Azimuth Consulting Group Partnership
218-2902 West Broadway
Vancouver, BC
Canada V6K 2G8

Phone: 604-730-1220
www.azimuthgroup.ca

Memorandum

Date: **May 23, 2019**

To: **Jamie Quesnel and Michel Groleau**

From: **Eric Franz and Gary Mann**

Our File: **AEM-19-03/WTP Permitting**

RE: **Whale Tail Permitting Support – Lake D1 and Lake D5 Baseline Aquatic Receiving Environment Data Memorandum (August 2018 to March 2019)**

This report was prepared by Azimuth Consulting Group Partnership (Azimuth) on behalf of Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle). This memorandum summarizes the baseline aquatic environment data collected between August 2018 and March 2019 at Lake D1 and Lake D5 to support the permitting process for the Whale Tail Pit Expansion Project.

Report Version

Version	Dates	Distribution
Draft for client review	Report issued: May 2, 2019	Jamie Quesnel (Agnico Eagle) Michel Groleau (Agnico Eagle)
Final version	Report issued: May 23, 2019	Jamie Quesnel (Agnico Eagle) Michel Groleau (Agnico Eagle)

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

1.1. Whale Tail Project

The Amaruq property is a 408 square kilometre (km^2) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km northwest of Meadowbank Mine in the Kivalliq Region of Nunavut (**Figure 1**). The initial phase of mining (i.e., the Approved Project) applies to the Whale Tail Pit deposit located at the north end of Whale Tail Lake. Mining the satellite deposit was approved under Nunavut Impact Review Board (NIRB) Project Certificate No. 008 (March 15, 2018) and Nunavut Water Board (NWB) Type A Water Use Licence 2AM-WTP1826 (July 11, 2018). Ore from the Project will be hauled to the Meadowbank Mine for milling under the existing Project Certificate (No. 004) and Water Use Licence (2AM-MEA1526).

Subsequent to the Approval of the Whale Tail Pit Project, Agnico Eagle submitted an Addendum to the FEIS (Golder, 2018) to expand and extend the Approved Whale Tail Pit Project (Approved Project) to include development of a larger Whale Tail Pit, IVR Pit (and associated waste rock storage facility and attenuation pond), and an underground mining operation. Collectively, these proposed developments are referred to as the "Expansion Project". The Expansion will expand the footprint of the Project within the Regional Study Area of the Approved Project, generate water that will require management, treatment, and discharge during the operations phase, and will extend the duration of the closure phase to refill the pits and underground mine. The aspects of water management plan in the Approved Project were not significantly altered to accommodate proposed changes in the Expansion Project[1]. Treated effluent will still be discharge to Mammoth Lake and Whale Tail Lake South basin, but alternate locations (Lake D1 and D5) are being considered as part of the Expansion.

1.2. Overview of the Baseline Program

Baseline sampling was completed at Lake D1 (**Figure 2**) and Lake D5 (**Figure 3**) beginning in August 2018. The study design followed the framework for the Core Receiving Environment Monitoring Program (CREMP) as outlined in the *Whale Tail Pit Addendum* (Azimuth 2018b), which mirrors the CREMP study design regarding monitoring components, the approach to sampling (SOPs), the QA/QC program, and data evaluation (Azimuth, 2015a). The purpose of the sampling program at Lake D1 and D5 is to provide baseline information on water quality, sediment chemistry, and biological communities (i.e., phytoplankton and benthic invertebrate taxonomy) in the event that one or both of the lakes is selected as an alternate discharge location for the Expansion Project.

[1] Details of the water management plan for the Expansion Project are provided in Golder (2018).

The components of the baseline freshwater monitoring program include:

- *In situ* water quality measurements (i.e., pH, DO, temperature, and specific conductivity)
- Water chemistry (e.g., metals concentrations [total and dissolved], nutrients, anions)
- Sediment chemistry (i.e., metals concentrations, particle size, TOC)
- Phytoplankton community
- Benthic invertebrate community

Bathymetry mapping of the north basin of Lake D1 and the majority of Lake D5 was completed during the August 2018 sampling event. The real-time bathymetry data were used to identify suitable sampling areas for collecting sediment and benthic invertebrates.

Table 1. Summary of baseline sampling at Lake D1 and Lake D5 in 2018 and 2019.

Year	Water Quality[1] and Phytoplankton Taxonomy	Sediment Chemistry	Benthos Taxonomy
2018	August, September, November	August[2]	August
2019	March (completed) May, July, August, and September (pending)	August (planned)	August (planned)

1. Water quality includes samples (n=2) for chemistry and in-situ limnology profiles in each lake for each Monthly event.
2. Sediment grab samples (n=5) and core samples (n=10) were collected in 2018.

2. METHODS AND RESULTS

2.1. Local Study Area

This overview of Lake D1 and D5 is based on field survey results from August 2018 and on information regarding the watershed boundaries and drainage patterns provided in the *2015 Hydrology Baseline for the FEIS* (Appendix C-6; Golder, 2016) and the *FEIS Addendum* for the Whale Tail Pit Expansion (Golder, 2018).

The landscape around the Amaruq property consists of rolling hills and relief with low-growing vegetative cover and poor soil development. Numerous lakes are interspersed among boulder fields, eskers and bedrock outcrops, with three indistinct and complex watersheds (i.e., A, B, and C) that all drain into Lake DS1. Lake D1 and D5 are located in a separate watershed to the south of Amaruq and outside the Hydrology Baseline Study Area as defined in the Approved Project (Golder, 2016).

Lake D1

Lake D1 is located approximately 4 km due south of Whale Tail Lake and west of the Haul Road connecting Meadowbank and Amaruq. In terms of surface area, Lake D1 is among the larger lakes in the study area, measuring approximately 1,390 ha in size. The drainage pattern for Lake D1 has not been formally assessment, but based on the watercourse and elevation data (NRC), the outlet of the lake appears to be located at its southwest corner (**Figure 1**).

At the time of the request to include Lake D1 in the August 2018 sampling event, there was no information regarding where on Lake D1 a potential discharge location would likely be situated. To help plan the August sampling program, a desktop assessment of aerial imagery was completed. The north basin of Lake D1 was deemed the most likely area for finding suitable sediment and benthic invertebrate sampling locations that met the study design requirements for depth (~ 8 m) and sediment composition (predominantly silt / clay). Prior to sampling, a bathymetry survey was completed in the north basin to identify an area where the lake depth was approximately 8 m (± 1.5 m) and relatively flat. The north west portion of the lake met the study design requirements for sediment and benthic invertebrate community sampling.

Lake D5

Lake D5 is located east of the Haul Road approximately 5 km south of the Amaruq camp. The lake is approximately 150 ha in size and is comprised of two main basins. The north basin is larger and more variable in depth. The deepest part of the lake was measured in a trough along the east shore, down-gradient from an esker oriented in a NW to SE direction. The lake bottom quickly drops off along the east shore to between 15 m and 19 m. The south basin is shallower (8 m to 9 m) and had morphological and sediment characteristics that matched the study design targets for sediment and benthic invertebrate sampling.

2.2. Water Quality

2.2.1 Methods

Water quality sampling was complete in August, September, and November in 2018 and March 2019 according to established sampling methods:

- Two sampling locations were monitored in each lake per event
- *In-situ* water quality measurements (pH, temperature, DO, and specific conductance) were collected at each location using a multi-parameter probe. Readings were taken at 1 m intervals to a depth of approximately 1 m above the sediment.

- Surface water samples were collected from each location at a depth of 3 m using a diaphragm pump and tubing. Samples were processed according to the SOP and submitted to ALS Environmental (Burnaby, BC) for analysis as per the routine CREMP.

2.2.2 Results – Limnology

Limnology profiles are shown for August, September, and November 2018, and March 2019 in **Figure 4** to **Figure 7**, respectively. For comparison purposes, the limnology profile data for Lake D1 and D5 are shown alongside the other Whale Tail Study Area Lakes and the reference areas INUG and PDL.

Limnology profiles for Lake D1 and D5 are characteristic of conditions measured at the other study area lakes during the baseline period. There was no evidence of vertical stratification for specific conductivity, temperature, or dissolved oxygen during the open water or ice-covered sampling events. Strong winds are common during the open water season which enhances mixing and maintains uniform temperature and high dissolved oxygen throughout the water column. Conductivity measured approximately 15 µS/cm at Lake D1 and 25 µS/cm during the ice-free period (**Figure 4** [August], **Figure 5** [September]).

2.2.3 Results – Chemistry

Baseline water chemistry data from Lake D1 and D5 are shown in **Table 2**.

Surface water in Lake D1 and D5 is soft, measuring less than 10 mg/L (as $CaCO_3$) in all samples from Lake D1 and less than 15 mg/L in all samples from Lake D5. The buffering capacity of the surface water is also quite low as evidenced by alkalinity concentrations (as bicarbonate) of between 5 mg/L and 13 mg/L, characteristic of low productivity headwater lakes in the Arctic. Consistent with the low turbidity, total suspended solids (TSS) levels were at or below detection (1 mg/L) for all lake samples. Surface water pH is circumneutral, measuring between 6.8 and 7.1 in samples submitted to the lab.

The majority of the chemistry parameters were below their respective MDLs for the samples, including cyanides (free and total), most metals (total and dissolved fractions), nitrates and nitrites, and ammonia (as N) to name a few. There were no metal exceedances of the guidelines for protection of drinking water (Guidelines for Canadian Drinking Water Quality [GCDWQ]) or aquatic life (Canadian Council of Ministers of the Environment [CCME]) in any of the samples from Lake D1 and D5. The Whale Tail study area lakes are generally considered ultra-oligotrophic (i.e., total phosphorous concentrations are typically below 0.004 mg/L), but would sometimes naturally fall into the oligotrophic category (CITE BASELINE WTP AZI); this same pattern was observed in both Lake D1 and D5.

2.3. Sediment Chemistry

2.3.1 Methods

Sediment sampling was conducted in August 2018 according to the SOP for the CREMP (Azimuth, 2015):

- Sediment sampling areas were established in each lake in areas where the total water depth was between 6.5 m and 9 m over an area approximately 100 m in diameter.
- Sediment grabs were collected at five replicate stations synoptic with samples collected for benthic invertebrate taxonomy. Replicate stations were located a minimum of 20 m apart. Samples were collected using a Petite Ponar grab sampler (6”x6”) and each sample was a composite of two grabs. Samples were analyzed for metals, total organic carbon, and grain size. One composite sample per area was submitted for analysis of mineral oil and grease and hydrocarbons.
- 10 replicate sediment cores were collected within the sampling area. Replicate samples were located a minimum of 10 m apart. Each core sample consisted of the top 1.5 cm of sediment. Sediment core samples were analyzed for metals, pH and moisture. Sediment cores are collected to provide better resolution for overlying, fine surficial sediments than can generally be achieved by grab sampling alone.
- Sediment grab and core samples were submitted to ALS Environmental for analysis. A complete list of the sediment parameters, detection limits, data quality objectives, and method references is present in Table 1 of the SOP (Azimuth, 2015).

2.3.2 Results

Chemistry results from the 2018 sediment are shown in the following tables:

- **Table 3:** Sediment grab chemistry results (metals, TOC, grain size)
- **Table 4:** Sediment core chemistry results (metals)
- **Table 5:** Sediment hydrocarbon results from composite samples

The sediment chemistry data were screened against the available CCME sediment quality guidelines (ie., interim sediment quality guidelines [ISQGs] and probable effect level concentrations [PELs]).

