

# Enos Lake Water Quality Monitoring Program

## 2023 Annual Report



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**BRITISH COLUMBIA  
CONSERVATION FOUNDATION**

# Executive Summary

From February to November 2023, the British Columbia Conservation Foundation (BCCF) conducted water quality sampling in Enos Lake based on the monitoring schedule and sampling procedures outlined in the *Enos Lake Protection and Monitoring Program* (ELPMP). Data collection was completed by experienced BCCF staff, with assistance from two community volunteers interested in the conservation and protection of the lake and its ecosystem.

Following the monitoring plan, water quality sampling was carried out on a quarterly basis occurring in February, May, August, and November. Samples collected were assessed for phosphorus, orthophosphate, and chlorophyll-*a* concentrations.

Results were referred to a registered professional biologist for analysis and review. Results indicated that both chlorophyll-*a* and total phosphorous increased relative to the 2019 to 2022 data but were similar to results from 2017 and 2018. Both chlorophyll-*a* and total phosphorus have seen gradual increases over the last two years. The majority (92%) of total phosphorous samples exceeded the target value of 12 µg/L in 2023; as a result, the annual average was also above target. There have been no exceedances above the target value for chlorophyll-*a* since 2017. Dissolved oxygen results met the target for the epilimnion ( $\geq 5$  mg/L) in all months, but did not meet the target for the hypolimnion ( $\geq 2$  mg/L) in August 2023. This also occurred from 2017 – 2021, and is considered a natural condition of Enos Lake. However, the severity of oxygen depletion in the hypolimnion has increased since 2017 and, concerningly, was noted to extend up into the thermocline in August of the last three years. The progression of hypoxia beyond the hypolimnion should be closely monitored.

Per the recommendations of the ELPMP, water quality monitoring should continue annually until at least one year post-build-out within the Enos Lake watershed, following the template provided in the ELPMP. Suggestions for data accuracy and improvement include continuing with a QA/QC program to increase confidence in field data collection methods and lab analysis (e.g., duplicate and field blank samples, YSI readings on ascent and descent of probes) and additional Secchi readings throughout the year.

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## 1.0 Background

An annual water quality monitoring program for Enos Lake was established in 2017 by the British Columbia Conservation Foundation (BCCF), per the management recommendations of the Enos Lake Protection and Monitoring Plan (ELPMP) (PGL 2016).

This report summarizes the monitoring of select chemical and physical water quality parameters to evaluate the seasonal water quality and productivity status of Enos Lake in 2023.

## 2.0 Introduction

Enos Lake is a small, relatively productive lake located on Vancouver Island's Nanoose Peninsula (Fig. 1). The lake is approximately 18 ha and is surrounded by nearby ponds and wetlands, supporting a wide diversity of birds and aquatic life. The lake is approximately 12 metres deep and drains into Enos Creek via a weir established in 1956 at its north outlet (PGL 2016).

Enos Lake is most well-known for the presence of a unique benthic and limnetic stickleback species-pair, protected under the federal Species at Risk Act (SARA). The pair were designated as Threatened in 1988, then re-classified and split into two species, each listed as Endangered in 2002 and renewed in 2012 (Environment Canada 2011). Recent research has suggested the species-pair is collapsing due to habitat changes caused by crayfish and/or changes in lake productivity (Taylor et al. 2006; Taylor & Piercey 2018).

Enos Lake undergoes thermal stratification in the summer months, resulting in a very warm surface water layer (epilimnion); this layer is separated from the cooler, deeper water (hypolimnion) by a narrow zone of rapid temperature change (thermocline). Solar radiation and wind movement at the water's surface work together to warm the uppermost layer. In contrast, the water at depth receives very little sunlight and remains cool and dark. Density differences prevent these two layers from mixing during the summer months.

From fall through early spring, as air temperatures drop and the amount of solar radiation decreases, the warm surface waters gradually cool and densify. Denser water settles down into the hypolimnion and initiates mixing throughout the entire water column, a process known as fall turnover. While Enos Lake occasionally receives thin ice cover during winter cold snaps, it typically does not freeze for extended periods of time.

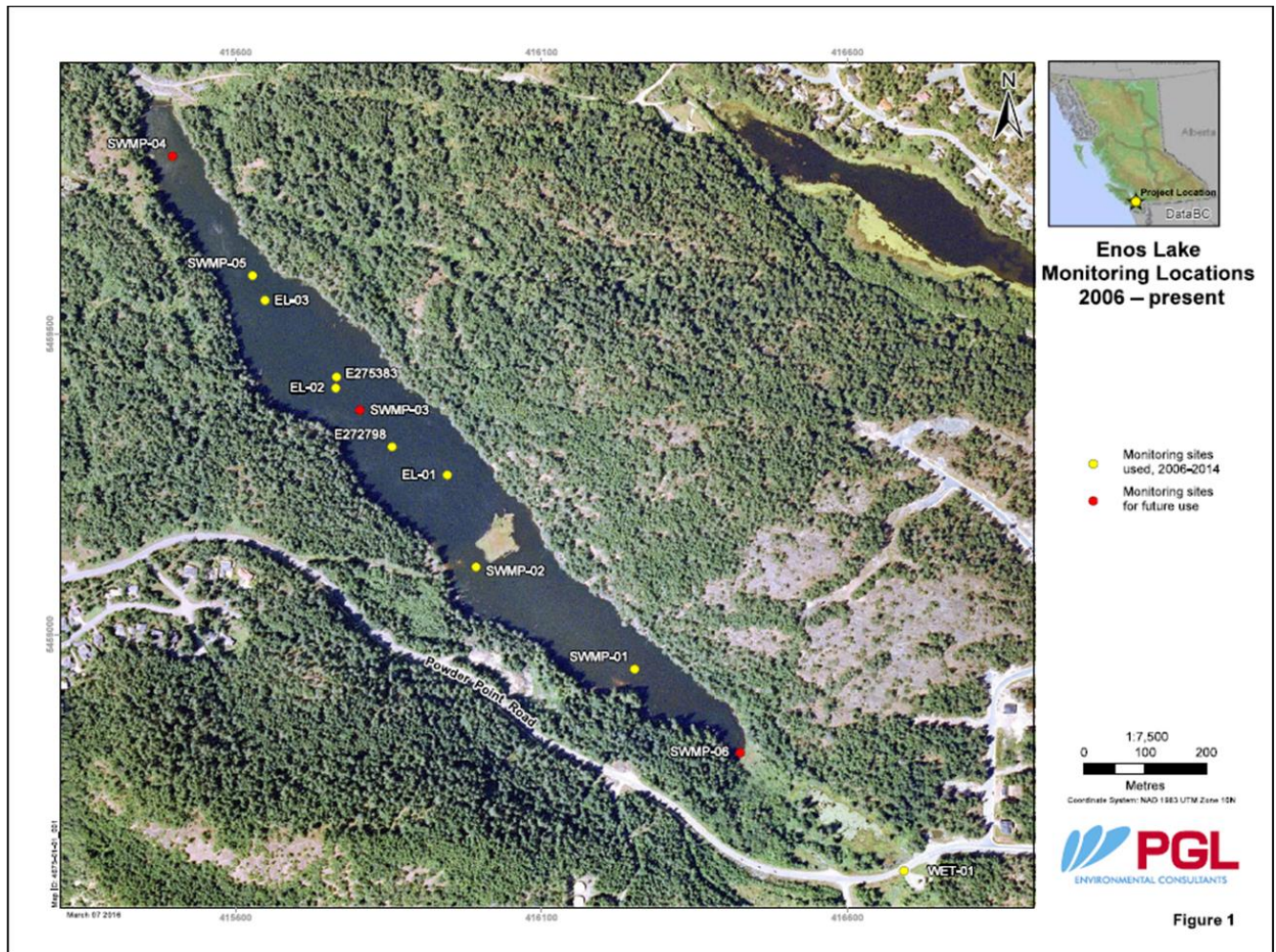


Figure 1: Enos Lake sampling locations (PGL 2016).

## 3.0 Methods

### 3.1 Scope of Work

BCCF was contracted to conduct water quality sampling as described in the ELPMP (Table 1) in 2023. Sampling occurred quarterly, and field crews consisted of one BCCF biologist and an additional volunteer or field technician. Water samples were collected from three depths at site SWMP-03 (Fig. 1), located at the deepest part of the lake. The site was accessed by boat with a small electric motor.



**Table 1: Proposed ELPMP Monitoring Schedule for 2018 (PGL 2016). Note. Sampling repeats on a 5-year cycle so 2023 is equivalent to 2018 in the annual cycle.**

2018												
Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Dissolved Oxygen		F			F			F			F	
Temperature		F			F			F			F	
Redox potential		F			F			F			F	
pH		F			F			F			F	
Secchi Depth		F			F			F			F	
Chlorophyll <i>a</i>		L			L			L			L	
Phosphorus		L			L			L			L	
E Coli												
Metals												
Hardness												
PAH												
<b>Legend</b>	<i>L</i> = Water sample from three depths at SWMP-03 <i>F</i> = 1m in situ profiles from SWMP-03 <i>E</i> = Five samples in 30 days, from SWMP-03 and any two shoreline locations. <i>M</i> = Five samples in 30 days, from SWMP-03 <i>P</i> = Surface sediment from SWMP-03, SWMP-06 and SWMP-04								<b>Note:</b> sampling repeats on a 5-year cycle until one year post-build-out of the lakes district. 2023 is equivalent to 2018 in the annual cycle.			

## 3.2 Data Collection

### 3.2.1 In Situ Field Parameters

*In situ* water quality parameters were collected once per quarter, beginning in February at site SWMP-03. The YSI handheld sonde probes measuring Dissolved Oxygen, pH, Specific Conductivity and ORP were calibrated by a BCCF technician immediately prior to each sampling date, and calibration records were kept for reference. Probes were replaced if calibration results indicated deviation from standard Good Laboratory Practice (GLP) values. Results were recorded at 1 m intervals throughout the water column, down to approximately 10-12 m (total site depth). Parameters measured included:

- Temperature (°C)
- Dissolved oxygen (mg/L and %)
- pH
- Specific Conductivity (µS/cm)
- Redox potential (mV)

Weather and surface observations were noted, and a water clarity measurement was recorded using a Secchi disk between 10 am and 4 pm.

### 3.2.2 Laboratory Samples

Water samples were collected once per quarter, beginning in February at site SWMP-03 at 1, 5, and 10 m depths using a 1 L Van Dorn sampler. Samples were collected for chlorophyll-*a* (unfiltered), orthophosphate (raw water) and total phosphorous (preserved H<sub>2</sub>SO<sub>4</sub>) analyses.

Water sampling procedures followed guidelines provided by ALS Laboratories, those outlined in the *Ambient Freshwater and Effluent Sampling Manual* (B.C. Ministry of Water, Land and Air Protection 2003) and those provided in the ELPMP (PGL 2016). Sample bottles were pre-labelled and handled carefully to prevent interior cap contamination or bottle contamination. The Van Dorn was rinsed before each sampling event and allowed to remain at the desired sampling depth for 10 seconds before retrieving samples to ensure mixing within the sampling tube. Water samples were carefully transferred to the bottles provided by ALS, packed in a cooler with ice and completed COC form. Samples were immediately shipped to the ALS lab in Burnaby for analysis by ground courier.

### 3.2.3 Additional Monitoring

In 2023, the Friends of Enos Lake also undertook additional monitoring as part of a Level 1 lake monitoring program. This included 15 approximately biweekly water clarity (Secchi depth) measurements and depth profiles (Temperature-DO) at site SWMP-03 from May 1 to September 26. This monitoring was managed by the B.C. Lake Stewardship Society; more information about sampling methods can be found at: <https://www.bclss.org/programs#bclsmmp-monitoring-levels>

### 3.3 Invasive Species and Wildlife

Incidental monitoring for invasive species occurred concurrently with water sampling, through visual observation and assessment of emergent/shallow submerged vegetation seen while travelling to the sample site and any plant matter attached to the boat anchor. Incidental wildlife observations were also noted.

### 3.4 Analysis

ALS Laboratories (Burnaby, BC) performed all sample analyses, including Quality Assurance/Quality Control (QA/QC) for assessment methods. Results were received by BCCF two to three weeks after sample submission.

## 4.0 Results

Water quality targets as listed in the ELPMP are summarized in Table 2. Each parameter is discussed in detail below.

**Table 2: Summary of Water Quality Monitoring Targets for data collected in 2023 (PGL 2016).**

	Parameter (units)	Water Quality Target
<b>In situ parameters</b>	Secchi depth (m)	None - supporting context only
	Dissolved Oxygen (mg/L)	≥5 mg/L epilimnion ≥2 mg/L hypolimnion
	Conductivity (µS/cm)	None - supporting context only
	Temperature (°C)	None - supporting context only
	pH	None - supporting context only
	Redox (mV)	None - supporting context only
<b>Lab result</b>	Total phosphorous (µg/L or mg/L)	≤12 µg/L
	Chlorophyll-a (µg/L)	Avoid any increase <sup>1</sup>
	Metals (various)	B.C. Water Quality Guidelines – Total Metals <sup>2</sup> , Freshwater Aquatic Life (both chronic & acute, where applicable)
	PAHs (µg/mg or mg/kg)	B.C. Water Quality Guidelines – Freshwater Sediments
	E. coli (#/mL)	B.C. Water Quality Guidelines – Recreation (Secondary contact) <sup>3</sup>

<sup>1</sup> – Chlorophyll-*a* baseline data for Enos Lake (2009-2013) ranges from 0.17 to 19.8 µg/L; values typically in the range of 4-5 µg/L (PGL 2016).

<sup>2</sup> – Certain metals (e.g., copper and aluminum) have guidelines for dissolved metals, which are not addressed through sampling for total metals.

