0.020	mg/L

Blank (BCK0186-BLK3)

Prepared & Analyzed: 11/11/25

Total Nitrate + Nitrite	ND	U	0.020	mg/L

Blank (BCK0186-BLK4)

Prepared & Analyzed: 11/11/25

Total Nitrate + Nitrite	ND	U	0.020	mg/L

LCS (BCK0186-BS1)

Prepared & Analyzed: 11/11/25

Total Nitrate + Nitrite	0.526		0.020	mg/L	0.5000		105%	90-110%

LCS (BCK0186-BS2)

Prepared & Analyzed: 11/11/25

Total Nitrate + Nitrite	0.526		0.020	mg/L	0.5000		105%	90-110%

LCS (BCK0186-BS3)

Prepared & Analyzed: 11/11/25

Total Nitrate + Nitrite	0.530		0.020	mg/L	0.5000		106%	90-110%

LCS (BCK0186-BS4)

Prepared & Analyzed: 11/11/25

Total Nitrate + Nitrite	0.529		0.020	mg/L	0.5000		106%	90-110%

Calibration Blank (BCK0186-CCB1)

Prepared & Analyzed: 11/11/25

Total Nitrate + Nitrite	ND	U		mg/L



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Thurston County Environmental Health
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Project Name: STREAMS
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Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCK0186 - No Prep - WetChem (Continued)										
Calibration Blank (BCK0186-CCB2)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	ND	U		mg/L						
Calibration Blank (BCK0186-CCB3)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	ND	U		mg/L						
Calibration Blank (BCK0186-CCB4)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	ND	U		mg/L						
Calibration Blank (BCK0186-CCB5)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	ND	U		mg/L						
Calibration Blank (BCK0186-CCB6)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	ND	U		mg/L						
Calibration Blank (BCK0186-CCB7)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	ND	U		mg/L						
Calibration Blank (BCK0186-CCB8)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	ND	U		mg/L						
Calibration Check (BCK0186-CCV1)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	1.03		0.020	mg/L	1.000		103%	85-115%		
Calibration Check (BCK0186-CCV2)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	1.03		0.020	mg/L	1.000		103%	85-115%		
Calibration Check (BCK0186-CCV3)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	1.04		0.020	mg/L	1.000		104%	85-115%		
Calibration Check (BCK0186-CCV4)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	1.04		0.020	mg/L	1.000		104%	85-115%		
Calibration Check (BCK0186-CCV5)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	1.04		0.020	mg/L	1.000		104%	85-115%		
Calibration Check (BCK0186-CCV6)					Prepared & Analyzed: 11/11/25					

ANALYSIS REPORT

Thurston County Environmental Health

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Project #: 40644

Date Received: 10/28/25

Date Reported: 11/26/25

Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCK0186 - No Prep - WetChem (Continued)										
Calibration Check (BCK0186-CCV6)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	1.04		0.020	mg/L	1.000		104%	85-115%		
Calibration Check (BCK0186-CCV7)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	1.04		0.020	mg/L	1.000		104%	85-115%		
Calibration Check (BCK0186-CCV8)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	1.04		0.020	mg/L	1.000		104%	85-115%		
Duplicate (BCK0186-DUP1)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	0.851		0.020	mg/L		0.850			0.08	20
Duplicate (BCK0186-DUP2)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	1.70		0.020	mg/L		1.70			0.2	20
Duplicate (BCK0186-DUP3)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	1.16		0.020	mg/L		1.16			0.07	20
Duplicate (BCK0186-DUP4)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	ND	U	0.020	mg/L		ND				20
Duplicate (BCK0186-DUP5)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	ND	U	0.020	mg/L		ND				20
Duplicate (BCK0186-DUP6)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	0.520		0.020	mg/L		0.521			0.05	20
Duplicate (BCK0186-DUP7)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	0.416		0.020	mg/L		0.416			0.01	20
Duplicate (BCK0186-DUP8)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	ND	U	0.020	mg/L		ND				20
Matrix Spike (BCK0186-MS1)					Prepared & Analyzed: 11/11/25					
Total Nitrate + Nitrite	1.91		0.020	mg/L	1.000	0.850	106%	85-115%		
Matrix Spike (BCK0186-MS2)					Prepared & Analyzed: 11/11/25					

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCK0186 - No Prep - WetChem (Continued)

Matrix Spike (BCK0186-MS2)

Source: A25J0671-07

Prepared & Analyzed: 11/11/25

Total Nitrate + Nitrite	2.76		0.020	mg/L	1.000	1.70	107%	85-115%

Matrix Spike (BCK0186-MS3)

Source: A25J0717-04

Prepared & Analyzed: 11/11/25

Total Nitrate + Nitrite	2.23		0.020	mg/L	1.000	1.16	107%	85-115%

Matrix Spike (BCK0186-MS4)

Source: A25J0717-14

Prepared & Analyzed: 11/11/25

Total Nitrate + Nitrite	1.07		0.020	mg/L	1.000	ND	107%	85-115%

Matrix Spike (BCK0186-MS5)

Source: A25J0717-24

Prepared & Analyzed: 11/11/25

Total Nitrate + Nitrite	1.07		0.020	mg/L	1.000	ND	107%	85-115%

Matrix Spike (BCK0186-MS6)

Source: A25J0776-03

Prepared & Analyzed: 11/11/25

Total Nitrate + Nitrite	1.60		0.020	mg/L	1.000	0.521	108%	85-115%

Matrix Spike (BCK0186-MS7)

Source: A25J0798-03

Prepared & Analyzed: 11/11/25

Total Nitrate + Nitrite	1.49		0.020	mg/L	1.000	0.416	107%	85-115%

Matrix Spike (BCK0186-MS8)

Source: A25J0798-09

Prepared & Analyzed: 11/11/25

Total Nitrate + Nitrite	1.07		0.020	mg/L	1.000	ND	107%	85-115%

Reference (BCK0186-SRM1)

Prepared & Analyzed: 11/11/25

Total Nitrate + Nitrite	1.22		0.020	mg/L	1.190		103%	90-110%

Batch: BCK0305 - No Prep - WetChem

Blank (BCK0305-BLK1)

Prepared: 11/19/25 Analyzed: 11/21/25

Total Kjeldahl Nitrogen	0.17	J	0.25	mg/L

Blank (BCK0305-BLK2)

Prepared: 11/19/25 Analyzed: 11/21/25

Total Kjeldahl Nitrogen	0.18	J	0.25	mg/L

LCS (BCK0305-BS1)

Prepared: 11/19/25 Analyzed: 11/21/25

Total Kjeldahl Nitrogen	0.51		0.25	mg/L	0.5000		101%	85-115%

LCS (BCK0305-BS2)

Prepared: 11/19/25 Analyzed: 11/21/25

Total Kjeldahl Nitrogen	0.53		0.25	mg/L	0.5000		105%	85-115%

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Quality Control

(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCK0305 - No Prep - WetChem (Continued)										
Calibration Blank (BCK0305-CCB1)					Prepared: 11/19/25 Analyzed: 11/21/25					
Total Kjeldahl Nitrogen	0.02			mg/L						
Calibration Blank (BCK0305-CCB2)					Prepared: 11/19/25 Analyzed: 11/21/25					
Total Kjeldahl Nitrogen	0.01			mg/L						
Calibration Blank (BCK0305-CCB3)					Prepared: 11/19/25 Analyzed: 11/21/25					
Total Kjeldahl Nitrogen	0.01			mg/L						
Calibration Blank (BCK0305-CCB4)					Prepared: 11/19/25 Analyzed: 11/21/25					
Total Kjeldahl Nitrogen	0.02			mg/L						
Calibration Check (BCK0305-CCV1)					Prepared: 11/19/25 Analyzed: 11/21/25					
Total Kjeldahl Nitrogen	1.00		0.25	mg/L	1.000		100%	85-115%		
Calibration Check (BCK0305-CCV2)					Prepared: 11/19/25 Analyzed: 11/21/25					
Total Kjeldahl Nitrogen	1.02		0.25	mg/L	1.000		102%	85-115%		
Calibration Check (BCK0305-CCV3)					Prepared: 11/19/25 Analyzed: 11/21/25					
Total Kjeldahl Nitrogen	1.03		0.25	mg/L	1.000		103%	85-115%		
Calibration Check (BCK0305-CCV4)					Prepared: 11/19/25 Analyzed: 11/21/25					
Total Kjeldahl Nitrogen	1.05		0.25	mg/L	1.000		105%	85-115%		
Duplicate (BCK0305-DUP1)					Source: A25K0091-01 Prepared: 11/19/25 Analyzed: 11/21/25					
Total Kjeldahl Nitrogen	47.4		0.25	mg/L		44.9			5	30
Duplicate (BCK0305-DUP2)					Source: A25K0118-01 Prepared: 11/19/25 Analyzed: 11/21/25					
Total Kjeldahl Nitrogen	51.1		0.25	mg/L		49.7			3	30
Duplicate (BCK0305-DUP3)					Source: A25K0135-08 Prepared: 11/19/25 Analyzed: 11/21/25					
Total Kjeldahl Nitrogen	0.42		0.25	mg/L		0.37			13	30
Matrix Spike (BCK0305-MS1)					Source: A25K0091-01 Prepared: 11/19/25 Analyzed: 11/21/25					
Total Kjeldahl Nitrogen	85.9		0.25	mg/L	40.00	44.9	103%	80-120%		
Matrix Spike (BCK0305-MS2)					Source: A25K0118-01 Prepared: 11/19/25 Analyzed: 11/21/25					

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Attention: JOHN HABERLIN
Project Name: STREAMS
Project #: 40644

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BCK0305 - No Prep - WetChem (Continued)

Matrix Spike (BCK0305-MS2)		Source: A25K0118-01		Prepared: 11/19/25 Analyzed: 11/21/25						
Total Kjeldahl Nitrogen	71.3		0.25	mg/L	20.00	49.7	108%	80-120%		
Matrix Spike (BCK0305-MS3)		Source: A25K0135-08		Prepared: 11/19/25 Analyzed: 11/21/25						
Total Kjeldahl Nitrogen	2.47		0.25	mg/L	2.000	0.37	105%	80-120%		
Reference (BCK0305-SRM1)				Prepared: 11/19/25 Analyzed: 11/21/25						
Total Kjeldahl Nitrogen	1.10		0.25	mg/L	1.120		99%	90-110%		

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ANALYSIS REPORT

Thurston County Environmental Health

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Project Name: STREAMS
Project #: 40644

Date Received: 10/28/25

Date Reported: 11/26/25

Notes and Definitions

Item	Definition
U	The compound was analyzed for but was not detected (Non-detect) at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
D	The reported value is from a dilution.
Dry	Sample results reported on a dry weight basis.
ND	Analyte NOT DETECTED at or above the reporting limit.
RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was matrix spiked or duplicated.

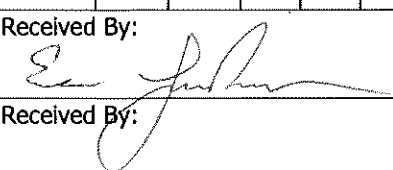
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Chain of Custody No.

Client Name & Address: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506				Invoice To: Thurston County Environmental Health 3000 Pacific Ave. SE Olympia, WA 98506											
Contact Person: John Haberlin				Invoice Contact: John Haberlin											
Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young											
Fax No:				Invoice Ph/Fax:											
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us											
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:											
Special Instructions: Please report to detection limit for all results.															
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)				Temperature upon Receipt: 13											
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested									
Project Number: 40644						Total Phosphate	Total Nitrogen	NOx	Ammonia	Orthophosphate					QA/QC
AmTest ID	Client ID (35 characters max)														
01	Eaton	10/14/25	10:30	H2O	1	X	X								
02	Thompson	10/14/25	10:55	H2O	1	X	X								
03	Thompson QA	10/14/25	10:55	H2O	1	X	x								X
04	Mcallister @ I5	10/14/25	11:30	H2O	1	x	x								
05	Woodland @ PG	10/14/25	12:00	H2O	1	x	x								
06	Woodland @ Draham	10/14/25	12:20	H2O	1	x	x								
07	Woodard @ Libby	10/14/25	13:15	H2O	1	x	x								
08	Woodard @ Libby QA	10/14/25	13:15	H2O	1	x	x								X
09	Clear Surface	10/21/25	9:20	H2O	1	x	x								
10	Clear Bottom	10/21/25	9:25	H2O	1	x	x								
Collected/Relinquished By: John Haberlin		Date 10/27/2025	Time 1500	Received By: 				Date 10/28/25	Time 1025						
Relinquished By:		Date	Time	Received By:				Date	Time						
Relinquished By:		Date	Time	Received By:				Date	Time						

COMMENTS:

Page 1 of 3

Fedex

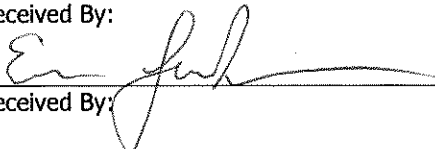
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Phone No: 360-867-2626				PO Number: Credit Card upon report per Aaron Young											
Fax No:				Invoice Ph/Fax:											
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: john.haberlin@co.thurston.wa.us, tc_lakes@co.thurston.wa.us											
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:											
Special Instructions: Please report to detection limit for all results.															
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)				Temperature upon Receipt: <u>1.3</u>											
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested									
Project Number: 40644						Total Phosphate	Total Nitrogen	NOx	Ammonia	Orthophosphate					QA/QC
AmTest ID	Client ID (35 characters max)														
<u>11</u>	Lawrence 1 Surface	10/21/25	10:30	H2O	1	X	X								
<u>12</u>	Lawrence 1 Bottom	10/21/25	10:35	H2O	1	X	X								
<u>13</u>	Lawrence 2 Surface	10/21/25	11:05	H2O	1	X	x								
<u>14</u>	Lawrence 2 Bottom	10/21/25	11:10	H2O	1	x	x								
<u>15</u>	Long 4 Surface	10/21/25	12:40	H2O	1	x	x								
<u>16</u>	Long 4 Bottom	10/21/25	12:45	H2O	1	x	x								
<u>17</u>	Long 3 Surface	10/21/25	13:00	H2O	1	x	x								
<u>18</u>	Long 3 Bottom	10/21/25	13:05	H2O	1	x	x								
<u>19</u>	St. Clair 1 Surface	10/22/25	9:05	H2O	1	x	x								
<u>20</u>	St. Clair 1 Bottom	10/22/25	9:10	H2O	1	x	x								
Collected/Relinquished By: John Haberlin		Date 10/27/2025	Time 1500	Received By: 				Date 10/28/25	Time 10/25						
Relinquished By:		Date	Time	Received By:				Date	Time						
Relinquished By:		Date	Time	Received By:				Date	Time						

COMMENTS:

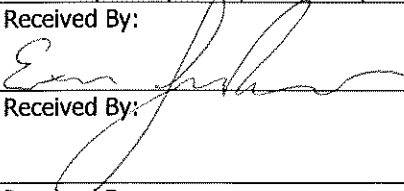
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Fax No:				Invoice Ph/Fax:												
E-mail: john.haberlin@co.thurston.wa.us				Invoice E-mail: <u>john.haberlin@co.thurston.wa.us</u> , tc_lakes@co.thurston.wa.us												
Report Delivery: (Choose all that apply) Mail / Fax / <u>Email</u> / Posted Online				Data posted to online account: YES / NO Web Login ID:												
Special Instructions: Please report to detection limit for all results.																
Requested TAT: (Rush must be pre-approved by lab) <u>Standard</u> RUSH (5 Day / 3 Day / 48 HR / 24 HR)						Temperature upon Receipt:										
Project Name: Streams		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested										
Project Number: 40644						Total Phosphate	Total Nitrogen	NOx	Ammonia	Orthophosphate					QA/QC	
AmTest ID	Client ID (35 characters max)															
21	St. Clair 2 Surface	10/22/25	10:05	H2O	1	X	X									
22	St. Clair 2 Bottom	10/22/25	10:10	H2O	1	X	X									
23	Offutt Surface	10/22/25	11:40	H2O	1	X	x									
24	Offutt Bottom	10/22/25	11:45	H2O	1	x	x									
Collected/Relinquished By: John Haberlin		Date 10/27/2025	Time 1500	Received By: 				Date 10/28/25	Time 1025							
Relinquished By:		Date	Time	Received By:				Date	Time							
Relinquished By:		Date	Time	Received By:				Date	Time							

COMMENTS:

Appendix C

Cyanobacteria Management Methods

Cyanobacteria Management Methods

This appendix summarizes external and internal lake management methods for cyanobacteria control, their advantages and disadvantages, and their suitability for implementation at Lake Lawrence. Actions assessed as suitable for implementation at Lake Lawrence are highlighted in green in Table 1 and further described in the sections below. Actions determined not feasible for implementation in Lake Lawrence and rationale are detailed in the *Methods Rejected* section.

Table 1 Cyanobacteria Management Feasibility Screening for Lake Lawrence.

