



Jay Project

2014 Water and Sediment Quality Supplemental Baseline Report

Prepared for: Dominion Diamond Ekati Corporation

Prepared by: Golder Associates Ltd.

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Abbreviations

Abbreviation	Definition
ALS	ALS Environmental
BTEX	benzene, ethylbenzene, toluene, and xylenes
Bottom	bottom of the water column
CCME	Canadian Council of Ministers of the Environment
CDWQG	Canadian Drinking Water Quality Guideline
CWQG	Canadian Water Quality Guidelines
DL	detection limit
DO	dissolved oxygen
DOC	dissolved organic carbon
Dominion Diamond	Dominion Diamond Ekati Corporation
dw	dry weight
e.g.	for example
Ekati Mine	Ekati Diamond Mine
et al.	and more than one additional author
F1 (C ₅ -C ₁₀)	hydrocarbon fraction that includes components with 5 to 10 carbon atoms
F2 (C ₁₀ -C ₁₆)	hydrocarbon fraction that includes components with 10 to 16 carbon atoms
FF	Far Field
i.e.	that is
ISQG	Interim Sediment Quality Guideline
Jay Pipe	Jay Kimberlite Pipe
K _d	vertical light attenuation coefficient
Mid	middle of the water column
N	nitrogen
NTU	nephelometric turbidity units
NWT	Northwest Territories
OECD	Organization for Economic Cooperation and Development
P	phosphorus
PAR	photosynthetically active radiation
PCDD	polychlorinated dibenzodioxin
PCDD/F	polychlorinated dibenzodioxins and polychlorinated dibenzofurans
PCDF	polychlorinated dibenzofuran
PEL	probable effects level
pH	potential of hydrogen; provides measure of the acidity or alkalinity of a solution on a scale of 1 to 14.
Project	Jay Project
QC	quality control
QA/QC	quality assurance/quality control
RPD	relative percent difference
SQG	Sediment Quality Guideline
SRSi	soluble reactive silica
TCDD	tetrachlorodibenzo-p-dioxin



Abbreviation	Definition
TDP	total dissolved phosphorus
TDS	total dissolved solids
TEF	toxic equivalency factor
TEQ	toxic equivalency
TKN	total Kjeldahl nitrogen
TN	total nitrogen
TOC	total organic carbon
Top	top of the water column
TP	total phosphorus
TSI	trophic state index
TSS	total suspended solids

Units of Measure

Unit	Definition
%	percent
<	less than
°C	degrees Celsius
CFU/100 mL	coliform-forming units per 100 millilitres
cm	centimetre
km	kilometre
m	metre
mg/kg dw	milligrams per kilogram dry weight
mg/L	milligrams per litre
mg-N/L	milligrams per litre as nitrogen
mg-P/L	milligrams per litre as phosphorus
mL	millilitre
mm	millimetre
pg/g	picograms per gram
µg/L	micrograms per litre
µg/g dw	micrograms per gram dry weight
µm	micron (micrometre)
µS/cm	microSiemens per centimetre



1 INTRODUCTION

1.1 Background

Dominion Diamond Corporation (Dominion Diamond) is a Canadian-owned and Northwest Territories (NWT) based mining company that mines, processes, and markets Canadian diamonds from the Ekati Diamond Mine (Ekati Mine). Dominion Diamond also markets Canadian diamonds from its 40% ownership of the Diavik Diamond Mine. The existing Ekati Mine is located approximately 200 kilometres (km) south of the Arctic Circle and 300 km northeast of Yellowknife, NWT (Map 1.1-1).

Dominion Diamond is proposing to develop the Jay kimberlite pipe (Jay pipe) located beneath Lac du Sauvage. The proposed Jay Project (Project) will be an extension of the Ekati Mine, which is a large, stable, and successful mining operation that has been operating for 16 years. Most of the infrastructure required to support the development of the Jay pipe and to process the kimberlite currently exist at the Ekati Mine. The Project is located in the southeastern portion of the Ekati claim block approximately 25 km from the main facilities and approximately 7 km to the northeast of the Misery Pit, in the Lac de Gras watershed (Map 1.1-2).

Baseline field programs were completed for water quality and sediment quality in 2013 to support environmental assessment of the Jay Project. The water and sediment quality baseline report, submitted as an annex (Annex XI) to the Developer's Assessment Report (Dominion Diamond 2014), provided a summary of the data collected during open-water conditions in 2013, including historical reference (pre-mining) and pre-2013 condition data, to characterize water and sediment quality in the lakes and streams within the baseline study area.

The objective of the 2014 water and sediment quality field program was to supplement the existing water quality and sediment quality data in the baseline study area, focusing on Lac du Sauvage, small localized lakes, and key regions of Lac de Gras that could be potentially influenced by the Jay Project. This field program included an under-ice (winter) water quality sampling event and three open-water (spring, summer, and fall) water quality sampling events. A sampling event for sediment quality was completed in fall. This report summarizes the supplemental baseline data collected from lakes and outlet streams of the baseline study area in 2014.

To meet the objectives of the 2014 water and sediment quality baseline program, specific field sampling and testing were undertaken to:

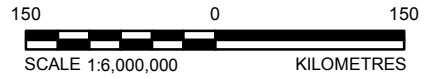
- characterize the physical limnology of the lakes in the study areas;
- characterize spatial and seasonal variability in water quality of lakes in the study area during under-ice and open-water conditions;
- characterize seasonal variability in water quality of outlet streams in the study area during under-ice and open-water conditions;
- characterize spatial variability in sediment quality of lakes; and,
- compare 2014 data to guidelines for the protection of aquatic life, human health, and site-specific water quality objectives.

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LEGEND

- JAY PROJECT
- EXISTING MINE OR PROJECT
- TERRITORIAL CAPITAL
- POPULATED PLACE
- HIGHWAY
- ALL-SEASON ROAD
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- TERRITORIAL/PROVINCIAL BOUNDARY
- TREELINE
- WATERCOURSE
- WATERBODY



REFERENCE

WATER OBTAINED FROM ATLAS OF CANADA
 NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
 PROJECTION: CANADA LAMBERT CONFORMAL CONIC

DOCUMENT

2014 WATER AND SEDIMENT QUALITY SUPPLEMENTAL MONITORING REPORT



PROJECT
 DOMINION DIAMOND
JAY PROJECT
 NORTHWEST TERRITORIES, CANADA

LOCATION OF THE JAY PROJECT



PROJECT	13-1328-0041	FILE No. SMR2014_WQ_001_GIS
DESIGN	MM 08/12/14	SCALE AS SHOWN
GIS	ANK 07/04/15	REV. 0
CHECK	CP 07/04/15	
REVIEW	KM 07/04/15	

MAP 1.1-1



LEGEND

- EKATI MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- KIMBERLITE PIPE
- WINTER ROAD
- TIBBITT TO CONTOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTOYTO WINTER ROAD
- ELEVATION CONTOUR (10 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY

REFERENCE

CANVEC © NATURAL RESOURCES CANADA, 2012
 NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
 DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

2014 WATER AND SEDIMENT QUALITY SUPPLEMENTAL MONITORING REPORT



PROJECT	JAY PROJECT		
	NORTHWEST TERRITORIES, CANADA		
EKATI PROPERTY MAP			
PROJECT	13-1328-0041	FILE No. SMR2014_WQ_002_GIS	
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CHECK	CP	07/04/15	
REVIEW	KM	07/04/15	
			MAP 1.1-2

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1.2 Baseline Study Area

The baseline study area for the 2014 water and sediment quality programs is located within the headwaters of the Coppermine watershed, and consists of sub-basins that flow directly into Lac du Sauvage and/or Lac de Gras.

In terms of sampling stations, the scope of the 2014 under-ice program was similar to that of the 2013 baseline open-water programs, with the exclusion of the shallow-depth stations in Lac du Sauvage. The core sampling areas were also revised for the 2014 open-water program, as compared to 2013, as the proposed project design shifted from the Jay-Cardinal project to the Jay Project.

The core areas sampled for the 2014 under-ice and open-water programs included:

- Lac du Sauvage and the Af sub-basin containing Lake Af1 and Duchess Lake;
- lakes within the Lac du Sauvage basin, such as Lake D3 (Counts Lake) in D basin; and,
- Lac du Sauvage outlet stream.

The additional sampling areas for the open-water programs included:

- Lac de Gras, including Slipper Bay¹ and the upper East Bay² (Far Field 2 [FF2]) areas;
- Lake P5 within the Lac de Gras basin; and,
- Lac de Gras outlet stream.

Paul Lake within the Lac de Gras basin was only sampled in the winter program.

The overall study design for the program was developed to optimize the collection of samples during one-week to two-week field programs, while collecting sufficient data to characterize spatial and temporal variability in water quality, and spatial variability in sediment quality.

As part of the 2014 program, sampling was undertaken in two areas of Lac de Gras, which are also sampled as part of the Ekati Mine and Diavik Diamond Mine aquatic effects monitoring programs. Samples were collected in Slipper Bay at the Slipper Bay stations established by the Ekati Mine (ERM Rescan 2014) and in the upper East Bay at the FF2 stations established by the Diavik Diamond Mine (Golder 2014). The same station identifiers as used in the Ekati and Diavik studies were used for this program.

¹ Slipper Bay is the same area sampled as part of the Ekati Mine aquatic effects monitoring program (AEMP). For the 2014 supplemental baseline, these stations were sampled, and the same station identifiers used by Ekati were applied to the samples collected from these stations. The results included in this report are independent of the Ekati AEMP monitoring.

² The upper East Bay is the Far Field 2 (FF2) area sampled as part of the Diavik Diamond Mine AEMP. For the 2014 supplemental baseline, these stations were sampled, and the same FF2 station identifiers used by Diavik were applied to the samples collected from these stations. The results included in this report are independent of the Diavik AEMP monitoring.



The basin naming convention used for the 2014 baseline program remained unchanged from 2013. This convention was developed for use during the preparation of the Developer's Assessment Report by all technical disciplines, including other aquatic components (i.e., hydrology, fish and fish habitat, and aquatic health). Further information regarding the physical setting of the Project and the baseline study area is available in the 2013 baseline report (Dominion Diamond 2014, Annex XI).

2 METHODS

2.1 General Approach

The 2014 water and sediment quality baseline program consisted of four sampling events during under-ice and open-water conditions. Water samples and physico-chemical water column measurements were collected during one under-ice sampling event (April [winter]), and three open-water sampling events (July [late spring], August [summer], and September [fall]) in 2014 (Table 2.1-1). Sediment quality samples were collected during the fall sampling event (Table 2.1-1).

Table 2.1-1 Water and Sediment Quality Sampling Periods, 2014

Sampling Program	Sample Type	Season	Timing of Sampling
Under-Ice	Water Quality	Winter	April 23 to 30
Open-Water	Water Quality	Late Spring	July 16 to 23
		Summer	August 6 to 18
		Fall	September 3 to 16
	Sediment Quality	Fall	September 3 to 16

The sampling plan for the 2014 under-ice, water quality program included the following general components:

- field physico-chemical water column measurements of water temperature, dissolved oxygen (DO), pH, and specific conductivity measured at 1 metre (m) depth increments at lake stations, and below the water surface at stream stations;
- collection of discrete water quality samples at lake stations from the top and bottom of the water column, or at mid-depth, depending on the presence of stratification; and,
- discrete water quality samples collected at stream stations from below the water surface.

The sampling plan for the 2014 open-water, water quality program included the following additional components:

- field measurements of light attenuation through the water column at lake stations;
- collection of depth-integrated water quality samples at lake stations; and,
- discrete water quality samples collected at stream stations from below the water surface.



Depth-integrated samples were collected specifically for the supplemental phytoplankton baseline program (for nutrient and chlorophyll *a* analysis). These samples are representative of the euphotic zone at each station (i.e., the primary zone of primary productivity within a water column). The discrete samples were collected as grab samples from specific depths in the water column (i.e., Top, Mid, and/or Bottom); the option for single or multiple depth samples was determined by the presence or absence of any discernible thermal or oxic stratification (see Section 2.3.2).

The sampling plan for the 2014 sediment quality program included the following components:

- collection of composite sediment samples at lake stations; and,
- collection of sediment samples for analysis of polychlorinated dibenzodioxin (PCDD; dioxins) and polychlorinated dibenzofuran (PCDF; furans) at select lake stations.

2.2 Sampling Locations

Sampling stations in the 2014 water and sediment sampling locations are shown in Maps 2.2-1 and 2.2-2.

For the under-ice program, sampling in Lac du Sauvage was the primary focus because there were limited under-ice data available across the lake compared to data available for open-water conditions. Eight sampling stations were located throughout internal sub-basins Aa, Ab, Ac, Ad, and Ae of Lac du Sauvage, including the outlet (Table 2.2-1). Two stations were sampled in Duchess Lake (sub-basin Af in the Lac du Sauvage basin) (Table 2.2-2), and one station was sampled in Lake Af1 (Table 2.2-2). Four small lakes within the Lac du Sauvage basin were included (Table 2.2-2). Three stations in Paul Lake (in the Lac de Gras basin) were also sampled (Table 2.2-3).

During the under-ice program, samples were collected at stations established in the following lakes and lake outlet streams as follows:

- Lac du Sauvage;
- Lac du Sauvage outlet;
- lakes within the Lac du Sauvage basin: Duchess Lake, Christine Lake, Lake C1, Counts Lake, Lake E1, and Lake Af1; and,
- Paul Lake within the Lac de Gras basin.

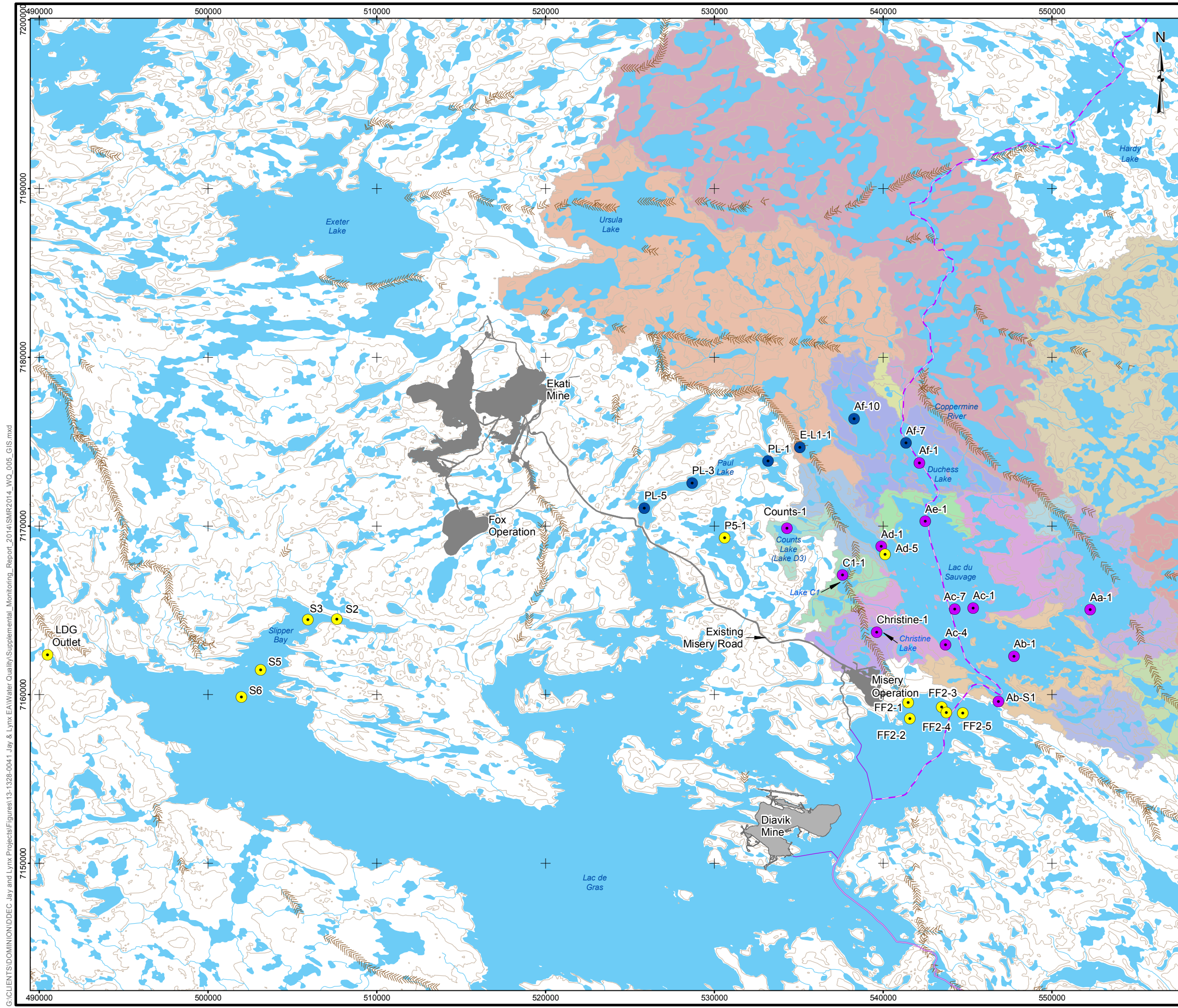
For the open-water programs, eight stations from the internal sub-basins of Lac du Sauvage were sampled, including the outlet (Table 2.2-1). One station was sampled in Duchess Lake, and four small lakes within the Lac du Sauvage basin were sampled (Table 2.2-2). In Lac de Gras, four stations in Slipper Bay, five stations in the Far Field 2 area, and the lake outlet were sampled (Table 2.2-4). Finally, one station in Lake P5 (within the Lac de Gras basin) was sampled (Table 2.2-3).



During the open-water program, samples were collected at stations established in the lakes and lake outlet streams as follows:

- Lac du Sauvage;
- Lac du Sauvage outlet;
- lakes within the Lac du Sauvage basin: Duchess Lake, Christine Lake, Lake C1, and Counts Lake;
- Lac de Gras: Slipper Bay, Far Field 2 area, and the lake outlet; and,
- Lake P5, within the Lac de Gras basin.

Not all stations were consistently sampled during each field program. Helicopters and boats were used to access the sites because they are located some distance from the camp at the Ekati Mine. Bad weather conditions (e.g., fog, high winds) within the field program schedule occasionally resulted in delays in the field programs.



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (20 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- WATER SAMPLING STATION (OPEN-WATER PROGRAM)
- WATER SAMPLING STATION (UNDER-ICE PROGRAM)
- WATER SAMPLING STATION (OPEN-WATER AND UNDER-ICE PROGRAMS)

BASIN

- Aa
- Ab
- Ac
- Ad
- Ae
- Af
- B
- C
- D
- E
- F
- F2
- G
- H
- I
- J
- K
- L

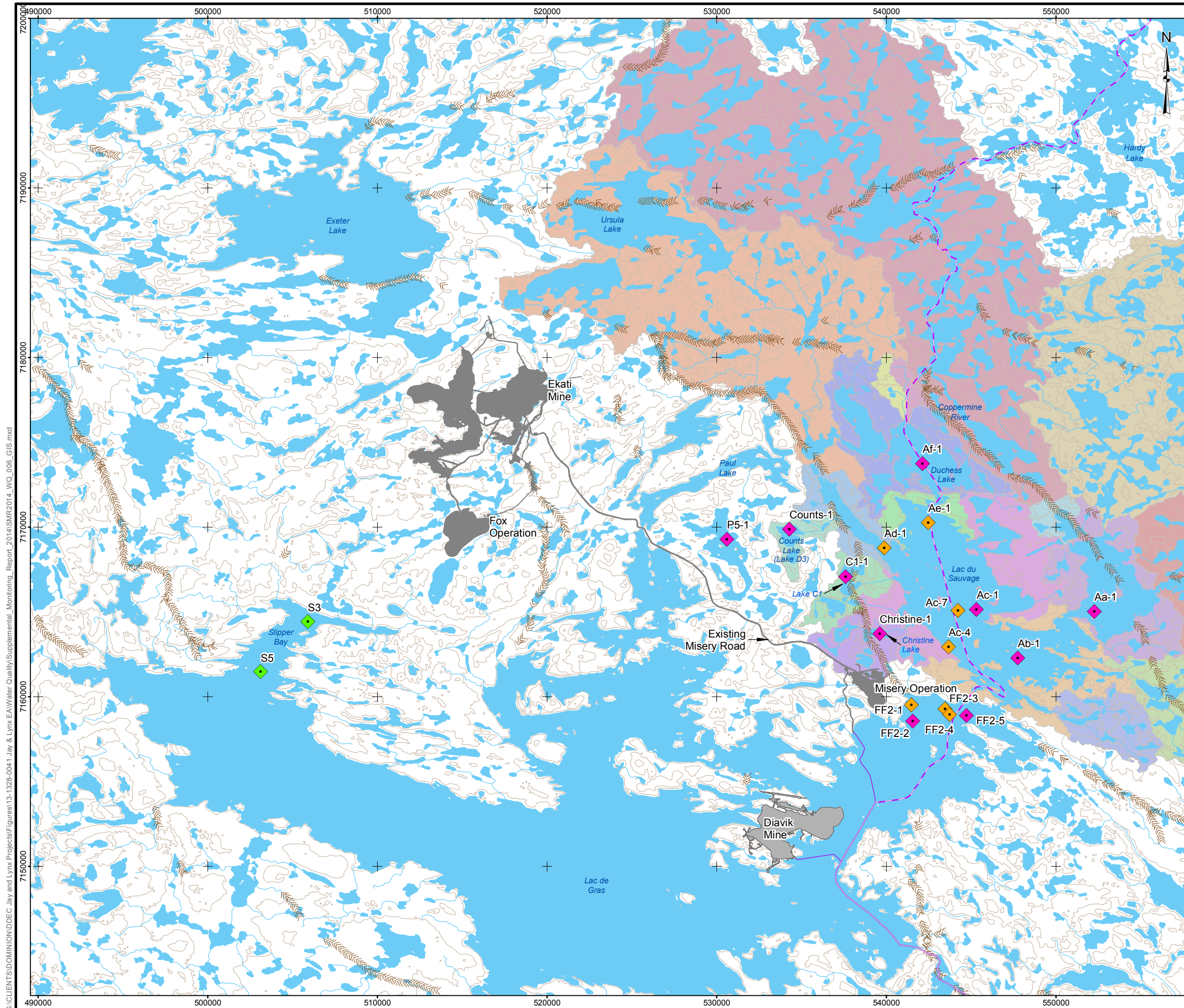
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 NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
 DATUM: NAD83 PROJECTION: UTM ZONE 12N

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WATER SAMPLING LOCATIONS , 2014		CHECK CP 07/04/15		MAP 2.2-1
		REVIEW KM 07/04/15		

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- LEGEND**
- EKATI MINE FOOTPRINT
 - DIAVIK MINE FOOTPRINT
 - WINTER ROAD
 - TIBBITT TO CONTWOYTO WINTER ROAD
 - NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
 - ELEVATION CONTOUR (20 m INTERVAL)
 - ESKER
 - WATERCOURSE
 - WATERBODY
 - ◆ SEDIMENT SAMPLING STATION (DIOXINS AND FURANS)
 - ◆ SEDIMENT SAMPLING STATION (PHYSICAL PARAMETERS, NUTRIENTS, AND METALS)
 - ◆ SEDIMENT SAMPLING STATION (PHYSICAL PARAMETERS, NUTRIENTS, METALS, DIOXINS AND FURANS))

- BASIN**
- Aa
 - Ab
 - Ac
 - Ad
 - Ae
 - Af
 - B
 - C
 - D
 - E
 - F
 - F2
 - G
 - H
 - I
 - J
 - K
 - L

REFERENCE
 NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
 NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
 DATUM: NAD83 PROJECTION: UTM ZONE 12N

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	GIS	ANK	07/04/15		
	CHECK	CP	07/04/15		
	REVIEW	KM	07/04/15		
MAP 2.2-2					

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**Table 2.2-1 Water and Sediment Quality Sampling Summary for Lac du Sauvage, 2014**

Area	Basin/ Lake ID	Station ID	Total Depth (m)	NAD 83, 12W		Sampling Period ^(a)			
				Easting (m)	Northing (m)	Winter	Late Spring	Summer	Fall
Lake									
Lac du Sauvage	Aa	Aa-1	11.4	552282	7165025	Top, Bottom	—	Mid, Chl a, DIN	Mid, Chl a, DIN, SQ, SDF
	Ab	Ab-1	12.7	547766	7162266	Top, Bottom	Mid, Chl a, DIN	Mid, Chl a, DIN	Mid, Chl a, DIN, SQ, SDF
	Ac	Ac-1	14.8	545339	7165138	Top, Bottom	Mid, Chl a, DIN	Mid, Chl a, DIN	Mid, Chl a, DIN, SQ, SDF
	Ac	Ac-4	12.9	543695	7162938	Mid	Mid, Chl a, DIN	Mid, Chl a, DIN	Mid, Chl a, DIN, SQ
	Ac	Ac-7	13.1	544247	7165068	Top, Bottom	Mid, Chl a, DIN	Mid, Chl a, DIN	Mid, Chl a, DIN, SQ
	Ad	Ad-1	12.2	539898	7168781	Top, Bottom	—	Mid, Chl a, DIN	Mid, Chl a, DIN, SQ
	Ad	Ad-5	25.3	540112	7168316	—	Mid, Chl a, DIN	—	—
	Ae	Ae-1	11.9	542494	7170252	Top, Bottom	Mid, Chl a, DIN	Mid, Chl a, DIN	Mid, Chl a, DIN, SQ
Streams/Outlet									
Lac du Sauvage Outlet	Outlet	Ab-S1	0.9	546850	7159585	Mid	Mid	Mid	Mid

a) Under stratified conditions, water samples in lakes were collected 1 m below the water surface (Top) and 1 m above the lake bed (Bottom); under mixed conditions, water samples were collected from the middle (Mid) of the water column.

Note: Chl a = indicates that depth-integrated chlorophyll a samples were collected; DIN = indicates that depth-integrated nutrient samples were collected; SQ = indicates that sediment quality samples were collected; SDF = indicates that sediment samples were collected for dioxins and furans; “—” = indicates the site was not sampled due to weather, environment, or schedule limitations.

ID = identification; NAD = North American Datum; m = metre.

Table 2.2-2 Water and Sediment Quality Sampling Summary for Lac du Sauvage Sub-basins, 2014

Basin/ Lake ID	Station ID	Total Depth (m)	NAD 83, 12W		Sampling Period ^(a)			
			Easting (m)	Northing (m)	Winter	Late Spring	Summer	Fall
Lac du Sauvage Sub-basin Lakes								
Duchess Lake (Af)	Af-1	15.1	542155	7173731	Top, Bottom	—	Mid, Chl a, DIN	Mid, Chl a, DIN, SQ, SDF
	Af-7	12.5	541367	7174902	Top, Bottom	—	—	—
Christine Lake	Christine-1	12.0	539626	7163705	Mid	—	Mid	Mid, SQ, SDF
Lake C1	C1-1	20.0	537612	7167085	Top, Bottom	—	Top, Bottom	Mid, SQ, SDF
Counts Lake	Counts-1	10.4	534303	7169862	Top, Bottom	—	—	Mid, SQ, SDF
Lake E1	E-L1-1	10.5	535065	7174657	Top, Bottom	—	—	—
Lake Af1	Af-10	7.5	538299	7176361	Mid	—	—	—

a) Under stratified conditions, water samples in lakes were collected 1 m below the water surface (Top) and 1 m above the lake bed (Bottom); under mixed conditions, water samples were collected from the middle (Mid) of the water column.

Note: Chl a = indicates that depth-integrated chlorophyll a samples were collected; DIN = indicates that depth-integrated nutrient samples were collected; SQ = indicates that sediment quality samples were collected; SDF = indicates that sediment samples were collected for dioxins and furans; “—” = indicates the site was not sampled due to weather, environment, or schedule limitations.

ID = identification; NAD = North American Datum; m = metre.

Table 2.2-3 Water and Sediment Quality Sampling Summary for Lac de Gras Sub-basins, 2014

Basin/ Lake ID	Station ID	Total Depth (m)	NAD 83, 12W		Sampling Period ^(a)			
			Easting (m)	Northing (m)	Winter	Late Spring	Summer	Fall
Lac de Gras								
Paul Lake	PL-1	9.5	533179	7173835	Top, Bottom	—	—	—
	PL-3	12.0	528681	7172550	Top, Bottom	—	—	—
	PL-5	6.5	525859	7171047	Mid	—	—	—
Lake P5	P5-1	9.9	530615	7169282	—	—	Mid	Mid, SQ, SDF

a) Under stratified conditions, water samples in lakes were collected 1 m below the water surface (Top) and 1 m above the lake bed (Bottom); under mixed conditions, water samples were collected from the middle (Mid) of the water column.

Note: SQ = indicates that sediment quality samples were collected; SDF = indicates that sediment samples were collected for dioxins and furans; “—” = indicates the site was not sampled due to weather, environment, or schedule limitations.

ID = identification; NAD = North American Datum; m = metre.

**Table 2.2-4 Water and Sediment Quality Sampling Summary for Lac de Gras, 2014**

Area	Basin/ Lake ID	Station ID	Total Depth (m)	NAD 83, 12W		Sampling Period ^(a)			
				Easting (m)	Northing (m)	Winter	Late Spring	Summer	Fall
Lake									
Lac de Gras	Slipper Bay	S2	6.5	507638	7164468	—	Mid, Chl a, DIN	Mid, Chl a, DIN	Mid, Chl a, DIN
		S3	13.5	505912	7164439	—	Mid, Chl a, DIN	Mid, Chl a, DIN	Mid, Chl a, DIN, SDF
		S5	18.1	503125	7161482	—	Mid, Chl a, DIN	Mid, Chl a, DIN	Mid, Chl a, DIN
		S6	28.8	501976	7159857	—	Mid, Chl a, DIN	Mid, Chl a, DIN	—
	Far Field 2	FF2-1	21.5	541500	7159522	—	Mid, Chl a, DIN	Mid, Chl a, DIN	Mid, Chl a, DIN, SQ
		FF2-2	18.8	541583	7158573	—	Mid, Chl a, DIN	Mid, Chl a, DIN	Mid, Chl a, DIN, SQ, SDF
		FF2-3	19.5	543478	7159267	—	Mid, Chl a, DIN	Mid, Chl a, DIN	Mid, Chl a, DIN, SQ
		FF2-4	20.3	543752	7158945	—	Mid, Chl a, DIN	Mid, Chl a, DIN	Mid, Chl a, DIN, SQ
		FF2-5	20.5	544734	7158898	—	Mid, Chl a, DIN	Mid, Chl a, DIN	Mid, Chl a, DIN, SQ, SDF
	Streams/Outlet								
Lac de Gras Outlet	Lac de Gras Outlet	LDG Outlet	1.5	490482	7162358	—	—	Mid	Mid

a) Under stratified conditions, water samples in lakes were collected 1 m below the water surface (Top) and 1 m above the lake bed (Bottom); under mixed conditions, water samples were collected from the middle (Mid) of the water column.

Note: Chl a = indicates that depth-integrated chlorophyll a samples were collected; DIN = indicates that depth-integrated nutrient samples were collected; SQ = indicates that sediment quality samples were collected; SDF = indicates that sediment samples were collected for dioxins and furans; "—" = indicates the site was not sampled due to weather, environment, or schedule limitations.

ID = identification; NAD = North American Datum; m = metre.

2.3 Field Methods

2.3.1 Field Measurements

At each sampling station, water depth and physico-chemical measurements were collected. In situ physico-chemical measurements of specific conductivity, DO (concentration and percent saturation), pH, and water temperature were collected at each lake and stream station using a submersible multi-sensor probe system (Hydrolab Series 5 DataSonde multiprobe). At all lake stations, in situ physico-chemical measurements were taken just below the surface (or below the ice during under-ice conditions), at 0.5 m below the surface, 1 m, and every 1 m thereafter throughout the water column ending at 1 m above the lake bed. At the stream stations, readings were taken mid-stream, approximately at mid-depth in the water column, to the extent possible.

Total depth of the water column was measured either by using a sounding line (under-ice conditions), a boat-mounted sonar unit (Hummingbird; open-water conditions), or measuring tape (outlet streams; open-water conditions).

During under-ice conditions, ice thickness was measured following auger access to the underlying water.

During open-water conditions, Secchi depth and light attenuation readings were collected. Secchi depth was measured using a Secchi disk at each of the lake stations; this information was used to provide a coarse estimate of the euphotic zone depth for the purposes of the depth-integrated sample collection (Section 2.3.3) required for the plankton study. Light attenuation through the water column was measured as photosynthetically active radiation (PAR) using a LI-COR LI-1400 light meter and submersible sensor. Measurements were taken at specific depths (i.e., 2.5 centimetres [cm], 10 cm, 0.5 m, 1 m, and every 1 m thereafter to a depth of 1 m above the lake bed, or to a depth where the PAR measurement was approximately 1% of the light immediately below the surface of the water [e.g., 0.025 m]).

2.3.2 Discrete Water Sample Collection

Depending on the presence of thermal or oxyc stratification, discrete samples for water quality were collected at lake stations from either Top, Mid, or Bottom depths. Stratification was determined by meeting temperature and DO criteria as follows:

- a temperature difference of 1 degree Celsius (°C) or greater over 1 m depth within the water column; and,
- a DO difference of greater than, or equal to, 5 milligrams per litre (mg/L) between the top and the bottom of the water column; or
- a DO in the top of the water column greater than the aquatic life guideline (6.5 mg/L for cold water species) and DO at the bottom of the water column less than the aquatic life guideline.

If either of these conditions were met, the water column was considered to be stratified and discrete surface (Top) and bottom (Bottom) samples were collected. If neither of these conditions were met, the station was considered to be fully mixed or homogenous, and a single mid-column (Mid) sample was collected. Lake stations were typically stratified during the under-ice period and fully mixed during the open-water period. Fully mixed conditions during the open-water period were likely a combination of



weather and timing of sample collection. Lake samples were collected using a Kemmerer sampler. At each station, the Kemmerer was triple-rinsed with surface water representative of the station, and then lowered to the required depth, triggered by the messenger to collect a 2.2 litre (L) sample, returned to the surface, and used to fill the lab-supplied sample bottles. This procedure was repeated until all sample bottles for the station were filled.

Stream water quality samples were collected from areas of observable flow (approximately mid-stream). Grab samples were collected by directly filling laboratory-provided bottles, with the opening of the bottle facing upstream, at a depth ideally in the vertical middle of the water column (Mid); this depth was generally 0.3 to 0.5 m below the water surface.

Sample bottles were provided by ALS Environmental (ALS; Yellowknife, Edmonton, and Burnaby locations), which is an analytical laboratory accredited by the Canadian Association for Laboratory Accreditation Inc. Water samples were processed (i.e., filtered and/or preserved as required, and refrigerated) at the mine site (environmental field office) according to the instructions provided by ALS. Water samples requiring filtration were filtered through a 0.45 micron (μm) Millipore filter in a Nalgene filter tower using a vacuum pump before being preserved with laboratory-provided preservative based on the required analysis. Water samples were kept refrigerated before shipping; ice-packs were added to the coolers to keep the samples as cool as possible during shipping. Samples were shipped to the analytical laboratory as soon as possible after sample collection and processing.

The water samples collected from all sites were analyzed by ALS.

2.3.3 Depth-Integrated Water Sample Collection

Depth-integrated composite samples were collected for nutrient and chlorophyll *a* analyses from the euphotic zone at select lake stations as supporting information for the plankton study. The euphotic zone is defined as the extent of the water column that is exposed to sufficient sunlight for photosynthesis to occur (typically to a depth in the water column where 1% of the irradiance just under the water surface is measured). While in the field, the euphotic zone was calculated as two times the Secchi depth (Koenings and Edmundson 1991; AENV 2006).

Once the euphotic depth was determined, a Kemmerer sampler was used to collect discrete water samples starting at the surface, and continuing every 2 m through the extent of the euphotic zone. If the total water column depth was less than two times the Secchi depth, a water sample was collected every 2 m from the surface to 2 m above the lake bed.

Equal volumes of the water from each discrete depth were combined into a large clean bucket to create a composite, depth-integrated sample. From this composite sample, single sub-samples were collected for nutrient analysis and duplicate sub-samples were collected for chlorophyll *a* analysis.

Samples for nutrient analyses were collected in sample bottles provided by ALS. Samples were processed on site (i.e., filtered and/or preserved as required, and refrigerated), stored, and shipped as described for discrete water samples. Samples were submitted to ALS for analysis of nutrient parameters.

Water samples for chlorophyll *a* analysis were filtered through a 47 mm Whatman Glass Fiber type C filter (nominal pore size: 1.2 μm) in a glass filter tower using a vacuum pump under low light conditions to prevent photo-shock in the algal cells. A sample volume of 500 millilitres (mL) was filtered for each

chlorophyll *a* sample. The filters were folded in half, placed in a pre-labelled Petri dish, wrapped with aluminum foil, and frozen. Frozen filters were submitted to the Biogeochemical Analytical Service Laboratory at University of Alberta, Edmonton, Alberta, for chlorophyll *a* analysis.

2.3.4 Sediment Sample Collection

To avoid disruption of the water column or potential contamination of water samples by suspended sediments, sediment samples at lake stations were collected after all field measurements and water quality samples had been collected, or by a separate team on a different day.

Composite sediment samples and discrete sediment samples for analysis of dioxins and furans were collected using a stainless steel 15 cm Ekman grab. For the station composite samples, lake sediment was removed from the Ekman grab with a plastic trowel, taking care to remove sediments from the centre of the grab to avoid the metal sides of the Ekman, and from the upper 5 cm of the grab. The process was repeated until sufficient sediment was collected (approximately 450 grams [g] dry weight or 1.5 kilograms wet weight) for analysis of the required parameters. Each composite sample comprised up to five separate sample grabs collected within close proximity around the sampling station. Sediment samples were composited by placing each of the five sub-samples into a clean, shallow, plastic pan, and mixing with a plastic spoon. Sediment samples were placed in laboratory-provided plastic bags and kept refrigerated until they could be transported to ALS.

Sediment samples for dioxin and furan analyses were collected with a decontaminated (i.e., acetone-washed and aluminum foil-wrapped) stainless steel 15 cm Ekman grab. Lake sediment from the upper 5 cm of the grab was removed from the Ekman grab using the aluminum spoon. This process was repeated until the 250 mL glass sample jar had been filled. These samples were refrigerated until they could be transported to ALS for analysis.

2.4 Constituents and Analysis

The major categories of parameters used to describe water and sediment quality, and a summarized description of water and sediment quality data analyses (e.g., comparison to guidelines and objectives), are provided in this section. For further details, refer to Section 2.8.1.4 of the Water and Sediment Quality Baseline Report (Annex XI).

2.4.1 Water Quality

Field-measured parameters (i.e., water temperature, DO, pH, and specific conductivity) were collected in situ (directly in the field) through the water column of the lake stations or in streams using submersible sondes. These data were used to describe the physico-chemical characteristics of the lakes and lake outlets.

Vertical light attenuation measurements through the water column, as PAR using a LI-COR light meter, were collected to provide a direct and quantitative estimate of the depth of the euphotic zone. All light measurements were converted to represent a percentage of the surface irradiance value as described in Section 2.8.1.4 of the Water and Sediment Quality Baseline Report (Annex XI). The vertical light attenuation coefficient (K_d) was also calculated to compare light attenuation through the water column at different stations and on different sampling occasions. Light attenuation was calculated as described in Section 2.8.1.4 of the Water and Sediment Quality Baseline Report (Annex XI).

Discrete water quality samples were analyzed at ALS for a suite of parameters, including:

- conventional parameters (i.e., gran alkalinity, total alkalinity, conductance, hardness, laboratory pH, total dissolved solids [TDS], total suspended solids [TSS], and turbidity);
- major ions (i.e., bicarbonate, calcium, chloride, fluoride, magnesium, potassium, sodium, and sulphate);
- nutrients (i.e., total organic carbon [TOC], dissolved organic carbon [DOC], total nitrogen [TN], total Kjeldahl nitrogen [TKN], total ammonia, nitrate, nitrite, total phosphorus [TP], total dissolved phosphorus [TDP], dissolved orthophosphate, and soluble reactive silica [SRSi]);
- total and dissolved metals, metalloids, and non-metals³ (i.e., aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, cesium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, and zinc), plus hexavalent chromium;
- hydrocarbons (i.e., benzene, ethylbenzene, toluene, xylenes [BTEX], hydrocarbon fractions F1 [C₅-C₁₀], F₁-BTEX, F2 [C₁₀-C₁₆], and total recoverable hydrocarbons); and,
- fecal coliforms.

Depth-integrated samples were analyzed at ALS and Biogeochemical Analytical Service Laboratory for:

- nutrients (i.e., TN, total dissolved nitrogen, TKN, dissolved Kjeldahl nitrogen, total ammonia, nitrate, nitrite, TP, TDP, dissolved orthophosphate, and SRSi); and,
- chlorophyll *a*.

Water quality data were compared to the following water quality guidelines and objectives (Table 2.4-1):

- Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQG) for the protection of aquatic life (CCME 1999, with updates to 2014);
- Health Canada's Canadian Drinking Water Quality Guidelines (CDWQGs) (Health Canada 2012); and,
- Ekati Mine's short- and long-term Site-Specific Water Quality Objectives for chloride, potassium, sulphate, nitrate, molybdenum, and vanadium (Elphick et al. 2011; Rescan 2012 a,b,c,d,e, respectively).

³ Henceforth, metals, metalloids (e.g., arsenic), and non-metals (e.g., selenium) will be referred to as metals.



Table 2.4-1 Water Quality Guidelines and Site-Specific Water Quality Objectives Developed for the Ekati Mine

Parameter	Guidelines				Ekati Mine Site-Specific Water Quality Objectives	
	Unit	Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-Term SSWQO	Long-Term SSWQO
Field Parameters						
Dissolved oxygen	mg/L	-	6.5	-	-	-
pH	-	-	6.5 – 9.0	6.5 – 8.5	-	-
Conventional Parameters						
pH	-	-	6.5 – 9.0	6.5 – 8.5	-	-
Total dissolved solids	mg/L	-	-	500	-	-
Major Ions						
Chloride	mg/L	640	120	250		64 ^(c,i)
Fluoride	mg/L	-	0.12	1.5	-	-
Potassium	mg/L	-	-	-	112 ^(d)	41 ^(d)
Sodium	mg/L	-	-	200	-	-
Sulphate	mg/L	-	-	500	343 ^(e,i)	45 ^(e,i)
Nutrients						
Total ammonia	mg-N/L	-	2.8 – 105 ^(j)	-	-	-
Nitrate	mg-N/L	124	2.9	10	-	1.2 ^(f,i)
Nitrite	mg-N/L	-	0.06	1.0	-	-
Total phosphorus	mg-P/L	-	0.01 – 0.02 ^(l,m)	-	-	-
Other Parameters						
Benzene	µg/L	-	370	5.0	-	-
Ethylbenzene	µg/L	-	90	2.4	-	-
Toluene	µg/L	-	2.0	24	-	-
Xylenes	µg/L	-	-	300	-	-
Total Metals						
Aluminum	µg/L	-	5 or 100 ^(j)	100	-	-
Antimony	µg/L	-	-	6.0	-	-
Arsenic	µg/L	-	5.0	10	-	-
Barium	µg/L	-	-	1,000	-	-
Boron	µg/L	29,000	1,500	5,000	-	-
Cadmium	µg/L	0.11 – 0.37 ^(k)	0.04 ^(k)	5.0	-	-
Chromium	µg/L	-	1.0	50	-	-
Copper	µg/L	-	2.0 ⁽ⁱ⁾	1,000	-	-
Iron	µg/L	-	300	300	-	-
Lead	µg/L	-	1.0 ⁽ⁱ⁾	10	-	-
Manganese	µg/L	-	-	50	-	-
Mercury	µg/L	-	0.026	1.0	-	-
Molybdenum	µg/L	-	73	-	223,000 ^(g)	19,000 ^(g)

Table 2.4-1 Water Quality Guidelines and Site-Specific Water Quality Objectives Developed for the Ekati Mine

Parameter	Guidelines				Ekati Mine Site-Specific Water Quality Objectives	
	Unit	Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-Term SSWQO	Long-Term SSWQO
Nickel	µg/L	-	25 ⁽ⁱ⁾	-	-	-
Selenium	µg/L	-	1.0	10	-	-
Silver	µg/L	-	0.1	-	-	-
Thallium	µg/L	-	0.8	-	-	-
Uranium	µg/L	33	15	20	-	-
Vanadium	µg/L	-	-	-	300 ^(h)	30 ^(h)
Zinc	µg/L	-	30	5,000	-	-
Dissolved Metals						
Chromium - Hexavalent	µg/L	-	1.0	-	-	-

a) Source: CCME (Canadian Council of Ministers of the Environment). 1999, with updates to 2014. Canadian Environmental Quality Guidelines. Winnipeg, MB, Canada.

b) Source: Health Canada. 2012. Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.

c) Elphick JRF, Bergh KD, Bailey HC. 2011. Chronic toxicity of chloride to freshwater species: effects of hardness and implications for water quality guidelines. Environ Toxicol Chem 30: 230-246.

d) Rescan (Rescan Environmental Services Ltd.). 2012a. Ekati Diamond Mine: Site-Specific Water Quality Objective for Potassium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

e) Rescan. 2012b. Ekati Diamond Mine: Site-specific Water Quality Objective for Sulphate. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

f) Rescan. 2012c. Ekati Diamond Mine: Site-Specific Water Quality Objective for Nitrate, (2012). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

g) Rescan. 2012d. Ekati Diamond Mine: Site Specific Water Quality Objective for Molybdenum, (2011). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

h) Rescan. 2012e. Ekati Diamond Mine: Site-specific Water Quality Objective for Vanadium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

i) Guidelines based on hardness of 10 mg CaCO₃/L.

j) Guidelines based on pH of 6.0 to 7.3, temperature of 6.1°C to 13.3°C, and water hardness of 4.7 to 5.2 mg/L.

k) Acute guideline applies to all waters of hardness below 5.3 mg CaCO₃/L; chronic guideline applies to all waters of hardness below 17 mg CaCO₃/L.

l) Trigger for transition from oligotrophic to mesotrophic status (0.01 mg/L) applied to Lac de Gras basin and mesotrophic to meso-eutrophic status (0.02 mg/L) applied to Lac du Sauvage basin as based on CCME (2004).

m) Source: CCME 2004. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems. Canadian Environmental Quality Guidelines, 2004. Winnipeg, MB, Canada.

- = no guideline or data; CWQG = Canadian Water Quality Guidelines; CDWQG = Canadian Drinking Water Quality Guideline; SSWQO = Site-Specific Water Quality Objective; mg/L = milligrams per litre; pH = potential of hydrogen, provides measure of the acidity or alkalinity of a solution on a scale of 0 to 14; mg-N/L = milligrams of nitrogen per litre; mg-P/L = milligrams of phosphorus per litre; µg/L = micrograms per litre; mg CaCO₃/L = milligrams calcium carbonate per litre.

2.4.2 Sediment Quality

Sediment samples were analyzed by ALS for the following parameters:

- physical parameters (i.e., organic content and particle size distribution [sand, 2 to 5 millimetres {mm}; silt, 0.002 to 0.05 mm; and clay, less than 0.002 mm]);
- nutrients (i.e., available nitrogen, available nitrate as nitrogen, available phosphorus, available phosphate as phosphorus, inorganic carbon, total carbon, and TOC);
- metals (i.e., aluminum, antimony, arsenic, barium, beryllium, bismuth, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, sulfur, thallium, tin, titanium, uranium, vanadium, and zinc); and,
- dioxins (i.e., 2,3,7,8-tetrachlorodibenzo-p-dioxin and six PCDD congeners) and furans (i.e., 10 PCDF congeners).

Sediment quality with respect to physical parameters, nutrients and metals, as applicable, was compared to the CCME Interim Sediment Quality Guideline (ISQG) and the probable effects level (PEL) for the protection of aquatic life (Table 2.4-2) (CCME 2001a).

In to the 2014 sediment quality program, select stations were sampled for the presence of dioxins and furans in sediment. Dioxins and furans are persistent organic pollutants that are introduced to the environment through the air as trace products of combustion, and are deposited on the surfaces of soil, plants, and infrastructure, and are introduced into waterbodies through direct deposition or runoff from the watershed. Many of these hydrophobic compounds have low water solubility and bond strongly to particulate matter in aquatic sediments. Sediments can become reservoirs for dioxins and furans and, if the sediments are disturbed, these pollutants can be reintroduced into the surface sediment layers or water column where they become available for uptake by aquatic organisms and incorporation into the food web (Van den Berg et al. 2006; US EPA 2014). Aquatic organisms may be exposed to dioxins and furans directly from water or sediment, or through the consumption of contaminated prey. Due to their highly lipophilic properties, all 2,3,7,8-substituted dioxins and furans readily accumulate in the tissues of aquatic organisms and biomagnify up the food chain (CCME 2001b), causing a multitude of biological and toxic responses (Environment Canada 2000).

To assess the toxicity of these complex mixtures, a toxic equivalency (TEQ) value for each sample is reported by the analytical lab, consistent with United States Environmental Protection Agency 1613B (US EPA 1994). The TEQ is calculated by multiplying concentrations of each of the dioxin and furan congeners by toxic equivalency factors (TEFs) relating the toxicity of each congener to the most toxic dioxin (i.e., 2,3,7,8-tetrachlorodibenzo-p-dioxin). The TEFs are provided by the World Health Organization (Van den Berg et al. 2006). For chemicals that are not detected, a value of zero (i.e., lower bound TEQ), half of the detection limit concentration (mid-point TEQ), or the detection limit (upper bound TEQ) may be substituted for the concentration in the calculation of TEQ. The mid-point TEQ has been used for the analysis herein. The mid-point TEQ is considered a reasonable approximation of sample TEQs, as the upper bound TEQ is likely an overestimate of concentrations and the lower bound TEQ may be an underestimate of concentrations. The Ontario Ministry of the Environment (OMOE 2011) recommends the use of a mid-point TEQ in their analytical protocol. For dioxin and furan samples, the mid-point TEQs for each station was compared to the ISQG and PEL guidelines for the protection of aquatic life (Table 2.4-2) (CCME 2001b).

Table 2.4-2 Sediment Quality Guidelines

Parameter	Unit	Guideline	
		ISQG	PEL
Total Metals ^(a)			
Arsenic	µg/g	5.9	17
Cadmium	µg/g	0.6	3.5
Chromium	µg/g	37.3	90
Copper	µg/g	35.7	197
Lead	µg/g	35	91.3
Mercury	µg/g	0.17	0.486
Zinc	µg/g	123	315
Dioxins and Furans			
PCDD/Fs ^(b)	pg/g	0.85	21.5

a) Source: CCME (Canadian Council of Ministers of the Environment). 2001a. Canadian Environmental Quality Guidelines. Winnipeg, MB, Canada

b) Expressed on a TEQ basis using TEFs for fish. Source: CCME (2001b).

ISQG = Interim Sediment Quality Guideline; PEL = probable effect level; µg/g = micrograms per gram; pg/g = picograms per gram; TEQ = toxic equivalency; TEF = toxic equivalency factor; PCDD/Fs = polychlorinated dibenzo-dioxins and polychlorinated dibenzofurans.



2.5 Quality Assurance and Quality Control

The QA/QC (quality assurance/quality control) practices applied during this study and detailed results of the QC analysis are provided in Appendix A.

2.5.1 Quality Assurance/Quality Control Results

The QA/QC program included a review of field data, assessment of QC samples that comprised water quality field and travel blank samples, water and sediment quality duplicate samples, and a comparison of dissolved and total parameter concentrations. The QA/QC practices applied during this study and detailed results of the QC analysis are provided in Appendix A.

Review of field physico-chemical data indicated that the field-measured data collected during open-water programs were reliable and within range; however, the field-measured pH and DO values from the under-ice program were periodically reading at levels that were outside an acceptable range, despite successful calibrations and servicing of the meter. As a result, the field-measured pH data from the under-ice program, and some DO measurements, were not reported; for the under-ice program, laboratory-measured pH was used as a surrogate measurement for field pH. The use of laboratory pH is associated with high degree of uncertainty because it is analyzed well outside the holding time requirement (i.e., time between collection of the sample and start of the analyses, which for pH is 15 minutes).

Samples for laboratory analyses were submitted as soon as possible after collection to maintain sample integrity. Analytical holding times were met for all samples, except for alkalinity, pH (mentioned above), nitrite, orthophosphate, fecal coliforms, turbidity, TSS, and TDS samples. Holding time exceedances are a problem associated with remote access field programs and the availability of scheduled charter flights.

The overall quality of the water quality data was determined to be high, the sediment data quality was determined to be moderate to high, and the dioxin and furan sediment data was determined to be moderate. Therefore, the results reported herein are determined to be adequate to meet the needs of the program.

3 2014 WATER QUALITY RESULTS

This section of the report presents an evaluation of water quality data collected for lakes and lake outlet streams in the baseline study area. Detailed results are provided in the following appendices:

- field water column profile figures for water temperature, pH, conductivity, and DO are provided in Appendix B (Field Physico-Chemical Water Profile Measurements);
- light attenuation data and figures are provided in Appendix C (Water Column Light Attenuation Profiles); and,
- field and laboratory water quality data are provided in Appendix D (Water Quality Data).

3.1 Lac du Sauvage Basin

3.1.1 Lac du Sauvage

Sampling stations in Lac du Sauvage included three stations from sub-basin Ac, two from sub-basin Ad, and one from each of sub-basins Aa, Ab, and Ae (Map 2.2-1 and Table 2.2-1):

- during the under-ice period, seven field physico-chemical water column profile measurements and 13 discrete water quality samples were collected.
- during the open-water period, 20 field physico-chemical water column profile measurements and 20 discrete water quality samples were collected.

Stations Aa-1 and Ad-1 were not sampled during the spring program due to weather constraints, and Station Ad-5 was only sampled once in 2014 (late spring).

Field-Measured Physico-Chemical Parameters

Thermal stratification was not discernible at any of the lake stations in Lac du Sauvage during the under-ice or open-water programs (Appendix B, Figure B-1a).

Oxic stratification was evident at Stations Aa-1, Ac-1, Ac-4, Ac-7 during the under-ice program (Appendix B, Figure B-1b), resulting in lower DO concentrations in the bottom waters than measured at the surface. Despite the presence of stratification, the water column remained generally oxygenated during the under-ice program, with DO ranging from 6.0 to 16.0 mg/L (44.3 to 110.0% saturation; Appendix D, Table D-1). Dissolved oxygen concentrations remained above the CWQG of 6.5 mg/L during the under-ice program, with the exception of from one measurement at Ac-1 bottom (6.0 mg/L) (Appendix D, Table D-1).

During the open-water programs, there were no occurrences of oxic stratification (Appendix B, Figure B-1b). The waters were well-oxygenated throughout the duration of the open-water program, although DO concentrations were slightly higher in the fall compared to summer and late spring; DO ranged from 9.9 to 12.6 mg/L (94.2% to 108.2% saturation; Appendix D, Table D-2). Dissolved oxygen concentrations were consistently above the CWQG during the open-water program.

Specific conductivity was similar among the stations and seasonal sampling programs, ranging from 9 to 14 microSiemens per centimetre ($\mu\text{S}/\text{cm}$) (Appendix B, Figure B-1c; Appendix D, Tables D-1 and D-2).

The pH values from the under-ice program failed the QC checks and are not discussed. During the open-water programs, pH in stations within Lac du Sauvage indicated that the lake water is neutral to slightly acidic. In general, there was little variability throughout the water column at each station and between sampling programs (ranging from 5.6 to 7.0 in late spring, 6.3 to 7.4 in the summer, and 6.9 to 7.1 in the fall; Appendix B, Figure B-1d; Appendix D, Table D-2). The pH values were lower in the spring conditions compared to summer and fall, which is a reflection of depressed pH in surface water during and shortly after freshet (e.g., Forsström et al. 2007; Buffam et al. 2008). During the open-water program, 85% of pH values were within the CWQG (pH 6.5 and 8.5) and CDWQG (pH 6.5 to 9.0).

The Euphotic Zone and Light Attenuation

Secchi depth was measured during the field program to provide a measure of water clarity and to estimate the depth of the euphotic zone for collecting depth-integrated samples for nutrients and chlorophyll *a*.

Secchi depths at the sampling stations in Lac du Sauvage ranged from 4.5 to 7.5 m (Appendix C, Table C-1). There was some seasonal variance, with the summer Secchi depths higher (mean = 6.2 m) than late spring (mean = 5.5 m) and fall (mean = 5.1 m). This trend suggests that the euphotic zone in Lac du Sauvage was deeper during the summer.

The euphotic zone is better defined from vertical light attenuation measurements, as compared to Secchi depth measurements, because light attenuation measurements are quantitative and less subjective. The euphotic zone extends from the surface of the water to a depth where PAR is approximately 1% of light measured immediately below the water surface. The attenuation coefficient (K_d) among all stations in Lac du Sauvage during late spring, summer, and fall ranged from 0.36 to 0.51 (Table 3.1-1). The attenuation coefficient is a measure of how much light is absorbed by the water column; therefore, the higher the value, the faster light is absorbed in the water column. This range characterizes Lac du Sauvage as a clear water lake. The range of K_d values for Lac du Sauvage was similar to 44 clear-water lakes in Alaska with a mean of 0.31 ± 0.12 (standard deviation) (Kirk 1994).

The light attenuation data supported the Secchi depth observations, in that light penetrated deeper into the water column during the summer (mean $K_d = 0.41$) compared to the late spring (mean $K_d = 0.42$) and fall (mean $K_d = 0.46$) (Table 3.1-1) (i.e., the euphotic zone was deeper in summer). On a spatial level across the three open-water sampling programs, light attenuated more rapidly through the water column at Station Ae-1 and least at Station Ac-7 (Appendix C, Figure C-1).

**Table 3.1-1 Attenuation Coefficients (K_d) at Stations in Lac du Sauvage, 2014**

Station	Sampling Event		
	Late Spring	Summer	Fall
Aa-1	—	0.44	0.47
Ab-1	0.41	0.45	0.42
Ac-1	0.42	0.39	0.47
Ac-4	0.44	0.36	0.47
Ac-7	0.40	0.39	0.44
Ad-1	—	0.46	0.47
Ad-5	0.37	—	—
Ae-1	0.46	0.43	0.51

— = not sampled due to inclement weather.

Water Quality in Discrete Samples

Conventional Water Quality Parameters

Concentrations of conventional water quality parameters for Lac du Sauvage (Table 3.1-2) were similar among stations and sampling events:

- Waters in Lac du Sauvage had low ionic strength; TDS concentrations ranged from less than 10 mg/L to 24 mg/L.
- The range of values for total alkalinity and total hardness were also low, and indicated that Lac du Sauvage is a very soft water lake (McNeely et al.1979), with a high potential sensitivity to acid deposition (Saffran and Trew 1996).
- The range of laboratory-measured pH values during under-ice conditions (6.2 to 6.9, with a median of pH 6.4), in lieu of the excluded under-ice field-measured pH due to quality problems, confirmed that the lake water is neutral to slightly acidic⁴. Most (77%) of the water samples had pH values that were below the CWQG and CDWQG lower bound guideline of pH 6.5. Field-measured pH during open-water conditions (6.0 to 7.3, with a median of 6.9; 10% of values below the CWQG and CDWQG), also confirmed that the lake is neutral to slightly acidic.
- The waters were characterized as clear, as indicated by low attenuation coefficients, TSS concentrations below the laboratory detection limit (DL), and turbidity values from 0.18 to 1.5 nephelometric turbidity units (NTU).

⁴ Due to probe malfunction, the under-ice field-measured pH values were deemed unreliable and were therefore not included in this report. Therefore, laboratory pH measurements are included as a surrogate measure of field pH to characterize under-ice conditions in 2014. However, laboratory pH measurements were completed outside of the holding time requirement and thus are associated with a level of uncertainty.

Major Ions

Concentrations of major ions (Table 3.1-2) were similar among stations and sampling events. The dominant major ions were bicarbonate, magnesium, and calcium during both open-water and under-ice conditions (Table 3.1-2). Detection limits and measured concentrations of major ions were below the associated guidelines and objectives.

Nutrients

Nutrient concentrations measured in the discrete water samples from Lac du Sauvage (Table 3.1-2) were generally similar among stations and sampling events:

- Total ammonia concentrations ranged from less than 0.005 to 0.018 milligrams per litre as nitrogen (mg-N/L) and were below the CWQG. Detectable concentrations were more prevalent during under-ice conditions.
- Total Kjeldahl nitrogen concentrations ranged from less than 0.05 mg-N/L to 0.29 mg-N/L.
- Nitrite was not detectable (DL of 0.002 mg-N/L) in any samples. Nitrate ranged from below the DL (0.006 mg-N/L) to 0.11 mg-N/L during under-ice conditions, but was not detected during open-water conditions.
- Concentrations of TP and TDP ranged from 0.0042 to 0.0098 milligrams per litre as phosphorus (mg-P/L) and from 0.0013 to 0.0067 mg-P/L, respectively, and were similar among sampling events. Dissolved orthophosphate concentrations were typically below the laboratory DL (0.001 mg-P/L), with the exception of one measurement of 0.0016 mg-P/L at Station Ac-1 during under-ice conditions. Based on the measured TP concentrations and CCME (2004) TP trigger ranges for Canadian lakes, Lac du Sauvage can be classified as oligotrophic (i.e., 0.004 to 0.01 mg-P/L).
- Concentrations of SRSi ranged from 0.050 to 0.41 mg/L, with higher concentrations measured during under-ice conditions than open-water conditions.
- Organic carbon occurred primarily in the dissolved form, with DOC concentrations ranging from 2.4 to 4.3 mg/L.

Metals

Concentrations of total and dissolved metals were either below DLs or, if detected, were below guidelines and objectives, with the exception of aluminum and copper (Table 3.1-2). Total aluminum concentrations ranged above the chronic CWQG of 5 micrograms per litre ($\mu\text{g/L}$)⁵ in two under-ice samples and two open-water samples, where field-measured pH values for the corresponding samples were less than pH 6.5. Total copper concentrations ranged from 0.49 to 2.2 $\mu\text{g/L}$; one measured value was above the CWQG (2 $\mu\text{g/L}$).

⁵ The aluminum guideline is dependent on pH; the guideline is 5 $\mu\text{g/L}$ if pH is less than 6.5, and 100 $\mu\text{g/L}$ if pH is greater than or equal to 6.5 (CCME 1999).



Other Water Quality Parameters

Concentrations of hydrocarbons (BTEX and hydrocarbon fractions F1 [C₆-C₁₀], F1 [C₆-C₁₀]-BTEX, and F2 [C₁₀-C₁₆]) were not detected in any open-water samples (Table 3.1-2). Toluene and xylene were detected at low concentrations (1.4 µg/L and 0.93 µg/L, respectively) at Station Aa-1 during under-ice conditions (Appendix D, Table D-3).

Fecal coliform concentrations were below the laboratory DL (less than 1 coliform forming units per 100 millilitres [CFU/100 mL]) in all samples, with the exception of one detectable value (1 CFU/100 mL) at Station Aa-1 during open-water conditions (summer program, Table 3.1-2; Appendix D, Table D-4).

Table 3.1-2 Water Quality in Lac du Sauvage, 2014

Parameter	Unit	Guidelines			Objectives		Under-Ice				Open-Water			
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-Term SSWQO	Long-Term SSWQO	Count	Min	Median	Max	Count	Min	Median	Max
Conventional Parameters														
Alkalinity, gran as (H+)	meg/L	-	-	-	-	-	13	<0.10	0.20	0.22	20	<0.10	<0.10	<0.20
Alkalinity, total as (CaCO ₃)	mg/L	-	-	-	-	-	13	5.0	6.6	8.4	20	3.3	4.3	11
Conductance	µS/cm	-	-	-	-	-	13	15	17	27	20	14	15	16
Hardness	mg/L	-	-	-	-	-	13	5.4	6.1	9.4	20	4.7	4.9	5.2
pH	-	-	6.5 - 9.0	6.5 - 8.5	-	-	13	6.2	6.4	6.9	20	6.5	6.7	7.2
Total dissolved solids	mg/L	-	-	500	-	-	13	<10	<10	24	20	<10	14	22
Total suspended solids	mg/L	-	-	-	-	-	13	<3.0	<3.0	<6.0	20	<3.0	<3.0	<6.0
Turbidity	NTU	-	-	-	-	-	13	0.18	0.28	0.43	20	0.4	0.54	1.5
Major Ions														
Bicarbonate	mg/L	-	-	-	-	-	13	6.1	8.1	10.0	20	<5.0	5.3	13
Calcium	mg/L	-	-	-	-	-	13	0.97	1.1	1.7	20	0.86	0.91	0.94
Chloride	mg/L	640	120	250	-	64 ^(c,i)	13	<0.5	<0.5	0.81	20	<0.5	<0.5	<0.5
Fluoride	mg/L	-	0.12	1.5	-	-	13	<0.02	<0.02	0.022	20	<0.02	<0.02	<0.02
Magnesium	mg/L	-	-	-	-	-	13	0.73	0.81	1.3	20	0.63	0.65	0.7
Potassium	mg/L	-	-	-	112 ^(d)	41 ^(d)	13	0.57	0.66	1.1	20	0.48	0.53	0.6
Sodium	mg/L	-	-	200	-	-	13	0.65	0.79	1.3	20	0.57	0.61	0.64
Sulphate	mg/L	-	-	500	343 ^(e,i)	45 ^(e,i)	13	1.1	1.4	2.4	20	0.95	1.2	1.4
Nutrients														
Total organic carbon	mg/L	-	-	-	-	-	13	2.4	2.7	4.2	20	2.9	3.2	4.5
Dissolved organic carbon	mg/L	-	-	-	-	-	13	2.4	2.7	4.3	20	2.8	3.0	4.0
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	13	<0.05	0.19	0.27	20	0.066	0.2	0.29
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	-	-	13	<0.05	0.14	0.23	20	0.066	0.2	0.29
Total ammonia	mg-N/L	-	0.069 - 222 ^(j)	-	-	-	13	<0.005	<0.005	0.018	20	<0.005	<0.005	0.012
Nitrate	mg-N/L	124	2.9	10	-	1.2 ^(f,i)	13	<0.006	<0.006	0.11	20	<0.006	<0.006	<0.006
Nitrite	mg-N/L	-	0.06	1	-	-	13	<0.002	<0.002	<0.002	20	<0.002	<0.002	<0.002
Total phosphorus	mg-P/L	-	0.02 ^(l,m)	-	-	-	13	0.0042	0.0062	0.0098	20	0.0048	0.0072	0.014
Total dissolved phosphorus	mg-P/L	-	-	-	-	-	13	0.0028	0.0037	0.0067	20	0.0013	0.0024	0.0045
Dissolved orthophosphate	mg-P/L	-	-	-	-	-	13	<0.001	<0.001	0.002	20	<0.001	<0.001	<0.001
Silica, reactive	mg/L	-	-	-	-	-	13	0.087	0.14	0.41	20	0.05	0.071	0.11
Other Parameters														
Benzene	µg/L	-	370	5.0	-	-	13	<0.5	<0.5	<0.5	20	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	-	90	2.4	-	-	13	<0.5	<0.5	<0.5	20	<0.5	<0.5	<0.5
Toluene	µg/L	-	2.0	24	-	-	13	<0.5	<0.5	1.4	20	<0.5	<0.5	<0.5
Xylenes	µg/L	-	-	300	-	-	13	<0.71	<0.71	0.93	20	<0.71	<0.71	<0.71
Petroleum hydrocarbons – F1 (C6-C10)-BTEX	µg/L	-	-	-	-	-	13	<100	<100	<100	20	<100	<100	<100
Petroleum hydrocarbons – F1 (C6-C10)	µg/L	-	-	-	-	-	13	<100	<100	<100	20	<100	<100	<100
Petroleum hydrocarbons – F2 (C10-C16)	µg/L	-	-	-	-	-	13	<250	<250	<250	20	<250	<250	<250
Fecal coliform	CFU/100 mL	-	-	-	-	-	13	<1.0	<1.0	<1.0	19	<1.0	<1.0	1.0

Table 3.1-2 Water Quality in Lac du Sauvage, 2014

Parameter	Unit	Guidelines			Objectives		Under-Ice				Open-Water			
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-Term SSWQO	Long-Term SSWQO	Count	Min	Median	Max	Count	Min	Median	Max
Total Metals														
Aluminum	µg/L	-	5 or 100 ⁽ⁱ⁾	100	-	-	13	2.9	3.5	6.9	20	5.5	7.5	29.0
Antimony	µg/L	-	-	6.0	-	-	13	<0.02	<0.02	<0.02	20	<0.02	<0.02	<0.02
Arsenic	µg/L	-	5.0	10	-	-	13	0.27	0.34	0.51	20	0.27	0.31	0.48
Barium	µg/L	-	-	1,000	-	-	13	0.98	1.2	2.6	20	1.0	1.1	1.5
Beryllium	µg/L	-	-	-	-	-	13	<0.01	<0.01	<0.01	20	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	13	<0.01	<0.01	0.012	20	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	-	13	1.6	3.2	4.1	20	<1.0	2.2	4.9
Cadmium	µg/L	0.11-0.37 ^(k)	0.04 ^(k)	5.0	-	-	13	<0.005	<0.005	<0.005	20	<0.005	<0.005	<0.005
Cesium	µg/L	-	-	-	-	-	13	<0.1	<0.1	<0.1	20	0.005	0.0059	0.010
Chromium	µg/L	-	1.0	50	-	-	13	<0.06	0.075	0.13	20	<0.06	<0.06	0.13
Cobalt	µg/L	-	-	-	-	-	13	<0.01	0.012	0.023	20	0.011	0.016	0.034
Copper	µg/L	-	2.0 ⁽ⁱ⁾	1,000	-	-	13	0.49	0.67	0.95	20	0.54	0.7	2.2
Iron	µg/L	-	300	300	-	-	13	1.4	3.8	11	20	6.1	11.0	34.0
Lead	µg/L	-	1 ⁽ⁱ⁾	10	-	-	13	<0.01	0.014	0.64	20	<0.01	<0.01	0.03
Lithium	µg/L	-	-	-	-	-	13	0.99	1.3	2.1	20	0.6	1.3	2.0
Manganese	µg/L	-	-	50	-	-	13	0.72	2.2	21	20	2.6	3.9	5.3
Mercury	µg/L	-	0.026	1.0	-	-	13	<0.0005	<0.0005	<0.0005	20	<0.0005	<0.0005	0.0008
Molybdenum	µg/L	-	73	-	223,000 ^(g)	19,000 ^(g)	13	<0.05	<0.05	<0.05	20	<0.05	<0.05	<0.05
Nickel	µg/L	-	25 ⁽ⁱ⁾	-	-	-	13	0.23	0.28	0.44	20	0.22	0.27	0.54
Selenium	µg/L	-	1.0	10	-	-	13	<0.04	<0.04	<0.04	20	<0.04	<0.04	<0.04
Silver	µg/L	-	0.1	-	-	-	13	<0.005	<0.005	<0.005	20	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	13	5.8	6.5	10.0	20	5.2	5.4	6.1
Thallium	µg/L	-	0.8	-	-	-	13	<0.01	<0.01	<0.01	20	<0.01	<0.01	<0.01
Tin	µg/L	-	-	-	-	-	13	<0.05	<0.05	<0.05	20	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	13	<0.1	0.19	0.28	20	0.18	0.40	1.8
Uranium	µg/L	33	15	20	-	-	13	0.012	0.019	0.028	20	0.014	0.020	0.029
Vanadium	µg/L	-	-	-	300 ^(h)	30 ^(h)	13	<0.05	0.058	0.12	20	<0.05	<0.05	0.059
Zinc	µg/L	-	30	5,000	-	-	13	<0.8	<0.8	3.3	20	<0.8	<0.8	3.0
Dissolved Metals														
Aluminum	µg/L	-	-	-	-	-	13	2.0	3.7	8.5	20	1.3	3.0	6.2
Antimony	µg/L	-	-	-	-	-	13	<0.02	<0.02	<0.02	20	<0.02	<0.02	<0.02
Arsenic	µg/L	-	-	-	-	-	13	0.26	0.33	0.5	20	0.27	0.3	0.43
Barium	µg/L	-	-	-	-	-	13	3.8	6.3	9.7	20	0.92	1.0	1.4
Beryllium	µg/L	-	-	-	-	-	13	<0.01	<0.01	<0.01	20	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	13	<0.01	<0.01	0.019	20	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	-	13	2.5	3.7	8.0	20	1.0	2.4	5.5
Cadmium	µg/L	-	-	-	-	-	13	<0.005	<0.005	<0.005	20	<0.005	<0.005	<0.005
Cesium	µg/L	-	-	-	-	-	13	<0.1	<0.1	<0.1	20	<0.005	<0.005	0.0064

Table 3.1-2 Water Quality in Lac du Sauvage, 2014

Parameter	Unit	Guidelines			Objectives		Under-Ice				Open-Water			
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-Term SSWQO	Long-Term SSWQO	Count	Min	Median	Max	Count	Min	Median	Max
Chromium	µg/L	-	-	-	-	-	13	<0.06	0.065	0.11	20	<0.06	<0.06	0.17
Chromium – Hexavalent	µg/L	-	1	-	-	-	13	<1.0	<1.0	<1.0	20	<1.0	<1.0	<1.0
Cobalt	µg/L	-	-	-	-	-	13	<0.01	<0.01	0.022	20	<0.01	<0.01	0.011
Copper	µg/L	-	-	-	-	-	13	0.51	0.65	0.95	20	0.5	0.62	1.2
Iron	µg/L	-	-	-	-	-	13	<1.0	<1.0	4.8	20	<1.0	1.5	6.2
Lead	µg/L	-	-	-	-	-	13	<0.01	0.011	0.17	20	<0.01	<0.01	0.012
Lithium	µg/L	-	-	-	-	-	13	1.0	1.4	2.0	20	0.88	1.3	1.6
Manganese	µg/L	-	-	-	-	-	13	0.33	0.81	20	20	0.27	0.52	2.1
Mercury	µg/L	-	-	-	-	-	13	<0.0005	<0.0005	<0.0005	20	<0.0005	<0.0005	0.0007
Molybdenum	µg/L	-	-	-	-	-	13	<0.05	<0.05	<0.05	20	<0.05	<0.05	<0.05
Nickel	µg/L	-	-	-	-	-	13	0.23	0.28	0.44	20	0.18	0.26	0.37
Selenium	µg/L	-	-	-	-	-	13	<0.04	<0.04	<0.04	20	<0.04	<0.04	<0.04
Silver	µg/L	-	-	-	-	-	13	<0.005	<0.005	<0.005	20	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	13	5.8	6.6	9.9	20	5.2	5.4	5.6
Thallium	µg/L	-	-	-	-	-	13	<0.01	<0.01	<0.01	20	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	13	<0.05	<0.05	0.17	20	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	13	<0.1	<0.1	0.29	20	<0.1	<0.1	0.3
Uranium	µg/L	-	-	-	-	-	13	0.012	0.017	0.028	20	0.013	0.018	0.024
Vanadium	µg/L	-	-	-	-	-	13	<0.05	0.071	0.12	20	<0.05	<0.05	<0.05
Zinc	µg/L	-	-	-	-	-	13	2.3	4.8	15	20	<0.8	<0.8	1.8

a) Source: CCME (Canadian Council of Ministers of the Environment). 1999, with updates to 2014. Canadian Environmental Quality Guidelines. Winnipeg, MB, Canada.

b) Source: Health Canada. 2012. Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.

c) Elphick JRF, Bergh KD, Bailey HC. 2011. Chronic toxicity of chloride to freshwater species: effects of hardness and implications for water quality guidelines. Environ Toxicol Chem 30: 230-246.

d) Rescan (Rescan Environmental Services Ltd.). 2012a. Ekati Diamond Mine: Site-Specific Water Quality Objective for Potassium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

e) Rescan. 2012b. Ekati Diamond Mine: Site-specific Water Quality Objective for Sulphate. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

f) Rescan. 2012c. Ekati Diamond Mine: Site-Specific Water Quality Objective for Nitrate, (2012). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

g) Rescan. 2012d. Ekati Diamond Mine: Site Specific Water Quality Objective for Molybdenum, (2011). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

h) Rescan. 2012e. Ekati Diamond Mine: Site-specific Water Quality Objective for Vanadium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

i) Guidelines based on hardness of 10 mg CaCO₃/L.

j) Open water guidelines based on pH of 6.0 to 7.3, water temperature of 6.1°C to 13.3°C, and water hardness of 4.7 to 5.2 mg/L. Under ice guidelines based on pH of 6.2 to 6.9, water temperature of 0.7°C to 3.8°C, and water hardness of 5.4 to 32 mg/L.

k) Acute guideline applies to all waters of hardness below 5.3 mg CaCO₃/L; chronic guideline applies to all waters of hardness below 17 mg CaCO₃/L.

l) Trigger for transition from oligotrophic to mesotrophic status (0.01 mg/L) applied to Lac de Gras basin and mesotrophic to meso-eutrophic status (0.02 mg/L) applied to Lac du Sauvage basin as based on CCME (2004).

m) Source: CCME. 2004. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems. Canadian Environmental Quality Guidelines, 2004. Winnipeg, MB, Canada.

Bolded concentrations are higher than relevant water quality guidelines.

- = no guideline or data; CWQG = Canadian Water Quality Guidelines; CDWQG = Canadian Drinking Water Quality Guideline; SSWQO = Site-Specific Water Quality Objective; H+ = hydrogen ions; CaCO₃ = calcium carbonate; mg CaCO₃/L = milligrams calcium carbonate per litre;

F1 (C6-C10) = hydrocarbon fraction F1; F2 (C10-C16) = hydrocarbon fraction F2; meq/L = milliequivalents per litre; mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; pH = potential of hydrogen, provides measure of the acidity or alkalinity of a solution on a scale of 0 to 14;

NTU = nephelometric turbidity units; mg-N/L = milligrams of nitrogen per litre; mg-P/L = milligrams of phosphorus per litre; µg/L = micrograms per litre; CFU/100 mL = coliform forming units per 100 millilitres; BTEX = benzene, toluene, ethylbenzene, xylene; <= less than.



Nutrients and Chlorophyll *a* in Depth-Integrated Samples

Concentrations of TP in depth-integrated (euphotic depth) samples were similar to the TP concentrations in the discrete samples (mid-depth samples) from Lac du Sauvage. Subtle differences in TP were evident, both in concentration range and median values, but these differences were not as evident for the other nutrients.

Concentrations of TP in the depth-integrated samples from Lac du Sauvage ranged from 0.0046 to 0.029 mg-P/L (median = 0.0066 mg-P/L) (Appendix D, Table D-20), compared to 0.0048 to 0.014 mg-P/L (median = 0.0072 mg-P/L) in the corresponding discrete samples (Table 3.1-2). This difference in the maximum concentrations is likely the result of variability in the distribution of TP through the water column. The depth-integrated samples represent an average of the TP distribution throughout the euphotic zone, while the discrete samples provide a snapshot of TP concentrations at discrete depths within the water column (mid-depth for the majority of discrete samples due to well-mixed conditions throughout the sampling programs).

Total dissolved phosphorus, TN, total ammonia, and SRSi concentrations in Lac du Sauvage were consistent between depth-integrated and discrete samples:

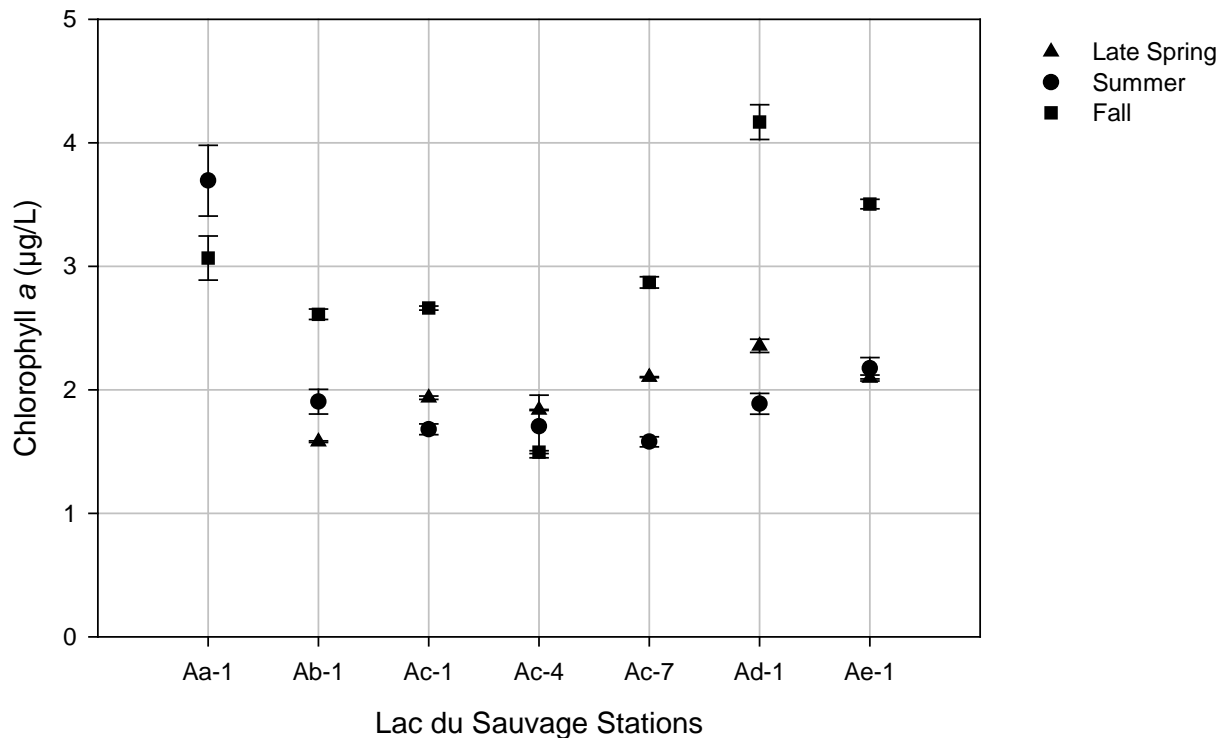
- Concentrations of TDP ranged from 0.001 to 0.0033 mg-P/L (median = 0.0023 mg-P/L) in the depth-integrated samples (Appendix D, Table D-20), compared to 0.0013 to 0.0045 mg-P/L (median = 0.0024 mg-P/L) in the corresponding discrete samples (Table 3.1-2).
- Concentrations of TN in the depth-integrated samples ranged from 0.12 to 0.3 mg-N/L (median = 0.2 mg-N/L) (Appendix D, Table D-20), compared to 0.066 to 0.29 mg-N/L (median = 0.2 mg-N/L) in the corresponding discrete samples (Table 3.1-2).
- Concentrations of total ammonia in the depth-integrated samples ranged from less than 0.005 to 0.014 mg-N/L (median = <0.005 mg-N/L) (Appendix D, Table D-20), compared to less than 0.005 to 0.012 mg-N/L (median = <0.005 mg-N/L) in the corresponding discrete samples (Table 3.1-2).
- Concentrations of SRSi ranged from 0.055 to 1.4 mg/L (median = 0.074 mg/L) in the depth-integrated samples (Appendix D, Table D-20), compared to 0.05 to 0.11 mg/L (median = 0.071 mg/L) in the corresponding discrete samples (Table 3.1-2). Most of the SRSi concentrations in the depth-integrated samples were less than 0.1 mg/L, which suggests that silica may be limiting for diatom growth (Reynolds 2006) throughout the water column.

Dissolved orthophosphate, nitrate, and nitrite concentrations in Lac du Sauvage were less than the analytical DL throughout the seasonal sampling programs (Appendix D, Table D-20; Table 3.1-2).

Total dissolved nitrogen concentrations in the depth-integrated samples from Lac du Sauvage ranged from 0.052 to 0.3 mg-N/L (median = 0.17 mg-N/L) (Appendix D, Table D-20); total dissolved nitrogen was not measured in the corresponding discrete samples.

Chlorophyll *a* concentrations in Lac du Sauvage ranged from 1.49 µg/L at Station Ac-4 during the fall sampling event to 4.17 µg/L at Station Ad-1 during the fall sampling event (Figure 3.1-1; Appendix D, Table D-24). Overall, chlorophyll *a* concentrations were higher during the fall sampling period, ranging from 1.49 to 4.17 µg/L (mean = 2.91 µg/L), compared to the late spring (1.58 to 2.36 µg/L; mean = 1.98 µg/L) or summer (1.58 to 3.69 µg/L; mean = 2.09 µg/L) sampling periods.

Figure 3.1-1 Mean Chlorophyll *a* Concentrations at Stations in Lac du Sauvage in Late Spring, Summer, and Fall, 2014



Note: Error bars = standard error; no data from Aa-1 in late spring.

µg/L = micrograms per litre.

Trophic Status Classification

Trophic status of the lakes was evaluated by examining the concentrations of TP, chlorophyll *a*, and water transparency (Secchi depth). In 2014, the discrete water sampling program for Lac du Sauvage yielded mean concentrations of 0.0078 mg-P/L for TP and 5.6 m for Secchi depth. The corresponding trophic state index (TSI) based on these measured values is 33.8 using TP and 35.1 using Secchi depth, for a rounded average of 35. In 2014, the depth-integrated sampling program yielded mean concentrations of 0.0083 mg-P/L for TP, 5.6 m for Secchi depth, and 2.35 µg/L for chlorophyll *a*. The corresponding TSI based on these values is 34.7 using TP, 38.9 using chlorophyll *a*, and 35.1 using Secchi depth, for a rounded average of 36. Based on these TSI values, and the classification systems of Vollenweider (1970) and Carlson (1977), Lac du Sauvage is classified as an oligotrophic lake. Lac du Sauvage can also be classified as oligotrophic (i.e., 0.004 to 0.01 mg-P/L), based on CCME (2004) TP trigger ranges for Canadian lakes.

3.1.2 Lac du Sauvage Outlet (Ab-S1)

Water samples were collected at the Lac du Sauvage outlet (Station Ab-S1) in 2014 (Map 2.2-1 and Table 2.2-1). One sample was collected from Ab-S1 during the under-ice program, and three samples were collected during the open-water program (late spring, summer, and fall), along with field measurements.

Field-Measured Physico-Chemical Parameters

In situ physico-chemical parameters varied slightly between sampling events (Appendix D, Table D-6). Stream water temperature was highest in the summer (12.8°C) and lowest in the winter (0.8°C), and stream temperatures were generally similar to surface water temperatures in Lac du Sauvage during the same seasonal sampling events (Appendix D, Table D-6).

Stream flow was well-oxygenated during all sampling events, with DO ranging from 10.3 mg/L (97.8% saturation) in the summer to 16.1 mg/L (113% saturation) in the winter; DO concentrations were within the CWQG and CDWQG guidelines (Appendix D, Table D-6).

Specific conductivity at Station Ab-S1 was similar among all sampling events (11 to 15 $\mu\text{S}/\text{cm}$; Appendix D, Table D-6).

Field-measured pH from the under-ice program failed QC checks and is not discussed. Similar to Lac du Sauvage, pH at Ab-S1 indicated that the lake outlet water was neutral to slightly acidic. In the late spring, pH at Ab-S1 (pH = 6.1) was outside the lower bound CWQG and CDWQG guideline (i.e., 6.5), but increased in the summer and fall (pH = 7.3 and 6.9, respectively; Appendix D, Table D-6).

Water Quality in Discrete Samples

Conventional Water Quality Parameters

Concentrations of conventional water quality parameters were similar among sampling events (Table 3.1-3):

- Waters in the Lac du Sauvage outlet had low ionic strength; TDS concentrations ranged from less than 10 mg/L to 22 mg/L.
- The range of values for total alkalinity and total hardness were also low, and indicated that Lac du Sauvage outlet is a very soft water stream (McNeely et al. 1979), with potential sensitivity to acid deposition (Saffran and Trew 1996).
- The laboratory-measured pH during under-ice conditions (6.5), in lieu of the excluded under-ice field-measured pH due to quality problems, and the range of field-measured pH during open-water conditions (6.1 to 7.3) confirmed that the lake outlet water is neutral to slightly acidic.
- The outlet waters were characterized as clear, with TSS concentrations below the laboratory DL and turbidity values from 0.33 to 0.64 NTU.

Table 3.1-3 Water Quality in the Lac du Sauvage Outlet, 2014

Parameter	Unit	Guidelines			Objectives		Under-Ice		Open-Water			
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-Term SSWQO	Long-Term SSWQO	Count	Value	Count	Min	Median	Max
Conventional Parameters												
Alkalinity, gran as (H+)	meg/L	-	-	-	-	-	1	0.13	3	<0.10	<0.10	<0.10
Alkalinity, total as (CaCO ₃)	mg/L	-	-	-	-	-	1	5.6	3	3.5	4.2	6.0
Conductivity	µS/cm	-	-	-	-	-	1	19.0	3	15	15	15
Hardness	mg/L	-	-	-	-	-	1	6.6	3	4.9	5.0	5.2
pH	-	-	6.5 - 9.0	6.5 - 8.5	-	-	1	6.5	3	6.6	6.6	7.0
Total dissolved solids	mg/L	-	-	500	-	-	1	<10.0	3	12	15	22
Total suspended solids	mg/L	-	-	-	-	-	1	<3.0	3	<3.0	<3.0	<3.0
Turbidity	NTU	-	-	-	-	-	1	0.33	3	0.40	0.48	0.64
Major Ions												
Bicarbonate	mg/L	-	-	-	-	-	1	6.8	3	<5.0	5.1	7.3
Calcium	mg/L	-	-	-	-	-	1	1.2	3	0.90	0.92	0.93
Chloride	mg/L	640	120	250	-	64 ^(c,i)	1	<0.5	3	<0.5	<0.5	<0.5
Fluoride	mg/L	-	0.12	1.5	-	-	1	<0.02	3	<0.02	<0.02	<0.02
Magnesium	mg/L	-	-	-	-	-	1	0.90	3	0.64	0.65	0.70
Potassium	mg/L	-	-	-	112 ^(d)	41 ^(d)	1	0.73	3	0.52	0.54	0.58
Sodium	mg/L	-	-	200	-	-	1	0.85	3	0.62	0.64	0.75
Sulphate	mg/L	-	-	500	343 ^(e,i)	45 ^(e,i)	1	1.4	3	1.1	1.1	1.4
Nutrients												
Total organic carbon	mg/L	-	-	-	-	-	1	3.2	3	2.9	3.0	3.7
Dissolved organic carbon	mg/L	-	-	-	-	-	1	3.2	3	2.8	3.1	3.8
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	1	0.16	3	0.13	0.25	0.27
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	-	-	1	0.16	3	0.13	0.25	0.27
Total ammonia	mg-N/L	-	0.069 - 222 ⁽ⁱ⁾	-	-	-	1	<0.005	3	<0.005	<0.005	0.0092
Nitrate	mg-N/L	124	2.9	10	-	1.2 ^(f,i)	1	<0.006	3	<0.006	<0.006	<0.006
Nitrite	mg-N/L	0.06	1	-	-	-	1	<0.002	3	<0.002	<0.002	<0.002
Total phosphorus	mg-P/L	-	0.02 ^(l,m)	-	-	-	1	0.0075	3	0.0050	0.0067	0.011
Total dissolved phosphorus	mg-P/L	-	-	-	-	-	1	0.0042	3	0.0020	0.0025	0.0030
Dissolved orthophosphate	mg-P/L	-	-	-	-	-	1	<0.001	3	<0.001	<0.001	<0.001
Silica, reactive	mg/L	-	-	-	-	-	1	0.076	3	0.061	0.062	0.087
Other Parameters												
Benzene	µg/L	-	370	5.0	-	-	1	<0.5	3	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	-	90	2.4	-	-	1	<0.5	3	<0.5	<0.5	<0.5
Toluene	µg/L	-	2.0	24	-	-	1	<0.5	3	<0.5	<0.5	<0.5
Xylenes	µg/L	-	-	-	-	-	1	<0.71	3	<0.71	<0.71	<0.71
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	-	-	-	-	-	1	<100	3	<100	<100	<100
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	-	-	-	-	-	1	<100	3	<100	<100	<100
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	-	-	-	-	-	1	<250	3	<250	<250	<250
Fecal coliform	CFU/100 mL	-	-	-	-	-	1	<1.0	3	<1.0	<1.0	<1.0

Table 3.1-3 Water Quality in the Lac du Sauvage Outlet, 2014

Parameter	Unit	Guidelines			Objectives		Under-Ice		Open-Water			
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-Term SSWQO	Long-Term SSWQO	Count	Value	Count	Min	Median	Max
Total Metals												
Aluminum	µg/L	-	5 or 100 ⁽ⁱ⁾	100	-	-	1	4.0	3	5.6	9.0	10
Antimony	µg/L	-	-	6.0	-	-	1	<0.02	3	<0.02	<0.02	<0.02
Arsenic	µg/L	-	5.0	10	-	-	1	0.34	3	0.29	0.30	0.30
Barium	µg/L	-	-	1,000	-	-	1	1.2	3	0.96	1.0	1.1
Beryllium	µg/L	-	-	-	-	-	1	<0.01	3	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	1	<0.01	3	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	-	1	1.6	3	<1.0	1.3	1.9
Cadmium	µg/L	0.11 - 0.37 ^(k)	0.04 ^(k)	5.0	-	-	1	<0.005	3	<0.005	<0.005	<0.005
Cesium	µg/L	-	-	-	-	-	1	<0.1	3	<0.005	0.0065	0.0065
Chromium	µg/L	-	1.0	50	-	-	1	<0.06	3	<0.06	<0.06	0.40
Cobalt	µg/L	-	-	-	-	-	1	0.010	3	0.015	0.016	0.017
Copper	µg/L	-	2.0 ⁽ⁱ⁾	1,000	-	-	1	0.66	3	0.55	0.63	0.87
Iron	µg/L	-	300	300	-	-	1	2.2	3	7.7	13.0	18.0
Lead	µg/L	-	1.0	10	-	-	1	<0.01	3	<0.01	<0.01	0.012
Lithium	µg/L	-	-	-	-	-	1	1.5	3	0.91	1.2	1.2
Manganese	µg/L	-	-	50	-	-	1	1.7	3	3.1	3.8	4.0
Mercury	µg/L	-	0.026	1.0	-	-	1	<0.0005	3	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	-	73	-	223,000 ^(g)	19,000 ^(g)	1	<0.05	3	<0.05	<0.05	<0.05
Nickel	µg/L	-	25 ⁽ⁱ⁾	-	-	-	1	0.30	3	0.26	0.26	0.31
Selenium	µg/L	-	1.0	10	-	-	1	<0.04	3	<0.04	<0.04	<0.04
Silver	µg/L	-	0.1	-	-	-	1	<0.005	3	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	1	7.1	3	5.2	5.7	5.8
Thallium	µg/L	-	0.8	-	-	-	1	<0.01	3	<0.01	<0.01	<0.01
Tin	µg/L	-	-	-	-	-	1	<0.05	3	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	1	<0.1	3	0.20	0.24	0.33
Uranium	µg/L	33	15	20	-	-	1	0.017	3	0.016	0.019	0.021
Vanadium	µg/L	-	-	-	300 ^(h)	30 ^(h)	1	0.078	3	<0.05	<0.05	<0.05
Zinc	µg/L	-	30	5,000	-	-	1	<0.8	3	<0.8	<0.8	12.0
Dissolved Metals												
Aluminum	µg/L	-	-	-	-	-	1	4.8	3	1.7	2.4	3.4
Antimony	µg/L	-	-	-	-	-	1	<0.02	3	<0.02	<0.02	<0.02
Arsenic	µg/L	-	-	-	-	-	1	0.37	3	0.26	0.29	0.33
Barium	µg/L	-	-	-	-	-	1	7.3	3	0.86	0.91	1.0
Beryllium	µg/L	-	-	-	-	-	1	<0.01	3	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	1	<0.01	3	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	-	1	5.1	3	<1.0	1.4	1.8
Cadmium	µg/L	-	-	-	-	-	1	<0.005	3	<0.005	<0.005	0.015
Cesium	µg/L	-	-	-	-	-	1	<0.1	3	<0.005	<0.005	0.0053

Table 3.1-3 Water Quality in the Lac du Sauvage Outlet, 2014

Parameter	Unit	Guidelines			Objectives		Under-Ice		Open-Water			
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-Term SSWQO	Long-Term SSWQO	Count	Value	Count	Min	Median	Max
Chromium	µg/L	-	-	-	-	-	1	0.080	3	<0.06	<0.06	<0.06
Chromium - Hexavalent	µg/L	-	1	-	-	-	1	<1.0	3	<1.0	<1.0	<1.0
Cobalt	µg/L	-	-	-	-	-	1	0.011	3	<0.01	<0.01	0.012
Copper	µg/L	-	-	-	-	-	1	0.65	3	0.56	0.64	0.86
Iron	µg/L	-	-	-	-	-	1	<1.0	3	1.2	1.6	1.7
Lead	µg/L	-	-	-	-	-	1	<0.01	3	<0.01	<0.01	<0.01
Lithium	µg/L	-	-	-	-	-	1	1.3	3	0.76	1.3	1.4
Manganese	µg/L	-	-	-	-	-	1	1.2	3	0.88	0.93	0.95
Mercury	µg/L	-	-	-	-	-	1	<0.0005	3	<0.0005	0.00064	0.00075
Molybdenum	µg/L	-	-	-	-	-	1	<0.05	3	<0.05	<0.05	<0.05
Nickel	µg/L	-	-	-	-	-	1	0.30	3	0.25	0.30	0.31
Selenium	µg/L	-	-	-	-	-	1	<0.04	3	<0.04	<0.04	<0.04
Silver	µg/L	-	-	-	-	-	1	<0.005	3	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	1	7.1	3	5.2	5.7	5.9
Thallium	µg/L	-	-	-	-	-	1	<0.01	3	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	1	<0.05	3	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	1	<0.1	3	<0.1	<0.1	0.19
Uranium	µg/L	-	-	-	-	-	1	0.02	3	0.015	0.016	0.019
Vanadium	µg/L	-	-	-	-	-	1	0.066	3	<0.05	<0.05	<0.05
Zinc	µg/L	-	-	-	-	-	1	6.4	3	<0.8	<0.8	4.8

- a) Source: CCME (Canadian Council of Ministers of the Environment). 1999, with updates to 2014. Canadian Environmental Quality Guidelines. Winnipeg, MB, Canada.
- b) Source: Health Canada. 2012. Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.
- c) Elphick JRF, Bergh KD, Bailey HC. 2011. Chronic toxicity of chloride to freshwater species: effects of hardness and implications for water quality guidelines. Environ Toxicol Chem 30: 230-246.
- d) Rescan (Rescan Environmental Services Ltd.). 2012a. Ekati Diamond Mine: Site-Specific Water Quality Objective for Potassium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.
- e) Rescan. 2012b Ekati Diamond Mine: Site-specific Water Quality Objective for Sulphate. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.
- f) Rescan. 2012c. Ekati Diamond Mine: Site-Specific Water Quality Objective for Nitrate, (2012). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.
- g) Rescan. 2012d. Ekati Diamond Mine: Site Specific Water Quality Objective for Molybdenum, (2011). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.
- h) Rescan. 2012e. Ekati Diamond Mine: Site-specific Water Quality Objective for Vanadium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.
- i) Guidelines based on hardness of 10 mg CaCO₃/L.
- j) Open water guidelines based on pH of 6.0 to 7.3, water temperature of 6.1°C to 13.3°C, and water hardness of 4.7 to 5.2 mg/L. Under ice guidelines based on pH of 6.2 to 6.9, water temperature of 0.7°C to 3.8°C, and water hardness of 5.4 to 32 mg/L.
- k) Acute guideline applies to all waters of hardness below 5.3 mg CaCO₃/L; chronic guideline applies to all waters of hardness below 17 mg CaCO₃/L.
- l) Trigger for transition from oligotrophic to mesotrophic status (0.01 mg/L) applied to Lac de Gras basin and mesotrophic to meso-eutrophic status (0.02 mg/L) applied to Lac du Sauvage basin as based on CCME (2004).
- m) Source: CCME 2004. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems. Canadian Environmental Quality Guidelines, 2004. Winnipeg, MB, Canada.