The grain size composition of sediment within the sediment / benthos sampling areas is primarily fine silt and clay (<63 µm). TOC content was lower in Lake D1 (3-4 % [dw]) compared to Lake D5 (8-10%). Sediment pH was generally on the acidic side of neutral (4.5 to 6.2), but within the range of pH measured in reference lakes INUG and PDL.

Lake D1 and D5 sediment core samples exceed the ISQG for arsenic and chromium in all 10 replicate samples. Sediments at Lake D5 were slightly more enriched in arsenic (47 mg/kg) and chromium (115

mg/kg) compared to Lake D1 (As = 17 mg/kg; Cr = 88 mg/kg). Lakes in the region are naturally elevated in both arsenic and chromium, including the reference areas INUG (max arsenic in 2018 = 131 mg/kg) and PDL (max chromium concentration = 155 mg/kg) (Azimuth, 2019). The highest arsenic concentrations among the study area lakes were measured in the north basin of Whale Tail Lake (WTN) in 2015 (570 to 1,780 mg/kg). Baseline sediment toxicity tests were completed in 2018 on sediment from Mammoth Lake and WTN to determine if sediments were naturally toxic to benthic invertebrates (*Chironomus dilutus* and *Hyalella azteca*). There was no effect on survival or growth for either test species exposed to WTN or Mammoth Lake sediment. Baseline sediment toxicity test results were reported in the 2018 CREMP Report (Azimuth, 2019).

Other metals that exceed the ISQG in at least one sample include cadmium (Lake D1), copper (Lake D1 and D5), and zinc (Lake D1 and D5). All three metals were less than their respective PEL sediment screening criteria.

2.4. Phytoplankton Community

2.4.1 Methods

Water samples for phytoplankton community assessment were collected synoptically with surface water samples for chemistry during each sampling event. Samples were collected using the same pump and tubing method described above. Water samples were preserved with Lugol's iodine solution and sent to David Findlay (Plankton R Us; Winnipeg, MB) for taxonomic identification, enumeration, and biomass estimates.

2.4.2 Results

Phytoplankton taxonomy data for August, September, and November 2018 are shown in **Table 6**; results for the March 2019 samples were not yet available for inclusion in this baseline data memorandum.

Six major taxonomic groups of phytoplankton are present in the study lakes, namely blue green algae (*Cyanophyta*), green algae (*Chlorophyta*), golden-brown algae (*Chrysophyta*), diatoms (*Cryptophyta*) and dinoflagellates (*Dinoflagellata*). Richness (at the lowest practical level of taxonomy) was relatively consistent in Lake D1 and D5. Between 29 and 34 taxa were identified during the open water sampling events in August and September. By November, the richness of the community had decreased to between 21 and 24 taxa in the four samples from Lake D1 and D5.

Estimates of phytoplankton biomass in Lake D1 and D5 varied slightly between the two lakes during the open water season. Higher total biomass was measured at Lake D1 in August and Lake D5 in September. The differences may be related to difference season patterns in water quality or simply an artifact of natural variability in phytoplankton productivity. Additional baseline sampling planned for 2019 will help refine the temporal variability in primary productivity at Lake D1 and Lake D5.

2.5. Benthos Community

2.5.1 Methods

Benthic invertebrates were collected at five replicate stations in each lake during the August 2018 sampling event. The samples were collected synoptic with the sediment grab samples at each station. Each replicate sample was a composite of two grabs (Petite Ponar) sieved through a 500 µm mesh bag. Contents retained in the bag (sediment and invertebrates) were transferred to an HDPE plastic jar and preserved to 5% buffered formalin. The preserved samples from Lake D1 and D5 were sent to Danuta Zaranko (ZEAS; Nobleton, ON) for taxonomic identification to the lowest practical level.

2.5.2 Results

Benthic invertebrate taxonomy results for August 2018 are presented in **Table 7**.

Total abundance (organisms/m^2) and total richness (# unique taxa) of benthic invertebrates was calculated for each replicate. Overall, abundance and richness of benthic taxa in Lake D1 and D5 were characteristic of depositional areas in northern lakes with low productivity and nutrient cycling. Insects, primarily chironomids, were the dominant benthic invertebrate taxa in terms of abundance and richness. Across the Lake D1 and D5 benthic samples, between 7 and 11 different *Insecta* taxa groups were identified in 2018. Lake D5 was more productive in 2018, with mean total abundance measuring 5,200 organisms/m^2 compared to 2,200 organisms/m^2 at Lake D1. As noted in the 2018 CREMP (Azimuth, 2019), there is substantial annual variability in benthic invertebrate abundance for lakes in the Whale Tail Study Area and the Meadowbank Study Area.

3. REFERENCES

Agnico Eagle. 2016. Whale Tail Pit Project - Meadowbank Mine Final Environmental Impact Statement and Type A Water Licence Amendments. Amendment/Reconsideration of the Project Certificate (No. 004/ File No. 03MN107) and Amendment to the Type A Water Licence (No. 2AM-MEA1525). Submitted to the Nunavut Impact Review Board. June 2016.

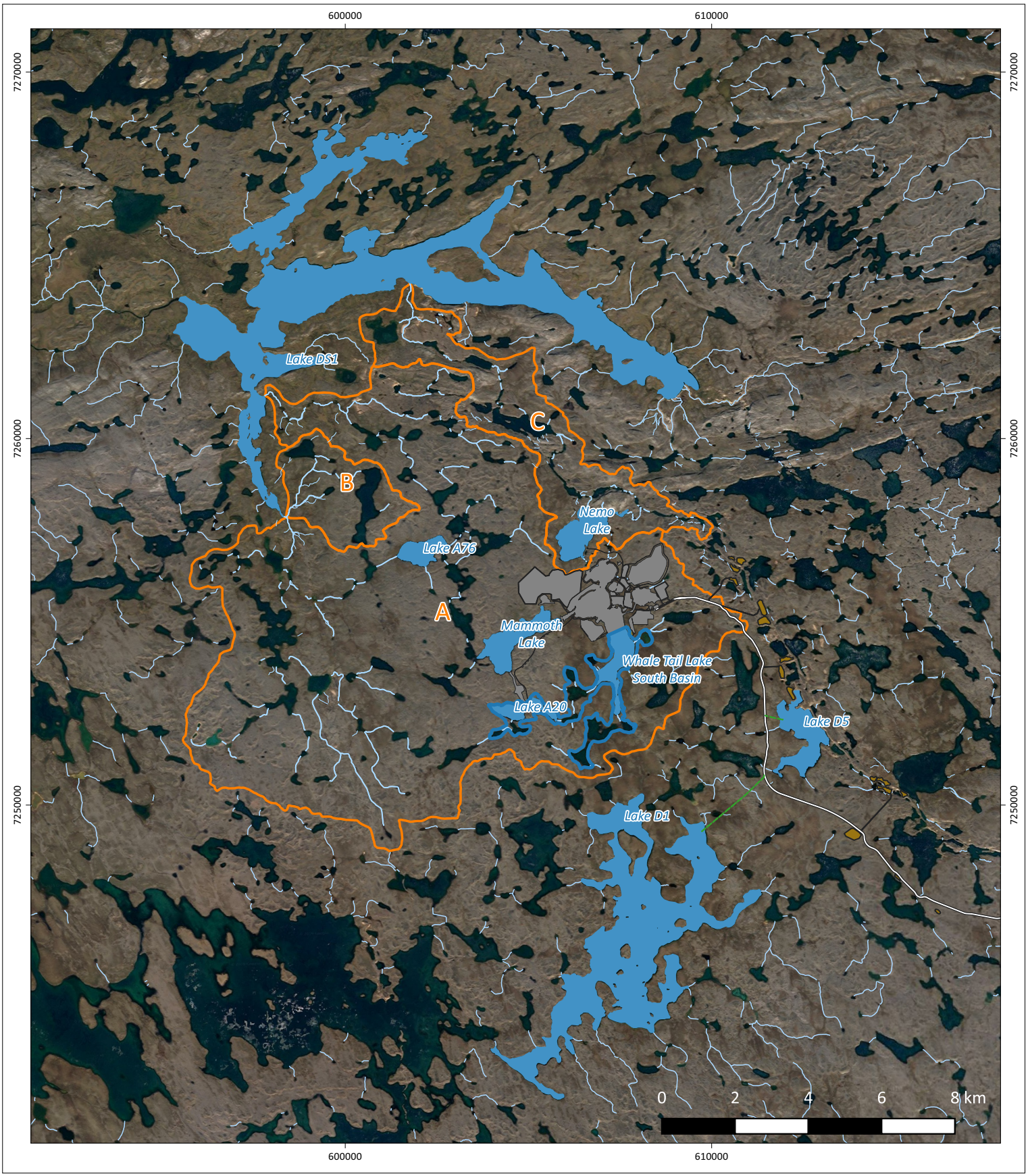
Azimuth Consulting Group (Azimuth). 2019. Core Receiving Environment Monitoring Program (CREMP): 2019. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. March, 2019.

Azimuth Consulting Group (Azimuth). 2018a. Whale Tail Pit Core Receiving Environment Monitoring Program (CREMP): 2014-2017 Baseline Studies. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. February, 2018.

Azimuth. 2018b. Core Receiving Environment Monitoring Program (CREMP): 2015 Plan Update – Whale Tail Pit Addendum. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. December, 2018.

Azimuth. 2015. Core Receiving Environment Monitoring Program (CREMP): 2015 Plan Update. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. November, 2015.

Golder Associates Limited (Golder). 2018. Final Environmental Impact Statement Addendum: Whale Tail Pit – Expansion Project. Report submitted to the Nunavut Impact Review Board.