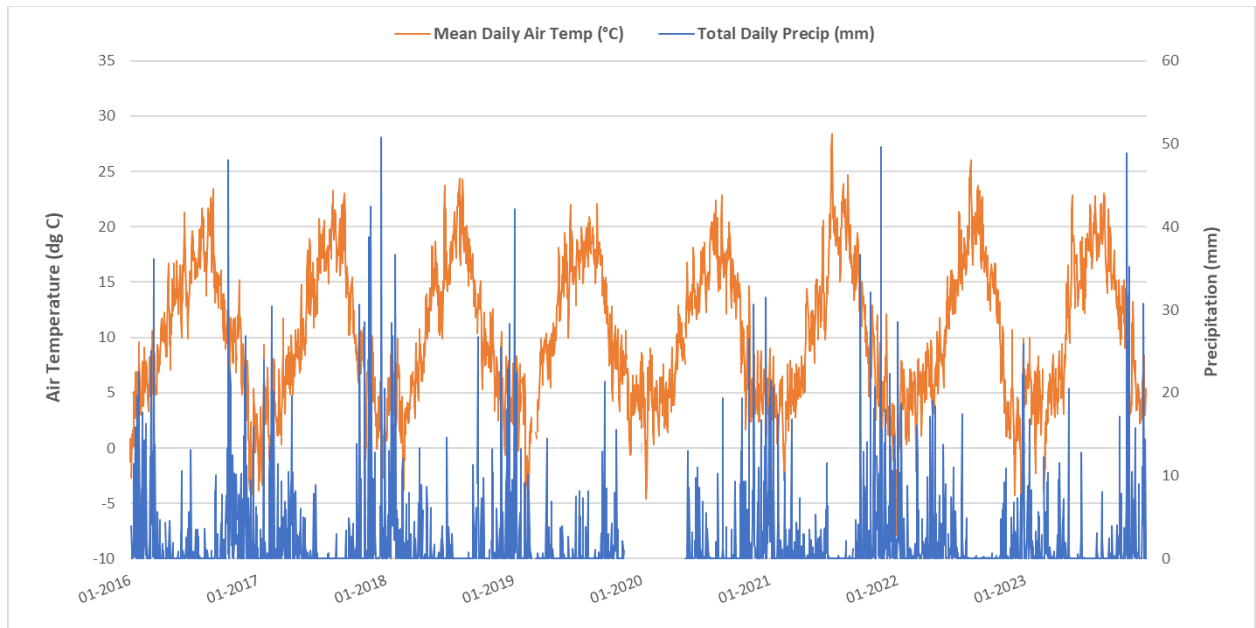
<sup>3</sup> – Secondary contact guidelines not available so Primary Contact guidelines used.

## 4.1 Air Temperature and Precipitation

Mean daily air temperature and precipitation data for 2016-2023 are summarized in Figure 2. A comparison of the mean monthly air temperature and precipitation for the summer period (June – September) is provided in Table 3.

Air temperatures from June to September of 2023 did not deviate far from temperatures observed in past years (Table 3). However, 2023 had less precipitation compared to the average recorded since 2016. July and September had approximately 30% of the average precipitation, and June had approximately 50%. August had slightly more precipitation compared to the average since 2016.





**Figure 1: Mean daily air temperature and precipitation for the Qualicum Beach Airport, 2016-2023 (Environment Canada 2023).**

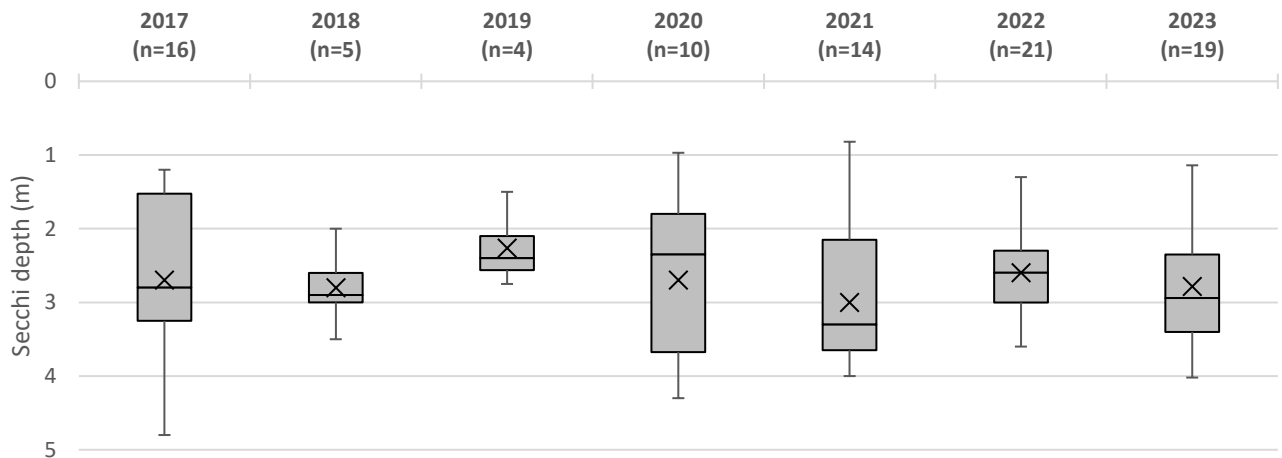
**Table 3: Mean monthly air temperature and precipitation for the Qualicum Beach Airport, June-September 2016-2023 (Environment Canada 2023).**

xx		Warmest mean monthly air temperature (since 2016)						
<b>June</b>								
	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
Air Temp (°C)	15.8	15.3	15.2	16.1	14.9	17.8	15.1	16.2
Precipitation (mm)	1.2	0.6	1.2	0.4	1.8	1.3	1.3	0.5
<b>July</b>								
	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
Air Temp (°C)	17.9	18.0	19.3	17.8	17.6	19.7	19.0	19.2
Precipitation (mm)	0.5	0.0	0.2	0.9	0.5	0.0	1.1	0.1
<b>August</b>								
	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
Air Temp (°C)	18.7	19.2	18.8	18.4	17.1	18.9	20.1	19.1
Precipitation (mm)	0.5	0.1	0.0	0.3	1.2	0.2	0.0	0.5
<b>September</b>								
	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
Air Temp (°C)	13.6	15.5	14.0	14.6	15.9	14.4	16.0	14.4
Precipitation (mm)	1.5	0.7	3.0	2.5	1.0	3.5	0.1	0.5

## 4.2 In situ Field Parameters

### 4.2.1 Water Clarity

Water clarity is evaluated using Secchi depth. In 2023, Secchi depth ranged between a minimum of 1.1 m on May 1 to a high of 4.0 m on July 21 and September 14. This pattern is consistent with a phytoplankton bloom in May, which appears to be a frequent occurrence for Enos Lake as seen in previous years. The average annual Secchi depth since 2017 is approximately 2.7 m (Fig. 3).

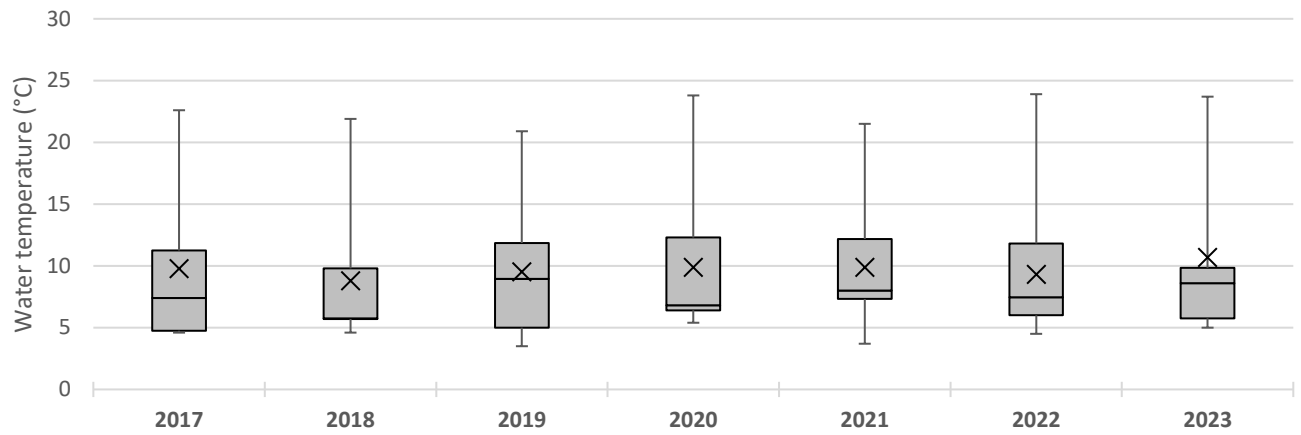


**Figure 3: Annual Secchi depth values, 2017-2023. X represents the mean, and the horizontal bar represents the median.**

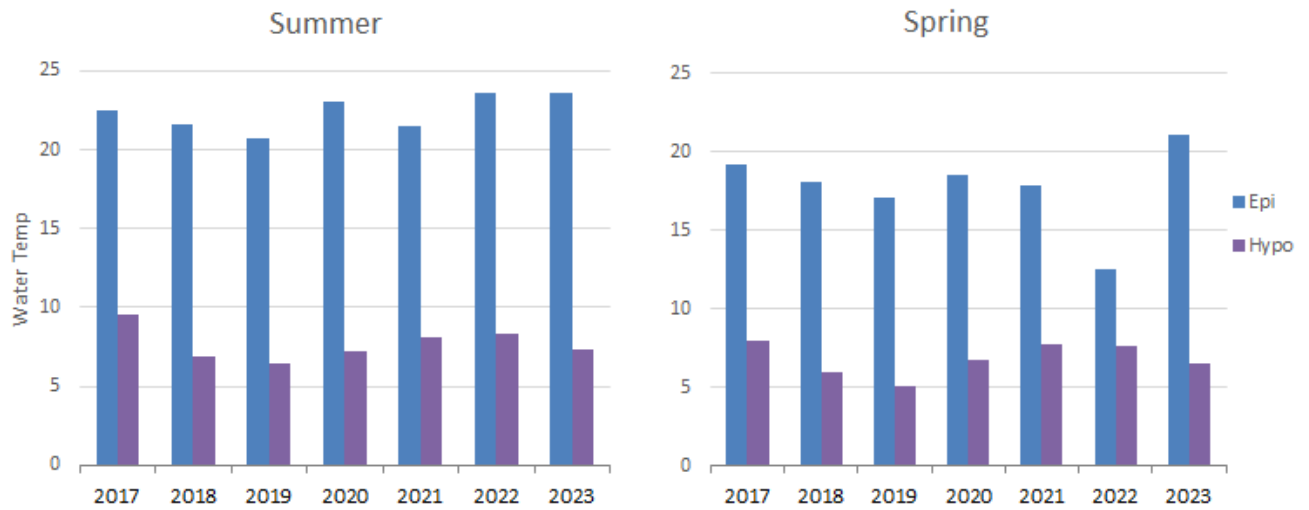
### 4.2.2 Temperature

In 2023, water temperature varied with the season. The lake was relatively isothermal (between 5-9°C) in February and November; however, strong thermal stratification was exhibited in May and August. The maximum water temperature recorded by BCCF was 23.7°C, measured at the surface (0.5 m) on August 15 at 12:40 pm (Fig. 3). The Friends of Enos Lake conducted additional weekly depth profiles during August and observed a maximum surface temperature of 25.8°C on July 21 at 1:10 pm.

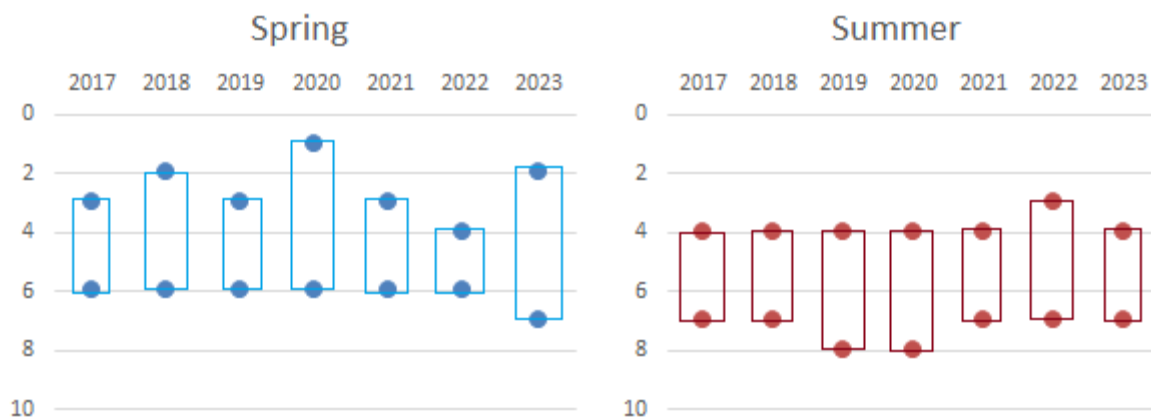
From 2017 to 2023, the epilimnion ranged from 12-22°C and 20-24°C in May and August, respectively, while the hypolimnion remained below 10°C (Fig. 4). Patterns of thermocline development are relatively consistent, with the greatest annual variation seen for spring surface temperatures. The thermocline is defined as the zone where water temperature changes  $\geq 1^\circ\text{C}$  with every meter of lake depth.