Bolded concentrations are higher than relevant water quality guidelines.

- = no guideline or data; CWQG = Canadian Water Quality Guidelines; CDWQG = Canadian Drinking Water Quality Guideline; SSWQO = Site-Specific Water Quality Objective; H+ = hydrogen ions; CaCO₃ = calcium carbonate; mg CaCO₃/L = milligrams calcium carbonate per litre; F1 (C6-C10) = hydrocarbon fraction F1; F2 (C10-C16) = hydrocarbon fraction F2; meq/L = milliequivalents per litre; mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; pH = potential of hydrogen, provides measure of the acidity or alkalinity of a solution on a scale of 0 to 14; NTU = nephelometric turbidity units; mg-N/L = milligrams of nitrogen per litre; mg-P/L = milligrams of phosphorus per litre; µg/L = micrograms per litre; CFU/100 mL = coliform forming units per 100 millilitres; BTEX = benzene, toluene, ethylbenzene, xylene; <= less than.



Major Ions

Major ions concentrations (Table 3.1-3) were similar among stations and sampling events. The dominant major ions were bicarbonate, magnesium, and sodium during both open-water and under-ice conditions (Table 3.1-3). Detection limits and measured concentrations of major ions were below the associated guidelines and objectives.

Nutrients

Nutrient concentrations measured in the discrete water samples from the Lac du Sauvage outlet (Table 3.1-3) were similar among stations and sampling events:

- Total ammonia concentrations ranged from less than 0.005 to 0.0092 mg-N/L and were below the CWQG.
- Total Kjeldahl nitrogen concentrations ranged from 0.13 to 0.27 mg-N/L, with higher concentrations generally measured during open-water conditions.
- Nitrate and nitrite were not detected (DL of 0.006 mg-N/L and 0.002 mg-N/L, respectively).
- Concentrations of TP and TDP ranged from 0.005 to 0.011 mg-P/L and from 0.002 to 0.003 mg-P/L, respectively; dissolved orthophosphate concentrations were consistently below the laboratory DL (0.001 mg-P/L); based on the measured TP concentrations and CCME (2004) TP trigger range for Canadian rivers, the outlet waters can be classified as oligotrophic to mesotrophic.
- Concentrations of SRSi ranged from 0.061 to 0.087 mg/L, and were similar during under-ice conditions and open-water conditions.
- Organic carbon occurred primarily in dissolved form, with TOC concentrations ranging from 2.9 to 3.7 mg/L and DOC concentrations from 2.8 to 3.8 mg/L.

Metals

Concentrations of total and dissolved metals were below DLs, or if detected, were below guidelines and objectives, with the exception of aluminum (Table 3.1-3). Total aluminum concentrations were above the chronic CWQG of 5 µg/L in one sample where the field-measured pH value was less than pH 6.5.

Other Water Quality Parameters

Concentrations of hydrocarbons (BTEX, total recoverable hydrocarbons, and petroleum hydrocarbons F1 [C₆-C₁₀], F1 [C₆-C₁₀]-BTEX, and F2 [C₁₀-C₁₆] fractions) were not detected in any sample (Table 3.1-3). Fecal coliform concentrations were also below the laboratory DL (less than 1 CFU/100 mL; Table 3.1-3).

3.1.3 Lac du Sauvage Sub-basin Lakes

Lakes within the Lac du Sauvage basin (Lac du Sauvage sub-basin lakes) sampled in 2014 included Duchess Lake, Christine Lake, Lake C1, Counts Lake, Lake E1, and Lake Af1 (Map 2.2-1). A total of 20 discrete water quality samples, two depth-integrated nutrient samples, 14 field physico-chemical water column profile measurements, and two PAR water column profile measurements were collected from these lakes.

Not all lakes and stations were sampled during each sampling event:

- During the under-ice period, discrete samples and physico-chemical profile measurements were collected at Stations Af-1 and Af-7 (Duchess Lake), Christine-1 (Christine Lake), C1-1 (Lake C1), E-L1-1 (Lake E1), and Af-10 (Lake Af1) (Map 2.2-1).
- Due to changes in the field program after the under-ice sampling program, resulting from a shift in the proposed Project design, Stations Af-7, E1-1, and Af-10 were excluded from the open-water sampling program; none of the Lac du Sauvage sub-basin lakes were sampled during the late spring sampling program.
- Discrete samples and physico-chemical water column profile measurements were collected at Stations Af-1, Christine-1, and C1-1 in the summer and fall, and Station Counts-1 in the fall.
- Depth-integrated samples and light attenuation profiles were collected from Station Af-1 in the summer and fall.

Field-Measured Physico-Chemical Parameters

The Lac du Sauvage sub-basin lakes were generally well-mixed, although temperature gradients were observed at Af-1 and Af-10 during under-ice conditions and at Stations Christine-1 and C1-1 in the summer (Appendix B, Figure B-2a).

Oxic stratification was evident at Counts-1, E-L1-1, Af-1, and Af-10 during the under-ice program (Appendix B, Figure B-2b), resulting in lower DO concentrations in the bottom waters than measured at the surface. During the under-ice program, water column DO concentrations throughout the Lac du Sauvage sub-basin lakes ranged from 1.6 to 13.9 mg/L (12.1% to 100.3% saturation), and 68% of the under-ice measurements were above the lower bound CWQG (6.5 mg/L). Measurements below the lower bound DO CWQG were recorded in the bottom waters (starting at 5 m depth) at Duchess Lake (Stations Af-1 and Af-10) and Lake E1 (Station E-L1-1; starting at 4 m depth) during the under-ice period (Appendix D, Table D-7). During the open-water program, waters remained well-oxygenated at all depths, with DO concentrations ranging from 7.8 to 12.9 mg/L (60.9% to 101.9% saturation); concentrations were generally higher in the fall than in the summer, and remained above the lower bound CWQG (Appendix D, Table D-8).

Specific conductivity differed between stations, but was similar among the seasonal sampling events for each station. Specific conductivity measurements ranged from 10 to 51 $\mu\text{S}/\text{cm}$ (48 to 51 $\mu\text{S}/\text{cm}$ at Christine-1; 16 to 19 $\mu\text{S}/\text{cm}$ at C1-1; and 9 to 15 $\mu\text{S}/\text{cm}$ at Stations Af-1, Counts-1, and Af-7) and varied little throughout the water column (Appendix D, Tables D-7 and D-8). Measurements were consistently highest at Christine-1 (Appendix B, Figure B-2c).

The pH values from the under-ice program failed the QC checks and are not reported. During the open-water programs, pH in Lac du Sauvage sub-basin lakes classified the lake waters as neutral to slightly acidic. In general, pH was similar among seasonal sampling events and generally uniform with depth throughout the water column. A slight decline in pH in the bottom waters at Stations Christine-1 and C1-1 was evident during the summer event (Appendix B, Figure B-2d). At the Lac du Sauvage sub-basin lakes, pH ranged from 6.2 to 7.7 during the summer and from 6.7 to 7.0 in the fall (Appendix D, Table D-8), and was generally highest at Station Christine-1 and lowest at Station Af-1. Ninety-six percent (96%) of pH values were within the CWQG and CDWQG guideline range.

The Euphotic Zone and Light Attenuation

Secchi depths at Station Af-1 in Duchess Lake were consistent among sampling events (3.5 to 3.8 m; Appendix C, Table C-1), despite variability in station depth.

Based on light attenuation data, Duchess Lake can be characterized as a clear water lake, with consistent attenuation coefficients in the summer ($K_d = 0.52$) and the fall ($K_d = 0.54$) (Table 3.1-4; Appendix C, Figure C-4).

Table 3.1-4 Attenuation Coefficients (K_d) at Station Af-1 in Duchess Lake, 2014

Station	Sampling Event		
	Late Spring	Summer	Fall
Af-1	—	0.52	0.54

— = not sampled due to inclement weather.

Water Quality in Discrete Samples

Conventional Water Quality Parameters

The range of concentrations and values of conventional water quality parameters (Table 3.1-5) were similar among stations and sampling events, with the exception of the higher hardness and TDS levels in Christine Lake:

- Waters in the Lac du Sauvage sub-basin lakes had low ionic strength; TDS concentrations ranged from 31 to 62 mg/L in Christine Lake, and from less than 10 to 44 mg/L in the other lakes.
- The range of total alkalinity across all stations was low, and indicated that the Lac du Sauvage sub-basin lakes have high potential sensitivity to acid deposition (Saffran and Trew 1996). Total hardness at Christine Lake (18 mg/L to 32 mg/L) indicated that the lake has very soft waters during open-water conditions and soft water during under-ice conditions. Total hardness was low (4.1 to 12 mg/L) across the remainder of the lakes, which indicated that they have very soft waters (McNeely et al.1979).



- The range of laboratory-measured pH values during under-ice conditions (pH 6.2 to 6.9, with a median of pH 6.4), in lieu of the excluded under-ice field-measured pH due to quality problems, and field-measured pH values during open-water conditions (6.3 to 7.4, median of 7.1) confirmed that the waters were neutral to slightly acidic. Most (67%) of the under-ice program water samples had laboratory-measured pH values below the lower bound CWQG and CDWQG guideline (6.5); only 14% of the open-water pH values were below the lower bound CWQG and CDWQG guideline.
- Concentrations of TSS ranged from below the laboratory DL (3 mg/L) to 3.8 mg/L, and turbidity values ranged from 0.29 to 1.0 NTU.

Major Ions

Major ions concentrations (Table 3.1-5) were similar among stations and sampling events, with the exception of higher concentrations of all major ions at Christine Lake than at the other Lac du Sauvage sub-basin lakes (Appendix E, Tables D-9 and D-10). The dominant major ions were bicarbonate, magnesium, sodium, and sulphate throughout the 2014 program. Detection limits and measured concentrations of major ions were below the associated guidelines.

Nutrients

Nutrient concentrations measured in the discrete water samples from the Lac du Sauvage sub-basin lakes (Table 3.1-5) were similar among stations and sampling events:

- Total ammonia concentrations ranged from less than 0.005 to 0.043 mg-N/L and were below the CWQG. Detectable ammonia concentrations were more prevalent during under-ice conditions.
- Total Kjeldahl nitrogen concentrations ranged from 0.11 to 0.34 mg-N/L, and were typically higher during under-ice conditions.
- Nitrite was not detected during the program (DL of 0.006 mg-N/L). Nitrate was not detected during open-water conditions, but ranged from below the DL (0.006 mg-N/L) to 0.26 mg-N/L during under-ice conditions.
- Concentrations of TP and TDP ranged from 0.0059 to 0.023 mg-P/L and from less than 0.001 to 0.007 mg-P/L, respectively. Dissolved orthophosphate ranged from below the laboratory DL (0.001 mg/L) to 0.003 mg-P/L during under-ice conditions, but was not detected during open-water conditions. Based on the measured TP concentrations and CCME (2004) TP trigger ranges for Canadian lakes, Duchess Lake can be classified as mesotrophic (i.e., 0.01 to 0.02 mg-P/L) and the other lakes can be classified as oligotrophic (i.e., 0.004 to 0.01 mg-P/L).
- Concentrations of SRSi ranged from 0.049 to 1.6 mg/L, with higher concentrations measured during under-ice conditions.
- Organic carbon occurred primarily in dissolved form, with TOC and DOC ranging from 2.5 to 6.0 mg/L and 2.8 to 5.7 mg/L, respectively.



Metals

Concentrations of total and dissolved metals were either below DLs or below guidelines and objectives, with the exception of aluminum, copper, iron, and manganese (Table 3.1-5). Total aluminum concentrations were above the chronic CWQG (5 µg/L) in 40% of samples where the corresponding field-measured pH value was less than pH 6.5. Total manganese concentrations ranged from 1.9 to 344 µg/L, with three measured concentrations (15% of all samples) above the CDWQG (50 µg/L). Total copper concentrations ranged from 0.51 to 2.5 µg/L, with two measured concentrations (7.3 µg/L at Af-1 in the fall, and 2.5 µg/L at C1-1 in the summer) above the CWQG (2 µg/L). Total iron concentrations ranged from 6.1 to 1,080 µg/L, with one measured concentration (520 µg/L at Af-1 in the fall) above the CWQG (300 µg/L).

Other Water Quality Parameters

Concentrations of hydrocarbons (BTEX, total recoverable hydrocarbons, and petroleum hydrocarbons F1 (C₆-C₁₀), F1 (C₆-C₁₀)-BTEX, and F2 (C₁₀-C₁₆) fractions were not detected in any samples (Table 3.1-5). Fecal coliform concentrations were also below the laboratory DL (less than 1 CFU/100 mL), with the exception of one detection of 1 CFU/100 mL at Af-1 in the summer (Table 3.1-5).

Table 3.1-5 Water Quality in the Lac du Sauvage Sub-basin Lakes, 2014

Parameter	Unit	Guidelines			Objectives		Under-Ice				Open-Water			
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-term SSWQO	Long-term SSWQO	Count	Min	Median	Max	Count	Min	Median	Max
Conventional Parameters														
Alkalinity, gran as (H+)	meg/L	-	-	-	-	-	12	0.10	0.15	0.21	8	<0.10	0.11	0.13
Alkalinity, total as (CaCO ₃)	mg/L	-	-	-	-	-	12	5.2	7.1	14.0	8	3.7	6.0	7.7
Conductance	µS/cm	-	-	-	-	-	12	19	23	89	8	12	20	57
Hardness	mg/L	-	-	-	-	-	12	6.6	8.9	32	8	4.1	6.3	18
pH	-	-	6.5 - 9.0	6.5 - 8.5	-	-	12	6.2	6.4	6.9	8	6.5	6.7	7.1
Total dissolved solids	mg/L	-	-	500	-	-	12	<10	18	53	8	<10	31	62
Total suspended solids	mg/L	-	-	-	-	-	12	<3.0	<3.0	3.8	8	<3.0	<3.0	<3.0
Turbidity	NTU	-	-	-	-	-	12	0.29	0.45	2.3	8	0.52	0.81	1.0
Major Ions														
Bicarbonate	mg/L	-	-	-	-	-	12	6.4	8.6	17	8	<5.0	7.3	9.4
Calcium	mg/L	-	-	-	-	-	12	1.2	1.6	4.1	8	0.74	0.9	2.5
Chloride	mg/L	640	120	250	-	64 ^(c,i)	12	<0.5	0.63	1.5	8	<0.5	<0.5	0.75
Fluoride	mg/L	-	0.12	1.5	-	-	12	<0.02	0.021	0.041	8	<0.02	0.028	0.038
Magnesium	mg/L	-	-	-	-	-	12	0.89	1.1	5.3	8	0.55	0.99	2.9
Potassium	mg/L	-	-	-	112 ^(d)	41 ^(d)	12	0.59	0.78	3.2	8	0.43	0.74	1.9
Sodium	mg/L	-	-	200	-	-	12	0.96	1.1	2.9	8	0.61	0.7	1.8
Sulphate	mg/L	-	-	500	343 ^(e,i)	45 ^(e,i)	12	1.49	1.84	22.3	8	0.81	2.0	12
Nutrients														
Total organic carbon	mg/L	-	-	-	-	-	12	2.5	4.6	6.0	8	2.8	4.5	5.4
Dissolved organic carbon	mg/L	-	-	-	-	-	12	2.5	4.3	5.7	8	2.8	4.5	5.3
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	12	0.13	0.28	0.5	8	0.14	0.24	0.34
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	-	-	12	0.11	0.19	0.29	8	0.14	0.24	0.34
Total ammonia	mg-N/L	-	0.069-222 ^(j)	-	-	-	12	<0.005	<0.005	0.043	8	<0.005	<0.005	0.012
Nitrate	mg-N/L	124	2.9	10	-	1.2 ^(f,i)	12	<0.006	0.047	0.26	8	<0.006	<0.006	<0.006
Nitrite	mg-N/L	-	0.06	1	-	-	12	<0.002	<0.002	<0.002	8	<0.002	<0.002	<0.002
Total phosphorus	mg-P/L	-	0.02 ^(l,m)	-	-	-	12	0.0059	0.0091	0.023	8	0.0059	0.0092	0.014
Total dissolved phosphorus	mg-P/L	-	-	-	-	-	12	0.0028	0.0041	0.007	8	<0.001	0.0029	0.0047
Dissolved orthophosphate	mg-P/L	-	-	-	-	-	12	<0.001	<0.001	0.003	8	<0.001	<0.001	<0.001
Silica, reactive	mg/L	-	-	-	-	-	12	0.14	0.52	1.6	8	0.049	0.078	0.21
Other Parameters														
Benzene	µg/L	-	370	5.0	-	-	12	<0.5	<0.5	<0.5	8	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	-	90	2.4	-	-	12	<0.5	<0.5	<0.5	8	<0.5	<0.5	<0.5
Toluene	µg/L	-	2.0	24	-	-	12	<0.5	<0.5	<0.5	8	<0.5	<0.5	<0.5
Xylenes	µg/L	-	-	300	-	-	12	<0.71	<0.71	<0.71	8	<0.71	<0.71	<0.71
Petroleum hydrocarbons – F1 (C6-C10)-BTEX	µg/L	-	-	-	-	-	12	<100	<100	<100	8	<100	<100	<100
Petroleum hydrocarbons – F1 (C6-C10)	µg/L	-	-	-	-	-	12	<100	<100	<100	8	<100	<100	<100
Petroleum hydrocarbons – F2 (C10-C16)	µg/L	-	-	-	-	-	12	<250	<250	<250	8	<250	<250	<250
Fecal coliform	CFU/100 mL	-	-	-	-	-	12	<1.0	<1.0	<1.0	8	<1.0	<1.0	1.0

Table 3.1-5 Water Quality in the Lac du Sauvage Sub-basin Lakes, 2014

Parameter	Unit	Guidelines			Objectives		Under-Ice				Open-Water			
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-term SSWQO	Long-term SSWQO	Count	Min	Median	Max	Count	Min	Median	Max
Total Metals														
Aluminum	µg/L	-	5 or 100 ^(j)	100	-	-	12	2.3	7.1	24	8	7.8	13.0	53
Antimony	µg/L	-	-	6.0	-	-	12	<0.02	<0.02	<0.02	8	<0.02	<0.02	<0.02
Arsenic	µg/L	-	5.0	10	-	-	12	0.21	0.46	0.87	8	0.24	0.41	0.52
Barium	µg/L	-	-	1,000	-	-	12	2.3	4.6	7.6	8	1.3	2.3	4.4
Beryllium	µg/L	-	-	-	-	-	12	<0.01	<0.01	<0.01	8	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	12	<0.01	<0.01	<0.01	8	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	-	12	1.3	3.7	5.9	8	2.1	2.4	6.0
Cadmium	µg/L	0.11 - 0.66 ^(k)	0.04 ^(k)	5.0	-	-	12	<0.005	<0.005	0.0071	8	<0.005	<0.005	<0.005
Cesium	µg/L	-	-	-	-	-	12	<0.1	<0.1	<0.1	8	<0.005	0.0091	0.069
Chromium	µg/L	-	1.0	50	-	-	12	<0.06	0.098	0.19	8	<0.06	<0.06	0.079
Cobalt	µg/L	-	-	-	-	-	12	0.014	0.039	2.0	8	0.02	0.036	0.064
Copper	µg/L	-	2.0 ^(j)	1,000	-	-	12	0.51	0.93	1.1	8	0.75	0.9	2.5
Iron	µg/L	-	300	300	-	-	12	6.1	33	1,080	8	19	32	108
Lead	µg/L	-	1.0	10	-	-	12	<0.01	0.015	0.053	8	<0.01	<0.01	0.012
Lithium	µg/L	-	-	-	-	-	12	1.2	2.0	3.1	8	1.3	1.9	2.4
Manganese	µg/L	-	-	50	-	-	12	1.9	8.9	344.0	8	2.3	5.4	14
Mercury	µg/L	-	0.026	1.0	-	-	12	<0.0005	<0.0005	<0.0005	8	<0.0005	0.00072	0.00096
Molybdenum	µg/L	-	73	-	223,000 ^(g)	19,000 ^(g)	12	<0.05	<0.05	0.063	8	<0.05	<0.05	0.055
Nickel	µg/L	-	25 ^(j)	-	-	-	12	0.36	0.74	1.3	8	0.29	0.54	1.0
Selenium	µg/L	-	1.0	10	-	-	12	<0.04	<0.04	<0.04	8	<0.04	<0.04	<0.04
Silver	µg/L	-	0.1	-	-	-	12	<0.005	<0.005	<0.005	8	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	12	7.0	9.5	32	8	4.8	6.3	20
Thallium	µg/L	-	0.8	-	-	-	12	<0.01	<0.01	<0.01	8	<0.01	<0.01	<0.01
Tin	µg/L	-	-	-	-	-	12	<0.05	<0.05	<0.05	8	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	12	<0.1	0.13	0.35	8	0.11	0.42	3.9
Uranium	µg/L	33	15	20	-	-	12	<0.01	0.031	0.073	8	0.012	0.015	0.038
Vanadium	µg/L	-	-	-	300 ^(h)	30 ^(h)	12	0.082	0.14	0.22	8	<0.05	<0.05	0.24
Zinc	µg/L	-	30	5,000	-	-	12	<0.8	0.83	1.7	8	<0.8	<0.8	<0.8
Dissolved Metals														
Aluminum	µg/L	-	-	-	-	-	12	1.9	6.6	20	8	2.2	4.8	5.8
Antimony	µg/L	-	-	-	-	-	12	<0.02	<0.02	<0.02	8	<0.02	<0.02	<0.02
Arsenic	µg/L	-	-	-	-	-	12	0.21	0.43	0.52	8	0.24	0.4	0.51
Barium	µg/L	-	-	-	-	-	12	5.1	8.5	28	8	1.2	2.1	4.2
Beryllium	µg/L	-	-	-	-	-	12	<0.01	<0.01	<0.01	8	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	12	<0.01	<0.01	<0.01	8	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	-	12	2.8	4.8	8.1	8	2.1	3.2	4.6
Cadmium	µg/L	-	-	-	-	-	12	<0.005	<0.005	0.012	8	<0.005	<0.005	<0.005
Cesium	µg/L	-	-	-	-	-	12	<0.1	<0.1	<0.1	8	<0.005	0.0064	0.018
Chromium	µg/L	-	-	-	-	-	12	<0.06	0.071	0.18	8	<0.06	<0.06	0.1
Chromium – Hexavalent	µg/L	-	1	-	-	-	12	<1.0	<1.0	<1.0	8	<1.0	<1.0	<1.0

Table 3.1-5 Water Quality in the Lac du Sauvage Sub-basin Lakes, 2014

Parameter	Unit	Guidelines			Objectives		Under-Ice				Open-Water			
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-term SSWQO	Long-term SSWQO	Count	Min	Median	Max	Count	Min	Median	Max
Cobalt	µg/L	-	-	-	-	-	12	0.01	0.03	2.0	8	<0.01	0.012	0.017
Copper	µg/L	-	-	-	-	-	12	0.57	0.87	1.1	8	0.54	0.81	2.2
Iron	µg/L	-	-	-	-	-	12	2.1	11.0	300.0	8	2.4	2.6	10
Lead	µg/L	-	-	-	-	-	12	<0.01	0.012	0.026	8	<0.01	<0.01	<0.01
Lithium	µg/L	-	-	-	-	-	12	1.2	2.1	3.0	8	1.4	1.6	2.4
Manganese	µg/L	-	-	-	-	-	12	1.3	7.0	353	8	0.26	0.5	0.62
Mercury	µg/L	-	-	-	-	-	12	<0.0005	<0.0005	<0.0005	8	<0.0005	0.00055	0.00084
Molybdenum	µg/L	-	-	-	-	-	12	<0.05	<0.05	0.057	8	<0.05	<0.05	0.064
Nickel	µg/L	-	-	-	-	-	12	0.32	0.75	1.3	8	0.27	0.47	0.68
Selenium	µg/L	-	-	-	-	-	12	<0.04	<0.04	<0.04	8	<0.04	<0.04	<0.04
Silver	µg/L	-	-	-	-	-	12	<0.005	<0.005	0.0051	8	<0.005	<0.005	0.0075
Strontium	µg/L	-	-	-	-	-	12	7.4	9.8	33.0	8	4.9	6.0	20
Thallium	µg/L	-	-	-	-	-	12	<0.01	<0.01	<0.01	8	<0.005	<0.005	0.006
Tin	µg/L	-	-	-	-	-	12	<0.05	<0.05	0.093	8	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	12	<0.1	<0.1	0.51	8	<0.1	<0.1	0.38
Uranium	µg/L	-	-	-	-	-	12	<0.01	0.029	0.072	8	0.011	0.013	0.031
Vanadium	µg/L	-	-	-	-	-	12	0.086	0.11	0.17	8	<0.05	<0.05	0.062
Zinc	µg/L	-	-	-	-	-	12	2.1	4.5	19	8	<0.8	<0.8	1.6

- a) Source: CCME (Canadian Council of Ministers of the Environment). 1999, with updates to 2014. Canadian Environmental Quality Guidelines. Winnipeg, MB, Canada.
- b) Source: Health Canada. 2012. Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.
- c) Elphick JRF, Bergh KD, Bailey HC. 2011. Chronic toxicity of chloride to freshwater species: effects of hardness and implications for water quality guidelines. Environ Toxicol Chem 30: 230-246.
- d) Rescan (Rescan Environmental Services Ltd.). 2012a. Ekati Diamond Mine: Site-Specific Water Quality Objective for Potassium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.
- e) Rescan. 2012b. Ekati Diamond Mine: Site-specific Water Quality Objective for Sulphate. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.
- f) Rescan. 2012c. Ekati Diamond Mine: Site-Specific Water Quality Objective for Nitrate, (2012). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.
- g) Rescan. 2012d. Ekati Diamond Mine: Site Specific Water Quality Objective for Molybdenum, (2011). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.
- h) Rescan. 2012e. Ekati Diamond Mine: Site-specific Water Quality Objective for Vanadium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.
- i) Guidelines based on hardness of 10 mg CaCO₃/L.
- j) Open water guidelines based on pH of 6.0 to 7.3, water temperature of 6.1°C to 13.3°C, and water hardness of 4.7 to 5.2 mg/L. Under ice guidelines based on pH of 6.2 to 6.9, water temperature of 0.7°C to 3.8°C, and water hardness of 5.4 to 32 mg/L.
- k) Acute guideline applies to all waters of hardness below 5.3 mg CaCO₃/L; chronic guideline applies to all waters of hardness below 17 mg CaCO₃/L.
- l) Trigger for transition from oligotrophic to mesotrophic status (0.01 mg/L) applied to Lac de Gras basin and mesotrophic to meso-eutrophic status (0.02 mg/L) applied to Lac du Sauvage basin as based on CCME (2004).
- m) Source: CCME 2004. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems. Canadian Environmental Quality Guidelines, 2004. Winnipeg, MB, Canada.

Bolded concentrations are higher than relevant water quality guidelines.

- = no guideline or data; CWQG = Canadian Water Quality Guidelines; CDWQG = Canadian Drinking Water Quality Guideline; SSWQO = Site-Specific Water Quality Objective; H+ = hydrogen ions; CaCO₃ = calcium carbonate; mg CaCO₃/L = milligrams calcium carbonate per litre; F1 (C6-C10) = hydrocarbon fraction F1; F2 (C10-C16) = hydrocarbon fraction F2; meq/L = milliequivalents per litre; mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; pH = potential of hydrogen, provides measure of the acidity or alkalinity of a solution on a scale of 0 to 14; NTU = nephelometric turbidity units; mg-N/L = milligrams of nitrogen per litre; mg-P/L = milligrams of phosphorus per litre; µg/L = micrograms per litre; CFU/100 mL = coliform forming units per 100 millilitres; BTEX = benzene, toluene, ethylbenzene, xylene; <= less than.



Nutrients and Chlorophyll *a* in Depth-Integrated Samples

Discrete and depth-integrated samples were collected at Station Af-1 in Duchess Lake in the summer and fall; samples were not collected at Station Af-1 in the late spring. Nutrient concentrations in Duchess Lake were generally higher in the summer than in the fall.

Concentrations of TP and SRSi in the depth-integrated (euphotic depth) samples from Duchess Lake were similar to the concentrations in the discrete samples (mid-depth samples):

- Concentrations of TP in the depth-integrated samples ranged from 0.011 to 0.019 mg-P/L (Appendix D, Table D-21), compared to 0.011 to 0.014 mg-P/L in the corresponding discrete samples (Table 3.1-5).
- Concentrations of SRSi in the depth-integrated samples ranged from 0.1 to 0.15 mg/L (Appendix D, Table D-21), compared to 0.093 to 0.16 mg/L in the corresponding discrete samples (Table 3.1-5).

Total dissolved phosphorus concentrations in the depth-integrated samples from Duchess Lake (0.0023 to 0.0034 mg-P/L; Appendix D, Table D-21) were lower than the corresponding discrete samples (0.0034 to 0.0047 mg-P/L) (Table 3.1-5).

In contrast, concentrations of TN in the depth-integrated samples from Station Af-1 in Duchess Lake ranged from 0.16 to 0.36 mg-N/L (Appendix D, Table D-21) and were generally higher than the corresponding discrete samples (0.15 to 0.29 mg-N/L; Table 3.1-5).

Concentrations of dissolved orthophosphate, total ammonia, nitrate, and nitrite at Station Af-1 in Duchess Lake were not detected throughout the seasonal sampling programs (Appendix D, Table D-21; Table 3.1-5).

Total dissolved nitrogen concentrations in the depth-integrated samples from Duchess Lake ranged from 0.085 to 0.24 mg-N/L (Appendix D, Table D-21); total dissolved nitrogen was not measured in the corresponding discrete samples.

Chlorophyll *a* concentrations at Station Af-1 in Duchess Lake ranged from 4.44 to 9.14 µg/L (Table 3.1-6; Appendix D, Table D-24). Overall, chlorophyll *a* concentrations were higher in the fall sampling period.

Table 3.1-6 Summary of Chlorophyll *a* at Station Af-1 in Duchess Lake, 2014

Sampling Event	Chlorophyll <i>a</i> (µg/L) Station Af-1
Late Spring	—
Summer	4.44 ± 0.15
Fall	9.14 ± 4.39

Note: Concentrations are mean ± standard error.

— = not sampled due to inclement weather; µg/L= micrograms per litre; ± = plus or minus.



Trophic Status Classification

In 2014, the discrete water sampling program for Duchess Lake yielded mean concentrations of 0.0125 mg-P/L for TP and 3.6 m for Secchi depth. The corresponding TSI based on these values is 40.6 using TP and 41.5 using Secchi depth, for a rounded average of 41. In 2014, the depth-integrated sampling program yielded mean concentrations of 0.015 mg-P/L for TP, 6.79 µg/L for chlorophyll *a*, and 3.6 m for Secchi depth. The corresponding TSI based on these values is 43.2 using TP, 49.4 using chlorophyll *a*, and 41.5 using Secchi depth, for a rounded average of 45. Based on these values, Duchess Lake is classified as mesotrophic using Vollenweider (1970) and Carlson (1977). Duchess Lake can also be classified as mesotrophic (i.e., 0.01 to 0.02 mg-P/L), based on CCME (2004) TP trigger ranges for Canadian lakes.

Trophic status for the remainder of the sub-basin lakes, based on discrete samples, is as follows:

- Christine Lake can be classified as oligotrophic based on TSI values for TP (31.2) and Secchi depth (42.8), for a rounded average of 37.
- Lake C1 can be classified as oligotrophic based on TSI values for TP (36.7) and Secchi depth (41.9), for a rounded average of 39.
- Counts Lake can be classified as oligotrophic based on TSI values for TP (34.6) and Secchi depth (35.4), for a rounded average of 35.
- Lake E1 can be classified as oligotrophic based on TSI values for TP (39.7).
- Lake Af1 can be classified as oligotrophic based on TSI values for TP (36.9).

3.2 Lac de Gras Basin

3.2.1 Slipper Bay Stations

There were four stations sampled from the Slipper Bay area in Lac de Gras (S2, S3, S5, and S6; Map 2.2-1). During the open-water program, 11 samples and 11 field physico-chemical water column profile measurements from Slipper Bay stations were collected. Station S6 was not sampled in the fall due to inclement weather. The Slipper Bay stations were added to the 2014 open-water program when the baseline study area was refined. Thus, the Slipper Bay stations were not sampled during the under-ice period.

Field-Measured Physico-Chemical Parameters

Thermal stratification was observed at all Lac de Gras Slipper Bay stations (S2, S3, S5, and S6) in late spring; however, the stations were well-mixed in summer and fall (Appendix B, Figure B-3a).

During the open-water programs, there were no occurrences of oxic stratification because there was little variability in DO concentrations throughout the water column (Appendix B, Figure B-3b).

Dissolved oxygen concentrations were similar among stations. Among sampling events, the waters were well-oxygenated throughout the duration of the open-water program, with DO ranging from 10.5 to 12.6 mg/L (98.4% to 110.9% saturation), and higher concentrations in the late spring and fall than in the summer (Appendix D, Table D-11). DO concentrations were consistently above the CWQG.



Specific conductivity was similar in the summer and fall sampling program, and ranged from 18 to 50 $\mu\text{S}/\text{cm}$. Specific conductivity measurements were consistently highest at Station S2 and lowest at Station S6 (Appendix D, Table D-11). In late spring, however, specific conductivity measurements at S2 and S3 were elevated (relative to summer and fall), and rapidly declined with depth (Appendix B, Figure B-3c). The elevated conductivity values at S2 and S3 are attributed to Koala watershed inflows to Lac de Gras through Slipper Bay that are influenced by discharges from the Long Lake Containment Facility. Elevated specific conductivity has been measured as far as Stations S3 to S6 in Lac de Gras (ERM Rescan 2014); however, they did not extend to Stations S5 and S6 during this program.

During the open-water programs, pH at Lac de Gras Slipper Bay stations characterized the lake water as neutral. In general, there was little variability throughout the water column at each station and between sampling programs (ranging from 6.9 to 7.4 in late spring, 7.0 to 7.8 in the summer, and 6.9 to 7.1 in the fall; Appendix B, Figure B-3d; Appendix D, Table D-11). The pH values were consistently within the CWQG and CDWQG.

The Euphotic Zone and Light Attenuation

Secchi depths at the Lac de Gras Slipper Bay stations ranged from 5.5 to 11 m (Appendix C, Table C-2). Mean Secchi depth at Lac de Gras Slipper Bay stations was greater in the summer (mean = 9.9 m) than in late spring (mean = 8.2 m) and fall (mean = 5.8 m).

The attenuation coefficient (K_d) among all stations in Slipper Bay during late spring, summer, and fall ranged from 0.22 to 0.66 (Table 3.2-1), which characterize Slipper Bay as a clear water embayment. The light attenuation data supported the Secchi depth observations, that light penetration was greater during summer (mean $K_d = 0.27$) compared to late spring (mean $K_d = 0.30$) and fall (mean $K_d = 0.31$) (i.e., the euphotic zone was deeper in summer). On a spatial level across the three open-water sampling programs, light attenuated more rapidly at Station S2, and least at Station S6 (Appendix C, Figure C-2).

Table 3.2-1 Attenuation Coefficients (K_d) at Stations in Lac de Gras Slipper Bay, 2014

Station	Sampling Event		
	Late Spring	Summer	Fall
S2	0.66	0.51	0.57
S3	0.37	0.33	0.34
S5	0.33	0.26	0.29
S6	0.22	0.22	—

— = not sampled due to inclement weather.



Water Quality in Discrete Samples

Conventional Water Quality Parameters

Concentrations of conventional water quality parameters were similar among stations and sampling events (Table 3.2-2):

- Waters in Slipper Bay of Lac de Gras had low ionic strength; TDS concentrations ranged from less than 10 mg/L to 35 mg/L.
- The range of values for total alkalinity and total hardness were also low, and indicated that Lac de Gras is a very soft water lake (McNeely et al. 1979) with high potential sensitivity to acid deposition (Saffran and Trew 1996).
- The range of open-water field-measured pH values confirmed that the lake water is neutral (pH 7.0 to 7.3, with a median of pH 7.2).
- The waters are clear, as indicated by the attenuation coefficient data, with TSS concentrations below the laboratory DL and turbidity values from 0.27 to 0.73 NTU.

Major Ions

Major ions concentrations were similar among stations and sampling events (Table 3.2-2). Detection limits and measured concentrations of major ions were below guidelines and objectives. The dominant ions were bicarbonate, magnesium, sodium, and sulphate.

Nutrients

Nutrient concentrations measured in the discrete water samples from Slipper Bay were consistent among stations and sampling events (Table 3.2-2):

- total ammonia concentrations ranged from less than 0.005 to 0.0056 mg-N/L, and were below the CWQG.
- TKN concentrations ranged from less than 0.05 to 0.21 mg-N/L.
- nitrate concentrations ranged from less than 0.006 to 0.1 mg-N/L. Nitrite concentrations were not detected (DL of 0.002 mg-N/L).
- concentrations of TP and TDP ranged from 0.0013 to 0.0086 mg-P/L and from less than 0.001 to 0.0033 mg-P/L, respectively; dissolved orthophosphate concentrations were not detected (DL of 0.001 mg/L). Based on the measured TP concentrations and CCME (2004) TP trigger ranges for Canadian lakes, Lac de Gras Slipper Bay stations can be classified as oligotrophic (i.e., 0.004 to 0.01 mg-P/L).
- concentrations of SRSi ranged from 0.037 to 0.16 mg/L.
- TOC and DOC concentrations ranged from 2.2 to 3.6 mg/L and 2.1 to 3.8 mg/L, respectively.



Metals

Concentrations of total and dissolved metals were below the DLs, or if detected, were below guidelines and objectives.

Other Water Quality Parameters

Concentrations of hydrocarbons (BTEX, total recoverable hydrocarbons, and petroleum hydrocarbons F1 [C₆-C₁₀], F1 [C₆-C₁₀]-BTEX, and F2 [C₁₀-C₁₆]) fractions) were not detected in any sample (Table 3.2-2). Fecal coliform concentrations were consistently below the laboratory DL (less than 1 CFU/100 mL) in all samples, with the exception of one detection of 1 CFU/100 mL at Station S2 in the late spring (Table 3.2-2).

Table 3.2-2 Water Quality in the Lac de Gras Slipper Bay Stations, 2014

Parameter	Unit	Guidelines			Objectives		Count	Open-Water		
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-term SSWQO	Long-term SSWQO		Min	Median	Max
Conventional Parameters										
Alkalinity, gran as (H+)	meg/L	-	-	-	-	-	11	<0.10	0.11	0.14
Alkalinity, total as (CaCO ₃)	mg/L	-	-	-	-	-	11	4.0	4.5	8.2
Conductance	µS/cm	-	-	-	-	-	11	23	32	53
Hardness	mg/L	-	-	-	-	-	11	6.5	7.8	11
pH	-	-	6.5 - 9.0	6.5 - 8.5	-	-	11	6.4	6.6	6.8
Total dissolved solids	mg/L	-	-	500	-	-	11	<10	23	35
Total suspended solids	mg/L	-	-	-	-	-	11	<3.0	<3.0	<3.0
Turbidity	NTU	-	-	-	-	-	11	0.27	0.42	0.73
Major Ions										
Bicarbonate	mg/L	-	-	-	-	-	11	<5.0	5.5	10
Calcium	mg/L	-	-	-	-	-	11	1.3	1.5	2.2
Chloride	mg/L	640	120	250	-	64 ^(c,i)	11	1.4	2.5	5.8
Fluoride	mg/L	-	0.12	1.5	-	-	11	<0.02	<0.02	0.026
Magnesium	mg/L	-	-	-	-	-	11	0.82	0.94	1.3
Potassium	mg/L	-	-	-	112 ^(d)	41 ^(d)	11	0.64	0.9	1.5
Sodium	mg/L	-	-	200	-	-	11	1.3	2.2	4.7
Sulphate	mg/L	-	-	500	343 ^(e,i)	45 ^(e,i)	11	2.7	3.7	7.2
Nutrients										
Total organic carbon	mg/L	-	-	-	-	-	11	2.2	2.7	3.6
Dissolved organic carbon	mg/L	-	-	-	-	-	11	2.1	2.7	3.8
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	11	<0.05	0.13	0.21
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	-	-	11	<0.05	0.13	0.21
Total ammonia	mg-N/L	-	2.8 - 105 ⁽ⁱ⁾	-	-	-	11	<0.005	<0.005	0.0056
Nitrate	mg-N/L	124	2.9	10	-	1.2 ^(f,i)	11	<0.006	<0.006	0.01
Nitrite	mg-N/L	-	0.06	1	-	-	11	<0.002	<0.002	<0.002
Total phosphorus	mg-P/L	-	0.01 ^(l,m)	-	-	-	11	0.0013	0.0033	0.0086
Total dissolved phosphorus	mg-P/L	-	-	-	-	-	11	<0.001	0.001	0.0033
Dissolved orthophosphate	mg-P/L	-	-	-	-	-	11	<0.001	<0.001	<0.001
Silica, reactive	mg/L	-	-	-	-	-	11	0.037	0.057	0.16
Other Parameters										
Benzene	µg/L	-	370	5.0	-	-	11	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	-	90	2.4	-	-	11	<0.5	<0.5	<0.5
Toluene	µg/L	-	2.0	24	-	-	11	<0.5	<0.5	<0.5
Xylenes	µg/L	-	-	300	-	-	11	<0.71	<0.71	<0.71
Petroleum hydrocarbons – F1 (C6-C10)-BTEX	µg/L	-	-	-	-	-	11	<100	<100	<100
Petroleum hydrocarbons – F1 (C6-C10)	µg/L	-	-	-	-	-	11	<100	<100	<100
Petroleum hydrocarbons – F2 (C10-C16)	µg/L	-	-	-	-	-	11	<250	<250	<250
Fecal coliform	CFU/100 mL	-	-	-	-	-	11	<1.0	<1.0	1.0

Table 3.2-2 Water Quality in the Lac de Gras Slipper Bay Stations, 2014

Parameter	Unit	Guidelines			Objectives		Count	Open-Water		
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-term SSWQO	Long-term SSWQO		Min	Median	Max
Total Metals										
Aluminum	µg/L	-	100 ⁽ⁱ⁾	100	-	-	11	2.6	5.1	84
Antimony	µg/L	-	-	6.0	-	-	11	<0.02	<0.02	0.031
Arsenic	µg/L	-	5.0	10	-	-	11	0.17	0.2	0.43
Barium	µg/L	-	-	1,000	-	-	11	2.0	2.6	4.8
Beryllium	µg/L	-	-	-	-	-	11	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	11	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	-	11	<1.0	2.3	5.1
Cadmium	µg/L	0.11 - 0.37 ^(k)	0.04 ^(k)	5.0	-	-	11	<0.005	<0.005	0.0058
Cesium	µg/L	-	-	-	-	-	11	0.0071	0.009	0.023
Chromium	µg/L	-	1.0	50	-	-	11	<0.06	<0.06	0.087
Cobalt	µg/L	-	-	-	-	-	11	0.024	0.028	0.32
Copper	µg/L	-	2.0 ⁽ⁱ⁾	1,000	-	-	11	0.52	0.62	1.4
Iron	µg/L	-	300	300	-	-	11	2.2	6.7	164
Lead	µg/L	-	1.0	10	-	-	11	<0.01	<0.01	0.069
Lithium	µg/L	-	-	-	-	-	11	1.3	1.4	1.7
Manganese	µg/L	-	-	50	-	-	11	2.0	2.6	41
Mercury	µg/L	-	0.026	1.0	-	-	11	<0.0005	0.00054	0.00064
Molybdenum	µg/L	-	73	-	223,000 ^(g)	19,000 ^(g)	11	0.2	0.52	1.3
Nickel	µg/L	-	25 ⁽ⁱ⁾	-	-	-	11	0.78	0.87	2.3
Selenium	µg/L	-	1.0	10	-	-	11	<0.04	<0.04	<0.04
Silver	µg/L	-	0.1	-	-	-	11	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	11	11	16	29
Thallium	µg/L	-	0.8	-	-	-	11	<0.01	<0.01	<0.01
Tin	µg/L	-	-	-	-	-	11	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	11	<0.1	<0.1	1.4
Uranium	µg/L	33	15	20	-	-	11	0.021	0.024	0.087
Vanadium	µg/L	-	-	-	300 ^(h)	30 ^(h)	11	<0.05	<0.05	0.13
Zinc	µg/L	-	30	5,000	-	-	11	<0.8	<0.8	1.2
Dissolved Metals										
Aluminum	µg/L	-	-	-	-	-	11	1.3	2.3	12
Antimony	µg/L	-	-	-	-	-	11	<0.02	<0.02	0.031
Arsenic	µg/L	-	-	-	-	-	11	0.17	0.19	0.23
Barium	µg/L	-	-	-	-	-	11	2.0	2.4	4.5
Beryllium	µg/L	-	-	-	-	-	11	<0.01	<0.01	0.01
Bismuth	µg/L	-	-	-	-	-	11	<0.01	<0.01	0.012
Boron	µg/L	-	-	-	-	-	11	<1.0	2.4	5.3
Cadmium	µg/L	-	-	-	-	-	11	<0.005	<0.005	0.0061
Cesium	µg/L	-	-	-	-	-	11	0.007	0.0082	0.019
Chromium	µg/L	-	-	-	-	-	11	<0.06	<0.06	0.085

Table 3.2-2 Water Quality in the Lac de Gras Slipper Bay Stations, 2014

Parameter	Unit	Guidelines			Objectives		Open-Water			
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-term SSWQO	Long-term SSWQO	Count	Min	Median	Max
Chromium - Hexavalent	µg/L	-	1	-	-	-	11	<1.0	<1.0	<1.0
Cobalt	µg/L	-	-	-	-	-	11	<0.01	0.011	0.032
Copper	µg/L	-	-	-	-	-	11	0.49	0.59	0.87
Iron	µg/L	-	-	-	-	-	11	<1.0	1.7	11
Lead	µg/L	-	-	-	-	-	11	<0.01	<0.01	<0.01
Lithium	µg/L	-	-	-	-	-	11	1.3	1.5	1.6
Manganese	µg/L	-	-	-	-	-	11	0.5	0.88	2.6
Mercury	µg/L	-	-	-	-	-	11	<0.0005	<0.0005	0.00058
Molybdenum	µg/L	-	-	-	-	-	11	0.21	0.52	1.4
Nickel	µg/L	-	-	-	-	-	11	0.74	0.82	0.95
Selenium	µg/L	-	-	-	-	-	11	<0.04	<0.04	<0.04
Silver	µg/L	-	-	-	-	-	11	<0.005	<0.005	0.0088
Strontium	µg/L	-	-	-	-	-	11	11	15	29
Thallium	µg/L	-	-	-	-	-	11	<0.005	<0.005	0.011
Tin	µg/L	-	-	-	-	-	11	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	11	<0.1	<0.1	0.25
Uranium	µg/L	-	-	-	-	-	11	0.018	0.021	0.03
Vanadium	µg/L	-	-	-	-	-	11	<0.05	<0.05	<0.05
Zinc	µg/L	-	-	-	-	-	11	<0.8	0.99	3.2

a) Source: CCME (Canadian Council of Ministers of the Environment). 1999, with updates to 2014. Canadian Environmental Quality Guidelines. Winnipeg, MB, Canada.

b) Source: Health Canada. 2012. Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.

c) Elphick JRF, Bergh KD, Bailey HC. 2011. Chronic toxicity of chloride to freshwater species: effects of hardness and implications for water quality guidelines. Environ Toxicol Chem 30: 230-246.

d) Rescan (Rescan Environmental Services Ltd.). 2012a. Ekati Diamond Mine: Site-Specific Water Quality Objective for Potassium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

e) Rescan. 2012b. Ekati Diamond Mine: Site-specific Water Quality Objective for Sulphate. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

f) Rescan. 2012c. Ekati Diamond Mine: Site-Specific Water Quality Objective for Nitrate, (2012). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

g) Rescan. 2012d. Ekati Diamond Mine: Site Specific Water Quality Objective for Molybdenum, (2011). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

h) Rescan. 2012e. Ekati Diamond Mine: Site-specific Water Quality Objective for Vanadium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

i) Guidelines based on hardness of 10 mg CaCO₃/L.

j) Guidelines based on pH of 6.0 to 7.3, temperature of 6.1°C to 13.3°C, and water hardness of 4.7 to 5.2 mg/L.

k) Acute guideline applies to all waters of hardness below 5.3 mg CaCO₃/L; chronic guideline applies to all waters of hardness below 17 mg CaCO₃/L.

l) Trigger for transition from oligotrophic to mesotrophic status (0.01 mg/L) applied to Lac de Gras basin and mesotrophic to meso-eutrophic status (0.02 mg/L) applied to Lac du Sauvage basin as based on CCME (2004).

m) Source: CCME 2004. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems. Canadian Environmental Quality Guidelines, 2004. Winnipeg, MB, Canada.

Bolded concentrations are higher than relevant water quality guidelines.

- = no guideline or data; CWQG = Canadian Water Quality Guidelines; CDWQG = Canadian Drinking Water Quality Guideline; SSWQO = Site-Specific Water Quality Objective; H+ = hydrogen ions; CaCO₃ = calcium carbonate; mg CaCO₃/L = milligrams calcium carbonate per litre; F1 (C6-C10) = hydrocarbon fraction F1; F2 (C10-C16) = hydrocarbon fraction F2; meq/L = milliequivalents per litre; mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; pH = potential of hydrogen, provides measure of the acidity or alkalinity of a solution on a scale of 0 to 14; NTU = nephelometric turbidity units; mg-N/L = milligrams of nitrogen per litre; mg-P/L = milligrams of phosphorus per litre; µg/L = micrograms per litre; CFU/100 mL = coliform forming units per 100 millilitres; BTEX = benzene, toluene, ethylbenzene, xylene; <= less than.

Nutrients and Chlorophyll *a* in Depth-Integrated Samples

Concentrations of TP, TN, total ammonia, and SRSi in the depth-integrated (euphotic depth) samples in Slipper Bay were similar to the concentrations measured in the discrete samples (mid-depth samples):

- Concentrations of TP in the depth-integrated samples ranged from 0.0016 to 0.0065 mg-P/L (median = 0.0031 mg-P/L) (Appendix D, Table D-22), compared to 0.0013 to 0.0086 mg-P/L (median = 0.0033 mg-P/L) in the corresponding discrete samples (Table 3.2-2).
- Concentrations of TN ranged from 0.073 to 0.23 mg-N/L in the depth-integrated samples (median = 0.15 mg-N/L) (Appendix D, Table D-22), compared to less than 0.05 to 0.21 mg-N/L (median = 0.13 mg-N/L) in the corresponding discrete samples (Table 3.2-2).
- Concentrations of total ammonia in the depth-integrated samples ranged from less than 0.005 to 0.0063 mg-N/L (median = <0.005 mg-N/L) (Appendix D, Table D-22), compared to concentrations in the corresponding discrete samples (<0.005 to 0.0056 mg-N/L; median = <0.005 mg-N/L) (Table 3.2-2).
- Concentrations of SRSi ranged from 0.04 to 0.14 mg/L in the depth-integrated samples (median = 0.056 mg/L) (Appendix D, Table D-22), compared to 0.037 to 0.16 mg/L (median = 0.057 mg/L) in the corresponding discrete samples (Table 3.2-2).

In contrast, concentrations of TDP in the depth-integrated samples from Slipper Bay ranged from less than 0.001 to 0.0019 mg-P/L (median = <0.001 mg-P/L) (Appendix D, Table D-22) and were generally lower than those in the corresponding discrete samples (<0.001 to 0.0033 mg-P/L; median = 0.001 mg-P/L) (Table 3.2-2).

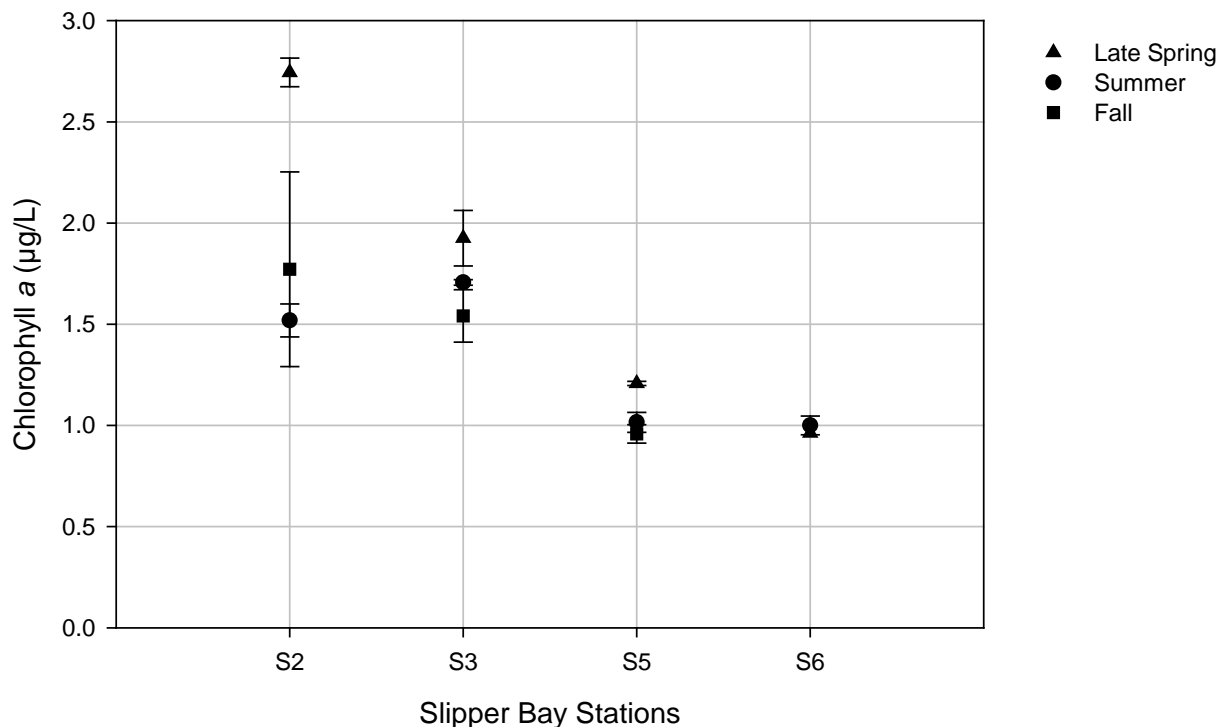
Concentrations of dissolved orthophosphate, nitrate, and nitrite were less than the analytical DL at the majority of stations in Slipper Bay throughout the seasonal sampling programs (Appendix D, Table D-22; Table 3.2-2).

Total dissolved nitrogen concentrations in the depth-integrated samples from Slipper Bay ranged from less than 0.05 to 0.22 mg-N/L (median = 0.13 mg-N/L) (Appendix D, Table D-22); total dissolved nitrogen was not measured in the corresponding discrete samples.

Chlorophyll *a* concentrations in Slipper Bay ranged from 0.96 µg/L at Station S6 during the late spring and S5 during the fall to a maximum of 2.74 at Station S2 during the late spring (Appendix D, Table D-24). Overall, higher chlorophyll *a* concentrations were measured during the late spring sampling period, ranging from 0.96 to 2.74 µg/L (mean = 1.71 µg/L), compared to the summer (1.00 to 1.71 µg/L; mean = 1.31 µg/L) and fall (0.96 to 1.77 µg/L; mean = 1.42 µg/L) (Figure 3.2-1). Throughout the open-water sampling programs, chlorophyll *a* concentrations at Stations S5 and S6 were lower and more consistent than concentrations measured at Stations S2 and S3.



Figure 3.2-1 Mean Chlorophyll *a* Concentrations at Stations in Lac de Gras Slipper Bay in Late Spring, Summer, and Fall, 2014



Note: Error bars = standard error.

µg/L = micrograms per litre.

Trophic Status Classification

In 2014, the discrete water sampling program for Slipper Bay yielded mean concentrations of 0.0041 mg-P/L for TP and 8.0 m for Secchi depth. The corresponding TSI based on these values is 24.5 using TP and 30.0 using Secchi depth, for a rounded average of 27. In 2014, the depth-integrated sampling program yielded mean concentrations of 0.0033 mg-P/L for TP, 1.49 µg/L for chlorophyll *a*, and 8.0 m for Secchi depth. The corresponding TSI based on these values is 24.1 using TP, 34.5 using chlorophyll *a*, and 30.0 using Secchi depth, for a rounded average of 29. Based on these TSI values, and the classification systems of Vollenweider (1970) and Carlson (1977), Slipper Bay is classified as oligotrophic. Slipper Bay can be classified as ultra-oligotrophic (i.e., <0.004 mg-P/L) to oligotrophic (i.e., 0.004 to 0.01 mg-P/L), based on CCME (2004) TP trigger ranges for Canadian lakes.

3.2.2 Far Field 2 Stations

There were five stations sampled from the far east bay (Far Field 2) region of Lac de Gras (FF2-1, FF2-2, FF2-3, FF2-4, and FF2-5; Map 2.2-1). During the open-water program, 15 samples and 14 field physico-chemical water column profile measurements were collected; a water column profile measurement was not collected from FF2-2 in September due to inclement weather. The Far Field 2 stations were added to the 2014 open-water program when the baseline study area was refined. Thus, the Far Field 2 stations were not sampled during the under-ice period.

Field-Measured Physico-Chemical Parameters

Thermal stratification was observed at all Far Field 2 stations in late spring; however, the stations were well-mixed in summer and fall (Appendix B, Figure B-4a).

During the open-water program, there were no occurrences of oxic stratification, as there was little variability in DO concentrations throughout the water column (Appendix B, Figure B-4b).

Dissolved oxygen concentrations were similar among stations and sampling events, and ranged from 11.0 to 12.9 mg/L (98.8% to 109.9% saturation; Appendix D, Table D-13). DO concentrations were consistently above the CWQG during the open-water program.

Specific conductivity was slightly higher in the fall than in late spring and summer, and uniform with depth in the summer and fall. In the late spring, conductivity was slightly lower in the surface waters than the bottom waters (Appendix B, Figure B-4c). Overall, specific conductivity ranged from 21 to 27 $\mu\text{S}/\text{cm}$, and there was little variability between stations (Appendix D, Table D-13).

During the open-water programs, pH at Far Field 2 stations characterized the lake as slightly acidic to neutral. In general, there was little variability throughout the water column at each station and between sampling programs (ranging from 6.2 to 7.4 in the late spring, 6.8 to 7.6 in the summer, and 7.0 to 7.1 in the fall; Appendix B, Figure B-4d; Appendix D, Table D-13). During the open-water program, 99% of the pH values were within the CWQG and CDWQG range.

The Euphotic Zone and Light Attenuation

Secchi depths at the sampling stations in Lac de Gras Far Field 2 ranged from 4.3 to 7.3 m (Appendix C, Table C-3). There was some seasonal variance, with Secchi depths in late spring (mean = 6.2 m) and fall (mean = 6.2 m) higher than the summer (mean = 5.0 m).

The attenuation coefficient (K_d) among all stations in Lac de Gras Far Field 2 during late spring, summer, and fall ranged from 0.25 to 0.32 (Table 3.2-3), which characterizes the water at Lac de Gras Far Field 2 as being clear. Light penetration during the fall (mean K_d = 0.28) was similar to late spring (mean K_d = 0.30) and summer (mean K_d = 0.30) (Table 3.2-3); however, the lower K_d in fall, which was supported by the Secchi depths, indicated the euphotic zone was deeper in fall. On a spatial level across the three open-water sampling programs, light attenuated more rapidly through the water column at Station FF2-4, and least at Stations FF2-1 and FF2-5 (Appendix C, Figure C-3).

**Table 3.2-3 Attenuation Coefficients (K_d) at Stations in Lac de Gras Far Field 2, 2014**

Station	Sampling Event		
	Late Spring	Summer	Fall
FF2-1	0.28	0.28	0.27
FF2-2	0.30	0.31	—
FF2-3	0.30	0.32	0.27
FF2-4	0.30	0.31	0.32
FF2-5	0.31	0.29	0.25

— = not sampled due to inclement weather.

Water Quality in Discrete Samples

Conventional Water Quality Parameters

Concentrations of conventional water quality parameters were consistent among stations and sampling events (Table 3.2-4):

- Waters in Lac de Gras, Far Field 2 area, had low ionic strength; TDS concentrations ranged from less than 10 mg/L to 30 mg/L.
- The range of values for total alkalinity and total hardness were also low, and indicated that Lac de Gras is a very soft water lake (McNeely et al.1979) with high potential sensitivity to acid deposition (Saffran and Trew 1996).
- The waters are clear, as indicated by the attenuation coefficient data, with TSS concentrations below the laboratory DL and turbidity values from 0.32 to 0.59 NTU.

Major Ions

Major ions concentrations were similar among stations and sampling events (Table 3.2-4).

Detection limits and measured concentrations of major ions were below guidelines and objectives.

The dominant major ions were bicarbonate, magnesium, sodium, and sulphate.

Nutrients

Nutrient concentrations measured in the discrete water samples from the Lac de Gras Far Field 2 stations were consistent among stations and sampling events (Table 3.2-4):

- Total ammonia concentrations ranged from less than 0.005 to 0.0075 mg-N/L, and were below the CWQG.
- Total Kjeldahl nitrogen concentrations ranged from less than 0.05 to 0.21 mg-N/L.
- Nitrate and nitrite were not detected (DL of 0.006 mg-N/L and 0.002 mg-N/L, respectively).



- Concentrations of TP and TDP ranged from 0.003 to 0.0089 mg-P/L and from less than 0.001 to 0.0039 mg-P/L, respectively; dissolved orthophosphate concentrations were always below the laboratory DL (less than 0.001 mg/L). Based on the measured TP concentrations and CCME (2004) TP trigger ranges for Canadian lakes, Far Field 2 stations can be classified as oligotrophic (i.e., 0.004 to 0.01 mg-P/L).
- Concentrations of SRSi ranged from 0.01 to 0.076 mg/L.
- Organic carbon concentrations ranged from 2.3 to 3.0 mg/L in both total and dissolved forms.

Metals

Concentrations of total and dissolved metals were either below the DLs, or if detected, were below guidelines and objectives.

Other Water Quality Parameters

Concentrations of hydrocarbons (BTEX, total recoverable hydrocarbons, and petroleum hydrocarbons F1 [C₆-C₁₀], F1 [C₆-C₁₀]-BTEX, and F2 [C₁₀-C₁₆]) fractions) were not detected in any sample (Table 3.2-4). Fecal coliform concentrations were also below the laboratory DL (less than 1 CFU/100 mL), with the exception of one detection of 1 CFU/100 mL at FF2-1 in the summer (Table 3.2-4).

Table 3.2-4 Water Quality in the Lac de Gras Far Field 2 Stations, 2014

Parameter	Unit	Guidelines			Objectives		Open-Water			
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-term SSWQO	Long-term SSWQO	Count	Min	Median	Max
Conventional Parameters										
Alkalinity, gran as (H+)	meg/L	-	-	-	-	-	15	<0.10	<0.10	0.13
Alkalinity, total as (CaCO ₃)	mg/L	-	-	-	-	-	15	4.5	5.2	8.1
Conductance	µS/cm	-	-	-	-	-	15	28	29	31
Hardness	mg/L	-	-	-	-	-	15	7.7	7.9	8.3
pH	-	-	6.5 - 9.0	6.5 - 8.5	-	-	15	6.5	6.7	6.9
Total dissolved solids	mg/L	-	-	500	-	-	15	<10	21	30
Total suspended solids	mg/L	-	-	-	-	-	15	<3.0	<3.0	<3.0
Turbidity	NTU	-	-	-	-	-	15	0.32	0.44	0.59
Major Ions										
Bicarbonate	mg/L	-	-	-	-	-	15	5.4	6.3	9.9
Calcium	mg/L	-	-	-	-	-	15	1.5	1.6	1.7
Chloride	mg/L	640	120	250	-	64 ^(c,i)	15	2.0	2.1	2.4
Fluoride	mg/L	-	0.12	1.5	-	-	15	<0.02	<0.02	0.029
Magnesium	mg/L	-	-	-	-	-	15	0.94	0.97	0.99
Potassium	mg/L	-	-	-	112 ^(d)	41 ^(d)	15	0.76	0.79	0.89
Sodium	mg/L	-	-	200	-	-	15	1.7	1.8	1.9
Sulphate	mg/L	-	-	500	343 ^(e,i)	45 ^(e,i)	15	2.8	3.0	3.4
Nutrients										
Total organic carbon	mg/L	-	-	-	-	-	15	2.3	2.5	3.0
Dissolved organic carbon	mg/L	-	-	-	-	-	15	2.3	2.6	3.0
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	15	<0.05	0.15	0.21
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	-	-	15	<0.05	0.15	0.21
Total ammonia	mg-N/L	-	2.8 - 105 ⁽ⁱ⁾	-	-	-	15	<0.005	<0.005	0.0075
Nitrate	mg-N/L	124	2.9	10	-	1.2 ^(f,i)	15	<0.006	<0.006	<0.006
Nitrite	mg-N/L	-	0.06	1	-	-	15	<0.002	<0.002	<0.002
Total phosphorus	mg-P/L	-	0.01 ^(l,m)	-	-	-	15	0.003	0.0046	0.0089
Total dissolved phosphorus	mg-P/L	-	-	-	-	-	15	<0.001	0.0018	0.0039
Dissolved orthophosphate	mg-P/L	-	-	-	-	-	15	<0.001	<0.001	<0.001
Silica, reactive	mg/L	-	-	-	-	-	15	0.01	0.039	0.076
Other Parameters										
Benzene	µg/L	-	370	5.0	-	-	15	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	-	90	2.4	-	-	15	<0.5	<0.5	<0.5
Toluene	µg/L	-	2.0	24	-	-	15	<0.5	<0.5	<0.5
Xylenes	µg/L	-	-	300	-	-	15	<0.71	<0.71	<0.71
Petroleum hydrocarbons – F1 (C6-C10)-BTEX	µg/L	-	-	-	-	-	15	<100	<100	<100
Petroleum hydrocarbons – F1 (C6-C10)	µg/L	-	-	-	-	-	15	<100	<100	<100
Petroleum hydrocarbons – F2 (C10-C16)	µg/L	-	-	-	-	-	15	<250	<250	<250
Fecal coliform	CFU/100 mL	-	-	-	-	-	14	<1.0	<1.0	1.0

Table 3.2-4 Water Quality in the Lac de Gras Far Field 2 Stations, 2014

Parameter	Unit	Guidelines			Objectives		Open-Water			
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-term SSWQO	Long-term SSWQO	Count	Min	Median	Max
Total Metals										
Aluminum	µg/L	-	100 ⁽ⁱ⁾	100	-	-	15	3.7	5.1	7.4
Antimony	µg/L	-	-	6.0	-	-	15	<0.02	<0.02	0.024
Arsenic	µg/L	-	5.0	10	-	-	15	0.26	0.27	0.3
Barium	µg/L	-	-	1,000	-	-	15	2.2	2.4	3.1
Beryllium	µg/L	-	-	-	-	-	15	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	15	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	-	15	2.0	2.3	3.9
Cadmium	µg/L	0.11 - 0.37 ^(k)	0.04 ^(k)	5.0	-	-	15	<0.005	<0.005	0.011
Cesium	µg/L	-	-	-	-	-	15	0.0065	0.0073	0.0084
Chromium	µg/L	-	1.0	50	-	-	15	<0.06	<0.06	0.074
Cobalt	µg/L	-	-	-	-	-	15	0.011	0.013	0.018
Copper	µg/L	-	2.0 ⁽ⁱ⁾	1,000	-	-	15	0.51	0.61	0.71
Iron	µg/L	-	300	300	-	-	15	3.4	4.6	7.4
Lead	µg/L	-	1.0	10	-	-	15	<0.01	<0.01	0.013
Lithium	µg/L	-	-	-	-	-	15	1.4	1.6	1.8
Manganese	µg/L	-	-	50	-	-	15	1.3	1.6	2.8
Mercury	µg/L	-	0.026	1.0	-	-	15	<0.0005	<0.0005	0.00078
Molybdenum	µg/L	-	73	-	223,000 ^(g)	19,000 ^(g)	15	0.43	0.5	0.55
Nickel	µg/L	-	25 ⁽ⁱ⁾	-	-	-	15	0.55	0.58	0.72
Selenium	µg/L	-	1.0	10	-	-	15	<0.04	<0.04	<0.04
Silver	µg/L	-	0.1	-	-	-	15	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	15	17	18	20
Thallium	µg/L	-	0.8	-	-	-	15	<0.01	<0.01	<0.01
Tin	µg/L	-	-	-	-	-	15	<0.05	<0.05	0.22
Titanium	µg/L	-	-	-	-	-	15	<0.1	0.11	0.39
Uranium	µg/L	33	15	20	-	-	15	0.052	0.057	0.072
Vanadium	µg/L	-	-	-	300 ^(h)	30 ^(h)	15	<0.05	<0.05	<0.05
Zinc	µg/L	-	30	5,000	-	-	15	<0.8	<0.8	1.4
Dissolved Metals										
Aluminum	µg/L	-	-	-	-	-	15	1.5	2.3	4.0
Antimony	µg/L	-	-	-	-	-	15	<0.02	<0.02	<0.02
Arsenic	µg/L	-	-	-	-	-	15	0.25	0.26	0.28
Barium	µg/L	-	-	-	-	-	15	2.2	2.4	2.7
Beryllium	µg/L	-	-	-	-	-	15	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	15	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	-	15	2.0	2.5	7.0
Cadmium	µg/L	-	-	-	-	-	15	<0.005	<0.005	<0.005
Cesium	µg/L	-	-	-	-	-	15	0.0054	0.0069	0.0078

Table 3.2-4 Water Quality in the Lac de Gras Far Field 2 Stations, 2014

Parameter	Unit	Guidelines			Objectives		Open-Water			
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-term SSWQO	Long-term SSWQO	Count	Min	Median	Max
Chromium	µg/L	-	-	-	-	-	15	<0.06	<0.06	0.071
Chromium - Hexavalent	µg/L	-	1	-	-	-	15	<1.0	<1.0	<1.0
Cobalt	µg/L	-	-	-	-	-	15	<0.01	<0.01	<0.01
Copper	µg/L	-	-	-	-	-	15	0.49	0.55	0.76
Iron	µg/L	-	-	-	-	-	15	<1.0	<1.0	1.4
Lead	µg/L	-	-	-	-	-	15	<0.01	<0.01	<0.01
Lithium	µg/L	-	-	-	-	-	15	1.1	1.5	2.0
Manganese	µg/L	-	-	-	-	-	15	0.16	0.23	0.48
Mercury	µg/L	-	-	-	-	-	15	<0.0005	<0.0005	0.00057
Molybdenum	µg/L	-	-	-	-	-	15	0.46	0.5	0.53
Nickel	µg/L	-	-	-	-	-	15	0.53	0.56	0.61
Selenium	µg/L	-	-	-	-	-	15	<0.04	<0.04	<0.04
Silver	µg/L	-	-	-	-	-	15	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	15	17.0	18.0	18.0
Thallium	µg/L	-	-	-	-	-	15	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	15	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	15	<0.1	<0.1	0.1
Uranium	µg/L	-	-	-	-	-	15	0.042	0.047	0.062
Vanadium	µg/L	-	-	-	-	-	15	<0.05	<0.05	0.067
Zinc	µg/L	-	-	-	-	-	15	<0.8	<0.8	1.3

a) Source: CCME (Canadian Council of Ministers of the Environment). 1999, with updates to 2014. Canadian Environmental Quality Guidelines. Winnipeg, MB, Canada.

b) Source: Health Canada. 2012. Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.

c) Elphick JRF, Bergh KD, Bailey HC. 2011. Chronic toxicity of chloride to freshwater species: effects of hardness and implications for water quality guidelines. Environ Toxicol Chem 30: 230-246.

d) Rescan (Rescan Environmental Services Ltd.). 2012a. Ekati Diamond Mine: Site-Specific Water Quality Objective for Potassium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

e) Rescan. 2012b. Ekati Diamond Mine: Site-specific Water Quality Objective for Sulphate. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

f) Rescan. 2012c. Ekati Diamond Mine: Site-Specific Water Quality Objective for Nitrate, (2012). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

g) Rescan. 2012d. Ekati Diamond Mine: Site Specific Water Quality Objective for Molybdenum, (2011). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

h) Rescan. 2012e. Ekati Diamond Mine: Site-specific Water Quality Objective for Vanadium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

i) Guidelines based on hardness of 10 mg CaCO₃/L.

j) Guidelines based on pH of 6.0 to 7.3, temperature of 6.1°C to 13.3°C, and water hardness of 4.7 to 5.2 mg/L.

k) Acute guideline applies to all waters of hardness below 5.3 mg CaCO₃/L; chronic guideline applies to all waters of hardness below 17 mg CaCO₃/L.

l) Trigger for transition from oligotrophic to mesotrophic status (0.01 mg/L) applied to Lac de Gras basin and mesotrophic to meso-eutrophic status (0.02 mg/L) applied to Lac du Sauvage basin as based on CCME (2004).

m) Source: CCME 2004. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems. Canadian Environmental Quality Guidelines, 2004. Winnipeg, MB, Canada.

Bolded concentrations are higher than relevant water quality guidelines.

- = no guideline or data; CWQG = Canadian Water Quality Guidelines; CDWQG = Canadian Drinking Water Quality Guideline; SSWQO = Site-Specific Water Quality Objective; H+ = hydrogen ions; CaCO₃ = calcium carbonate; mg CaCO₃/L = milligrams calcium carbonate per litre;

F1 (C6-C10) = hydrocarbon fraction F1; F2 (C10-C16) = hydrocarbon fraction F2; meq/L = milliequivalents per litre; mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; pH = potential of hydrogen,; provides measure of the acidity or alkalinity of a solution on a scale of 0 to 14;

NTU = nephelometric turbidity units; mg-N/L = milligrams of nitrogen per litre; mg-P/L = milligrams of phosphorus per litre; µg/L = micrograms per litre; CFU/100 mL = coliform forming units per 100 millilitres; BTEX = benzene, toluene, ethylbenzene, xylene; <= less than.



Nutrients and Chlorophyll *a* in Depth-Integrated Samples

Concentrations of TP, TN, total ammonia, and SRSi in the depth-integrated (euphotic depth) samples from Far Field 2 were similar to the concentrations in the discrete samples (mid-depth samples):

- Concentrations of TP in the depth-integrated samples ranged from 0.0024 to 0.0084 mg-P/L (median = 0.0042 mg-P/L) (Appendix D, Table D-23), compared to 0.003 to 0.0089 mg-P/L (median = 0.0046 mg-P/L) in the corresponding discrete samples (Table 3.2-4).
- Concentrations of TDP in the depth-integrated samples ranged from less than 0.001 to 0.0053 mg-P/L (median = 0.001 mg-P/L) (Appendix D, Table D-23), compared to less than 0.001 to 0.0039 mg-P/L (median = 0.0018 mg-P/L) in the corresponding discrete samples (Table 3.2-4).
- Concentrations of TN in the depth-integrated samples ranged from 0.053 to 0.29 mg-N/L (median = 0.15 mg-N/L) (Appendix D, Table D-23), compared to less than 0.05 to 0.21 mg-N/L (median = 0.15 mg-N/L) in the corresponding discrete samples (Table 3.2-4).
- Concentrations of total ammonia in the depth-integrated samples ranged from less than 0.005 to 0.012 mg-N/L (median = <0.005 mg-N/L) (Appendix D, Table D-23), compared to less than 0.005 to 0.0075 mg-N/L (median = <0.005 mg-N/L) in the corresponding discrete samples (Table 3.2-4).
- Concentrations of SRSi in the depth-integrated samples ranged from 0.035 to 0.073 mg/L (median = 0.039 mg/L) (Appendix D, Table D-23), compared to 0.01 to 0.076 mg/L (median = 0.039 mg/L) in the corresponding discrete samples (Table 3.2-4).

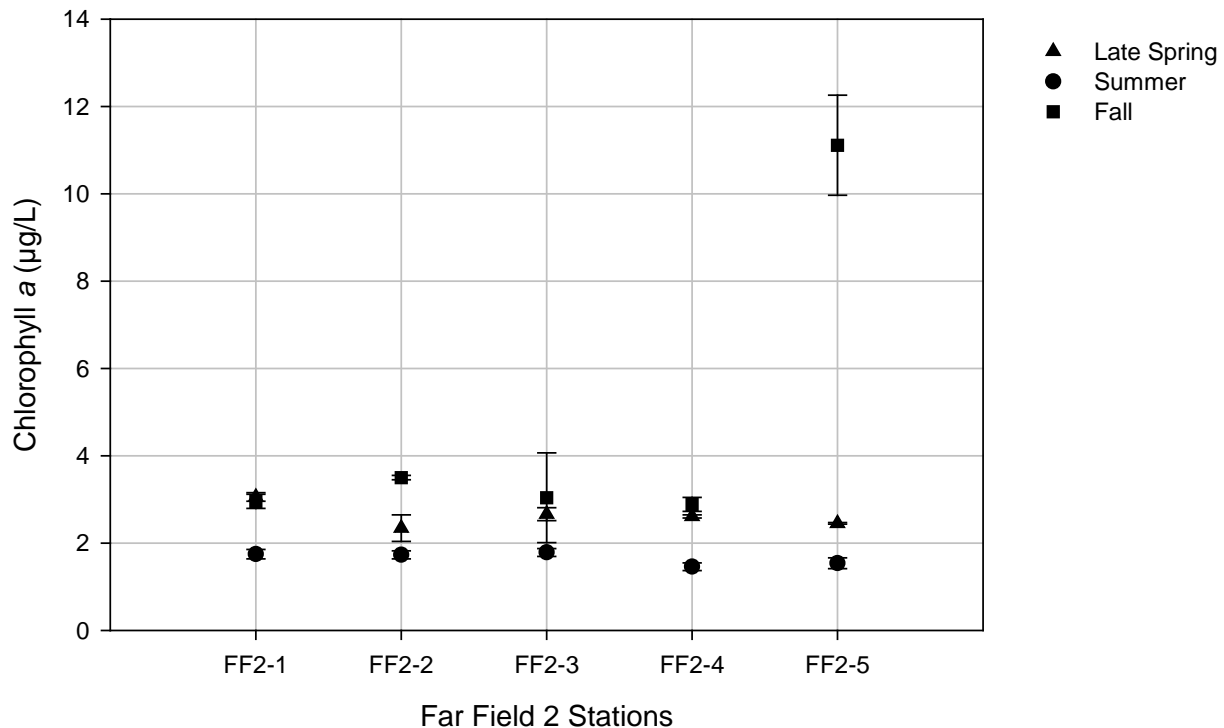
Concentrations of dissolved orthophosphate, nitrate, and nitrite in Far Field 2 were not detected throughout the seasonal sampling programs (Appendix D, Table D-23; Table 3.2-4).

Total dissolved nitrogen concentrations in the depth-integrated samples from Far Field 2 ranged from less than 0.05 to 0.26 mg-N/L (median = 0.16 mg-N/L) (Appendix D, Table D-23); total dissolved nitrogen was not measured in the corresponding discrete samples.

Chlorophyll *a* concentrations in Far Field 2 ranged from 1.46 µg/L at Station FF2-4 during the summer to a maximum of 11.12 µg/L at Station FF2-5 during the fall (Appendix D, Table D-24). Overall, higher chlorophyll *a* concentrations were observed during the fall sampling period, ranging from 2.89 to 11.12 µg/L (mean = 4.70 µg/L), compared to summer (1.46 to 1.79 µg/L; mean = 1.65 µg/L) and fall (2.34 to 3.06 µg/L; mean = 2.62 µg/L) (Table 3.2-4).



Figure 3.2-2 Mean Chlorophyll a Concentrations at Stations in Lac de Gras Far Field 2 in Late Spring, Summer, and Fall, 2014



Note: Error bars = standard error.

µg/L = micrograms per litre.

Trophic Status Classification

In 2014, the discrete water sampling program for Far Field 2 yielded mean concentrations of 0.0048 mg-P/L for TP and 5.8 m for Secchi depth. The corresponding TSI based on the measured values is 26.8 using TP and 34.6 using Secchi depth, for a rounded average of 31. In 2014, the depth-integrated sampling program yielded mean concentrations of 0.0047 mg-P/L for TP, 2.99 µg/L for chlorophyll *a*, and 5.8 m for Secchi depth. The corresponding TSI based on measured values is 26.5 using TP, 41.3 using chlorophyll *a*, and 34.6 using Secchi depth, for a rounded average of 34. Based on these TSI values, and the classification system of Vollenweider (1970), Far Field 2 is classified as oligotrophic, and based on the classification system of Carlson (1977), Far Field 2 is classified as oligotrophic to mesotrophic. Based on CCME (2004) TP trigger ranges for Canadian lakes, Far Field 2 is classified as oligotrophic (i.e., 0.004 and 0.01 mg-P/L).

3.2.3 Lac de Gras Outlet

Two discrete water quality samples and physico-chemical water column profile measurements were collected at the Lac de Gras outlet (Station LDG Outlet; Map 2.2-1) during the open-water period (summer and fall sampling events). Sampling at the Lac de Gras outlet was limited to the open-water field programs.

Field-Measured Physico-Chemical Parameters

Field-measured physico-chemical parameters varied slightly between the two sampling events (Appendix D, Table D-15). Stream water temperature was highest in the summer (11.7°C) and lowest in the winter (8.3°C); stream temperatures were consistent with surface water temperatures observed in Lac de Gras during the same seasonal sampling events.

Stream flow was well-oxygenated during both sampling events, with DO ranging from 10.9 mg/L (100.8% saturation) in the summer to 11.6 mg/L (98.9% saturation) in the fall. Dissolved oxygen concentrations were consistently within CWQG (Appendix D, Table D-15).

Specific conductivity was similar between the two sampling events (20 to 22 $\mu\text{S}/\text{cm}$; Appendix D, Table D-15).

Measured pH at the outlet ranged from 6.9 to 7.2, indicating that Lac de Gras outlet water was circumneutral. The pH values were consistently with the CWQG and CDWQG guideline range (Appendix D, Table D-15).

Water Quality in Discrete Samples

Conventional Water Quality Parameters

Concentrations of conventional water quality parameters were consistent among sampling events (Table 3.2-5).

- Waters in Lac de Gras outlet had low ionic strength; TDS concentrations were less than 20 mg/L.
- The range of values for total alkalinity and total hardness were also low, and indicated that Lac de Gras outlet is a very soft water stream (McNeely et al. 1979) with sensitivity to acid deposition (Saffran and Trew 1996).
- The waters were clear as indicated by TSS concentrations being consistently below the laboratory DL and the turbidity values ranging from 0.21 to 0.31 NTU.

Major Ions

Major ions concentrations were similar among sampling events (Table 3.2-5). Detection limits and measured concentrations of major ions were below guidelines and objectives. Dominant major ions were bicarbonate, magnesium, sodium, and sulphate.

Table 3.2-5 Water Quality in the Lac de Gras Outlet, 2014

Parameter	Unit	Guidelines			Objectives		Open-Water		
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-term SSWQO	Long-term SSWQO	Count	Min	Max
Conventional Parameters									
Alkalinity, gran as (H+)	meg/L	-	-	-	-	-	2	<0.10	<0.10
Alkalinity, total as (CaCO ₃)	mg/L	-	-	-	-	-	2	3.8	6.9
Conductance	µS/cm	-	-	-	-	-	2	23	25
Hardness	mg/L	-	-	-	-	-	2	6.8	7.0
pH	-	-	6.5 - 9.0	6.5 - 8.5	-	-	2	6.5	7.1
Total dissolved solids	mg/L	-	-	500	-	-	2	19	<20
Total suspended solids	mg/L	-	-	-	-	-	2	<3.0	<3.0
Turbidity	NTU	-	-	-	-	-	2	0.21	0.31
Major Ions									
Bicarbonate	mg/L	-	-	-	-	-	2	<5.0	8.4
Calcium	mg/L	-	-	-	-	-	2	1.2	1.3
Chloride	mg/L	640	120	250	-	64 ^(c,i)	2	1.4	1.4
Fluoride	mg/L	-	0.12	1.5	-	-	2	<0.02	<0.02
Magnesium	mg/L	-	-	-	-	-	2	0.81	0.84
Potassium	mg/L	-	-	-	112 ^(d)	41 ^(d)	2	0.7	0.71
Sodium	mg/L	-	-	200	-	-	2	1.3	1.4
Sulphate	mg/L	-	-	500	343 ^(e,i)	45 ^(e,i)	2	2.7	2.7
Nutrients									
Total organic carbon	mg/L	-	-	-	-	-	2	2.4	2.4
Dissolved organic carbon	mg/L	-	-	-	-	-	2	2.5	2.6
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	2	<0.05	<0.05
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	-	-	2	<0.05	<0.05
Total ammonia	mg-N/L	-	2.8 - 105 ^(j)	-	-	-	2	<0.005	0.0066
Nitrate	mg-N/L	124	2.9	10	-	1.2 ^(f,i)	2	<0.006	<0.006
Nitrite	mg-N/L	-	0.06	1	-	-	2	<0.002	<0.002
Total phosphorus	mg-P/L	-	0.01 ^(l,m)	-	-	-	2	0.0013	0.0045
Total dissolved phosphorus	mg-P/L	-	-	-	-	-	2	<0.001	0.0024
Dissolved orthophosphate	mg-P/L	-	-	-	-	-	2	<0.001	<0.001
Silica, reactive	mg/L	-	-	-	-	-	2	0.045	0.048
Other Parameters									
Benzene	µg/L	-	370	5.0	-	-	2	<0.5	<0.5
Ethylbenzene	µg/L	-	90	2.4	-	-	2	<0.5	<0.5
Toluene	µg/L	-	2.0	24	-	-	2	<0.5	<0.5
Xylenes	µg/L	-	-	300	-	-	2	<0.71	<0.71
Petroleum hydrocarbons – F1 (C6-C10)-BTEX	µg/L	-	-	-	-	-	2	<100	<100
Petroleum hydrocarbons – F1 (C6-C10)	µg/L	-	-	-	-	-	2	<100	<100
Petroleum hydrocarbons – F2 (C10-C16)	µg/L	-	-	-	-	-	2	<250	<250
Fecal coliform	CFU/100 mL	-	-	-	-	-	2	<1.0	<1.0

Table 3.2-5 Water Quality in the Lac de Gras Outlet, 2014

Parameter	Unit	Guidelines			Objectives		Open-Water		
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-term SSWQO	Long-term SSWQO	Count	Min	Max
Total Metals									
Aluminum	µg/L	-	100 ⁽ⁱ⁾	100	-	-	2	2.6	3.9
Antimony	µg/L	-	-	6.0	-	-	2	<0.02	<0.02
Arsenic	µg/L	-	5.0	10	-	-	2	0.19	0.21
Barium	µg/L	-	-	1,000	-	-	2	1.9	2
Beryllium	µg/L	-	-	-	-	-	2	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	2	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	-	2	1.5	1.7
Cadmium	µg/L	0.11 - 0.37 ^(k)	0.04 ^(k)	5.0	-	-	2	<0.005	<0.005
Cesium	µg/L	-	-	-	-	-	2	0.0079	0.0086
Chromium	µg/L	-	1.0	50	-	-	2	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	-	2	0.02	0.027
Copper	µg/L	-	2.0 ⁽ⁱ⁾	1,000	-	-	2	0.54	0.55
Iron	µg/L	-	300	300	-	-	2	3.1	3.2
Lead	µg/L	-	1.0	10	-	-	2	<0.01	<0.01
Lithium	µg/L	-	-	-	-	-	2	1.2	1.6
Manganese	µg/L	-	-	50	-	-	2	1.7	1.9
Mercury	µg/L	-	0.026	1.0	-	-	2	<0.0005	0.00061
Molybdenum	µg/L	-	73	-	223,000 ^(g)	19,000 ^(g)	2	0.21	0.24
Nickel	µg/L	-	25 ⁽ⁱ⁾	-	-	-	2	0.81	0.87
Selenium	µg/L	-	1.0	10	-	-	2	<0.04	<0.04
Silver	µg/L	-	0.1	-	-	-	2	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	2	11	12
Thallium	µg/L	-	0.8	-	-	-	2	<0.01	<0.01
Tin	µg/L	-	-	-	-	-	2	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	2	<0.1	<0.1
Uranium	µg/L	33	15	20	-	-	2	0.02	0.02
Vanadium	µg/L	-	-	-	300 ^(h)	30 ^(h)	2	<0.05	<0.05
Zinc	µg/L	-	30	5,000	-	-	2	<0.8	<0.8
Dissolved Metals									
Aluminum	µg/L	-	-	-	-	-	2	2.0	3.3
Antimony	µg/L	-	-	-	-	-	2	<0.02	<0.02
Arsenic	µg/L	-	-	-	-	-	2	0.19	0.21
Barium	µg/L	-	-	-	-	-	2	1.9	2.0
Beryllium	µg/L	-	-	-	-	-	2	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	2	<0.01	<0.01
Boron	µg/L	-	-	-	-	-	2	1.5	4.9
Cadmium	µg/L	-	-	-	-	-	2	<0.005	<0.005
Cesium	µg/L	-	-	-	-	-	2	0.0079	0.0084
Chromium	µg/L	-	-	-	-	-	2	<0.06	0.14

Table 3.2-5 Water Quality in the Lac de Gras Outlet, 2014

Parameter	Unit	Guidelines			Objectives		Open-Water		
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-term SSWQO	Long-term SSWQO	Count	Min	Max
Chromium - Hexavalent	µg/L	-	1	-	-	-	2	<1.0	<1.0
Cobalt	µg/L	-	-	-	-	-	2	0.013	0.014
Copper	µg/L	-	-	-	-	-	2	0.55	0.59
Iron	µg/L	-	-	-	-	-	2	<1.0	1.4
Lead	µg/L	-	-	-	-	-	2	<0.01	<0.01
Lithium	µg/L	-	-	-	-	-	2	1.4	1.6
Manganese	µg/L	-	-	-	-	-	2	1.0	1.1
Mercury	µg/L	-	-	-	-	-	2	<0.0005	0.00063
Molybdenum	µg/L	-	-	-	-	-	2	0.21	0.24
Nickel	µg/L	-	-	-	-	-	2	0.85	0.85
Selenium	µg/L	-	-	-	-	-	2	<0.04	<0.04
Silver	µg/L	-	-	-	-	-	2	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	2	11	12
Thallium	µg/L	-	-	-	-	-	2	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	2	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	2	<0.1	<0.1
Uranium	µg/L	-	-	-	-	-	2	0.018	0.018
Vanadium	µg/L	-	-	-	-	-	2	<0.05	<0.05
Zinc	µg/L	-	-	-	-	-	2	<0.8	1.1

a) Source: CCME (Canadian Council of Ministers of the Environment). 1999, with updates to 2014. Canadian Environmental Quality Guidelines. Winnipeg, MB, Canada.

b) Source: Health Canada. 2012. Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.

c) Elphick JRF, Bergh KD, Bailey HC. 2011. Chronic toxicity of chloride to freshwater species: effects of hardness and implications for water quality guidelines. Environ Toxicol Chem 30: 230-246.

d) Rescan (Rescan Environmental Services Ltd.). 2012a. Ekati Diamond Mine: Site-Specific Water Quality Objective for Potassium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

e) Rescan. 2012b. Ekati Diamond Mine: Site-specific Water Quality Objective for Sulphate. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

f) Rescan. 2012c. Ekati Diamond Mine: Site-Specific Water Quality Objective for Nitrate, (2012). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

g) Rescan. 2012d. Ekati Diamond Mine: Site Specific Water Quality Objective for Molybdenum, (2011). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

h) Rescan. 2012e. Ekati Diamond Mine: Site-specific Water Quality Objective for Vanadium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

i) Guidelines based on hardness of 10 mg CaCO₃/L.

j) Guidelines based on pH of 6.0 to 7.3, temperature of 6.1°C to 13.3°C, and water hardness of 4.7 to 5.2 mg/L.

k) Acute guideline applies to all waters of hardness below 5.3 mg CaCO₃/L; chronic guideline applies to all waters of hardness below 17 mg CaCO₃/L.

l) Trigger for transition from oligotrophic to mesotrophic status (0.01 mg/L) applied to Lac de Gras basin and mesotrophic to meso-eutrophic status (0.02 mg/L) applied to Lac du Sauvage basin as based on CCME (2004).

m) Source: CCME 2004. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems. Canadian Environmental Quality Guidelines, 2004. Winnipeg, MB, Canada.

Bolded concentrations are higher than relevant water quality guidelines.

- = no guideline or data; CWQG = Canadian Water Quality Guidelines; CDWQG = Canadian Drinking Water Quality Guideline; SSWQO = Site-Specific Water Quality Objective; H⁺ = hydrogen ions; CaCO₃ = calcium carbonate; mg CaCO₃/L = milligrams calcium carbonate per litre; F1 (C6-C10) = hydrocarbon fraction F1; F2 (C10-C16) = hydrocarbon fraction F2; meq/L = milliequivalents per litre; mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; pH = potential of hydrogen, provides measure of the acidity or alkalinity of a solution on a scale of 0 to 14; NTU = nephelometric turbidity units; mg-N/L = milligrams of nitrogen per litre; mg-P/L = milligrams of phosphorus per litre; µg/L = micrograms per litre; CFU/100 mL = coliform forming units per 100 millilitres; BTEX = benzene, toluene, ethylbenzene, xylene; <= less than.

Nutrients

Nutrient concentrations measured in discrete water samples from the Lac de Gras Outlet were consistent among sampling events, and those measured in Lac de Gras (Table 3.2-5):

- Total ammonia concentrations ranged from less than 0.005 to 0.0066 mg-N/L and were below the CWQG.
- Total Kjeldahl nitrogen concentrations were not detected (DL of 0.05 mg-N/L).
- Nitrate and nitrite were not detected (DL of 0.006 mg-N/L and 0.002 mg-N/L, respectively).
- Concentrations of TP and TDP ranged from 0.0013 to 0.0045 mg-P/L and from less than 0.001 to 0.0024 mg-P/L, respectively; dissolved orthophosphate concentrations were not detected (DL of 0.001 mg/L); based on the measured TP concentrations and CCME (2004) trigger range for Canadian rivers, the Lac de Gras outlet can be classified as oligotrophic.
- Concentrations of SRSi ranged from 0.045 to 0.048 mg/L.
- Total organic carbon concentrations in both samples were measured at 2.4 mg/L, and DOC concentrations ranged from 2.5 to 2.6 mg/L.

Metals

Concentrations of total and dissolved metals were either below the DLs, or if detected, were below guidelines and objectives.

Other Water Quality Parameters

Concentrations of hydrocarbons (BTEX, total recoverable hydrocarbons, and petroleum hydrocarbons F1 [C₆-C₁₀] F1 [C₆-C₁₀]-BTEX, and F2 [C₁₀-C₁₆]) fractions) were not detected in any sample (Table 3.2-5). Fecal coliform concentrations were also below the laboratory DL (less than 1 CFU/100 mL; Table 3.2-5).

3.3 Lac de Gras Sub-basin Lakes

3.3.1 Paul Lake

Sampling stations in Paul Lake included three stations (PL-1, PL-3, and PL-5) (Map 2.2-1). Five samples and three field physico-chemical water column profile measurements were collected from Paul Lake during the 2014 under-ice program. Paul Lake was not included in the open-water field programs.

Field-Measured Physico-Chemical Parameters

Thermal stratification was not discernible at any Paul Lake stations during the under-ice program (Appendix B, Figure B-5a).

Oxic stratification was evident at all Paul Lake stations during the under-ice program (i.e., PL-1, PL-3 and PL-5) (Appendix B, Figure B-5b), with lower DO concentrations measured in the deeper waters. Dissolved oxygen concentrations ranged from 2.8 to 11.8 mg/L under-ice (20.7% to 85.3% saturation), with 43% of the DO above the lower bound CWQG. DO measurements below the lower bound CWQG were recorded at all three Paul Lake stations (Appendix D, Table D-16).



Under-ice specific conductivity measurements ranged from 15 to 24 $\mu\text{S}/\text{cm}$. The highest specific conductivity values were measured at Station PL-5 and the lowest at Station PL-1; specific conductivity tended to increase with depth (Appendix B, Figure B-5c; Appendix D, Table D-16). Field-measured pH data from the under-ice program failed the QC checks and are not reported.

Water Quality in Discrete Samples

Conventional Water Quality Parameters

Concentrations of conventional water quality parameters were consistent among stations (Table 3.3-1):

- Waters in Paul Lake had low ionic strength; TDS concentrations ranged from 28 to 32 mg/L.
- The range of values for total alkalinity and total hardness were also low, and indicated that Paul Lake is a very soft water lake (McNeely et al.1979) with moderate to high potential sensitivity to acid deposition (Saffran and Trew 1996).
- The range of laboratory-measured pH values during under-ice conditions (6.6 to 6.7), in lieu of the excluded under-ice field-measured pH due to quality problems, confirmed that the lake water is slightly acidic. The pH values were consistently above the lower bound CWQG and CDWQG guideline (6.5).
- The waters were clear, as indicated by TSS concentrations measured below the laboratory DL and turbidity values from 0.38 to 0.68 NTU.

Major Ions

Major ions concentrations were similar among sampling stations (Table 3.3-1). Detection limits and measured concentrations of major ions were below associated guidelines and objectives. The dominant major ions were bicarbonate, magnesium, and sulphate.

Nutrients

Nutrient concentrations measured in Paul Lake were generally similar among stations (Table 3.3-1):

- Total ammonia and nitrite concentrations were less than the laboratory DL.
- Total Kjeldahl nitrogen concentrations ranged from 0.20 mg-N/L to 0.28 mg-N/L.
- Nitrate ranged from 0.04 mg-N/L to 0.13 mg-N/L. Nitrite concentrations were not detected (DL of 0.002 mg-N/L).
- Concentrations of TP and TDP ranged from 0.0066 to 0.015 mg-P/L and from 0.0033 to 0.0061 mg-P/L, respectively. Dissolved orthophosphate concentrations were less than the laboratory DL (0.001 mg-P/L). Based on the TP concentrations and the CCME (2004) trigger range for Canadian lakes, Paul Lake can be classified as oligotrophic to mesotrophic.
- Concentrations of SRSi ranged from 0.3 to 0.83 mg/L.
- Organic carbon occurred primarily in the dissolved form, with DOC concentrations ranging from 2.4 to 4.3 mg/L.