Method	Effectiveness	Cost	Impact Risk	Feasibility	Suitability
Watershed (External Nutrient Loading Control) Methods					
Septic System Management	Low	High	Low	Moderate	Yes, but not expected to meaningfully improve lake water quality
Stormwater Management	Low	Moderate	Low	Moderate	Yes, but not expected to meaningfully improve lake water quality
Stream Phosphorus Inactivation	Low-Moderate	Moderate	Moderate	Low	No, there is no major surface phosphorus loading source.
Waterfowl Management	Low-Moderate	Moderate	Low	Moderate	Yes
Shoreline Management	Low-Moderate	Moderate	Low	Moderate	Yes
Lake Physical Methods					
Lake Mixing	Low	Moderate	Low	Moderate	No – uncertain effectiveness
Sonication	Low	Moderate	Low-Moderate	Low	No – uncertain effectiveness
Lake dilution	Moderate	High	Low	Low	No – high cost
Hypolimnetic Oxygenation/ Aeration	High	Moderate-High	Low- -Would Benefit Fish	Moderate	Yes
Ozone/ Microbubbles/ Nanobubbles	Low	Moderate	Low	Low	No – not effective, experimental
Hypolimnetic Withdrawal	Low	Moderate	High	Low	No – insufficient inflow, downstream impacts
Dredging	Low-Moderate	Very High	Moderate	Low	No – high cost/benefit
Shading (Dyes)	Moderate	Moderate	High	Low	No – not feasible
Lake Chemical Methods					
Algaecide treatment	Moderate	Low-Moderate	Low-Moderate	Moderate	No –not a long-term solution
Chemical Phosphorus Inactivation (“lake reset” or repeated lower doses)	High	Moderate-High	Low-Moderate	High	Yes – effectiveness will depend on timing of treatment and the product used.
Alum	High	Moderate	Low-Moderate	High	Yes
Lanthanum	High	Moderate-High	Low	High	Yes
ZVI	Uncertain	Low	Low	High	Maybe – could be explored as an experimental treatment. Uncertain effectiveness and longevity
Proprietary Chemicals	Uncertain	High	Unknown	Moderate	No – higher cost and requires experiment permit
Calcium	Low	Moderate	Low	High	No – uncertain effectiveness
Lake Biological Methods					
Carp removal	Low	Moderate-High	Low-Moderate	Low	No – high cost/ benefit
Biomanipulation (Zooplankton planting; Piscivore stocking)	Low	Low-Moderate	Low-Moderate	Low	No – not feasible, low effectiveness
Aquatic Weed Harvesting	Low-Moderate	Moderate	Low	Moderate	No – high cost/benefit
Macrophyte plantings	Low	Moderate	Low	Low	No – high cost/benefit
Barley Straw	Low	Low	Low-Moderate	Low	No – uncertain benefit

In-Lake Techniques

The following sections summarize the most feasible in-lake management techniques that may be used to improve the algae community and meet the water quality objectives. These techniques are considered feasible for reducing the magnitude and frequency of toxic cyanobacteria blooms. There are advantages and disadvantages to each management technique; some are more experimental with limited scientific studies of effectiveness; and there are wide differences in initial and long-term costs. Table 1 provides a comparative summary of these techniques.

It is important to recognize that any lake management technique aimed at controlling algae, if successful, is likely to impact aquatic macrophyte populations. The clearer water means more sunlight for plant growth. Since most plants obtain their nutrients from the sediments rather than the water, lake nutrient reduction techniques typically do not impact them. Although phosphorus inactivation methods reduce nutrient availability in sediments where most aquatic macrophytes obtain nutrients, macrophyte roots typically penetrate below the inactivation zone (upper 10 centimeters) and are not affected by inactivation treatments. Lake management should focus on achieving the appropriate ecological balance between algae and plants, since too much of either can be problematic.

Lake Phosphorus Inactivation

Alum Treatment

Alum treatments have been used successfully in many lakes in Washington (Table 2). Several strategies have been implemented in Washington and around the world to inactivate phosphorus in the lake and its sediments or even in the within inlets draining to the lake (inflow stream alum injection).

Applications of aluminum sulfate (alum), in a sufficient dose to inactivate all mobile sediment phosphorus, have been shown to be effective for at least 10 years in lakes with low watershed inputs (Cooke et al. 2005). When alum is added to water it forms a floc that grows in size and weight as it settles through the water column, sorbing inorganic phosphorus and incorporating particulate organic phosphorus through entrapment (Burrows 1977, Driscoll and Schecher 1990). The alum floc settles to the sediments, where it continues to control phosphorus by sorbing additional phosphorus that is present in the sediments. This forms a barrier to future phosphorus release from sediments into the water column. The resultant phosphorus that is bound to aluminum in the lake sediments is very stable and is thought to be nearly permanently bound (Rydin and Welch 1998).

When alum is added to water, it consumes alkalinity, which can result in lowering pH. When pH lowers, more aluminum becomes dissolved, which lowers its effectiveness and also poses toxicity to fish in the lake. Low pH (<6) can directly harm lake biota, as well as increasing solubility of other toxic metals. To counteract negative ecological outcomes, particularly for larger treatments in soft-water lakes (such as

those in western Washington), a buffering agent is added during treatment to mitigate a significant pH drop. A common buffer is sodium aluminate, which also serves as an aluminum source for phosphorus sequestration. The ratio typically used for alum and sodium aluminate is 2:1 by volume. Sodium aluminate is expensive and adds a lot to the cost of alum treatments. Sodium aluminate is usually not needed, even in soft-water lakes, for low dose (less than 5 mg Al/L) applications.

Multiple small alum doses typically cost more than a whole lake alum dose, due to higher mobilization costs. However, costs can be similar if an expensive buffer (sodium aluminate) is not needed to neutralize small alum doses but is needed for large alum doses. Multiple small alum doses are more appropriate for lakes with high external loading, which would reduce the longevity of a whole lake alum dose. Multiple small alum doses are sometimes preferred over a large long-term dose for financial reasons or to reduce potential impacts of aluminum toxicity to aquatic organisms. Multiple small alum doses can be used to strip phosphorus from the water column and to inactivate sediment phosphorus. Lake Ketchum in Snohomish County is an example of first conducting a larger alum treatment targeting sediment sequestration (19 mg Al/L), followed by smaller annual treatments (~4 mg Al/L).

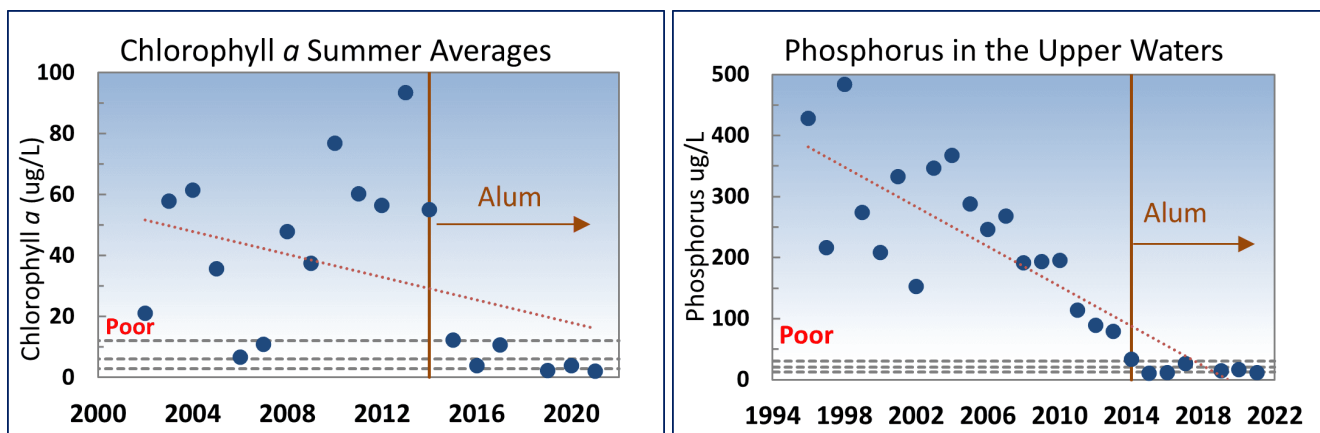


Figure 1. Annual average chlorophyll-a and surface total phosphorus in Lake Ketchum (Snohomish County, WA) following whole-lake alum treatment in 2014 and 2015 and annual treatments thereafter (Snohomish County, unpublished data).

Under the APAM permit, an onsite storage facility is required for any treatment requiring 9,000 gallons of alum or more, or the project proponent must have a plan to store any unused alum or buffering products.

Table 2. Comparison of Alum Treatment Doses in Washington.

Lake (County)	Treatment Date	Volumetric Dose (mg Al/L)	Aerial Dose (g Al/m ²)	Longevity (years) ^a	Reference
Heart Lake (Skagit)	April 2018	12.9	32.1	>5	Herrera 2019
Lake Campbell (Skagit)	October 1985	10.9	26	>8	Cooke et al. 2005
Lake Erie (Skagit)	September 1985	10.9	20	>8	Cooke et al. 2005
Lake Ketchum (Snohomish)	May 2014	19	66.5	--	G. Williams/M. Burghdoff (pers. comm.)
	March 2015	19	66.5	--	
	Annual 2016-2025	~4	~14	--	
Lake Stevens (Snohomish)	Annual 2013-2020	0.15	NP	unknown	Tetra Tech 2022
Long Lake (Kitsap)	September 1980	5.5	10.7	>11	Rydin et al. 2000
	September 1991	5.5	10.7	>11	Rydin et al. 2000
	August 2006	2.5	4.6	<1	Tetra Tech 2010
	April 2007	17.5	36.2	NP	Tetra Tech 2010
	April 2019	NP	NP	TBD	S. Brattebo (pers. comm.)
Lake Ballinger (King)	June 1990	5.0	6.5	unknown	Rydin et al. 2000
Phantom Lake (King)	September 1990	4.2	9.5	unknown	Rydin et al. 2000
Hicklin Lake (King)	April 2005	22	NP	3	King County 2006
Lake Fenwick (King)	October 2023 (planned)	11.7	NP	unknown	S. Brattebo (pers. comm.)
Long Lake (Thurston)	September 1983	7.7	27.7	5	Cooke et al. 2005
	2008 (planned)	15.2	54.9	unknown	Tetra Tech 2006
Green Lake (King)	October 1991	8.6	34	3	Herrera 2003
	April 2004	24	94	>10	Herrera 2004
	April 2016	8.2	32	>8	Herrera 2016
Pattison Lake (Thurston)	September 1983	7.7	30.8	7	Cooke et al. 2005
Black Lake (Thurston)	April 2016	1.9	13	>5	Herrera 2017a
	May 2021	54.5	317	unknown	Herrera 2021
Wapato Lake (Pierce)	July 1984	7.8	11.7	<1	Cooke et al. 2005
	July 2008	67.7	108	5	Herrera 2017b
	April 2017	56.3	90	>6	Herrera 2018
Waughop Lake (Pierce)	March 2020	40	NP	unknown	Tetra Tech 2023
	July 2020	40	NP		
	July 2023	20	NP		
Liberty Lake (Spokane)	1980-1981	NP	NP	NP	B. Adams (pers. comm.)
Medical Lake (Spokane)	Aug.-Sept. 1977	12.2	83.5	unknown	Rydin et al. 2000
Newman Lake (Spokane)	May 2021	NP	NP	NP	S. Brattebo (pers. comm.)
Blackmans Lake (Snohomish)	March-April 2025	19.7	85.8	>1	Herrera 2025

^a Longevity reported by reference or observed through 2023.

mg Al/L = milligrams of aluminum per liter

g Al/m² = grams of aluminum per square meter

NA = not applicable

NP = Not provided

Advantages

- Instantaneous water column phosphorus control
- Long-term, stable sediment phosphorus control
- Floc rapidly settled to bottom
- Promotion of water clarity
- Cost-effective and widely successful

Disadvantages

- Potential impacts of aluminum toxicity to aquatic organisms (however, extensive use of a buffer and monitoring in our region has minimized this risk)
- Sediment phosphorus monitoring required for accurate dosage calculations
- Limited effectiveness when watershed load is dominant

Suitability for Lake Lawrence

Alum treatment would be a suitable management method to inactivate available phosphorus in Lake Lawrence given the strong influence of internal phosphorus loading on seasonal water quality conditions. Alum is comparable in cost to lanthanum-modified clay but typically has greater longevity because it is applied at rates with a higher phosphorus binding capacity than lanthanum. The long-term effectiveness of alum treatments in other Washington lakes with similar internal loading characteristics demonstrates its potential applicability. Given Lake Lawrence's documented history of internal phosphorus release and recurring harmful algal blooms, alum treatment could provide meaningful reduction in phosphorus availability and bloom intensity if external inputs remain relatively small.

Lake Lawrence is a soft-water lake and would therefore require a buffering agent for a large alum dose. For smaller doses, a buffering agent would likely not be required; however, confirmation is needed to ensure that a lower alum dose (<2 mg Al / L) would not result in substantial and ecologically damaging decreases in pH.

Planning Level Costs

Planning level costs for water column stripping and sediment inactivation with alum are provided in the *Planning Level Comparison for Phosphorus Inactivation* subsection at the end of this section.

Lanthanum Treatment

Lanthanum (La^{3+}) has a strong affinity for phosphate (PO_4^{3-}), such that it chemically inactivates phosphate through precipitation and forms a mineral of extremely low solubility. Therefore, similar to alum, it forms a stable, long-lasting bond with phosphate. Lanthanum is available for application in lakes as lanthanum-modified bentonite (LMB), which is applied as a slurry using either Phoslock or EutroSORB® G. Bentonite is an adsorbent clay that serves as bonding site for lanthanum until it binds with phosphorus to form

lanthanum phosphate (LaPO_4). A newer product, iron-coated lanthanum (EutroSORB® SI) has recently been approved for use in Washington in the APAM permit.

Unlike alum, however, lanthanum is not a coagulant and therefore does not trap and remove particles in the water column. Rather, lanthanum works mainly in the sediment to bind phosphate that would normally be released to the water through decomposition or changes in sediment chemistry. The lanthanum in LMB binds only to inorganic phosphate (soluble reactive phosphorus or orthophosphate) and does not address organic phosphorus until it degrades to phosphate. Lanthanum can be applied in frequent small dose to 'strip' the water column of inorganic phosphorus. Although alum treatment effectiveness and duration have been much better studied (see Cooke et al. 2005), there are many studies published to date worldwide (see Copetti et al. 2016). Kitsap Lake, in Bremerton, Washington, has undergone annual lanthanum treatments with notable improvements in water quality and no closures during the high lake use periods of June through August.

EutroSORB® SI differs from bentonite-based products in that lanthanum is incorporated into an iron-oxide substrate rather than clay. This formulation is designed to enhance phosphorus binding under a wide range of environmental conditions. EutroSORB® SI is typically applied to sediments to inactivate mobile phosphorus and can also function as a reactive cap that limits phosphorus release under low-oxygen conditions. Because the material does not rely on bentonite clay, it may produce less short-term turbidity and may be better suited for targeted sediment treatments or areas where minimizing suspended solids is desirable. As with other lanthanum-based treatments, dosage calculations and jar testing are recommended to ensure appropriate rates.

Lanthanum concentrations immediately following application may exceed estimated toxicity thresholds, particularly for zooplankton, and little study has been done for impacts on benthic organisms (Copetti et al. 2016). Generally, because lanthanum is applied in phosphorus-rich waters, the amount of free lanthanum ions is low as they bind to phosphate. Jar tests prior to application can be used to confirm appropriate dosing and minimize ecological effects.

Phoslock® is the tradename of the original commercially available LMB product that was developed in Australia in the 1990s. EutroSORB® is an LMB product developed over the past few years by SeaPRO®, a major manufacturer of lake management chemicals. Currently, there are several formulations of EutroSORB®, including products designed for sediment inactivation (EutroSORB® G and EutroSORB® SI), water column stripping (EutroSORB® WC), and filtration of flowing waters (EutroSORB® F), and EutroSORB® WC has an undisclosed ingredient(s) to flocculate particulate phosphorus that is evaluated in the next section on *Proprietary Product Treatment*.

Advantages

- Provides stable and long-term inactivation of phosphorus in the water column and/or sediment
- Remains effective and non-toxic under a wide range of pH and oxygen conditions

Disadvantages

- Temporarily increases turbidity from clay
- Requires monitoring for accurate dosage calculations
- Has fewer case studies to evaluate effectiveness and duration of treatments compared to alum
- Has limited effectiveness when watershed load is dominant

Suitability for Lake Lawrence

Lanthanum treatment would be a suitable management method to reduce available phosphorus in Lake Lawrence, particularly for controlling internal phosphorus loading from lake sediments. Phoslock®, EutroSORB® G, EutroSORB® SI are currently permitted for use in Washington and are best used for sediment inactivation lasting one to several years. These products may also be applied in smaller doses to strip phosphate from the water column, though additional product is typically required to inactivate phosphorus released from recent sediments over a 1-year period.

Jar testing prior to treatment is recommended to verify appropriate dosing and assess treatment performance under site-specific water chemistry conditions (e.g., alkaline). Additional characterization of Lake Lawrence water chemistry, including alkalinity, hardness, and dissolved organic carbon, would help determine treatment feasibility and optimize application rates.

Planning Level Costs

Planning level costs for lanthanum treatment are provided in the *Planning Level Comparison for Phosphorus Inactivation* subsection at the end of this section.

Iron Application

Iron (Fe) amendments are used to reduce internal phosphorus (P) loading by increasing the capacity of sediments (and, in some cases, the water column) to bind phosphate. Iron can be applied as iron salts (e.g., ferric chloride, ferrous chloride, ferric/ferrous sulfate) or as iron-bearing solids (including iron oxyhydroxides and zero-valent iron [ZVI]). Following application, phosphate can be removed from the water column through adsorption and co-precipitation with iron (oxyhydr)oxides and subsequently retained in surface sediments, where iron can function as a dynamic P “trap” under appropriate geochemical conditions. Under anoxic, low sulfur conditions, phosphorus can be retained in association with ferrous iron as vivianite, which can act as a longer-term P sink. These processes are highly sensitive to sulfur cycling and redox dynamics.

A synthesis of iron-addition restoration studies in shallow lakes found that most evaluated applications increased P retention, and field studies commonly reported reduced water column chlorophyll responses without observed toxic effects, while emphasizing that outcomes depend strongly on lake-specific conditions (Bakker et al. 2016). Across systems, iron addition was most successful when external P loading was low and when sediment organic matter, sulfate, and sediment disturbance by fish/crayfish were also relatively low.