**Figure 4: Mean annual water temperature values (n=4 samples per year), 2017-2023. X represents the mean, and the horizontal bar represents the median.**



**Figure 5: Mean annual water temperature for stratified layers in Enos Lake, 2017-2023. The blue bar represents the epilimnion, while the purple bar represents the hypolimnion.**

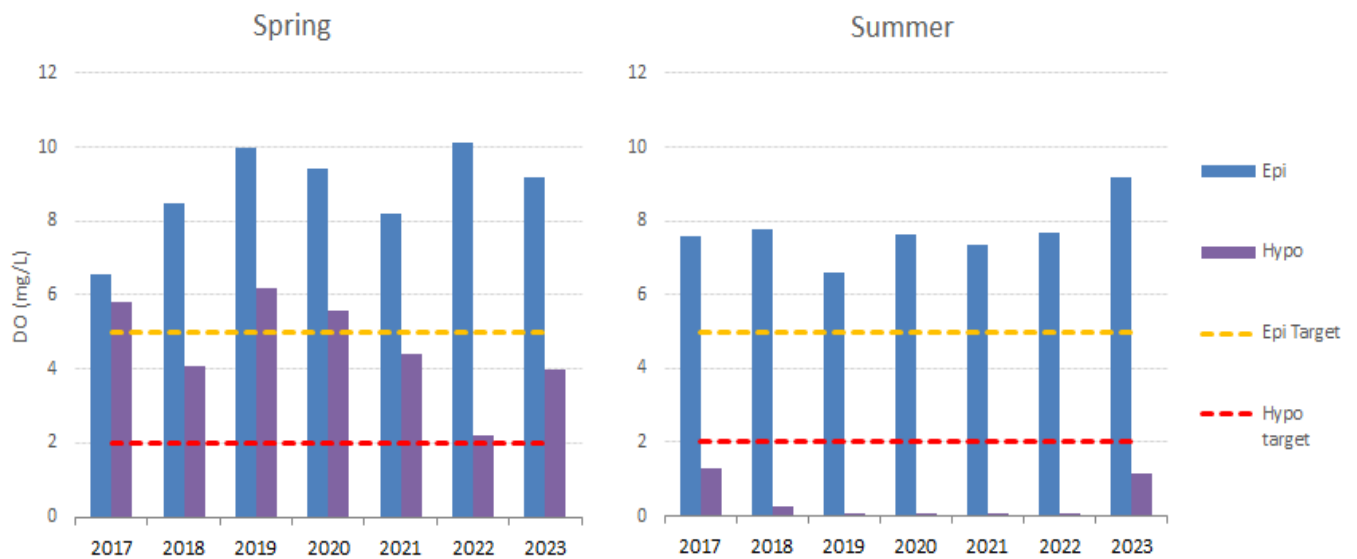


**Figure 6: Measured thermocline depths for Enos Lake, 2017-2023. Dots represent the maximum and minimum recorded depths of the thermocline.**

### 4.2.3 Dissolved Oxygen

In 2023, the dissolved oxygen (D.O.) water quality target ( $\geq 5$  mg/L for the epilimnion) was met throughout the year; however, the D.O. target for the hypolimnion ( $\geq 2$  mg/L) was not met in the summer. The D.O. was depleted below the thermocline by mid-May, with severe anoxic conditions developing upwards to 7 m from the surface by mid-August. The mean hypolimnion D.O. was slightly higher during the 2023 summer than the past five years; however, this remained below the target (Fig. 7).

The epilimnion has not dropped below the D.O. target since sampling began in 2017; however, the hypolimnion is consistently below target in summer; this is mentioned in the ELPMP, which noted that D.O. concentrations are "often below 1.0 mg/L" and that it is a natural existing condition of the lake (PGL 2016) and is due to the decomposition of organic matter (Deniseger 2022).



**Figure 7: Stratified layer mean dissolved oxygen concentrations for Enos Lake, 2017-2023. The blue bar represents the epilimnion, while the purple bar represents the hypolimnion. The yellow dashed line is the D.O. target for the epilimnion, while the red dashed line is the D.O. target for the hypolimnion.**

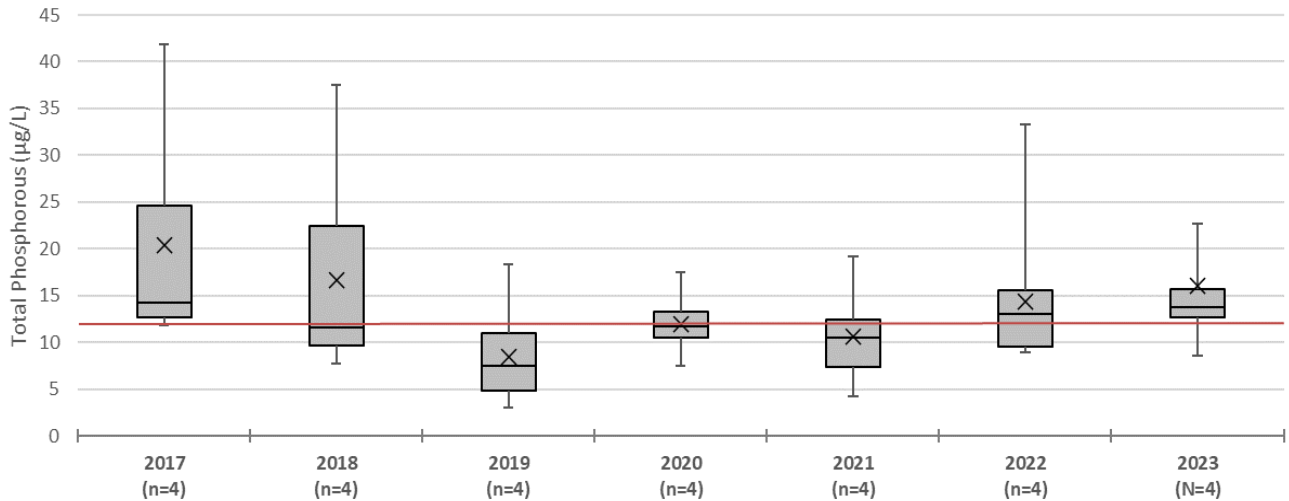
## 4.3 Laboratory Samples

### 4.3.1 Phosphorous

In 2023, the mean annual total phosphorous (total P) was  $16.1 \mu\text{g/L}$  ( $SD = 3.6$ ), which is above the water quality target of  $12 \mu\text{g/L}$ . Individual samples exceeded the target threshold on 11 occasions from May to November of 2023 (Table 4).

In 2021 and 2019, the mean annual total P was below target at  $10.68 \mu\text{g/L}$  ( $SD = 4.27$ ) and  $7.3 \mu\text{g/L}$  ( $SD = 5.0$ ), respectively. In 2020, 2022, 2018, and 2017, the averages were at or above target at  $12.0 \mu\text{g/L}$  ( $SD = 2.5$ ),  $14.4 \mu\text{g/L}$  ( $SD = 6.8$ ),  $16.6 \mu\text{g/L}$  ( $SD = 10.6$ ), and  $20.4 \mu\text{g/L}$  ( $SD = 11.1$ ), respectively (Fig. 8).

Orthophosphate was undetectable in 2023, with values below the laboratory Reporting Detection Limit (RDL) of 1 µg/L for all samples.

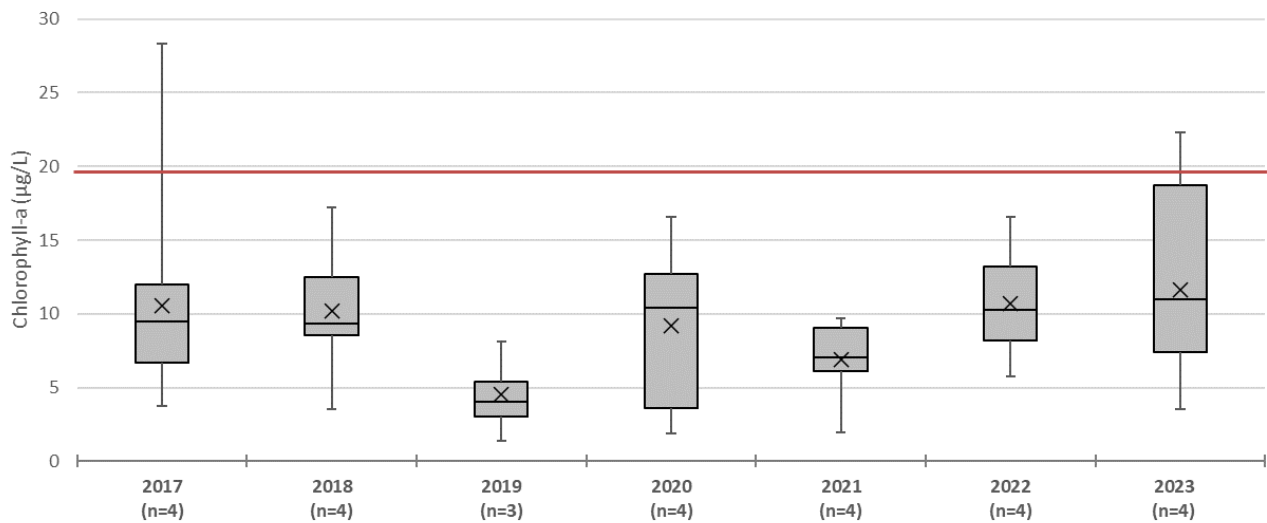


**Figure 8: Mean annual total phosphorous values, 2017-2023. Red line shows the threshold target (12 µg/L).**

#### 4.3.2 Chlorophyll-a

In 2023, chlorophyll-*a* concentrations were above the upper limit of 19.8 µg/L as specified in the ELPMP on three occasions. The maximum chlorophyll-*a* concentration was 22.3 µg/L, collected on May 15, 2023, at 5 m depth (Table 4).

The mean annual chlorophyll-*a* concentration across all depths and dates in 2023 was 11.7 µg/L ( $SD = 6.4$ ). This is the highest annual mean since monitoring began in 2017 and 1 µg/L higher than the next highest which was observed in 2022 (Fig. 9).



**Figure 9: Mean annual chlorophyll-a results for Enos Lake, 2017-2023. Red line shows the threshold target (19.8 µg/L).**

**Table 4. Summary of Laboratory Results from Enos Lake 2023 Water Quality Monitoring.**

Date		13-Feb-23					15-May-23				15-Aug-23				14-Nov-23			
Site		SWMP-03					SWMP-03				SWMP-03				SWMP-03			
	Units	RDL <sup>5</sup>	1 m	5 m	10 m	Duplicate 1 m	1 m	5 m	10 m	Duplicate 10 m	1 m	5 m	10 m	Duplicate 5 m	1 m	5 m	10 m	Duplicate 10 m
<b>Plant pigments</b>																		
Chlorophyll-a	µg/L	0.5	18.0	20.9	21.7	19.0	5.3	22.3	14.5	6.6	3.6	5.9	7.9	6.3	11.4	10.5	10.6	12.0
<b>Anions &amp; Nutrients</b>																		
Orthophosphate Dissolved (as P)	mg/L	0.0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Phosphorus (P)	mg/L	0.0	0.0155	0.0133	0.0141	0.0139	<b>0.0122</b>	<b>0.0129</b>	<b>0.0163</b>	<b>0.0122</b>	0.0086	<b>0.0227</b>	<b>0.0203</b>	<b>0.0162</b>	<b>0.0135</b>	0.0143	<b>0.0122</b>	<b>0.0135</b>

<sup>5</sup> – RDL = Reportable Detection Limit

#### 4.4 Invasive Species and Wildlife Observations

No aquatic invasive species were noted during field sampling in 2023. Several species of waterfowl and birds of prey were observed on or near the lake, along with otter scat on the banks. These wildlife observations are consistent with previous years.

### 5.0 Discussion

The primary intent of the Enos Lake monitoring program is to better understand the lake's productivity trends (PGL 2016; Deniseger 2022) and to build a consistent, long-term database to assess the overall health of Enos Lake concerning ongoing development, land use, and increasing population within the



watershed (Deniseger 2020; Nordin 2017; PGL 2016). The general management objective for Enos Lake is to maintain pre-development water quality and to avoid eutrophication (PGL 2016).

Watershed disturbances such as logging, road building, development, and climate change impacts all have the potential to shift the lake's trophic status through increased stormwater runoff, nutrient loading, rising air and water temperatures, and seasonal variability in precipitation. Therefore, it is important to take surrounding land use and seasonal climate patterns into account when interpreting the water quality trends of Enos Lake.

## 5.1 In situ Field Parameters

### 5.1.1 Water Quality

Secchi depth is a relatively simple measure of clarity, which can provide insight into lake health and productivity (Deniseger 2021). The Secchi readings collected in 2023 followed a similar trend as in the last three years, indicating an early spring phytoplankton bloom occurred in late February. The advantage of additional Secchi depth observations collected by the Friends of Enos Lake throughout the year is that it allows for a broader understanding of Enos Lake's ecological dynamics. Monthly Secchi readings should continue, as they are a relatively inexpensive and simple way to gain additional insight into blooms or sediment loading.

### 5.1.2 Temperature

Water temperature influences the lake's susceptibility to watershed activities and disturbance. Also, it affects several chemical and physical water quality parameters and has a significant and pronounced effect on stratification and mixing (Deniseger 2021). Enos Lake usually begins to thermally stratify as early as March and April and undergoes fall turnover between October and November (Nordin 2017 and Deniseger 2018). In 2023, isothermal mixing was noted in February, while stratification was observed in May, suggesting adherence to this typical pattern. Stratification continued through late summer, contributing to the strongly anoxic conditions observed below 6 m depth in August. The additional results collected by Friends of Enos Lake suggest stratification persisted into October. By November, the lake was fully mixed.