Legend

- Project Lakes
- Watercourse
- Max Impoundment Area
- Watershed Boundaries

Project Shapefiles

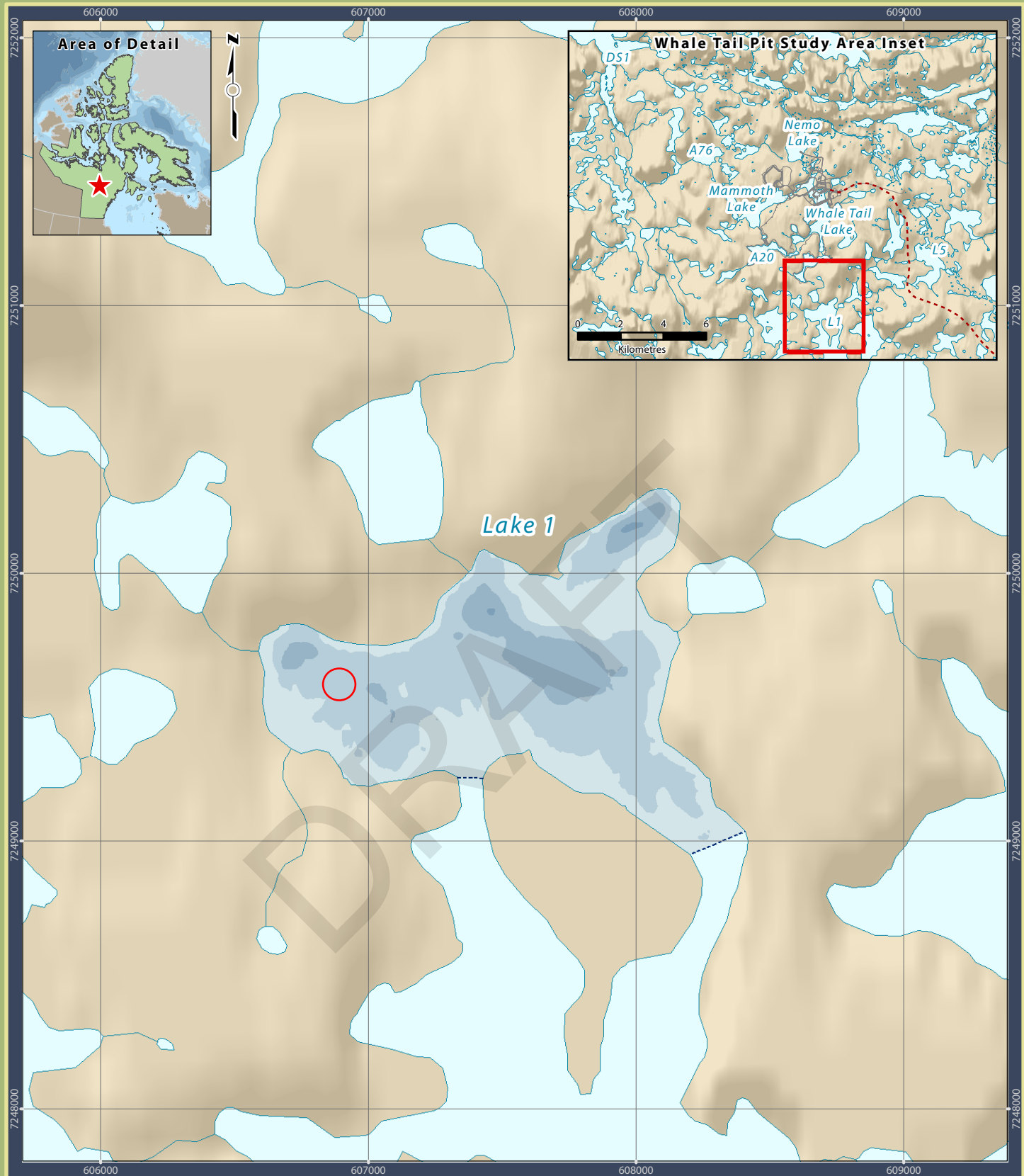
- Esker / Quarry
- Infrastructure
- Haul Road
- Proposed Road

AZIMUTH

CLIENT	Agnico Eagle Mines Limited - Meadowbank Division
FIGURE 1	Whale Tail Study Area Lakes
PROJECT	Lake D1 and Lake D5 Baseline Aquatic Receiving Environment Results (August 2018 - March 2019)

Date: April 30, 2019
Datum: NAD 83 UTM Zone 14N
Scale: 1:140,000
Software: QGIS version 3.2.3

REFERENCES:
1. Detailed lake and stream shapefiles from Agnico Eagle
2. Watercourse and waterbody data from NRC (all rights reserved)
3. Basemap imagery from Google



Legend

- Exploration Access Road
- Bathymetric Survey Extent
- Sediment / benthos sampling station

Bathymetry - Depth (m)

- 0 - 4
- 5 - 9
- 10 - 14
- 15 - 19
- 20 - 24
- 25 - 29
- 30 - 33

0 250 500
Metres

Projection: UTM Zone 14 NAD83

Data Sources:
Natural Resources Canada, GeoBase®
National Topographic Database
Agnico-Eagle Mines Limited.
Azimuth Consulting Group Inc.

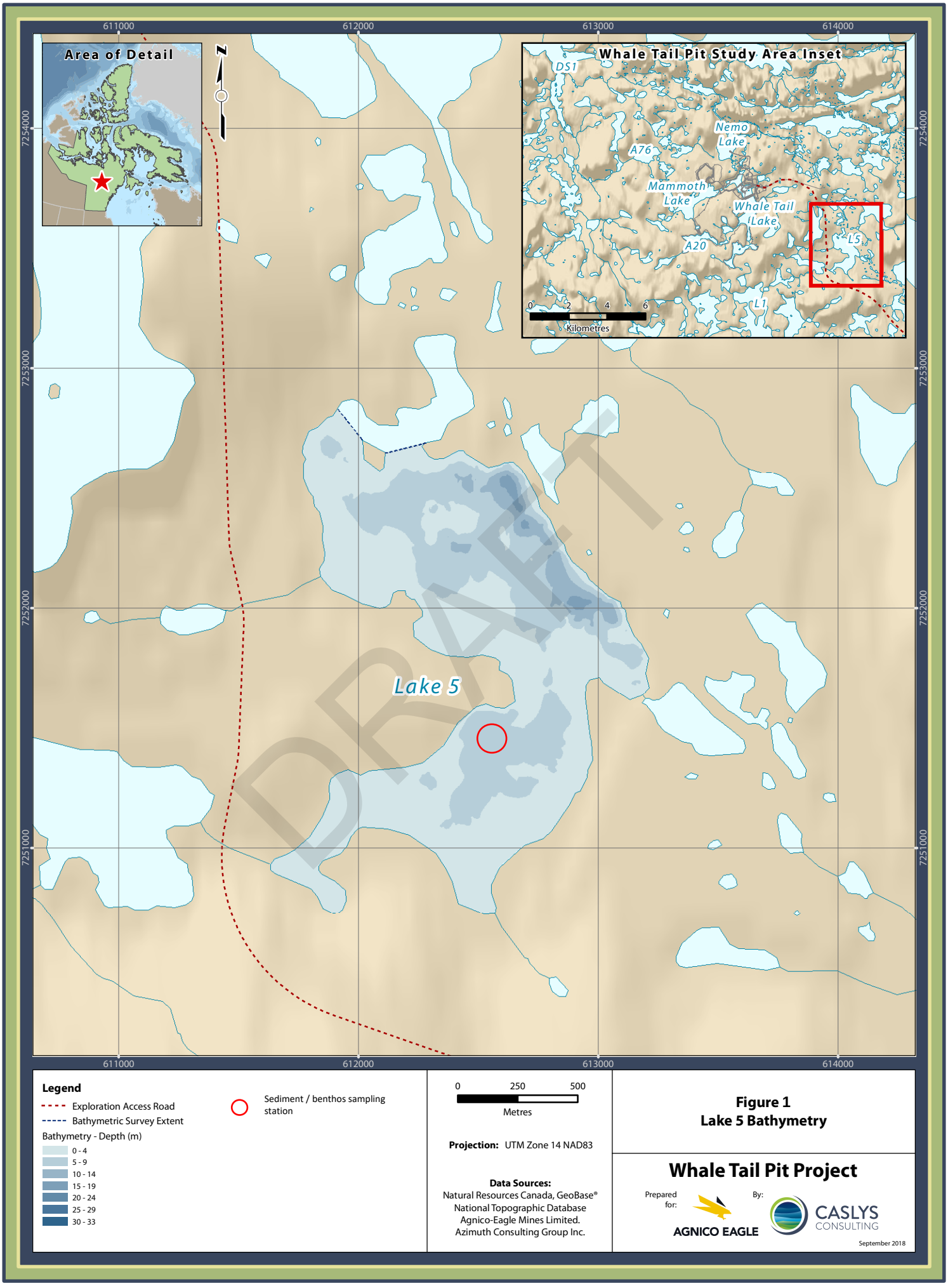
Figure 2
Lake 1 Bathymetry

Whale Tail Pit Project

Prepared for: AGNICO EAGLE

By: CASLYS CONSULTING

September 2018



Legend

- Exploration Access Road
- Bathymetric Survey Extent
- Sediment / benthos sampling station

Bathymetry - Depth (m)

- 0 - 4
- 5 - 9
- 10 - 14
- 15 - 19
- 20 - 24
- 25 - 29
- 30 - 33

0 250 500
Metres

Projection: UTM Zone 14 NAD83

Data Sources:
Natural Resources Canada, GeoBase®
National Topographic Database
Agnico-Eagle Mines Limited.
Azimuth Consulting Group Inc.

Figure 1
Lake 5 Bathymetry

Whale Tail Pit Project

Prepared for: AGNICO EAGLE

By: CASLYS CONSULTING

September 2018

Figure 4. Whale Tail Study Area Lakes – August 2018 limnology profiles.

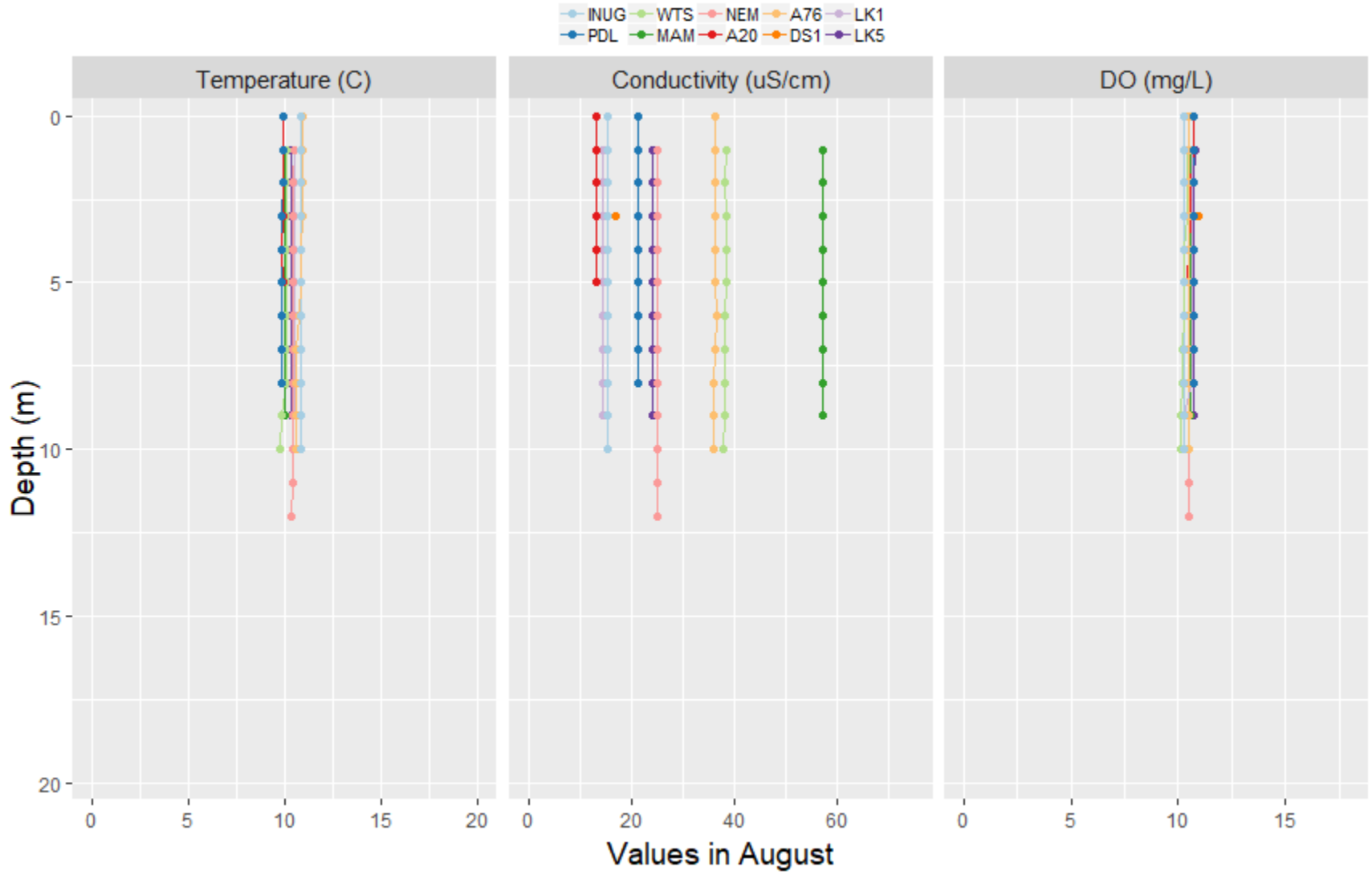


Figure 5. Whale Tail Study Area Lakes – September 2018 limnology profiles.