Table 3.3-1 Water Quality in Paul Lake, 2014

Parameter	Unit	Guidelines			Objectives		Under-ice			
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-term SSWQO	Long-term SSWQO	Count	Min	Median	Max
Conventional Parameters										
Alkalinity, gran as (H+)	meg/L	-	-	-	-	-	5	0.14	0.21	0.24
Alkalinity, total as (CaCO ₃)	mg/L	-	-	-	-	-	5	7.0	9.0	12
Conductance	µS/cm	-	-	-	-	-	5	27	31	36
Hardness	mg/L	-	-	-	-	-	5	10	12	13
pH	-	-	6.5 - 9.0	6.5 - 8.5	-	-	5	6.6	6.6	6.7
Total dissolved solids	mg/L	-	-	500	-	-	5	28	30	32
Total suspended solids	mg/L	-	-	-	-	-	5	<3.0	<3.0	<3.0
Turbidity	NTU	-	-	-	-	-	5	0.38	0.5	0.68
Major Ions										
Bicarbonate	mg/L	-	-	-	-	-	5	10	12	14
Calcium	mg/L	-	-	-	-	-	5	1.7	2.0	2.4
Chloride	mg/L	640	120	250	-	64 ^(c,i)	5	0.58	0.65	0.67
Fluoride	mg/L	-	0.12	1.5	-	-	5	<0.02	<0.02	<0.02
Magnesium	mg/L	-	-	-	-	-	5	1.4	1.6	1.8
Potassium	mg/L	-	-	-	112 ^(d)	41 ^(d)	5	0.86	1.0	1.1
Sodium	mg/L	-	-	200	-	-	5	1.1	1.3	1.5
Sulphate	mg/L	-	-	500	343 ^(e,i)	45 ^(e,i)	5	2.1	2.8	3.2
Nutrients										
Total organic carbon	mg/L	-	-	-	-	-	5	4.5	5.3	5.4
Dissolved organic carbon	mg/L	-	-	-	-	-	5	4.5	5.0	5.2
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	5	0.3	0.32	0.35
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	-	-	5	0.2	0.23	0.28
Total ammonia	mg-N/L	-	0.069 - 222 ⁽ⁱ⁾	-	-	-	5	<0.005	<0.005	<0.005
Nitrate	mg-N/L	124	2.9	10	-	1.2 ^(f,j)	5	0.04	0.099	0.13
Nitrite	mg-N/L	-	0.06	1	-	-	5	<0.002	<0.002	<0.002
Total phosphorus	mg-P/L	-	0.01 ^(l,m)	-	-	-	5	0.0066	0.0093	0.015
Total dissolved phosphorus	mg-P/L	-	-	-	-	-	5	0.0033	0.0044	0.0061
Dissolved orthophosphate	mg-P/L	-	-	-	-	-	5	<0.001	<0.001	<0.001
Silica, reactive	mg/L	-	-	-	-	-	5	0.3	0.4	0.83
Other Parameters										
Benzene	µg/L	-	370	5.0	-	-	5	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	-	90	2.4	-	-	5	<0.5	<0.5	<0.5
Toluene	µg/L	-	2.0	24	-	-	5	<0.5	<0.5	<0.5
Xylenes	µg/L	-	-	300	-	-	5	<0.71	<0.71	<0.71
Petroleum hydrocarbons – F1 (C6-C10)	µg/L	-	-	-	-	-	5	<100	<100	<100
Petroleum hydrocarbons – F1 (C6-C10)-BTEX	µg/L	-	-	-	-	-	5	<100	<100	<100
Petroleum hydrocarbons – F2 (C10-C16)	µg/L	-	-	-	-	-	5	<250	<250	<250
Fecal coliform	CFU/100 mL	-	-	-	-	-	5	<1.0	<1.0	<1.0

Table 3.3-1 Water Quality in Paul Lake, 2014

Parameter	Unit	Guidelines			Objectives		Under-ice			
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-term SSWQO	Long-term SSWQO	Count	Min	Median	Max
Total Metals										
Aluminum	µg/L	-	5 or 100 ⁽ⁱ⁾	100	-	-	5	5.7	8.3	16
Antimony	µg/L	-	-	6.0	-	-	5	<0.02	<0.02	0.099
Arsenic	µg/L	-	5.0	10	-	-	5	0.47	0.56	0.66
Barium	µg/L	-	-	1,000	-	-	5	4.0	5.1	9.6
Beryllium	µg/L	-	-	-	-	-	5	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	5	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	-	5	3.0	3.4	6.6
Cadmium	µg/L	0.11 - 0.66 ^(k)	0.04 ^(k)	5.0	-	-	5	<0.005	<0.005	0.0066
Cesium	µg/L	-	-	-	-	-	5	<0.1	<0.1	<0.1
Chromium	µg/L	-	1.0	50	-	-	5	0.095	0.099	0.25
Cobalt	µg/L	-	-	-	-	-	5	0.039	0.07	0.078
Copper	µg/L	-	2.0 ⁽ⁱ⁾	1,000	-	-	5	1.5	1.6	2.0
Iron	µg/L	-	300	300	-	-	5	23.0	52.0	109.0
Lead	µg/L	-	1 ⁽ⁱ⁾	10	-	-	5	0.012	0.02	0.048
Lithium	µg/L	-	-	-	-	-	5	2.3	2.8	3.2
Manganese	µg/L	-	-	50	-	-	5	7.3	26	74
Mercury	µg/L	-	0.026	1.0	-	-	5	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	-	73	-	223,000 ^(g)	19,000 ^(g)	5	<0.05	<0.05	0.057
Nickel	µg/L	-	25 ⁽ⁱ⁾	-	-	-	5	1.1	1.3	1.6
Selenium	µg/L	-	1.0	10	-	-	5	<0.04	<0.04	<0.04
Silver	µg/L	-	0.1	-	-	-	5	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	5	12	14	16
Thallium	µg/L	-	0.8	-	-	-	5	<0.01	<0.01	<0.01
Tin	µg/L	-	-	-	-	-	5	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	5	<0.1	0.36	0.72
Uranium	µg/L	33	15	20	-	-	5	0.043	0.043	0.061
Vanadium	µg/L	-	-	-	300 ^(h)	30 ^(h)	5	<0.05	0.053	0.069
Zinc	µg/L	-	30	5,000	-	-	5	1.0	3.3	16
Dissolved Metals										
Aluminum	µg/L	-	-	-	-	-	5	3.9	4.7	7.5
Antimony	µg/L	-	-	-	-	-	5	<0.02	<0.02	0.069
Arsenic	µg/L	-	-	-	-	-	5	0.43	0.51	0.59
Barium	µg/L	-	-	-	-	-	5	7.7	8.2	13
Beryllium	µg/L	-	-	-	-	-	5	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	5	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	-	5	5.4	5.8	7.8
Cadmium	µg/L	-	-	-	-	-	5	<0.005	<0.005	<0.005
Cesium	µg/L	-	-	-	-	-	5	<0.1	<0.1	<0.1
Chromium	µg/L	-	-	-	-	-	5	0.077	0.12	0.14

Table 3.3-1 Water Quality in Paul Lake, 2014

Parameter	Unit	Guidelines			Objectives		Under-ice			
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-term SSWQO	Long-term SSWQO	Count	Min	Median	Max
Chromium - Hexavalent	µg/L	-	1	-	-	-	5	<1.0	<1.0	<1.0
Cobalt	µg/L	-	-	-	-	-	5	0.036	0.047	0.056
Copper	µg/L	-	-	-	-	-	5	1.4	1.5	1.8
Iron	µg/L	-	-	-	-	-	5	7.4	21	26
Lead	µg/L	-	-	-	-	-	5	<0.01	<0.01	0.019
Lithium	µg/L	-	-	-	-	-	5	2.2	2.8	2.9
Manganese	µg/L	-	-	-	-	-	5	4.1	25	61
Mercury	µg/L	-	-	-	-	-	5	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	-	-	-	-	-	5	<0.05	<0.05	0.051
Nickel	µg/L	-	-	-	-	-	5	1.1	1.3	1.4
Selenium	µg/L	-	-	-	-	-	5	<0.04	<0.04	<0.04
Silver	µg/L	-	-	-	-	-	5	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	5	11	14	16
Thallium	µg/L	-	-	-	-	-	5	<0.01	<0.01	<0.01
Tin	µg/L	-	-	-	-	-	5	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	5	<0.1	<0.1	0.44
Uranium	µg/L	-	-	-	-	-	5	0.039	0.043	0.057
Vanadium	µg/L	-	-	-	-	-	5	<0.05	<0.05	<0.05
Zinc	µg/L	-	-	-	-	-	5	4.7	7.8	16

Guideline exceedances by median concentrations are based on guidelines calculated using median values of hardness, pH, and temperature, and are not included in the percent exceedance calculations.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.

a) Source: CCME (Canadian Council of Ministers of the Environment). 1999, with updates to 2014. Canadian Environmental Quality Guidelines. Winnipeg, MB, Canada.

b) Source: Health Canada. 2012. Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.

c) Elphick JRF, Bergh KD, Bailey HC. 2011. Chronic toxicity of chloride to freshwater species: effects of hardness and implications for water quality guidelines. Environ Toxicol Chem 30: 230-246.

d) Rescan (Rescan Environmental Services Ltd.). 2012a. Ekati Diamond Mine: Site-Specific Water Quality Objective for Potassium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

e) Rescan. 2012b. Ekati Diamond Mine: Site-specific Water Quality Objective for Sulphate. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

f) Rescan. 2012c. Ekati Diamond Mine: Site-Specific Water Quality Objective for Nitrate, (2012). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

g) Rescan. 2012d. Ekati Diamond Mine: Site Specific Water Quality Objective for Molybdenum, (2011). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

h) Rescan. 2012e. Ekati Diamond Mine: Site-specific Water Quality Objective for Vanadium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.

i) Guidelines based on hardness of 10 mg CaCO₃/L.

j) Guidelines based on pH of 6.2 to 6.9, temperature of 0.7°C to 3.8°C, and water hardness of 5.4 to 32 mg/L.

k) Acute guideline applies to all waters of hardness below 5.3 mg CaCO₃/L; chronic guideline applies to all waters of hardness below 17 mg CaCO₃/L.

l) Trigger for transition from oligotrophic to mesotrophic status (0.01 mg/L) applied to Lac de Gras basin and mesotrophic to meso-eutrophic status (0.02 mg/L) applied to Lac du Sauvage basin as based on CCME (2004).

m) Source: CCME 2004. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems. Canadian Environmental Quality Guidelines, 2004. Winnipeg, MB, Canada.

Bolded concentrations are higher than relevant water quality guidelines.

- = no guideline or data; CWQG = Canadian Water Quality Guidelines; CDWQG = Canadian Drinking Water Quality Guideline; SSWQO = Site-Specific Water Quality Objective; H⁺ = hydrogen ions; CaCO₃ = calcium carbonate; mg CaCO₃/L = milligrams calcium carbonate per litre;

F1 (C6-C10) = hydrocarbon fraction F1; F2 (C10-C16) = hydrocarbon fraction F2; meq/L = milliequivalents per litre; mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; pH = potential of hydrogen, provides measure of the acidity or alkalinity of a solution on a scale of 0 to 14; NTU = nephelometric turbidity units; mg-N/L = milligrams of nitrogen per litre; mg-P/L = milligrams of phosphorus per litre; µg/L = micrograms per litre; CFU/100 mL = coliform forming units per 100 millilitres; BTEX = benzene, toluene, ethylbenzene, xylene; <= less than.

Metals

Concentrations of total and dissolved metals were either below DLs, or if detected, were below guidelines and objectives, with the exception of copper and manganese (Table 3.3-1). Total copper concentrations ranged from 1.5 to 2.0 µg/L; one measured value (at Station PL-1) was equal to the CWQG (2 µg/L). Total manganese concentrations ranged from 7.3 to 74 µg/L; one measured value (at Station PL-3 [74 µg/L]) was above the CDWQG (50 µg/L).

Other Water Quality Parameters

Concentrations of hydrocarbons (BTEX; and hydrocarbon fractions F1 [C₆-C₁₀], F1 [C₆-C₁₀]-BTEX, and F2 [C₁₀-C₁₆]) were not detected (Table 3.3-1).

Fecal coliform concentrations were also not detected (DL of 1 CFU/100 mL).

3.3.2 Lake P5

One station (P5-1) in Lake P5 was sampled during open-water conditions (summer and fall only) in the 2014 baseline program (Maps 2.2-1). Two samples and two physico-chemical water column profile measurements were collected from Paul Lake during the 2014 open-water program. Lake P5 was not sampled during the under-ice field program.

Field-Measured Physico-Chemical Parameters

Thermal and oxic stratification were not discernable at Lake P5 during open-water conditions (Appendix C, Figures C-5a and C-5b). Water temperature was higher in the summer than in the fall, and varied little with depth throughout the water column (Appendix E, Table E-17). Dissolved oxygen concentrations at Station P5-1 ranged from 9.9 to 12.7 mg/L during the open-water period (95.4 to 101.1% saturation) and were higher in the fall than in the summer. Dissolved oxygen concentrations were consistently above the CWQG at Lake P5 during the open-water period (Appendix E, Table E-17).

Specific conductivity was consistent among the stations and sampling events, ranging from 14 to 15 µS/cm (Appendix B, Figure B-5c).

The pH measurements ranged from 7.0 to 7.5 in Lake P5, and indicated that the lake water is circumneutral. In general, there was little pH variability throughout the water column at each station, with higher values measured in summer (Appendix B, Figure B-5d). The pH was consistently within the CWQG and CDWQG guideline range (Appendix D, Table D-17).

Water Quality in Discrete Samples

Conventional Water Quality Parameters

Concentrations of conventional water quality parameters were consistent among open-water sampling events (Table 3.3-2):

- Waters in Lake P5 had low ionic strength; TDS concentrations ranged from less than 10 mg/L to 32 mg/L.
- The range of values for total alkalinity and total hardness were also low, and indicated that Lake P5 is a very soft water lake (McNeely et al. 1979) with high potential sensitivity to acid deposition (Saffran and Trew 1996).
- The waters are clear, as indicated by TSS concentrations below the laboratory DL and turbidity values from 0.6 to 0.77 NTU.

Major Ions

Major ions concentrations were similar among sampling events (Table 3.3-2). Detection limits and measured concentrations of major ions were below guidelines and objectives. The dominant ions were bicarbonate, magnesium, and sodium.

Nutrients

Nutrient concentrations measured in the discrete water samples from Lake P5 were similar among sampling events (Table 3.3-2):

- Total ammonia was not detected (DL of 0.005 mg-N/L).
- Total Kjeldahl nitrogen concentrations ranged from 0.22 to 0.24 mg-N/L.
- Nitrate and nitrite were not detected (DL of 0.006 mg-N/L and 0.002 mg-N/L, respectively).
- Concentrations of TP and TDP ranged from 0.0079 to 0.0085 mg-P/L and from 0.002 to 0.003 mg-P/L, respectively; dissolved orthophosphate concentrations were always below the laboratory DL (less than 0.001 mg/L). Based on the CCME (2004) trigger range for lakes, the lake can be classified as oligotrophic.
- Concentrations of SRSi ranged from 0.1 to 0.12 mg/L.
- Total organic carbon concentrations ranged from 3.0 to 3.6 mg/L, with DOC values of 3.2 mg/L.

Metals

Concentrations of total and dissolved metals were either below the DLs, or if detected, were below guidelines and objectives.



Other Water Quality Parameters

Concentrations of hydrocarbons (BTEX, total recoverable hydrocarbons, and petroleum hydrocarbons F1 [C₆-C₁₀], F1 [C₆-C₁₀]-BTEX, and F2 [C₁₀-C₁₆] fractions) were not detected in any sample (Appendix E, Table E-2). Fecal coliform concentrations were also below the laboratory DL (less than 1 CFU/100 mL; Appendix E, Table E-2).

Trophic Status Calculation

The discrete water sampling program for Lake P5 yielded mean concentrations of 0.0082 mg/L mg P/L for TP and 4.5 m for Secchi depth. The corresponding TSI based on the measured values is 34.5 using TP and 38.3 using Secchi depth, for a rounded average of 36. Based on this value and the classification systems of Carlson (1977), Lake P5 would be classified as an oligotrophic lake.

Table 3.3-2 Water Quality in Lake P5, 2014

Parameter	Unit	Guidelines			Objectives		Open-Water		
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-Term SSWQO	Long-Term SSWQO	Count	Min	Max
Conventional Parameters									
Alkalinity, gran as (H+)	meg/L	-	-	-	-	-	2	<0.10	0.12
Alkalinity, total as (CaCO ₃)	mg/L	-	-	-	-	-	2	5.8	5.9
Conductance	µS/cm	-	-	-	-	-	2	16	17
Hardness	mg/L	-	-	-	-	-	2	5.7	5.8
pH	-	-	6.5 - 9.0	6.5 - 8.5	-	-	2	6.6	6.9
Total dissolved solids	mg/L	-	-	500	-	-	2	<10	32
Total suspended solids	mg/L	-	-	-	-	-	2	<3.0	<3.0
Turbidity	NTU	-	-	-	-	-	2	0.6	0.77
Major Ions									
Bicarbonate	mg/L	-	-	-	-	-	2	7.1	7.1
Calcium	mg/L	-	-	-	-	-	2	0.9	0.9
Chloride	mg/L	640	120	250	-	64 ^(c,i)	2	<0.5	<0.5
Fluoride	mg/L	-	0.12	1.5	-	-	2	<0.02	0.024
Magnesium	mg/L	-	-	-	-	-	2	0.85	0.85
Potassium	mg/L	-	-	-	112 ^(d)	41 ^(d)	2	0.59	0.63
Sodium	mg/L	-	-	200	-	-	2	0.64	0.72
Sulphate	mg/L	-	-	500	343 ^(e,i)	45 ^(e,i)	2	1.1	1.1
Nutrients									
Total organic carbon	mg/L	-	-	-	-	-	2	3.0	3.6
Dissolved organic carbon	mg/L	-	-	-	-	-	2	3.2	3.2
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	2	0.22	0.24
Total Kjeldahl Nitrogen	mg-N/L	-	-	-	-	-	2	0.22	0.24
Total ammonia	mg-N/L	-	2.8 - 105 ⁽ⁱ⁾	-	-	-	2	<0.005	<0.005
Nitrate	mg-N/L	124	2.9	10	-	1.2 ^(f,i)	2	<0.006	<0.006
Nitrite	mg-N/L	-	0.06	1	-	-	2	<0.002	<0.002
Total phosphorus	mg-P/L	-	0.01 ^(l,m)	-	-	-	2	0.0079	0.0085
Total dissolved phosphorus	mg-P/L	-	-	-	-	-	2	0.002	0.003
Dissolved orthophosphate	mg-P/L	-	-	-	-	-	2	<0.001	<0.001
Silica, reactive	mg/L	-	-	-	-	-	2	0.1	0.12
Other Parameters									
Benzene	µg/L	-	370	5.0	-	-	2	<0.5	<0.5
Ethylbenzene	µg/L	-	90	2.4	-	-	2	<0.5	<0.5
Toluene	µg/L	-	2.0	24	-	-	2	<0.5	<0.5
Xylenes	µg/L	-	-	300	-	-	2	<0.71	<0.71
Petroleum hydrocarbons – F1 (C6-C10)-BTEX	µg/L	-	-	-	-	-	2	<100	<100
Petroleum hydrocarbons – F1 (C6-C10)	µg/L	-	-	-	-	-	2	<100	<100
Petroleum hydrocarbons – F2 (C10-C16)	µg/L	-	-	-	-	-	2	<250	<250
Fecal coliform	CFU/100 mL	-	-	-	-	-	2	<1.0	<1.0

Table 3.3-2 Water Quality in Lake P5, 2014

Parameter	Unit	Guidelines			Objectives		Open-Water		
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-Term SSWQO	Long-Term SSWQO	Count	Min	Max
Total Metals									
Aluminum	µg/L	-	100 ^(j)	100	-	-	2	6.7	8.1
Antimony	µg/L	-	-	6.0	-	-	2	<0.02	<0.02
Arsenic	µg/L	-	5.0	10	-	-	2	0.18	0.18
Barium	µg/L	-	-	1,000	-	-	2	1.2	1.3
Beryllium	µg/L	-	-	-	-	-	2	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	2	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	-	2	2.2	2.9
Cadmium	µg/L	0.11 - 0.37 ^(k)	0.04 ^(k)	5.0	-	-	2	<0.005	<0.005
Cesium	µg/L	-	-	-	-	-	2	0.0053	0.0053
Chromium	µg/L	-	1.0	50	-	-	2	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	-	2	0.021	0.022
Copper	µg/L	-	2.0 ^(l)	1,000	-	-	2	0.64	0.64
Iron	µg/L	-	300	300	-	-	2	20.0	22.0
Lead	µg/L	-	1.0	10	-	-	2	<0.01	0.025
Lithium	µg/L	-	-	-	-	-	2	1.1	1.2
Manganese	µg/L	-	-	50	-	-	2	4.5	5.8
Mercury	µg/L	-	0.026	1.0	-	-	2	<0.0005	0.00064
Molybdenum	µg/L	-	73	-	223,000 ^(g)	19,000 ^(g)	2	<0.05	<0.05
Nickel	µg/L	-	25 ⁽ⁱ⁾	-	-	-	2	0.21	0.24
Selenium	µg/L	-	1.0	10	-	-	2	<0.04	<0.04
Silver	µg/L	-	0.1	-	-	-	2	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	2	5.4	5.6
Thallium	µg/L	-	0.8	-	-	-	2	<0.01	<0.01
Tin	µg/L	-	-	-	-	-	2	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	2	0.16	0.17
Uranium	µg/L	33	15	20	-	-	2	0.016	0.021
Vanadium	µg/L	-	-	-	300 ^(h)	30 ^(h)	2	<0.05	<0.05
Zinc	µg/L	-	30	5,000	-	-	2	<0.8	<0.8
Dissolved Metals									
Aluminum	µg/L	-	-	-	-	-	2	1.8	2.4
Antimony	µg/L	-	-	-	-	-	2	<0.02	<0.02
Arsenic	µg/L	-	-	-	-	-	2	0.19	0.2
Barium	µg/L	-	-	-	-	-	2	1.1	1.2
Beryllium	µg/L	-	-	-	-	-	2	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	2	<0.01	<0.01
Boron	µg/L	-	-	-	-	-	2	1.3	1.4
Cadmium	µg/L	-	-	-	-	-	2	<0.005	<0.005
Cesium	µg/L	-	-	-	-	-	2	<0.005	<0.005

Table 3.3-2 Water Quality in Lake P5, 2014

Parameter	Unit	Guidelines			Objectives		Open-Water		
		Acute CWQG ^(a)	Chronic CWQG ^(a)	CDWQG ^(b)	Short-Term SSWQO	Long-Term SSWQO	Count	Min	Max
Chromium	µg/L	-	-	-	-	-	2	<0.06	<0.06
Chromium – Hexavalent	µg/L	-	1	-	-	-	2	<1.0	<1.0
Cobalt	µg/L	-	-	-	-	-	2	<0.01	<0.01
Copper	µg/L	-	-	-	-	-	2	0.52	0.74
Iron	µg/L	-	-	-	-	-	2	1.2	1.6
Lead	µg/L	-	-	-	-	-	2	<0.01	<0.01
Lithium	µg/L	-	-	-	-	-	2	1.2	1.3
Manganese	µg/L	-	-	-	-	-	2	0.26	0.28
Mercury	µg/L	-	-	-	-	-	2	<0.0005	<0.0005
Molybdenum	µg/L	-	-	-	-	-	2	<0.05	<0.05
Nickel	µg/L	-	-	-	-	-	2	0.21	0.24
Selenium	µg/L	-	-	-	-	-	2	<0.04	<0.04
Silver	µg/L	-	-	-	-	-	2	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	2	5.7	5.8
Thallium	µg/L	-	-	-	-	-	2	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	2	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	2	<0.1	<0.1
Uranium	µg/L	-	-	-	-	-	2	0.014	0.016
Vanadium	µg/L	-	-	-	-	-	2	<0.05	<0.05
Zinc	µg/L	-	-	-	-	-	2	<0.8	1.2

- a) Source: CCME (Canadian Council of Ministers of the Environment). 1999, with updates to 2014. Canadian Environmental Quality Guidelines. Winnipeg, MB, Canada.
- b) Source: Health Canada.(2012. Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.
- c) Elphick JRF, Bergh KD, Bailey HC. 2011. Chronic toxicity of chloride to freshwater species: effects of hardness and implications for water quality guidelines. Environ Toxicol Chem 30: 230-246.
- d) Rescan (Rescan Environmental Services Ltd.). 2012a. Ekati Diamond Mine: Site-Specific Water Quality Objective for Potassium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.
- e) Rescan. 2012b. Ekati Diamond Mine: Site-specific Water Quality Objective for Sulphate. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.
- f) Rescan. 2012c. Ekati Diamond Mine: Site-Specific Water Quality Objective for Nitrate, (2012). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.
- g) Rescan. 2012d. Ekati Diamond Mine: Site Specific Water Quality Objective for Molybdenum, (2011). Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.
- h) Rescan. 2012e. Ekati Diamond Mine: Site-specific Water Quality Objective for Vanadium. Prepared for BHP Billiton Canada Inc. Yellowknife, NWT, Canada.
- i) Guidelines based on hardness of 10 mg CaCO₃/L.
- j) Guidelines based on pH of 6.0 to 7.3, temperature of 6.1°C to 13.3°C, and water hardness of 4.7 to 5.2 mg/L.
- k) Acute guideline applies to all waters of hardness below 5.3 mg CaCO₃/L; chronic guideline applies to all waters of hardness below 17 mg CaCO₃/L.
- l) Trigger for transition from oligotrophic to mesotrophic status (0.01 mg/L) applied to Lac de Gras basin and mesotrophic to meso-eutrophic status (0.02 mg/L) applied to Lac du Sauvage basin as based on CCME (2004).
- m) Source: CCME 2004. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems. Canadian Environmental Quality Guidelines, 2004. Winnipeg, MB, Canada.

Bolded concentrations are higher than relevant water quality guidelines.

- = no guideline or data; CWQG = Canadian Water Quality Guidelines; CDWQG = Canadian Drinking Water Quality Guideline; SSWQO = Site-Specific Water Quality Objective; H+ = hydrogen ions; CaCO₃ = calcium carbonate; mg CaCO₃/L = milligrams calcium carbonate per litre; F1 (C6-C10) = hydrocarbon fraction F1; F2 (C10-C16) = hydrocarbon fraction F2; meq/L = milliequivalents per litre; mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; pH = potential of hydrogen, provides measure of the acidity or alkalinity of a solution on a scale of 0 to 14; NTU = nephelometric turbidity units; mg-N/L = milligrams of nitrogen per litre; mg-P/L = milligrams of phosphorus per litre; µg/L = micrograms per litre; CFU/100 mL = coliform forming units per 100 millilitres; BTEX = benzene, toluene, ethylbenzene, xylene; <= less than.



4 2014 SEDIMENT QUALITY RESULTS

This section of the report presents an evaluation of sediment quality data collected for lakes in the baseline study area in 2014. Detailed sediment quality data are provided in Appendix E, Sediment Quality Data.

4.1 Lac du Sauvage

Seven sediment samples, one from each of seven stations in Lac du Sauvage, were collected during the fall sampling event; three samples were collected from sub-basin Ac, and one each from sub-basins Aa, Ab, Ad, and Ae. The station sample depth ranged from 11.4 to 14.8 m (Appendix E, Table E-1).

The sediments in Lac du Sauvage were predominantly composed of silt material (median = 88%) (Table 4.1-1). Total organic carbon concentration ranged from 7,000 to 17,000 milligrams per kilogram dry weight (mg/kg dw). Available nitrogen ranged from 850 to 1,710 mg/kg dw and available phosphorus ranged from 700 to 1,280 mg/kg dw.

Total metal concentrations were below CCME Sediment Quality Guideline (SQG), with the exception of arsenic and chromium (Table 4.1-1). Total arsenic concentrations exceeded the ISQG of 5.9 micrograms per gram dry weight ($\mu\text{g/g dw}$) in all seven samples, and exceeded the probable effect level (PEL) of 17 $\mu\text{g/g dw}$ in six of the seven samples (all except Station Aa-1). Total chromium concentrations exceeded the ISQG of 37.3 $\mu\text{g/g dw}$ in all seven samples.

Table 4.1-1 Sediment Quality in Lac du Sauvage, 2014

Parameter	Unit (Dry Weight)	Guideline		Stations	
		ISQG ^(a)	PEL ^(b)	Range	Median
Physical Parameters					
Maximum depth	m	-	-	10.2 to 13	11.0
% clay (<0.002 mm)	%	-	-	3.1 to 13	9.4
% silt (0.002 to 0.05 mm)	%	-	-	86 to 92	88
% sand (2 to 5 mm)	%	-	-	0.67 to 7.4	1.5
Nutrients					
Nitrogen, available	mg/kg	-	-	850 to 1710	1,300
Phosphorus, available	mg/kg	-	-	700 to 1280	1,010
Phosphate, available	mg/kg	-	-	11 to 108	12
Carbon, total	%	-	-	0.8 to 1.7	1.4
Carbon, inorganic	mg/kg	-	-	<1,000 to 1600	1,100
Carbon, total organic	mg/kg	-	-	7000 to 17,000	12,300
CaCO ₃ equivalent	%	-	-	<0.8 to 1.3	0.94
Total Metals					
Aluminum	$\mu\text{g/g}$	-	-	13,100 to 21,500	19,700
Arsenic	$\mu\text{g/g}$	5.9	17	16 to 143	79
Barium	$\mu\text{g/g}$	-	-	96 to 191	153
Beryllium	$\mu\text{g/g}$	-	-	0.4 to 0.62	0.59

**Table 4.1-1 Sediment Quality in Lac du Sauvage, 2014**

Parameter	Unit (Dry Weight)	Guideline		Stations	
		ISQG ^(a)	PEL ^(b)	Range	Median
Bismuth	µg/g	-	-	0.23 to 0.37	0.35
Boron	µg/g	-	-	<5.0 to 5.6	5.3
Cadmium	µg/g	0.6	3.5	<0.1 to 0.19	0.13
Chromium	µg/g	37	90	49 to 77	71
Cobalt	µg/g	-	-	11 to 29	18
Copper	µg/g	36	197	20 to 36	33
Iron	µg/g	-	-	23,800 to 52,100	39,300
Lead	µg/g	35	91	3.9 to 5.7	5.2
Lithium	µg/g	-	-	35 to 55	52
Manganese	µg/g	-	-	267 to 3610	1,670
Mercury	µg/g	0.17	0.49	0.012 to 0.019	0.016
Molybdenum	µg/g	-	-	1.2 to 6	2.6
Nickel	µg/g	-	-	27 to 52	44
Selenium	µg/g	-	-	<0.2 to 0.26	0.2
Strontium	µg/g	-	-	11 to 16	14
Sulfur	µg/g	-	-	220 to 540	380
Thallium	µg/g	-	-	0.19 to 0.35	0.31
Titanium	µg/g	-	-	861 to 1230	1,060
Uranium	µg/g	-	-	2 to 3.4	2.9
Vanadium	µg/g	-	-	42 to 63	57
Zinc	µg/g	123	315	47 to 82	73

a) Source: CCME (Canadian Council of Ministers of the Environment). 2001a. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life: Introduction. Updated. Canadian Environmental Quality Guidelines, 1999. Winnipeg, MB, Canada.

Note:

Nitrate as N, antimony, silver and tin data were not included in the table because all reported concentrations were below the detection limit.

Values above ISQG are **bolded**; values above PEL are **bolded and underlined**.

- = no guideline or data; ISQG = Interim Sediment Quality Guideline; PEL = probable effect level; m = metre, % = percent; < = less than; mm = millimetre; mg/kg = milligrams per kilogram; µg/g = micrograms per gram.



4.2 Lac du Sauvage Sub-basin Lakes

One sediment sample was collected from each of Duchess Lake (Station Af-1), Christine Lake (Station Christine-1), Lake C1 (Station C1-1), and Counts Lake (Station Counts-1) during the fall sampling event. Sample depths ranged from 10.4 to 20.0 m (Appendix E, Table E-2).

The sediments in the sub-basin lakes were predominantly silt (median = 81%) (Table 4.2-1). Total organic carbon concentration ranged from 12,900 to 93,800 mg/kg dw. Available nitrogen ranged from 1,530 to 7,580 mg/kg dw and available phosphorus ranged from 604 to 1,740 mg/kg dw.

Concentrations exceeded the CCME Sediment Quality Guideline (SQG) (CCME 2001a) for four metals (Table 4.2-1). Total arsenic concentrations exceeded the ISQG of 5.9 µg/g dw in all four samples, and the PEL of 17 µg/g dw in two of the four samples (Christine-1 and C1-1). Total chromium concentrations exceeded the ISQG of 37 µg/g dw in all four samples. Total copper concentrations exceeded the ISQG of 36 µg/g dw in three of the four samples (Christine-1, C1-1, and Counts-1). Total zinc exceeded the ISQG of 123 µg/g dw in Christine Lake only.

Table 4.2-1 Sediment Quality in Lac du Sauvage Sub-basin Lakes, 2014

Parameters	Unit (Dry Weight)	Guideline		Stations	
		ISQG ^(a)	PEL ^(a)	Range	Median
Physical Parameters					
Maximum depth	m	-	-	10.4 to 20	11.2
% clay (<0.002 mm)	%	-	-	8.8 to 22	12
% silt (0.002 to 0.05 mm)	%	-	-	76 to 90	81
% sand (2 to 5 mm)	%	-	-	0.52 to 12	2.9
Nutrients					
Nitrogen, available	mg/kg	-	-	1530 to 7580	5,770
Nitrate as N	mg/kg	-	-	<1.0 to 1.4	<1.0
Phosphorus, available	mg/kg	-	-	604 to 1740	1585.0
Phosphate, available	mg/kg	-	-	5.1 to 62	32
Carbon, total	%	-	-	1.4 to 9.4	7.4
Carbon, inorganic	mg/kg	-	-	<1,000 to 1300	<1,000
Carbon, total organic	mg/kg	-	-	12,900 to 93,800	73,900
CaCO ₃ equivalent	%	-	-	<0.8 to 1.1	<0.8
Total Metals					
Aluminum	µg/g	-	-	19,300 to 22,000	20,800
Antimony	µg/g	-	-	<0.1 to 0.12	<0.1
Arsenic	µg/g	5.9	17	7.3 to 116	18
Barium	µg/g	-	-	130 to 159	145
Beryllium	µg/g	-	-	0.59 to 0.89	0.8
Bismuth	µg/g	-	-	0.34 to 0.58	0.52
Boron	µg/g	-	-	5.5 to 12	10
Cadmium	µg/g	0.6	3.5	<0.1 to 0.5	0.32

**Table 4.2-1 Sediment Quality in Lac du Sauvage Sub-basin Lakes, 2014**

Parameters	Unit (Dry Weight)	Guideline		Stations	
		ISQG ^(a)	PEL ^(a)	Range	Median
Chromium	µg/g	37	90	60 to 69	66
Cobalt	µg/g	-	-	13 to 49	15
Copper	µg/g	36	197	26 to 105	75
Iron	µg/g	-	-	27,700 to 88,000	31,100
Lead	µg/g	35	91	5.3 to 8.2	6.9
Lithium	µg/g	-	-	33 to 52	43
Manganese	µg/g	-	-	282 to 634	346
Mercury	µg/g	0.17	0.49	0.022 to 0.11	0.043
Molybdenum	µg/g	-	-	1 to 4.2	3.3
Nickel	µg/g	-	-	38 to 65	51
Selenium	µg/g	-	-	<0.2 to 1.2	0.72
Silver	µg/g	-	-	<0.2 to 0.26	0.22
Strontium	µg/g	-	-	14 to 23	15
Sulfur	µg/g	-	-	340 to 2130	1,680
Thallium	µg/g	-	-	0.29 to 0.39	0.34
Titanium	µg/g	-	-	558 to 1180	696
Uranium	µg/g	-	-	3 to 5.4	4.4
Vanadium	µg/g	-	-	51 to 59	55
Zinc	µg/g	123	315	71 to 125	104

a) Source: CCME (Canadian Council of Ministers of the Environment). 2001a. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life: Introduction. Updated. Canadian Environmental Quality Guidelines, 1999. Winnipeg, MB, Canada.

Note:

Tin data were not included in the table because all reported concentrations were below the detection limit.

Values above ISQG are **bolded**; values above PEL are **bolded and underlined**.

- = no guideline or data; ISQG = Interim Sediment Quality Guideline; PEL = probable effect level; m = metre, % = percent; < = less than; mm = millimetre; mg/kg = milligrams per kilogram; µg/g = micrograms per gram.



4.3 Lac de Gras Basin

4.3.1 Far Field 2 Stations

Five sediment samples were collected from the Lac de Gras Far Field 2 stations (FF2-1 through FF2-5) during the fall sampling event. Sample depths ranged from 19.0 to 21.3 m (Appendix E, Table E-3).

The sediments were predominantly silt (median = 88%) (Table 4.3-1). Total organic carbon concentration ranged from 13,700 to 20,200 mg/kg dw. Available nitrogen ranged from 1,180 to 1,750 mg/kg dw and available phosphorus ranged from 854 to 1,570 mg/kg dw.

Concentrations exceeded the SQG for three metals (Table 4.3-1). Total arsenic concentrations exceeded the ISQG of 5.9 µg/g dw in all five samples, and the PEL of 17 µg/g dw in four of the five samples (all samples except FF2-5). Total chromium concentrations exceeded the ISQG of 37 µg/g dw in all five samples. Total copper concentrations exceeded the ISQG of 36 µg/g dw in four of the five samples (all samples except FF2-5).

Table 4.3-1 Sediment Quality in the Lac de Gras Far Field 2 Stations, 2014

Parameters	Unit (Dry Weight)	Guideline		Station	
		ISQG ^(a)	PEL ^(a)	Range	Median
Physical Parameters					
Maximum depth	m	-	-	19 to 21.3	19.5
% clay (<0.002 mm)	%	-	-	5 to 6.8	6.0
% silt (0.002 to 0.05 mm)	%	-	-	88 to 93	88
% sand (2 to 5 mm)	%	-	-	2.3 to 6.5	5.6
Nutrients					
Nitrogen, available	mg/kg	-	-	1,180 to 1,750	1,480
Nitrate as N	mg/kg	-	-	<1.0 to 1.2	<1.0
Phosphorus, available	mg/kg	-	-	854 to 1,570	1,030
Phosphate, available	mg/kg	-	-	20 to 37	23
Carbon, total	%	-	-	1.4 to 2	1.8
Carbon, inorganic	mg/kg	-	-	<1,000 to <1,000	<1,000
Carbon, total organic	mg/kg	-	-	13,700 to 20,200	17,900
CaCO ₃ equivalent	%	-	-	<0.8 to 0.81	<0.8
Total Metals					
Aluminum	µg/g	-	-	18,200 to 19,400	18,600
Arsenic	µg/g	5.9	17	15 to 170	61
Barium	µg/g	-	-	115 to 146	124
Beryllium	µg/g	-	-	0.57 to 0.61	0.59
Bismuth	µg/g	-	-	0.33 to 0.36	0.35
Boron	µg/g	-	-	5.7 to 6.1	6.0
Cadmium	µg/g	0.6	3.5	<0.1 to 0.18	0.1
Chromium	µg/g	37	90	61 to 66	63
Cobalt	µg/g	-	-	21 to 44	32

**Table 4.3-1 Sediment Quality in the Lac de Gras Far Field 2 Stations, 2014**

Parameters	Unit (Dry Weight)	Guideline		Station	
		ISQG ^(a)	PEL ^(a)	Range	Median
Copper	µg/g	36	197	33 to 41	38
Iron	µg/g	-	-	28,200 to 64,500	40,900
Lead	µg/g	35	91	5 to 5.4	5.2
Lithium	µg/g	-	-	42 to 46	44
Manganese	µg/g	-	-	1,040 to 3,630	2,630
Mercury	µg/g	0.17	0.49	0.014 to 0.017	0.016
Molybdenum	µg/g	-	-	1.3 to 3.8	2.2
Nickel	µg/g	-	-	36 to 50	39
Selenium	µg/g	-	-	<0.2 to 0.32	0.23
Strontium	µg/g	-	-	14 to 16	15
Sulfur	µg/g	-	-	380 to 540	540
Thallium	µg/g	-	-	0.27 to 0.31	0.28
Titanium	µg/g	-	-	834 to 988	918
Uranium	µg/g	-	-	3.2 to 3.6	3.5
Vanadium	µg/g	-	-	50 to 54	53
Zinc	µg/g	123	315	65 to 73	70

a) Source: CCME (Canadian Council of Ministers of the Environment). 2001a. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life: Introduction. Updated. Canadian Environmental Quality Guidelines, 1999. Winnipeg, MB, Canada.

Note:

Antimony, silver and tin data were not included in the table because all reported concentrations were below the detection limit.

Values above ISQG are **bolded**; values above PEL are **bolded and underlined**.

- = no guideline or data; ISQG = Interim Sediment Quality Guideline; PEL = probable effect level; m = metre, % = percent; < = less than; mm = millimetre; mg/kg = milligrams per kilogram; µg/g = micrograms per gram.



4.4 Lac de Gras Sub-basin Lakes

One sample was collected from Lake P5 (Station P5-1; within Lac de Gras basin) during the fall sampling program from a depth of 9.0 m (Appendix E, Table E-4).

The sample from Lake P5 was composed predominantly of silt (79%) (Table 4.4-1). Total organic carbon concentration was 48,200 mg/kg dw, available nitrogen was 3,960 mg/kg dw, and available phosphorus was 1,390 mg/kg dw.

Metal concentrations exceeded the ISQG, for arsenic, chromium, copper, and zinc (Table 4.4-1).

Table 4.4-1 Sediment Quality in Lake P5, 2014

Parameter	Unit (Dry Weight)	Guideline		Station
		ISQG ^(a)	PEL ^(a)	Value
Physical Parameters				
Maximum depth	m	-	-	9.0
% clay (<0.002 mm)	%	-	-	20
% silt (0.002 to 0.05 mm)	%	-	-	79
% sand (2 to 5 mm)	%	-	-	1.3
Nutrients				
Nitrogen, available	mg/kg	-	-	3,960
Phosphorus, available	mg/kg	-	-	1390
Phosphate, available	mg/kg	-	-	71
Carbon, total	%	-	-	4.8
Carbon, total organic	mg/kg	-	-	48,200
Total Metals				
Aluminum	µg/g	-	-	27,400
Arsenic	µg/g	5.9	17	10
Barium	µg/g	-	-	159
Beryllium	µg/g	-	-	1.0
Bismuth	µg/g	-	-	0.64
Boron	µg/g	-	-	7.6
Cadmium	µg/g	0.6	3.5	0.18
Chromium	µg/g	37	90	82
Cobalt	µg/g	-	-	18
Copper	µg/g	36	197	64
Iron	µg/g	-	-	36,700
Lead	µg/g	35	91	7.2
Lithium	µg/g	-	-	63
Manganese	µg/g	-	-	423
Mercury	µg/g	0.17	0.49	0.022
Molybdenum	µg/g	-	-	3.2
Nickel	µg/g	-	-	84

**Table 4.4-1 Sediment Quality in Lake P5, 2014**

Parameter	Unit (Dry Weight)	Guideline		Station
		ISQG ^(a)	PEL ^(a)	Value
Selenium	µg/g	-	-	0.47
Strontium	µg/g	-	-	16
Sulfur	µg/g	-	-	1,150
Thallium	µg/g	-	-	0.34
Titanium	µg/g	-	-	1,020
Uranium	µg/g	-	-	6.6
Vanadium	µg/g	-	-	72
Zinc	µg/g	123	315	135

a) Source: CCME (Canadian Council of Ministers of the Environment). 2001a. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life: Introduction. Updated. Canadian Environmental Quality Guidelines, 1999. Winnipeg, MB, Canada.

Note:

Nitrate as N, inorganic carbon, CaCO₃ equivalent, antimony, silver and tin data were not included in the table because all reported concentrations were below the detection limit.

Values above ISQG are **bolded**; values above PEL are **bolded and underlined**.

- = no guideline or data; ISQG = Interim Sediment Quality Guideline; PEL = probable effect level; m = metre, % = percent; < = less than; mm = millimetre; mg/kg = milligrams per kilogram; µg/g = micrograms per gram.

4.5 Dioxins and Furans in Sediment

Fourteen sediment samples for dioxin and furan analysis were collected from the baseline study area during the fall sampling event (Appendix E, Table E-5). The samples were collected from stations in Lac du Sauvage (Stations Ac-1, Ab-1, Aa-1, Ae-1, and Ad-1), Duchess Lake (Station Af-1), Lac du Sauvage sub-basin lakes (Stations Christine-1 and Counts-1), Lac de Gras sub-basin lake (Station P5-1), Lac de Gras Far Field 2 area (Stations FF2-5 and FF2-2), and Lac de Gras Slipper Bay (Stations S3 and S5).

As described in Section 2.4.2, the mid-point TEQ was calculated for each sample, based on individual congener concentrations and TEFs, to represent the overall toxicity of the sample. Overall, the mid-point TEQs for the samples ranged from 0.140 to 0.610 picogram per gram (pg/g) (median = 0.315 pg/g), remaining below the ISQG of 0.850 pg/g (Table 4.5-1).

Table 4.5-1 Dioxins and Furans in Sediments within the Baseline Study Area, 2014
Part A

Toxic Equivalency (TEQ)	Unit	Guidelines		Stations					
				Aa-1	Ab-1	Ac-1	Ad-1	Ae-1	Af-1
		ISQG ^(a)	PEL ^(a)	11-Sep-14	11-Sep-14	11-Sep-14	5-Sep-14	5-Sep-14	9-Sep-14
Mid-point PCDD/F TEQ	pg/g	0.85	21.5	0.283	0.296	0.610	0.180	0.246	0.236

Part B

Toxic Equivalency (TEQ)	Unit	Guidelines		Stations							
				S3	S5	FF2-2	FF2-5	Counts-1	C1-1	Christine-1	P5-1
		ISQG ^(a)	PEL ^(a)	8-Sep-14	8-Sep-14	12-Sep-14	12-Sep-14	13-Sep-14	14-Sep-14	14-Sep-14	14-Sep-14
Mid-point PCDD/F TEQ	pg/g	0.85	21.5	0.356	0.448	0.140	0.178	0.513	0.432	0.524	0.333

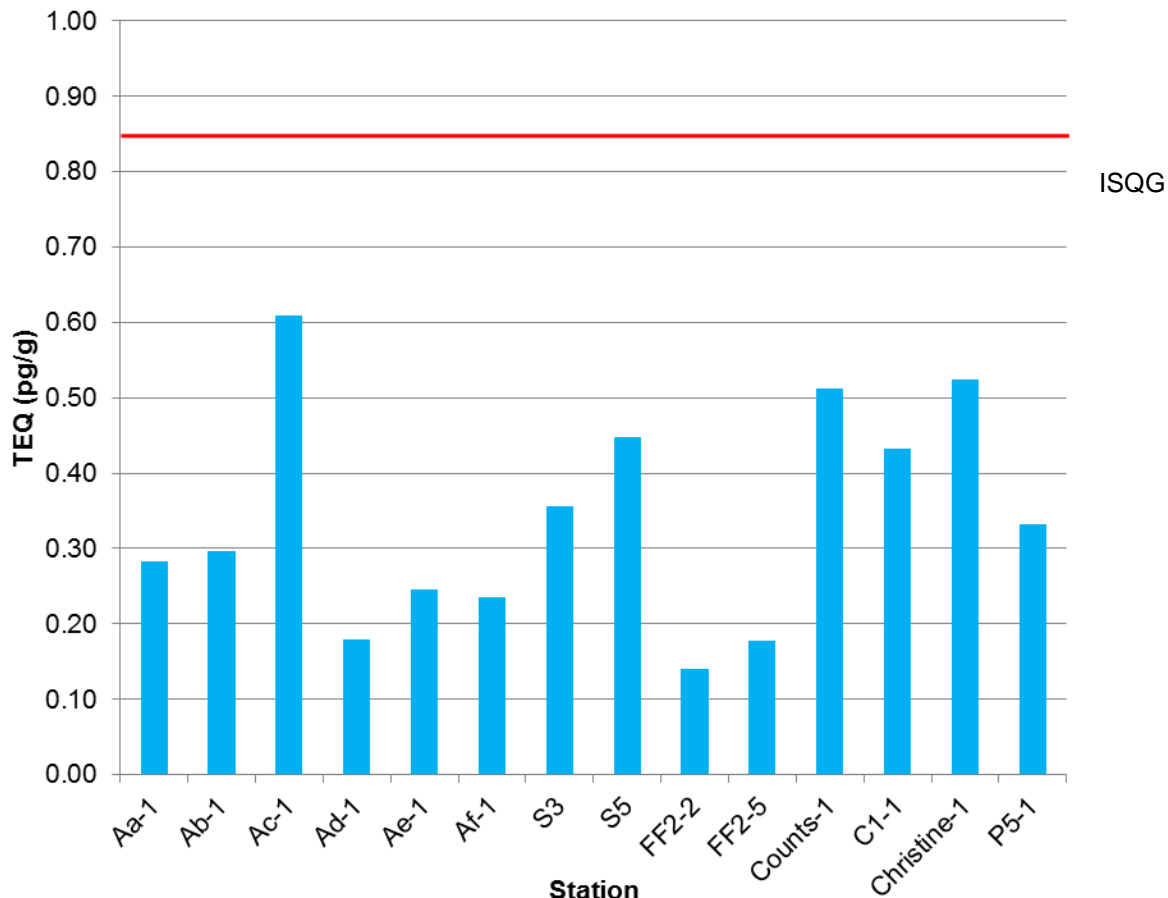
a) Source: CCME. 2001b. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life: Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/Fs). In: Canadian Environmental Quality Guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg, MB, Canada.

ISQG = Interim Sediment Quality Guideline; PEL = probable effect level; pg/g = picograms per gram; PCDD/F = polychlorinated dibenzodioxins and polychlorinated dibenzofurans.



The highest sediment mid-point TEQ was measured in Lac du Sauvage at Station Ac-1, and the lowest TEQ was measured in Lac de Gras at Far Field 2 Station FF2-2 (Figure 4.5-1).

Figure 4.5-1 Mid-Point Toxicity Equivalencies (TEQs) for Sediments within the Baseline Study Area, 2014



ISQG = Interim Sediment Quality Guideline; pg/g = picogram per gram.

5 SUMMARY

The 2014 water and sediment quality program was designed to supplement the existing water and sediment quality datasets for the Jay Project. The 2014 program was carried out over four sampling events under two conditions: under-ice (winter program) condition, and open-water (late spring, summer, and fall programs) condition. Water quality sampling was conducted in all four programs, while sediment quality sampling was limited to the fall program.

Twenty-eight lake stations were sampled for field and laboratory water quality parameters across 10 lakes (Lac du Sauvage, Duchess Lake, lakes of the Lac du Sauvage sub-basin [Christine Lake, Lake C1, Counts Lake, Lake E-L1, Lake Af1], Lac de Gras, and lakes of the Lac de Gras sub-basin [Paul Lake and Lake P5]). Two lake outlet streams (outlets of Lac du Sauvage and Lac de Gras) were also sampled for field and laboratory water quality parameters. Sediment samples were collected from seven lakes (Lac du Sauvage, Christine Lake, Lake C1, Counts Lake, Duchess Lake, Lac de Gras, Lake P5). Sediment samples were collected from 17 lake stations for laboratory analysis of particle size, nutrients, and metals; samples for laboratory analysis of dioxins and furans were collected from a subset of 14 lake stations.

Water quality in lakes and lake outlet streams of the baseline study area was typical of that found in Arctic and sub-Arctic freshwater systems. Water quality in the baseline study area in 2014 can be characterized as follows:

- clear, with mean Secchi depths ranging from 3.1 to 11 m and vertical light attenuation coefficients (K_d) ranging from 0.22 to 0.66;
- thermally stratified in winter, isothermal in late spring or fall, and either weakly or not stratified during summer; the sub-basin lakes (e.g., Christine Lake, Lake C1) were more likely to be thermally stratified in the summer than the large lakes (e.g., Lac du Sauvage, Lac de Gras); however, this may be attributed to weather conditions and timing of sampling;
- well-oxygenated at the surface in outlet streams and throughout the water column in most lakes with certain exceptions; DO concentrations were sufficient to support aquatic life (i.e., not below the lower bound CWQG of 6.5 mg/L), with the exception of deeper reaches of the water column in Duchess Lake, Lake E1, and Paul Lake in winter;
- low specific conductivity, with slightly higher levels in Lac de Gras compared to Lac du Sauvage, and variable levels in the Lac du Sauvage and Lac de Gras sub-basin lakes; specific conductivity was elevated throughout the water column at Christine Lake, and at Slipper Bay Stations S2 and S3;
- slightly acidic to neutral pH (near or slightly below the lower CWQG of pH 6.5);
- low TDS concentrations, and consequently low alkalinity and hardness levels; TDS concentrations and hardness were elevated at Christine Lake compared to the other lakes; bicarbonate, magnesium, sodium, and sulphate were the dominant ions; there was little variability in ionic dominance within each lake or sampling area, with the exception of Slipper Bay, where ion concentrations were highest at Station S2, and gradually decreased with distance from the Slipper Lake inflow, and the Lac du Sauvage sub-basin lakes, where ion concentrations were higher at Christine Lake than the other lakes;



- low nutrient concentrations, with the trophic status of the lakes characterized within the range of oligotrophic to mesotrophic, and the outlet streams characterized as oligotrophic;
- some nutrient concentrations (i.e., ammonia, nitrate, and soluble reactive silica) in discrete samples were higher during the under-ice than open-water period;
- nutrient concentrations were typically lower at the lake outlets than in the lakes, and were higher in Paul Lake, Lac du Sauvage, and the Lac du Sauvage sub-basin lakes than the other lakes; and,
- total metals concentrations were generally low, and below detection limits and CWQGs, with the exception of aluminum, copper, iron, and manganese concentrations (Table 5-1), which were above CWQGs in 13%, 4%, 2%, and 4% of the samples, respectively; for water with pH values below 6.5, aluminum concentrations were generally above the pH-dependent CWQG of 5 µg/L.

Surface sediment quality in the lakes of the baseline study area in 2014 is characterized as follows:

- predominantly composed of silt or silty-clay bed material;
- nitrogen, organic carbon, and phosphorus concentrations were variable between lakes;
- metals concentrations were below the SQG, with the exception of arsenic, chromium, copper, and zinc concentrations (Table 5-1), which were above ISQGs in 100%, 100%, 47%, and 12% of samples, respectively; arsenic concentrations were above the PEL in 71% of the samples; and,
- dioxin and furan mid-point TEQs were less than the ISQG, with the highest values measured in the Lac du Sauvage sub-basin lake stations (particularly at Counts-1 and Christine-1) and the Lac de Gras Slipper Bay stations (S3 and S5).

The results of the 2014 water and sediment quality supplemental baseline study are similar to those found in the 2013 baseline study (Annex XI).

- Secchi depths and K_d values measured in 2014 were consistent with the 2013 data. In 2013, waters were clear with Secchi depths ranging from 2 to 9 m, and K_d values that ranged from 0.38 to 0.83.
- Lake stations were weakly stratified or not thermally stratified in the summer of 2014 (with the exception of Lake C1 and Christine Lake); however, many stations were thermally stratified during the under-ice period. In 2013, lakes were thermally stratified in the summer, but not in late spring or fall; sampling was not conducted during the under-ice period in 2013.
- The water column remained well-oxygenated in 2014, and concentrations below the CWQG of 6.5 mg/L were observed only in deeper waters during the winter. In 2013, oxic stratification occurred at two lakes in the summer (i.e., Lake Af1 and Lake E1), while the remaining stations maintained DO concentrations throughout the water column that were sufficient to support aquatic life (i.e., not below the CWQG of 6.5 mg/L).



- Specific conductivity was low throughout the lakes and lake outlet streams in 2014, with the exception of elevated conductivity readings observed at some stations that were new to the sampling program in 2014 (i.e., Christine Lake and Slipper Bay Stations S2 and S3), and waters were slightly acidic to neutral (near or slightly below the lower CWQG of pH 6.5). In 2013, specific conductivity was low throughout the lakes and streams and pH was slightly acidic (near or below the lower CWQG of pH 6.5).
- Ranges of TDS, alkalinity, and hardness measured in 2014 were similar to the 2013 data, with the exception of elevated TDS concentrations and hardness values recorded at Christine Lake. In 2013, lakes were low in TDS, alkalinity, and hardness. Lakes and streams had very soft water as per the scale of water hardness of McNeely et al. (1979); lakes were highly sensitive to acid inputs as per the lake acid sensitivity scale of Saffran and Trew (1996), and streams were sensitive as per the stream acid sensitivity scale of Boward et al. (1999). Consistent with data collected in 2014, the dominant ions in 2013 were bicarbonate, magnesium, sodium or calcium, and sulphate.
- The range of measured nutrient concentrations and mean trophic status index values calculated in 2014 were similar to 2013. In both years, nutrient concentrations were low, with mean TSI values within the range for oligotrophic to mesotrophic lakes and oligotrophic streams.
- Total metals concentrations in 2014 were generally low, and were generally below detection limits or below CWQGs except for aluminum, copper, iron, and manganese. In 2014, aluminum concentrations were less than the chronic guideline in most samples during open-water conditions, but were above the guideline in a few samples during the under-ice period. Copper, iron, and manganese concentrations were also occasionally above CWQGs or CDWQGs. In 2013, total metals concentrations were generally low (i.e., either not detected or below the CWQG) except for aluminum, chromium, copper, iron, and manganese. Aluminum concentrations were generally above the pH-dependent CWQG of 5 µg/L. Iron concentrations were above the CWQG and CDWQG in Lake E1 in 2013, and aluminum, chromium, copper, iron, and manganese concentrations were above CWQGs or CDWQGs at a stream in sub-basin L (L-S1). Overall, total metals concentrations were generally low during both 2013 and 2014 with occasional guideline exceedances for similar parameters.
- The physical composition and concentrations of parameters (e.g., nutrients, metals) for sediments collected in 2014 were consistent with 2013. In both years, lake sediments were of a silty-clay composition, and nutrients were variable in nitrogen, organic carbon, and phosphorus content between locations. Metals concentrations were variable between sampling stations; however, in both 2013 and 2014, concentrations of arsenic and chromium were typically above ISQG or PEL, and copper was commonly above the ISQG. In 2013, zinc concentrations did not exceed the ISQG, but occasionally exceeded in 2014; however, the 2014 zinc exceedances were from lakes that were new to the 2014 program (i.e., Lake P5 and Christine Lake).

Table 5-1 Summary of Water and Sediment Quality in Lakes of the Baseline Study Area, 2014

Area	Basin/Lake ID	Station ID	Water Quality Parameters Above Guidelines or Outside the Guideline Range ^(a)		Sediment Quality Parameters Above Guidelines ^(b)	Sensitivity to Acid Deposition ^(c)		Water Hardness ^(d)		Trophic State ^(e)
			Open-Water	Under-Ice	Open-Water	Open-Water	Under-Ice	Open-Water	Under-Ice	
Lac du Sauvage	Aa	Aa-1	none	pH	arsenic and chromium	high	high	very soft	very soft	oligotrophic
	Ab	Ab-1	none	pH	<u>arsenic</u> and chromium					
	Ac	Ac-1	none	DO, pH	<u>arsenic</u> , chromium					
		Ac-4	none	pH	<u>arsenic</u> , chromium					
		Ac-7	none	pH	<u>arsenic</u> , chromium					
	Ad	Ad-1	none	pH	<u>arsenic</u> , chromium					
		Ad-5	pH, aluminum, copper	-	-					
Ae	Ae-1	pH, aluminum	pH, aluminum	<u>arsenic</u> , chromium						
Lac du Sauvage Outlet	Outlet	Ab-S1	pH and aluminum	none	-	sensitive	sensitive	very soft	very soft	oligotrophic
Lac du Sauvage Sub-basin Lakes	Christine Lake	Christine-1	none	none	<u>arsenic</u> , chromium, copper, zinc	high	high	very soft	soft	oligotrophic
	Lake C1	C1-1	aluminum and copper	none	<u>arsenic</u> , chromium, copper	high	high	very soft	very soft	oligotrophic
	Counts Lake	Counts-1	none	none	arsenic, chromium, copper	high	high	very soft	very soft	oligotrophic
	Lake E-L1	E-L1-1	-	DO, pH, aluminum	-	-	high	-	very soft	oligotrophic
	Lake Af1	Af-10	-	DO, pH, aluminum, iron, manganese	-	-	high	-	very soft	oligotrophic
	Duchess Lake	Af-1	copper and iron	DO, pH, aluminum, manganese	arsenic, chromium	high	high	very soft	very soft	mesotrophic
Af-7		-	DO, pH, aluminum, manganese	-	-	high	-	very soft		
Lac de Gras	LDG Slipper Bay	S2	none	-	-	high	-	very soft	-	oligotrophic
		S3	none	-	-					
		S5	none	-	-					
		S6	pH	-	-					
Lac de Gras	LDG Far Field 2	FF2-1	none	-	<u>arsenic</u> , chromium, copper	high	-	very soft	-	oligotrophic to mesotrophic
		FF2-2	none	-	<u>arsenic</u> , chromium, copper					
		FF2-3	none	-	<u>arsenic</u> , chromium, copper					
		FF2-4	none	-	<u>arsenic</u> , chromium, copper					
		FF2-5	none	-	arsenic, chromium					
Lac de Gras Outlet	Outlet	LDG Outlet	none	-	-	sensitive	-	very soft	-	oligotrophic
Lac de Gras Sub-basin Lakes	Paul Lake	PL-1	-	DO, copper	-	-	moderate to high	-	very soft	oligotrophic
		PL-3	-	DO, manganese	-					
		PL-5	-	DO	-					
	Lake P5	P5-1	none	-	arsenic, chromium, copper, zinc	high	-	very soft	-	oligotrophic

a) Parameters above Canadian Water Quality Guideline or Canadian Drinking Water Guidelines.

b) Parameters above Interim Sediment Quality Guidelines; underlined parameters were above their probable effects level.

c) Classifications are based on the lake and stream acid sensitivity scales (Saffran and Trew 1996).

d) Classifications are based on the qualitative scale of water hardness (McNeely et al. 1979).

e) Trophic status is based on calculated trophic state index values for discrete and depth-integrated samples and classification schemes of Carlson (1977) for lakes and CCME (2004) for streams.

- = no samples were collected; none = no parameters were above guidelines; ID = identification; pH = potential of hydrogen, provides measure of the acidity or alkalinity of a solution on a scale of 1 to 14; DO = dissolved oxygen.



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APPENDIX A

QUALITY ASSURANCE AND QUALITY CONTROL



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Abbreviations

Abbreviation	Definition
—	no data or not applicable
BTEX	benzene, toluene, ethylbenzene, and xylenes
CALA	Canadian Association for Laboratory Accreditation
CaCO ₃	calcium carbonate
DL	detection limit
e.g.,	for example
Golder	Golder Associates Ltd.
H ⁺	hydrogen ion
i.e.,	that is
QA	quality assurance
QC	quality control
QA/QC	quality assurance and quality control
pH	potential of hydrogen; provides measure of the acidity or alkalinity of a solution on a scale of 0 to 14
RPD	relative percent difference

Units of Measure

Unit	Definition
%	percent
<	less than
µg/L	micrograms per litre
µS/cm	microsiemens per centimetre
CFU/100 mL	coliform forming units per 100 millilitres
mg/kg	milligrams per kilogram
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mg N/L	milligrams nitrogen per litre
mg P/L	milligrams phosphorus per litre
mm	millimetre
NTU	nephelometric turbidity unit



A1 INTRODUCTION

Quality assurance and quality control (QA/QC) practices determine data integrity and are relevant to all aspects of this supplemental monitoring program. These practices are applied throughout the activities undertaken within the program, from sample collection to data analysis, and reporting. Quality assurance (QA) encompasses management and technical practices designed to confirm that the data generated are of consistent high quality. Quality control (QC) is an aspect of QA that includes the procedures used to measure and evaluate data quality, and the corrective actions to apply when data quality objectives are not met.

This appendix describes QA/QC practices applied during this study, evaluates QC data, and describes the implications of QC results to the interpretation of study results.



A2 QUALITY ASSURANCE

Quality assurance applicable to this study covers three areas of internal and external management, as described below.

A2.1 Field Crew Training and Operations

Golder Associates Ltd. (Golder) field crews are trained to be proficient in standardized field sampling procedures, data recording, and equipment operations applicable to water and sediment quality sampling. Field work was completed according to approved specific work instructions and established Golder technical procedures. Specific work instructions are standardized forms that describe exact sampling locations and provide specific sampling instructions for the work to be undertaken, such as equipment needs and calibration requirements, sample handling and storage requirements, sample labelling and shipping protocols, and laboratory contacts, and reference appropriate technical procedures. The specific work instructions also provide specific guidelines for field record keeping and sample tracking. Technical procedures are consistent with information described in the relevant scientific literature (e.g., Environment Canada 1993; APHA 2012), and outline relevant general information regarding protocols for field sample collection and in situ field measurements.

Other key QA processes applicable to field crews included:

- A pre-field meeting with the field crew and the project/task manager was held before the field work to discuss the purpose of the field program, specify the roles of crew members, address questions regarding the specific work instructions, and discuss equipment needs, field logistics, and contingency plans.
- During field work, field data were recorded on standardized field data sheets or in a bound field book, according to established field record-keeping procedures. In addition, field crews checked in with task managers regularly to provide an update on work completed.
- Samples were documented and tracked using chain-of-custody forms, and receipt of samples by the analytical laboratory was confirmed. One field crew member was assigned the responsibility for managing the sample shipping process so that:
 - all required samples were collected;
 - chain-of-custody and analytical request forms were completed and correct; and,
 - proper labelling and documentation procedures were followed.



A2.2 Laboratory

Only Canadian Association for Laboratory Accreditation Inc. (CALA) accredited analytical labs were used for the analysis of water and sediment samples collected for this program. Under CALA's accreditation program, performance evaluation assessments are conducted for laboratory procedures, methods, and internal QC. As a result, there was high confidence that the analytical data reported by the labs were reliable.

One member of the Jay Project (Project) team was designated as the laboratory liaison.

A2.3 Office Operations

Office-related QA included:

- using appropriately trained personnel for each data management, analysis, and reporting task;
- using standardized data manipulation/summary tools, where required;
- filing data and project information according to standardized protocols;
- establishing a data management system to ensure an organized, consistent system of data storage, QC, and retrieval; and,
- senior review of work products at appropriate milestones.

A3 QUALITY CONTROL

A3.1 Field Control Procedures

The QC sample types used in this program included:

- **Travel blanks** (water samples only) consist of deionized water provided in sampling bottles by the analytical laboratory. Travel blanks accompany the samples through all steps of collection and transportation. They are handled, stored, and treated the same as the collected samples, but are not filtered or exposed to sampling equipment. Travel blanks are used to detect potential sample contamination due to ambient conditions, or that may have occurred during shipping and laboratory analysis
- **Field blanks** (water samples only) consist of deionized water provided by the analytical laboratory, which are processed in the field, handled the same, and analyzed for the same constituents as the water samples collected during the field program (e.g., preserved, filtered). Field blanks are used to detect potential sample contamination during sample collection, handling, shipping, and analysis.
- **Equipment blanks** (water samples only) consist of deionized water provided by the analytical laboratory, which is exposed to the sampling environment at the sample site, and rinsed through cleaned field sampling equipment. The rinsate is distributed into sampling bottles, and handled in the same manner as the collected water samples. Equipment blanks are used to assess the adequacy of the decontamination of sample collection equipment.



- **Duplicate samples** (water and sediment samples) consist of additional samples collected at the same time and location as water or sediment samples collected during a field program, using the same sampling methods. They are used to check within-site variation, and the precision of field sampling methods and laboratory analysis.

The water and sediment quality field QC analysis for this program consisted of the collection and analysis of blank samples and field duplicate samples. It includes the analysis of QC samples for depth-integrated nutrients and chlorophyll *a* samples collected for the plankton program; phytoplankton and zooplankton QC results are provided in the 2014 Plankton Supplemental Baseline Report; Dominion Diamond 2015).

Quality control blanks and duplicate samples for the water quality component of the field program accounted for approximately 10 percent (%) of the total number of water samples submitted for analysis. Quality control duplicate samples for the sediment quality component of the field program accounted for approximately 10% of the total number of sediment samples submitted for analysis. All QC samples were submitted "blind" to the analytical laboratories, and were analyzed for the same set of parameters as the collected water and sediment samples.

A3.2 Office Quality Control Procedures

Relevant elements of office-based QC include:

- saving unaltered laboratory files in the Project directory so they are accessible to the team as required;
- comparing sample data entered into the Project database against final laboratory reports to confirm data accuracy;
- creating backup files before each major operation as data are analyzed;
- checking the data in the Project database against the raw data obtained from database or analytical laboratories; and,
- verifying the accuracy of calculations performed to generate summary statistics.

A3.3 Initial Laboratory Data Screening

Upon receipt of water and sediment quality data from the analytical laboratory, a series of standard checks were performed to screen for potential data quality issues. These checks allowed potential re-analysis of samples to verify questionable data, or generate data for missing parameters. Data checks included:

- verification that all required parameters and samples were analyzed;
- verification that data were reported using appropriate units;
- verification that analyses were done with appropriate detection limit;



- verification that field versus laboratory data were similar for parameters with corresponding field and laboratory data (e.g., conductivity); if large discrepancies were present, then laboratory data were considered correct;
- data logic checks: presence of zero values, comparisons of total dissolved solids and conductivity, hardness and alkalinity, total and dissolved phosphorus, total and dissolved organic carbon, total and dissolved metals, measured and calculated total dissolved solids;
- identification of outliers;
- review of blank results for evidence of contamination (Section A3.4.1);
- review of duplicate sample results for evidence of unacceptable variation (Section A3.4.2);
- review of laboratory QC data (i.e., sample temperature and integrity of containers upon receipt, review laboratory qualifiers, holding times, internal duplicates, ion balance, percent recovery of spiked analytes); and,
- review of field-collected data for completeness, and unexpected values and trends.

If results of data screening indicated that there were any errors or potential data quality issues, the analytical laboratory was contacted and re-analysis of the parameters in question in the affected samples was requested. If data were verified by the analytical laboratory, but remained questionable based on the above evaluation, qualifiers were added to affected concentrations in the Project dataset for consideration during data summary and analysis, or data were excluded from further analysis (and identified in the report or appendix tables as excluded, with the corresponding reasons).

A3.4 Quality Control Data Evaluation

A3.4.1 Blanks

Concentrations in water quality blanks were considered notable if they were greater than or equal to five times the corresponding detection limit (DL). This threshold is based on the Practical Quantitation Limit defined by the United States Environmental Protection Agency and takes into account the potential for reduced accuracy when concentrations approach or are below DLs (USEPA 2000; AENV 2006). This criterion was not applied to pH, however, because detection limits are not applicable to pH in the deionized water used to prepare field blanks.

The implications of notable results in field blanks to data quality were evaluated relative to concentrations observed in surface waters sampled during the field program. The aim of this evaluation was to determine whether contamination:

- was limited to a field blank or was apparent in the corresponding water samples as well;
- resulted in a consistent bias; and,
- was severe enough to warrant invalidating the affected data.



To address these questions, notable concentrations in blank samples were interpreted as follows:

- If a blank QC sample had a detectable concentration of a parameter that was higher than the concentration measured in corresponding surface water samples, it was assumed that the concentration in the blank was the result of an isolated field or lab error. In this case, the corresponding water samples were considered uncontaminated.
- If the detectable concentration in the blank QC sample was less than 10% of the corresponding surface water concentration, and less than five times the mean DL, the data for the corresponding water samples were considered acceptable for the parameter in question and were included in further analysis.

A3.4.2 Duplicate Samples

Differences between concentrations measured in duplicate water and sediment samples were calculated as the relative percent difference (RPD) for each parameter. Before calculating the RPD, concentrations below the DL were replaced with the DL value in cases when only one of the concentrations for a given parameter was detectable. The RPD was calculated using the following formula:

$$RPD = (|difference\ in\ concentration\ between\ two\ of\ the\ duplicate\ samples| / mean\ concentration) \times 100$$

The RPD value for a given parameter was considered notable if:

- it was greater than 20%; and,
- concentrations in one or both samples were greater than or equal to five times the DL.

The number of parameters with exceedances of the evaluation criteria was compared with the total number of parameters analyzed to evaluate analytical precision. Analytical precision was rated as follows:

- **high**, if less than 10% of the total number of parameters were notably different from one another;
- **moderate**, if 10% to 30% of the total number of parameters were notably different from one another; or,
- **low**, if more than 30% of the total number of parameters were notably different from one another.

For chlorophyll *a* duplicate results, differences between concentrations were calculated as standard deviation and standard error, in addition to RPD, for each station and date.

A3.4.3 Dissolved to Total Results Comparison

Measured dissolved concentrations in the water quality data (discrete and depth-integrated samples) for a number of nutrient and metals constituents were compared to their corresponding measured total concentrations. Samples were screened by a comparison of values between samples (RPD) and the value relative to the detection limit (DL; greater than 5xDL). If the dissolved concentration was greater than 20% of the corresponding total concentration, and both (total and dissolved) concentrations were greater than 5xDL, the dissolved concentration was considered notable.



A3.5 Quality Control Results

A3.5.1 Water Quality Field Measurements

Multi-meters were used to take in situ measurements through the water column at each sampling location of water temperature, pH, dissolved oxygen (DO), and conductivity. Several multi-meters were used during each seasonal program because multiple crews were in the field at the same time.

For the under-ice program, a Hydrolab Series 5 Minisonde multiprobe and a YSI 600QS multi-meter were used. Despite pre-program servicing of the meters and daily calibration, these meters did not function reliably for pH and sometimes DO (e.g., periodically reading pH and DO parameters at levels that were outside of an acceptable range). For the open-water programs, two Hydrolab Series 5 datasondes were used. These meters functioned reliably over each open-water program.

Throughout the program, a set of Winkler samples were collected from specific locations for titration to provide DO results to compare to corresponding meter readings. Water was collected with a Kemmerer at a depth that had an in situ DO reading measured, and transferred to biochemical oxygen demand bottles, which were filled such that there was no air space in the bottle after filling. Titrations were performed as soon as possible after the samples were collected. Each DO titration was performed using a Hach model OX-2P titration kit, which measures DO between 0.2 and 20 milligrams per litre (mg/L). The Winkler DO data were compared to the field DO readings at the end of each day, to test the reliability of the meter readings.

Steps were taken in the field to achieve the highest quality of field data possible, but due to the lack of consistency in the data, it was decided to not include field-measured pH data from the under-ice event in the baseline report. All field data (i.e., water temperature, pH, DO, and conductivity) from the open-water programs have been included in the baseline report.

A3.5.2 Discrete Water Quality Field Blanks

Twelve discrete blank QC samples (three travel blanks, four field blanks, and five equipment blanks) were collected and analyzed during the water quality program. All measured parameter concentrations in the blank QC samples were reviewed, especially those where concentrations measured more than or equal to five times the detection limit (i.e., reportable detections). Of all the parameters analyzed from the QC blank samples, reportable detections occurred in 1.5% of the entire dataset.

- Equipment blanks had the highest number of reportable detections (2.4%), with the most substantial detections found in the under-ice (winter) program equipment blank for a number of metals (e.g., total sodium, aluminum, iron, titanium, and zinc). Dissolved boron and zinc concentrations were also measured well above the corresponding total concentrations, which is consistent with observations from the under-ice dataset. Few reportable detections were noted for the open-water equipment QC blank samples, which were limited to conductivity measurements slightly above five times the DL. Overall, the number of reportable detections in the equipment blanks were not of a magnitude that is considered to have any influence on the results of the water quality samples.
- Reportable detections were lower in the field QC blanks (1.1%) and travel QC blanks (0.4%), which were limited to slight conductivity measurements just above five times the DL. These detections were not considered to have any influence on the results of the water quality samples.



Results for the discrete water quality field blank samples are provided in Section A4, Table A4-1.

A3.5.3 Discrete Water Quality Duplicate Samples

Seven discrete duplicate samples were collected during the 2014 program: two from the under-ice (winter) program, and five from the open-water programs (one in late spring, and two in summer and fall). Duplicate samples were collected as follows:

- winter: stations Af-7 and C-L1;
- late spring: station FF2-4;
- summer: stations S3 and Lac de Gras (LDG) Outlet; and,
- fall: stations S2 and FF2-3.

Across the dataset of duplicate samples (i.e., seven pairs of samples in total), 2.2% of the concentrations differed by more than 20% between duplicate pairs (Table A3.5-1).

Overall, the level of precision for this dataset is rated as high.

Table A3.5-1 Summary of Relative Percent Difference Between Discrete Water Quality Duplicate Samples

Sample Month	Duplicate Pairs	RPD over 20%	
		Number of Parameters	Percent of Parameters
Winter	Af-7	1	1.1
	C-L1	5	5.5
Late spring	FF2-4	3	3.3
Summer	S3	3	3.3
	LDG Outlet	1	1.1
Fall	S2	1	1.1
	FF2-3	0	0
All duplicate pairs (total)		14	2.2

RPD = relative percent difference; % = percent.

Results for the discrete water quality duplicate samples are provided in Section A4, Table A4-2.

A3.5.4 Depth-Integrated Water Quality Field Blanks

Six depth-integrated water quality blank QC samples (two travel blanks and four field blanks) were collected and analyzed during the plankton field program (a travel and field QC blank was collected from each of the open-water programs). The blank QC data were reviewed for parameters with concentrations reported at more than or equal to five times the detection limit (i.e., reportable parameter detections).

One reportable parameter detection in a field blank sample was identified, which corresponded to 1.4% of the entire dataset.



Results for the depth-integrated water quality field blank samples are provided in Section A4, Table A4-3.

A3.5.5 Depth-Integrated Water Quality Duplicate Samples

Three depth-integrated duplicate QC samples were collected during the 2014 plankton program, one during each of the three sampling events. Duplicate samples were collected as follows:

- late spring: station FF2-5;
- summer: station S3; and,
- fall: station Ac-1.

No notable results were determined in this QC data set (i.e., three pairs of samples in total); therefore, the level of precision for this dataset is rated as high.

Results for the depth-integrated water quality duplicate samples are provided in Section A4, Table A4-4.

A3.5.6 Sediment Quality Duplicate Samples

Two sediment quality duplicate samples were collected during the 2014 summer program.

Across the dataset of sediment quality duplicate samples (i.e., two pairs of samples in total), 10.3% of the values differed by more than 20% between duplicate pairs (Table A3.5-2). Overall, the level of precision for this dataset is rated as moderate to high. Of the 39 parameters, six of them had RPD values over 20% in at least one pair of duplicate samples.

Table A3.5-2 Summary of Relative Percent Difference Between Sediment Quality Duplicate Samples

Sample Month	Duplicate Pairs	RPD over 20%	
		Number of Parameters	Percent of Parameters
Fall	Ab-1	2	5.1
	FF2-4	6	15.4
All duplicate pairs (total)		8	10.3

RPD = relative percent difference; % = percent.

One duplicate sample was collected for analysis of polychlorinated dibenzo-p-dioxin (PCDDs; dioxin) and polychlorinated dibenzofuran (PCDFs; furan) congeners. Overall, 25.0% of the congener values differed by more than 20% between the duplicate pair (Table A4-6), and the level of precision of the dataset is rated as moderate.

Results for the sediment quality duplicate samples, and the dioxin and furan duplicate sample are provided in Section A4, Tables A4-5 and A4-6, respectively.



A3.5.7 Chlorophyll a Duplicate Samples

Duplicate samples were collected for chlorophyll *a* analyses at all stations during all sampling events associated with the 2014 sampling program (Table A4-7).

Six duplicate chlorophyll *a* samples (12.8%) were considered notably different from one another (i.e., RPD value was greater than 20%). These samples were:

- Lac du Sauvage (Station Aa-4) collected in summer (RPD = 29.7%);
- Duchess Lake (Station Af-1) collected in fall (RPD = 96.1%);
- Lac de Gras Slipper Bay Area (Station S2) collected in fall (RPD = 54.3%);
- Lac de Gras Far Field 2 Area (Station FF2-2) collected in late spring (RPD = 26.0%);
- Lac de Gras Far Field 2 Area (Station FF2-3) collected in fall (RPD = 67.7%); and,
- Lac de Gras Far Field 2 Area (Station FF2-5) collected in fall (RPD = 20.6%).

Overall, the level of reproducibility in the field data collection for the chlorophyll *a* is rated as moderate.

A3.5.8 Dissolved to Total Results Comparison

For the discrete water quality dataset, 1.6% of the dissolved parameter concentrations were considered notable; that is, they were more than 20% higher than their corresponding total concentration. The overall level of precision for this dataset is therefore rated as high. Of these parameters, 5.4% of the dissolved organic carbon concentrations were higher than their TOC concentrations. Additionally, 5.4% of the dissolved aluminum, 32.6% of the dissolved barium, and 8.7% of the dissolved copper concentrations were more than 20% higher than their corresponding total concentrations.

No notable dissolved parameters were identified in the depth-integrated water quality dataset. The overall level of precision for this dataset is therefore rated as high.



A3.6 Overall Data Quality

The results of the overall review of field data indicated that the majority of the data recoded in the field was of high quality. Key outcomes included:

- All of the field measurements collected throughout the three open-water programs were within the ranges that would be expected for northern waters.
- Although appropriate mitigations were taken in the field to achieve reliable field data, the range observed in the pH data from the under-ice (winter) sampling trip was too large to report. Field-measured pH data for this sampling trip was excluded from the reporting.
- Evaluation of the water quality QC samples indicated that:
 - detectable parameters were noted in 1.5% of the discrete blank samples and 1.4% of the depth-integrated blank samples;
 - 2.2% of duplicate concentrations differed by more than 20%; depth-integrated water quality duplicate pairs had no notable results;
 - 1.6% of the values differed by more than 20% between dissolved and total discrete water quality parameters.
- Evaluation of the sediment quality QC samples indicated that:
 - 10.3% of the duplicate concentrations differed by more than 20%.

The overall quality of the water quality data was determined to be high and sediment data quality determined to be moderate to high. Therefore, the results reported herein are determined to be adequate to meet the needs of the program.

A4 DETAILED RESULTS TABLES

Table A4-1 Discrete Water Quality Blank Results From the Jay Project Baseline Study Area, 2014

Sample Name	DL 1 ^(a)	DL 2 ^(a)	Unit	Equipment Blank	Travel Blank	Field Blank	Equipment Blank	Travel Blank	Equipment Blank	Equipment Blank	Field Blank	Field Blank	Equipment Blank	Travel Blank	Field Blank
Sampling Season				Winter	Winter	Late Spring	Late Spring	Summer	Summer	Summer	Summer	Summer	Fall	Fall	Fall
Sample Date				23-Apr-14	29-Apr-14	21-Jul-14	22-Jul-14	11-Aug-14	13-Aug-14	15-Aug-14	16-Aug-14	15-Aug-14	11-Sep-14	12-Sep-14	14-Sep-14
Conventional Parameters															
Alkalinity, gran (as H ⁺)	0.1	-	meq/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1
Alkalinity, total (as CaCO ₃)	2.0	-	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Conductance	0.2	-	µS/cm	0.70	0.75	0.45	0.82	0.69	1.08^(b)	1.42^(b)	1.20^(b)	1.82^(b)	1.29^(b)	1.62^(b)	1.28^(b)
Hardness	0.5	-	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
pH	0.1	-	-	4.67	4.72	5.26	5.32	5.13	5.28	5.43	5.28	5.28	5.12	5.18	5.10
Total dissolved solids	10.0	20.0	mg/L	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<20.0	<20.0	-	<10.0	<10.0	<10.0
Total suspended solids	3.0	-	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Turbidity	0.1	-	NTU	0.22	<0.1	<0.1	<0.1	<0.1	0.17	0.20	0.13	-	<0.1	<0.1	0.29
Major Ions															
Bicarbonate	5.0	-	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Calcium	0.02	-	mg/L	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chloride	0.5	-	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoride	0.02	-	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.02	<0.02	<0.02
Magnesium	0.004	-	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.006
Potassium	0.02	-	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Sodium	0.005	-	mg/L	0.042^(b)	<0.005	0.080^(b)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Sulphate	0.05	-	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nutrients															
Total organic carbon	0.5	-	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dissolved organic carbon	0.5	-	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total nitrogen (calculated)	0.05	-	mg N/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05
Total Kjeldahl nitrogen	0.05	-	mg N/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total ammonia	0.005	-	mg N/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate	0.006	-	mg N/L	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Nitrite	0.002	-	mg N/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total phosphorus	0.001	-	mg P/L	<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 dissolved phosphorus	0.001	-	mg P/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved orthophosphate	0.001	-	mg P/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001
Silica, reactive	0.005	0.01	mg/L	<0.005	<0.005	<0.005	<0.005	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01
Other Parameters															
Benzene	0.5	-	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5	-	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	0.5	-	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylenes	0.71	-	µg/L	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	100	-	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100



Table A4-1 Discrete Water Quality Blank Results From the Jay Project Baseline Study Area, 2014

Sample Name	DL 1 ^(a)	DL 2 ^(a)	Unit	Equipment Blank	Travel Blank	Field Blank	Equipment Blank	Travel Blank	Equipment Blank	Equipment Blank	Field Blank	Field Blank	Equipment Blank	Travel Blank	Field Blank	
				Winter	Winter	Late Spring	Late Spring	Summer	Summer	Summer	Summer	Summer	Fall	Fall	Fall	
				23-Apr-14	29-Apr-14	21-Jul-14	22-Jul-14	11-Aug-14	13-Aug-14	15-Aug-14	16-Aug-14	15-Aug-14	11-Sep-14	12-Sep-14	14-Sep-14	
Petroleum hydrocarbons - F1 (C6-C10)	100	-	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Petroleum hydrocarbons - F2 (C10-C16)	250	-	µg/L	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250
Fecal Coliform	1	-	CFU/100mL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Metals																
Aluminum	0.3	-	µg/L	6.24 ^(b)	0.64	<0.3	<0.3	<0.3	<0.3	1.80 ^(b)	<0.3	<0.3	<0.3	<0.3	<0.3	0.65
Antimony	0.02	-	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	0.02	-	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Barium	0.05	-	µg/L	0.206	<0.05	<0.05	<0.05	<0.05	<0.05	0.051	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Beryllium	0.01	-	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	0.01	-	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	1.0	-	µg/L	4.8	1.6	<1.0	2.8	2.2	<1.0	<1.0	1.1	<1.0	<1.0	<1.0	1.5	1.1
Cadmium	0.005	-	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cesium	0.005	0.1	µg/L	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	0.06	-	µg/L	0.061	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Cobalt	0.01	-	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	0.1	-	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	0.29	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Iron	1.0	-	µg/L	7.8 ^(b)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.5	<1.0	<1.0	<1.0	<1.0	<1.0
Lead	0.01	-	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	0.5	-	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Manganese	0.05	-	µg/L	0.139	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.059
Mercury	0.0005	-	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	0.00087	<0.0005	<0.0005	<0.0005	<0.0005	0.00081	<0.0005	<0.0005	<0.0005
Molybdenum	0.05	-	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	0.06	-	µg/L	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Selenium	0.04	-	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	0.005	-	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	0.05	-	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Thallium	0.01	-	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	0.05	-	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	0.1	-	µg/L	0.78 ^(b)	<0.1	<0.1	<0.1	<0.1	<0.1	0.15	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	0.01	-	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	0.05	-	µg/L	<0.05	<0.05	0.054	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	0.8	-	µg/L	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Dissolved Metals																
Aluminum	0.3	-	µg/L	2.12 ^(b)	0.69	0.71	<0.3	<0.3	0.31	<0.3	<0.3	0.91	<0.3	<0.3	<0.3	0.71
Antimony	0.02	-	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	0.02	-	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Barium	0.05	-	µg/L	5.68	<0.05	0.14	<0.05	<0.05	0.070	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.065
Beryllium	0.01	-	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Table A4-1 Discrete Water Quality Blank Results From the Jay Project Baseline Study Area, 2014

Sample Name	DL 1 ^(a)	DL 2 ^(a)	Unit	Equipment Blank	Travel Blank	Field Blank	Equipment Blank	Travel Blank	Equipment Blank	Equipment Blank	Field Blank	Field Blank	Equipment Blank	Travel Blank	Field Blank		
Sampling Season				Winter	Winter	Late Spring	Late Spring	Summer	Summer	Summer	Summer	Summer	Summer	Summer	Fall	Fall	Fall
Sample Date				23-Apr-14	29-Apr-14	21-Jul-14	22-Jul-14	11-Aug-14	13-Aug-14	15-Aug-14	16-Aug-14	15-Aug-14	11-Sep-14	12-Sep-14	14-Sep-14		
Bismuth	0.01	-	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Boron	1.0	-	µg/L	8.7 ^(D)	<1.0	<1.0	4.2	2.3	<1.0	<1.0	2.0	<1.0	<1.0	<1.0	1.4	<1.0	
Cadmium	0.005	-	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cesium	0.005	0.1	µg/L	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Chromium	0.06	-	µg/L	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.09	<0.06	<0.06	<0.06	
Chromium - hexavalent	1.0	-	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Cobalt	0.01	-	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Copper	0.1	-	µg/L	0.13	<0.1	0.14	<0.1	<0.1	<0.1	0.14	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Iron	1.0	-	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Lead	0.01	-	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Lithium	0.5	-	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Manganese	0.05	-	µg/L	<0.05	<0.05	0.123	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.077	
Mercury	0.0005	-	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0007	<0.0005	
Molybdenum	0.05	-	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Nickel	0.06	-	µg/L	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	
Selenium	0.04	-	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	
Silver	0.005	-	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Strontium	0.05	-	µg/L	0.109	<0.05	0.105	<0.05	<0.05	0.051	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.075	
Thallium	0.005	0.01	µg/L	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Tin	0.05	-	µg/L	<0.05	<0.05	0.088	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Titanium	0.1	-	µg/L	0.11	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Uranium	0.01	-	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Vanadium	0.05	-	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Zinc	0.8	-	µg/L	9.15 ^(D)	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	0.98	<0.8	<0.8	1.14	
Calculated Quantities																	
Values over five times the DL	-	-	%	7.6	0	1.1	0	0	1.1	2.2	1.1	1.1	1.1	1.1	1.1	1.1	

Note:

Bolded values failed to pass one or more quality control checks.

The percentage of values over five times the DL for the entire dataset is 1.5%.

(D) = value is greater than five times the method detection limit.

a) = samples were typically analyzed at the method detection limit DL 1; however, a second detection limit (DL 2DL) apply to some parameters.

DL = Detection Limit; H⁺ = hydrogen ions; CaCO₃ = calcium carbonate; BTEX = benzene, toluene, ethylbenzene, and xylenes; - = no data or not applicable; meq/L = milliequivalents per litre; mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; NTU = nephelometric turbidity units; mg P/L = milligrams phosphorus per litre; mg N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; CFU/100 mL = coliform forming units per 100 millilitres; % = percent; < = less than.