### 5.1.3 Dissolved Oxygen

Since sampling began in 2017, the epilimnion has not dropped below the D.O. target; however, the hypolimnion is consistently below the target in summer. This is mentioned in the ELPMP as a natural existing condition of the lake (PGL 2016). The anoxic conditions in the hypolimnion are due to a combination of isolation from the atmosphere and decomposition of organic matter (Deniseger 2022). It is highly likely that the summer droughts and heat that have occurred over recent years have exacerbated the lack of oxygen at depth (Deniseger 2022). Although the dissolved oxygen recorded on August 15, 2023, was slightly higher than the summer averages seen in last five years, it remained below the target. Additional readings conducted by the Friends of Enos showed anoxic conditions in the hypolimnion starting as early as May and lasting until September. Enos Lake is susceptible to a late summer fish kill if wind-induced mixing draws deeper anoxic water to the surface (Deniseger 2022). This presents a risk for the Enos Lake stickleback species.

## 5.2 Laboratory Samples

### 5.2.1 Phosphorous

Phosphorous is an important nutrient and key indicator of productivity in lakes. Excessive phosphorous can result in blooms and low D.O. levels, which impacts water quality and fish health (Deniseger 2021).

Total phosphorous levels in 2023 exceeded guidelines in the majority (92%) of the samples and appear to have increased compared to the past four years. The max concentration recorded was lower than in 2022, and concentrations during the spring, summer, and fall were similar; however, higher concentrations recorded during the February sampling brought the mean above that seen in 2022. Concentrations during the August sampling were 22.7 µg/L at 5 m and 20.3 µg/L at 10 m, indicating internal loading of phosphorous caused by strongly anoxic conditions, similar to 2022 (Deniseger 2022).

Once lakes become eutrophic or hypereutrophic, it is challenging to reverse this process. Prevention is a far more effective tool for protecting lake water quality (Deniseger 2022). Preventative measures include limiting nutrient loading caused by land disturbance and runoff, which can be achieved through the preservation of native vegetation and wide riparian buffers, avoidance of pavement or large landscapes in favour of permeable pavements or forested landscapes, sediment mitigation measures during construction, and a stormwater management plan to capture and treat runoff (WDNR 2006).

### 5.2.2 Chlorophyll-a

Chlorophyll-a is a major photosynthetic pigment of algae; thus, concentrations within lakes can be used to indicate algae quantities and as a parameter to gauge biological productivity. A target for Enos Lake outlined in the ELPMP was to avoid any increase in chlorophyll-*a* over time from the baseline values ranging from 0.17 – 19.8 µg/L (Table 2). The guidelines target has been met based on the data gathered over the last seven years. Although concentrations were recorded above this on three occasions in 2023, the average across all depths was 11.7 µg/L.

General trophic status classification using total P and chlorophyll-*a* is summarized in Table 5 below, per comments in Deniseger (2021).

**Table 5: Summary of trophic status classification based on chlorophyll-*a* and total phosphorous.**

Total phosphorous	<10 µg/L <sup>1</sup>	Oligotrophic
	10 - 30 µg/L <sup>1</sup>	Mesotrophic
	>30 µg/L <sup>1</sup>	Eutrophic
Chlorophyll- <i>a</i>	<2 µg/L	Oligotrophic
	2 - 7 µg/L	Mesotrophic
	>7 µg/L	Eutrophic

Using the assessment values in Table 5 for mean annual total P, Enos Lake would be considered mesotrophic (or moderately productive) from 2017 to 2018 and 2020 to 2023, but oligotrophic (low productivity) in 2019. Enos Lake would be considered mesotrophic in 2019 and 2021 but eutrophic (or highly productive) in 2017 to 2018, 2020, 2022, and 2023 using the assessment method for mean annual chlorophyll-a.

Year-to-year variability highlights the importance of building a long-term dataset to illustrate trends over time. As lakes become more eutrophic (more biologically productive), algal blooms (including blue-green algae) can become more prevalent, which leads to lower D.O. concentrations, impaired water quality, and impacts on recreational use and drinking water (Deniseger 2022).

Climate change will present further challenges as summer water temperatures increase, prompting further growth of algae and phytoplankton. The past two years are likely examples of the transition to more extreme summer conditions predicted in the future (Deniseger 2022).

### 5.3 Invasive Species and Wildlife Observations

No aquatic invasive species were noted during field sampling in 2023. Several species of waterfowl and birds of prey were observed on or near the lake, along with otter scat on the banks. These observations reaffirm that Enos Lake provides important habitat for wildlife.

## 6.0 Recommendations

1. Ongoing monitoring and water quality protection efforts will help prevent Enos Lake from undergoing significant detrimental changes in productivity. Future monitoring should, at minimum, follow the suggested schedule and guidelines as laid out in the ELPMP (PGL 2016).
2. Of specific concern, the trend of intensifying hypoxia at depth and extending into the thermocline requires close attention to late summer mixing that could result in fish die-offs in the coming years.
3. 2023 again showed the value of additional Secchi measurements. This should continue year-round, as volunteer capacity allows.
4. A water budget for Enos Lake is recommended in order to support long-term watershed management planning.
5. Additional suggestions for data accuracy include continuing to implement a QA/QC program to increase confidence in field data collection methods and lab analysis results (e.g., duplicate and field blank samples, duplicate YSI readings on ascent & descent of probes).

## 7.0 References

- BC Ministry of Water, Land and Air Protection. 2003. Ambient Freshwater and Effluent Sampling Manual. Available from: <[https://www.for.gov.bc.ca/hts/risc/pubs/aquatic/ambient/part\\_e\\_water\\_and\\_wastewater\\_sampling\\_ambient\\_freshwater\\_and\\_effluent\\_sampling\\_simulate\\_template.pdf](https://www.for.gov.bc.ca/hts/risc/pubs/aquatic/ambient/part_e_water_and_wastewater_sampling_ambient_freshwater_and_effluent_sampling_simulate_template.pdf)>.
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- Taylor, E. B., & Piercey, R. S. 2018. Going, going, gone: evidence for loss of an endemic species pair of threespine sticklebacks (*Gasterosteus aculeatus*) with implications for protection under species-at-risk legislation. *Conservation genetics*, 19(2), 297-308.
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## 8.0 Appendix – Laboratory Results



## CERTIFICATE OF ANALYSIS

<p><b>Work Order</b> : <b>VA23A3323</b></p> <p>Client : <b>The British Columbia Conservation Foundation</b></p> <p>Contact : Thea Rodgers</p> <p>Address : 105 - 1885 Boxwood Rd Nanaimo BC Canada V9S 5X9</p> <p>Telephone : 250-390-2525</p> <p>Project : 1303094</p> <p>PO : ----</p> <p>C-O-C number : 20-1041242</p> <p>Sampler : AA, TR</p> <p>Site : ----</p> <p>Quote number : VA23-BCCF100-001 (Enos Lake Project)</p> <p>No. of samples received : 4</p> <p>No. of samples analysed : 4</p>	<p>Page : 1 of 2</p> <p>Laboratory : Vancouver - Environmental</p> <p>Account Manager : Sneha Sansare</p> <p>Address : 8081 Lougheed Highway Burnaby BC Canada V5A 1W9</p> <p>Telephone : +1 604 253 4188</p> <p>Date Samples Received : 14-Feb-2023 09:07</p> <p>Date Analysis Commenced : 15-Feb-2023</p> <p>Issue Date : 23-Feb-2023 09:15</p>
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This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

### Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Brianna Allen	Production/Validation Manager	Inorganics, Burnaby, British Columbia
Caitlin Macey	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia





## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances  
 LOR: Limit of Reporting (detection limit).

Unit	Description
µg/L	micrograms per litre
mg/L	milligrams per litre

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

## Analytical Results

Sub-Matrix: Water

(Matrix: Water)

					Client sample ID	SWMP 03-1m	SWMP 03-1m rep.	SWMP 03-5m	SWMP 03-10m	----
					Client sampling date / time	13-Feb-2023 11:10	13-Feb-2023 11:14	13-Feb-2023 11:22	13-Feb-2023 11:26	----
Analyte	CAS Number	Method	LOR	Unit	VA23A3323-001	VA23A3323-002	VA23A3323-003	VA23A3323-004	-----	----
					Result	Result	Result	Result	-----	----
<b>Anions and Nutrients</b>										
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----	----
Phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0155	0.0139	0.0133	0.0141	-----	----
<b>Plant Pigments</b>										
Chlorophyll a	479-61-8	E870	0.010	µg/L	18.0	19.0	20.9	21.7	-----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.




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## QUALITY CONTROL INTERPRETIVE REPORT

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<p><b>Work Order</b> : <b>VA23A3323</b></p> <p><b>Client</b> : <b>The British Columbia Conservation Foundation</b></p> <p><b>Contact</b> : Thea Rodgers</p> <p><b>Address</b> : 105 - 1885 Boxwood Rd Nanaimo BC Canada V9S 5X9</p> <p><b>Telephone</b> : 250-390-2525</p> <p><b>Project</b> : 1303094</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : 20-1041242</p> <p><b>Sampler</b> : AA, TR</p> <p><b>Site</b> : ----</p> <p><b>Quote number</b> : VA23-BCCF100-001 (Enos Lake Project)</p> <p><b>No. of samples received</b> : 4</p> <p><b>No. of samples analysed</b> : 4</p>	<p><b>Page</b> : 1 of 6</p> <p><b>Laboratory</b> : Vancouver - Environmental</p> <p><b>Account Manager</b> : Sneha Sansare</p> <p><b>Address</b> : 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9</p> <p><b>Telephone</b> : +1 604 253 4188</p> <p><b>Date Samples Received</b> : 14-Feb-2023 09:07</p> <p><b>Issue Date</b> : 23-Feb-2023 09:15</p>
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This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

**Key**

- Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
  - CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
  - DQO: Data Quality Objective.
  - LOR: Limit of Reporting (detection limit).
  - RPD: Relative Percent Difference.
- 

### ***Workorder Comments***

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Holding times are displayed as "----" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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### ***Summary of Outliers***

#### ***Outliers : Quality Control Samples***

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

#### ***Outliers: Reference Material (RM) Samples***

- No Reference Material (RM) Sample outliers occur.

### ***Outliers : Analysis Holding Time Compliance (Breaches)***

- No Analysis Holding Time Outliers exist.

### ***Outliers : Frequency of Quality Control Samples***

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001</b>											
HDPE SWMP 03-10m	E378-U	13-Feb-2023	15-Feb-2023	----	----		16-Feb-2023	3 days	2 days	✓	
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001</b>											
HDPE SWMP 03-1m	E378-U	13-Feb-2023	15-Feb-2023	----	----		16-Feb-2023	3 days	2 days	✓	
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001</b>											
HDPE SWMP 03-1m rep.	E378-U	13-Feb-2023	15-Feb-2023	----	----		16-Feb-2023	3 days	2 days	✓	
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001</b>											
HDPE SWMP 03-5m	E378-U	13-Feb-2023	15-Feb-2023	----	----		16-Feb-2023	3 days	2 days	✓	
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>											
Amber glass total (sulfuric acid) SWMP 03-10m	E372-U	13-Feb-2023	21-Feb-2023	----	----		21-Feb-2023	28 days	8 days	✓	
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>											
Amber glass total (sulfuric acid) SWMP 03-1m	E372-U	13-Feb-2023	21-Feb-2023	----	----		21-Feb-2023	28 days	8 days	✓	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>											
<b>Amber glass total (sulfuric acid)</b> SWMP 03-1m rep.	E372-U	13-Feb-2023	21-Feb-2023	----	----		21-Feb-2023	28 days	8 days	✓	
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>											
<b>Amber glass total (sulfuric acid)</b> SWMP 03-5m	E372-U	13-Feb-2023	21-Feb-2023	----	----		21-Feb-2023	28 days	8 days	✓	
<b>Plant Pigments : Chlorophyll-a by Fluorometry</b>											
<b>Opaque HDPE</b> SWMP 03-10m	E870	13-Feb-2023	15-Feb-2023	2 days	2 days	✓	21-Feb-2023	672 hrs	6 days	✓	
<b>Plant Pigments : Chlorophyll-a by Fluorometry</b>											
<b>Opaque HDPE</b> SWMP 03-1m	E870	13-Feb-2023	15-Feb-2023	2 days	2 days	✓	21-Feb-2023	672 hrs	6 days	✓	
<b>Plant Pigments : Chlorophyll-a by Fluorometry</b>											
<b>Opaque HDPE</b> SWMP 03-1m rep.	E870	13-Feb-2023	15-Feb-2023	2 days	2 days	✓	21-Feb-2023	672 hrs	6 days	✓	
<b>Plant Pigments : Chlorophyll-a by Fluorometry</b>											
<b>Opaque HDPE</b> SWMP 03-5m	E870	13-Feb-2023	15-Feb-2023	2 days	2 days	✓	21-Feb-2023	672 hrs	6 days	✓	

**Legend & Qualifier Definitions**

Rec. HT: ALS recommended hold time (see units).



## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	835508	1	10	10.0	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	840651	1	8	12.5	5.0	✔
<b>Laboratory Control Samples (LCS)</b>							
Chlorophyll-a by Fluorometry	E870	835150	1	14	7.1	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	835508	1	10	10.0	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	840651	1	8	12.5	5.0	✔
<b>Method Blanks (MB)</b>							
Chlorophyll-a by Fluorometry	E870	835150	1	14	7.1	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	835508	1	10	10.0	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	840651	1	8	12.5	5.0	✔
<b>Matrix Spikes (MS)</b>							
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	835508	1	10	10.0	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	840651	0	8	0.0	5.0	✖





## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

<i>Analytical Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U Vancouver - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U Vancouver - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.  Field filtration is recommended to ensure test results represent conditions at time of sampling.
Chlorophyll-a by Fluorometry	E870 Vancouver - Environmental	Water	EPA 445.0 (mod)	Chlorophyll a is determined by solvent extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.
<i>Preparation Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Digestion for Total Phosphorus in water	EP372 Vancouver - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Chlorophyll-a Extraction	EP870 Vancouver - Environmental	Water	EPA 445.0 (mod)	Chlorophyll-a solvent extraction.