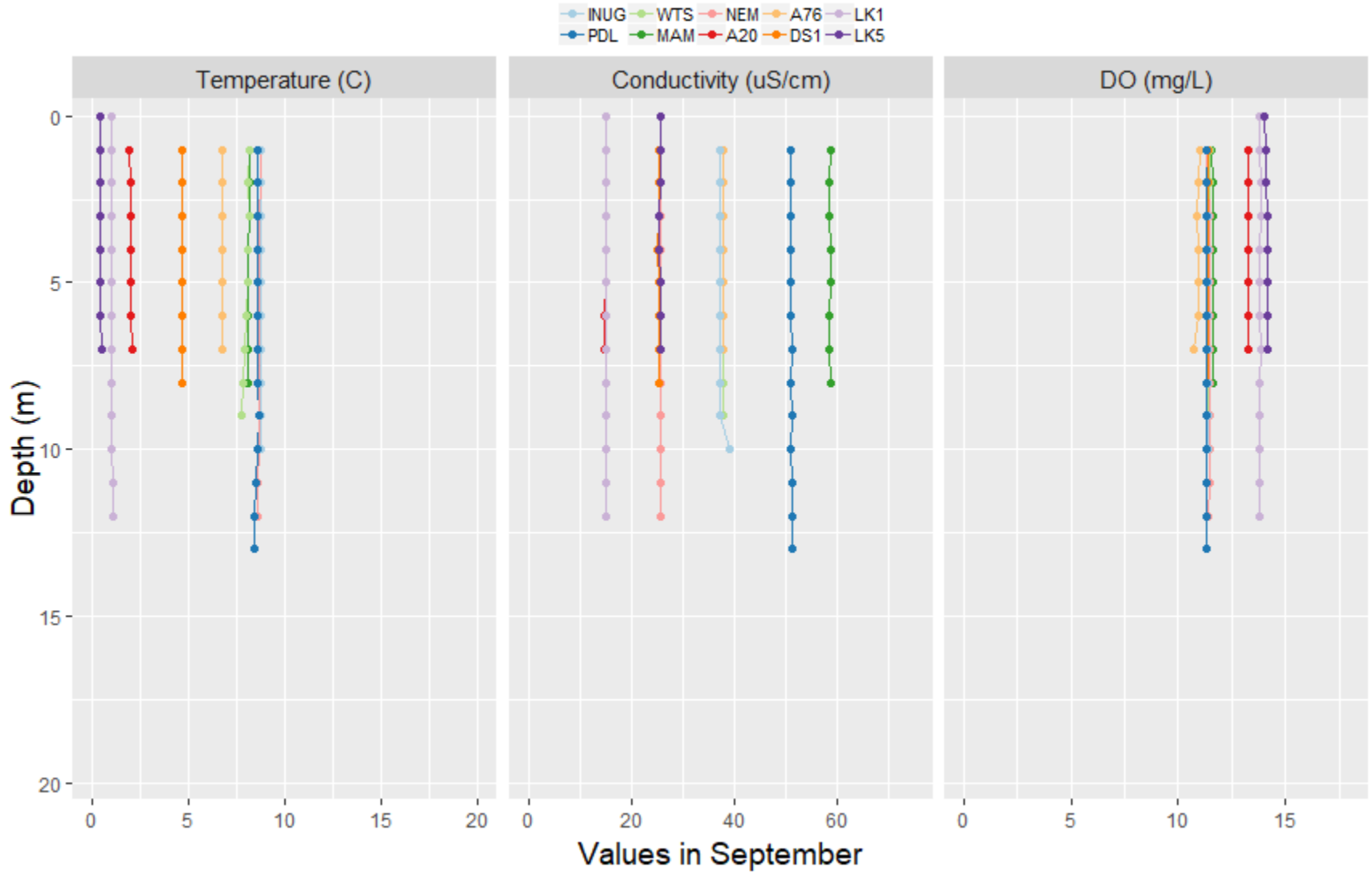


Figure 6. Whale Tail Study Area Lakes – November 2018 limnology profiles.

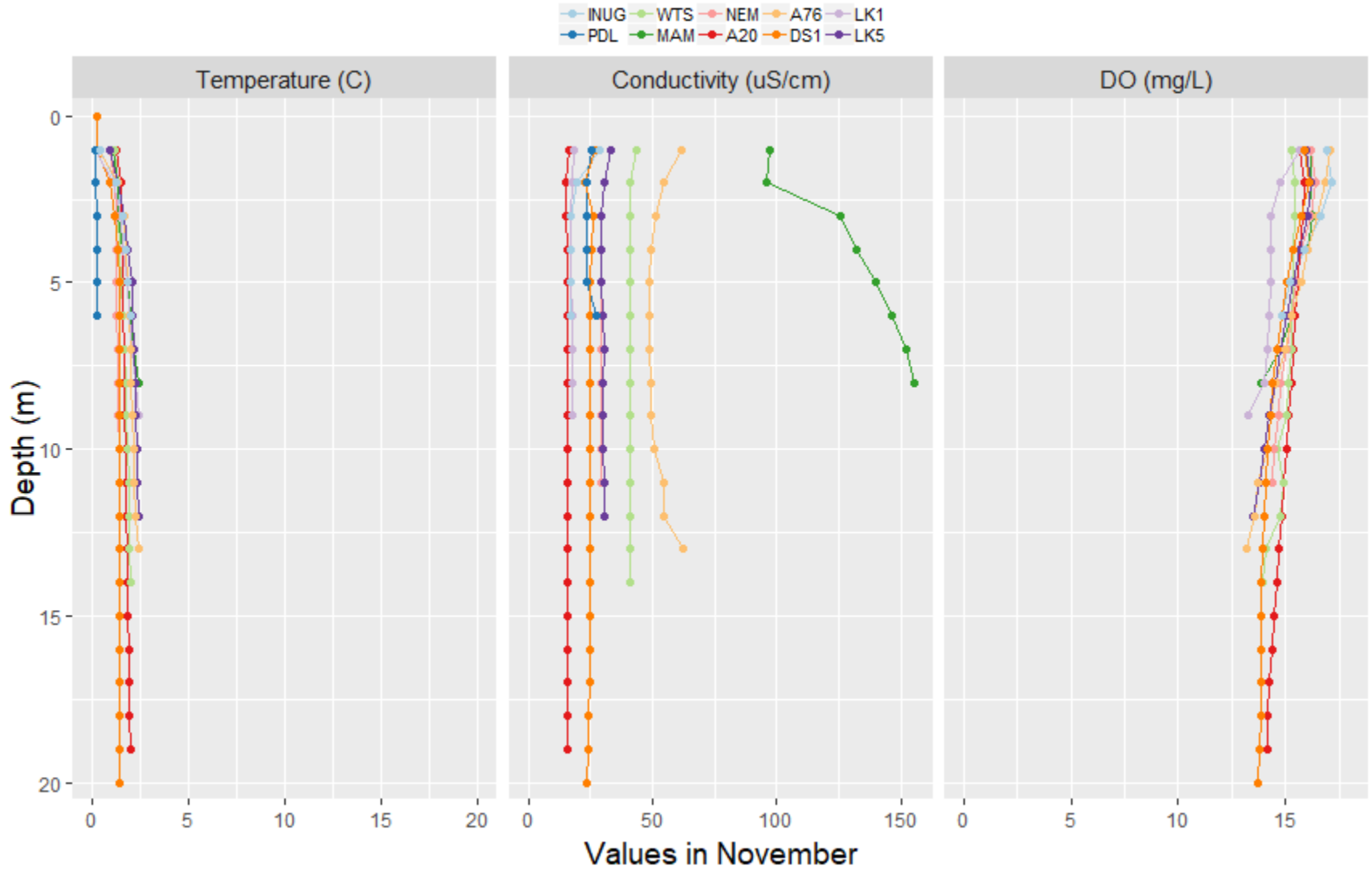


Figure 7. Whale Tail Study Area Lakes – March 2019 limnology profiles.

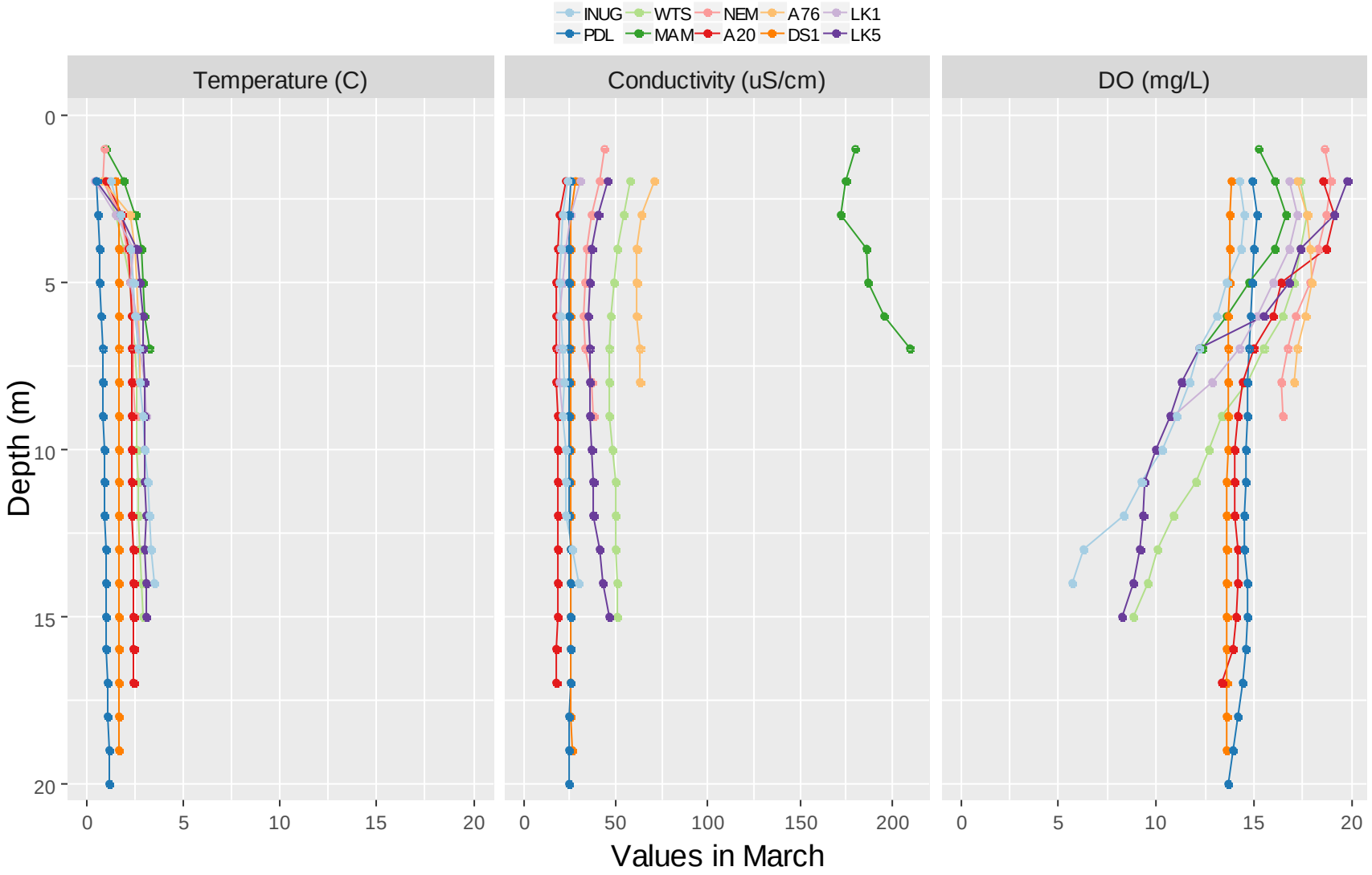


Table 2. Water chemistry data for Lake D1 and Lake D5, August 2018 to March 2019.