Table A4-2 Discrete Water Quality Duplicate Results From the Jay Project Baseline Study Area, 2014

Location					Af-7			C-L1			FF2-4			S3			LDG Outlet			S2			FF2-3				
Sample Name					Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate			
Sampling Season					Winter	Winter		Winter	Winter		Late Spring	Late Spring		Summer	Summer		Summer	Summer		Fall	Fall		Fall	Fall			
Sample Date	Unit	DL 1 ^(A)	DL 2 ^(A)	DL 3 ^(A)	25-Apr-14	25-Apr-14	RPD	25-Apr-14	25-Apr-14	RPD	20-Jul-14	20-Jul-14	RPD	14-Aug-14	14-Aug-14	RPD	15-Aug-14	15-Aug-14	RPD	8-Sep-14	8-Sep-14	RPD	12-Sep-14	12-Sep-14	RPD		
Conventional Parameters																											
Alkalinity, gran (as H+)	meq/L	0.1	-	-	0.15	<0.1	-	0.16	0.15	-	0.10	0.11	-	<0.1	<0.1	-	<0.1	<0.1	-	0.12	0.12	-	0.12	0.10	-		
Alkalinity, total (as CaCO ₃)	mg/L	2.0	-	-	5.9	5.1	-	9.2	9.3	-	4.7	5.1	-	4.5	4.3	-	3.8	4.1	-	6.0	6.8	-	6.2	5.7	-		
Conductance	µS/cm	0.2	-	-	21.7	22.7	4.5%	32.4	32.8	1.2%	29.2	29.2	0.0%	31.6	31.7	0.3%	23.3	23.4	0.4%	46.8	48.3	3.2%	30.4	29.9	1.7%		
Hardness	mg/L	0.5	-	-	7.39	7.63	3.2%	11.9	11.8	0.8%	7.98	7.58	5.1%	7.80	7.62	2.3%	6.79	6.58	3.1%	10.1	10.2	1.0%	8.06	7.89	2.1%		
pH	-	0.1	-	-	6.33	6.24	1.4%	6.58	6.62	0.6%	6.66	6.73	1.0%	6.52	6.52	0.0%	6.51	6.53	0.3%	6.72	6.88	2.4%	6.93	6.87	0.9%		
Total dissolved solids	mg/L	10.0	20.0	-	10.8 ^(T)	10.9	0.9%	15.6	15.8	1.3%	13.8	10.7	25.3%	14.5	14.3	1.4%	10.6	10.6	0.0%	21.8	22.9	4.9%	14.1	13.4	5.1%		
Total suspended solids	mg/L	3.0	-	-	<3.0	<3.0	-	<3.0	<3.0	-	<3.0	<3.0	-	<3.0	<3.0	-	<3.0	<3.0	-	<3.0	<3.0	-	<3.0	<3.0	-		
Turbidity	NTU	0.1	-	-	0.66	0.59	11.2%	0.34	0.63	-	0.55	0.50	-	0.39	0.39	-	0.31	0.37	-	0.42	0.35	-	0.35	0.30	-		
Major Ions																											
Bicarbonate	mg/L	5.0	-	-	7.2	6.2	-	11.2	11.4	-	5.8	6.2	-	5.5	5.3	-	<5	5.0	-	7.3	8.3	-	7.5	7.0	-		
Calcium	mg/L	0.02	-	-	1.34	1.38	2.9%	1.77	1.76	0.6%	1.60	1.51	5.8%	1.56	1.47	5.9%	1.34	1.27	5.4%	1.98	2.03	2.5%	1.64	1.57	4.4%		
Chloride	mg/L	0.5	-	-	0.72	1.0	-	<0.5	<0.5	-	2.36	2.38	-	2.48	2.50	-	1.44	1.44	-	4.36	4.48	2.7%	2.03	2.00	-		
Fluoride	mg/L	0.02	-	-	0.021	<0.02	-	0.041	0.043	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	0.026	0.026	-	<0.02	<0.02	-		
Magnesium	mg/L	0.004	-	-	0.98	1.01	3.0%	1.82	1.8	1.1%	0.968	0.922	4.9%	0.951	0.956	0.5%	0.839	0.824	1.8%	1.25	1.25	0.0%	0.961	0.963	0.2%		
Potassium	mg/L	0.02	-	-	0.774	0.81	4.5%	1.28	1.29	0.8%	0.789	0.858	8.4%	0.936	0.937	0.1%	0.700	0.691	1.3%	1.32	1.36	3.0%	0.885	0.888	0.3%		
Sodium	mg/L	0.005	-	-	1.10	1.20	8.7%	1.31	1.35	3.0%	1.80	1.68	6.9%	2.19	2.17	0.9%	1.36	1.27	6.8%	3.69	3.8	2.9%	1.85	1.72	7.3%		
Sulphate	mg/L	0.05	-	-	1.87	1.99	6.2%	3.81	3.9	2.3%	3.44	3.36	2.4%	3.73	3.72	0.3%	2.68	2.67	0.4%	5.53	5.74	3.7%	2.97	2.81	5.5%		
Nutrients																											
Total organic carbon	mg/L	0.5	1	-	4.81	4.98	3.5%	4.96	5.24	-	2.84	2.62	8.1%	2.54	2.44	-	2.42	2.29	-	3.22	2.90	10.5%	2.47	2.51	-		
Dissolved organic carbon	mg/L	0.5	-	-	4.52	4.73	4.5%	4.88	4.95	1.4%	2.83	2.89	2.1%	2.36	2.49	-	2.53	2.26	-	3.00	2.97	1.0%	2.79	2.58	7.8%		
Total nitrogen	mg N/L	0.05	-	-	0.364	0.409	11.6%	0.151	0.284	-	0.136	0.146	-	0.184	0.138	-	<0.05	<0.05	-	<0.05	<0.05	-	0.175	0.193	-		
Total Kjeldahl nitrogen	mg N/L	0.05	-	-	0.258	0.315	19.9%	0.137	0.269	-	0.136	0.146	-	0.184	0.138	-	<0.05	<0.05	-	<0.05	<0.05	-	0.175	0.193	-		
Total ammonia	mg N/L	0.005	-	-	<0.005	<0.005	-	<0.005	<0.005	-	0.0075	0.0059	-	<0.005	<0.005	-	0.0066	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-		
Nitrate	mg N/L	0.006	-	-	0.106	0.0942	11.8%	0.014	0.0149	-	<0.006	<0.006	-	<0.006	<0.006	-	<0.006	<0.006	-	0.0102	0.0233	-	<0.006	<0.006	-		
Nitrite	mg N/L	0.002	-	-	<0.002	<0.002	-	<0.002	<0.002	-	<0.002	<0.002	-	<0.002	<0.002	-	<0.002	<0.002	-	<0.002	0.006	-	<0.002	<0.002	-		
Total phosphorus	mg P/L	0.001	-	-	0.0185	0.0218	16.4%	0.0092	0.0099	7.3%	0.0040	0.0047	-	0.0060	0.0049	-	0.0045	0.0079	-	0.0031	0.0034	-	0.0045	0.0054	-		
Total dissolved phosphorus	mg P/L	0.001	-	-	0.0045	0.0045	-	0.007	0.0041	-	0.0013	0.0019	-	0.0033	0.0025	-	0.0024	0.0023	-	0.0012	0.0013	-	0.0016	0.0021	-		
Dissolved orthophosphate	mg P/L	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	-		
Silica, reactive	mg/L	0.005	0.01	-	0.301	0.275	9.0%	0.232	0.234	0.9%	0.0757	0.0713	6.0%	0.057	0.057	0.0%	0.048	0.048	-	0.067	0.067	0.0%	0.034	0.061	-		
Other Parameters																											
Benzene	µg/L	0.5	-	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-		
Ethylbenzene	µg/L	0.5	-	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-		
Toluene	µg/L	0.5	-	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	-		
Xylenes	µg/L	0.71	-	-	<0.71	<0.71	-	<0.71	<0.71	-	<0.71	<0.71	-	<0.71	<0.71	-	<0.71	<0.71	-	<0.71	<0.71	-	<0.71	<0.71	-		
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	100	-	-	<100	<100	-	<100	<100	-	<100	<100	-	<100	<100	-	<100	<100	-	<100	<100	-	<100	<100	-		
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	100	-	-	<100	<100	-	<100	<100	-	<100	<100	-	<100	<100	-	<100	<100	-	<100	<100	-	<100	<100	-		
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	250	-	-	<250	<250	-	<250	<250	-	<250	<250	-	<250	<250	-	<250	<250	-	<250	<250	-	<250	<250	-		
Fecal Coliform	CFU/100mL	1	-	-	<1	<1	-	<1	<1	-	<1	<1	-	<1	<1	-	<1	<1	-	<1	<1	-	<1	<1	-		



Table A4-2 Discrete Water Quality Duplicate Results From the Jay Project Baseline Study Area, 2014

Location	Sample Name	Sampling Season	Sample Date	Unit	DL 1 ^(A)	DL 2 ^(A)	DL 3 ^(A)	Af-7		RPD	C-L1		RPD	FF2-4		RPD	S3		RPD	LDG Outlet		RPD	S2		RPD	FF2-3		RPD		
								Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate
								Winter	Winter		Winter	Winter		Late Spring	Late Spring		Summer	Summer		Summer	Summer		Summer	Summer		Fall	Fall		Fall	Fall
								25-Apr-14	25-Apr-14		25-Apr-14	25-Apr-14		20-Jul-14	20-Jul-14		14-Aug-14	14-Aug-14		15-Aug-14	15-Aug-14		8-Sep-14	8-Sep-14		12-Sep-14	12-Sep-14			
Total Metals																														
Aluminum	µg/L	0.3	-	-	8.01	8.92	10.8%	6.41	14.0	74.4%	4.96	4.46	10.6%	5.75	6.60	13.8%	3.92	3.58	9.1%	4.00	3.72	7.3%	5.36	4.99	7.1%					
Antimony	µg/L	0.02	-	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	0.022	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-					
Arsenic	µg/L	0.02	-	-	0.556	0.543	2.4%	0.504	0.501	0.6%	0.282	0.257	9.3%	0.196	0.203	3.5%	0.190	0.183	3.8%	0.201	0.213	5.8%	0.296	0.295	0.3%					
Barium	µg/L	0.05	-	-	4.57	4.42	3.3%	3.99	4.43	10.5%	2.59	2.56	1.2%	2.61	2.69	3.0%	2.00	1.96	2.0%	3.10	3.05	1.6%	2.44	2.39	2.1%					
Beryllium	µg/L	0.01	-	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-					
Bismuth	µg/L	0.01	-	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-					
Boron	µg/L	1.0	-	-	2.0	4.1	-	5.9	6.9	15.6%	3.7	3.7	-	1.6	1.7	-	1.5	1.5	-	4.1	4.0	-	2.1	2.1	-					
Cadmium	µg/L	0.005	-	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-					
Cesium	µg/L	0.005	0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	0.0071	0.0059	-	0.0095	0.0089	-	0.0079	0.0075	-	0.0096	0.0107	-	0.0073	0.0079	-					
Chromium	µg/L	0.06	-	-	0.074	0.094	-	0.19	0.119	-	0.07	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-					
Cobalt	µg/L	0.01	-	-	0.037	0.04	-	0.021	0.029	-	0.016	0.014	-	0.027	0.032	-	0.027	0.034	-	0.026	0.029	-	0.011	0.013	-					
Copper	µg/L	0.1	-	-	1.05	1.04	1.0%	1.03	0.91	12.4%	0.68	0.86	23.4%	0.79	0.91	14.1%	0.54	0.55	1.8%	0.61	0.62	1.6%	0.59	0.66	11.2%					
Iron	µg/L	1.0	-	-	15.2	13.7	10.4%	15	24.4	47.7%	6.5	5.9	9.7%	6.2	8.2	27.8%	3.1	3.9	-	11.1	11.7	5.3%	4.6	6.2	-					
Lead	µg/L	0.01	-	-	0.011	<0.01	-	0.026	0.039	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	0.02	-					
Lithium	µg/L	0.5	-	-	1.89	1.81	-	2.17	2.6	-	1.66	1.25	-	1.28	1.44	-	1.59	1.53	-	1.37	1.27	-	1.77	1.68	-					
Manganese	µg/L	0.05	-	-	7.54	6.46	15.4%	3.03	3.04	0.3%	2.81	2.84	1.1%	2.48	2.80	12.1%	1.87	2.15	13.9%	3.50	3.48	0.6%	1.56	1.66	6.2%					
Mercury	µg/L	0.0005	0.25	-	<0.0005	0.73	-	<0.0005	<0.0005	-	<0.0005	<0.0005	-	0.00055	0.00052	-	<0.0005	<0.0005	-	0.00057	<0.0005	-	<0.0005	<0.0005	-					
Molybdenum	µg/L	0.05	-	-	<0.05	<0.05	-	<0.05	0.063	-	0.517	0.545	5.3%	0.566	0.565	0.2%	0.238	0.235	-	1.08	1.13	4.5%	0.468	0.441	5.9%					
Nickel	µg/L	0.06	-	-	0.579	0.603	4.1%	0.807	0.865	6.9%	0.597	0.572	4.3%	0.856	0.872	1.9%	0.808	0.86	6.2%	0.777	0.719	7.8%	0.573	0.587	2.4%					
Selenium	µg/L	0.04	-	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-					
Silver	µg/L	0.005	-	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-					
Strontium	µg/L	0.05	-	-	8.96	8.79	1.9%	10.8	12	10.5%	18.2	17.2	5.6%	16.7	17.0	1.8%	12.1	12.2	0.8%	24.2	24.7	2.0%	18.3	17.6	3.9%					
Thallium	µg/L	0.01	-	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-					
Tin	µg/L	0.05	-	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-					
Titanium	µg/L	0.1	-	-	<0.1	0.17	-	<0.1	1.29	-	0.11	<0.1	-	0.12	0.36	-	<0.1	<0.1	-	<0.1	0.1	-	0.13	0.18	-					
Uranium	µg/L	0.01	-	-	0.044	0.044	-	0.011	0.013	-	0.070	0.068	2.9%	0.025	0.026	-	0.020	0.021	-	0.024	0.022	-	0.060	0.056	6.9%					
Vanadium	µg/L	0.05	-	-	0.118	0.118	-	0.136	0.144	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-					
Zinc	µg/L	0.8	-	-	<0.8	<0.8	-	0.81	9.82	-	<0.8	0.94	-	<0.8	1.02	-	<0.8	<0.8	-	<0.8	<0.8	-	<0.8	0.99	-					
Dissolved Metals																														
Aluminum	µg/L	0.3	-	-	6.5	6.73	3.5%	6.71	8.07	18.4%	2.26	2.33	3.1%	2.83	2.82	0.4%	3.26	2.18	39.7%	1.86	1.41	-	2.38	2.11	12.0%					
Antimony	µg/L	0.02	-	-	<0.02	<0.02	-	<0.02	0.02	-	<0.02	0.027	-	0.021	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-					
Arsenic	µg/L	0.02	-	-	0.476	0.507	6.3%	0.48	0.453	5.8%	0.246	0.254	3.2%	0.196	0.192	2.1%	0.190	0.177	7.1%	0.232	0.205	12.4%	0.260	0.261	0.4%					
Barium	µg/L	0.05	-	-	7.5 ^(M)	9.77	26.3%	8.92	15.4	53.3%	2.40	2.48	3.3%	2.51	2.48	1.2%	1.93	1.89	2.1%	3.16	3.09	2.2%	2.46	2.29	7.2%					
Beryllium	µg/L	0.01	-	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-					
Bismuth	µg/L	0.01	-	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-					
Boron	µg/L	1.0	-	-	4.3	4.3	-	6.6	10.9	49.1%	2.7	2.9	-	1.7	1.5	-	1.5	1.3	-	1.9	4.2	-	2.2	3.5	-					
Cadmium	µg/L	0.005	-	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-					
Cesium	µg/L	0.005	0.01	0.1	<0.1	<0.1	-	<0.1	<0.1	-	0.0061	0.0061	-	0.0082	0.0086	-	0.0079	0.0090	-	0.0085	0.011	-	0.0069	0.0073	-					
Chromium	µg/L	0.06	-	-	0.098	0.078	-	0.109	0.11	-	<0.06	<0.06	-	<0.06	0.084	-	0.141	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-					

Table A4-2 Discrete Water Quality Duplicate Results From the Jay Project Baseline Study Area, 2014

Location Sample Name Sampling Season Sample Date	Unit	DL 1 ^(A)	DL 2 ^(A)	DL 3 ^(A)	Af-7		RPD	C-L1		RPD	FF2-4		RPD	S3		RPD	LDG Outlet		RPD	S2		RPD	FF2-3		RPD		
					Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate
					Winter	Winter		Winter	Winter		Late Spring	Late Spring		Summer	Summer		Summer	Summer		Fall	Fall		Fall	Fall		Fall	Fall
					25-Apr-14	25-Apr-14		25-Apr-14	25-Apr-14		20-Jul-14	20-Jul-14		14-Aug-14	14-Aug-14		15-Aug-14	15-Aug-14		8-Sep-14	8-Sep-14		12-Sep-14	12-Sep-14			
Chromium - hexavalent	µg/L	1.0	-	-	<1	<1	-	<1	<1	-	<1	<1	-	<1	<1	-	<1	<1	-	<1	<1	-	<1	<1	-		
Cobalt	µg/L	0.01	-	-	0.035	0.033	-	0.017	0.018	-	<0.01	<0.01	-	<0.01	<0.01	-	0.013	0.015	-	0.011	0.012	-	<0.01	<0.01	-		
Copper	µg/L	0.1	-	-	0.96	0.98	2.1%	1.0	0.93	7.3%	0.71	0.68	4.3%	0.87	0.57	41.7%	0.59	0.54	8.8%	0.74	0.66	11.4%	0.64	0.55	15.1%		
Iron	µg/L	1.0	-	-	9.7	8.9	8.6%	3.9	5.8	-	<1	<1	-	<1	<1	-	<1	<1	-	3.8	2.1	-	<1	<1	-		
Lead	µg/L	0.01	-	-	0.013	<0.01	-	0.012	0.017	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-		
Lithium	µg/L	0.5	-	-	2.05	2.13	-	2.51	2.03	-	1.65	1.32	-	1.53	1.22	-	1.55	1.39	-	1.45	1.42	-	2.03	1.73	-		
Manganese	µg/L	0.05	-	-	6.8	6.01	12.3%	1.56	1.7	8.6%	0.474	0.591	22.0%	0.751	0.565	28.3%	1.11	1.02	8.5%	0.815	1.19	37.4%	0.239	0.185	-		
Mercury	µg/L	0.0005	-	-	<0.0005	<0.0005	-	<0.0005	<0.0005	-	<0.0005	<0.0005	-	<0.0005	0.00066	-	<0.0005	<0.0005	-	0.00051	0.00057	-	<0.0005	<0.0005	-		
Molybdenum	µg/L	0.05	-	-	<0.05	<0.05	-	<0.05	<0.05	-	0.534	0.510	4.6%	0.615	0.547	11.7%	0.236	0.240	-	1.11	1.13	1.8%	0.469	0.450	4.1%		
Nickel	µg/L	0.06	-	-	0.564	0.58	2.8%	0.801	0.802	0.1%	0.608	0.575	5.6%	0.800	0.881	9.6%	0.849	0.773	9.4%	0.738	0.726	1.6%	0.545	0.556	2.0%		
Selenium	µg/L	0.04	-	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-		
Silver	µg/L	0.005	-	-	0.0051	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-		
Strontium	µg/L	0.05	-	-	8.99	9.28	3.2%	11.3	11.3	0.0%	18.0	17.7	1.7%	16.3	16.2	0.6%	12.1	11.6	4.2%	24.4	24.9	2.0%	18.4	17.2	6.7%		
Thallium	µg/L	0.005	0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-		
Tin	µg/L	0.05	-	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	0.055	-		
Titanium	µg/L	0.1	-	-	0.24	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-		
Uranium	µg/L	0.01	-	-	0.053	0.046	-	0.012	0.011	-	0.05	0.053	-	0.021	0.021	-	0.018	0.020	-	0.019	0.020	-	0.047	0.049	-		
Vanadium	µg/L	0.05	-	-	0.11	0.103	-	0.152	0.057	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	0.067	<0.05	-		
Zinc	µg/L	0.8	-	-	2.65	4.42	-	5.6	13.5	82.7%	<0.8	<0.8	-	0.99	1.08	-	1.06	1.16	-	<0.8	<0.8	-	0.94	<0.8	-		
Calculated Quantities																											
RPD values over 20%	-	-	-	-	-	-	2.2%	-	-	5.4%	-	-	3.3%	-	-	3.3%	-	-	1.1%	-	-	2.2%	-	-	0.0%		

Note:
Bolded values failed to pass one or more quality control checks. **Bolded** RPD values are greater than 20%.
 RPD was only calculated if samples failed the first quality control check (i.e., if they were greater than five times the DL).
 The percentage of RPD values over 20% for the entire dataset is 2.2%.
 (A) = samples were typically analyzed at the method detection limit DL 1, however a second detection limit (DL 2 DL) apply to some parameters.
 (M) = value exceeds the corresponding total metal value by 20% or more.
 (T) = value is outside the allowed specific conductivity vs. total dissolved solids ratio range.
 (S) = value is outside the allowed specific conductivity vs. total dissolved solids (calculated) ratio range.
 DL= Detection Limit; LDG = Lac de Gras; H⁺ = hydrogen ions; CaCO₃ = calcium carbonate; BTEX = benzene, toluene, ethylbenzene, and xylenes; - = no data or not applicable; meq/L = milliequivalents per litre; mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; NTU = nephelometric turbidity units; mg P/L = milligrams phosphorus per litre; mg N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; CFU/100 mL = coliform forming units per 100 millilitres; % = percent; < = less than.


Table A4-3 Depth-Integrated Water Quality Field Blank Results From the Jay Project Baseline Study Area, 2014

Sample Name	Unit	DL 1 ^(a)	DL 2 ^(a)	Field Blank	Travel Blank	Field Blank	Field Blank	Travel Blank	Field Blank
Sampling Season				Late Spring	Late Spring	Summer	Summer	Fall	Fall
Sample Date				21-Jul-14	22-Jul-14	11-Aug-14	15-Aug-14	12-Sep-14	14-Sep-14
Nutrients									
Total nitrogen	mg N/L	0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05
Total dissolved nitrogen	mg N/L	0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl nitrogen	mg N/L	0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dissolved Kjeldahl nitrogen	mg N/L	0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total ammonia	mg N/L	0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate	mg N/L	0.006	-	<0.006	-	<0.006	<0.006	<0.006	<0.006
Nitrite	mg N/L	0.002	-	<0.002	-	<0.002	<0.002	<0.002	<0.002
Nitrate + nitrite	mg N/L	0.006	-	<0.006	-	<0.006	<0.006	<0.006	<0.006
Total phosphorus	mg P/L	0.001	-	<0.001	<0.001	<0.001	0.0013	<0.001	<0.001
Total dissolved phosphorus	mg P/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved orthophosphate	mg P/L	0.001	-	<0.001	-	<0.001	<0.001	<0.001	<0.001
Silica, reactive	mg/L	0.005	0.01	<0.005	-	0.103 ^(b)	<0.01	<0.01	<0.01
Calculated Quantities									
Values over five times the DL	%	-	-	0.0	0.0	7.7	0.0	0.0	0.0

Note:

Bolded values failed to pass one or more quality control checks.

The percentage of values over five times the DL for the entire dataset is 1.4%.

Due to laboratory error, not all parameters were analysed for the travel blank sample collected in late spring.

a) = samples were typically analysed at the detection limit DL 1; however, a second detection limit (DL 2) applies to some parameters.

b) = value is greater than five times the method detection limit.

DL = Detection Limit; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; mg/L = milligrams per litre; < = less than; - = no data or not applicable.

Table A4-4 Depth-Integrated Water Quality Duplicate Results From the Jay Project Baseline Study Area, 2014

Location				FF2-5-D		RPD (%)	S3-D		RPD (%)	Ac-1-D		RPD (%)
				Sample	Duplicate		Sample	Duplicate		Sample	Duplicate	
Sample Name	Unit	DL 1 ^(a)	DL 2 ^(a)	Late Spring	Late Spring	RPD (%)	Summer	Summer	RPD (%)	Fall	Fall	RPD (%)
Sampling Season				20-Jul	20-Jul		14-Aug	14-Aug		11-Sept	11-Sept	
Sample Date (2014)				20-Jul	20-Jul		14-Aug	14-Aug		11-Sept	11-Sept	
Nutrients												
Total nitrogen	mg N/L	0.05	-	0.131	0.197	-	0.151	0.142	-	0.191	0.191	-
Total dissolved nitrogen	mg N/L	0.05	-	0.066	0.192	-	0.087	0.2	-	0.213	0.138	-
Total Kjeldahl nitrogen	mg N/L	0.05	-	0.131	0.197	-	0.151	0.134	-	0.191	0.191	-
Dissolved Kjeldahl nitrogen	mg N/L	0.05	-	0.066	0.192	-	0.087	0.193	-	0.213	0.138	-
Total ammonia	mg N/L	0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
Nitrate	mg N/L	0.006	-	<0.006	<0.006	-	<0.006	0.0074	-	<0.006	<0.006	-
Nitrite	mg N/L	0.002	-	<0.002	<0.002	-	<0.002	<0.002	-	<0.002	<0.002	-
Nitrate + nitrite	mg N/L	0.006	-	<0.006	<0.006	-	<0.006	0.0074	-	<0.006	<0.006	-
Total phosphorus	mg P/L	0.001	-	0.0041	0.0054	-	0.0037	0.005	-	0.0053	0.0062	15.7%
Total dissolved phosphorus	mg P/L	0.001	-	0.001	<0.001	-	0.0019	0.0026	-	0.0011	0.0014	-
Dissolved orthophosphate	mg P/L	0.001	-	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-
Silica, reactive	mg/L	0.005	0.01	0.0723	0.073	1.0%	0.056	0.057	1.8%	0.058	0.059	1.7%
Calculated Quantities												
Values over five times the DL	%	-	-	-	-	0.0%	-	-	0.0%	-	-	0.0%

Note:

Bolded values failed to pass one or more quality control checks (**bolded** RPD values are greater than 20%).

The percentage of RPD values over 20% for the entire dataset is 0%.

a) samples were typically analysed at the detection limit DL 1; however, a second detection limit (DL 2) applies to some parameters.

DL = Detection Limit; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; mg/L = milligrams per litre; < = less than; - = no data or not applicable.

Table A4-5 Sediment Quality Duplicate Results From the Jay Project Baseline Study Area, 2014

Parameter	Units	DL	Ab-1		RPD	FF2-4		RPD
			Sample	Duplicate		Sample	Duplicate	
			9/11/2014	9/11/2014		9/14/2014	9/14/2014	
Physical Parameters								
Clay (<0.002 mm)	%	0.1	9.41	8.55	10%	5.97	6.04	1%
Silt (0.002 to 0.05 mm)	%	0.1	87.8	85.9	2%	90.7	91.5	1%
Sand (2 to 5 mm)	%	0.1	2.77	5.53	67%	3.30	2.42	31%
Nutrients								
Nitrogen, Available	mg/kg	200	1540	1580	3%	1480	1500	1%
Nitrate as N	mg/kg	1	<1.0	1.2	-	<1.0	1.1	-
Phosphorus, Available	mg/kg	50	964	1060	9%	1030	902	13%
Phosphate, Available	mg/kg	2	10.9	12.5	14%	23.0	21.4	7%
Carbon, Total	%	0.1	1.7	1.7	0%	1.8	1.7	6%
Carbon, Inorganic	mg/kg	1000	<1,000	<1,000	-	<1,000	<1,000	-
Carbon, Total Organic	mg/kg	1000	17,000	17,200	1%	17,900	11,700	42%
CaCO ₃ Equivalent	%	0.8	<0.80	<0.80	-	<0.80	<0.80	-
Total Metals								
Aluminum	ug/g	50	18,600	18,100	3%	18,900	19,500	3%
Antimony	ug/g	0.1	<0.10	<0.10	-	<0.10	<0.10	-
Arsenic	ug/g	0.1	143	192	29%	61.3	20.1	101%
Barium	ug/g	0.5	191	182	5%	123	123	0%
Beryllium	ug/g	0.2	0.57	0.56	-	0.60	0.59	-
Bismuth	ug/g	0.2	0.35	0.34	-	0.36	0.38	-
Boron	ug/g	5	5.0	<5.0	-	6.0	5.3	-
Cadmium	ug/g	0.1	0.19	0.2	-	<0.10	<0.10	-
Chromium	ug/g	0.5	63.7	63.0	1%	63.7	66.0	4%
Cobalt	ug/g	0.1	28.7	27.1	6%	32.1	26.5	19%
Copper	ug/g	0.5	33.0	32.9	0%	38.0	39.3	3%



Table A4-5 Sediment Quality Duplicate Results From the Jay Project Baseline Study Area, 2014

Parameter	Units	DL	Ab-1		RPD	FF2-4		RPD
			Sample	Duplicate		Sample	Duplicate	
			9/11/2014	9/11/2014		9/14/2014	9/14/2014	
Iron	ug/g	50	50,000	57,400	14%	40,900	31,100	27%
Lead	ug/g	0.5	5.24	5.23	0%	5.44	5.48	1%
Lithium	ug/g	0.5	45.7	45.0	2%	45.7	44.9	2%
Manganese	ug/g	1	1,670	1,680	1%	2,630	1,880	33%
Mercury	ug/g	0.005	0.019	0.020	-	0.016	0.016	-
Molybdenum	ug/g	0.1	3.54	4.25	18%	2.15	1.59	30%
Nickel	ug/g	0.5	49.4	49.5	0%	39.3	39.2	0%
Selenium	ug/g	0.2	0.26	0.27	-	0.23	0.22	-
Silver	ug/g	0.2	<0.20	<0.20	-	<0.20	<0.20	-
Strontium	ug/g	1	14.3	14.1	1%	15.7	14.3	9%
Sulfur	ug/g	100	540	490	-	540	500	-
Thallium	ug/g	0.05	0.34	0.31	9%	0.30	0.29	1%
Tin	ug/g	2	<2.0	<2.0	-	<2.0	<2.0	-
Titanium	ug/g	1	939	889	5%	918	917	0%
Uranium	ug/g	0.05	2.92	2.92	0%	3.63	3.68	1%
Vanadium	ug/g	0.2	53.6	52.8	2%	53.7	55.3	3%
Zinc	ug/g	5	72.8	71.9	1%	68.7	70.5	3%

Note:

Bolded RPD values are greater than 20%.

The percentage of RPD values over 20% for the entire dataset is 10.3%.

DL= Detection Limit; CaCO₃ = calcium carbonate; - = no data or not applicable; mg/kg = milligrams per kilogram; % = percent; < = less than.



Table A4-6 Sediment PCDD and PCDF Duplicate Results from the Jay Project Baseline Study Area, 2014

Sample Name	Unit	Ac-1	R-01-14	RPD
Sampling Season		Sample	Duplicate	
Sample Date		11-Sep-14	11-Sep-14	
Polychlorinated dibenzo-p-dioxins (PCDDs)				
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	<0.26	<0.2	-
1,2,3,7,8-Pentachlorodibenzo-p-dioxins (PeCDD)	pg/g	0.4	0.11	114%
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	<0.11	<0.092	-
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	<0.11	<0.091	-
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	<0.11	<0.092	-
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	0.8	0.854	7%
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	5.77	4.8	18%
Total Tetrachlorodibenzo-p-dioxin (TCDD) equivalents	pg/g	1.64	1.85	12%
Polychlorinated dibenzofurans (PCDFs)				
2,3,7,8-tetrachlorodibenzofuran (TCDF)	pg/g	<0.28	0.37	-
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	<0.12	<0.077	-
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	<0.11	<0.068	-
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	<0.065	<0.034	-
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	<0.059	<0.032	-
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.11	0.11	0%
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	<0.063	<0.033	-
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	<0.048	<0.08	-
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	<0.073	<0.12	-
Octachlorodibenzofuran (OCDF)	pg/g	0.139	0.12	15%
Total Tetrachlorodibenzofurans (TCDF) equivalents	pg/g	0.78	1.17	40%
Toxic Equivalency (TEQ)				
Mid-Point PCDD/F TEQ	-	0.61	0.299	68%

Note:

Bolded values failed to pass one or more quality control checks (bolded RPD values are greater than 20%).

The percentage of RPD values over 20% for the entire PCDD/F dataset is 25%.

— = no data or not applicable; pg/g = picograms per gram; % = percent; < = less than.



Table A4-7 Chlorophyll a Field Duplicate Results From the Jay Project Baseline Study Area, 2014

Lake	Station	Date	Rep 1 (µg/L)	Rep 2 (µg/L)	Mean (µg/L)	Standard Deviation (µg/L)	Standard Error (µg/L)	RPD (%)
Lac du Sauvage	Aa-1	10-Aug-14	3.41	3.98	3.69	0.41	0.29	15.5
		11-Sep-14	2.89	3.25	3.07	0.25	0.18	11.7
	Ab-1	19-Jul-14	1.57	1.59	1.58	0.01	0.01	0.8
		11-Aug-14	2.00	1.80	1.90	0.14	0.10	10.5
		11-Sep-14	2.66	2.57	2.61	0.06	0.04	3.3
	Ac-1	19-Jul-14	1.92	1.95	1.94	0.02	0.01	1.4
		11-Aug-14	1.64	1.72	1.68	0.06	0.04	5.1
		11-Sep-14	2.65	2.68	2.66	0.02	0.02	1.3
	Ac-4	19-Jul-14	1.83	1.84	1.84	0.01	0.00	0.5
		10-Aug-14	1.45	1.96	1.70	0.36	0.25	29.7
		10-Sep-14	1.48	1.51	1.49	0.02	0.01	1.5
	Ac-7	19-Jul-14	2.11	2.10	2.10	0.01	0.00	0.4
		9-Aug-14	1.62	1.54	1.58	0.06	0.04	5.2
		9-Sep-14	2.92	2.83	2.87	0.07	0.05	3.2
	Ad-1	19-Jul-14	2.41	2.30	2.36	0.07	0.05	4.5
		9-Aug-14	1.97	1.80	1.89	0.12	0.08	9.0
		5-Sep-14	4.31	4.03	4.17	0.20	0.14	6.8
	Ae-1	19-Jul-14	2.12	2.07	2.10	0.03	0.02	2.3
9-Aug-14		2.26	2.09	2.18	0.12	0.09	8.0	
5-Sep-14		3.47	3.54	3.51	0.05	0.04	2.2	
Duchess Lake	Af-1	9-Aug-14	4.29	4.59	4.44	0.21	0.15	6.8
		9-Sep-14	13.53	4.75	9.14	6.21	4.39	96.1
Lac de Gras – Slipper Bay	S2	21-Jul-14	2.67	2.82	2.74	0.10	0.07	5.1
		14-Aug-14	1.60	1.44	1.52	0.12	0.08	10.7
		8-Sep-14	2.25	1.29	1.77	0.68	0.48	54.3
	S3	21-Jul-14	2.06	1.79	1.93	0.19	0.14	14.3
		14-Aug-14	1.69	1.72	1.71	0.02	0.01	1.6
		8-Sep-14	1.67	1.41	1.54	0.18	0.13	16.8

Table A4-7 Chlorophyll a Field Duplicate Results From the Jay Project Baseline Study Area, 2014

Lake	Station	Date	Rep 1 (µg/L)	Rep 2 (µg/L)	Mean (µg/L)	Standard Deviation (µg/L)	Standard Error (µg/L)	RPD (%)
Lac de Gras – Slipper Bay (continued)	S5	21-Jul-14	1.20	1.22	1.21	0.01	0.01	1.7
		14-Aug-14	1.06	0.97	1.02	0.07	0.05	9.7
		8-Sep-14	1.00	0.91	0.96	0.06	0.05	9.5
	S6	21-Jul-14	0.96	-	0.96	-	-	-
		14-Aug-14	1.05	0.95	1.00	0.07	0.05	9.2
Lac de Gras - Far Field 2	FF2-1	22-Jul-14	2.96	3.15	3.06	0.14	0.10	6.4
		12-Aug-14	1.64	1.86	1.75	0.15	0.11	12.4
		12-Sep-14	2.79	3.12	2.96	0.23	0.16	11.0
	FF2-2	20-Jul-14	2.65	2.04	2.34	0.43	0.30	26.0
		12-Aug-14	1.64	1.82	1.73	0.13	0.09	10.5
		12-Sep-14	3.45	3.55	3.50	0.07	0.05	2.9
	FF2-3	20-Jul-14	2.51	2.81	2.66	0.21	0.15	11.1
		12-Aug-14	1.70	1.88	1.79	0.13	0.09	10.1
		12-Sep-14	2.01	4.07	3.04	1.45	1.03	67.7
	FF2-4	20-Jul-14	2.58	2.65	2.61	0.05	0.04	2.7
		12-Aug-14	1.55	1.37	1.46	0.13	0.09	12.3
		11-Sep-14	2.73	3.05	2.89	0.23	0.16	11.2
	FF2-5	20-Jul-14	2.47	2.44	2.45	0.02	0.02	1.4
		11-Aug-14	1.42	1.66	1.54	0.17	0.12	16.0
		12-Sep-14	9.97	12.26	11.12	1.62	1.15	20.6

Note:

Bolded values indicate a notable QC result (bolded RPD values are greater than 20%).

Rep = replicate; µg/L = micrograms per litre; % = percent; RPD = relative percent difference; QC = quality control; Y= yes; N = no; - = no data or not applicable.

The percentage of RPD values over 20% for the entire dataset is 12.8%.



A5 REFERENCES

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2014 Water and Sediment Quality Supplemental Baseline Report

Jay Project

Appendix B, Field Physico-Chemical Water Profile Measurements

April 2015

APPENDIX B

FIELD PHYSICO-CHEMICAL WATER

PROFILE MEASUREMENTS



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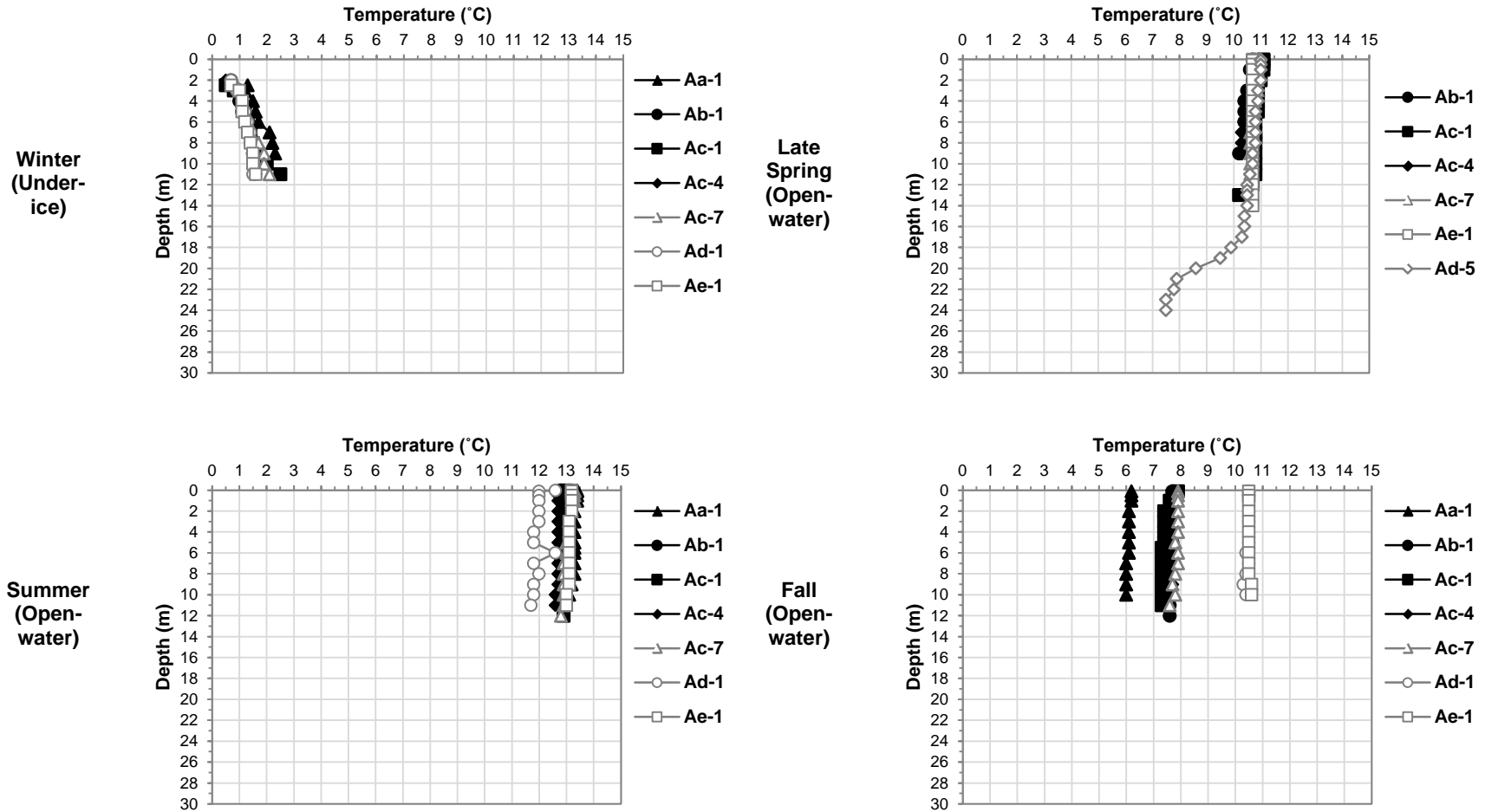
Abbreviations

Abbreviation	Definition
DO	Dissolved oxygen
pH	potential of hydrogen, provides measure of the acidity or alkalinity of a solution on a scale of 0 to 14

Units of Measure

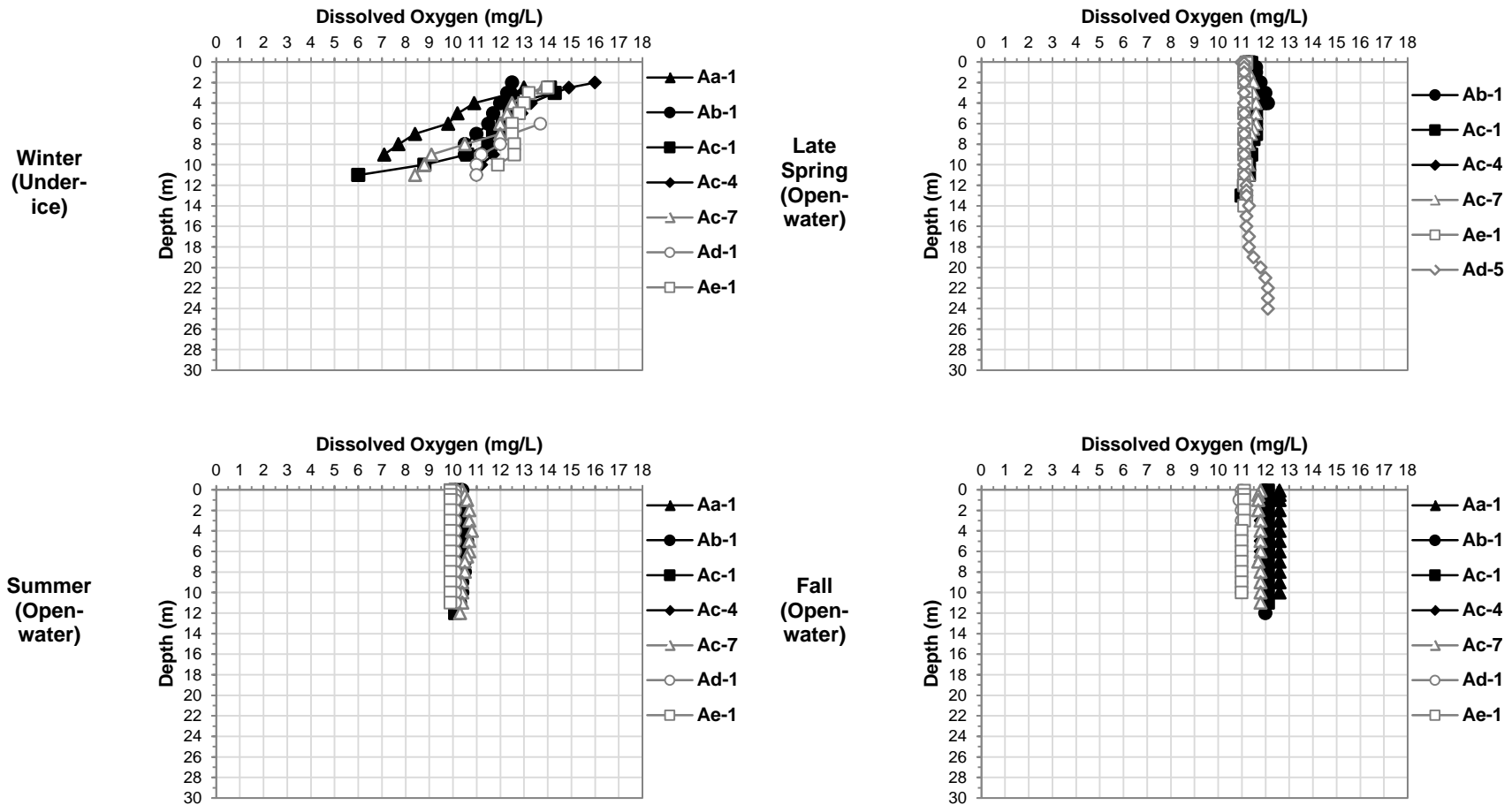
Unit	Definition
°C	degrees Celsius
µS/cm	microSeimens per centimetre
m	metre
mg/L	milligrams per litre

Figure B-1a Temperature (°C) Profiles at Lac du Sauvage Stations, 2014



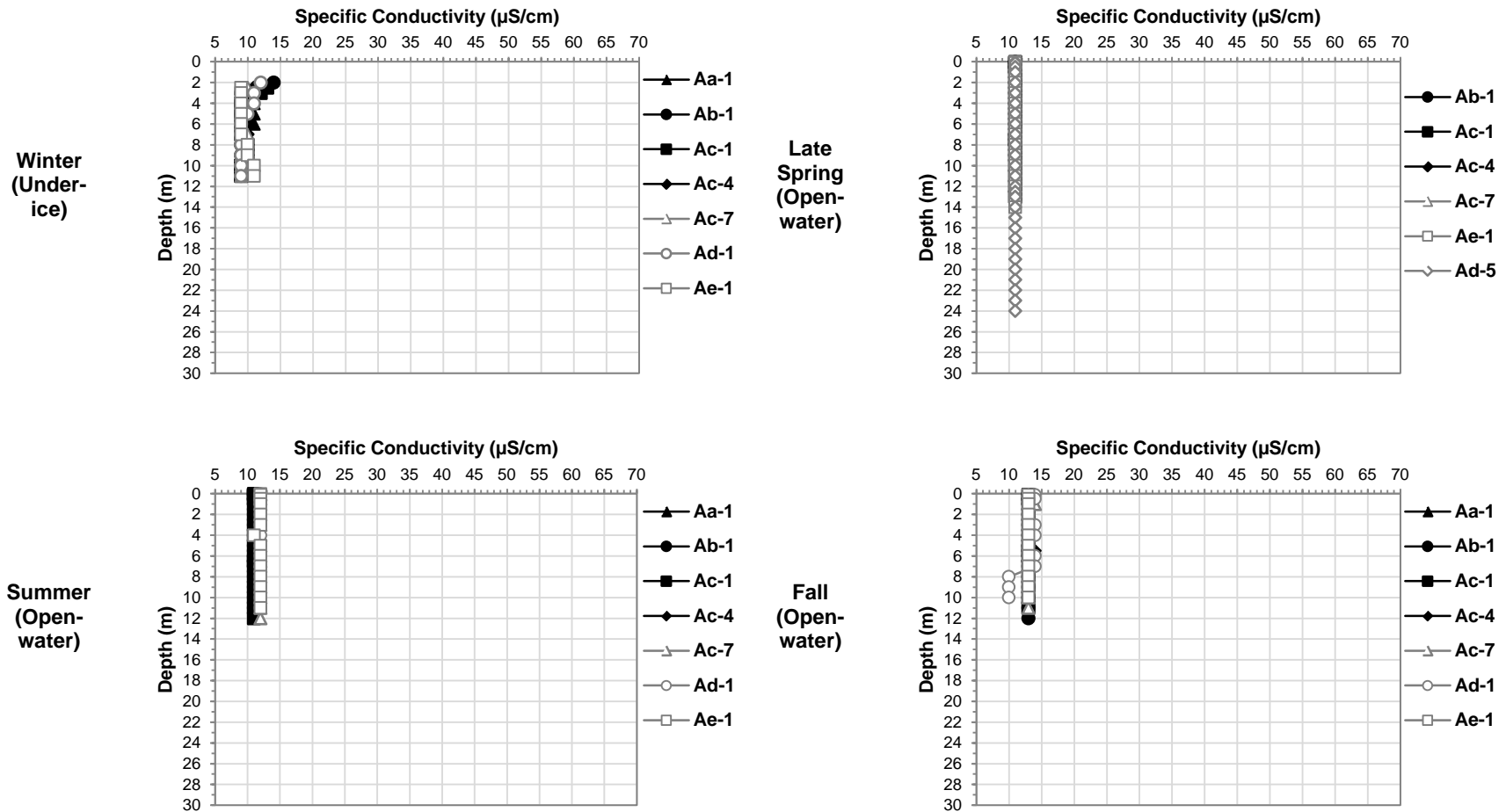
Note: In late spring, station Ad-5 was sampled in place of station Ad-1, and station Aa-1 was not sampled due to weather conditions and time constraints.
 m = metre ; °C = degrees Celsius.

Figure B-1b Dissolved Oxygen (mg/L) Profiles at Lac du Sauvage Stations, 2014



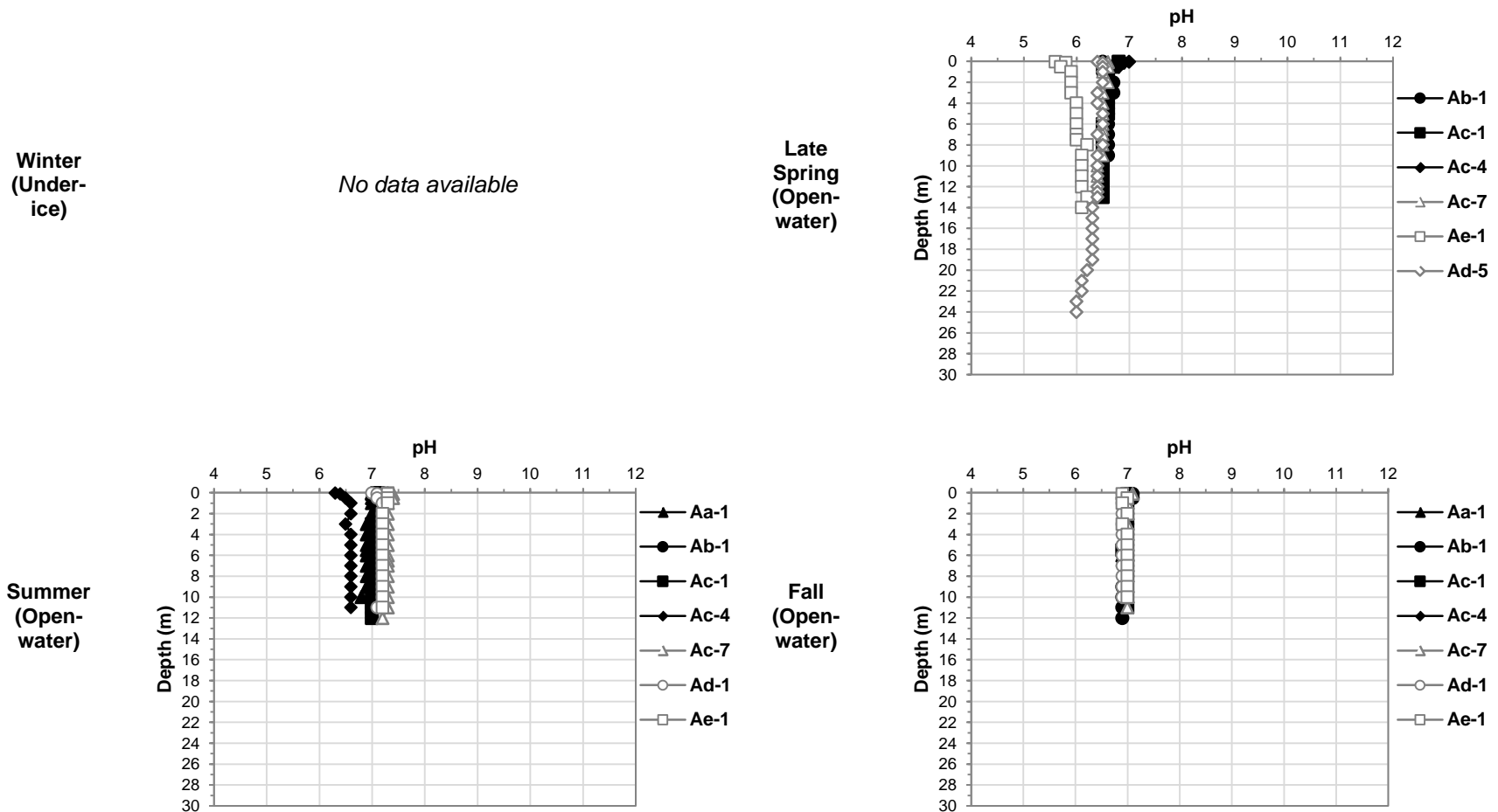
Note: In late spring, station Ad-5 was sampled in place of station Ad-1, and station Aa-1 was not sampled due to weather conditions and time constraints. DO data at depths of 3 m, 4 m, and 5 m from station Ad-1 in the winter program were not included as certain measurements were outside of the acceptable quality control range. m = metre; mg/L = milligrams per litre; DO = dissolved oxygen.

Figure B-1c Specific Conductivity ($\mu\text{S/cm}$) Profiles at Lac du Sauvage Stations, 2014



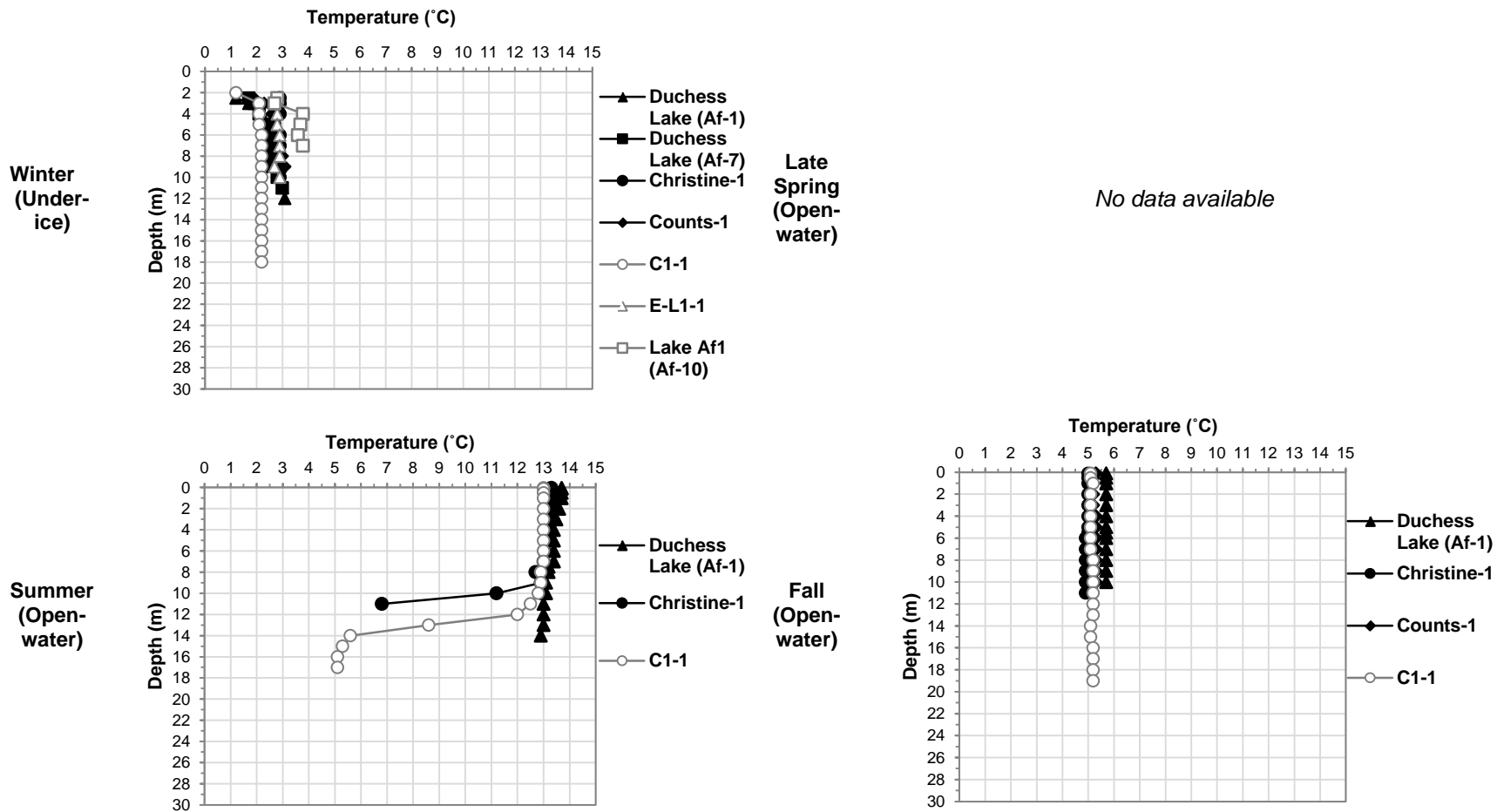
Note: In late spring, station Ad-5 was sampled in place of station Ad-1, and station Aa-1 was not sampled due to weather conditions and time constraints. Specific conductivity at the Lac du Sauvage stations in Late Spring was uniform with depth and among all stations (i.e., equal to 11 $\mu\text{S/cm}$). m = metre; $\mu\text{S/cm}$ = microSeimens per centimetre.

Figure B-1d pH Profiles at Lac du Sauvage Stations, 2014



Note: In late spring, station Ad-5 was sampled in place of station Ad-1, and station Aa-1 was not sampled due to weather conditions and time constraints. pH data from the winter program were not included as measurements were outside of the acceptable quality control range.
 m = metre; pH = potential of hydrogen.

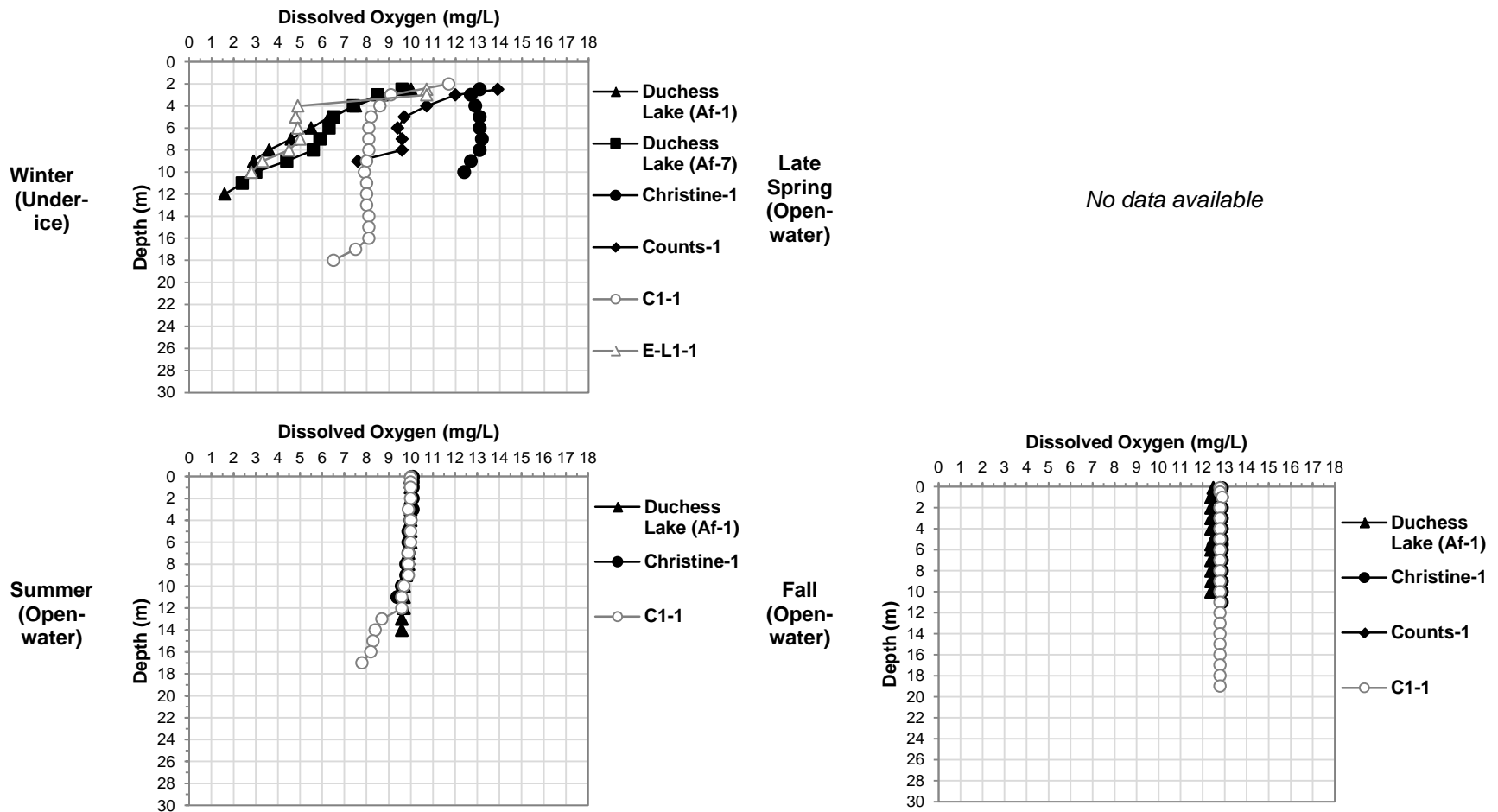
Figure B-2a Temperature (°C) Profiles at Lac du Sauvage Sub-Basin Lakes, 2014



Note: The Lac du Sauvage sub-basin lakes were not visited in late spring. Stations Af-7, E-L1-1, and Af-10 were dropped from the open-water program and are therefore not included on the figures. Due to weather conditions and time constraints, station Counts-1 was not sampled in the summer.

°C = degrees Celsius; m = metre.

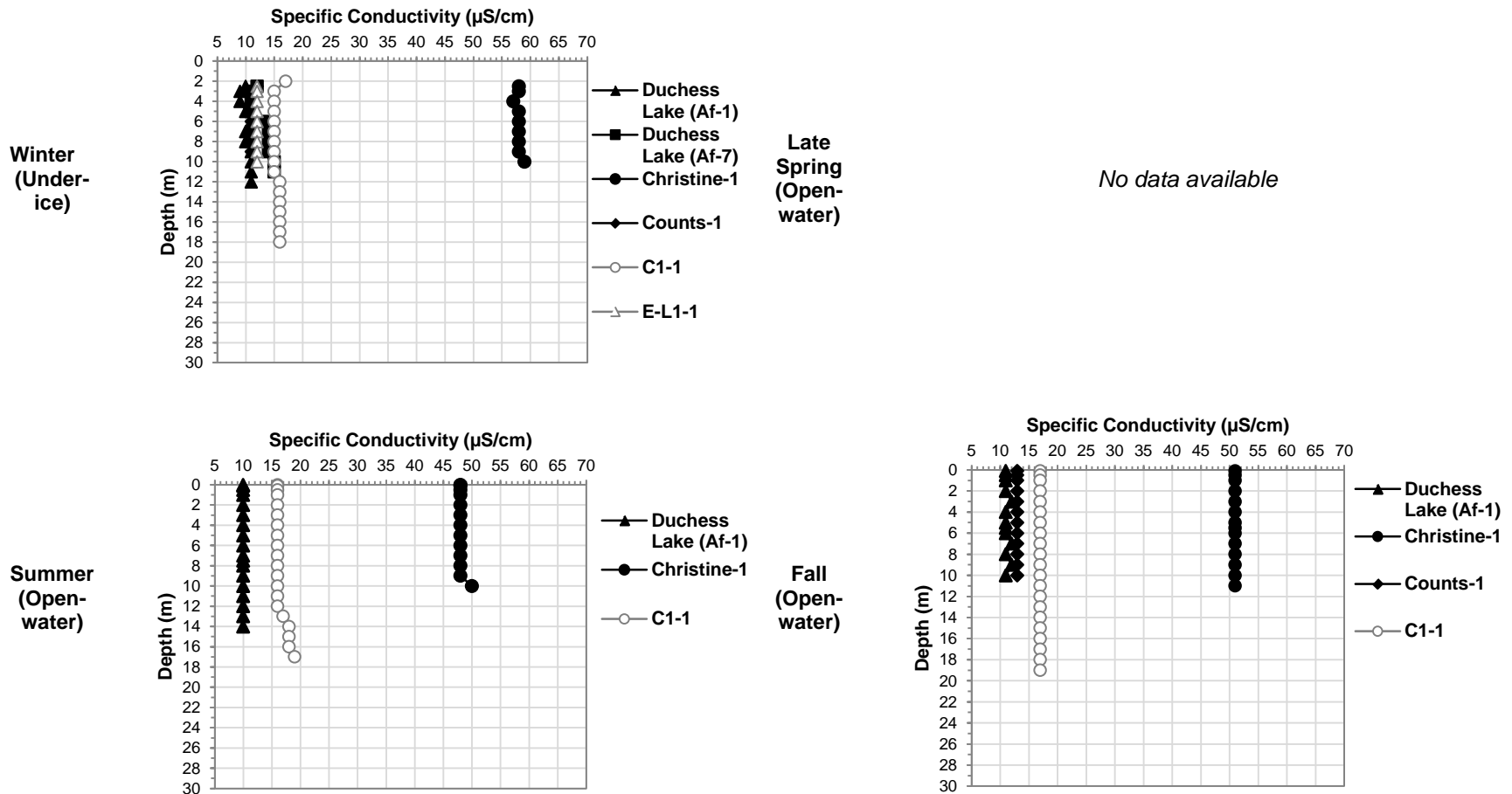
Figure B-2b Dissolved Oxygen (mg/L) Profiles at Lac du Sauvage Sub-Basin Lakes, 2014



Note: The Lac du Sauvage sub-basin lakes were not visited in late spring. Stations Af-7, E-L1-1, and Af-10 were dropped from the open-water program and are therefore not included on the figures. Due to weather conditions and time constraints, station Counts-1 was not sampled in the summer. DO data from Lake Af1 (Af-10) in the winter program were outside the acceptable quality control range and excluded from the figure.

m = metre; mg/L = milligrams per litre.

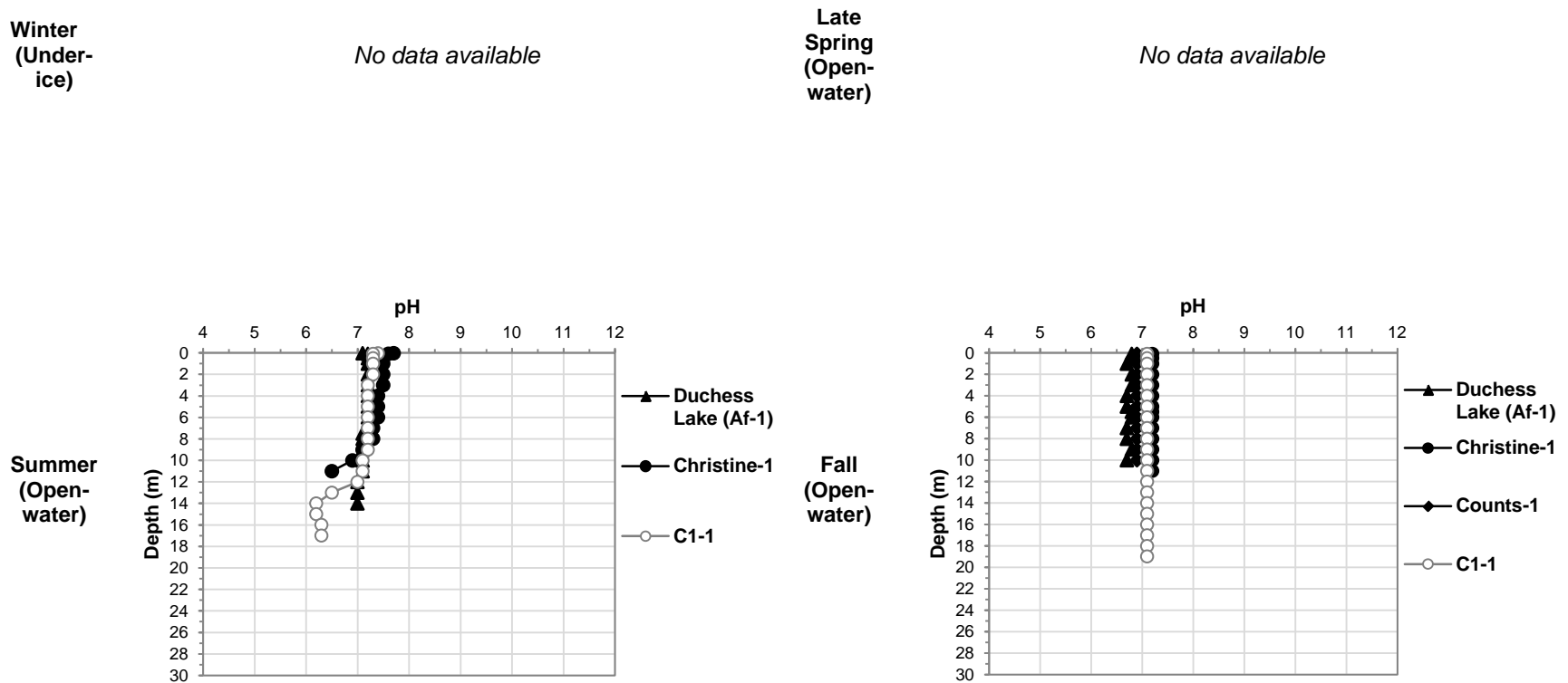
Figure B-2c Specific Conductivity ($\mu\text{S}/\text{cm}$) Profiles at Lac du Sauvage Sub-Basin Lakes, 2014



Note: The Lac du Sauvage sub-basin lakes were not visited in late spring. Stations Af-7, E-L1-1, and Af-10 were dropped from the open-water program and are therefore not included on the figures. Due to weather conditions and time constraints, station Counts-1 was not sampled in the summer. Specific conductivity data from Lake Af1 (Af-10) in the winter program were outside the acceptable quality control range and excluded from the figure.

m = metre; $\mu\text{S}/\text{cm}$ = microSeimens per centimetre.

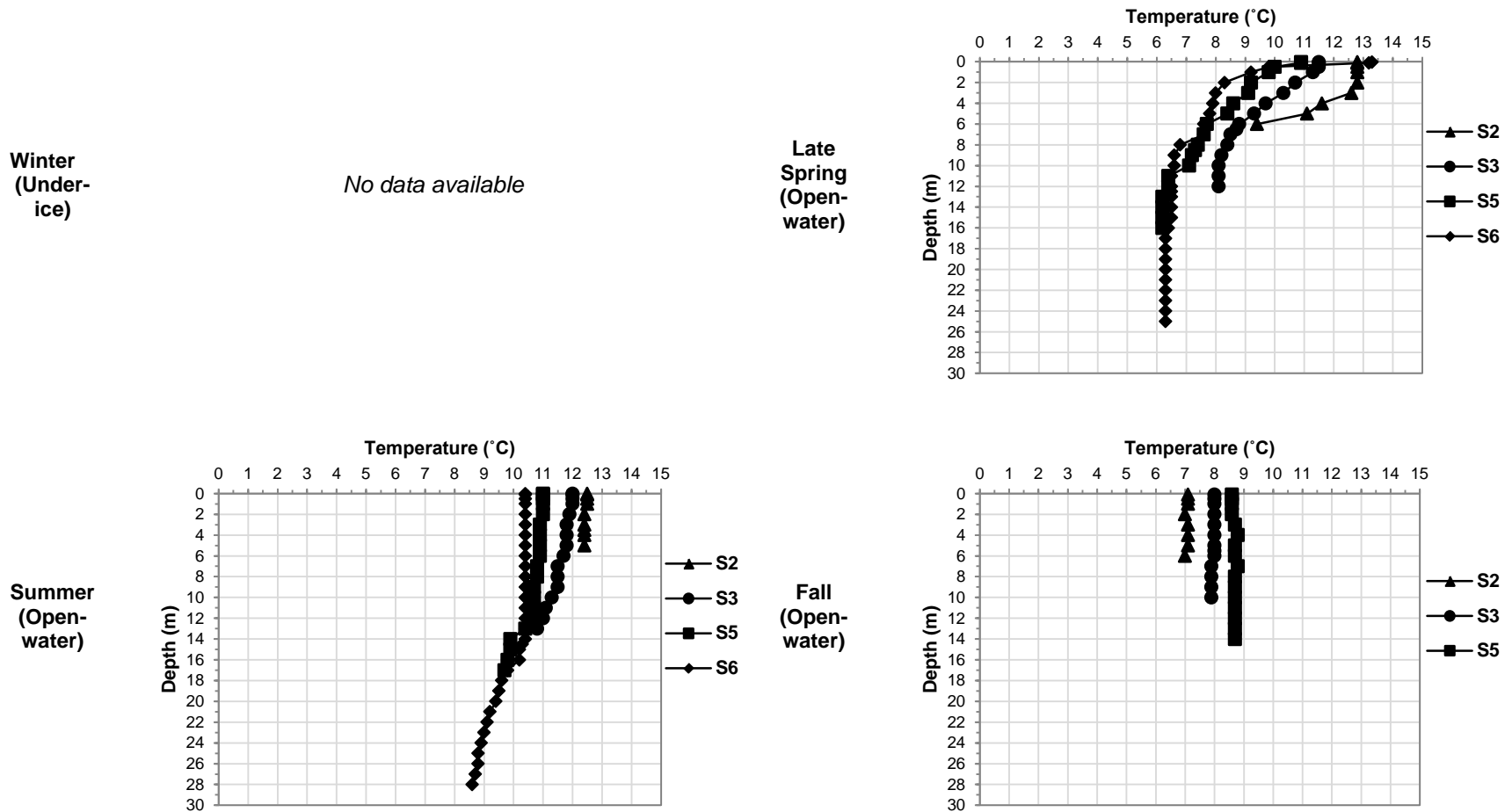
Figure B-2d pH Profiles at Lac du Sauvage Sub-Basin Lakes, 2014



Note: The Lac du Sauvage sub-basin lakes were not visited in late spring. Stations Af-7, E-L1-1, and Af-10 were dropped from the open-water program and are therefore not included on the figures. Due to weather conditions and time constraints, station Counts-1 was not sampled in the summer. pH data from the winter program were not included as measurements were outside of the acceptable quality control range.

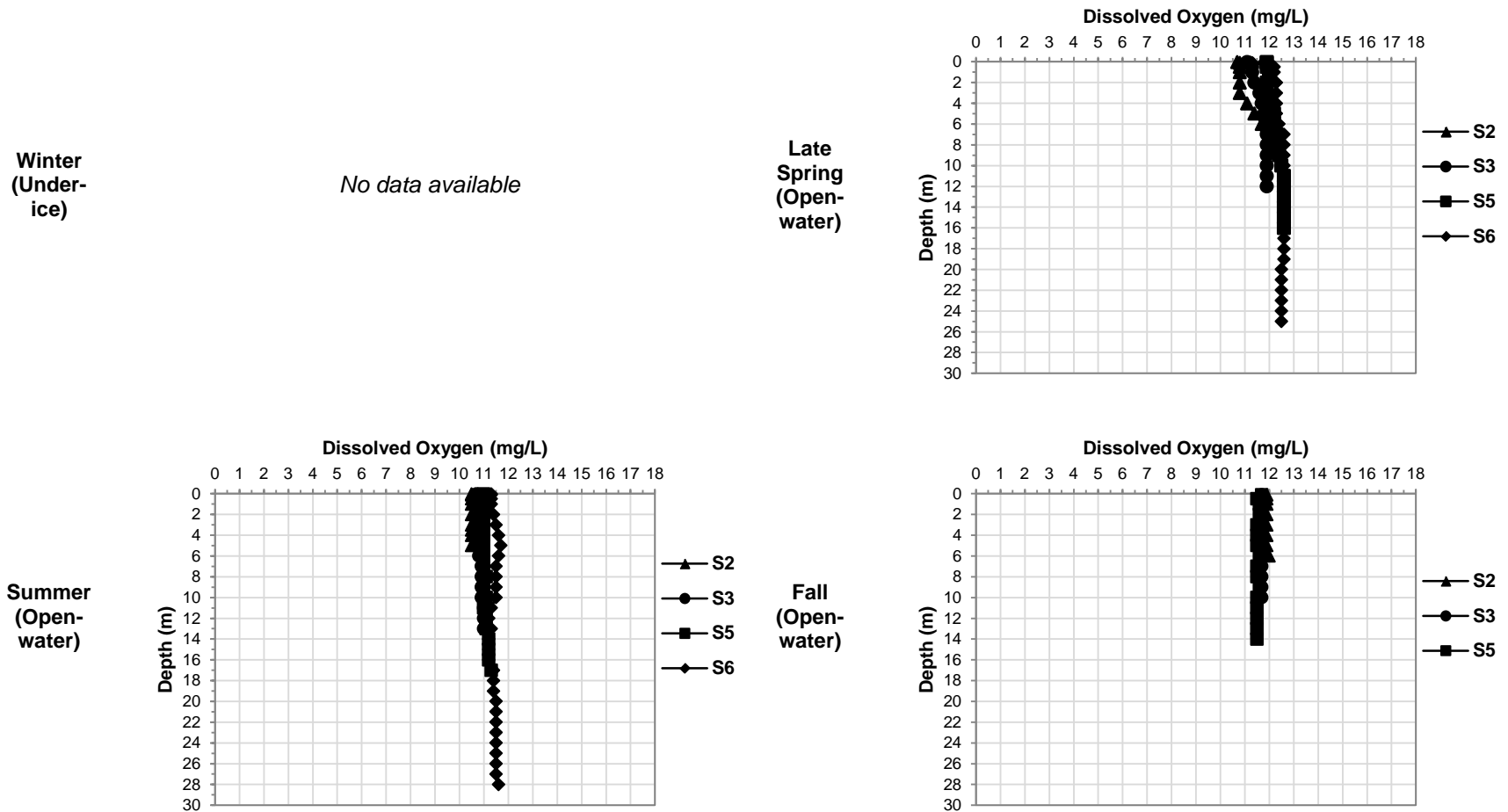
m = metre.

Figure B-3a Temperature (°C) Profiles at Lac de Gras Slipper Bay, 2014



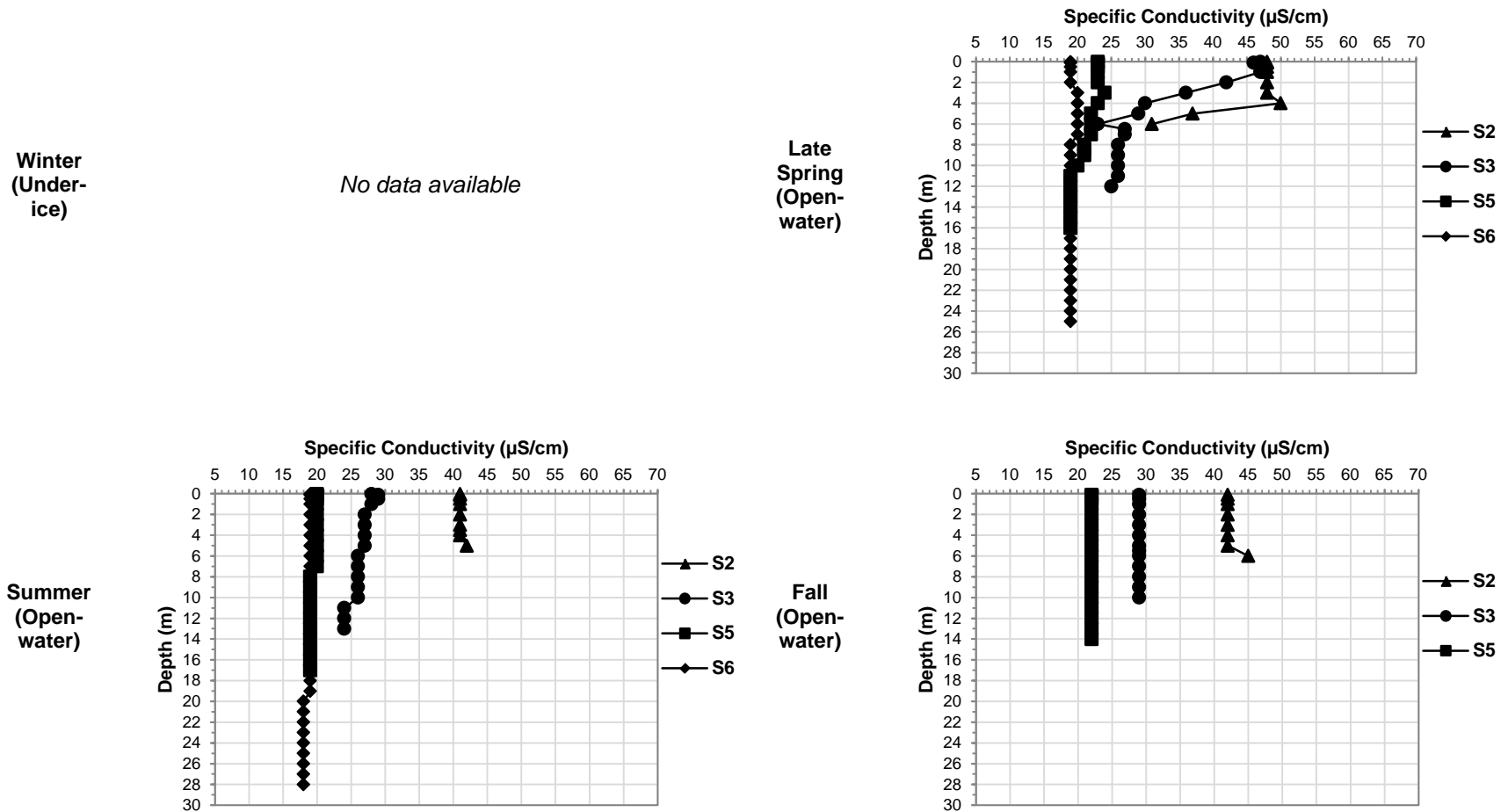
Note: Lac de Gras Slipper Bay stations were not part of the winter program and are therefore not included in Figure B-3a. Due to weather conditions and time constraints, station S6 was not sampled in the fall.
 m = metre; °C = degrees Celsius.

Figure B-3b Dissolved Oxygen (mg/L) Profiles at Lac de Gras Slipper Bay, 2014



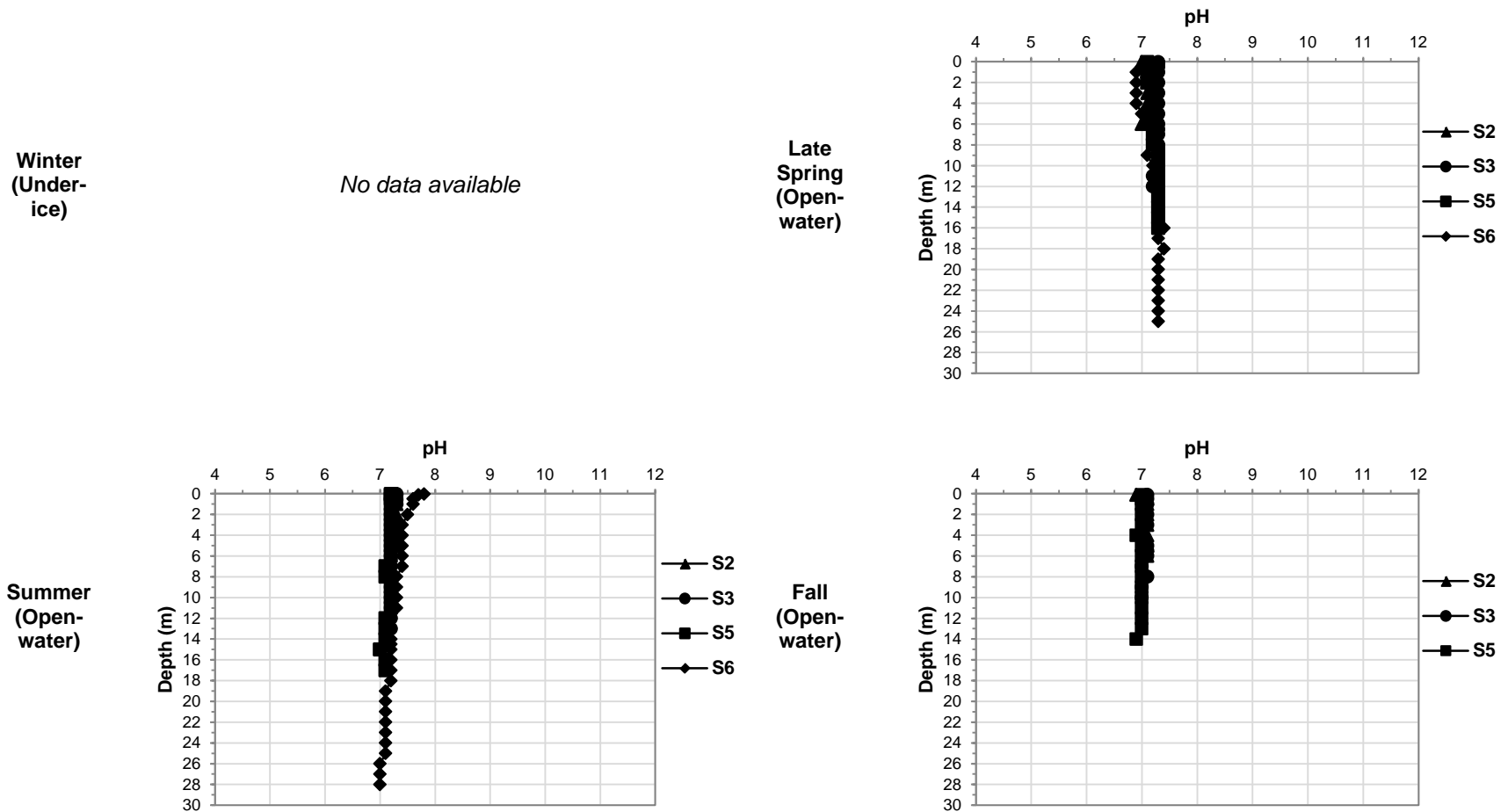
Note: Lac de Gras Slipper Bay stations were not part of the winter program and are therefore not included in Figure B-3b.
 Due to weather conditions and time constraints, station S6 was not sampled in the fall.
 m = metre; mg/L = milligrams per litre.

Figure B-3c Specific Conductivity ($\mu\text{S}/\text{cm}$) Profiles at Lac de Gras Slipper Bay, 2014



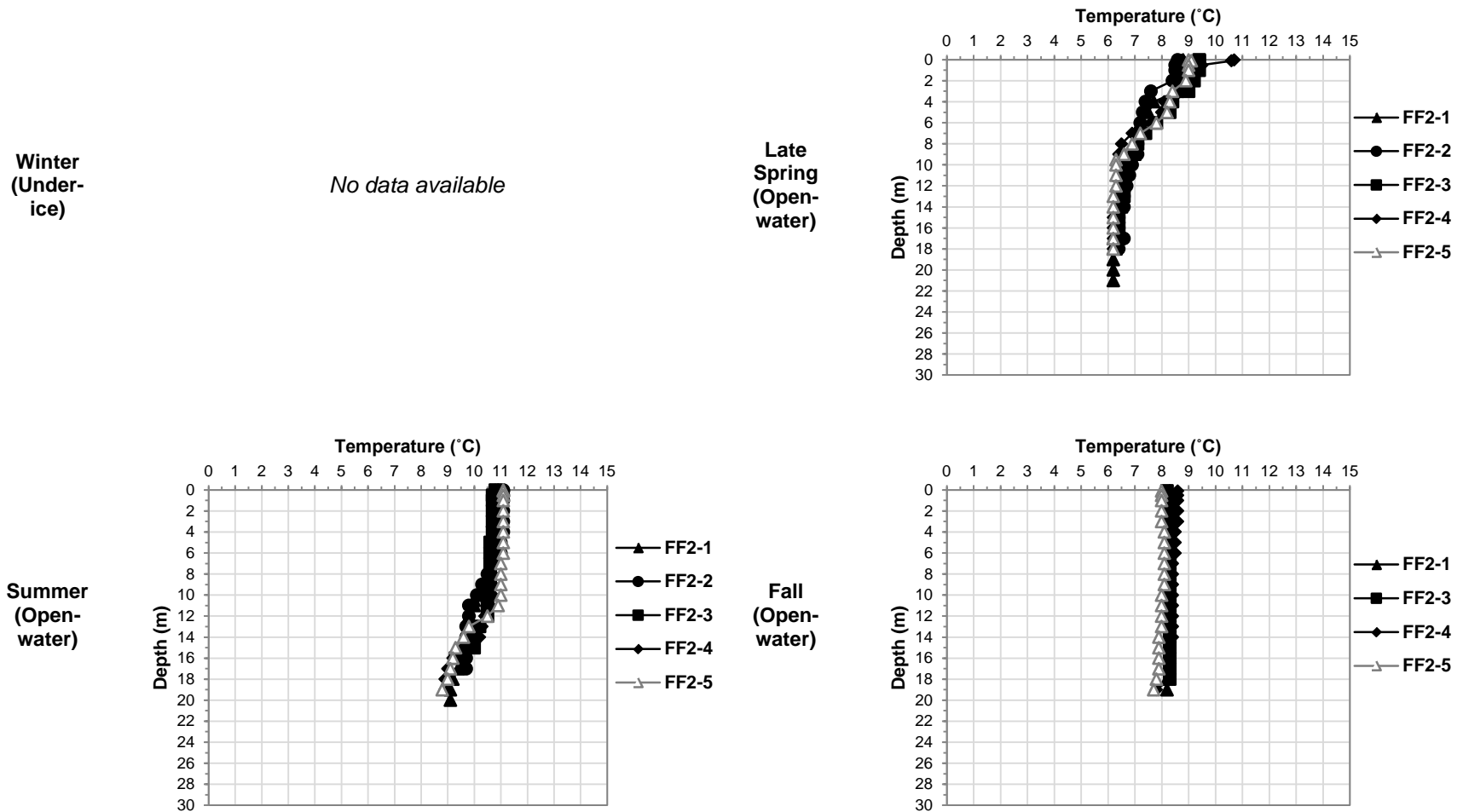
Note: Lac de Gras Slipper Bay stations were not part of the winter under-ice program and are therefore not included in Figure B-3c. Due to weather conditions and time constraints, station S6 was not sampled in the fall. m = metre; $\mu\text{S}/\text{cm}$ = microSeimens per centimetre.

Figure B-3d pH Profiles at Lac de Gras Slipper Bay, 2014



Notes: Lac de Gras Slipper Bay stations were not part of the winter program and are therefore not included in Figure B-3d. Due to weather conditions and time constraints, station S6 was not sampled in the fall. m = metre.

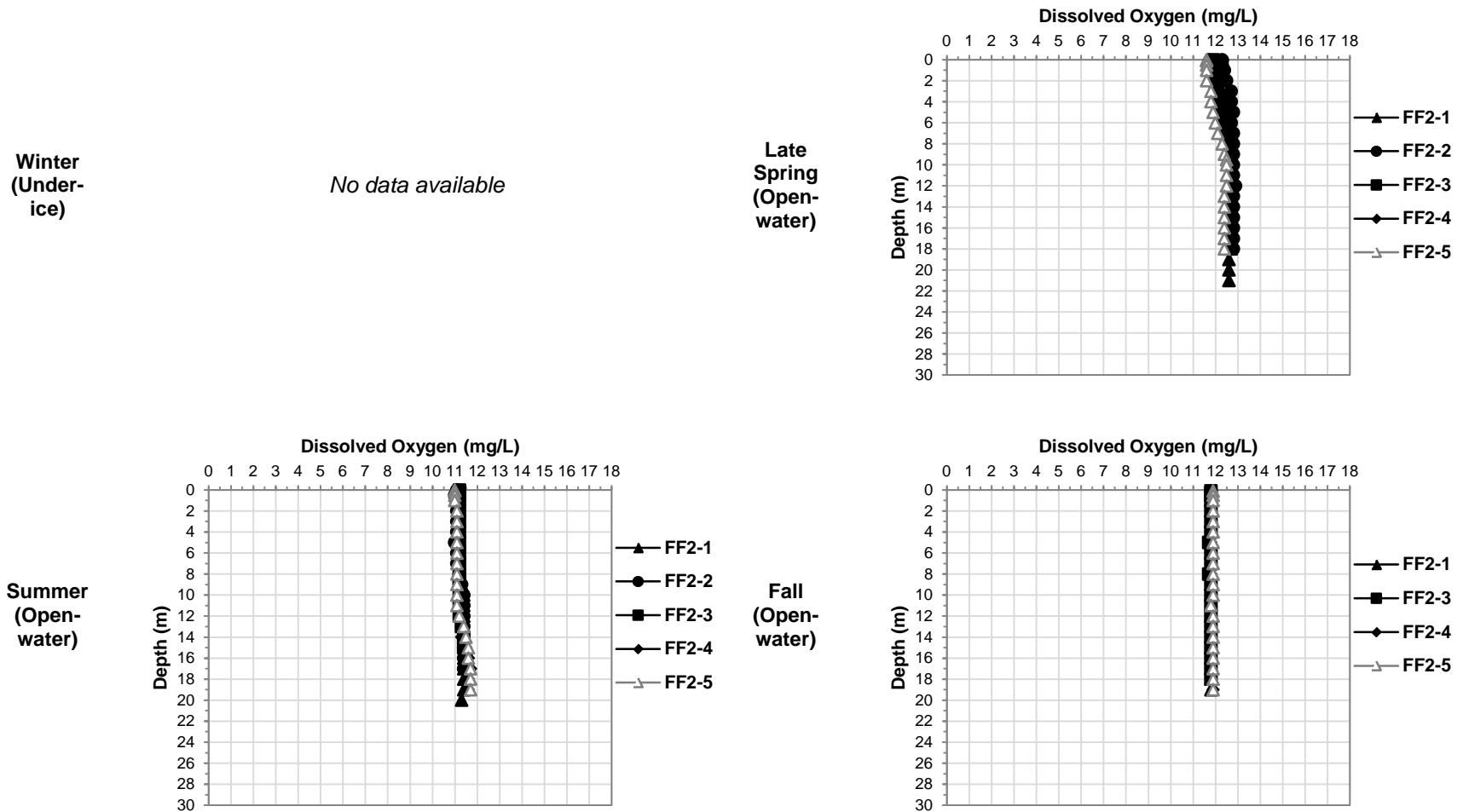
Figure B-4a Temperature (°C) Profiles at Lac de Gras Far Field 2 Stations, 2014



Note: Lac de Gras Far Field 2 stations were not part of the winter program and are therefore not included in Figure B-4a. A profile was not recorded at FF2-2 in the fall due to inclement weather.

m = metre; °C = degrees Celsius.

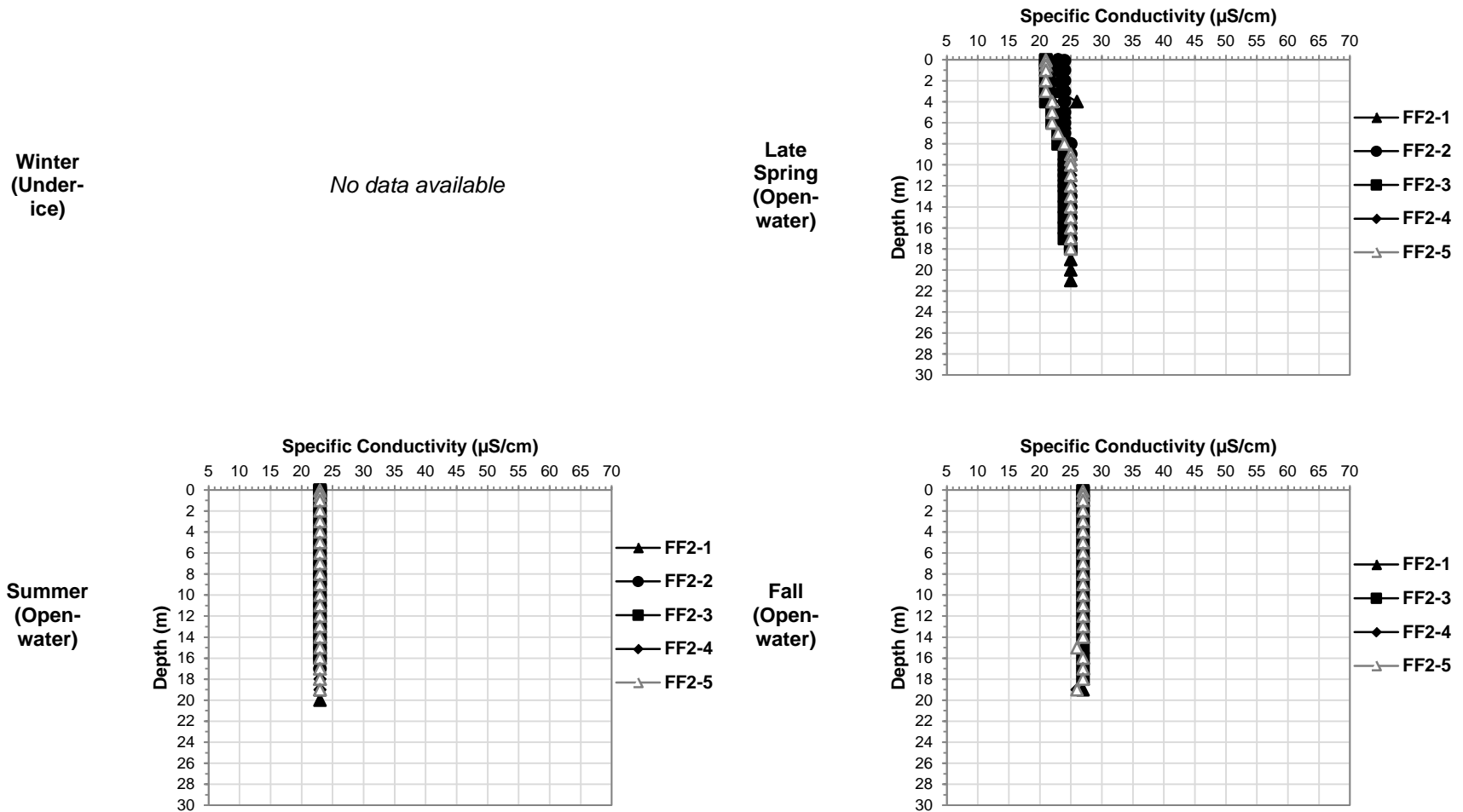
Figure B-4b Dissolved Oxygen (mg/L) Profiles at Lac de Gras Far Field 2 Stations, 2014



Note: Lac de Gras Far Field 2 stations were not part of the winter under-ice program and are therefore not included in Figure B-4b. A profile was not recorded at FF2-2 in the fall due to inclement weather.

m = metre; mg/L = milligrams per litre.

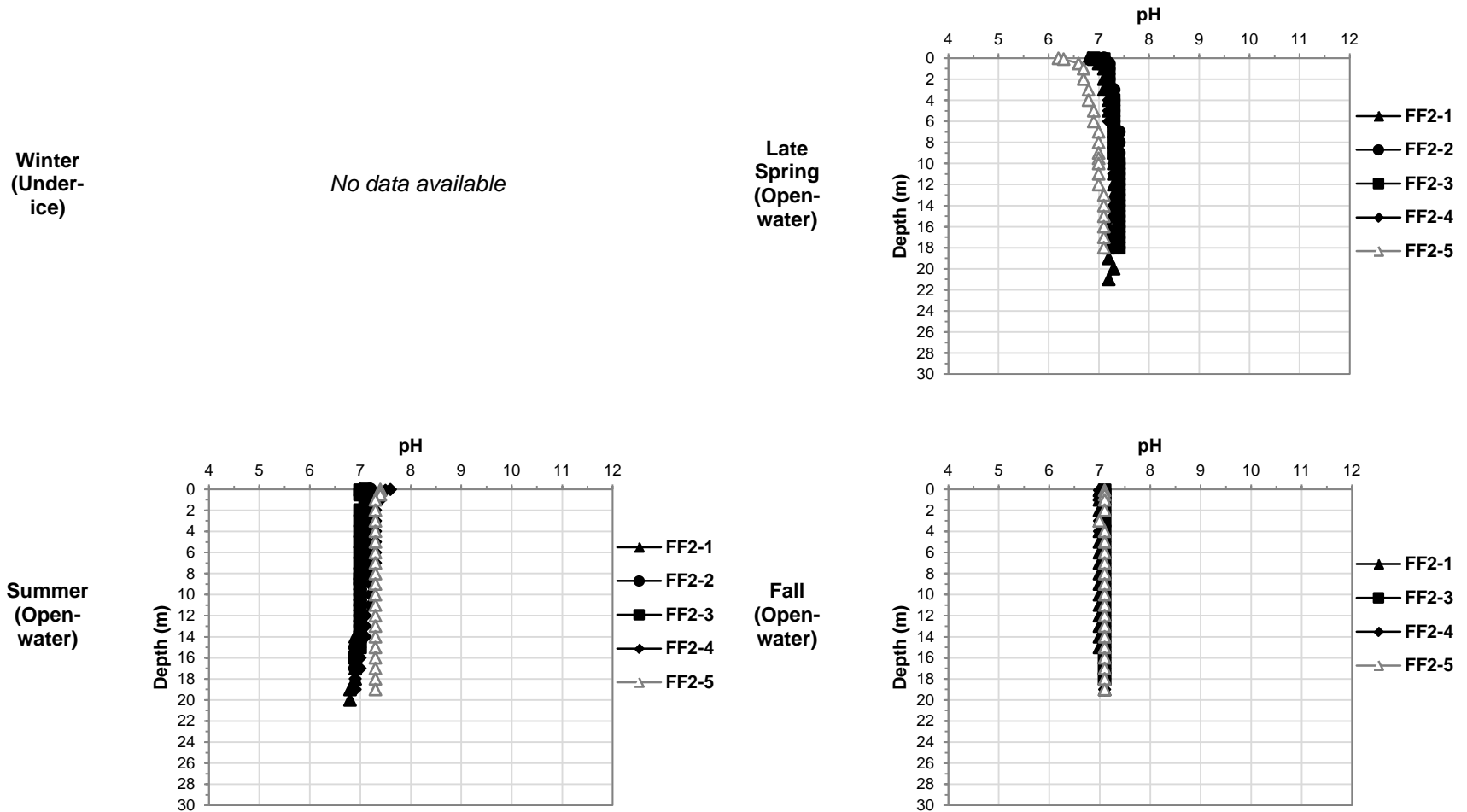
Figure B-4c Specific Conductivity ($\mu\text{S}/\text{cm}$) Profiles at Lac de Gras Far Field 2 Stations, 2014



Note: Lac de Gras Far Field 2 stations were not part of the winter program and are therefore not included in Figure B-4c. A profile was not recorded at FF2-2 in the fall due to inclement weather.

m = metre; $\mu\text{S}/\text{cm}$ = microSeimens per centimetre.

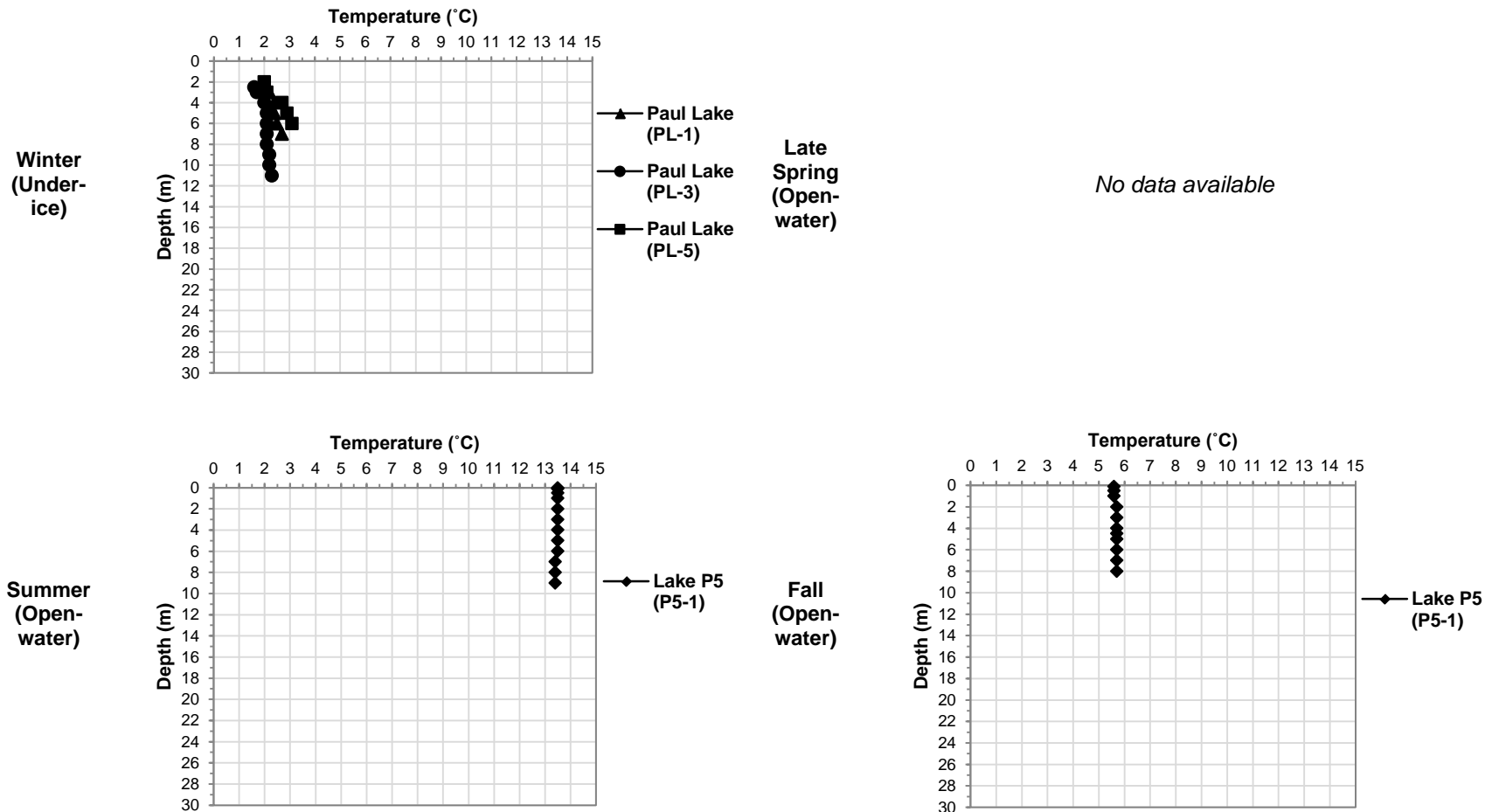
Figure B-4d pH Profiles at Lac de Gras Far Field 2 Stations, 2014



Note: Lac de Gras Far Field 2 stations were not part of the winter program and are therefore not included in Figure B-4d. A profile was not recorded at FF2-2 in the fall due to inclement weather.