## QUALITY CONTROL REPORT

<p><b>Work Order</b> : <b>VA23A3323</b></p> <p><b>Client</b> : The British Columbia Conservation Foundation</p> <p><b>Contact</b> : Thea Rodgers</p> <p><b>Address</b> : 105 - 1885 Boxwood Rd Nanaimo BC Canada V9S 5X9</p> <p><b>Telephone</b> :</p> <p><b>Project</b> : 1303094</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : 20-1041242</p> <p><b>Sampler</b> : AA, TR      250-390-2525</p> <p><b>Site</b> : ----</p> <p><b>Quote number</b> : VA23-BCCF100-001 (Enos Lake Project)</p> <p><b>No. of samples received</b> : 4</p> <p><b>No. of samples analysed</b> : 4</p>	<p><b>Page</b> : 1 of 4</p> <p><b>Laboratory</b> : Vancouver - Environmental</p> <p><b>Account Manager</b> : Sneha Sansare</p> <p><b>Address</b> : 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9</p> <p><b>Telephone</b> : +1 604 253 4188</p> <p><b>Date Samples Received</b> : 14-Feb-2023 09:07</p> <p><b>Date Analysis Commenced</b> : 15-Feb-2023</p> <p><b>Issue Date</b> : 23-Feb-2023 09:15</p>
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This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

### Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Brianna Allen	Production/Validation Manager	Vancouver Inorganics, Burnaby, British Columbia
Caitlin Macey	Team Leader - Inorganics	Vancouver Inorganics, Burnaby, British Columbia



## General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

- Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
- CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
- DQO = Data Quality Objective.
- LOR = Limit of Reporting (detection limit).
- RPD = Relative Percent Difference
- # = Indicates a QC result that did not meet the ALS DQO.

## Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

## Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Anions and Nutrients (QC Lot: 835508)</b>											
VA23A3284-001	Anonymous	Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0111	0.0109	2.12%	20%	----
<b>Anions and Nutrients (QC Lot: 840651)</b>											
KS2300477-001	Anonymous	Phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0391	0.0388	0.745%	20%	----



### Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Anions and Nutrients (QCLot: 835508)</b>						
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
<b>Anions and Nutrients (QCLot: 840651)</b>						
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
<b>Plant Pigments (QCLot: 835150)</b>						
Chlorophyll a	479-61-8	E870	0.01	µg/L	<0.010	----

### Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: Water

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
<b>Anions and Nutrients (QCLot: 835508)</b>									
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 mg/L	95.3	80.0	120	----
<b>Anions and Nutrients (QCLot: 840651)</b>									
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.05 mg/L	91.8	80.0	120	----
<b>Plant Pigments (QCLot: 835150)</b>									
Chlorophyll a	479-61-8	E870	0.01	µg/L	5 µg/L	106	80.0	120	----

### Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: Water

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Anions and Nutrients (QCLot: 835508)</b>										
VA23A3323-001	SWMP 03-1m	Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0358 mg/L	0.03 mg/L	119	70.0	130	----

Page : 4 of 4  
Work Order : VA23A3323  
Client : The British Columbia Conservation Foundation  
Project : 1303094

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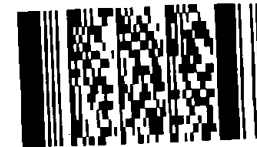
Chain of Custody (COC) / Analytical Request Form

COC Number: 20 - 1041242

Canada Toll Free: 1 800 668 9878

Page 1 of 1

Environmental Division  
Vancouver  
Work Order Reference  
**VA23A3323**



Telephone : +1 604 253 4188

<b>Report To</b> Contact and company name below will appear on the final report Company: <u>BC Conservation Foundation</u> Contact: <u>Thea Rodgers</u> Phone: <u>250-240-2525 ext-104</u> Street: <u>405-1885 Boxwood Road</u> City/Province: <u>Nanaimo BC</u> Postal Code: <u>V9T 0A6</u>		<b>Reports / Recipients</b> Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL) Merge QC/QCI Reports with COA <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX Email 1 or Fax: <u>trodgers@bccf.com</u> Email 2: <u>aandrosoff@bccf.com</u> Email 3:		<b>Turnaround Time (TAT) Requested</b> <input type="checkbox"/> Routine [R] if received by 3pm M-F - no surcharges apply <input type="checkbox"/> 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum <input type="checkbox"/> 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum <input type="checkbox"/> 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum <input type="checkbox"/> 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum <input type="checkbox"/> Same day [E2] if received by 10am M-S - 200% rush surcharge. Addit may apply to rush requests on weekends, statutory holidays and non-ro	
<b>Invoice To</b> Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Copy of Invoice with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		<b>Invoice Recipients</b> Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX Email 1 or Fax: <u>aandrosoff@bccf.com</u> Email 2: <u>limerick@bccf.com</u>		<b>Date and Time Required for all E&amp;P TATs:</b> For all tests with rush TATs requested, please of	
<b>Project Information</b> ALS Account # / Quote # <u>BCCF ENOS LAKE</u> Job #: <u>1303094</u> PO / AFE: <u>(VA23-BCCF100-00)</u> LSD:		<b>Oil and Gas Required Fields (client use)</b> AFE/Cost Center: PO# Major/Minor Code: Routing Code: Requisitioner: Location:		<b>Analysis Rec</b> Indicate Filtered (F), Preserved (P) or Filtered and	
ALS Lab Work Order # (ALS use only):		ALS Contact: <u>Sneha Sansare</u>		Sampler: <u>TR/AA</u>	
<b>Sample Identification and/or Coordinates</b> (This description will appear on the report)		<b>Date</b> (dd-mmm-yy)		<b>Time</b> (hh:mm)	
Sample Identification and/or Coordinates <u>SWMP 03 - 1 m</u> <u>SWMP 03 - 1 m rep.</u> <u>SWMP 03 - 5 m</u> <u>SWMP 03 - 10 m</u>		Date <u>13-Feb-23</u> <u>13-Feb-23</u> <u>"</u> <u>"</u>		Time <u>11:10</u> <u>11:14</u> <u>11:22</u> <u>11:26</u>	
<b>ALS Sample #</b> (ALS use only)		<b>Sample Type</b>		<b>NUMBER OF CONTAINERS</b>	
<u>SWMP 03 - 1 m</u> <u>SWMP 03 - 1 m rep.</u> <u>SWMP 03 - 5 m</u> <u>SWMP 03 - 10 m</u>		<u>Water</u> <u>Water</u> <u>Water</u> <u>Water</u>		<u>3</u> <u>3</u> <u>3</u> <u>3</u>	
<b>Drinking Water (DW) Samples<sup>1</sup> (client use)</b>		<b>Notes / Specify Limits for result evaluation by selecting from drop-down below</b> (Excel COC only)		<b>SAMPLE RECEIPT DETAILS (ALS use only)</b>	
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<u>E870 - 0.01 mg/L</u> <u>Ⓢ Please filter w/li 48 hours!</u>		Cooling Method: <input type="checkbox"/> NONE <input type="checkbox"/> ICE <input type="checkbox"/> ICE PACKS <input type="checkbox"/> FROZEN <input type="checkbox"/> COOLING INITIATED	
Are samples for human consumption/ use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<u>E-372-U</u> <u>E378-U</u> <u>0.002 mg/L</u> <u>0.001 mg/L</u>		Submission Comments identified on Sample Receipt Notification: <input type="checkbox"/> YES <input type="checkbox"/> NO Cooler Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A Sample Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A	
<b>SHIPMENT RELEASE (client use)</b>		<b>INITIAL SHIPMENT RECEPTION (ALS use only)</b>		<b>FINAL SHIPMENT RECEPTION (ALS use only)</b>	
Released by: <u>AA</u> Date: <u>Feb 13, 2023</u> Time: <u>12:45</u>		Received by: Date: Time:		Received by: <u>RP</u> Date: <u>2/14/23</u> Time: <u>10:15 AM</u>	





## CERTIFICATE OF ANALYSIS

<p><b>Work Order</b> : <b>VA23B0623</b></p> <p><b>Client</b> : <b>The British Columbia Conservation Foundation</b></p> <p><b>Contact</b> : Thea Rodgers</p> <p><b>Address</b> : 105 - 1885 Boxwood Rd Nanaimo BC Canada V9S 5X9</p> <p><b>Telephone</b> : 250-390-2525</p> <p><b>Project</b> : 1304015</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : 20-1018401</p> <p><b>Sampler</b> : AA/PL</p> <p><b>Site</b> : ----</p> <p><b>Quote number</b> : VA23-BCCF100-001 (Enos Lake Project)</p> <p><b>No. of samples received</b> : 4</p> <p><b>No. of samples analysed</b> : 4</p>	<p><b>Page</b> : 1 of 3</p> <p><b>Laboratory</b> : Vancouver - Environmental</p> <p><b>Account Manager</b> : Sneha Sansare</p> <p><b>Address</b> : 8081 Lougheed Highway Burnaby BC Canada V5A 1W9</p> <p><b>Telephone</b> : +1 604 253 4188</p> <p><b>Date Samples Received</b> : 16-May-2023 08:15</p> <p><b>Date Analysis Commenced</b> : 17-May-2023</p> <p><b>Issue Date</b> : 30-May-2023 10:10</p>
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This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

### Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia



## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances  
 LOR: Limit of Reporting (detection limit).

Unit	Description
µg/L	micrograms per litre
mg/L	milligrams per litre

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

## Analytical Results

Sub-Matrix: Water

(Matrix: Water)

					Client sample ID	SWMP 03-1m	SWMP 03-1m rep	SWMP03 -5m	SWMP 03-10m	----
					Client sampling date / time	15-May-2023 11:55	15-May-2023 11:58	15-May-2023 12:00	15-May-2023 12:05	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA23B0623-001	VA23B0623-002	VA23B0623-003	VA23B0623-004	-----	----
					Result	Result	Result	Result	-----	----
<b>Anions and Nutrients</b>										
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U/VA	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	----
Phosphorus, total	7723-14-0	E372-U/VA	0.0020	mg/L	0.0122	0.0122	0.0129	0.0163	0.0163	----
<b>Plant Pigments</b>										
Chlorophyll a	479-61-8	E870/VA	0.010	µg/L	5.34	6.56	22.3	14.5	14.5	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.






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## QUALITY CONTROL INTERPRETIVE REPORT

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<p><b>Work Order</b> : <b>VA23B0623</b></p> <p><b>Client</b> : <b>The British Columbia Conservation Foundation</b></p> <p><b>Contact</b> : Thea Rodgers</p> <p><b>Address</b> : 105 - 1885 Boxwood Rd Nanaimo BC Canada V9S 5X9</p> <p><b>Telephone</b> : 250-390-2525</p> <p><b>Project</b> : 1304015</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : 20-1018401</p> <p><b>Sampler</b> : AA/PL</p> <p><b>Site</b> : ----</p> <p><b>Quote number</b> : VA23-BCCF100-001 (Enos Lake Project)</p> <p><b>No. of samples received</b> : 4</p> <p><b>No. of samples analysed</b> : 4</p>	<p><b>Page</b> : 1 of 6</p> <p><b>Laboratory</b> : Vancouver - Environmental</p> <p><b>Account Manager</b> : Sneha Sansare</p> <p><b>Address</b> : 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9</p> <p><b>Telephone</b> : +1 604 253 4188</p> <p><b>Date Samples Received</b> : 16-May-2023 08:15</p> <p><b>Issue Date</b> : 30-May-2023 10:14</p>
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This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

**Key**

- Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
- CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
- DQO: Data Quality Objective.
- LOR: Limit of Reporting (detection limit).
- RPD: Relative Percent Difference.

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### ***Workorder Comments***

Holding times are displayed as "----" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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### ***Summary of Outliers***

#### ***Outliers : Quality Control Samples***

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

#### ***Outliers: Reference Material (RM) Samples***

- No Reference Material (RM) Sample outliers occur.

***Outliers : Analysis Holding Time Compliance (Breaches)***

- Analysis Holding Time Outliers exist - please see following pages for full details.

***Outliers : Frequency of Quality Control Samples***

- No Quality Control Sample Frequency Outliers occur.



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001</b>											
HDPE SWMP 03-10m	E378-U	15-May-2023	18-May-2023	----	----		18-May-2023	3 days	3 days	*	EHT
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001</b>											
HDPE SWMP 03-1m	E378-U	15-May-2023	18-May-2023	----	----		18-May-2023	3 days	3 days	*	EHT
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001</b>											
HDPE SWMP 03-1m rep	E378-U	15-May-2023	18-May-2023	----	----		18-May-2023	3 days	3 days	*	EHT
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001</b>											
HDPE SWMP03 -5m	E378-U	15-May-2023	18-May-2023	----	----		18-May-2023	3 days	3 days	*	EHT
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>											
Amber glass total (sulfuric acid) SWMP 03-10m	E372-U	15-May-2023	25-May-2023	----	----		26-May-2023	28 days	11 days	✓	
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>											
Amber glass total (sulfuric acid) SWMP 03-1m	E372-U	15-May-2023	25-May-2023	----	----		26-May-2023	28 days	11 days	✓	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>										
<b>Amber glass total (sulfuric acid)</b> SWMP 03-1m rep	E372-U	15-May-2023	25-May-2023	----	----		26-May-2023	28 days	11 days	✓
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>										
<b>Amber glass total (sulfuric acid)</b> SWMP03 -5m	E372-U	15-May-2023	25-May-2023	----	----		26-May-2023	28 days	11 days	✓
<b>Plant Pigments : Chlorophyll-a by Fluorometry</b>										
<b>Opaque HDPE</b> SWMP 03-1m	E870	15-May-2023	17-May-2023	2 days	2 days	* EHT	24-May-2023	672 hrs	7 days	✓
<b>Plant Pigments : Chlorophyll-a by Fluorometry</b>										
<b>Opaque HDPE</b> SWMP 03-1m rep	E870	15-May-2023	17-May-2023	2 days	2 days	* EHT	24-May-2023	672 hrs	7 days	✓
<b>Plant Pigments : Chlorophyll-a by Fluorometry</b>										
<b>Opaque HDPE</b> SWMP 03-10m	E870	15-May-2023	17-May-2023	2 days	2 days	✓	24-May-2023	672 hrs	7 days	✓
<b>Plant Pigments : Chlorophyll-a by Fluorometry</b>										
<b>Opaque HDPE</b> SWMP03 -5m	E870	15-May-2023	17-May-2023	2 days	2 days	✓	24-May-2023	672 hrs	7 days	✓

**Legend & Qualifier Definitions**

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).



## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	944877	1	20	5.0	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	954262	1	12	8.3	5.0	✔
<b>Laboratory Control Samples (LCS)</b>							
Chlorophyll-a by Fluorometry	E870	941913	1	20	5.0	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	944877	1	20	5.0	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	954262	1	12	8.3	5.0	✔
<b>Method Blanks (MB)</b>							
Chlorophyll-a by Fluorometry	E870	941913	1	20	5.0	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	944877	1	20	5.0	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	954262	1	12	8.3	5.0	✔
<b>Matrix Spikes (MS)</b>							
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	944877	1	20	5.0	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	954262	1	12	8.3	5.0	✔





## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

<i>Analytical Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U Vancouver - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U Vancouver - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.  Field filtration is recommended to ensure test results represent conditions at time of sampling.
Chlorophyll-a by Fluorometry	E870 Vancouver - Environmental	Water	EPA 445.0 (mod)	Chlorophyll a is determined by solvent extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.
<i>Preparation Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Digestion for Total Phosphorus in water	EP372 Vancouver - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Chlorophyll-a Extraction	EP870 Vancouver - Environmental	Water	EPA 445.0 (mod)	Chlorophyll-a solvent extraction.

## QUALITY CONTROL REPORT

<p><b>Work Order</b> : <b>VA23B0623</b></p> <p><b>Client</b> : The British Columbia Conservation Foundation</p> <p><b>Contact</b> : Thea Rodgers</p> <p><b>Address</b> : 105 - 1885 Boxwood Rd Nanaimo BC Canada V9S 5X9</p> <p><b>Telephone</b> :</p> <p><b>Project</b> : 1304015</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : 20-1018401</p> <p><b>Sampler</b> : AA/PL            250-390-2525</p> <p><b>Site</b> : ----</p> <p><b>Quote number</b> : VA23-BCCF100-001 (Enos Lake Project)</p> <p><b>No. of samples received</b> : 4</p> <p><b>No. of samples analysed</b> : 4</p>	<p><b>Page</b> : 1 of 4</p> <p><b>Laboratory</b> : Vancouver - Environmental</p> <p><b>Account Manager</b> : Sneha Sansare</p> <p><b>Address</b> : 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9</p> <p><b>Telephone</b> : +1 604 253 4188</p> <p><b>Date Samples Received</b> : 16-May-2023 08:15</p> <p><b>Date Analysis Commenced</b> : 17-May-2023</p> <p><b>Issue Date</b> : 30-May-2023 10:10</p>
--	--

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

### Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Miles Gropen	Department Manager - Inorganics	Vancouver Inorganics, Burnaby, British Columbia



## General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

- Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
- CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
- DQO = Data Quality Objective.
- LOR = Limit of Reporting (detection limit).
- RPD = Relative Percent Difference
- # = Indicates a QC result that did not meet the ALS DQO.

## Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

## Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Anions and Nutrients (QC Lot: 944877)</b>											
KS2301585-001	Anonymous	Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 954262)</b>											
VA23B0623-001	SWMP 03-1m	Phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0122	0.0118	0.0004	Diff <2x LOR	----



### Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Anions and Nutrients (QCLot: 944877)</b>						
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
<b>Anions and Nutrients (QCLot: 954262)</b>						
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
<b>Plant Pigments (QCLot: 941913)</b>						
Chlorophyll a	479-61-8	E870	0.01	µg/L	<0.010	----

### Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report					
					Spike		Recovery (%)		Recovery Limits (%)	Qualifier
					Concentration	LCS	Low	High		
<b>Anions and Nutrients (QCLot: 944877)</b>										
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 mg/L	99.2	80.0	120	----	
<b>Anions and Nutrients (QCLot: 954262)</b>										
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.05 mg/L	90.2	80.0	120	----	
<b>Plant Pigments (QCLot: 941913)</b>										
Chlorophyll a	479-61-8	E870	0.01	µg/L	5 µg/L	96.2	80.0	120	----	

### Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Matrix Spike (MS) Report						
					Spike		Recovery (%)		Recovery Limits (%)		Qualifier
					Concentration	Target	MS	Low	High		
<b>Anions and Nutrients (QCLot: 944877)</b>											
KS2301586-001	Anonymous	Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0234 mg/L	0.03 mg/L	78.1	70.0	130	----	
<b>Anions and Nutrients (QCLot: 954262)</b>											
VA23B0623-002	SWMP 03-1m rep	Phosphorus, total	7723-14-0	E372-U	0.0468 mg/L	0.05 mg/L	93.6	70.0	130	----	

Page : 4 of 4  
Work Order : VA23B0623  
Client : The British Columbia Conservation Foundation  
Project : 1304015

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Chain of Custody (COC) / Analytical Request Form

COC Number: 20 - 1018401

Canada Toll Free: 1 800 668 9878

Page 1 of 1

Report To		Reports / Recipients		Turnaround Time (TAT) Requested		AFFIX ALS BARCODE LABEL HERE (ALS use only)				
Contact and company name below will appear on the final report		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EXD (DIGITAL)		<input type="checkbox"/> Routine [R] if received by 3pm M-F - no surcharges apply <input type="checkbox"/> 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum <input type="checkbox"/> 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum <input type="checkbox"/> 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum <input type="checkbox"/> 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum <input type="checkbox"/> Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests						
Company: BC Conservation Foundation		Merge QC/QCI Reports with COA <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A		Date and Time Required for all E&P TATs: dd-mm-yy hh:mm am/pm						
Contact: Aaron Androsoff		<input type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX		For all tests with rush TATs requested, please contact your AM to confirm availability.						
Phone: 25 748-957-7591		Email 1 or Fax: aandrosoff@bcf.com		Analysis Request						
Company address below will appear on the final report		Email 2: <del>himerick@bcf.com</del>		Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below						
Street: #05-1885 Boxwood Road		Email 3:		NUMBER OF CONTAINERS	chlorophyll a	Total Phosphorus				
City/Province: Nanaimo BC		Invoice Recipients					orthophosphate (dissolved)	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	
Postal Code: V9T 0A6		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX								SUSPECTED HAZARD (see notes)
Invoice To: Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		Email 1 or Fax: aandrosoff@bcf.com								
Copy of Invoice with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		Email 2: himerick@bcf.com								
Project Information		Oil and Gas Required Fields (client use)								
ALS Account # / Quote #: BCF KENDS LAKE		AFE/Cost Center: PO#		<div style="border: 1px solid black; padding: 5px; transform: rotate(-5deg);">           Environmental Division            Vancouver            Work Order Reference  <b>VA23B0623</b>              Telephone: +1 604 253 4188         </div>						
Job #: 1304015		Major/Minor Code: Routing Code:								
PO / AFE:		Requisitioner:								
LSD:		Location:								
ALS Lab Work Order # (ALS use only):		ALS Contact: Sneha Sangare		Sampler: AA/PL						
ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mm-yy)	Time (hh:mm)	Sample Type	3	3	3	3		
	SWMP 03 - 1m	15/May/23	11:55	water	✓	✓	✓	✓		
	SWMP 03 - 1m rep.	15/May/23	11:58	water	✓	✓	✓	✓		
	SWMP 03 - 5m	15/May/23	12:00	water	✓	✓	✓	✓		
	SWMP 03 - 10m	15/May/23	12:05	water	✓	✓	✓	✓		
Drinking Water (DW) Samples (client use)		Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)		SAMPLE RECEIPT DETAILS (ALS use only)						
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		E870-0.01mg/L   E-372-U   E378-U		Cooling Method: <input type="checkbox"/> NONE <input type="checkbox"/> ICE <input checked="" type="checkbox"/> ICE PACKS <input type="checkbox"/> FROZEN <input type="checkbox"/> COOLING INITIATED						
Are samples for human consumption/ use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		@ please filter within 48 hrs   0.002 mg/L   0.001 mg/L		Submission Comments identified on Sample Receipt Notification: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO						
				Cooler Custody Seals Intact: <input type="checkbox"/> YES <input checked="" type="checkbox"/> N/A Sample Custody Seals Intact: <input type="checkbox"/> YES <input checked="" type="checkbox"/> N/A						
				INITIAL COOLER TEMPERATURES °C: FINAL COOLER TEMPERATURES °C: 11						
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (ALS use only)		FINAL SHIPMENT RECEPTION (ALS use only)						
Released by: Aaron Androsoff Date: May 15 2023 Time: 13:00		Received by: Date: Time:		Received by: SC Date: MAY 16 2023 Time: 8:15 am						



## CERTIFICATE OF ANALYSIS

<p><b>Work Order</b> : <b>VA23B8904</b></p> <p><b>Client</b> : <b>The British Columbia Conservation Foundation</b></p> <p><b>Contact</b> : Aaron Androsoff</p> <p><b>Address</b> : 105 - 1885 Boxwood Rd Nanaimo BC Canada V9S 5X9</p> <p><b>Telephone</b> : ----</p> <p><b>Project</b> : 1304015</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : 20-1065177</p> <p><b>Sampler</b> : AA</p> <p><b>Site</b> : ----</p> <p><b>Quote number</b> : VA23-BCCF100-001 (Enos Lake Project)</p> <p><b>No. of samples received</b> : 4</p> <p><b>No. of samples analysed</b> : 4</p>	<p><b>Page</b> : 1 of 3</p> <p><b>Laboratory</b> : ALS Environmental - Vancouver</p> <p><b>Account Manager</b> : Sneha Sansare</p> <p><b>Address</b> : 8081 Lougheed Highway Burnaby BC Canada V5A 1W9</p> <p><b>Telephone</b> : +1 604 253 4188</p> <p><b>Date Samples Received</b> : 16-Aug-2023 08:45</p> <p><b>Date Analysis Commenced</b> : 16-Aug-2023</p> <p><b>Issue Date</b> : 24-Aug-2023 10:20</p>
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This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

### Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Kim Jensen	Department Manager - Metals	Inorganics, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia



## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances  
 LOR: Limit of Reporting (detection limit).

Unit	Description
µg/L	micrograms per litre
mg/L	milligrams per litre

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

## Analytical Results

Sub-Matrix: Water					Client sample ID	SWMP 03-1m	SWMP 03-5m	SWMP 03-5m(REP)	SWMP 03-10M	----
(Matrix: Water)					Client sampling date / time	15-Aug-2023 12:53	15-Aug-2023 12:58	15-Aug-2023 01:05	15-Aug-2023 00:00	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA23B8904-001	VA23B8904-002	VA23B8904-003	VA23B8904-004	-----	
					Result	Result	Result	Result	----	
<b>Anions and Nutrients</b>										
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U/VA	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----	
Phosphorus, total	7723-14-0	E372-U/VA	0.0020	mg/L	0.0086	0.0227	0.0162	0.0203	----	
<b>Plant Pigments</b>										
Chlorophyll a	479-61-8	E870/VA	0.010	µg/L	3.55	5.89	6.25	7.88	----	

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.







## QUALITY CONTROL INTERPRETIVE REPORT

<p><b>Work Order</b> : <b>VA23B8904</b></p> <p><b>Client</b> : <b>The British Columbia Conservation Foundation</b></p> <p><b>Contact</b> : Aaron Androsoff</p> <p><b>Address</b> : 105 - 1885 Boxwood Rd Nanaimo BC Canada V9S 5X9</p> <p><b>Telephone</b> : ----</p> <p><b>Project</b> : 1304015</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : 20-1065177</p> <p><b>Sampler</b> : AA</p> <p><b>Site</b> : ----</p> <p><b>Quote number</b> : VA23-BCCF100-001 (Enos Lake Project)</p> <p><b>No. of samples received</b> : 4</p> <p><b>No. of samples analysed</b> : 4</p>	<p><b>Page</b> : 1 of 6</p> <p><b>Laboratory</b> : ALS Environmental - Vancouver</p> <p><b>Account Manager</b> : Sneha Sansare</p> <p><b>Address</b> : 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9</p> <p><b>Telephone</b> : +1 604 253 4188</p> <p><b>Date Samples Received</b> : 16-Aug-2023 08:45</p> <p><b>Issue Date</b> : 24-Aug-2023 10:21</p>
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This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

**Key**

- Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
- CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
- DQO: Data Quality Objective.
- LOR: Limit of Reporting (detection limit).
- RPD: Relative Percent Difference.

### Workorder Comments

Holding times are displayed as "----" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

### Summary of Outliers

#### Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

#### Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

***Outliers : Analysis Holding Time Compliance (Breaches)***

- Analysis Holding Time Outliers exist - please see following pages for full details.

***Outliers : Frequency of Quality Control Samples***

- No Quality Control Sample Frequency Outliers occur.