Lake					Lake D1							
(Station)					(LK1)							
Area-Replicate ID	Aquatic Life Guidelines[1]	Human Health Guidelines[2]	Trigger[3]	Threshold[3]	LK1-01	LK1-02	LK1-03	LK1-04	LK1-05	LK1-06	LK1-07	LK1-08
Date					14-Aug-18	14-Aug-18	23-Sep-18	23-Sep-18	16-Nov-18	16-Nov-18	14-Mar-19	14-Mar-19
Time					14:00	15:40	13:15	12:39	10:30	10:30	13:50	13:24
ALS Sample ID					L2152738-13	L2152738-14	L2173524-7	L2173524-8	L2200253-1	L2200253-2	L2247639-5	L2247639-6
Field Measurements (3 m)												
Temperature (°C)					10.51	10.57	1.0	0.99	1.49	1.45	1.49	1.3
Specific Conductivity (µS/cm)					14.5	14.3	15	15.1	17.4	17.2	30.9	25.6
Dissolved Oxygen (mg/L)					10.64	10.71	13.87	13.83	14.32	16.0	16.8	17.3
pH	6.5 - 9.0		6.5 - 7.94	6.5 - 9.0	6.2	6.21	6.36	6.4	6.44	6.55	7.11	6.64
Physical Tests (mg/L)												
Conductivity (µS/cm)			23.5		13.8	13.6	14.4	14.4	15.4	14.8	26.5	24.9
Hardness			8.5		5.5	5.4	5.41	5.49	6.56	6.21	9.16	8.79
pH (Laboratory)	6.5 - 9.0		6.50 - 7.94	6.5 - 9.0	6.93	6.93	6.92	6.89	6.8	6.83	7.06	7.04
Total Suspended Solids			3	5	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Total Dissolved Solids			18		13.3	11.1	13.9	13.5	12.6	15	18.8	17.1
Turbidity (NTU)					0.44	0.43	0.3	0.3	0.22	0.2	0.1	*<0.10*
Anions and Nutrients (mg/L)												
Alkalinity - Bicarbonate			8.6		4.8	4.9	5.1	5.1	5.2	5	8.4	7.9
Alkalinity - Carbonate			4		*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Alkalinity - Hydroxide					*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Alkalinity - Total			8.55		4.8	4.9	5.1	5.1	5.2	5	8.4	7.9
Ammonia (as N)[4]	***equation***		0.065	0.126	0.0064	*<0.0050*	0.0292	0.0384	0.0075	0.0064	0.0163	0.0198
Bromide					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Chloride	120	250	60.3	120	0.71	0.7	0.73	0.73	0.76	0.75	1.27	1.18
Fluoride	0.12	1.5			0.035	0.035	0.036	0.036	0.039	0.038	0.049	0.05
Nitrate (as N)	3	10	1.50	3	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	0.0083	*<0.0050*
Nitrite (as N)	0.06	1	0.031	0.06	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Total Kjeldahl Nitrogen			0.17		0.119	0.102	0.117	0.131	0.105	0.105	0.184	0.116
Ortho Phosphate (as P)			0.002		0.0016	0.0014	0.0013	0.0012	0.0011	0.0013	*<0.0010*	*<0.0010*
Phosphorus (P)-Total Diss.					0.0025	*<0.0020*	0.0031	0.0024	*<0.0020*	0.003	0.0025	0.0037
Phosphorus (P)-Total	0.004		0.006	0.004	0.0039	0.0021	0.004	0.0074	0.0045	0.003	0.003	0.0023
Silicate (as SiO_2)			1		*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	0.76	0.62
Sulphate (SO_4)		500	64.7	128	1.02	1.01	1.06	1.06	1.15	1.12	1.72	1.64
Cyanides												
Total Cyanide					*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Free Cyanide	0.005				*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Organic / Inorganic Carbon (mg/L)												
Dissolved Organic Carbon			2.6		1.39	1.53	2.04	1.9	*<0.50*	1.88	2.4	2.38
Total Organic Carbon			2.8		1.5	1.63	1.88	2.23	1.88	1.9	2.35	2.11
Plant Pigments (µg/L)												
Chlorophyll-*a*					0.387	0.476	0.348	0.375	0.429	0.582	0.623	0.602
Total Metals (mg/L)												
Aluminum[4]	***equation***		0.054	0.1	0.0083	0.0087	0.0071	0.0068	0.0038	0.0043	*<0.0030*	0.0031
Antimony		0.006	0.010	0.02	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.005	0.01	0.0026	0.005	*<0.00010*	*<0.00010*	0.0001	0.0001	*<0.00010*	0.0001	0.00011	0.00013
Barium		1	0.50	1	0.00259	0.00263	0.00246	0.00239	0.00258	0.00258	0.00466	0.00392
Beryllium			0.0027	0.0053	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Bismuth					*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron	1.5	5	0.76	1.5	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Cadmium[4]	***equation***	0.005	0.000025	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium			2.15		1.31	1.25	1.28	1.28	1.4	1.39	2.23	2.04
Cesium					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Chromium[5]	0.001	0.05	0.00056	0.001	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper[3]	***equation***	1	0.0012	0.002	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Iron	0.3	0.3	0.16	0.3	0.021	0.023	0.016	0.015	*<0.010*	*<0.010*	0.068	*<0.010*
Lead[3]	***equation***	0.01	0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium			0.048	0.096	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium			0.83		0.547	0.556	0.577	0.58	0.628	0.624	0.98	0.948
Manganese[4]		0.05	0.32	***equation***	0.00243	0.0023	0.00135	0.00137	0.00075	0.00074	0.00145	0.0007
Mercury	0.000026	0.001	0.000018	0.000026	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.073		0.037	0.073	*<0.00020*	*<0.00020*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Nickel[4]	***equation***		0.013	0.025	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Phosphorus					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium			0.5		0.281	0.278	0.262	0.265	0.291	0.295	0.449	0.426
Rubidium					0.00041	0.00039	0.00037	0.00036	0.00035	0.00033	0.00057	0.00055
Selenium	0.001	0.01	0.00055	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon					0.28	0.29	0.25	0.25	0.23	0.25	0.34	0.32
Silver	0.00025				*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		200	0.9751		0.518	0.528	0.581	0.598	0.614	0.614	0.942	0.906
Strontium			0.02789	0.049	0.00715	0.00689	0.0072	0.00716	0.0076	0.00763	0.012	0.0112
Sulfur					*<0.50*	*<0.50*	*<0.50*	0.58	*<0.50*	*<0.50*	0.71	0.54
Tellurium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium	0.0008		0.000405	0.0008	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Thorium					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Tin			0.0002		*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Titanium			1.00008	2	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*
Tungsten					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium	0.015	0.02	0.00752	0.015	0.000025	0.000028	0.000022	0.000023	0.000021	0.000022	0.000029	0.000029
Vanadium			0.0035	0.006	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[4]	0.03	0.5	0.006252	***equation***	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zirconium					*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*
Dissolved Metals (mg/L)												
Aluminum[4]			0.026266	0.05	0.0029	0.0025	0.0022	0.0026	0.0021	0.0015	0.0012	0.0011
Antimony	0.010	0.02			*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.0026	0.005			*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	0.00011	0.00012
Barium	0.50	1			0.0025	0.00273	0.0024	0.00248	0.00282	0.00281	0.00455	0.00378
Beryllium	0.0027	0.0053			*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Bismuth					*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron	0.76	1.5			*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Cadmium	0.000025	0.00004			*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium					1.28	1.25	1.22	1.24	1.48	1.4	2.07	1.98
Cesium					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Chromium	0.00055	0.001			*<0.00010*	*<0.00010*	*<0.00010*	0.00011	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper	0.0012	0.002			0.00023	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	0.00022	0.00028	0.00027
Iron	0.16	0.3			*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Lead	0.00053	0.001			*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium	0.048	0.096			*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium					0.558	0.553	0.572	0.582	0.694	0.657	0.966	0.932
Manganese[4]	0.32	***equation***			0.00044	0.00049	0.00051	0.0005	0.00011	0.00011	0.00043	0.00033
Mercury	0.000018	0.000026			*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.037	0.073			*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Nickel	0.013	0.025			*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Phosphorus					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium					0.287	0.282	0.255	0.263	0.338	0.343	0.43	0.41
Rubidium					0.00039	0.00036	0.00041	0.00037	0.00046	0.00035	0.0006	0.00049
Selenium	0.00055	0.001			*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon					0.208	0.214	0.185	0.183	0.215	0.206	0.327	0.305
Silver					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*

Table 2. Water chemistry data for Lake D1 and Lake D5, August 2018 to March 2019.

Lake (Station) Area-Replicate ID Date	Aquatic Life Guidelines[1]	Human Health Guidelines[2]	Trigger[3]	Threshold[3]	Lake D1 (LK1)							
					LK1-01 14-Aug-18	LK1-02 14-Aug-18	LK1-03 23-Sep-18	LK1-04 23-Sep-18	LK1-05 16-Nov-18	LK1-06 16-Nov-18	LK1-07 14-Mar-19	LK1-08 14-Mar-19
Sodium					0.52	0.522	0.557	0.562	0.688	0.669	0.921	0.893
Strontium			0.027953	0.049	0.0069	0.00682	0.00678	0.00674	0.00866	0.00781	0.0113	0.0109
Sulfur					*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	0.63	0.62
Tellurium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium			0.00041	0.0008	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Thorium					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Tin			0.0002		*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Titanium			1.01	2	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*
Tungsten					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium			0.0075	0.015	0.000023	0.000022	0.000021	0.00002	0.000021	0.00002	0.000025	0.000025
Vanadium			0.0035	0.006	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[4]			0.0053	***equation***	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Zirconium					*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2018.