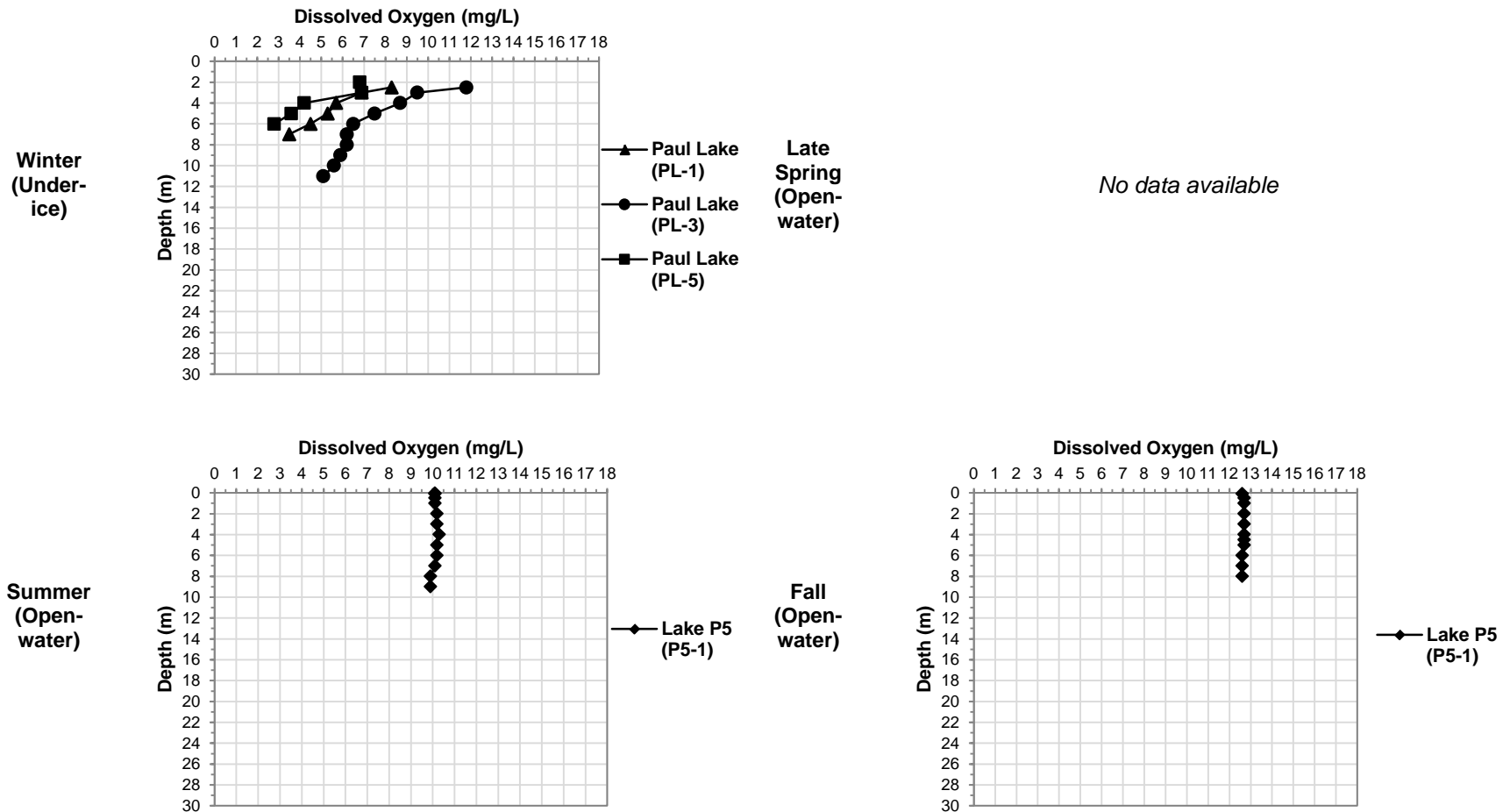
m = metre.

Figure B-5a Temperature (°C) Profiles at Lac de Gras Sub-Basin Lakes, 2014



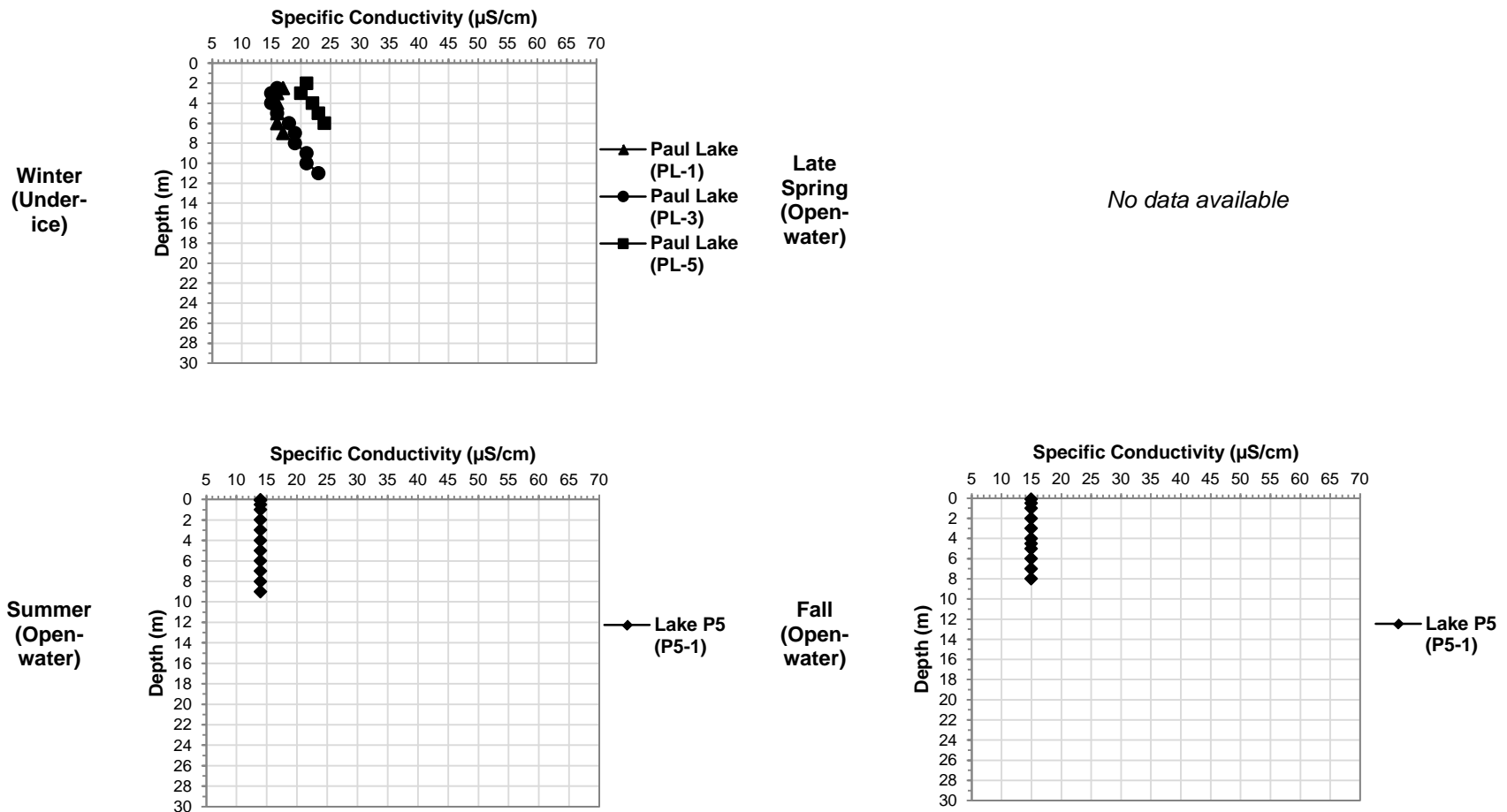
Note : Lac de Gras sub-basins stations were not part of the late spring program and are therefore not included in Figure B-5a.
 Paul Lake stations were dropped after the winter program, but Lake P5 was added.
 m = metre; °C = degrees Celsius.

Figure B-5b Dissolved Oxygen (mg/L) Profiles at Lac de Gras Sub-Basin Lakes, 2014



Note: Lac de Gras sub-basins stations were not part of the late spring program and are therefore not included in Figure B-5b. Paul Lake stations were dropped after the winter program, but Lake P5 was added.
 m = metre; mg/L = milligrams .per litre.

Figure B-5c Specific Conductivity ($\mu\text{S}/\text{cm}$) Profiles at Lac de Gras Sub-Basin Lakes, 2014



Note: Lac de Gras sub-basins stations were not part of the late spring program and are therefore not included in Figure B-5c. Paul Lake stations were dropped after the under-ice program, but Lake P5 was added.
 m = metre; $\mu\text{S}/\text{cm}$ = microSeimens per centimeter.

Figure B-5d pH Profiles at Lac de Gras Sub-Basin Lakes, 2014

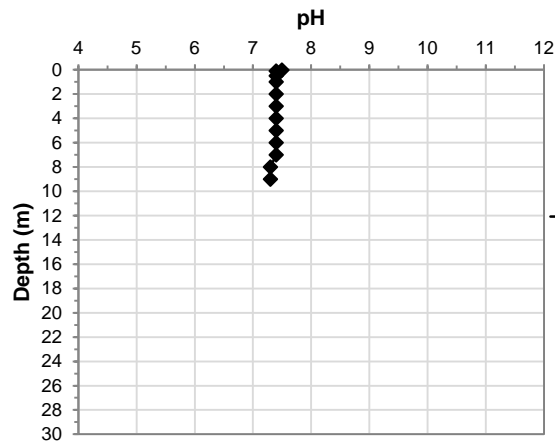
**Winter
(Under-
ice)**

No data available

**Late
Spring
(Open-
water)**

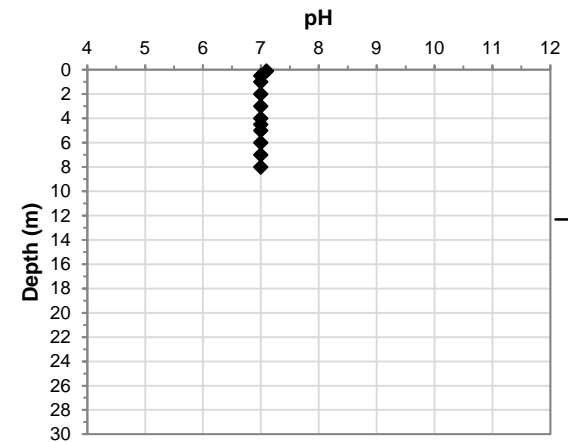
No data available

**Summer
(Open-
water)**



◆ Lake P5
(P5-1)

**Fall
(Open-
water)**



◆ Lake P5
(P5-1)

Note: Lac de Gras sub-basins stations were not part of the late spring program and are therefore not included in Figure B-5d.
 pH data from the winter program were not included as measurements were outside of the acceptable quality control range.
 m = metre.



APPENDIX C

WATER COLUMN LIGHT ATTENUATION PROFILES



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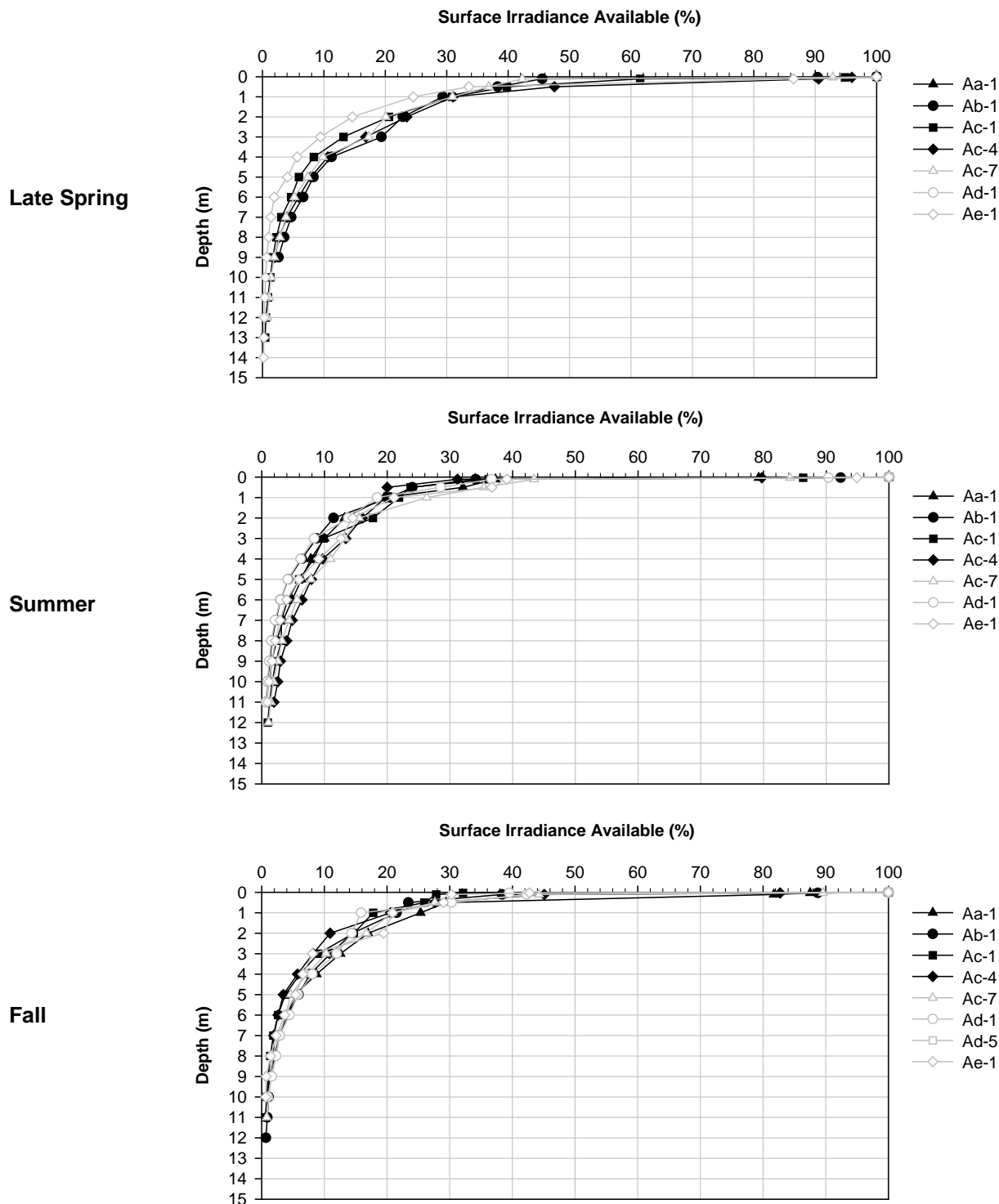
Abbreviations

Abbreviation	Definition
–	not sampled
d	depth
I_d	irradiance at depth
I_0	irradiance at surface
n/a	not applicable

Units of Measure

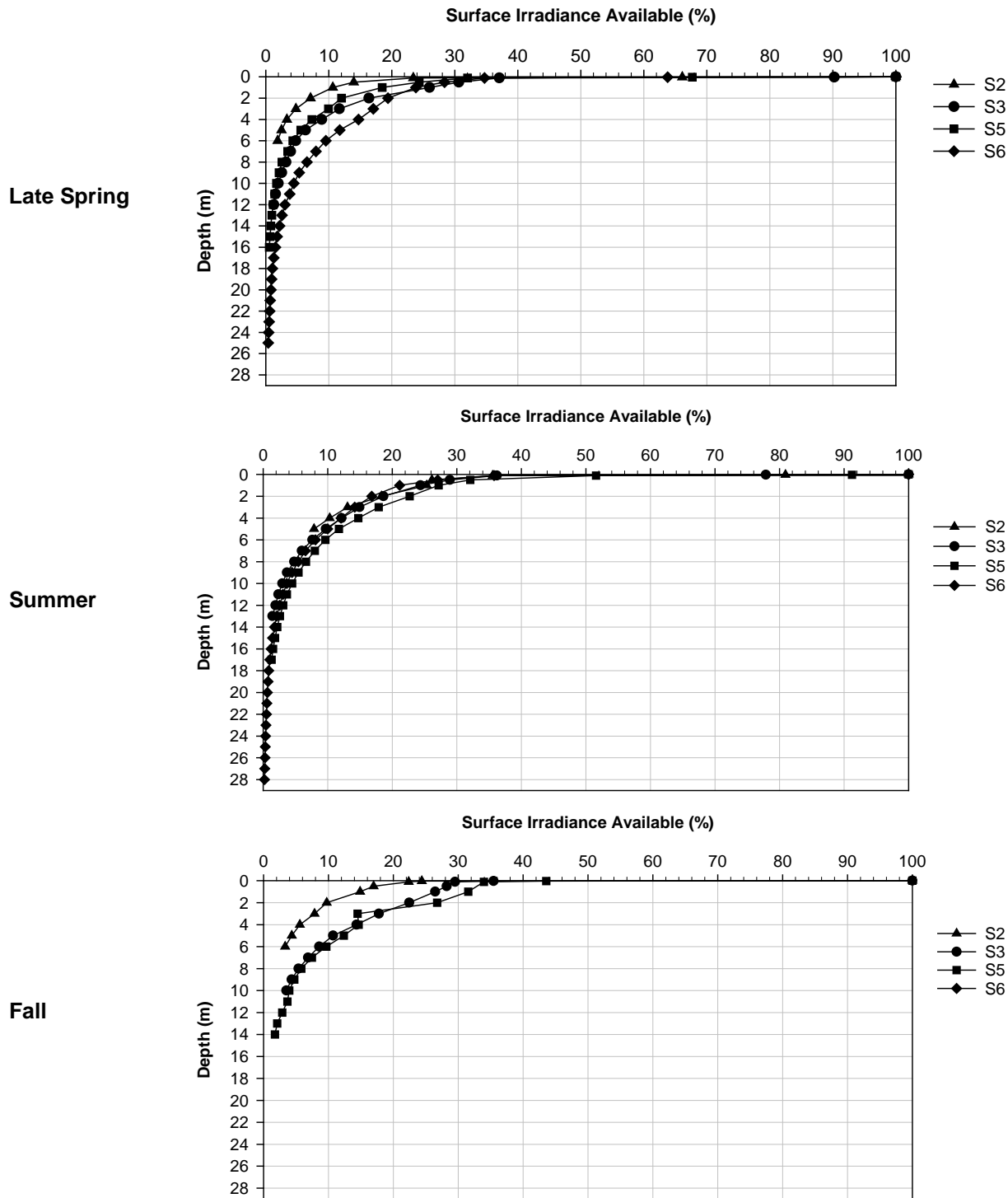
Unit	Definition
%	percent
% SI	percent surface irradiance
K_d	attenuation coefficient
m	metre
$\mu\text{mols/s/m}^2$	micromoles per second per square metre

Figure C-1 Seasonal Light Attenuation Profiles as a Percentage of Surface Irradiance in Lac du Sauvage (Lac du Sauvage Sub-Basins Aa, Ab, Ac, Ad, and Ae), 2014



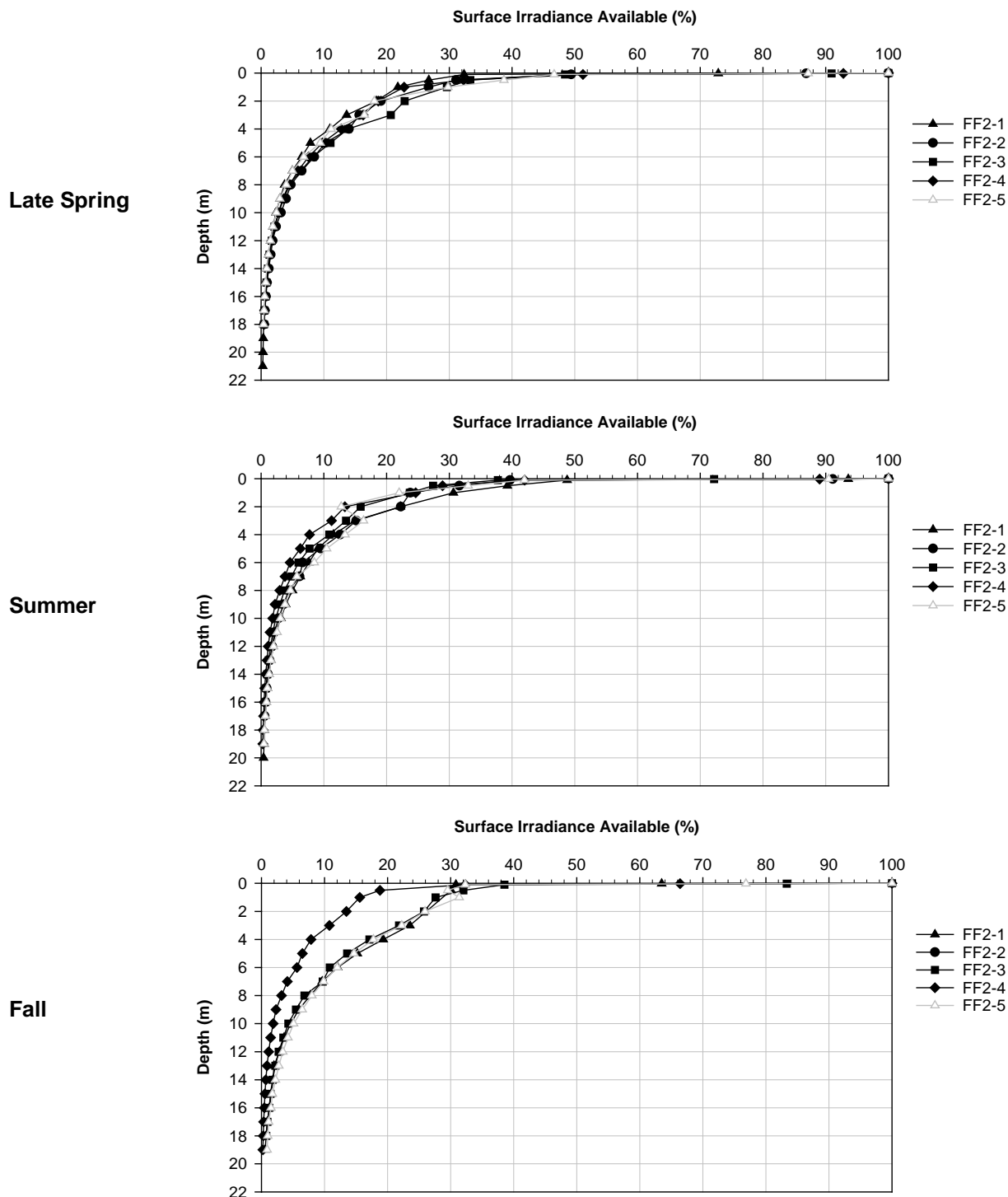
m = metre; % = percent.

Figure C-2 Seasonal Light Attenuation Profiles as a Percentage of Surface Irradiance at Slipper Bay Stations in Lac de Gras, 2014



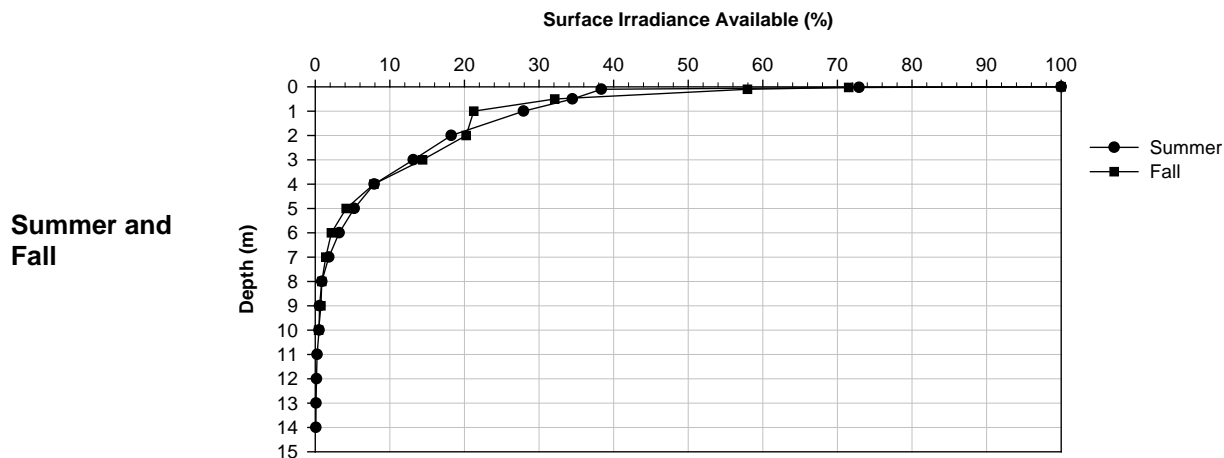
m = metre; % = percent.

Figure C-3 Seasonal Light Attenuation Profiles as a Percentage of Surface Irradiance at Far Field 2 Stations in Lac de Gras, 2014



m = metre; % = percent.

**Figure C-4 Seasonal Light Attenuation Profiles as a Percentage of Surface Irradiance in
Duchess Lake (Lac du Sauvage Sub-Basin Af), 2014**



m = metre; % = percent.

Table C-1 Seasonal Light Attenuation Profile Data From Lac du Sauvage and Duchess Lake During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	μmols/s/m ²	% SI = (I _d /I ₀) x 100	m	K _d = -[ln(I _d /I ₀)]/d
Location	Station	Sample Date	Depth (m)							
Lac du Sauvage	Aa-1	July	—	—	—	—	—	—	—	—
		10-Aug-14	Surface	11.4	4.5	9.0	1,420	100.0	10.0	n/a
			0.025				1,125	79.2		9.31
			0.1				528.9	37.2		9.88
			0.5				455.4	32.1		2.27
			1				277.1	19.5		1.63
			2				187.3	13.2		1.01
			3				142	10.0		0.77
			4				110.8	7.8		0.64
			5				89.75	6.3		0.55
			6				68.7	4.8		0.50
		7	47.89	3.4	0.48					
		8	33.7	2.4	0.47					
		9	22.24	1.6	0.46					
		10	17.92	1.3	0.44					
		11-Sep-14	Surface	10.5	4.5	9.0	1,724	100.0	9.0	n/a
			0.025				1,509	87.5		5.33
			0.1				1,409	81.7		2.02
			0.5				506.9	29.4		2.45
			1				436.7	25.3		1.37
			2				292.4	17.0		0.89
	3		216.1				12.5	0.69		
	4		150.9				8.8	0.61		
	5		91.87				5.3	0.59		
	6		70.14				4.1	0.53		
	7	45.7	2.7	0.52						
	8	34.86	2.0	0.49						
	9	24.12	1.4	0.47						
	10	16.33	0.9	0.47						
	Ab-1	19-Jul-14	Surface	10.1	6.3	Bottom	3,358	100.0	Bottom	n/a
			0.025				3,036	90.4		4.03
			0.1				1,529	45.5		7.87
			0.5				1,285	38.3		1.92
			1				985.4	29.3		1.23
			2				767.2	22.8		0.74
			3				649.7	19.3		0.55
			4				377.6	11.2		0.55
			5				278.0	8.3		0.50
			6				222.2	6.6		0.45
			7				156.3	4.7		0.44
	8	118.2	3.5	0.42						
	9	87.29	2.6	0.41						

Table C-1 Seasonal Light Attenuation Profile Data From Lac du Sauvage and Duchess Lake During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	μmols/s/m ²	% SI = (I _d /I ₀) x 100	m	K _d = -[ln(I _d /I ₀)]/d
Location	Station	Sample Date	Depth (m)							
Lac du Sauvage	Ab-1	11-Aug-14	Surface	12.5	6.5	Bottom	3,358	100.0	9.0	n/a
			0.025				3,100	92.3		3.20
			0.1				1,145	34.1		10.76
			0.5				806.5	24.0		2.85
			1				686.5	20.4		1.59
			2				384.2	11.4		1.08
			3				292	8.7		0.81
			4				214	6.4		0.69
			5				140.9	4.2		0.63
			6				100.1	3.0		0.59
			7				75.1	2.2		0.54
			8				54.56	1.6		0.51
	9	42.72	1.3	0.48						
	10	31.25	0.9	0.47						
	11	23.56	0.7	0.45						
	Ab-1	11-Sep-14	Surface	13.0	5.5	11	1,740	100.0	9.0	n/a
			0.025				1,544	88.7		4.78
			0.1				667	38.3		9.59
			0.5				407.1	23.4		2.91
			1				374.5	21.5		1.54
			2				251.7	14.5		0.97
			3				190.7	11.0		0.74
			4				134.2	7.7		0.64
			5				102.2	5.9		0.57
6			70.75				4.1	0.53		
7			48.7				2.8	0.51		
8			32.28				1.9	0.50		
9	23.72	1.4	0.48							
10	18.88	1.1	0.45							
11	15.45	0.9	0.43							
12	11.6	0.7	0.42							

Table C-1 Seasonal Light Attenuation Profile Data From Lac du Sauvage and Duchess Lake During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation	
Unit				m	m	m	$\mu\text{mols/s/m}^2$	% SI = $(I_d/I_0) \times 100$	m	$K_d = -[\ln(I_d/I_0)]/d$	
Location	Station	Sample Date	Depth (m)								
Lac du Sauvage	Ac-1	19-Jul-14	Surface	14.8	5.0	10.0	3216	100.0	10.0	n/a	
			0.025				3051	94.9		2.11	
			0.1				1978	61.5		4.86	
			0.5				1,279.81	39.8		1.84	
			1				992.18	30.9		1.18	
			2				661.7	20.6		0.79	
			3				423.4	13.2		0.68	
			4				268.6	8.4		0.62	
			5				190.7	5.9		0.57	
			6				150.2	4.7		0.51	
			7				98.3	3.1		0.50	
			8				72.32	2.2		0.47	
			9				53.78	1.7		0.45	
	10	40.25	1.3	0.44							
	11	28.12	0.9	0.43							
	12	17.49	0.5	0.43							
	13	13.16	0.4	0.42							
			11-Aug-14	Surface	12.6	6.5	13	3,440	100.0	11.0	n/a
				0.025				2,970	86.3		5.88
				0.1				1,244	36.2		10.17
				0.5				815.9	23.7		2.88
				1				752.2	21.9		1.52
				2				609.2	17.7		0.87
				3				337.7	9.8		0.77
4				284.8				8.3	0.62		
5				204.9				6.0	0.56		
6				142.9				4.2	0.53		
7				106.7				3.1	0.50		
8	108	3.1	0.43								
9	77.77	2.3	0.42								
10	57.01	1.7	0.41								
11	42.18	1.2	0.40								
12	32.35	0.9	0.39								

Table C-1 Seasonal Light Attenuation Profile Data From Lac du Sauvage and Duchess Lake During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	μmols/s/m ²	% SI = (I _d /I ₀) x 100	m	K _d = -[ln(I _d /I ₀)]/d
Location	Station	Sample Date	Depth (m)							
Lac du Sauvage	Ac-1	11-Sep-14	Surface	11.5	6.0	Bottom	2,883	100.0	8.0	n/a
			0.025				926	32.1		45.43
			0.1				802.2	27.8		12.79
			0.5				747.9	25.9		2.70
			1				512.9	17.8		1.73
			2				423.6	14.7		0.96
			3				259.5	9.0		0.80
			4				175.8	6.1		0.70
			5				107.8	3.7		0.66
			6				74.98	2.6		0.61
			7				53.53	1.9		0.57
	8	38.91	1.3	0.54						
	9	29.98	1.0	0.51						
	10	22.95	0.8	0.48						
	11	16.01	0.6	0.47						
	Ac-4	19-Jul-14	10.2	5.3	Bottom	3,964	100.0	Bottom	n/a	
						0.025	3,804		96.0	1.65
						0.1	3,590		90.6	0.99
						0.5	1,884		47.5	1.49
						1	1,230		31.0	1.17
						2	930.5		23.5	0.72
						3	666.3		16.8	0.59
						4	421.4		10.6	0.56
						5	310.9		7.8	0.51
		6	232.2	5.9	0.47					
		7	157.9	4.0	0.46					
		8	107.1	2.7	0.45					
		9	78.56	2.0	0.44					
		10-Aug-14	12.0	6.5	Bottom	650.4	100.0	Bottom	n/a	
						0.025	518.6		79.7	9.06
						0.1	202.9		31.2	11.65
						0.5	130		20.0	3.22
						1	128.3		19.7	1.62
2	104.2					16.0	0.92			
3	87.03					13.4	0.67			
4	63.21					9.7	0.58			
5	51.39					7.9	0.51			
6	41.67	6.4	0.46							
7	31.57	4.9	0.43							
8	25.88	4.0	0.40							
9	19.33	3.0	0.39							
10	16.5	2.5	0.37							
11	12.6	1.9	0.36							

Table C-1 Seasonal Light Attenuation Profile Data From Lac du Sauvage and Duchess Lake During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	$\mu\text{mols/s/m}^2$	% SI = $(I_d/I_0) \times 100$	m	$K_d = -[\ln(I_d/I_0)]/d$
Location	Station	Sample Date	Depth (m)							
Lac du Sauvage	Ac-4	10-Sep-14	Surface	11.0	5.5	Bottom	1,911	100.0	9.0	n/a
			0.025				1,581	82.7		7.58
			0.1				861.2	45.1		7.97
			0.5				527.8	27.6		2.57
			1				393	20.6		1.58
			2				208.6	10.9		1.11
			3				156.1	8.2		0.83
			4				108.9	5.7		0.72
			5				65.75	3.4		0.67
			6				49.69	2.6		0.61
			7				36.46	1.9		0.57
	8	36.14	1.9	0.50						
	9	23.81	1.2	0.49						
	10	17.26	0.9	0.47						
	Ac-7	19-Jul-14	Surface	13.0	5.3	10.6	3,299	100.0	10.0	n/a
			0.025				3,064	92.9		2.96
			0.1				1,395	42.3		8.61
			0.5				1,215	36.8		2.00
			1				1,020	30.9		1.17
			2				661.2	20.0		0.80
			3				570.8	17.3		0.58
			4				323.7	9.8		0.58
			5				242.7	7.4		0.52
			6				170.7	5.2		0.49
7			125.5				3.8	0.47		
8			93.42				2.8	0.45		
9			62.37				1.9	0.44		
10	45.43	1.4	0.43							
11	34.45	1.0	0.41							
12	25.9	0.8	0.40							

Table C-1 Seasonal Light Attenuation Profile Data From Lac du Sauvage and Duchess Lake During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation	
Unit				m	m	m	$\mu\text{mols/s/m}^2$	% SI = $(I_d/I_0) \times 100$	m	$K_d = -[\ln(I_d/I_0)]/d$	
Location	Station	Sample Date	Depth (m)								
Lac du Sauvage	Ac-7	9-Aug-14	Surface	13.1	7.5	Bottom	3,560	100.0	11.0	n/a	
			0.025				2,999	84.2		6.86	
			0.1				1,546	43.4		8.34	
			0.5				1,260	35.4		2.08	
			1				936.2	26.3		1.34	
			2				552.4	15.5		0.93	
			3				470.9	13.2		0.67	
			4				389.5	10.9		0.55	
			5				278.7	7.8		0.51	
			6				200.5	5.6		0.48	
			7				155.3	4.4		0.45	
			8				113.6	3.2		0.43	
	9	90.15	2.5	0.41							
	10	65.11	1.8	0.40							
	11	50.75	1.4	0.39							
	12	38.47	1.1	0.38							
			9-Sep-14	Surface	12.0	5.5	11.0	3,178	100.0	10.0	n/a
				0.025				2,847	89.6		4.40
				0.1				1,406	44.2		8.16
				0.5				878	27.6		2.57
				1				661	20.8		1.57
				2				530.2	16.7		0.90
				3				326.4	10.3		0.76
4				230.3				7.2	0.66		
5				146.8				4.6	0.61		
6				120.4				3.8	0.55		
7				88.41				2.8	0.51		
8	55.98	1.8	0.50								
9	46.32	1.5	0.47								
10	37.28	1.2	0.44								
11	25.29	0.8	0.44								

Table C-1 Seasonal Light Attenuation Profile Data From Lac du Sauvage and Duchess Lake During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	μmols/s/m ²	% SI = (I _d /I ₀) x 100	m	K _d = -[ln(I _d /I ₀)]/d
Location	Station	Sample Date	Depth (m)							
Lac du Sauvage	Ad-1	July	—	—	—	—	—	—	—	—
		9-Aug-14	Surface	12.2	5.5	11.0	3,156	100.0	9.0	n/a
			0.025				2,852	90.4		4.05
			0.1				1,156	36.6		10.04
			0.5				899.4	28.5		2.51
			1				579.8	18.4		1.69
			2				434.8	13.8		0.99
			3				262.7	8.3		0.83
			4				194.9	6.2		0.70
			5				130.5	4.1		0.64
			6				94.2	3.0		0.59
			7				66.66	2.1		0.55
		8	48.25	1.5	0.52					
		9	36.76	1.2	0.49					
		10	28	0.9	0.47					
		11	20.94	0.7	0.46					
		5-Sep-14	Surface	10.7	4.5	9.0	2,182	100.0	10.0	n/a
			0.025				862	39.5		37.15
			0.1				922	42.3		8.61
			0.5				661	30.3		2.39
			1				346	15.9		1.84
			2				313	14.3		0.97
			3				260.8	12.0		0.71
			4				176	8.1		0.63
			5				126	5.8		0.57
			6				96.89	4.4		0.52
			7				62.43	2.9		0.51
		8	49.89	2.3	0.47					
		9	35	1.6	0.46					
10	20.68	0.9	0.47							

Table C-1 Seasonal Light Attenuation Profile Data From Lac du Sauvage and Duchess Lake During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	μmols/s/m ²	% SI = (I _d /I ₀) x 100	m	K _d = -[ln(I _d /I ₀)]/d
Location	Station	Sample Date	Depth (m)							
Lac du Sauvage	Ad-5	19-Jul-14	Surface	25.0	5.3	10.6	3,927	100.0	9.0	n/a
			0.025				3,412	86.9		5.62
			0.1				1,356	34.5		10.63
			0.5				1,258	32.0		2.28
			1				1,107	28.2		1.27
			2				736.8	18.8		0.84
			3				430.5	11.0		0.74
			4				277.5	7.1		0.66
			5				122.3	3.1		0.69
			6				128	3.3		0.57
			7				87.47	2.2		0.54
			8				60.67	1.5		0.52
			9				42.74	1.1		0.50
			10				29.81	0.8		0.49
			11				21.89	0.6		0.47
			12				15.07	0.4		0.46
			13				10.71	0.3		0.45
			14				7.504	0.2		0.45
			15				5.095	0.1		0.44
			16				3.786	0.1		0.43
			17				3.645	0.1		0.41
			18				2.64	0.1		0.41
			19				1.946	0.0		0.40
			20				1.424	0.0		0.40
		21	1.654	0.0	0.37					
		22	0.7808	0.0	0.39					
23	0.6224	0.0	0.38							
24	0.4882	0.0	0.37							
	August	—	—	—	—	—	—	—	—	
	September	—	—	—	—	—	—	—	—	

Table C-1 Seasonal Light Attenuation Profile Data From Lac du Sauvage and Duchess Lake During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation	
Unit				m	m	m	$\mu\text{mols/s/m}^2$	% SI = $(I_d/I_0) \times 100$	m	$K_d = -[\ln(I_d/I_0)]/d$	
Location	Station	Sample Date	Depth (m)								
Lac du Sauvage	Ae-1	19-Jul-14	Surface	15.6	5.5	11.0	3,669	100.0	7.0	n/a	
			0.025				3,889	106.0		-2.33	
			0.1				3,173	86.5		1.45	
			0.5				1,232.6	33.6		2.18	
			1				900.3	24.5		1.40	
			2				536.7	14.6		0.96	
			3				345.8	9.4		0.79	
			4				207.2	5.6		0.72	
			5				148.9	4.1		0.64	
			6				70.16	1.9		0.66	
			7				49.21	1.3		0.62	
			8				36.36	1.0		0.58	
			9				24.56	0.7		0.56	
			10				17.51	0.5		0.53	
	11	13.43	0.4	0.51							
	12	10.38	0.3	0.49							
	13	7.688	0.2	0.47							
	14	5.889	0.2	0.46							
		9-Aug-14		Surface	11.9	6.4	Bottom	3,456	100.0	9.0	n/a
				0.025				3,279	94.9		2.10
				0.1				1,350	39.1		9.40
				0.5				1,268	36.7		2.01
				1				728.1	21.1		1.56
				2				500	14.5		0.97
				3				435.3	12.6		0.69
				4				313.3	9.1		0.60
	5			204.2				5.9	0.57		
	6			136.7				4.0	0.54		
	7			99.57				2.9	0.51		
	8			73.65				2.1	0.48		
	9	55.75	1.6	0.46							
	10	38.35	1.1	0.45							
	11	29.63	0.9	0.43							

Table C-1 Seasonal Light Attenuation Profile Data From Lac du Sauvage and Duchess Lake During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	μmols/s/m ²	% SI = (I _d /I ₀) x 100	m	K _d = -[ln(I _d /I ₀)]/d
Location	Station	Sample Date	Depth (m)							
Lac du Sauvage	Ae-1	5-Sep-14	Surface	10.2	5.0	10.0	3,461	100.0	8.0	n/a
			0.025				1,479	42.7		34.01
			0.1				1,048	30.3		11.95
			0.5				1,004	29.0		2.48
			1				722	20.9		1.57
			2				673	19.4		0.82
			3				280	8.1		0.84
			4				227	6.6		0.68
			5				187.5	5.4		0.58
			6				127	3.7		0.55
			7				80	2.3		0.54
			8				49	1.4		0.53
			9				24.23	0.7		0.55
10	22.15	0.6	0.51							
Duchess Lake	Af-1	July	—	—	—	—	—	—	—	—
		9-Aug-14	Surface	15.1	3.8	15.0	3,402	100.0	8.0	n/a
			0.025				2,480	72.9		12.64
			0.1				1,304	38.3		9.59
			0.5				1,172	34.5		2.13
			1				949.2	27.9		1.28
			2				619.9	18.2		0.85
			3				446.8	13.1		0.68
			4				268.2	7.9		0.64
			5				177.6	5.2		0.59
			6				108.9	3.2		0.57
			7				61.22	1.8		0.57
			8				29.21	0.9		0.59
			9				19.13	0.6		0.58
			10				16.86	0.5		0.53
			11				8.062	0.2		0.55
			12				5.333	0.2		0.54
13	3.461	0.1	0.53							
14	2.333	0.1	0.52							

Table C-1 Seasonal Light Attenuation Profile Data From Lac du Sauvage and Duchess Lake During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	μmols/s/m ²	% SI = (I _d /I ₀) x 100	m	K _d = -[ln(I _d /I ₀)]/d
Location	Station	Sample Date	Depth (m)							
Duchess Lake	Af-1	9-Sep-14	Surface	11.0	3.5	11.0	748	100.0	7.0	n/a
			0.025				535	71.5		13.41
			0.1				433.5	58.0		5.46
			0.5				240	32.1		2.27
			1				158.9	21.2		1.55
			2				151.2	20.2		0.80
			3				107.6	14.4		0.65
			4				58.62	7.8		0.64
			5				30.97	4.1		0.64
			6				16.12	2.2		0.64
			7				10.43	1.4		0.61
8	6.434	0.9	0.59							
9	5.515	0.7	0.55							
10	3.229	0.4	0.54							

a) Euphotic zone depth based on two times the Secchi depth.

b) Euphotic zone depth based on LI-COR light readings.

Note:

% SI = (I_d/I₀) x 100, where I_d and I₀ are irradiance at depth (d) and at the surface.

K_d = -[ln(I_d/I₀)]/d, where K_d is the attenuation coefficient at depth (d) and I_d and I₀ are irradiance at depth (d) and at the surface.

— = not sampled; n/a = not applicable; m = metre; μmol/s/m² = micromoles per second per square metre; % SI = percent surface irradiance.

Table C-2 Seasonal Light Attenuation Profile Data From Lac de Gras Slipper Bay During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	μmols/s/m ²	% SI = (I _d /I ₀) x 100	m	K _d = -[ln(I _d /I ₀)]/d
Location	Station	Sample Date	Depth (m)							
Lac de Gras – Slipper Bay	S2	21-Jul-14	Surface	6.5	5.8	Bottom	2,198	100.0	Bottom	n/a
			0.025				1,453	66.1		16.56
			0.1				514.2	23.4		14.53
			0.5				306.5	13.9		3.94
			1				233.4	10.6		2.24
			2				156	7.1		1.32
			3				104.8	4.8		1.01
			4				73.39	3.3		0.85
			5				54.36	2.5		0.74
		6	40.87	1.9	0.66					
		14-Aug-14	Surface	6.5	Bottom	Bottom	1,130	100.0	n/a	
			0.025				914.5	80.9	8.46	
			0.1				401.6	35.5	10.35	
			0.5				295.4	26.1	2.68	
			1				286.4	25.3	1.37	
			2				207	18.3	0.85	
			3				147.5	13.1	0.68	
			4				116.4	10.3	0.57	
			5				88.96	7.9	0.51	
		8-Sep-14	Surface	7.0	5.5	Bottom	2,146	100.0	n/a	
			0.025				523	24.4	56.47	
			0.1				480	22.4	14.98	
			0.5				363.8	17.0	3.55	
			1				318.9	14.9	1.91	
	2		208.5				9.7	1.17		
	3		168.5				7.9	0.85		
	4		119.7				5.6	0.72		
	5		93.23				4.3	0.63		
	S3	21-Jul-14	Surface	12.9	6.3	12.6	1,731	100.0	n/a	
			0.025				1,562	90.2	4.11	
			0.1				641.2	37.0	9.93	
			0.5				530.2	30.6	2.37	
			1				449.7	26.0	1.35	
			2				283.2	16.4	0.91	
			3				201.9	11.7	0.72	
			4				153.4	8.9	0.61	
			5				108.9	6.3	0.55	
			6				82.05	4.7	0.51	
			7				67.85	3.9	0.46	
			8				55.16	3.2	0.43	
			9				43.49	2.5	0.41	
			10				34.06	2.0	0.39	
			11				26.63	1.5	0.38	
	12	21.59	1.2	0.37						

Table C-2 Seasonal Light Attenuation Profile Data From Lac de Gras Slipper Bay During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation	
Unit				m	m	m	$\mu\text{mol/s/m}^2$	% SI = $(I_d/I_0) \times 100$	m	$K_d = -[\ln(I_d/I_0)]/d$	
Location	Station	Sample Date	Depth (m)								
Lac de Gras – Slipper Bay	S3	14-Aug-14	Surface	13.5	11.0	Bottom	1,186	100.0	13.0	n/a	
			0.025				923.7	77.9		10.00	
			0.1				429.2	36.2		10.16	
			0.5				342.8	28.9		2.48	
			1				288.8	24.4		1.41	
			2				220.9	18.6		0.84	
			3				176.7	14.9		0.63	
			4				143.9	12.1		0.53	
			5				114.9	9.7		0.47	
			6				90.25	7.6		0.43	
			7				70.8	6.0		0.40	
			8				56.64	4.8		0.38	
			9				43.53	3.7		0.37	
	10	34.9	2.9	0.35							
	11	27.8	2.3	0.34							
	12	22.42	1.9	0.33							
	13	16.81	1.4	0.33							
		S3	8-Sep-14	Surface	11.0	6.0	Bottom	1,453	100.0	Bottom	n/a
	0.025			515				35.4	41.49		
	0.1			428.5				29.5	12.21		
	0.5			409.9				28.2	2.53		
	1			384.2				26.4	1.33		
	2			326				22.4	0.75		
3	258			17.8				0.58			
4	208			14.3				0.49			
5	155.4			10.7				0.45			
6	124.4			8.6				0.41			
7	99.35	6.8	0.38								
8	78.27	5.4	0.37								
9	62.63	4.3	0.35								
10	50.88	3.5	0.34								

Table C-2 Seasonal Light Attenuation Profile Data From Lac de Gras Slipper Bay During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	$\mu\text{mols/s/m}^2$	% SI = $(I_d/I_0) \times 100$	m	$K_d = -[\ln(I_d/I_0)]/d$
Location	Station	Sample Date	Depth (m)							
Lac de Gras – Slipper Bay	S5	21-Jul-04	Surface	17.3	9.5	Bottom	2,406	100.0	11.0	n/a
			0.025				1,629	67.7		15.60
			0.1				770	32.0		11.39
			0.5				585.7	24.3		2.83
			1				444.1	18.5		1.69
			2				289.14	12.0		1.06
			3				239.1	9.9		0.77
			4				175.6	7.3		0.65
			5				133.1	5.5		0.58
			6				103.1	4.3		0.53
			7				83.33	3.5		0.48
			8				61.64	2.6		0.46
			9				50.31	2.1		0.43
			10				40.33	1.7		0.41
			11				33.62	1.4		0.39
			12				27.84	1.2		0.37
			13				22.64	0.9		0.36
	14	19.06	0.8	0.35						
	15	15.76	0.7	0.34						
	16	13.05	0.5	0.33						
	S5	14-Aug-14	Surface	18.1	11.0	Bottom	820	100.0	17.0	n/a
			0.025				748.1	91.2		3.67
			0.1				422.9	51.6		6.62
			0.5				263	32.1		2.27
			1				222.8	27.2		1.30
			2				186	22.7		0.74
			3				146.7	17.9		0.57
			4				120.7	14.7		0.48
			5				96.13	11.7		0.43
			6				78.97	9.6		0.39
			7				65.6	8.0		0.36
			8				54.3	6.6		0.34
			9				44.71	5.5		0.32
			10				36.73	4.5		0.31
11			30.11				3.7	0.30		
12			25.41				3.1	0.29		
13			21.2				2.6	0.28		
14	17.86	2.2	0.27							
15	15.03	1.8	0.27							
16	12.47	1.5	0.26							
17	10.6	1.3	0.26							

Table C-2 Seasonal Light Attenuation Profile Data From Lac de Gras Slipper Bay During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	$\mu\text{mols/s/m}^2$	% SI = $(I_d/I_0) \times 100$	m	$K_d = -[\ln(I_d/I_0)]/d$
Location	Station	Sample Date	Depth (m)							
Lac de Gras – Slipper Bay	S5	8-Sep-14	Surface	14.0	6.0	12.0	1,944	100.0	Bottom	n/a
			0.025				847	43.6		33.23
			0.1				660.1	34.0		10.80
			0.5				440	-		2.97
			1				613	31.5		1.15
			2				520.1	26.8		0.66
			3				281.5	14.5		0.64
			4				284.5	14.6		0.48
			5				240.3	12.4		0.42
			6				187.8	9.7		0.39
			7				144.8	7.4		0.37
			8				113	5.8		0.36
			9				91.87	4.7		0.34
			10				76.72	3.9		0.32
			11				71.32	3.7		0.30
12	55.74	2.9	0.30							
13	40.78	2.1	0.30							
14	33.82	1.7	0.29							

Table C-2 Seasonal Light Attenuation Profile Data From Lac de Gras Slipper Bay During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	$\mu\text{mols/s/m}^2$	% SI = $(I_d/I_0) \times 100$	m	$K_d = -[\ln(I_d/I_0)]/d$
Location	Station	Sample Date	Depth (m)							
Lac de Gras – Slipper Bay	S6	21-Jul-14	Surface	25.5	11.0	21.0	1,834	100.0	17.0	n/a
			0.025				1,170	63.8		17.98
			0.1				636.6	34.7		10.58
			0.5				519.9	28.3		2.52
			1				436.6	23.8		1.44
			2				355.5	19.4		0.82
			3				312.8	17.1		0.59
			4				269.6	14.7		0.48
			5				215.2	11.7		0.43
			6				174.5	9.5		0.39
			7				145.8	7.9		0.36
			8				119.7	6.5		0.34
			9				97.15	5.3		0.33
			10				81.23	4.4		0.31
			11				69.28	3.8		0.30
			12				55.45	3.0		0.29
			13				46.88	2.6		0.28
			14				40.01	2.2		0.27
			15				32.7	1.8		0.27
			16				27.78	1.5		0.26
			17				22.88	1.2		0.26
			18				18.88	1.0		0.25
			19				16.83	0.9		0.25
			20				14.86	0.8		0.24
			21				12.44	0.7		0.24
22	10.92	0.6	0.23							
23	9.365	0.5	0.23							
24	8.1	0.4	0.23							
25	6.967	0.4	0.22							

Table C-2 Seasonal Light Attenuation Profile Data From Lac de Gras Slipper Bay During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	µmols/s/m ²	% SI = (I _d /I ₀) x 100	m	K _d = -[ln(I _d /I ₀)]/d
Location	Station	Sample Date	Depth (m)							
Lac de Gras – Slipper Bay	S6	14-Aug-14	Surface	28.8	11.0	22.0	630.6	100.0	15.0	n/a
			0.025				554.4	87.9		5.15
			0.1				225.5	35.8		10.28
			0.5				170.5	27.0		2.62
			1				133.3	21.1		1.55
			2				106	16.8		0.89
			3				89.36	14.2		0.65
			4				75.94	12.0		0.53
			5				62.98	10.0		0.46
			6				50.98	8.1		0.42
			7				41.2	6.5		0.39
			8				34.24	5.4		0.36
			9				28.16	4.5		0.35
			10				23.02	3.7		0.33
			11				19.19	3.0		0.32
			12				15.99	2.5		0.31
			13				13.25	2.1		0.30
			14				11.04	1.8		0.29
			15				9.08	1.4		0.28
			16				7.682	1.2		0.28
			17				6.411	1.0		0.27
			18				5.34	0.8		0.27
			19				4.709	0.7		0.26
			20				4.077	0.6		0.25
			21				3.571	0.6		0.25
			22				3.164	0.5		0.24
			23				2.675	0.4		0.24
			24				2.315	0.4		0.23
		25	1.998	0.3	0.23					
26	1.744	0.3	0.23							
27	1.51	0.2	0.22							
28	1.264	0.2	0.22							
	September	—	—	—	—	—	—	—	—	

a) Euphotic zone depth based on two times the Secchi depth.

b) Euphotic zone depth based on LI-COR light readings.

Note:

% SI = (I_d/I₀) x 100, where I_d and I₀ are irradiance at depth (d) and at the surface.

K_d = -[ln(I_d/I₀)]/d, where K_d is the attenuation coefficient at depth (d) and I_d and I₀ are irradiance at depth (d) and at the surface.

— = not sampled; n/a = not applicable; m = metre; µmol/s/m² = micromoles per second per square metre; % SI = percent surface irradiance.

- = data excluded due to anomalous field data (i.e., outside of an expected data range)

Table C-3 Seasonal Light Attenuation Profile Data From Lac de Gras Far Field 2 During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	$\mu\text{mols/s/m}^2$	% SI = $(I_d/I_0) \times 100$	m	$K_d = -[\ln(I_d/I_0)]/d$
Location	Station	Sample Date	Depth (m)							
Lac de Gras – Far Field 2	FF2-1	22-Jul-14	Surface	21.5	5.0	10.0	779.5	100.0	13.0	n/a
			0.025				568.2	72.9		12.65
			0.1				252.1	32.3		11.29
			0.5				208.3	26.7		2.64
			1				169.8	21.8		1.52
			2				143.1	18.4		0.85
			3				106.2	13.6		0.66
			4				85.42	11.0		0.55
			5				61.22	7.9		0.51
			6				50.32	6.5		0.46
			7				38.68	5.0		0.43
			8				29.02	3.7		0.41
			9				23.29	3.0		0.39
			10				18.35	2.4		0.37
			11				14.63	1.9		0.36
			12				11.77	1.5		0.35
			13				9.331	1.2		0.34
			14				7.218	0.9		0.33
			15				6.209	0.8		0.32
			16				5.005	0.6		0.32
			17				3.935	0.5		0.31
18	3.175	0.4	0.31							
19	2.625	0.3	0.30							
20	2.295	0.3	0.29							
21	1.996	0.3	0.28							

Table C-3 Seasonal Light Attenuation Profile Data From Lac de Gras Far Field 2 During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	$\mu\text{mols/s/m}^2$	% SI = $(I_d/I_0) \times 100$	m	$K_d = -[\ln(I_d/I_0)]/d$
Location	Station	Sample Date	Depth (m)							
Lac de Gras – Far Field 2	FF2-1	12-Aug-14	Surface	21.3	4.3	8.6	3,045	100.0	14.0	n/a
			0.025				2,850	93.6		2.65
			0.1				1,485	48.8		7.18
			0.5				1,195	39.2		1.87
			1				933.3	30.7		1.18
			2				675.5	22.2		0.75
			3				455.5	15.0		0.63
			4				350.6	11.5		0.54
			5				274.5	9.0		0.48
			6				232.2	7.6		0.43
			7				190	6.2		0.40
			8				152.1	5.0		0.37
			9				119	3.9		0.36
			10				95.92	3.2		0.35
			11				68.62	2.3		0.34
			12				58.34	1.9		0.33
			13				47.41	1.6		0.32
			14				37.89	1.2		0.31
			15				30.38	1.0		0.31
			16				23.96	0.8		0.30
17	19.31	0.6	0.30							
18	15.38	0.5	0.29							
19	13.72	0.5	0.28							
20	11.25	0.4	0.28							

Table C-3 Seasonal Light Attenuation Profile Data From Lac de Gras Far Field 2 During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	μmols/s/m ²	% SI = (I _d /I ₀) x 100	m	K _d = -[ln(I _d /I ₀)]/d
Location	Station	Sample Date	Depth (m)							
Lac de Gras – Far Field 2	FF2-1	12-Sep-14	Surface	20.0	6.0	12.0	428.3	100.0	16.0	n/a
			0.025				271.9	63.5		18.18
			0.1				132	30.8		11.77
			0.5				128.7	30.0		2.40
			1				150.1	35.0		1.05
			2				127.6	29.8		0.61
			3				100.7	23.5		0.48
			4				82.68	19.3		0.41
			5				65.09	15.2		0.38
			6				51.68	12.1		0.35
			7				41.22	9.6		0.33
			8				33.09	7.7		0.32
			9				25.31	5.9		0.31
			10				19.87	4.6		0.31
			11				15.36	3.6		0.30
			12				12.21	2.9		0.30
			13				8.47	2.0		0.30
			14				7.819	1.8		0.29
			15				6.633	1.5		0.28
			16				5.36	1.3		0.27
17	3.888	0.9	0.28							
18	3.101	0.7	0.27							
19	2.502	0.6	0.27							

Table C-3 Seasonal Light Attenuation Profile Data From Lac de Gras Far Field 2 During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	μmols/s/m ²	% SI = (I _d /I ₀) x 100	m	K _d = -[ln(I _d /I ₀)]/d
Location	Station	Sample Date	Depth (m)							
Lac de Gras – Far Field 2	FF2-2	20-Jul-04	Surface	18.75	6.6	13.2	3,321	100.0	14.0	n/a
			0.025				2,886	86.9		5.62
			0.1				1,641	49.4		7.05
			0.5				1,032	31.1		2.34
			1				886	26.7		1.32
			2				632.7	19.1		0.83
			3				519.8	15.7		0.62
			4				464.4	14.0		0.49
			5				339.4	10.2		0.46
			6				280.6	8.4		0.41
			7				214.2	6.4		0.39
			8				157	4.7		0.38
			9				131.6	4.0		0.36
			10				104.9	3.2		0.35
			11				78.87	2.4		0.34
			12				60.58	1.8		0.33
			13				50.49	1.5		0.32
			14				40.33	1.2		0.32
		15	30.89	0.9	0.31					
		16	25.66	0.8	0.30					
		17	19.63	0.6	0.30					
		18	15.88	0.5	0.30					
		12-Aug-14	Surface	18.5	4.5	9.0	3,278	100.0	13.0	n/a
			0.025				2,987	91.1		3.72
			0.1				1,300	39.7		9.25
			0.5				1,035	31.6		2.31
			1				778.7	23.8		1.44
			2				729.4	22.3		0.75
			3				496.9	15.2		0.63
			4				412.6	12.6		0.52
			5				310	9.5		0.47
			6				216.5	6.6		0.45
			7				200.1	6.1		0.40
			8				143.9	4.4		0.39
			9				116.9	3.6		0.37
			10				90.53	2.8		0.36
11	68.8		2.1				0.35			
12	56.9		1.7				0.34			
13	44		1.3				0.33			
14	35.26		1.1				0.32			
15	28.5	0.9	0.32							
16	22.7	0.7	0.31							
17	17.89	0.5	0.31							
September	—	19.0	6.0	12.0	—	—	—	—		

Table C-3 Seasonal Light Attenuation Profile Data From Lac de Gras Far Field 2 During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation	
Unit				m	m	m	μmols/s/m ²	% SI = (I _d /I ₀) x 100	m	K _d = -[ln(I _d /I ₀)]/d	
Location	Station	Sample Date	Depth (m)								
Lac de Gras – Far Field 2	FF2-3	20-Jul-14	Surface	19.5	6.5	13.0	3,227	100.0	13.0	n/a	
			0.025				2,935	91.0		3.79	
			0.1				1,563	48.4		7.25	
			0.5				1,076	33.3		2.20	
			1				955	29.6		1.22	
			2				737.9	22.9		0.74	
			3				666.7	20.7		0.53	
			4				446.2	13.8		0.49	
			5				356.6	11.1		0.44	
			6				266.1	8.2		0.42	
			7				203.9	6.3		0.39	
			8				141.7	4.4		0.39	
			9				111	3.4		0.37	
			10				88.95	2.8		0.36	
			11				68.15	2.1		0.35	
			12				54.65	1.7		0.34	
			13				42.6	1.3		0.33	
			14				34.43	1.1		0.32	
	15	27.45	0.9	0.32							
	16	22.45	0.7	0.31							
	17	17.09	0.5	0.31							
	18	14.04	0.4	0.30							
		FF2-3	12-Aug-14	Surface	17.2	4.5	9.0	3,179	100.0	13.0	n/a
	0.025			2,296				72.2	13.02		
	0.1			1,199				37.7	9.75		
	0.5			871.3				27.4	2.59		
	1			752.8				23.7	1.44		
	2			504				15.9	0.92		
	3			429.8				13.5	0.67		
	4			344.5				10.8	0.56		
	5			245.1				7.7	0.51		
	6			189				5.9	0.47		
	7			154				4.8	0.43		
	8			117.9				3.7	0.41		
9	94.99			3.0				0.39			
10	73.37			2.3				0.38			
11	59.29			1.9				0.36			
12	47.62			1.5				0.35			
13	37.7	1.2	0.34								
14	30.29	1.0	0.33								
15	24.44	0.8	0.32								
16	19.85	0.6	0.32								

Table C-3 Seasonal Light Attenuation Profile Data From Lac de Gras Far Field 2 During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation	
Unit				m	m	m	μmols/s/m ²	% SI = (I _d /I ₀) x 100	m	K _d = -[ln(I _d /I ₀)]/d	
Location	Station	Sample Date	Depth (m)								
Lac de Gras – Far Field 2	FF2-3	12-Sep-14	Surface	19.0	6.5	13.0	502.1	100.0	15.0	n/a	
			0.025				418.3	83.3		7.30	
			0.1				193.4	38.5		9.54	
			0.5				160.7	32.0		2.28	
			1				138.6	27.6		1.29	
			2				129.4	25.8		0.68	
			3				109.5	21.8		0.51	
			4				85.91	17.1		0.44	
			5				68.17	13.6		0.40	
			6				54.37	10.8		0.37	
			7				48.68	9.7		0.33	
			8				34.22	6.8		0.34	
			9				27.44	5.5		0.32	
			10				21.38	4.3		0.32	
			11				17.34	3.5		0.31	
			12				13.64	2.7		0.30	
			13				10.98	2.2		0.29	
			14				8.725	1.7		0.29	
	15	7.145	1.4	0.28							
	16	6.095	1.2	0.28							
	17	4.668	0.9	0.28							
	18	3.777	0.8	0.27							
		FF2-4	20-Jul-14	Surface	19.3	7.1	14.2	3,482	100.0	13.0	n/a
				0.025				3,232	92.8		2.98
				0.1				1,787	51.3		6.67
				0.5				1,124	32.3		2.26
				1				793.5	22.8		1.48
				2				649.7	18.7		0.84
				3				566.2	16.3		0.61
				4				444.4	12.8		0.51
				5				340.3	9.8		0.47
				6				263.1	7.6		0.43
				7				204.6	5.9		0.40
				8				158.5	4.6		0.39
				9				124.8	3.6		0.37
				10				96.96	2.8		0.36
11				77.12				2.2	0.35		
12				59.31				1.7	0.34		
13				47.28				1.4	0.33		
14				37.81				1.1	0.32		
15	30.24	0.9	0.32								
16	22.95	0.7	0.31								
17	19.05	0.5	0.31								
18	15.47	0.4	0.30								

Table C-3 Seasonal Light Attenuation Profile Data From Lac de Gras Far Field 2 During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	$\mu\text{mols/s/m}^2$	% SI = $(I_d/I_0) \times 100$	m	$K_d = -[\ln(I_d/I_0)]/d$
Location	Station	Sample Date	Depth (m)							
Lac de Gras – Far Field 2	FF2-4	12-Aug-14	Surface	20.3	4.5	9.0	2,600	100.0	11.0	n/a
			0.025				2,315	89.0		4.64
			0.1				1,092	42.0		8.68
			0.5				751.6	28.9		2.48
			1				640.2	24.6		1.40
			2				346.8	13.3		1.01
			3				291.8	11.2		0.73
			4				200.5	7.7		0.64
			5				161.9	6.2		0.56
			6				119.4	4.6		0.51
			7				98.25	3.8		0.47
			8				76.53	2.9		0.44
			9				57.27	2.2		0.42
			10				47.23	1.8		0.40
			11				36.13	1.4		0.39
			12				29.15	1.1		0.37
			13				24	0.9		0.36
			14				18.15	0.7		0.35
			15				14.55	0.6		0.35
			16				11.96	0.5		0.34
17	9.626	0.4	0.33							
18	7.817	0.3	0.32							
19	6.574	0.3	0.31							

Table C-3 Seasonal Light Attenuation Profile Data From Lac de Gras Far Field 2 During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation	
Unit				m	m	m	$\mu\text{mols/s/m}^2$	% SI = $(I_d/I_0) \times 100$	m	$K_d = -[\ln(I_d/I_0)]/d$	
Location	Station	Sample Date	Depth (m)								
Lac de Gras – Far Field 2	FF2-4	12-Sep-14	Surface	20.0	6.5	13.0	2,851	100.0	11.0	n/a	
			0.025				1,893	66.4		16.38	
			0.1				921.4	32.3		11.30	
			0.5				535.8	18.8		3.34	
			1				444.1	15.6		1.86	
			2				383.6	13.5		1.00	
			3				307.1	10.8		0.74	
			4				223.9	7.9		0.64	
			5				185	6.5		0.55	
			6				160.1	5.6		0.48	
			7				116.7	4.1		0.46	
			8				90.3	3.2		0.43	
			9				65.4	2.3		0.42	
			10				52.8	1.9		0.40	
			11				40.88	1.4		0.39	
			12				32.04	1.1		0.37	
			13				24.92	0.9		0.36	
			14				19.64	0.7		0.36	
			15				15.21	0.5		0.35	
	16	12.41	0.4	0.34							
	17	9.74	0.3	0.33							
	18	7.673	0.3	0.33							
	19	6.128	0.2	0.32							
		FF2-5	20-Jul-14	Surface	19.1	6.0	12.0	3,424	100.0	13.0	n/a
				0.025				2,987	87.2		5.46
				0.1				1,599	46.7		7.61
				0.5				1,325	38.7		1.90
				1				1,020	29.8		1.21
				2				617.3	18.0		0.86
				3				563.8	16.5		0.60
				4				382	11.2		0.55
				5				322.5	9.4		0.47
				6				232.6	6.8		0.45
				7				171.2	5.0		0.43
				8				136.3	4.0		0.40
				9				101.6	3.0		0.39
				10				82.94	2.4		0.37
				11				63.42	1.9		0.36
12				50.55				1.5	0.35		
13				39.8				1.2	0.34		
14				30				0.9	0.34		
15				24.51				0.7	0.33		
16	19.19	0.6	0.32								
17	16.06	0.5	0.32								
18	12.78	0.4	0.31								

Table C-3 Seasonal Light Attenuation Profile Data From Lac de Gras Far Field 2 During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	μmols/s/m ²	% SI = (I _d /I ₀) x 100	m	K _d = -[ln(I _d /I ₀)]/d
Location	Station	Sample Date	Depth (m)							
Lac de Gras – Far Field 2	FF2-5	11-Aug-14	Surface	20.5	7.3	14.6	3,911	100.0	14.0	n/a
			0.025				3,539	90.5		4.00
			0.1				1,641	42.0		8.68
			0.5				1,290	33.0		2.22
			1				859.8	22.0		1.51
			2				498.4	12.7		1.03
			3				637.9	16.3		0.60
			4				523.2	13.4		0.50
			5				408.5	10.4		0.45
			6				330.5	8.5		0.41
			7				222.2	5.7		0.41
			8				181.9	4.7		0.38
			9				149.1	3.8		0.36
			10				120.3	3.1		0.35
			11				99.71	2.5		0.33
			12				77.2	2.0		0.33
			13				60.67	1.6		0.32
			14				49.58	1.3		0.31
			15				38.96	1.0		0.31
			16				32.75	0.8		0.30
17	25.55	0.7	0.30							
18	20.53	0.5	0.29							
19	17.25	0.4	0.29							

Table C-3 Seasonal Light Attenuation Profile Data From Lac de Gras Far Field 2 During the Open-Water Period, 2014

Parameter				Total Depth	Secchi Depth	Euphotic Zone ^(a)	Light Penetration	Percent Surface Irradiance Available	Euphotic Zone ^(b)	Light Attenuation
Unit				m	m	m	μmols/s/m ²	% SI = (I _d /I ₀) x 100	m	K _d = -[ln(I _d /I ₀)]/d
Location	Station	Sample Date	Depth (m)							
Lac de Gras – Far Field 2	FF2-5	12-Sep-14	Surface	20.0	6.0	12.0	347.3	100.0	17.0	n/a
			0.025				266.9	76.8		10.53
			0.1				112.2	32.3		11.30
			0.5				102.5	-		2.44
			1				108.9	-		1.16
			2				90.04	25.9		0.67
			3				77.22	22.2		0.50
			4				61.66	17.8		0.43
			5				50.92	14.7		0.38
			6				41.68	12.0		0.35
			7				34.2	9.8		0.33
			8				27.77	8.0		0.32
			9				22.44	6.5		0.30
			10				17.66	5.1		0.30
			11				14.53	4.2		0.29
			12				11.7	3.4		0.28
			13				9.514	2.7		0.28
			14				7.693	2.2		0.27
			15				6.019	1.7		0.27
			16				5.185	1.5		0.26
17	3.955	1.1	0.26							
18	3.414	1.0	0.26							
19	3.083	0.9	0.25							

a) Euphotic zone depth based on two times the Secchi depth.

b) Euphotic zone depth based on LI-COR light readings.

Note:

% SI = (I_d/I₀) x 100, where I_d and I₀ are irradiance at depth (d) and at the surface.

K_d = -[ln(I_d/I₀)]/d, where K_d is the attenuation coefficient at depth (d) and I_d and I₀ are irradiance at depth (d) and at the surface.

— = not sampled; n/a = not applicable; m = metre; μmol/s/m² = micromoles per second per square metre; % SI = percent surface irradiance.

- = data excluded due to anomalous field data (i.e., outside of an expected data range).



APPENDIX D

WATER QUALITY DATA



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Abbreviations

Abbreviation	Definition
—	data outside expected range and excluded or no guideline
BTEX	benzene, ethylbenzene, toluene, xylene
Bottom	bottom of the water column
CaCO ₃	calcium carbonate
CDWQG	Canadian Drinking Water Quality Guideline
CFU	coliform forming units
CWQG	Canadian Water Quality Guideline
DO	dissolved oxygen
F	fraction
ID	identification
Mid	middle of the water column
NAD	North American Datum
NTU	nephelometric turbidity unit
pH	potential of hydrogen, provides measure of the acidity or alkalinity of a solution on a scale of 0 to 14
SSWQO	Site-Specific Water Quality Objective
Top	top of the water column

Units of Measure

Unit	Definition
%	percent
% Sat	percent saturation
<	less than
°C	degrees Celsius
CFU/100mL	coliform forming units per 100 millilitres
m	metre
meg/L	milliequivalents per litre
mg/L	milligrams per litre
mg N/L	milligrams per litre as nitrogen
mg P/L	milligrams per litre as phosphorus
µg/L	micrograms per litre
µS/cm	microSiemens per centimetre

Table D-1 Field Profile Data from Lac du Sauvage during the Under-Ice Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Ice Thickness (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Aa-1	28-Apr-14	10.0	2.2	2.5	1.3	13.0	92.3	10	-
				3	1.2	12.6	89.3	10	-
				4	1.5	10.9	78.0	11	-
				5	1.6	10.2	73.5	11	-
				6	1.7	9.8	70.2	11	-
				7	2.1	8.4	60.5	10	-
				8	2.2	7.7	56.1	10	-
				9	2.3	7.1	51.5	10	-
Ab-1	24-Apr-14	12.7	1.6	2	0.7	12.5	87.3	14	-
				3	1.0	12.3	86.6	9	-
				4	1.0	12.0	84.4	9	-
				5	1.1	11.7	83.0	9	-
				6	1.3	11.5	81.8	10	-
				7	1.4	11.0	78.5	9	-
				8	1.5	10.5	75.1	9	-
				9	1.5	10.5	72.0	9	-

Table D-1 Field Profile Data from Lac du Sauvage during the Under-Ice Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Ice Thickness (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Ac-1	24-Apr-14	13.0	1.8	2.5	0.5	14.1	102.3	13	-
				3	0.8	14.3	100.4	12	-
				4	1.1	12.5	88.5	9	-
				5	1.2	12.4	87.5	9	-
				6	1.3	12.1	86.0	9	-
				7	1.4	11.7	83.3	9	-
				8	1.5	11.5	82.4	10	-
				9	1.6	10.6	76.0	10	-
				10	2.0	8.8	64.3	9	-
				11	2.5	6.0	44.3	9	-
Ac-4	24-Apr-14	11.5	1.9	2	0.5	16.0	110.0	12	-
				2.5	0.8	14.9	105.0	11	-
				3	1.0	14.3	100.5	10	-
				4	1.1	13.3	93.5	9	-
				5	1.2	12.9	91.3	10	-
				6	1.3	12.5	88.8	10	-
				7	1.4	12.0	85.6	10	-
				8	1.4	12.0	86.1	10	-
				9	1.5	11.7	83.1	10	-
				10	1.5	11.2	80.2	10	-
11	1.6	11.0	78.7	10	-				

Table D-1 Field Profile Data from Lac du Sauvage during the Under-Ice Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Ice Thickness (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Ac-7	24-Apr-14	13.0	1.9	2.5	0.9	13.8	97.4	10	-
				3	1.0	13.2	93.0	9	-
				4	1.1	12.5	88.5	9	-
				5	1.2	12.3	86.8	9	-
				6	1.3	12.0	85.2	9	-
				7	1.4	12.0	85.4	10	-
				8	1.7	10.5	75.6	10	-
				9	1.9	9.1	66.0	9	-
				10	1.9	8.8	63.7	9	-
				11	2.1	8.4	61.3	9	-
Ad-1	25-Apr-14	13.0	1.6	2	0.7	-	-	12	-
				3	0.9	-	-	11	-
				4	1.1	-	-	11	-
				5	1.2	-	-	10	-
				6	1.3	13.7	97.3	9	-
				7	1.4	12.5	89.2	9	-
				8	1.4	12.0	85.5	9	-
				9	1.5	11.2	80.1	9	-
				10	1.5	11.0	79.0	9	-
				11	1.5	11.0	78.3	9	-

Table D-1 Field Profile Data from Lac du Sauvage during the Under-Ice Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Ice Thickness (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Ae-1	25-Apr-14	12.0	1.7	2.5	0.7	-	-	9	-
				3	1.0	14.0	98.9	9	-
				4	1.1	13.2	93.6	9	-
				5	1.1	13.0	91.8	9	-
				6	1.2	12.8	90.7	9	-
				7	1.3	12.5	88.7	9	-
				8	1.4	12.5	88.7	10	-
				9	1.5	12.6	89.7	10	-
				10	1.5	12.6	89.9	11	-
				11	1.6	11.9	85.6	11	-

Note:

Bolded concentrations are higher than relevant water quality guidelines, or outside the recommended range.

- = data excluded due to anomalous field data (i.e., outside of an expected data range).

m = metre; °C = degrees Celsius; mg/L = milligrams per litre; %Sat = percent saturation; µS/cm = microSiemens per centimetre.

Table D-2 Field Profile Data from Lac du Sauvage during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Aa-1	10-Aug-14	11.4	4.5	0.025	13.4	10.1	96.9	11	7.0
				0.1	13.4	10.1	96.9	11	7.0
				0.5	13.4	10.1	96.9	11	7.0
				1	13.4	10.1	97.0	11	7.0
				2	13.3	10.1	97.1	11	7.0
				3	13.3	10.1	97.0	11	6.9
				4	13.3	10.1	97.0	11	6.9
				5	13.3	10.1	97.1	11	6.9
				6	13.3	10.1	97.0	11	6.9
				7	13.3	10.1	97.1	11	6.9
	8	13.3	10.1	97.0	11	6.9			
	9	13.2	10.1	96.7	11	6.9			
	10	13.1	10.0	95.6	11	6.8			
	11-Sep-14	10.5	4.5	0.1	6.2	12.6	101.5	13	7.0
				0.5	6.2	12.6	101.5	13	7.0
				1	6.2	12.6	101.5	13	7.0
				2	6.1	12.6	101.8	13	7.0
				3	6.1	12.6	101.2	13	7.0
				4	6.1	12.6	101.3	13	7.0
				5	6.1	12.6	101.6	13	7.0
6				6.1	12.6	101.6	13	6.9	
7				6.0	12.6	101.6	13	7.0	
8				6.0	12.6	101.0	13	7.0	
9	6.0	12.6	101.2	13	7.0				
10	6.0	12.6	101.1	13	7.0				

Table D-2 Field Profile Data from Lac du Sauvage during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Ab-1	19-Jul-14	10.1	6.3	0.025	10.7	11.3	102.5	11	6.5
				0.1	10.7	11.4	102.3	11	6.5
				0.5	10.7	11.6	103.1	11	6.5
				1	10.6	11.6	104.6	11	6.5
				2	10.7	11.8	105.5	11	6.7
				3	10.5	12.0	108.2	11	6.7
				4	10.4	12.1	108.0	11	6.6
				5	10.4	-	105.6	11	6.6
				6	10.4	-	-	11	6.6
				7	10.4	-	-	11	6.6
	8	10.4	-	-	11	6.6			
	9	10.2	-	-	11	6.6			
	11-Aug-14	12.5	6.5	0.025	12.8	10.4	98.6	11	7.2
				0.1	12.8	10.3	98.3	11	7.2
				0.5	12.8	10.3	98.1	11	7.2
				1	12.8	10.4	98.5	11	7.1
				2	12.8	10.4	98.8	11	7.1
				3	12.8	10.5	99.6	11	7.2
				4	12.8	10.6	100.4	11	7.1
				5	12.8	10.6	100.6	11	7.0
				6	12.8	10.5	100.2	11	7.0
				6.5	12.8	10.5	100.1	11	7.0
7				12.8	10.5	99.9	11	7.0	
8				12.8	10.5	99.5	11	7.0	
9	12.8	10.4	99.0	11	7.0				
10	12.8	10.4	98.6	11	7.0				
11	12.8	10.3	98.3	11	7.0				



Table D-2 Field Profile Data from Lac du Sauvage during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Ab-1	11-Sep-14	13.0	5.5	0.1	7.7	12.0	100.5	13	7.1
				0.5	7.7	12.0	100.3	13	7.1
				1	7.7	11.9	100.2	13	7.0
				2	7.7	12.0	100.2	13	7.0
				3	7.7	12.0	100.2	13	7.0
				4	7.7	12.0	100.2	13	7.0
				5	7.7	12.0	100.1	13	7.0
				6	7.7	11.9	100.0	13	7.0
				6.5	7.7	11.9	100.2	13	7.0
				7	7.6	12.0	100.3	13	7.0
				8	7.6	12.0	100.5	13	7.0
				9	7.6	12.0	100.4	13	6.9
10	7.6	12.0	100.4	13	6.9				
11	7.6	12.0	100.2	13	6.9				
12	7.6	12.0	100.5	13	6.9				



Table D-2 Field Profile Data from Lac du Sauvage during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Ac-1	19-Jul-14	14.8	5.0	0.025	11.1	11.3	103.3	11	6.8
				0.1	11.1	11.4	103.5	11	6.8
				0.5	11.1	11.4	103.6	11	6.7
				1	11.1	11.4	104.2	11	6.6
				2	11.0	11.6	104.7	11	6.6
				3	10.9	11.6	105.5	11	6.6
				4	10.9	11.8	106.3	11	6.6
				5	10.9	11.6	105.4	11	6.6
				6	10.8	11.6	105.3	11	6.5
				7	10.8	11.6	105.1	11	6.5
				7.5	10.8	11.5	104.5	11	6.5
				8	10.8	11.3	102.6	11	6.5
				9	10.8	11.4	103.1	11	6.5
				10	10.8	11.3	102.3	11	6.5
11	10.8	11.3	102.1	11	6.5				
12	10.7	11.1	100.2	11	6.5				
13	10.2	11.0	98.5	11	6.5				



Table D-2 Field Profile Data from Lac du Sauvage during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Ac-1	11-Aug-14	12.6	6.5	0.025	13.0	10.1	96.8	11	7.1
				0.1	13.0	10.1	96.8	11	7.1
				0.5	13.0	10.2	97.2	11	7.2
				1	13.0	10.2	97.2	11	7.1
				2	13.0	10.2	97.5	11	7.1
				3	13.0	10.3	98.3	11	7.0
				4	13.0	10.3	98.4	11	7.0
				5	13.0	10.3	98.5	11	7.0
				6	13.0	10.3	98.5	11	7.1
				6.5	13.0	10.3	98.3	11	7.0
				7	13.0	10.3	98.2	11	7.0
				8	12.9	10.3	98.0	11	7.0
				9	12.9	10.2	97.5	11	7.0
10	12.9	10.2	97.3	11	7.0				
11	12.9	10.2	96.9	11	7.0				
12	12.9	10.1	96.4	11	7.0				



Table D-2 Field Profile Data from Lac du Sauvage during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Ac-1	11-Sep-14	11.5	6.0	0.1	7.9	12.1	101.8	13	7.0
				0.5	7.7	12.0	101.3	13	7.0
				1	7.6	12.1	101.3	13	7.0
				2	7.4	12.1	100.9	13	7.0
				3	7.4	12.1	100.7	13	7.0
				4	7.4	12.1	100.9	13	7.0
				5	7.4	12.1	100.6	13	7.0
				5.5	7.4	12.1	100.6	13	6.9
				6	7.3	12.1	100.8	13	7.0
				7	7.3	12.1	100.5	13	7.0
				8	7.3	12.1	100.4	13	7.0
Ac-4	19-Jul-14	10.2	5.3	0.025	10.8	11.2	101.4	11	7.0
				0.1	10.8	11.3	100.2	11	6.9
				0.5	10.7	11.4	102.8	11	6.8
				1	10.7	-	101.6	11	6.6
				2	10.7	11.2	103.4	11	6.6
				3	10.6	-	103.4	11	6.5
				4	10.6	-	-	11	6.5
				5	10.6	-	-	11	6.6
				6	10.4	-	-	11	6.5
				7	10.3	-	-	11	6.6
				8	10.3	-	-	11	6.5
9	10.3	-	-	11	6.5				



Table D-2 Field Profile Data from Lac du Sauvage during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Ac-4	10-Aug-14	12.0	6.5	0.025	12.7	10.2	97.0	11	6.3
				0.1	12.7	10.2	96.6	11	6.4
				0.5	12.7	10.2	96.5	11	6.5
				1	12.7	10.2	96.7	11	6.6
				2	12.7	10.2	96.7	11	6.6
				3	12.7	10.2	96.8	11	6.5
				4	12.7	10.2	96.9	11	6.6
				5	12.7	10.2	96.8	11	6.6
				6	12.7	10.2	97.0	11	6.6
				7	12.7	10.2	96.8	11	6.6
				8	12.7	10.2	96.6	11	6.6
	9	12.7	10.2	96.5	11	6.6			
	10	12.6	10.2	96.5	11	6.6			
	11	12.6	10.2	96.4	11	6.6			
	10-Sep-14	11.0	5.5	0.1	7.7	11.9	99.8	13	7.1
				0.5	7.7	11.9	99.7	13	7.1
				1	7.7	11.9	99.6	13	7.0
				2	7.7	11.8	99.4	13	7.0
				3	7.7	11.8	99.3	13	7.0
				4	7.7	11.9	99.5	13	7.0
				5	7.7	11.8	99.2	13	7.0
5.5				7.8	11.9	99.7	14	6.9	
6				7.7	11.8	99.4	13	7.0	
7				7.7	11.8	99.5	13	6.9	
8	7.7	11.9	99.8	13	7.0				
9	7.7	11.9	99.6	13	7.0				
10	7.7	11.9	99.5	13	7.0				



Table D-2 Field Profile Data from Lac du Sauvage during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Ac-7	19-Jul-14	13.0	5.3	0.025	10.9	11.2	101.1	11	6.6
				0.1	10.9	11.2	101.4	11	6.6
				0.5	10.9	11.2	101.6	11	6.6
				1	10.9	11.3	102.3	11	6.5
				2	10.9	11.5	103.9	11	6.6
				3	10.9	11.5	103.8	11	6.5
				4	10.8	11.6	104.6	11	6.5
				5	10.8	11.6	104.4	11	6.5
				6	10.7	11.6	104.9	11	6.5
				6.5	10.7	11.5	103.8	11	6.5
				7	10.6	11.4	102.7	11	6.5
				8	10.6	11.3	102.1	11	6.5
				9	10.6	11.2	101.1	11	6.5
10	10.6	11.3	101.5	11	6.4				
11	10.6	11.3	101.5	11	6.4				
12	10.6	11.2	101.1	11	6.4				



Table D-2 Field Profile Data from Lac du Sauvage during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Ac-7	9-Aug-14	13.1	7.5	0.025	13.3	10.4	100.2	12	7.3
				0.1	13.3	10.4	100.2	12	7.4
				0.5	13.3	10.5	100.7	12	7.4
				1	13.3	10.6	101.4	12	7.3
				2	13.2	10.7	101.2	12	7.3
				3	13.1	10.7	102.4	12	7.3
				4	13.1	10.8	102.9	12	7.3
				5	13.0	10.7	102.4	12	7.3
				6	13.0	10.7	102.5	12	7.3
				6.5	13.0	10.6	101.2	12	7.3
				7	12.9	10.5	100.5	12	7.3
				8	12.9	10.5	99.8	12	7.3
	9	12.9	10.4	99.3	12	7.3			
	10	12.9	10.4	98.9	12	7.3			
	11	12.9	10.4	98.8	12	7.3			
	12	12.8	10.3	98.0	12	7.2			
	9-Sep-14	12.0	5.5	0.1	7.9	11.8	99.3	13	7.1
				0.5	7.9	11.7	98.9	13	7.0
				1	7.9	11.7	99.0	14	7.0
				2	7.9	11.7	98.9	13	7.0
				3	7.9	11.8	99.4	13	7.0
				4	7.9	11.8	99.3	13	7.0
5				7.8	11.8	99.2	13	7.0	
6				7.9	11.8	99.0	13	7.0	
7				7.9	11.7	98.9	13	7.0	
8				7.8	11.8	99.0	13	7.0	
9	7.7	11.8	99.1	13	7.0				
10	7.8	11.8	98.6	13	7.0				
11	7.6	11.8	98.7	13	7.0				

Table D-2 Field Profile Data from Lac du Sauvage during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Ad-5	19-Jul-14	25.3	5.3	0.025	11.0	11.0	99.9	11	6.4
				0.1	11.0	11.1	99.8	11	6.5
				0.5	11.0	11.1	99.8	11	6.5
				1	11.0	11.1	100.7	11	6.5
				2	11.0	11.1	100.3	11	6.5
				3	10.9	11.1	100.6	11	6.4
				4	10.9	11.1	100.8	11	6.4
				5	10.8	11.1	100.4	11	6.5
				6	10.8	11.1	100.1	11	6.5
				7	10.8	11.1	100.4	11	6.4
				8	10.8	11.1	99.8	11	6.5
				9	10.7	11.1	99.9	11	6.4
				10	10.7	11.1	100.0	11	6.4
				11	10.6	11.1	99.9	11	6.4
				12	10.5	11.2	100.6	11	6.4
				12.5	10.5	11.2	100.5	11	6.4
				13	10.5	11.2	100.8	11	6.4
				14	10.5	11.3	100.8	11	6.3
				15	10.4	11.2	100.5	11	6.3
				16	10.4	11.2	100.5	11	6.3
				17	10.3	11.3	100.1	11	6.3
				18	9.9	11.3	100.4	11	6.3
				19	9.5	11.5	100.2	11	6.3
				20	8.6	11.8	100.9	11	6.2
21	7.9	12.0	101.1	11	6.1				
22	7.8	12.1	101.3	11	6.1				
23	7.5	12.1	101.0	11	6.0				
24	7.5	12.1	100.8	11	6.0				



Table D-2 Field Profile Data from Lac du Sauvage during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Ad-1	9-Aug-14	12.2	5.5	0.025	12.6	10.1	95.2	12	7.0
				0.1	12.0	10.1	95.3	12	7.1
				0.5	12.0	10.1	95.1	12	7.1
				1	12.0	10.1	95.3	12	7.2
				2	12.0	10.1	95.2	12	7.2
				3	12.0	10.1	95.1	12	7.2
				4	11.8	10.1	95.1	12	7.2
				5	11.8	10.1	95.1	12	7.2
				6	12.6	10.1	95.1	12	7.2
				7	11.8	10.1	95.0	12	7.2
				8	12.0	10.1	94.9	12	7.2
	9	11.8	10.1	95.0	12	7.2			
	10	11.8	10.1	95.0	12	7.2			
	11	11.7	10.1	95.0	12	7.1			
	5-Sep-14	10.7	4.5	0.1	10.5	11.0	98.4	14	6.9
				0.5	10.5	11.0	98.4	14	6.9
				1	10.5	10.9	98.2	13	6.9
				2	10.5	11.0	98.5	13	6.9
				3	10.5	11.0	98.5	14	6.9
				4	10.5	11.0	98.5	14	6.9
				5	10.5	11.0	98.7	13	6.9
6				10.4	11.0	98.6	14	6.9	
7				10.5	11.0	98.6	14	6.9	
8				10.4	11.0	98.5	10	6.9	
9	10.3	11.0	98.7	10	6.9				
10	10.4	11.0	98.4	10	6.9				

**Table D-2 Field Profile Data from Lac du Sauvage during the Open-Water Period, 2014**

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Ae-1	19-Jul-14	15.6	5.5	0.025	10.7	11.2	100.6	11	5.6
				0.1	10.7	11.2	100.2	11	5.8
				0.5	10.7	11.1	100.6	11	5.7
				1	10.7	11.1	100.5	11	5.9
				2	10.7	11.1	100.2	11	5.9
				3	10.7	11.2	100.8	11	5.9
				4	10.7	11.2	100.4	11	6.0
				5	10.7	11.1	100.6	11	6.0
				6	10.7	11.2	100.9	11	6.0
				7	10.7	11.1	100.4	11	6.0
				7.5	10.7	11.1	100.6	11	6.0
				8	10.7	11.2	100.5	11	6.2
				9	10.7	11.1	100.3	11	6.1
				10	10.7	11.2	100.8	11	6.1
11	10.7	11.1	100.4	11	6.1				
12	10.7	11.1	100.1	11	6.1				
13	10.7	11.2	100.2	11	6.2				
14	10.7	11.1	100.3	11	6.1				



Table D-2 Field Profile Data from Lac du Sauvage during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Ae-1	9-Aug-14	11.9	6.4	0.025	13.2	9.9	94.9	12	7.3
				0.1	13.2	9.9	94.2	12	7.3
				0.5	13.2	9.9	94.2	12	7.3
				1	13.2	9.9	94.3	12	7.3
				2	13.2	9.9	94.5	12	7.2
				3	13.1	9.9	94.5	12	7.2
				4	13.1	9.9	94.5	11	7.2
				5	13.1	9.9	94.5	12	7.2
				6	13.1	9.9	94.3	12	7.2
				7	13.1	9.9	94.6	12	7.2
				8	13.1	9.9	94.3	12	7.2
9	13.1	9.9	94.6	12	7.2				
10	13.0	9.9	94.3	12	7.2				
11	13.0	9.9	94.2	12	7.2				

Table D-2 Field Profile Data from Lac du Sauvage during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Ae-1	5-Sep-14	10.2	5.0	0.1	10.5	11.1	99.2	13	6.9
				0.5	10.5	11.1	99.2	13	7.0
				1	10.5	11.1	99.1	13	6.9
				2	10.5	11.1	99.3	13	7.0
				3	10.5	11.1	99.0	13	6.9
				4	10.5	11.0	99.1	13	7.0
				5	10.5	11.0	99.1	13	7.0
				6	10.5	11.0	98.9	13	7.0
				7	10.5	11.0	98.9	13	7.0
				8	10.5	11.0	98.7	13	7.0
9	10.6	11.0	98.9	13	7.0				
10	10.6	11.0	98.5	13	7.0				

Note:

Bolded concentrations are higher than relevant water quality guidelines, or outside the recommended range.

- = data excluded due to anomalous field data (i.e., outside of an expected data range).

m = metre; °C = degrees Celsius; mg/L = milligrams per litre; %Sat = percent saturation; µS/cm = microSiemens per centimetre.