Field evidence indicates that sulfate reduction can divert added iron away from phosphate binding by promoting Fe-sulfide formation, reducing the iron available for P retention. In a comparative field study of two urban lakes (Heinrich et al. 2022), added iron was preserved in sediments in both systems, but phosphorus retention improved in one lake while sulfur was retained by excess iron in the other; the authors attributed the contrast to differing sulfate reduction rates and concluded that planning for iron amendments should explicitly consider the competing process of iron sulfide formation and may require additional iron to account for it.

ZVI is a form of iron typically used in soil and groundwater remediation efforts to bind chemical contaminants by transferring an electron to a contaminant compound. Contaminants in groundwater that have been inactivated by ZVI include petroleum hydrocarbons, pesticides, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and nitrates. These results support ZVI's capacity to bind phosphate under controlled conditions, but translating engineered-system performance to open-water lake settings requires site-specific testing and monitoring.

Advantages

- Can enhance retention of dissolved phosphate and reduce internal P loading when lake chemistry supports durable Fe–P retention pathways.
- Potential for formation of redox-stable Fe(II)–P minerals (e.g., vivianite) under favorable (low sulfur) conditions.
- Not expected to have environmental impacts at anticipated dosage

Disadvantages

- Phosphorus bound to iron in lakes and reservoirs can be resuspended due to dissolution in anoxic conditions
- Effectiveness can be reduced where sulfate reduction drives Fe-sulfide formation, diverting iron from phosphate binding.
- In organic matter-rich, frequently mixed, and intermittently anoxic systems, iron addition can yield only short-term improvements and may be followed by intensified seasonal P release
- Limited effectiveness when watershed load is dominant

Suitability for Lake Lawrence

Iron/ZVI is not rejected for Lake Lawrence but, at this time, is best suited for pilot-scale testing. The lake develops low-oxygen/anoxic conditions at the sediment–water interface during summer, which is a critical constraint for iron-based sequestration strategies. In such settings, the long-term success of iron (including ZVI) depends on whether the system favors durable Fe–P retention (including vivianite formation) without substantial diversion of iron into sulfide phases. Given these uncertainties, iron/ZVI is best characterized as an experimental or pilot-scale option for Lake Lawrence unless additional site-specific sediment and sediment-water-interface chemistry and bench/pilot testing indicate favorable sulfur and organic matter controls and a practical pathway to sustain iron-mediated P retention.

Planning Level Costs

Planning level costs for iron treatment are provided in the *Planning Level Comparison for Phosphorus Inactivation* subsection at the end of this section.

Proprietary Product Treatment

There are several proprietary formulations available on the market that provide binding sites for dissolved phosphorus in the water column and produce floccules that will pull particulates, including algae and sediment, from the water column. In this way, the products act similarly to alum. Product longevity has not yet been demonstrated in field applications in Washington State.

Currently available products include EutroSORB WC, produced by SePRO and SeDox Max, produced by OASE Professional. All manufacturers claim that their products do not impact water chemistry (including pH) and have low toxicity to aquatic life and humans, but no case studies are as-of-yet available to support these claims.

Advantages

- Intended to provide phosphorus inactivation in the water column and/or sediment

Disadvantages

- Monitoring required for accurate dosage calculations
- Few case studies to evaluate effectiveness and duration of treatments
- Limited effectiveness when watershed load is dominant
- Uncertain stability and toxicity impacts, assumed to be similar to alum and lanthanum

Suitability for Lake Lawrence

There is no available information to support the claims of the manufacturers regarding the effectiveness and low ecological impacts. However, if the claims hold true, these products could be effective alternatives to alum (which has toxicity and pH concerns) and LMB (which does not remove particulate phosphorus).

The above-described proprietary products are not currently approved in the Washington State Department of Ecology's APAM Permit. As such, an experimental application permit would need to be obtained for treatment in Lake Lawrence. This would likely entail thorough monitoring before, during, and after application.

Planning Level Costs

Planning level costs for EutroSORB WC and SeDox Max are provided in the *Planning Level Comparison for Phosphorus Inactivation* subsection.

Calcium Application

Calcium is applied to lakes in the form of lime (CaO , Ca(OH)_2) or calcite (CaCO_3). Lime addition mimics natural calcite (CaCO_3) precipitation in hard water lakes that strips phosphorus from the water column. CaO and Ca(OH)_2 addition in water increases aqueous pH and facilitates the formation of CaCO_3 . Direct addition of CaCO_3 is deemed beneficial because it precipitates and then reacts with dissolved orthophosphate in the water column. Calcium applications are generally not effective in soft water lakes present in western Washington. There is so little background calcium that the applied amount is not sufficient to precipitate phosphorus as was demonstrated in Lake Steilacoom (Herrera 2009).

Advantages

- Short-term removal of available phosphorus from water column

Disadvantages

- Possible limitation to provide only short-term improvements due to the redissolution of precipitating CaCO_3 as it settles in deep waters
- Potential to cause high pH in the water column
- Limited effectiveness in soft water lakes
- Limited effectiveness when watershed load is dominant

Suitability for Lake Lawrence

Calcium is not a suitable inactivation approach for Lake Lawrence, because the lake is soft-water (similar to Lake Steilacoom, where a calcium treatment was ineffective). Alternative phosphorus inactivation treatments are expected to be more effective due to the lake's frequent elevated pH, which can allow dissolution of bound phosphorus.

Planning Level Costs

Planning level costs for calcium (as OASE SeDox Max) are provided in the *Planning Level Comparison for Phosphorus Inactivation* subsection.

Monitoring and Permitting Requirements for Phosphorus Inactivation Chemicals

All chemical phosphorus inactivation treatments require coverage under the Washington State Department of Ecology Aquatic Plant and Algae Management (APAM) General Permit. The APAM permit governs the discharge of phosphorus sequestration products to waters of the State and establishes conditions to protect water quality, aquatic life, and designated beneficial uses.

While monitoring requirements vary by product type and application method, phosphorus inactivation treatments share common permitting expectations. These requirements are intended to ensure that treatment dosages are appropriate for site-specific conditions and that short- and long-term effects on water quality remain within acceptable limits.

Pre-treatment monitoring is required to characterize baseline lake conditions and inform dosage development. This monitoring typically includes vertical water column profiles (e.g., temperature, dissolved oxygen, pH) and laboratory analysis of water chemistry parameters relevant to treatment performance and ecological risk, such as alkalinity, hardness, dissolved organic carbon, and background concentrations of treatment-related constituents (e.g., aluminum, iron, or lanthanum). Data must be representative of proposed treatment areas and sufficient to support dose assessments or bench-scale testing where applicable.

Jar testing is an important component of pre-treatment evaluation and may be required under the APAM permit depending on the product and application method. Jar testing is used to assess treatment performance under site-specific water chemistry conditions and to verify that proposed application rates are effective while remaining protective of water quality. These tests help evaluate key responses such as phosphorus removal efficiency, pH sensitivity, floc formation or settling behavior, and the potential for short-term water quality impacts.

Monitoring during treatment is required to confirm that lake conditions remain within permit specifications. Field monitoring generally focuses on parameters most sensitive to treatment effects, particularly pH and dissolved oxygen, and is conducted at locations representative of lake-wide or treatment-area conditions. If monitoring indicates that permit thresholds may be exceeded, treatment activities may need to be adjusted or suspended in accordance with permit conditions.

Post-treatment monitoring and reporting are required to document treatment effects and confirm stabilization of water quality conditions. Follow-up monitoring typically includes water column profiles and laboratory analyses shortly after treatment, with additional monitoring over subsequent weeks to months depending on the chemical used and treatment scale. Monitoring results must be reported to Ecology in accordance with permit requirements.

The APAM permit includes provisions for the use of **experimental phosphorus control products or application approaches** that are not yet fully established under standard permit conditions. Experimental use generally requires development of an Experimental Phosphorus Control Product Plan, which documents the scientific rationale for the proposed treatment, product composition, application methods, and enhanced monitoring intended to evaluate treatment performance and environmental effects. For Lake Lawrence, experimental phosphorus control products, such as EutroSorb WC and SeDox Max, would require additional justification beyond that required for established products. An experimental plan would typically include site-specific objectives, pre- and post-treatment monitoring sufficient to evaluate effectiveness and potential unintended impacts, and clear criteria for determining whether the treatment should be modified or discontinued. Use of experimental products would be expected to occur at limited spatial scales or as pilot applications prior to consideration of broader implementation.

For Lake Lawrence, permitting and monitoring requirements represent an important consideration in project planning and cost, particularly given the lake's soft-water chemistry. Regardless of the selected product, compliance with APAM permit conditions would be required to ensure that phosphorus inactivation treatments are implemented safely and effectively.

Planning Level Comparison for Chemical Phosphorus Inactivation

This section provides a comparison of the phosphorus inactivation products identified as potentially suitable for Lake Lawrence. This comparison is planning level to support screening and selecting a management strategy for Lake Lawrence. Each product is evaluated using the same assumptions for targeting inactivation of active phosphorus within the top 10 cm of the lake sediments within the hypolimnion for both the Big and West basins.

For this comparison, the products are evaluated under two effective approaches for chemical phosphorus sequestration for lake: (a) "Lake Reset" – Complete Sediment Phosphorus Inactivation; and (b) Repeated Lower Dose Phosphorus Inactivation (Table 3).

Table 3. Pros and Cons of Chemical Phosphorus Inactivation for Approaches A and B.

Approach A: Lake Reset		Approach B: Repeated Lower Dose	
<i>Pros</i>	<i>Cons</i>	<i>Pros</i>	<i>Cons</i>
● Long-term improvement given low external loading ● Single contactor procurement process ● Single year of permit-required monitoring	● High upfront cost ● Potential large investment in ineffective treatment for relative un-tested chemicals (or in lakes with high external loads). ● Permit requires monitoring before and after each treatment.	● Lower cost per treatment ● Lake clarifying products (alum, Eutrosorb WC) will provide immediate improvements in water quality. ● Ability to change products based on cost/effectiveness. ● For alum, lower doses are not likely to require a buffer, which is more costly and more challenging to apply.	● For alum (without buffer), increased possibility of pH issues. ● Potentially higher overall long-term cost. ● Permit requires monitoring before and after each treatment. ● Cost increases for material and mobilization over time. ● May require repeated contractor bids ● Repeated "mobilization" and monitoring costs.

Under Approach A ("lake reset"), the phosphorus inactivation chemical dose is developed based on the total amount of phosphorus in the lake sediments and in the lake water column. Sediment inactivation doses were developed for the Big Basin deep area (deeper than 15 feet), Big Basin shallows (5 to 15 feet), and the West basin (below 5 feet depth) and summed together. The doses are based on an average sediment active phosphorus concentration in the top 10 cm, the sediment treatment area, and a water column stripping dose. For Big Basin deep area, the sediment active phosphorus concentration is estimated at 605 mg/kg-DW with a treatment area of 516,900 m² to inactivate 1,387 kg of phosphorus in sediments, along with 85 kg of phosphorus in the water column. For Big Basin shallows, the sediment active phosphorus concentration is estimated at 518 mg/kg-DW with a treatment area of 166,727 m² to inactivate 654 kg of phosphorus in sediments, along with 3 kg of phosphorus in the water column. For West Basin, the sediment active phosphorus concentration is estimated at 147 mg/kg-DW with a treatment area of 108,092 m² to inactivate 69 kg of phosphorus in sediments, along with 9 kg of phosphorus in the water column.

The application dose is based on industry standards for treatment (Table 4). Under Approach B (“repeated lower dose”), the dose identified under Approach A is split across multiple treatments, typically one year apart. For this LCMP, the dose has been split evenly across 4 treatment in 10 years, assuming early spring treatments in years 1, 4, 7, and 10. The exception is ZVI, which due to its lower cost was split into two 50-percent-dose treatments in years 1 and 6. There are additional approaches, such as a larger partial treatment in the first year, followed by repeated lower dose treatments every year or two years. These could be further explored if a chemical phosphorus sequestration is selected as the preferred management strategy for Lake Lawrence.

Table 4. Assumptions for Dose and Material Cost Estimates for Phosphorus Inactivation Chemicals.

Approach	Cost per Unit	Approach A: “Lake Reset” Ratio	Approach B: Repeated Lower Dose Ratio (50% dose ZVI; 25% dose all others)
Alum	Alum: \$1.80/gal; Buffer: \$6.60/gal	Sediment: 20 Al : 1 P (by mass) Water: 1 Al : 1 P (by mass) Buffer Needed (\$246/kg P)	2 Al: 1 P (by mass) No buffer needed (\$162/kg P)
Lanthanum (EutroSorb G; 10% La)	\$8.25/kg	50 product : 1 P or 5 La : 1 P (by mass) (\$412/kg P)	12.5 product : 1 P or 0.5 La : 1 P (by mass) (\$103/kg P)
Lanthanum (EutroSorb SI; 10% La)	\$20.50/dose units (sold per 10 dose units)	22 dose units: 1 kg P (\$450/kg P)	2.2 dose units: 1 kg P (\$113/kg P)
Lanthanum (Phoslock; 5% La)	\$3.64/kg	100 product : 1 P or 5 La : 1 P (by mass) (\$364/kg P)	10 product: 1 P or 0.5 La : 1 P (by mass) (\$91/kg P)
Iron (ZVI)	\$1.21/kg	44 Fe: 1 P (by mass) (\$53/kg P)	22 Fe: 1 P (by mass) (\$27/kg P)
Proprietary Blend – Calcium (OASE SeDox Max)	\$11.15/kg	50 product : 1 P (by mass) (\$558/kg P)	12.5 product : 1 P (by mass) (\$140/kg P)
Proprietary Blend – EutroSORB WC	\$25.00/dose units (sold per 10 dose units)	22 dose units : 1 kg P (\$550/kg P)	2.2 dose units : 1 kg P (\$138/kg P)

Note that the costs in these table reflect material cost estimates as of October 2025 and do not reflect mobilization/application costs, sales tax, permitting or monitoring fees, or inflation.

Approximate dose and cost estimates were developed for phosphorus inactivation through water-column stripping and sediment treatment using alum, lanthanum-based products, iron (including ZVI), and proprietary blends under current lake conditions (Table 5). Differences in unit costs among products should be interpreted cautiously, as lower material costs do not necessarily indicate greater effectiveness or longer-term phosphorus control. Treatment durability is strongly influenced by sediment redox conditions, sulfur cycling, and ongoing external nutrient inputs. For example, iron-based treatments exhibit relatively low unit costs but greater uncertainty regarding long-term phosphorus retention under anoxic or sulfur-rich conditions. In contrast, alum and lanthanum-based products have

higher unit costs that reflect conservative binding assumptions, established permitting frameworks, and demonstrated long-term performance in Washington lakes. Proprietary products represent both the highest costs and the greatest uncertainty due to limited field validation and additional permitting requirements. Accordingly, cost comparisons should be evaluated in the context of treatment reliability, regulatory maturity, and site-specific lake conditions rather than as a standalone ranking metric.

The longevity of sediment phosphorus inactivation is closely tied to continued control of external phosphorus loading and the stability of phosphorus–chemical associations in lake sediments. Where external inputs remain low and sediment conditions are favorable, whole-lake (“Lake Reset”) treatments may provide multi-year to decadal reductions in internal phosphorus loading. Where external loading or sediment processes introduce greater uncertainty, repeated lower-dose applications may offer a more adaptive management approach, albeit with higher cumulative costs over time. Selection between these approaches should therefore explicitly consider watershed nutrient controls and tolerance for uncertainty in treatment longevity. Table 6 provides a high-level comparison of the evaluated phosphorus inactivation chemicals for Lake Lawrence.

Overall, chemical phosphorus inactivation can be implemented either as a one-time, whole-lake treatment or as a series of smaller applications over time. For Lake Lawrence, planning-level estimates indicate that whole-lake treatments generally range from approximately \$0.32 to \$1.92 million, depending on the product used. Alum and lanthanum-based treatments fall within the middle of this range (approximately \$0.85 to \$1.58 million) and offer the highest confidence in long-term performance and regulatory acceptance. Iron-based treatments appear less costly at face value (approximately \$0.32 million), but carry greater uncertainty regarding treatment longevity under low-oxygen sediment conditions. Proprietary products represent the upper end of the cost range (approximately \$1.86 to \$1.92 million) and the greatest uncertainty due to limited field experience and additional permitting requirements. Lower-dose repeated treatments would reduce individual treatment costs (approximately \$0.17 to \$0.50 million every 3 years) but may result in higher long-term costs and ongoing permitting, mobilization, and monitoring needs. Together, these planning-level comparisons highlight the tradeoff between higher upfront investment with greater certainty of outcomes and lower short-term costs with increased uncertainty and long-term commitments. Final selection of a phosphorus inactivation strategy should balance cost, confidence in performance, and integration with long-term watershed nutrient management.