2. Guidelines for Canadian Drinking Water Quality (Federal-Provincial-Territorial Committee on Health and the Environment). Standards for the following parameters are aesthetic and meant to protect against taste and odour: chloride, sulphate, copper, iron, manganese, sodium, zinc.

3. Trigger and threshold values are presented in "CREMP 2015 Plan Update" (Azimuth 2015a).
A number of thresholds were derived from methods (or sources) other than CCME guidelines - see Azimuth (2015a) for details.

4. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

5. Chromium CCME guideline is for Cr VI.

Shaded concentrations exceed the CCME aquatic life guidelines.

Bordered concentrations exceed the GCDWQ.

Italicized numbers are below detection limits.

"-" not analyzed/not sampled

n/a = issues with the water quality probe. No data collected.

Table 2. Water chemistry data for Lake D1 and Lake D5, August 2018 to March 2019.

Lake					Lake D5							
(Station)					(LK5)							
Area-Replicate ID	Aquatic Life Guidelines[1]	Human Health Guidelines[2]	Trigger[3]	Threshold[3]	LK5-01	LK5-02	LK5-03	LK5-04	LK5-05	LK5-06	LK5-07	LK5-08
Date					15-Aug-18	15-Aug-18	23-Sep-18	23-Sep-18	16-Nov-18	16-Nov-18	9-Mar-19	9-Mar-19
Time					16:40	17:30	10:30	9:45	10:30	10:30	12:30	13:28
ALS Sample ID					L2152738-15	L2152738-16	L2173524-5	L2173524-6	L2200253-3	L2200253-4	L2244752-4	L2244752-5
Field Measurements (3 m)												
Temperature (°C)					10.34	10.31	0.1	0.43	1.8	1.66	1.86	1.75
Specific Conductivity (µS/cm)					24.3	24.3	25.7	25.5	30.3	29.4	39.4	40.1
Dissolved Oxygen (mg/L)					10.74	10.73	14.39	14.14	15.5	16.1	18.3	19.1
pH	6.5 - 9.0		6.5 - 7.94	6.5 - 9.0	6.57	6.73	6.78	7.04	6.81	7.11	7.07	7.05
Physical Tests (mg/L)												
Conductivity (µS/cm)			23.5		23.5	23.5	25	24.3	25.8	26.6	36.6	36.2
Hardness			8.5		9.88	9.73	10.5	10.5	11.7	11.5	14.2	14
pH (Laboratory)	6.5 - 9.0		6.50 - 7.94	6.5 - 9.0	7.24	7.23	7.18	7.21	7.15	7.2	7.16	7.16
Total Suspended Solids			3	5	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Total Dissolved Solids			18		18	18.1	22.3	17.6	12.9	16.9	21.5	22.8
Turbidity (NTU)					0.26	0.27	0.19	0.18	0.18	0.18	0.11	0.11
Anions and Nutrients (mg/L)												
Alkalinity - Bicarbonate			8.6		9.1	9	9.4	9.4	10	10.3	13	12.6
Alkalinity - Carbonate			4		*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Alkalinity - Hydroxide					*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Alkalinity - Total			8.55		9.1	9	9.4	9.4	10	10.3	13	12.6
Ammonia (as N)[4]	***equation***		0.065	0.126	*<0.0050*	0.0069	0.0096	0.0257	*<0.0050*	0.0138	0.0128	0.0128
Bromide					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Chloride	120	250	60.3	120	0.66	0.66	0.69	0.69	0.74	0.74	0.99	0.97
Fluoride	0.12	1.5			0.032	0.032	0.033	0.032	0.036	0.034	0.047	0.044
Nitrate (as N)	3	10	1.50	3	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Nitrite (as N)	0.06	1	0.031	0.06	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Total Kjeldahl Nitrogen			0.17		0.105	0.149	0.101	0.122	0.202	0.181	0.109	0.117
Ortho Phosphate (as P)			0.002		0.0015	*<0.0010*	0.0013	0.0017	0.0017	0.0017	*<0.0010*	*<0.0010*
Phosphorus (P)-Total Diss.					*<0.0020*	*<0.0020*	0.0021	0.0024	0.0029	0.003	*<0.0020*	*<0.0020*
Phosphorus (P)-Total	0.004		0.006	0.004	*<0.0020*	*<0.0020*	0.0073	0.0037	0.0025	0.0028	0.0032	0.0069
Silicate (as SiO_2)			1		0.79	0.77	0.91	0.85	0.84	0.8	1.2	1.14
Sulphate (SO_4)		500	64.7	128	1.84	1.84	1.99	1.94	2.18	2.08	2.65	2.66
Cyanides												
Total Cyanide					*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Free Cyanide	0.005				*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Organic / Inorganic Carbon (mg/L)												
Dissolved Organic Carbon			2.6		1.34	1.36	2.13	2.07	1.69	1.79	1.84	1.84
Total Organic Carbon			2.8		1.35	1.45	2.1	1.75	1.75	1.7	2.03	2.14
Plant Pigments (µg/L)												
Chlorophyll-*a*					0.298	0.315	0.328	0.386	0.667	0.76	1.05	0.578
Total Metals (mg/L)												
Aluminum[4]	***equation***		0.054	0.1	0.0034	0.0033	0.0042	0.0034	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Antimony		0.006	0.010	0.02	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.005	0.01	0.0026	0.005	0.00017	0.00016	0.00016	0.00016	0.00018	0.00016	0.00019	0.00019
Barium		1	0.50	1	0.00258	0.00244	0.00241	0.00251	0.00277	0.00281	0.00418	0.00403
Beryllium			0.0027	0.0053	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Bismuth					*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron	1.5	5	0.76	1.5	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Cadmium[4]	***equation***	0.005	0.000025	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium			2.15		2.5	2.4	2.47	2.5	2.74	2.6	3.36	3.4
Cesium					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Chromium[5]	0.001	0.05	0.00056	0.001	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper[3]	***equation***	1	0.0012	0.002	*<0.00050*	*<0.00050*	0.00157	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Iron	0.3	0.3	0.16	0.3	0.017	0.016	0.012	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Lead[3]	***equation***	0.01	0.00053	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium			0.048	0.096	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium			0.83		1.02	0.976	1.05	1.07	1.17	1.11	1.54	1.49
Manganese[4]		0.05	0.32	***equation***	0.00227	0.00218	0.0011	0.00109	0.00063	0.00072	0.00112	0.00091
Mercury	0.000026	0.001	0.000018	0.000026	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.073		0.037	0.073	*<0.00020*	*<0.00020*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Nickel[4]	***equation***		0.013	0.025	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Phosphorus					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium			0.5		0.321	0.305	0.305	0.312	0.344	0.327	0.502	0.478
Rubidium					0.00034	0.00035	0.00033	0.00034	0.00035	0.0004	0.00047	0.00048
Selenium	0.001	0.01	0.00055	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon					0.48	0.46	0.48	0.46	0.5	0.46	0.58	0.56
Silver	0.00025				*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		200	0.9751		0.566	0.545	0.618	0.63	0.678	0.695	0.866	0.838
Strontium			0.02789	0.049	0.00942	0.00893	0.00951	0.0095	0.0106	0.0102	0.0129	0.0129
Sulfur					0.94	0.87	0.78	0.82	0.75	0.68	0.82	0.84
Tellurium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium	0.0008		0.000405	0.0008	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Thorium					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Tin			0.0002		*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Titanium			1.00008	2	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*
Tungsten					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium	0.015	0.02	0.00752	0.015	0.000013	0.000013	0.000013	0.000013	0.000011	0.000011	0.000013	0.000011
Vanadium			0.0035	0.006	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[4]	0.03	0.5	0.006252	***equation***	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zirconium					*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*
Dissolved Metals (mg/L)												
Aluminum[4]			0.026266	0.05	0.0016	0.0013	0.0013	0.0032	*<0.0010*	*<0.0010*	*<0.0010*	0.0012
Antimony	0.010	0.02			*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.0026	0.005			0.00013	0.00012	0.00012	0.00012	0.00015	0.00014	0.00017	0.00016
Barium	0.50	1			0.00244	0.00243	0.00243	0.00252	0.0029	0.00282	0.00371	0.00385
Beryllium	0.0027	0.0053			*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Bismuth					*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron	0.76	1.5			*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Cadmium	0.000025	0.00004			*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium					2.35	2.32	2.43	2.41	2.73	2.69	3.26	3.22
Cesium					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Chromium	0.00055	0.001			*<0.00010*	0.00025	*<0.00010*	0.00014	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper	0.0012	0.002			*<0.00020*	*<0.00020*	*<0.00020*	0.00073	*<0.00020*	*<0.00020*	0.00023	0.00022
Iron	0.16	0.3			*<0.010*	*<0.010*	*<0.010*	*<0.010*	0.037	*<0.010*	*<0.010*	*<0.010*
Lead	0.00053	0.001			0.000066	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium	0.048	0.096			*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium					0.973	0.954	1.07	1.08	1.19	1.18	1.48	1.45
Manganese[4]	0.32	***equation***			0.00035	0.00028	0.0004	0.0004	0.00033	*<0.00010*	0.00018	0.00023
Mercury	0.000018	0.000026			*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.037	0.073			*<0.000050*	0.000053	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Nickel	0.013	0.025			0.00107	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Phosphorus					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium					0.31	0.303	0.303	0.303	0.372	0.366	0.46	0.46
Rubidium					0.00036	0.00034	0.00039	0.00037	0.00037	0.00037	0.00047	0.00045
Selenium	0.00055	0.001			*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon					0.373	0.394	0.418	0.405	0.453	0.417	0.564	0.569
Silver					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*

Table 2. Water chemistry data for Lake D1 and Lake D5, August 2018 to March 2019.

Lake (Station) Area-Replicate ID Date	Aquatic Life Guidelines[1]	Human Health Guidelines[2]	Trigger[3]	Threshold[3]	Lake D5 (LK5)							
					LK5-01 15-Aug-18	LK5-02 15-Aug-18	LK5-03 23-Sep-18	LK5-04 23-Sep-18	LK5-05 16-Nov-18	LK5-06 16-Nov-18	LK5-07 9-Mar-19	LK5-08 9-Mar-19
Sodium					0.544	0.528	0.629	0.623	0.712	0.688	0.832	0.82
Strontium			0.027953	0.049	0.00878	0.00879	0.00894	0.0089	0.0106	0.0106	0.0139	0.0139
Sulfur					0.79	0.92	*<0.50*	0.65	0.52	0.63	1.06	0.8
Tellurium					*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*	*<0.00020*
Thallium			0.00041	0.0008	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Thorium					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Tin			0.0002		*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Titanium			1.01	2	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*
Tungsten					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Uranium			0.0075	0.015	0.000012	0.000011	0.000012	0.000011	0.000013	0.000011	0.000012	*<0.000010*
Vanadium			0.0035	0.006	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[4]			0.0053	***equation***	0.0021	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Zirconium					*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*	*<0.000060*

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2018.

2. Guidelines for Canadian Drinking Water Quality (Federal-Provincial-Territorial Committee on Health and the Environment). Standards for the following parameters are aesthetic and meant to protect against taste and odour: chloride, sulphate, copper, iron, manganese, sodium, zinc.