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times Rec Actual		Eval	Analysis Date	Holding Times Rec Actual		Eval	
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>											
HDPE SWMP 03-10M	E378-U	15-Aug-2023	18-Aug-2023	3 days	3 days	✓	19-Aug-2023	3 days	4 days	*	EHT
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>											
HDPE SWMP 03-1m	E378-U	15-Aug-2023	18-Aug-2023	3 days	3 days	✓	19-Aug-2023	3 days	4 days	*	EHT
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>											
HDPE SWMP 03-5m	E378-U	15-Aug-2023	18-Aug-2023	3 days	3 days	✓	19-Aug-2023	3 days	4 days	*	EHT
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>											
HDPE SWMP 03-5m(REP)	E378-U	15-Aug-2023	18-Aug-2023	3 days	3 days	✓	19-Aug-2023	3 days	4 days	*	EHT
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>											
Amber glass total (sulfuric acid) SWMP 03-1m	E372-U	15-Aug-2023	22-Aug-2023	28 days	7 days	✓	23-Aug-2023	28 days	8 days	✓	
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>											
Amber glass total (sulfuric acid) SWMP 03-5m	E372-U	15-Aug-2023	22-Aug-2023	28 days	7 days	✓	23-Aug-2023	28 days	8 days	✓	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>										
<b>Amber glass total (sulfuric acid)</b> SWMP 03-10M	E372-U	15-Aug-2023	22-Aug-2023	28 days	7 days	✓	23-Aug-2023	28 days	9 days	✓
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>										
<b>Amber glass total (sulfuric acid)</b> SWMP 03-5m(REP)	E372-U	15-Aug-2023	22-Aug-2023	28 days	7 days	✓	23-Aug-2023	28 days	9 days	✓
<b>Plant Pigments : Chlorophyll-a by Fluorometry</b>										
<b>Opaque HDPE</b> SWMP 03-1m	E870	15-Aug-2023	17-Aug-2023	2 days	2 days	* EHT	21-Aug-2023	672 hrs	4 days	✓
<b>Plant Pigments : Chlorophyll-a by Fluorometry</b>										
<b>Opaque HDPE</b> SWMP 03-5m	E870	15-Aug-2023	17-Aug-2023	2 days	2 days	* EHT	21-Aug-2023	672 hrs	4 days	✓
<b>Plant Pigments : Chlorophyll-a by Fluorometry</b>										
<b>Opaque HDPE</b> SWMP 03-10M	E870	15-Aug-2023	16-Aug-2023	2 days	2 days	✓	21-Aug-2023	672 hrs	5 days	✓
<b>Plant Pigments : Chlorophyll-a by Fluorometry</b>										
<b>Opaque HDPE</b> SWMP 03-5m(REP)	E870	15-Aug-2023	16-Aug-2023	2 days	2 days	✓	21-Aug-2023	672 hrs	5 days	✓

**Legend & Qualifier Definitions**

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).



## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	1091772	1	17	5.8	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1096420	1	15	6.6	5.0	✔
<b>Laboratory Control Samples (LCS)</b>							
Chlorophyll-a by Fluorometry	E870	1088660	2	26	7.6	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	1091772	1	17	5.8	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1096420	1	15	6.6	5.0	✔
<b>Method Blanks (MB)</b>							
Chlorophyll-a by Fluorometry	E870	1088660	2	26	7.6	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	1091772	1	17	5.8	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1096420	1	15	6.6	5.0	✔
<b>Matrix Spikes (MS)</b>							
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	1091772	1	17	5.8	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1096420	1	15	6.6	5.0	✔



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

<i>Analytical Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U ALS Environmental - Vancouver	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U ALS Environmental - Vancouver	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.  Field filtration is recommended to ensure test results represent conditions at time of sampling.
Chlorophyll-a by Fluorometry	E870 ALS Environmental - Vancouver	Water	EPA 445.0 (mod)	Chlorophyll a is determined by solvent extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.
<i>Preparation Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Digestion for Total Phosphorus in water	EP372 ALS Environmental - Vancouver	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Chlorophyll-a Extraction	EP870 ALS Environmental - Vancouver	Water	EPA 445.0 (mod)	Chlorophyll-a solvent extraction.



## QUALITY CONTROL REPORT

<p><b>Work Order</b> : <b>VA23B8904</b></p> <p><b>Client</b> : The British Columbia Conservation Foundation</p> <p><b>Contact</b> : Aaron Androsoff</p> <p><b>Address</b> : 105 - 1885 Boxwood Rd Nanaimo BC Canada V9S 5X9</p> <p><b>Telephone</b> :</p> <p><b>Project</b> : 1304015</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : 20-1065177</p> <p><b>Sampler</b> : AA        ----</p> <p><b>Site</b> : ----</p> <p><b>Quote number</b> : VA23-BCCF100-001 (Enos Lake Project)</p> <p><b>No. of samples received</b> : 4</p> <p><b>No. of samples analysed</b> : 4</p>	<p><b>Page</b> : 1 of 4</p> <p><b>Laboratory</b> : ALS Environmental - Vancouver</p> <p><b>Account Manager</b> : Sneha Sansare</p> <p><b>Address</b> : 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9</p> <p><b>Telephone</b> : +1 604 253 4188</p> <p><b>Date Samples Received</b> : 16-Aug-2023 08:45</p> <p><b>Date Analysis Commenced</b> : 16-Aug-2023</p> <p><b>Issue Date</b> : 24-Aug-2023 10:19</p>
--	--

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

### Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Kim Jensen	Department Manager - Metals	Vancouver Inorganics, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Vancouver Inorganics, Burnaby, British Columbia





## General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

- Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
- CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
- DQO = Data Quality Objective.
- LOR = Limit of Reporting (detection limit).
- RPD = Relative Percent Difference
- # = Indicates a QC result that did not meet the ALS DQO.

## Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

## Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Anions and Nutrients (QC Lot: 1091772)</b>											
KS2303026-001	Anonymous	Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0100	mg/L	0.160	0.158	1.26%	20%	----
<b>Anions and Nutrients (QC Lot: 1096420)</b>											
VA23B8904-001	SWMP 03-1m	Phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0086	0.0066	0.0019	Diff <2x LOR	----



### Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Anions and Nutrients (QCLot: 1091772)</b>						
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
<b>Anions and Nutrients (QCLot: 1096420)</b>						
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
<b>Plant Pigments (QCLot: 1088660)</b>						
Chlorophyll a	479-61-8	E870	0.01	µg/L	<0.010	----
<b>Plant Pigments (QCLot: 1090973)</b>						
Chlorophyll a	479-61-8	E870	0.01	µg/L	<0.010	----

### Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Anions and Nutrients (QCLot: 1091772)</b>									
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 mg/L	107	80.0	120	----
<b>Anions and Nutrients (QCLot: 1096420)</b>									
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.05 mg/L	91.2	80.0	120	----
<b>Plant Pigments (QCLot: 1088660)</b>									
Chlorophyll a	479-61-8	E870	0.01	µg/L	5 µg/L	91.1	80.0	120	----
<b>Plant Pigments (QCLot: 1090973)</b>									
Chlorophyll a	479-61-8	E870	0.01	µg/L	5 µg/L	91.0	80.0	120	----



## Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level  $\geq$  1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Anions and Nutrients (QCLot: 1091772)</b>										
VA23B8904-001	SWMP 03-1m	Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0318 mg/L	0.03 mg/L	106	70.0	130	----
<b>Anions and Nutrients (QCLot: 1096420)</b>										
VA23B8904-002	SWMP 03-5m	Phosphorus, total	7723-14-0	E372-U	0.0446 mg/L	0.05 mg/L	89.2	70.0	130	----



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Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

COC Number: 20 - 1065177

Page 1 of 1

<b>Report To</b> Contact and company name below will appear on the final report		<b>Reports / Recipients</b>			<b>Turnaround Time (TAT) Requested</b>			<b>AFFIX ALS BARCODE LABEL HERE</b> (ALS use only)			
Company:	BC Conservation Foundation	Select Report Format:	<input checked="" type="checkbox"/> PDF <input type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL)	<input type="checkbox"/> Routine [R] if received by 3pm M-F - no surcharges apply <input type="checkbox"/> 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum <input type="checkbox"/> 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum <input type="checkbox"/> 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum <input type="checkbox"/> 1 day [P1] if received by 3pm M-F - 100% rush surcharge minimum <input type="checkbox"/> Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests							
Contact:	Aaron Androsco	Merge QC/QCI Reports with COA	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	Date and Time Required for all E&P TATs: dd-mm-yy hh:mm am/pm							
Phone:	728-957-2591	Compare Results to Criteria on Report - provide details below if box checked		For all tests with rush TATs requested, please contact your AM to confirm availability.			<b>Analysis Request</b>				
Company address below will appear on the final report		Select Distribution:	<input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX				Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below				
Street:	#105-1885 Boxwood Rd.	Email 1 or Fax:					<b>NUMBER OF CONTAINERS</b> chlorophyll a Total Phosphorus Orthophosphate (dissolve d)	<b>SAMPLES ON HOLD</b> EXTENDED STORAGE REQUIRED SUSPECTED HAZARD (see notes)			
City/Province:	Nanaimo BC	Email 2:	aandrosco@bccf.com								
Postal Code:	V9T 8A6	Email 3:									
Invoice To:	Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	<b>Invoice Recipients</b>									
Contact:		Select Invoice Distribution:	<input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX								
Project Information		Oil and Gas Required Fields (client use)									
ALS Account # / Quote #:	BCCF ENDS LAKE	AFE/Cost Center:	PO#:								
Job #:	1304015	Major/Minor Code:	Routing Code:								
PO / AFE:		Requisitioner:									
LSD:		Location:									
ALS Lab Work Order # (ALS use only):		ALS Contact:	Sneha Sansare	Sampler:	AA						
ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mm-yy)	Time (hh:mm)	Sample Type							
	SWMP 03 - 1m	08/15/23	12:53	W	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
	SWMP 03 - 5m	08/15/23	12:58	W	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
	SWMP 03 - 5m (rep)	08/15/23	1:05	W	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
	SWMP 03 - 10m			W	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
<b>Drinking Water (DW) Samples (client use)</b>		<b>Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)</b>			<b>SAMPLE RECEIPT DETAILS (ALS use only)</b>						
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		E870 - 0.01mg/L   E-372-U   E378-U			Cooling Method: <input type="checkbox"/> NONE <input type="checkbox"/> ICE <input checked="" type="checkbox"/> ICE PACKS <input type="checkbox"/> FROZEN <input type="checkbox"/> COOLING INITIATED						
Are samples for human consumption/ use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		⊗ please filter within 48 hrs			Submission Comments identified on Sample Receipt Notification: <input type="checkbox"/> YES <input type="checkbox"/> NO						
		a.002 mg/L   0.001 mg/L			Cooler Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A Sample Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A						
					INITIAL COOLER TEMPERATURES °C: FINAL COOLER TEMPERATURES °C: 15						
<b>SHIPMENT RELEASE (client use)</b>		<b>INITIAL SHIPMENT RECEPTION (ALS use only)</b>			<b>FINAL SHIPMENT RECEPTION (ALS use only)</b>						
Released by:	Aaron Androsco	Date:	Aug 15, 2023	Time:	14:42	Received by:	JC	Date:	16/8/23	Time:	8:45am

Environmental Division  
 Vancouver  
 Work Order Reference  
**VA23B8904**  
  
 Telephone : +1 604 263 4188



## CERTIFICATE OF ANALYSIS

<p><b>Work Order</b> : <b>VA23C7438</b></p> <p><b>Client</b> : <b>The British Columbia Conservation Foundation</b></p> <p><b>Contact</b> : Aaron Androsoff</p> <p><b>Address</b> : 105 - 1885 Boxwood Rd Nanaimo BC Canada V9S 5X9</p> <p><b>Telephone</b> : ----</p> <p><b>Project</b> : 1304015</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : 20-1018397</p> <p><b>Sampler</b> : AA</p> <p><b>Site</b> : ----</p> <p><b>Quote number</b> : VA23-BCCF100-001 (Enos Lake Project)</p> <p><b>No. of samples received</b> : 4</p> <p><b>No. of samples analysed</b> : 4</p>	<p><b>Page</b> : 1 of 3</p> <p><b>Laboratory</b> : ALS Environmental - Vancouver</p> <p><b>Account Manager</b> : Sneha Sansare</p> <p><b>Address</b> : 8081 Lougheed Highway Burnaby BC Canada V5A 1W9</p> <p><b>Telephone</b> : +1 604 253 4188</p> <p><b>Date Samples Received</b> : 15-Nov-2023 09:00</p> <p><b>Date Analysis Commenced</b> : 15-Nov-2023</p> <p><b>Issue Date</b> : 23-Nov-2023 22:48</p>
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This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

### Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Leon Yang	Analyst	Inorganics, Burnaby, British Columbia



## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances  
 LOR: Limit of Reporting (detection limit).

Unit	Description
µg/L	micrograms per litre
mg/L	milligrams per litre

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

## Analytical Results

Sub-Matrix: Water

(Matrix: Water)

					Client sample ID	SWMP 03 -1m	SWMP 03 -1m (rep)	SWMP 03 -5m	SWMP 03 -10m	----
					Client sampling date / time	14-Nov-2023 12:40	14-Nov-2023 12:40	14-Nov-2023 12:47	14-Nov-2023 12:50	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA23C7438-001	VA23C7438-002	VA23C7438-003	VA23C7438-004	-----	----
					Result	Result	Result	Result	-----	----
<b>Anions and Nutrients</b>										
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U/VA	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	----
Phosphorus, total	7723-14-0	E372-U/VA	0.0020	mg/L	0.0135	0.0133	0.0143	0.0122	0.0122	----
<b>Plant Pigments</b>										
Chlorophyll a	479-61-8	E870/VA	0.010	µg/L	11.4	12.0	10.5	10.6	10.6	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.





