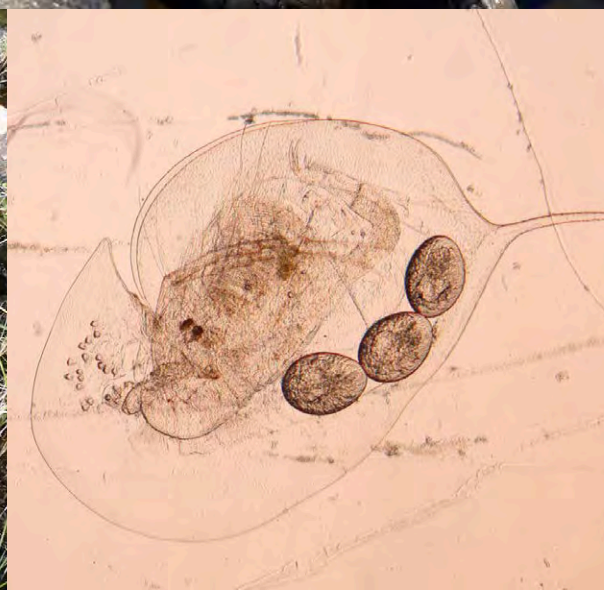
Ekati Diamond Mine

2014 Aquatic Effects Monitoring Program
Part 2 - Data Report



DOMINION DIAMOND

Dominion Diamond Ekati Corporation

EKATI DIAMOND MINE

2014 Aquatic Effects Monitoring Program Part 2 - Data Report

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GLOSSARY AND ABBREVIATIONS

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

AANDC	Aboriginal Affairs and Northern Development Canada
AEMP	Aquatic Effects Monitoring Program. A comprehensive, early-warning monitoring program designed to detect changes in aquatic ecosystems potentially influenced by the Ekati Diamond Mine.
ALS	ALS Environmental Services
Benthic	Pertaining to the bottom region of a water body, on or near bottom sediments or rocks.
Benthos	Benthos communities are a group of organisms that live associated with the bottom of lakes or streams. These communities contain a diverse assortment of organisms that have different mechanisms of feeding. The term benthos is used interchangeably with benthic invertebrates in this report. Benthos are an important food source for fish.
Biomass	The amount of living matter as measured on a weight or concentration basis. Biomass is an indication of the amount of food available for higher trophic levels. In the AEMP, phytoplankton biomass is estimated as chlorophyll *a*, and zooplankton biomass is measured as milligrams of dry weight per cubic metre.
CCME	Canadian Council of Ministers of the Environment
CCREM	Canadian Council of Resource and Environment Ministers
Chlorophyll	Chlorophyll is a molecule contained in photosynthetic organisms which is required to carry out photosynthesis. Chlorophyll *a* is used as an indicator of phytoplankton biomass in this report.
DDEC	Dominion Diamond Ekati Corporation
DFO	Fisheries and Oceans Canada
Diatom	Diatoms are a type of single celled algae. They photosynthesize and may live either free-floating in water (as phytoplankton) or attached to substrates (as periphyton). Diatoms contain a silica shell (called a frustule) outside of their cell membrane.

Diptera	Refers to a taxonomic order of insects. Dipterans are the true flies, and their larval stages are a major component of lake and stream benthos communities. Dipterans are characterized by a single pair of functional wings and include a wide diversity of species. Diptera include the familiar mosquito and black-fly, and their larvae are an important food source for fish. Their abundance and diversity can be used as an indicator of lake or stream water and sediment quality.
Diversity Indices	A measure of how varied in terms of genera a community of organisms is. In general, a healthy ecosystem will support a variety of species and have a high diversity index.
DL	Detection Limit
DO	Dissolved Oxygen
EC	Environment Canada
Ecology	The study of the interactions between organisms and their environment.
Ecosystem	A community of interacting organisms considered together with the chemical and physical factors that make up their environment.
EEM	Environmental Effects Monitoring
Effect	Refers to any potential change in the aquatic environment that is a result of project activities associated with the Ekati Diamond Mine.
EPT	Ephemeroptera, Plecoptera and Trichoptera
EROD	Ethoxyresorufin-O-deethylase
ERM	Environmental Resources Management
Euphotic Zone	The euphotic zone refers to the upper portion of the water column in which adequate light is present for photosynthesis to occur.
EZD	Euphotic zone depth
Freshet	Freshet refers to a high water flow event within a stream. In snowmelt driven systems such as the Arctic, the term is commonly used to refer to spring hydrology conditions in which the majority of annual water volume passes through streams in a short period of time. At the Ekati Diamond Mine, freshet typically begins in late May or early June, and lasts for a few weeks.
GO	General Oceanics
Hydrology	The study of the properties of water and its movement in relation to land.
IEMA	Independent Environmental Monitoring Agency.
ISO	International Organization for Standardization

ISQG	Interim Sediment Quality Guideline
K-B	Kajak-Brinkhurst
KPSF	King Pond Settling Facility. A settlement facility in the King-Cujo Watershed used to store mine water at the Ekati Diamond Mine.
LLCF	Long Lake Containment Facility. An engineered storage site used to confine the fine fraction of the processed kimberlite (i.e., tailings) and mine water in Long Lake at the Ekati Diamond Mine.
MQO	Measurement Qualified Objective
MSC	Meteorological Services of Canada
PDC	Panda Diversion Channel. An engineered channel used to divert water from North Panda Lake to Kodiak Lake.
PEL	Probable Effects Level
PET	Potential Evapotranspiration
Phytoplankton	Phytoplankton are microscopic primary producers that live free-floating in water. These organisms are single-celled algae that photosynthesize. Some common types of phytoplankton include diatoms and cyanobacteria.
Primary Producers	In this report, primary producers refer to organisms that convert sunlight into food through the process of photosynthesis. Aquatic primary producers can include phytoplankton, periphyton, macrophytes, and submerged vegetation. Only phytoplankton are examined as part of the Ekati Diamond Mine AEMP.
QA/QC	Quality Assurance and Quality Control
RMSD	Root Mean Square Deviate
Runoff Coefficient	A ratio that expresses the precipitation contributing to overland flow in relation to the total precipitation occurring over a given area.
RPD	Relative Percent Difference
SD	Standard Deviation
SE	Standard Error
Secchi Depth	Secchi depth is the depth at which a Secchi disc (standardized white and black disc) can no longer be seen when it is lowered into a lake. Secchi depth can be used to calculate the depth of the euphotic zone.
Shannon Diversity Index (H)	Is an index defined as: $H = -\sum pi \times \ln(pi)$, where pi is the proportion of the ith species or genera at a sampling station and $\sum$ indicates that the $pi \times \ln(pi)$ is summed over all species or genera.

Simpson's Diversity Index (D)	Is considered a dominance index because it weights towards the most abundant species (represents the probability that two individuals selected at random from the population are different species or genera) and is defined as: $D = 1 - \sum(p_i)2$, where p_i is the proportion of the ith species or genera at a sampling station and $\sum$ indicates that the $(p_i)2$ is summed over all species or genera.
SNP	Surveillance Network Program
SSWQO	Site Specific Water Quality Objective
SWE	Snow-water-equivalent
TBRG	Tipping Bucket Rain Gauge
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TSS	Total Suspended Solids
US EPA	United States Environmental Protection Agency
WLWB	Wek'èezhìi Land and Water Board
WRSA	Waste Rock Storage Area
WSC	Water Survey of Canada
Zooplankton	Zooplankton are small animals that live in the water column. They are secondary producers and feed mainly on phytoplankton.

Units of Measurement and Symbols

Centimetre	cm	**Metres above sea level**	masl
Cubic metre	m^3	**Micrometre (micron)**	µ
Degree	°	**Microsiemens**	µS
Degrees Celsius	°C	**Microsiemens per centimetre**	µS/cm
Gram	g	**Milligrams per kilogram**	mg/kg
Greater than	>	**Milligrams per litre**	mg/L
Kilometre	km	**Parts per million**	ppm
Less than	<	**Percent**	%
Litre	L	**Plus or minus**	±
Metre	m		

1. INTRODUCTION

1.1 BACKGROUND

The Aquatic Effects Monitoring Program (AEMP) at the Ekati Diamond Mine is a requirement specified in Dominion Diamond Ekati Corporation's (DDEC) Class A Water Licence (W2012L2-0001). Sampling conducted for the 2014 AEMP was permitted through the Aurora Research Institute Scientific Research Licence (15382) issued for the Ekati Diamond Mine for the collection of samples between January 1 and December 31, 2014.

The AEMP is designed to detect changes in the aquatic ecosystem that may be caused by the Ekati Mine project activities. The 2014 AEMP was conducted as specified in the document titled *Ekati Diamond Mine: Aquatic Effects Monitoring Program Plan for 2013 to 2015* (Rescan 2013). This plan was developed following a detailed review or re-evaluation of 2010 to 2012 AEMP results completed in November of 2012 and presented to stakeholders at a workshop held in December 2012 (Rescan 2012a). Stakeholders that participated in the meetings and provided feedback to the program included Environment Canada (EC), Fisheries and Oceans Canada (DFO), Aboriginal Affairs and Northern Development Canada (AANDC), the Yellowknives Dene First Nation, the Independent Environmental Monitoring Agency (IEMA) and the Wek'eezhii Land and Water Board (WLWB; Rescan 2013).

Following the workshops, the WLWB solicited written comments from stakeholders to consider and provided recommendations to be incorporated into an AEMP design for 2013 to 2015. The final AEMP Plan for 2013 to 2015 (Rescan 2013b) incorporated each of the recommendations provided in the 2012 re-evaluation (Rescan 2012a) and two additional requests made by the WLWB. A summary of the WLWB approved changes to the field methods and laboratory methods implemented in 2013 and 2014 are included in Sections 1.3 and 1.4.

As completed in the past, the AEMP report includes a Summary Report which provides an overall summary of the evaluation of effects. The main AEMP report is comprised of three parts:

1. Part 1 - Evaluation of Effects: provides the methods used to assess change in the aquatic environment and summarizes the results of the effects assessments.
2. Part 2 - Data Report: reports on the state of the aquatic environment at the Ekati Diamond Mine in 2014, including the field methodology and results for each of the aquatic environmental components (e.g., physical limnology).
3. Part 3 - Statistical Report: provides the detailed results of the statistical analyses reported in the effects analysis.

1.2 OBJECTIVES

The objective of this AEMP report (Part 2 – Data Report) is to provide a comprehensive overview of the aquatic environment at the Ekati Diamond Mine in 2014. This report includes a description of the 2014 AEMP field methods and both the detailed and summarized data collected during the 2014

sampling period (October 2013 to September 2014). This AEMP Data Report has been divided into three main sections:

1. Introduction: includes a brief overview of the background and objectives of the AEMP, describes changes made to the AEMP since the last AEMP Re-evaluation (Rescan 2012a), and describes related monitoring programs and studies.
2. Sampling Design and Methods: includes the sampling design for each component (e.g., under-ice physical limnology) of the aquatic environmental sampling program as well as the field and laboratory methods, where applicable.
3. Results and Discussion: includes a written summary and interpretation of the results of each component of the aquatic environmental sampling program, followed by supporting tables and figures.

1.3 CHANGES TO AEMP FIELD SAMPLING METHODS

- In 2014 monitoring began in Fay Bay and Upper Exeter Lake, and two sampling locations in the Pigeon Stream: Reach 7 (reference location) and Reach 1 (monitoring location). The sampling was initiated to monitor the potential effects in the Pigeon-Fay and Upper Exeter Watershed following to the connection of the Pigeon Stream Diversion to the natural Pigeon Stream during the winter of 2014;
- August lake water sampling replication was reduced from triplicates to duplicates in 2014;
- Beginning in 2013 water quality samples were collected from deep stratum in Leslie Lake to provide a more accurate depiction of open water-season water quality in the lake; and
- Beginning in 2014 sediment sampling was completed at mid-depth locations only (removed deep-depth locations).

1.4 CHANGES TO AEMP LABORATORY METHODS

In 2013 and 2014, phytoplankton taxonomic analysis was completed by EcoAnalysts in Moscow, Idaho rather than Fraser Environmental Services in Surrey, BC as was done from 1996 to 2012. The methods differed slightly between the two taxonomists: the methods of Fraser Environmental Services included a "rare species scan", which is not part of the general protocol employed by EcoAnalysts. In the 2013 AEMP Part 2 – Data Report (ERM Rescan 2014), the EcoAnalysts phytoplankton data included a "rare species scan" in addition to their regular protocols in order to make the data comparable among years. In 2014, the scan was discontinued because the additional information it provided was deemed to be of low importance in the determination of mine effects on phytoplankton. The decision required the removal of rare species from the historical dataset (see Part 1 – Evaluation of Effects).

1.5 ADDITIONAL MONITORING IN THE AQUATIC ENVIRONMENT

There are three other components to the aquatic monitoring at the Ekati Diamond Mine, including the Surveillance Network Program (SNP), special effects studies and monitoring programs, and

environmental baseline studies. The SNP assesses DDEC's compliance with Water Licence (W2012L2-0001) and sampling is conducted and reported on separately in monthly reports completed by DDEC staff according to the Water Licence. Data from two SNP sampling stations, located at two effluent discharge locations, 1616-30 in the Long Lake Containment Facility (LLCF) and 1616-43 in the King Pond Settling Facility (KPSF), are also incorporated into the AEMP for comparative purposes. Special effects studies are carried out on as-needed basis to answer questions raised by the results of AEMP monitoring that require further investigation or to focus on specific topics by providing additional information not typically collected in the AEMP.

In 2014, the following studies were undertaken as part of the special effects studies and monitoring programs:

- Lac de Gras Water Quality Monitoring Station – monitoring at sites S5 and S6 in the north arm of Lac de Gras, beyond the current extent of the AEMP, was continued to determine if a new water quality monitoring station is required beyond the current site, S3. Sampling at sites S5 and S6 began in 2013 and the necessity of the addition of one or both stations to the annual AEMP program will be assessed as part of the 2015 AEMP re-evaluation.
- Grizzly Lake Biological Communities – phytoplankton and zooplankton were sampled in August to assess if communities have been altered following observed changes in the under-ice temperature profiles from 2011 to 2013. Results from biological monitoring in 2013 indicated that the taxonomic composition of the zooplankton assemblage may have changed through time; however, the lack of data from 2004 to 2012 made it difficult to determine whether these changes represented a trend through time or the differences were due to natural variability (ERM Rescan 2014). Thus, an additional year of phytoplankton and zooplankton monitoring was recommended in 2014 (ERM Rescan 2014).
- 2014 Pigeon Stream Diversion (PSD) Monitoring Program – the PSD was designed and constructed as compensation for the loss of stream habitat during the development of Pigeon Pit at the Ekati Diamond Mine in accordance with Fisheries Authorization #SC99037. Under the authorization a monitoring program was established to assess the effectiveness of the PSD in providing productive fish habitat. The 2014 PSD Monitoring report describes the results of the first post-construction year of the monitoring program of the PSD (ERM 2015). Physical components including stream flow, water temperature, stream habitat, water quality and soil and sediment quality were assessed. Sampled biological components included vegetation monitoring, coarse and fine particulate organic matter (CPOM/FPOM), CPOM retention, organic matter processing (leaf packs), periphyton/epilithon, benthic invertebrates, and the number, biological characteristics and migration patterns of all species and life stages of fish, although fish monitoring efforts focused primarily on Arctic grayling (ERM 2015).
- Hydrocarbon Exposure to Fish – a follow-up study to the results of the 2012 EROD (ethoxyresorufin-O-deethylase) activity analyses (completed as part of the 2012 AEMP; Rescan 2012a) which indicated evidence of hydrocarbon exposure in slimy sculpin and round whitefish that may have been related to mine activities. Results from this study were submitted on December 18, 2014 to the WLWB in a separate report entitled "Characterization of Hydrocarbons found in the Arctic Aquatic Environment near the Ekati Diamond Mine" (DDEC 2014b).

2. SAMPLE DESIGN AND METHODS

2.1 SAMPLE DESIGN

The following environmental components were monitored as part of the AEMP in 2014:

- meteorology (October 2013 to September 2014);
- hydrology (October 2013 to September 2014);
- under-ice physical limnology (April 2014);
- open water season physical limnology (August 2014);
- under-ice season lake water quality (April 2014);
- open water season lake water quality (July, August, and September 2014);
- open water season stream water quality (June, July, August, and September 2014);
- lake phytoplankton (August 2014);
- lake zooplankton (August 2014);
- lake benthos (August 2014); and
- stream benthos (August 2014); and
- lake sediments (August 2014).

Fish communities were sampled in 2012 and are next scheduled for sampling in 2015 (every three years).

Lakes and streams assessed as part of the AEMP are located in four watersheds: Koala, King-Cujo, Carrie Pond, and Pigeon-Fay and Upper Exeter (Figure 2.1-1). The LLCF provides headwater discharge into the Koala Watershed and water discharged from the KPSF provides headwater to the King-Cujo Watershed. Water is typically pumped annually from Desperation Pond, which receives seepage from the Misery Waste Rock Storage Area (WRSA), to Carrie Pond (the receiving environment). The LLCF, the KPSF, and Desperation Pond are the key direct influences from the mine on the downstream aquatic environments within these three watersheds. A specific objective of the AEMP is to monitor potential changes to the aquatic environment downstream of these facilities (see Part 1 - Evaluation of Effects). The Pigeon-Fay and Upper Exeter Watershed does not receive any discharge from Pigeon Pit, as all minewater and drainage from the WRSA is directed into the LLCF. Thus, potential influences at these sites stem from the construction and operation of the PSD and from fugitive dust deposition from Pigeon Pit activities.

In the Koala Watershed, the AEMP monitors waters downstream of the LLCF including the LLCF discharge (SNP station 1616-30), Leslie Lake, Leslie-Moose Stream, Moose Lake, Moose-Nero Stream, Nema Lake, Nema-Martine Stream, Slipper Lake, Slipper-Lac de Gras Stream, and two lake monitoring sites in Lac de Gras (S2 and S3; Figures 2.1-1 and 2.1-2). The internal-watershed reference area (Vulture Lake, Vulture-Polar Stream) is located 5 km upstream of the Ekati Diamond Mine

camp at the north end of the Koala Watershed (Figures 2.1-1 and 2.1-2). Although the Lower Panda Diversion Channel (PDC), Kodiak Lake, and Kodiak-Little Stream are not downstream of the LLCF they are monitored and evaluated as part of the AEMP because of historical influences and their proximity to mine operations (Figures 2.1-1 and 2.1-2). Grizzly Lake is the source of potable water for the Ekati Diamond Mine main camp and has been monitored for water quality since 1998; in 2009 Grizzly Lake became an evaluated lake in the AEMP (Part 1 – Evaluation of Effects; Figures 2.1-1 and 2.1-2).

In the King-Cujo Watershed, monitored locations include the KPSF discharge (SNP station 1616-43), Cujo Lake, Cujo Outflow Stream, Christine-Lac du Sauvage Stream, and two lake monitoring sites in Lac du Sauvage (LdS2 and LdS1; Figures 2.1-1 and 2.1-2).

In the Carrie Pond Watershed, a single location was monitored (Mossing Outflow), located downstream of Carrie Pond (Figure 2.1-1 and 2.1-2).

In the Pigeon-Fay and Upper Exeter Watershed, monitored locations included Fay Bay, Upper Exeter Lake, and two sites along the Pigeon Stream, one reference site upstream of the PSD (Pigeon Reach 7) and one monitoring site downstream of the PSD (Pigeon Reach 1; Figures 2.1-1 and 2.1-2).

The AEMP sampling program also includes two external watershed reference locations: Counts Lake (and outflow stream), and Nanuq Lake (and outflow stream), located 17 km and 26 km from the Ekati Diamond Mine, respectively (Figures 2.1-1 and 2.1-2).

Summaries of the lake and stream sampling locations for the various environmental components monitored as part of the 2014 AEMP are provided in Tables 2.1-1 and 2.1-2, respectively. A summary of the 2014 sampling program is provided in Table 2.1-3 and bathymetric maps depicting the sampling locations for water quality, physical limnology, phytoplankton, zooplankton, lake benthos and lake sediments within each lake are provided in Figures 2.1-3 to 2.1-16.

Supporting Tables and Figures

Table 2.1-1. AEMP Lake Sampling Locations, 2014

Lake Sites	Physical Limnology	Water Quality	Phytoplankton and Zooplankton	Lake Benthos	Lake Sediments
Reference					
Nanuq	X	X	X	X	X
Counts	X	X	X	X	X
Vulture	X	X	X	X	X
Koala Watershed					
Grizzly	X	X	-	-	-
Kodiak	X	X	X	X	X
Leslie	X	X	X	X	X
Moose	X	X	X	X	X
Nema	X	X	X	X	X
Slipper	X	X	X	X	X
S2	X	X	X	X	X
S3	X	X	X	-	-
King-Cujo Watershed					
Cujo	X	X	X	X	X
LdS2	X	X	-	-	-
LdS1	X	X	X	X	X
Pigeon-Fay and Upper Exeter Watershed					
Fay Bay	X	X	X[1]	-	X
Upper Exeter	X	X	X[1]	-	X

Dashes (-) indicate not applicable.
[1] Phytoplankton sampling only.

Table 2.1-2. AEMP Stream Sampling Locations, 2014

Stream Sites	Water Quality	Benthos	Hydrology Station	Stream Flows, Hydrometric Levelling Surveys and Hydraulic Geometry Surveys
Reference				
Nanuq Outflow	X	X	-	-
Counts Outflow	X	X	X	X
Vulture-Polar	X	X	X	X
Pigeon Reach 7	X	-	-	-
Koala Watershed				
Lower PDC	X	-	X	X
Kodiak-Little	X	X	-	-
1616-30 (LLCF)	X	-	(pumps)	(pumps)
Leslie-Moose	X	-	-	-
Moose-Nero	X	X	-	-
Nema-Martine	X	X	X	X
Slipper-Lac de Gras	X	X	X	X
King-Cujo Watershed				
1616-43 (KPSF)	X	-	(pumps)	(pumps)
Cujo Outflow	X	X	X	X
Christine-Lac du Sauvage	X	-	X	X
Mossing Outflow	X	-	-	-
Pigeon-Fay and Upper Exeter Watershed				
Pigeon Reach 1	X	-	-[1]	-

Dashes (-) indicate not applicable.
[1] Hydrometric station is not a part of the AEMP network. It was installed to support the PSD Monitoring Program (data analysis is included in the PSD monitoring report (ERM 2015)).

Table 2.1-3. Summary of the AEMP Sampling Program, 2014

Monitoring	Seasonal Frequency and Timing	Sample Replication, Depths, and Location
Meteorology		
Koala meteorology station	continuous	download data and check sensors bi-weekly
Polar Lake meteorology station	ice-free period (June/July) to September/October)	download data and check sensors bi-weekly
Snow Survey	April	n=10 @ 12 locations
Nipher snow gauge	snowfall period (October to May)	check weekly or after snow event

(continued)

Table 2.1-3. Summary of the AEMP Sampling Program, 2014 (completed)

Monitoring	Seasonal Frequency and Timing	Sample Replication, Depths, and Location
Hydrology		
Servicing of automated stations	prior to freshet	at time of installation
Manual flow measurements	late May to late August	bi-weekly, 2 to 3 times during freshet
Hydrometric levelling surveys	early May to late August	at time of installation, then bi-weekly to monthly
Hydraulic geometry surveys	August	during low flow
Physical Limnology		
Lakes	April	n=1 profile over deepest part of lake or at lake station
	early August	n=1 profile over deepest part of lake or at lake station, Secchi depth
	July and September	Pigeon Watershed only
		n=1 profile over deepest part of lake or at lake station, Secchi depth
Water Quality		
Lakes	April	n=2 @ mid water column depth
		n=2 @ 2 m from the bottom
	early August	n=2 @ 1 m
		n=2 @ mid water column depth
		n=2 @ 2m from the bottom at Leslie Lake only
	July and September	n=2 @ 1 m and n=2 @ mid water column depth at Pigeon-Fay and Upper Exeter Watershed stations only
Streams	freshet (early June), July, mid-August, fall high flows (September)	n=2
	Biweekly during open water season	n=2 at Pigeon Reach 1 only
Phytoplankton		
Lakes	early August	n=3 @ 1 m
Zooplankton[1]		
Lakes	early August	n=3 vertical hauls from 1 m above bottom to surface
Benthos[1]		
Lakes	early August	n=3 @ 5-10 m depth (mid)
Streams	early August to early September	n=5
Sediment Quality		
Lakes	early August	n=3 @ 5-10 m depth (mid) Ekman grabs and cores