3. Trigger and threshold values are presented in "CREMP 2015 Plan Update" (Azimuth 2015a).
A number of thresholds were derived from methods (or sources) other than CCME guidelines - see Azimuth (2015a) for details.

4. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

5. Chromium CCME guideline is for Cr VI.

Shaded concentrations exceed the CCME aquatic life guidelines.

Bordered concentrations exceed the GCDWQ.

Italicized numbers are below detection limits.

"-" not analyzed/not sampled

n/a = issues with the water quality probe. No data collected.

Table 3. Sediment grab chemistry, Lake D1 and Lake D5, 2018.

Lake & Basin	Screening Criteria				Lake D1					Lake D5				
Area-Replicate ID	CCME[1]		Meadowbank[2]		LK1-1	LK1-2	LK1-3	LK1-4	LK1-5	LK5-1	LK5-2	LK5-3	LK5-4	LK5-5
Date	ISQG	PEL	Trigger	Threshold	15-Aug-18	15-Aug-18	15-Aug-18	15-Aug-18	15-Aug-18	16-Aug-18	16-Aug-18	16-Aug-18	16-Aug-18	16-Aug-18
Physical & Organic Parameters														
Moisture (%)					80.6	79.7	79.9	79.7	81.5	90.6	89.6	90.3	91.1	90
pH					5.89	5.39	5.83	5.79	5.51	4.99	4.82	5.39	5.16	4.89
TOC (% dw)					4.46	2.79	3.81	3.84	3.95	9.48	10	8.85	9.93	9.33
Particle Size														
% Gravel (>2mm)					*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	41.9
% Sand (2.00mm - 0.063mm)					5.8	16.2	7	5.9	8.6	10.8	2.5	9.6	12.5	2.5
% Silt (0.063mm - 4µm)					86.1	77.6	75.6	76.8	78.1	83.2	91.3	82.1	78.1	51.8
% Clay (<4µm)					8	6.3	17.4	17.3	13.4	6.1	6.2	8.3	9.4	3.8
Total Metals (mg/kg dw)														
Aluminum					20800	11600	26400	24600	19500	17600	13900	18100	16100	15000
Antimony					0.22	0.14	0.18	0.19	0.18	0.39	0.42	0.41	0.42	0.39
Arsenic*	5.9	17	120.9		**9.17**	**7.79**	**27.8**	**49.7**	**8.1**	**44.7**	**94.1**	**34.9**	**57.4**	**53**
Barium					119	46.1	120	124	120	67.8	52.3	107	71.2	62.5
Beryllium					1.27	0.83	2.43	2.70	1.46	1.23	1.15	1.39	1.25	1.16
Bismuth					0.58	0.33	0.8	0.79	0.61	0.46	0.49	0.5	0.49	0.45
Boron					7.0	5.6	7.7	6.0	8.0	13.7	11.3	14.0	11.7	10.8
Cadmium*	0.6	3.5	1.10		**0.767**	0.095	0.067	0.068	0.444	0.251	0.285	0.307	0.275	0.26
Calcium					3500	1740	2230	1810	3080	2450	1930	2800	2160	2030
Chromium*	37.3	90	135.0		**117**	**92.2**	**110**	**108**	**97**	**127**	**97.6**	**127**	**115**	**107**
Cobalt					12.2	9.04	16	16.7	11.3	17.9	30.8	17.8	24.1	22.1
Copper*	35.7	197	83.4		**38.2**	13.5	**47.6**	**50.5**	34.3	**46.8**	**54.4**	**52.3**	**52.3**	**48.5**
Iron					24700	31500	61400	80700	24500	86900	257000	69100	157000	147000
Lead	35	91.3	25.3	35	13.1	7.8	16.8	17.1	13.9	12.8	11.2	12.6	12.3	11.4
Lithium					21	11.6	24.3	21.6	19.5	15.1	10.5	14.7	13.2	12.2
Magnesium					10200	6400	9160	8360	8830	8370	5780	8030	7370	6640
Manganese					362	417	1160	1100	360	365	624	422	472	437
Mercury	0.17	0.486	0.102	0.17	0.017	0.023	0.030	0.031	0.030	0.0614	0.0665	0.0669	0.068	0.0634
Molybdenum					3.30	1.16	4.73	6.2	2.83	6.1	9.96	7.58	9.36	8.75
Nickel					87.1	43	98.8	76.2	75.9	78.5	76.1	81.5	81.5	73.9
Phosphorus					658	617	856	946	618	860	1060	686	787	722
Potassium					2620	1040	3080	2580	2480	1940	1340	2070	1790	1520
Selenium					0.51	*<0.20*	0.49	0.58	0.44	1.06	1.7	1.07	1.35	1.30
Silver					0.18	*<0.10*	0.14	0.15	0.19	0.32	0.37	0.33	0.35	0.32
Sodium					134	85	118	97	131	150	104	162	123	114
Strontium					33.1	19.1	24.9	20.7	28	19.7	13.3	21.5	17.3	16.2
Thallium					0.179	0.074	0.194	0.175	0.183	0.153	0.136	0.173	0.153	0.14
Titanium					771	478	689	587	651	419	290	383	354	316
Uranium					18.9	5.58	22.4	24.3	17.9	9.15	9.06	10.2	9.56	8.84
Vanadium					31.1	20	34.1	32.7	29	28	21.4	28.6	26.1	23.8
Zinc*	123	315	114.2		109	45.3	114	103	89.6	90.4	83.2	106	92.7	85.2

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

   ISQG = interim sediment quality guideline

   PEL = probable effect level

2. Trigger and threshold values shown here for context only; they were developed for Meadowbank in the CREMP Design Document 2012 (Azimuth, 2012d).

Thresholds are set equal to CCME ISQG guidelines, where available.

* CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the ISQG.

123 Bolded and shaded concentrations also exceed the PEL.

Italicized numbers are below detection limits.

Table 4. Conventional sediment core chemistry, Lake D1 and Lake D5, 2018.

Lake & Basin	Screening Criteria				Lake D1 LK1									
Area-Replicate ID	CCME[1]		Meadowbank[2]		SC-1	SC-2	SC-3	SC-4	SC-5	SC-6	SC-7	SC-8	SC-9	SC-10
Date					14-Aug-18	14-Aug-18	14-Aug-18	15-Aug-18	15-Aug-18	15-Aug-18	15-Aug-18	15-Aug-18	15-Aug-18	15-Aug-18
ALS Sample ID	ISQG	PEL	Trigger	Threshold	L2155903	L2155903	L2155903	L2155903	L2155903	L2155903	L2155903	L2155903	L2155903	L2155903
Physical & Organic Parameters														
Moisture (%)					82.7	86.6	87	88.5	89.2	88.4	88.0	82.7	92.2	86.3
pH					5.30	5.53	5.66	5.81	5.76	5.68	5.71	5.66	5.45	5.68
Total Metals (mg/kg dw)														
Aluminum					20500	20700	15900	18400	22800	22000	21200	23200	17400	17700
Antimony					0.24	0.19	0.15	0.15	0.15	0.17	0.16	0.22	0.15	0.12
Arsenic*	5.9	17	120.0		**13.7**	**8.64**	**10.4**	**7.12**	**10.7**	**15.1**	**10.3**	**78.3**	**10.9**	**6.95**
Barium					129	127	95.3	111	120	130	128	116	120	110
Beryllium					1.19	1.24	1.21	1.44	1.85	1.86	1.78	2.87	1.56	1.26
Bismuth					0.58	0.58	0.55	0.59	0.84	0.79	0.75	0.72	0.66	0.54
Boron					6	6.1	8.5	9.5	8.5	9.5	10.1	7	10.6	7.9
Cadmium*	0.6	3.5	1.10		**0.968**	**0.696**	0.147	0.118	0.081	0.136	0.116	0.055	0.184	0.066
Calcium					3590	3170	2310	2500	2230	2280	2370	1600	2730	2650
Chromium*	37.3	90	114.3		**117**	**117**	**66.7**	**76.8**	**90.9**	**83.5**	**76.9**	**96.1**	**70.9**	**83.6**
Cobalt					12.9	11.6	8.03	8.59	10.6	10.40	9.6	18.4	9.23	8.94
Copper*	35.7	197	126.0		**35.9**	**40.7**	23.5	29.7	**37**	34.5	33.8	**48.6**	28.7	27.9
Iron					26200	24300	27300	25900	39600	44400	37600	106000	34600	23900
Lead	35	91.3	32.5	35	13	13.4	12.3	13.4	14.3	14.7	14.4	19.5	14.3	12.3
Lithium					20.4	20.2	13.9	17.4	20.1	18.6	18.4	16	15.6	17
Magnesium					10600	10100	6330	7420	8190	7390	7260	6500	7040	7670
Manganese					407	373	442	375	589	615	496	1440	458	346
Mercury	0.17	0.486	0.104	0.17	0.0187	0.0229	0.0412	0.0452	0.0363	0.0443	0.0436	0.0345	0.0672	0.0355
Molybdenum					2.96	2.11	2.21	2.66	3.21	3.4	2.79	7.1	2.43	2.25
Nickel					86.6	79.5	46	56.2	56.3	50.4	48.5	51.2	50.6	58.8
Phosphorus					628	608	668	607	737	685	685	868	743	563
Potassium					2720	2610	2060	2370	2980	2950	2880	2590	2480	2440
Selenium					0.49	0.53	0.34	0.34	0.43	0.43	0.4	0.76	0.5	0.29
Silver					0.2	0.17	0.12	0.13	*<0.10*	0.11	0.12	*<0.10*	0.21	0.12
Sodium					141	152	142	153	168	173	171	103	172	142
Strontium					34	30.9	23.2	23.7	25.2	25.1	24.1	20.2	25.9	26.5
Thallium					0.225	0.17	0.15	0.163	0.203	0.195	0.192	0.173	0.169	0.149
Tin					*<2.0*	2.3	2.1	2.5	2.4	2.9	2.4	2.1	*<2.0*	*<2.0*
Titanium					852	733	480	493	553	528	505	601	514	617
Uranium					23	20.2	10.2	12.1	14.6	13.6	12.9	20.9	11.4	12.1
Vanadium					34	30.8	22.7	25.3	31.4	30.2	29.1	30.3	25.2	26.4
Zinc*	123	315	121.3		**148**	100	70.9	82	99.2	94.6	89.9	103	81	73.7

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.
   ISQG = interim sediment quality guideline
   PEL = probable effect level
2. Trigger and threshold values shown here for context only; they were developed for Meadowbank in the CREMP Design Document 2012 (Azimuth, 2012d). Thresholds are set equal to CCME ISQG guidelines, where available.

* CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the ISQG.

123 Bolded and shaded concentrations also exceed the PEL.

Italicized numbers are below detection limits.

Table 4. Conventional sediment core chemistry, Lake D1 and Lake D5, 2018.