**Table D-3 Laboratory Water Quality Data from Lac du Sauvage during the Under-Ice Period, 2014
 Part A**

Location	Unit	Aa-1		Ab-1		Ac-1		Ac-4	Ac-7		Ad-1		Ae-1		
Sample Name		Aa-1-Bottom	Aa-1-Top	Ab-1-Bottom	Ab-1-Top	Ac-1-Bottom	Ac-1-Top	Ac-4-Mid	Ac-7-Bottom	Ac-7-Top	Ad-1-Bottom	Ad-1-Top	Ae-1-Bottom	Ae-1-Top	
Sampling Season		Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	
Sample Date		28/04/2014	28/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	25/04/2014	25/04/2014	25/04/2014	25/04/2014
Easting (NAD 83, 12W)		552282	552282	547766	547766	543339	543339	543695	544247	544247	539898	539898	542494	542494	
Northing (NAD 83, 12W)		7165025	7165025	7162266	7162266	7165138	7165138	7162938	7165068	7165068	7168781	7168781	7170252	7170252	
Field Measurements															
Total depth	m	10.0	10.0	12.7	12.7	13.0	13.0	11.5	13.0	13.0	13.0	13.0	12.0	12.0	
Sample depth	m	9.0	3.0	11.0	2.0	12.0	3.0	6.0	11.0	3.0	11.0	3.0	11.0	2.5	
Ice thickness	m	2.2	2.2	1.6	1.6	1.8	1.8	1.9	1.9	1.9	1.6	1.6	1.7	1.7	
Snow depth	m	0.08	0.08	0.13	0.13	0.13	0.13	0.10	0.13	0.13	0.30	0.30	0.18	0.18	
Water temperature	°C	2.3	1.2	1.5	0.70	2.5	0.80	1.3	2.1	1.0	1.5	0.7	1.6	0.70	
Specific conductivity	µS/cm	10.0	10.0	8.9	14.0	9.3	12.0	9.9	9.3	9.1	8.9	12.0	11.0	8.8	
Dissolved oxygen	mg/L	7.1	12.6	10.5	12.5	6.0 ^(C)	14.3	12.5	8.4	13.2	11.0	-	11.9	-	
Dissolved oxygen saturation	%	51.5	89.3	72.0	87.3	44.3	100.4	88.8	61.3	93.0	78.3	-	85.6	-	
Conventional Parameters															
Alkalinity, gran as (H ⁺)	meq/L	<0.10	0.12	<0.10	0.16	0.10	0.11	0.22	0.12	0.20	<0.10	0.20	<0.10	0.14	
Alkalinity, total as (CaCO ₃)	mg/L	5.6	7.4	5.9	7.7	5.0	5.6	7.0	7.2	7.3	5.3	8.4	6.6	6.2	
Conductance	µS/cm	18	22	15	15	16	18	17	16	20	16	27	19	17	
Hardness	mg/L	6.4	7.2	5.5	5.4	5.8	6.6	6.0	5.7	6.8	5.7	9.4	6.9	6.1	
pH	-	6.4 ^(C, D)	6.9	6.2 ^(C, D)	6.4 ^(C, D)	6.3 ^(C, D)	6.4 ^(C, D)	6.3 ^(C, D)	6.4 ^(C, D)	6.5	6.4 ^(C, D)	6.8	6.4 ^(C, D)	6.4 ^(C, D)	
Total dissolved solids	mg/L	21	24	<10	<10	<10	<10	<10	<10	<10	<10	13	16	15	
Total suspended solids	mg/L	<3	<6	<3	<3	<3	<3	<3	<3	<3	3.7	<3	<3	<3	
Turbidity	NTU	0.21	0.43	0.18	0.24	0.23	0.28	0.29	0.20	0.34	0.23	0.28	0.35	0.35	
Major Ions															
Bicarbonate	mg/L	6.8	9.0	7.2	9.4	6.1	6.8	8.5	8.8	8.8	6.4	10	8.1	7.6	
Calcium	mg/L	1.2	1.3	0.99	0.97	1.1	1.2	1.1	1.0	1.2	1.0	1.7	1.3	1.1	
Chloride	mg/L	<0.5	0.52	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.53	0.53	0.81	0.57	<0.5	
Fluoride	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	0.022	0.022	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Magnesium	mg/L	0.82	0.95	0.74	0.73	0.77	0.88	0.8	0.77	0.92	0.76	1.3	0.92	0.81	
Potassium	mg/L	0.66	0.78	0.57	0.59	0.59	0.7	0.64	0.59	0.74	0.62	1.1	0.74	0.66	
Sodium	mg/L	0.83	0.96	0.71	0.66	0.65	0.79	0.78	0.72	0.86	0.76	1.3	0.94	0.83	
Sulphate	mg/L	1.1	1.8	1.3	1.3	1.3	1.6	1.4	1.4	1.9	1.4	2.4	1.7	1.5	

**Table D-3 Laboratory Water Quality Data from Lac du Sauvage during the Under-Ice Period, 2014
 Part A**

Location	Unit	Aa-1		Ab-1		Ac-1		Ac-4	Ac-7		Ad-1		Ae-1	
		Aa-1-Bottom	Aa-1-Top	Ab-1-Bottom	Ab-1-Top	Ac-1-Bottom	Ac-1-Top	Ac-4-Mid	Ac-7-Bottom	Ac-7-Top	Ad-1-Bottom	Ad-1-Top	Ae-1-Bottom	Ae-1-Top
Sample Name		Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter
Sampling Season		28/04/2014	28/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	25/04/2014	25/04/2014	25/04/2014	25/04/2014
Sample Date		552282	552282	547766	547766	543339	543339	543695	544247	544247	539898	539898	542494	542494
Easting (NAD 83, 12W)		7165025	7165025	7162266	7162266	7165138	7165138	7162938	7165068	7165068	7168781	7168781	7170252	7170252
Northing (NAD 83, 12W)														
Nutrients														
Total organic carbon	mg/L	2.7	3.5	2.4	2.6	2.4	3.0	2.7	2.5	3.2	2.7	4.2	3.3	3.1
Dissolved organic carbon	mg/L	2.7	3.5	2.5	2.6	2.4	3.1	2.7	2.6	3.3	2.6	4.3	3.3	3.1
Total nitrogen (calculated)	mg-N/L	0.27	0.23	0.16	0.20	0.22	0.15	0.20	0.12	0.13	<0.05	0.21	0.19	0.13
Total Kjeldahl nitrogen	mg-N/L	0.19	0.23	0.12	0.19	0.11	0.14	0.18	0.074	0.13	<0.05	0.21	0.14	0.13
Total ammonia	mg-N/L	<0.005	<0.005	0.011	<0.005	<0.005	<0.005	0.016	0.018	<0.005	0.0074	<0.005	0.010	<0.005
Nitrate	mg-N/L	0.085	<0.006	0.039	0.0078	0.11	0.009	0.025	0.043	<0.006	0.039	<0.006	0.047	<0.006
Nitrite	mg-N/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total phosphorus	mg-P/L	0.0054	0.0093	0.0042	0.0074	0.0065	0.0059	0.0053	0.0043	0.0087	0.0062	0.0086	0.0052	0.0098
Total dissolved phosphorus	mg-P/L	0.0033	0.0031	0.0034	0.0051	0.0051	0.0039	0.0036	0.0036	0.0067	0.0037	0.0057	0.0028	0.0052
Dissolved orthophosphate	mg-P/L	<0.001	<0.001	<0.001	<0.001	0.0016	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Silica, reactive	mg/L	0.40	0.12	0.25	0.12	0.41	0.089	0.14	0.22	0.099	0.23	0.089	0.17	0.087
Other Parameters														
Benzene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	<0.5	1.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylenes	µg/L	<0.71	0.93	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250
Fecal coliforms	CFU/100mL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Metals														
Aluminum	µg/L	2.9	5.4	3.3	3.3	4.5	3.1	5.2 ^(c)	3.3	3.9	3.9	3.0	6.9 ^(c)	3.5
Antimony	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	0.38	0.44	0.29	0.29	0.27	0.34	0.3	0.29	0.37	0.28	0.51	0.35	0.35
Barium	µg/L	2.6	2.5	0.98	1.1	1.3	1.2	1.2	1.1	1.2	1.1	1.7	1.8	1.3
Beryllium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	1.6	3.0	3.2	1.7	3.6	4.1	2.5	3.7	2.5	3.4	4.1	3.6	1.8
Cadmium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cesium	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	µg/L	<0.06	0.083	<0.06	0.075	0.13	0.078	0.069	0.087	0.12	0.061	0.11	0.061	0.061
Cobalt	µg/L	0.023	0.018	<0.01	0.012	0.011	<0.01	<0.01	<0.01	0.016	0.014	0.013	0.02	0.012
Copper	µg/L	0.67	0.79	0.50	0.52	0.49	0.67	0.67	0.50	0.73	0.55	0.95	0.71	0.67

**Table D-3 Laboratory Water Quality Data from Lac du Sauvage during the Under-Ice Period, 2014
 Part A**

Location	Unit	Aa-1		Ab-1		Ac-1		Ac-4	Ac-7		Ad-1		Ae-1		
Sample Name		Aa-1-Bottom	Aa-1-Top	Ab-1-Bottom	Ab-1-Top	Ac-1-Bottom	Ac-1-Top	Ac-4-Mid	Ac-7-Bottom	Ac-7-Top	Ad-1-Bottom	Ad-1-Top	Ae-1-Bottom	Ae-1-Top	
Sampling Season		Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter
Sample Date		28/04/2014	28/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	25/04/2014	25/04/2014	25/04/2014	25/04/2014
Easting (NAD 83, 12W)		552282	552282	547766	547766	543339	543339	543695	544247	544247	539898	539898	542494	542494	
Northing (NAD 83, 12W)		7165025	7165025	7162266	7162266	7165138	7165138	7162938	7165068	7165068	7168781	7168781	7170252	7170252	
Iron	µg/L	11	7.3	2.7	1.4	6.3	1.7	4.5	3.8	3.1	5.5	1.8	10	2.2	
Lead	µg/L	<0.01	0.017	0.014	0.015	0.029	0.022	0.64	0.012	0.022	0.010	<0.01	<0.01	0.014	
Lithium	µg/L	1.4	1.7	0.99	1.2	1.2	1.3	1.2	1.3	1.5	1.2	2.1	1.4	1.2	
Manganese	µg/L	21	1.9	2.8	0.72	14	0.74	2.2	4.2	0.74	3.2	1.0	4.7	0.97	
Mercury	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Molybdenum	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Nickel	µg/L	0.26	0.31	0.26	0.23	0.26	0.32	0.30	0.26	0.32	0.28	0.44	0.31	0.27	
Selenium	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	
Silver	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Strontium	µg/L	7.2	8.2	5.8	5.8	6.5	6.7	6.3	6.3	7.2	6.3	10.0	7.4	6.4	
Thallium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Tin	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Titanium	µg/L	0.27	0.28	<0.1	<0.1	0.14	0.19	0.22	0.11	0.28	<0.1	<0.1	0.21	0.22	
Uranium	µg/L	0.012	0.017	0.017	0.016	0.019	0.02	0.019	0.018	0.02	0.018	0.025	0.028	0.021	
Vanadium	µg/L	<0.05	<0.05	0.058	0.055	0.064	0.056	<0.05	0.066	<0.05	0.093	0.12	0.12	0.10	
Zinc	µg/L	0.81	3.3	<0.8	<0.8	<0.8	<0.8	0.82	<0.8	<0.8	1.7	<0.8	<0.8	<0.8	
Dissolved Metals															
Aluminum	µg/L	2.2	3.1	5.0	2.9	3.7	8.5	6.6	4.2	4.5	2.0	4.1	3.3	3.0	
Antimony	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Arsenic	µg/L	0.37	0.44	0.29	0.30	0.27	0.33	0.30	0.27	0.35	0.26	0.50	0.34	0.37	
Barium	µg/L	5.4	5.0	9.7	5.7	6.3	8.3	9.2	7.0	6.3	6.3	3.8	4.6	5.4	
Beryllium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Bismuth	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.019	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	
Boron	µg/L	3.7	3.7	6.6	3.1	3.0	4.8	8.0	5.8	6.6	5.4	2.5	2.8	2.8	
Cadmium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cesium	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Chromium	µg/L	<0.06	0.066	0.065	0.065	<0.06	0.082	0.075	0.081	0.11	0.064	0.063	<0.06	0.061	
Chromium - Hexavalent	µg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Cobalt	µg/L	0.022	0.014	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.011	<0.01	0.013	0.014	<0.01	
Copper	µg/L	0.63	0.75	0.51	0.58	0.65	0.71	0.67	0.52	0.73	0.59	0.95	0.69	0.64	
Iron	µg/L	4.8	3.0	<1.0	<1.0	2.1	<1.0	<1.0	1.2	1.9	<1.0	<1.0	2.4	<1.0	
Lead	µg/L	0.011	0.012	<0.01	0.019	0.015	0.017	0.17	<0.01	0.034	<0.01	<0.01	<0.01	<0.01	
Lithium	µg/L	1.6	1.6	1.1	1.1	1.2	1.7	1.3	1.1	1.5	1.0	2.0	1.6	1.4	
Manganese	µg/L	20.0	1.6	0.83	0.33	12.0	0.38	0.68	1.9	0.53	0.44	0.81	3.3	0.61	

**Table D-3 Laboratory Water Quality Data from Lac du Sauvage during the Under-Ice Period, 2014
 Part A**

Location	Unit	Aa-1		Ab-1		Ac-1		Ac-4	Ac-7		Ad-1		Ae-1		
Sample Name		Aa-1-Bottom	Aa-1-Top	Ab-1-Bottom	Ab-1-Top	Ac-1-Bottom	Ac-1-Top	Ac-4-Mid	Ac-7-Bottom	Ac-7-Top	Ad-1-Bottom	Ad-1-Top	Ae-1-Bottom	Ae-1-Top	
Sampling Season		Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter
Sample Date		28/04/2014	28/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	24/04/2014	25/04/2014	25/04/2014	25/04/2014	25/04/2014
Easting (NAD 83, 12W)		552282	552282	547766	547766	543339	543339	543695	544247	544247	539898	539898	542494	542494	
Northing (NAD 83, 12W)		7165025	7165025	7162266	7162266	7165138	7165138	7162938	7165068	7165068	7168781	7168781	7170252	7170252	
Mercury	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Molybdenum	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Nickel	µg/L	0.28	0.28	0.25	0.23	0.26	0.32	0.28	0.26	0.32	0.3	0.44	0.27	0.28	
Selenium	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	
Silver	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Strontium	µg/L	7.4	8.4	6.0	5.8	6.5	7.2	6.4	6.1	7.2	6.2	9.9	7.6	6.6	
Thallium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Tin	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.17	<0.05	<0.05	<0.05	
Titanium	µg/L	0.29	0.11	<0.1	<0.1	0.18	<0.1	<0.1	<0.1	0.15	<0.1	<0.1	<0.1	<0.1	
Uranium	µg/L	0.012	0.017	0.016	0.016	0.016	0.02	0.018	0.017	0.021	0.014	0.028	0.025	0.022	
Vanadium	µg/L	<0.05	<0.05	0.071	0.062	0.083	0.076	<0.05	0.055	0.061	0.099	0.12	0.097	0.094	
Zinc	µg/L	4.5	4.9	15	4.8	4.0	6.5	8.6	5.9	4.8	7.3	2.3	2.7	3.8	

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; µg/L = micrograms per litre; < = less than; % = percent.

**Table D-3 Laboratory Water Quality Data from Lac du Sauvage during the Under-Ice Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guideline				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Field Measurements											
Total depth	m	13	<0.10	12.9	12.2	13	-	-	-	-	-
Sample depth	m	13	2.0	6.0	6.7	12	-	-	-	-	-
Ice thickness	m	13	1.6	1.8	1.8	2.2	-	-	-	-	-
Snow depth	m	13	0.08	0.13	0.15	0.3	-	-	-	-	-
Water temperature	°C	13	0.7	1.3	1.4	2.5	-	-	-	-	-
Specific conductivity	µS/cm	13	8.8	9.9	10	14	-	-	-	-	-
Dissolved oxygen	mg/L	11	6.0^(C)	11.9	10.9	14.3	-	9	-	-	-
Dissolved oxygen saturation	%	11	44.3	85.6	77.4	100.4	-	-	-	-	-
Conventional Parameters											
Alkalinity, gran as (H ⁺)	meq/L	13	<0.10	0.20	0.14	0.22	-	-	-	-	-
Alkalinity, total as (CaCO ₃)	mg/L	13	5.0	6.6	6.6	8.4	-	-	-	-	-
Conductance	µS/cm	13	15	17	18	27	-	-	-	-	-
Hardness	mg/L	13	5.4	6.1	6.4	9.4	-	-	-	-	-
pH	-	13	6.2^(C, D)	6.4^(C, D)	6.4^(C, D)	6.9	-	77	77	-	-
Total dissolved solids	mg/L	13	<10	<10	<10	24	-	-	-	-	-
Total suspended solids	mg/L	13	<3	<3	<3	<6	-	-	-	-	-
Turbidity	NTU	13	0.18	0.28	0.28	0.43	-	-	-	-	-



**Table D-3 Laboratory Water Quality Data from Lac du Sauvage during the Under-Ice Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guideline				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Major Ions											
Bicarbonate	mg/L	13	6.1	8.1	8.0	10	-	-	-	-	-
Calcium	mg/L	13	0.97	1.1	1.2	1.7	-	-	-	-	-
Chloride	mg/L	13	<0.5	<0.5	<0.5	0.81	-	-	-	-	-
Fluoride	mg/L	13	<0.02	<0.02	<0.02	0.022	-	-	-	-	-
Magnesium	mg/L	13	0.73	0.81	0.86	1.3	-	-	-	-	-
Potassium	mg/L	13	0.57	0.66	0.69	1.1	-	-	-	-	-
Sodium	mg/L	13	0.65	0.79	0.83	1.3	-	-	-	-	-
Sulphate	mg/L	13	1.1	1.4	1.5	2.4	-	-	-	-	-
Nutrients											
Total organic carbon	mg/L	13	2.4	2.7	3.0	4.2	-	-	-	-	-
Dissolved organic carbon	mg/L	13	2.4	2.7	3.0	4.3	-	-	-	-	-
Total nitrogen (calculated)	mg-N/L	13	<0.05	0.19	0.17	0.27	-	-	-	-	-
Total Kjeldahl nitrogen	mg-N/L	13	<0.05	0.14	0.14	0.23	-	-	-	-	-
Total ammonia	mg-N/L	13	<0.005	<0.005	0.006	0.018	-	-	-	-	-
Nitrate	mg-N/L	13	<0.006	<0.006	<0.006	0.11	-	-	-	-	-
Nitrite	mg-N/L	13	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
Total phosphorus	mg-P/L	13	0.0042	0.0062	0.007	0.0098	-	-	-	-	-
Total dissolved phosphorus	mg-P/L	13	0.0028	0.0037	0.004	0.0067	-	-	-	-	-
Dissolved orthophosphate	mg-P/L	13	<0.001	<0.001	<0.001	0.0016	-	-	-	-	-
Silica, reactive	mg/L	13	0.087	0.14	0.18	0.41	-	-	-	-	-



**Table D-3 Laboratory Water Quality Data from Lac du Sauvage during the Under-Ice Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guideline				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Other Parameters											
Benzene	µg/L	13	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Ethylbenzene	µg/L	13	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Toluene	µg/L	13	<0.5	<0.5	<0.5	1.4	-	-	-	-	-
Xylenes	µg/L	13	<0.71	<0.71	<0.71	0.93	-	-	-	-	-
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	13	<100	<100	<100	<100	-	-	-	-	-
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	13	<100	<100	<100	<100	-	-	-	-	-
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	13	<250	<250	<250	<250	-	-	-	-	-
Fecal coliform	CFU/100mL	13	<1	<1	<1	<1	-	-	-	-	-
Total Metals											
Aluminum	µg/L	13	2.9	3.5	4.0	6.9 ^(c)	-	15	-	-	-
Antimony	µg/L	13	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-
Arsenic	µg/L	13	0.27	0.34	0.34	0.51	-	-	-	-	-
Barium	µg/L	13	0.98	1.2	1.5	2.6	-	-	-	-	-
Beryllium	µg/L	13	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Bismuth	µg/L	13	<0.01	<0.01	<0.01	0.012	-	-	-	-	-
Boron	µg/L	13	1.6	3.2	3.0	4.1	-	-	-	-	-
Cadmium	µg/L	13	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Cesium	µg/L	13	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-
Chromium	µg/L	13	<0.06	0.075	0.076	0.13	-	-	-	-	-
Cobalt	µg/L	13	<0.01	0.012	0.012	0.023	-	-	-	-	-



**Table D-3 Laboratory Water Quality Data from Lac du Sauvage during the Under-Ice Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guideline				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Copper	µg/L	13	0.49	0.67	0.65	0.95	-	-	-	-	-
Iron	µg/L	13	1.4	3.8	4.8	11	-	-	-	-	-
Lead	µg/L	13	<0.01	0.014	0.063	0.64	-	-	-	-	-
Lithium	µg/L	13	0.99	1.3	1.4	2.1	-	-	-	-	-
Manganese	µg/L	13	0.72	2.2	4.5	21	-	-	-	-	-
Mercury	µg/L	13	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-
Molybdenum	µg/L	13	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Nickel	µg/L	13	0.23	0.28	0.29	0.44	-	-	-	-	-
Selenium	µg/L	13	<0.04	<0.04	<0.04	<0.04	-	-	-	-	-
Silver	µg/L	13	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Strontium	µg/L	13	5.8	6.5	6.9	10	-	-	-	-	-
Thallium	µg/L	13	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Tin	µg/L	13	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Titanium	µg/L	13	<0.1	0.19	0.16	0.28	-	-	-	-	-
Uranium	µg/L	13	0.012	0.019	0.019	0.028	-	-	-	-	-
Vanadium	µg/L	13	<0.05	0.058	0.063	0.12	-	-	-	-	-
Zinc	µg/L	13	<0.8	<0.8	<0.8	3.3	-	-	-	-	-



**Table D-3 Laboratory Water Quality Data from Lac du Sauvage during the Under-Ice Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guideline				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Dissolved Metals											
Aluminum	µg/L	13	2.0	3.7	4.1	8.5	-	-	-	-	-
Antimony	µg/L	13	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-
Arsenic	µg/L	13	0.26	0.33	0.34	0.5	-	-	-	-	-
Barium	µg/L	13	3.8	6.3	6.4	9.7	-	-	-	-	-
Beryllium	µg/L	13	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Bismuth	µg/L	13	<0.01	<0.01	<0.01	0.019	-	-	-	-	-
Boron	µg/L	13	2.5	3.7	4.5	8.0	-	-	-	-	-
Cadmium	µg/L	13	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Cesium	µg/L	13	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-
Chromium	µg/L	13	<0.06	0.065	0.064	0.11	-	-	-	-	-
Chromium – Hexavalent	µg/L	13	<1	<1	<1	<1	-	-	-	-	-
Cobalt	µg/L	13	<0.01	<0.01	<0.01	0.022	-	-	-	-	-
Copper	µg/L	13	0.51	0.65	0.66	0.95	-	-	-	-	-
Iron	µg/L	13	<1.0	<1.0	1.5	4.8	-	-	-	-	-
Lead	µg/L	13	<0.01	0.011	0.024	0.17	-	-	-	-	-
Lithium	µg/L	13	1.0	1.4	1.4	2.0	-	-	-	-	-
Manganese	µg/L	13	0.33	0.81	3.3	20	-	-	-	-	-
Mercury	µg/L	13	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-
Molybdenum	µg/L	13	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Nickel	µg/L	13	0.23	0.28	0.29	0.44	-	-	-	-	-



**Table D-3 Laboratory Water Quality Data from Lac du Sauvage during the Under-Ice Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guideline				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Selenium	µg/L	13	<0.04	<0.04	<0.04	<0.04	-	-	-	-	-
Silver	µg/L	13	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Strontium	µg/L	13	5.8	6.6	7.0	9.9	-	-	-	-	-
Thallium	µg/L	13	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Tin	µg/L	13	<0.05	<0.05	<0.05	0.17	-	-	-	-	-
Titanium	µg/L	13	<0.1	<0.1	<0.1	0.29	-	-	-	-	-
Uranium	µg/L	13	0.012	0.017	0.019	0.028	-	-	-	-	-
Vanadium	µg/L	13	<0.05	0.071	0.069	0.12	-	-	-	-	-
Zinc	µg/L	13	2.3	4.8	5.8	15	-	-	-	-	-

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

Guideline exceedances by median concentrations are based on guidelines calculated using median values of hardness, pH, and temperature, and are not included in the percent exceedance calculations.

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; CWQG = Canadian Water Quality Guidelines; CDWQG = Canadian Drinking Water Quality Guidelines; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; SSWQO = Site-Specific Water Quality Objective; µg/L = micrograms per litre; < = less than; % = percent.

**Table D-4 Laboratory Discrete Water Quality Data from Lac du Sauvage during the Open-Water Period, 2014
 Part A**

Location	Unit	Aa-1		Ab-1			Ac-1			Ac-4			Ac-7			Ad-5	Ad-1		Ae-1		
Sample Name		Aa-1-Mid	Aa-1-Mid	Ab-1-Mid	Ab-1-Mid	Ab-1-Mid	Ac-1-Mid	Ac-1-Mid	Ac-1-Mid	Ac-4-Mid	Ac-4-Mid	Ac-4-Mid	Ac-7-Mid	Ac-7-Mid	Ac-7-Mid	Ad-5-Mid	Ad-1-Mid	Ad-1-Mid	Ae-1-Mid	Ae-1-Mid	Ae-1-Mid
Sampling Season		Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall
Sample Date		10/08/2014	11/09/2014	19/07/2014	11/08/2014	11/09/2014	19/07/2014	11/08/2014	11/09/2014	19/07/2014	10/08/2014	10/09/2014	19/07/2014	09/08/2014	09/09/2014	19/07/2014	09/08/2014	05/09/2014	19/07/2014	09/08/2014	05/09/2014
Easting (NAD 83, 12W)		552282	552282	547766	547766	547766	543339	543339	543339	543695	543695	543695	544247	544247	544247	540112	539898	539898	542494	542494	542494
Northing (NAD 83, 12W)		7165025	7165025	7162266	7162266	7162266	7165138	7165138	7165138	7162938	7162938	7162938	7165068	7165068	7165068	7168316	7168781	7168781	7170252	7170252	7170252
Field Measured																					
Total depth	m	11.4	10.5	10.1	12.5	13.0	14.8	12.6	11.5	10.2	12.0	11.0	13.0	13.1	12.0	25.5	12.2	10.7	15.6	11.9	10.2
Sample depth	m	5.5	6.0	5.0	6.5	6.5	7.5	6.5	5.5	5.0	6.0	5.5	6.5	6.5	6.0	13.0	6.0	5.0	7.5	6.0	5.0
Secchi depth	m	4.5	4.5	6.3	6.5	5.5	5.0	6.5	6.0	5.3	6.5	5.5	5.3	7.5	5.5	5.3	5.5	4.5	5.5	6.4	5.0
Water temperature	°C	13.3	6.1	10.4	12.8	7.7	10.8	13.0	7.3	10.6	12.7	7.8	10.7	13.0	7.9	10.5	11.8	10.5	10.7	13.1	10.5
Specific conductivity	µS/cm	11	13	11	11	13	11	11	13	11	11	14	12	12	13	11	12	13	11	12	13
Dissolved oxygen	mg/L	10.1	12.6	-	10.5	11.9	11.5	10.3	12.1	-	10.2	11.9	11.5	10.6	11.8	11.2	10.1	11.0	11.1	9.9	11.0
Dissolved oxygen saturation	%	96.9	101.6	105.6	100.1	100.2	104.5	98.4	100.6	-	97.0	99.7	103.8	101.2	99.0	100.5	95.1	98.7	100.6	94.3	99.1
pH	-	6.9	6.9	6.6	7.0	7.0	6.5	7.0	6.9	6.6	6.6	6.9	6.5	7.3	7.0	6.4 ^(C, D)	7.2	6.9	6.0 ^(C, D)	7.2	7.0
Conventional Parameters																					
Alkalinity, gran as (H ⁺)	meq/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.11	<0.1	<0.1	<0.1	<0.1	<0.1
Alkalinity, total as (CaCO ₃)	mg/L	4.3	4.0	4.3	4.0	4.1	8.3	4.1	4.1	5.2	5.0	3.7	4.1	4.6	4.6	11.0	4.5	4.4	3.3	4.3	4.1
Conductance	µS/cm	15	15	14	14	15	15	15	15	14	15	15	14	14	16	15	14	15	14	14	15
Hardness	mg/L	5.0	5	5.0	4.9	5.0	4.7	5	4.9	4.9	4.9	4.9	4.8	5.0	4.9	4.8	5.0	5.2	4.7	5.0	5.2
pH	-	6.8	6.5	6.7	6.6	6.5	7.2	6.6	6.5	6.7	6.8	6.5	6.7	6.7	6.7	6.8	6.7	6.7	6.7	6.7	6.7
Total dissolved solids	mg/L	20	14	12	<10	14	13	15	17	17	18	<10	12	14	14	17	22	15	14	12	15
Total suspended solids	mg/L	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<6	<3	<3	<3	<3	<3	<3	<3	<3	<3
Turbidity	NTU	0.56	0.71	0.45	0.40	0.45	0.80	0.52	0.55	0.53	0.52	0.55	0.71	0.55	0.46	1.50	0.66	0.49	0.64	0.52	0.47
Major Ions																					
Bicarbonate	mg/L	5.2	<5	5.3	<5	5.0	10	<5	<5	6.4	6.1	<5	<5	5.6	5.7	13	5.5	5.4	<5	5.3	<5
Calcium	mg/L	0.94	0.91	0.92	0.90	0.92	0.86	0.92	0.90	0.90	0.92	0.88	0.86	0.93	0.89	0.87	0.92	0.94	0.86	0.92	0.92
Chloride	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoride	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L	0.64	0.66	0.67	0.64	0.65	0.63	0.65	0.65	0.65	0.64	0.64	0.65	0.64	0.64	0.64	0.66	0.70	0.63	0.64	0.69
Potassium	mg/L	0.56	0.60	0.50	0.51	0.57	0.49	0.53	0.57	0.50	0.53	0.57	0.50	0.52	0.53	0.50	0.55	0.53	0.48	0.52	0.53
Sodium	mg/L	0.62	0.61	0.62	0.61	0.60	0.60	0.61	0.60	0.62	0.63	0.60	0.63	0.62	0.57	0.62	0.64	0.63	0.60	0.61	0.64
Sulphate	mg/L	0.95	1.3	1.4	1.0	1.3	1.3	1.0	1.3	1.3	1.1	1.3	1.3	0.97	1.2	1.3	1.0	1.1	1.3	0.97	1.0
Nutrients																					
Total organic carbon	mg/L	3.2	3.4	3.5	2.9	3.2	3.6	2.9	3.1	3.6	2.9	3.7	4.5	2.9	3.1	3.6	3.0	3.1	3.9	3.0	3.1
Dissolved organic carbon	mg/L	3.1	3.3	2.8	2.8	3.2	2.9	2.9	3.0	2.9	3.0	4.0	3.1	2.8	3.2	3.0	2.9	3.2	3.1	3.1	3.1
Total nitrogen (calculated)	mg-N/L	0.29	0.16	0.19	0.22	0.17	0.22	0.19	0.11	0.19	0.27	0.13	0.22	0.28	0.066	0.23	0.25	0.13	0.18	0.21	0.22
Total Kjeldahl nitrogen	mg-N/L	0.29	0.16	0.19	0.22	0.17	0.22	0.19	0.11	0.19	0.27	0.13	0.22	0.28	0.066	0.23	0.25	0.13	0.18	0.21	0.22
Total ammonia	mg-N/L	<0.005	0.012	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

**Table D-4 Laboratory Discrete Water Quality Data from Lac du Sauvage during the Open-Water Period, 2014
 Part A**

Location	Unit	Aa-1		Ab-1			Ac-1			Ac-4			Ac-7			Ad-5	Ad-1		Ae-1		
Sample Name		Aa-1-Mid	Aa-1-Mid	Ab-1-Mid	Ab-1-Mid	Ab-1-Mid	Ac-1-Mid	Ac-1-Mid	Ac-1-Mid	Ac-4-Mid	Ac-4-Mid	Ac-4-Mid	Ac-7-Mid	Ac-7-Mid	Ac-7-Mid	Ad-5-Mid	Ad-1-Mid	Ad-1-Mid	Ae-1-Mid	Ae-1-Mid	Ae-1-Mid
Sampling Season		Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall
Sample Date		10/08/2014	11/09/2014	19/07/2014	11/08/2014	11/09/2014	19/07/2014	11/08/2014	11/09/2014	19/07/2014	10/08/2014	10/09/2014	19/07/2014	09/08/2014	09/09/2014	19/07/2014	09/08/2014	05/09/2014	19/07/2014	09/08/2014	05/09/2014
Easting (NAD 83, 12W)		552282	552282	547766	547766	547766	543339	543339	543339	543695	543695	543695	544247	544247	544247	540112	539898	539898	542494	542494	542494
Northing (NAD 83, 12W)	7165025	7165025	7162266	7162266	7162266	7165138	7165138	7165138	7162938	7162938	7162938	7165068	7165068	7165068	7168316	7168781	7168781	7170252	7170252	7170252	
Nitrate	mg-N/L	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	
Nitrite	mg-N/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Total phosphorus	mg-P/L	0.012	0.014	0.0094	0.0095	0.0071	0.0072	0.0077	0.006	0.0059	0.012	0.0048	0.0064	0.0075	0.005	0.0066	0.0098	0.0053	0.0062	0.0087	0.0068
Total dissolved phosphorus	mg-P/L	0.0045	0.002	0.0019	0.0035	0.0015	0.0025	0.003	0.0018	0.0023	0.0026	0.0013	0.0019	0.0028	0.0014	0.002	0.0032	0.0022	0.0026	0.0043	0.0024
Dissolved orthophosphate	mg-P/L	<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	<0.001	<0.001	<0.001	<0.001
Silica, reactive	mg/L	0.094	0.050	0.084	0.067	0.061	0.094	0.071	0.062	0.085	0.066	0.061	0.090	0.07	0.061	0.11	0.074	0.062	0.10	0.084	0.059
Other Parameters																					
Benzene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylenes	µg/L	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250
Fecal coliform	CFU/100 mL	1.0	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Metals																					
Aluminum	µg/L	6.5	11	7.3	6.5	6.4	12	8.6	7.7	14	6.6	6.9	13	7.3	7.1	29 ^(c)	11	6.5	13 ^(c)	9.1	5.5
Antimony	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	0.48	0.43	0.27	0.31	0.30	0.29	0.33	0.33	0.29	0.29	0.33	0.30	0.30	0.31	0.32	0.32	0.33	0.28	0.31	0.33
Barium	µg/L	1.4	1.4	1.0	1.0	1.1	1.3	1.1	1.1	1.1	1.0	1.1	1.2	1.0	1.1	1.5	1.2	1.1	1.3	1.2	1.1
Beryllium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	2.3	3.1	1.9	1.8	1.6	4.1	1.9	1.7	4.5	2.5	3.2	1.7	2.3	1.5	2.8	2.1	<1.0	4.9	2.6	<1.0
Cadmium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cesium	µg/L	0.0059	0.0077	0.0066	0.0056	0.0058	0.0066	0.0057	0.0052	0.0051	0.0059	0.0051	0.0057	0.0062	0.0055	0.010	0.0062	0.0067	0.0080	0.0058	0.0056
Chromium	µg/L	<0.06	<0.06	<0.06	<0.06	0.065	<0.06	<0.06	<0.06	0.069	<0.06	0.064	<0.06	0.069	<0.06	0.13	<0.06	<0.06	<0.06	0.063	<0.06
Cobalt	µg/L	0.013	0.024	0.017	0.012	0.011	0.017	0.012	0.018	0.02	0.015	0.017	0.016	0.015	0.016	0.034	0.015	0.02	0.018	0.014	0.014
Copper	µg/L	0.59	0.54	0.62	0.7	0.76	0.62	1.2	0.7	1.1	0.73	0.6	0.83	0.63	0.67	2.2 ^(c)	0.56	0.82	1.6	0.58	0.82
Iron	µg/L	20	21	10	6.1	9.1	17	11	11	11	8.2	10	15	9.1	11	34	12	12	15	11	9.5
Lead	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.012	<0.01	0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	0.015	<0.01	<0.01

**Table D-4 Laboratory Discrete Water Quality Data from Lac du Sauvage during the Open-Water Period, 2014
 Part A**

Location	Unit	Aa-1		Ab-1			Ac-1			Ac-4			Ac-7			Ad-5	Ad-1		Ae-1		
Sample Name		Aa-1-Mid	Aa-1-Mid	Ab-1-Mid	Ab-1-Mid	Ab-1-Mid	Ac-1-Mid	Ac-1-Mid	Ac-1-Mid	Ac-4-Mid	Ac-4-Mid	Ac-4-Mid	Ac-7-Mid	Ac-7-Mid	Ac-7-Mid	Ad-5-Mid	Ad-1-Mid	Ad-1-Mid	Ae-1-Mid	Ae-1-Mid	Ae-1-Mid
Sampling Season		Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall
Sample Date		10/08/2014	11/09/2014	19/07/2014	11/08/2014	11/09/2014	19/07/2014	11/08/2014	11/09/2014	19/07/2014	10/08/2014	10/09/2014	19/07/2014	09/08/2014	09/09/2014	19/07/2014	09/08/2014	05/09/2014	19/07/2014	09/08/2014	05/09/2014
Easting (NAD 83, 12W)		552282	552282	547766	547766	547766	543339	543339	543339	543695	543695	543695	544247	544247	544247	540112	539898	539898	542494	542494	542494
Northing (NAD 83, 12W)		7165025	7165025	7162266	7162266	7162266	7165138	7165138	7165138	7162938	7162938	7162938	7165068	7165068	7165068	7168316	7168781	7168781	7170252	7170252	7170252
Lithium	µg/L	1.6	1.2	1.4	0.81	1.2	1.3	0.6	1.2	1.4	1.3	1.2	1.3	1.5	1.1	1.3	2.0	1.4	1.2	1.6	1.1
Manganese	µg/L	4.7	3.7	3.8	2.6	3.7	4.7	3.1	3.9	4.1	3.0	4.9	4.4	2.8	3.8	4.9	3.3	5.1	5.3	3.3	4.0
Mercury	µg/L	0.00059	<0.0005	<0.0005	0.00071	0.00051	<0.0005	0.00083	0.00054	<0.0005	0.00051	0.00053	<0.0005	<0.0005	<0.0005	<0.0005	0.00072	0.00055	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	0.24	0.24	0.29	0.26	0.23	0.34	0.26	0.31	0.31	0.27	0.32	0.3	0.25	0.22	0.54	0.27	0.29	0.39	0.27	0.27
Selenium	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	5.6	5.3	5.6	5.4	5.2	5.4	6.1	5.2	5.4	5.4	5.3	5.3	5.7	5.4	5.5	5.9	5.4	5.3	5.7	5.3
Thallium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	0.34	0.52	0.19	0.18	0.23	0.83	0.53	0.26	0.64	0.42	0.67	0.59	0.19	0.45	1.8	0.54	0.24	0.27	0.38	0.3
Uranium	µg/L	0.014	0.014	0.022	0.017	0.016	0.026	0.02	0.019	0.02	0.018	0.018	0.024	0.021	0.017	0.029	0.027	0.019	0.028	0.021	0.022
Vanadium	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.059	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	0.82	<0.8	<0.8	<0.8	<0.8	<0.8	3.0	1.5	<0.8	0.86	<0.8	<0.8
Dissolved Metals																					
Aluminum	µg/L	2.9	1.3	3.1	2.5	3.2	4.7	3.3	2.3	2.3	2.4	1.7	3.6	3.3	2.1	3.5	3.3	2.4	4.0	6.2	2.0
Antimony	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	0.43	0.42	0.30	0.29	0.32	0.27	0.33	0.32	0.28	0.30	0.30	0.29	0.28	0.29	0.31	0.29	0.32	0.27	0.31	0.31
Barium	µg/L	1.2	1.3	1.0	0.92	0.97	1.2	1.0	1.1	1.0	0.97	0.97	1.1	0.99	0.98	1.4	1.0	1.0	1.2	1.1	1.0
Beryllium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	2.6	4.4	1.4	1.2	4.4	5.2	5.5	1.7	2.0	3.1	3.7	1.8	1.9	4.1	2.2	3.2	1.0	1.8	1.9	2.9
Cadmium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cesium	µg/L	0.0064	0.0052	0.0053	<0.005	0.0052	<0.005	<0.005	<0.005	0.0051	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0051	<0.005	0.0061	<0.005
Chromium	µg/L	0.086	<0.06	0.15	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.065	<0.06	<0.06	<0.06	<0.06	<0.06	0.064	<0.06	<0.06	0.17	<0.06
Chromium – Hexavalent	µg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.011	<0.01
Copper	µg/L	0.6	0.66	0.61	0.5	0.64	1.0	0.54	0.66	0.61	1.2	0.53	0.62	0.71	0.74	0.66	0.61	0.61	0.65	0.57	0.6
Iron	µg/L	4.7	2.2	<1.0	<1.0	1.1	2.1	1.3	1.2	<1.0	<1.0	<1.0	1.6	1.8	1.1	2.1	1.4	2.9	1.5	6.2	2.0
Lead	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	1.6	1.3	1.3	0.88	1.2	1.3	1.5	1.3	1.4	1.4	1.2	1.3	1.3	1.0	1.1	1.5	1.3	1.4	1.6	1.3
Manganese	µg/L	0.27	0.44	0.62	0.50	0.33	0.74	0.42	0.57	0.48	0.35	0.54	0.34	0.6	0.59	2.1	0.33	1.2	0.30	1.6	0.98
Mercury	µg/L	0.0007	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00065	0.00068	<0.0005	0.00069	<0.0005	<0.0005	0.00053	<0.0005

**Table D-4 Laboratory Discrete Water Quality Data from Lac du Sauvage during the Open-Water Period, 2014
 Part A**

Location	Unit	Aa-1		Ab-1			Ac-1			Ac-4			Ac-7			Ad-5	Ad-1		Ae-1		
Sample Name		Aa-1-Mid	Aa-1-Mid	Ab-1-Mid	Ab-1-Mid	Ab-1-Mid	Ac-1-Mid	Ac-1-Mid	Ac-1-Mid	Ac-4-Mid	Ac-4-Mid	Ac-4-Mid	Ac-7-Mid	Ac-7-Mid	Ac-7-Mid	Ad-5-Mid	Ad-1-Mid	Ad-1-Mid	Ae-1-Mid	Ae-1-Mid	Ae-1-Mid
Sampling Season		Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall
Sample Date		10/08/ 2014	11/09/ 2014	19/07/ 2014	11/08/ 2014	11/09/ 2014	19/07/ 2014	11/08/ 2014	11/09/ 2014	19/07/ 2014	10/08/ 2014	10/09/ 2014	19/07/ 2014	09/08/ 2014	09/09/ 2014	19/07/ 2014	09/08/ 2014	05/09/ 2014	19/07/ 2014	09/08/ 2014	05/09/ 2014
Easting (NAD 83, 12W)		552282	552282	547766	547766	547766	543339	543339	543339	543695	543695	543695	544247	544247	544247	540112	539898	539898	542494	542494	542494
Northing (NAD 83, 12W)	7165025	7165025	7162266	7162266	7162266	7165138	7165138	7165138	7162938	7162938	7162938	7165068	7165068	7165068	7168316	7168781	7168781	7170252	7170252	7170252	
Molybdenum	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Nickel	µg/L	0.22	0.20	0.27	0.22	0.26	0.34	0.24	0.21	0.29	0.26	0.24	0.3	0.24	0.18	0.37	0.27	0.3	0.29	0.27	
Selenium	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	
Silver	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Strontium	µg/L	5.6	5.3	5.5	5.6	5.3	5.2	5.5	5.2	5.5	5.4	5.2	5.3	5.5	5.4	5.3	5.5	5.4	5.3	5.6	
Thallium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Tin	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Titanium	µg/L	<0.1	<0.1	<0.1	0.12	<0.1	0.14	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.11	<0.1	<0.1	0.11	<0.1	<0.1	0.3	
Uranium	µg/L	0.013	0.015	0.017	0.014	0.019	0.02	0.018	0.017	0.017	0.017	0.017	0.019	0.019	0.017	0.024	0.018	0.018	0.02	0.021	
Vanadium	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Zinc	µg/L	<0.8	<0.8	<0.8	<0.8	<0.8	1.3	<0.8	<0.8	<0.8	<0.8	0.91	0.92	0.96	0.93	<0.8	0.93	1.8	1.4	<0.8	

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; µg/L = micrograms per litre; < = less than; % = percent.

**Table D-4 Laboratory Discrete Water Quality Data from Lac du Sauvage during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guideline				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Field Measured											
Total depth	m	20	10.1	12	12.7	25.5	-	-	-	-	-
Sample depth	m	20	5.0	6.0	6.3	13	-	-	-	-	-
Secchi depth	m	20	4.5	5.5	5.6	7.5	-	-	-	-	-
Water temperature	°C	20	6.1	10.6	10.5	13.3	-	-	-	-	-
Specific conductivity	µS/cm	19	11	12	12	14	-	-	-	-	-
Dissolved oxygen	mg/L	18	9.9	11.1	11.1	12.6	-	-	-	-	-
Dissolved oxygen saturation	%	19	94.3	100.1	99.8	105.6	-	-	-	-	-
pH	-	20	6.0^(C, D)	6.9	6.8	7.3	-	10	10	-	-
Conventional Parameters											
Alkalinity, gran as (H ⁺)	meq/L	20	<0.1	<0.1	<0.1	<0.2	-	-	-	-	-
Alkalinity, total as (CaCO ₃)	mg/L	20	3.3	4.3	4.8	11	-	-	-	-	-
Conductance	µS/cm	20	14	15	15	16	-	-	-	-	-
Hardness	mg/L	20	4.7	4.9	4.9	5.2	-	-	-	-	-
pH	-	20	6.5	6.7	6.7	7.2	-	-	-	-	-
Total dissolved solids	mg/L	20	<10	14	14	22	-	-	-	-	-
Total suspended solids	mg/L	20	<3	<3	<3	<6	-	-	-	-	-
Turbidity	NTU	20	0.4	0.54	0.6	1.5	-	-	-	-	-
Major Ions											
Bicarbonate	mg/L	20	<5	5.3	<5	13	-	-	-	-	-
Calcium	mg/L	20	0.86	0.91	0.90	0.94	-	-	-	-	-



**Table D-4 Laboratory Discrete Water Quality Data from Lac du Sauvage during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guideline				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Chloride	mg/L	20	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Fluoride	mg/L	20	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-
Magnesium	mg/L	20	0.63	0.65	0.65	0.70	-	-	-	-	-
Potassium	mg/L	20	0.48	0.53	0.53	0.60	-	-	-	-	-
Sodium	mg/L	20	0.57	0.61	0.61	0.64	-	-	-	-	-
Sulphate	mg/L	20	0.95	1.2	1.2	1.4	-	-	-	-	-
Nutrients											
Total organic carbon	mg/L	20	2.9	3.2	3.3	4.5	-	-	-	-	-
Dissolved organic carbon	mg/L	20	2.8	3.0	3.1	4.0	-	-	-	-	-
Total nitrogen (calculated)	mg-N/L	20	0.066	0.20	0.20	0.29	-	-	-	-	-
Total Kjeldahl nitrogen	mg-N/L	20	0.066	0.20	0.20	0.29	-	-	-	-	-
Total ammonia	mg-N/L	20	<0.005	<0.005	<0.005	0.012	-	-	-	-	-
Nitrate	mg-N/L	20	<0.006	<0.006	<0.006	<0.006	-	-	-	-	-
Nitrite	mg-N/L	20	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
Total phosphorus	mg-P/L	20	0.0048	0.0072	0.0078	0.014	-	-	-	-	-
Total dissolved phosphorus	mg-P/L	20	0.0013	0.0024	0.0025	0.0045	-	-	-	-	-
Dissolved orthophosphate	mg-P/L	20	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
Silica, reactive	mg/L	20	0.050	0.071	0.075	0.11	-	-	-	-	-
Other Parameters											
Benzene	µg/L	20	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Ethylbenzene	µg/L	20	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-



**Table D-4 Laboratory Discrete Water Quality Data from Lac du Sauvage during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guideline				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Toluene	µg/L	20	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Xylenes	µg/L	20	<0.71	<0.71	<0.71	<0.71	-	-	-	-	-
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	20	<100	<100	<100	<100	-	-	-	-	-
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	20	<100	<100	<100	<100	-	-	-	-	-
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	20	<250	<250	<250	<250	-	-	-	-	-
Fecal coliform	CFU/100mL	19	<1.0	<1.0	<1.0	1.0	-	-	-	-	-
Total Metals											
Aluminum	µg/L	20	5.5	7.5	9.8	29 ^(C)	-	10	-	-	-
Antimony	µg/L	20	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-
Arsenic	µg/L	20	0.27	0.31	0.32	0.48	-	-	-	-	-
Barium	µg/L	20	1.0	1.1	1.2	1.5	-	-	-	-	-
Beryllium	µg/L	20	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Bismuth	µg/L	20	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Boron	µg/L	20	<1.0	2.2	2.4	4.9	-	-	-	-	-
Cadmium	µg/L	20	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Cesium	µg/L	20	0.0051	0.0059	0.0062	0.01	-	-	-	-	-
Chromium	µg/L	20	<0.06	<0.06	<0.06	0.13	-	-	-	-	-
Cobalt	µg/L	20	0.011	0.016	0.017	0.034	-	-	-	-	-
Copper	µg/L	20	0.54	0.70	0.84	2.2 ^(C)	-	5	-	-	-
Iron	µg/L	20	6.1	11	13	34	-	-	-	-	-
Lead	µg/L	20	<0.01	<0.01	<0.01	0.03	-	-	-	-	-



**Table D-4 Laboratory Discrete Water Quality Data from Lac du Sauvage during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guideline				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Lithium	µg/L	20	0.60	1.3	1.3	2.0	-	-	-	-	-
Manganese	µg/L	20	2.6	3.9	3.9	5.3	-	-	-	-	-
Mercury	µg/L	20	<0.0005	<0.0005	<0.0005	0.00083	-	-	-	-	-
Molybdenum	µg/L	20	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Nickel	µg/L	20	0.22	0.27	0.29	0.54	-	-	-	-	-
Selenium	µg/L	20	<0.04	<0.04	<0.04	<0.04	-	-	-	-	-
Silver	µg/L	20	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Strontium	µg/L	20	5.2	5.4	5.5	6.1	-	-	-	-	-
Thallium	µg/L	20	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Tin	µg/L	20	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Titanium	µg/L	20	0.18	0.40	0.48	1.8	-	-	-	-	-
Uranium	µg/L	20	0.014	0.020	0.021	0.029	-	-	-	-	-
Vanadium	µg/L	20	<0.05	<0.05	<0.05	0.059	-	-	-	-	-
Zinc	µg/L	20	<0.8	<0.8	<0.8	3.0	-	-	-	-	-
Dissolved Metals											
Aluminum	µg/L	20	1.3	3.0	3.0	6.2	-	-	-	-	-
Antimony	µg/L	20	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-
Arsenic	µg/L	20	0.27	0.30	0.31	0.43	-	-	-	-	-
Barium	µg/L	20	0.92	1.0	1.1	1.4	-	-	-	-	-
Beryllium	µg/L	20	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Bismuth	µg/L	20	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-



**Table D-4 Laboratory Discrete Water Quality Data from Lac du Sauvage during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guideline				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Boron	µg/L	20	1.0	2.4	2.8	5.5	-	-	-	-	-
Cadmium	µg/L	20	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Cesium	µg/L	20	<0.005	<0.005	<0.005	0.0064	-	-	-	-	-
Chromium	µg/L	20	<0.06	<0.06	<0.06	0.17	-	-	-	-	-
Chromium - Hexavalent	µg/L	20	<1	<1	<1	<1	-	-	-	-	-
Cobalt	µg/L	20	<0.01	<0.01	<0.01	0.011	-	-	-	-	-
Copper	µg/L	20	0.50	0.62	0.67	1.2	-	-	-	-	-
Iron	µg/L	20	<1.0	1.5	1.8	6.2	-	-	-	-	-
Lead	µg/L	20	<0.01	<0.01	<0.01	0.012	-	-	-	-	-
Lithium	µg/L	20	0.88	1.3	1.3	1.6	-	-	-	-	-
Manganese	µg/L	20	0.27	0.52	0.67	2.1	-	-	50	-	-
Mercury	µg/L	20	<0.0005	<0.0005	<0.0005	0.0007	-	-	-	-	-
Molybdenum	µg/L	20	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Nickel	µg/L	20	0.18	0.26	0.26	0.37	-	-	-	-	-
Selenium	µg/L	20	<0.04	<0.04	<0.04	<0.04	-	-	-	-	-
Silver	µg/L	20	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Strontium	µg/L	20	5.2	5.4	5.4	5.6	-	-	-	-	-
Thallium	µg/L	20	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Tin	µg/L	20	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Titanium	µg/L	20	<0.1	<0.1	<0.1	0.30	-	-	-	-	-
Uranium	µg/L	20	0.013	0.018	0.018	0.024	-	-	-	-	-



**Table D-4 Laboratory Discrete Water Quality Data from Lac du Sauvage during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guideline				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Vanadium	µg/L	20	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Zinc	µg/L	20	<0.8	<0.8	<0.8	1.8	-	-	-	-	-

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

Guideline exceedances by median concentrations are based on guidelines calculated using median values of hardness, pH, and temperature, and are not included in the percent exceedance calculations.

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; CWQG = Canadian Drinking Water Quality Guidelines; DWQG = Drinking Water Quality Guidelines; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; SSWQO = Site-Specific Water Quality Objective; µg/L = micrograms per litre; < = less than; % = percent.



Table D-5 Laboratory Water Quality Data from the Lac du Sauvage Outlet during the Under-Ice Period, 2014

Location	Unit	LDS Outlet
Sample Name		Ab-S1
Sampling Season		Winter
Sample Date		24/04/2014
Easting (NAD 83, 12W)		546850
Northing (NAD 83, 12W)		7159585
Field Measured		
Total depth	m	0.7
Sample depth	m	0.25
Ice thickness	m	0.0
Snow depth	m	0.0
Water temperature	°C	0.8
Specific conductivity	µS/cm	15
Dissolved oxygen	mg/L	16.1
Dissolved oxygen saturation	%	113
Conventional Parameters		
Alkalinity, gran as (H ⁺)	meq/L	0.13
Alkalinity, total as (CaCO ₃)	mg/L	5.6
Conductance	µS/cm	19
Hardness	mg/L	6.6
pH	-	6.5
Total dissolved solids	mg/L	<10
Total suspended solids	mg/L	<3
Turbidity	NTU	0.33
Major Ions		
Bicarbonate	mg/L	6.8
Calcium	mg/L	1.2
Chloride	mg/L	<0.5
Fluoride	mg/L	<0.02
Magnesium	mg/L	0.9
Potassium	mg/L	0.73
Sodium	mg/L	0.85
Sulphate	mg/L	1.4
Nutrients		
Total organic carbon	mg/L	3.2
Dissolved organic carbon	mg/L	3.2
Total nitrogen (calculated)	mg-N/L	0.16
Total Kjeldahl nitrogen	mg-N/L	0.16
Total ammonia	mg-N/L	<0.005
Nitrate	mg-N/L	<0.006



Table D-5 Laboratory Water Quality Data from the Lac du Sauvage Outlet during the Under-Ice Period, 2014

Location	Unit	LDS Outlet
Sample Name		Ab-S1
Sampling Season		Winter
Sample Date		24/04/2014
Easting (NAD 83, 12W)		546850
Northing (NAD 83, 12W)		7159585
Nitrite	mg-N/L	<0.002
Total phosphorus	mg-P/L	0.0075
Total dissolved phosphorus	mg-P/L	0.0042
Dissolved orthophosphate	mg-P/L	<0.001
Silica, reactive	mg/L	0.076
Other Parameters		
Benzene	µg/L	<0.5
Ethylbenzene	µg/L	<0.5
Toluene	µg/L	<0.5
Xylenes	µg/L	<0.71
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	<100
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	<100
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	<250
Fecal coliform	CFU/100mL	<1
Total Metals		
Aluminum	µg/L	4.0
Antimony	µg/L	<0.02
Arsenic	µg/L	0.34
Barium	µg/L	1.2
Beryllium	µg/L	<0.01
Bismuth	µg/L	<0.01
Boron	µg/L	1.6
Cadmium	µg/L	<0.005
Cesium	µg/L	<0.1
Chromium	µg/L	<0.06
Cobalt	µg/L	0.01
Copper	µg/L	0.66
Iron	µg/L	2.2
Lead	µg/L	<0.01
Lithium	µg/L	1.5
Manganese	µg/L	1.7
Mercury	µg/L	<0.0005
Molybdenum	µg/L	<0.05
Nickel	µg/L	0.3



Table D-5 Laboratory Water Quality Data from the Lac du Sauvage Outlet during the Under-Ice Period, 2014

Location	Unit	LDS Outlet
Sample Name		Ab-S1
Sampling Season		Winter
Sample Date		24/04/2014
Easting (NAD 83, 12W)		546850
Northing (NAD 83, 12W)		7159585
Selenium	µg/L	<0.04
Silver	µg/L	<0.005
Strontium	µg/L	7.1
Thallium	µg/L	<0.01
Tin	µg/L	<0.05
Titanium	µg/L	<0.1
Uranium	µg/L	0.017
Vanadium	µg/L	0.078
Zinc	µg/L	<0.8
Dissolved Metals		
Aluminum	µg/L	4.8
Antimony	µg/L	<0.02
Arsenic	µg/L	0.37
Barium	µg/L	7.3
Beryllium	µg/L	<0.01
Bismuth	µg/L	<0.01
Boron	µg/L	5.1
Cadmium	µg/L	<0.005
Cesium	µg/L	<0.1
Chromium	µg/L	0.08
Chromium - Hexavalent	µg/L	<1
Cobalt	µg/L	0.011
Copper	µg/L	0.65
Iron	µg/L	<1
Lead	µg/L	<0.01
Lithium	µg/L	1.3
Manganese	µg/L	1.2
Mercury	µg/L	<0.0005
Molybdenum	µg/L	<0.05
Nickel	µg/L	0.3
Selenium	µg/L	<0.04
Silver	µg/L	<0.005
Strontium	µg/L	7.1
Thallium	µg/L	<0.01



Table D-5 Laboratory Water Quality Data from the Lac du Sauvage Outlet during the Under-Ice Period, 2014

Location	Unit	LDS Outlet
Sample Name		Ab-S1
Sampling Season		Winter
Sample Date		24/04/2014
Easting (NAD 83, 12W)		546850
Northing (NAD 83, 12W)		7159585
Tin	µg/L	<0.05
Titanium	µg/L	<0.1
Uranium	µg/L	0.02
Vanadium	µg/L	0.066
Zinc	µg/L	6.4

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; µg/L = micrograms per litre; < = less than; % = percent.



Table D-6 Laboratory Discrete Water Quality from the Lac du Sauvage Outlet during the Open-Water Period, 2014 Part A

Location	Unit	LDS Outlet		
Sample Name		Ab-S1	Ab-S1	Ab-S1
Sampling Season		Late Spring	Summer	Fall
Sample Date		20/07/2014	11/08/2014	06/09/2014
Easting (NAD 83, 12W)		546850	546850	546850
Northing (NAD 83, 12W)		7159585	7159585	7159585
Field Measured				
Total Depth	m	0.9	0.8	0.4
Sample Depth	m	0.45	0.4	0.2
Water temperature	°C	11.3	12.8	9.0
Specific Conductivity	µS/cm	12	11	13
Dissolved oxygen	mg/L	11.2	10.3	11.3
Dissolved oxygen saturation	%	101.7	97.8	98.4
pH	-	6.1^(C, D)	7.3	6.9
Conventional Parameters				
Alkalinity, gran as (H ⁺)	meq/L	<0.1	<0.1	<0.1
Alkalinity, total as (CaCO ₃)	mg/L	4.2	3.5	6.0
Conductance	µS/cm	15	15	15
Hardness	mg/L	5.0	4.9	5.2
pH	-	6.6	6.6	7.0
Total dissolved solids	mg/L	15	12	22
Total suspended solids	mg/L	<3	<3	<3
Turbidity	NTU	0.64	0.4	0.48
Major Ions				
Bicarbonate	mg/L	5.1	<5.0	7.3
Calcium	mg/L	0.93	0.9	0.92
Chloride	mg/L	<0.5	<0.5	<0.5
Fluoride	mg/L	<0.02	<0.02	<0.02
Magnesium	mg/L	0.64	0.65	0.7
Potassium	mg/L	0.58	0.52	0.54
Sodium	mg/L	0.75	0.62	0.64
Sulphate	mg/L	1.4	1.1	1.1
Nutrients				
Total organic carbon	mg/L	3.7	2.9	3.0
Dissolved organic carbon	mg/L	3.8	2.8	3.1
Total nitrogen (calculated)	mg-N/L	0.27	0.25	0.13
Total Kjeldahl nitrogen	mg-N/L	0.27	0.25	0.13
Total ammonia	mg-N/L	0.0092	<0.005	<0.005
Nitrate	mg-N/L	<0.006	<0.006	<0.006



Table D-6 Laboratory Discrete Water Quality from the Lac du Sauvage Outlet during the Open-Water Period, 2014 Part A

Location Sample Name Sampling Season Sample Date Easting (NAD 83, 12W) Northing (NAD 83, 12W)	Unit	LDS Outlet		
		Ab-S1	Ab-S1	Ab-S1
		Late Spring	Summer	Fall
		20/07/2014	11/08/2014	06/09/2014
		546850	546850	546850
		7159585	7159585	7159585
		Nitrite	mg-N/L	<0.002
Total phosphorus	mg-P/L	0.0067	0.011	0.0050
Total dissolved phosphorus	mg-P/L	0.0025	0.0030	0.0020
Dissolved orthophosphate	mg-P/L	<0.001	<0.001	<0.001
Silica, reactive	mg/L	0.087	0.062	0.061
Other Parameters				
Benzene	µg/L	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	<0.5	<0.5	<0.5
Toluene	µg/L	<0.5	<0.5	<0.5
Xylenes	µg/L	<0.71	<0.71	<0.71
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	<100	<100	<100
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	<100	<100	<100
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	<250	<250	<250
Fecal coliform	CFU/100mL	<1	<1	<1
Total Metals				
Aluminum	µg/L	10 ^(c)	5.6	9.0
Antimony	µg/L	<0.02	<0.02	<0.02
Arsenic	µg/L	0.3	0.29	0.3
Barium	µg/L	1.1	1.0	0.96
Beryllium	µg/L	<0.01	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01	<0.01
Boron	µg/L	1.9	1.3	<1.0
Cadmium	µg/L	<0.005	<0.005	<0.005
Cesium	µg/L	0.0065	<0.005	0.0065
Chromium	µg/L	<0.06	<0.06	0.40
Cobalt	µg/L	0.017	0.015	0.016
Copper	µg/L	0.63	0.55	0.87
Iron	µg/L	13	7.7	18
Lead	µg/L	<0.01	<0.01	0.012
Lithium	µg/L	1.2	0.91	1.2
Manganese	µg/L	3.8	3.1	4.0
Mercury	µg/L	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	<0.05	<0.05	<0.05



**Table D-6 Laboratory Discrete Water Quality from the Lac du Sauvage Outlet during the Open-Water Period, 2014
Part A**

Location	Unit	LDS Outlet		
Sample Name		Ab-S1	Ab-S1	Ab-S1
Sampling Season		Late Spring	Summer	Fall
Sample Date		20/07/2014	11/08/2014	06/09/2014
Easting (NAD 83, 12W)		546850	546850	546850
Northing (NAD 83, 12W)		7159585	7159585	7159585
Nickel	µg/L	0.31	0.26	0.26
Selenium	µg/L	<0.04	<0.04	<0.04
Silver	µg/L	<0.005	<0.005	<0.005
Strontium	µg/L	5.8	5.7	5.2
Thallium	µg/L	<0.01	<0.01	<0.01
Tin	µg/L	<0.05	<0.05	<0.05
Titanium	µg/L	0.33	0.24	0.20
Uranium	µg/L	0.021	0.016	0.019
Vanadium	µg/L	<0.05	<0.05	<0.05
Zinc	µg/L	<0.8	<0.8	12
Dissolved Metals				
Aluminum	µg/L	3.4	2.4	1.7
Antimony	µg/L	<0.02	<0.02	<0.02
Arsenic	µg/L	0.26	0.33	0.29
Barium	µg/L	1.0	0.86	0.91
Beryllium	µg/L	<0.01	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01	<0.01
Boron	µg/L	1.8	1.4	<1.0
Cadmium	µg/L	0.015	<0.005	<0.005
Cesium	µg/L	<0.005	0.0053	<0.005
Chromium	µg/L	<0.06	<0.06	<0.06
Chromium – Hexavalent	µg/L	<1	<1	<1
Cobalt	µg/L	<0.01	<0.01	0.012
Copper	µg/L	0.86	0.64	0.56
Iron	µg/L	1.2	1.6	1.7
Lead	µg/L	<0.01	<0.01	<0.01
Lithium	µg/L	1.4	0.76	1.3
Manganese	µg/L	0.93	0.95	0.88
Mercury	µg/L	<0.0005	0.00075	0.00064
Molybdenum	µg/L	<0.05	<0.05	<0.05
Nickel	µg/L	0.31	0.30	0.25
Selenium	µg/L	<0.04	<0.04	<0.04
Silver	µg/L	<0.005	<0.005	<0.005



Table D-6 Laboratory Discrete Water Quality from the Lac du Sauvage Outlet during the Open-Water Period, 2014 Part A

Location	Unit	LDS Outlet		
Sample Name		Ab-S1	Ab-S1	Ab-S1
Sampling Season		Late Spring	Summer	Fall
Sample Date		20/07/2014	11/08/2014	06/09/2014
Easting (NAD 83, 12W)		546850	546850	546850
Northing (NAD 83, 12W)		7159585	7159585	7159585
Strontium	µg/L	5.9	5.7	5.2
Thallium	µg/L	<0.005	<0.005	<0.005
Tin	µg/L	<0.05	<0.05	<0.05
Titanium	µg/L	<0.1	0.19	<0.1
Uranium	µg/L	0.019	0.015	0.016
Vanadium	µg/L	<0.05	<0.05	<0.05
Zinc	µg/L	4.8	<0.8	<0.8

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; µg/L = micrograms per litre; < = less than; % = percent.



**Table D-6 Laboratory Discrete Water Quality from the Lac du Sauvage Outlet during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Field Measured											
Total Depth	m	3	0.4	0.8	0.7	0.9	-	-	-	-	-
Sample Depth	m	3	0.2	0.3	0.3	0.3	-	-	-	-	-
Water temperature	°C	3	9.0	11.3	11	12.8	-	-	-	-	-
Specific Conductivity	µS/cm	3	11	12	12	13	-	-	-	-	-
Dissolved oxygen	mg/L	3	10.3	11.2	11.0	11.3	-	-	-	-	-
Dissolved oxygen saturation	%	3	97.8	98.4	99.3	101.7	-	-	-	-	-
pH	-	3	6.1 ^(C, D)	6.9	6.7	7.3	-	33	33	-	-
Conventional Parameters											
Alkalinity, gran as (H ⁺)	meq/L	3	<0.10	<0.10	<0.10	<0.10	-	-	-	-	-
Alkalinity, total as (CaCO ₃)	mg/L	3	3.5	4.2	4.6	6.0	-	-	-	-	-
Conductivity	µS/cm	3	15	15	15	15	-	-	-	-	-
Hardness	mg/L	3	4.9	5.0	5.0	5.2	-	-	-	-	-
pH	-	3	6.6	6.6	6.8	7.0	-	-	-	-	-
Total dissolved solids	mg/L	3	12	15	16	22	-	-	-	-	-
Total suspended solids	mg/L	3	<3	<3	<3	<3	-	-	-	-	-
Turbidity	NTU	3	0.4	0.48	0.51	0.64	-	-	-	-	-
Major Ions											
Bicarbonate	mg/L	3	<5	5.1	5.0	7.3	-	-	-	-	-
Calcium	mg/L	3	0.90	0.92	0.92	0.93	-	-	-	-	-
Chloride	mg/L	3	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Fluoride	mg/L	3	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-
Magnesium	mg/L	3	0.64	0.65	0.67	0.7	-	-	-	-	-



**Table D-6 Laboratory Discrete Water Quality from the Lac du Sauvage Outlet during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Potassium	mg/L	3	0.52	0.54	0.54	0.58	-	-	-	-	-
Sodium	mg/L	3	0.62	0.64	0.67	0.75	-	-	-	-	-
Sulphate	mg/L	3	1.1	1.1	1.2	1.4	-	-	-	-	-
Nutrients											
Total organic carbon	mg/L	3	2.9	3.0	3.2	3.7	-	-	-	-	-
Dissolved organic carbon	mg/L	3	2.8	3.1	3.2	3.8	-	-	-	-	-
Total nitrogen (calculated)	mg-N/L	3	0.13	0.25	0.22	0.27	-	-	-	-	-
Total Kjeldahl nitrogen	mg-N/L	3	0.13	0.25	0.22	0.27	-	-	-	-	-
Total ammonia	mg-N/L	3	<0.005	<0.005	<0.005	0.0092	-	-	-	-	-
Nitrate	mg-N/L	3	<0.006	<0.006	<0.006	<0.006	-	-	-	-	-
Nitrite	mg-N/L	3	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
Total phosphorus	mg-P/L	3	0.005	0.0067	0.0074	0.011	-	-	-	-	-
Total dissolved phosphorus	mg-P/L	3	0.002	0.0025	0.0025	0.003	-	-	-	-	-
Dissolved orthophosphate	mg-P/L	3	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
Silica, reactive	mg/L	3	0.061	0.062	0.070	0.087	-	-	-	-	-
Other Parameters											
Benzene	µg/L	3	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Ethylbenzene	µg/L	3	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Toluene	µg/L	3	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Xylenes	µg/L	3	<0.71	<0.71	<0.71	<0.71	-	-	-	-	-
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	3	<100	<100	<100	<100	-	-	-	-	-
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	3	<100	<100	<100	<100	-	-	-	-	-
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	3	<250	<250	<250	<250	-	-	-	-	-



**Table D-6 Laboratory Discrete Water Quality from the Lac du Sauvage Outlet during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Fecal coliform	CFU/100mL	3	<1	<1	<1	<1	-	-	-	-	-
Total Metals											
Aluminum	µg/L	3	5.6	9.0	8.2	10 ^(C)	-	33	-	-	-
Antimony	µg/L	3	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-
Arsenic	µg/L	3	0.29	0.30	0.29	0.30	-	-	-	-	-
Barium	µg/L	3	0.96	1.0	1.0	1.1	-	-	-	-	-
Beryllium	µg/L	3	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Bismuth	µg/L	3	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Boron	µg/L	3	<1	1.3	1.2	1.9	-	-	-	-	-
Cadmium	µg/L	3	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Cesium	µg/L	3	<0.005	0.0065	0.0052	0.0065	-	-	-	-	-
Chromium	µg/L	3	<0.06	<0.06	0.15	0.40	-	-	-	-	-
Cobalt	µg/L	3	0.015	0.016	0.016	0.017	-	-	-	-	-
Copper	µg/L	3	0.55	0.63	0.68	0.87	-	-	-	-	-
Iron	µg/L	3	7.7	13	13	18	-	-	-	-	-
Lead	µg/L	3	<0.01	<0.01	0.0073	0.012	-	-	-	-	-
Lithium	µg/L	3	0.91	1.2	1.1	1.2	-	-	-	-	-
Manganese	µg/L	3	3.1	3.8	3.6	4.0	-	-	-	-	-
Mercury	µg/L	3	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-
Molybdenum	µg/L	3	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Nickel	µg/L	3	0.26	0.26	0.28	0.31	-	-	-	-	-
Selenium	µg/L	3	<0.04	<0.04	<0.04	<0.04	-	-	-	-	-
Silver	µg/L	3	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-



**Table D-6 Laboratory Discrete Water Quality from the Lac du Sauvage Outlet during the Open-Water Period, 2014
 Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Strontium	µg/L	3	5.2	5.7	5.6	5.8	-	-	-	-	-
Thallium	µg/L	3	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Tin	µg/L	3	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Titanium	µg/L	3	0.20	0.24	0.26	0.33	-	-	-	-	-
Uranium	µg/L	3	0.016	0.019	0.019	0.021	-	-	-	-	-
Vanadium	µg/L	3	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Zinc	µg/L	3	<0.8	<0.8	4.3	12	-	-	-	-	-
Dissolved Metals											
Aluminum	µg/L	3	1.7	2.4	2.5	3.4	-	-	-	-	-
Antimony	µg/L	3	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-
Arsenic	µg/L	3	0.26	0.29	0.29	0.33	-	-	-	-	-
Barium	µg/L	3	0.86	0.91	0.92	1.0	-	-	-	-	-
Beryllium	µg/L	3	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Bismuth	µg/L	3	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Boron	µg/L	3	<1	1.4	1.2	1.8	-	-	-	-	-
Cadmium	µg/L	3	<0.005	<0.005	0.0067	0.015	-	-	-	-	-
Cesium	µg/L	3	<0.005	<0.005	<0.005	0.0053	-	-	-	-	-
Chromium	µg/L	3	<0.06	<0.06	<0.06	<0.06	-	-	-	-	-
Chromium - Hexavalent	µg/L	3	<1	<1	<1	<1	-	-	-	-	-
Cobalt	µg/L	3	<0.01	<0.01	<0.01	0.012	-	-	-	-	-
Copper	µg/L	3	0.56	0.64	0.69	0.86	-	-	-	-	-
Iron	µg/L	3	1.2	1.6	1.5	1.7	-	-	-	-	-
Lead	µg/L	3	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-

**Table D-6 Laboratory Discrete Water Quality from the Lac du Sauvage Outlet during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Lithium	µg/L	3	0.76	1.3	1.1	1.4	-	-	-	-	-
Manganese	µg/L	3	0.88	0.93	0.92	0.95	-	-	-	-	-
Mercury	µg/L	3	<0.0005	0.00064	<0.0005	0.00075	-	-	-	-	-
Molybdenum	µg/L	3	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Nickel	µg/L	3	0.25	0.30	0.29	0.31	-	-	-	-	-
Selenium	µg/L	3	<0.04	<0.04	<0.04	<0.04	-	-	-	-	-
Silver	µg/L	3	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Strontium	µg/L	3	5.2	5.7	5.6	5.9	-	-	-	-	-
Thallium	µg/L	3	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Tin	µg/L	3	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Titanium	µg/L	3	<0.1	<0.1	<0.1	0.19	-	-	-	-	-
Uranium	µg/L	3	0.015	0.016	0.017	0.019	-	-	-	-	-
Vanadium	µg/L	3	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Zinc	µg/L	3	<0.8	<0.8	1.9	4.8	-	-	-	-	-

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

Guideline exceedances by median concentrations are based on guidelines calculated using median values of hardness, pH, and temperature, and are not included in the percent exceedance calculations.

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; CWQG = Canadian Drinking Water Quality Guidelines; DWQG = Drinking Water Quality Guidelines; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; SSWQO = Site-Specific Water Quality Objective; µg/L = micrograms per litre; < = less than; % = percent.



Table D-7 Field Profile Data from Lac du Sauvage, Sub-Basin Lakes, during the Under-Ice Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Ice Thickness (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Af-1	25-Apr-14	13.3	1.7	2.5	1.2	10.0	70.8	10	-
				3	1.7	8.7	62.6	9	-
				4	2.2	7.5	54.8	9	-
				5	2.3	6.3	46.2	10	-
				6	2.5	5.5	40.3	11	-
				7	2.7	4.6	33.9	10	-
				8	2.8	3.6	26.7	10	-
				9	2.9	2.9	21.5	11	-
				10	2.9	2.8	20.6	11	-
				11	3.0	2.4	17.7	11	-
Af-7	25-Apr-14	12.5	2.0	2.5	1.7	9.6	68.5	12	-
				3	1.9	8.5	61.4	11	-
				4	2.1	7.4	53.7	11	-
				5	2.3	6.5	47.5	11	-
				6	2.4	6.3	45.8	13	-
				7	2.4	5.9	43.4	14	-
				8	2.5	5.6	41.2	14	-
				9	2.6	4.4	32.4	14	-
				10	2.8	3.0	22.2	15	-
				11	3.0	2.4	17.5	15	-
Af-10	26-Apr-14	7.5	1.8	2.5	2.8	-	-	-	-
				3	2.7	-	-	-	-
				4	3.8	-	-	-	-
				5	3.7	-	-	-	-
				6	3.6	-	-	-	-
				7	3.8	-	-	-	-



Table D-7 Field Profile Data from Lac du Sauvage, Sub-Basin Lakes, during the Under-Ice Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Ice Thickness (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
C1-1	25-Apr-14	19.0	1.6	2	1.2	11.7	82.5	17	-
				3	2.1	9.1	67.5	15	-
				4	2.1	8.6	62.9	15	-
				5	2.1	8.2	59.7	15	-
				6	2.2	8.1	59.1	15	-
				7	2.2	8.1	58.9	15	-
				8	2.2	8.1	59.0	15	-
				9	2.2	8.0	58.0	15	-
				10	2.2	7.9	57.7	15	-
				11	2.2	8.0	58.0	15	-
				12	2.2	8.0	58.3	16	-
				13	2.2	8.0	58.5	16	-
				14	2.2	8.1	58.7	16	-
				15	2.2	8.1	58.8	16	-
Counts-1	26-Apr-14	10.1	2.0	2.5	1.9	13.9	100.3	12	-
				3	2.3	12.0	87.9	11	-
				4	2.6	10.7	78.4	11	-
				5	2.7	9.7	71.5	11	-
				6	2.7	9.4	69.3	11	-
				7	2.9	9.6	71.1	11	-
				8	3.0	9.6	70.9	11	-
				9	3.1	7.6	57.0	11	-
Christine-1	25-Apr-14	11.0	2.0	2.5	2.9	13.1	96.5	58	-
				3	2.9	12.7	93.9	58	-
				4	2.9	12.9	95.7	57	-
				5	2.9	13.1	96.6	58	-
				6	2.9	13.1	97.1	58	-
				7	2.9	13.2	97.4	58	-
				8	2.9	13.1	97.3	58	-
				9	2.9	12.7	94.7	58	-
10	2.9	12.4	92.3	59	-				



Table D-7 Field Profile Data from Lac du Sauvage, Sub-Basin Lakes, during the Under-Ice Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Ice Thickness (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
E-L1-1	26-Apr-14	10.5	1.8	2.5	2.2	10.7	77.4	12	-
				3	2.7	10.7	77.4	12	-
				4	2.8	4.9	36.5	12	-
				5	2.8	4.8	35.5	12	-
				6	2.9	4.9	36.1	12	-
				7	2.9	5.0	36.9	12	-
				8	2.9	4.5	33.0	12	-
				9	2.7	3.3	24.8	12	-
				10	2.9	2.8	20.9	12	-

Note:

Bolded concentrations are higher than relevant water quality guidelines, or outside the recommended range

m = metre; °C = degrees Celsius; mg/L = milligrams per litre; %Sat = percent saturation; µS/cm = microSemens per centimetre.

- = data excluded due to anomalous field data (i.e., outside of an expected data range)



Table D-8 Field Profile Data from Lac du Sauvage, Sub-Basin Lakes, during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Af-1	9-Aug-14	15.1	3.8	0.025	13.7	10.0	96.7	10	7.1
				0.1	13.7	10.0	96.8	10	7.2
				0.5	13.7	10.0	96.7	10	7.2
				1	13.7	10.0	96.7	10	7.2
				2	13.6	10.0	96.5	10	7.2
				3	13.5	10.0	96.7	10	7.2
				4	13.4	10.0	96.7	10	7.2
				5	13.4	10.0	96.5	10	7.2
				6	13.4	10.0	96.1	10	7.2
				7	13.4	9.9	95.7	10	7.2
				7.5	13.2	9.9	95.2	10	7.1
				8	13.2	9.9	94.7	10	7.1
				9	13.1	9.8	94.0	10	7.1
				10	13.1	9.7	93.2	10	7.1
	11	13.0	9.7	93.2	10	7.1			
	12	13.0	9.7	92.9	10	7.0			
	13	13.0	9.6	92.6	10	7.0			
	14	12.9	9.6	92.2	10	7.0			
	9-Sep-14	11.0	3.5	0.1	5.7	12.5	99.4	11	6.8
				0.5	5.7	12.5	99.5	11	6.8
				1	5.7	12.4	99.0	11	6.7
				2	5.7	12.4	99.4	11	6.8
				3	5.7	12.4	99.1	12	6.8
				4	5.7	12.4	98.9	11	6.7
				5	5.7	12.5	99.4	11	6.7
				5.5	5.7	12.4	99.3	11	6.8
				6	5.7	12.4	99.1	11	6.8
7				5.7	12.4	99.1	12	6.7	
8				5.7	12.4	99.1	11	6.7	
9				5.7	12.4	98.9	12	6.8	
10				5.7	12.4	98.8	11	6.7	



Table D-8 Field Profile Data from Lac du Sauvage, Sub-Basin Lakes, during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
Christine-1	16-Aug-14	12.0	3.1	0.025	13.3	10.1	97.1	48	7.7
				0.1	13.3	10.1	97.1	48	7.6
				0.5	13.3	10.1	96.9	48	7.5
				1	13.3	10.1	97.2	48	7.5
				2	13.3	10.1	97.0	48	7.5
				3	13.2	10.1	96.7	48	7.5
				4	13.2	10.0	96.3	48	7.4
				5	13.1	9.9	95.3	48	7.4
				6	13.0	9.9	94.5	48	7.4
				7	13.0	9.8	94.3	48	7.3
				8	12.7	9.8	96.1	48	7.3
	9	12.9	9.8	93.3	48	7.1			
	10	11.2	9.6	83.0	50	6.9			
	11	6.8	9.4	78.0	-	6.5			
	14-Sep-14	11.4	3.5	0.1	5.0	12.9	100.9	51	7.2
				0.5	5.0	12.9	100.5	51	7.2
				1	5.0	12.9	101.0	51	7.2
				2	5.0	12.9	101.0	51	7.2
				3	5.0	12.9	100.6	51	7.2
				4	5.0	12.9	100.7	51	7.2
				5	5.0	12.9	100.9	51	7.2
				5.5	5.0	12.9	100.9	51	7.2
				6	4.9	12.9	100.9	51	7.2
7				4.9	12.9	100.9	51	7.2	
8				4.9	12.9	101.0	51	7.2	
9				4.9	12.9	101.0	51	7.2	
10	4.9	12.9	100.9	51	7.2				
11	4.9	12.9	100.9	51	7.2				



Table D-8 Field Profile Data from Lac du Sauvage, Sub-Basin Lakes, during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
C-L1	16-Aug-14	18.2	3.5	0.025	13.0	10.0	95.0	16	7.4
				0.1	13.0	10.0	95.0	16	7.3
				0.5	13.0	10.0	95.1	16	7.3
				1	13.0	10.0	95.1	16	7.3
				2	13.0	10.0	95.2	16	7.3
				3	13.0	9.9	94.9	16	7.2
				4	13.0	10.0	95.2	16	7.2
				5	13.0	10.0	95.2	16	7.2
				6	13.0	10.0	95.2	16	7.2
				7	13.0	9.9	94.9	16	7.2
				8	12.9	9.9	94.6	16	7.2
				9	12.9	9.9	94.3	16	7.2
				10	12.8	9.7	93.6	16	7.1
				11	12.5	9.6	91.7	16	7.1
				12	12.0	9.6	90.5	16	7.0
				13	8.6	8.7	78.3	17	6.5
				14	5.6	8.4	68.2	18	6.2
15	5.3	8.3	65.9	18	6.2				
16	5.1	8.2	65.1	18	6.3				
17	5.1	7.8	60.9	19	6.3				



Table D-8 Field Profile Data from Lac du Sauvage, Sub-Basin Lakes, during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
C-L1 (continued)	14-Sep-14	20.0	3.5	0.1	5.1	12.8	101.0	17	7.1
				0.5	5.1	12.8	100.9	17	7.1
				1	5.2	12.9	101.2	17	7.1
				2	5.1	12.8	100.8	17	7.1
				3	5.1	12.8	100.6	17	7.1
				4	5.1	12.8	100.8	17	7.1
				5	5.1	12.8	101.9	17	7.1
				6	5.1	12.8	100.8	17	7.1
				7	5.1	12.8	100.7	17	7.1
				8	5.2	12.8	101.0	17	7.1
				9	5.2	12.8	100.9	17	7.1
				10	5.2	12.8	101.1	17	7.1
				11	5.2	12.8	100.8	17	7.1
				12	5.2	12.8	100.8	17	7.1
				13	5.2	12.8	100.5	17	7.1
				14	5.1	12.8	100.9	17	7.1
				15	5.1	12.8	100.9	17	7.1
				16	5.2	12.8	100.9	17	7.1
				17	5.2	12.8	100.9	17	7.1
18	5.2	12.8	101.0	17	7.1				
19	5.2	12.8	100.7	17	7.1				
Counts-1	13-Sep-14	10.4	5.5	0.1	5.3	12.8	100.5	13	6.9
				0.5	5.2	12.8	100.6	13	6.9
				1	5.2	12.7	100.5	13	6.9
				2	5.2	12.8	100.6	13	6.9
				3	5.2	12.7	100.4	13	6.9
				4	5.3	12.7	100.4	13	6.9
				5	5.3	12.6	100.5	13	6.9
				6	5.3	12.7	100.6	13	6.9
				7	5.3	12.7	100.6	13	6.9
				8	5.3	12.7	100.3	13	6.9
				9	5.3	12.7	100.5	13	6.9
10	5.3	12.7	100.2	13	6.9				

Note:

Bolded concentrations are higher than relevant water quality guidelines, or outside the recommended range.

m = metre; °C = degrees Celsius; mg/L = milligrams per litre; %Sat = percent saturation; µS/cm = microSemens per centimetre.

- = data excluded due to anomalous field data (i.e., outside of an expected data range).

**Table D-9 Laboratory Water Quality Data from the Lac du Sauvage Sub-Basin Lakes during the Under-Ice Period, 2014
 Part A**

Location	Units	Duchess Lake				Lake Af1	Christine Lake	Lake C1		Counts Lake		Lake E1		
Sample Name		Af-1 Bottom	Af-1-Top	Af-7-Bottom	Af-7-Top	Af-10-Mid	Christine-1-Mid	C-L1-Bottom	C-L1-Top	Counts-1-Bottom	Counts-1-Top	E-L1-1-Bottom	E-L1-1-Top	
Sampling Season		Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	
Sample Date		25/04/2014	25/04/2014	25/04/2014	25/04/2014	26/04/2014	25/04/2014	25/04/2014	25/04/2014	25/04/2014	26/04/2014	26/04/2014	26/04/2014	26/04/2014
Easting (NAD 83, 12W)		542155	542155	541367	541367	538299	7163705	537612	537612	7169862	7169862	535065	535065	
Northing (NAD 83, 12W)		7173731	7173731	7174902	7174902	7176361	539626	7167085	7167085	534303	534303	7174657	7174657	
Field Measured														
Total depth	m	13.3	13.3	12.5	12.5	7.5	11.0	19.0	19.0	10.1	10.1	10.5	10.5	
Sample depth	m	12.0	3.0	11.0	3.0	4.0	5.0	18.0	2.0	9.0	3.0	9.0	2.5	
Ice thickness	m	1.7	1.7	2.0	2.0	1.8	2.0	1.6	1.6	2.0	2.0	1.8	1.8	
Snow depth	m	0.15	0.15	0.05	0.05	-	0.02	0.3	0.3	0.1	0.1	0.3	0.3	
Water temperature	°C	3.1	1.7	3.0	1.9	3.8	2.9	2.2	1.2	3.1	2.3	2.7	2.2	
Specific conductivity	µS/cm	11	8.8	15	11	18	58	16	17	11	11	12	12	
Dissolved oxygen	mg/L	1.6^(C)	8.7	2.4^(C)	8.5	0.3^(C)	13.1	6.5	11.7	7.6	12.0	3.3^(C)	10.7	
Dissolved oxygen	%	12.1	62.6	17.5	61.4	2.5	96.6	47.7	82.5	57.0	87.9	24.8	77.4	
Conventional Parameters														
Alkalinity, gran as (H ⁺)	meq/L	0.15	0.10	0.13	0.15	0.12	0.21	0.18	0.16	0.10	0.12	0.10	0.14	
Alkalinity, total as (CaCO ₃)	mg/L	6.7	6.4	8.9	5.9	11	14	10	9.2	7.3	6.6	5.2	6.8	
Conductance	µS/cm	19	20	26	22	26	89	29	32	19	20	21	25	
Hardness	mg/L	6.6	6.9	8.9	7.4	9.3	32	10	12	12	7.1	7.6	8.8	
pH	-	6.4^(C, D)	6.4^(C, D)	6.2^(C, D)	6.3^(C, D)	6.4^(C, D)	6.9	6.5	6.6	6.5	6.5	6.3^(C, D)	6.4^(C, D)	
Total dissolved solids	mg/L	12	<10	20	18	24	53	17	22	14	15	17	22	
Total suspended solids	mg/L	<3	<3	<3	<3	3.8	<3	<3	<3	<3	3.4	<3	<3	
Turbidity	NTU	0.51	0.54	0.39	0.66	2.3	0.33	0.29	0.34	0.36	0.35	0.54	0.76	
Major Ions														
Bicarbonate	mg/L	8.1	7.8	11	7.2	13	17	12	11	8.9	8.1	6.4	8.3	
Calcium	mg/L	1.2	1.2	1.6	1.3	1.7	4.1	1.5	1.8	3.1	1.2	1.5	1.6	
Chloride	mg/L	0.6	0.74	0.75	0.72	0.66	1.5	<0.5	<0.5	<0.5	<0.5	0.59	0.71	
Fluoride	mg/L	<0.02	0.023	<0.02	0.021	<0.02	<0.02	<0.02	0.041	0.024	0.026	<0.02	0.021	
Magnesium	mg/L	0.89	0.91	1.2	0.98	1.2	5.3	1.6	1.8	0.99	1.0	0.96	1.2	
Potassium	mg/L	0.67	0.73	0.88	0.77	0.7	3.2	1.1	1.3	0.78	0.8	0.59	0.75	
Sodium	mg/L	0.98	1.1	1.4	1.1	1.2	2.9	1.1	1.3	0.99	0.96	0.99	1.3	
Sulphate	mg/L	1.49	1.78	1.76	1.87	1.52	22.3	3.39	3.81	1.77	1.81	2.33	2.83	

**Table D-9 Laboratory Water Quality Data from the Lac du Sauvage Sub-Basin Lakes during the Under-Ice Period, 2014
 Part A**

Location	Units	Duchess Lake				Lake Af1	Christine Lake	Lake C1		Counts Lake		Lake E1		
Sample Name		Af-1 Bottom	Af-1-Top	Af-7-Bottom	Af-7-Top	Af-10-Mid	Christine-1-Mid	C-L1-Bottom	C-L1-Top	Counts-1-Bottom	Counts-1-Top	E-L1-1-Bottom	E-L1-1-Top	
Sampling Season		Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	
Sample Date		25/04/2014	25/04/2014	25/04/2014	25/04/2014	26/04/2014	25/04/2014	25/04/2014	25/04/2014	25/04/2014	26/04/2014	26/04/2014	26/04/2014	26/04/2014
Easting (NAD 83, 12W)		542155	542155	541367	541367	538299	7163705	537612	537612	7169862	7169862	535065	535065	
Northing (NAD 83, 12W)		7173731	7173731	7174902	7174902	7176361	539626	7167085	7167085	534303	534303	7174657	7174657	
Nutrients														
Total organic carbon	mg/L	3.6	4.7	4.8	4.8	4.2	6.0	4.4	5.0	2.5	2.7	4.2	5.3	
Dissolved organic carbon	mg/L	3.3	4.2	4.6	4.5	4.2	5.7	4.3	4.9	2.5	2.7	4.1	5.2	
Total nitrogen (calculated)	mg-N/L	0.28	0.3	0.41	0.36	0.5	0.17	0.28	0.15	0.15	0.13	0.23	0.29	
Total Kjeldahl nitrogen	mg-N/L	0.13	0.28	0.21	0.26	0.24	0.15	0.22	0.14	0.11	0.12	0.17	0.29	
Total ammonia	mg-N/L	0.0059	<0.005	0.0068	<0.005	0.043	<0.005	<0.005	<0.005	<0.005	<0.005	0.0062	<0.005	
Nitrate	mg-N/L	0.16	0.024	0.20	0.11	0.26	0.02	0.054	0.014	0.04	0.017	0.053	<0.006	
Nitrite	mg-N/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Total phosphorus	mg-P/L	0.0091	0.023^(T)	0.009	0.019	0.0097	0.0063	0.0091	0.0092	0.0059	0.0061	0.0075	0.016	
Dissolved phosphorus	mg-P/L	0.0032	0.0054	0.0048	0.0045	0.0036	0.0035	0.0063	0.007	0.0028	0.003	0.0028	0.0055	
Dissolved orthophosphate	mg-P/L	0.003	<0.001	0.0023	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0016	<0.001	
Silica, reactive	mg/L	1.0	0.14	0.94	0.30	0.80	0.55	0.35	0.23	0.49	0.36	1.3	1.6	
Other Parameters														
Benzene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Ethylbenzene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Toluene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Xylenes	µg/L	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	
Fecal coliform	CFU/100mL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Total Metals														
Aluminum	µg/L	7.3^(C)	5.7^(C)	9.2^(C)	8.0^(C)	9.7^(C)	6.8	5.3	6.4	2.6	2.3	21^(C)	24^(C)	
Antimony	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Arsenic	µg/L	0.64	0.48	0.67	0.56	0.87	0.41	0.44	0.50	0.21	0.24	0.38	0.35	
Barium	µg/L	4.6	3.6	5.8	4.6	7.2	7.6	4.3	4.0	2.5	2.3	5.2	5.7	
Beryllium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Bismuth	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Boron	µg/L	1.3	3.8	4.5	2.0	2.5	2.9	4.7	5.9	4.0	4.1	3.3	3.6	
Cadmium	µg/L	<0.005	<0.005	<0.005	<0.005	0.0071	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0056	
Cesium	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Chromium	µg/L	<0.06	0.10	0.12	0.074	0.095	0.095	0.11	0.19	0.090	0.062	0.15	0.18	
Cobalt	µg/L	0.35	0.031	0.37	0.037	2.0	0.041	0.033	0.021	0.018	0.014	0.19	0.11	
Copper	µg/L	0.72	0.89	1.1	1.1	0.96	1.1	0.81	1.0	0.51	0.59	0.85	1.1	

**Table D-9 Laboratory Water Quality Data from the Lac du Sauvage Sub-Basin Lakes during the Under-Ice Period, 2014
 Part A**

Location	Units	Duchess Lake				Lake Af1	Christine Lake	Lake C1		Counts Lake		Lake E1		
Sample Name		Af-1 Bottom	Af-1-Top	Af-7-Bottom	Af-7-Top	Af-10-Mid	Christine-1-Mid	C-L1-Bottom	C-L1-Top	Counts-1-Bottom	Counts-1-Top	E-L1-1-Bottom	E-L1-1-Top	
Sampling Season		Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	
Sample Date		25/04/2014	25/04/2014	25/04/2014	25/04/2014	26/04/2014	25/04/2014	25/04/2014	25/04/2014	25/04/2014	26/04/2014	26/04/2014	26/04/2014	26/04/2014
Easting (NAD 83, 12W)		542155	542155	541367	541367	538299	7163705	537612	537612	7169862	7169862	535065	535065	
Northing (NAD 83, 12W)		7173731	7173731	7174902	7174902	7176361	539626	7167085	7167085	534303	534303	7174657	7174657	
Iron	µg/L	230	8.3	161	15	1,080 ^(C)	9.4	51	15	12	6.1	200	61	
Lead	µg/L	0.013	0.011	<0.01	0.011	0.017	0.029	0.014	0.026	<0.01	0.053	0.016	0.015	
Lithium	µg/L	1.4	1.8	2.0	1.9	2.2	3.1	2.0	2.2	1.3	1.2	1.9	2.5	
Manganese	µg/L	115 ^(D)	4.0	93 ^(D)	7.5	344 ^(D)	4.2	15	3.0	4.0	1.9	18	10	
Mercury	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Molybdenum	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	0.063	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Nickel	µg/L	0.61	0.49	0.83	0.58	1.3	1.0	0.75	0.81	0.36	0.36	0.73	0.89	
Selenium	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	
Silver	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Strontium	µg/L	7.8	8.1	10.0	9.0	12.0	32.0	9.9	11.0	7.0	7.1	9.2	11.0	
Thallium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Tin	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Titanium	µg/L	<0.1	0.13	0.17	<0.1	0.14	0.12	<0.1	<0.1	<0.1	0.35	0.25	0.19	
Uranium	µg/L	0.029	0.032	0.047	0.044	0.049	0.015	0.011	0.011	<0.01	<0.01	0.06	0.073	
Vanadium	µg/L	0.12	0.12	0.14	0.12	0.14	0.14	0.15	0.14	0.082	0.095	0.22	0.18	
Zinc	µg/L	<0.8	<0.8	0.85	<0.8	1.5	1.2	<0.8	0.81	<0.8	1.3	1.3	1.7	
Dissolved Metals														
Aluminum	µg/L	4.4	5.3	7.3	6.5	8.5	7.0	6.0	6.7	2.6	1.9	17.0	20.0	
Antimony	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Arsenic	µg/L	0.33	0.46	0.49	0.48	0.52	0.45	0.42	0.48	0.21	0.22	0.32	0.33	
Barium	µg/L	10	5.7	9.7	7.5	28	14	7.3	8.9	5.2	5.1	8.2	9.2	
Beryllium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Bismuth	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Boron	µg/L	3.7	2.8	4.7	4.3	8.1	6.8	5.3	6.6	5.4	3.3	3.8	4.9	
Cadmium	µg/L	<0.005	<0.005	<0.005	<0.005	0.012	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cesium	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Chromium	µg/L	<0.06	0.063	<0.06	0.098	0.12	0.079	<0.06	0.11	<0.06	<0.06	0.14	0.18	
Chromium - Hexavalent	µg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Cobalt	µg/L	0.32	0.025	0.34	0.035	2.0	0.022	0.020	0.017	0.011	0.010	0.18	0.093	
Copper	µg/L	0.68	0.87	1.0	0.96	0.86	1.1	0.8	1.0	0.6	0.57	0.79	1.1	
Iron	µg/L	30.0	6.0	50.0	9.7	300.0	2.1	13.0	3.9	6.0	3.0	72.0	31.0	
Lead	µg/L	<0.01	<0.01	<0.01	0.013	0.012	0.013	<0.01	0.012	0.014	0.026	<0.01	0.011	
Lithium	µg/L	1.6	1.9	2.2	2.1	2.3	3.0	1.9	2.5	1.2	1.5	2.2	2.4	
Manganese	µg/L	111.0	3.6	89.0	6.8	353.0	1.3	7.3	1.6	2.5	1.5	17.0	9.3	

**Table D-9 Laboratory Water Quality Data from the Lac du Sauvage Sub-Basin Lakes during the Under-Ice Period, 2014
 Part A**

Location	Units	Duchess Lake				Lake Af1	Christine Lake	Lake C1		Counts Lake		Lake E1		
Sample Name		Af-1 Bottom	Af-1-Top	Af-7-Bottom	Af-7-Top	Af-10-Mid	Christine-1-Mid	C-L1-Bottom	C-L1-Top	Counts-1-Bottom	Counts-1-Top	E-L1-1-Bottom	E-L1-1-Top	
Sampling Season		Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	Winter	
Sample Date		25/04/2014	25/04/2014	25/04/2014	25/04/2014	26/04/2014	25/04/2014	25/04/2014	25/04/2014	25/04/2014	26/04/2014	26/04/2014	26/04/2014	26/04/2014
Easting (NAD 83, 12W)		542155	542155	541367	541367	538299	7163705	537612	537612	7169862	7169862	535065	535065	
Northing (NAD 83, 12W)		7173731	7173731	7174902	7174902	7176361	539626	7167085	7167085	534303	534303	7174657	7174657	
Mercury	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Molybdenum	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	0.057	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Nickel	µg/L	0.62	0.45	0.83	0.56	1.3	0.93	0.75	0.80	0.35	0.32	0.75	0.90	
Selenium	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	
Silver	µg/L	<0.005	<0.005	<0.005	0.0051	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Strontium	µg/L	7.9	8.2	11.0	9.0	12.0	33.0	9.7	11.0	7.9	7.4	9.9	11.0	
Thallium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Tin	µg/L	<0.05	<0.05	<0.05	<0.05	0.09	<0.05	0.093	<0.05	<0.05	0.073	<0.05	0.055	
Titanium	µg/L	<0.1	0.19	0.11	0.24	0.16	<0.1	<0.1	<0.1	<0.1	0.51	<0.1	<0.1	
Uranium	µg/L	0.025	0.04	0.04	0.053	0.033	0.017	<0.01	0.012	0.011	<0.01	0.057	0.072	
Vanadium	µg/L	0.099	0.10	0.11	0.11	0.14	0.11	0.12	0.15	0.086	0.098	0.17	0.17	
Zinc	µg/L	5.9	2.1	4.1	2.7	19.0	6.5	5.0	5.6	3.6	3.3	4.1	5.3	

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

T) = concentration higher than the trigger for transition from mesotrophic to meso-eutrophic status (0.02 mg/L) applied to Lac du Sauvage basin as based on CCME (2004).

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; µg/L = micrograms per litre; < = less than; % = percent.