Table 5. Lake Lawrence Phosphorus Inactivation Cost Estimates.											
Approach	Phosphorous Inactivation Product	Application Dose ^a	Materials Cost	Mobilization ^b	Sales Tax (9.25%)	Contingency (10%)	Treatment Cost	Monitoring ^c	Contractor Oversight and Reporting ^d	Cost / Treatment	10-Year Cost
Approach A: Lake Reset Sediment P: 2111 kg Water Column P: 97 kg	Buffered Alum	42,308 kg (Alum: 96,154 gallons; Aluminate: 52,885 gallons)	\$520,626	\$145,775	\$61,642	\$72,804	\$800,847	\$18,000	\$30,000	\$848,847	
	Eutrosorb G	105,526 kg	\$870,589	\$243,765	\$103,078	\$121,743	\$1,339,175	\$18,000	\$30,000	\$1,387,175	
	Eutrosorb SI	48,684 PDUs	\$998,027	\$279,447	\$118,166	\$139,564	\$1,535,205	\$18,000	\$30,000	\$1,583,205	
	PhosLock	211,052 kg	\$768,229	\$215,104	\$90,958	\$107,429	\$1,181,720	\$18,000	\$30,000	\$1,229,720	
	ZVI	97,148 kg	\$180,901	\$50,652	\$21,419	\$25,297	\$278,269	\$14,000	\$30,000	\$322,269	
	OASE SeDox	105,526 kg	\$1,176,614	\$329,452	\$139,311	\$164,538	\$1,809,915	\$18,500	\$30,000	\$1,858,415	
	Eutrosorb WC	48,684 PDUs	\$1,217,106	\$340,790	\$144,105	\$170,200	\$1,872,201	\$18,500	\$30,000	\$1,920,701	
Approach B: Repeated Lower Dose Sediment P: 528 kg Water Column P: 97 kg	Unbuffered Alum (25% dose)	10,650 kg (Alum: 48,409 gallons; Aluminate: 0 gallons)	\$86,652	\$24,263	\$10,260	\$12,117	\$133,292	\$18,000	\$16,250	\$167,542	\$835,776
	Eutrosorb G (25% dose)	26,381 kg	\$217,647	\$60,941	\$25,769	\$30,436	\$334,794	\$18,000	\$16,250	\$369,044	\$1,840,962
	Eutrosorb SI (25% dose)	12,171 PDUs	\$249,507	\$69,862	\$29,542	\$34,891	\$383,801	\$18,000	\$16,250	\$418,051	\$2,085,434
	PhosLock (25% dose)	52,763 kg	\$192,057	\$53,776	\$22,740	\$26,857	\$295,430	\$18,000	\$16,250	\$329,680	\$1,644,598
	ZVI (50% dose)	48,574 kg	\$90,450	\$25,326	\$10,709	\$12,649	\$139,134	\$14,000	\$17,500	\$170,634	\$387,553
	OASE SeDox (25% dose)	26,381 kg	\$294,154	\$82,363	\$34,828	\$41,134	\$452,479	\$18,500	\$16,250	\$487,229	\$2,430,524
	Eutrosorb WC (25% dose)	12,171 PDUs	\$304,276	\$85,197	\$36,026	\$42,550	\$468,050	\$18,500	\$16,250	\$502,800	\$2,508,201

- a. Water Column inactivation targeted for Alum and EutroSorb WC
- b. Mobilization Assumed at 28% for Large Treatments or at least \$16,000 for smaller treatments (from Lake Ketchum 5000 gal unbuffered alum treatment)
- c. Monitoring Costs assume APAM permit requirements are followed, with a consultant providing 7 of 10 monitoring events and required reporting to Ecology for each event. The APAM permit allows for decreased
- d. For Approach B - Contractor Oversight is assumed to be \$20,000 in the first year and \$15,000 thereafter, for an average \$16,250 per treatment for 4 treatments or \$17,500 for 2 treatments (ZVI only)
- e. For Approach B, a 4% annual escalation is assumed.



Table 6. Comparison of Water Column Phosphorus Inactivation Chemicals.				
Water Column Inactivation Method	Alum	Lanthanum	Proprietary Blend	Iron
Commercial Products	Available from general chemical suppliers	Phoslock EutroSORB G EutroSORB SI	EutroSORB WC OASE SeDox Max (Calcium-based)	Zero Valent Iron (ZVI) Iron Salts
Mode of Inactivation	Forms stable complexes with dissolved phosphorus. Forms floccules that pull particulate phosphorus (i.e., algae and sediment from the water column. Stable at pH 6 to 9.	Lanthanum forms stable complexes with dissolved phosphorus. Binding efficiency is highest between pH 5 and 7. Dissolution may occur at elevated pH levels (>9).	Form complexes with dissolved phosphorus. EutroSORB WC includes a floccule agent that, like alum, will pull particulate phosphorus (i.e., algae and sediment from the water column.	Ferric iron forms redox-sensitive bond with phosphate Ferrous iron, under anoxic conditions, may create a stable bond with phosphate to form vivianite. May not occur in the presence of sulfide.
Application Approach	Applied at water surface and settled to the sediment. Alum is expected to sink and incorporate into the lake sediments. May also be injected into the water column or directly to the sediments.	Applied as lanthanum modified bentonite or iron-bound lanthanum across the water surface. Expected to incorporate into the lake's sediments. May also be injected into the water column or directly to the sediments.	Applied at water surface and settled to the sediment. May also be injected into the water column or directly to the sediments.	Applied at water surface and settled to the sediment. May also be injected into the water column or directly to the sediments.
Potential Negative Consequences	Aluminum toxicity to aquatic life may occur at high doses if inadequate buffer is applied and the pH is outside permitted range of 6-8.5. This can be prevented through rigorous planning and monitoring as required by the permit.	Lanthanum concentration immediately following application may exceed estimated toxicity thresholds, particularly for zooplankton, and little study has been done for impacts on benthic organisms. Generally, because lanthanum is applied in phosphorus-rich waters, the amount of free lanthanum ions is low as they bind to phosphate. Jar tests prior to application can be used to ensure proper dosage. Iron-bound lanthanum remains bound to iron until anoxia reduce the iron	The specific make-up of the blends is proprietary. Typically, toxicity testing of the chemical are done and may be provided to Ecology prior to permitting. If alum and lanthanum blend, then the same potential impacts and toxicity prevention approaches.	Phosphorus bound to iron may be released under anoxic conditions or where sulfate reduction promotes iron sulfide formation, reducing long term effectiveness. No toxicological impacts expected.
Permitting	Alum is an approved phosphorus inactivation chemical in the APAM permit.	Lanthanum-modified bentonite (EutroSorb G and Phoslock) and iron-bound lanthanum (EutroSorb SI) are an approved phosphorus inactivation chemicals in the APAM permit.	Ecology must be allowed to confirm that the chemicals in the product are already approved or applicant must develop a Experimental Phosphorus Control Product Use Plan.	Iron and ZVI are approved phosphorus inactivation chemical in the APAM permit.
Approach A: Lake Reset Cost (\$M)	\$0.85 million	\$1.23 to \$1.58 million	\$1.86 to 1.92 million	\$0.32 million
Approach B: Repeated Lower Dose – 10-year Cost (\$M)	\$0.84 million (25% dose in years 1, 4, 7, and 10)	\$1.64 to \$2.09 million (25% dose in years 1, 4, 7, and 10)	\$2.43 to \$2.51 million (25% dose in years 1, 4, 7, and 10)	\$0.39 million (50% dose in years 1 and 6)
Confidence in Effectiveness	High, established studies.	Moderate-high, growing number of regional treatments with.	Low	Low
Recent Past Applications in Washington	Lacamas Lake, Camas, Washington (2024, 2025); 2025 treatment with lanthanum Lake Ketchum, Snohomish County, Washington (2025, annually [unbuffered]) Blackmans Lake, Snohomish, Washington (2025) Black Lake, Tumwater, Washington (2021) Waughop Lake, Lakewood, Washington (2020) Heart Lake, Anacortes, Washington (2018) Wapato Lake, Tacoma, Washington (2017) Green Lake, Seattle, Washington (2016)	PhosLock: White Lake, Auburn, Washington (2025) EutroSorb G: Lacamas Lake, Camas, Washington (2024, 2025); 2025 treatment with alum Long Lake, Thurston County (2022– [annually]); 2024 treatment with alum Kitsap Lake, Bremerton, Washington (2020 – [annually]) Lake Lorene, Federal Way, Washington (2012)	None known	ZVI: Lake Steilacoom, Lakewood, Washington (2024, 2025) Lake Lorene, Federal Way, Washington (2024, 2025)

Hypolimnetic Oxygenation and Aeration

Hypolimnetic oxygenation or aeration techniques are implemented to combat hypolimnetic anoxia by maintaining or increasing DO levels in the hypolimnion while preserving thermal stratification. Hypolimnetic oxygenation uses pure oxygen, whereas hypolimnetic aeration uses air to maintain oxygen levels. Maintaining oxygenated conditions in the hypolimnion transfers oxygen into the underlying surficial sediments to suppress the release of phosphorus and nitrogen from sediments, settled particulate matter, and groundwater inflow. Maintaining stratification reduces the mixing of nutrient-rich hypolimnion water to the epilimnion.

Hypolimnetic aeration/oxygenation systems typically involve the installation of diffuser tubes or plates on the lake bottom to inject air or oxygen into the bottom of the hypolimnion. A vertical structure is needed to carry the released bubbles and associated water up to the top of the hypolimnion (partial lift) or epilimnion (full lift). Once there, bubbles are released at the lake surface and the aerated water is discharged near the lake sediments. A summary of lakes where hypolimnetic oxygenation or aeration have been deployed is provided in Table 7.

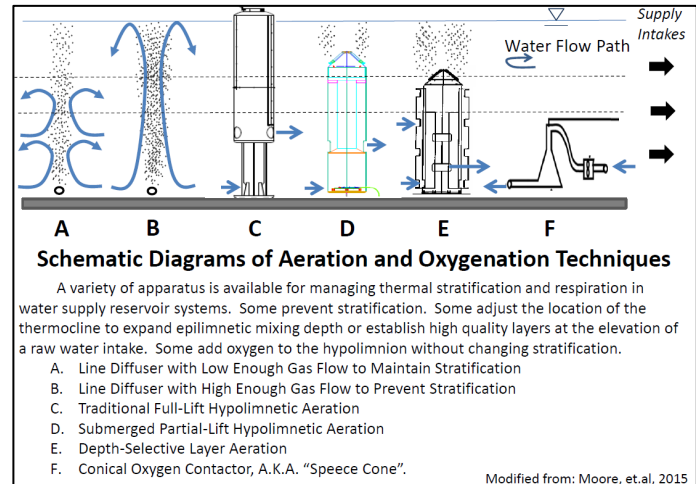


Table 7. Hypolimnetic Oxygenation and Aeration System Examples.

Lake, Location	Install Year	Lake Characteristics	System	Effect on Phosphorus Release	Source
Newman Lake Spokane County, Washington	1992 (renovation planned as of 2022)	Mean depth = 5.8 m Max depth = 9.1 m Area = 490 ha	Hypolimnetic oxygenation with Speece Cone and alum emitter	Decrease in lake phosphorus concentrations	Moore et al. 2012
Stevens Lake Snohomish County, Washington	1994 (retired in 2012)	Mean depth = 20.5 m Max depth = 46 m Area = 421 ha	Hypolimnetic aeration	Reduced sediment phosphorus. Decrease in effectiveness in final years attributed to saturation of iron-binding sites for phosphorus	Snohomish County and TetraTech 2012
Lake Fenwick Kent, Washington	1994 (renovated in 2020)	Mean depth = 4.0 m Max depth = 9.4 m Area = 9 ha	Hypolimnetic aeration	Not evaluated.	Ecology 2002
Falling Creek Reservoir Vinton, Virginia	2013	Mean depth = 4.0 m Max depth = 9.3 m Area = 11.9 ha	Hypolimnetic oxygenation with Oxygen Saturation Technology	Increased DO and maintained thermal stratification. Decrease in hypolimnion TP and SRP during operation	Gerling et al. 2014

Table 7 (continued). Hypolimnetic Oxygenation and Aeration System Examples.

Lake, Location	Install Year	Lake Characteristics	System	Effect on Phosphorus Release	Source
Sarah's Pond Orleans, Massachusetts	2021	Mean depth = 3 m Max depth = 5.3 m Area = 2.3 ha	Hypolimnetic oxygenation with Oxygen Saturation Technology	Reduction in sediment phosphorus release. Temporarily Decreased effectiveness due to electrical service shutdown and expanded anoxic area due to hot weather.	Wagner 2022
Lake Hodges, San Diego, California	2020	Mean depth = 6.4 m Max depth = 19.2 m Area = 230 ha	Hypolimnetic oxygenation with Speece Cone	Increased DO in deep waters. Decreased hypolimnetic phosphorus levels, and decreased in surface TP and chlorophyll a (algae biomass)	Rodal- Morales et al. 2024

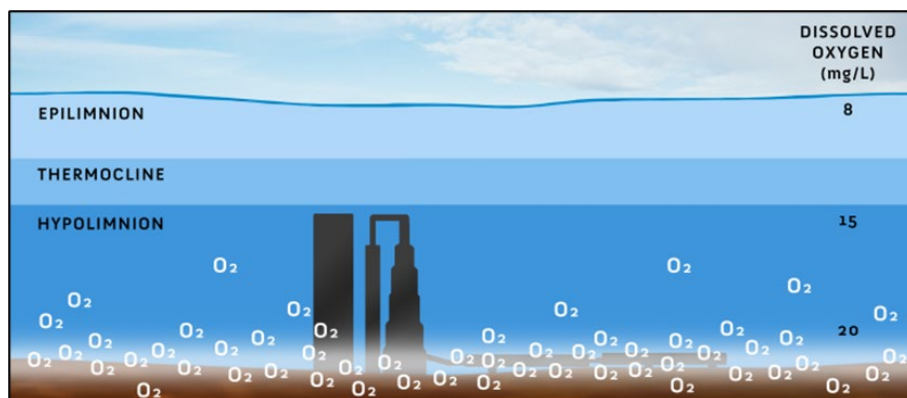
See Preece et al. 2019 for an expanded list of hypolimnetic oxygenation systems.

Recent advances in oxygenation technology, particularly Oxygen Saturation Technology (OST), have been developed to address limitations associated with traditional aeration and oxygenation systems. OST administers precise concentrations of oxygen at strategic depths in a waterbody, also known as side-stream supersaturation (SSS). The OST's design eliminates bubbles, which eliminates turbulence, sediment resuspension, and undesirable mixing. These systems can maintain dissolved oxygen (DO) levels as high as 20 mg/L directly over and into the sediments, where oxygen is needed most. They may also help prevent oxygen-related fish mortality. These high dissolved oxygen levels (exceeding those from simple saturation with the air) are important to overcome the high oxygen demand of organic-rich sediments in eutrophic lakes. Traditional hypolimnetic aeration systems can fail because they do not meet the sediment oxygen demand. As a result, OST represents a promising and increasingly applied approach, particularly for small to moderately sized lakes where internal loading is a dominant water quality driver.

Generally, the cost of installing a hypolimnetic aeration system can range from hundreds of thousands to millions of dollars. In addition to the initial capital investments, these systems require ongoing operation and maintenance costs to ensure they continue to operate efficiently. The maintenance cost can include electricity bills for running the system, periodic cleaning and replacement of diffuser membranes, and inspection of the system components. Costs can therefore accumulate over time. For example, Cooke et al. (2005) reported combined installation and operating costs of about \$1,240 per hectare per year over a 10-year period for the hypolimnetic aeration system installed in Lake Stevens, Snohomish County. For a 421-hectare lake, this equates to roughly \$5 million over 10 years. Despite this investment, the system ultimately was decommissioned as operating and maintenance costs rose and effectiveness lessened. The decreased effectiveness was hypothesized to be due to saturation of iron in the sediment with phosphorus, that is the system was able to effectively sequester phosphorus to the native iron in the sediments, but the available iron was exhausted. Iron supplementation was considered, but due to the high costs for retrofitting the hypolimnetic aeration system and uncertainty in the efficacy of iron additions, Lake Stevens is now managed with annual alum treatments. More recently, a hypolimnetic aeration system was installed in Lake Fenwick, a 22-acre lake in King County, and recently this system was upgraded at a cost of \$900,000.

While early-generation systems such as Lake Stevens demonstrated that performance can decline over time due to factors such as sediment phosphorus saturation of available iron and insufficient oxygen delivery and challenges in operations and maintenance, newer technologies such as

OST are specifically designed to address these limitations by improving oxygen transfer efficiency and maintaining higher dissolved oxygen concentrations at the sediment-water interface and improving maintainability. An OST system functions by transporting approximately 95 percent pure oxygen from an onshore facility to an in-lake device where the water is supersaturated with oxygen. The water is then injected back into deep areas of the lake where it disperses over the sediment surface. Oxygenated water can coat and penetrate the sediments, preventing the release of phosphorus from iron-phosphate complexes and allowing the oxidized iron to bind to phosphate released by microbial decay of organic matter. The onshore facility consists of a compressor and an oxygen generator. There is no storage of oxygen on the premises.



A current example of OST implementation is the Spanaway Lake project in Pierce County, Washington. Pierce County Surface Water Management, in coordination with Pierce County Parks and Recreation, is implementing an OST system to address toxic algae events linked to low dissolved oxygen conditions. Herrera developed preliminary system design plans in 2024, including four oxygen distribution points located in the deepest areas of the ~250-acre lake. The system includes both in-water and upland infrastructure, consisting of subsurface oxygen distribution lines, an onshore prefabricated building to house compressors and oxygen generation equipment, and associated electrical and control systems. Construction is anticipated to occur in mid to late 2026 following completion of permitting, equipment fabrication, and contractor procurement. The total project cost (not including long-term operations and maintenance) is estimated at over \$2.4 million, which consists of \$220,000 for design, \$1.32 million for the OST system equipment, \$78,200 for the building, and \$470,000 for construction (including taxes and contingency).

Advantages

An oxygenation system would have the following advantages:

- Reduces phosphorus release from anoxic sediments
- Increases deep water oxygen, improves fish habitat and aquatic life uses
- Degrades organic matter and cyanotoxins faster by using aerobic microbes
- Is a non-chemical alternative

In addition to these advantages, new oxygen saturation technology (OST) pumping oxygenated water to and from hypolimnion is very promising for small lakes and is cheaper than traditional oxygenation systems.