[1] *Reference lakes and lakes of the Koala and King-Cujo watersheds only.*

Figure 2.1-1
AEMP Lake and Stream Sampling Locations, 2014

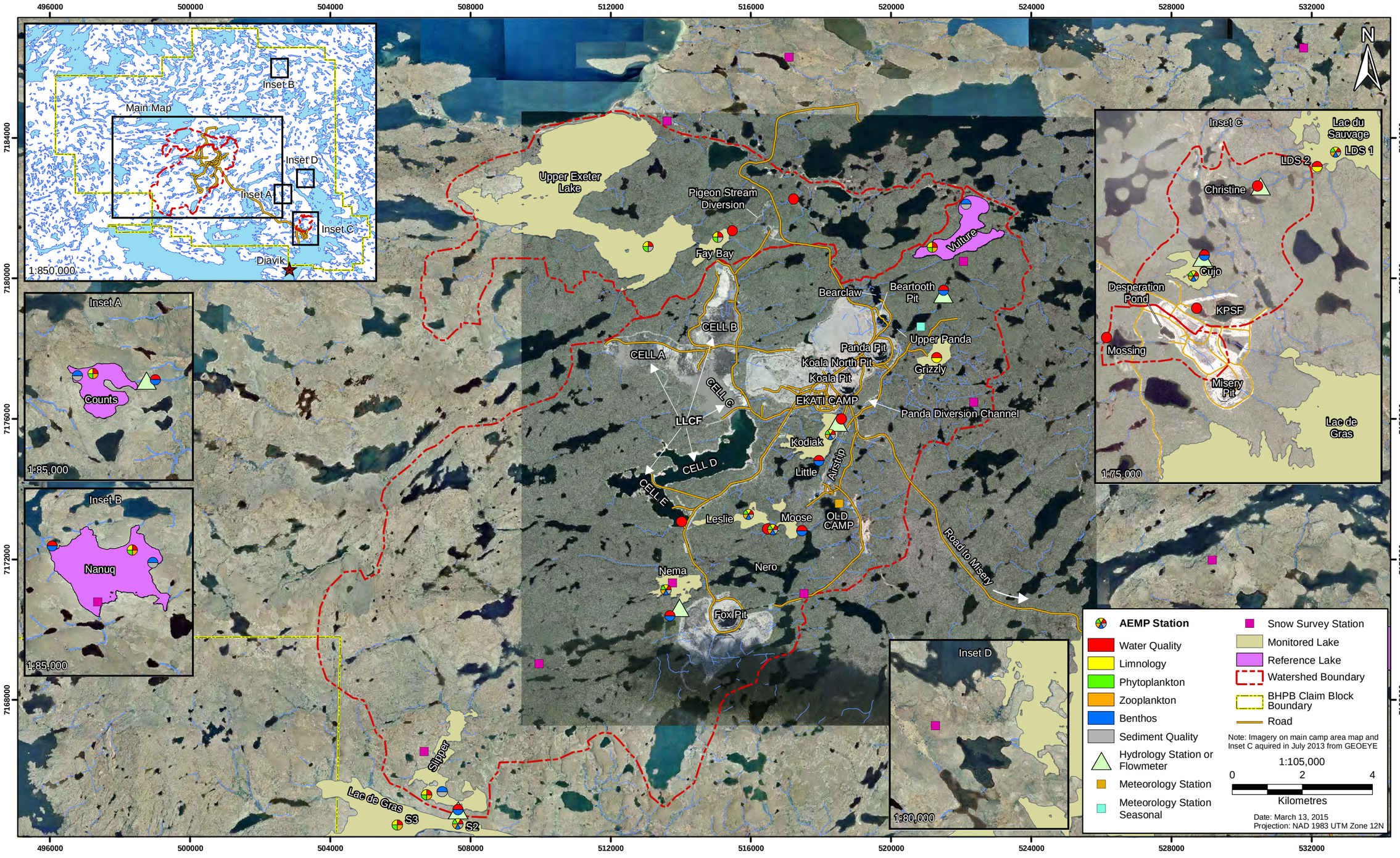


Figure 2.1-2
Surface Water Flow Through the AEMP Sampling Area

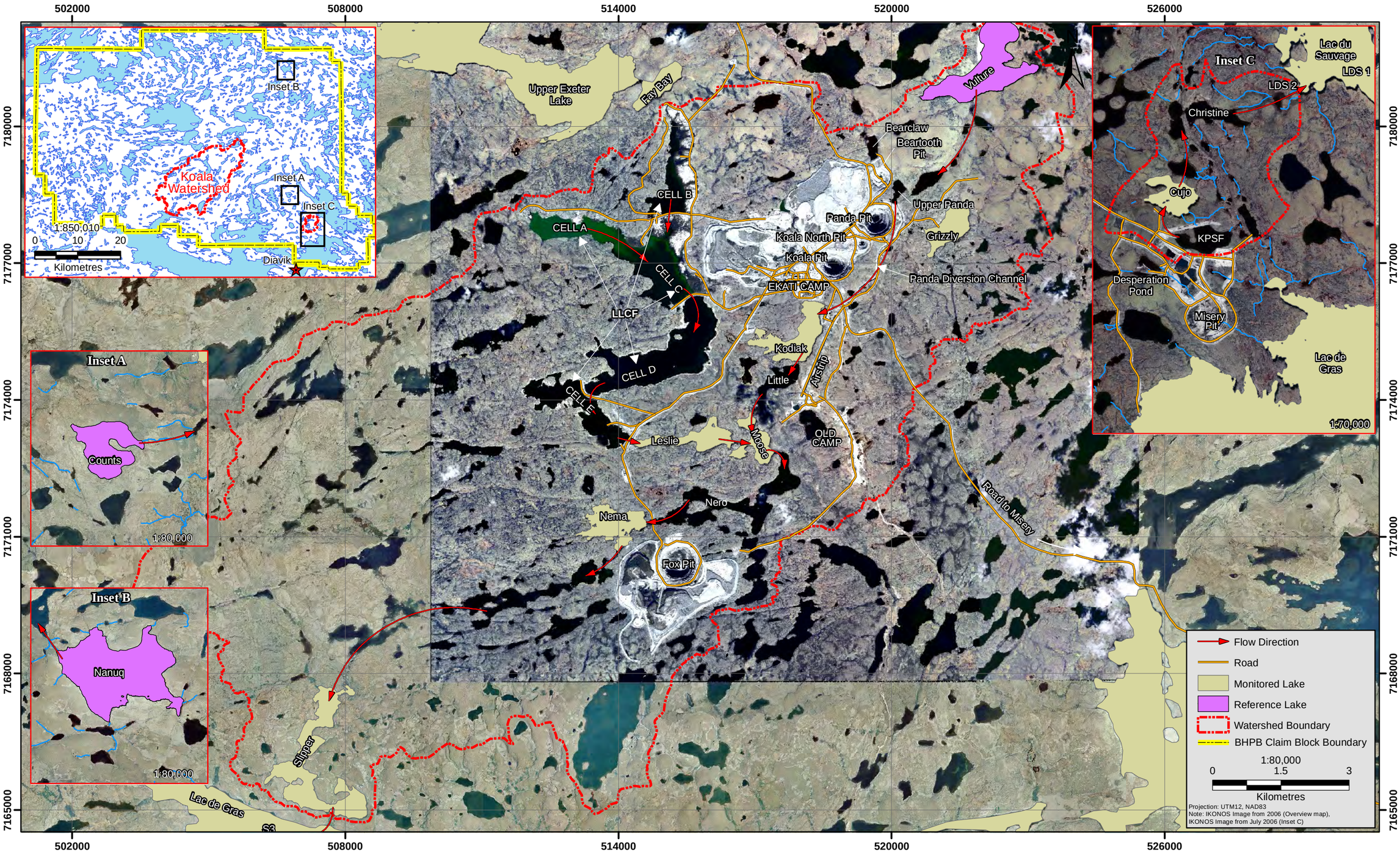


Figure 2.1-3

Environmental Sampling Locations for Nanuq Lake, 2014

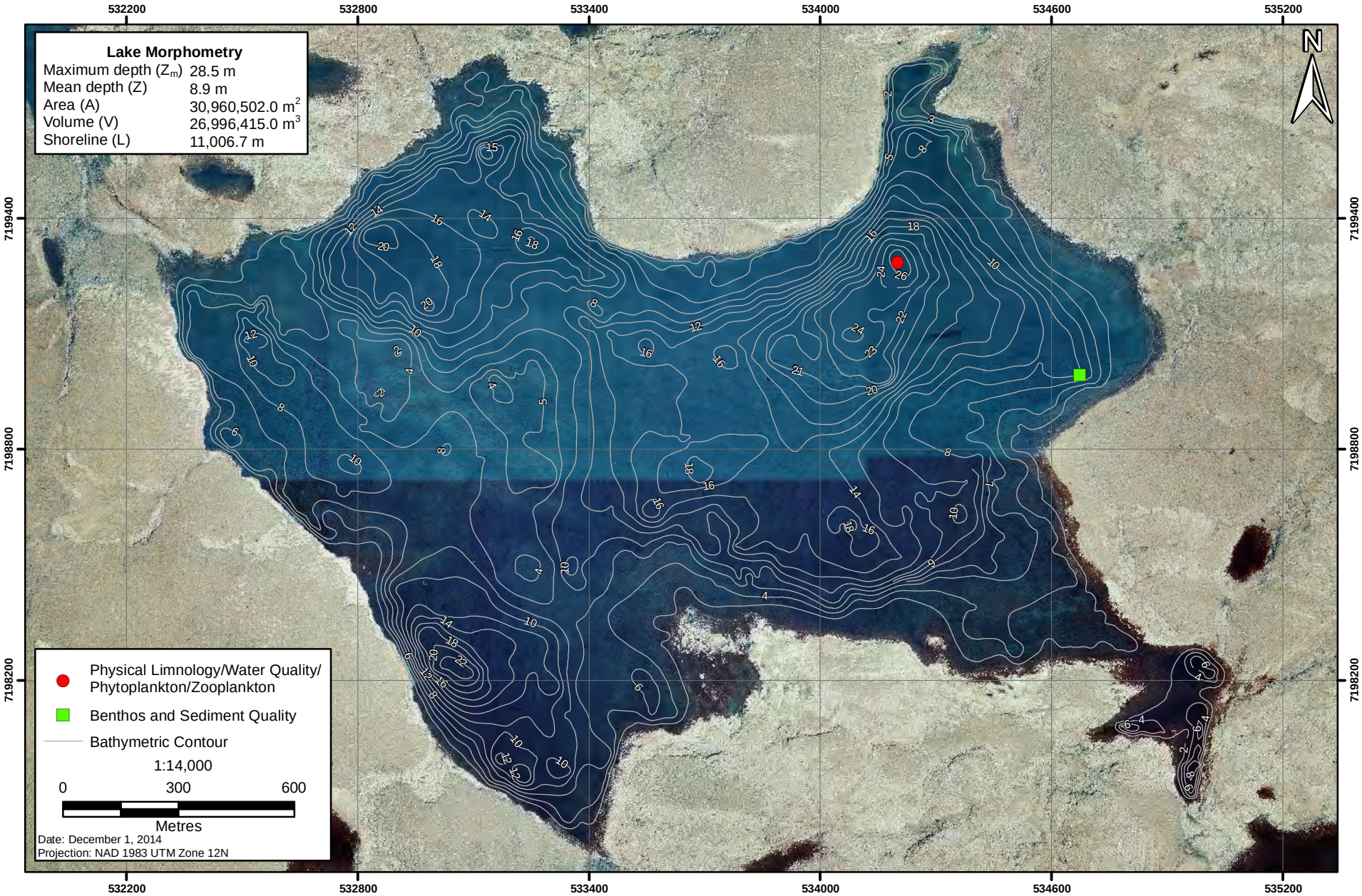


Figure 2.1-4

Environmental Sampling Locations for Counts Lake, 2014

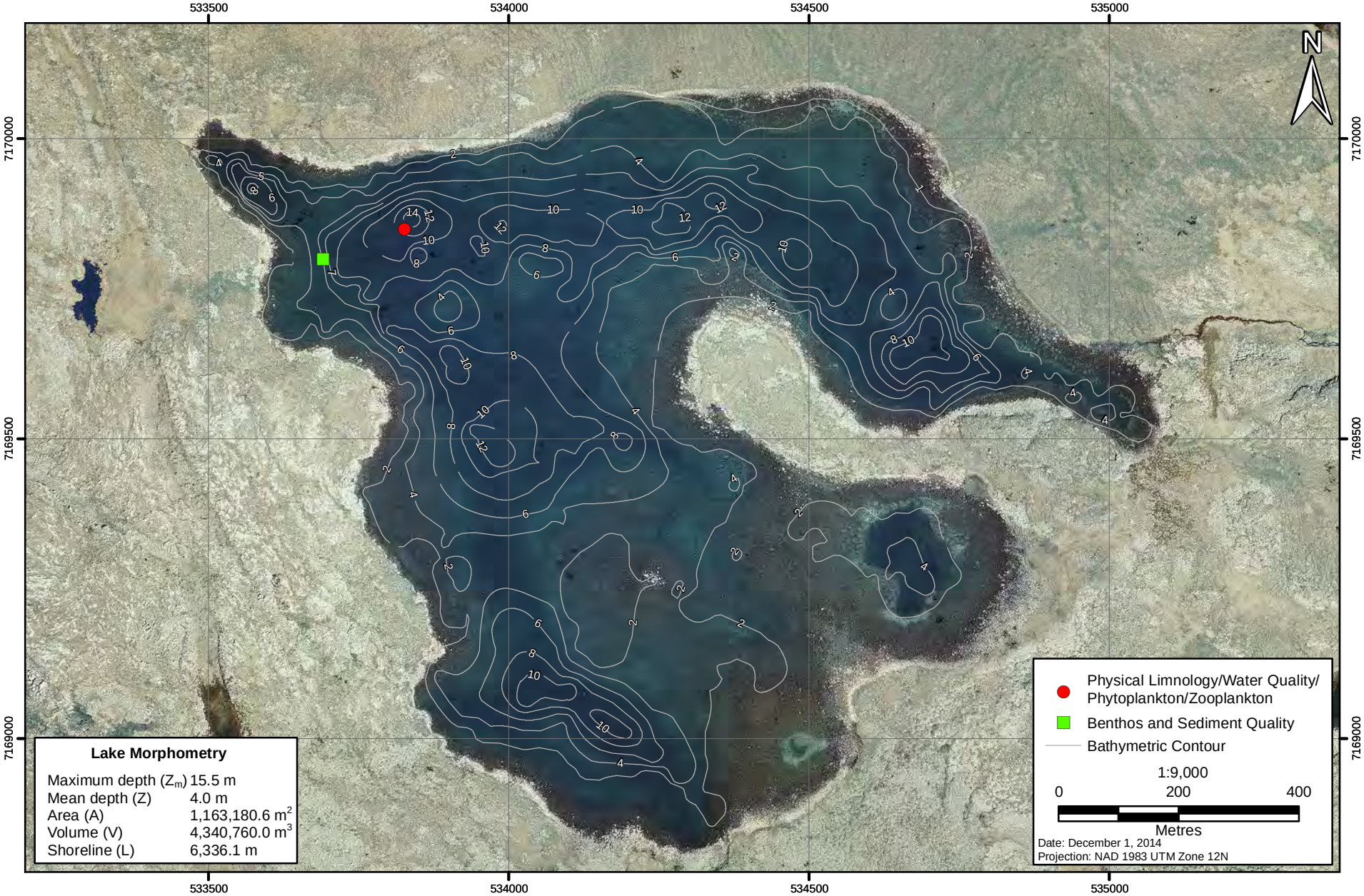


Figure 2.1-5

Environmental Sampling Locations for Vulture Lake, 2014

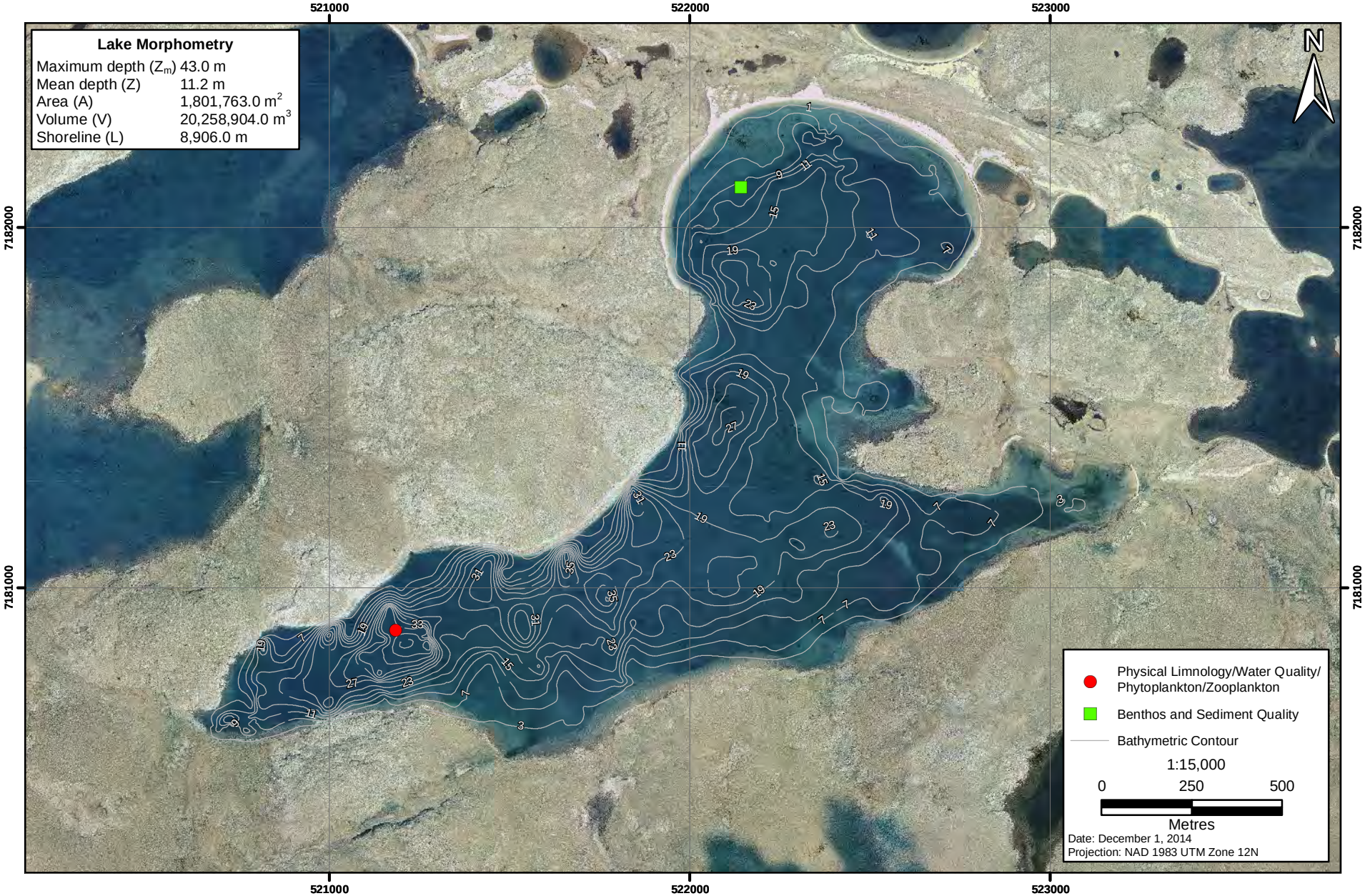


Figure 2.1-6
Environmental Sampling Locations for Grizzly Lake, 2014

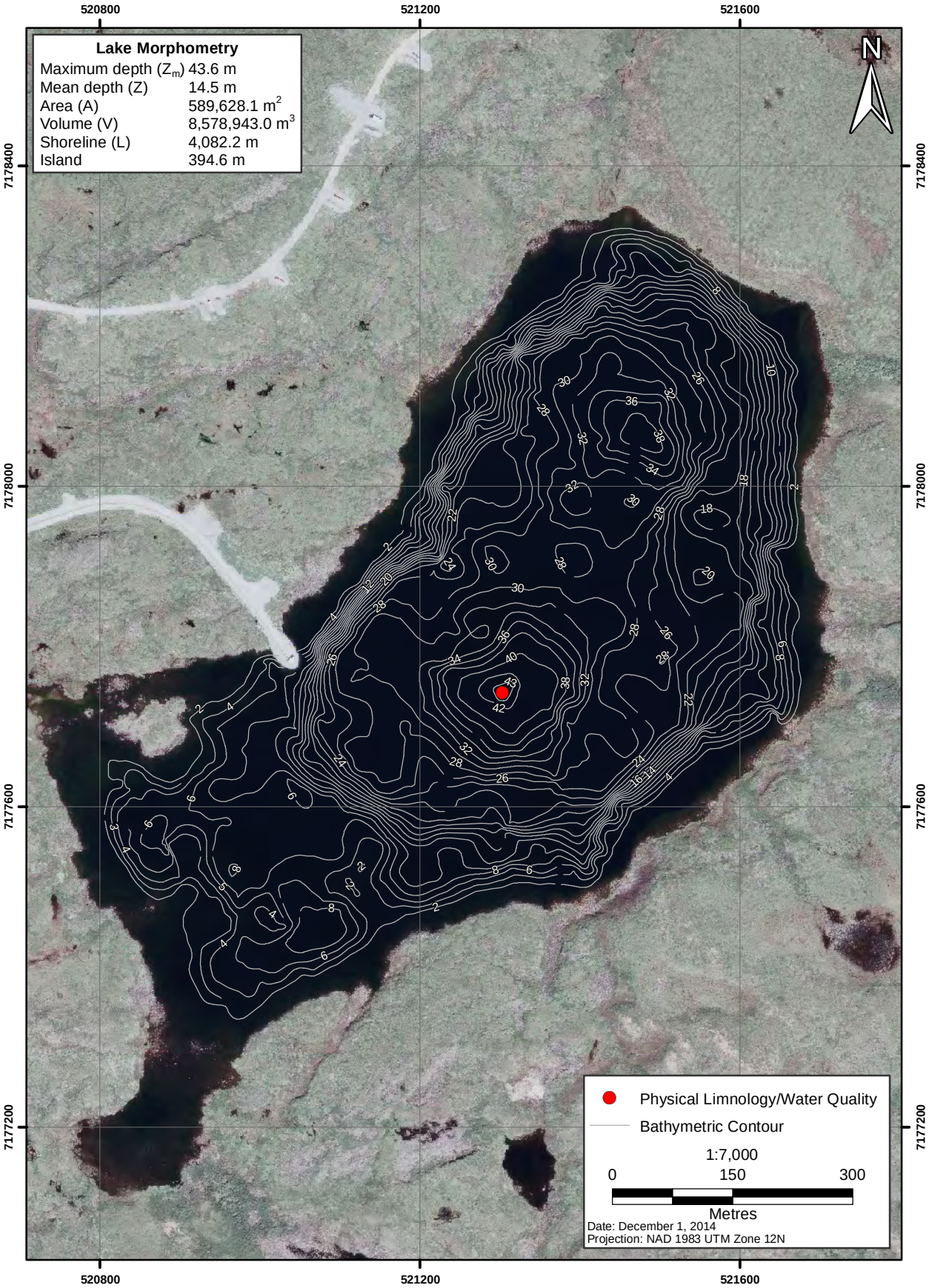


Figure 2.1-7

Environmental Sampling Locations for Kodiak Lake, 2014

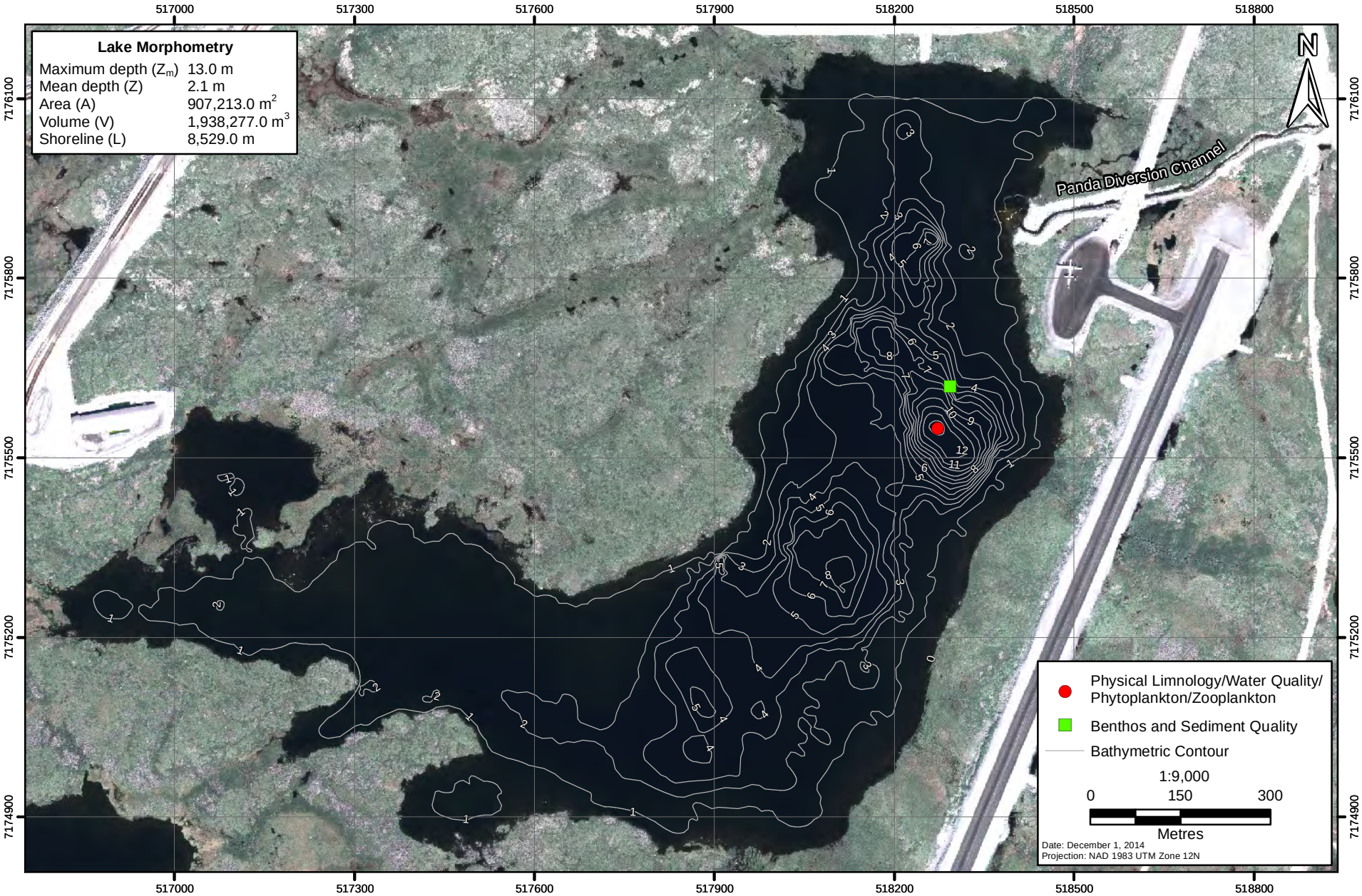


Figure 2.1-8

Environmental Sampling Locations for Leslie Lake, 2014

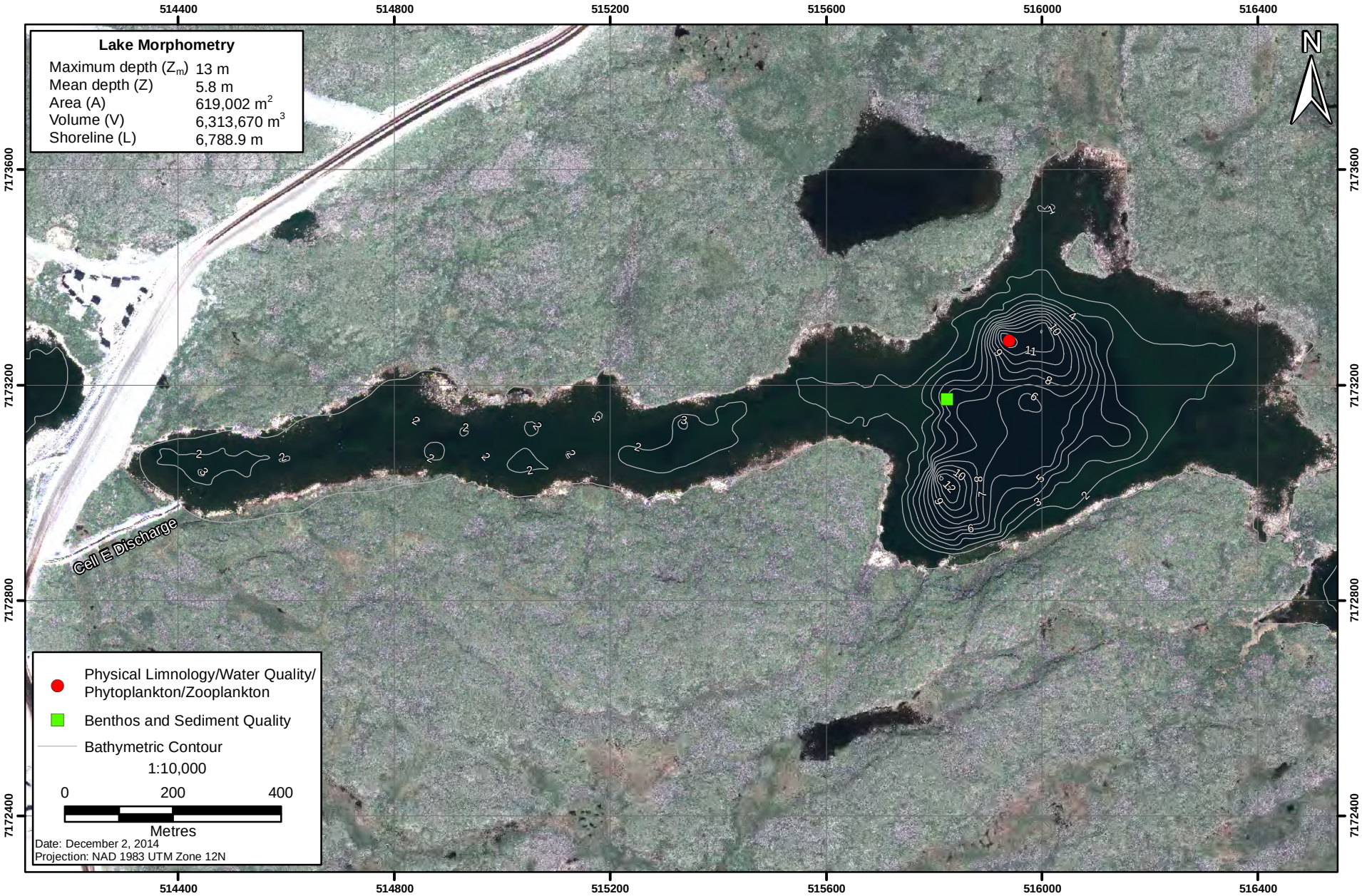


Figure 2.1-9

Environmental Sampling Locations for Moose Lake, 2014

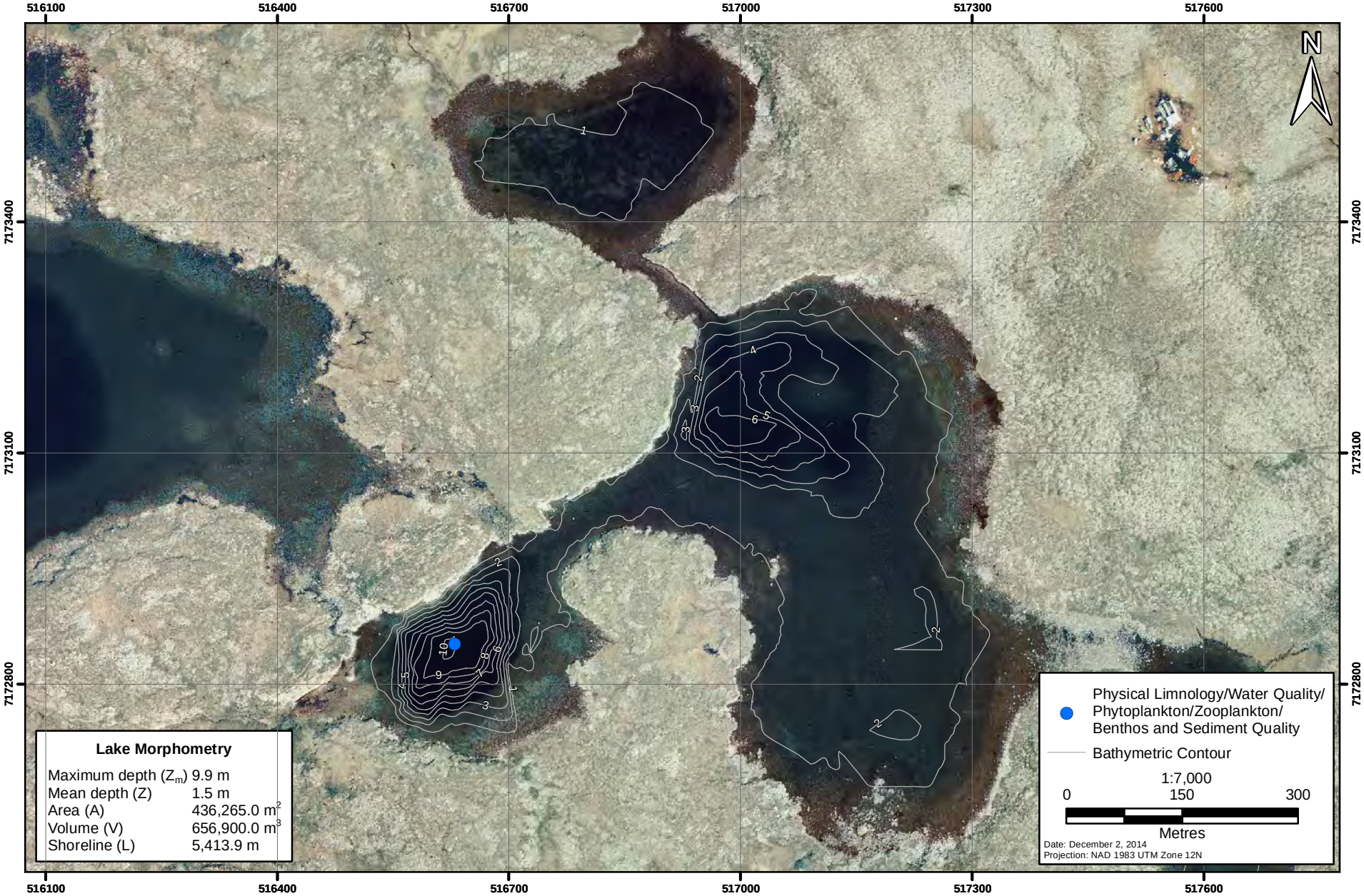


Figure 2.1-10

Environmental Sampling Locations for Nema Lake, 2014

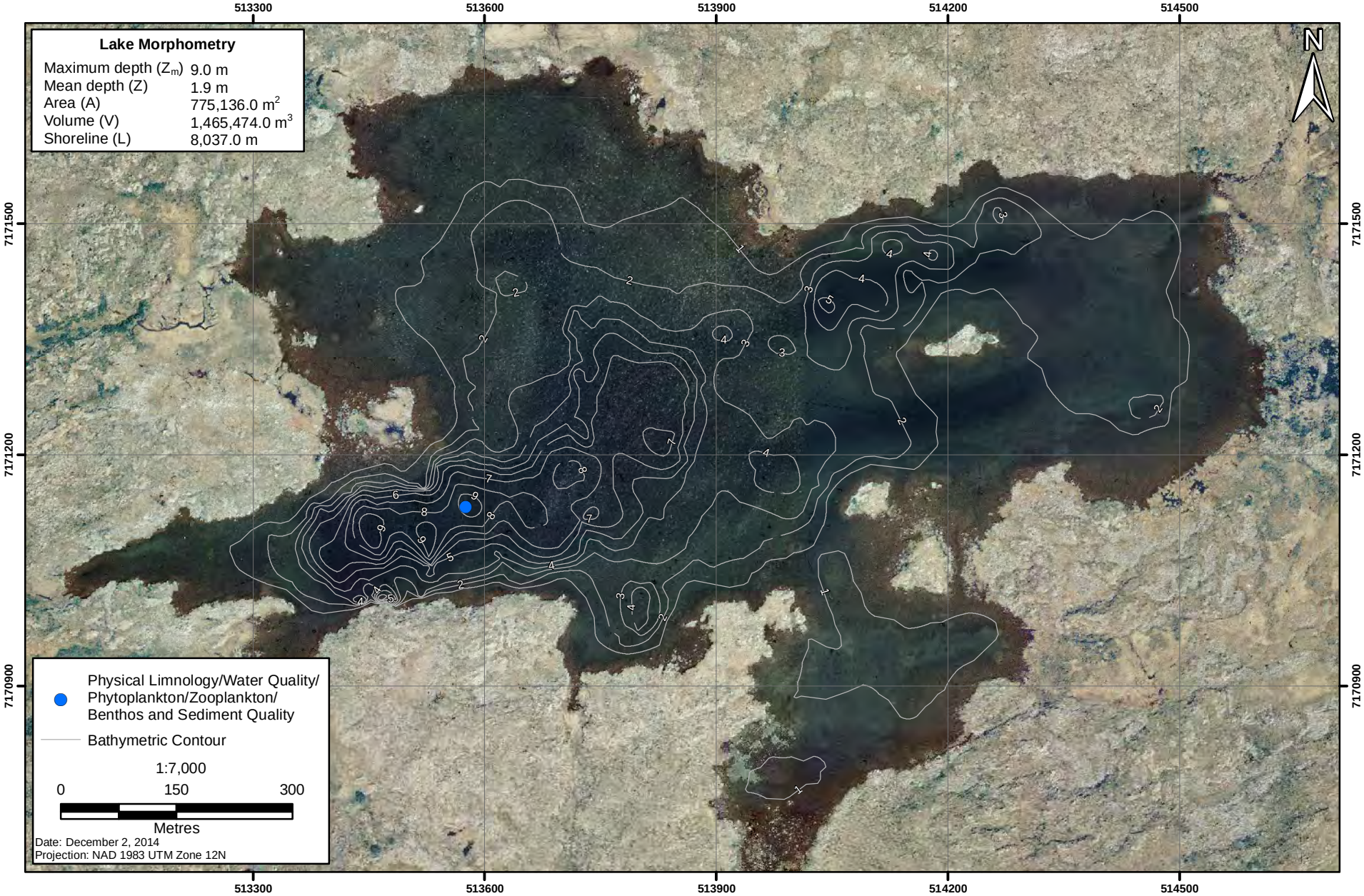


Figure 2.1-11
Environmental Sampling Locations for Slipper Lake, 2014

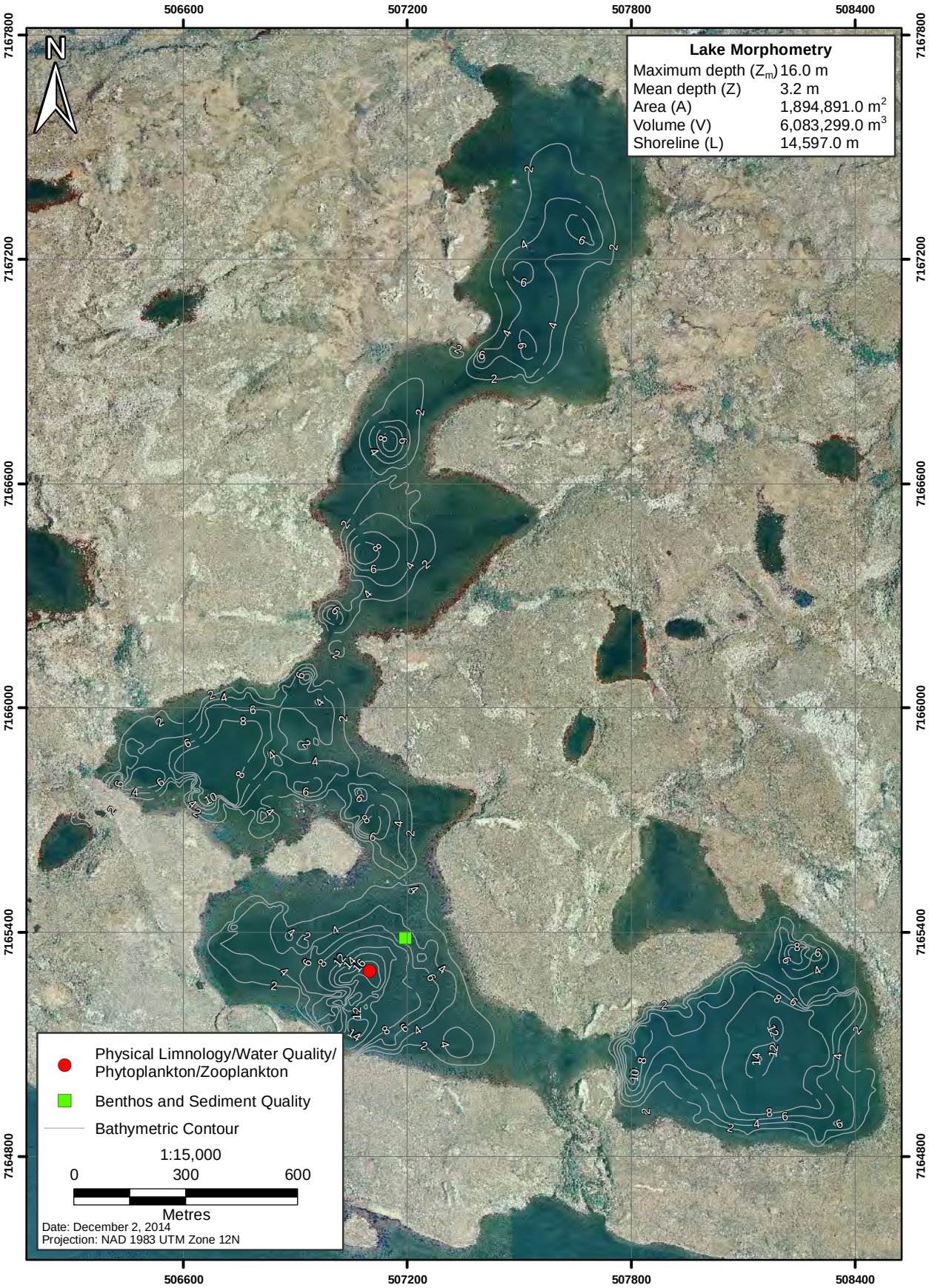


Figure 2.1-12

Environmental Sampling Locations for Lac de Gras, 2014

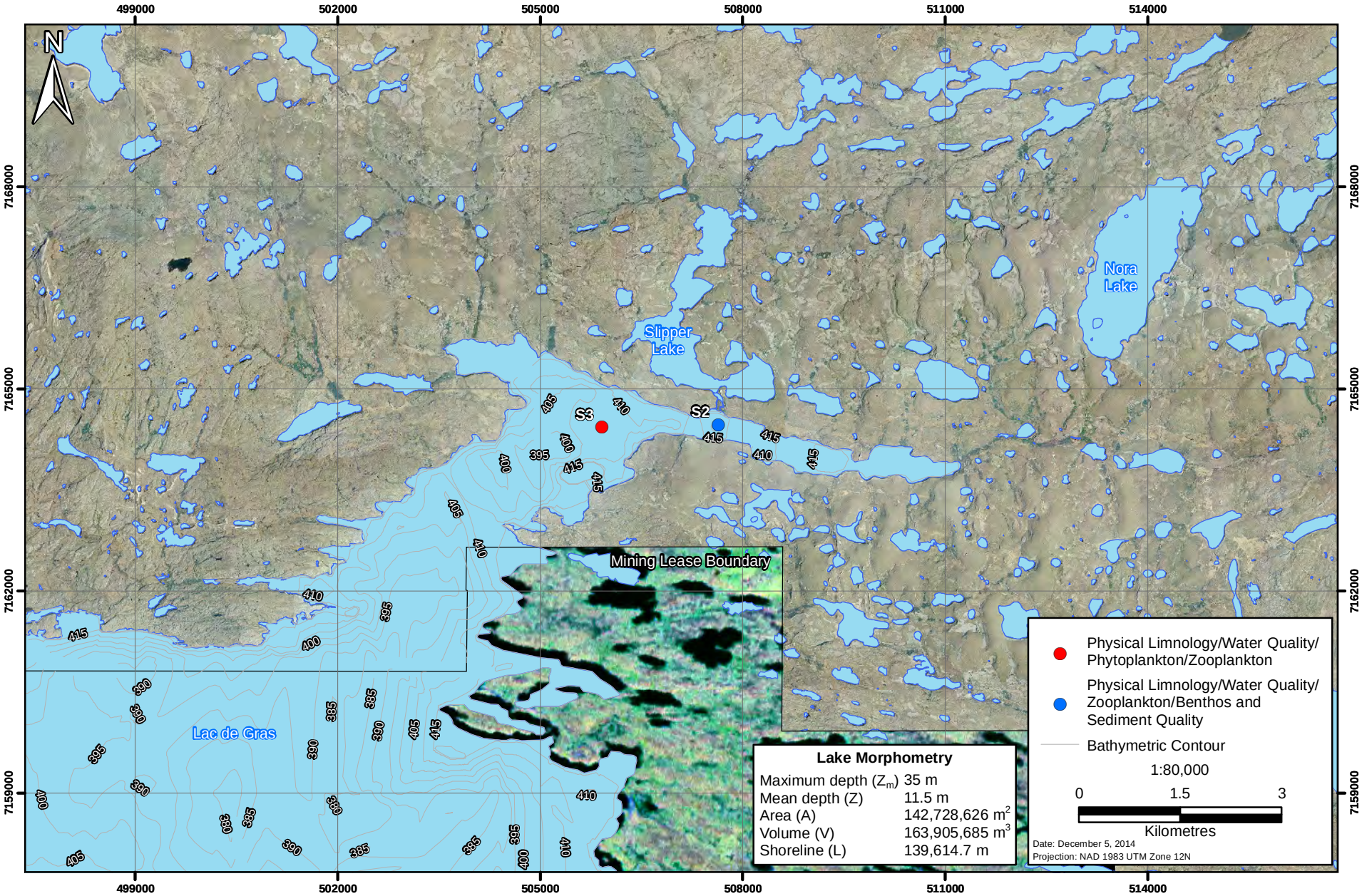


Figure 2.1-13

Environmental Sampling Locations for Cujo Lake, 2014

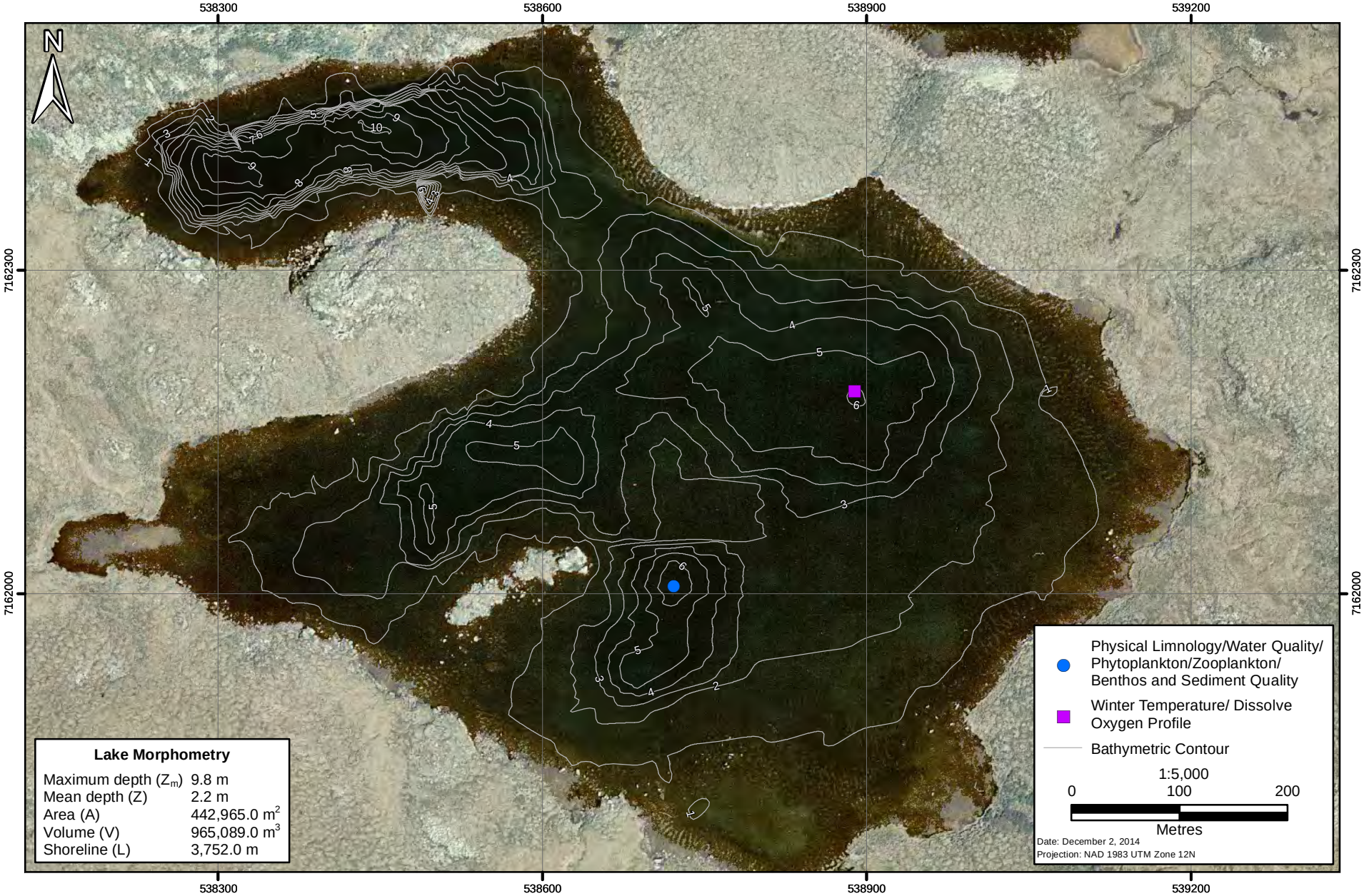


Figure 2.1-14
Environmental Sampling Locations for Lac du Sauvage, 2014

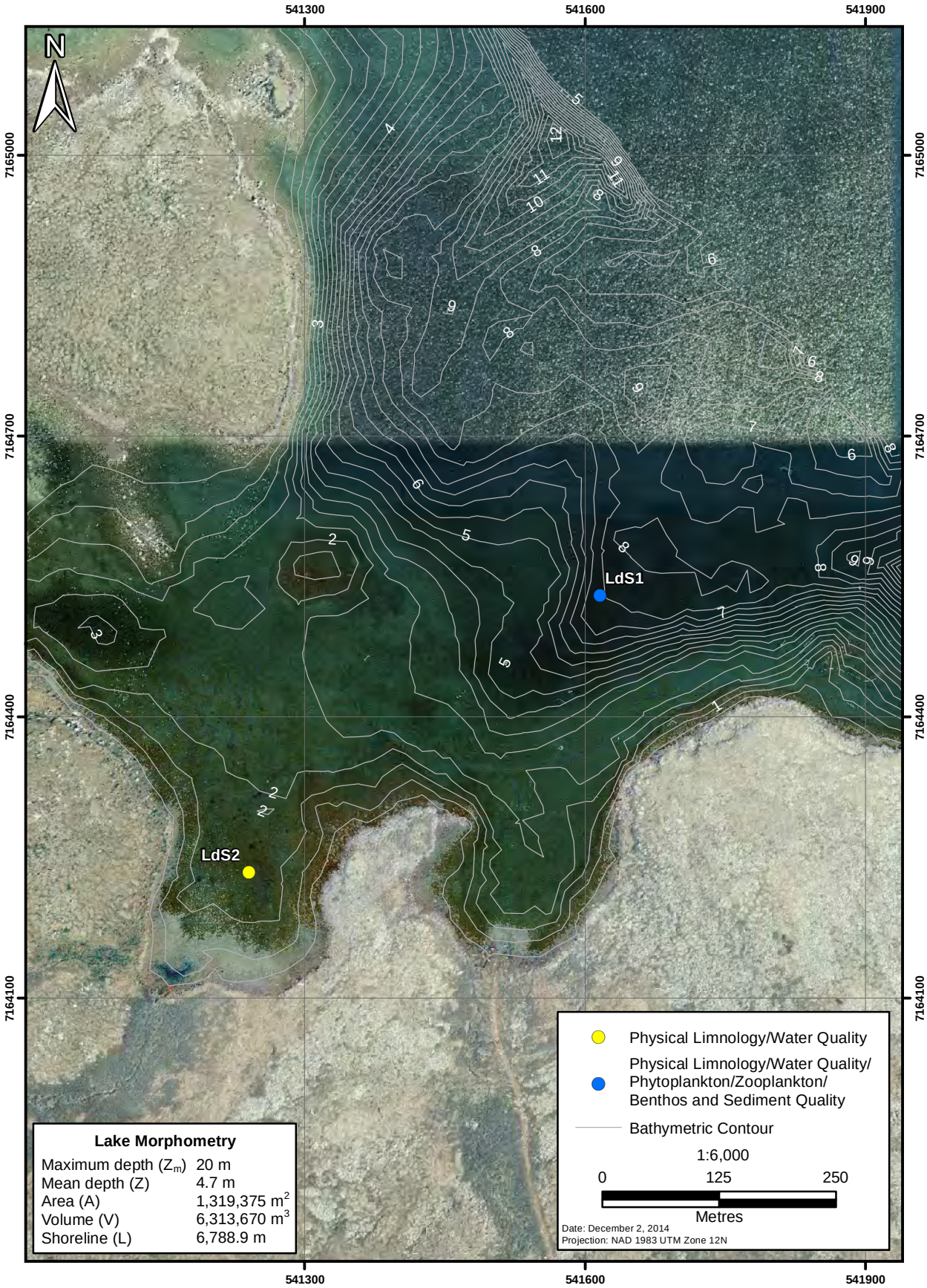


Figure 2.1-15
Environmental Sampling Locations for Fay Bay, 2014

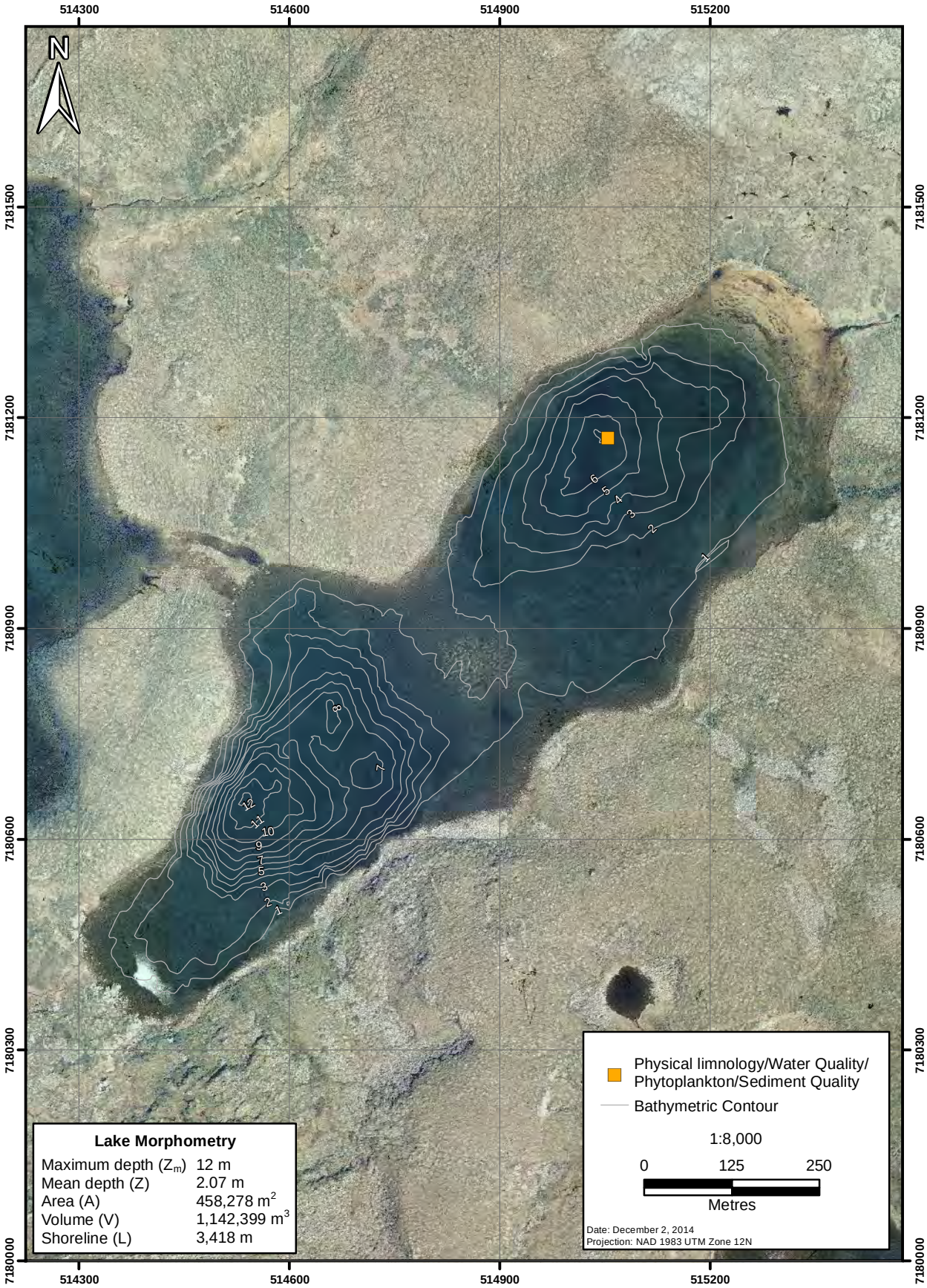
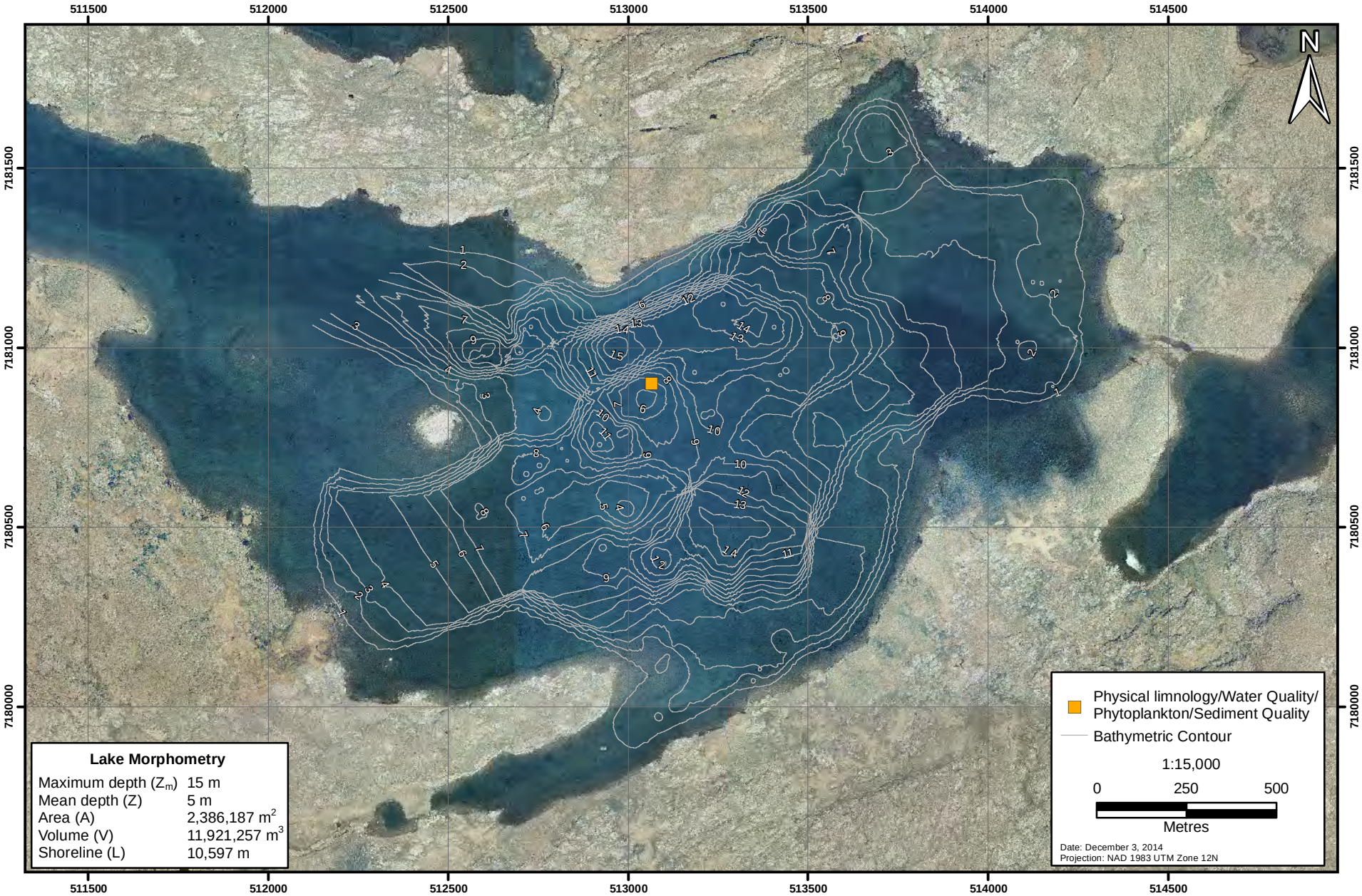


Figure 2.1-16

Environmental Sampling Locations for Upper Exeter Lake, 2014



2.2 METEOROLOGY

2.2.1 Field Methodology

The meteorological monitoring program includes the operation of the Koala automated meteorological station that has been in continuous operation since 1993 (Figure 2.1-1). The Koala station operates year round and continuously monitors wind speed and direction (at 10 m height), air temperature, humidity, rainfall, total precipitation (as of June 2014) and snow depth (as of February 2014).

The Polar Lake micrometeorological station is operated during the open water season (typically June through September; Figure 2.1-1). In 2014, the station was commissioned on June 28 and decommissioned on October 12. The station includes sensors for monitoring wind speed and direction, air temperature, humidity, water temperature, solar radiation, net radiation, and rainfall. Data from this station are used to calculate open water evaporation using the Penman Combination Method from Chow et al (1988). Historically, both meteorological stations used a Campbell Scientific CR10 data logger which was upgraded to the current generation CR1000 data logger in November 2013. The data loggers automatically control the operation of each station and store the measurements from each sensor in hourly and daily data tables. During each station's operating period, DDEC Environment personnel visit every two weeks to download data from the data logger. Both stations are powered by a 12 volt deep cycle marine battery and solar panel.

The tipping bucket rain gauges (TBRGs) used at both stations record rainfall during the summer months, but they are not modified to record total precipitation through the winter. During the winter months, DDEC Environment personnel manually monitor a Nipher snow gauge adjacent to the Koala station to generate monthly totals for snow-water-equivalent (SWE) precipitation. This involves placing a container inside the Nipher gauge to collect snow for about a week, after which it is exchanged with an empty container. The retrieved container of snow is brought inside to melt and the resulting volume of liquid water is then measured to determine the SWE for that collection period. A Geonor all-weather precipitation gauge was installed at the Koala station in June 2014 to be used alongside the Koala TBRG and Nipher gauges. The Geonor gauge utilizes a single Alter wind screen to reduce precipitation undercatch caused by the wind.

Snow surveys are completed near the end of the winter period (typically late April or early May) at 12 locations within the DDEC claim block. In 2014, the snow survey was completed from April 5 to April 10 (Figure 2.1-1). Each snow survey sample location involved the collection of ten cores along a snow course, measured over 100 m. Each snow core was collected in a specialized coring cylinder that measures the snow depth. This cylinder was then weighed with and without the snow core in order to calculate the SWE and density of the extracted snow core.

2.2.2 Data Analysis

All meteorological data were reviewed after collection in order to filter out or correct any erroneous values. The screening process used by ERM draws on screening criteria used by the United States Environmental Protection Agency (US EPA 2000) and Environment Canada (2004b), as well as using professional judgment. Any erroneous data were marked as missing if they could not be corrected.

After the data were screened, the recorded hourly and daily values were analyzed and processed into daily and monthly summaries.

Air temperature and precipitation data obtained from Kugluktuk and Yellowknife airports were also used for comparison with the data collected at the Ekati Diamond Mine.

Rainfall recorded by the Geonor in the summer was more accurate than rainfall recorded by the TBRG due to TBRG maintenance issues. For reporting purposes, the rainfall amounts presented in Section 3.1 were those recorded by the Geonor, where available.

All SWE values from the Nipher Snow Gauge were corrected for wind speed using the Nipher snow equation from Goodison et al. (1998):

$$R = 100 - 0.44W^2 - 1.98W \qquad \text{(Equation 1)}$$

where R is the gauge value/true value, in percent, W is the mean wind speed at the Nipher snow gauge height in m/s over the period between Nipher measurements. The Power Law was used to correct the 10 m wind speeds from the Koala station to the 1 m Nipher gauge height. Terrain was assumed to be flat and open country.

Monthly SWE totals were calculated from weekly SWE measurements. For months that did not have Nipher gauge readings taken on the last day of the month or the following day, linear interpolation was used to estimate the amount of SWE accumulated in one month compared to the following month.

Evaporation was calculated on a daily basis from the Polar Lake micrometeorological station using the Penman Combination Method from Chow et al. (1988). If a full month of evaporation data was not available for a particular month (due to station installation and removal dates), evaporation was estimated by multiplying the available mean monthly evaporation by the number of total days in that month. This method was only used for months that were not missing a significant number of days of evaporation data as determined by meteorological conditions measured at the Koala station during this time. If the meteorological conditions during the period of available evaporation data were representative of the whole month, then this evaporation estimate method was used.

If a month was missing a significant number of days of evaporation data such that the above estimate method would be inaccurate (i.e., the daily evaporation rate from the available data period was not representative of the whole month), monthly evaporation was estimated using the potential evapotranspiration (PET) method along with the ratio between a full month's measured evaporation and calculated PET (Thornwaite 1948).

2.3 HYDROLOGY

Hydrometric measurements were undertaken throughout the open water season in 2014 (Table 2.1-1; Figure 2.1-1). Automated hydrometric monitoring stations were installed from late May to early June, and operated until mid-September, when stations were demobilized for winter. A minimum of five manual streamflow measurements were completed at each station throughout the open water season. Differential levelling surveys were conducted approximately monthly, in conjunction with every second manual streamflow measurement in order to maintain elevational control at the stations. Cross-sectional geometry surveys were completed once during low flows in August to support development of the stage-discharge relationships and to monitor the stability of hydraulic controls at each monitoring location.

The stage-discharge measures were collected for the purpose of developing rating curves and estimating hydrologic parameters (i.e., annual runoff and runoff coefficients) as described below.

2.3.1 Stage Measurement

Three local benchmarks were previously installed at each station to establish and maintain datum elevation control. One primary benchmark at each station was assigned an assumed local elevation of 100.000 (masl). All recorded water levels were referenced to this primary bench mark. The water level, as measured by the pressure transducer at each hydrometric monitoring station, was checked and compared to previous surveys at the site during each survey to ensure there was no drift or movement in the sensors. Each survey was completed using either a Nikon AC2-s engineer's rod and level or a Nikon Nivo 3.M total station to check whether any change or drift in the position or signal of the transducers had occurred. The data loggers recorded stage at 10 minute intervals at all stations except station Slipper-Lac de Gras and station Vulture-Polar which recorded at 15 and 30 minute intervals, respectively. Data loggers were installed as soon as possible after snowmelt began in spring and were removed in mid-September, prior to winter freeze up. Where necessary, stage data were corrected using the surveyed water elevations. One-metre staff gauges were used to provide on-site independent checks of recorded and surveyed stage levels.

2.3.2 Streamflow Measurement

Streamflow (discharge) was measured manually by ERM and/or DDEC staff. These measurements were completed at each hydrometric station throughout the open water season, providing measurements over a wide range of water depths and discharges.

Manual discharge measurements requires measuring water velocity and depth at regular intervals along a cross-section of the stream of interest. The cross-sectional area of the stream (m^2) and the velocity of the water (m/s) were used to compute discharge (m^3/s). Measurements were collected using a hand-held electromagnetic current meter (Hach Model FH950). A minimum of 20 velocity and depth measurements were typically obtained across the stream cross-section. In some cases, during low flow conditions, the channel width decreased and the number of measurements obtained was less than 20.

Velocity measurements were collected at 60% of the flow depth, which is generally accepted as representing the mean velocity of the vertical water section (Herschy 2009). When water depths were greater than 0.75 m, current velocities were measured at 20% and 80% of the water depth, with the average of the two readings taken to represent the mean velocity for the vertical.

Measurement error was calculated for each discharge measurement at each station. Measurement error comprised the sum of errors from the physical measurements of channel (width, depth, and velocity), instrumentation errors (current meter averaging interval and calibration errors), and the sum of errors associated with velocity measurement (number of measured verticals, and number of measurements per vertical). Measurement error was expressed as uncertainty (%) at a 95% confidence interval (Herschy 2009).

2.3.3 Rating Curves

Stage was converted to streamflow discharge estimates using an empirical stage-discharge relationship (a rating curve). Rating curve equations were developed using standard methods outlined by the International Organization for Standardization (ISO 2010). Discharge was determined by a power function, of the form:

$$Q = C\,(h - a)^{b} \qquad \text{(Equation 2)}$$

where Q is the discharge (m^3/s), C and b are regression coefficients, and h is the stage (water level in metres). Variable a represents a datum correction for, initially, the stage at zero flow (m), assuming that the gauge is positioned at a level below the point of zero flow.

By convention, rating curves are plotted on graphs where the dependent variable (Q) is plotted as the x-coordinate along the abscissa and the independent variable (h) is plotted as the y-coordinate along the ordinate (Herschy 2009). Rating curves were constructed using the "Graphical Rating Development Toolbox" within the Aquarius Server™ software, Version 3.4.149 (Aquatics Informatics Inc. 2011, 2014).

The root mean square deviate (RMS) is a statistical parameter that describes how well the values predicted by the stage-discharge relation fit or represent the observed data. The departure from true values computed by this statistic combines both bias and lack of precision. The lower the RMS, the better the estimated values provided by the rating curve.

The RMS which is used by the Aquarius® software as an overall measure of error of the stage-discharge relationship (Equation 3):

$$RMS = \sqrt{\frac{\sum_{i=1}^{n}\left(\frac{Q_m - Q_o}{Q_m}\right)^2}{n}} \qquad \text{(Equation 3)}$$

where n is the number of rating points used to develop the stage-discharge relation, Q_o is the observed discharge during the manual discharge measurement, and Q_m is the discharge calculated by the developed rating equation.

Rating curves for each station were typically constructed using rating measurements collected during each year of monitoring in order to assess the overall stability of hydraulic conditions in the channel. At station Slipper-Lac de Gras measurements collected prior to 2013 did not fit the same stage-discharge relationship as subsequent years and only rating measurements collected in 2013 and 2014 were used. In some cases a breakpoint was required. Breakpoints are used when cross-sectional channel geometry changes above a certain elevation, altering the stage-discharge relationship (e.g., when a river overtops its banks). When a breakpoint is used, one rating equation defines flows at low stages and one equation defines flow at high stages. Additionally, at stations Lower PDC and Christine-Lac du Sauvage, a shift was added in the rating curve to account for seasonal changes in the stage-discharge relationship.

2.3.4 Hydrologic Parameters and Flow Estimation

To generate hydrographs and estimate hydrologic parameters such as annual runoff and runoff coefficients, flow conditions were estimated for the periods prior to mobilization and after removal of the hydrometric stations. Thawing and freezing dates were estimated by analyzing air temperature data collected on site. May 26 was the first day in 2014 when the daily mean air temperature was above zero. Freshet began around May 19 at the regional Water Survey of Canada (WSC) station Coppermine River below Desteffany Lake (10PA001) with a peak discharge occurring on June 1. The Ekati Diamond Mine AEMP watersheds are smaller in size than the regional station and usually have a delayed freshet and peak discharge. Based on the local temperature data and regional stations, the onset of spring freshet was estimated to have begun between May 29 and June 1 at the AEMP hydrometric stations. Similarly, October 10 was estimated as the date when freeze-up occurred; the date when air temperatures were below zero for more than ten consecutive days. Logarithmic growth and geometric decay functions were used to fill the data gaps between discharge generated from the rating curve or manual flow measurements and the estimated dates when water began flowing or the channel froze to its bed.

In many cases the highest recorded discharge corresponds to the first day of monitoring. This was likely due to peak flows occurring prior to the installation of monitoring equipment. Similarly the lowest flow captured during the open water season often corresponded to the day stations were demobilized (September 12).

Estimates of annual runoff and runoff coefficients were calculated from the available data and interpolated using the equation:

$$Ro = (Q \times t)/A \qquad \text{(Equation 4)}$$

where runoff (Ro; units = mm) is calculated as discharge (Q; units = m^3/s) multiplied by time (t; units = seconds) divided by basin area (A; units = km^2). Runoff is valuable for obtaining gross estimates of the water available from a basin. It is standardized by drainage area, so it is a useful index for comparing the hydrologic responses of basins of different sizes. Runoff coefficients evaluate the ratio of precipitation that contributes to streamflow. To compute each runoff coefficient, runoff from each station is divided by the total precipitation at the Koala meteorological station for the 2014 hydrologic year (corrected for under catch).

2.3.5 Hydraulic Geometry Surveys

Hydraulic geometry surveys were completed at each monitoring station in order to define the channel geometry of the gauged stream sections and identify hydraulic controls at each station. The hydraulic controls within the channel are important in determining stage-discharge relationships at each station. Hydraulic geometry is also important for monitoring the stability of the streams over time.

Cross-sections were identified perpendicular to the direction of flow in the channel reach and were surveyed using a total station (Nikon Nivo 3.M). Two sections were surveyed at Cujo Outflow; one at the flow gauging section of the outlet channel, and the other as a shoreline profile at the automated station. Three cross-sections were completed at each remaining station. At station Slipper-Lac de Gras, each of the cross-sections were completed within the outlet channel of Slipper Lake (the automated station is not in the outlet, it is located along the shore of Slipper Lake). At each remaining station, one transect was surveyed upstream of the automated station at the upstream boundary control, one transect was surveyed at the automated station, and one transect was surveyed downstream of the automated station at the downstream boundary control. All surveyed cross-sections were referenced to the established local datum.

2.4 PHYSICAL LIMNOLOGY

2.4.1 Physical Limnology Field Methodology

2.4.1.1 Under-ice Season (April)

Under-ice temperature and dissolved oxygen (DO) profiles were conducted in late April, coincident with under-ice lake water quality sampling (Table 2.1-1; Figures 2.1-1 to 2.1-16). Additional profiles were collected from January through April in Kodiak and Cujo lakes because low DO concentrations have been observed at these locations in the past.