**Table D-9 Laboratory Water Quality Data from the Lac du Sauvage Sub-Basin Lakes during the Under-Ice Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Field Measured											
Total depth	m	12	7.5	11.8	12.4	19.0	-	-	-	-	-
Sample depth	m	12	2.0	5.0	6.8	18.0					
Ice thickness	m	12	1.6	1.7	1.8	1.8	-	-	-	-	-
Snow depth	m	11	0.02	0.2	0.2	0.3	-	-	-	-	-
Water temperature	°C	12	1.2	2.5	2.5	3.8	-	-	-	-	-
Specific conductivity	µS/cm	12	8.8	12.0	17.0	58.0	-	-	-	-	-
Dissolved oxygen	mg/L	12	0.3^(C)	8.0	7.2	13.1	-	33	-	-	-
Dissolved oxygen	%	12	2.5	59.2	52.5	96.6	-	-	-	-	-
Conventional Parameters											
Alkalinity, gran as (H ⁺)	meq/L	12	0.10	0.15	0.14	0.21	-	-	-	-	-
Alkalinity, total as (CaCO ₃)	mg/L	12	5.2	7.1	8.1	14.0	-	-	-	-	-
Conductance	µS/cm	12	19	23	29	89	-	-	-	-	-
Hardness	mg/L	12	6.6	8.9	11.0	32.0	-	-	-	-	-
pH	-	12	6.2^(C, D)	6.4^(C, D)	6.4^(C, D)	6.9	-	67	67	-	-
Total dissolved solids	mg/L	12	<10	18	20	53	-	-	-	-	-
Total suspended solids	mg/L	12	<3	<3	1.9	3.8	-	-	-	-	-
Turbidity	NTU	12	0.29	0.45	0.62	2.3	-	-	-	-	-



**Table D-9 Laboratory Water Quality Data from the Lac du Sauvage Sub-Basin Lakes during the Under-Ice Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Major Ions											
Bicarbonate	mg/L	12	6.4	8.6	9.9	17	-	-	-	-	-
Calcium	mg/L	12	1.2	1.6	1.8	4.1	-	-	-	-	-
Chloride	mg/L	12	<0.5	0.63	0.60	1.5	-	-	-	-	-
Fluoride	mg/L	12	<0.02	0.021	0.018	0.041	-	-	-	-	-
Magnesium	mg/L	12	0.89	1.1	1.5	5.3	-	-	-	-	-
Potassium	mg/L	12	0.59	0.78	1.00	3.2	-	-	-	-	-
Sodium	mg/L	12	0.96	1.1	1.3	2.9	-	-	-	-	-
Sulphate	mg/L	12	1.49	1.84	3.9	22.3	-	-	-	-	-
Nutrients											
Total organic carbon	mg/L	12	2.5	4.6	4.3	6.0	-	-	-	-	-
Dissolved organic carbon	mg/L	12	2.5	4.3	4.2	5.7	-	-	-	-	-
Total nitrogen (calculated)	mg-N/L	12	0.13	0.28	0.27	0.50	-	-	-	-	-
Total Kjeldahl nitrogen	mg-N/L	12	0.11	0.19	0.19	0.29	-	-	-	-	-
Total ammonia	mg-N/L	12	<0.005	<0.005	0.0069	0.043	-	-	-	-	-
Nitrate	mg-N/L	12	<0.006	0.047	0.079	0.26	-	-	-	-	-
Nitrite	mg-N/L	12	<0.002	<0.002	0.001	<0.002	-	-	-	-	-
Total phosphorus	mg-P/L	12	0.0059	0.0091	0.011	0.023^(T)	-	-	-	-	-
Dissolved phosphorus	mg-P/L	12	0.0028	0.0041	0.0044	0.007	-	-	-	-	-
Dissolved orthophosphate	mg-P/L	12	<0.001	<0.001	0.00095	0.003	-	-	-	-	-
Silica, reactive	mg/L	12	0.14	0.52	0.67	1.6	-	-	-	-	-

**Table D-9 Laboratory Water Quality Data from the Lac du Sauvage Sub-Basin Lakes during the Under-Ice Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Other Parameters											
Benzene	µg/L	12	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Ethylbenzene	µg/L	12	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Toluene	µg/L	12	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Xylenes	µg/L	12	<0.71	<0.71	<0.71	<0.71	-	-	-	-	-
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	12	<100	<100	<100	<100	-	-	-	-	-
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	12	<100	<100	<100	<100	-	-	-	-	-
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	12	<250	<250	<250	<250	-	-	-	-	-
Fecal coliform	CFU/100mL	12	<1	<1	<1	<1	-	-	-	-	-
Total Metals											
Aluminum	µg/L	12	2.3	7.1 ^(C)	9 ^(C)	24 ^(C)	-	58	-	-	-
Antimony	µg/L	12	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-
Arsenic	µg/L	12	0.21	0.46	0.48	0.87	-	-	-	-	-
Barium	µg/L	12	2.3	4.6	4.8	7.6	-	-	-	-	-
Beryllium	µg/L	12	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Bismuth	µg/L	12	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Boron	µg/L	12	1.3	3.7	3.6	5.9	-	-	-	-	-
Cadmium	µg/L	12	<0.005	<0.005	0.0032	0.0071	-	-	-	-	-
Cesium	µg/L	12	<0.1	<0.1	0.05	<0.1	-	-	-	-	-
Chromium	µg/L	12	<0.06	0.098	0.11	0.19	-	-	-	-	-
Cobalt	µg/L	12	0.014	0.039	0.26	2.0	-	-	-	-	-



**Table D-9 Laboratory Water Quality Data from the Lac du Sauvage Sub-Basin Lakes during the Under-Ice Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Copper	µg/L	12	0.51	0.93	0.89	1.1	-	-	-	-	-
Iron	µg/L	12	6.1	33.0	154	1,080 ^(C)	-	8	-	-	-
Lead	µg/L	12	<0.01	0.015	0.0180	0.053	-	-	-	-	-
Lithium	µg/L	12	1.2	2.0	1.9	3.1	-	-	-	-	-
Manganese	µg/L	12	1.9	8.9	52 ^(D)	344 ^(D)	-	-	25	-	-
Mercury	µg/L	12	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-
Molybdenum	µg/L	12	<0.05	<0.05	<0.05	0.063	-	-	-	-	-
Nickel	µg/L	12	0.36	0.74	0.73	1.3	-	-	-	-	-
Selenium	µg/L	12	<0.04	<0.04	0.020	<0.04	-	-	-	-	-
Silver	µg/L	12	<0.005	<0.005	0.0025	<0.005	-	-	-	-	-
Strontium	µg/L	12	7.0	9.5	11	32	-	-	-	-	-
Thallium	µg/L	12	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Tin	µg/L	12	<0.05	<0.05	0.025	<0.05	-	-	-	-	-
Titanium	µg/L	12	<0.1	0.13	0.13	0.35	-	-	-	-	-
Uranium	µg/L	12	<0.01	0.031	0.032	0.073	-	-	-	-	-
Vanadium	µg/L	12	0.082	0.14	0.14	0.22	-	-	-	-	-
Zinc	µg/L	12	<0.8	0.83	0.89	1.7	-	-	-	-	-



**Table D-9 Laboratory Water Quality Data from the Lac du Sauvage Sub-Basin Lakes during the Under-Ice Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Dissolved Metals											
Aluminum	µg/L	12	1.9	6.6	7.7	20	-	-	-	-	-
Antimony	µg/L	12	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-
Arsenic	µg/L	12	0.21	0.43	0.39	0.52	-	-	-	-	-
Barium	µg/L	12	5.1	8.5	9.8	28.0	-	-	-	-	-
Beryllium	µg/L	12	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Bismuth	µg/L	12	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Boron	µg/L	12	2.8	4.8	5.0	8.1	-	-	-	-	-
Cadmium	µg/L	12	<0.005	<0.005	<0.005	0.012	-	-	-	-	-
Cesium	µg/L	12	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-
Chromium	µg/L	12	<0.06	0.071	0.078	0.18	-	-	-	-	-
Chromium - Hexavalent	µg/L	12	<1	<1	<1	<1	-	-	-	-	-
Cobalt	µg/L	12	0.01	0.03	0.25	2.0	-	-	-	-	-
Copper	µg/L	12	0.57	0.87	0.86	1.1	-	-	-	-	-
Iron	µg/L	12	2.1	11	44	300	-	-	-	-	-
Lead	µg/L	12	<0.01	0.012	0.011	0.026	-	-	-	-	-
Lithium	µg/L	12	1.2	2.1	2.1	3.0	-	-	-	-	-
Manganese	µg/L	12	1.3	7.0	50	353	-	-	-	-	-
Mercury	µg/L	12	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-
Molybdenum	µg/L	12	<0.05	<0.05	<0.05	0.057	-	-	-	-	-
Nickel	µg/L	12	0.32	0.75	0.72	1.3	-	-	-	-	-



**Table D-9 Laboratory Water Quality Data from the Lac du Sauvage Sub-Basin Lakes during the Under-Ice Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Selenium	µg/L	12	<0.04	<0.04	<0.04	<0.04	-	-	-	-	-
Silver	µg/L	12	<0.005	<0.005	<0.005	0.0051	-	-	-	-	-
Strontium	µg/L	12	7.4	9.8	11.000	33	-	-	-	-	-
Thallium	µg/L	12	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Tin	µg/L	12	<0.05	<0.05	<0.05	0.093	-	-	-	-	-
Titanium	µg/L	12	<0.1	<0.1	0.130	0.51	-	-	-	-	-
Uranium	µg/L	12	<0.01	0.029	0.030	0.072	-	-	-	-	-
Vanadium	µg/L	12	0.086	0.11	0.12	0.17	-	-	-	-	-
Zinc	µg/L	12	2.1	4.5	5.6	19.0	-	-	-	-	-

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

T) = concentration higher than the trigger for transition from mesotrophic to meso-eutrophic status (0.02 mg/L) applied to Lac du Sauvage basin as based on CCME (2004).

Guideline exceedances by median concentrations are based on guidelines calculated using median values of hardness, pH, and temperature, and are not included in the percent exceedance calculations.

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; CWQG = Canadian Drinking Water Quality Guidelines; DWQG = Drinking Water Quality Guidelines; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; SSWQO = Site-Specific Water Quality Objective; µg/L = micrograms per litre; < = less than; % = percent.



**Table D-10 Laboratory Water Quality Data from Lac du Sauvage Sub-Basin Lakes during the Open-Water Period, 2014
Part A**

Location	Unit	Duchess Lake		Christine Lake		Lake C1			Counts Lake
Sample Name		Af-1-Mid	Af-1-Mid	Christine-1-Mid	Christine-1-Mid	C1-1-Bottom	C1-1-Top	C1-1-Mid	Counts-1
Sampling Season		Summer	Fall	Summer	Fall	Summer	Summer	Fall	Fall
Sample Date		09/08/2014	09/09/2014	16/08/2014	14/09/2014	16/08/2014	16/08/2014	14/09/2014	13/09/2014
Easting (NAD 83, 12W)		7173731	7173731	7163705	7163705	537612	537612	537612	7169862
Northing (NAD 83, 12W)		542155	542155	539626	539626	7167085	7167085	7167085	534303
Field Measured									
Total depth	m	15.1	11.0	12.0	11.4	18.2	18.2	20.0	10.4
Sample depth	m	7.5	5.5	6.0	5.5	17.0	1.0	10.0	5.0
Secchi depth	m	3.8	3.5	3.1	3.5	3.5	3.5	3.5	5.5
Water temperature	°C	13.2	5.7	13.0	5.0	5.2	13.0	5.2	5.3
Specific conductivity	µS/cm	10	11	48	51	17	16	17	13
Dissolved oxygen	mg/L	9.9	12.4	9.9	12.9	12.8	10.0	12.8	12.6
Dissolved oxygen saturation	%	95.2	99.3	94.5	100.9	101.1	95.1	101.1	100.5
pH	-	7.1	6.8	7.4	7.2	7.1	7.3	7.1	6.9
Conventional Parameters									
Alkalinity, gran as (H ⁺)	meq/L	<0.1	<0.1	0.13	0.10	0.11	0.11	0.11	<0.1
Alkalinity, total as (CaCO ₃)	mg/L	3.7	4.7	6.8	7.7	6.0	7.4	4.8	5.4
Conductance	µS/cm	12	15	53	57	20	22	18	16
Hardness	mg/L	4.1	4.3	18.0	18.0	6.3	6.3	6.3	4.6
pH	-	6.6	6.9	6.7	7.0	6.9	6.5	6.6	7.1
Total dissolved solids	mg/L	16	17	62	31	13	32	44	<10
Total suspended solids	mg/L	<3	<3	<3	<3	<3	<3	<3	<3
Turbidity	NTU	1.0	1.2	0.93	0.84	0.57	0.52	0.81	0.56



**Table D-10 Laboratory Water Quality Data from Lac du Sauvage Sub-Basin Lakes during the Open-Water Period, 2014
Part A**

Location	Unit	Duchess Lake		Christine Lake		Lake C1			Counts Lake
Sample Name		Af-1-Mid	Af-1-Mid	Christine-1-Mid	Christine-1-Mid	C1-1-Bottom	C1-1-Top	C1-1-Mid	Counts-1
Sampling Season		Summer	Fall	Summer	Fall	Summer	Summer	Fall	Fall
Sample Date		09/08/2014	09/09/2014	16/08/2014	14/09/2014	16/08/2014	16/08/2014	14/09/2014	13/09/2014
Easting (NAD 83, 12W)		7173731	7173731	7163705	7163705	537612	537612	537612	7169862
Northing (NAD 83, 12W)		542155	542155	539626	539626	7167085	7167085	7167085	534303
Major Ions									
Bicarbonate	mg/L	<5	5.7	8.3	9.4	7.3	9.0	5.9	6.5
Calcium	mg/L	0.76	0.77	2.5	2.5	0.90	0.90	0.88	0.74
Chloride	mg/L	<0.5	<0.5	0.74	0.75	<0.5	<0.5	<0.5	<0.5
Fluoride	mg/L	<0.02	<0.02	0.027	0.038	0.029	0.027	0.028	0.035
Magnesium	mg/L	0.55	0.58	2.9	2.9	1.0	0.98	0.99	0.68
Potassium	mg/L	0.43	0.48	1.8	1.9	0.79	0.73	0.74	0.61
Sodium	mg/L	0.61	0.62	1.6	1.8	0.75	0.64	0.66	0.70
Sulphate	mg/L	0.81	1.1	12	12	2.0	2.2	1.9	1.4
Nutrients									
Total organic carbon	mg/L	3.8	3.8	5.4	5.3	4.5	4.5	5.0	2.8
Dissolved organic carbon	mg/L	3.6	3.9	5.1	5.3	4.5	4.5	4.1	2.8
Total nitrogen (calculated)	mg-N/L	0.29	0.15	0.21	0.25	0.34	0.17	0.14	0.24
Total Kjeldahl nitrogen	mg-N/L	0.29	0.15	0.21	0.25	0.34	0.17	0.14	0.24
Total ammonia	mg-N/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.012
Nitrate	mg-N/L	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Nitrite	mg-N/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total phosphorus	mg-P/L	0.014	0.011	0.0073	0.0059	0.0091	0.0092	0.011	0.011
Dissolved phosphorus	mg-P/L	0.0047	0.0034	0.0028	<0.001	0.0023	0.0036	0.0029	0.0044
Dissolved orthophosphate	mg-P/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Silica, reactive	mg/L	0.16	0.093	0.077	0.069	0.049	0.21	0.078	0.12



**Table D-10 Laboratory Water Quality Data from Lac du Sauvage Sub-Basin Lakes during the Open-Water Period, 2014
 Part A**

Location	Unit	Duchess Lake		Christine Lake		Lake C1			Counts Lake
Sample Name		Af-1-Mid	Af-1-Mid	Christine-1-Mid	Christine-1-Mid	C1-1-Bottom	C1-1-Top	C1-1-Mid	Counts-1
Sampling Season		Summer	Fall	Summer	Fall	Summer	Summer	Fall	Fall
Sample Date		09/08/2014	09/09/2014	16/08/2014	14/09/2014	16/08/2014	16/08/2014	14/09/2014	13/09/2014
Easting (NAD 83, 12W)		7173731	7173731	7163705	7163705	537612	537612	537612	7169862
Northing (NAD 83, 12W)		542155	542155	539626	539626	7167085	7167085	7167085	534303
Other Parameters									
Benzene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylenes	µg/L	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71
Petroleum hydrocarbons – F1 (C6-C10)	µg/L	<100	<100	<100	<100	<100	<100	<100	<100
Petroleum hydrocarbons – F1 (C6-C10)-BTEX	µg/L	<100	<100	<100	<100	<100	<100	<100	<100
Petroleum hydrocarbons – F2 (C10-C16)	µg/L	<250	<250	<250	<250	<250	<250	<250	<250
Fecal coliform	CFU/100mL	1.0	<1	<1	<1	<1	<1	<1	<1
Total Metals									
Aluminum	µg/L	16	28	11	8.6	7.8	53 ^(C)	15	13
Antimony	µg/L	<0.02	<0.4	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	0.52	0.53	0.42	0.4	0.42	0.39	0.41	0.24
Barium	µg/L	2.2	2.2	4.4	4.1	2.1	4.2	2.3	1.3
Beryllium	µg/L	<0.01	<1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	3.6	<20	2.1	2.7	2.4	6.0	2.2	2.1
Cadmium	µg/L	<0.005	<0.2 ^(DL>A, C)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cesium	µg/L	0.0091	0.011	0.013	0.013	0.0062	0.069	0.0076	<0.005
Chromium	µg/L	<0.06	<0.8	<0.06	<0.06	<0.06	0.079	<0.06	<0.06
Cobalt	µg/L	0.036	<0.2	0.063	0.064	0.030	0.064	0.032	0.020

**Table D-10 Laboratory Water Quality Data from Lac du Sauvage Sub-Basin Lakes during the Open-Water Period, 2014
Part A**

Location	Unit	Duchess Lake		Christine Lake		Lake C1			Counts Lake
Sample Name		Af-1-Mid	Af-1-Mid	Christine-1-Mid	Christine-1-Mid	C1-1-Bottom	C1-1-Top	C1-1-Mid	Counts-1
Sampling Season		Summer	Fall	Summer	Fall	Summer	Summer	Fall	Fall
Sample Date		09/08/2014	09/09/2014	16/08/2014	14/09/2014	16/08/2014	16/08/2014	14/09/2014	13/09/2014
Easting (NAD 83, 12W)		7173731	7173731	7163705	7163705	537612	537612	537612	7169862
Northing (NAD 83, 12W)		542155	542155	539626	539626	7167085	7167085	7167085	534303
Copper	µg/L	0.75	7.3 ^(C)	0.90	1.2	0.84	2.5 ^(C)	1.4	0.85
Iron	µg/L	47	520 ^(C, S)	35	32	19	108	24	26
Lead	µg/L	<0.01	<0.1 ^(DL>C)	<0.01	<0.01	<0.01	0.01	0.012	<0.01
Lithium	µg/L	1.6	<10	2.4	2.3	1.9	2.2	1.8	1.3
Manganese	µg/L	5.4	<5	8.1	7.6	5.0	14	5.3	2.3
Mercury	µg/L	0.00072	0.0011	0.00086	0.00096	0.00083	<0.0005	0.00055	<0.0005
Molybdenum	µg/L	<0.05	<0.1	0.055	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	0.31	0.47	0.69	1.0	0.49	0.55	0.54	0.29
Selenium	µg/L	<0.04	<0.4	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	<0.005	<0.4 ^(DL>C)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	5.2	5.8	20	19	6.3	7.2	6.3	4.8
Thallium	µg/L	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	µg/L	<0.05	<0.4	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	0.81	<5	0.51	0.11	0.23	3.9	0.39	0.42
Uranium	µg/L	0.038	<0.1	0.019	0.017	0.012	0.012	0.015	0.012
Vanadium	µg/L	0.078	<0.5	<0.05	<0.05	<0.05	0.24	<0.05	0.066
Zinc	µg/L	<0.8	<4	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8



**Table D-10 Laboratory Water Quality Data from Lac du Sauvage Sub-Basin Lakes during the Open-Water Period, 2014
Part A**

Location	Unit	Duchess Lake		Christine Lake		Lake C1			Counts Lake
Sample Name		Af-1-Mid	Af-1-Mid	Christine-1-Mid	Christine-1-Mid	C1-1-Bottom	C1-1-Top	C1-1-Mid	Counts-1
Sampling Season		Summer	Fall	Summer	Fall	Summer	Summer	Fall	Fall
Sample Date		09/08/2014	09/09/2014	16/08/2014	14/09/2014	16/08/2014	16/08/2014	14/09/2014	13/09/2014
Easting (NAD 83, 12W)		7173731	7173731	7163705	7163705	537612	537612	537612	7169862
Northing (NAD 83, 12W)		542155	542155	539626	539626	7167085	7167085	7167085	534303
Dissolved Metals									
Aluminum	µg/L	5.8	3.8	4.9	3.3	3.6	5.0	4.8	2.2
Antimony	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	0.51	0.43	0.39	0.36	0.43	0.43	0.40	0.24
Barium	µg/L	1.8	1.9	4.2	3.8	1.9	2.1	2.2	1.2
Beryllium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	2.1	2.8	4.6	4.1	2.5	2.2	3.2	4.0
Cadmium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cesium	µg/L	0.0058	<0.01	0.014	0.018	0.006	0.0068	0.0064	<0.005
Chromium	µg/L	0.069	<0.06	0.1	<0.06	<0.06	<0.06	<0.06	<0.06
Chromium – Hexavalent	µg/L	<1	<1	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	0.014	0.011	0.017	0.017	0.011	<0.01	0.012	0.011
Copper	µg/L	0.87	0.71	2.2	0.81	0.76	0.81	0.86	0.54
Iron	µg/L	10	5.2	2.6	2.8	2.4	2.6	2.6	4.4
Lead	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	1.5	1.2	2.4	2.3	1.7	1.6	1.4	1.4
Manganese	µg/L	0.62	0.42	0.43	0.57	0.5	0.26	0.46	0.59
Mercury	µg/L	0.00058	0.00063	0.00055	0.00083	0.00084	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	<0.05	<0.05	0.064	0.058	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	0.30	0.29	0.68	0.64	0.47	0.47	0.51	0.27

**Table D-10 Laboratory Water Quality Data from Lac du Sauvage Sub-Basin Lakes during the Open-Water Period, 2014
Part A**

Location	Unit	Duchess Lake		Christine Lake		Lake C1			Counts Lake
Sample Name		Af-1-Mid	Af-1-Mid	Christine-1-Mid	Christine-1-Mid	C1-1-Bottom	C1-1-Top	C1-1-Mid	Counts-1
Sampling Season		Summer	Fall	Summer	Fall	Summer	Summer	Fall	Fall
Sample Date		09/08/2014	09/09/2014	16/08/2014	14/09/2014	16/08/2014	16/08/2014	14/09/2014	13/09/2014
Easting (NAD 83, 12W)		7173731	7173731	7163705	7163705	537612	537612	537612	7169862
Northing (NAD 83, 12W)		542155	542155	539626	539626	7167085	7167085	7167085	534303
Selenium	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	<0.005	<0.005	<0.005	0.0054	<0.005	<0.005	0.0075	<0.005
Strontium	µg/L	5.0	5.0	20	20	6.0	6.2	5.9	4.9
Thallium	µg/L	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	0.21	<0.1	<0.1	<0.1	<0.1	0.38	<0.1	0.11
Uranium	µg/L	0.031	0.031	0.018	0.019	0.011	0.013	0.012	0.011
Vanadium	µg/L	<0.05	0.057	<0.05	<0.05	<0.05	<0.05	<0.05	0.062
Zinc	µg/L	1.6	<0.8	<0.8	<0.8	0.94	<0.8	1.3	<0.8

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

S) = concentration higher than the relevant site-specific objective.

DL>C) = detection limit was greater than the relevant chronic aquatic life guideline.

DL>A, C) = detection limit was greater than the relevant chronic and acute aquatic life guideline.

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; µg/L = micrograms per litre; < = less than; % = percent.



Table D-10 Laboratory Water Quality Data from Lac du Sauvage Sub-Basin Lakes during the Open-Water Period, 2014
Part B

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Field Measured											
Total depth	m	7	10.4	13.6	16.6	20	-	-	-	-	-
Sample depth	m	7	1.0	6.0	7.4	17	-	-	-	-	-
Secchi depth	m	7	3.1	3.5	3.8	5.5	-	-	-	-	-
Water temperature	°C	7	5.0	5.3	8.5	13.2	-	-	-	-	-
Specific conductivity	µS/cm	7	10	17	25	51	-	-	-	-	-
Dissolved oxygen	mg/L	7	7.8	10	10.8	12.9	-	-	-	-	-
Dissolved oxygen saturation	%	7	60.9	95.2	92.6	101.1	-	-	-	-	-
pH	-	7	6.3 ^(C, D)	7.1	7.0	7.4	-	14	14	-	-
Conventional Parameters											
Alkalinity, gran as (H ⁺)	meq/L	7	<0.1	0.11	0.12	0.13	-	-	-	-	-
Alkalinity, total as (CaCO ₃)	mg/L	7	3.7	6.0	6.0	7.7	-	-	-	-	-
Conductance	µS/cm	7	12	20	28	57	-	-	-	-	-
Hardness	mg/L	7	4.1	6.3	9.1	18	-	-	-	-	-
pH	-	7	6.5	6.7	6.8	7.1	-	-	-	-	-
Total dissolved solids	mg/L	7	<10	31	29	62	-	-	-	-	-
Total suspended solids	mg/L	7	<3	<3	<3	<3	-	-	-	-	-
Turbidity	NTU	7	0.52	0.81	0.75	1.0	-	-	-	-	-
Major Ions											
Bicarbonate	mg/L	7	<5	7.3	7.0	9.4	-	-	-	-	-
Calcium	mg/L	7	0.74	0.90	1.3	2.5	-	-	-	-	-
Chloride	mg/L	7	<0.5	<0.5	<0.5	0.75	-	-	-	-	-
Fluoride	mg/L	7	<0.02	0.028	0.027	0.038	-	-	-	-	-
Magnesium	mg/L	7	0.55	0.99	1.4	2.9	-	-	-	-	-
Potassium	mg/L	7	0.43	0.74	0.99	1.9	-	-	-	-	-
Sodium	mg/L	7	0.61	0.7	0.96	1.8	-	-	-	-	-
Sulphate	mg/L	7	0.81	2.0	4.6	12	-	-	-	-	-



**Table D-10 Laboratory Water Quality Data from Lac du Sauvage Sub-Basin Lakes during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Nutrients											
Total organic carbon	mg/L	7	2.8	4.5	4.5	5.4	-	-	-	-	-
Dissolved organic carbon	mg/L	7	2.8	4.5	4.3	5.3	-	-	-	-	-
Total nitrogen (calculated)	mg-N/L	7	0.14	0.24	0.23	0.34	-	-	-	-	-
Total Kjeldahl nitrogen	mg-N/L	7	0.14	0.24	0.23	0.34	-	-	-	-	-
Total ammonia	mg-N/L	7	<0.005	<0.005	<0.005	0.012	-	-	-	-	-
Nitrate	mg-N/L	7	<0.006	<0.006	<0.006	<0.006	-	-	-	-	-
Nitrite	mg-N/L	7	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
Total phosphorus	mg-P/L	7	0.0059	0.0092	0.0096	0.014	-	-	-	-	-
Dissolved phosphorus	mg-P/L	7	<0.001	0.0029	0.0031	0.0047	-	-	-	-	-
Dissolved orthophosphate	mg-P/L	7	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
Silica, reactive	mg/L	7	0.049	0.078	0.11	0.21	-	-	-	-	-
Other Parameters											
Benzene	µg/L	7	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Ethylbenzene	µg/L	7	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Toluene	µg/L	7	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Xylenes	µg/L	7	<0.71	<0.71	<0.71	<0.71	-	-	-	-	-
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	7	<100	<100	<100	<100	-	-	-	-	-
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	7	<100	<100	<100	<100	-	-	-	-	-
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	7	<250	<250	<250	<250	-	-	-	-	-
Fecal coliform	CFU/100mL	7	<1	<1	0.57	1.0	-	-	-	-	-
Total Metals											
Aluminum	µg/L	7	7.8	13	18	53 ^(C)	-	14	-	-	-
Antimony	µg/L	7	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-
Arsenic	µg/L	7	0.24	0.41	0.40	0.52	-	-	-	-	-
Barium	µg/L	7	1.3	2.3	2.9	4.4	-	-	-	-	-
Beryllium	µg/L	7	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-



Table D-10 Laboratory Water Quality Data from Lac du Sauvage Sub-Basin Lakes during the Open-Water Period, 2014
Part B

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Bismuth	µg/L	7	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Boron	µg/L	7	2.1	2.4	3.0	6.0	-	-	-	-	-
Cadmium	µg/L	7	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Cesium	µg/L	7	<0.005	0.0091	0.018	0.069	-	-	-	-	-
Chromium	µg/L	7	<0.06	<0.06	<0.06	0.079	-	-	-	-	-
Cobalt	µg/L	7	0.02	0.036	0.044	0.064	-	-	-	-	-
Copper	µg/L	7	0.75	0.90	1.2	2.5 ^(C)	-	14	-	-	-
Iron	µg/L	7	19	32	42	108	-	-	-	-	-
Lead	µg/L	7	<0.01	<0.01	<0.01	0.012	-	-	-	-	-
Lithium	µg/L	7	1.3	1.9	1.9	2.4	-	-	-	-	-
Manganese	µg/L	7	2.3	5.4	6.9	14	-	-	-	-	-
Mercury	µg/L	7	<0.0005	0.00072	0.00064	0.00096	-	-	-	-	-
Molybdenum	µg/L	7	<0.05	<0.05	<0.05	0.055	-	-	-	-	-
Nickel	µg/L	7	0.29	0.54	0.55	1.0	-	-	-	-	-
Selenium	µg/L	7	<0.04	<0.04	<0.04	<0.04	-	-	-	-	-
Silver	µg/L	7	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Strontium	µg/L	7	4.8	6.3	9.8	20	-	-	-	-	-
Thallium	µg/L	7	<0.01	<0.01	0.005	<0.01	-	-	-	-	-
Tin	µg/L	7	<0.05	<0.05	0.025	<0.05	-	-	-	-	-
Titanium	µg/L	7	0.11	0.42	0.91	3.9	-	-	-	-	-
Uranium	µg/L	7	0.012	0.015	0.018	0.038	-	-	-	-	-
Vanadium	µg/L	7	<0.05	<0.05	0.069	0.24	-	-	-	-	-
Zinc	µg/L	7	<0.8	<0.8	<0.8	<0.8	-	-	-	-	-



Table D-10 Laboratory Water Quality Data from Lac du Sauvage Sub-Basin Lakes during the Open-Water Period, 2014
Part B

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Dissolved Metals											
Aluminum	µg/L	7	2.2	4.8	4.2	5.8	-	-	-	-	-
Antimony	µg/L	7	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-
Arsenic	µg/L	7	0.24	0.40	0.39	0.51	-	-	-	-	-
Barium	µg/L	7	1.2	2.1	2.4	4.2	-	-	-	-	-
Beryllium	µg/L	7	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Bismuth	µg/L	7	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Boron	µg/L	7	2.1	3.2	3.2	4.6	-	-	-	-	-
Cadmium	µg/L	7	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Cesium	µg/L	7	<0.005	0.0064	0.0085	0.018	-	-	-	-	-
Chromium	µg/L	7	<0.06	<0.06	<0.06	0.10	-	-	-	-	-
Chromium – Hexavalent	µg/L	7	<1	<1	<1	<1	-	-	-	-	-
Cobalt	µg/L	7	<0.01	0.012	0.013	0.017	-	-	-	-	-
Copper	µg/L	7	0.54	0.81	0.97	2.2	-	-	-	-	-
Iron	µg/L	7	2.4	2.6	3.9	10.0	-	-	-	-	-
Lead	µg/L	7	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Lithium	µg/L	7	1.4	1.6	1.8	2.4	-	-	-	-	-
Manganese	µg/L	7	0.26	0.50	0.49	0.62	-	-	-	-	-
Mercury	µg/L	7	<0.0005	0.00055	0.00051	0.00084	-	-	-	-	-
Molybdenum	µg/L	7	<0.05	<0.05	<0.05	0.064	-	-	-	-	-
Nickel	µg/L	7	0.27	0.47	<0.05	0.68	-	-	-	-	-
Selenium	µg/L	7	<0.04	<0.04	<0.04	<0.04	-	-	-	-	-
Silver	µg/L	7	<0.005	<0.005	<0.005	0.0075	-	-	-	-	-
Strontium	µg/L	7	4.9	6.0	9.7	20	-	-	-	-	-
Thallium	µg/L	7	<0.005	<0.005	<0.005	0.006	-	-	-	-	-
Tin	µg/L	7	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Titanium	µg/L	7	<0.1	<0.1	0.13	0.38	-	-	-	-	-



Table D-10 Laboratory Water Quality Data from Lac du Sauvage Sub-Basin Lakes during the Open-Water Period, 2014
Part B

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Uranium	µg/L	7	0.011	0.013	0.017	0.031	-	-	-	-	-
Vanadium	µg/L	7	<0.05	<0.05	<0.05	0.062	-	-	-	-	-
Zinc	µg/L	7	<0.8	<0.8	<0.8	1.6	-	-	-	-	-

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

S) = concentration higher than the relevant site-specific objective.

DL>C) = detection limit was greater than the relevant chronic aquatic life guideline.

DL>A, C) = detection limit was greater than the relevant chronic and acute aquatic life guideline.

Guideline exceedances by median concentrations are based on guidelines calculated using median values of hardness, pH, and temperature, and are not included in the percent exceedance calculations.

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; CWQG = Canadian Water Quality Guidelines; CDWQG = Canadian Drinking Water Quality Guidelines; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; SSWQO = Site-Specific Water Quality Objective; µg/L = micrograms per litre; < = less than; % = percent.

Table D-11 Field Profile Data from Lac de Gras, Slipper Bay, during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
S2	21-Jul-14	6.5	5.8	0.025	12.8	10.7	101.7	48	7.0
				0.1	12.8	10.8	101.8	48	7.1
				0.5	12.8	10.8	101.8	48	7.1
				1	12.8	10.8	101.9	48	7.1
				2	12.8	10.8	101.8	48	7.1
				3	12.6	10.8	101.7	48	7.1
				4	11.6	11.1	101.9	50	7.1
				5	11.1	11.4	101.7	37	7.1
	6	9.4	11.7	102.2	31	7.0			
	14-Aug-14	6.5	6.5	0.025	12.5	10.5	99.2	41	7.3
				0.1	12.5	10.5	99.0	41	7.3
				0.5	12.5	10.5	99.2	41	7.3
				1	12.5	10.5	99.1	41	7.3
				2	12.4	10.5	99.2	41	7.3
				3	12.4	10.5	99.1	41	7.3
				3.5	12.4	10.5	98.9	41	7.3
				4	12.4	10.5	98.8	41	7.3
	8-Sep-14	7.0	3.0	0.1	7.1	11.9	98.5	42	6.9
				0.5	7.1	11.9	98.6	42	7.1
				1	7.1	11.9	98.5	42	7.1
				2	7.0	11.9	98.5	42	7.1
3				7.1	11.9	98.4	42	7.1	
4				7.1	11.9	98.6	42	7.1	
S3	21-Jul-14	12.9	6.3	0.025	11.5	11.1	102.4	47	7.3
				0.1	11.5	11.2	103.2	46	7.3
				0.5	11.5	11.3	103.2	47	7.3
				1	11.3	11.3	103.2	47	7.3
				2	10.7	11.4	102.4	42	7.3
				3	10.3	11.6	102.4	36	7.3
				4	9.7	11.7	102.9	30	7.3
				5	9.3	11.8	102.6	29	7.3
				6	8.8	11.9	102.0	23	7.3
				6.5	8.7	11.9	102.1	27	7.3
				7	8.5	11.9	102.1	27	7.3
				8	8.4	11.9	101.7	26	7.3
				9	8.2	11.9	101.2	26	7.3
10	8.1	11.9	101.1	26	7.3				
11	8.1	11.9	100.9	26	7.2				
12	8.1	11.9	100.8	25	7.2				

Table D-11 Field Profile Data from Lac de Gras, Slipper Bay, during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
S3 (continued)	14-Aug-14	13.5	10.5	0.025	12.0	10.7	99.9	28	7.3
				0.1	12.0	10.7	100.1	29	7.3
				0.5	12.0	10.7	100.1	29	7.3
				1	12.0	10.7	100.1	28	7.3
				2	11.9	10.8	100.2	27	7.2
				3	11.8	10.8	100.3	27	7.2
				4	11.8	10.8	100.2	27	7.2
				5	11.8	10.8	100.2	27	7.2
				6	11.7	10.8	100.1	26	7.2
				7	11.5	10.9	100.3	26	7.2
				8	11.5	10.9	100.3	26	7.2
				9	11.5	10.9	100.3	26	7.2
				10	11.3	10.9	99.9	26	7.2
	11	11.1	11.0	100.2	24	7.2			
	12	11.0	11.0	100.0	24	7.2			
	13	10.8	11.0	100.0	24	7.2			
	8-Sep-14	11.0	6.0	0.1	8.0	11.7	99.0	29	7.1
				0.5	8.0	11.7	98.9	29	7.1
				1	8.0	11.7	99.1	29	7.1
				2	8.0	11.7	99.3	29	7.1
				3	8.0	11.7	98.8	29	7.1
				4	8.0	11.7	99.1	29	7.0
				5	8.0	11.7	98.7	29	7.1
5.5				8.0	11.7	98.9	29	7.1	
6				8.0	11.7	99.0	29	7.1	
7				7.9	11.7	98.9	29	7.0	
8	7.9	11.7	99.0	29	7.1				
9	7.9	11.7	98.9	29	7.0				
10	7.9	11.7	99.0	29	7.0				

Table D-11 Field Profile Data from Lac de Gras, Slipper Bay, during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
S5	21-Jul-14	17.3	9.5	0.025	10.9	11.9	107.2	23	7.1
				0.1	10.9	11.9	107.3	23	7.1
				0.5	10.0	11.9	105.0	23	7.1
				1	9.8	12.0	105.1	23	7.1
				2	9.2	11.9	103.6	23	7.1
				3	9.1	11.9	103.3	24	7.2
				4	8.6	12.0	103.1	23	7.2
				5	8.4	12.2	103.5	22	7.2
				6	7.7	12.2	102.8	22	7.2
				7	7.6	12.3	102.5	22	7.2
				8	7.4	12.3	102.5	21	7.2
				8.5	7.3	12.3	102.4	21	7.3
				9	7.2	12.4	102.4	21	7.3
				10	7.1	12.5	102.6	20	7.3
				11	6.4	12.6	102.2	19	7.3
				12	6.4	12.6	102.2	19	7.3
	13	6.2	12.6	102.1	19	7.3			
	14	6.2	12.6	102.0	19	7.3			
	15	6.2	12.6	101.9	19	7.3			
	16	6.2	12.6	101.7	19	7.3			
	14-Aug-14	18.1	11.0	0.025	11.0	11.0	100.2	20	7.2
				0.1	11.0	11.0	100.1	20	7.2
				0.5	11.0	11.0	100.2	20	7.2
				1	11.0	11.0	100.2	20	7.2
				2	11.0	11.0	100.3	20	7.2
				3	10.9	11.0	100.2	20	7.2
				4	10.9	11.0	100.3	20	7.2
				5	10.9	11.0	100.2	20	7.2
				6	10.9	11.0	100.3	20	7.2
				7	10.8	11.0	100.1	20	7.1
				8	10.8	11.1	100.3	19	7.1
				9	10.7	11.0	100.2	19	7.2
				10	10.7	11.1	100.3	19	7.2
				11	10.7	11.0	100.0	19	7.2
12				10.6	11.1	100.1	19	7.1	
13				10.4	11.1	100.0	19	7.1	
14				9.9	11.2	100.0	19	7.1	
15				9.9	11.2	99.8	19	7.0	
16	9.8	11.2	99.7	19	7.1				
17	9.7	11.3	99.6	19	7.1				

Table D-11 Field Profile Data from Lac de Gras, Slipper Bay, during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
S5 (continued)	8-Sep-14	14.0	6.0	0.1	8.6	11.7	100.5	22	7.0
				0.5	8.6	11.5	99.2	22	7.0
				1	8.6	11.6	99.2	22	7.0
				2	8.6	11.6	99.4	22	7.0
				3	8.7	11.5	99.1	22	7.0
				4	8.8	11.5	99.1	22	6.9
				5	8.7	11.5	99.3	22	7.0
				6	8.7	11.5	99.3	22	7.0
				7	8.8	11.6	99.4	22	7.0
				8	8.7	11.5	99.0	22	7.0
				9	8.7	11.5	99.3	22	7.0
				10	8.7	11.6	99.2	22	7.0
				11	8.7	11.5	99.2	22	7.0
				12	8.7	11.5	99.1	22	7.0
S6	21-Jul-14	25.5	10.5	0.025	13.3	11.8	110.9	19	7.1
				0.1	13.2	11.3	108.4	19	7.1
				0.5	9.8	12.2	107.5	19	7.0
				1	9.2	12.2	106.2	19	6.9
				2	8.3	12.3	105.4	19	6.9
				3	8.0	12.3	103.9	20	6.9
				4	7.9	12.3	103.9	20	6.9
				5	7.8	12.3	103.8	20	7.0
				6	7.6	12.4	103.7	20	7.1
				7	7.6	12.6	103.9	20	7.2
				8	6.8	12.6	102.9	19	7.2
				9	6.6	12.6	102.9	19	7.1
				10	6.6	12.6	102.6	19	7.2
				11	6.5	12.6	102.6	19	7.3
				12	6.5	12.6	102.4	19	7.3
				12.5	6.5	12.6	102.5	19	7.3
				13	6.5	12.6	102.3	19	7.3
				14	6.5	12.6	102.4	19	7.3
				15	6.5	12.6	102.3	19	7.3
				16	6.4	12.6	102.2	19	7.4
				17	6.3	12.6	101.9	19	7.3
				18	6.3	12.6	101.8	19	7.4
				19	6.3	12.6	102.0	19	7.3
				20	6.3	12.5	101.7	19	7.3
				21	6.3	12.5	101.5	19	7.3
22	6.3	12.5	101.5	19	7.3				
23	6.3	12.5	101.5	19	7.3				
24	6.3	12.5	101.4	19	7.3				
25	6.3	12.5	101.4	19	7.3				

Table D-11 Field Profile Data from Lac de Gras, Slipper Bay, during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
S6 (continued)	14-Aug-14	28.8	11.0	0.025	10.4	11.3	101.7	19	7.8
				0.1	10.4	11.3	101.9	19	7.7
				0.5	10.4	11.3	101.8	19	7.6
				1	10.4	11.3	102.1	19	7.6
				2	10.4	11.4	102.7	19	7.5
				3	10.4	11.5	103.3	19	7.4
				4	10.4	11.6	104.5	19	7.4
				5	10.4	11.7	104.9	19	7.4
				6	10.4	11.6	104.6	19	7.4
				7	10.4	11.5	104.0	19	7.4
				8	10.4	11.5	103.6	19	7.3
				9	10.4	11.5	103.4	19	7.3
				10	10.4	11.5	103.0	19	7.3
				11	10.4	11.3	101.5	19	7.3
				12	10.4	11.2	101.2	19	7.2
				13	10.4	11.3	101.2	19	7.2
				14	10.4	11.2	100.9	19	7.2
				14.5	10.3	11.2	100.6	19	7.2
				15	10.2	11.2	100.6	19	7.2
				16	10.2	11.2	100.7	18	7.2
				17	9.8	11.4	100.3	19	7.2
				18	9.6	11.4	100.5	19	7.2
				19	9.5	11.4	100.6	19	7.1
				20	9.4	11.5	100.6	18	7.1
				21	9.2	11.5	100.2	18	7.1
				22	9.1	11.5	100.2	18	7.1
				23	9.0	11.5	100.2	18	7.1
				24	8.9	11.5	100.0	18	7.1
25	8.8	11.5	100.1	18	7.1				
26	8.8	11.5	100.0	18	7.0				
27	8.7	11.5	99.7	18	7.0				
28	8.6	11.6	99.9	18	7.0				

Note:

Bolded concentrations are higher than relevant water quality guidelines, or outside the recommended range.

m = metre; °C = degrees Celsius; mg/L = milligrams per litre; %Sat = percent saturation; µS/cm = microSemens per centimetre.

- = data excluded due to anomalous field data (i.e., outside of an expected data range).

**Table D-12 Laboratory Discrete Water Quality Data from Lac de Gras Slipper Bay during the Open-Water Period, 2014
 Part A**

Location	Unit	S2			S3			S5			S6	
Sample Name		S2-Mid	S2-Mid	S2-Mid	S3-Mid	S3-Mid	S3-Mid	S5-Mid	S5-Mid	S5-Mid	S6-Mid	S6-Mid
Sampling Season		Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer
Sample Date		21/07/2014	14/08/2014	08/09/2014	21/07/2014	14/08/2014	08/09/2014	21/07/2014	14/08/2014	08/09/2014	21/07/2014	14/08/2014
Easting (NAD 83, 12W)		507638	507638	507638	505912	505912	505912	503125	503125	503125	501976	501976
Northing (NAD 83, 12W)		7164461	7164461	7164461	7164431	7164431	7164431	7161481	7161481	7161481	7159857	7159857
Field Measured												
Total depth	m	6.5	6.5	7.0	12.9	13.5	11.0	17.3	18.1	14.0	25.5	28.8
Sample depth	m	3.0	3.5	3.0	6.5	7.0	5.5	8.5	9.0	7.0	13.0	15.0
Secchi depth	m	5.8	6.5	5.5	6.3	11.0	6.0	9.5	11.0	6.0	11.0	11.0
Water temperature	°C	12.6	12.4	7.1	8.7	11.5	8.0	7.3	10.7	8.8	6.5	10.3
Specific conductivity	µS/cm	48	41	42	27	26	29	21	19	22	19	19
Dissolved oxygen	mg/L	10.8	10.5	11.9	11.9	10.9	11.7	12.3	11.0	11.6	12.6	11.2
Dissolved oxygen saturation	%	101.7	98.9	98.4	102.1	100.3	98.9	102.4	100.2	99.4	102.4	100.6
pH	-	7.1	7.3	7.1	7.3	7.2	7.1	7.3	7.2	7.0	7.3	7.2
Conventional Parameters												
Alkalinity, gran as (H ⁺)	meq/L	0.12	0.14	0.12	0.11	<0.1	<0.1	<0.1	<0.1	0.10	<0.1	<0.1
Alkalinity, total as (CaCO ₃)	mg/L	8.2	5.4	6.0	5.5	4.5	5.2	4.3	4.2	4.3	4.2	4.0
Conductance	µS/cm	53	49	47	33	32	32	26	24	24	23	24
Hardness	mg/L	11	10	10	7.8	7.8	7.9	6.9	6.7	7.0	6.6	6.5
pH	-	6.8	6.7	6.7	6.7	6.5	6.6	6.7	6.5	6.6	6.6	6.4 ^(C, D)
Total dissolved solids	mg/L	26	35	23	20	29	20	10	27	15	<10	24
Total suspended solids	mg/L	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Turbidity	NTU	0.73	0.43	0.42	0.61	0.39	0.29	0.43	0.39	0.27	0.28	0.43
Major Ions												
Bicarbonate	mg/L	10	6.6	7.3	6.7	5.5	6.3	5.3	5.1	5.3	5.1	<5
Calcium	mg/L	2.2	2.1	2.0	1.6	1.6	1.5	1.4	1.3	1.3	1.3	1.3
Chloride	mg/L	5.8	4.8	4.4	3.0	2.5	2.6	1.9	1.5	1.4	1.5	1.4
Fluoride	mg/L	<0.02	<0.02	0.026	<0.02	<0.02	<0.02	<0.02	<0.02	0.021	<0.02	<0.02
Magnesium	mg/L	1.3	1.2	1.3	0.94	0.95	1.0	0.85	0.84	0.89	0.82	0.83
Potassium	mg/L	1.5	1.4	1.3	0.9	0.94	0.91	0.72	0.7	0.7	0.64	0.69
Sodium	mg/L	4.7	4.0	3.7	2.4	2.2	2.2	1.6	1.4	1.3	1.4	1.3
Sulphate	mg/L	7.2	5.9	5.5	4.4	3.7	4.5	3.4	2.8	3.1	3.0	2.7

**Table D-12 Laboratory Discrete Water Quality Data from Lac de Gras Slipper Bay during the Open-Water Period, 2014
 Part A**

Location	Unit	S2			S3			S5			S6	
Sample Name		S2-Mid	S2-Mid	S2-Mid	S3-Mid	S3-Mid	S3-Mid	S5-Mid	S5-Mid	S5-Mid	S6-Mid	S6-Mid
Sampling Season		Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer
Sample Date		21/07/2014	14/08/2014	08/09/2014	21/07/2014	14/08/2014	08/09/2014	21/07/2014	14/08/2014	08/09/2014	21/07/2014	14/08/2014
Easting (NAD 83, 12W)		507638	507638	507638	505912	505912	505912	503125	503125	503125	501976	501976
Northing (NAD 83, 12W)		7164461	7164461	7164461	7164431	7164431	7164431	7161481	7161481	7161481	7159857	7159857
Nutrients												
Total organic carbon	mg/L	3.6	2.8	3.2	3.0	2.5	2.7	2.7	2.3	2.5	2.5	2.2
Dissolved organic carbon	mg/L	3.8	2.7	3.0	3.0	2.4	2.8	2.8	2.2	2.6	2.7	2.1
Total nitrogen (calculated)	mg-N/L	0.21	0.11	<0.05	0.16	0.18	<0.05	0.16	<0.05	<0.05	0.13	0.15
Total Kjeldahl nitrogen	mg-N/L	0.21	0.11	<0.05	0.16	0.18	<0.05	0.16	<0.05	<0.05	0.13	0.15
Total ammonia	mg-N/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0056	<0.005	<0.005
Nitrate	mg-N/L	<0.006	<0.006	0.01	<0.006	<0.006	0.0081	<0.006	<0.006	<0.006	<0.006	<0.006
Nitrite	mg-N/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total phosphorus	mg-P/L	0.006	0.0053	0.0031	0.002	0.006	0.0047	0.0013	0.0086	0.0015	0.0033	0.0027
Total dissolved phosphorus	mg-P/L	<0.001	0.0026	0.0012	<0.001	0.0033	<0.001	<0.001	0.0021	<0.001	0.001	0.0021
Dissolved orthophosphate	mg-P/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Silica, reactive	mg/L	0.16	0.079	0.067	0.073	0.057	0.047	0.061	0.044	0.037	0.051	0.043
Other Parameters												
Benzene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylenes	µg/L	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250
Fecal coliform	CFU/100mL	1.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Metals												
Aluminum	µg/L	14	6.3	4.0	6.7	5.8	3.9	5.1	84	3.1	2.6	3.1
Antimony	µg/L	0.031	0.027	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	0.22	0.23	0.2	0.18	0.2	0.22	0.2	0.43	0.21	0.17	0.18
Barium	µg/L	4.8	3.3	3.1	2.8	2.6	2.4	2.4	2.9	2.1	2.0	2.0
Beryllium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	3.0	2.2	4.1	2.3	1.6	3.5	1.9	3.4	<1	5.1	1.4
Cadmium	µg/L	0.0053	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0058	<0.005	<0.005	<0.005
Cesium	µg/L	0.01	0.01	0.0096	0.0076	0.0095	0.009	0.0073	0.023	0.0071	0.008	0.0081
Chromium	µg/L	0.067	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.087	<0.06	<0.06	<0.06
Cobalt	µg/L	0.058	0.029	0.026	0.03	0.027	0.024	0.028	0.32	0.027	0.031	0.025
Copper	µg/L	0.96	0.64	0.61	0.83	0.79	0.53	0.62	1.4	0.53	0.52	0.53

**Table D-12 Laboratory Discrete Water Quality Data from Lac de Gras Slipper Bay during the Open-Water Period, 2014
 Part A**

Location	Unit	S2			S3			S5			S6	
Sample Name		S2-Mid	S2-Mid	S2-Mid	S3-Mid	S3-Mid	S3-Mid	S5-Mid	S5-Mid	S5-Mid	S6-Mid	S6-Mid
Sampling Season		Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer
Sample Date		21/07/2014	14/08/2014	08/09/2014	21/07/2014	14/08/2014	08/09/2014	21/07/2014	14/08/2014	08/09/2014	21/07/2014	14/08/2014
Easting (NAD 83, 12W)		507638	507638	507638	505912	505912	505912	503125	503125	503125	501976	501976
Northing (NAD 83, 12W)		7164461	7164461	7164461	7164431	7164431	7164431	7161481	7161481	7161481	7159857	7159857
Iron	µg/L	21	14	11	7.1	6.2	6.7	4.8	164	4.4	3.5	2.2
Lead	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.069	<0.01	<0.01	<0.01
Lithium	µg/L	1.5	1.3	1.4	1.6	1.3	1.5	1.4	1.7	1.4	1.3	1.4
Manganese	µg/L	3.9	3.9	3.5	2.5	2.5	2.4	2.6	41	2.1	2.6	2.0
Mercury	µg/L	0.00064	0.00054	0.00057	<0.0005	0.00055	0.00055	<0.0005	<0.0005	0.00056	<0.0005	<0.0005
Molybdenum	µg/L	1.3	1.3	1.1	0.58	0.57	0.52	0.31	0.21	0.2	0.22	0.24
Nickel	µg/L	0.93	0.82	0.78	0.96	0.86	0.8	0.92	2.3	0.87	0.95	0.86
Selenium	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	29	27	24	18	17	16	13	13	11	11	12
Thallium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	0.39	<0.1	<0.1	0.23	0.12	<0.1	<0.1	1.4	0.1	<0.1	<0.1
Uranium	µg/L	0.034	0.027	0.024	0.028	0.025	0.021	0.024	0.087	0.021	0.022	0.022
Vanadium	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.13	<0.05	<0.05	<0.05
Zinc	µg/L	1.0	<0.8	<0.8	0.98	<0.8	<0.8	<0.8	1.2	1.2	<0.8	<0.8
Dissolved Metals												
Aluminum	µg/L	12	3.1	1.9	5.8	2.8	1.6	4.3	2.0	1.3	2.3	2.1
Antimony	µg/L	0.031	0.024	<0.02	<0.02	0.021	0.022	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	0.22	0.21	0.23	0.18	0.2	0.21	0.17	0.19	0.18	0.18	0.19
Barium	µg/L	4.5	3.3	3.2	2.8	2.5	2.4	2.4	2.0	2.1	2.0	2.0
Beryllium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.012	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	4.8	2.4	1.9	2.4	1.7	<1	2.4	1.7	2.7	5.3	1.3
Cadmium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	0.0061	<0.005	<0.005	<0.005	<0.005	<0.005
Cesium	µg/L	0.01	0.01	0.0085	0.0077	0.0082	0.019	0.0087	0.007	0.007	0.0072	0.0081
Chromium	µg/L	0.085	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Chromium - Hexavalent	µg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	0.032	0.012	0.011	0.013	<0.01	0.013	0.013	<0.01	<0.01	<0.01	<0.01
Copper	µg/L	0.74	0.65	0.74	0.59	0.87	0.64	0.54	0.58	0.49	0.56	0.54
Iron	µg/L	11	3.0	3.8	2.9	<1	1.7	1.8	<1	<1	<1	<1
Lead	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	1.5	1.6	1.5	1.5	1.5	1.3	1.3	1.5	1.6	1.6	1.3
Manganese	µg/L	2.6	1.1	0.82	1.1	0.75	0.58	1.3	0.88	0.5	1.4	0.82

**Table D-12 Laboratory Discrete Water Quality Data from Lac de Gras Slipper Bay during the Open-Water Period, 2014
 Part A**

Location	Unit	S2			S3			S5			S6	
Sample Name		S2-Mid	S2-Mid	S2-Mid	S3-Mid	S3-Mid	S3-Mid	S5-Mid	S5-Mid	S5-Mid	S6-Mid	S6-Mid
Sampling Season		Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer
Sample Date		21/07/2014	14/08/2014	08/09/2014	21/07/2014	14/08/2014	08/09/2014	21/07/2014	14/08/2014	08/09/2014	21/07/2014	14/08/2014
Easting (NAD 83, 12W)		507638	507638	507638	505912	505912	505912	503125	503125	503125	501976	501976
Northing (NAD 83, 12W)		7164461	7164461	7164461	7164431	7164431	7164431	7161481	7161481	7161481	7159857	7159857
Mercury	µg/L	0.00057	0.00058	0.00051	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	1.3	1.4	1.1	0.61	0.62	0.52	0.33	0.28	0.21	0.23	0.22
Nickel	µg/L	0.95	0.79	0.74	0.89	0.8	0.77	0.92	0.82	0.81	0.87	0.85
Selenium	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	0.0088	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	29	29	24	17	16	15	13	12	11	12	11
Thallium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	0.011	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	0.25	<0.1	<0.1	0.14	<0.1	<0.1	0.24	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.03	0.027	0.019	0.024	0.021	0.027	0.022	0.02	0.018	0.021	0.018
Vanadium	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	2.4	3.1	<0.8	1.3	0.99	<0.8	2.1	3.2	<0.8	<0.8	<0.8

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; µg/L = micrograms per litre; < = less than; % = percent.

**Table D-12 Laboratory Discrete Water Quality Data from Lac de Gras Slipper Bay during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Field Measured											
Total depth	m	11	6.5	13.5	14.6	28.8	-	-	-	-	-
Sample depth	m	11	3.0	7.0	7.3	15.0	-	-	-	-	-
Secchi depth	m	11	5.5	6.5	8.0	11.0	-	-	-	-	-
Water temperature	°C	11	6.5	8.8	9.4	12.6	-	-	-	-	-
Specific conductivity	µS/cm	11	19	27	28	48	-	-	-	-	-
Dissolved oxygen	mg/L	11	10.5	11.6	11.5	12.6	-	-	-	-	-
Dissolved oxygen saturation	%	11	98.4	100.2	92.3	102.4	-	-	-	-	-
pH	-	11	7.0	7.2	7.2	7.3	-	-	-	-	-
Conventional Parameters											
Alkalinity, gran as (H ⁺)	meq/L	11	<0.1	0.11	0.11	0.14	-	-	-	-	-
Alkalinity, total as (CaCO ₃)	mg/L	11	4.0	4.5	5.1	8.2	-	-	-	-	-
Conductance	µS/cm	11	23	32	33	53	-	-	-	-	-
Hardness	mg/L	11	6.5	7.8	8.0	11	-	-	-	-	-
pH	-	11	6.4^(C, D)	6.6	6.6	6.8	-	9	9	-	-
Total dissolved solids	mg/L	11	<10	23	21	35	-	-	-	-	-
Total suspended solids	mg/L	11	<3	<3	<3	<3	-	-	-	-	-
Turbidity	NTU	11	0.27	0.42	0.42	0.73	-	-	-	-	-

**Table D-12 Laboratory Discrete Water Quality Data from Lac de Gras Slipper Bay during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Major Ions											
Bicarbonate	mg/L	11	<5	5.5	6.0	10	-	-	-	-	-
Calcium	mg/L	11	1.3	1.5	1.6	2.2	-	-	-	-	-
Chloride	mg/L	11	1.4	2.5	2.8	5.8	-	-	-	-	-
Fluoride	mg/L	11	<0.02	<0.02	<0.02	0.026	-	-	-	-	-
Magnesium	mg/L	11	0.82	0.94	0.99	1.3	-	-	-	-	-
Potassium	mg/L	11	0.64	0.9	0.95	1.5	-	-	-	-	-
Sodium	mg/L	11	1.3	2.2	2.4	4.7	-	-	-	-	-
Sulphate	mg/L	11	2.7	3.7	4.2	7.2	-	-	-	-	-
Nutrients											
Total organic carbon	mg/L	11	2.2	2.7	2.7	3.6	-	-	-	-	-
Dissolved organic carbon	mg/L	11	2.1	2.7	2.7	3.8	-	-	-	-	-
Total nitrogen (calculated)	mg-N/L	11	<0.05	0.13	0.11	0.21	-	-	-	-	-
Total Kjeldahl nitrogen	mg-N/L	11	<0.05	0.13	0.11	0.21	-	-	-	-	-
Total ammonia	mg-N/L	11	<0.005	<0.005	<0.005	0.0056	-	-	-	-	-
Nitrate	mg-N/L	11	<0.006	<0.006	<0.006	0.01	-	-	-	-	-
Nitrite	mg-N/L	11	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
Total phosphorus	mg-P/L	11	0.0013	0.0033	0.0041	0.0086	-	-	-	-	-
Total dissolved phosphorus	mg-P/L	11	<0.001	0.001	0.0014	0.0033	-	-	-	-	-
Dissolved orthophosphate	mg-P/L	11	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
Silica, reactive	mg/L	11	0.037	0.057	0.066	0.16	-	-	-	-	-

**Table D-12 Laboratory Discrete Water Quality Data from Lac de Gras Slipper Bay during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Other Parameters											
Benzene	µg/L	11	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Ethylbenzene	µg/L	11	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Toluene	µg/L	11	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Xylenes	µg/L	11	<0.71	<0.71	<0.71	<0.71	-	-	-	-	-
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	11	<100	<100	<100	<100	-	-	-	-	-
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	11	<100	<100	<100	<100	-	-	-	-	-
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	11	<250	<250	<250	<250	-	-	-	-	-
Fecal coliform	CFU/100mL	11	<1	<1	<1	1.0	-	-	-	-	-
Total Metals											
Aluminum	µg/L	11	2.6	5.1	13	84	-	-	-	-	-
Antimony	µg/L	11	<0.02	<0.02	<0.02	0.031	-	-	-	-	-
Arsenic	µg/L	11	0.17	0.2	0.22	0.43	-	-	-	-	-
Barium	µg/L	11	2.0	2.6	2.8	4.8	-	-	-	-	-
Beryllium	µg/L	11	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Bismuth	µg/L	11	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Boron	µg/L	11	<1	2.3	2.6	5.1	-	-	-	-	-
Cadmium	µg/L	11	<0.005	<0.005	<0.005	0.0058	-	-	-	-	-
Cesium	µg/L	11	0.0071	0.009	0.0099	0.023	-	-	-	-	-
Chromium	µg/L	11	<0.06	<0.06	<0.06	0.087	-	-	-	-	-
Cobalt	µg/L	11	0.024	0.028	0.056	0.32	-	-	-	-	-

**Table D-12 Laboratory Discrete Water Quality Data from Lac de Gras Slipper Bay during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Copper	µg/L	11	0.52	0.62	0.72	1.4	-	-	-	-	-
Iron	µg/L	11	2.2	6.7	22	164	-	-	-	-	-
Lead	µg/L	11	<0.01	<0.01	0.011	0.069	-	-	-	-	-
Lithium	µg/L	11	1.3	1.4	1.4	1.7	-	-	-	-	-
Manganese	µg/L	11	2.0	2.6	6.2	41	-	-	-	-	-
Mercury	µg/L	11	<0.0005	0.00054	<0.0005	0.00064	-	-	-	-	-
Molybdenum	µg/L	11	0.20	0.52	0.6	1.3	-	-	-	-	-
Nickel	µg/L	11	0.78	0.87	1.0	2.3	-	-	-	-	-
Selenium	µg/L	11	<0.04	<0.04	<0.04	<0.04	-	-	-	-	-
Silver	µg/L	11	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Strontium	µg/L	11	11	16	17	29	-	-	-	-	-
Thallium	µg/L	11	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Tin	µg/L	11	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Titanium	µg/L	11	<0.1	<0.1	0.23	1.4	-	-	-	-	-
Uranium	µg/L	11	0.021	0.024	0.030	0.087	-	-	-	-	-
Vanadium	µg/L	11	<0.05	<0.05	<0.05	0.13	-	-	-	-	-
Zinc	µg/L	11	<0.8	<0.8	<0.8	1.2	-	-	-	-	-
Dissolved Metals											
Aluminum	µg/L	11	1.3	2.3	3.6	12	-	-	-	-	-
Antimony	µg/L	11	<0.02	<0.02	<0.02	0.031	-	-	-	-	-
Arsenic	µg/L	11	0.17	0.19	0.20	0.23	-	-	-	-	-

**Table D-12 Laboratory Discrete Water Quality Data from Lac de Gras Slipper Bay during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Barium	µg/L	11	2.0	2.4	2.7	4.5	-	-	-	-	-
Beryllium	µg/L	11	<0.01	<0.01	<0.01	0.01	-	-	-	-	-
Bismuth	µg/L	11	<0.01	<0.01	<0.01	0.012	-	-	-	-	-
Boron	µg/L	11	<1	2.4	2.5	5.3	-	-	-	-	-
Cadmium	µg/L	11	<0.005	<0.005	<0.005	0.0061	-	-	-	-	-
Cesium	µg/L	11	0.007	0.0082	0.0093	0.019	-	-	-	-	-
Chromium	µg/L	11	<0.06	<0.06	<0.06	0.085	-	-	-	-	-
Chromium - Hexavalent	µg/L	11	<1	<1	<1	<1	-	-	-	-	-
Cobalt	µg/L	11	<0.01	0.011	0.011	0.032	-	-	-	-	-
Copper	µg/L	11	0.49	0.59	0.63	0.87	-	-	-	-	-
Iron	µg/L	11	<1	1.7	2.4	11	-	-	-	-	-
Lead	µg/L	11	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Lithium	µg/L	11	1.3	1.5	1.5	1.6	-	-	-	-	-
Manganese	µg/L	11	0.5	0.88	1.1	2.6	-	-	-	-	-
Mercury	µg/L	11	<0.0005	<0.0005	<0.0005	0.00058	-	-	-	-	-
Molybdenum	µg/L	11	0.21	0.52	0.62	1.4	-	-	-	-	-
Nickel	µg/L	11	0.74	0.82	0.84	0.95	-	-	-	-	-
Selenium	µg/L	11	<0.04	<0.04	<0.04	<0.04	-	-	-	-	-
Silver	µg/L	11	<0.005	<0.005	<0.005	0.0088	-	-	-	-	-
Strontium	µg/L	11	11	15	17	29	-	-	-	-	-
Thallium	µg/L	11	<0.005	<0.005	<0.005	0.011	-	-	-	-	-



**Table D-12 Laboratory Discrete Water Quality Data from Lac de Gras Slipper Bay during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Tin	µg/L	11	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Titanium	µg/L	11	<0.1	<0.1	<0.1	0.25	-	-	-	-	-
Uranium	µg/L	11	0.018	0.021	0.022	0.03	-	-	-	-	-
Vanadium	µg/L	11	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Zinc	µg/L	11	<0.8	0.99	1.4	3.2	-	-	-	-	-

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

Guideline exceedances by median concentrations are based on guidelines calculated using median values of hardness, pH, and temperature, and are not included in the percent exceedance calculations.

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; CWQG = Canadian Water Quality Guidelines; CDWQG = Canadian Drinking Water Quality Guidelines; m = metre; mg/L = milligrams per litre;

mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; SSWQO = Site-Specific Water Quality Objective; µg/L = micrograms per litre; < = less than; % = percent.

Table D-13 Field Profile Data from Lac de Gras (Far Field 2) during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
FF2-1	22-Jul-14	21.5	5.0	0.025	8.8	12.3	105.6	23	6.8
				0.1	8.7	12.3	105.6	23	6.9
				0.5	8.7	12.3	105.5	23	7.0
				1	8.7	12.3	105.5	23	7.1
				2	8.7	12.3	105.5	23	7.1
				3	8.6	12.3	105.5	23	7.1
				4	7.7	12.5	104.9	26	7.2
				5	7.5	12.6	105.1	24	7.2
				6	7.2	12.6	104.7	24	7.3
				7	7.1	12.7	104.6	24	7.3
				8	7.0	12.7	104.5	24	7.3
				9	6.6	12.7	104.0	25	7.3
				10	6.5	12.7	103.6	25	7.3
				11	6.4	12.7	103.3	25	7.3
				12	6.4	12.7	103.2	25	7.3
				13	6.4	12.6	102.9	25	7.3
				14	6.3	12.6	102.8	25	7.3
				15	6.3	12.6	102.4	25	7.3
				16	6.3	12.7	102.4	25	7.2
				17	6.2	12.6	102.1	25	7.2
				18	6.2	12.6	101.7	25	7.2
19	6.2	12.6	101.5	25	7.2				
20	6.2	12.6	101.5	25	7.3				
21	6.2	12.6	101.6	25	7.2				

Table D-13 Field Profile Data from Lac de Gras (Far Field 2) during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
FF2-1 (continued)	12-Aug-14	21.3	4.3	0.025	10.9	11.2	101.6	23	7.0
				0.1	10.9	11.1	101.5	23	7.1
				0.5	10.9	11.2	101.5	23	7.1
				1	10.9	11.1	101.5	23	7.1
				2	10.8	11.2	101.4	23	7.1
				3	10.7	11.2	101.4	23	7.1
				4	10.7	11.2	101.3	23	7.0
				5	10.6	11.2	101.5	23	7.0
				6	10.6	11.2	101.4	23	7.0
				7	10.6	11.2	101.3	23	7.0
				8	10.5	11.2	101.5	23	7.0
				9	10.4	11.3	101.6	23	7.0
				10	10.1	11.4	101.6	23	7.0
				10.5	10.0	11.4	101.3	23	7.0
				11	10.0	11.4	101.2	23	7.0
				12	9.8	11.4	101.1	23	7.0
				13	9.8	11.4	101.0	23	7.0
				14	9.7	11.4	101.1	23	6.9
				15	9.6	11.4	100.8	23	6.9
				16	9.6	11.4	100.7	23	6.9
17	9.4	11.4	100.6	23	6.9				
18	9.2	11.4	100.2	23	6.9				
19	9.1	11.4	99.2	23	6.8				
20	9.1	11.3	98.8	23	6.8				

**Table D-13 Field Profile Data from Lac de Gras (Far Field 2) during the Open-Water Period, 2014**

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
FF2-1 (continued)	12-Sep-14	20.0	6.0	0.1	8.3	11.8	100.3	27	7.0
				0.5	8.3	11.8	100.3	27	7.0
				1	8.3	11.8	100.4	27	7.0
				2	8.3	11.8	100.2	27	7.0
				3	8.3	11.8	100.3	27	7.0
				4	8.3	11.8	100.3	27	7.0
				5	8.3	11.8	100.3	27	7.0
				6	8.3	11.8	100.3	27	7.0
				7	8.3	11.8	100.3	27	7.0
				8	8.3	11.8	100.3	27	7.0
				9	8.3	11.8	100.3	27	7.0
				10	8.3	11.8	100.2	27	7.0
				11	8.3	11.8	100.5	27	7.0
				12	8.3	11.8	100.4	27	7.0
				13	8.3	11.8	100.3	27	7.0
				14	8.2	11.8	100.3	27	7.0
				15	8.3	11.8	100.2	27	7.0
				16	8.2	11.8	100.2	27	7.1
				17	8.2	11.8	100.4	27	7.1
18	8.2	11.8	100.2	27	7.1				
19	8.2	11.8	100.2	27	7.1				



Table D-13 Field Profile Data from Lac de Gras (Far Field 2) during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
FF2-2	20-Jul-14	18.8	6.6	0.025	8.6	12.3	105.8	23	7.1
				0.1	8.7	12.3	105.7	24	7.1
				0.5	8.5	12.3	105.6	23	7.2
				1	8.5	12.4	105.9	24	7.2
				2	8.4	12.5	106.1	24	7.2
				3	7.6	12.7	105.8	24	7.3
				4	7.4	12.7	105.9	24	7.3
				5	7.3	12.8	105.8	24	7.3
				6	7.2	12.7	105.7	24	7.3
				7	7.2	12.8	105.6	24	7.4
				8	7.1	12.8	105.7	25	7.4
				9	7.1	12.8	105.5	25	7.4
				10	6.9	12.8	105.4	24	7.4
				11	6.8	12.8	105.3	24	7.4
				12	6.7	12.9	105.2	24	7.4
				13	6.6	12.8	105.1	25	7.4
				14	6.6	12.8	104.1	25	7.4
				15	6.4	12.8	104.1	25	7.4
16	6.4	12.8	103.8	25	7.4				
17	6.6	12.8	103.7	25	7.4				
18	6.4	12.8	103.4	25	7.4				



Table D-13 Field Profile Data from Lac de Gras (Far Field 2) during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
FF2-2 (continued)	12-Aug-14	18.5	4.5	0.025	11.1	11.1	101.1	23	7.2
				0.1	11.1	11.1	101.1	23	7.1
				0.5	11.1	11.0	101.1	23	7.1
				1	11.1	11.1	101.2	23	7.2
				2	11.1	11.1	101.1	23	7.2
				3	11.1	11.1	101.0	23	7.2
				4	11.1	11.1	101.2	23	7.1
				5	11.0	11.0	100.9	23	7.1
				6	11.0	11.1	100.9	23	7.1
				7	10.8	11.1	101.0	23	7.1
				8	10.5	11.2	101.1	23	7.1
				9	10.3	11.3	101.3	23	7.0
				10	10.1	11.4	101.2	23	7.0
				11	9.8	11.4	101.2	23	7.0
				12	9.8	11.4	101.3	23	7.0
				13	9.7	11.4	101.0	23	7.0
				14	9.7	11.4	101.1	23	7.0
15	9.7	11.4	101.1	23	6.9				
16	9.7	11.4	101.0	23	6.9				
17	9.7	11.4	101.0	23	6.9				



Table D-13 Field Profile Data from Lac de Gras (Far Field 2) during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
FF2-3	20-Jul-14	19.5	6.5	0.025	9.4	11.9	104.2	21	6.9
				0.1	9.4	12.0	104.5	21	7.1
				0.5	9.3	12.0	104.4	21	7.1
				1	9.4	12.0	104.4	21	7.2
				2	9.2	12.0	104.2	21	7.2
				3	9.0	12.0	103.3	21	7.2
				4	8.4	12.1	103.1	21	7.3
				5	8.3	12.2	103.3	22	7.3
				6	7.8	12.3	103.4	22	7.3
				7	7.4	12.4	103.3	23	7.3
				8	7.1	12.5	103.1	23	7.3
				9	7.0	12.6	103.3	24	7.3
				10	6.6	12.7	103.5	24	7.4
				11	6.6	12.7	103.3	24	7.4
				12	6.6	12.7	103.3	24	7.4
				13	6.6	12.7	103.3	24	7.4
				14	6.5	12.7	103.2	24	7.4
				15	6.4	12.7	103.2	24	7.4
16	6.4	12.7	103.3	24	7.4				
17	6.4	12.7	103.1	24	7.4				
18	6.3	12.7	103.0	25	7.4				

Table D-13 Field Profile Data from Lac de Gras (Far Field 2) during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
FF2-3 (continued)	12-Aug-14	17.2	4.5	0.025	10.8	11.2	101.2	23	7.1
				0.1	10.8	11.2	101.4	23	7.0
				0.5	10.7	11.2	101.3	23	7.0
				1	10.7	11.2	101.3	23	7.1
				2	10.7	11.2	101.1	23	7.0
				3	10.7	11.2	101.3	23	7.0
				4	10.7	11.2	101.1	23	7.0
				5	10.6	11.2	101.4	23	7.0
				6	10.6	11.2	101.2	23	7.0
				7	10.6	11.2	101.1	23	7.0
				8	10.6	11.2	101.4	23	7.0
				8.5	10.6	11.2	101.2	23	7.0
				9	10.6	11.2	101.2	23	7.0
				10	10.5	11.2	101.2	23	7.0
				11	10.5	11.2	101.2	23	7.0
				12	10.5	11.2	101.2	23	7.0
13	10.2	11.3	101.4	23	7.0				
14	10.0	11.4	101.3	23	7.0				
15	10.0	11.4	101.5	23	7.0				
16	9.3	11.5	101.4	23	6.9				

Table D-13 Field Profile Data from Lac de Gras (Far Field 2) during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
FF2-3 (continued)	12-Sep-14	19.0	6.5	0.1	8.2	11.8	100.1	27	7.1
				0.5	8.3	11.8	100.0	27	7.1
				1	8.3	11.8	100.1	27	7.1
				2	8.3	11.8	100.2	27	7.1
				3	8.3	11.8	100.0	27	7.1
				4	8.3	11.8	100.3	27	7.1
				5	8.3	11.7	100.1	27	7.1
				6	8.3	11.8	100.4	27	7.1
				7	8.3	11.8	100.1	27	7.1
				8	8.3	11.7	100.0	27	7.1
				9	8.3	11.8	100.1	27	7.1
				10	8.3	11.8	100.0	27	7.1
				11	8.3	11.8	100.0	27	7.1
				12	8.3	11.8	100.2	27	7.1
				13	8.3	11.8	100.2	27	7.1
				14	8.3	11.8	100.3	27	7.1
				15	8.3	11.8	100.0	27	7.1
				16	8.3	11.8	100.0	27	7.1
17	8.3	11.8	99.9	27	7.1				
18	8.3	11.8	100.1	27	7.1				



Table D-13 Field Profile Data from Lac de Gras (Far Field 2) during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
FF2-4	20-Jul-14	19.3	7.1	0.025	10.7	11.7	105.7	21	7.1
				0.1	10.6	11.7	106.1	21	7.1
				0.5	9.5	11.9	104.5	21	7.1
				1	9.2	12.0	104.4	21	7.2
				2	8.7	12.0	103.5	22	7.2
				3	8.7	12.1	103.5	22	7.2
				4	8.1	12.2	103.4	22	7.2
				5	8.0	12.4	103.9	22	7.2
				6	7.6	12.5	104.1	23	7.2
				7	6.9	12.6	103.7	24	7.3
				8	6.5	12.7	103.4	25	7.3
				9	6.4	12.7	103.0	25	7.3
				9.5	6.5	12.7	103.0	25	7.3
				10	6.4	12.7	103.1	25	7.3
				11	6.4	12.7	103.0	25	7.3
				12	6.4	12.7	103.2	25	7.4
				13	6.3	12.7	102.9	25	7.4
				14	6.3	12.7	102.5	25	7.3
15	6.2	12.7	102.6	25	7.3				
16	6.2	12.7	102.7	25	7.4				
17	6.2	12.7	102.8	25	7.3				
18	6.2	12.7	102.9	25	7.3				

Table D-13 Field Profile Data from Lac de Gras (Far Field 2) during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
FF2-4 (continued)	12-Aug-14	20.3	4.5	0.025	10.8	11.1	100.9	23	7.6
				0.1	10.8	11.1	101.2	23	7.5
				0.5	10.8	11.1	101.2	23	7.4
				1	10.8	11.0	101.2	23	7.4
				2	10.8	11.2	101.4	23	7.3
				3	10.7	11.2	101.7	23	7.3
				4	10.7	11.2	101.7	23	7.3
				5	10.7	11.2	101.9	23	7.3
				6	10.7	11.2	101.8	23	7.3
				7	10.7	11.2	101.6	23	7.3
				8	10.7	11.2	101.7	23	7.2
				9	10.7	11.2	101.5	23	7.2
				10	10.7	11.2	101.6	23	7.2
				11	10.6	11.2	101.3	23	7.2
				12	10.4	11.3	101.4	23	7.1
				13	10.3	11.3	101.5	23	7.1
				14	10.2	11.3	101.6	23	7.1
				15	9.5	11.5	101.6	23	7.0
				16	9.2	11.6	101.5	23	7.0
17	9.0	11.7	101.7	23	7.0				
18	8.9	11.6	101.0	23	6.9				
19	8.9	11.6	100.6	23	6.9				

Table D-13 Field Profile Data from Lac de Gras (Far Field 2) during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
FF2-4 (continued)	12-Sep-14	20.0	6.5	0.1	8.6	11.8	101.2	27	7.0
				0.5	8.6	11.8	101.2	27	7.0
				1	8.6	11.8	101.5	27	7.0
				2	8.6	11.8	101.1	27	7.1
				3	8.6	11.8	101.1	27	7.0
				4	8.5	11.8	101.0	27	7.0
				5	8.5	11.8	100.9	27	7.1
				6	8.5	11.8	100.6	27	7.1
				7	8.4	11.8	100.7	27	7.1
				8	8.4	11.8	100.7	27	7.1
				9	8.4	11.8	100.6	27	7.1
				10	8.4	11.8	100.4	27	7.1
				11	8.4	11.8	100.5	27	7.1
				12	8.4	11.8	100.5	27	7.1
				13	8.4	11.8	100.2	27	7.1
				14	8.4	11.8	100.5	27	7.1
				15	8.3	11.8	100.6	27	7.1
				16	8.3	11.8	100.5	27	7.1
				17	8.3	11.8	100.5	27	7.1
18	8.3	11.8	100.3	27	7.1				
19	7.8	11.9	100.1	26	7.1				

Table D-13 Field Profile Data from Lac de Gras (Far Field 2) during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
FF2-5	20-Jul-14	19.1	6.0	0.025	9.0	11.6	109.1	21	6.2
				0.1	9.1	11.6	109.0	21	6.3
				0.5	9.0	11.6	109.0	21	6.6
				1	9.0	11.6	109.0	21	6.7
				2	8.9	11.6	108.8	21	6.7
				3	8.4	11.8	108.9	21	6.8
				4	8.3	11.8	109.0	22	6.8
				5	8.2	11.9	109.2	22	6.9
				6	7.8	12.0	108.8	22	6.9
				7	7.2	12.1	109.1	23	7.0
				8	6.9	12.3	109.5	24	7.0
				9	6.6	12.4	109.9	25	7.0
				9.5	6.3	12.5	109.6	25	7.0
				10	6.3	12.5	109.4	25	7.0
				11	6.3	12.5	109.4	25	7.0
				12	6.3	12.5	109.2	25	7.0
				13	6.2	12.4	108.8	25	7.1
				14	6.2	12.4	108.6	25	7.1
15	6.2	12.4	108.3	25	7.1				
16	6.2	12.4	108.4	25	7.1				
17	6.2	12.4	108.0	25	7.1				
18	6.2	12.4	108.1	25	7.1				

Table D-13 Field Profile Data from Lac de Gras (Far Field 2) during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
FF2-5 (continued)	11-Aug-14	20.5	7.3	0.025	11.1	11.0	100.4	23	7.4
				0.1	11.1	11.0	100.7	23	7.4
				0.5	11.1	11.0	100.7	23	7.4
				1	11.1	11.0	100.9	23	7.3
				2	11.1	11.1	101.1	23	7.3
				3	11.1	11.1	101.2	23	7.3
				4	11.1	11.1	101.2	23	7.3
				5	11.1	11.1	101.4	23	7.3
				6	11.1	11.1	101.3	23	7.3
				7	11.0	11.1	101.5	23	7.3
				8	11.0	11.1	101.4	23	7.3
				9	11.0	11.1	101.4	23	7.3
				10	11.0	11.1	101.4	23	7.3
				11	10.9	11.1	101.1	23	7.3
				12	10.5	11.2	101.0	23	7.3
				13	9.8	11.4	101.3	23	7.3
				14	9.6	11.5	101.8	23	7.3
				15	9.3	11.6	102.1	23	7.3
				16	9.2	11.6	102.0	23	7.3
17	9.1	11.7	101.8	23	7.3				
18	9.0	11.7	101.7	23	7.3				
19	8.8	11.7	101.3	23	7.3				

Table D-13 Field Profile Data from Lac de Gras (Far Field 2) during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
FF2-5 (continued)	12-Sep-14	20.0	6.0	0.1	8.0	11.9	101.0	27	7.1
				0.5	8.0	11.9	100.4	27	7.1
				1	8.0	11.9	100.4	27	7.1
				2	8.0	11.9	100.4	27	7.1
				3	8.0	11.9	100.5	27	7.0
				4	8.1	11.9	100.3	27	7.1
				5	8.1	11.9	100.3	27	7.1
				6	8.1	11.9	100.4	27	7.1
				7	8.1	11.9	100.5	27	7.1
				8	8.1	11.9	100.5	27	7.1
				9	8.1	11.9	100.4	27	7.1
				10	8.0	11.9	100.5	27	7.1
				11	8.0	11.8	100.2	27	7.1
				12	8.0	11.9	100.4	27	7.1
				13	8.0	11.9	100.5	27	7.1
				14	7.9	11.9	100.2	27	7.1
				15	7.9	11.9	100.3	26	7.1
				16	7.9	11.9	100.4	27	7.1
				17	7.9	11.9	100.2	27	7.1
18	7.8	11.9	100.1	27	7.1				
19	7.7	11.9	100.0	26	7.1				

Note: A profile was not recorded at FF2-2 in the fall due to inclement weather.

Bolded concentrations are higher than relevant water quality guidelines, or outside the recommended range.

m = metre; °C = degrees Celsius; mg/L = milligrams per litre; %Sat = percent saturation; µS/cm = microSemens per centimetre.

- = data excluded due to anomalous field data (i.e., outside of an expected data range).

**Table D-14 Laboratory Discrete Water Quality Data from Lac de Gras Far Field 2 during the Open-Water Period, 2014
 Part A**

Location	Unit	FF2-1			FF2-2			FF2-3			FF2-4			FF2-5		
Sample Name		FF2-1-Mid	FF2-1-Mid	FF2-1-Mid	FF2-2-Mid	FF2-2-Mid	FF2-2-Mid	FF2-3-Mid	FF2-3-Mid	FF2-3-Mid	FF2-4-Mid	FF2-4-Mid	FF2-4-Mid	FF2-5-Mid	FF2-5-Mid	FF2-5-Mid
Sampling Season		Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall
Sample Date		22/07/2014	12/08/2014	12/09/2014	20/07/2014	12/08/2014	12/09/2014	20/07/2014	12/08/2014	12/09/2014	20/07/2014	12/08/2014	11/09/2014	20/07/2014	11/08/2014	12/09/2014
Easting (NAD 83, 12W)		541500	541500	541500	541583	541583	541583	543478	543478	543478	543752	543752	543752	544734	544734	544734
Northing (NAD 83, 12W)		7159522	7159522	7159522	7158573	7158573	7158573	7159267	7159267	7159267	7158945	7158945	7158945	7158898	7158898	7158898
Field Measured																
Total depth	m	21.5	21.3	20.0	18.75	18.5	19.0	19.5	17.2	19.0	19.25	20.3	20.0	19.1	20.5	20.0
Sample depth	m	11.0	11.0	10.0	9.0	9.0	10.0	10.0	8.5	10.0	9.5	10.0	10.0	9.5	10.0	10.0
Secchi depth	m	5.0	4.3	6.0	6.6	4.5	6.0	6.5	4.5	6.5	7.1	4.5	6.5	6.0	7.3	6.0
Water temperature	°C	6.4	10.0	8.3	7.1	10.3	8.4	6.7	10.6	8.3	6.5	10.7	8.4	6.3	11.0	8.0
Specific conductivity	µS/cm	25	23	27	25	23	27	24	23	27	25	23	27	25	23	27
Dissolved oxygen	mg/L	12.7	11.4	11.8	12.8	11.3	11.8	12.7	11.2	11.8	12.7	11.2	11.8	12.5	11.1	11.9
Dissolved oxygen saturation	%	103.3	101.3	100.2	105.5	101.3	100.5	103.4	101.2	100.0	103.0	101.6	100.4	109.6	101.4	100.5
pH	-	7.3	7.0	7.0	7.4	7.0	7.0	7.3	7.0	7.1	7.3	7.2	7.1	7.0	7.3	7.1
Conventional Parameters																
Alkalinity, gran as (H ⁺)	meq/L	0.11	0.10	<0.1	0.10	0.10	0.13	0.10	0.10	0.12	0.10	<0.1	<0.1	<0.1	0.12	<0.1
Alkalinity, total as (CaCO ₃)	mg/L	4.5	5.3	5.6	7.0	4.7	5.8	4.8	5.2	6.2	4.7	4.9	4.8	8.1	5.1	5.6
Conductance	µS/cm	30	28	30	29	29	31	28	29	30	29	29	29	28	28	30
Hardness	mg/L	8.0	8.3	8.0	7.9	8.1	7.9	7.9	7.8	8.1	8.0	7.9	8.0	7.7	7.7	7.7
pH	-	6.7	6.6	6.9	6.5	6.6	6.9	6.6	6.6	6.9	6.7	6.6	6.6	6.7	6.7	6.9
Total dissolved solids	mg/L	15	25	17	21	30	<10	21	24	28	18	23	27	12	19	12
Total suspended solids	mg/L	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Turbidity	NTU	0.48	0.42	0.36	0.59	0.45	0.34	0.58	0.32	0.35	0.55	0.44	0.46	0.48	0.42	0.39
Major Ions																
Bicarbonate	mg/L	5.4	6.5	6.8	8.6	5.8	7.1	5.8	6.3	7.5	5.8	6.0	5.8	9.9	6.2	6.8
Calcium	mg/L	1.6	1.7	1.6	1.6	1.6	1.6	1.5	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.5
Chloride	mg/L	2.4	2.1	2.0	2.3	2.1	2.0	2.2	2.0	2.0	2.4	2.1	2.2	2.2	2.0	2.0
Fluoride	mg/L	<0.02	0.025	0.025	<0.02	0.026	0.029	<0.02	0.026	<0.02	<0.02	0.027	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L	0.97	0.99	0.97	0.98	0.97	0.96	0.97	0.95	0.96	0.97	0.95	0.97	0.94	0.96	0.95
Potassium	mg/L	0.79	0.79	0.89	0.79	0.81	0.89	0.79	0.79	0.89	0.79	0.79	0.89	0.76	0.79	0.88
Sodium	mg/L	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.8	1.8	1.7	1.8	1.8	1.8
Sulphate	mg/L	3.3	3.0	2.8	3.3	3.0	2.9	3.3	3.0	3.0	3.4	3.0	3.2	3.3	2.8	2.8
Nutrients																
Total organic carbon	mg/L	3.0	2.4	2.3	2.7	2.5	2.5	2.8	2.3	2.5	2.8	2.5	2.5	2.8	2.5	2.4
Dissolved organic carbon	mg/L	3.0	2.4	2.5	2.8	2.4	2.5	2.7	2.3	2.8	2.8	2.5	2.8	2.8	2.4	2.6
Total nitrogen (calculated)	mg-N/L	0.15	0.21	0.17	0.14	0.14	0.14	0.17	0.16	0.18	0.14	0.14	<0.05	0.15	0.17	0.19
Total Kjeldahl nitrogen	mg-N/L	0.15	0.21	0.17	0.14	0.14	0.14	0.17	0.16	0.18	0.14	0.14	<0.05	0.15	0.17	0.19
Total ammonia	mg-N/L	<0.005	<0.005	<0.005	<0.005	0.0052	<0.005	<0.005	<0.005	<0.005	0.0075	<0.005	0.005	<0.005	<0.005	<0.005
Nitrate	mg-N/L	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006

**Table D-14 Laboratory Discrete Water Quality Data from Lac de Gras Far Field 2 during the Open-Water Period, 2014
 Part A**

Location	Unit	FF2-1			FF2-2			FF2-3			FF2-4			FF2-5		
Sample Name		FF2-1-Mid	FF2-1-Mid	FF2-1-Mid	FF2-2-Mid	FF2-2-Mid	FF2-2-Mid	FF2-3-Mid	FF2-3-Mid	FF2-3-Mid	FF2-4-Mid	FF2-4-Mid	FF2-4-Mid	FF2-5-Mid	FF2-5-Mid	FF2-5-Mid
Sampling Season		Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall
Sample Date		22/07/2014	12/08/2014	12/09/2014	20/07/2014	12/08/2014	12/09/2014	20/07/2014	12/08/2014	12/09/2014	20/07/2014	12/08/2014	11/09/2014	20/07/2014	11/08/2014	12/09/2014
Easting (NAD 83, 12W)		541500	541500	541500	541583	541583	541583	543478	543478	543478	543752	543752	543752	544734	544734	544734
Northing (NAD 83, 12W)		7159522	7159522	7159522	7158573	7158573	7158573	7159267	7159267	7159267	7158945	7158945	7158945	7158898	7158898	7158898
Nitrite	mg-N/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total phosphorus	mg-P/L	0.0046	0.0042	0.0035	0.0042	0.0071	0.0041	0.0049	0.0047	0.0045	0.004	0.0049	0.003	0.0047	0.0089	0.0047
Total dissolved phosphorus	mg-P/L	<0.001	0.0039	<0.001	0.0021	0.0021	0.0014	0.0018	0.0028	0.0016	0.0013	0.0026	<0.001	0.0018	0.0034	0.0019
Dissolved orthophosphate	mg-P/L	<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
Silica, reactive	mg/L	0.068	0.041	0.034	0.071	0.042	0.034	0.07	0.01	0.034	0.076	0.038	0.037	0.068	0.039	0.036
Other Parameters																
Benzene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylenes	µg/L	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250
Fecal coliform	CFU/100mL	<1	1.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1
Total Metals																
Aluminum	µg/L	5.3	4.3	3.7	5.9	5.1	4.8	5.4	5.0	5.4	5.0	4.4	6.2	7.4	4.2	6.0
Antimony	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.024	<0.02	<0.02	<0.02
Arsenic	µg/L	0.28	0.26	0.3	0.27	0.26	0.26	0.26	0.27	0.30	0.28	0.27	0.28	0.28	0.27	0.27
Barium	µg/L	2.9	2.3	2.3	3.1	2.2	2.4	2.7	2.3	2.4	2.6	2.3	2.7	2.4	2.4	2.2
Beryllium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	3.4	2.2	2.3	2.3	2.5	2.0	2.3	2.1	2.1	3.7	3.9	2.2	2.3	2.8	2.3
Cadmium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	0.011	<0.005	<0.005	<0.005	<0.005	<0.005	0.0076	<0.005	<0.005	<0.005
Cesium	µg/L	0.0068	0.007	0.008	0.0065	0.0073	0.0079	0.0065	0.0082	0.0073	0.0071	0.0071	0.0076	0.0082	0.0069	0.0084
Chromium	µg/L	0.069	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.07	<0.06	0.074	<0.06	<0.06	0.07
Cobalt	µg/L	0.018	0.011	0.012	0.016	0.013	0.016	0.015	0.012	0.011	0.016	0.016	0.011	0.014	0.013	0.011
Copper	µg/L	0.58	0.62	0.56	0.63	0.61	0.55	0.65	0.63	0.59	0.68	0.59	0.71	0.56	0.61	0.51
Iron	µg/L	7.4	4.4	3.9	6.9	4.2	4.9	6.9	4.1	4.6	6.5	3.7	6.7	6.8	3.4	4.6
Lead	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.013	<0.01	<0.01	<0.01
Lithium	µg/L	1.6	1.5	1.8	1.7	1.6	1.5	1.6	1.4	1.8	1.7	1.4	1.6	1.4	1.8	1.4
Manganese	µg/L	2.8	1.6	1.6	2.8	1.6	1.6	2.8	1.6	1.6	2.8	1.5	1.6	2.8	1.3	1.7
Mercury	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	0.00072	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00078	<0.0005	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	0.52	0.51	0.46	0.5	0.52	0.45	0.50	0.5	0.47	0.52	0.50	0.48	0.50	0.55	0.43
Nickel	µg/L	0.62	0.56	0.57	0.64	0.57	0.72	0.59	0.57	0.57	0.60	0.60	0.58	0.63	0.57	0.55

**Table D-14 Laboratory Discrete Water Quality Data from Lac de Gras Far Field 2 during the Open-Water Period, 2014
 Part A**

Location	Unit	FF2-1			FF2-2			FF2-3			FF2-4			FF2-5		
Sample Name		FF2-1-Mid	FF2-1-Mid	FF2-1-Mid	FF2-2-Mid	FF2-2-Mid	FF2-2-Mid	FF2-3-Mid	FF2-3-Mid	FF2-3-Mid	FF2-4-Mid	FF2-4-Mid	FF2-4-Mid	FF2-5-Mid	FF2-5-Mid	FF2-5-Mid
Sampling Season		Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall
Sample Date		22/07/2014	12/08/2014	12/09/2014	20/07/2014	12/08/2014	12/09/2014	20/07/2014	12/08/2014	12/09/2014	20/07/2014	12/08/2014	11/09/2014	20/07/2014	11/08/2014	12/09/2014
Easting (NAD 83, 12W)		541500	541500	541500	541583	541583	541583	543478	543478	543478	543752	543752	543752	544734	544734	544734
Northing (NAD 83, 12W)		7159522	7159522	7159522	7158573	7158573	7158573	7159267	7159267	7159267	7158945	7158945	7158945	7158898	7158898	7158898
Selenium	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	19	18	19	18	19	17	17	18	18	18	18	17	17	20	17
Thallium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	0.22	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	0.18	0.39	<0.1	0.14	0.11	<0.1	<0.1	0.13	0.13	0.11	0.25	0.32	0.10	<0.1	<0.1
Uranium	µg/L	0.072	0.055	0.057	0.071	0.052	0.058	0.064	0.052	0.06	0.07	0.053	0.055	0.069	0.055	0.054
Vanadium	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	<0.8	<0.8	<0.8	0.82	<0.8	1.4	<0.8	<0.8	<0.8	<0.8	<0.8	0.92	0.85	<0.8	<0.8
Dissolved Metals																
Aluminum	µg/L	2.5	2.3	2.1	4.0	2.9	3.7	2.7	1.8	2.4	2.3	1.7	1.6	2.3	1.6	1.5
Antimony	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	0.28	0.25	0.25	0.26	0.25	0.26	0.28	0.28	0.26	0.25	0.26	0.26	0.28	0.26	0.25
Barium	µg/L	2.6	2.7	2.2	2.7	2.5	2.3	2.5	2.4	2.5	2.4	2.3	2.5	2.4	2.3	2.2
Beryllium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	2.6	3.0	2.5	2.3	2.4	7.0	2.5	2.1	2.2	2.7	2.0	4.0	2.5	5.0	2.5
Cadmium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cesium	µg/L	0.0054	0.0068	0.0075	0.0073	0.0076	0.0075	0.0062	0.007	0.0069	0.0061	0.0065	0.0063	0.0063	0.0078	0.0074
Chromium	µg/L	<0.06	<0.06	<0.06	<0.06	0.071	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Chromium - Hexavalent	µg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	µg/L	0.51	0.58	0.55	0.65	0.50	0.51	0.58	0.76	0.64	0.71	0.69	0.49	0.49	0.5	0.49
Iron	µg/L	<1	<1	<1	1.1	<1	1.4	1.1	<1	<1	<1	<1	<1	<1	<1	<1
Lead	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	1.6	1.5	1.9	1.5	1.6	1.8	1.7	1.3	2.0	1.7	1.4	1.5	1.5	1.1	1.5
Manganese	µg/L	0.31	0.19	0.19	0.48	0.18	0.46	0.34	0.19	0.24	0.47	0.20	0.23	0.34	0.16	0.18
Mercury	µg/L	<0.0005	0.00057	0.00053	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00051	<0.0005	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	0.52	0.5	0.47	0.5	0.53	0.47	0.51	0.5	0.47	0.53	0.53	0.51	0.49	0.51	0.46
Nickel	µg/L	0.57	0.57	0.54	0.6	0.53	0.55	0.56	0.54	0.55	0.61	0.58	0.58	0.56	0.55	0.55
Selenium	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	18	18	18	17	18	18	17	18	18	18	18	17	17	18	17
Thallium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

**Table D-14 Laboratory Discrete Water Quality Data from Lac de Gras Far Field 2 during the Open-Water Period, 2014
 Part A**

Location	Unit	FF2-1			FF2-2			FF2-3			FF2-4			FF2-5		
Sample Name		FF2-1-Mid	FF2-1-Mid	FF2-1-Mid	FF2-2-Mid	FF2-2-Mid	FF2-2-Mid	FF2-3-Mid	FF2-3-Mid	FF2-3-Mid	FF2-4-Mid	FF2-4-Mid	FF2-4-Mid	FF2-5-Mid	FF2-5-Mid	FF2-5-Mid
Sampling Season		Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall
Sample Date		22/07/2014	12/08/2014	12/09/2014	20/07/2014	12/08/2014	12/09/2014	20/07/2014	12/08/2014	12/09/2014	20/07/2014	12/08/2014	11/09/2014	20/07/2014	11/08/2014	12/09/2014
Easting (NAD 83, 12W)		541500	541500	541500	541583	541583	541583	543478	543478	543478	543752	543752	543752	544734	544734	544734
Northing (NAD 83, 12W)		7159522	7159522	7159522	7158573	7158573	7158573	7159267	7159267	7159267	7158945	7158945	7158945	7158898	7158898	7158898
Tin	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.062	0.047	0.048	0.058	0.046	0.047	0.054	0.042	0.047	0.050	0.044	0.050	0.050	0.045	0.044
Vanadium	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.067	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	<0.8	<0.8	<0.8	<0.8	<0.8	1.3	0.9	<0.8	0.94	<0.8	<0.8	<0.8	<0.8	<0.8	0.84

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; µg/L = micrograms per litre; < = less than; % = percent.