Disadvantages

An oxygenation system would have the following disadvantages:

- May potentially resuspend sediment layer nutrients/ions in the water column
- Causes sedimentation of organic matter
- Requires installation and operational cost (electricity)
- Is ineffective in shallow lakes/ reservoirs with a large surface area (i.e., weak to no stratification)
- May require continuous operation
- Can be ineffective when external nutrients are not controlled

Suitability for Lake Lawrence

Hypolimnetic oxygenation is a suitable management technique for Lake Lawrence. The lake maintains seasonal stratification despite its relatively shallow depth (~6 m), allowing hypolimnetic anoxia to develop and drive internal phosphorus loading. Because external nutrient inputs are minimal, addressing internal loading is critical for improving water quality. Oxygenation directly targets this mechanism by maintaining oxic conditions at the sediment–water interface, thereby limiting phosphorus release. As a result, it has strong potential to reduce nutrient availability in the water column and mitigate cyanobacteria blooms. Given the lake’s size and depth, OST may be particularly well suited, as it can efficiently deliver oxygen to the hypolimnion without disrupting stratification.

While effective, this approach requires significant upfront investment for design, permitting, and construction. HOS systems also require continuous power and maintenance, and may require one-time or ongoing treatments of supplemental iron to the lake to sustain phosphorus binding. Land may need to be acquired for placement and construction of the onshore facility, plus addition of a three-phase electrical supply to sufficiently power the facility and device.

Planning Level Costs

Planning level costs for implementation of an HOS device in Lake Lawrence are based on the ongoing installation of an OST device in Spanaway Lake since the lake size is similar to Lake Lawrence (hypolimnetic volumes of ~ 2,500 and 2,700 acre-feet, respectively). Installing an HOS device in Lake Lawrence is expected to cost approximately \$220,000 to design and \$2.2 million to construct (including taxes and contingency costs). We recommend two manufacturer maintenance visits per year: one pre-season in April and one mid-season in August. This maintenance plan and annual operation costs are estimated at approximately \$22,000 per year. Altogether, HOS in Lake Lawrence will cost approximately \$2.6 million over 10 years, not including permitting costs to be completed by the contractor and Thurston County. Replacement parts range up to \$1,800 and emergency repairs outside of warranty service are billed at \$250 per hour; these incidental costs are not included in the above estimate.

External Loading Control Methods

The annual phosphorus budget for Lake Lawrence indicates that the majority of phosphorus in the lake comes from internal sediment loading (81 percent annually and 97 percent in summer, see Appendix A).

Septic System Management

Conventional septic systems offer little treatment or reduction of phosphorus, except the settling of solid-bound phosphorus to the bottom the septic tank. Concentrations in effluent range from 1 to 26 mg/L (1,000 to 26,000 µg/L) (McCray et al. 2005). Phosphorus is treated or removed by soils in the drain field after leaving septic tank as effluent. Within a properly sized drain field, phosphorus will undergo mineralization, bind (adsorb) to soil particles, and be taken up by plants. A particular issue for lakes is the presence of septic systems, along the immediate perimeter, which may have critically undersized drain fields in shallow, pervious soils that do not offer the binding sites and residence time necessary for phosphorus removal. For this reason, septic systems are not allowed to be installed within 100 feet of a lake in Washington and within up to 300 feet in other states.

The effectiveness of soils and underlying aquifer materials in attenuating P movement to subsurface and surface water depends upon a number of factors including: the soil chemical and physical properties, the chemical properties and loading rate of the wastewater, site hydrology, proximity of the site to surface water, and the design and management of the onsite sewage disposal system (McCray et al. 2005).

Advanced septic system technology has shown promise for removing phosphorus in areas with limited drain field area or highly pervious soils. A pilot study at Newman Lake in Spokane County, Washington, installed membrane bioreactor treatment systems and measured the ability to reduce phosphorus, nitrogen, and other wastewater constituents. These systems can treat up to 97.9 percent nitrogen, 98.1 percent phosphorus, and 99.99 percent fecal coliform bacteria (Morrison Maierle 2022).

The cost of the membrane bioreactor systems is not trivial. In the Newman Lake pilot study, two models were installed (Morrison Maierle 2022). For a single residence, initial equipment costs ranged from \$27,500 to \$44,000, with an annual maintenance contract of \$500. Cost can vary substantially based on existing site conditions and electrical capacity. The lifespan of the installed systems is estimated at 25 to 35 years. The average cost to install a conventional septic system in Washington State is \$15,500, but this also varies widely and depending on many factors (<https://www.nexgenseptics.com/>).

Failing septic systems farther away from the lake and streams may also contribute substantial phosphorus to the lake via stream base flow and groundwater. Because proximity is the greatest factor, we recommend that inspections for failing or inadequate systems prioritize residences located adjacent to the lake and streams.

Techniques such as septic system function assessment, microbial source tracking, and nutrient source tracing should be used to assess cost-effective source-control actions, regardless of their immediate impact to lake phosphorus loading by septic systems in the watershed.

Advantages

- Reduces phosphorus loading to the lake in the long term
- Maintains and upgrades critical individual wastewater infrastructure

Disadvantages

- Costly
- Will not provide immediate relief

Suitability for Lake Lawrence

Given that internal sediment loading dominates phosphorus inputs to Lake Lawrence, septic system management is unlikely to provide meaningful improvement to lake water quality on its own. External sources, including any septic contributions, represent a very small fraction of the total phosphorus budget. As a result, even a highly successful septic management program would have limited measurable impact on lake phosphorus concentrations. That said, we recommend taking steps to identify any septic systems that may be contributing disproportionate phosphorus loads to Lake Lawrence, particularly those located adjacent to the lake or along nearby streams. These include failing systems that are no longer functioning as designed, as well as systems with inadequate local soil conditions for phosphorus removal. Important factors to evaluate include distance to the lake or stream, depth to the water table, and soil chemistry.

We recommend encouraging septic system owners throughout the watershed to complete routine inspections as required by state law. In locations where systems are found to be inadequate, advanced treatment systems (ATUs), such as membrane bioreactor systems, may be considered. Installation of such technology must be permitted by the Thurston County Health Department, per WAC 246-272A. We recommend coordination with Thurston County Health Department and the State Department of Health, to develop a pathway for upgrading septic systems that do not have adequate drainfield areas or soil treatment.

Replacing or upgrading septic systems can be very expensive (up to \$20,000 to \$40,000), depending on the location and installation constraints. However, there are numerous grants and low-interest loans available that may ease the upfront investment. This includes Craft3 Clean Water Loans, a low-interest loan program.

While septic management is a reasonable long-term housekeeping measure, the primary focus of phosphorus reduction efforts for Lake Lawrence should be directed toward controlling internal sediment loading, which is the dominant driver of phosphorus in the lake.

Planning Level Costs

Septic system inspections and enforcement should be performed by Thurston County at an enhanced rate, as time and funding allow. Thurston County Health Department should also identify how to allow

and promote upgrading of septic systems that do not have adequate drain field areas or soil treatment. Funding of County Health Department activities and new septic systems are not included in this LCMP.

Stormwater Management

Stormwater runoff can also be an important pathway of nutrients to surface water and groundwater. Fertilized areas, domestic animals, wildlife, and erosion of soils and organic matter contribute phosphorus to stormwater runoff. Stormwater management seeks to treat or infiltrate runoff from impervious and pollutant-generating surfaces prior to discharge to lake. External phosphorus reductions may be achieved through source control and stormwater treatment. Source control can include reduction in phosphorus-containing fertilizer use, identification and removal of illicit sewage connections, pet waste management, and erosion control. Stormwater treatment can include detention facilities, rain gardens, and regional treatment facilities. Stormwater management that reduces peak flows entering streams will also reduce streambank erosion. Lake management plans can be used to declare a lake as sensitive to phosphorus inputs and require new developments to install stormwater treatment systems that are designed to remove phosphorus not just suspended solids.

Advantages

- Reduces phosphorus loading to the lake in the long term
- Reduces other pollutants (e.g., metals)

Disadvantages

- Expensive, low cost-effectiveness
- Does not address immediate bloom issues

Suitability for Lake Lawrence

The Lake Lawrence watershed is characterized primarily by hay/pasture agricultural land and low-intensity residential development, with scattered areas of higher-intensity development. These land uses can generate phosphorus-laden stormwater runoff through fertilizer application on pastures and lawns, livestock and pet waste, and erosion from disturbed soils and roadways. However, as with septic management, the overall benefit of stormwater management for reducing lake phosphorus concentrations is expected to be limited, given that internal sediment loading dominates the phosphorus budget. Surface runoff and precipitation each contribute only approximately 1 percent of the summer phosphorus load (see Appendix A for more detail).

That said, practical and low-cost source control measures are still worth pursuing, particularly in areas immediately adjacent to the lake. Recommended actions include reducing phosphorus-containing fertilizer use on lakeside lawns and pastures, managing livestock access to the shoreline and nearby drainages, promoting pet and livestock waste management, and controlling erosion along disturbed banks and unpaved roads. Where stormwater conveyances discharge directly to the lake or its tributary

streams, small treatment practices such as rain gardens or vegetated buffer strips could provide incremental benefit while also improving overall watershed health.

Shoreline Management

Over the years, people altered the lakeshore by removing trees and dead wood from the shorelines and by building bulkheads. Concrete or rock wall bulkheads negatively impact fish and wildlife habitat. They can accelerate erosion of shallow lake sediments by increasing wave energy, which can fuel cyanobacteria growth by suspending sediment nutrients.

Best management practices for lake shorelines include healthy shoreline alternatives that use native plants, beaches, and wood to protect houses while improving habitat for fish and wildlife, views, and recreational opportunities. Healthy shoreline alternatives are designed to create a more gradual sloping shoreline and overhanging vegetation to provide protected, shallow water habitat needed by fish and a food source for native birds and wildlife. Healthy shorelines are simply lake edges planted with shrubs, trees, or perennials instead of lawn to the water's edge. These plants have lots of benefits over lawn, including the following:

- Have deeper roots that trap and filter up to nine times more phosphorus
- Stabilize the shoreline, preventing erosion
- Provide great habitat and food for birds, turtles, frogs and other beneficial aquatic life
- Can add beauty to your shoreline and potentially increase property values
- Need little maintenance once established

Benefits of healthy shorelines for property owners include the following:

- Reduced lake sediment erosion
- Reduced wave-induced sediment nutrient recycling and cyanobacteria growth
- Reduced Canada geese activity and droppings on property
- Easier access to beach and water
- Shallow gradient shorelines are often favored over steeper designs, especially if you have small children
- More usable shoreline with beach and cove
- Reduced maintenance
- Potential for increased property values
- Many shoreline management actions may also reduce attractiveness to waterfowl, described in the previous section.

Advantages

- Reduces phosphorus loading to the lake in the long term
- Improves lake habitat quality

Disadvantages

- Expensive, low cost-effectiveness on a large scale
- Does not address immediate algae bloom issues

Suitability for Lake Lawrence

Developing a healthy shoreline program to promote and fund replacement of bulkheads and lawns with native plants is a suitable management action to reduce nutrient inputs and support water quality in Lake Lawrence. While shoreline management alone will not address the dominant internal sediment loading driving phosphorus in the lake, it can provide meaningful long-term benefits by reducing erosion, filtering nutrient runoff, and discouraging Canada geese activity along the shoreline.

Methods Rejected

We rejected several management and restoration methods for Lake Lawrence due to high cost and/or low certainty in success. Rejected methods and rationale for rejection are described in the sections below and summarized below in Table 8.

Table 8. Rejected Management/Restoration Methods for Lake Lawrence.	
Management Method	Rationale for Rejection
Proprietary Chemical Product Treatment	Expensive; uncertain effectiveness for phosphorus inactivation; requires experiment permit
Calcium	Uncertain effectiveness for phosphorus inactivation
Dredging	Very expensive, difficult to permit
Stream Phosphorus Inactivation	Expensive; no perennial streams to Lake Lawrence.
Sonification	Low confidence in success
Lake Mixing	Expensive, low confidence in success
Lake Dilution	Expensive; low confidence in success
Hypolimnetic withdrawal	Ineffective due to low inflows; negative downstream impacts
Shading (dyes)	Not feasible per the Washington State APAM permit
Biological Control (biomanipulation, barley straw, macrophytes)	Potential for unintended ecological consequences. Low confidence in success.
Algaecides	Not a long-term solution
Ozone/Microbubble/Nanobubbles	Low confidence in success
Aquatic Vegetation Harvesting	Expensive at the scale of Lake Lawrence and does not address the primary phosphorus source (deep water sediments)
Aquatic Vegetation Planting	Expensive and low confidence in success
Straw	Low confidence in success

Dredging

Dredging is a technique that can be used to control phosphorus levels in lakes. The process involves removing sediment and organic material from the bottom of the lake, which can contain significant amounts of phosphorus that have accumulated over time. By removing this material, the amount of phosphorus in the lake can be reduced, which can help to prevent the growth of harmful algal blooms and promote better water quality.

Dredging can be a complex and costly process that requires specialized equipment and expertise. The process typically involves the use of a dredge, which is a machine that is designed to scoop up sediment and other material from the bottom of the lake. The material is then transported to a dewatering site to remove excess water and then to a disposal site, where it can be treated or stored for later use. Dredging is very expensive primarily due to costs associated with dewatering and disposal of the material. Alum

may be used to settle the sediment and associated phosphorus suspended by dredging, and to inactivate phosphorus in remaining sediments.

General advantages of dredging include:

- Removal of sediment as a phosphorus source
- Increased lake depth, causing reduced aquatic weed entanglement risk and improving recreational uses

General disadvantages of dredging include:

- Difficulty to permit
- Prohibitively expensive (\$ millions)
- Impacts to aquatic life
- Temporary increased turbidity
- Temporary public use disturbance

Key considerations which may impact the dredging design, feasible equipment, and costs include sediment solids composition, lake bathymetry, volume and surface area of sediment to be dredged, availability of nearby disposal sites/options, whether the dredged material containing invasive species or other contaminants, upland site availability for staging, and the expected duration and frequency of dredging.

Previous Dredging Analyses

The KCM (1991) Lake Lawrence Phase I Restoration Analysis Report recommended dredging a portion of the organic sediment layer in the hypolimnetic portions (>12 feet in depth) of the East (Big) and West basins (169 acres) to reduce internal phosphorus loading, as the primary method for lake improvement and cyanobacteria control.

KCM chose the partial dredging strategy based on the assumption that phosphorus levels in the sediment would decline with sediment depth. Subsequent sediment analyses determined no differences in phosphorus (i.e., phosphorus release did not decrease with partial dredging) in the organic sediment layer, which in some locations was estimated at over 20 feet deep (Hartman Associates 1995). Since phosphorus release is a function of organic sediment surface area rather than sediment depth, the researchers determined the removal of the entire depth of organic sediment across at least 94 to 150 acres of the hypolimnion (56 to 89 percent of the hypolimnion area) would be required to meet the 50 to 80 percent reduction goal for internal phosphorus release. Or a partial removal may be performed with additional remedial activities such as capping or alum treatments in un-dredged areas (Hartman Associates 1995).

The 1995 Lake Lawrence Final Dredge and Disposal Design Report (Hartman Associates 1995) analyzed a variety of dredging and disposal options to develop a preferred in-lake restoration dredging alternative. The analysts ultimately chose a dredging design to remove up to 120,000 cubic yards (cy) of near-shore (<6 feet lake depth) organic sediment only, after a 1995 survey determined hypolimnetic sediment

removal was not feasible¹. This strategy would primarily restore lake access but was also estimated to reduce internal loading from sediment suspended by boat props and recreational activities. Hartman Associates next evaluated three sediment disposal alternatives: 1) Centrifuge Dewatering System, 2) Confined Upland Dewatering System, and 3) Slurry Land Application Disposal. The centrifuge dewatering system was selected as the preferred disposal approach, as the option with the least: dredging time (one winter's time), recreational impact, acreage required for upland disposal, noise and traffic impact, and impact to lake water level.

Based on this disposal selection and required equipment, the selected dredging design specified mechanical suction dredging equipment (rather than hydraulic dredging equipment) to remove approximately 79,200 cy of sediment cake from the lake (based on 120,000 in-situ cy) between October and April, resulting in a lake level reduction of about 2 inches across the 330-acre lake. The dredged slurry would be transported to a location upland of each East and West basin and dewatered by centrifuge system (operating 24/7), deposited in a temporary adjacent stockpile area, then trucked to a permanent disposal site <20 miles away (undefined), while the water is returned to Lake Lawrence. A pilot test was performed to simulate this design in Lake Lawrence and evaluate effectiveness of centrifuging with and without additives, which was successful and determined that a polymer (e.g., polyamine polymer or flocculant) was necessary for dewatering the sediment and meeting water quality standards for immediately returning water to Lake Lawrence.

Contractor pre- and post-dredge surveys, upland site acquisition, project supervision, contract administration, water quality monitoring, and permitting represent necessary costs in addition to the capital and labor costs associated with the dredging process. The total cost of the preferred alternative for near-shore dredging only was estimated in 1995 to be \$1.85 million, which amounts to approximately \$4.0 million in 2026, or \$50.50 per cy of material removed, according to the inflation calculator from the U.S. Bureau of Labor Statistics², and would not provide necessary internal loading reductions.