An auger was used to drill a hole through the ice at the designated site within the deepest area of each lake. Ice chips were scooped from the augured hole before sampling. A YSI 6820™ continuously sampling sonde equipped with an optical DO probe, thermistor, and depth sensor was used to collect DO and temperature profiles. The probe and thermistor measurements were allowed to stabilize at the surface before the sonde was lowered slowly through the water column. Data were collected from the lake's surface to just above (0.5 to 1 m) the water-sediment interface.

2.4.1.2 Open Water Season (August)

Water transparency as well as DO and temperature profiles were measured at designated sites within the deepest area of each lake in August (Table 2.1-1; Figures 2.1-1 to 2.1-16). Water transparency was measured by taking the Secchi depth using a standard 20 cm black and white Secchi disk. The Secchi disk was attached to a metered line and lowered over the shaded side of the boat until it was no longer visible in the water column. The disk was then slowly raised until it once again became visible and this depth was recorded to the nearest 0.1 m. Temperature and DO profiles were obtained with a YSI ProODO™ optical DO probe equipped with a thermistor and 50 m cable marked at 0.5 m intervals. The probe and thermistor measurements were allowed to stabilize at the surface before the device was lowered slowly through the water column. Depth, temperature, and DO (mg/L and % saturation) were recorded at every 0.5 m depth for lakes less than 10 m deep and every 1 m for lakes greater than 10 m deep.

2.4.2 Physical Limnology Data Analysis

Secchi depths were used to calculate the euphotic zone depth (EZD), which is defined for the purpose of the AEMP as the depth at which 1% of surface radiation occurs. This generally represents the zone in a waterbody where integrated photosynthesis equals the integrated respiration (i.e., compensation depth). Above this depth net primary production is possible given sufficient nutrient availability. The EZD was calculated as follows:

$$k' = 1.7/Ds \qquad \text{(Equation 5)}$$

where k' = light extinction coefficient, D_s is the Secchi depth, and 1.7 is a constant derived from experimental and is widely accepted for non-turbid waters (Poole and Atkins 1929).

From this, the EZD was calculated as follows:

$$EZD = 4.6/k' \quad \text{(Equation 6)}$$

DO data from both under-ice and open water sampling periods were compared to the Canadian Council of Ministers of the Environment (CCME) freshwater guidelines for cold water organisms. The guideline is 9.5 mg/L for "early life stages", and 6.5 mg/L for "other life stages" (CCME 1999). The guideline of 6.5 mg/L is most applicable to the biota living in the water column in lakes. The guideline of 9.5 mg/L was established to protect salmonid larvae in redds (CCME 1999) and is therefore more applicable to DO concentrations at the lake bottom. CCME does not specify whether the guidelines are applicable throughout the water column, or as an overall mean. Nonetheless, the guidelines can be used as an indication of habitat quality (with respect to DO) for a particular life stage; however, it must be acknowledged that even pristine lakes may not always achieve DO concentrations within the guidelines, especially during ice-cover. For the purposes of the AEMP, data collected at each depth are compared to the guideline and discussed in relation to the proportion of the water column above and/or below the guideline.

2.5 WATER QUALITY

2.5.1 Water Quality Field Methodology

2.5.1.1 Lake Under-ice (April) Water Quality

In late April, lake water quality samples were collected by DDEC staff at the designated sampling site within the deepest area of each lake (Tables 2.1-1 and 2.5-1; Figures 2.1-1 to 2.1-16). Duplicate samples were collected at two depths within the water column: mid-depth and deep depth (2 m above the sediment-water interface).

An auger was used to drill a hole through the ice and ice chips were scooped from the augured hole before sampling. An acid-cleaned 2.5 L Niskin attached to a metred line was lowered to the designated depth of the water column to collect samples. Silicon tubing was used inside the sampler (rather than latex) to minimize sample contamination. A 1 L sample was collected for analysis of general variables, a 250 mL sample in an acid-cleaned bottle for total metals, a 250 mL amber glass sample for total organic carbon and ammonia-N, and a 40 mL vial for total mercury. Clean sample bottles for water collection were provided by ALS Environmental Services (ALS) in Burnaby, BC. Total metals bottles were acid cleaned by the laboratory prior to shipment to the mine site. The total metals, total organic carbon/ammonia-N samples were preserved in the field with nitric acid (HNO_3) and sulfuric acid (H_2SO_4), respectively. Samples were stored in a cooler in the field and refrigerated upon returning to camp where they were stored until they were shipped to the laboratory for analysis.

2.5.1.2 Lake Open Water (August) Water Quality

Lake water quality samples were collected in August at designated sampling sites within the deepest area of each lake (Tables 2.1-1 and 2.5-1; Figures 2.1-1 to 2.1-16). Samples were collected in duplicate from both a shallow depth (1 m below the water surface) and mid-depth (middle of the water column). Duplicate samples were also collected from deep-depth (2 m above the sediment-water interface) at Leslie Lake.

An acid-cleaned, Teflon-lined General Oceanics FLO bottle (GO-FLO; 5 L) was used to collect water samples. The GO-FLO was attached to a metred line that terminated with a five pound weight. The weight and line were attached so that the GO-FLO hung vertically in the water column and the weight hung slightly below the GO-FLO. To collect a sample the GO-FLO was opened and lowered into the water column to the predetermined sampling depth. A Teflon-coated brass messenger was then used to trigger the bottle closed and the bottle was brought to the surface. A 1 L sample was collected for analysis of general variables, a 250 mL sample in an acid-cleaned bottle for total metals, a 250 mL amber glass sample for total organic carbon (TOC) and ammonia-N, and a 40 mL vial for mercury. Clean sample bottles for water collection were provided by ALS in Burnaby, BC. Total metals bottles were acid cleaned by the laboratory prior to shipment to the mine site. The total metals, TOC/ammonia-N, and mercury samples were preserved in the field with nitric acid (HNO_3), sulfuric acid (H_2SO_4), and hydrochloric acid (HCl), respectively. Samples were stored in a cooler in the field and refrigerated upon returning to camp where they were stored until they were shipped to the laboratory for analyses.

2.5.1.3 Stream Water Quality

Stream water quality samples were collected, in duplicate, four times during the open water season (freshet [early June], July, August, and September) at each of the AEMP stream sites, in addition to biweekly samples collected at Pigeon Stream Reach 1 (Table 2.1-2; Figure 2.1-1). Additional water quality samples were collected at stations 1616-30 and 1616-43 as part of the Ekati Diamond Mine SNP. SNP data from these sites were incorporated into the AEMP dataset for samples that were collected on dates that were coincident with the AEMP sampling period.

Samples were collected by standing downstream of the point of sample collection, submerging the bottle with the mouth positioned upstream and raising and lowering the bottle within the stream in attempt to collect an integrated sample throughout the water column. Care was taken to avoid potential surface water contamination of the sample. A 1 L sample was collected for analysis of general variables, a 250 mL sample in an acid-cleaned bottle for total metals, a 250 mL sample in an amber glass bottle for TOC and ammonia-N, and a 40 mL vial for mercury. Clean sample bottles for water collection were provided by ALS in Burnaby, BC. Total metals bottles were acid cleaned by the laboratory prior to shipment to the mine site. The total metals, TOC/ammonia-N, and mercury samples were preserved in the field with nitric acid (HNO_3), sulfuric acid (H_2SO_4), and hydrochloric acid (HCl), respectively. Samples were stored in a cooler in the field and refrigerated upon returning to camp where they were stored until they were shipped to the laboratory for analyses.

2.5.2 Water Quality Laboratory Analysis

All water quality samples were sent to ALS for analyses of water quality variables at the lowest available detection limit (Table 2.5-2). Analyses were completed to provide detection limits that were below the CCME guidelines for the protection of freshwater aquatic life (CCME 2014b).

2.5.3 Water Quality - Quality Assurance and Quality Control (QA/QC)

Field and travel blanks were processed during each sample session (e.g., June stream water quality or August lake water quality) to account for 5% of the number of samples collected. An equipment blank was also collected at the beginning of each lake sampling session from each sampler (Niskin or GO-FLO) used to collect water samples. Duplicate samples were also collected at each site and sampling depth.

2.5.4 Water Quality Data Analysis

As outlined in the AEMP Plan for 2013 to 2015 (Rescan 2013), a subset of the analytical results for water quality were evaluated: pH, total alkalinity, hardness, chloride, sulphate, potassium, total suspended solids, total ammonia, nitrite, nitrate, total phosphate-P, total organic carbon, total antimony, total arsenic, total barium, total boron, total cadmium, total copper, total molybdenum, total nickel, total selenium, total strontium, total uranium, and total vanadium.

Data collected at SNP stations 1616-30 and 1616-43, which represent the water quality in the LLCF (Cell E) and KPSF, respectively, are presented in the tables and figures of this report for numerical and graphical comparison, but are not included in the analyses and discussion of the dataset.

For the purpose of data analysis and presentation, half of the analytical detection limit was calculated when variable concentrations were less than the analytical detection limit. The duplicate samples from both depth strata were pooled and averaged to obtain an overall site mean for each sampling period.

Stream water quality from all months were compared to August lake water quality and discussed in terms of effluent discharge from the LLCF and KPSF. This comparison ensures that monitoring lake water quality during August only will not impact the likelihood of detecting a potential mine effect.

Where available, water quality variables were compared to the CCME guidelines for the protection of freshwater aquatic life (CCME 2014b). The variables, chloride, potassium, sulphate, nitrate-N, total molybdenum and total vanadium were also compared to the applicable site specific water quality objectives (SSWQOs) developed for the Ekati Diamond Mine (Elphick, Bergh, and Bailey 2011; Rescan 2012b, 2012c, 2012d, 2012f, 2012e). For total phosphate-P, lake specific benchmarks were derived in accordance with the Canadian Guidance Framework for the Management of Phosphorus in Freshwater Systems (Environment Canada 2004a; CCME 2007). The framework uses a tiered approach where predefined trigger ranges are based on the trophic status for the lakes being addressed (Table 2.5-3). The trigger ranges are based on the range of total phosphate-P concentrations in water that define the reference trophic status for a site. These ranges are therefore system-specific. The framework requires further assessment if the upper value of the trigger range is exceeded or total phosphate-P concentrations have increased more than 50% of the mean baseline value. In such cases, other environmental factors should be considered and further assessment may include the recommendation of remediation or restoration (Environment Canada 2004a). The mean baseline + 50% for the open water season are appropriate benchmarks for the management of phosphorus at the majority of the Ekati Diamond Mine lakes (Table 2.5-4). However, the benchmarks for Counts, Grizzly, Slipper, and Cujo lakes were set at 0.01 (the upper limit of the oligotrophic range) because the mean baseline + 50% was greater than the upper limit of the trigger range for each of these lakes (Tables 2.5-3 and 2.5-4). SSWQO or CCME guidelines are not available for total antimony, total barium, total manganese or total strontium; therefore, benchmarks for these variables are provincial guidelines, other guidelines and criteria, or are taken from the published literature. See also Section 2.3 of Part 1 - Evaluation of Effects for a discussion on water quality benchmarks. The percentage of water quality samples that were greater than the applicable CCME guideline, SSWQO, or other benchmark was evaluated for each group of samples (e.g., under-ice, open water season, monthly), along with the factor by which the concentrations were greater than the guideline.

Supporting Tables

Table 2.5-1. GPS Coordinates for Water, Phytoplankton, and Zooplankton Samples Collected in AEMP Lakes, August 2014

		Coordinates	
Lake	Date	Easting	Northing
Nanuq	5-Aug-14	534178	7199302
Counts	9-Aug-14	533827	7169856
Vulture	3-Aug-14	521186	7180869
Grizzly	10-Aug-14	521324	7177743
Kodiak	29-Jul-14	518278	7175543
Leslie	31-Jul-14	515960	7173263
Moose	31-Jul-14	516651	7172836
Nema	2-Aug-14	513576	7171134
Slipper	4-Aug-14	507106	7165294
S2	30-Jul-14	507626	7164479
S3	30-Jul-14	505912	7164439
Cujo	7-Aug-14	538721	7161991
LdS2	8-Aug-14	541234	7164237
LdS1	8-Aug-14	541611	7164537
Fay Bay	1-Aug-14	515056	7181172
Upper Exeter	10-Aug-14	513067	7180905

Note:
UTM 12, NAD 83

Table 2.5-2. Water Quality Variables, 2014

Variables	Units	Variables	Units
Physical/Ion		**Total Metals**	
Conductivity (EC)	µs/cm	Aluminum (Al)	mg/L
Hardness	mg/L	Antimony (Sb)	mg/L
pH	pH	Arsenic (As)	mg/L
Total Suspended Solids	mg/L	Barium (Ba)	mg/L
Total Dissolved Solids (Calculated)	mg/L	Beryllium (Be)	mg/L
Turbidity	NTU	Boron (B)	mg/L
Ion Balance	%	Cadmium (Cd)	mg/L
Alkalinity, Total	mg/L	Calcium (Ca)	mg/L
Bicarbonate, (HCO_3)	mg/L	Chromium (Cr)	mg/L
Carbonate (CO_3)	mg/L	Cobalt (Co)	mg/L
Hydroxide	mg/L	Copper (Cu)	mg/L
Chloride (Cl)	mg/L	Iron (Fe)	mg/L
Sulphate (SO_4)	mg/L	Lead (Pb)	mg/L
Potassium (K)	mg/L	Magnesium (Mg)	mg/L
Silicon (Si)	mg/L	Manganese (Mn)	mg/L
Nutrients/Organics		Mercury (Hg)	mg/L
Total Ammonia-N	mg/L	Molybdenum (Mo)	mg/L
Nitrate-N	mg/L	Nickel (Ni)	mg/L
Nitrite-N	mg/L	Selenium (Se)	mg/L
Total Kjeldahl Nitrogen	mg/L	Silver (Ag)	mg/L
Dissolved Orthophosphate-P	mg/L	Sodium (Na)	mg/L
Total Phosphate-P	mg/L	Strontium (Sr)	mg/L
Total Organic Carbon	mg/L	Uranium (U)	mg/L
		Vanadium (V)	mg/L
		Zinc (Zn)	mg/L

Table 2.5-3. Phosphorus Trigger Ranges for Lakes

Trophic Level	Total Phosphate-P (mg/L)
Ultra-oligotrophic	< 0.004
Oligotrophic	0.004 - 0.01
Mesotrophic	0.01 - 0.02
Meso-eutrophic	0.02 - 0.035
Eutrophic	0.035 - 0.10
Hypereutrophic	> 0.10

Table 2.5-4. Total Phosphate-P Benchmark Concentrations, AEMP Lakes

Lake	Benchmark Value (mg/L)
Nanuq	0.0025
Counts	0.01
Vulture	0.0043
Grizzly	0.01
Kodiak	0.018
Leslie	0.0096
Moose	0.0077
Nema	0.0091
Slipper	0.01
Lac de Gras (S2 and S3)	0.0054
Cujo	0.01
Lac du Sauvage (LdS2 and LdS1)	0.0069
Fay Bay	0.0093
Upper Exeter	0.0053

2.6 PHYTOPLANKTON

2.6.1 Phytoplankton Field Methodology

Phytoplankton was sampled in early August (coinciding with lake water quality sampling) at select AEMP lakes (Tables 2.1-1 and 2.5-1; Figures 2.1-1 to 2.1-16). Six samples were collected in total from each site: three for biomass estimation (as chlorophyll *a*) and three for taxonomic analysis.

One litre phytoplankton samples were collected 1 m below the surface, using a Teflon-lined 5 L GO-FLO, following the same method as for open water season lake water quality. The labelled 1 L plastic bottles used for the collection of biomass samples were wrapped in foil to prevent light penetration and kept in a cooler until further processing later that day. Lugol's iodine solution was added (as a preservative) to taxonomic samples until the sample became a weak tea colour. Taxonomic samples were stored in darkness prior to shipping to the laboratory.

2.6.2 Phytoplankton Laboratory and Taxonomic Analysis

Chlorophyll *a* samples were obtained by filtering the samples onto 0.45 µm nitrocellulose filters using a vacuum-filtration apparatus at the on-site laboratory. A volume of the collected water in the 1 L sample was filtered until a brown or green colour was visible on the filter (typically 300 mL). Filters were then removed from the apparatus with forceps, placed in black plastic tubes to prevent light penetration, labelled, and frozen. Samples were stored frozen on site until they were sent to ALS in Yellowknife for analysis of chlorophyll *a* content.

Taxonomy samples were sent to EcoAnalysts Inc. in Moscow, Idaho, for identification and enumeration. Once at the lab, and prior to taxonomic enumeration and identification, samples were checked and the sample identification number, pertinent location and replicate information, sample date, habitat type, and sample volume were confirmed. The sample volume was measured using a graduated cylinder and the initial sample volume was recorded; depending on the density of the algae and detritus observed, an appropriate subsample was taken and the subsample volume was recorded. The subsample was homogenized thoroughly and allowed to settle in an Utermohl-type settling chamber for approximately 24 hours to allow the algae to settle to the bottom. The settled sample was examined and enumerated at 630× magnification using an inverted Leica microscope. Phytoplankton were identified to the lowest practical taxon using the transect method until at least 300 natural counting units were enumerated. For colonial algae, each colony was counted as one natural unit and cell numbers of each unit were recorded, or in the case of filaments, each filament was counted as one natural unit and the cell numbers of each filament were recorded. For each sample, taxa were reported in cells/mL.

2.6.3 Phytoplankton QA/QC

In addition to collecting replicate samples (Table 2.5-1), the reproducibility of taxonomic identification and enumeration was tested on approximately 10% of the 2014 phytoplankton samples by two different taxonomists. The method as outlined in Section 2.6.2 was followed by the two taxonomists and the results were compared by calculating the relative percent difference (RPD) in the estimate of cells/mL. The RPD was calculated for the replicated estimates (rep1 and rep2) according to:

$$RPD = 100 \mid rep1 - rep2 \mid /[(rep1 + rep2)/2] \quad \text{(Equation 7)}$$

The similarity of taxa identified was assessed using Jaccard's similarity index (S_j), after taxa were grouped by genus. Jaccard's similarity index was calculated according to:

$$Sj = j/(j+a+b) \quad \text{(Equation 8)}$$

where *j* is the number of taxa common to both samples, *a* is the number of taxa in sample A that are not in sample B, and *b* is the number of taxa in sample B, but not in sample A (Chimney and Bowers 2006). A photographic record (reference collection) of the identified taxa was compiled.