Lake & Basin	Screening Criteria				Lake D5 LK5									
Area-Replicate ID					SC-1	SC-2	SC-3	SC-4	SC-5	SC-6	SC-7	SC-8	SC-9	SC-10
Date	CCME[1]		Meadowbank[2]		16-Aug-18	16-Aug-18	16-Aug-18	16-Aug-18	16-Aug-18	16-Aug-18	16-Aug-18	16-Aug-18	16-Aug-18	16-Aug-18
ALS Sample ID	ISQG	PEL	Trigger	Threshold	L2155903	L2155903	L2155903	L2155903	L2155903	L2155903	L2155903	L2155903	L2155903	L2155903
Physical & Organic Parameters														
Moisture (%)					94.3	94.8	94.3	91.9	94	92.6	91.3	93.5	93.6	93.1
pH					5.88	6.15	4.76	4.47	4.7	4.55	5.13	4.91	5.78	4.46
Total Metals (mg/kg dw)														
Aluminum					16000	13800	15500	17500	12800	12500	20400	19200	18900	17700
Antimony					0.31	0.22	0.37	0.45	0.41	0.45	0.4	0.43	0.28	0.48
Arsenic*	5.9	17	120.0		**12**	**9.47**	**49.5**	**69.8**	**94.4**	**78**	**22.4**	**43.6**	**13.8**	**75.8**
Barium					103	91.5	61.7	62.5	53.8	46.1	139	100	143	61.8
Beryllium					1.01	0.87	1.1	1.22	1.02	1.01	1.39	1.38	1.2	1.32
Bismuth					0.37	0.31	0.45	0.54	0.46	0.45	0.52	0.53	0.42	0.56
Boron					13.1	13.1	12.1	10.7	10.2	10.3	11.8	13.9	13.7	11.7
Cadmium*	0.6	3.5	1.10		0.24	0.214	0.233	0.291	0.254	0.265	0.322	0.301	0.283	0.324
Calcium					3490	3940	2460	2030	1870	1570	2650	2540	3480	2010
Chromium*	37.3	90	114.3		**106**	**92.6**	**116**	**130**	**96.8**	**88.1**	**144**	**129**	**116**	**128**
Cobalt					9.82	8.37	14.2	20.1	21.7	26.30	14.8	17.1	11.3	25.6
Copper*	35.7	197	126.0		34.5	30.6	**44.9**	**56.5**	**49.9**	**52.9**	**54.5**	**53**	**40.6**	**63**
Iron					26600	22800	99700	145000	246000	298000	46000	83500	26200	185000
Lead	35	91.3	32.5	35	12	11.1	12.7	13.7	11.7	10.6	12.6	13.3	11.7	13.7
Lithium					13.4	12.1	13.2	13.1	8.9	8.6	15.9	13.8	16	12.7
Magnesium					7380	6900	7660	7880	5450	5130	9190	8090	8630	7450
Manganese					326	368	391	454	715	597	394	462	394	519
Mercury	0.17	0.486	0.104	0.17	0.0706	0.059	0.077	0.0824	0.0872	0.0751	0.0551	0.0822	0.0468	0.0767
Molybdenum					3.32	2.79	5.57	8.28	10.10	10.4	7.09	7.92	4.58	10.6
Nickel					61.2	57.2	72	77.4	69.8	70.8	84.8	79.7	73.2	86.7
Phosphorus					644	746	1060	840	1170	1170	577	842	592	818
Potassium					1950	1600	1630	1690	1300	1200	2380	2130	2370	1780
Selenium					0.69	0.62	1.18	1.39	1.49	1.67	1.09	1.08	0.71	1.64
Silver					0.76	1.15	1.09	0.99	0.75	0.86	1.32	1.69	0.76	1.44
Sodium					186	179	153	141	119	98	171	187	197	128
Strontium					23.4	23.1	18.7	17.8	13	11.6	23	20.6	23.5	16.1
Thallium					0.134	0.109	0.129	0.162	0.122	0.128	0.205	0.174	0.172	0.163
Tin					*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	3.1	2.5
Titanium					300	257	297	328	239	256	428	353	369	355
Uranium					7.19	5.95	8.4	10.1	8.43	8.12	10.9	10	8.9	10.5
Vanadium					24.6	21.4	25.6	27.9	20.4	19.5	31.8	28.6	27.4	28.3
Zinc*	123	315	121.3		74.1	63.5	85.5	97.4	82.1	79.2	**141**	112	102	103

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.
   ISQG = interim sediment quality guideline
   PEL = probable effect level
2. Trigger and threshold values shown here for context only; they were developed for Meadowbank in the CREMP Design Document 2012 (Azimuth, 2012d). Thresholds are set equal to CCME ISQG guidelines, where available.

* CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the ISQG.

123 Bolded and shaded concentrations also exceed the PEL.

Italicized numbers are below detection limits.

Table 5. Hydrocarbon and PAH results for composite sediment grabs, Lake D1 and Lake D5, 2018.

Lake		CCME Guidelines[1]		Lake D1	Lake D5
Area ID	Lowest DL	ISQG	PEL	LK1	LK5
Date				15-Aug-18	16-Aug-18
Physical Parameters					
Moisture (%)				79.9	90.6
Aggregate Organics (mg/kg)					
Mineral Oil and Grease	500			1280	*<1900*
Hydrocarbons (mg/kg)					
EPH10-19	200			*<480*	*<980*
EPH19-32	200			*<480*	*<980*
LEPH	200			*<480*	*<980*
HEPH	200			*<480*	*<980*
2-Bromobenzotrifluoride (%)				103.2	100.5
Polycyclic Aromatic Hydrocarbons (mg/kg)					
Acenaphthene	0.005	0.00671	0.0889	*<0.010*	*<0.015*
Acenaphthylene	0.005	0.00587	0.128	*<0.010*	*<0.015*
Anthracene	0.004	0.0469	0.245	*<0.0080*	*<0.012*
Benz(a)anthracene	0.01	0.0317	0.385	*<0.020*	*<0.030*
Benzo(a)pyrene	0.01	0.0319	0.782	*<0.020*	*<0.030*
Benzo(b&j)fluoranthene	0.01			*<0.020*	*<0.030*
Benzo(b+j+k)fluoranthene	0.015			*<0.028*	*<0.042*
Benzo(g,h,i)perylene	0.01			*<0.020*	*<0.030*
Benzo(k)fluoranthene	0.01			*<0.020*	*<0.030*
Chrysene	0.01	0.0571	0.862	*<0.020*	*<0.030*
Dibenz(a,h)anthracene	0.005	0.00622	0.135	*<0.010*	*<0.015*
Fluoranthene	0.01	0.111	2.355	*<0.020*	*<0.030*
Fluorene	0.01	0.0212	0.144	*<0.020*	*<0.030*
Indeno(1,2,3-c,d)pyrene	0.01			*<0.020*	*<0.030*
1-Methylnaphthalene	0.05			*<0.10*	*<0.15*
2-Methylnaphthalene	0.01	0.0202	0.201	*<0.020*	*<0.030*
Naphthalene	0.01	0.0346	0.391	*<0.020*	*<0.030*
Phenanthrene	0.01	0.0419	0.515	*<0.020*	*<0.030*
Pyrene	0.01	0.053	0.875	*<0.020*	*<0.030*
Quinoline	0.05			*<0.10*	*<0.15*
Acenaphthene d10				96.5	91.2
Chrysene d12				113.8	106.6
Naphthalene d8				91.8	85.0
Phenanthrene d10				107.3	103.0
B(a)P Total Potency Equivalent	0.02			*<0.020*	*<0.029*
IACR (CCME)	0.15			*<0.21*	*<0.32*

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

ISQG = interim sediment quality guideline

PEL = probable effect level

Bolded concentrations exceed the ISQG guideline.

Italicized numbers are below detection limits.

Table 6. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Lake D1 and Lake D5, 2018.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)							Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	TOTAL		
Lake D1										
LK1-1	14-Aug-18	0	21	43	6.9	4.4	16	90	31	0.84
LK1-2	14-Aug-18	0	16	31	5.4	6.9	13	73	28	0.82
LK1-3	23-Sep-18	0	9.8	56	21	4.6	8.4	100	34	0.84
LK1-4	23-Sep-18	0.2	8.6	44	19	0.7	5.2	78	29	0.80
LK1-5	9-Nov-18	0	8.0	31	12	14	4.3	69	22	0.74
LK1-6	9-Nov-18	0	8.1	32	11	16	2.4	69	24	0.72
Lake D5										
LK5-1	15-Aug-18	0	24	20	17	4.4	3.1	69	29	0.85
LK5-2	15-Aug-18	0	16	20	21	2.2	18	77	31	0.88
LK5-3	23-Sep-18	0	16	77	41	1.7	6.7	142	29	0.85
LK5-4	23-Sep-18	0	13	68	42	2.7	15	141	30	0.83
LK5-5	16-Nov-18	0	5.7	28	14	17	4.9	70	21	0.76
LK5-6	16-Nov-18	0	5.1	29	11	17	3.0	64	24	0.79

Table 6. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Lake D1 and Lake D5, 2018.

Area-Replicate	Date	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
Lake D1								
LK1-1	14-Aug-18	0	1,121,704	517,448	39,320	29,336	1,400	1,709,208
LK1-2	14-Aug-18	0	1,006,560	344,832	116,144	37,120	1,200	1,505,856
LK1-3	23-Sep-18	0	281,776	764,304	526,232	29,336	400	1,602,048
LK1-4	23-Sep-18	800	352,216	499,296	620,224	400	600	1,473,536
LK1-5	9-Nov-18	0	904,356	510,738	237,589	60,338	200	1,713,220
LK1-6	9-Nov-18	0	993,108	482,770	223,404	78,068	100	1,777,450
Lake D5								
LK5-1	15-Aug-18	0	726,984	244,856	304,128	15,168	1,800	1,292,936
LK5-2	15-Aug-18	0	446,008	664,728	735,768	1,400	200	1,848,104
LK5-3	23-Sep-18	0	273,592	591,088	762,904	1,600	600	1,629,784
LK5-4	23-Sep-18	0	652,482	312,111	346,172	79,268	300	1,390,333
LK5-5	16-Nov-18	0	592,299	361,056	293,880	69,130	300	1,316,665
LK5-6	16-Nov-18	0	542,553	335,933	307,665	61,738	400	1,248,289

Table 7. Benthic invertebrate abundance and richness by major taxa group, Lake D1 and Lake D5, 2018.

Area-Replicate	Depth (m)	Abundance (#/m^2)					Richness (# taxa)				
		Oligo	Insects	Molluscs	Other Taxa	**Total**	Oligochaetes	Insects	Molluscs	Other Taxa	**Total**
Lake D1											
Rep 1	7.9	174	3457	630	43	4304	2	11	2	2	19
Rep 2	7.9	43	1348	500	87	1978	1	7	2	2	18
Rep 3	7.2	0	1196	413	109	1717	0	7	3	2	20
Rep 4	7.5	43	1087	261	65	1457	1	11	3	3	18
Rep 5	8.2	43	1000	304	43	1391	1	7	2	1	13
	Area Mean	***61***	***1617***	***422***	***70***	***2170***	***1***	***9***	***2***	***2***	***18***
Lake D5											
Rep 1	8.0	0	4978	913	109	6000	0	9	2	3	16
Rep 2	7.4	130	4043	1543	43	5761	2	7	2	1	17
Rep 3	7.3	22	3804	1043	152	5022	1	7	2	3	11
Rep 4	7.4	87	3783	1130	43	5043	1	10	2	2	13
Rep 5	7.3	22	3304	935	22	4283	1	9	2	1	16
	Area Mean	***52***	***3983***	***1113***	***74***	***5222***	***1***	***8***	***2***	***2***	***15***

Notes:

Other taxa: (Turbellaria, Acalyptonotidae, Hygrobatidae, Lebertiidae, Oxidae, and Notostraca).