Suitability for Lake Lawrence Dredging

Dredging is not suitable for Lake Lawrence because of the prohibitively high contractor and disposal costs, challenging logistics, difficult permitting process, aquatic life use risks, and long project duration. It is likely that a dredging project to the scale of reducing phosphorus loading by 80 percent would cost several millions of dollars and would take several years to decades to complete. Other methods of

¹ The April 1995 bathymetric survey and sampling effort found the sediment in Lake Lawrence was so unconsolidated that removing sediment from the hypolimnion where organic sediment thickness was definable (i.e., 49 acres out of 169 total hypolimnetic area in the East basin only, where organic sediment thickness was <20 feet) would cause adjacent areas of sediment to slide or collapse back into the dredged area. To prevent this, dredging approximately 4.1 million cy of hypolimnetic sediment (i.e., 49 acres down to the non-organic sediment bottom plus some from atop the 'undefined' area) would be required, which was prohibitively expensive (\$47 million in 1995 USD), would take 12 years to complete, and was not estimated to meet project water quality goals (at only 20 to 25 percent reduction in internal phosphorus loading).

² [CPI Inflation Calculator](#)

internal phosphorus release reduction are significantly more cost-effective and less impactful to aquatic life.

Planning Level Cost Comparison for Dredging Options

There are several contractors capable of dredging but only a few local options specializing in small lakes. One contractor quoted \$55 to \$75 per cubic yard of clean material removed, where the material would be left on-site or trucked away, respectively. Table 9 below shows the contractor estimated costs (not including taxes or contingency) for three scenarios of lake dredging; removing sediment from at least the hypolimnion of the Big Basin is required to sufficiently reduce internal phosphorus loading at a cost of at least \$251 million. The near shore dredging option is significantly less expensive and could improve recreation, but is still cost prohibitive and will not reduce phosphorus loading.

Table 9. Contractor Cost Estimates for Dredging Options.

	Whole Lake	Big Basin Hypolimnion Only	Whole-Lake, Near Shore Only
Sediment Depth to Remove (ft)	20	20	1
Targeted Lake Depth Range (ft)	All	> 15	0-6
Sediment Surface Area (acres)	326.5	141.8	65.1
Volume to Remove (acre-ft)	6,530	2,836	65.1
Volume to Remove (cy)	10,532,890	4,574,468	Approx. 120,000
Cost (onsite disposal)	\$579 million	\$251 million	\$6.6 million
Cost (trucked disposal)	\$790 million	\$343 million	\$9.0 million

Additionally, permitting this project would be difficult, time-extensive, and costly. We estimate this project could require, but is not limited to, the following permits: CWA Section 401/404, US Army Corps of Engineers (USACE) Section 408, USACE Section 10, Endangered Species Act Section 7, SEPA, Washington State WDFW HPA, Washington State Department of Natural Resources (DNR) Aquatic Use Permit, and a Washington State Department of Ecology Shoreline Substantial Development Permit. Altogether, the permitting process would take approximately up to 2 years and cost around \$230,000 or more.

Stream Phosphorus Inactivation

Phosphorus inactivation products can be applied at the mouth of streams or stormwater outfalls entering a lake to inactivate phosphorus prior to it becoming available for lake algae. Systems that pump aluminum-based inactivating compounds into an inflow pipe, ditch, or stream have become more widespread (Pilgrim and Brezonik 2005, Wagner et al. 2017). In some cases, a retention pond is provided to capture aluminum floc before it enters the lake, whereas in others the floc is allowed to enter the lake and settle onto target sediments where further P inactivation can occur. Due to high installation and operating costs, alum injection is most effective for large volumes of water that a system either conveys from a large drainage area or stores in a large basin (EPA 2021).

An alum injection system could be designed for lake inlet(s) that injects low doses of alum through tubing from onshore storage tanks to an aeration or circulator system mounted in the stream bed for thorough mixing of the alum with stream waters. A flow-weighted dosing system would be used that adjusts the dose with stream flow and may be integrated with a water quality monitoring system to measure pH or other parameters to terminate treatment exceeded programmed thresholds. A buffer such as sodium hydroxide or aluminate can be added but is not likely needed for low doses, mixed systems, and pH feedback mechanisms.

Alternatively, lanthanum-modified clay or zero valent iron can be used to inactivate stream phosphorus in lake inlet(s). Porous bags can be filled with either product and placed in the bottom of the stream channel and may require installation of a hard substrate to prevent them from sinking in soft stream sediment. The bags are turned on one occasion before they are replaced when they are expected to become ineffective based on the phosphorus loading rate relative to the amount of inactivation product.

Advantages

- Reduces phosphorus loading to the lake long-term

Disadvantages

- Alum could impact aquatic biota from aluminum toxicity if the pH is outside 6.5-8.5.
- Ecology may not permit alum injection in a stream without containment and removal of the alum floc.
- It requires routine O&M and has an annual operating cost.

Suitability for Lake Lawrence

Stream phosphorus inactivation with an alum injection system is not suitable for Lake Lawrence because placement and operation at any of the lake inlets would be difficult, presents a risk for aluminum toxicity to aquatic organisms under extreme pH conditions (less than 6 or greater than 8.5), may not be allowed by Ecology without a floc retention system, and the relative contribution of stream phosphorus input to the lake is low. Stream phosphorus inactivation with filter bags of lanthanum-modified clay or zero valent iron is not suitable for Lake Lawrence because the bag replacement would be labor intensive and difficult to predict, and the relative contribution of stream phosphorus input to the lake is low.

Sonification

Sonation treatment implements high frequency (>20 KHz) ultrasound for the control of cyanobacterial blooms. The ultrasonic waves act as a barrier to upward movement of algal cells into the photic zone. The waves also reduce cyanobacterial growth by causing structural and functional cellular damage. The LG Sonic system continuously monitors cyanobacteria pigments and water quality parameters to systematically transmit ultrasonic waves when conditions warrant. There are few well-studied implementations of sonication systems and reports are largely anecdotal with highly variable results. In a

recent review, Lürling and Mucci (2020) concluded that low-frequency ultrasound should be avoided, as it is ineffective; high-frequency treatment is more effective, but it is costly due to energy demand, and its effective range is limited.

Advantages

- Permanent control
- Some devices provide real-time data on lake quality.

Disadvantages

- Few lake case studies to confirm effectiveness; results have been variable
- May cause cell lysis, and increase extracellular cyanotoxin levels
- Benthic blooms may still occur.
- Limited by the effective treatment radius
- Requires a permanent contract for monitoring

Suitability for Lake Lawrence

Sonification treatment in Lake Lawrence is not recommended due to the low certainty of success.

Lake Mixing

The key objective of lake aeration or mixing technologies is that the circulating or mixing motion of the water is also circulating and mixing algae cells. Most bloom-forming cyanobacteria can regulate their buoyancy to optimize their position in the water column and float to the surface. Mixing promotes growth of preferred algae such as green algae and diatoms because under natural conditions their time in the sunlit photic zone is determined by their sinking rate, so mixing increases their time in the photic zone. Cyanobacteria have air vacuoles that provide buoyancy and allow them to remain within the photic zone for longer periods of time. Aeration or mixing reduces this advantage, although to do so requires that mixing velocities need to be high enough to overcome cyanobacteria buoyancy, which can vary and be difficult to predict.

While cyanobacteria concentrations may be reduced, total algal biomass and chlorophyll-a concentrations may increase and green the water from the decreased settling rates. Whole-lake mixing by aeration disrupts the thermocline and increases nutrient availability by mixing deep waters to the surface. These technologies also introduce oxygen either passively through increased mixing and turbulence of surface waters or more actively through pumping air through the water. These changes in algal community populations and oxygen levels result in other changes in the lake food web.

Surface Mixing (SolarBees)

The SolarBee is a solar-energy–driven, mixing device that is used to mix either the epilimnion or the entire lake volume. Like other mixing devices it controls algae through mixing them throughout the water column (Hudnell et al. 2010). Although no air is pumped into the water, additional oxygen is added through turbulence and increased contact with air above the lake surface. Surface mixing is theorized to combat cyanobacteria dominance by (1) increasing contact with cyanobacteria pathogens, predators, and bacteria that lyse cyanobacteria; (2) promoting competitor algae; and (3) interfering with the advantages of buoyancy-regulating cyanobacteria (Hudnell et al. 2010).

There are no significant design costs or issues associated with these; they are modular units that are easily scalable depending upon lake surface area. While SolarBees appear to primarily be used in small lakes and ponds, there have been successful applications in larger lakes, reservoirs, and drinking water supplies.

Advantages

- SolarBees have no long-term energy costs because they are solar-powered.
- Can sink algae to below the photic zone, decreasing productivity
- Mixing systems can mix either epilimnion or entire water column.
- Can give advantage to diatoms and other beneficial algae that can't control their buoyancy
- Easily scalable modular units
- Low/no design costs

Disadvantages

- Epilimnetic mixing does not address sediment-derived phosphorus.
- Few case studies for epilimnion mixing
- Can increase algae biomass and decrease water clarity by reducing settling rate of non-buoyant algae
- Often insufficient oxidation of sediments to reduce sediment phosphorus release

Suitability for Lake Lawrence

Surface mixing with a SolarBee unit is not expected to be an effective tool to manage cyanobacteria in Lake Lawrence.

Whole-Lake Mixing

Artificial circulation and mechanical mixers have been successfully used in lakes and reservoirs as physical controls to increase oxygen concentrations in bottom waters and to de-stratify the water column to remove the optimal habitat for buoyant cyanobacteria.

The two most common types of destratification are air injection and mechanical mixing (Hudson and Kirschner 1997). Air injection is a “bottom-up” approach that quickly pumps air to the bottom of the lake so that it will rise and carry the water from the hypolimnetic layers to the top layer. Mechanical mixing uses a “top-down” approach wherein a rotating propeller in the surface layers pushes the water downward, displacing bottom waters to the surface, where they are reoxygenated by the atmosphere. Popular commercially available models are powered by solar panels. Although artificial circulation is beneficial for oxygen and nutrient redistribution, the ecological effects on plant and animal life of de-stratifying a lake are not always predictable and could potentially be harmful (Hudson and Kirschner 1997).

Advantages

- Permanent control by both mixing and oxygenation
- Depending upon design may also target sediment derived phosphorus
- Many lake applications for case studies for whole-lake mixing

Disadvantages

- Resuspension of sediment layer nutrients in the water column
- Sedimentation of organic matter
- Installation and operational cost
- Ineffective in shallow lakes/ reservoirs with a large surface area
- May require continuous operation
- Can be ineffective when external nutrients are not controlled
- These need to be carefully designed and engineered. Poorly sized or designed applications can worsen problems.
- Larger mixing systems require shore based electrical supply and long, air supply line.

Suitability for Lake Lawrence

Whole-lake mixing is not recommended for Lake Lawrence because of its high cost and high uncertainty in its ability control the internal phosphorus load.

Lake Dilution

Lake dilution is a restoration technique that involves adding low-nutrient water to a lake to reduce nutrient concentrations (specifically phosphorus), suppress algal growth, and improve water transparency. This is commonly achieved by increasing flushing rates during spring and summer (Welch et al. 1981). The technique can improve lake quality through two complementary processes: reducing the concentration of the limiting nutrient (typically phosphorus) and increasing the water exchange rate so that algal loss rates exceed growth rates. Dilution primarily reduces algal growth rates, while flushing increases loss rates; when large volumes of low-nutrient water are introduced, both effects can occur simultaneously. This technique is most appropriate where large volumes of low-nutrient water are readily available and can be delivered to the lake. Primary costs include the infrastructure needed to convey water and ongoing operation and maintenance.

Water level management using hydraulic structures is a related approach most commonly applied in shallow, polymictic lakes. Lowering the water level can help control macrophyte growth, while raising the water level increases water volume and dilutes nutrient concentrations (Dunalska 2025). In the absence of nutrients, phytoplankton cannot regenerate. However, water level changes must be carefully managed, as the littoral zone provides critical habitat for fish and benthic organisms, and fluctuating water levels can influence nutrient release from shoreline sediments.

Advantages

- Can reduce water phosphorus concentrations and algal biomass
- Improves water transparency and overall lake water quality
- Can suppress phytoplankton by increasing loss rates beyond growth rates

Disadvantages

- Requires an accessible and reliable source of low-nutrient water
- Does not address internal sediment loading
- High infrastructure and operational costs for water delivery
- Water level fluctuations can negatively impact littoral habitat for fish and benthic organisms
- May function only as an emergency measure to temporarily reduce algal blooms rather than a long-term solution to eutrophication

Suitability for Lake Lawrence

Lake dilution is not recommended for Lake Lawrence. The technique requires a large, accessible source of low-nutrient water, which is not readily available in the Lake Lawrence watershed. Even if a suitable water source could be identified, the infrastructure required to deliver adequate volumes of water to the lake would be prohibitively expensive. Furthermore, because internal sediment loading dominates the phosphorus budget at Lake Lawrence, dilution would provide limited long-term benefit without also addressing nutrient release from the lake sediments.

Hypolimnetic Withdrawal

Hypolimnetic withdrawal involves blocking the surface outflow and installing a pipe at the deepest point of the lake, with the outlet positioned below the existing lake outlet. This configuration creates the hydraulic head needed to passively draw nutrient-rich, anoxic bottom water out of the lake. During the stratified period, this water exits the lake through the pipe rather than being mixed into the water column, directly reducing the nutrient content of the lake (Dunalska, 2025). In addition, the low stability of the waters results in a shorter summer stratification period and thus a reduction in the duration of anoxic conditions in the bottom layers. Over time, long-term operation can reduce phosphorus concentrations in the surface layer of the bottom sediments. Hypolimnetic withdrawal is generally a low-cost solution compared to other physical treatment methods. However, discharging nutrient-rich bottom water directly to the outlet may negatively affect water quality in downstream waterbodies, and could therefore require the installation of a downstream treatment system, which would increase overall costs. This type of restoration is most effective on stratified lakes with a positive water balance (i.e., high inflows).

Advantages

- Low-cost relative to other physical treatment methods
- Directly removes nutrient-rich, anoxic bottom water from the lake
- Reduces the duration of summer stratification and hypolimnetic anoxia
- Can reduce phosphorus concentrations in surface sediment layers over time
- Does not require chemical additions to the lake

Disadvantages

- Most effective only on lakes with a positive water balance
- Discharge of nutrient-rich bottom water may degrade downstream water quality
- May require installation of a downstream treatment system, increasing costs
- Provides limited benefited if inflow are insufficient to maintain hydraulic head
- Long-term infrastructure maintenance required

Suitability for Lake Lawrence

Hypolimnetic withdrawal is not recommended for Lake Lawrence. This method is most effective on lakes with high inflows which Lake Lawrence lacks. Furthermore, the discharge of nutrient-rich bottom water would negatively affect downstream water quality.

Shading (dyes)

Lake dyes are water soluble colorants that are added to lakes and ponds to reduce light penetration and limit the growth of algae and cyanobacteria. Cyanobacteria contain chlorophyll-a and phycobiliproteins that allow them to capture light energy more efficiently than other phytoplankton, and some planktonic species can regulate their buoyancy to position themselves optimally within the euphotic zone to maximize light capture (ITRC 2025). Light is therefore a primary factor determining cyanobacteria distribution in the water column, in addition to temperature, nutrient availability, and wave-driven shear stress (ITRC, 2025). By absorbing and scattering sunlight, dyes reduce the depth of the photic zone and can suppress algal and cyanobacterial growth, particularly for organisms at least two feet below the surface (NYSFOLA 2009).

Dyes are typically applied at the shoreline beginning in spring and periodically throughout the growing season. Dosing rates for commonly used dyes are generally in the range of one to two gallons of dye solution per million gallons of water (Madsen et al. 1999). After the initial application, periodic re-dosing is necessary to maintain light-filtering properties as dyes fade and are diluted by inflows. The practicality and cost of dye applications are largely dependent on the volume of the water body and the rate of dilution from incoming clear-water sources, the larger the volume and the greater the inflow, the more dye is required to maintain effectiveness.

While dyes have been commercially available for decades, published scientific evidence of their effectiveness in lakes is limited. Dye shading may also alter the species composition of algae and cyanobacteria rather than eliminating them altogether, as some species are more light-sensitive than others depending on their position in the water column (Suski et al. 2018). Dyes have no direct effect on phosphorus or other nutrient concentrations and do not address the underlying causes of eutrophication.

Advantages

- Easy to apply and relatively inexpensive per application
- Can suppress algal and cyanobacterial growth by reducing light availability
- Most effective for organisms residing at least two feet below the surface

Disadvantages

- Uncertain stability and toxicity impacts, assumed to be minimal
- Does not reduce phosphorus or other nutrient concentrations
- Requires repeated applications to remain effective
- May shift species composition rather than eliminate cyanobacteria
- Limited scientific evidence of effectiveness in lakes
- Visibly alters the appearance of the lake, which may raise aesthetic concerns
- Can negatively impact beneficial aquatic plants and light-dependent organisms

Suitability for Lake Lawrence

Lake dyes are not recommended for Lake Lawrence. Under the Washington State APAM permit, dyes may not be applied directly to any lake that discharges to other surface waters of the state. As Lake Lawrence has a surface outlet, it does not meet the conditions required for permitted dye application, making this option unavailable. Furthermore, because internal sediment loading dominates the phosphorus budget at Lake Lawrence, shading would have no meaningful effect on the root cause of water quality impairment. Even where permitted, dyes do not reduce phosphorus concentrations and would provide only superficial and temporary suppression of algal growth without addressing the underlying nutrient dynamics driving blooms in the lake.

Biomanipulation

This method involves increasing the pressure on phytoplankton communities by reducing or removing planktivorous fish (Shapiro, 1990; Shapiro and Wright, 1984) or by increasing grazers and zooplankton populations (Ger et al., 2014; Kà et al., 2012). By increasing pressure on phytoplankton, the goal is to reduce their populations through increased consumption by other feeders. Biomanipulation can also involve removal of common carp or other benthivorous fish to reduce phosphorus loading from sediment disturbance and fish excretion. Removal of zooplanktivorous and benthivorous fish and the addition of piscivores are the most frequently applied biomanipulation methods.