**Table D-14 Laboratory Discrete Water Quality Data from Lac de Gras Far Field 2 during the Open-Water Period, 2014
Part B**

Parameter		Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Field Measured											
Total depth	m	15	17.2	19.5	19.6	21.5	-	-	-	-	-
Sample depth	m	15	8.5	10	9.8	11	-	-	-	-	-
Secchi depth	m	15	4.3	6.0	5.8	7.3	-	-	-	-	-
Water temperature	°C	15	6.3	8.3	8.5	11	-	-	-	-	-
Specific conductivity	µS/cm	15	23	25	25	27	-	-	-	-	-
Dissolved oxygen	mg/L	15	11.1	11.8	11.9	12.8	-	-	-	-	-
Dissolved oxygen saturation	%	15	100.0	101.3	102.2	109.6	-	-	-	-	-
pH	-	15	7.0	7.1	7.1	7.4	-	-	-	-	-
Conventional Parameters											
Alkalinity, gran as (H ⁺)	meq/L	15	<0.1	<0.1	<0.1	0.13	-	-	-	-	-
Alkalinity, total as (CaCO ₃)	mg/L	15	4.5	5.2	5.5	8.1	-	-	-	-	-
Conductance	µS/cm	15	28	29	29	31	-	-	-	-	-
Hardness	mg/L	15	7.7	7.9	7.9	8.3	-	-	-	-	-
pH	-	15	6.5	6.7	6.7	6.9	-	-	-	-	-
Total dissolved solids	mg/L	15	<10	21	20	30	-	-	-	-	-
Total suspended solids	mg/L	15	<3	<3	<3	<3	-	-	-	-	-
Turbidity	NTU	15	0.32	0.44	0.44	0.59	-	-	-	-	-
Major Ions											
Bicarbonate	mg/L	15	5.4	6.3	6.7	9.9	-	-	-	-	-
Calcium	mg/L	15	1.5	1.6	1.6	1.7	-	-	-	-	-
Chloride	mg/L	15	2.0	2.1	2.1	2.4	-	-	-	-	-
Fluoride	mg/L	15	<0.02	<0.02	<0.02	0.029	-	-	-	-	-



**Table D-14 Laboratory Discrete Water Quality Data from Lac de Gras Far Field 2 during the Open-Water Period, 2014
Part B**

Parameter		Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Magnesium	mg/L	15	0.94	0.97	0.96	0.99	-	-	-	-	-
Potassium	mg/L	15	0.76	0.79	0.82	0.89	-	-	-	-	-
Sodium	mg/L	15	1.7	1.8	1.8	1.9	-	-	-	-	-
Sulphate	mg/L	15	2.8	3.0	3.1	3.4	-	-	-	-	-
Nutrients											
Total organic carbon	mg/L	15	2.3	2.5	2.6	3.0	-	-	-	-	-
Dissolved organic carbon	mg/L	15	2.3	2.6	2.6	3.0	-	-	-	-	-
Total nitrogen (calculated)	mg-N/L	15	<0.05	0.15	0.15	0.21	-	-	-	-	-
Total Kjeldahl nitrogen	mg-N/L	15	<0.05	0.15	0.15	0.21	-	-	-	-	-
Total ammonia	mg-N/L	15	<0.005	<0.005	<0.005	0.0075	-	-	-	-	-
Nitrate	mg-N/L	15	<0.006	<0.006	<0.006	<0.006	-	-	-	-	-
Nitrite	mg-N/L	15	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
Total phosphorus	mg-P/L	15	0.003	0.0046	0.0048	0.0089	-	-	-	-	-
Total dissolved phosphorus	mg-P/L	15	<0.001	0.0018	0.0019	0.0039	-	-	-	-	-
Dissolved orthophosphate	mg-P/L	15	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
Silica, reactive	mg/L	15	0.01	0.039	0.047	0.076	-	-	-	-	-
Other Parameters											
Benzene	µg/L	15	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Ethylbenzene	µg/L	15	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Toluene	µg/L	15	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Xylenes	µg/L	15	<0.71	<0.71	<0.71	<0.71	-	-	-	-	-
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	15	<100	<100	<100	<100	-	-	-	-	-
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	15	<100	<100	<100	<100	-	-	-	-	-



**Table D-14 Laboratory Discrete Water Quality Data from Lac de Gras Far Field 2 during the Open-Water Period, 2014
Part B**

Parameter		Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	15	<250	<250	<250	<250	-	-	-	-	-
Fecal coliform	CFU/100mL	14	<1	<1	<1	1.0	-	-	-	-	-
Total Metals											
Aluminum	µg/L	15	3.7	5.1	5.2	7.4	-	-	-	-	-
Antimony	µg/L	15	<0.02	<0.02	<0.02	0.024	-	-	-	-	-
Arsenic	µg/L	15	0.26	0.27	0.27	0.30	-	-	-	-	-
Barium	µg/L	15	2.2	2.4	2.5	3.1	-	-	-	-	-
Beryllium	µg/L	15	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Bismuth	µg/L	15	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Boron	µg/L	15	2.0	2.3	2.6	3.9	-	-	-	-	-
Cadmium	µg/L	15	<0.005	<0.005	<0.005	0.011	-	-	-	-	-
Cesium	µg/L	15	0.0065	0.0073	0.0074	0.0084	-	-	-	-	-
Chromium	µg/L	15	<0.06	<0.06	<0.06	0.074	-	-	-	-	-
Cobalt	µg/L	15	0.011	0.013	0.014	0.018	-	-	-	-	-
Copper	µg/L	15	0.51	0.61	0.61	0.71	-	-	-	-	-
Iron	µg/L	15	3.4	4.6	5.3	7.4	-	-	-	-	-
Lead	µg/L	15	<0.01	<0.01	<0.01	0.013	-	-	-	-	-
Lithium	µg/L	15	1.4	1.6	1.6	1.8	-	-	-	-	-
Manganese	µg/L	15	1.3	1.6	2.0	2.8	-	-	-	-	-
Mercury	µg/L	15	<0.0005	<0.0005	<0.0005	0.00078	-	-	-	-	-
Molybdenum	µg/L	15	0.43	0.50	0.49	0.55	-	-	-	-	-
Nickel	µg/L	15	0.55	0.58	0.59	0.72	-	-	-	-	-
Selenium	µg/L	15	<0.04	<0.04	<0.04	<0.04	-	-	-	-	-

**Table D-14 Laboratory Discrete Water Quality Data from Lac de Gras Far Field 2 during the Open-Water Period, 2014
Part B**

Parameter		Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Silver	µg/L	15	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Strontium	µg/L	15	17	18	18	20	-	-	-	-	-
Thallium	µg/L	15	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Tin	µg/L	15	<0.05	<0.05	<0.05	0.22	-	-	-	-	-
Titanium	µg/L	15	<0.1	0.11	0.14	0.39	-	-	-	-	-
Uranium	µg/L	15	0.052	0.057	0.06	0.072	-	-	-	-	-
Vanadium	µg/L	15	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Zinc	µg/L	15	<0.8	<0.8	<0.8	1.4	-	-	-	-	-
Dissolved Metals											
Aluminum	µg/L	15	1.5	2.3	2.4	4.0	-	-	-	-	-
Antimony	µg/L	15	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-
Arsenic	µg/L	15	0.25	0.26	0.26	0.28	-	-	-	-	-
Barium	µg/L	15	2.2	2.4	2.4	2.7	-	-	-	-	-
Beryllium	µg/L	15	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Bismuth	µg/L	15	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Boron	µg/L	15	2.0	2.5	3.0	7.0	-	-	-	-	-
Cadmium	µg/L	15	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Cesium	µg/L	15	0.0054	0.0069	0.0068	0.0078	-	-	-	-	-
Chromium	µg/L	15	<0.06	<0.06	<0.06	0.071	-	-	-	-	-
Chromium - Hexavalent	µg/L	15	<1	<1	<1	<1	-	-	-	-	-
Cobalt	µg/L	15	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Copper	µg/L	15	0.49	0.55	0.58	0.76	-	-	-	-	-
Iron	µg/L	15	<1	<1	<1	1.4	-	-	-	-	-



**Table D-14 Laboratory Discrete Water Quality Data from Lac de Gras Far Field 2 during the Open-Water Period, 2014
Part B**

Parameter		Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Lead	µg/L	15	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Lithium	µg/L	15	1.1	1.5	1.6	2.0	-	-	-	-	-
Manganese	µg/L	15	0.16	0.23	0.28	0.48	-	-	-	-	-
Mercury	µg/L	15	<0.0005	<0.0005	<0.0005	0.00057	-	-	-	-	-
Molybdenum	µg/L	15	0.46	0.50	0.50	0.53	-	-	-	-	-
Nickel	µg/L	15	0.53	0.56	0.56	0.61	-	-	-	-	-
Selenium	µg/L	15	<0.04	<0.04	<0.04	<0.04	-	-	-	-	-
Silver	µg/L	15	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Strontium	µg/L	15	17	18	18	18	-	-	-	-	-
Thallium	µg/L	15	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Tin	µg/L	15	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Titanium	µg/L	15	<0.1	<0.1	<0.1	0.1	-	-	-	-	-
Uranium	µg/L	15	0.042	0.047	0.048	0.062	-	-	-	-	-
Vanadium	µg/L	15	<0.05	<0.05	<0.05	0.067	-	-	-	-	-
Zinc	µg/L	15	<0.8	<0.8	<0.8	1.3	-	-	-	-	-

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

Guideline exceedances by median concentrations are based on guidelines calculated using median values of hardness, pH, and temperature, and are not included in the percent exceedance calculations.

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; CWQG = Canadian Water Quality Guidelines; CDWQG = Canadian Drinking Water Quality Guidelines; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; SSWQO = Site-Specific Water Quality Objective; µg/L = micrograms per litre; < = less than; % = percent.



Table D-15 Laboratory Water Quality Data From the Lac de Gras Outlet During the Open-Water Period, 2014

Location	Unit	LdG Outlet	LdG Outlet
Sampling Season		Summer	Fall
Sample Date		15/08/2014	06/09/2014
Easting (NAD 83, 12W)		7162358	7162358
Northing (NAD 83, 12W)		490487	490487
Field Measured			
Total depth	m	1.5	0.7
Sample depth	mg/L	0.3	0.3
Water temperature	°C	11.7	8.3
Specific Conductivity	µS/cm	20.0	22
Dissolved oxygen	mg/L	10.9	11.6
Dissolved oxygen saturation	%	100.8	98.9
pH	-	7.2	6.9
Conventional Parameters			
Alkalinity, gran as (H ⁺)	meq/L	<0.1	<0.1
Alkalinity, total as (CaCO ₃)	mg/L	3.8	6.9
Conductance	µS/cm	23	25
Hardness	mg/L	6.8	7.0
pH	-	6.5	7.1
Total dissolved solids	mg/L	<20	19
Total suspended solids	mg/L	<3	<3
Turbidity	NTU	0.31	0.21
Major Ions			
Bicarbonate	mg/L	<5	8.4
Calcium	mg/L	1.3	1.2
Chloride	mg/L	1.4	1.4
Fluoride	mg/L	<0.02	<0.02
Magnesium	mg/L	0.84	0.81
Potassium	mg/L	0.70	0.71
Sodium	mg/L	1.4	1.3
Sulphate	mg/L	2.7	2.7
Nutrients			
Total organic carbon	mg/L	2.4	2.4
Dissolved organic carbon	mg/L	2.5	2.6
Total nitrogen (calculated)	mg-N/L	<0.05	<0.05
Total Kjeldahl nitrogen	mg-N/L	<0.05	<0.05
Total ammonia	mg-N/L	0.0066	<0.005
Nitrate	mg-N/L	<0.006	<0.006
Nitrite	mg-N/L	<0.002	<0.002
Total phosphorus	mg-P/L	0.0045	0.0013
Total dissolved phosphorus	mg-P/L	0.0024	<0.001
Dissolved orthophosphate	mg-P/L	<0.001	<0.001
Silica, reactive	mg/L	0.048	0.045



Table D-15 Laboratory Water Quality Data From the Lac de Gras Outlet During the Open-Water Period, 2014

Location	Unit	LdG Outlet	LdG Outlet
Sampling Season		Summer	Fall
Sample Date		15/08/2014	06/09/2014
Easting (NAD 83, 12W)		7162358	7162358
Northing (NAD 83, 12W)		490487	490487
Other Parameters			
Benzene	µg/L	<0.5	<0.5
Ethylbenzene	µg/L	<0.5	<0.5
Toluene	µg/L	<0.5	<0.5
Xylenes	µg/L	<0.71	<0.71
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	<100	<100
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	<100	<100
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	<250	<250
Fecal coliform	CFU/100mL	<1	<1
Total Metals			
Aluminum	µg/L	3.9	2.6
Antimony	µg/L	<0.02	<0.02
Arsenic	µg/L	0.19	0.21
Barium	µg/L	2.0	1.9
Beryllium	µg/L	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01
Boron	µg/L	1.5	1.7
Cadmium	µg/L	<0.005	<0.005
Cesium	µg/L	0.0079	0.0086
Chromium	µg/L	<0.06	<0.06
Cobalt	µg/L	0.027	0.02
Copper	µg/L	0.54	0.55
Iron	µg/L	3.1	3.2
Lead	µg/L	<0.01	<0.01
Lithium	µg/L	1.6	1.2
Manganese	µg/L	1.9	1.7
Mercury	µg/L	<0.0005	0.00061
Molybdenum	µg/L	0.24	0.21
Nickel	µg/L	0.81	0.87
Selenium	µg/L	<0.04	<0.04
Silver	µg/L	<0.005	<0.005
Strontium	µg/L	12	11
Thallium	µg/L	<0.01	<0.01
Tin	µg/L	<0.05	<0.05
Titanium	µg/L	<0.1	<0.1
Uranium	µg/L	0.02	0.02
Vanadium	µg/L	<0.05	<0.05
Zinc	µg/L	<0.8	<0.8



Table D-15 Laboratory Water Quality Data From the Lac de Gras Outlet During the Open-Water Period, 2014

Location	Unit	LdG Outlet	LdG Outlet
Sampling Season		Summer	Fall
Sample Date		15/08/2014	06/09/2014
Easting (NAD 83, 12W)		7162358	7162358
Northing (NAD 83, 12W)		490487	490487
Dissolved Metals			
Aluminum	µg/L	3.3	2.0
Antimony	µg/L	<0.02	<0.02
Arsenic	µg/L	0.19	0.21
Barium	µg/L	1.9	2.0
Beryllium	µg/L	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01
Boron	µg/L	1.5	4.9
Cadmium	µg/L	<0.005	<0.005
Cesium	µg/L	0.0079	0.0084
Chromium - Hexavalent	µg/L	<1	<1
Chromium	µg/L	0.14	<0.06
Cobalt	µg/L	0.013	0.014
Copper	µg/L	0.59	0.55
Iron	µg/L	<1	1.4
Lead	µg/L	<0.01	<0.01
Lithium	µg/L	1.6	1.4
Manganese	µg/L	1.1	1.0
Mercury	µg/L	<0.0005	0.00063
Molybdenum	µg/L	0.24	0.21
Nickel	µg/L	0.85	0.85
Selenium	µg/L	<0.04	<0.04
Silver	µg/L	<0.005	<0.005
Strontium	µg/L	12	11
Thallium	µg/L	<0.005	<0.005
Tin	µg/L	<0.05	<0.05
Titanium	µg/L	<0.1	<0.1
Uranium	µg/L	0.018	0.018
Vanadium	µg/L	<0.05	<0.05
Zinc	µg/L	1.1	<0.8

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; µg/L = micrograms per litre; < = less than; % = percent.

Table D-16 Field Profile Data from Paul Lake during the Under-Ice Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Ice Thickness (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
PL-1	29-Apr-14	7.5	1.9	2.5	1.9	8.3	59.6	17	-
				3	2.2	6.9	50.2	16	-
				4	2.4	5.7	41.7	16	-
				5	2.4	5.3	38.5	16	-
				6	2.5	4.5	32.7	16	-
				7	2.7	3.5	25.9	17	-
PL-3	29-Apr-14	12.0	1.9	2.5	1.6	11.8	85.3	16	-
				3	1.7	9.5	68.4	15	-
				4	2.0	8.7	63.2	15	-
				5	2.1	7.5	55.0	16	-
				6	2.1	6.5	46.9	18	-
				7	2.1	6.2	45.3	19	-
				8	2.1	6.2	44.9	19	-
				9	2.2	5.9	42.8	21	-
				10	2.2	5.6	40.4	21	-
PL-5	29-Apr-14	6.5	1.9	2	2.0	6.8	49.2	21	-
				3	2.1	6.9	50.1	20	-
				4	2.7	4.2	31.0	22	-
				5	2.9	3.6	26.7	23	-
				6	3.1	2.8	20.7	24	-

Note:

Bolded concentrations are higher than relevant water quality guidelines, or outside the recommended range.

m = metre; °C = degrees Celsius; mg/L = milligrams per litre; %Sat = percent saturation; µS/cm = microSemens per centimetre.

- = data excluded due to anomalous field data (i.e., outside of an expected data range).



Table D-17 Field Profile Data from Lake P5 during the Open-Water Period, 2014

Station Code	Sample Date	Maximum Depth (m)	Secchi Depth (m)	Profile Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat)	Specific Conductivity (µS/cm)	pH
P5-1	16-Aug-14	9.9	4.5	0.025	13.5	10.1	97.9	14	7.5
				0.1	13.5	10.1	97.4	14	7.4
				0.5	13.5	10.1	97.3	14	7.4
				1	13.5	10.1	97.4	14	7.4
				2	13.5	10.2	97.8	14	7.4
				3	13.5	10.2	98.4	14	7.4
				4	13.5	10.3	97.9	14	7.4
				5	13.5	10.2	98.8	14	7.4
				6	13.5	10.2	98.3	14	7.4
				7	13.4	10.1	97.7	14	7.4
	8	13.4	9.9	95.8	14	7.3			
	9	13.4	9.9	95.4	14	7.3			
	14-Sep-14	9.0	4.5	0.1	5.6	12.6	100.7	15	7.1
				0.5	5.6	12.7	101.1	15	7.0
				1	5.6	12.7	100.9	15	7.0
				2	5.7	12.7	100.8	15	7.0
				3	5.7	12.7	100.9	15	7.0
				4	5.7	12.7	101.0	15	7.0
4.5				5.7	12.7	101.0	15	7.0	
5				5.7	12.7	100.9	15	7.0	
6	5.7	12.6	101.0	15	7.0				
7	5.7	12.6	100.8	15	7.0				
8	5.7	12.6	100.8	15	7.0				

Note:

Bolded concentrations are higher than relevant water quality guidelines, or outside the recommended range.

m = metre; °C = degrees Celsius; mg/L = milligrams per litre; %Sat = percent saturation; µS/cm = microSemens per centimetre.

- = data excluded due to anomalous field data (i.e., outside of an expected data range).



**Table D-18 Laboratory Water Quality Data from Paul Lake during the Under-Ice Period, 2014
 Part A**

Location	Units	PL-1		PL-3		PL-5
Sample Name		PL-1-Bottom	PL-1-Top	PL-3-Bottom	PL-3-Top	PL-5-Mid
Sampling Season		Winter	Winter	Winter	Winter	Winter
Sample Date		29/04/2014	29/04/2014	29/04/2014	29/04/2014	29/04/2014
Easting (NAD 83, 12W)		533179	533179	528681	528681	525859
Northing (NAD 83, 12W)		7173835	7173835	7172550	7172550	7171047
Field Measured						
Total depth	m	7.5	7.5	12	12	6.5
Sample depth	m	7.0	3.0	11	2.5	4.0
Ice thickness	m	1.9	1.9	1.9	1.9	1.9
Snow depth	m	0.15	0.15	0.1	0.1	0.1
Water temperature	°C	2.7	2.2	2.3	1.6	2.7
Specific conductivity	µS/cm	17	16	23	16	22
Dissolved oxygen	mg/L	3.5 ^(c)	6.9	5.1 ^(c)	11.8	4.2 ^(c)
Dissolved oxygen saturation	%	25.9	50.2	37.6	85.3	31.0
Conventional Parameters						
Alkalinity, gran as (H ⁺)	meq/L	0.14	0.18	0.21	0.15	0.24
Alkalinity, total (as CaCO ₃)	mg/L	8.3	9.7	11	9.1	11
Conductance	µS/cm	27	31	36	30	35
Hardness	mg/L	10	12	13	11	13
pH	-	6.6	6.6	6.7	6.7	6.6
Total dissolved solids	mg/L	30.0	29.0	28.0	30.0	32.0
Total suspended solids	mg/L	<3	<3	<3	<3	<3
Turbidity	NTU	0.5	0.68	0.38	0.6	0.45



**Table D-18 Laboratory Water Quality Data from Paul Lake during the Under-Ice Period, 2014
Part A**

Location	Units	PL-1		PL-3		PL-5
Sample Name		PL-1-Bottom	PL-1-Top	PL-3-Bottom	PL-3-Top	PL-5-Mid
Sampling Season		Winter	Winter	Winter	Winter	Winter
Sample Date		29/04/2014	29/04/2014	29/04/2014	29/04/2014	29/04/2014
Easting (NAD 83, 12W)		533179	533179	528681	528681	525859
Northing (NAD 83, 12W)		7173835	7173835	7172550	7172550	7171047
Major Ions						
Bicarbonate	mg/L	10	12	14	11	13
Calcium	mg/L	1.7	2.0	2.4	2.0	2.2
Chloride	mg/L	0.59	0.67	0.67	0.58	0.65
Fluoride	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L	1.4	1.6	1.8	1.5	1.7
Potassium	mg/L	0.86	1	1.1	0.97	1.1
Sodium	mg/L	1.1	1.3	1.5	1.3	1.5
Sulphate	mg/L	2.1	2.5	2.9	2.8	3.2
Nutrients						
Total organic carbon	mg/L	4.5	5.2	5.3	5.4	5.3
Dissolved organic carbon	mg/L	4.5	5.0	5.1	4.9	5.2
Total nitrogen (calculated)	mg-N/L	0.33	0.32	0.35	0.32	0.3
Total Kjeldahl Nitrogen	mg-N/L	0.23	0.25	0.22	0.28	0.2
Total ammonia	mg-N/L	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate	mg-N/L	0.1	0.074	0.13	0.04	0.099
Nitrite	mg-N/L	<0.002	<0.002	<0.002	<0.002	<0.002
Total phosphorus	mg-P/L	0.011^(T)	0.0093	0.0066	0.015^(T)	0.0077
Total dissolved phosphorus	mg-P/L	0.0061	0.0044	0.0034	0.0052	0.0033
Dissolved orthophosphate	mg-P/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silica, reactive	mg/L	0.4	0.3	0.83	0.34	0.53



**Table D-18 Laboratory Water Quality Data from Paul Lake during the Under-Ice Period, 2014
Part A**

Location	Units	PL-1		PL-3		PL-5
Sample Name		PL-1-Bottom	PL-1-Top	PL-3-Bottom	PL-3-Top	PL-5-Mid
Sampling Season		Winter	Winter	Winter	Winter	Winter
Sample Date		29/04/2014	29/04/2014	29/04/2014	29/04/2014	29/04/2014
Easting (NAD 83, 12W)		533179	533179	528681	528681	525859
Northing (NAD 83, 12W)		7173835	7173835	7172550	7172550	7171047
Other Parameters						
Benzene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Xylenes	µg/L	<0.71	<0.71	<0.71	<0.71	<0.71
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	<100	<100	<100	<100	<100
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	<100	<100	<100	<100	<100
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	<250	<250	<250	<250	<250
Fecal coliform	CFU/100mL	<1	<1	<1	<1	<1
Total Metals						
Aluminum	µg/L	8.3	16	6.4	8.8	5.7
Antimony	µg/L	<0.02	0.099	<0.02	<0.02	<0.02
Arsenic	µg/L	0.56	0.62	0.66	0.47	0.52
Barium	µg/L	4.0	9.6	5.5	5.1	5.0
Beryllium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	3.4	3.4	3.0	6.6	4.5
Cadmium	µg/L	<0.005	0.0066	<0.005	0.0063	<0.005
Cesium	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	µg/L	0.099	0.13	0.099	0.25	0.095
Cobalt	µg/L	0.053	0.071	0.078	0.039	0.07



**Table D-18 Laboratory Water Quality Data from Paul Lake during the Under-Ice Period, 2014
Part A**

Location	Units	PL-1		PL-3		PL-5
Sample Name		PL-1-Bottom	PL-1-Top	PL-3-Bottom	PL-3-Top	PL-5-Mid
Sampling Season		Winter	Winter	Winter	Winter	Winter
Sample Date		29/04/2014	29/04/2014	29/04/2014	29/04/2014	29/04/2014
Easting (NAD 83, 12W)		533179	533179	528681	528681	525859
Northing (NAD 83, 12W)		7173835	7173835	7172550	7172550	7171047
Copper	µg/L	1.6	2.0 ^(C)	1.6	1.5	1.6
Iron	µg/L	49	52	109	23	65
Lead	µg/L	0.02	0.048	0.012	0.04	0.02
Lithium	µg/L	2.3	2.8	2.8	2.7	3.2
Manganese	µg/L	26	26	74 ^(D)	7.3	40
Mercury	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	<0.05	0.057	<0.05	<0.05	<0.05
Nickel	µg/L	1.3	1.6	1.5	1.1	1.3
Selenium	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	12	14	15	13	16
Thallium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	0.36	0.72	0.29	0.37	<0.1
Uranium	µg/L	0.059	0.061	0.043	0.043	0.043
Vanadium	µg/L	<0.05	<0.05	0.056	0.053	0.069
Zinc	µg/L	3.3	3.6	1.2	16	1.0



**Table D-18 Laboratory Water Quality Data from Paul Lake during the Under-Ice Period, 2014
Part A**

Location	Units	PL-1		PL-3		PL-5
Sample Name		PL-1-Bottom	PL-1-Top	PL-3-Bottom	PL-3-Top	PL-5-Mid
Sampling Season		Winter	Winter	Winter	Winter	Winter
Sample Date		29/04/2014	29/04/2014	29/04/2014	29/04/2014	29/04/2014
Easting (NAD 83, 12W)		533179	533179	528681	528681	525859
Northing (NAD 83, 12W)		7173835	7173835	7172550	7172550	7171047
Dissolved Metals						
Aluminum	µg/L	6.7	7.5	3.9	4.7	4.4
Antimony	µg/L	<0.02	0.069	<0.02	<0.02	<0.02
Arsenic	µg/L	0.51	0.59	0.51	0.48	0.43
Barium	µg/L	7.7	8.2	8.4	8.0	13.0
Beryllium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	5.8	5.8	6.5	5.4	7.8
Cadmium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cesium	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	0.077	0.13	0.14	0.12
Chromium – Hexavalent	µg/L	<1	<1	<1	<1	<1
Cobalt	µg/L	0.044	0.056	0.054	0.036	0.047
Copper	µg/L	1.4	1.8	1.5	1.5	1.5
Iron	µg/L	21	24	26	7.4	16
Lead	µg/L	<0.01	0.012	<0.01	0.019	<0.01
Lithium	µg/L	2.2	2.8	2.8	2.9	2.9
Manganese	µg/L	23	25	61	4.1	34
Mercury	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	<0.05	0.051	<0.05	<0.05	<0.05
Nickel	µg/L	1.3	1.4	1.4	1.1	1.3

**Table D-18 Laboratory Water Quality Data from Paul Lake during the Under-Ice Period, 2014
Part A**

Location	Units	PL-1		PL-3		PL-5
Sample Name		PL-1-Bottom	PL-1-Top	PL-3-Bottom	PL-3-Top	PL-5-Mid
Sampling Season		Winter	Winter	Winter	Winter	Winter
Sample Date		29/04/2014	29/04/2014	29/04/2014	29/04/2014	29/04/2014
Easting (NAD 83, 12W)		533179	533179	528681	528681	525859
Northing (NAD 83, 12W)		7173835	7173835	7172550	7172550	7171047
Selenium		µg/L	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	11	14	16	13	15
Thallium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	<0.1	0.29	<0.1	0.44	<0.1
Uranium	µg/L	0.049	0.057	0.039	0.043	0.042
Vanadium	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	4.7	7.8	5.1	16	9.9

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

T) = concentration higher than the trigger for transition from oligotrophic to mesotrophic status (0.01 mg/L) applied to Lac de Gras basin as based on CCME (2004).

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre;

NAD = North American Datum; NTU = nephelometric turbidity units; µg/L = micrograms per litre; < = less than; % = percent.



**Table D-18 Laboratory Water Quality Data from Paul Lake during the Under-Ice Period, 2014
 Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Field Measured											
Total depth	m	5	6.5	7.5	9.1	12.0	-	-	-	-	-
Sample depth	m	5	2.5	4.0	5.5	11.0	-	-	-	-	-
Ice thickness	m	5	1.9	1.9	1.9	1.9	-	-	-	-	-
Snow depth	m	5	0.1	0.1	0.12	0.15	-	-	-	-	-
Water temperature	°C	5	1.6	2.3	2.3	2.7	-	-	-	-	-
Specific conductivity	µS/cm	5	16	17	19	23	-	-	-	-	-
Dissolved oxygen	mg/L	5	3.5 ^(C)	5.1 ^(C)	6.3 ^(C)	11.8	-	60	-	-	-
Dissolved oxygen saturation	%	5	25.9	37.6	46.0	85.3	-	-	-	-	-
Conventional Parameters											
Alkalinity, gran as (H ⁺)	meq/L	5	0.14	0.21	0.18	0.24	-	-	-	-	-
Alkalinity, total as (CaCO ₃)	mg/L	5	7.0	9.0	9.3	12	-	-	-	-	-
Conductance	µS/cm	5	27	31	32	36	-	-	-	-	-
Hardness	mg/L	5	10	12	12	13	-	-	-	-	-
pH	-	5	6.6	6.6	6.7	6.7	-	-	-	-	-
Total dissolved solids	mg/L	5	28	30	30	32	-	-	-	-	-
Total suspended solids	mg/L	5	<3	<3	<3	<3	-	-	-	-	-
Turbidity	NTU	5	0.38	0.5	0.52	0.68	-	-	-	-	-
Major Ions											
Bicarbonate	mg/L	5	10	12	12	14	-	-	-	-	-
Calcium	mg/L	5	1.7	2.0	2.0	2.4	-	-	-	-	-
Chloride	mg/L	5	0.58	0.65	0.63	0.67	-	-	-	-	-
Fluoride	mg/L	5	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-
Magnesium	mg/L	5	1.4	1.6	1.6	1.8	-	-	-	-	-
Potassium	mg/L	5	0.86	1.0	1.0	1.1	-	-	-	-	-
Sodium	mg/L	5	1.1	1.3	1.3	1.5	-	-	-	-	-



**Table D-18 Laboratory Water Quality Data from Paul Lake during the Under-Ice Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Sulphate	mg/L	5	2.1	2.8	2.7	3.2	-	-	-	-	-
Nutrients											
Total organic carbon	mg/L	5	4.5	5.3	5.1	5.4	-	-	-	-	-
Dissolved organic carbon	mg/L	5	4.5	5.0	4.9	5.2	-	-	-	-	-
Total nitrogen (calculated)	mg-N/L	5	0.30	0.32	0.32	0.35	-	-	-	-	-
Total Kjeldahl Nitrogen	mg-N/L	5	0.20	0.23	0.23	0.28	-	-	-	-	-
Total ammonia	mg-N/L	5	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Nitrate	mg-N/L	5	0.040	0.099	0.089	0.13	-	-	-	-	-
Nitrite	mg-N/L	5	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
Total phosphorus	mg-P/L	5	0.0066	0.0093	0.01^(T)	0.015^(T)	-	-	-	-	-
Total dissolved phosphorus	mg-P/L	5	0.0033	0.0044	0.0045	0.0061	-	-	-	-	-
Dissolved orthophosphate	mg-P/L	5	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
Silica, reactive	mg/L	5	0.30	0.4	0.48	0.83	-	-	-	-	-
Other Parameters											
Benzene	µg/L	5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Ethylbenzene	µg/L	5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Toluene	µg/L	5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
Xylenes	µg/L	5	<0.71	<0.71	<0.71	<0.71	-	-	-	-	-
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	5	<100	<100	<100	<100	-	-	-	-	-
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	5	<100	<100	<100	<100	-	-	-	-	-
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	5	<250	<250	<250	<250	-	-	-	-	-
Fecal coliform	CFU/100mL	5	<1	<1	<1	<1	-	-	-	-	-
Total Metals											
Aluminum	µg/L	5	5.7	8.3	9.1	16	-	-	-	-	-
Antimony	µg/L	5	<0.02	<0.02	0.028	0.099	-	-	-	-	-
Arsenic	µg/L	5	0.47	0.56	0.57	0.66	-	-	-	-	-

**Table D-18 Laboratory Water Quality Data from Paul Lake during the Under-Ice Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Barium	µg/L	5	4.0	5.1	5.8	9.6	-	-	-	-	-
Beryllium	µg/L	5	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Bismuth	µg/L	5	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Boron	µg/L	5	3.0	3.4	4.2	6.6	-	-	-	-	-
Cadmium	µg/L	5	<0.005	<0.005	<0.005	0.0066	-	-	-	-	-
Cesium	µg/L	5	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-
Chromium	µg/L	5	0.095	0.099	0.13	0.25	-	-	-	-	-
Cobalt	µg/L	5	0.039	0.070	0.062	0.078	-	-	-	-	-
Copper	µg/L	5	1.5	1.6	1.6	2.0 ^(C)	-	25	-	-	-
Iron	µg/L	5	23	52	59	109	-	-	-	-	-
Lead	µg/L	5	0.012	0.02	0.028	0.048	-	-	-	-	-
Lithium	µg/L	5	2.3	2.8	2.8	3.2	-	-	-	-	-
Manganese	µg/L	5	7.3	26	34	74 ^(D)	-	25	-	-	-
Mercury	µg/L	5	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-
Molybdenum	µg/L	5	<0.05	<0.05	<0.05	0.057	-	-	-	-	-
Nickel	µg/L	5	1.1	1.3	1.4	1.6	-	-	-	-	-
Selenium	µg/L	5	<0.04	<0.04	<0.04	<0.04	-	-	-	-	-
Silver	µg/L	5	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Strontium	µg/L	5	12	14	14	16	-	-	-	-	-
Thallium	µg/L	5	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Tin	µg/L	5	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Titanium	µg/L	5	<0.1	0.36	0.36	0.72	-	-	-	-	-
Uranium	µg/L	5	0.043	0.043	0.05	0.061	-	-	-	-	-
Vanadium	µg/L	5	<0.05	0.053	<0.05	0.069	-	-	-	-	-
Zinc	µg/L	5	1.0	3.3	5.0	16.0	-	-	-	-	-

**Table D-18 Laboratory Water Quality Data from Paul Lake during the Under-Ice Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Dissolved Metals											
Aluminum	µg/L	5	3.9	4.7	5.4	7.5	-	-	-	-	-
Antimony	µg/L	5	<0.02	<0.02	0.022	0.069	-	-	-	-	-
Arsenic	µg/L	5	0.43	0.51	0.51	0.59	-	-	-	-	-
Barium	µg/L	5	7.7	8.2	9.0	13	-	-	-	-	-
Beryllium	µg/L	5	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Bismuth	µg/L	5	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Boron	µg/L	5	5.4	5.8	6.3	7.8	-	-	-	-	-
Cadmium	µg/L	5	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Cesium	µg/L	5	<0.1	<0.1	0.05	<0.1	-	-	-	-	-
Chromium	µg/L	5	0.077	0.12	0.11	0.14	-	-	-	-	-
Chromium - Hexavalent	µg/L	5	<1	<1	<1	<1	-	-	-	-	-
Cobalt	µg/L	5	0.036	0.047	0.047	0.056	-	-	-	-	-
Copper	µg/L	5	1.4	1.5	1.6	1.8	-	-	-	-	-
Iron	µg/L	5	7.4	21	19	26	-	-	-	-	-
Lead	µg/L	5	<0.01	<0.01	<0.01	0.019	-	-	-	-	-
Lithium	µg/L	5	2.2	2.8	2.7	2.9	-	-	-	-	-
Manganese	µg/L	5	4.1	25	29	61	-	-	-	-	-
Mercury	µg/L	5	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-
Molybdenum	µg/L	5	<0.05	<0.05	<0.05	0.051	-	-	-	-	-
Nickel	µg/L	5	1.1	1.3	1.3	1.4	-	-	-	-	-
Selenium	µg/L	5	<0.04	<0.04	<0.04	<0.04	-	-	-	-	-
Silver	µg/L	5	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
Strontium	µg/L	5	11	14	14	16	-	-	-	-	-
Thallium	µg/L	5	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-
Tin	µg/L	5	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-

**Table D-18 Laboratory Water Quality Data from Paul Lake during the Under-Ice Period, 2014
Part B**

Parameter	Unit	Summary Statistics									
		2014									
		Count	Min	Median	Mean	Max	% Above Guidelines				
							Acute CWQG	Chronic CWQG	CDWQG	Short-term SSWQO	Long-term SSWQO
Titanium	µg/L	5	<0.1	<0.1	0.18	0.44	-	-	-	-	-
Uranium	µg/L	5	0.039	0.043	0.046	0.057	-	-	-	-	-
Vanadium	µg/L	5	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-
Zinc	µg/L	5	4.7	7.8	8.7	16.0	-	-	-	-	-

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

T) = concentration higher than the trigger for transition from mesotrophic to meso-eutrophic status (0.02 mg/L) applied to Lac du Sauvage basin as based on CCME (2004).

Guideline exceedances by median concentrations are based on guidelines calculated using median values of hardness, pH, and temperature, and are not included in the percent exceedance calculations.

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; CWQG = Canadian Water Quality Guidelines; CDWQG = Canadian Drinking Water Quality Guidelines; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; SSWQO = Site-Specific Water Quality Objective; µg/L = micrograms per litre; < = less than; % = percent.



Table D-19 Laboratory Discrete Water Quality Data from Lac de Gras Sub-Basin Lakes during the Open-Water Period, 2014

Location Sample Name Sampling Season Sample Date Easting (NAD 83, 12W) Northing (NAD83, 12W)	Unit	Lake P5	
		P5-1-Mid	P5-1-Mid
		Summer	Fall
		16/08/2014	14/09/2014
		530615	530615
		7169282	7169282
Field Measured			
Total depth	m	9.9	9.0
Sample depth	m	5.0	4.5
Secchi depth	m	4.5	4.5
Water temperature	°C	13.5	5.7
Specific conductivity	µS/cm	14	15
Dissolved oxygen	mg/L	10.2	12.7
Dissolved oxygen saturation	%	98.8	101.0
pH	-	7.4	7.0
Conventional Parameters			
Alkalinity, gran as (H ⁺)	meq/L	<0.1	0.12
Alkalinity, total as (CaCO ₃)	mg/L	5.9	5.8
Conductance	µS/cm	16	17
Hardness	mg/L	5.7	5.8
pH	-	6.6	6.9
Total dissolved solids	mg/L	32	<10
Total suspended solids	mg/L	<3	<3
Turbidity	NTU	0.77	0.6
Major Ions			
Bicarbonate	mg/L	7.1	7.1
Calcium	mg/L	0.90	0.90
Chloride	mg/L	<0.5	<0.5
Fluoride	mg/L	<0.02	0.024
Magnesium	mg/L	0.85	0.85
Potassium	mg/L	0.59	0.63
Sodium	mg/L	0.64	0.72
Sulphate	mg/L	1.1	1.1
Nutrients			
Total organic carbon	mg/L	3.6	3.0
Dissolved organic carbon	mg/L	3.2	3.2
Total nitrogen (calculated)	mg-N/L	0.24	0.22
Total Kjeldahl nitrogen	mg-N/L	0.24	0.22
Total ammonia	mg-N/L	<0.005	<0.005
Nitrate	mg-N/L	<0.006	<0.006



Table D-19 Laboratory Discrete Water Quality Data from Lac de Gras Sub-Basin Lakes during the Open-Water Period, 2014

Location	Sample Name	Lake P5	
		P5-1-Mid	P5-1-Mid
		Summer	Fall
		16/08/2014	14/09/2014
		530615	530615
		7169282	7169282
Sampling Season	Sample Date	Unit	
Easting (NAD 83, 12W)	Northing (NAD83, 12W)		
Nitrite	mg-N/L	<0.002	<0.002
Total phosphorus	mg-P/L	0.0085	0.0079
Total dissolved phosphorus	mg-P/L	0.002	0.003
Dissolved orthophosphate	mg-P/L	<0.001	<0.001
Silica, reactive	mg/L	0.12	0.10
Other Parameters			
Benzene	µg/L	<0.5	<0.5
Ethylbenzene	µg/L	<0.5	<0.5
Toluene	µg/L	<0.5	<0.5
Xylenes	µg/L	<0.71	<0.71
Petroleum hydrocarbons - F1 (C6-C10)	µg/L	<100	<100
Petroleum hydrocarbons - F1 (C6-C10)-BTEX	µg/L	<100	<100
Petroleum hydrocarbons - F2 (C10-C16)	µg/L	<250	<250
Fecal coliform	CFU/100mL	<1	<1
Total Metals			
Aluminum	µg/L	8.1	6.7
Antimony	µg/L	<0.02	<0.02
Arsenic	µg/L	0.18	0.18
Barium	µg/L	1.3	1.2
Beryllium	µg/L	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01
Boron	µg/L	2.9	2.2
Cadmium	µg/L	<0.005	<0.005
Cesium	µg/L	0.0053	0.0053
Chromium	µg/L	<0.06	<0.06
Cobalt	µg/L	0.021	0.022
Copper	µg/L	0.64	0.64
Iron	µg/L	22	20
Lead	µg/L	<0.01	0.025
Lithium	µg/L	1.2	1.1
Manganese	µg/L	5.8	4.5
Mercury	µg/L	0.00064	<0.0005
Molybdenum	µg/L	<0.05	<0.05
Nickel	µg/L	0.24	0.21



Table D-19 Laboratory Discrete Water Quality Data from Lac de Gras Sub-Basin Lakes during the Open-Water Period, 2014

Location Sample Name Sampling Season Sample Date Easting (NAD 83, 12W) Northing (NAD83, 12W)	Unit	Lake P5	
		P5-1-Mid	P5-1-Mid
		Summer	Fall
		16/08/2014	14/09/2014
		530615	530615
		7169282	7169282
		Selenium	µg/L
Silver	µg/L	<0.005	<0.005
Strontium	µg/L	5.6	5.4
Thallium	µg/L	<0.01	<0.01
Tin	µg/L	<0.05	<0.05
Titanium	µg/L	0.17	0.16
Uranium	µg/L	0.021	0.016
Vanadium	µg/L	<0.05	<0.05
Zinc	µg/L	<0.8	<0.8
Dissolved Metals			
Aluminum	µg/L	2.4	1.8
Antimony	µg/L	<0.02	<0.02
Arsenic	µg/L	0.20	0.19
Barium	µg/L	1.2	1.1
Beryllium	µg/L	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01
Boron	µg/L	1.3	1.4
Cadmium	µg/L	<0.005	<0.005
Cesium	µg/L	<0.005	<0.005
Chromium	µg/L	<0.06	<0.06
Chromium - Hexavalent	µg/L	<1	<1
Cobalt	µg/L	<0.01	<0.01
Copper	µg/L	0.74	0.52
Iron	µg/L	1.2	1.6
Lead	µg/L	<0.01	<0.01
Lithium	µg/L	1.3	1.2
Manganese	µg/L	0.28	0.26
Mercury	µg/L	<0.0005	<0.0005
Molybdenum	µg/L	<0.05	<0.05
Nickel	µg/L	0.24	0.21
Selenium	µg/L	<0.04	<0.04
Silver	µg/L	<0.005	<0.005
Strontium	µg/L	5.8	5.7
Thallium	µg/L	<0.005	<0.005



Table D-19 Laboratory Discrete Water Quality Data from Lac de Gras Sub-Basin Lakes during the Open-Water Period, 2014

Location	Unit	Lake P5	
Sample Name		P5-1-Mid	P5-1-Mid
Sampling Season		Summer	Fall
Sample Date		16/08/2014	14/09/2014
Easting (NAD 83, 12W)		530615	530615
Northing (NAD83, 12W)		7169282	7169282
Tin	µg/L	<0.05	<0.05
Titanium	µg/L	<0.1	<0.1
Uranium	µg/L	0.016	0.014
Vanadium	µg/L	<0.05	<0.05
Zinc	µg/L	<0.8	1.2

Note:

Bolded concentrations are higher than relevant water quality guidelines.

C) = concentration higher than the relevant chronic aquatic life guideline or outside the recommended pH, DO, or total alkalinity concentration range.

D) = concentration higher than the relevant drinking water guideline or outside the recommended pH or DO concentration range.

- = no guideline or data; BTEX = benzene, toluene, ethylbenzene, and xylenes; °C = degrees Celsius; CaCO₃ = calcium carbonate; CFU/100 mL = coliform forming units per 100 millilitres; m = metre; mg/L = milligrams per litre; mg N/L = milligrams nitrogen per litre; mg P/L = milligrams phosphorus per litre; meq/L = milliequivalents per litre; NAD = North American Datum; NTU = nephelometric turbidity units; µg/L = micrograms per litre; < = less than; % = percent.

**Table D-20 Depth-Integrated Nutrient Data from Lac du Sauvage during the Open-Water Period, 2014
 Part A**

Location	Unit	Aa-1		Ab-1			Ac-1			Ac-4			Ac-7			Ad-5	Ad-1		Ae-1		
Sample Name		Aa-1-D	Aa-1-D	Ab-1-D	Ab-1-D	Ab-1-D	Ac-1-D	Ac-1-D	Ac-1-D	Ac-4-D	Ac-4-D	Ac-4-D	Ac-7-D	Ac-7-D	Ac-7-D	Ad-5-D	Ad-1-D	Ad-1-D	Ae-1-D	Ae-1-D	Ae-1-D
Sampling Season		Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall
Sample Date		10-Aug-14	11-Sep-14	19-Jul-14	11-Aug-14	11-Sep-14	19-Jul-14	11-Aug-14	11-Sep-14	19-Jul-14	10-Aug-14	10-Sep-14	19-Jul-14	9-Aug-14	9-Sep-14	19-Jul-14	9-Aug-14	5-Sep-14	19-Jul-14	9-Aug-14	5-Sep-14
Easting (NAD 83, 12W)		552282	552282	547766	547766	547766	543339	543339	543339	543695	543695	543695	544247	544247	544247	540112	539898	539898	542494	542494	542494
Northing (NAD 83, 12W)		7165025	7165025	7162266	7162266	7162266	7165138	7165138	7165138	7162938	7162938	7162938	7165068	7165068	7165068	7168316	7168781	7168781	7170252	7170252	7170252
Composite Sample Collection																					
Start depth	m	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
End depth	m	8.0	8.0	10.0	12.0	8.0	10.0	12.0	10.0	10.0	12.0	10.0	12.0	12.0	10.0	12.0	10.0	8.0	12.0	10.0	8.0
Nutrients																					
Total nitrogen	mg-N/L	0.3	0.24	0.17	0.22	0.2	0.15	0.2	0.19	0.12	0.29	0.22	0.14	0.25	0.13	0.16	0.25	0.2	0.18	0.2	0.19
Total dissolved nitrogen	mg-N/L	0.26	0.18	0.11	0.26	0.13	0.17	0.21	0.21	0.052	0.15	0.2	0.096	0.3	0.06	0.083	0.23	0.24	0.16	0.21	0.12
Total Kjeldahl nitrogen	mg-N/L	0.3	0.24	0.17	0.22	0.2	0.15	0.2	0.19	0.12	0.29	0.22	0.14	0.25	0.13	0.16	0.25	0.2	0.18	0.2	0.19
Dissolved Kjeldahl nitrogen	mg-N/L	0.26	0.18	0.11	0.26	0.13	0.17	0.21	0.21	0.052	0.15	0.2	0.096	0.3	0.06	0.083	0.23	0.24	0.16	0.21	0.12
Total ammonia	mg-N/L	<0.005	<0.005	<0.005	<0.005	<0.005	0.0096	<0.005	<0.005	<0.005	<0.005	<0.005	0.014	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate	mg-N/L	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Nitrite	mg-N/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total phosphorus	mg-P/L	0.013	0.0075	0.0046	0.0083	0.029^(T)	0.0055	0.0073	0.0053	0.0049	0.0096	0.005	0.0057	0.0074	0.005	0.0068	0.009	0.0063	0.0059	0.014	0.0062
Total dissolved phosphorus	mg-P/L	0.0032	0.0018	0.0023	0.003	0.0015	0.0025	0.0024	0.0011	0.0015	0.0029	0.001	0.0029	0.0032	0.0015	0.0023	0.0033	0.0019	0.0013	0.0029	0.0018
Dissolved orthophosphate	mg-P/L	<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	<0.001	<0.001	<0.001	<0.001
Silica, reactive	mg/L	0.093	0.055	0.084	0.066	0.061	0.095	0.081	0.058	0.087	0.067	0.063	0.092	1.4	0.061	0.1	0.07	0.07	0.1	0.077	0.064

Note:

Bolded concentrations are higher than relevant water quality guidelines.

T) = concentration higher than the trigger for transition from mesotrophic to meso-eutrophic status (0.02 mg/L) applied to Lac du Sauvage basin as based on CCME (2004).

- = no guideline or data; NAD = North American Datum; m = metre; mg/L = milligrams per litre; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; < = less than.

**Table D-20 Depth-Integrated Nutrient Data from Lac du Sauvage during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics								
		2014								
		Count	Min	Median	Mean	Max	% Above Guideline			
							Acute CWQG	Chronic CWQG	CDWQG	Long-term SSWQO
Composite Sample Collection										
Start depth	m	20	0.3	0.3	0.3	0.3	-	-	-	-
End depth	m	20	8.0	10.0	10.0	12.0	-	-	-	-
Nutrients										
Total nitrogen	mg-N/L	20	0.12	0.2	0.2	0.3	-	-	-	-
Total dissolved nitrogen	mg-N/L	20	0.052	0.17	0.17	0.3	-	-	-	-
Total Kjeldahl nitrogen	mg-N/L	20	0.12	0.2	0.2	0.3	-	-	-	-
Dissolved Kjeldahl nitrogen	mg-N/L	20	0.052	0.17	0.17	0.3	-	-	-	-
Total ammonia	mg-N/L	20	<0.005	<0.005	0.0034	0.014	-	-	-	-
Nitrate	mg-N/L	20	<0.006	<0.006	0.003	<0.006	-	-	-	-
Nitrite	mg-N/L	20	<0.002	<0.002	0.001	<0.002	-	-	-	-
Total phosphorus	mg-P/L	20	0.0046	0.0066	0.0083	0.029^(T)	-	-	-	-
Total dissolved phosphorus	mg-P/L	20	0.001	0.0023	0.0022	0.0033	-	-	-	-
Dissolved orthophosphate	mg-P/L	20	<0.001	<0.001	0.0005	<0.001	-	-	-	-
Silica, reactive	mg/L	20	0.055	0.074	0.14	1.4	-	-	-	-

Note:

Bolded concentrations are higher than relevant water quality guidelines.

T) = concentration higher than the trigger for transition from mesotrophic to meso-eutrophic status (0.02 mg/L) applied to Lac du Sauvage basin as based on CCME (2004).

Guideline exceedances by median concentrations are based on guidelines calculated using median values of hardness, pH, and temperature, and are not included in the percent exceedance calculations.

- = no guideline or data; CWQG = Canadian Water Quality Guidelines; CDWQG = Canadian Drinking Water Quality Guidelines; SSWQO = Site-Specific Water Quality Objective; m = metre; mg/L = milligrams per litre; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; < = less than.



Table D-21 Depth-Integrated Nutrient Data from Duchess Lake during the Open-Water Period, 2014

Location	Unit	Af-1	
Sample Name		Af-1-D	Af-1-D
Sampling Season		Summer	Fall
Sample Date		9-Aug-14	9-Sep-14
Easting (NAD 83, 12W)		542155	542155
Northing (NAD 83, 12W)		7173731	7173731
Composite Sample Collection			
Start depth	m	0.3	0.3
End depth	m	6.0	6.0
Nutrients			
Total nitrogen	mg-N/L	0.36	0.16
Total dissolved nitrogen	mg-N/L	0.24	0.085
Total Kjeldahl nitrogen	mg-N/L	0.36	0.16
Dissolved Kjeldahl nitrogen	mg-N/L	0.24	0.085
Total ammonia	mg-N/L	<0.005	<0.005
Nitrate	mg-N/L	<0.006	<0.006
Nitrite	mg-N/L	<0.002	<0.002
Total phosphorus	mg-P/L	0.019	0.011
Total dissolved phosphorus	mg-P/L	0.0034	0.0023
Dissolved orthophosphate	mg-P/L	<0.001	<0.001
Silica, reactive	mg/L	0.15	0.1

Note:

Bolded concentrations are higher than relevant water quality guidelines.

- = no guideline or data; NAD = North American Datum; m = metre; mg/L = milligrams per litre; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; < = less than.

**Table D-22 Depth-Integrated Nutrient Data Lac de Gras Slipper Bay during the Open-Water Period, 2014
 Part A**

Location	Unit	S2			S3			S5			S6	
Sample Name		S2-D	S2-D	S2-D	S3-D	S3-D	S3-D	S5-D	S5-D	S5-D	S6-D	S6-D
Sampling Season		Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer
Sample Date		21-Jul-14	14-Aug-14	8-Sep-14	21-Jul-14	14-Aug-14	8-Sep-14	21-Jul-14	14-Aug-14	8-Sep-14	21-Jul-14	14-Aug-14
Easting (NAD 83, 12W)		507638	507638	507638	505912	505912	505912	503125	503125	503125	501976	501976
Northing (NAD 83, 12W)		7164461	7164461	7164461	7164431	7164431	7164431	7161481	7161481	7161481	7159857	7159857
Composite Sample Collection												
Start depth	m	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
End depth	m	6.0	6.0	6.0	12.0	12.0	10.0	16.0	18.0	10.0	22.0	22.0
Nutrients												
Total nitrogen	mg-N/L	0.22	0.15	0.14	0.19	0.15	0.13	0.23	0.095	0.073	0.16	0.1
Total dissolved nitrogen	mg-N/L	0.22	0.14	0.13	0.2	0.087	<0.05	0.15	0.14	0.07	0.13	0.11
Total Kjeldahl nitrogen	mg-N/L	0.22	0.15	0.14	0.19	0.15	0.12	0.23	0.095	0.064	0.16	0.1
Dissolved Kjeldahl nitrogen	mg-N/L	0.22	0.14	0.13	0.2	0.087	<0.05	0.15	0.14	0.061	0.13	0.11
Total ammonia	mg-N/L	0.0063	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate	mg-N/L	<0.006	<0.006	<0.006	<0.006	<0.006	0.008	<0.006	<0.006	0.0089	<0.006	<0.006
Nitrite	mg-N/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total phosphorus	mg-P/L	0.0045	0.0065	0.0031	0.0025	0.0037	0.0027	0.0016	0.0033	0.0024	0.003	0.0039
Total dissolved phosphorus	mg-P/L	<0.001	0.0015	<0.001	0.0015	0.0019	<0.001	<0.001	0.0013	<0.001	<0.001	0.0016
Dissolved orthophosphate	mg-P/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Silica, reactive	mg/L	0.14	0.08	0.075	0.08	0.056	0.05	0.063	0.046	0.04	0.052	0.044

Note:

Bolded concentrations are higher than relevant water quality guidelines.

- = no guideline or data; NAD = North American Datum; m = metre; mg/L = milligrams per litre; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; < = less than.

**Table D-22 Depth-Integrated Nutrient Data from Lac de Gras Slipper Bay during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics								
		2014								
		Count	Min	Median	Mean	Max	% Above Guideline			
							Acute CWQG	Chronic CWQG	CDWQG	Long-term SSWQO
Composite Sample Collection										
Start depth	m	11	0.3	0.3	0.3	0.3	-	-	-	-
End depth	m	11	6.0	12.0	13.0	22.0	-	-	-	-
Nutrients										
Total nitrogen	mg-N/L	11	0.073	0.15	0.15	0.23	-	-	-	-
Total dissolved nitrogen	mg-N/L	11	<0.05	0.13	0.13	0.22	-	-	-	-
Total Kjeldahl nitrogen	mg-N/L	11	0.064	0.15	0.15	0.23	-	-	-	-
Dissolved Kjeldahl nitrogen	mg-N/L	11	<0.05	0.13	0.13	0.22	-	-	-	-
Total ammonia	mg-N/L	11	<0.005	<0.005	<0.005	0.0063	-	-	-	-
Nitrate	mg-N/L	11	<0.006	<0.006	<0.006	0.0089	-	-	-	-
Nitrite	mg-N/L	11	<0.002	<0.002	<0.002	<0.002	-	-	-	-
Total phosphorus	mg-P/L	11	0.0016	0.0031	0.0033	0.0065	-	-	-	-
Total dissolved phosphorus	mg-P/L	11	<0.001	<0.001	<0.001	0.0019	-	-	-	-
Dissolved orthophosphate	mg-P/L	11	<0.001	<0.001	<0.001	<0.001	-	-	-	-
Silica, reactive	mg/L	11	0.04	0.056	0.065	0.14	-	-	-	-

Note:

Bolded concentrations are higher than relevant water quality guidelines.

Guideline exceedances by median concentrations are based on guidelines calculated using median values of hardness, pH, and temperature, and are not included in the percent exceedance calculations.

- = no guideline or data; CWQG = Canadian Water Quality Guidelines; CDWQG = Canadian Drinking Water Quality Guidelines; SSWQO = Site-Specific Water Quality Objective; m = metre; mg/L = milligrams per litre; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; < = less than.

**Table D-23 Depth-Integrated Nutrient Data from Lac de Gras Far Field 2 during the Open-Water Period, 2014
 Part A**

Location	Unit	FF2-1			FF2-2			FF2-3			FF2-4			FF2-5		
Sample Name		FF2-1-D	FF2-1-D	FF2-1-D	FF2-2-D	FF2-2-D	FF2-2-D	FF2-3-D	FF2-3-D	FF2-3-D	FF2-4-D	FF2-4-D	FF2-4-D	FF2-5-D	FF2-5-D	FF2-5-D
Sampling Season		Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall	Late Spring	Summer	Fall
Sample Date		22-Jul-14	12-Aug-14	12-Sep-14	20-Jul-14	12-Aug-14	12-Sep-14	20-Jul-14	12-Aug-14	12-Sep-14	20-Jul-14	12-Aug-14	11-Sep-14	20-Jul-14	11-Aug-14	12-Sep-14
Easting (NAD 83, 12W)		541500	541500	541500	541583	541583	541583	543478	543478	543478	543752	543752	543752	544734	544734	544734
Northing (NAD 83, 12W)		7159522	7159522	7159522	7158573	7158573	7158573	7159267	7159267	7159267	7158945	7158945	7158945	7158898	7158898	7158898
Composite Sample Collection																
Start depth	m	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
End depth	m	10.0	8.0	10.0	14.0	8.0	12.0	14.0	8.0	12.0	14.0	8.0	12.0	12.0	14.0	12.0
Nutrients																
Total nitrogen	mg-N/L	0.29	0.19	0.21	0.079	0.18	0.11	0.086	0.21	0.13	0.053	0.1	0.18	0.13	0.15	0.2
Total dissolved nitrogen	mg-N/L	0.13	0.26	0.18	0.16	0.24	0.089	0.12	0.21	0.11	<0.05	0.18	0.14	0.066	0.2	0.16
Total Kjeldahl nitrogen	mg-N/L	0.29	0.19	0.21	0.079	0.18	0.11	0.086	0.21	0.13	0.053	0.1	0.18	0.13	0.15	0.2
Dissolved Kjeldahl nitrogen	mg-N/L	0.13	0.26	0.18	0.16	0.24	0.089	0.12	0.21	0.11	<0.05	0.18	0.14	0.066	0.2	0.16
Total ammonia	mg-N/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.012	<0.005	<0.005	<0.005	<0.005	<0.005	0.0087
Nitrate	mg-N/L	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Nitrite	mg-N/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total phosphorus	mg-P/L	0.0047	0.0064	0.0026	0.0042	0.0051	0.004	0.0055	0.0056	0.0036	0.0041	0.0059	0.0024	0.0041	0.0084	0.0041
Total dissolved phosphorus	mg-P/L	0.0015	0.0028	<0.001	<0.001	<0.001	<0.001	0.0013	0.0046	<0.001	<0.001	0.0053	<0.001	0.001	0.0028	0.0017
Dissolved orthophosphate	mg-P/L	<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
Silica, reactive	mg/L	0.066	0.035	0.039	0.072	0.037	0.038	0.071	0.039	0.037	0.073	0.038	0.037	0.072	0.04	0.037

Note:

Bolded concentrations are higher than relevant water quality guidelines.

- = no guideline or data; NAD = North American Datum; m = metre; mg/L = milligrams per litre; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; < = less than.

**Table D-23 Depth-Integrated Nutrient Data from Lac de Gras Far Field 2 during the Open-Water Period, 2014
Part B**

Parameter	Unit	Summary Statistics								
		2014								
		Count	Min	Median	Mean	Max	% Above Guideline			
							Acute CWQG	Chronic CWQG	CDWQG	Long-term SSWQO
Composite Sample Collection										
Start depth	m	15	0.3	0.3	0.3	0.3	-	-	-	-
End depth	m	15	8.0	12.0	11.0	14.0	-	-	-	-
Nutrients										
Total nitrogen	mg-N/L	15	0.053	0.15	0.15	0.29	-	-	-	-
Total dissolved nitrogen	mg-N/L	15	<0.05	0.16	0.15	0.26	-	-	-	-
Total Kjeldahl nitrogen	mg-N/L	15	0.053	0.15	0.15	0.29	-	-	-	-
Dissolved Kjeldahl nitrogen	mg-N/L	15	<0.05	0.16	0.15	0.26	-	-	-	-
Total ammonia	mg-N/L	15	<0.005	<0.005	0.0035	0.012	-	-	-	-
Nitrate	mg-N/L	15	<0.006	<0.006	0.003	<0.006	-	-	-	-
Nitrite	mg-N/L	15	<0.002	<0.002	0.001	<0.002	-	-	-	-
Total phosphorus	mg-P/L	15	0.0024	0.0042	0.0047	0.0084	-	-	-	-
Total dissolved phosphorus	mg-P/L	15	<0.001	0.001	0.002	0.0053	-	-	-	-
Dissolved orthophosphate	mg-P/L	15	<0.001	<0.001	0.0005	<0.001	-	-	-	-
Silica, reactive	mg/L	15	0.035	0.039	0.048	0.073	-	-	-	-

Note:

Bolded concentrations are higher than relevant water quality guidelines.

Guideline exceedances by median concentrations are based on guidelines calculated using median values of hardness, pH, and temperature, and are not included in the percent exceedance calculations.

- = no guideline or data; CWQG = Canadian Water Quality Guidelines; CDWQG = Canadian Drinking Water Quality Guidelines; SSWQO = Site-Specific Water Quality Objective; m = metre; mg/L = milligrams per litre; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; < = less than.



Table D-24 Chlorophyll a Field Duplicates Collected in Lac du Sauvage, Duchess Lake, and Lac de Gras (Slipper Bay and Far Field 2), during the Open-Water Period, 2014

Lake	Station ID	Date ^(a)	Mean (µg/L)	Standard Deviation (µg/L)	Standard Error (µg/L)
Lac du Sauvage	Aa-1	10-Aug-14	3.69	0.41	0.29
		11-Sep-14	3.07	0.25	0.18
	Ab-1	19-Jul-14	1.58	0.01	0.01
		11-Aug-14	1.90	0.14	0.10
		11-Sep-14	2.61	0.06	0.04
	Ac-1	19-Jul-14	1.94	0.02	0.01
		11-Aug-14	1.68	0.06	0.04
		11-Sep-14	2.66	0.02	0.02
	Ac-4	19-Jul-14	1.84	0.01	0.00
		10-Aug-14	1.70	0.36	0.25
		10-Sep-14	1.49	0.02	0.01
	Ac-7	19-Jul-14	2.10	0.01	0.00
		9-Aug-14	1.58	0.06	0.04
		9-Sep-14	2.87	0.07	0.05
	Ad-1	19-Jul-14	2.36	0.07	0.05
		9-Aug-14	1.89	0.12	0.08
		5-Sep-14	4.17	0.20	0.14
	Ae-1	19-Jul-14	2.10	0.03	0.02
9-Aug-14		2.18	0.12	0.09	
5-Sep-14		3.51	0.05	0.04	
Duchess Lake	Af-1	9-Aug-14	4.44	0.21	0.15
		9-Sep-14	9.14	6.21	4.39
Lac de Gras – Slipper Bay	S2	21-Jul-14	2.74	0.10	0.07
		14-Aug-14	1.52	0.12	0.08
		8-Sep-14	1.77	0.68	0.48
	S3	21-Jul-14	1.93	0.19	0.14
		14-Aug-14	1.71	0.02	0.01
		8-Sep-14	1.77	0.68	0.48
	S5	21-Jul-14	1.21	0.01	0.01
		14-Aug-14	1.02	0.07	0.05
		8-Sep-14	0.96	0.06	0.05
S6	21-Jul-14	0.962 ^(b)	-	-	
	14-Aug-14	1.00	0.07	0.05	



Table D-24 Chlorophyll a Field Duplicates Collected in Lac du Sauvage, Duchess Lake, and Lac de Gras (Slipper Bay and Far Field 2), during the Open-Water Period, 2014

Lake	Station ID	Date ^(a)	Mean (µg/L)	Standard Deviation (µg/L)	Standard Error (µg/L)
Lac de Gras – Far Field 2	FF2-1	22-Jul-14	3.06	0.14	0.10
		12-Aug-14	1.75	0.15	0.11
		12-Sep-14	2.96	0.23	0.16
	FF2-2	20-Jul-14	2.34	0.43	0.30
		12-Aug-14	1.73	0.13	0.09
		12-Sep-14	3.50	0.07	0.05
	FF2-3	20-Jul-14	2.66	0.21	0.15
		12-Aug-14	1.79	0.13	0.09
		12-Sep-14	3.04	1.45	1.03
	FF2-4	20-Jul-14	2.61	0.05	0.04
		12-Aug-14	1.46	0.13	0.09
		11-Sep-14	2.89	0.23	0.16
	FF2-5	20-Jul-14	2.45	0.02	0.02
		11-Aug-14	1.54	0.17	0.12
		12-Sep-14	11.12	1.62	1.15

Note:

a) chlorophyll a samples were not collected from stations Aa-1 and Af-1 in late spring and station S6 in the fall due to weather constraints.

b) a duplicate chlorophyll a sample was not collected from station S6 in late spring.

ID = identification; µg/L = micrograms per litre; - = no data or not applicable.



APPENDIX E

SEDIMENT QUALITY DATA



Tables

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Abbreviations

Abbreviation	Definition
-	no guideline or data
CaCO ₃	calcium carbonate
ISQG	Interim Sediment Quality Guidelines
N	nitrogen
NAD	North American Datum
PEL	Probable Effects Level

Units of Measure

Unit	Definition
%	percent
<	less than
m	metre
mg/kg	milligrams per kilogram
mm	millimetre
µg/g	micrograms per gram

**Table E-1 Sediment Quality Data from Lac du Sauvage, 2014
Part A**

Location	Unit (Dry Weight)	Aa-1	Ab-1	Ac-1	Ac-4	Ac-7	Ad-1	Ae-1
Sample Name		Fall	Fall	Fall	Fall	Fall	Fall	Fall
Sampling Season		09/12/2014	09/11/2014	09/11/2014	09/09/2014	09/09/2014	09/05/2014	09/08/2014
Sample Date		552282	547766	543339	543695	544247	539898	542494
Easting (NAD 83, 12W)		7165025	7162266	7165138	7162938	7165068	7168781	7170252
Northing (NAD 83, 12W)								
Physical Parameters								
Maximum depth	m	10.5	13.0	11.5	11.0	12.0	10.7	10.2
% Clay (<0.002 mm)	%	3.1	9.4	11	13	12	6.8	6.9
% Silt (0.002-0.05 mm)	%	90	88	88	86	86	91	92
% Sand (2-5 mm)	%	7.4	2.8	1.5	1.4	1.5	2.2	0.67
Nutrients								
Nitrogen, Available	mg/kg	850	1,540	1,300	1,710	1,600	1,040	960
Nitrate as N	mg/kg	<1	<1	<1	<4	<1	<1	<4
Phosphorus, Available	mg/kg	830	964	1280	1010	1150	1160	700
Phosphate, Available	mg/kg	12	11	29	108	19	12	11
Carbon, Total	%	0.9	1.7	1.4	1.7	1.4	1.2	0.8
Carbon, Inorganic	mg/kg	<1,000	<1,000	<1,000	1,400	1,600	1,300	1,100
Carbon, Total Organic	mg/kg	9,100	17,000	13,700	15,600	12,300	10,700	7,000
CaCO ₃ Equivalent	%	<0.8	<0.8	<0.8	1.2	1.3	1.1	0.94
Total Metals								
Aluminum	µg/g	13,100	18,600	21,500	21,300	20,700	19,700	17,200
Antimony	µg/g	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	µg/g	16^(l)	143^(l, P)	23^(l, P)	17^(l, P)	131^(l, P)	79^(l, P)	95^(l, P)
Barium	µg/g	96	191	158	147	165	153	140
Beryllium	µg/g	0.4	0.57	0.61	0.62	0.61	0.59	0.46

**Table E-1 Sediment Quality Data from Lac du Sauvage, 2014
Part A**

Location	Unit (Dry Weight)	Aa-1	Ab-1	Ac-1	Ac-4	Ac-7	Ad-1	Ae-1
Sample Name		Fall	Fall	Fall	Fall	Fall	Fall	Fall
Sampling Season		Fall	Fall	Fall	Fall	Fall	Fall	Fall
Sample Date		09/12/2014	09/11/2014	09/11/2014	09/09/2014	09/09/2014	09/05/2014	09/08/2014
Easting (NAD 83, 12W)		552282	547766	543339	543695	544247	539898	542494
Northing (NAD 83, 12W)		7165025	7162266	7165138	7162938	7165068	7168781	7170252
Bismuth	µg/g	0.23	0.35	0.36	0.36	0.37	0.33	0.26
Boron	µg/g	5.4	5.0	5.6	5.3	<5	5.4	<5
Cadmium	µg/g	<0.1	0.19	0.13	0.14	0.19	0.1	<0.1
Chromium	µg/g	49^(l)	64^(l)	77^(l)	76^(l)	72^(l)	71^(l)	62^(l)
Cobalt	µg/g	11	29	18	15	23	21	18
Copper	µg/g	21	33	33	35	36	25	20
Iron	µg/g	23,800	50,000	37,100	32,000	52,100	44,400	39,300
Lead	µg/g	3.9	5.2	5.3	5.4	5.7	5.2	4.6
Lithium	µg/g	35	46	55	53	52	53	44
Manganese	µg/g	267	1,670	661	522	2,290	1,960	3,610
Mercury	µg/g	0.012	0.019	0.014	0.018	0.016	0.016	0.014
Molybdenum	µg/g	1.2	3.5	1.4	1.5	2.8	2.6	6.0
Nickel	µg/g	27	49	46	44	52	42	35
Selenium	µg/g	<0.2	0.26	0.2	0.24	0.24	<0.2	<0.2
Silver	µg/g	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Strontium	µg/g	11	14	16	16	14	15	14
Sulfur	µg/g	350	540	430	380	400	290	220
Thallium	µg/g	0.19	0.34	0.31	0.31	0.35	0.3	0.25
Tin	µg/g	<2	<2	<2	<2	<2	<2	<2
Titanium	µg/g	861	939	1,230	1,180	1,060	1,140	1,040

**Table E-1 Sediment Quality Data from Lac du Sauvage, 2014
Part A**

Location	Unit (Dry Weight)	Aa-1	Ab-1	Ac-1	Ac-4	Ac-7	Ad-1	Ae-1
Sample Name		Aa-1	Ab-1	Ac-1	Ac-4	Ac-7	Ad-1	Ae-1
Sampling Season		Fall	Fall	Fall	Fall	Fall	Fall	Fall
Sample Date		09/12/2014	09/11/2014	09/11/2014	09/09/2014	09/09/2014	09/05/2014	09/08/2014
Easting (NAD 83, 12W)		552282	547766	543339	543695	544247	539898	542494
Northing (NAD 83, 12W)		7165025	7162266	7165138	7162938	7165068	7168781	7170252
Uranium	µg/g	2.0	2.9	3.1	3.4	3.2	2.4	2.3
Vanadium	µg/g	42	54	63	61	59	57	50
Zinc	µg/g	47	73	81	79	82	72	61

Note:

Bolded concentrations are higher than sediment quality guidelines.

(I) = value higher than the Interim Sediment Quality Guideline.

(P) = value higher than the Probable Effects Level.

- = no guideline or data; CaCO₃ = calcium carbonate; m = metre; µg/g = micrograms per gram; mm = millimetre; mg/kg = milligrams per kilogram; N = nitrogen; NAD = North American Datum; % = percent; < = less than.



**Table E-1 Sediment Quality Data from Lac du Sauvage, 2014
Part B**

Parameters	Unit (Dry Weight)	Summary Statistics						
		2014						
		Count	Minimum	Median	Mean	Maximum	% Above Guideline	
							ISQG	PEL
Physical Parameters								
Maximum depth	m	7	10.2	11.0	11.3	13.0	-	-
% Clay (<0.002 mm)	%	7	3.1	9.4	8.9	13	-	-
% Silt (0.002-0.05 mm)	%	7	86	88	89	92	-	-
% Sand (2-5 mm)	%	7	0.67	1.5	2.5	7.4	-	-
Nutrients								
Nitrogen, Available	mg/kg	7	850	1,300	1,286	1,710	-	-
Nitrate as N	mg/kg	7	<1	<1	<1	<4	-	-
Phosphorus, Available	mg/kg	7	700	1,010	1,013	1,280	-	-
Phosphate, Available	mg/kg	7	11	12	29	108	-	-
Carbon, Total	%	7	0.8	1.4	1.3	1.7	-	-
Carbon, Inorganic	mg/kg	7	<1,000	1,100	<1,000	1,600	-	-
Carbon, Total Organic	mg/kg	7	7,000	12,300	12,200	17,000	-	-
CaCO ₃ Equivalent	%	7	<0.8	0.94	0.82	1.3	-	-
Total Metals								
Aluminum	µg/g	7	13,100	19,700	18,871	21,500	-	-
Antimony	µg/g	7	<0.1	<0.1	<0.1	<0.1	-	-
Arsenic	µg/g	7	16 ^(I)	79 ^(I, P)	72 ^(I, P)	143 ^(I, P)	100	86
Barium	µg/g	7	96	153	150	191	-	-
Beryllium	µg/g	7	0.4	0.59	0.55	0.62	-	-
Bismuth	µg/g	7	0.23	0.35	0.32	0.37	-	-
Boron	µg/g	7	<5	5.3	<5	5.6	-	-
Cadmium	µg/g	7	<0.1	0.13	0.12	0.19	-	-
Chromium	µg/g	7	49 ^(I)	71 ^(I)	67 ^(I)	77 ^(I)	100	-
Cobalt	µg/g	7	11	18	19	29	-	-
Copper	µg/g	7	20	33	29	36	-	-
Iron	µg/g	7	23,800	39,300	39,814	52,100	-	-
Lead	µg/g	7	3.9	5.2	5.1	5.7	-	-
Lithium	µg/g	7	35	52	48	55	-	-
Manganese	µg/g	7	267	1,670	1,569	3,610	-	-
Mercury	µg/g	7	0.012	0.016	0.015	0.019	-	-
Molybdenum	µg/g	7	1.2	2.6	2.7	6.0	-	-
Nickel	µg/g	7	27	44	42	52	-	-
Selenium	µg/g	7	<0.2	0.2	0.18	0.26	-	-
Silver	µg/g	7	<0.2	<0.2	<0.2	<0.2	-	-
Strontium	µg/g	7	11	14	14	16	-	-



**Table E-1 Sediment Quality Data from Lac du Sauvage, 2014
Part B**

Parameters	Unit (Dry Weight)	Summary Statistics						
		2014						
		Count	Minimum	Median	Mean	Maximum	% Above Guideline	
							ISQG	PEL
Sulfur	µg/g	7	220	380	373	540	-	-
Thallium	µg/g	7	0.19	0.31	0.29	0.35	-	-
Tin	µg/g	7	<2.0	<2.0	<2.0	<2.0	-	-
Titanium	µg/g	7	861	1,060	1,064	1,230	-	-
Uranium	µg/g	7	2.0	2.9	2.8	3.4	-	-
Vanadium	µg/g	7	42	57	55	63	-	-
Zinc	µg/g	7	47	73	71	82	-	-

Note:

Bolded concentrations are higher than sediment quality guidelines.

(I) = value higher than the Interim Sediment Quality Guideline.

(P) = value higher than the Probable Effects Level.

- = no guideline or data; CaCO₃ = calcium carbonate; ISQG = Interim Sediment Quality Guidelines; m = metre; µg/g = micrograms per gram; mm = millimetre; mg/kg = milligrams per kilogram; N = nitrogen; NAD = North American Datum; PEL = Probable Effects Level; % = percent; < = less than.



**Table E-2 Sediment Quality Data from Lac du Sauvage Sub-Basin Lakes, 2014
Part A**

Location	Unit (Dry Weight)	Duchess Lake	Christine Lake	Lake C1	Counts Lake
Sample Name		Af-1	Christine-1	C1-1	Counts-1
Sampling Season		Fall	Fall	Fall	Fall
Sample Date		09/09/2014	09/14/2014	09/14/2014	09/13/2014
Easting (NAD 83, 12W)		542155	7163705	537612	534303
Northing (NAD 83, 12W)		7173731	539626	7167085	7169862
Physical Parameters					
Maximum depth	m	11.0	11.4	20.0	10.4
% Clay (<0.002 mm)	%	8.8	12	12	22
% Silt (0.002-0.05 mm)	%	90	76	83	78
% Sand (2-5 mm)	%	1.6	12	4.2	0.52
Nutrients					
Nitrogen, Available	mg/kg	1,530	6,750	4,790	7,580
Nitrate as N	mg/kg	<1	1.4	<1	<1
Phosphorus, Available	mg/kg	604	1,740	1,480	1,690
Phosphate, Available	mg/kg	27	5.1	62	37
Carbon, Total	%	1.4	9.4	6.2	8.6
Carbon, Inorganic	mg/kg	1,300	<1,000	<1,000	<1,000
Carbon, Total Organic	mg/kg	12,900	93,800	61,700	86,100
CaCO ₃ Equivalent	%	1.1	<0.8	<0.8	<0.8
Total Metals					
Aluminum	µg/g	19,300	20,700	20,900	22,000
Antimony	µg/g	<0.1	0.12	<0.1	<0.1
Arsenic	µg/g	7.3^(l)	116^(l, P)	20^(l, P)	17^(l)
Barium	µg/g	134	159	155	130
Beryllium	µg/g	0.59	0.89	0.71	0.89
Bismuth	µg/g	0.34	0.58	0.52	0.52
Boron	µg/g	5.5	12	8.9	11
Cadmium	µg/g	<0.1	0.5	0.35	0.29
Chromium	µg/g	69^(l)	64^(l)	68^(l)	60^(l)
Cobalt	µg/g	13	49	18	13
Copper	µg/g	26	105^(l)	84^(l)	67^(l)
Iron	µg/g	27,700	88,000	29,000	33,200
Lead	µg/g	5.3	8.2	7.0	6.8
Lithium	µg/g	52	33	44	42
Manganese	µg/g	298	634	394	282
Mercury	µg/g	0.022	0.11	0.046	0.04
Molybdenum	µg/g	1.0	4.2	3.2	3.3
Nickel	µg/g	38	65	53	48
Selenium	µg/g	<0.2	1.2	0.74	0.69



**Table E-2 Sediment Quality Data from Lac du Sauvage Sub-Basin Lakes, 2014
Part A**

Location	Unit (Dry Weight)	Duchess Lake	Christine Lake	Lake C1	Counts Lake
Sample Name		Af-1	Christine-1	C1-1	Counts-1
Sampling Season		Fall	Fall	Fall	Fall
Sample Date		09/09/2014	09/14/2014	09/14/2014	09/13/2014
Easting (NAD 83, 12W)		542155	7163705	537612	534303
Northing (NAD 83, 12W)		7173731	539626	7167085	7169862
Silver	µg/g	<0.2	0.26	0.23	<0.2
Strontium	µg/g	15	23	14	15
Sulfur	µg/g	340	2,120	1,240	2,130
Thallium	µg/g	0.29	0.37	0.39	0.32
Tin	µg/g	<2	<2	<2	<2
Titanium	µg/g	1,180	558	788	603
Uranium	µg/g	3.0	4.7	4.2	5.4
Vanadium	µg/g	57	53	59	51
Zinc	µg/g	71	125^(I)	87	121

Note:

Bolded concentrations are higher than sediment quality guidelines.

(I) = value higher than the Interim Sediment Quality Guideline.

(P) = value higher than the Probable Effects Level.

- = no guideline or data; CaCO₃ = calcium carbonate; m = metre; µg/g = micrograms per gram; mm = millimetre; mg/kg = milligrams per kilogram; N = nitrogen; NAD = North American Datum; % = percent; < = less than.



**Table E-2 Sediment Quality Data from Lac du Sauvage Sub-Basin Lakes, 2014
Part B**

Parameter	Unit (Dry Weight)	Summary Statistics						
		2014						
		Count	Minimum	Median	Mean	Maximum	% Above Guideline	
ISQG	PEL							
Physical Parameters								
Maximum depth	m	4	10.4	11.2	13.2	20.0	-	-
% Clay (<0.002 mm)	%	4	8.8	12	14	22	-	-
% Silt (0.002-0.05 mm)	%	4	76	81	82	90	-	-
% Sand (2-5 mm)	%	4	0.52	2.9	4.7	12	-	-
Nutrients								
Nitrogen, Available	mg/kg	4	1,530	5,770	5,163	7,580	-	-
Nitrate as N	mg/kg	4	<1	<1	<1	1.4	-	-
Phosphorus, Available	mg/kg	4	604	1585	1379	1740	-	-
Phosphate, Available	mg/kg	4	5.1	32	33	62	-	-
Carbon, Total	%	4	1.4	7.4	6.4	9.4	-	-
Carbon, Inorganic	mg/kg	4	<1,000	<1,000	<1,000	1,300	-	-
Carbon, Total Organic	mg/kg	4	12,900	73,900	63,625	93,800	-	-
CaCO ₃ Equivalent	%	4	<0.8	<0.8	<0.8	1.1	-	-
Total Metals								
Aluminum	µg/g	4	19,300	20,800	20,725	22,000	-	-
Antimony	µg/g	4	<0.1	<0.1	<0.1	0.12	-	-
Arsenic	µg/g	4	7.3^(I)	18^(I, P)	40^(I, P)	116^(I, P)	100	50
Barium	µg/g	4	130	145	145	159	-	-
Beryllium	µg/g	4	0.59	0.8	0.77	0.89	-	-
Bismuth	µg/g	4	0.34	0.52	0.49	0.58	-	-
Boron	µg/g	4	5.5	10	9.3	12	-	-
Cadmium	µg/g	4	<0.1	0.32	0.3	0.5	-	-
Chromium	µg/g	4	60^(I)	66^(I)	65^(I)	69^(I)	100	-
Cobalt	µg/g	4	13	15	23	49	-	-
Copper	µg/g	4	26	75^(I)	70^(I)	105^(I)	75	-
Iron	µg/g	4	27,700	31,100	44,475	88,000	-	-
Lead	µg/g	4	5.3	6.9	6.8	8.2	-	-
Lithium	µg/g	4	33	43	42	52	-	-
Manganese	µg/g	4	282	346	402	634	-	-
Mercury	µg/g	4	0.022	0.043	0.053	0.11	-	-
Molybdenum	µg/g	4	1.0	3.3	2.9	4.2	-	-
Nickel	µg/g	4	38	51	51	65	-	-
Selenium	µg/g	4	<0.2	0.72	0.68	1.2	-	-
Silver	µg/g	4	<0.2	0.22	<0.2	0.26	-	-
Strontium	µg/g	4	14	15	17	23	-	-



**Table E-2 Sediment Quality Data from Lac du Sauvage Sub-Basin Lakes, 2014
Part B**

Parameter	Unit (Dry Weight)	Summary Statistics						
		2014						
		Count	Minimum	Median	Mean	Maximum	% Above Guideline	
ISQG	PEL							
Sulfur	µg/g	4	340	1,680	1,458	2,130	-	-
Thallium	µg/g	4	0.29	0.34	0.34	0.39	-	-
Tin	µg/g	4	<2.0	<2.0	<2.0	<2.0	-	-
Titanium	µg/g	4	558	696	782	1,180	-	-
Uranium	µg/g	4	3.0	4.4	4.3	5.4	-	-
Vanadium	µg/g	4	51	55	55	59	-	-
Zinc	µg/g	4	71	104	101	125^(I)	25	-

Note:

Bolded concentrations are higher than sediment quality guidelines.

(I) = value higher than the Interim Sediment Quality Guideline.

(P) = value higher than the Probable Effects Level.

- = no guideline or data; CaCO₃ = calcium carbonate; ISQG = Interim Sediment Quality Guidelines; m = metre; µg/g = micrograms per gram; mm = millimetre; mg/kg = milligrams per kilogram; N = nitrogen; NAD = North American Datum; PEL = Probable Effects Level; % = percent; < = less than.



**Table E-3 Sediment Quality Data from Lac de Gras Far Field 2, 2014
Part A**

Location	Unit (Dry Weight)	FF2-1	FF2-2	FF2-3	FF2-4	FF2-5
Sample Name		FF2-1	FF2-2	FF2-3	FF2-4	FF2-5
Sampling Season		Fall	Fall	Fall	Fall	Fall
Sample Date		09/14/2014	09/14/2014	09/14/2014	09/14/2014	09/14/2014
Easting (NAD 83, 12W)		541500	541583	543478	543752	544734
Northing (NAD 83, 12W)		7159522	7158573	7159267	7158945	7158898
Physical Parameters						
Maximum depth	m	21.3	19.0	19.5	19.5	19.3
% Clay (<0.002 mm)	%	6.8	6.2	5.5	6.0	5.0
% Silt (0.002-0.05 mm)	%	88	88	88	91	93
% Sand (2-5 mm)	%	5.6	5.8	6.5	3.3	2.3
Nutrients						
Nitrogen, Available	mg/kg	1,730	1,750	1,430	1,480	1,180
Nitrate as N	mg/kg	<1	<1	<1	<1	1.2
Phosphorus, Available	mg/kg	1,450	1,570	970	1,030	854
Phosphate, Available	mg/kg	37	20	20	23	27
Carbon, Total	%	2.0	2.0	1.7	1.8	1.4
Carbon, Inorganic	mg/kg	<1,000	<1,000	<1,000	<1,000	<1,000
Carbon, Total Organic	mg/kg	19,800	20,200	16,800	17,900	13,700
CaCO ₃ Equivalent	%	0.81	<0.8	<0.8	<0.8	<0.8
Total Metals						
Aluminum	µg/g	18,600	18,200	19,400	18,900	18,400
Antimony	µg/g	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	µg/g	112^(L, P)	170^(L, P)	42^(L, P)	61^(L, P)	15^(L)
Barium	µg/g	143	146	124	123	115
Beryllium	µg/g	0.57	0.59	0.61	0.6	0.57
Bismuth	µg/g	0.35	0.34	0.35	0.36	0.33
Boron	µg/g	5.7	5.7	6.0	6.0	6.1
Cadmium	µg/g	0.13	0.18	0.1	<0.1	<0.1
Chromium	µg/g	63^(L)	61^(L)	66^(L)	64^(L)	63^(L)
Cobalt	µg/g	35	44	25	32	21
Copper	µg/g	38^(L)	41^(L)	38^(L)	38^(L)	33
Iron	µg/g	47,300	64,500	34,100	40,900	28,200
Lead	µg/g	5.1	5.0	5.2	5.4	5.2
Lithium	µg/g	44	42	44	46	45
Manganese	µg/g	1,040	2,130	3,300	2,630	3,630
Mercury	µg/g	0.016	0.017	0.014	0.016	0.014
Molybdenum	µg/g	2.2	3.8	1.6	2.2	1.3
Nickel	µg/g	43	50	38	39	36
Selenium	µg/g	0.32	0.3	<0.2	0.23	<0.2



**Table E-3 Sediment Quality Data from Lac de Gras Far Field 2, 2014
Part A**

Location	Unit (Dry Weight)	FF2-1	FF2-2	FF2-3	FF2-4	FF2-5
Sample Name		FF2-1	FF2-2	FF2-3	FF2-4	FF2-5
Sampling Season		Fall	Fall	Fall	Fall	Fall
Sample Date		09/14/2014	09/14/2014	09/14/2014	09/14/2014	09/14/2014
Easting (NAD 83, 12W)		541500	541583	543478	543752	544734
Northing (NAD 83, 12W)		7159522	7158573	7159267	7158945	7158898
Silver	µg/g	<0.2	<0.2	<0.2	<0.2	<0.2
Strontium	µg/g	16	14	14	16	15
Sulfur	µg/g	520	540	540	540	380
Thallium	µg/g	0.27	0.31	0.27	0.3	0.28
Tin	µg/g	<2	<2	<2	<2	<2
Titanium	µg/g	849	834	978	918	988
Uranium	µg/g	3.5	3.5	3.5	3.6	3.2
Vanadium	µg/g	52	50	54	54	53
Zinc	µg/g	71	73	70	69	65

Note:

Bolded concentrations are higher than sediment quality guidelines.

(I) = value higher than the Interim Sediment Quality Guideline.

(P) = value higher than the Probable Effects Level.

- = no guideline or data; CaCO₃ = calcium carbonate; m = metre; µg/g = micrograms per gram; mm = millimetre; mg/kg = milligrams per kilogram; N = nitrogen; NAD = North American Datum; % = percent; < = less than.



**Table E-3 Sediment Quality Data from Lac de Gras Far Field 2, 2014
Part B**

	Unit (Dry Weight)	Summary Statistics						
		2014						
		Count	Minimum	Median	Mean	Maximum	% Above Guideline	
ISQG	PEL							
Physical Parameters								
Maximum depth	m	5	19.0	19.5	19.7	21.3	-	-
% Clay (<0.002 mm)	%	5	5.0	6.0	5.9	6.8	-	-
% Silt (0.002-0.05 mm)	%	5	88	88	89	93	-	-
% Sand (2-5 mm)	%	5	2.3	5.6	4.7	6.5	-	-
Nutrients								
Nitrogen, Available	mg/kg	5	1,180	1,480	1,514	1,750	-	-
Nitrate as N	mg/kg	5	<1	<1	<1	1.2	-	-
Phosphorus, Available	mg/kg	5	854	1,030	1,175	1,570	-	-
Phosphate, Available	mg/kg	5	20	23	25	37	-	-
Carbon, Total	%	5	1.4	1.8	1.8	2.0	-	-
Carbon, Inorganic	mg/kg	5	<1,000	<1,000	<1,000	<1,000	-	-
Carbon, Total Organic	mg/kg	5	13,700	17,900	17,680	20,200	-	-
CaCO ₃ Equivalent	%	5	<0.8	<0.8	<0.8	0.81	-	-
Total Metals								
Aluminum	µg/g	5	18,200	18,600	18,700	19,400	-	-
Antimony	µg/g	5	<0.1	<0.1	<0.1	<0.1	-	-
Arsenic	µg/g	5	15^(I)	61^(I, P)	80^(I, P)	170^(I, P)	100	80
Barium	µg/g	5	115	124	130	146	-	-
Beryllium	µg/g	5	0.57	0.59	0.59	0.61	-	-
Bismuth	µg/g	5	0.33	0.35	0.35	0.36	-	-
Boron	µg/g	5	5.7	6.0	5.9	6.1	-	-
Cadmium	µg/g	5	<0.1	0.1	0.1	0.18	-	-
Chromium	µg/g	5	61^(I)	63^(I)	63^(I)	66^(I)	100	-
Cobalt	µg/g	5	21	32	31	44	-	-
Copper	µg/g	5	33	38^(I)	38^(I)	41^(I)	80	-
Iron	µg/g	5	28,200	40,900	43,000	64,500	-	-
Lead	µg/g	5	5.0	5.2	5.2	5.4	-	-
Lithium	µg/g	5	42	44	44	46	-	-
Manganese	µg/g	5	1,040	2,630	2,546	3,630	-	-
Mercury	µg/g	5	0.014	0.016	0.015	0.017	-	-
Molybdenum	µg/g	5	1.3	2.2	2.2	3.8	-	-
Nickel	µg/g	5	36	39	41	50	-	-
Selenium	µg/g	5	<0.2	0.23	0.21	0.32	-	-
Silver	µg/g	5	<0.2	<0.2	<0.2	<0.2	-	-
Strontium	µg/g	5	14	15	15	16	-	-



**Table E-3 Sediment Quality Data from Lac de Gras Far Field 2, 2014
Part B**

	Unit (Dry Weight)	Summary Statistics						
		2014						
		Count	Minimum	Median	Mean	Maximum	% Above Guideline	
							ISQG	PEL
Sulfur	µg/g	5	380	540	504	540	-	-
Thallium	µg/g	5	0.27	0.28	0.28	0.31	-	-
Tin	µg/g	5	<2	<2	<2	<2	-	-
Titanium	µg/g	5	834	918	913	988	-	-
Uranium	µg/g	5	3.2	3.5	3.4	3.6	-	-
Vanadium	µg/g	5	50	53	53	54	-	-
Zinc	µg/g	5	65	70	69	73	-	-

Note:

Bolded concentrations are higher than sediment quality guidelines.

(I) = value higher than the Interim Sediment Quality Guideline.

(P) = value higher than the Probable Effects Level.

- = no guideline or data; CaCO₃ = calcium carbonate; ISQG = Interim Sediment Quality Guidelines; m = metre; µg/g = micrograms per gram; mm = millimetre; mg/kg = milligrams per kilogram; N = nitrogen; NAD = North American Datum; PEL = Probable Effects Level; % = percent; < = less than.

**Table E-4 Sediment Quality Data from the Lac de Gras Sub-Basin Lakes, 2014**

Location	Unit (Dry Weight)	Lake P5
Sample Name		P5-1
Sampling Season		Fall
Sample Date		09/14/2014
Easting (NAD 83, 12W)		530615
Northing (NAD 83, 12W)		7169282
Physical Parameters		
Maximum depth	m	9.0
% Clay (<0.002 mm)	%	20
% Silt (0.002-0.05 mm)	%	79
% Sand (2-5 mm)	%	1.3
Nutrients		
Nitrogen, Available	mg/kg	3,960
Nitrate as N	mg/kg	<1.0
Phosphorus, Available	mg/kg	1,390
Phosphate, Available	mg/kg	71
Carbon, Total	%	4.8
Carbon, Inorganic	mg/kg	<1,000
Carbon, Total Organic	mg/kg	48,200
CaCO ₃ Equivalent	%	<0.8
Total Metals		
Aluminum	µg/g	27,400
Antimony	µg/g	<0.1
Arsenic	µg/g	10^(l)
Barium	µg/g	159
Beryllium	µg/g	1.0
Bismuth	µg/g	0.64
Boron	µg/g	7.6
Cadmium	µg/g	0.18
Chromium	µg/g	82^(l)
Cobalt	µg/g	18
Copper	µg/g	64^(l)
Iron	µg/g	36,700
Lead	µg/g	7.2
Lithium	µg/g	63
Manganese	µg/g	423
Mercury	µg/g	0.022
Molybdenum	µg/g	3.2
Nickel	µg/g	84
Selenium	µg/g	0.47
Silver	µg/g	<0.2

**Table E-4 Sediment Quality Data from the Lac de Gras Sub-Basin Lakes, 2014**

Location	Unit (Dry Weight)	Lake P5
Sample Name		P5-1
Sampling Season		Fall
Sample Date		09/14/2014
Easting (NAD 83, 12W)		530615
Northing (NAD 83, 12W)		7169282
Strontium	µg/g	16
Sulfur	µg/g	1,150
Thallium	µg/g	0.34
Tin	µg/g	<2
Titanium	µg/g	1,020
Uranium	µg/g	6.6
Vanadium	µg/g	72
Zinc	µg/g	135^(I)

Note:

Bolded concentrations are higher than sediment quality guidelines.

(I) = value higher than the Interim Sediment Quality Guideline.

(P) = value higher than the Probable Effects Level.

- = no guideline or data; CaCO₃ = calcium carbonate; m = metre; µg/g = micrograms per gram; mm = millimetre; mg/kg = milligrams per kilogram; N = nitrogen; NAD = North American Datum; % = percent; < = less than.

Table E-5 Dioxins and Furans in Sediments within the Baseline Study Area, 2014

Location Sample Name Sampling Season Date Sampled Easting (NAD 83, 12W) Northing (NAD 83, 12W) Unit (Dry Weight)	Lac du Sauvage					Duchess Lake	Lac de Gras, Slipper Bay		Lac de Gras, Far Field 2		Lac du Sauvage, Sub-Basin Lakes			Lake P5	
	Aa-1	Ab-1	Ac-1	Ad-1	Ae-1	Af-1	S3	S5	FF2-2	FF2-5	Counts-1	C1-1	Christine-1	P5-1	
	Fall	Fall	Fall	Fall	Fall	Fall	Fall	Fall	Fall	Fall	Fall	Fall	Fall	Fall	
	09/11/2014	09/11/2014	09/11/2014	09/05/2014	09/05/2014	09/09/2014	09/08/2014	09/08/2014	09/12/2014	09/12/2014	09/13/2014	09/14/2014	09/14/2014	09/14/2014	
	552282	547766	543339	539898	542494	542494	505912	503125	541583	544734	7169862	537612	7163705	530615	
7165025	7162266	7165138	7168781	7170252	7170252	7164431	7161481	7158573	7158898	534303	7167085	539626	7169282		
Polychlorinated dibenzo-p-dioxins (PCDDs; Dioxins)															
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	<0.32	<0.37	<0.26	<0.17	<0.13	<0.18	<0.32	<0.31	<0.11	<0.16	<0.56	<0.46	<0.46	<0.46
1,2,3,7,8-Pentachlorodibenzo-p-dioxins (PeCDD)	pg/g	<0.082	<0.083	0.400	<0.079	0.150	0.099	<0.15	<0.18	<0.043	<0.064	<0.21	<0.20	<0.24	<0.073
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	<0.067	<0.059	<0.11	<0.055	<0.039	<0.047	<0.11	<0.16	<0.084	<0.049	<0.15	<0.13	<0.26	<0.067
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	<0.065	<0.055	<0.11	<0.055	<0.040	<0.046	<0.11	<0.17	<0.082	<0.049	<0.15	<0.13	<0.27	<0.066
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	<0.066	<0.057	<0.11	<0.055	<0.040	<0.047	<0.11	<0.17	<0.083	<0.049	<0.15	<0.13	<0.27	<0.067
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	0.420	0.427	0.800	0.227	0.145	0.709	0.42	0.340	0.510	0.618	0.62	0.49	1.90	0.220
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	2.27	2.12	5.77	1.29	0.490	4.12	1.79	0.93	2.84	2.88	2.91	1.93	12.4	1.01
Total Tetrachlorodibenzo-p-dioxin (TCDD) equivalents	pg/g	<0.32	1.21	1.64	2.28	<0.13	1.84	5.07	1.26	<0.11	<0.16	6.65	<0.46	4.97	<0.46
Polychlorinated dibenzofurans (PCDFs; Furans)															
2,3,7,8-tetrachlorodibenzofuran (TCDF)	pg/g	<0.52	<0.38	<0.28	0.27	<0.11	<0.23	0.47	0.24	0.130	0.26	<0.56	<0.48	<0.48	<0.32
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	<0.12	<0.13	<0.12	<0.050	<0.055	<0.091	<0.14	<0.14	<0.048	<0.053	<0.17	<0.20	<0.19	<0.084
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	<0.12	<0.13	<0.11	<0.043	<0.049	<0.079	<0.12	<0.12	0.043	<0.046	<0.15	<0.18	<0.17	<0.080
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	<0.034	<0.044	<0.065	<0.034	<0.044	<0.029	<0.088	<0.18	<0.048	0.042	<0.13	<0.11	<0.27	<0.067
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	<0.030	0.044	<0.059	0.040	<0.040	<0.027	<0.079	1.00	<0.045	<0.033	<0.12	<0.10	<0.24	<0.063
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.160	0.064	0.110	<0.045	<0.058	<0.038	0.19	<0.23	0.110	0.100	0.24	<0.13	<0.34	0.137
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	<0.031	<0.038	<0.063	<0.033	<0.042	<0.029	<0.083	<0.17	<0.047	<0.034	<0.13	<0.10	<0.25	<0.058
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	<0.043	0.058	<0.048	<0.061	<0.024	0.070	<0.079	<0.12	0.042	<0.046	0.177	<0.088	0.22	0.091
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	<0.066	<0.043	<0.073	<0.091	<0.036	<0.025	<0.12	<0.18	<0.040	<0.068	<0.10	<0.13	<0.25	<0.060
Octachlorodibenzofuran (OCDF)	pg/g	0.117	0.099	0.139	0.096	0.210	<0.043	<0.087	<0.14	0.092	0.147	<0.18	<0.11	0.42	0.110
Total Tetrachlorodibenzofurans (TCDF) equivalents	pg/g	<0.52	<0.38	0.78	1.76	0.62	1.07	4.91	1.54	0.806	0.42	5.47	3.31	8.54	<0.32
Toxic Equivalency (TEQ)															
Mid Point PCDD/F TEQ	pg/g	0.283	0.296	0.610	0.180	0.246	0.236	0.356	0.448	0.140	0.178	0.513	0.432	0.524	0.333

Note:

Bolded concentrations are higher than relevant sediment quality guidelines:

- = no guideline or data; pg/g = picograms per gram; NAD = North American Datum; % = percent; < = less than.