2.6.4 Phytoplankton Data Analysis

Density (cells/mL) was calculated for each replicate taxonomy sample and a mean was calculated for each lake station. Taxonomic analysis included the calculation of genus richness, dominance, and diversity indices for the phytoplankton community according to:

- genus richness = the total number of genera present;
- G(90) = the number of genera that contribute 90% of organisms;
- maximum dominance (%) = the genus contributing the greatest proportion of organisms;
- Shannon Diversity Index, $H' = \sum_{i=1}^{G} \frac{n_i}{N} \ln \frac{n_i}{N}$
- Simpson's Diversity Index, $1 - D = 1 - \sum_{i=1}^{G} \left(\frac{n_i}{N} \right)^2$

  where n_i is the number of individuals in genera i, G is the number of genera, and N is the total number of all individuals.

All individuals were included in density calculations, but those that were not identified to the genus level were removed from the dataset for genus richness, dominance, and diversity calculations. Individuals identified as likely belonging to a certain genera (e.g., *Chlorella?*) were considered to be a part of the questioned genera and individuals identified to the species level were grouped into genera.

2.7 ZOOPLANKTON

2.7.1 Zooplankton Field Methodology

Zooplankton biomass and taxonomy samples were collected in August (coinciding with lake water quality sampling) at select AEMP lakes (Tables 2.1-1 and 2.5-1; Figures 2.1-1 to 2.1-14). Samples were collected using a conical 0.3 m diameter, 118 µm mesh zooplankton net. Six samples were collected in total from each site: three for biomass estimation and three for taxonomic analysis.

The zooplankton net was equipped with a plastic cod-end and a GO flowmeter (Model 2030R) to estimate the flow through the net. The flowmeter reading was recorded prior to sampling and the net was then deployed cod-end first. When the net was approximately one or two metres from the lake bottom, it was pulled to the surface at a rate of approximately 0.5 m/s. The flowmeter reading was recorded when the net reached the surface. The net was then rinsed with water that had been filtered through it prior to collecting a sample and the sample was transferred to a pre-labelled 500 mL plastic jar. Zooplankton biomass samples were stored in a cooler for further processing later that day. Samples for taxonomic analysis were preserved in the field with buffered formalin to a final concentration of 5% and the jars were sealed with electrical tape to help prevent leakage.

2.7.2 Zooplankton Laboratory and Taxonomic Analysis

Zooplankton biomass samples were filtered onto pre-weighed, P8 grade filter papers using the vacuum-filtration apparatus at the on-site laboratory. Samples were dried at 60°C for approximately 24 hours. The dried samples were weighed to determine the dry weight of the zooplankton. Biomass as dry weight was standardized to mg/m^3 after calculating the volume of water filtered using the flowmeter reading.

Taxonomy samples were sent to EcoAnalysts Inc. in Moscow, Idaho, for identification and enumeration. Zooplankton taxonomy samples were processed in the laboratory, by rinsing the sample with 70% ethanol into a 500 mL beaker and then weighing the sample. A 1 mL Hensen-Stempel pipette was inserted into the sample and was used to stir the sample to attain homogeneity. Care was taken to mix the sample in a random fashion (not swirling) with the Hensen-Stempel pipette. A 1 mL subsample was captured from the homogeneous sample during the mixing process to avoid bias (due to sinking of heavier plankton organisms), and the subsample was rinsed into a watch glass with 70% ethanol. Based on the organism density of the first 1 mL of the subsample, more 1 mL aliquots were added until the target count (between 200 and 400) of coarse (non-rotifers) zooplankters and fine (rotifers) zooplankters were present. If the target count was exceeded in 1 mL of sample, a secondary dilution was made by transferring aliquots from the subsample into a second beaker and further diluting the subsample. No more than 3 mL were identified and enumerated at one time and each dish was counted in its entirety to allow proper abundance calculations. This was because one cannot ensure proportionate distribution in the counting chamber. Therefore, to more accurately project numbers at selected dilutions, the entire dish was counted. After the target count was reached, a weight was taken of the sample and recorded to obtain the percent subsample analyzed.

Organisms were identified to the lowest taxonomic level possible. After identifying organisms from sample aliquots sufficient to reach the target count, the remainder of the sample was placed under a stereomicroscope and checked for the presence of large organisms (e.g., Chaoboridae, *Leptodora* sp., etc.) that were not identified in the subsampled portion. If such organisms were present, they were noted by the taxonomist as large and rare ("L/R") in the data.

2.7.3 Zooplankton QA/QC

As a measure of QA/QC, the reproducibility of results achieved when subsampling was tested on 10% of the zooplankton samples in 2014. For each of the samples selected for assessment of subsampling reproducibility (e.g., Leslie Lake replicate 2) the sample jar, along with the vials and slides used during the primary identification and enumerations, were given to a second taxonomist for re-identification and re-enumeration. Re-analysis entailed the second QC taxonomist re-identifying and re-enumerating the selected samples using the same methods as provided above. Differences in identified taxa between the two samples were calculated as a percent similarity:

$$\textit{Percent similarity} = 100 - 0.5 \sum |a - b| \qquad \text{(Equation 9)}$$

where a is the percentage of individuals of a taxon in sample A, and b is the percentage of the same taxon in sample B (Whittaker and Fairbanks 1958). The percent similarity between the samples was an indication of taxonomic precision.

A measurement qualified objective (MQO) of ≥ 85% is recommended for percent similarity of taxonomic identification. If the MQO was not met, the reasons for the discrepancies between taxonomists were discussed. If a major discrepancy was found between the two taxonomists in terms of organism identification or enumeration, the last batch of samples that had been counted by the taxonomist under review was recounted. A reference collection was compiled.

2.7.4 Zooplankton Data Analysis

Density (organisms/m^3) was calculated for each sample from the total number of individuals and the volume of water filtered during sampling (calculated from the flowmeter data). Taxonomic analysis included the calculation of genus richness, dominance, and diversity indices as in Section 2.6.4. All organisms were included in density calculations, but those that were not identified to the genus level (e.g., nauplii) were removed from the dataset for genus richness, dominance and diversity calculations. Organisms identified to the species level were grouped into genera. Means were calculated for triplicate samples collected within each lake. Taxa that were observed in samples but were not identified as zooplankton (i.e., Chironomidae, Acari, and Harpacticoida) were excluded from density and diversity calculations.

2.8 BENTHIC INVERTEBRATES (BENTHOS)

2.8.1 Benthos Field Methodology

2.8.1.1 Lake Benthos

Triplicate samples were collected in August from mid depth (approximately 5 to 10 m) within each lake (Table 2.1-1; Figures 2.1-3 to 2.1-14). Each replicate contained three composite samples to minimize variability between samples. Replicate samples were collected at different locations of approximately equal water depth. GPS coordinates were recorded, documenting the location of each replicate sample (Table 2.8-1).

Lake benthos samples were collected using an Ekman grab. The Ekman was opened and slowly lowered into the sediment using a metered line. The depth of the water column was recorded and the Ekman was triggered shut using a brass messenger. The triggered Ekman was brought to the surface and inspected to ensure that a complete sediment sample had been obtained. The sediment was released into a 500 µm sieve bucket and any sediment remaining in the Ekman was rinsed into the bucket using water that had been filtered through it prior to obtaining a sample. The bucket was then gently agitated, allowing the fine sediments to pass through the sieve. A second and third grab (composite samples) were collected and added to the sieve bucket for washing, until finally the combined washed sediments were transferred to a labelled 500 mL plastic jar and preserved with buffered formalin to a final concentration of 10%. Samples were sealed with electrical tape to help prevent leakage and stored in coolers until they were sent for analysis.

2.8.1.2 Stream Benthos

Stream benthos samples were collected over a period of approximately one month using Hester-Dendy artificial substrate samplers. Each sampler consisted of nine 7.5 × 7.5 cm plates stacked vertically with a 0.5 cm gap between each plate. These samplers were placed within each stream in early August and retrieved approximately one month later in early September (Table 2.1-2; Figure 2.1-1). Five replicate samples were collected from each stream.

Collected samplers were disassembled and processed by gently scraping each of the nine plates with a toothbrush. Material from the upper surface of the top plate and lower surface of the bottom plate was not collected. Collected benthos and debris was rinsed into a 106 µm sieve using pre-filtered water. Samples were then rinsed into labelled 500 mL plastic jars and preserved in the field with buffered formalin to a final concentration of 10%. Samples were sealed with electrical tape to help prevent leakage and stored in coolers until they were sent for analysis.

2.8.2 Benthos Laboratory and Taxonomic Analysis

Lake and stream benthos samples were shipped to EcoAnalysts in Moscow, Idaho, for identification and enumeration. Benthos taxonomy samples were processed in the laboratory by a trained sorting technician. First the technician recorded the primary matrix type (inorganic, coarse organic, fine organic, vegetation, or filamentous algae) and estimated the volume of detritus in the sample. Prior to sorting, any significant amount of inorganic material was removed from the sample. Each sample

was then washed into a shallow pan of water, where large organics were inspected and removed. The remaining sample was repeatedly agitated with water and passed through a sieve until the majority of inorganics had been removed. The removed inorganic portion of each sample was examined by multiple technicians to ensure no invertebrates were inadvertently removed from the sample.

The organic portion of the sample was then evenly distributed into the bottom of a Caton style tray (tray with 2 inch grids and a 250 micron mesh bottom). Grids were randomly selected and their contents transferred to a petri dish, where the material was sorted under a dissecting microscope (minimum 10× magnification). The benthic invertebrates were counted as they were placed in 70% ethanol. Sorters picked and counted only benthic organisms with heads, those that were alive during sampling and contain attributes required for taxonomic identification. Grids were sorted until the target count of organisms (300 organisms) was reached. The sorted organisms were identified to the lowest taxonomic level possible and the number of individuals of each taxon counted.

2.8.3 Benthos QA/QC

As part of QA/QC, the sorting efficiency of at least 95% of the samples was examined by having a second technician re-sort at least 20% of the sorted material, to ensure at least 90% of the organisms had been removed. Estimated percent efficiency was calculated as:

$$\textit{Sorting efficiency} = \frac{\textit{original count}}{\textit{original count} + (\textit{QA count} \times \textit{QA squares} / \textit{QT squares})} \times 100 \qquad \text{(Equation 10)}$$

where *original count* is the number of organisms picked by the first sorter, *QA count* is the number of organisms found in the QA sort completed by the second technician, *QA squares* is the number of grids sorted during the QA process, and *QT squares* is the total number of grids in the QA Caton tray.

If the sorting efficiency estimate was less than 90% then the sample was re-sorted until it passed the 90% efficacy requirement. Organisms found during the QC process were added to those found during the sort. This is consistent with Environmental Effects Monitoring (EEM) guidelines which state that sorting efficiencies of 90% or greater are considered acceptable, while groups of samples containing greater error require resorting (Environment Canada 2002).

In addition to sorting efficiencies, taxonomist QC was performed on approximately 10% of the 2014 lake and stream benthos samples. Taxa identified in three lake and four stream samples were re-evaluated by a second QC taxonomist to verify identifications. Percent similarity was calculated using the Whittaker and Fairbanks model to compare the similarity of the two sets of data (see equation 9 in Section 2.7.3; Whittaker and Fairbanks 1958). If the percent similarity was less than 100%, any discrepancies were discussed by the two taxonomists and necessary adjustments made to the final dataset. A reference collection was compiled.

2.8.4 Benthos Data Analysis

For lake and stream benthos, raw counts were converted to density (organisms/m^2) using the surface area of the Ekman grab (0.0225 m^2) and the surface area of the Hester-Dendy sampler (0.09 m^2), respectively. Taxonomic analysis for lake benthos included the calculation of dipteran genus richness, dominance, and diversity indices as in Section 2.6.4. The same calculations were

conducted for stream benthos and an additional set of calculations was conducted for EPT (Ephemeroptera, Plecoptera, and Trichoptera) genera. All organisms were included in density calculations, but those that were not identified to the genus level were removed from the dataset for genus richness, dominance, and diversity calculations. Organisms identified to the species level were grouped into genera. Means were calculated for triplicate samples collected from each lake.

Supporting Table

Table 2.8-1. GPS Coordinates and Distances between Replicate Benthic Samples Collected in AEMP Lakes, August 2014

Lake	Depth Strata	Date	Rep 1		Rep 2		Rep 3		Distance Between Replicates (m)		
			Easting	Northing	Easting	Northing	Easting	Northing	Minimum	Maximum	Average
Nanuq	Mid	5-Aug-14	534670	7199088	534658	7199090	534666	7199092	10.0	12.4	11.5
Counts	Mid	9-Aug-14	533764	7169717	533773	7169717	533779	7169728	7.6	11.2	9.3
Vulture	Mid	3-Aug-14	522156	7182144	522159	7182138	522162	7182136	6.7	14.8	11.8
Kodiak	Mid	29-Jul-14	518289	7175649	518286	7175649	518278	7175647	3.0	7.0	5.2
Leslie	Mid	31-Jul-14	515824	7173175	515840	7173182	515837	7173170	8.1	20.6	15.4
Moose	Mid	31-Jul-14	516618	7172851	516617	7172854	516614	7172847	3.2	23.4	10.7
Nema	Mid	2-Aug-14	513564	7171134	513555	7171134	513548	7171147	8.1	16.3	11.1
Slipper	Mid	4-Aug-14	507193	7165431	507175	7165409	507175	7165416	4.0	28.4	16.2
S2	Mid	3-Aug-14	507653	7164469	507661	7164473	507669	7164472	7.8	8.9	8.4
Cujo	Mid	7-Aug-14	538725	7162007	538725	7162011	538729	7162007	4.0	4.0	4.0
LdS1	Mid	8-Aug-14	541610	7164521	541623	7164528	541615	7164527	14.8	14.8	14.8

Note:
UTM 12, NAD 83

2.9 SEDIMENT QUALITY

2.9.1 Sediment Quality Field Methodology

Sediment samples were collected in August from mid (~5 m to 10 m) depth within designated sampling lakes (Table 2.1-1; Figures 2.1-3 to 2.1-14). Samples were collected in triplicate using both an Ekman grab and a Kajak-Brinkhurst (K-B) corer. Replicate samples were collected at different locations of approximately equal water depth (Table 2.9-1).

2.9.1.1 Ekman Sampling Sediment Quality

The Ekman was opened and slowly lowered into the sediment using a metered line. The depth of the water column was recorded and the Ekman was triggered shut using a brass messenger. The triggered Ekman was brought to the surface and inspected to ensure that a complete sediment sample was obtained. The water overlying the sediment sample was carefully drained from the Ekman and the sample was again examined to ensure that it had not been significantly disturbed. The sample was then carefully released from the Ekman onto a white tray. Sediment characteristics (e.g., colour, texture, smell, presence of organic matter, etc.) were recorded and a photo was taken. The top 2 cm of sediment was collected with a plastic spoon and placed into two Whirl-Pak bags, a bag for chemical analysis and a bag for particle sizing. Samples were stored in a cooler in the field and refrigerated upon returning to camp where they were stored until they were shipped for analysis.

2.9.1.2 Core Sampling Sediment Quality

A K-B corer was used to collect sediment core samples. A stainless steel tube was screwed into the head of the corer, and a clear polyvinyl chloride inner core tube was inserted into the stainless steel tube, secured, and the trigger mechanism set. The corer was then lowered over the side of the boat on a metered line. The corer was lowered into the sediments slowly and care was taken to ensure that the corer did not tip over. A messenger was then used to trigger the plunger such that enough suction was created to hold the core in the tube. The corer was brought to the surface where a plastic bung was inserted into the bottom of the tube to hold the core in. The core tube was then separated from the corer, a plastic bung placed on the top of the tube, and the tube placed on the extruder. Slowly, the core was extruded to remove the overlying water. The uppermost centimeter of the sediment core was sliced off with a thin, plastic sheet and placed into a Whirl-Pak bag for chemical analysis (no particle size analysis. Each core sample contained five composite cores (collected in the same location) to ensure there was sufficient sediment to complete all chemical analyses. Samples were stored in a cooler in the field and refrigerated upon returning to camp where they were stored until they were shipped to the laboratory for analysis.

2.9.2 Sediment Quality Laboratory Analysis

All sediment quality samples were sent to ALS in Burnaby, BC for analyses of sediment quality variables at the lowest available detection limit (Table 2.9-2). Analyses were completed to provide detection limits that were below the CCME guidelines for the protection of freshwater aquatic life (CCME 2014a).

2.9.3 Sediment Quality Data Analysis

As outlined in the AEMP Plan for 2013 to 2015 (Rescan 2013), a subset of the analytical results for sediment quality were evaluated: available phosphorus, total nitrogen, total organic carbon (TOC), total aluminum, total antimony, total arsenic, total copper, total molybdenum, total nickel, total selenium, total strontium and total zinc.

For the purpose of data analysis and presentation, half of the analytical detection limit was calculated when variable concentrations were less than the analytical detection limit. The triplicate samples were averaged to obtain a site mean.

Total arsenic, total copper, and total zinc sediment quality variables were compared to the Canadian Council of Ministers of the Environment (CCME) guidelines for the protection of freshwater aquatic life (CCME 2014a). The percentage of sediment quality samples greater than a CCME guideline was evaluated for Ekman and core samples, along with the factor by which the guideline was greater.

Supporting Tables and Plates

Table 2.9-1. GPS Coordinates and Distances between Replicate Sediment Samples Collected in AEMP Lakes, August 2014

Lake	Depth Strata	Date	Rep 1		Rep 2		Rep 3		Distance Between Replicates (m)		
			Easting	Northing	Easting	Northing	Easting	Northing	Minimum	Maximum	Average
Nanuq	Mid	5-Aug-14	534670	7199088	534658	7199090	534666	7199092	5.7	12.2	8.7
Counts	Mid	9-Aug-14	533673	7169833	533675	7169834	533679	7169828	2.2	64.3	24.8
Vulture	Mid	3-Aug-14	522155	7182128	522164	7182136	522174	7182133	10.4	19.6	14.0
Kodiak	Mid	29-Jul-14	518279	7175659	518279	7175633	518289	7175652	12.2	26.0	19.9
Leslie	Mid	31-Jul-14	515823	7173182	515828	7173175	515834	7173177	6.3	12.1	9.0
Moose	Mid	4-Aug-14	516613	7172837	516624	7172842	516609	7172844	8.1	15.1	11.8
Nema	Mid	2-Aug-14	513588	7171125	513589	7171135	513599	7171138	10.0	17.0	12.5
Slipper	Mid	4-Aug-14	507203	7165413	507202	7165414	507199	7165409	1.4	5.8	4.3
S2	Mid	30-Jul-14	507626	7164479	507638	7164483	-	-		12.6	
Cujo	Mid	7-Aug-14	538712	7162005	538713	7162000	-	-		5.1	
LdS1	Mid	8-Aug-14	541603	7164536	541604	7164536	541612	7164534	1.0	9.2	6.2
Fay Bay	Mid	3-Aug-14	515052	7181164	515070	7181149	515064	7181158	10.8	23.4	15.9
Upper Exeter	Mid	10-Aug-14	513082	7180895	513088	7180887	513087	7180894	5.1	10.0	7.4

Notes:
UTM 12, NAD 83
Dashes indicate that coordinates were not recorded.

Table 2.9-2. Sediment Quality Variables, 2014

Variables	Units	Variables	Units
Particle Size		**Metals *(cont'd)***	
Gravel (>2 mm)	%	Iron (Fe)	mg/kg
Sand (2 mm - 0.063 mm)	%	Lead (Pb)	mg/kg
Silt (0.063 mm - 4 µm)	%	Lithium (Li)	mg/kg
Clay (<4 µm)	%	Magnesium (Mg)	mg/kg
Nutrients/Organics		Manganese (Mn)	mg/kg
Available Phosphorus (P)	mg/kg	Mercury (Hg)	mg/kg
Total Nitrogen (N)	%	Molybdenum (Mo)	mg/kg
Total Organic Carbon	%	Nickel (Ni)	mg/kg
Metals		Phosphorus (P)	mg/kg
Aluminum (Al)	mg/kg	Potassium (K)	mg/kg
Antimony (Sb)	mg/kg	Selenium (Se)	mg/kg
Arsenic (As)	mg/kg	Silver (Ag)	mg/kg
Barium (Ba)	mg/kg	Sodium (Na)	mg/kg
Beryllium (Be)	mg/kg	Strontium (Sr)	mg/kg
Bismuth (Bi)	mg/kg	Thallium (Tl)	mg/kg
Boron (B)	mg/kg	Tin (Sn)	mg/kg
Cadmium (Cd)	mg/kg	Titanium (Ti)	mg/kg
Calcium (Ca)	mg/kg	Uranium (U)	mg/kg
Chromium (Cr)	mg/kg	Vanadium (V)	mg/kg
Cobalt (Co)	mg/kg	Zinc (Zn)	mg/kg
Copper (Cu)	mg/kg		

Note:
Results are expressed on a dry weight basis.

2.10 2014 SPECIAL STUDIES

2.10.1 Lac de Gras Water Quality Monitoring Station

Results of the 2013 AEMP sampling program determined that mine effects detected in Lac de Gras at S2 and S3 may extend beyond the current sampling extent of the AEMP in Lac de Gras to sites S5 and S6 that were monitored as part of the AEMP Special Studies in 2013 (ERM Rescan 2014). In order to better detect potential effects related to discharge from the LLCF, S5 and S6 sites were monitored again in 2014.

2.10.1.1 Field Methodology

Sampling at sites S5 and S6 in the north arm of Lac de Gras was completed during the under-ice and open water season. Physical limnology data and water quality samples were collected in April and August alongside the regular AEMP lake sampling (Table 2.10-1; Figure 2.10-1). Sampling replication and sampling methods were identical to that described in Section 2.4 and 2.5 for AEMP lake physical limnology and water quality sampling. Laboratory analyses and QA/QC methods were also identical to those employed for the annual AEMP samples (see Sections 2.5-2 and 2.5-3).

2.10.1.2 Data Analysis

Physical limnology and water quality data are presented in Section 3.10.1. An assessment of whether the addition of stations S5 and S6 to the annual AEMP program is warranted will be included in the 2015 AEMP Re-evaluation (DDEC 2014a).

2.10.2 Grizzly Lake Biological Communities

Biological communities (phytoplankton and zooplankton) were sampled in Grizzly Lake on August 10 to assess if communities have been altered following observed changes in the under-ice temperature profiles from 2011 to 2013 (thermal stratification with cooler surface temperatures was observed; (ERM Rescan 2014; Table 2.10-1; Figure 2.10-1).

2.10.2.1 Field Methodology

Sampling protocols for phytoplankton and zooplankton at Grizzly Lake were identical to AEMP lake biological sampling procedures (see Sections 2.6 and 2.7, respectively).

2.10.2.2 Data Analysis

The 2014 phytoplankton and zooplankton community data for Grizzly Lake were analyzed according to AEMP procedures (see Sections 2.6 and 2.7). Results for each biological community were compared to historical and reference communities, using methods similar to those completed for other monitored AEMP sites (see Section 2.2 in Part 1 – Evaluation of Effects for further details on the evaluation methods). Table 2.10-2 provides a list of historical samples available for Grizzly Lake. See Section 3.3.1 to 3.3.2 in Part 1 – Evaluation of Effects for a full list of sampling dates for AEMP reference lakes. Regression analyses were not performed on biological variables in Grizzly Lake due to the relatively small number of data points. Thus, where possible, graphical analysis was the

primary means through which changes were evaluated. In addition, 2014 mean values for some evaluated biological variables (i.e., biomass, density, and diversity) were compared against mean baseline values ± 2 standard deviations (SD). Comparisons were also made against mean 2003 values ± 2 SD, as 2003 represents the last year in which biological communities were sampled in Grizzly Lake, prior to this special study which was initiated in 2013.

Supporting Tables and Figures

Table 2.10-1. Special Study Sampling Locations, 2014

Lake	Coordinates		Water Quality	Physical Limnology	Phytoplankton	Zooplankton
	Easting	Northing				
S2	507626	7164479	X[1]	X[1]	-	-
S3	505912	7164439	X[1]	X[1]	-	-
S5	503131	7161492	X	X	-	-
S6	501991	7159853	X	X	-	-
Grizzly	521324	7177743	X[1]	X[1]	X	X

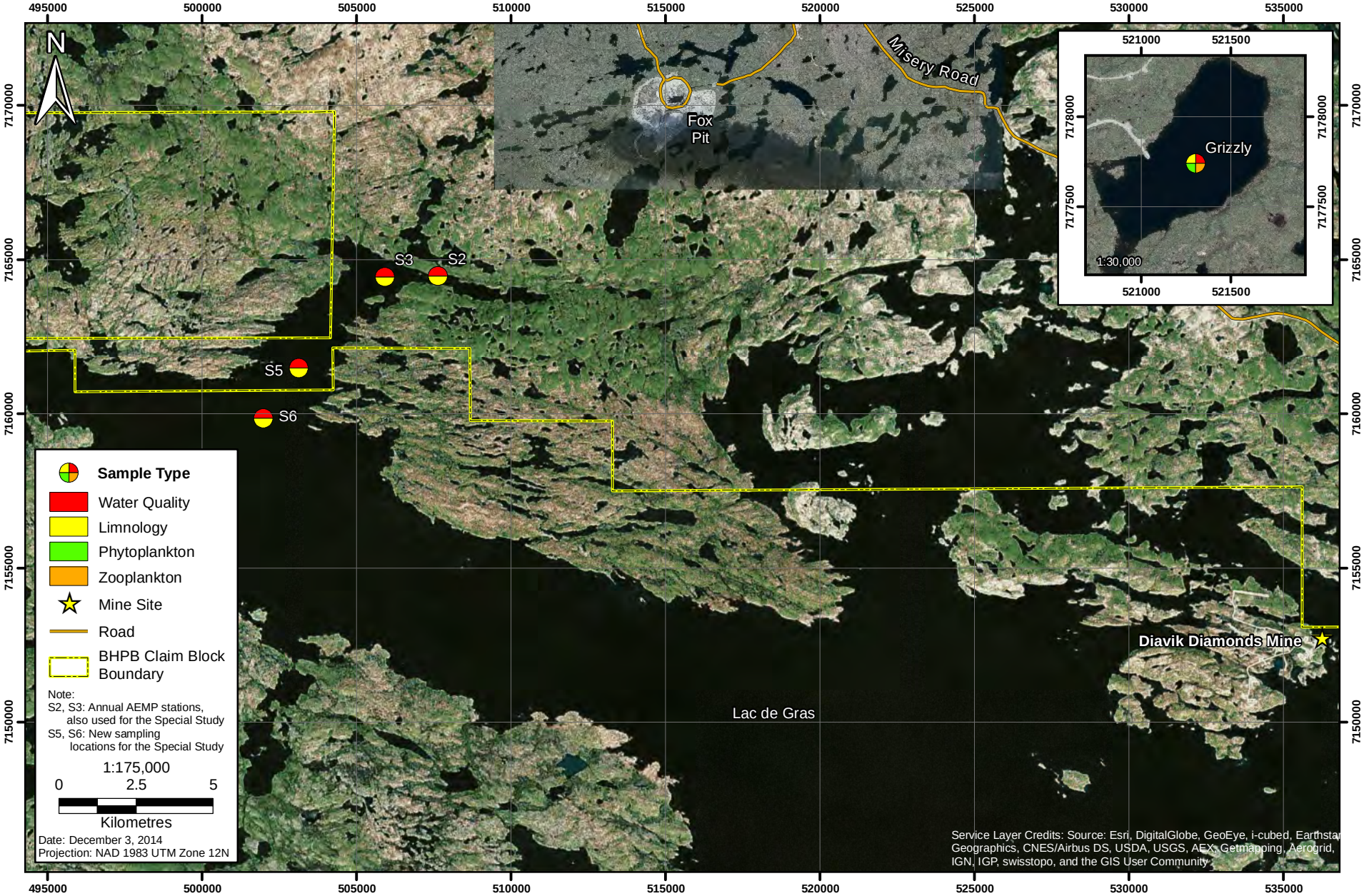
Notes:
Dashes (-) indicate not applicable.
UTM 12, NAD 83
[1] *Water quality and physical limnology AEMP data used in the Special Study.*

Table 2.10-2. Plankton Sampling Completed in Grizzly Lake

Year	Phytoplankton	Zooplankton
1994	13-Aug[1]	14-Aug
1997	7-Aug	7-Aug
1998	8-Aug	8-Aug
1999	6-Aug	6-Aug
2003	8-Aug	8-Aug
2013	31-Jul	31-Jul
2014	10-Aug	10-Aug

[1] *Only biomass (as chlorophyll a) data was collected in 1994.*

Figure 2.10-1
Special Study Sampling Locations, 2014



3. RESULTS AND DISCUSSION

3.1 METEOROLOGY

The meteorological monitoring program at the Ekati Diamond Mine in 2014 included the operation of the Koala automated meteorological station, which has been in continuous operation since 1993, and the micrometeorological station on Polar Lake (Figure 2.1-1). The Polar Lake station was in operation during the open water season to provide data to estimate open water evaporation. During the winter of 2013/2014, DDEC Environment personnel monitored a Nipher snow gauge at the Koala meteorological station to generate monthly totals for SWE precipitation. In addition, snow surveys were completed between April 5 and April 10, 2014 at twelve locations within the DDEC claim block; six of the snow monitoring stations were within the Koala Watershed (Figure 2.1-1). Air temperature and precipitation data obtained from Kugluktuk and Yellowknife airports were used for comparison to the data collected at the Ekati Diamond Mine (Table 3.1-1).

The 12-month (October 2013 to September 2014) mean air temperature was -9.7°C at the Koala station; this is half a degree warmer than the 12-month mean for the Kugluktuk station (Tables 3.1-2 and 3.1-3) and 1.1°C warmer than the Climate Normal (Table 3.1-2).

Across Canada, the 2013/2014 winter was 0.4°C below normal, and was ranked the 44th warmest of 67 consecutive years on record. In the Mackenzie District region (which includes the Ekati Diamond Mine), mean temperatures during each season ranged from 0.2°C to 1.6°C above normal (Table 3.1-4). Although the 2013/2014 winter was only 0.2°C above normal, the last time the Mackenzie District region had a cooler than normal winter was 1993/1994 (Environment Canada 2014). The summer of 2014 was the 7th warmest summer of the past 67 years on record, with a departure of 1.6°C above normal.

Observations from the Koala Nipher snow gauge between October 2013 and May 2014 produced SWE estimates of 178 mm (uncorrected for wind effects), or 201 mm (corrected for wind effects; Table 3.1-5). The differences between these values illustrate the uncertainty associated with monitoring snow fall due to wind-induced undercatch. The snow survey conducted at 12 sampling stations around the DDEC claim block in mid-April 2014 yielded a mean SWE value of 67 mm (Table 3.1-6). This indicates that while 178 to 201 mm of snow may have fallen, a substantial portion of the snow pack was lost to sublimation, evaporation, and wind redistribution. The snow survey value of 67 mm represents the volume available for snow melt runoff during the freshet.

From the available October 2013 to September 2014 rainfall data (missing May 1 to June 5; the TBRG and Geonor precipitation gauge were not installed during this period), a total of 98 mm of rain was recorded at the Koala station (Table 3.1-7). Combining winter SWE and summer rainfall, the total precipitation was 275 mm (uncorrected for wind effects), or 299 mm (corrected for wind effects) during the 2014 water year (October 1, 2013 to September 30, 2014, missing June 1 to 4; Tables 3.1-8 and 3.1-9), which is less than the expected mean of 345 mm for the Ekati Diamond Mine site (Rescan 2000). Rainfall between June and August accounted for 65% of the total annual rainfall. Rainfall made up 49% of the total precipitation (corrected for wind effects) over the entire year.

The Mackenzie District region was drier than normal in all seasons in 2014, with precipitation amounts ranging from 34% to 5% lower than normal (Table 3.1-4). Winter 2013/2014 was the second driest winter in 67 years (34% lower than normal), and fall 2014 was the ninth driest (14% lower than normal).

Wind speed and direction data collected from the Koala station indicate that the prevailing wind direction during the winter period (October 2013 to May 2014) was from the northwest with a secondary component from the east (Figure 3.1-1). During the summer period (June to September), the wind directions primarily came from the northeast, and were more omnidirectional than in the winter (Figure 3.1-1). Mean wind speeds were about 5 m/s in all seasons. Calm conditions (hourly mean wind speeds of < 0.5 m/s) represented 2.5% of winter observations, and 0.4% of summer observations. Taking into account missing data, wind speed and direction patterns were similar to previous years.

The Polar Lake micrometeorological station operated between June 28 and October 12 (Table 3.1-10). The high latitude and continental climate of the Ekati Diamond Mine area combine to produce long, sunny days providing abundant energy to drive evaporation during the summer season. Using the Penman equation (and PET methodology for the missing June observations; see Section 2.2.2), open water evaporation at the Polar Lake station was calculated to be 313 mm for the ice-free period (assumed to be from May 26 to October 2) with the exclusion of May as a result of missing evaporation data (Polar Lake station was not installed and PET method could not be used accurately; Table 3.1-11).

Supporting Tables and Figures

Table 3.1-1. Meteorology Summary, 2013/2014

Parameter	Koala Meteorological Station	Polar Lake Micrometeorological Station	Kugluktuk Airport	Yellowknife Airport
Air Temperature	October 2013 to September 2014	June 28 to October 12, 2014	October 2013 to September 2014	October 2013 to September 2014
Rainfall	October 2013 to September 2014	June 28 to October 12, 2014	October 2013 to September 2014	October 2013 to September 2014
Total Precipitation	June 6 to September 30, 2014	-	October 2013 to September 2014	October 2013 to September 2014
Snowfall (Nipher snow gauge)	October 7 2013 to May 2 2014	-	-	-
Snow Depth	February 4 to September 30, 2014	-	Available but not used	Available but not used
Wind Speed and Direction	October 2013 to September 2014	June 28 to October 12, 2014	Available but not used	Available but not used
Penman Evaporation	-	June 28 to October 12, 2014	-	-

Note:
Dashes (-) indicate data not collected.