Some species of cyanobacteria are more resistant to grazing pressures from zooplankton. Cell/colony/filament size, toxicity, and poor nutritional value are defense mechanisms against grazing (Moustaka-Gouni and Sommer 2020). Grazers may fail to feed if cyanobacterial species, especially filamentous species, can surpass the optimal size range for food based on grazer body size.

Advantages

- Potential for long-term benefits
- No chemical residuals

Disadvantages

- Uncertainty of success
- Does not address nutrient issues
- May remove desirable fish species (e.g., trout)

Suitability for Lake Lawrence

Biomanipulation is not recommended for Lake Lawrence because of the uncertainty of success.

Algaecides

Algaecides provide short-term algae control by killing the algae and cyanobacteria in the water column. However, algaecides may affect other aquatic biota to varying degrees and accelerate recycling of nutrients. Algaecides are effective only while the active ingredient is in the water column and available for uptake by the algae (Cooke et al. 2005). Typically, two or more applications must occur within the same season to provide effective control of algae and cyanobacteria throughout the season. Algaecides do not reduce phosphorus or nitrogen concentrations and do not provide long-term control. In fact, they increase recycling of phosphorus and decrease dissolved oxygen from algae decay.

Currently, endothal (e.g., Hydrothol® 191) and sodium carbonate peroxyhydrate (e.g., PAK 27 or Phycomycin) are the only algaecides permitted for use in the State of Washington. The primary algaecide utilized in Washington State is sodium carbonate peroxyhydrate. When applied to the lake, this compound breaks down into hydrogen peroxide and sodium carbonate. The hydrogen peroxide oxidizes and thus kills the target algae. After contact, the hydrogen peroxide breaks down harmlessly into water and oxygen. When properly applied at a low rate, this algaecide is selective for cyanobacteria, which are lacking a cell wall, and does not harm many of the more beneficial green algae that are protected by a cell wall. When sodium carbonate peroxyhydrate is applied in accordance with directions on the label, no harm is expected to birds, other terrestrial animals, freshwater fish, or freshwater invertebrates (EPA 2011).

Sodium carbonate peroxyhydrate can also be used to kill *E. coli* and other fecal coliform bacteria that often cause beach closures due to waterfowl droppings and other fecal sources. Small peroxyhydrate treatments limited to the waters in the vicinity of a closed beach can be used to reduce *E. coli* counts to levels below the threshold for public safety closures.

Advantages

- Rapid water quality improvement
- Inexpensive management option
- Sodium carbonate peroxyhydrate algaecides:
 - Have no use restrictions and are non-toxic to wildlife.
 - Oxidize intra-cellular cyanobacteria toxins and also kill fecal bacteria.
 - Can be applied at low rates to not impact most beneficial green algae.
 - Rapidly degrade into water and oxygen.
 - Do not accumulate in the environment.

Disadvantages

- Sodium carbonate peroxyhydrate algaecides:
 - Are effective short-term only, while the active ingredient is in the water.

- May affect non-target plants or other aquatic organisms, if not applied according to the label.
- Do not reduce nutrients and can accelerate recycling of nutrients.
- Typically require more than one application within the same season for effective control.
- May require a 24-hour swimming restriction (for Hydrothol 191 but not sodium carbonate peroxyhydrate) and can have possible toxic effects to fish.
- Require a permit and licensed applicator.

Suitability for Lake Lawrence

Algaecides are not a cost-effective tool for cyanobacteria management, because they only work for a short time. Since blooms are difficult to predict, there may be logistical challenges in mobilizing a contractor rapidly enough to provide treatment. An algaecide treatment may only lessen a bloom for as little as 2 days. In addition to the higher costs, relying on algaecides as a sole management strategy would have negative ecological consequences.

Under certain situations, sodium carbonate peroxyhydrate treatments may be suitable for short-term treatment of the entire lake or for impacted swim beaches with a barrier and isolated areas of scum accumulation. Lake residents are accustomed to using herbicides for aquatic plant control, and they are not likely to object to the use of algaecides. Sodium carbonate peroxyhydrate has no use restrictions or aquatic toxicity. When applied at a low rate, it primarily oxidizes cyanobacteria and cyanotoxins rather than beneficial green algae.

Planning Level Costs

The cost for the material and application of sodium carbonate peroxyhydrate treatment is approximately \$250 per acre. A single whole-lake treatments would cost approximately \$97,500. However, multiple treatments may be required in a single year. Assuming two to four treatments per year, the cost of algaecide-only management would be \$200,000 to \$400,000 per year.

Ozone, Microbubbles, and Nanobubbles

Ozone is a strong oxidant that is majorly employed in water treatment for pre-oxidation to control natural organic matter to minimize the formation of disinfection by-products. Studies have shown its ability to damage cyanobacteria cells (Coral et al., 2013; Fan et al., 2013; Wert and Rosario-Ortiz 2013) while simultaneously oxidizing cyanotoxins and taste and odor compounds (Meriluoto et al., 2017; Wert et al., 2014). Ozone application for managing blooms at the source may be promising but is limited by structural and safety requirements that make for a complex application. Furthermore, the efficiency of aqueous ozone oxidation is restricted by rapid decay rates.

Microbubbles (diameter 10–50 µm) and nanobubbles (<200 nm) have attracted increasing scientific attention in recent years. Due to their small diameters, these tiny bubbles have low rising velocities in the aqueous phase, high internal pressures, and rapid mass transfer rates that can significantly improve gas solubility (Atkinson et al., 2019; Hu and Xia, 2018; Li et al., 2014).

Nanobubble aeration uses compressed gas (e.g., air, ozone, carbon dioxide) to produce nanobubbles (bubbles 2,000 times smaller than a grain of salt) to aerate the water column. The key advantage of using nanobubbles versus traditional aeration technologies is that the very small bubbles move both vertically and horizontally, spreading out evenly and remaining in the water column for long periods of time (versus floating to the surface and dispersing), and therefore this technology greatly increases oxygen transfer. Another advantage is that the bubbles are too small to cause water currents and disrupt a stable thermocline. Bubbles are typically injected near the sediment surface, thus reducing phosphorus release from the sediments without physically disturbing the sediments, which can occur from traditional aeration systems. The high oxygen transfer rate and resultant oxidation (through creation of ozone and other oxidative compounds) has been shown to breakdown algae cells and degrade toxins.

Advantages

- Very small bubbles spread out evenly and remain in the water column for long periods of time (versus floating to the surface and mixing water column).
- Greatly increases oxygen transfer and benefits aquatic life uses
- Reduces phosphorus release from sediments
- Breaks down algae cells and degrades toxins
- Easily scalable modular units
- Low/no design costs

Disadvantages

- Requires supply of compressed gas (e.g., air, ozone, carbon dioxide)
- Few case studies to evaluate effectiveness and duration of treatments with some recent reports of ineffective systems
- New technology with many companies; specifications and costs vary

Suitability for Lake Lawrence

Ozone, microbubbles, or nanobubble are not recommended for Lake Lawrence due to the limited information on effectiveness and the initial investment cost.

Aquatic Vegetation Harvesting

Aquatic plants (macrophytes) take up nutrients from the sediments and water within a lake. Mechanical harvesting of aquatic plants involves the removal of excessive plant biomass from lakes using specialized equipment such as harvesters and cutters. Aquatic plants store significant amounts of nutrients in their tissues. By removing excess plant biomass, mechanical harvesting helps to remove these nutrients from the lake.

Mechanical Harvester

A mechanical harvester is similar to a lawn mower positioned on a barge. This machine can mow aquatic plants and bring them onto the boat. This method will not remove plant roots but will harvest a large amount of plants in a small amount of time. These plants can grow back within a few weeks, thus requiring multiple harvesting events over the course of a growing season. Harvesters must be cleaned before entering the lake, as they are often hired to mow lakes with invasive populations, and fragments of these plants can cause infestations in other lakes.

Suction Harvesting

A dredging device or suction harvester will suck up plants, ensuring removal of root fragments. Divers operate a hose attached to a dredge to suck up the entire plant from the sediment. The suction hose dredges up the plant, as well as sediment and water. The contents of the hose are deposited onto a fine screen that holds the plants while filtering out the water and sediment. Usually, the sediment and water is returned to the lake, behind an area sectioned off from the rest of the lake by a sediment curtain. After the sediment behind the curtain settles, the curtain is removed. Plant material remains in the screen and is not returned to the water. Dredging or suction harvesting will require permits, including an HPA from WDFW, a Section 404 permit from the US Army Corps of Engineers, and additional local permits.

Advantages

- This method quickly removes large amounts of plants from the lake.
- Habitat for fish can be maintained if plants are not cut too short.
- Harvesting can target areas of the lake.

Disadvantages

- Mechanical harvesting of some aquatic plants, like Eurasian milfoil, can result in fragmentation and spread of the infestation. Diver dredging is expensive.
- Requires continual monitoring and management
- Plants grow back and may need to be harvested multiple times within a season.
- A large amount of plant material will be generated, and it will need a place to dry out on shore or be hauled away to a disposal facility.

Suitability for Lake Lawrence

Aquatic plant harvesting is not recommended for Lake Lawrence. The high-cost relative to expected benefit, combined with uncertainty in its effectiveness at reducing internal phosphorus loading, makes it a poor fit as a management strategy for this lake.

Aquatic Vegetation Planting

Submerged aquatic plants (macrophytes) can control cyanobacteria through three main processes: (1) macrophytes compete with phytoplankton for nutrients, taking up nutrients from the sediments, and can prevent resuspension of sediments during rainfall and wind events; (2) macrophyte coverage provides habitat for zooplankton grazers of cyanobacteria; and (3) some macrophytes secrete allelochemicals that are inhibitory to phytoplankton.

Advantages

- Potential for long-term benefits
- No chemical residuals
- Increased fish habitat

Disadvantages

- Uncertainty in ideal macrophyte coverage
- Relatively minor nutrient control
- Does not address external nutrient loads
- Macrophytes may not be desired by shoreline homeowners

Suitability for Lake Lawrence

Aquatic vegetation planting is not recommended for Lake Lawrence. The expected benefit relative to cost is low.

Straw

Applying straws such as barley and rice straws in lake systems is considered an alternative cyanobacterial control strategy. The mode of action of barley straws for cyanobacteria control is not entirely understood and has been a subject of much debate. However, various researchers have indicated that the release of allelopathic compounds during the aerobic decay of straws is a potential mechanism for controlling algae. Barley straws do not provide immediate improvements in water quality. The decomposition of straws may create an oxygen demand in the water column. Therefore, successful application may require oxygen-rich systems as low oxygen levels can slow or hinder the straws from releasing algal inhibitory substances.

Advantages

- No chemical residuals
- Rotting straw may provide habitat for invertebrates

- Low cost

Disadvantages

- Do not provide immediate relief
- Inhibitory action is not understood
- May reduce lake oxygen levels due to decomposition
- May be a visual or boating nuisance
- Does not address nutrient issues

Suitability for Lake Lawrence

The use of straws is not recommended for Lake Lawrence due to the low certainty in success.

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Appendix D

Additional Funding Options

Table D-1. Lake Lawrence Cyanobacteria Management Plan – Potential Supplementary Funding Options.							
Name	Funder or Administrative Agency	Award Range	Target Purpose	Required Applicants or Lead Entities	Match Requirement	Notes	Resource URL
National Estuary Program's Coastal Watersheds Grant Program	Restore America's Estuaries, US EPA	Not funding new projects at this time.	Protect/restore water quality or ecological integrity coastal or estuarine habitat	Public agencies (federal, state, tribal, intertribal, regional water pollution control, etc.), non-profits, local governments, academic institutions, for-profit organizations.	33% (25% total cost), but ability to request full or partial waiver	Projects within specific geographic areas (including Lower Columbia River and floodplains) following Congressionally set priorities (see list online; includes recurring HABs). Awarded annually to 3 to 10 awardees.	https://estuaries.org/coastal-watershed-grants/
Aquatic Invasive Plants Management Grants	WA Ecology	Depends on project: \$30K–\$75K	Aquatic invasive plants management activities (e.g., mapping/inventory, IAVMP development, public education, plant control activities, pilot projects, evaluation of implementation, and follow-up monitoring)	State agencies, counties, cities, special purpose districts, tribes	None	Funds originate from boat trailer registration fees. Lower match % and higher grant total for early Infestation grants.	https://ecology.wa.gov/About-us/Payments-contracts-grants/Grants-loans/Find-a-grant-or-loan/Aquatic-Invasive-Plants-Management-Grants
Stormwater Capacity Grants Program	WA Ecology	Set biennially based on state budget	Stormwater projects	Phase I and Phase II NPDES municipal permittees	None	Noncompetitive; activities and equipment necessary for permit installation	https://ecology.wa.gov/About-us/Payments-contracts-grants/Grants-loans/Find-a-grant-or-loan/Stormwater-capacity-grants
Stormwater Grants of Regional or Statewide Significance (GROSS)	WA Ecology	≤\$300K	Stormwater projects	Phase I and Phase II NPDES municipal permittees	None	Competitive; assist permittees in completing projects that will benefit multiple permittees	https://ecology.wa.gov/About-us/Payments-contracts-grants/Grants-loans/Find-a-grant-or-loan/Grants-of-regional-or-statewide-significance
Water Quality Combined Funding Program	WA Ecology	Varies	Single-application process for all funding sources at once- eligible projects benefit water quality	Varies	Varies	Funds from: CWA Section 319 grants, Centennial Clean Water Program grants, Clean Water Act State Revolving fund (CWSRF), stormwater financial assistance program (SFAP)	https://ecology.wa.gov/About-us/Payments-contracts-grants/Grants-loans/Find-a-grant-or-loan/Water-Quality-grants-and-loans
Land and Water Conservation Fund-State Program	WA Recreation and Conservation Office	\$200K–\$2M Not accepting applications in 2026.	Develop outdoor recreation resources (parks, trails, wildlife lands) – available to all communities	local agencies, special purpose districts, tribes, state agencies	50%	Eligible projects: certain types of land acquisition, development/renovation of parks; applicants MUST have a comprehensive recreation or conservation plan.	https://rco.wa.gov/grant/land-and-water-conservation-fund/
Salmon Recovery & Puget Sound Acquisition and Restoration (PSAR) Grants	WA Recreation and Conservation Office	No maximum	Restore degraded salmon habitat and protect existing, high-quality habitat (including actual habitat used by salmon and land/water supporting salmon processes);	Local agencies, special purpose districts (port, park, conservation, school), tribes, state agencies, private landowners, nonprofits, regional fisheries enhancement groups	Varies	The grant program for both salmon recovery and PSAR grants are run together and generally have the same requirements. PSAR program is to help implement habitat protection/restoration in the Puget Sound only, co-managed by the Partnership.	https://rco.wa.gov/grant/salmon-recovery/
WaterSMART Water Strategy Grants	Bureau of Reclamation	\$100-400K	Support early planning for water marketing, supply, or management projects, river restoration projects, or domestic water supply projects for disadvantaged and Tribal communities.		0, 25, or 50% non-federal match depending on project type	Program paused.	https://www.usbr.gov/watersmart/waterstrategy/index.html

Table D-1 (continued). Lake Lawrence Cyanobacteria Management Plan – Potential Supplementary Funding Options.							
Name	Funder or Administrative Agency	Award Range	Target Purpose	Required Applicants or Lead Entities	Match Requirement	Notes	Resource URL
Healthy Watersheds Consortium (HWC) Grants	US EPA	\$2.1 million, awarded incrementally over 6 years;	To accelerate and expand the strategic protection of healthy watersheds, including freshwater, estuarine, and marine ecosystems, across the United States.	Nonprofit, non-governmental organizations, interstate agencies, and intertribal consortia only.	>40% total project cost match	Program paused.	https://www.epa.gov/hwp/healthy-watersheds-consortium-grants
Aquatic Lands Enhancement Account	WA Recreation and Conservation Office	≤\$1M	Aquatic lands improvement	WA agencies or tribes may apply	50%	Usually awarded at \$500k for acquisition, improvement, or protection of aquatic lands for public purposes; or to provide or improve public access to the waterfront.	https://rco.wa.gov/grant/aquatic-lands-enhancement-account/
WWRP – Farmland Preservation	WA Recreation and Conservation Office	No maximum (*but see note)	To buy development rights on farmlands to ensure they remain available for farming, and restore natural functions to improve land's viability for farming	Cities, counties, nonprofit nature conservancies, State Conservation Commission	50%	*Stewardship plans not to exceed \$10k; restoration elements may not exceed half of total land acquisition costs	https://rco.wa.gov/grant/washington-wildlife-and-recreation-program-farmland-preservation/
WWRP – Forestland Preservation	WA Recreation and Conservation Office	≤\$500K	Conserve land for timber, wildlife, public access. Used to lease or buy voluntary land preservation/conservation agreements to restore forests and/or ensure they remain available for timber production in the future.	Cities, counties, nonprofit nature conservancies, State Conservation Commission	50%	Commonly used with conservation easement/lease to restore stream corridors to support clean water/fish habitat. Eligible forests: industrial, private, community, tribal, publicly owned forests of contiguous 5+ acres devoted primarily to timber production and enrolled in a county's open space or forestland property tax program.	https://rco.wa.gov/grant/washington-wildlife-and-recreation-program-forestland-preservation/
WWRP – Habitat Conservation (includes 3 categories)	WA Recreation and Conservation Office	Varies by category (e.g., no cap, ≥\$25k request, and/or ≤\$1M)	Conserve natural areas/wildlife habitat, improve/acquire recreation areas	Cities, counties, towns, tribes, nonprofit nature conservancies, special purpose districts, port districts (and other political subdivisions), state agencies	50%	For a broad range of land conservation efforts, from conserving natural areas near big cities to protecting the most pristine and unique collections of plants in the state. Typically used to buy land to conserve wildlife habitat and to restore state lands	https://rco.wa.gov/grant/washington-wildlife-and-recreation-program-habitat/
WWRP – Recreation Projects	WA Recreation and Conservation Office	Varies by category (e.g., no cap, ≥\$25k request, and/or ≤\$1M)	Land protection and outdoor recreation (parks, trails, water access)	Cities, counties, towns, tribes, nonprofit nature conservancies, special purpose districts, port districts (and other political subdivisions), state agencies	Varies by applicant	For a broad range of land protection and outdoor recreation including for local and state parks, trails, water access, and the conservation and restoration of state land. Typically used to buy land for a park, building athletic facilities, building/renovating parks, developing regional trails, developing state lands. Applicants must have a comprehensive recreation or conservation plan.	https://rco.wa.gov/grant/washington-wildlife-and-recreation-program-recreation/

Note that this is a starting point and a non-exhaustive list that can and should be continuously updated as project needs and funding options change.