## QUALITY CONTROL INTERPRETIVE REPORT

<p><b>Work Order</b> : <b>VA23C7438</b></p> <p><b>Client</b> : <b>The British Columbia Conservation Foundation</b></p> <p><b>Contact</b> : Aaron Androsoff</p> <p><b>Address</b> : 105 - 1885 Boxwood Rd Nanaimo BC Canada V9S 5X9</p> <p><b>Telephone</b> : ----</p> <p><b>Project</b> : 1304015</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : 20-1018397</p> <p><b>Sampler</b> : AA</p> <p><b>Site</b> : ----</p> <p><b>Quote number</b> : VA23-BCCF100-001 (Enos Lake Project)</p> <p><b>No. of samples received</b> : 4</p> <p><b>No. of samples analysed</b> : 4</p>	<p><b>Page</b> : 1 of 6</p> <p><b>Laboratory</b> : ALS Environmental - Vancouver</p> <p><b>Account Manager</b> : Sneha Sansare</p> <p><b>Address</b> : 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9</p> <p><b>Telephone</b> : +1 604 253 4188</p> <p><b>Date Samples Received</b> : 15-Nov-2023 09:00</p> <p><b>Issue Date</b> : 23-Nov-2023 22:48</p>
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This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

**Key**

- Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
- CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
- DQO: Data Quality Objective.
- LOR: Limit of Reporting (detection limit).
- RPD: Relative Percent Difference.

### ***Workorder Comments***

Holding times are displayed as "----" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

### ***Summary of Outliers***

#### ***Outliers : Quality Control Samples***

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

#### ***Outliers: Reference Material (RM) Samples***

- No Reference Material (RM) Sample outliers occur.



***Outliers : Analysis Holding Time Compliance (Breaches)***

- No Analysis Holding Time Outliers exist.

***Outliers : Frequency of Quality Control Samples***

- No Quality Control Sample Frequency Outliers occur.



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)</b>											
HDPE SWMP 03 -10m	E378-U	14-Nov-2023	16-Nov-2023	3 days	2 days	✔	16-Nov-2023	3 days	2 days	✔	
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)</b>											
HDPE SWMP 03 -1m	E378-U	14-Nov-2023	16-Nov-2023	3 days	2 days	✔	16-Nov-2023	3 days	2 days	✔	
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)</b>											
HDPE SWMP 03 -1m (rep)	E378-U	14-Nov-2023	16-Nov-2023	3 days	2 days	✔	16-Nov-2023	3 days	2 days	✔	
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)</b>											
HDPE SWMP 03 -5m	E378-U	14-Nov-2023	16-Nov-2023	3 days	2 days	✔	16-Nov-2023	3 days	2 days	✔	
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>											
Amber glass total (sulfuric acid) SWMP 03 -10m	E372-U	14-Nov-2023	22-Nov-2023	28 days	8 days	✔	23-Nov-2023	28 days	9 days	✔	
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>											
Amber glass total (sulfuric acid) SWMP 03 -1m	E372-U	14-Nov-2023	22-Nov-2023	28 days	8 days	✔	23-Nov-2023	28 days	9 days	✔	
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>											
Amber glass total (sulfuric acid) SWMP 03 -1m (rep)	E372-U	14-Nov-2023	22-Nov-2023	28 days	8 days	✔	23-Nov-2023	28 days	9 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>										
<b>Amber glass total (sulfuric acid)</b> SWMP 03 -5m	E372-U	14-Nov-2023	22-Nov-2023	28 days	8 days	✔	23-Nov-2023	28 days	9 days	✔
<b>Plant Pigments : Chlorophyll-a by Fluorometry</b>										
<b>Opaque HDPE</b> SWMP 03 -10m	E870	14-Nov-2023	15-Nov-2023	2 days	1 days	✔	16-Nov-2023	28 days	1 days	✔
<b>Plant Pigments : Chlorophyll-a by Fluorometry</b>										
<b>Opaque HDPE</b> SWMP 03 -1m	E870	14-Nov-2023	15-Nov-2023	2 days	1 days	✔	16-Nov-2023	28 days	1 days	✔
<b>Plant Pigments : Chlorophyll-a by Fluorometry</b>										
<b>Opaque HDPE</b> SWMP 03 -1m (rep)	E870	14-Nov-2023	15-Nov-2023	2 days	1 days	✔	16-Nov-2023	28 days	1 days	✔
<b>Plant Pigments : Chlorophyll-a by Fluorometry</b>										
<b>Opaque HDPE</b> SWMP 03 -5m	E870	14-Nov-2023	15-Nov-2023	2 days	1 days	✔	16-Nov-2023	28 days	1 days	✔

**Legend & Qualifier Definitions**

Rec. HT: ALS recommended hold time (see units).



## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	1240014	1	15	6.6	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1248129	1	8	12.5	5.0	✔
<b>Laboratory Control Samples (LCS)</b>							
Chlorophyll-a by Fluorometry	E870	1237933	1	4	25.0	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	1240014	1	15	6.6	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1248129	1	8	12.5	5.0	✔
<b>Method Blanks (MB)</b>							
Chlorophyll-a by Fluorometry	E870	1237933	1	4	25.0	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	1240014	1	15	6.6	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1248129	1	8	12.5	5.0	✔
<b>Matrix Spikes (MS)</b>							
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	1240014	1	15	6.6	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1248129	1	8	12.5	5.0	✔



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

<i>Analytical Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U ALS Environmental - Vancouver	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U ALS Environmental - Vancouver	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.  Field filtration is recommended to ensure test results represent conditions at time of sampling.
Chlorophyll-a by Fluorometry	E870 ALS Environmental - Vancouver	Water	EPA 445.0 (mod)	Chlorophyll a is determined by solvent extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.
<i>Preparation Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Digestion for Total Phosphorus in water	EP372 ALS Environmental - Vancouver	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Chlorophyll-a Extraction	EP870 ALS Environmental - Vancouver	Water	EPA 445.0 (mod)	Chlorophyll-a solvent extraction.

## QUALITY CONTROL REPORT

<p><b>Work Order</b> : <b>VA23C7438</b></p> <p>Client : The British Columbia Conservation Foundation</p> <p>Contact : Aaron Androsoff</p> <p>Address : 105 - 1885 Boxwood Rd Nanaimo BC Canada V9S 5X9</p> <p>Telephone : </p> <p>Project : 1304015</p> <p>PO : ----</p> <p>C-O-C number : 20-1018397</p> <p>Sampler : AA ----</p> <p>Site : ----</p> <p>Quote number : VA23-BCCF100-001 (Enos Lake Project)</p> <p>No. of samples received : 4</p> <p>No. of samples analysed : 4</p>	<p>Page : 1 of 4</p> <p>Laboratory : ALS Environmental - Vancouver</p> <p>Account Manager : Sneha Sansare</p> <p>Address : 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9</p> <p>Telephone : +1 604 253 4188</p> <p>Date Samples Received : 15-Nov-2023 09:00</p> <p>Date Analysis Commenced : 15-Nov-2023</p> <p>Issue Date : 23-Nov-2023 22:48</p>
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This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

### Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Leon Yang	Analyst	Vancouver Inorganics, Burnaby, British Columbia



## General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

- Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
- CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
- DQO = Data Quality Objective.
- LOR = Limit of Reporting (detection limit).
- RPD = Relative Percent Difference
- # = Indicates a QC result that did not meet the ALS DQO.

## Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

## Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Anions and Nutrients (QC Lot: 1240014)</b>											
KS2304377-001	Anonymous	Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0100	mg/L	0.106	0.106	0.548%	20%	----
<b>Anions and Nutrients (QC Lot: 1248129)</b>											
VA23C7438-001	SWMP 03 -1m	Phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0135	0.0128	0.0006	Diff <2x LOR	----



### Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Anions and Nutrients (QCLot: 1240014)</b>						
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
<b>Anions and Nutrients (QCLot: 1248129)</b>						
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
<b>Plant Pigments (QCLot: 1237933)</b>						
Chlorophyll a	479-61-8	E870	0.01	µg/L	<0.010	----

### Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: Water

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
<b>Anions and Nutrients (QCLot: 1240014)</b>									
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 mg/L	108	80.0	120	----
<b>Anions and Nutrients (QCLot: 1248129)</b>									
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.05 mg/L	94.0	80.0	120	----
<b>Plant Pigments (QCLot: 1237933)</b>									
Chlorophyll a	479-61-8	E870	0.01	µg/L	5 µg/L	95.6	80.0	120	----

### Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: Water

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Anions and Nutrients (QCLot: 1240014)</b>										
VA23C7347-001	Anonymous	Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	ND mg/L	0.03 mg/L	ND	70.0	130	----
<b>Anions and Nutrients (QCLot: 1248129)</b>										
VA23C7438-002	SWMP 03 -1m (rep)	Phosphorus, total	7723-14-0	E372-U	0.0460 mg/L	0.05 mg/L	92.0	70.0	130	----



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Work Order : VA23C7438  
Client : The British Columbia Conservation Foundation  
Project : 1304015

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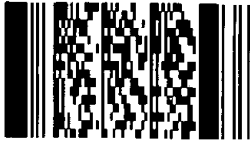


Chain of Custody (COC) / Analytical Request Form

COC Number: 20 - 1018397

Canada Toll Free: 1 800 668 9878

Page of

<b>Report To</b> Contact and company name below will appear on the final report Company: <b>BC Conservation Foundation</b> Contact: <b>Aaron Androsoff</b> Phone: <b>778-957-7591</b> Company address below will appear on the final report Street: <b>#105 - 1885 Boxwood Road</b> City/Province: <b>Nanaimo BC</b> Postal Code: <b>V9T 0A6</b>		<b>Reports / Recipients</b> Select Report Format: <input checked="" type="checkbox"/> PDF <input type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL) Merge QC/QCI Reports with COA <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX Email 1 or Fax: <b>aandrosoff@bcclp.com</b> Email 2: Email 3:		<b>Turnaround Time (TAT) Requested</b> <input type="checkbox"/> Routine [R] if received by 3pm M-F - no surcharges apply <input type="checkbox"/> 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum <input type="checkbox"/> 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum <input type="checkbox"/> 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum <input type="checkbox"/> 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum <input type="checkbox"/> Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests Date and Time Required for all E&P TATs: dd-mm-yy hh:mm am/pm For all tests with rush TATs requested, please contact your AM to confirm availability.		<b>AFFIX ALS BARCODE LABEL HERE</b> (ALS use only)					
<b>Invoice To</b> Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Copy of Invoice with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		<b>Invoice Recipients</b> Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX Email 1 or Fax: <b>aandrosoff@bcclp.com</b> Email 2: <b>rguxhelli@bcclp.com</b>		<b>Analysis Request</b> Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below							
<b>Project Information</b> ALS Account # / Quote # <b>BCCLP ENOS LAKE</b> Job #: <b>1304015</b> PO / AFE: LSD:		<b>Oil and Gas Required Fields (client use)</b> AFE/Cost Center: PO# Major/Minor Code: Routing Code: Requisitioner: Location:		<b>NUMBER OF CONTAINERS</b> Chlorophyll a Total Phosphorus Ortho phosphates (arsenite)		<b>SAMPLES ON HOLD</b> <b>EXTENDED STORAGE REQUIRED</b> <b>SUSPECTED HAZARD (see notes)</b>					
ALS Lab Work Order # (ALS use only): <b>7438</b>		ALS Contact: <b>Sneha Sanbarr</b>		Sampler: <b>AA</b>		<div style="border: 1px solid black; padding: 5px;"> <p>Environmental Division Vancouver Work Order Reference <b>VA23C7438</b></p>  <p>Telephone: +1 604 253 4188</p> </div>					
<b>ALS Sample # (ALS use only)</b>		<b>Sample Identification and/or Coordinates (This description will appear on the report)</b>		<b>Date (dd-mm-yy)</b>				<b>Time (hh:mm)</b>		<b>Sample Type</b>	
		<b>SWMP 03 - 2m</b>		<b>14/Nov/23</b>				<b>12:40</b>		<b>3</b>	
		<b>SWMP 03 - 2m (rep)</b>		<b>11</b>				<b>12:40</b>		<b>3</b>	
		<b>SWMP 03 - 5m</b>		<b>11</b>				<b>12:47</b>		<b>3</b>	
		<b>SWMP 03 - 10m</b>		<b>11</b>		<b>12:50</b>		<b>3</b>			
<b>Drinking Water (DW) Samples<sup>1</sup> (client use)</b> Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Are samples for human consumption/ use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only) <b>E870 - 0.01 mg/L</b> <b>⊗ please Filter within 48 hrs</b> <b>E-372-U</b> <b>0.002 mg/L</b> <b>E378-U</b> <b>0.001 mg/L</b>		<b>Cooling Method:</b> <input type="checkbox"/> NONE <input type="checkbox"/> ICE <input checked="" type="checkbox"/> ICE PACKS <input type="checkbox"/> FROZEN <input type="checkbox"/> COOLING INITIATED <b>Submission Comments identified on Sample Receipt Notification:</b> <input type="checkbox"/> YES <input type="checkbox"/> NO <b>Cooler Custody Seals Intact:</b> <input type="checkbox"/> YES <input type="checkbox"/> N/A <b>Sample Custody Seals Intact:</b> <input type="checkbox"/> YES <input type="checkbox"/> N/A <b>INITIAL COOLER TEMPERATURES °C</b> <b>FINAL COOLER TEMPERATURES °C</b> <b>3</b>							
<b>SHIPMENT RELEASE (client use)</b> Released by: <b>Aaron Androsoff</b> Date: <b>Nov 14, 2023</b> Time: <b>14:15</b>		<b>INITIAL SHIPMENT RECEPTION (ALS use only)</b> Received by: Date: Time:		<b>FINAL SHIPMENT RECEPTION (ALS use only)</b> Received by: <b>JC</b> Date: <b>15-11-23</b> Time: <b>9am</b>							