Table 3.1-2. Mean Monthly Air Temperature (°C) at Koala, Polar Lake, and Regional Meteorological Stations, 2013/2014

Month	Koala Station	Polar Lake Station	Kugluktuk Airport	Yellowknife Airport
2013				
October	-2.5	-	-1.8	1.3[1]
November	-18.3[2]	-	-17.0	-14.1
December	-30.4	-	-25.3	-30.7[1]
2014				
January	-29.7	-	-27.4	-25.3
February	-28.7	-	-29.5[3]	-26.1
March	-26.2	-	-25.0	-20.4
April	-16.4	-	-18.7	-7.4[1]
May	-2.2	-	-3.3	4.8
June	11.2	-	4.4	14.7
July	15.5	15.3	11.3	18.1
August	9.5	9.4	7.7	13.7
September	1.9	2.1	2.1	6.5
Mean[4]	**-9.7**	**-**	**-10.2**	**-5.4**
Normal	**-10.8[5]**	**-**	**-10.3[6]**	**-4.3[6]**

Note:
Dashes (-) indicate data not available.
[1] *Missing 1 or 2 days of data.*
[2] *Missing November 11 to 26.*
[3] *Missing 6 days of data.*
[4] *Mean of October 2013 to September 2014.*
[5] *Environmental Assessment Report for Sable, Pigeon and Beartooth Pipes (Rescan 2000).*
[6] *Canadian Climate Normals 1981-2010 from Environment Canada-Meteorological Services of Canada (MSC) website (http://climate.weather.gc.ca/climate_normals/).*

Table 3.1-3. Summary of Mean Daily Air Temperature at Koala Station, 2013/2014

Date	Mean Daily Temperature (°C)	Date	Mean Daily Temperature (°C)	Date	Mean Daily Temperature (°C)	Date	Mean Daily Temperature (°C)	Date	Mean Daily Temperature (°C)	Date	Mean Daily Temperature (°C)
01-Oct-13	-1.2	01-Nov-13	-8.1	01-Dec-13	-25.6	01-Jan-14	-35.6	01-Feb-14	-23.6	01-Mar-14	-33.6
02-Oct-13	-2.3	02-Nov-13	-10.6	02-Dec-13	-23.3	02-Jan-14	-30.8	02-Feb-14	-23.4	02-Mar-14	-31.4
03-Oct-13	-1.7	03-Nov-13	-10.4	03-Dec-13	-22.0	03-Jan-14	-33.0	03-Feb-14	-22.6	03-Mar-14	-28.4
04-Oct-13	3.4	04-Nov-13	-13.0	04-Dec-13	-28.2	04-Jan-14	-32.0	04-Feb-14	-18.3	04-Mar-14	-25.5
05-Oct-13	3.7	05-Nov-13	-17.5	05-Dec-13	-27.2	05-Jan-14	-35.7	05-Feb-14	-16.9	05-Mar-14	-27.1
06-Oct-13	0.8	06-Nov-13	-16.6	06-Dec-13	-25.6	06-Jan-14	-33.5	06-Feb-14	-21.5	06-Mar-14	-30.6
07-Oct-13	-0.7	07-Nov-13	-13.2	07-Dec-13	-24.7	07-Jan-14	-32.8	07-Feb-14	-28.3	07-Mar-14	-28.1
08-Oct-13	-1.3	08-Nov-13	-19.9	08-Dec-13	-28.7	08-Jan-14	-24.3	08-Feb-14	-31.2	08-Mar-14	-29.0
09-Oct-13	-0.1	09-Nov-13	-23.4	09-Dec-13	-28.4	09-Jan-14	-28.8	09-Feb-14	-31.0	09-Mar-14	-29.6
10-Oct-13	1.9	10-Nov-13	-20.0	10-Dec-13	-29.1	10-Jan-14	-29.3	10-Feb-14	-30.3	10-Mar-14	-36.4
11-Oct-13	-0.8	11-Nov-13	-	11-Dec-13	-31.5	11-Jan-14	-35.4	11-Feb-14	-33.4	11-Mar-14	-33.6
12-Oct-13	-3.0	12-Nov-13	-	12-Dec-13	-36.8	12-Jan-14	-35.5	12-Feb-14	-31.3	12-Mar-14	-26.2
13-Oct-13	-2.4	13-Nov-13	-	13-Dec-13	-37.6	13-Jan-14	-33.3	13-Feb-14	-27.1	13-Mar-14	-30.9
14-Oct-13	-0.1	14-Nov-13	-	14-Dec-13	-36.6	14-Jan-14	-34.1	14-Feb-14	-32.0	14-Mar-14	-30.0
15-Oct-13	1.1	15-Nov-13	-	15-Dec-13	-26.9	15-Jan-14	-21.4	15-Feb-14	-25.7	15-Mar-14	-22.9
16-Oct-13	0.2	16-Nov-13	-	16-Dec-13	-28.5	16-Jan-14	-26.8	16-Feb-14	-28.1	16-Mar-14	-13.4
17-Oct-13	-1.2	17-Nov-13	-	17-Dec-13	-29.1	17-Jan-14	-25.7	17-Feb-14	-28.7	17-Mar-14	-14.3
18-Oct-13	-3.6	18-Nov-13	-	18-Dec-13	-32.9	18-Jan-14	-35.8	18-Feb-14	-24.9	18-Mar-14	-19.2
19-Oct-13	-6.7	19-Nov-13	-	19-Dec-13	-36.5	19-Jan-14	-35.9	19-Feb-14	-28.9	19-Mar-14	-26.4
20-Oct-13	-3.2	20-Nov-13	-	20-Dec-13	-34.7	20-Jan-14	-26.9	20-Feb-14	-32.2	20-Mar-14	-25.6
21-Oct-13	-2.5	21-Nov-13	-	21-Dec-13	-26.2	21-Jan-14	-32.4	21-Feb-14	-32.1	21-Mar-14	-25.4
22-Oct-13	-0.7	22-Nov-13	-	22-Dec-13	-24.2	22-Jan-14	-26.0	22-Feb-14	-32.9	22-Mar-14	-21.1
23-Oct-13	-1.3	23-Nov-13	-	23-Dec-13	-23.1	23-Jan-14	-20.8	23-Feb-14	-32.7	23-Mar-14	-24.3
24-Oct-13	-2.6	24-Nov-13	-	24-Dec-13	-30.1	24-Jan-14	-29.6	24-Feb-14	-33.4	24-Mar-14	-23.4
25-Oct-13	-6.0	25-Nov-13	-	25-Dec-13	-32.6	25-Jan-14	-31.1	25-Feb-14	-29.1	25-Mar-14	-22.9
26-Oct-13	-14.0	26-Nov-13	-	26-Dec-13	-34.4	26-Jan-14	-32.4	26-Feb-14	-33.7	26-Mar-14	-25.1
27-Oct-13	-11.9	27-Nov-13	-28.6	27-Dec-13	-37.3	27-Jan-14	-29.6	27-Feb-14	-34.8	27-Mar-14	-22.2
28-Oct-13	-8.5	28-Nov-13	-28.4	28-Dec-13	-33.0	28-Jan-14	-24.4	28-Feb-14	-35.8	28-Mar-14	-22.9
29-Oct-13	-5.9	29-Nov-13	-23.9	29-Dec-13	-36.1	29-Jan-14	-26.5			29-Mar-14	-31.3
30-Oct-13	-1.9	30-Nov-13	-23.1	30-Dec-13	-37.0	30-Jan-14	-19.8			30-Mar-14	-28.8
31-Oct-13	-5.7			31-Dec-13	-35.7	31-Jan-14	-21.5			31-Mar-14	-22.1
Mean	**-2.5**	**Mean**	**-18.3**	**Mean**	**-30.4**	**Mean**	**-29.7**	**Mean**	**-28.7**	**Mean**	**-26.2**

(continued)

Table 3.1-3. Summary of Mean Daily Air Temperature at Koala Station, 2013/2014 (completed)

Date	Mean Daily Temperature (°C)	Date	Mean Daily Temperature (°C)	Date	Mean Daily Temperature (°C)	Date	Mean Daily Temperature (°C)	Date	Mean Daily Temperature (°C)	Date	Mean Daily Temperature (°C)
01-Apr-14	-28.5	01-May-14	-4.9	01-Jun-14	7.8	01-Jul-14	16.9	01-Aug-14	10.2	01-Sep-14	9.7
02-Apr-14	-30.0	02-May-14	-13.6	02-Jun-14	-0.3	02-Jul-14	19.1	02-Aug-14	13.6	02-Sep-14	9.0
03-Apr-14	-25.2	03-May-14	-16.5	03-Jun-14	-1.8	03-Jul-14	19.5	03-Aug-14	12.6	03-Sep-14	8.6
04-Apr-14	-21.3	04-May-14	-17.3	04-Jun-14	-0.9	04-Jul-14	17.6	04-Aug-14	12.0	04-Sep-14	4.8
05-Apr-14	-26.7	05-May-14	-13.8	05-Jun-14	-0.9	05-Jul-14	17.8	05-Aug-14	14.2	05-Sep-14	1.9
06-Apr-14	-28.2	06-May-14	-10.4	06-Jun-14	2.2	06-Jul-14	13.4	06-Aug-14	9.0	06-Sep-14	0.6
07-Apr-14	-24.4	07-May-14	-8.9	07-Jun-14	7.6	07-Jul-14	11.2	07-Aug-14	7.1	07-Sep-14	-0.1
08-Apr-14	-18.7	08-May-14	-6.9	08-Jun-14	10.5	08-Jul-14	12.3	08-Aug-14	7.4	08-Sep-14	0.2
09-Apr-14	-21.9	09-May-14	-5.4	09-Jun-14	12.1	09-Jul-14	11.5	09-Aug-14	10.2	09-Sep-14	1.6
10-Apr-14	-27.8	10-May-14	-5.6	10-Jun-14	10.0	10-Jul-14	12.5	10-Aug-14	10.5	10-Sep-14	4.6
11-Apr-14	-24.9	11-May-14	-4.6	11-Jun-14	6.0	11-Jul-14	9.6	11-Aug-14	10.1	11-Sep-14	4.8
12-Apr-14	-22.5	12-May-14	-3.8	12-Jun-14	9.2	12-Jul-14	11.5	12-Aug-14	13.0	12-Sep-14	-0.9
13-Apr-14	-23.7	13-May-14	1.2	13-Jun-14	13.4	13-Jul-14	15.0	13-Aug-14	13.6	13-Sep-14	1.6
14-Apr-14	-19.7	14-May-14	3.3	14-Jun-14	11.6	14-Jul-14	18.0	14-Aug-14	8.8	14-Sep-14	-0.9
15-Apr-14	-18.0	15-May-14	-1.5	15-Jun-14	10.8	15-Jul-14	16.9	15-Aug-14	10.5	15-Sep-14	-3.6
16-Apr-14	-13.8	16-May-14	-0.3	16-Jun-14	12.1	16-Jul-14	12.9	16-Aug-14	11.8	16-Sep-14	-2.3
17-Apr-14	-9.7	17-May-14	-4.7	17-Jun-14	18.2	17-Jul-14	8.0	17-Aug-14	7.9	17-Sep-14	1.1
18-Apr-14	-6.8	18-May-14	0.5	18-Jun-14	16.8	18-Jul-14	7.2	18-Aug-14	3.6	18-Sep-14	3.0
19-Apr-14	-5.2	19-May-14	5.0	19-Jun-14	17.8	19-Jul-14	10.7	19-Aug-14	4.8	19-Sep-14	3.5
20-Apr-14	-4.7	20-May-14	-0.6	20-Jun-14	16.8	20-Jul-14	14.4	20-Aug-14	6.8	20-Sep-14	3.9
21-Apr-14	-8.5	21-May-14	-1.8	21-Jun-14	12.9	21-Jul-14	16.2	21-Aug-14	6.6	21-Sep-14	4.1
22-Apr-14	-15.3	22-May-14	-2.1	22-Jun-14	10.1	22-Jul-14	16.4	22-Aug-14	8.5	22-Sep-14	4.0
23-Apr-14	-17.6	23-May-14	-0.1	23-Jun-14	14.0	23-Jul-14	18.9	23-Aug-14	11.0	23-Sep-14	4.1
24-Apr-14	-15.5	24-May-14	0.2	24-Jun-14	19.4	24-Jul-14	20.0	24-Aug-14	12.2	24-Sep-14	0.1
25-Apr-14	-14.9	25-May-14	-0.5	25-Jun-14	20.9	25-Jul-14	19.5	25-Aug-14	12.0	25-Sep-14	0.4
26-Apr-14	-14.7	26-May-14	6.6	26-Jun-14	19.2	26-Jul-14	22.1	26-Aug-14	10.3	26-Sep-14	-0.6
27-Apr-14	-5.2	27-May-14	5.5	27-Jun-14	19.7	27-Jul-14	21.4	27-Aug-14	6.2	27-Sep-14	-0.4
28-Apr-14	-1.2	28-May-14	8.1	28-Jun-14	17.6	28-Jul-14	20.4	28-Aug-14	5.7	28-Sep-14	2.3
29-Apr-14	-0.6	29-May-14	11.4	29-Jun-14	11.2	29-Jul-14	19.4	29-Aug-14	7.5	29-Sep-14	-3.6
30-Apr-14	2.3	30-May-14	8.4	30-Jun-14	12.6	30-Jul-14	20.3	30-Aug-14	8.7	30-Sep-14	-2.9
		31-May-14	5.1			31-Jul-14	9.1	31-Aug-14	9.7		
Mean	**-16.4**	**Mean**	**-2.2**	**Mean**	**11.2**	**Mean**	**15.5**	**Mean**	**9.5**	**Mean**	**1.9**

Note:
Dash (-) indicates a period of missing data.

Table 3.1-4. Temperature and Precipitation Departures for the Mackenzie District Region

	Air Temperature (Ranked Warmest to Coldest)		Precipitation (Ranked Wettest to Driest)	
Period	Rank (out of 67)	Departure (°C)	Rank (out of 67)	Departure (%)
Winter 2013/2014	37	0.2	66	-34.2
Spring 2014	35	0.5	40	-5.2
Summer 2014	7	1.6	45	-9.8
Fall 2014	40	0.6	59	-14.4

Table 3.1-5. Koala Nipher Snow Gauge Data Summary, 2013/2014

Date	Snow-Water-Equivalent (mm)		Weather Observations At Time Of Nipher Snow Gauge Visit
	Uncorrected	Corrected for Wind Speed[1]	
7-Oct-13	-	-	Temperature: 1.1°C; Wind Direction: 80 degrees north; Wind Speed: 9 km/h; Conditions: Cloudy
11-Oct-13	-	-	Temperature: 0.1°C; Wind Direction: 290 degrees north; Wind Speed: 32 km/h; Conditions: Snowing
18-Oct-13	3.8	4.4	Temperature: -2.1°C; Wind Direction: 120 degrees north; Wind Speed: 11 km/h; Conditions: Clear
25-Oct-13	9.9	11.0	Temperature: -4.5°C; Wind Direction: 290 degrees north; Wind Speed: 24 km/h; Conditions: Snowing
October Total	**16.1**	**18.1**	
1-Nov-13	2.4	2.7	Temperature: -8.0°C; Wind Direction: 290 degrees north; Wind Speed: 17 km/h; Conditions: Snowing
8-Nov-13	3.6	3.9	Temperature: -17.0°C; Wind Direction: 110 degrees north; Wind Speed: 21 km/h; Conditions: Clear
15-Nov-13	3.2	3.6	Temperature: -18.3°C; Wind Direction: 340 degrees north; Wind Speed: 20 km/h; Conditions: Cloudy
22-Nov-13	2.0	2.2	Temperature: -30.3°C; Wind Direction: 250 degrees north; Wind Speed: 4 km/h; Conditions: Clear
29-Nov-13	2.5	2.6	Temperature: -24.1°C; Wind Direction: 80 degrees north; Wind Speed: 24 km/h; Conditions: Cloudy
November Total	**11.6**	**12.6**	
6-Dec-13	2.2	2.3	Temperature: -26.0°C; Wind Direction: 110 degrees north; Wind Speed: 19 km/h; Conditions: Blowing Snow
13-Dec-13	3.7	4.0	Temperature: -38.1°C; Wind Direction: 280 degrees north; Wind Speed: 4 km/h; Conditions: Clear
20-Dec-13	2.9	3.1	Temperature: -33.2°C; Wind Direction: 300 degrees north; Wind Speed: 22 km/h; Conditions: Cloudy
27-Dec-13	0.8	0.9	Temperature: -36.1°C; Wind Direction: 310 degrees north; Wind Speed: 26 km/h; Conditions: Ice Crystals
December Total	**20.0**	**21.6**	
5-Jan-14	24.2	28.6	Temperature: -33.7°C; Wind Direction: 290 degrees north; Wind Speed: 7 km/h; Conditions: Ice Crystals
10-Jan-14	0.9	1.0	Temperature: -32.8°C; Wind Direction: 240 degrees north; Wind Speed: 22 km/h; Conditions: Cloudy
17-Jan-14	6.6	7.2	Temperature: -23.6°C; Wind Direction: 360 degrees north; Wind Speed: 6 km/h; Conditions: Cloudy
24-Jan-14	1.6	1.8	Temperature: -31.1°C; Wind Direction: 260 degrees north; Wind Speed: 9 km/h; Conditions: Clear
31-Jan-14	4.8	5.4	Temperature: -24.8°C; Wind Direction: 350 degrees north; Wind Speed: 28 km/h; Conditions: Blowing Snow
January Total	**27.3**	**30.8**	

(continued)

Table 3.1-5. Koala Nipher Snow Gauge Data Summary, 2013/2014 (completed)

Date	Snow-Water-Equivalent (mm)		Weather Observations At Time Of Nipher Snow Gauge Visit
	Uncorrected	Corrected for Wind Speed[1]	
7-Feb-14	6.3	7.5	Temperature: -26.8°C; Wind Direction: 20 degrees north; Wind Speed: 32 km/h; Conditions: Clear
14-Feb-14	0.4	0.4	Temperature: -31.1°C; Wind Direction: 120 degrees north; Wind Speed: 9 km/h; Conditions: Clear
21-Feb-14	3.7	4.2	Temperature: -23.0°C; Wind Direction: 50 degrees north; Wind Speed: 7 km/h; Conditions: Clear
February Total	**11.4**	**13.3**	
1-Mar-14	1.0	1.1	Temperature: -33.0°C; Wind Direction: 110 degrees north; Wind Speed: 11 km/h; Conditions: Sunny
7-Mar-14	0.3	0.3	Temperature: -24.0°C; Wind Direction: 280 degrees north; Wind Speed: 43 km/h; Conditions: Blowing Snow
15-Mar-14	0.6	0.7	Temperature: -17.6°C; Wind Direction: 120 degrees north; Wind Speed: 39 km/h; Conditions: Blowing Snow
22-Mar-14	4.2	4.8	Temperature: -19.1°C; Wind Direction: 270 degrees north; Wind Speed: 20 km/h; Conditions: Clear
28-Mar-14	5.2	6.2	Temperature: -21.8°C; Wind Direction: 200 degrees north; Wind Speed: 35 km/h; Conditions: Blowing Snow
March Total	**11.3**	**13.2**	
4-Apr-14	2.4	2.8	Temperature: -17.2°C; Wind Direction: 70 degrees north; Wind Speed: 33 km/h; Conditions: Snowing
11-Apr-14	8.2	9.4	Temperature: -22.6°C; Wind Direction: 310 degrees north; Wind Speed: 20 km/h; Conditions: Clear
19-Apr-14	0.0	0.0	Temperature: -5.8°C; Wind Direction: 110 degrees north; Wind Speed: 15 km/h; Conditions: Mainly Clear
25-Apr-14	1.4	1.5	Temperature: -13.0°C; Wind Direction: 120 degrees north; Wind Speed: 22 km/h; Conditions: Clear
April Total	**46.2**	**51.2**	
2-May-14	49.3	57.1	Temperature: -15.3°C; Wind Direction: 20 degrees north; Wind Speed: 46 km/h; Conditions: Cloudy
9-May-14	0.8	0.9	Temperature: -3.2°C; Wind Direction: 60 degrees north; Wind Speed: 28 km/h; Conditions: Overcast
16-May-14	5.2	5.7	Temperature: 0.0°C; Wind Direction: 310 degrees north; Wind Speed: 22 km/h; Conditions: Snowing
23-May-14	10.0	11.7	Temperature: 0.0°C; Wind Direction: 220 degrees north; Wind Speed: 13 km/h; Conditions: Freezing Rain
30-May-14	3.5	4.0	Temperature: 5.4°C; Wind Direction: 330 degrees north; Wind Speed: 11 km/h; Conditions: Mainly Cloudy
May Total	**33.6**	**40.4**	
8 Month Total Oct 2013 to May 2014	**177.6**	**201.3**	

Notes: Dashes (-) indicate data not available.
Monthly totals were calculated by interpolating between gauge readings
[1] Corrected for wind speed using the Nipher snow equation from Goodison et al. (1998).

Table 3.1-6. Summary of 2014 Snow Surveys

Site Name	Location	Sample Date	Mean Depth of Snow (cm)	Mean Snow-Water-Equivalent (mm)	Mean Density (%)
M-1	Vulture	8-Apr-14	25.8	63.9	24.8
M-2	Grizzly	5-Apr-14	19.5	47.0	24.1
M-3	Nema Lake	9-Apr-14	11.2	43.7	39.0
M-4	Slipper	10-Apr-14	23.4	27.0	11.5
M-5	Norm's Esker	10-Apr-14	6.1	11.2	18.5
M-6	Paul	6-Apr-14	52.1	133.7	25.7
M-7	Fox	10-Apr-14	34.3	73.0	21.3
M-8	Big Hill	9-Apr-14	31.2	76.3	24.5
M-9	Nanuq	7-Apr-14	25.7	81.7	31.8
M-10	Ursula	10-Apr-14	40.8	87.0	21.3
M-11	Lac du Sauvage	10-Apr-14	28.4	61.0	21.5
M-12	Eagle	10-Apr-14	43.7	95.0	21.8
Mean[1]			**28.5**	**66.7**	**23.8**
Koala Mean[2]			**24.2**	**55.1**	**24.2**

[1] *Mean for all 12 sample stations.*
[2] *Mean for the six stations that are within the Koala watershed (M-1, M-2, M-3, M-4, M-7, M-8).*

Table 3.1-7. Summary of Total Daily Rain (mm) at Koala Station Recorded with the Tipping Bucket Rain Gauge, 2013/2014

Date	Rainfall (TBRG, mm)	Date	Rainfall (TBRG, mm)	Date	Rainfall (TBRG, mm)	Precipitation (Geonor, mm)	Date	Rainfall (TBRG, mm)	Precipitation (Geonor, mm)	Date	Rainfall (TBRG, mm)	Precipitation (Geonor, mm)	Date	Rainfall (TBRG, mm)	Precipitation (Geonor, mm)
01-Oct-13	0.0	01-May-14	-	01-Jun-14	-	-	01-Jul-14	0.0	0.0	01-Aug-14	0.8	0.4	01-Sep-14	0.5	0.0
02-Oct-13	0.0	02-May-14	-	02-Jun-14	-	-	02-Jul-14	0.0	0.0	02-Aug-14	1.3	1.0	02-Sep-14	0.0	0.0
03-Oct-13	0.0	03-May-14	-	03-Jun-14	-	-	03-Jul-14	0.0	0.0	03-Aug-14	0.5	0.4	03-Sep-14	0.0	0.1
04-Oct-13	0.0	04-May-14	-	04-Jun-14	-	-	04-Jul-14	0.0	0.0	04-Aug-14	0.5	0.5	04-Sep-14	7.9	5.7
05-Oct-13	7.6	05-May-14	-	05-Jun-14	-	-	05-Jul-14	0.0	0.0	05-Aug-14	0.3	0.2	05-Sep-14	1.5	1.2
06-Oct-13	0.0	06-May-14	-	06-Jun-14	-	0.0	06-Jul-14	0.0	0.2	06-Aug-14	0.0	0.1	06-Sep-14	0.3	0.5
07-Oct-13	0.0	07-May-14	-	07-Jun-14	-	0.0	07-Jul-14	0.0	0.0	07-Aug-14	0.0	0.0	07-Sep-14	0.0	0.6
08-Oct-13	0.0	08-May-14	-	08-Jun-14	-	0.7	08-Jul-14	0.0	0.0	08-Aug-14	0.0	0.0	08-Sep-14	0.5	0.9
09-Oct-13	3.3	09-May-14	-	09-Jun-14	-	0.2	09-Jul-14	0.0	0.0	09-Aug-14	0.0	0.0	09-Sep-14	0.0	0.0
10-Oct-13	2.8	10-May-14	-	10-Jun-14	-	0.0	10-Jul-14	1.0	2.9	10-Aug-14	6.9	5.3	10-Sep-14	0.0	0.0
11-Oct-13	0.0	11-May-14	-	11-Jun-14	-	0.0	11-Jul-14	1.8	0.0	11-Aug-14	0.0	0.0	11-Sep-14	0.0	0.0
12-Oct-13	0.0	12-May-14	-	12-Jun-14	-	0.0	12-Jul-14	0.0	0.0	12-Aug-14	0.0	0.0	12-Sep-14	0.0	0.3
13-Oct-13	0.0	13-May-14	-	13-Jun-14	-	0.6	13-Jul-14	0.0	0.0	13-Aug-14	8.4	6.5	13-Sep-14	0.0	0.0
14-Oct-13	0.5	14-May-14	-	14-Jun-14	-	0.4	14-Jul-14	0.0	0.1	14-Aug-14	0.0	0.0	14-Sep-14	0.0	0.1
15-Oct-13	0.0	15-May-14	-	15-Jun-14	-	0.3	15-Jul-14	0.0	0.8	15-Aug-14	0.0	0.0	15-Sep-14	0.0	0.0
16-Oct-13	0.0	16-May-14	-	16-Jun-14	-	1.3	16-Jul-14	39.4	29.1	16-Aug-14	6.1	4.8	16-Sep-14	0.0	0.0
17-Oct-13	0.0	17-May-14	-	17-Jun-14	-	0.0	17-Jul-14	1.3	1.0	17-Aug-14	0.3	0.3	17-Sep-14	1.0	1.1
18-Oct-13	0.0	18-May-14	-	18-Jun-14	-	0.0	18-Jul-14	0.3	0.1	18-Aug-14	0.0	0.0	18-Sep-14	1.3	0.8
19-Oct-13	0.0	19-May-14	-	19-Jun-14	0.0	0.0	19-Jul-14	0.0	0.0	19-Aug-14	0.0	0.0	19-Sep-14	0.0	0.6
20-Oct-13	0.0	20-May-14	-	20-Jun-14	0.0	0.0	20-Jul-14	0.0	0.0	20-Aug-14	0.0	0.0	20-Sep-14	1.5	0.7
21-Oct-13	0.0	21-May-14	-	21-Jun-14	0.0	0.1	21-Jul-14	0.0	0.0	21-Aug-14	0.0	0.0	21-Sep-14	3.0	2.4
22-Oct-13	0.0	22-May-14	-	22-Jun-14	0.0	0.0	22-Jul-14	0.0	0.0	22-Aug-14	0.0	0.0	22-Sep-14	0.8	0.7
23-Oct-13	0.0	23-May-14	-	23-Jun-14	0.0	0.0	23-Jul-14	0.0	0.0	23-Aug-14	0.0	0.0	23-Sep-14	0.3	0.5
24-Oct-13	0.0	24-May-14	-	24-Jun-14	0.0	0.0	24-Jul-14	0.0	0.0	24-Aug-14	0.0	0.0	24-Sep-14	0.0	0.2
25-Oct-13	0.0	25-May-14	-	25-Jun-14	0.0	0.0	25-Jul-14	0.0	0.0	25-Aug-14	0.0	0.0	25-Sep-14	0.3	0.2
26-Oct-13	0.0	26-May-14	-	26-Jun-14	0.3	0.2	26-Jul-14	0.0	0.0	26-Aug-14	1.3	0.9	26-Sep-14	0.0	0.0
27-Oct-13	0.0	27-May-14	-	27-Jun-14	0.0	0.1	27-Jul-14	0.0	0.0	27-Aug-14	0.0	0.4	27-Sep-14	0.0	0.0
28-Oct-13	0.0	28-May-14	-	28-Jun-14	0.3	0.4	28-Jul-14	3.8	2.6	28-Aug-14	0.0	0.0	28-Sep-14	2.8	1.5
29-Oct-13	0.0	29-May-14	-	29-Jun-14	0.0	0.0	29-Jul-14	0.0	0.0	29-Aug-14	0.0	0.0	29-Sep-14	0.3	0.0
30-Oct-13	0.0	30-May-14	-	30-Jun-14	0.0	0.0	30-Jul-14	0.0	0.0	30-Aug-14	0.0	0.0	30-Sep-14	2.0	2.0
31-Oct-13	0.0	31-May-14	-				31-Jul-14	0.0	0.2	31-Aug-14	0.8	1.1			
Total	**14.2**	**Total**	**-**	**Total**	**0.5**	**4.3**	**Total**	**47.5**	**37.2**	**Total**	**26.9**	**21.9**	**Total**	**23.9**	**20.2**

Notes:
Dashes (-) indicate data not available.
The tipping bucket rain gauge was re-installed on June 19.
The Geonor precipitation gauge was installed on June 6.
Due to maintenance issues, the tipping bucket rain gauge was less accurate than the Geonor.

Table 3.1-8. Monthly Precipitation (mm) at the Koala and Polar Lake Stations, 2013/2014

Month	Koala Station					Polar Lake Station Rainfall (TBRG, mm)
	Rainfall (TBRG, mm)	Precipitation (Geonor, mm)	SWE (Nipher, mm)	Precipitation (All Gauges, mm)[1]	Mean Snow Depth (cm)	
2013						
October	14.2	-	16.1 (18.1)	30.3 (32.4)	-	-
November	0.0	-	11.6 (12.6)	11.6 (12.6)	-	-
December	-	-	20.0 (21.6)	20.0 (21.6)	-	-
2014						
January	-	-	27.3 (30.8)	27.3 (30.8)	-	-
February	-	-	11.4 (13.3)	11.4 (13.3)	1.4[2]	-
March	-	-	11.3 (13.2)	11.3 (13.2)	1.3	-
April	-	-	46.2 (51.2)	46.2 (51.2)	0.6	-
May	-	-	33.6 (40.4)	33.6 (40.4)	0.2	-
June	0.5[3]	4.3[4]	-	4.3[5]	0.0	-
July	47.5	37.2	-	37.2	0.0	37.1
August	26.9	21.9	-	21.9	0.0	19.5
September	23.9	20.2	-	20.2	0.1	18.0
12 Month Total	**-**	**-**	**177.6 (201.3)**	**275.3 (299.1)[5]**	**-**	**-**

Notes:
SWE = snow-water-equivalent
Dashes (-) indicate data not available.
Values in brackets are corrected for wind speed.
Due to maintenance issues, the tipping bucket rain gauge was less accurate than the Geonor.
The low snow depth values are due to windswept snow.
[1] *SWE (corrected for wind speed) + Rainfall, in 2013; SWE (corrected for wind speed) and Geonor gauge precipitation, in 2014.*
[2] *Installed on February 4.*
[3] *Re-installed on June 19.*
[4] *Installed on June 6.*
[5] *Missing June 1 to 5.*

Table 3.1-9. Total Monthly Precipitation (mm) at Koala and Regional Meteorological Stations, 2013/2014

Month	Koala Station[1] (mm)	Kugluktuk Airport (mm)	Yellowknife Airport (mm)
2013			
October	30.3 (32.4)	47.0	28.8[2]
November	11.6 (12.6)	3.4	15.8
December	20.0 (21.6)	4.8	13.2[2]
2014			
January	27.3 (30.8)	3.6	30.2[2]
February	11.4 (13.3)	5.2[3]	7.6
March	11.3 (13.2)	7.0	5.8
April	46.2 (51.2)	3.0	4.6
May	33.6 (40.4)	15.2	22.4[2]
June	4.3[4]	25.6	4.2
July	37.2	46.2	14.6[2]
August	21.9	18.2	61.8[2]
September	20.2	49.2	12.6
12 Month Total	**275.3 (299.1)[4]**	**228.4**	**221.6**
Normal	**345.0[5]**	**247.2[6]**	**288.6[6]**

[1] *The snow-water-equivalent data from the Koala Nipher snow gauge (uncorrected for wind effects) were used in these calculations.*
[2] *Missing 1 or 2 days of data.*
[3] *Missing 6 days of data.*
[4] *Missing June 1 to 5.*
[5] *Environmental Assessment Report for Sable, Pigeon and Beartooth Pipes (Rescan 2000).*
[6] *Canadian Climate Normals 1981-2010 from Environment Canada-Meteorological Services of Canada (MSC) website (http://climate.weather.gc.ca/climate_normals/).*

Table 3.1-10. Summary of Mean Daily Meteorological Parameters Recorded at Polar Lake Station, 2014

Date	1.9 m Mean Daily Air Temp. (°C)	0.5 m Mean Daily Air Temp. (°C)	-0.5 m Mean Daily Water Temp. (°C)	-1.0 m Mean Daily Water Temp. (°C)	1.9 m Mean Daily Rel. Humid. (%)	0.5 m Mean Daily Rel. Humid. (%)	2.3 m Mean Daily Wind Spd. (m/s)	0.5 m Mean Daily Wind Spd. (m/s)	Mean Daily Global Solar Rad. (W/m²)	Mean Daily Net Radiation (W/m²)
29-Jun-14	11.0	11.3	15.0	15.0	76.9	79.6	5.9	5.8	142.9	92.5
30-Jun-14	12.5	12.5	15.2	14.9	64.0	66.5	1.6	1.7	211.3	134.4
1-Jul-14	16.3	16.0	16.7	16.2	53.7	58.2	2.5	2.2	322.7	205.6
2-Jul-14	18.5	18.6	17.4	16.9	45.8	48.5	2.4	2.3	301.0	194.6
3-Jul-14	19.2	19.2	17.7	17.0	48.3	50.7	2.2	2.2	236.6	139.0
4-Jul-14	17.5	17.3	17.1	17.0	48.5	52.0	5.3	5.0	337.9	217.0
5-Jul-14	17.5	17.3	17.2	17.0	51.3	54.6	3.2	3.0	313.9	204.4
6-Jul-14	13.3	13.4	17.1	16.9	67.0	70.9	4.6	4.1	249.2	143.0
7-Jul-14	10.9	11.0	16.8	16.7	67.3	70.4	2.7	2.5	264.0	140.3
8-Jul-14	11.8	11.9	16.5	16.3	67.3	70.9	4.2	4.0	315.6	187.9
9-Jul-14	11.4	11.5	16.2	16.0	58.2	61.1	3.0	3.0	291.8	176.5
10-Jul-14	12.5	12.6	15.9	15.8	61.9	64.8	3.2	3.1	182.4	106.9
11-Jul-14	9.9	10.2	15.1	15.0	68.9	73.2	5.8	4.2	269.3	156.0
12-Jul-14	11.7	11.7	15.0	14.8	63.0	65.3	2.9	3.0	316.7	200.7
13-Jul-14	15.3	15.3	15.1	14.9	50.5	52.2	4.2	3.9	272.6	160.9
14-Jul-14	18.2	18.0	15.3	15.1	57.6	59.6	3.0	2.8	178.0	107.0
15-Jul-14	16.7	16.5	15.8	15.6	75.0	77.5	2.9	2.5	107.0	52.0
16-Jul-14	13.1	13.2	15.4	15.3	85.6	87.3	6.3	4.0	133.4	66.4
17-Jul-14	8.4	8.8	14.3	14.2	78.6	81.4	5.6	4.0	191.1	73.8
18-Jul-14	7.4	7.8	13.1	13.1	71.1	75.4	5.8	5.5	213.2	112.7
19-Jul-14	10.4	10.2	13.6	13.4	63.4	67.9	2.7	1.8	312.9	177.3

(continued)

Table 3.1-10. Summary of Mean Daily Meteorological Parameters Recorded at Polar Lake Station, 2014 (continued)

Date	1.9 m Mean Daily Air Temp. (°C)	0.5 m Mean Daily Air Temp. (°C)	-0.5 m Mean Daily Water Temp. (°C)	-1.0 m Mean Daily Water Temp. (°C)	1.9 m Mean Daily Rel. Humid. (%)	0.5 m Mean Daily Rel. Humid. (%)	2.3 m Mean Daily Wind Spd. (m/s)	0.5 m Mean Daily Wind Spd. (m/s)	Mean Daily Global Solar Rad. (W/m²)	Mean Daily Net Radiation (W/m²)
20-Jul-14	13.7	13.2	14.8	14.5	54.0	59.3	1.9	1.9	319.6	200.7
21-Jul-14	16.0	15.7	15.7	15.3	53.2	58.1	2.5	2.5	230.6	131.1
22-Jul-14	16.2	15.9	15.5	15.2	61.9	66.1	2.4	2.3	185.7	91.5
23-Jul-14	17.7	17.3	16.1	15.6	65.2	67.9	1.5	1.5	190.7	110.5
24-Jul-14	20.0	19.8	17.0	16.4	57.8	59.6	2.3	2.3	217.5	141.6
25-Jul-14	19.2	19.0	18.1	17.3	76.3	78.0	1.8	1.8	211.7	137.7
26-Jul-14	21.6	21.3	19.4	18.6	58.2	61.1	1.8	1.8	232.6	154.9
27-Jul-14	20.8	20.6	19.9	19.0	60.8	63.7	1.9	1.8	204.8	119.6
28-Jul-14	20.1	19.9	20.3	19.6	69.1	72.4	2.2	2.1	183.0	91.0
29-Jul-14	19.1	18.9	20.3	19.5	68.3	70.9	0.9	1.0	150.1	67.8
30-Jul-14	20.2	20.1	19.9	19.4	66.3	68.0	3.1	3.0	151.9	76.4
31-Jul-14	9.3	9.9	17.2	17.2	78.0	81.6	4.7	3.1	99.7	28.2
1-Aug-14	10.6	11.0	14.8	14.9	62.4	66.1	6.1	5.7	144.4	59.1
2-Aug-14	13.4	13.4	14.3	14.2	69.6	72.2	4.5	4.3	151.0	69.9
3-Aug-14	12.2	12.1	14.6	14.5	80.6	82.7	3.3	3.0	195.9	91.2
4-Aug-14	11.6	11.8	15.0	14.9	77.3	79.1	2.9	3.1	210.3	122.1
5-Aug-14	14.1	14.1	14.9	14.8	77.4	78.9	3.8	3.6	129.4	67.5
6-Aug-14	9.1	9.4	14.2	14.2	80.1	83.1	4.6	4.6	147.1	67.5
7-Aug-14	7.0	7.4	13.4	13.4	69.6	73.7	5.0	4.9	230.4	122.7
8-Aug-14	7.1	7.3	13.0	12.9	65.0	68.0	2.2	2.3	208.3	99.9
9-Aug-14	9.6	9.7	12.9	12.8	63.2	65.9	1.8	1.8	161.7	87.4

(continued)

Table 3.1-10. Summary of Mean Daily Meteorological Parameters Recorded at Polar Lake Station, 2014 (continued)

Date	1.9 m Mean Daily Air Temp. (°C)	0.5 m Mean Daily Air Temp. (°C)	-0.5 m Mean Daily Water Temp. (°C)	-1.0 m Mean Daily Water Temp. (°C)	1.9 m Mean Daily Rel. Humid. (%)	0.5 m Mean Daily Rel. Humid. (%)	2.3 m Mean Daily Wind Spd. (m/s)	0.5 m Mean Daily Wind Spd. (m/s)	Mean Daily Global Solar Rad. (W/m²)	Mean Daily Net Radiation (W/m²)
10-Aug-14	10.5	10.6	12.7	12.6	83.4	84.9	2.5	2.4	67.9	-1.2
11-Aug-14	9.6	9.5	12.9	12.8	70.0	73.9	2.6	2.6	253.8	106.7
12-Aug-14	12.8	13.0	13.1	13.0	60.2	61.6	3.0	2.8	220.8	120.6
13-Aug-14	13.5	13.5	13.5	13.4	84.7	85.6	4.4	4.3	96.9	53.5
14-Aug-14	8.9	9.1	12.9	12.9	88.8	89.7	2.1	1.8	59.5	13.4
15-Aug-14	10.4	10.3	13.0	12.8	79.9	81.8	1.8	1.9	155.6	99.6
16-Aug-14	11.7	11.7	13.0	12.8	92.4	93.0	3.3	3.1	47.7	3.5
17-Aug-14	8.1	8.4	12.5	12.5	81.6	84.4	6.6	5.2	154.6	89.4
18-Aug-14	3.8	4.0	11.7	11.7	75.5	79.2	3.0	3.1	134.9	49.4
19-Aug-14	4.6	4.8	11.1	11.1	69.8	73.9	3.8	3.8	233.6	100.3
20-Aug-14	6.3	6.5	10.8	10.8	67.5	70.7	2.6	2.1	172.5	71.8
21-Aug-14	6.5	6.7	10.6	10.6	74.9	77.7	3.1	3.2	154.9	64.5
22-Aug-14	8.4	8.5	10.5	10.4	68.2	69.7	2.8	2.7	191.5	88.8
23-Aug-14	11.0	10.6	10.8	10.6	64.3	66.8	2.5	2.4	207.1	105.1
24-Aug-14	12.5	12.4	10.8	10.8	56.9	58.8	4.4	4.0	139.3	66.8
25-Aug-14	11.9	11.7	11.0	10.9	66.2	67.9	2.7	2.6	147.4	67.4
26-Aug-14	10.2	10.1	11.4	11.3	79.7	82.5	3.2	2.1	124.6	48.1
27-Aug-14	6.4	6.7	10.8	10.9	77.2	80.1	4.8	3.7	98.2	48.1
28-Aug-14	5.8	5.9	10.4	10.4	69.8	74.0	3.9	2.4	173.7	76.3
29-Aug-14	6.4	6.5	10.6	10.4	68.6	69.3	1.1	1.3	205.6	78.5
30-Aug-14	8.2	8.2	10.2	10.2	70.8	72.3	3.6	3.3	127.8	46.6

(continued)

Table 3.1-10. Summary of Mean Daily Meteorological Parameters Recorded at Polar Lake Station, 2014 (continued)

Date	1.9 m Mean Daily Air Temp. (°C)	0.5 m Mean Daily Air Temp. (°C)	-0.5 m Mean Daily Water Temp. (°C)	-1.0 m Mean Daily Water Temp. (°C)	1.9 m Mean Daily Rel. Humid. (%)	0.5 m Mean Daily Rel. Humid. (%)	2.3 m Mean Daily Wind Spd. (m/s)	0.5 m Mean Daily Wind Spd. (m/s)	Mean Daily Global Solar Rad. (W/m²)	Mean Daily Net Radiation (W/m²)
31-Aug-14	9.8	9.8	10.3	10.2	83.0	84.3	4.1	3.8	123.4	57.8
1-Sep-14	9.7	9.6	10.5	10.4	76.9	78.2	2.1	2.1	127.3	61.0
2-Sep-14	8.9	8.8	10.7	10.6	69.6	71.2	1.6	1.6	137.6	71.2
3-Sep-14	8.7	8.7	10.3	10.3	72.4	74.2	2.6	2.6	60.2	15.6
4-Sep-14	5.1	5.3	9.7	9.8	73.3	76.9	5.8	4.8	138.3	50.6
5-Sep-14	2.6	3.0	8.1	8.2	70.1	73.5	4.7	4.5	100.1	8.5
6-Sep-14	1.2	1.6	6.8	6.9	80.6	83.9	7.9	8.1	93.2	23.0
7-Sep-14	0.3	0.6	5.2	5.3	77.7	81.3	6.9	3.1	88.5	26.7
8-Sep-14	0.5	0.8	4.7	4.8	85.7	88.1	5.4	3.0	108.3	55.6
9-Sep-14	2.1	2.1	4.6	4.7	75.3	78.9	4.8	3.6	155.4	61.0
10-Sep-14	5.1	5.3	4.7	4.8	61.4	64.0	6.1	5.5	149.3	57.3
11-Sep-14	5.0	5.3	5.2	5.2	70.5	71.3	3.0	3.0	138.1	62.6
12-Sep-14	-0.5	-0.2	4.5	4.6	79.7	82.2	3.7	3.6	47.8	6.8
13-Sep-14	2.2	2.4	4.0	4.1	73.2	74.9	4.3	4.2	121.3	33.1
14-Sep-14	-1.1	-1.0	3.9	4.0	75.0	78.5	3.5	3.2	113.3	29.1
15-Sep-14	-3.3	-3.0	3.2	3.4	59.9	63.7	2.1	2.3	44.4	-3.6
16-Sep-14	-2.1	-2.1	3.2	3.3	60.0	63.0	2.2	2.3	132.7	36.9
17-Sep-14	1.1	1.1	2.6	2.7	88.7	89.3	3.0	2.8	16.4	-7.6
18-Sep-14	3.0	2.9	3.1	3.1	90.1	91.0	2.4	1.2	51.3	28.5
19-Sep-14	3.6	3.6	3.5	3.5	87.8	88.6	2.8	2.7	66.9	30.3
20-Sep-14	4.0	4.0	3.6	3.7	93.8	94.5	2.1	2.2	39.0	14.6

(continued)

Table 3.1-10. Summary of Mean Daily Meteorological Parameters Recorded at Polar Lake Station, 2014 (completed)

Date	1.9 m Mean Daily Air Temp. (°C)	0.5 m Mean Daily Air Temp. (°C)	-0.5 m Mean Daily Water Temp. (°C)	-1.0 m Mean Daily Water Temp. (°C)	1.9 m Mean Daily Rel. Humid. (%)	0.5 m Mean Daily Rel. Humid. (%)	2.3 m Mean Daily Wind Spd. (m/s)	0.5 m Mean Daily Wind Spd. (m/s)	Mean Daily Global Solar Rad. (W/m²)	Mean Daily Net Radiation (W/m²)
21-Sep-14	4.0	4.0	4.0	4.0	96.6	96.9	2.6	2.6	39.3	22.3
22-Sep-14	4.0	4.0	3.9	3.9	95.9	96.2	5.4	4.8	31.7	16.3
23-Sep-14	4.5	4.4	4.3	4.3	83.7	85.5	8.5	8.4	74.8	38.3
24-Sep-14	0.1	0.4	3.3	3.4	81.2	82.7	3.7	3.1	57.9	11.0
25-Sep-14	0.3	0.4	3.1	3.3	86.8	87.9	2.4	1.4	59.7	-2.2
26-Sep-14	-0.2	-0.1	2.9	3.0	70.2	72.5	2.3	2.3	99.9	-3.5
27-Sep-14	-0.2	-0.4	2.6	2.8	66.4	70.3	1.9	1.8	111.0	4.3
28-Sep-14	2.2	2.2	2.7	2.7	90.6	91.0	3.3	3.1	31.5	9.7
29-Sep-14	-3.5	-3.2	1.7	1.8	90.5	92.3	9.6	8.7	31.0	-1.8
30-Sep-14	-2.9	-2.7	0.1	0.3	92.2	94.6	10.6	9.5	22.5	-10.2
1-Oct-14	-3.3	-3.0	0.0	0.1	90.3	94.2	-	-	64.9	-0.5
2-Oct-14	-5.7	-5.3	0.1	0.4	82.8	90.3	-	-	54.7	-16.4
3-Oct-14	-5.7	-5.4	0.2	0.7	87.6	90.2	-	-	45.6	-6.5
4-Oct-14	-7.8	-7.7	0.4	1.0	84.2	88.1	-	-	88.3	-18.4
5-Oct-14	-11.7	-11.1	0.5	1.1	83.8	85.3	-	-	65.6	-21.0
6-Oct-14	-9.0	-8.7	0.6	1.2	86.3	87.8	4.3	-	38.4	-16.1
7-Oct-14	-2.1	-2.0	0.7	1.2	94.6	95.3	4.0	-	49.3	-5.9
8-Oct-14	-1.7	-1.7	0.7	1.1	91.7	93.0	2.0	-	44.8	-10.7
9-Oct-14	-1.7	-1.7	0.6	1.1	92.2	93.8	2.7	2.6	41.4	-3.3
10-Oct-14	-1.2	-1.3	0.6	1.1	96.7	97.3	4.6	3.7	35.0	1.1
11-Oct-14	-3.6	-3.6	0.6	1.1	93.6	95.2	9.3	7.2	29.0	-5.2

Note: Dashes (-) indicate data not available.