Table D-2. Lake Lawrence Cyanobacteria Management Plan – Other Potentially Useful Programs.					
Name	Funder or Administrative Agency	Target Purpose	Required Applicants or Lead Entities	Notes	Resource URL
Forest Legacy Program	US Forest Service	Encourage the protection of privately owned forest lands through conservation easements or land purchases.	States and tribes		https://www.fs.usda.gov/managing-land/private-land/forest-legacy
Family Forest Fish Passage Program	WA DNR	Assist private forestland owners in activities to improve fish passage to upstream habitat (e.g., removing culverts, stream crossing structures, and replacement of other eligible barriers with new structures).	Private or small forest landowner (timber harvest restrictions) with fish-bearing stream	Applications accepted year-round.	https://www.dnr.wa.gov/ffpp
Regional Conservation Partnership Program (RCPP)	USDA NRCS	Partner with farmers, ranchers, and forest landowners to engage in a range of on-the-ground conservation activities like land management/improvement/restoration, land rentals, easements, and public works/watersheds.	Agricultural producer association or other producer group, state or local government, Indian tribes, famer cooperatives, water/irrigation/other districts, municipal water/wastewater entity, higher education institutions, conservation district, entity that has a farmland or grassland protection program that purchases land easements.	RCPP projects fall under two different categories: RCPP Classic and RCPP Alternative Funding Arrangements (AFAs). RCPP Classic projects are implemented using NRCS contracts and easements with producers, landowners and communities, in collaboration with project partners. Through RCPP AFAs, NRCS provides funding to partners to support conservation activities with eligible producers and landowners on eligible land. RCPP AFA funding reimburses partners for conservation activities done for or on behalf of producers, landowners, or other entities.	https://www.nrcs.usda.gov/programs-initiatives/regional-conservation-partnership-program
Rivers and Habitat Open Space Program (WAC 222-23)	WA DNR	Easement to protect forestland with at-risk species (critical habitat), or CMZ river habitat	WA landowners of forestland, free of hazardous substances or other jeopardizing conditions to conservation	Program is funded by a grant and requires submission of an application. The 2027-2029 funding period application window closes May 31, 2026.	https://www.dnr.wa.gov/programs-and-services/forest-practices/small-forest-landowners/rivers-and-habitat-open-space
Forestry Riparian Easement Program	WA DNR	Easement to protect fish habitat	Landowners with >20 acres of contiguous forest, or >80 acres forest in WA, with other timber harvest specs	Reimburses landowners for the value of the trees they are required to leave to protect fish habitat. The program provides compensation for a minimum of 50 percent of the timber value and applies to trees adjacent to streams, wetlands, seeps, or unstable slopes.	https://www.dnr.wa.gov/programs-and-services/forest-practices/small-forest-landowners/forestry-riparian-easement-program
Natural Resource Investments (NRI)	WA State Conservation Commission, local conservation districts	Offer incentive-based programs to empower landowners to voluntarily install BMPs to improve water quality and habitat, and are farm-friendly.	Conservation districts		https://www.scc.wa.gov/programs/natural-resource-investments
Conservation Reserve Enhancement Program (CREP)	WA State Conservation Commission, Farm Service Agency, local conservation districts	Restore streams along farmland by planting native vegetation	Farmers/landowners	Farmers are paid directly by program for planting native vegetation as a buffer, project costs/maintenance for 5 years covered by program, and landowners paid rent for acreage restored and receive enrollment bonus, renewable for 10–15 year contracts.	https://www.scc.wa.gov/conservation-reserve-enhancement-program

Note that this is a non-exhaustive list that can and should be continuously updated as project needs and program options change.



Appendix E

Glossary of Lake Terms

Glossary of Lake Terms

Source: King County Lakes webpage:

<https://kingcounty.gov/en/legacy/services/environment/water-and-land/lakes/glossary>

Aerobic: Living in the presence of oxygen. Most organisms are aerobic and must have oxygen available in order to survive.

Algae: Single celled nonvascular plants occurring singly or in groups (colonies). They contain chlorophyll-*a*, used to produce their own food by means of photosynthesis. Algae form the base of the food chain in aquatic environments.

Algal bloom: Heavy growth of algae in and on a body of water, often a result of high nutrient concentrations.

Alkalinity: The acid neutralizing capacity of a solution, usually related to the amount of carbonates present; buffering capacity.

Allochthonous: Arising in another biotope, from outside of the lake basin.

Anaerobic: Living in the absence of oxygen. Some bacteria can survive and grow without oxygen present.

Anoxic: No oxygen present in the system; see anaerobic.

Average: The sum of a group of numbers divided by the total number of values in the group. (see "Mean")

Bathymetric map: A map showing the bottom contours and depth of a lake.

Benthic: Bottom area of the lake which hosts the community of organisms (benthos) that live in or on the sediment.

Biochemical oxygen demand (BOD): The decrease in oxygen content in milligrams per liter of a sample of water in the dark at a certain temperature over a certain period of time due to microbial respiration.

Biogenic: Arising as a result of life processes of organisms

Biomass: The total organic matter present.

Biovolume: Space occupied by organic matter.

Bluegreen algae: See cyanobacteria.

Buffer: A mixture of weak acids and their salts which (in solution) is able to greatly minimize changes in the hydrogen-ion concentration.

Catchment basin: See “Watershed.”

Chlorophyll-a: A green pigment in plants which is used to capture light energy and convert it, along with water and carbon dioxide, into food or organic material.

Chlorophyte algae: Bright green algae that occur in lakes as plankton, as well as forming tangled masses of filaments coming up from the lake bottom or near shorelines. This group does especially well in warm water and bright light and is usually abundant in summer. The species are very diverse, including several that look more like grassy aquatic plants than algae. Another species, Botryococcus, turns bright orange under certain conditions, but is not toxic like the marine red tides.

Chrysophyte algae: Golden algae that are common members of the plankton in small lakes. They can be solitary or make colonies with large numbers of individuals. Some species make a protective silica sheath around the cells or have a covering of siliceous scales that preserve in lake sediments and have been used for reconstruction studies of past lake environments.

Concentration: The amount of one substance in a given amount of another substance, such as the weight of a chemical in a liter of water.

Conductivity: The measure of water’s capacity to convey an electric current. Increasing the numbers of dissolved ions also increases the conductivity.

Core: Sample of soil or sediment taken in such a way as to keep the vertical characteristic of the sediment undisturbed.

Cryptophyte algae: Algae with a characteristic brown color, which are solitary and mobile, with two whip-like appendages (“flagella”). They are common residents of the plankton in lakes and are known as excellent food items for planktonic animals, thus supporting healthy food chains.

Cyanobacteria: Bacteria living in lakes and streams that make their own food instead of decomposing dead organisms and are very similar to freshwater algae in lake ecosystems. Many cyanobacteria grow especially well in lakes with high phosphorus content and are sometimes used as indicators of change due to human impacts through watershed development. Several species can make toxins dangerous to humans and other mammals if ingested. High concentrations of these cells in the water can result in closure of lakes to recreation or domestic use of water, although this has been relatively rare in occurrence historically.

Decomposers: Organisms, mostly bacteria or fungi, that break down complex organic material into its inorganic constituents.

Detritus: Settleable material suspended in the water: organic detritus, from the decomposition of the broken down remains of organisms; inorganic detritus, settleable mineral materials.

Dimictic lake: A lake which circulates twice a year.

Drainage basin: The area drained by, or contributing to, a stream, lake, or other water body.

Ecosystems: Any complex of living organisms together with all the other biotic and abiotic (non-living) factors which affect them.

Diatoms: Golden-brown algae that make intricate siliceous shells, which are found in lake plankton and attached to wood and rocks along shorelines. Many diatoms grow in cool water and low light, and are often abundant in winter and early spring in temperate lakes. Diatoms are nutritious food for planktonic animals and are important components of a healthy food chain in lakes. The shells preserve well in sediments and can be used in studies of lake history.

Dissolved oxygen: The oxygen gas that is dissolved in water as O₂

Ecosystem: Any complex of living organisms along with all other factors that affect them and are affected by them.

Epilimnion: The warmer, less dense, upper layer of a lake lying above cooler water (metalimnion and hypolimnion) in some seasons of the year.

Euglenophyte algae: Algae often found in ponds and smaller water bodies, particularly in the warm seasons of the year. They may be bright green, orange or brown. Euglenoid algae are mobile, using a whip-like appendage ("flagellum") to move through the water. Some make an organic shell that encloses the cell, with the flagellum inserted through a pore.

Euphotic zone. That part of a water body where light penetration is sufficient to maintain photosynthesis.

Eutrophic: Waters in which algae grow into large populations and biovolumes, generally related to nutrient supply. Trophic state indicators above 50 are classified as eutrophic.

Eutrophication: The physical, chemical, and biological changes associated with enrichment of a body of freshwater due to increases in nutrients and sedimentation.

Fecal coliform bacteria: A group of organisms common to the intestinal tract of vertebrates.

Fall turnover: The mixing of thermally stratified waters that commonly occurs during early autumn. The sequence of events leading to a turnover includes: cooling of surface waters leading to a density change in surface water that produces convection currents from top to bottom, and circulation of the total water volume by wind action. Turnover generally results in uniformity of the physical and chemical properties of the water.

Green algae: See chlorophyte algae.

Holomictic: Lakes that are completely circulated to the bottom at the time of winter cooling.

Humic substances: Organic substances incompletely broken down by decomposers such as bacteria. Humic acids are large molecular organic acids that are present in water, often giving the water a yellow or brown color.

Hydrogen sulfide gas: A gas resulting from the reduction of sulfate containing organic matter under anaerobic conditions which is frequently found in the hypolimnion of eutrophic lakes.

Hypolimnion: The colder, dense, deep water layer in a thermally stratified lake, lying below the metalimnion and removed from surface influences.

Isopleth: A line for the same numerical value of a given quantity.

Lake level: Water level of a lake in centimeters relative to a given point established when the first King County lake level gauge was installed at the lake.

Lentic: slowly flowing.

Limiting nutrient: Essential nutrient for algae that is available in the smallest amount in the environment, relative to the needs of the organisms.

Limnology: The study of lakes and inland waters as ecosystems.

Littoral: The shallow region in a body of water which can be inhabited by rooted aquatic plants. This is somewhat dependent on the ability of light to penetrate the water. Specific animal groups also inhabit this zone.

Loading: The total amount of material (sediment or nutrients) entering a water body via streams, overland flow, precipitation, direct discharge, or other means over time (usually considered annually). Recycling of nutrients among sediment, organisms and water is sometimes referred to as "internal loading."

Mean: (see "Average") The sum of a group of numbers divided by the total number of values in the group.

Median: The datum in a set of numbers that represents the exact center of the group: half of the numbers are smaller and the other half are larger.

Mesotrophic: Waters that promote algae growth at rates intermediate between eutrophy and oligotrophy. Trophic state indicators between 40 and 50 are classified as mesotrophic.

Metalimnion: The layer of water in a lake between the epilimnion and hypolimnion in which the temperature, and thus density, change rapidly over a short distance. (see Thermocline).

Monomictic: A water pattern of lakes in which thermal mixing and stable stratification alternate once per year.

Morphology: Study of configuration or form.

Nannoplankton: Those organisms suspended in open water which because of their small size cannot be collected by most nets. They can be recovered by sedimentation or centrifugation.

NH₃ - N: The ammonia nitrogen portion of total nitrogen in a sample. Increases in the absence of oxygen.

NO₂₊₃ - N: Nitrite and nitrate nitrogen portions of total nitrogen in a sample.

Nitrogen: One of the elements essential for the growth of organisms. Nitrogen is most abundant on the earth in the form of N₂, comprising 80% of the atmosphere, but is usually taken up by plants in the forms NO₃, NO₂ and NH₃.

Nonpoint source pollution: Pollution from diverse sources difficult to pinpoint as separate entities and thus more complicated to control or manage. Examples of "nonpoint sources" include area-wide erosion (as opposed to landslides or mass wasting), widespread failure of septic systems, certain farming practices or forestry practices, and residential/urban land uses (such as fertilizing or landscaping).

Noxious weeds: A legal definition of by the State of Washington that lists specific non-native, invasive plants known to destroy habitat for other plants or animals, or documented as having caused serious agricultural problems. A list of names is published each year by the Department of Ecology which lists the level of threat posed by the plants and the legal responsibilities of owners who find them growing on their properties. Individual counties may modify the list to fit specific distributions within the county.

Nutrient: Any chemical element, ion, or compound required by an organism for growth and reproduction.

Oligotrophic: Waters that are nutrient poor and which, as a result, have little algal production. Trophic state indicators below 40 are classified as oligotrophic.

Orthophosphate (PO₄): The dissolved portion of phosphorus that is available for biological uptake. Also called soluble reactive phosphorus based on the analytical method.

Oxidation: A chemical process that can occur in the uptake of oxygen.

Periphyton: The biological community attached to substrate (such as rocks, sediments, aquatic plants) that is primarily composed of algae.

pH: The negative logarithm of the hydrogen ion concentration in a solution. This is a measure of acidity. pH decreases as acidity increases. Values below 7 are considered acidic.

Precipitation: Rain or snow. Volunteer lake monitors record daily rain in millimeters (or snow measured in millimeters of water equivalent).

Pheophytin: A pigment compound resulting from the degradation of chlorophyll a, usually found in algal remains, suspended organic matter, or bottom sediments.

Phosphorus: One of the elements essential for growth and reproduction. Phosphorus is often the limiting or least available nutrient for plant growth in temperate freshwater ecosystems. The primary original source of phosphorus is from the earth in the form of phosphate rocks.

Photic zone: The upper water in a lake in which light penetrates enough to enable plants to carry out photosynthesis.

Photosynthesis: The production of organic matter (carbohydrates) from inorganic carbon and water, utilizing the energy of light.

Phytoplankton: Free floating microscopic organisms that photosynthesize (algae and cyanobacteria).

Productivity: The production and accumulation of organic matter, usually measured over a certain period of time.

Pyrrophyte algae: These algae, also called dinoflagellates, are solitary and mobile, with two appendages ("flagella") that move the cell through water using whiplike motions. In marine waters, certain species are known for making toxic "red tides" that can render shellfish poisonous for humans. Freshwater dinoflagellates are not known to produce toxins and, while they may color the water brown or red when abundant, have never been considered dangerous.

Residence time: The average length of time that water or a chemical within the water, such as phosphate, remains in a lake.

Secchi disk: A 20-cm (8-inch) diameter disk painted white and black in alternating quadrants. It is used to measure Secchi depth, which is the transparency of the water in lakes.

Sediment: Solid material deposited in the bottom of a lake over time.

Stratification: The separation of water into nearly discrete layers caused by differences in temperature and subsequent water density differences.

Stagnation period: The period of time in which through warming (or cooling) from above a density stratification is formed that prevents a mixing of the water mass.

Stratification stability: The work that must be done to destroy or equalize the density stratification existing in a lake.

Standing crop: The biomass present in a body of water at a particular time.

Suspension: Very finely divided particles of an insoluble solid material dispersed in a liquid.

Thermocline: The zone of rapid temperature decrease in a vertical section of lake water. Typically, the temperature decrease reaches 1°C or more for each meter of descent. (See metalimnion.)

Transparency: Water clarity of a lake as measured with a Secchi disk.

Trophic state: A term used to describe the productivity of a lake ecosystem classifying it as one of three increasing categories based on algal biomass: oligotrophic, mesotrophic, or eutrophic. Trophic state indicators are calculated on the basis of total phosphorus, chlorophyll-*a* and Secchi transparency measurements.

Turbidity: Cloudiness in water caused by the suspension of tiny particles (algae or detritus).

Turnover: The mixing of lake water from top to bottom after a period of stable stratification. This typically occurs in fall and is caused by wind and seasonal cooling of surface waters.

UV254: A measure of water color; measures water sample's absorbance of ultra violet rays at a wavelength of 254 nanometers.

Van Dorn sampler: A water sampling device that allows collection of a water sample from a desired depth without contaminating the sample with water from other depths.

Watershed: The geographical area that contributes surface and groundwater flow to a stream, lake, or other body of water. This can also be referred to as the "catchment basin" or "drainage basin."

Watershed management: The planning and carrying out of actions, legal requirements and protective measures taken by agencies and citizens to preserve and enhance the natural resources of a drainage basin for the production and protection of water supplies and water-based resources.

Water year (WY): A division of the earth year based on the general pattern of annual wet and dry periods rather than by calendar months. The U.S. Geological Survey uses the water year of October 1 through September 30 for data analysis.

Zooplankton: Small animals found in the water of lakes that possess limited powers of locomotion, and which feed on bacteria, algae, smaller animals, and organic detritus present in the water.