Table 3.1-11. Penman Method Open Water Evaporation (mm) at Polar Lake, 2014

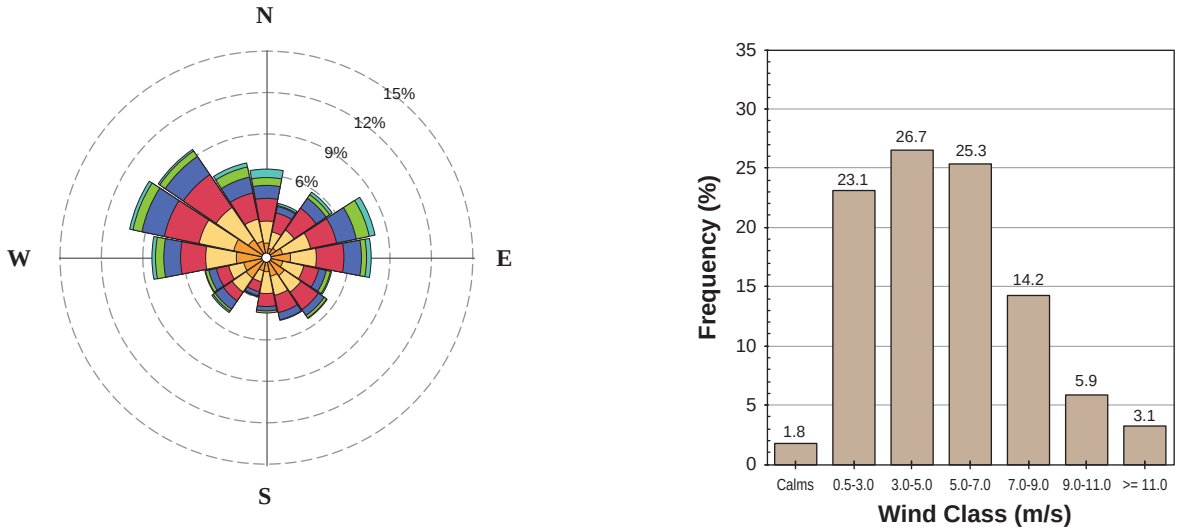
Month	Open Water Evaporation (mm)
May	-
June	101.4[1]
July	121.4[1]
August	63.1
September	25.0
October	0
Total	**310.9[2]**

Note:
Dashes (-) indicate data not available.
[1] Estimated using the Thornthwaite Potential Evapotranspiration Method (see Section 2.2.2).
[2] The open water season (50% ice free) is assumed to be from May 26 to October 2, 2014. May, June and October evaporation data are missing because the Polar Lake micrometeorological station was commissioned on June 28, 2014 and decommissioned on October 12, 2014.

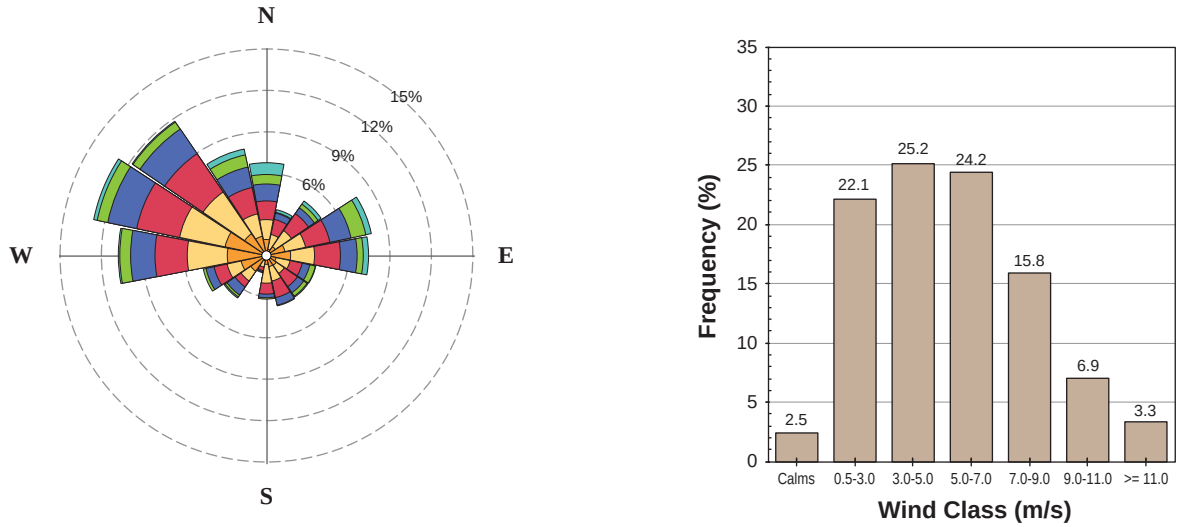
Figure 3.1-1

Wind Rose and Frequency Distribution for Koala Meteorological Station, October 1, 2013 to September 30, 2014

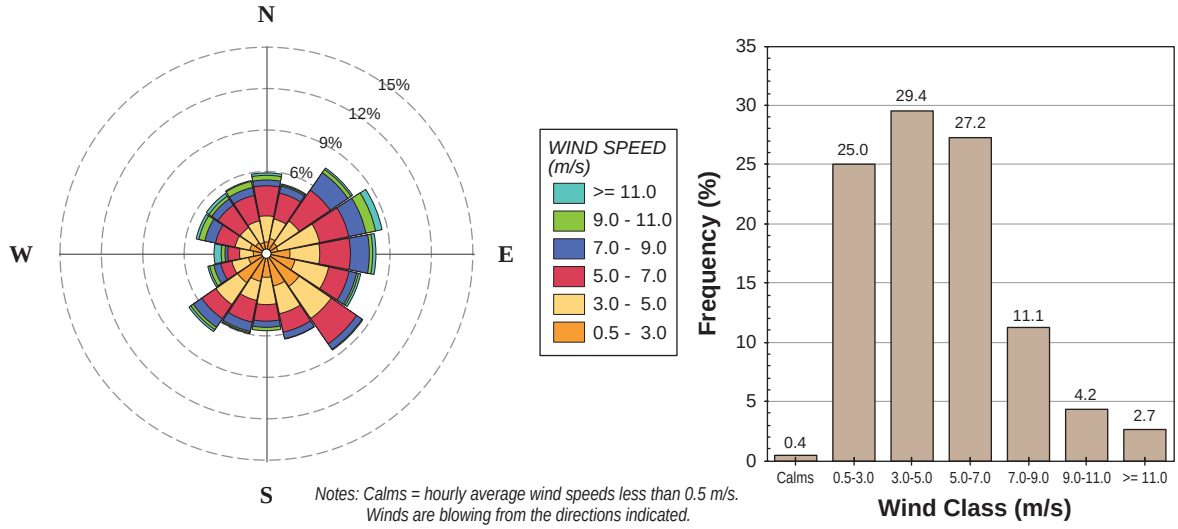
12 Month Period; October 1, 2013 to September 30, 2014



Winter; October 1, 2013 to May 31, 2014



Summer; June 1, 2014 to September 30, 2014



Notes: Calms = hourly average wind speeds less than 0.5 m/s.
Winds are blowing from the directions indicated.

3.2 HYDROLOGY

Streamflow monitoring was undertaken in 2014 at four streams within the Koala Watershed (Vulture-Polar, Lower PDC, Nema-Martine, and Slipper-Lac de Gras), and two streams within the King-Cujo Watershed (Cujo Outflow and Christine-Lac du Sauvage), along with one reference watershed (Counts Outflow; Table 3.2-1). Automated hydrometric monitoring stations were installed from late May to early June, and operated until late September, when stations were demobilized for winter. Each hydrometric station consisted of a staff gauge, three benchmarks, an INW Model PS9800 pressure transducer (± 0.1% full scale output accuracy, 4-20 mA output), and a Terrascience Elf2 datalogger that recorded water stage at 10 to 30 minute intervals throughout the open water season.

Manual streamflow and concurrent stage measurements were conducted at each station approximately biweekly throughout the open water season, and more frequently during freshet high flows (Tables 3.2-2 to 3.2-8). Stage-discharge measurements (Tables 3.2-9 to 3.2-15) were used to develop stage-discharge relationships and construct rating curves for each station (Figures 3.2-1 to 3.2-7). Additionally, cross-sectional geometry surveys were conducted to support development of rating curves. The cross sections surveyed at the stations will be used to monitor the stability of hydraulic controls at each monitoring location in subsequent years.

3.2.1 Rating Curves

2014 Rating curves are based on cumulative data collected at the Ekati Diamond Mine since 2004 (Figures 3.2-1 to 3.2-7). Cujo Outflow and Counts Outflow include data beginning in 2007 and Slipper-LDG includes data beginning in 2013. The Nema-Martine and Christine-Lac du Sauvage rating curves are based on 2013 and 2014 data only. In previous AEMP reports, data collected in one open-water season was compared with the previous year to determine whether or not the stage-discharge relationship had changed, and a new rating curve was needed. If the values were greater than 10% from the established rating curve, a new rating curve was created and the old one was no longer used. In 2014, the dataset was re-evaluated, and it was determined that although between individual years there was greater than 10% measurement uncertainty, a general stage-discharge relationship exists at most stations. Therefore, a base rating curve was established where possible using all years of data collected, and individual departures from the base curve were tracked using rating shifts. The inclusion of all data within the dataset will allow for better understanding of the inter-annual variability of the streams, and will also help to identify measurement uncertainty in data collection.

At station Vulture-Polar, a rating shift was not applied to the 2014 measurements even though they were greater than 10% from the base curve. Due to the low discharge values, there was greater overall uncertainty in the discharge measurements for Vulture-Polar, thus applying a shift was determined to be inappropriate at this station.

At station Lower PDC, a rating shift was required during mid-season flows when rating measurements plotted to the left of the base curve indicating higher than estimated stage likely as a result of instream vegetation causing additional drag on water flowing downstream. A shift was used to adjust flows from the base curve from June 18th onwards (Figure 3.2-2).

At station Christine-Lac du Sauvage, all rating measurements plotted to the left of the rating curve constructed in 2013, and so a shift was applied through the entire monitoring period. Subsequent years of measurement are needed to determine if the shift is a function of changes to the hydraulic geometry within the stream, or due to measurement error.

The August 16 measurement from station Cujo Lake was not used to develop the 2014 rating curve due to the large uncertainty in the measurement (due to negligible flow in the channel). All remaining measurements used to develop the rating curves had errors less than 17% (Tables 3.2-2 to 3.2-8).

Rating curve error and uncertainty were assessed in two ways. First, uncertainty from the manual flow measurement process was determined (95% confidence level), and varied from 3.7% to 26.3% (Tables 3.2-2 to 3.2-8). Second, rating curves were constructed to optimize the RMS error (RMS is a unitless value). RMSD varied from 7.5 at Nema-Martine to 41.2 at Vulture-Polar (Figures 3.2-1 to 3.2-7).

Rating curves were used to develop discharge hydrographs, which are a calculated time series of daily discharge from the water levels recorded at the automated hydrometric stations (Figures 3.2-1 to 3.2-7; Tables 3.2-9 to 3.2-15).

3.2.2 Hydrographs and Hydrologic Indices

The hydrologic year in the Ekati Diamond Mine area is defined by the onset of freezing conditions. The 2014 hydrologic year began in mid-October 2013 and ended in mid-October 2014. Following winter, daily average air temperature first rose above zero for one day on April 30, 2014. Temperatures dropped again, ranging from -17 to 5°C, before consistently maintaining an average daily temperature above zero. Long days in late May/early June provide large amounts of solar energy to generate snow melt runoff, and the frozen ground inhibited infiltration. The majority of snowmelt and runoff occurred in the first week of June. As a result, discharge rose very quickly at the start of the freshet season. Streamflow began first at Counts Outflow, followed by the Lower PDC (Figures 3.2-1 to 3.2-7).

Hydrometric stations were installed from the last week of May to the first week of June. Peak flow was estimated to have occurred between May 29 and June 1 following the rapid freshet rising limb of the hydrograph (see Figures 3.2-1 to 3.2-7). Between 48% and 88% of total annual runoff occurred in May and June (Figure 3.2-8; see also Table 8-2 in Part 1 – Evaluation of Effects). Winter freeze up is expected to have occurred at all of monitored streams by October 10 based on a review of available air temperature records.

During the hydrologic year, 263 mm of precipitation fell in the Ekati Diamond Mine area (Table 3.1-7), which is below the normal value of 345 mm. Two large rain events occurred in the summer of 2014: one on May 2 (57 mm) and another on July 16 (29 mm). Total runoff in 2014 varied from 28 mm at Cujo Outflow to 100 mm at Counts Outflow (Table 3.2-17). Maximum daily discharges varied from 0.06 m^3/s at Cujo Outflow to 7.14 m^3/s at Slipper-Lac de Gras (Table 3.2-16). The majority of annual runoff occurred during freshet (Figures 3.2-1 to 3.2-7), with the exception of Counts Outflow and Slipper-Lac de Gras, which had a secondary peak occur around July 17, following a large rain event. Pumping of approximately 133,000 m^3 of water from Bearclaw Lake to North Panda Lake between August 7 and 14 is also evident in the Lower PDC hydrograph (Table 3.2-18; Figure 3.2-2).

3.2.3 Hydraulic Geometry Surveys

Channel geometry surveys were conducted at all seven hydrometric monitoring stations. These surveys will be used to monitor channel stability over multiple years. Cross-sectional representations of the channels are displayed in Figures 3.2-9 to 3.2-15.

Supporting Tables and Figures

Table 3.2-1. Locations for Hydrometric Stations, AEMP Stream Sites, 2014

Station Number	Location	Northing (m)	Easting (m)	Drainage Area (km^2)
WGS-14	Vulture–Polar	7179565	521484	7
WGS-39	Lower PDC	7175900	518600	21
n/a	Nema-Martine	7170646	513921	114
WGS-24	Slipper–Lac de Gras	7164913	507616	185
WGL-46	Cujo Outflow	7162100	539000	3
n/a	Christine-Lac du Sauvage	7163840	540025	13
WGS-35	Counts Outflow	7169713	535280	4

Table 3.2-2. Manual Flow Measurements at Vulture-Polar Stream, 2014

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Vulture-Polar			
Stream Name	Vulture-Polar			
Date Monitored	2-Jun-14			
Time at Site (24 hr)	**Start Time:**	8:30:00 AM	**End Time:**	11:15:00 AM
Personnel	Kim Balsillie, Jaclyn Bowman			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	521484	7179565		
Weather Conditions	overcast			

Transducer Information			
DL Model	ELF2 s/n 0071	**PT Serial #**	914008
Gain	3.558	**Offset**	0.001
Status	Okay	**Battery**	4.4V
# of Records	52	**Memory Free**	32504
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 63	1.887	101.887		**100.000**	Windy
BM 62			1.935	~~99.952~~	do not use
BM 60			1.971	99.916	
WL			1.763	100.124	
PT			2.601	99.286	
TBM			1.457	100.430	
TBM	1.259	101.689		100.430	
BM 63			1.687	100.002	
BM 62			1.723	99.966	shot twice
BM 60			1.772	99.917	
WL			1.564	100.125	
PT			2.401	99.288	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 63	100.000	100.001	0.001	
BM 62	99.970	99.966	-0.003	
BM 60	99.916	99.917	0.001	

Summary	
Staff Gauge Reading (m)	0.956
Stage from WL Survey (m)	100.125
Pressure Transducer Reading (m)	0.836
Pressure Transducer Elevation (m)	99.288
Discharge (m^3/s)	**0.2**
Cross Sectional Area	1.311
Average Velocity	0.169

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	10:30	**End**	11:08	**Location**	~30 m US of PT	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Current Meter			**Instrument Serial #**		131641001571	
Real Time Reading (m)	**Start**	**Reading**	0.837	**Time**	9:57	**Staff Gauge (m)**	**0.956**
	End	**Reading**	0.835	**Time**	11:00	**Time of SG Reading**	9:20

No.	Notes	Station (m)	Depth (m)	Distance (m)	Area (m^2)	Velocity (m/s) 60%	20%	80%	Q (m^3/s)	% of Total Q %
1	RB weeds	5.40	0.10	0.0	0.03	0			0.000	0.0
2		5.15	0.27	0.3	0.05	0.01			0.001	0.2
3		5.00	0.30	0.2	0.05	0.03			0.001	0.6
4		4.85	0.32	0.2	0.05	-0.04			-0.002	-0.9
5		4.70	0.33	0.1	0.05	0.03			0.001	0.7
6		4.55	0.37	0.2	0.06	0.08			0.004	2.0
7		4.40	0.39	0.1	0.05	0.16			0.008	3.5
8		4.30	0.38	0.1	0.04	0.19			0.007	3.3
9		4.20	0.38	0.1	0.04	0.21			0.008	3.6
10		4.10	0.38	0.1	0.04	0.2			0.008	3.4
11		4.00	0.40	0.1	0.04	0.19			0.008	3.4
12		3.90	0.42	0.1	0.04	0.21			0.009	4.0
13		3.80	0.44	0.1	0.04	0.25			0.011	5.0
14		3.70	0.45	0.1	0.04	0.28			0.013	5.7
15		3.60	0.44	0.1	0.04	0.29			0.013	5.8
16		3.50	0.42	0.1	0.04	0.31			0.013	5.9
17		3.40	0.38	0.1	0.04	0.33			0.013	5.7
18		3.30	0.40	0.1	0.04	0.32			0.013	5.8
19		3.20	0.42	0.1	0.04	0.3			0.013	5.7
20		3.10	0.42	0.1	0.04	0.2			0.008	3.8
21		3.00	0.42	0.1	0.04	0.19			0.008	3.6
22		2.90	0.43	0.1	0.04	0.21			0.009	4.1
23		2.80	0.41	0.1	0.05	0.21			0.011	4.9
24		2.65	0.32	0.2	0.05	0.3			0.014	6.5
25		2.50	0.30	0.2	0.05	0.27			0.012	5.5
26		2.35	0.31	0.2	0.05	0.26			0.014	6.4
27		2.15	0.18	0.2	0.02	0.17			0.004	1.8
28	weeds	2.09	0.13	0.1	0.07	0			0.000	0.0
29	LB	1.07	0.00	1.0	0.07	0			0.000	0.0
30										
31										
32										
33										
Total Q									**0.221**	**100.0**

General Notes

Data logger started June 1, 2014, prior to installation at the station.

(continued)

Table 3.2-2. Manual Flow Measurements at Vulture-Polar Stream, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Vulture-Polar			
Stream Name	Vulture-Polar			
Date Monitored	5-Jun-14			
Time at Site (24 hr)	**Start Time:**	11:38:00 AM	**End Time:**	
Personnel	Jaclyn Bowman, Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	521484	7179565		
Weather Conditions	cloudy, cold			

Transducer Information			
DL Model	ELF2 s/n 0071	**PT Serial #**	914008
Gain	3.558	**Offset**	0.001
Status	Okay	**Battery**	4.4V
# of Records	200	**Memory Free**	32430
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 63	1.893	101.893		**100.000**	
BM 62			1.928	99.965	
BM 60			1.977	99.916	
WL			1.901	99.992	
PT			2.607	99.286	bolt
TBM			1.499	100.394	
TBM	1.319	101.713		100.394	
BM 63			1.712	100.001	
BM 62			1.748	99.965	
BM 60			1.797	99.916	
WL			1.721	99.992	
PT			2.427	99.286	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 63	100.000	100.001	0.000	
BM 62	99.970	99.965	-0.004	
BM 60	99.916	99.916	0.001	

Summary	
Staff Gauge Reading (m)	0.830
Stage from WL Survey (m)	99.992
Pressure Transducer Reading (m)	0.706
Pressure Transducer Elevation (m)	99.286
Discharge (m^3/s)	**0.1**
Cross Sectional Area	0.888
Average Velocity	0.087

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	12:49	**End**	13:21	**Location**	4 m DS of station	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Current Meter			**Instrument Serial #**		131641001571	
Real Time Reading (m)	**Start**	**Reading**	0.706	**Time**	13:00	**Staff Gauge (m)**	**0.830**
	End	**Reading**	0.706	**Time**	13:30	**Time of SG Reading**	11:35

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	RB	1.35	0.00	0.0	0.02	0			0.000	0.0
2		1.45	0.47	0.1	0.04	0.01			0.000	0.5
3		1.50	0.48	0.1	0.02	0.02			0.000	0.6
4		1.55	0.50	0.1	0.03	0.02			0.001	0.6
5		1.60	0.51	0.1	0.03	0.03			0.001	1.0
6		1.65	0.52	0.0	0.03	0.02			0.001	0.7
7		1.70	0.54	0.1	0.03	0.06			0.002	2.1
8		1.75	0.56	0.1	0.03	0.06			0.002	2.2
9		1.80	0.56	0.1	0.03	0.02			0.001	0.7
10		1.85	0.56	0.1	0.03	0.12			0.003	4.4
11		1.90	0.57	0.0	0.03	0.1			0.003	3.7
12		1.95	0.57	0.1	0.03	0.18			0.005	6.7
13		2.00	0.56	0.1	0.03	0.2			0.006	7.3
14		2.05	0.56	0.0	0.03	0.21			0.006	7.6
15		2.10	0.54	0.1	0.03	0.23			0.006	8.1
16		2.15	0.56	0.0	0.03	0.25			0.007	9.1
17		2.20	0.56	0.1	0.03	0.29			0.008	10.5
18		2.25	0.57	0.0	0.03	0.28			0.008	10.4
19		2.30	0.55	0.0	0.03	0.28			0.008	10.0
20		2.35	0.56	0.1	0.03	0.21			0.006	7.6
21		2.40	0.54	0.0	0.03	0.15			0.004	5.3
22		2.45	0.54	0.1	0.03	0.13			0.004	4.6
23		2.50	0.54	0.0	0.03	0.04			0.001	1.4
24	behind rock	2.55	0.54	0.0	0.03	0.01			0.000	0.4
25	behind rock	2.60	0.54	0.1	0.04	-0.02			-0.001	-1.1
26	behind rock	2.70	0.54	0.1	0.11	-0.03			-0.003	-4.2
27	LB	3.00	0.00	0.3	0.08	0			0.000	0.0
28										
29										
30										
31										
32										
33										
Total Q									**0.077**	**100.0**

General Notes

Found the tag for benchmark 61 in the stream bed.

(continued)

Table 3.2-2. Manual Flow Measurements at Vulture-Polar Stream, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Vulture-Polar			
Stream Name	Vulture-Polar			
Date Monitored	27-Jun-14			
Time at Site (24 hr)	**Start Time:**	11:48:00 AM	**End Time:**	
Personnel	Catherine Graydon, Gillian McNaughton			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	521484	7179565		
Weather Conditions	sunny, no clouds			

Transducer Information			
DL Model	ELF2 s/n 0071	**PT Serial #**	914008
Gain	3.558	**Offset**	0.001
Status	Ok	**Battery**	100%
# of Records	1256	**Memory Free**	31903
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 63	2.005	102.005		**100.000**	
BM 62			2.016	99.989	
BM 60			2.080	99.925	
WL			2.055	99.950	
PT			2.706	99.299	
TBM			2.116	99.889	
TBM	2.085	101.974		99.889	
BM 63			1.976	99.998	
BM 62			1.986	99.988	
BM 60			2.050	99.924	
WL			2.027	99.947	
PT			2.676	99.298	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 63	100.000	99.999	-0.001	
BM 62	99.970	99.989	0.019	
BM 60	99.916	99.925	0.009	

Summary	
Staff Gauge Reading (m)	0.756
Stage from WL Survey (m)	99.949
Pressure Transducer Reading (m)	0.629
Pressure Transducer Elevation (m)	99.319
Discharge (m^3/s)	**0.1**
Cross Sectional Area	0.740
Average Velocity	0.108

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	12:48	**End**		**Location**	4 m DS of station	
Method	Velocity-area (Mid-section)			**Instrument Model**		Swoffer (3" propellor)	
Flow Meter Type	Current Velocity Meter			**Instrument Serial #**		-	
Real Time Reading (m)	**Start**	**Reading**	0.629	**Time**	11:30	**Staff Gauge (m)**	**0.756**
	End	**Reading**	0.629	**Time**	12:30	**Time of SG Reading**	11:46

No.	Notes	Station (m)	Depth (m)	Distance (m)	Area (m^2)	Velocity (m/s) 60%	20%	80%	Q (m^3/s)	% of Total Q %
1	LB	8.04	0.00	0.0	0.03	0.000			0.000	0.0
2		7.90	0.48	0.1	0.05	0.356			0.016	20.3
3		7.85	0.46	0.1	0.02	0.027			0.001	0.8
4	behind rock	7.80	0.45	0.0	0.02	0.001			0.000	0.0
5	behind rock	7.75	0.46	0.0	0.03	0.003			0.000	0.1
6	behind rock	7.65	0.46	0.1	0.03	0.027			0.001	1.1
7		7.60	0.47	0.1	0.02	0.085			0.002	2.5
8		7.55	0.47	0.0	0.02	0.151			0.004	4.4
9		7.50	0.48	0.1	0.02	0.184			0.004	5.5
10		7.45	0.48	0.0	0.02	0.196			0.005	5.9
11		7.40	0.49	0.1	0.02	0.214			0.005	6.5
12		7.35	0.48	0.0	0.02	0.201			0.005	6.0
13		7.30	0.47	0.0	0.02	0.179			0.004	5.3
14		7.25	0.48	0.0	0.02	0.184			0.004	5.5
15		7.20	0.47	0.0	0.02	0.190			0.004	5.6
16		7.15	0.47	0.1	0.02	0.194			0.005	5.7
17		7.10	0.50	0.0	0.02	0.210			0.005	6.5
18		7.05	0.50	0.0	0.02	0.176			0.004	5.5
19		7.00	0.50	0.0	0.02	0.128			0.003	4.0
20		6.95	0.49	0.0	0.02	0.093			0.002	2.8
21	behind rock	6.90	0.47	0.1	0.02	0.033			0.001	1.0
22	behind rock	6.85	0.48	0.0	0.02	0.094			0.002	2.8
23	behind rock	6.80	0.46	0.1	0.02	0.024			0.001	0.7
24	behind rock	6.75	0.45	0.1	0.02	0.016			0.000	0.5
25	behind rock	6.70	0.44	0.0	0.03	0.006			0.000	0.2
26	behind rock	6.60	0.43	0.1	0.04	0.010			0.000	0.6
27	behind rock	6.50	0.40	0.1	0.03	0.007			0.000	0.3
28	RB	6.45	0.00	0.0	0.01	0.000			0.000	0.0
29										
30										
31										
32										
33										
Total Q									**0.080**	**100.0**

General Notes

Converted velocities measured using a swoffer to 3" calibration. Assumed calibration completed on 2" propeller.

(continued)

Table 3.2-2. Manual Flow Measurements at Vulture-Polar Stream, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Vulture-Polar			
Stream Name	Vulture-Polar			
Date Monitored	6-Jul-14			
Time at Site (24 hr)	**Start Time:**	1:38:00 PM	**End Time:**	2:15:00 PM
Personnel	Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	521484	7179565		
Weather Conditions				

Transducer Information			
DL Model	ELF2 s/n 0071	**PT Serial #**	914008
Gain	3.558	**Offset**	0.001
Status	-	**Battery**	-
# of Records	-	**Memory Free**	-
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes

Summary	
Staff Gauge Reading (m)	-
Stage from WL Survey (m)	-
Pressure Transducer Reading (m)	0.576
Pressure Transducer Elevation (m)	-
Discharge (m^3/s)	**0.1**
Cross Sectional Area	0.623
Average Velocity	0.080

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	13:38	**End**	14:15	**Location**	-	
Method	Velocity-area (Mid-section)			**Instrument Model**	FH950		
Flow Meter Type	Current Meter			**Instrument Serial #**	-		
Real Time Reading (m)	**Start**	**Reading**	0.576	**Time**	13:30	**Staff Gauge (m)**	-
	End	**Reading**	0.575	**Time**	14:00	**Time of SG Reading**	-

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	LB	2.25	0.00	0.0	0.00	0			0.000	0.0
2		2.30	0.18	0.0	0.01	-0.04			0.000	-0.7
3		2.35	0.41	0.1	0.02	-0.03			-0.001	-1.2
4		2.40	0.42	0.0	0.02	-0.03			-0.001	-1.3
5		2.45	0.42	0.1	0.02	-0.01			0.000	-0.4
6		2.50	0.42	0.0	0.02	0			0.000	0.0
7		2.55	0.42	0.0	0.02	0.01			0.000	0.4
8		2.60	0.41	0.1	0.02	0.03			0.001	1.2
9		2.65	0.41	0.0	0.02	0.04			0.001	1.6
10		2.70	0.42	0.1	0.02	0.11			0.002	4.6
11		2.75	0.41	0.0	0.02	0.14			0.003	5.7
12		2.80	0.42	0.0	0.02	0.2			0.004	8.4
13		2.85	0.42	0.1	0.02	0.26			0.005	10.9
14		2.90	0.42	0.0	0.02	0.27			0.006	11.3
15		2.95	0.41	0.1	0.02	0.27			0.006	11.0
16		3.00	0.41	0.0	0.02	0.29			0.006	11.9
17		3.05	0.43	0.0	0.02	0.29			0.006	12.4
18		3.10	0.42	0.1	0.02	0.25			0.005	10.5
19		3.15	0.42	0.0	0.02	0.19			0.004	8.0
20		3.20	0.44	0.1	0.02	0.06			0.001	2.6
21		3.25	0.45	0.0	0.02	0.05			0.001	2.2
22		3.30	0.45	0.0	0.02	0.03			0.001	1.3
23		3.35	0.43	0.1	0.02	0			0.000	0.0
24		3.40	0.44	0.0	0.02	0.01			0.000	0.4
25		3.45	0.42	0.1	0.02	-0.01			0.000	-0.4
26		3.50	0.41	0.0	0.03	0			0.000	0.0
27		3.60	0.39	0.1	0.04	0.01			0.000	0.8
28		3.70	0.36	0.1	0.04	-0.02			-0.001	-1.4
29	RB	3.80	0.00	0.1	0.02	0			0.000	0.0
30										
31										
32										
33										
Total Q									**0.050**	**100.0**

General Notes

(continued)

Table 3.2-2. Manual Flow Measurements at Vulture-Polar Stream, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Vulture-Polar			
Stream Name	Vulture-Polar			
Date Monitored	25-Jul-14			
Time at Site (24 hr)	**Start Time:**	4:14:00 PM	**End Time:**	5:10:00 PM
Personnel	Kim Balsillie, Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	521484	7179565		
Weather Conditions	sunny			

Transducer Information			
DL Model	ELF2 s/n 0071	**PT Serial #**	914008
Gain	3.558	**Offset**	0.001
Status	Okay	**Battery**	100%
# of Records	2609	**Memory Free**	31225
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 63	1.724	101.724		**100.000**	
BM 62			1.736	99.988	
BM 60			1.798	99.926	
WL			1.863	99.861	
PT			2.428	99.296	
TBM			2.157	99.567	
TBM	2.122	101.689		99.567	
BM 63			1.688	100.001	
BM 62			1.701	99.988	
BM 60			1.762	99.927	
WL			1.828	99.861	
PT			2.394	99.295	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 63	100.000	100.001	0.000	
BM 62	99.970	99.988	0.019	
BM 60	99.916	99.927	0.011	

Summary	
Staff Gauge Reading (m)	0.693
Stage from WL Survey (m)	99.861
Pressure Transducer Reading (m)	0.563
Pressure Transducer Elevation (m)	99.298
Discharge (m^3/s)	**0.0**
Cross Sectional Area	0.612
Average Velocity	0.052

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	16:50	**End**	17:08	**Location**	same as last	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950LB	
Flow Meter Type	Current Meter			**Instrument Serial #**		-	
Real Time Reading (m)	**Start**	**Reading**	0.563	**Time**	16:30	**Staff Gauge (m)**	**0.693**
	End	**Reading**	0.563	**Time**	17:30	**Time of SG Reading**	-

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	LB	2.00	0.00	0.0	0.00	0			0.000	0.0
2		2.05	0.15	0.0	0.01	-0.01			0.000	-0.2
3		2.10	0.40	0.1	0.03	-0.06			-0.002	-5.6
4		2.20	0.39	0.1	0.04	-0.01			0.000	-1.2
5		2.30	0.38	0.1	0.04	0			0.000	0.0
6		2.40	0.40	0.1	0.03	0			0.000	0.0
7		2.45	0.40	0.1	0.02	0.02			0.000	1.2
8		2.50	0.40	0.0	0.02	0.05			0.001	3.1
9		2.55	0.40	0.0	0.02	0.11			0.002	6.9
10		2.60	0.40	0.1	0.02	0.11			0.002	6.9
11		2.65	0.40	0.0	0.01	0.13			0.002	5.7
12		2.67	0.40	0.0	0.01	0.18			0.002	5.6
13		2.70	0.40	0.0	0.01	0.19			0.002	5.9
14		2.72	0.40	0.0	0.01	0.21			0.002	6.5
15		2.75	0.41	0.0	0.02	0.27			0.004	13.8
16		2.80	0.41	0.0	0.02	0.26			0.005	16.6
17		2.85	0.41	0.1	0.02	0.24			0.005	15.3
18		2.90	0.40	0.0	0.01	0.21			0.003	9.2
19		2.92	0.40	0.0	0.01	0.14			0.001	4.4
20		2.95	0.42	0.0	0.02	0.13			0.002	6.8
21		3.00	0.43	0.0	0.02	0.06			0.001	4.0
22	rock in front	3.05	0.43	0.0	0.02	0.01			0.000	0.7
23	rock in front	3.10	0.43	0.1	0.02	-0.01			0.000	-0.7
24	rock in front	3.15	0.39	0.0	0.02	0.01			0.000	0.6
25	rock in front	3.20	0.41	0.1	0.03	0			0.000	0.0
26	rock in front	3.30	0.38	0.1	0.04	-0.01			0.000	-1.2
27	rock in front	3.40	0.38	0.1	0.04	-0.01			0.000	-1.2
28	rock in front	3.50	0.34	0.1	0.03	-0.03			-0.001	-3.2
29	RB	3.60	0.00	0.1	0.02	0			0.000	0.0
30										
31										
32										
33										
Total Q									**0.032**	**100.0**

General Notes

(continued)

Table 3.2-2. Manual Flow Measurements at Vulture-Polar Stream, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Vulture-Polar			
Stream Name	Vulture-Polar			
Date Monitored	9-Aug-14			
Time at Site (24 hr)	**Start Time:**	2:05:00 PM	**End Time:**	2:55:00 PM
Personnel	Breanne M., Gillian M.			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	521484	7179565		
Weather Conditions				

Transducer Information			
DL Model	ELF2 s/n 0071	**PT Serial #**	914008
Gain	3.558	**Offset**	0.001
Status	-	**Battery**	-
# of Records	-	**Memory Free**	-
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes

Summary	
Staff Gauge Reading (m)	-
Stage from WL Survey (m)	-
Pressure Transducer Reading (m)	0.512
Pressure Transducer Elevation (m)	-
Discharge (m^3/s)	**0.0**
Cross Sectional Area	0.520
Average Velocity	0.034

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	2:05:00 PM	**End**	2:55:00 PM	**Location**	-	
Method	Velocity-area (Mid-section)			**Instrument Model**	FH950		
Flow Meter Type	Current Meter			**Instrument Serial #**	-		
Real Time Reading (m)	**Start**	**Reading**	0.512	**Time**	14:00	**Staff Gauge (m)**	-
	End	**Reading**	0.512	**Time**	15:00	**Time of SG Reading**	-

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	LB	2.00	0.00	0.0	0.02	0			0.000	0.0
2	behind big boulde	2.10	0.34	0.1	0.03	0			0.000	0.0
3	behind big boulde	2.15	0.33	0.0	0.02	0			0.000	0.0
4	behind big boulde	2.20	0.32	0.1	0.02	0			0.000	0.0
5	behind big boulde	2.25	0.33	0.0	0.02	0			0.000	0.0
6	behind big boulde	2.30	0.34	0.0	0.02	-0.01			0.000	-1.0
7	behind big boulde	2.35	0.34	0.1	0.02	0			0.000	0.0
8		2.40	0.34	0.0	0.02	0.01			0.000	1.0
9		2.45	0.35	0.1	0.02	0.04			0.001	4.0
10		2.50	0.35	0.0	0.02	0.06			0.001	6.0
11		2.55	0.35	0.0	0.02	0.07			0.001	7.0
12		2.60	0.34	0.1	0.02	0.08			0.001	7.8
13		2.65	0.35	0.0	0.02	0.08			0.001	8.0
14		2.70	0.36	0.1	0.02	0.11			0.002	11.4
15		2.75	0.36	0.0	0.02	0.12			0.002	12.4
16		2.80	0.37	0.0	0.02	0.16			0.003	17.0
17		2.85	0.37	0.1	0.02	0.18			0.003	19.1
18		2.90	0.37	0.0	0.02	0.1			0.002	10.6
19		2.95	0.37	0.1	0.02	0.03			0.001	3.2
20		3.00	0.37	0.0	0.02	0.01			0.000	1.1
21		3.05	0.37	0.0	0.02	0.01			0.000	1.1
22	behind a big rock	3.10	0.36	0.1	0.02	0			0.000	0.0
23	behind a big rock	3.15	0.36	0.0	0.02	-0.01			0.000	-1.0
24	behind a big rock	3.20	0.36	0.1	0.02	-0.01			0.000	-1.0
25	behind a big rock	3.25	0.35	0.0	0.02	-0.02			0.000	-2.0
26	behind a big rock	3.30	0.34	0.0	0.02	-0.01			0.000	-1.0
27	behind a big rock	3.35	0.32	0.1	0.02	-0.01			0.000	-0.9
28	behind a big rock	3.40	0.32	0.0	0.02	-0.01			0.000	-0.9
29	behind a big rock	3.45	0.30	0.1	0.02	-0.02			0.000	-1.7
30	RB	3.50	0.00	0.0	0.01	0			0.000	0.0
31										
32										
33										
Total Q									**0.017**	**100.0**

General Notes

(continued)

Table 3.2-2. Manual Flow Measurements at Vulture-Polar Stream, 2014 (completed)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Vulture-Polar			
Stream Name	Vulture-Polar			
Date Monitored	20-Aug-14			
Time at Site (24 hr)	**Start Time:**	9:00:00 AM	**End Time:**	1:50:00 PM
Personnel	Jaclyn B., Mike S.			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	521484	7179565		
Weather Conditions				

Transducer Information			
DL Model	ELF2 s/n 0071	**PT Serial #**	914008
Gain	3.558	**Offset**	0.001
Status	Okay	**Battery**	100%
# of Records	3852	**Memory Free**	30604
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 63	2.058	102.058		**100.000**	
BM 62			2.080	99.978	
BM 60			2.144	99.914	
WL			2.271	99.787	
PT			-	-	
BM1			0.982	101.076	new
TBM			2.205	99.853	
TBM	2.003	101.856		99.853	
BM 63			1.857	99.999	
BM 62			1.879	99.977	
BM 60			1.942	99.914	
WL			2.070	99.786	
PT			-	-	
BM1			0.781	101.075	new

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 63	100.000	100.000	-0.001	
BM 62	99.970	99.978	0.008	
BM 60	99.916	99.914	-0.002	

Summary

Staff Gauge Reading (m)	0.632
Stage from WL Survey (m)	99.787
Pressure Transducer Reading (m)	0.501
Pressure Transducer Elevation (m)	99.286
Discharge (m^3/s)	**0.0**
Cross Sectional Area	0.509
Average Velocity	0.038

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	13:10	**End**	13:30	**Location**	~3 m downstream of station	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Current Meter			**Instrument Serial #**		141401001994	
Real Time Reading (m)	**Start**	**Reading**	0.501	**Time**	13:43	**Staff Gauge (m)**	**0.632**
	End	**Reading**	0.501	**Time**	13:00	**Time of SG Reading**	13:00

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	RB	2.68	0.00	0.0	0.01	0			0.000	0.0
2	behind rock	2.60	0.28	0.1	0.03	0			0.000	0.0
3	behind rock	2.50	0.32	0.1	0.03	-0.01			0.000	-1.6
4	behind rock	2.40	0.33	0.1	0.03	-0.01			0.000	-1.7
5		2.30	0.34	0.1	0.03	0			0.000	0.0
6		2.20	0.36	0.1	0.03	0.05			0.001	6.9
7		2.15	0.36	0.1	0.02	0.07			0.001	6.4
8		2.10	0.36	0.0	0.02	0.08			0.001	7.4
9		2.05	0.36	0.1	0.02	0.1			0.002	9.2
10		2.00	0.36	0.0	0.02	0.09			0.002	8.3
11		1.95	0.35	0.1	0.02	0.09			0.002	8.0
12		1.90	0.34	0.1	0.03	0.07			0.002	9.1
13		1.80	0.35	0.1	0.03	0.08			0.002	10.7
14		1.75	0.34	0.1	0.02	0.08			0.001	6.9
15		1.70	0.34	0.1	0.02	0.07			0.001	6.1
16		1.65	0.35	0.1	0.02	0.07			0.001	6.3
17		1.60	0.33	0.0	0.02	0.07			0.001	5.9
18		1.55	0.35	0.1	0.02	0.06			0.001	5.4
19		1.50	0.36	0.1	0.03	0.03			0.001	4.1
20		1.40	0.36	0.1	0.04	0.03			0.001	5.5
21		1.30	0.34	0.1	0.03	0			0.000	0.0
22		1.20	0.32	0.1	0.02	-0.03			-0.001	-2.9
23	LB	1.18	0.00	0.0	0.00	0			0.000	0.0
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
Total Q									**0.020**	**100.0**

General Notes

Table 3.2-3. Manual Flow Measurements at Lower Panda Diversion Channel (PDC), 2014

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	LPDC			
Stream Name	Lower Panda Diversion Channel			
Date Monitored	30-May-14			
Time at Site (24 hr)	**Start Time:**	2:15:00 PM	**End Time:**	5:40:00 PM
Personnel	Kim Balsillie, Jaclyn Bowman, Rich Ehlert, Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	518600	7175900		
Weather Conditions	overcast			

Transducer Information			
DL Model	ELF2 s/n 0016	**PT Serial #**	426013
Gain	3.5144	**Offset**	0.0062
Status	Okay	**Battery**	4.5V
# of Records	0	**Memory Free**	32656
Date Serviced	21-May-14	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 36	1.261	101.261		**100.000**	
BM 35			1.379	99.882	
BM 33			1.293	99.968	
WL			2.047	99.214	
PT			2.157	99.104	hose clamp
TBM			1.724	99.537	
TBM	1.638	101.175		99.537	
BM 36			1.174	100.001	
BM 35			1.292	99.883	
BM 33			1.206	99.969	
WL			1.963	99.212	
PT			2.069	99.106	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 36	100.000	100.001	0.000	
BM 35	99.883	99.883	-0.001	
BM 33	99.969	99.969	-0.001	

Summary	
Staff Gauge Reading (m)	0.418
Stage from WL Survey (m)	99.213
Pressure Transducer Reading (m)	0.452
Pressure Transducer Elevation (m)	98.761
Discharge (m^3/s)	**0.9**
Cross Sectional Area	2.579
Average Velocity	0.331

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	17:00	**End**	17:.36	**Location**	~10 m DS of PT		
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950		
Flow Meter Type	Current Meter			**Instrument Serial #**		131641001571		
Real Time Reading (m)	**Start**	**Reading**	0.454	**Time**	17:00	**Staff Gauge (m)**	**0.418**	
	End	**Reading**	0.449	**Time**	17:40	**Time of SG Reading**	17:03	

No.	Notes	Station (m)	Depth (m)	Distance (m)	Area (m^2)	Velocity (m/s) 60%	20%	80%	Q (m^3/s)	% of Total Q %
1	RB	7.65	0.00	0.0	0.02	0			0.000	0.0
2	large rock upstream	7.40	0.12	0.3	0.03	-0.02			-0.001	-0.1
3		7.15	0.26	0.3	0.07	0.01			0.001	0.1
4		6.90	0.48	0.3	0.12	0.04			0.005	0.6
5		6.65	0.49	0.3	0.12	0.11			0.013	1.6
6		6.40	0.59	0.3	0.13	0.15			0.020	2.3
7		6.20	0.53	0.2	0.11	0.29			0.031	3.6
8		6.00	0.67	0.2	0.13	0.31			0.042	4.9
9		5.80	0.53	0.2	0.11	0.55			0.058	6.8
10		5.60	0.68	0.2	0.14	0.53			0.072	8.4
11		5.40	0.68	0.2	0.14	0.5			0.068	8.0
12		5.20	0.64	0.2	0.13	0.47			0.060	7.1
13		5.00	0.64	0.2	0.13	0.56			0.072	8.4
14		4.80	0.63	0.2	0.13	0.46			0.058	6.8
15		4.60	0.60	0.2	0.12	0.6			0.072	8.4
16		4.40	0.53	0.2	0.11	0.67			0.071	8.3
17		4.20	0.49	0.2	0.10	0.47			0.046	5.4
18		4.00	0.46	0.2	0.09	0.44			0.040	4.7
19		3.80	0.47	0.2	0.14	0.42			0.059	6.9
20	rock	3.40	0.17	0.4	0.06	0.61			0.036	4.3
21	edge of rock	3.10	0.50	0.3	0.16	-0.06			-0.010	-1.1
22		2.75	0.49	0.4	0.15	0.18			0.026	3.1
23		2.50	0.42	0.3	0.11	0.11			0.012	1.4
24		2.25	0.17	0.3	0.04	0.03			0.001	0.1
25		2.00	0.05	0.3	0.02	0			0.000	0.0
26	LB	1.45	0.00	0.6	0.00	0			0.000	0.0
27										
28										
29										
30										
31										
32										
33										
Total Q									**0.853**	**100.0**

General Notes

Station installed. Very high water level. Old weed growth is present from last year. Visible ice upstream may come down later and affect stage.

(continued)

Table 3.2-3. Manual Flow Measurements at Lower Panda Diversion Channel (PDC), 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	LPDC			
Stream Name	Lower Panda Diversion Channel			
Date Monitored	6-Jun-14			
Time at Site (24 hr)	**Start Time:**	1:29:00 PM	**End Time:**	
Personnel	Kim Balsillie, Jaclyn Bowman			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	518600	7175900		
Weather Conditions	Sunny, cloudy			

Transducer Information			
DL Model	ELF2 s/n 0016	**PT Serial #**	426013
Gain	3.5144	**Offset**	0.0062
Status	Okay	**Battery**	4.5V
# of Records	1007	**Memory Free**	32028
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 36	1.088	101.088		**100.000**	
BM 35			1.206	99.882	
BM 33			1.127	99.961	
BM 34			1.866	99.222	
WL			2.003	99.085	
PT			2.232	98.856	
TBM			2.021	99.067	
TBM	1.785	100.852		99.067	
BM 36			0.852	100.000	
BM 35			0.969	99.883	
BM 33			0.891	99.961	
BM 34			1.630	99.222	
WL			1.768	99.084	
PT			1.993	98.859	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 36	100.000	100.000	0.000	
BM 35	99.883	99.883	-0.001	
BM 33	99.969	99.961	-0.008	

Summary	
Staff Gauge Reading (m)	0.252
Stage from WL Survey (m)	99.085
Pressure Transducer Reading (m)	0.285
Pressure Transducer Elevation (m)	98.800
Discharge (m^3/s)	**0.3**
Cross Sectional Area	1.072
Average Velocity	0.306

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	16:09	**End**	16:33	**Location**	~1 m US of PT	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Current Meter			**Instrument Serial #**		131641001571	
Real Time Reading (m)	**Start**	**Reading**	0.284	**Time**	15:40	**Staff Gauge (m)**	**0.252**
	End	**Reading**	0.286	**Time**	16:10	**Time of SG Reading**	15:31

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1		6.00	0.00	0.0	0.05	0			0.000	0.0
2		5.50	0.18	0.5	0.08	-0.01			-0.001	-0.2
3		5.15	0.14	0.4	0.05	0.16			0.008	2.4
4		4.80	0.20	0.4	0.06	0.25			0.014	4.2
5		4.60	0.25	0.2	0.05	0.21			0.011	3.2
6		4.40	0.29	0.2	0.06	0.2			0.012	3.5
7		4.20	0.33	0.2	0.05	0.31			0.015	4.7
8		4.10	0.36	0.1	0.04	0.46			0.017	5.0
9		4.00	0.32	0.1	0.03	0.53			0.017	5.2
10		3.90	0.21	0.1	0.02	0.56			0.012	3.6
11		3.80	0.22	0.1	0.03	0.6			0.020	6.0
12		3.60	0.29	0.2	0.04	0.43			0.019	5.7
13		3.50	0.26	0.1	0.03	0.54			0.014	4.3
14		3.40	0.29	0.1	0.03	0.6			0.017	5.3
15		3.30	0.30	0.1	0.03	0.68			0.020	6.2
16		3.20	0.30	0.1	0.03	0.74			0.022	6.8
17		3.10	0.33	0.1	0.03	0.68			0.022	6.8
18		3.00	0.27	0.1	0.04	0.55			0.022	6.8
19		2.80	0.33	0.2	0.07	0.29			0.019	5.8
20		2.60	0.28	0.2	0.07	0.33			0.023	7.0
21		2.30	0.19	0.3	0.05	0.33			0.016	4.8
22		2.10	0.21	0.2	0.04	0.03			0.001	0.4
23		1.90	0.14	0.2	0.03	0.17			0.005	1.6
24		1.65	0.15	0.3	0.03	0.11			0.004	1.1
25		1.45	0.08	0.2	0.03	-0.03			-0.001	-0.2
26		1.00	0.00	0.5	0.02	0			0.000	0.0
27										
28										
29										
30										
31										
32										
33										
Total Q									**0.328**	**100.0**

General Notes

(continued)

Table 3.2-3. Manual Flow Measurements at Lower Panda Diversion Channel (PDC), 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	LPDC			
Stream Name	Lower Panda Diversion Channel			
Date Monitored	25-Jun-14			
Time at Site (24 hr)	**Start Time:**	2:00:00 PM	**End Time:**	
Personnel	Catherine Graydon, Kristina Poitras			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	518600	7175900		
Weather Conditions	smokey			

Transducer Information			
DL Model	ELF2 s/n 0016	**PT Serial #**	426013
Gain	3.5144	**Offset**	0.0062
Status	Okay	**Battery**	100%
# of Records	3736	**Memory Free**	30666
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 36	0.499	100.499		**100.000**	survey did not close
BM 35			0.589	99.910	
BM 34			1.241	99.258	
BM 33			0.512	99.987	
WL			1.483	99.016	
PT			1.614	98.885	
TBM			0.699	99.800	
TBM	0.550	100.350		99.800	
BM 36			0.438	99.912	
BM 35			0.529	99.821	
BM 34			1.182	99.168	
BM 33			0.452	99.898	
WL			1.437	98.913	
PT			1.559	98.791	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 36	100.000	99.956	-0.044	survey did not close
BM 35	99.883	99.866	-0.017	
BM 33	99.969	99.943	-0.026	

Summary	
Staff Gauge Reading (m)	0.158
Stage from WL Survey (m)	-
Pressure Transducer Reading (m)	0.184
Pressure Transducer Elevation (m)	-
Discharge (m^3/s)	**0.1**
Cross Sectional Area	0.955
Average Velocity	0.146

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	15:00	**End**		**Location**	Same as previous	
Method	Velocity-area (Mid-section)			**Instrument Model**		Swoffer (3" propellor)	
Flow Meter Type	Current Velocity Meter			**Instrument Serial #**		-	
Real Time Reading (m)	**Start**	**Reading**	0.184	**Time**	15:00	**Staff Gauge (m)**	**0.158**
	End	**Reading**	0.184	**Time**	15:40	**Time of SG Reading**	14:31

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	LB	6.20	0.00	0.0	0.01	0			0.000	0.0
2		6.40	0.09	0.2	0.04	0.142			0.005	3.7
3		7.00	0.25	0.6	0.11	0.215			0.024	17.3
4		7.30	0.15	0.3	0.04	0.335			0.013	9.0
5		7.50	0.08	0.2	0.02	0.366			0.006	4.2
6		7.70	0.09	0.2	0.02	0.328			0.006	4.2
7		7.90	0.13	0.2	0.03	0.292			0.008	5.4
8		8.10	0.21	0.2	0.03	0.259			0.008	5.8
9		8.20	0.25	0.1	0.03	0.247			0.006	4.4
10		8.30	0.29	0.1	0.04	0.225			0.010	7.0
11		8.50	0.27	0.2	0.05	0.218			0.012	8.4
12		8.70	0.20	0.2	0.04	0.191			0.008	5.5
13		8.90	0.34	0.2	0.07	0.119			0.008	5.8
14		9.10	0.41	0.2	0.08	0.155			0.013	9.1
15		9.30	0.20	0.2	0.04	0.209			0.008	6.0
16		9.50	0.25	0.2	0.05	0.025			0.001	0.9
17		9.70	0.25	0.2	0.05	0			0.000	0.0
18		9.90	0.20	0.2	0.04	0			0.000	0.0
19		10.10	0.31	0.2	0.06	0.064			0.004	2.8
20		10.30	0.27	0.2	0.05	0.007			0.000	0.3
21		10.50	0.20	0.2	0.04	0			0.000	0.0
22		10.70	0.00	0.2	0.02	0			0.000	0.0
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
Total Q									**0.140**	**100.0**

General Notes

Swoffer with a 3" propellor was used in the velocity-area measurement. Survey did not close.

(continued)

Table 3.2-3. Manual Flow Measurements at Lower Panda Diversion Channel (PDC), 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	LPDC			
Stream Name	Lower Panda Diversion Channel			
Date Monitored	7-Jul-14			
Time at Site (24 hr)	**Start Time:**	3:35:00 PM	**End Time:**	4:20:00 PM
Personnel	Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	518600	7175900		
Weather Conditions				

Transducer Information			
DL Model	ELF2 s/n 0016	**PT Serial #**	426013
Gain	3.5144	**Offset**	0.0062
Status		**Battery**	
# of Records		**Memory Free**	
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes

Summary	
Staff Gauge Reading (m)	-
Stage from WL Survey (m)	-
Pressure Transducer Reading (m)	0.137
Pressure Transducer Elevation (m)	-
Discharge (m^3/s)	**0.1**
Cross Sectional Area	0.444
Average Velocity	0.170

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	15:35	**End**	16:20	**Location**	-	
Method	Velocity-area (Mid-section)			**Instrument Model**	FH950		
Flow Meter Type	Current Meter			**Instrument Serial #**	141401001994		
Real Time Reading (m)	**Start**	**Reading**	0.137	**Time**	15:30	**Staff Gauge (m)**	-
	End	**Reading**	0.137	**Time**	16:20	**Time of SG Reading**	-

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	LB	1.45	0.00	0.0	0.02	0			0.000	0.0
2		1.85	0.10	0.4	0.03	0.13			0.003	4.3
3		1.95	0.10	0.1	0.01	0.24			0.002	3.2
4		2.05	0.07	0.1	0.01	0.18			0.001	1.7
5		2.15	0.07	0.1	0.01	0.19			0.001	1.8
6		2.25	0.06	0.1	0.01	0.24			0.001	1.9
7		2.35	0.06	0.1	0.01	0.26			0.002	2.1
8		2.45	0.09	0.1	0.01	0.34			0.003	4.1
9		2.55	0.09	0.1	0.01	0.18			0.002	2.1
10	behind rock	2.65	0.20	0.1	0.02	0.02			0.000	0.5
11	behind rock	2.75	0.22	0.1	0.02	0.09			0.002	2.6
12	on rock	2.85	0.12	0.1	0.01	0.43			0.005	6.8
13	on rock	2.95	0.10	0.1	0.01	0.32			0.003	4.2
14	on rock	3.05	0.10	0.1	0.01	0.31			0.003	4.1
15	on rock	3.15	0.10	0.1	0.01	0.27			0.003	4.5
16	on rock	3.30	0.20	0.2	0.03	0.26			0.008	10.3
17		3.45	0.22	0.2	0.03	0.15			0.005	6.6
18	on rock	3.60	0.14	0.2	0.02	0.41			0.009	11.4
19		3.75	0.16	0.2	0.02	0.14			0.003	4.4
20		3.90	0.17	0.2	0.03	0.2			0.005	6.8
21		4.05	0.11	0.2	0.02	0.17			0.003	3.7
22		4.20	0.16	0.2	0.02	0.24			0.006	7.6
23		4.35	0.10	0.1	0.02	0.12			0.002	2.4
24		4.50	0.14	0.2	0.02	0.07			0.001	1.9
25		4.65	0.12	0.2	0.02	0.04			0.001	1.0
26	behind rock	4.80	0.12	0.1	0.02	0			0.000	0.0
27	behind rock	4.90	0.10	0.1	0.02	0			0.000	0.0
28	rock	5.10	0.00	0.2	0.00	0			0.000	0.0
29	RB	5.50	0.00	0.4	0.00	0			0.000	0.0
30										
31										
32										
33										
Total Q									**0.076**	**100.0**

General Notes

Medium to large sized rocks across streambed.

(continued)

Table 3.2-3. Manual Flow Measurements at Lower Panda Diversion Channel (PDC), 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	LPDC			
Stream Name	Lower Panda Diversion Channel			
Date Monitored	24-Jul-14			
Time at Site (24 hr)	**Start Time:**	10:55:00 AM	**End Time:**	12:00:00 AM
Personnel	Kimberly Balsallie, Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	518600	7175900		
Weather Conditions	smokey			

Transducer Information			
DL Model	ELF2 s/n 0016	**PT Serial #**	426013
Gain	3.5144	**Offset**	0.0062
Status	Okay	**Battery**	100%
# of Records	7893	**Memory Free**	28583
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 36	1.029	101.029		**100.000**	
BM 35			1.137	99.892	
BM 34			1.759	99.270	
BM 33			1.055	99.974	
WL			2.026	99.003	
PT			2.137	98.892	
TBM			1.926	99.103	
TBM	1.864	100.967		99.103	
BM 36			0.967	100.000	
BM 35			1.074	99.893	
BM 34			1.698	99.269	
BM 33			0.989	99.978	
WL			1.965	99.002	
PT			2.073	98.894	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 36	100.000	100.000	0.000	
BM 35	99.883	99.893	0.010	
BM 33	99.969	99.976	0.007	

Summary	
Staff Gauge Reading (m)	0.119
Stage from WL Survey (m)	99.003
Pressure Transducer Reading (m)	0.131
Pressure Transducer Elevation (m)	98.872
Discharge (m^3/s)	**0.1**
Cross Sectional Area	0.723
Average Velocity	0.108

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	11:50	**End**	12:10	**Location**	1 m US of station		
Method	Velocity-area (Mid-section)				**Instrument Model**	FH950		
Flow Meter Type	Current Meter				**Instrument Serial #**	141401001994		
Real Time Reading (m)	**Start**	**Reading**	0.131	**Time**	11:50	**Staff Gauge (m)**	**0.119**	
	End	**Reading**	0.131	**Time**	12:10	**Time of SG Reading**	-	

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	RB	1.20	0.00	0.0	0.04	0			0.000	0.0
2	rock in front	2.10	0.08	0.9	0.04	-0.02			-0.001	-1.1
3		2.25	0.07	0.2	0.02	0.01			0.000	0.2
4	moved due to rock	2.60	0.07	0.4	0.02	0.06			0.001	1.4
5		2.75	0.10	0.2	0.02	0.03			0.000	0.6
6		2.90	0.13	0.2	0.02	0.12			0.002	3.0
7		3.05	0.13	0.2	0.02	0.17			0.003	3.6
8	on rock	3.15	0.13	0.1	0.01	0.2			0.002	2.5
9		3.20	0.12	0.1	0.01	0.18			0.002	2.8
10		3.35	0.19	0.2	0.03	0.18			0.005	6.6
11		3.50	0.20	0.2	0.03	0.24			0.007	9.3
12		3.65	0.26	0.2	0.03	0.17			0.004	5.7
13		3.70	0.24	0.1	0.02	0.11			0.002	2.5
14		3.80	0.23	0.1	0.03	0.23			0.007	8.5
15		3.95	0.22	0.2	0.02	0.21			0.005	5.9
16		4.00	0.28	0.0	0.02	0.14			0.003	3.8
17		4.10	0.22	0.1	0.03	0.28			0.008	9.9
18		4.25	0.23	0.2	0.03	0.17			0.005	6.3
19	behind/side rock	4.35	0.28	0.1	0.02	0.08			0.002	2.2
20		4.40	0.28	0.1	0.03	0.13			0.004	4.7
21		4.55	0.24	0.1	0.04	0.16			0.006	7.4
22		4.70	0.26	0.2	0.04	0.14			0.005	7.0
23		4.85	0.22	0.1	0.03	0.12			0.004	5.1
24	behind rock	5.00	0.22	0.2	0.03	0.06			0.002	2.5
25		5.15	0.10	0.2	0.02	0.01			0.000	0.2
26	in eddy	5.30	0.16	0.1	0.02	0			0.000	0.0
27	in eddy	5.45	0.08	0.2	0.04	-0.01			0.000	-0.5
28	LB	6.35	0.00	0.9	0.04	0			0.000	0.0
29										
30										
31										
32										
33										
Total Q									**0.078**	**100.0**

General Notes

(continued)

Table 3.2-3. Manual Flow Measurements at Lower Panda Diversion Channel (PDC), 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	LPDC			
Stream Name	Panda Diversion Channel			
Date Monitored	1-Aug-14			
Time at Site (24 hr)	Start Time:	3:48:00 PM	End Time:	
Personnel	Catherin Graydon			
Station Cordinates	Easting	Northing	Elevation	
	518600	7175900		
Weather Conditions				

Transducer Information			
DL Model	ELF2 s/n 0016	PT Serial #	426013
Gain	3.5144	Offset	0.0062
Status	-	Battery	-
# of Records	-	Memory Free	-
Date Serviced	21-May-14	Crest Gauges	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes

Summary	
Staff Gauge Reading (m)	-
Stage from WL Survey (m)	
Pressure Transducer Reading (m)	0.106
Pressure Transducer Elevation (m)	
Discharge (m^3/s)	**0.048**
Cross Sectional Area	0.438
Average Velocity	0.109

Discharge Measurement - Mid-Section Method

Measurement Time	Start	3:48:00 PM	End		Location	-	
Method	Velocity-area (Mid-section)			Instrument Model		FH950	
Flow Meter Type	Electromagnetic			Instrument Serial #		141401001994	
Real Time Reading (m)	Start	Reading	0.106	Time	15:40	Staff Gauge (m)	-
	End	Reading	0.107	Time	16:20	Time of SG Reading	-

No.	Notes	Station (m)	Depth (m)	Distance (m)	Area (m^2)	Velocity (m/s) 60%	20%	80%	Q (m^3/s)	% of Total Q %
1		2.00	0.00	0.0	0.01	0			0.000	0.0
2		2.20	0.08	0.2	0.02	0			0.000	0.0
3		2.40	0.08	0.2	0.02	0.08			0.001	2.7
4		2.60	0.12	0.2	0.02	0.04			0.001	2.0
5		2.80	0.10	0.2	0.02	0.02			0.000	0.8
6		3.00	0.10	0.2	0.02	0.04			0.001	1.7
7		3.20	0.14	0.2	0.03	0.12			0.003	7.0
8		3.40	0.14	0.2	0.03	0.17			0.005	10.0
9		3.60	0.10	0.2	0.02	0.14			0.003	5.9
10		3.80	0.12	0.2	0.02	0.17			0.004	8.5
11		4.00	0.16	0.2	0.03	0.13			0.004	8.7
12		4.20	0.19	0.2	0.04	0.09			0.003	7.2
13		4.40	0.18	0.2	0.04	0.29			0.010	21.9
14		4.60	0.16	0.2	0.03	0.11			0.004	7.4
15		4.80	0.11	0.2	0.02	0.14			0.003	6.5
16		5.00	0.14	0.2	0.03	0.04			0.001	2.3
17		5.20	0.10	0.2	0.02	0.04			0.001	1.7
18		5.40	0.07	0.2	0.01	0.17			0.002	5.0
19		5.60	0.06	0.2	0.01	0.03			0.000	0.8
20		5.80	0.00	0.2	0.00	0			0.000	0.0
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
Total Q									**0.048**	**100.0**

General Notes

(continued)

Table 3.2-3. Manual Flow Measurements at Lower Panda Diversion Channel (PDC), 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	LPDC			
Stream Name	Lower Panda Diversion Channel			
Date Monitored	9-Aug-14			
Time at Site (24 hr)	**Start Time:**	9:25:00 AM	**End Time:**	10:35:00 AM
Personnel	Breanne M., Gillian M.			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	518600	7175900		
Weather Conditions				

Transducer Information			
DL Model	ELF2 s/n 0016	**PT Serial #**	426013
Gain	3.5144	**Offset**	0.0062
Status	-	**Battery**	-
# of Records	-	**Memory Free**	-
Date Serviced	21-May-14	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes

Summary	
Staff Gauge Reading (m)	-
Stage from WL Survey (m)	-
Pressure Transducer Reading (m)	0.188
Pressure Transducer Elevation (m)	-
Discharge (m^3/s)	**0.1**
Cross Sectional Area	0.884
Average Velocity	0.166

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	9:25	**End**	10:35	**Location**	-	
Method	Velocity-area (Mid-section)			**Instrument Model**	FH950		
Flow Meter Type	Current Meter			**Instrument Serial #**	141401001994		
Real Time Reading (m)	**Start**	**Reading**	0.188	**Time**	9:30	**Staff Gauge (m)**	-
	End	**Reading**	0.188	**Time**	10:30	**Time of SG Reading**	-

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	RB	0.60	0.00	0.0	0.01	0			0.000	0.0
2		0.75	0.08	0.2	0.01	0.07			0.001	0.6
3		0.90	0.12	0.2	0.02	0.02			0.000	0.2
4		1.05	0.12	0.2	0.02	0.08			0.001	1.0
5	on a large boulder	1.20	0.00	0.2	0.00	0			0.000	0.0
6		1.35	0.14	0.2	0.02	0.11			0.002	1.6
7		1.50	0.16	0.2	0.02	0.12			0.003	2.0
8		1.65	0.17	0.2	0.03	0.19			0.005	3.3
9		1.80	0.18	0.2	0.03	0.31			0.008	5.7
10		1.95	0.24	0.2	0.04	0.16			0.006	3.9
11		2.10	0.30	0.2	0.05	0.19			0.009	5.8
12	boulders around	2.25	0.26	0.2	0.04	0.4			0.016	10.7
13		2.40	0.27	0.2	0.04	0.33			0.013	9.1
14		2.55	0.34	0.2	0.05	0.21			0.011	7.3
15		2.70	0.35	0.2	0.05	0.17			0.009	6.1
16		2.85	0.36	0.2	0.05	0.33			0.018	12.2
17		3.00	0.39	0.2	0.06	0.24			0.014	9.6
18		3.15	0.34	0.2	0.05	0.06			0.003	2.1
19		3.30	0.34	0.2	0.05	0.3			0.015	10.5
20		3.45	0.34	0.2	0.05	0.19			0.010	6.6
21		3.60	0.26	0.2	0.04	0.08			0.003	2.1
22	on a rock	3.75	0.25	0.2	0.04	0			0.000	0.0
23		3.90	0.23	0.2	0.03	-0.02			-0.001	-0.5
24		4.05	0.20	0.2	0.03	0.01			0.000	0.2
25		4.20	0.21	0.2	0.03	-0.03			-0.001	-0.6
26		4.35	0.12	0.1	0.02	0.01			0.000	0.1
27	rock above water	4.50	0.00	0.2	0.00	0			0.000	0.0
28	behind boulder	4.65	0.08	0.2	0.01	0.04			0.000	0.3
29	rocks above water	4.80	0.00	0.1	0.00	0			0.000	0.0
30	rocks above water	5.10	0.00	0.3	0.00	0			0.000	0.0
31	LB	5.20	0.00	0.1	0.00	0			0.000	0.0
32										
33										
Total Q									**0.146**	**100.0**

General Notes

(continued)

Table 3.2-3. Manual Flow Measurements at Lower Panda Diversion Channel (PDC), 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	LPDC			
Stream Name	Lower Panda Diversion Channel			
Date Monitored	13-Aug-14			
Time at Site (24 hr)	**Start Time:**	9:30:00 AM	**End Time:**	10:55:00 AM
Personnel	JB, MS			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	518600	7175900		
Weather Conditions				

Transducer Information			
DL Model	ELF2 s/n 0016	**PT Serial #**	426013
Gain	3.5144	**Offset**	0.0062
Status	Okay	**Battery**	100%
# of Records	10807	**Memory Free**	27129
Date Serviced	21-May-14	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
	100.000			
	99.883			
	99.969			

Summary	
Staff Gauge Reading (m)	0.178
Stage from WL Survey (m)	
Pressure Transducer Reading (m)	0.198
Pressure Transducer Elevation (m)	
Discharge (m^3/s)	**0.2**
Cross Sectional Area	0.570
Average Velocity	0.284

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	10:30	**End**	10:55	**Location**	4 m downstream of station	
Method	Velocity-area (Mid-section)			**Instrument Model**	FH950		
Flow Meter Type	Current Meter			**Instrument Serial #**	141401001994		
Real Time Reading (m)	**Start**	**Reading**	0.199	**Time**	10:30	**Staff Gauge (m)**	**0.178**
	End	**Reading**	0.198	**Time**	11:00	**Time of SG Reading**	10:08

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	RB	1.65	0.00	0.0	0.01	0			0.000	0.0
2		1.80	0.13	0.2	0.02	0.08			0.002	1.0
3		1.95	0.17	0.2	0.03	0.04			0.001	0.6
4	edge of rock	2.10	0.10	0.2	0.02	0.43			0.006	4.0
5		2.25	0.06	0.2	0.01	0.43			0.004	2.4
6		2.40	0.21	0.2	0.03	0.07			0.002	1.4
7		2.55	0.15	0.2	0.02	0.21			0.005	2.9
8		2.70	0.19	0.2	0.03	0.25			0.007	4.4
9		2.85	0.29	0.2	0.04	0.3			0.013	8.1
10		3.00	0.29	0.2	0.04	0.51			0.022	13.7
11		3.15	0.21	0.2	0.03	0.39			0.012	7.6
12		3.30	0.13	0.2	0.02	0.49			0.010	5.9
13		3.45	0.22	0.2	0.03	0.48			0.016	9.8
14		3.60	0.21	0.2	0.03	0.52			0.016	10.1
15		3.75	0.16	0.2	0.02	0.59			0.014	8.8
16		3.90	0.11	0.2	0.02	0.3			0.005	3.1
17		4.05	0.12	0.2	0.02	0.22			0.004	2.4
18		4.20	0.15	0.2	0.02	0.31			0.007	4.3
19		4.35	0.15	0.1	0.02	0.32			0.007	4.5
20		4.50	0.09	0.2	0.01	0.25			0.003	2.1
21		4.65	0.09	0.2	0.01	0.18			0.002	1.5
22		4.80	0.11	0.1	0.02	0.03			0.001	0.4
23		5.00	0.08	0.2	0.03	0.06			0.002	1.2
24	LB	5.60	0.00	0.6	0.02	0			0.000	0.0
25										
26										
27										
28										
29										
30										
31										
32										
33										
Total Q									**0.162**	**100.0**

General Notes

Surveyed with a total station. Station set up on temporary benchmark. TBM set on road on the right bank of channel. Backsight to benchmark 34. Benchmarks not surveyed with auto level. 2-peg test of auto level was non-operational.

(continued)

Table 3.2-3. Manual Flow Measurements at Lower Panda Diversion Channel (PDC), 2014 (completed)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	LPDC			
Stream Name	Panda Diversion Channel			
Date Monitored	21-Aug-14			
Time at Site (24 hr)	**Start Time:**	2:00:00 PM	**End Time:**	
Personnel	Kate Mansfield, Kristina Poitras			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	518600	7175900		
Weather Conditions	overcast			

Transducer Information			
DL Model	ELF2 s/n 0016	**PT Serial #**	426013
Gain	3.5144	**Offset**	0.0062
Status	-	**Battery**	-
# of Records	-	**Memory Free**	-
Date Serviced	21-May-14	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes

Summary	
Staff Gauge Reading (m)	-
Stage from WL Survey (m)	-
Pressure Transducer Reading (m)	0.086
Pressure Transducer Elevation (m)	-
Discharge (m^3/s)	**0.026**
Cross Sectional Area	0.998
Average Velocity	0.026

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	14:00	**End**		**Location**	15 m d/s from station	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Electromagnetic			**Instrument Serial #**		141401001994	
Real Time Reading (m)	**Start**	**Reading**	0.086	**Time**	14:00	**Staff Gauge (m)**	-
	End	**Reading**	0.086	**Time**	14:30	**Time of SG Reading**	-

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	LB	4.25	0.00	0.0	0.05	0			0.000	0.0
2		3.60	0.16	0.7	0.06	0.02			0.001	4.6
3		3.50	0.18	0.1	0.02	0.03			0.001	2.1
4		3.40	0.20	0.1	0.02	0			0.000	0.0
5		3.30	0.23	0.1	0.02	0.02			0.000	1.8
6		3.20	0.23	0.1	0.02	0.04			0.001	3.5
7		3.10	0.22	0.1	0.02	0.04			0.001	3.4
8		3.00	0.34	0.1	0.03	0.05			0.002	6.5
9		2.90	0.36	0.1	0.04	0.03			0.001	4.2
10		2.80	0.36	0.1	0.04	0.01			0.000	1.4
11		2.70	0.36	0.1	0.04	0.01			0.000	1.4
12	rock	2.60	0.36	0.1	0.04	0			0.000	0.0
13	rock	2.50	0.37	0.1	0.04	0			0.000	0.0
14	rock	2.40	0.36	0.1	0.04	0			0.000	0.0
15		2.30	0.37	0.1	0.04	0.01			0.000	1.4
16		2.20	0.38	0.1	0.04	0.04			0.002	5.9
17		2.10	0.39	0.1	0.04	0.01			0.000	1.5
18		2.00	0.41	0.1	0.04	0.02			0.001	3.2
19		1.90	0.40	0.1	0.04	0.03			0.001	4.6
20		1.80	0.42	0.1	0.04	0.05			0.002	8.1
21		1.70	0.42	0.1	0.04	0.04			0.002	6.5
22		1.60	0.42	0.1	0.04	0.04			0.002	6.5
23		1.50	0.40	0.1	0.04	0.03			0.001	4.6
24		1.40	0.40	0.1	0.04	0.04			0.002	6.2
25		1.30	0.38	0.1	0.04	0.03			0.001	4.4
26		1.20	0.38	0.1	0.04	0.03			0.001	4.4
27		1.10	0.26	0.1	0.05	0.07			0.004	14.0
28	RB	0.80	0.00	0.3	0.00	0			0.000	0.0
29										
30										
31										
32										
33										
Total Q									**0.026**	**100.0**

General Notes

Table 3.2-4. Manual Flow Measurements at Nema-Martine, 2014

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Nema-Martine			
Stream Name	Nema-Martine			
Date Monitored	2-Jun-14			
Time at Site (24 hr)	**Start Time:**	11:25:00 AM	**End Time:**	3:30:00 PM
Personnel	Kim Balsillie, Jaclyn Bowman			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	513921	7170646		
Weather Conditions	overcast, windy, cold			

Transducer Information			
DL Model	ELF2 s/n 0018	**PT Serial #**	2157050
Gain	3.52168	**Offset**	0.0179
Status	Okay	**Battery**	4.7V
# of Records	0	**Memory Free**	32535
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 97	0.821	100.821		**100.000**	
BM 96			0.986	99.835	
BM 95			1.070	99.751	
WL			1.371	99.450	
PT			2.196	98.625	
TBM			1.339	99.482	
TBM	1.353	100.835		99.482	
BM 97			0.835	100.000	
BM 96			1.001	99.834	
BM 95			1.084	99.751	
WL			1.387	99.448	
PT			2.207	98.628	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 97	100.000	100.000	0.000	
BM 96	99.826	99.835	0.008	
BM 95	99.739	99.751	0.012	

Summary	
Staff Gauge Reading (m)	0.624
Stage from WL Survey (m)	99.449
Pressure Transducer Reading (m)	0.829
Pressure Transducer Elevation (m)	98.620
Discharge (m^3/s)	**2.0**
Cross Sectional Area	9.337
Average Velocity	0.210

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	14:28	**End**	15:15	**Location**	At rebar transect	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Current Meter			**Instrument Serial #**		131641001571	
Real Time Reading (m)	**Start**	**Reading**	0.829	**Time**	14:25	**Staff Gauge (m)**	**0.624**
	End	**Reading**	0.828	**Time**	15:35	**Time of SG Reading**	12:00

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	RB	0.09	0.00	0.0	0.01	0			0.000	0.0
2		0.20	0.23	0.1	0.13	0.24			0.031	1.6
3		1.20	0.50	1.0	0.50	0.23			0.115	5.9
4		2.20	0.40	1.0	0.40	0.22			0.088	4.5
5		3.20	0.12	1.0	0.12	0.25			0.030	1.5
6		4.20	0.28	1.0	0.28	0.13			0.036	1.9
7	on rock	5.20	0.14	1.0	0.14	0.16			0.022	1.1
8		6.20	0.28	1.0	0.28	0.17			0.048	2.4
9		7.20	0.20	1.0	0.20	0.15			0.030	1.5
10		8.20	0.20	1.0	0.20	0.26			0.052	2.7
11		9.20	0.24	1.0	0.24	0.12			0.029	1.5
12	rock beside	10.20	0.32	1.0	0.32	0.29			0.093	4.7
13	rock in front	11.20	0.34	1.0	0.34	0.1			0.034	1.7
14		12.20	0.28	1.0	0.28	0.14			0.039	2.0
15		13.20	0.36	1.0	0.36	0.17			0.061	3.1
16	rock in front	14.20	0.04	1.0	0.04	0.13			0.005	0.3
17	Rebar	15.20	0.16	1.0	0.21	0.1			0.021	1.1
18		16.80	0.34	1.6	0.44	0.18			0.080	4.1
19		17.80	0.34	1.0	0.34	0.15			0.051	2.6
20		18.80	0.30	1.0	0.30	0.15			0.045	2.3
21		19.80	0.38	1.0	0.38	0.13			0.049	2.5
22	on rock	20.80	0.27	1.0	0.27	0.16			0.043	2.2
23		21.80	0.64	1.0	0.64	0.08			0.051	2.6
24		22.80	0.48	1.0	0.58	0.27			0.156	7.9
25		24.20	0.63	1.4	0.63	0.35			0.221	11.3
26		24.80	0.73	0.6	0.37	0.26			0.095	4.8
27		25.20	0.51	0.4	0.41	0.42			0.171	8.8
28		26.40	0.33	1.2	0.26	0.41			0.108	5.5
29		26.80	0.52	0.4	0.26	0.36			0.094	4.8
30		27.40	0.46	0.6	0.28	0.22			0.061	3.1
31	LB	28.00	0.00	0.6	0.14	0			0.000	0.0
32										
33										
Total Q									**1.958**	**100.0**

General Notes

Logger started at 12:25 MST. Huge boulders, grass on right bank. Gravels present on left bank.

(continued)

Table 3.2-4. Manual Flow Measurements at Nema-Martine, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Nema-Martine			
Stream Name	Nema-Martine			
Date Monitored	5-Jun-14			
Time at Site (24 hr)	**Start Time:**	8:24:00 AM	**End Time:**	
Personnel	Jaclyn Bowman, Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	513921	7170646		
Weather Conditions	cloudy			

Transducer Information			
DL Model	ELF2 s/n 0018	**PT Serial #**	2157050
Gain	3.52168	**Offset**	0.0179
Status	Okay	**Battery**	4.7V
# of Records	403	**Memory Free**	32329
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 97	0.818	100.818		**100.000**	
BM 96			0.985	99.833	
BM 95			1.071	99.747	
WL			1.428	99.390	
PT			2.224	98.594	
TBM			1.171	99.647	
TBM	1.125	100.772		99.647	
BM 97			0.773	99.999	
BM 96			0.940	99.832	
BM 95			1.026	99.746	
WL			1.383	99.389	
PT			2.178	98.594	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 97	100.000	100.000	-0.001	
BM 96	99.826	99.833	0.007	
BM 95	99.739	99.747	0.007	

Summary	
Staff Gauge Reading (m)	0.576
Stage from WL Survey (m)	99.390
Pressure Transducer Reading (m)	0.784
Pressure Transducer Elevation (m)	98.605
Discharge (m^3/s)	**1.6**
Cross Sectional Area	8.092
Average Velocity	0.193

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	9:31	**End**	10:35	**Location**	~3 m DS of PT	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Current Meter			**Instrument Serial #**		131641001571	
Real Time Reading (m)	**Start**	**Reading**	0.784	**Time**	8:26	**Staff Gauge (m)**	**0.576**
	End	**Reading**	0.785	**Time**	10:35	**Time of SG Reading**	8:26

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	LB	0.10	0.00	0.0	0.05	0			0.000	0.0
2		0.60	0.20	0.5	0.10	0.27			0.027	1.7
3		1.10	0.44	0.5	0.20	0.32			0.063	4.0
4		1.50	0.50	0.4	0.35	0.3			0.105	6.7
5	on rock	2.50	0.56	1.0	0.56	0.21			0.118	7.5
6	on rock	3.50	0.30	1.0	0.30	0.33			0.099	6.3
7	on rock	4.50	0.41	1.0	0.41	0.28			0.115	7.3
8	behind boulder	5.50	0.52	1.0	0.52	0.13			0.068	4.3
9	behind rock edge	6.50	0.56	1.0	0.56	0.14			0.078	5.0
10		7.50	0.33	1.0	0.33	0.17			0.056	3.6
11		8.50	0.33	1.0	0.40	0.13			0.051	3.3
12	on rock	9.90	0.08	1.4	0.08	0.18			0.014	0.9
13		10.50	0.17	0.6	0.09	0.16			0.015	1.0
14		11.00	0.39	0.5	0.20	0.17			0.033	2.1
15	rebar rock	11.50	0.00	0.5	0.00	0			0.000	0.0
16	on rock, new line	12.90	0.26	1.4	0.31	0.2			0.062	4.0
17	behind boulder	13.90	0.30	1.0	0.30	0.05			0.015	1.0
18		14.90	0.39	1.0	0.39	0.11			0.043	2.7
19	on rock	15.90	0.19	1.0	0.21	0.16			0.033	2.1
20		17.10	0.32	1.2	0.32	0.26			0.083	5.3
21		17.90	0.30	0.8	0.27	0.18			0.049	3.1
22	rock in front	18.90	0.22	1.0	0.22	0.12			0.026	1.7
23		19.90	0.28	1.0	0.28	0.27			0.076	4.8
24		20.90	0.28	1.0	0.28	0.25			0.070	4.5
25		21.90	0.16	1.0	0.16	0.32			0.051	3.3
26		22.90	0.20	1.0	0.20	0.26			0.052	3.3
27		23.90	0.21	1.0	0.21	0.23			0.048	3.1
28		24.90	0.14	1.0	0.14	0.16			0.022	1.4
29		25.90	0.28	1.0	0.28	0.11			0.031	2.0
30		26.90	0.36	1.0	0.38	0.16			0.060	3.9
31	RB	28.00	0.00	1.1	0.00	0			0.000	0.0
32										
33										
Total Q									**1.566**	**100.0**

General Notes

(continued)

Table 3.2-4. Manual Flow Measurements at Nema-Martine, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Nema-Martine			
Stream Name	Nema-Martine			
Date Monitored	7-Jul-14			
Time at Site (24 hr)	**Start Time:**	10:00:00 AM	**End Time:**	11:00:00 AM
Personnel	Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	513921	7170646		
Weather Conditions				

Transducer Information			
DL Model	ELF2 s/n 0018	**PT Serial #**	2157050
Gain	3.52168	**Offset**	0.0179
Status	-	**Battery**	-
# of Records	-	**Memory Free**	-
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey					
Stn	**BS**	**HI**	**FS**	**Elevation**	**Notes**

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes

Summary	
Staff Gauge Reading (m)	-
Stage from WL Survey (m)	-
Pressure Transducer Reading (m)	0.528
Pressure Transducer Elevation (m)	-
Discharge (m^3/s)	**0.3**
Cross Sectional Area	3.839
Average Velocity	0.076

Discharge Measurement - Mid-Section Method							
Measurement Time	**Start**	10:00	**End**	11:00	**Location**	at rebar	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Current Meter			**Instrument Serial #**		141401001994	
Real Time Reading (m)	**Start**	**Reading**	0.528	**Time**	10:05	**Staff Gauge (m)**	-
	End	**Reading**	0.528	**Time**	11:05	**Time of SG Reading**	-

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	LB	47.40	0.00	0.0	0.09	0			0.000	0.0
2	behind rock edge	48.15	0.23	0.8	0.17	0.11			0.019	6.5
3		48.90	0.21	0.8	0.16	0.11			0.017	5.9
4		49.65	0.36	0.8	0.27	0.1			0.027	9.3
5	behind rock	50.40	0.42	0.8	0.32	0			0.000	0.0
6	on rock	51.15	0.24	0.8	0.18	0.11			0.020	6.8
7	on rock	51.90	0.22	0.8	0.17	0.1			0.017	5.7
8	behind rock	52.65	0.31	0.8	0.23	0.02			0.005	1.6
9		53.40	0.39	0.8	0.29	0.05			0.015	5.0
10	behind rock	54.15	0.30	0.8	0.23	0			0.000	0.0
11		54.90	0.15	0.8	0.11	0.11			0.012	4.2
12	rock	55.65	0.00	0.8	0.00	0			0.000	0.0
13		56.30	0.14	0.6	0.10	0.03			0.003	1.0
14		57.05	0.10	0.8	0.08	0.13			0.010	3.3
15		57.80	0.00	0.8	0.00	0			0.000	0.0
16		58.20	0.09	0.4	0.05	0.1			0.005	1.9
17		59.00	0.00	0.8	0.00	0			0.000	0.0
18		60.00	0.10	1.0	0.10	0.13			0.013	4.5
19		61.00	0.00	1.0	0.00	0			0.000	0.0
20		61.40	0.12	0.4	0.08	0.05			0.004	1.4
21		62.40	0.11	1.0	0.09	0.05			0.004	1.5
22		63.00	0.00	0.6	0.00	0			0.000	0.0
23		64.00	0.06	1.0	0.05	0.08			0.004	1.4
24		64.70	0.11	0.7	0.08	0.11			0.008	2.9
25		65.40	0.10	0.7	0.09	0.06			0.006	1.9
26		66.55	0.11	1.2	0.13	0.08			0.010	3.5
27		67.70	0.09	1.2	0.10	0.11			0.011	3.9
28		68.85	0.08	1.2	0.10	0.08			0.008	2.6
29		70.10	0.14	1.3	0.16	0.12			0.019	6.5
30		71.10	0.08	1.0	0.07	0.05			0.003	1.2
31		71.80	0.10	0.7	0.09	0.17			0.015	5.3
32		72.90	0.10	1.1	0.11	0.15			0.016	5.4
33		73.90	0.16	1.0	0.16	0.12			0.020	6.8
34		74.95	0.00	1.1	0.00	0			0.000	0.0
35										
Total Q									**0.291**	**100.0**

General Notes

(continued)

Table 3.2-4. Manual Flow Measurements at Nema-Martine, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Nema-Martine			
Stream Name	Nema-Martine			
Date Monitored	26-Jul-14			
Time at Site (24 hr)	**Start Time:**	8:40:00 AM	**End Time:**	9:50:00 AM
Personnel	Kim Balsillie, Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	513921	7170646		
Weather Conditions	sunny, smokey			

Transducer Information			
DL Model	ELF2 s/n 0018	**PT Serial #**	2157050
Gain	3.52168	**Offset**	0.0179
Status	Okay	**Battery**	100%
# of Records	7749	**Memory Free**	28659
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 97	0.701	100.701		**100.000**	
BM 96			0.915	99.786	
BM 95			1.036	99.665	
WL			1.530	99.171	
PT			2.024	98.677	
TBM			1.684	99.017	
TBM	1.674	100.691		99.017	
BM 97			0.689	100.002	
BM 96			0.904	99.787	
BM 95			1.026	99.665	
WL			1.521	99.170	
PT			2.014	98.677	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 97	100.000	100.001	0.001	
BM 96	99.826	99.787	-0.040	
BM 95	99.739	99.665	-0.074	

Summary	
Staff Gauge Reading (m)	0.283
Stage from WL Survey (m)	99.171
Pressure Transducer Reading (m)	0.496
Pressure Transducer Elevation (m)	98.674
Discharge (m^3/s)	**0.2**
Cross Sectional Area	3.850
Average Velocity	0.060

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	9:20	**End**	9:45	**Location**	same as last	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Current Meter			**Instrument Serial #**		141401001994	
Real Time Reading (m)	**Start**	**Reading**	0.496	**Time**	9:25	**Staff Gauge (m)**	**0.283**
	End	**Reading**	0.496	**Time**	9:45	**Time of SG Reading**	-

No.	Notes	Station (m)	Depth (m)	Distance (m)	Area (m^2)	Velocity (m/s) 60%	20%	80%	Q (m^3/s)	% of Total Q %
1	LB	1.77	0.00	0.0	0.02	0			0.000	0.0
2		2.00	0.15	0.2	0.08	0.07			0.005	2.4
3		2.80	0.24	0.8	0.19	0.07			0.013	5.9
4		3.60	0.20	0.8	0.16	0.05			0.008	3.5
5		4.40	0.41	0.8	0.33	0.06			0.020	8.6
6		5.20	0.07	0.8	0.06	0.06			0.003	1.5
7		6.00	0.15	0.8	0.12	0.09			0.011	4.7
8		6.80	0.28	0.8	0.22	0.01			0.002	1.0
9		7.60	0.34	0.8	0.27	0.07			0.019	8.3
10		8.40	0.29	0.8	0.23	0			0.000	0.0
11		9.20	0.12	0.8	0.11	0.08			0.009	4.0
12		10.30	0.08	1.1	0.08	0.06			0.005	2.0
13		11.10	0.06	0.8	0.05	0.01			0.000	0.2
14		11.90	0.10	0.8	0.08	0.07			0.006	2.4
15		12.70	0.12	0.8	0.12	0.13			0.016	6.8
16		13.90	0.10	1.2	0.11	0.06			0.006	2.7
17		14.80	0.07	0.9	0.06	0.11			0.007	2.9
18		15.60	0.07	0.8	0.07	0.09			0.006	2.6
19		16.70	0.08	1.1	0.10	0.08			0.008	3.6
20		18.15	0.12	1.5	0.14	0.08			0.011	4.7
21		18.95	0.12	0.8	0.09	0.1			0.009	4.1
22		19.70	0.10	0.8	0.10	0.07			0.007	3.1
23		20.95	0.13	1.3	0.24	0.09			0.022	9.6
24		23.45	0.13	2.5	0.24	0.03			0.007	3.1
25		24.65	0.08	1.2	0.11	0.11			0.012	5.4
26		26.25	0.10	1.6	0.12	0.04			0.005	2.0
27		26.95	0.08	0.7	0.06	0.07			0.004	2.0
28		27.85	0.14	0.9	0.10	0.05			0.005	2.1
29		28.35	0.21	0.5	0.13	0.02			0.003	1.1
30		29.05	0.00	0.7	0.07	0			0.000	0.0
31										
32										
33										
Total Q									**0.229**	**100.0**

General Notes

(continued)

Table 3.2-4. Manual Flow Measurements at Nema-Martine, 2014 (completed)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Nema-Martine			
Stream Name	Nema-Martine			
Date Monitored	3-Aug-14			
Time at Site (24 hr)	**Start Time:**	8:03	**End Time:**	2:30:00 PM
Personnel	C. Graydon, M. Soloducha			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	513921	7170646		
Weather Conditions				

Transducer Information			
DL Model	ELF2 s/n 0018	**PT Serial #**	2157050
Gain	3.52168	**Offset**	0.0179
Status	-	**Battery**	-
# of Records	-	**Memory Free**	-
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 97	0.764	100.764		**100.000**	
BM 96			0.983	99.781	
BM 95			1.099	99.665	
WL			1.626	99.138	
PT			-	-	
SG			0.872	99.892	Top of staff gauge
TBM			1.563	99.201	
TBM	1.645	100.846		99.201	
BM 97			0.846	100.000	
BM 96			1.065	99.781	
BM 95			1.183	99.663	
WL			1.707	99.139	
PT			-	-	
SG			0.954	99.892	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 97	100.000	100.000	0.000	
BM 96	99.826	99.781	-0.045	
BM 95	99.739	99.664	-0.075	

Summary	
Staff Gauge Reading (m)	-
Stage from WL Survey (m)	99.139
Pressure Transducer Reading (m)	0.453
Pressure Transducer Elevation (m)	98.686
Discharge (m^3/s)	**0.2**
Cross Sectional Area	3.736
Average Velocity	0.048

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	8:03	**End**		**Location**		
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Current Meter			**Instrument Serial #**		141401001994	
Real Time Reading (m)	**Start**	**Reading**	0.453	**Time**	8:05	**Staff Gauge (m)**	-
	End	**Reading**	0.453	**Time**	9:05	**Time of SG Reading**	-

No.	Notes	Station (m)	Depth (m)	Distance (m)	Area (m^2)	Velocity (m/s) 60%	20%	80%	Q (m^3/s)	% of Total Q %
1		1.95	0.00	0.0	0.01	0			0.000	0.0
2		2.10	0.14	0.2	0.12	0.05			0.006	3.2
3		3.60	0.27	1.5	0.41	0.05			0.020	11.2
4		5.10	0.17	1.5	0.26	0.02			0.005	2.8
5		6.60	0.08	1.5	0.12	0.06			0.007	4.0
6		8.10	0.29	1.5	0.44	0.06			0.026	14.5
7		9.60	0.13	1.5	0.20	0.06			0.012	6.5
8		11.10	0.04	1.5	0.06	0			0.000	0.0
9		12.60	0.13	1.5	0.20	0.05			0.010	5.4
10		14.10	0.13	1.5	0.22	0.05			0.011	6.1
11		16.00	0.14	1.9	0.24	0.08			0.019	10.6
12		17.50	0.10	1.5	0.15	0			0.000	0.0
13		19.00	0.08	1.5	0.16	0.05			0.008	4.4
14		21.50	0.14	2.5	0.28	0.05			0.014	7.8
15		23.00	0.08	1.5	0.12	0.04			0.005	2.7
16		24.50	0.13	1.5	0.20	0.03			0.006	3.2
17		26.00	0.13	1.5	0.20	0.05			0.010	5.4
18		27.50	0.18	1.5	0.27	0.06			0.016	9.0
19		29.00	0.08	1.5	0.08	0.05			0.004	2.2
20		29.50	0.08	0.5	0.03	0.06			0.002	0.9
21		29.70	0.00	0.2	0.01	0			0.000	0.0
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
Total Q									**0.180**	**100.0**

General Notes

Table 3.2-5. Manual Flow Measurements at Slipper–Lac de Gras, 2014

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Slipper-LdG			
Stream Name	Slipper-Lac de Gras			
Date Monitored	1-Jun-14			
Time at Site (24 hr)	**Start Time:**	9:30:00 AM	**End Time:**	3:00:00 PM
Personnel	Jaclyn Bowman Genevieve Morinville			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	507616	7164913		
Weather Conditions	overcast			

Transducer Information			
DL Model	ELF2 s/n 0023	**PT Serial #**	614004
Gain	3.5144	**Offset**	0.0141
Status	Okay	**Battery**	4.4V
# of Records	0	**Memory Free**	32535
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 48	1.171	101.171		**100.000**	
BM 47			1.483	99.688	
BM 46			-	-	
BM 49			1.198	99.973	
BM 50			1.179	99.992	x
WL			1.650	99.521	
PT			1.482	99.689	Top of PVC
TBM			1.197	99.974	
TBM	1.403	101.377		99.974	
BM 48			1.366	100.011	shot twice
BM 47			1.689	99.688	shot twice
BM 46			-	-	
BM 49			1.404	99.973	shot twice
BM 50			1.375	100.002	shot twice
WL			1.852	99.525	
PT			1.687	99.690	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 49	99.943	99.973	0.030	
BM 47	99.685	99.688	0.003	
BM 50	99.980	99.997	0.018	

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	12:42	**End**	14:06	**Location**	At wire, DS of PT	
Method	Velocity-area (Mid-section)			**Instrument Model**	FH950		
Flow Meter Type	Current Meter			**Instrument Serial #**	131641001571		
Real Time Reading (m)	**Start**	**Reading**	0.458	**Time**	12:40	**Staff Gauge (m)**	**0.602**
	End	**Reading**	0.457	**Time**	14:00	**Time of SG Reading**	10:14

No.	Notes	Station (m)	Depth (m)	Distance (m)	Area (m^2)	Velocity (m/s) 60%	20%	80%	Q (m^3/s)	% of Total Q %
1	RB	8.30	0.00	0.0	0.08	0			0.000	0.0
2		9.00	0.24	0.7	0.20	-0.01			-0.002	-0.1
3	weeds	10.00	0.40	1.0	0.40	-0.01			-0.004	-0.1
4	ice hitting sensor	11.00	0.75	1.0	0.75		0.79	0.54	0.499	13.2
5		12.00	0.75	1.0	0.75		0.96	0.6	0.585	15.4
6		13.00	0.62	1.0	0.62	0.44			0.273	7.2
7		14.00	0.54	1.0	0.54	0.38			0.205	5.4
8		15.00	0.51	1.0	0.51	0.44			0.224	5.9
9		16.00	0.45	1.0	0.45	0.15			0.068	1.8
10		17.00	0.34	1.0	0.34	0.08			0.027	0.7
11	rock/weeds	18.00	0.10	1.0	0.10	0.03			0.003	0.1
12	weeds	19.00	0.17	1.0	0.17	0.06			0.010	0.3
13	weeds	20.00	0.08	1.0	0.08	0.08			0.006	0.2
14		21.00	0.29	1.0	0.29	0.37			0.107	2.8
15		22.00	0.41	1.0	0.41	0.53			0.217	5.7
16		23.00	0.40	1.0	0.40	0.29			0.116	3.1
17	island	24.00	0.23	1.0	0.23	-0.01			-0.002	-0.1
18		25.00	0.24	1.0	0.24	0.52			0.125	3.3
19		26.00	0.47	1.0	0.47	0.38			0.179	4.7
20		27.00	0.22	1.0	0.22	0.22			0.048	1.3
21		28.00	0.12	1.0	0.12	0.3			0.036	0.9
22		29.00	0.22	1.0	0.22	0.47			0.103	2.7
23	beside rock	30.00	0.15	1.0	0.15	0.16			0.024	0.6
24		31.00	0.20	1.0	0.20	0.36			0.072	1.9
25		32.00	0.23	1.0	0.23	0.21			0.048	1.3
26	boulders	33.00	0.10	1.0	0.10	0.66			0.066	1.7
27		34.00	0.23	1.0	0.23	0.37			0.085	2.2
28		35.00	0.23	1.0	0.23	0.5			0.115	3.0
29	on a big rock	36.00	0.10	1.0	0.10	1.21			0.121	3.2
30		37.00	0.22	1.0	0.22	0.34			0.075	2.0
31		38.00	0.24	1.0	0.24	0.4			0.096	2.5
32		39.00	0.12	1.0	0.12	0.62			0.074	2.0
33		40.00	0.33	1.0	0.33	0.58			0.191	5.0
34		41.00	0.45	1.0	0.45	0.56			0.252	6.6
35	rebar (rock)	42.00	0.26	1.0	0.26	-0.08			-0.021	-0.5
36		43.00	0.00	1.0	0.00	0			0.000	0.0
37		44.00	0.17	1.0	0.17	0.28			0.048	1.3
38		45.00	0.27	1.0	0.27	0.32			0.086	2.3
39		46.00	0.12	1.0	0.12	0.4			0.048	1.3
40		47.00	0.44	1.0	0.44	0.39			0.172	4.5
41		48.00	0.22	1.0	0.22	0.59			0.130	3.4

(continued)

Table 3.2-5. Manual Flow Measurements at Slipper–Lac de Gras, 2014 (continued)

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	Notes	(m)	(m)	(m)	(m^2)	60%	20%	80%	(m^3/s)	%
42		49.00	0.18	1.0	0.18	0.28			0.050	1.3
43		50.00	0.12	1.0	0.12	0.15			0.018	0.5
44	island, boulders	51.00	0.18	1.0	0.18	0.01			0.002	0.0
45		52.00	0.25	1.0	0.25	0.21			0.053	1.4
46		53.00	0.37	1.0	0.37	0.25			0.093	2.4
47		54.00	0.47	1.0	0.47	0.37			0.174	4.6
48		55.00	0.53	1.0	0.53	0.31			0.164	4.3
49		56.00	0.46	1.0	0.46	0.35			0.161	4.2
50		57.00	0.18	1.0	0.18	0.04			0.007	0.2
51		58.00	0.17	1.0	0.17	0.03			0.005	0.1
52	land	59.00	0.00	1.0	0.00	0			0.000	0.0
53	land	60.00	0.00	1.0	0.00	0			0.000	0.0
54	land	61.00	0.00	1.0	0.00	0			0.000	0.0
55		62.00	0.20	1.0	0.20	0.3			0.060	1.6
56		63.00	0.30	1.0	0.30	0.29			0.087	2.3
57		64.00	0.17	1.0	0.17	0.3			0.051	1.3
58	LB	65.00	0.00	1.0	0.09	0			0.000	0.0
Total Q									**3.792**	**100.0**

Summary	
Staff Gauge Reading (m)	0.602
Stage from WL Survey (m)	99.523
Pressure Transducer Reading (m)	0.457
Pressure Transducer Elevation (m)	99.066
Discharge (m^3/s)	**3.8**
Cross Sectional Area	9.748
Average Velocity	0.389

General Notes

Station installed at 10:40 MST. Logger started at 06:50 June 1, 2014.

(continued)

Table 3.2-5. Manual Flow Measurements at Slipper–Lac de Gras, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Slipper-LdG			
Stream Name	Slipper-Lac de Gras			
Date Monitored	7-Jun-14			
Time at Site (24 hr)	**Start Time:**	8:30:00 AM	**End Time:**	
Personnel	Jaclyn Bowman, Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	507616	7164913		
Weather Conditions				

Transducer Information			
DL Model	ELF2 s/n 0023	**PT Serial #**	614004
Gain	3.5144	**Offset**	0.0141
Status	Okay	**Battery**	4.3
# of Records	880	**Memory Free**	32088
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 48	1.401	101.401		**100.000**	Windy
BM 47			1.723	99.678	
BM 46			1.405	99.996	TBM
BM 49			1.451	99.950	
BM 50			1.410	99.991	
WL			1.972	99.429	
PT			2.668	98.733	
SG			1.501	99.900	0.0 = 98.900
TBM			1.405	99.996	
TBM	1.237	101.233		99.996	
BM 48			1.232	100.001	
BM 47			1.555	99.678	
BM 46			1.237	99.996	TBM
BM 49			1.282	99.951	
BM 50			1.242	99.991	
WL			1.804	99.429	
PT			2.501	98.732	
SG			1.334	99.899	0.0 = 99.899

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 49	99.943	99.951	0.007	
BM 47	99.685	99.678	-0.007	
BM 50	99.980	99.991	0.011	

Summary	
Staff Gauge Reading (m)	0.536
Stage from WL Survey (m)	99.429
Pressure Transducer Reading (m)	0.703
Pressure Transducer Elevation (m)	98.726
Discharge (m^3/s)	**3.1**
Cross Sectional Area	13.108
Average Velocity	0.240

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	10:11	**End**	11:00	**Location**	At wire, DS of PT	
Method	Velocity-area (Mid-section)			**Instrument Model**	FH950		
Flow Meter Type	Currnet Meter			**Instrument Serial #**	131641001571		
Real Time Reading (m)	**Start**	**Reading**	0.703	**Time**	9:11	**Staff Gauge (m)**	**0.536**
	End	**Reading**	0.703	**Time**	11:00	**Time of SG Reading**	9:11

No.	Notes	Station (m)	Depth (m)	Distance (m)	Area (m^2)	Velocity (m/s) 60%	20%	80%	Q (m^3/s)	% of Total Q %
1	RB	7.10	0.00	0.0	0.20	0			0.000	0.0
2		9.00	0.21	1.9	0.41	0			0.000	0.0
3		11.00	0.58	2.0	0.87	0.58			0.505	16.0
4		12.00	0.70	1.0	0.70	0.57			0.399	12.7
5		13.00	0.55	1.0	0.83	0.32			0.264	8.4
6		15.00	0.46	2.0	0.92	0.27			0.248	7.9
7		17.00	0.25	2.0	0.50	0.1			0.050	1.6
8	in weeds	19.00	0.14	2.0	0.28	0.02			0.006	0.2
9	in weeds	21.00	0.20	2.0	0.40	0.05			0.020	0.6
10	on boulder	23.00	0.12	2.0	0.24	0.32			0.077	2.4
11	on rock	25.00	0.18	2.0	0.36	0.19			0.068	2.2
12	in front of bar	27.00	0.22	2.0	0.44	0.14			0.062	2.0
13		29.00	0.15	2.0	0.30	0.31			0.093	3.0
14		31.00	0.20	2.0	0.40	0.21			0.084	2.7
15		33.00	0.00	2.0	0.00	0			0.000	0.0
16	shallow riffle	35.00	0.17	2.0	0.34	0.63			0.214	6.8
17	rock in front	37.00	0.18	2.0	0.36	0.27			0.097	3.1
18		39.00	0.00	2.0	0.00	0			0.000	0.0
19	rebar	41.00	0.34	2.0	0.68	0.27			0.184	5.8
20	in front of rock	43.00	0.00	2.0	0.00	0			0.000	0.0
21		45.00	0.10	2.0	0.20	0.28			0.056	1.8
22	on rock	47.00	0.34	2.0	0.68	0.4			0.272	8.6
23		49.00	0.18	2.0	0.36	0.09			0.032	1.0
24	rocks in front, poo	51.00	0.19	2.0	0.38	0.03			0.011	0.4
25		53.00	0.26	2.0	0.52	0.15			0.078	2.5
26	rock ahead	55.00	0.54	2.0	1.08	0.11			0.119	3.8
27	between rocks	57.00	0.26	2.0	0.52	0.01			0.005	0.2
28	land	59.00	0.00	2.0	0.00	0			0.000	0.0
29		61.10	0.00	2.1	0.00	0			0.000	0.0
30		62.50	0.26	1.4	0.66	0.31			0.206	6.5
31	LB	66.20	0.00	3.7	0.48	0			0.000	0.0
32										
33										
Total Q									**3.150**	**100.0**

General Notes

The station was re-installed with a longer piece of conduit in a vertical placement as installed in 2013.

(continued)

Table 3.2-5. Manual Flow Measurements at Slipper–Lac de Gras, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Slipper-LdG			
Stream Name	Slipper-Lac de Gras			
Date Monitored	28-Jun-14			
Time at Site (24 hr)	**Start Time:**	16:17	**End Time:**	
Personnel	J. Anderson			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	507616	7164913		
Weather Conditions				

Transducer Information			
DL Model	ELF2 s/n 0023	**PT Serial #**	614004
Gain	3.5144	**Offset**	0.0141
Status	-	**Battery**	-
# of Records	-	**Memory Free**	-
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 48				-	
BM 47				99.719	
BM 46				-	
BM 49				99.924	
BM 50				99.986	
WL				99.041	
PT				-	
SG				99.900	1 m mark

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 49	99.943	99.924	-0.020	
BM 47	99.685	99.719	0.034	
BM 50	99.980	99.986	0.006	

Summary

Staff Gauge Reading (m)	0.445
Stage from WL Survey (m)	99.041
Pressure Transducer Reading (m)	0.612
Pressure Transducer Elevation (m)	98.428
Discharge (m^3/s)	**1.0**
Cross Sectional Area	10.308
Average Velocity	0.100

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	16:17	**End**		**Location**	At wire, DS of PT	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Currnet Meter			**Instrument Serial #**			
Real Time Reading (m)	**Start**	**Reading**	0.612	**Time**	16:20	**Staff Gauge (m)**	**0.445**
	End	**Reading**	0.613	**Time**	17:10	**Time of SG Reading**	16:30

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1		0.00	0.32	0.0	0.03	0			0.000	0.0
2		0.20	0.32	0.2	0.16	0.16			0.026	2.5
3		1.00	0.62	0.8	0.56	0.01			0.006	0.5
4		2.00	0.60	1.0	0.60	0.33			0.198	19.1
5		3.00	0.50	1.0	0.50	0.12			0.060	5.8
6		4.00	0.40	1.0	0.40	0.07			0.028	2.7
7		5.00	0.36	1.0	0.36	0			0.000	0.0
8		6.00	0.30	1.0	0.30	0.06			0.018	1.7
9		7.00	0.18	1.0	0.18	0			0.000	0.0
10		8.00	0.10	1.0	0.23	-0.01			-0.002	-0.2
11		11.50	0.21	3.5	0.42	0			0.000	0.0
12		12.00	0.29	0.5	0.51	0.12			0.061	5.9
13		15.00	0.12	3.0	0.30	-0.02			-0.006	-0.6
14		17.00	0.17	2.0	0.34	0.06			0.020	2.0
15		19.00	0.08	2.0	0.20	0.06			0.012	1.2
16		22.00	0.10	3.0	0.30	0.29			0.087	8.4
17		25.00	0.10	3.0	0.30	0.53			0.159	15.4
18		28.00	0.08	3.0	0.24	0			0.000	0.0
19		31.00	0.24	3.0	0.72	0.01			0.007	0.7
20		34.00	0.06	3.0	0.21	0.2			0.042	4.1
21		38.00	0.28	4.0	0.98	0.3			0.294	28.4
22		41.00	0.22	3.0	0.55	0			0.000	0.0
23		43.00	0.35	2.0	0.53	0			0.000	0.0
24		44.00	0.44	1.0	0.66	-0.01			-0.007	-0.6
25		46.00	0.18	2.0	0.36	0.07			0.025	2.4
26		48.00	0.00	2.0	0.00	0			0.000	0.0
27		51.00	0.00	3.0	0.00	0			0.000	0.0
28		52.00	0.10	1.0	0.10	0.05			0.005	0.5
29		53.00	0.14	1.0	0.18	0.01			0.002	0.2
30		54.50	0.00	1.5	0.11	0			0.000	0.0
31										
32										
33										
Total Q									**1.035**	**100.0**

General Notes

(continued)

Table 3.2-5. Manual Flow Measurements at Slipper–Lac de Gras, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Slipper-LdG			
Stream Name	Slipper-Lac de Gras			
Date Monitored	7-Jul-14			
Time at Site (24 hr)	**Start Time:**	11:36:00 AM	**End Time:**	12:29:00 PM
Personnel	Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	507616	7164913		
Weather Conditions				

Transducer Information			
DL Model	ELF2 s/n 0023	**PT Serial #**	614004
Gain	3.5144	**Offset**	0.0141
Status	-	**Battery**	-
# of Records	-	**Memory Free**	-
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	11:36	**End**	12:29	**Location**	At wire, DS of PT	
Method	Velocity-area (Mid-section)			**Instrument Model**	FH950		
Flow Meter Type	Currnet Meter			**Instrument Serial #**			
Real Time Reading (m)	**Start**	**Reading**	0.595	**Time**	11:30	**Staff Gauge (m)**	-
	End	**Reading**	0.594	**Time**	12:30	**Time of SG Reading**	-

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	RB	1.00	0.00	0.0	0.57	0			0.000	0.0
2		3.00	0.57	2.0	1.14	0.32			0.365	36.9
3		5.00	0.48	2.0	0.96	0.14			0.134	13.6
4	on rock	7.00	0.20	2.0	0.40	0.08			0.032	3.2
5	behind rock	9.00	0.12	2.0	0.12	0.01			0.001	0.1
6		9.01	0.00	0.0	0.00	0			0.000	0.0
7	grass	12.99	0.00	4.0	0.00	0			0.000	0.0
8	grassy	13.00	0.22	0.0	0.44	0.13			0.057	5.8
9		17.00	0.24	4.0	0.84	0.1			0.084	8.5
10		20.00	0.08	3.0	0.24	0.03			0.007	0.7
11		23.00	0.08	3.0	0.20	0.18			0.036	3.6
12	behind rocks	25.00	0.06	2.0	0.12	0.08			0.010	1.0
13		27.00	0.23	2.0	0.46	-0.01			-0.005	-0.5
14		29.00	0.10	2.0	0.20	0.05			0.010	1.0
15	in front of rock	31.00	0.10	2.0	0.20	0.37			0.074	7.5
16		33.00	0.30	2.0	0.60	-0.06			-0.036	-3.6
17		35.00	0.06	2.0	0.12	0.03			0.004	0.4
18	rock	37.00	0.00	2.0	0.00	0			0.000	0.0
19		38.00	0.52	1.0	0.52	0.1			0.052	5.3
20	behind rock	39.00	0.25	1.0	0.25	0.15			0.038	3.8
21		40.00	0.10	1.0	0.15	0.33			0.050	5.0
22	stagnant water	42.00	0.00	2.0	0.00	0			0.000	0.0
23	stagnant water	44.00	0.00	2.0	0.00	0			0.000	0.0
24		45.00	0.13	1.0	0.13	0			0.000	0.0
25		46.00	0.29	1.0	0.29	0.04			0.012	1.2
26		47.00	0.44	1.0	0.44	0.03			0.013	1.3
27	grass	48.00	0.33	1.0	1.16	0.02			0.023	2.3
28	grass	54.00	0.16	6.0	0.56	0.01			0.006	0.6
29	behind rock	55.00	0.14	1.0	0.14	0.02			0.003	0.3
30	grass and rocks	56.00	0.13	1.0	0.65	0.03			0.020	2.0
31	LB	65.00	0.00	9.0	0.59	0			0.000	0.0
32										
33										
Total Q									**0.988**	**100.0**

Summary	
Staff Gauge Reading (m)	-
Stage from WL Survey (m)	-
Pressure Transducer Reading (m)	0.594
Pressure Transducer Elevation (m)	-
Discharge (m^3/s)	**1.0**
Cross Sectional Area	11.482
Average Velocity	0.086

General Notes

(continued)

Table 3.2-5. Manual Flow Measurements at Slipper–Lac de Gras, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Slipper-LdG			
Stream Name	Slipper-Lac de Gras			
Date Monitored	25-Jul-14			
Time at Site (24 hr)	**Start Time:**	11:50:00 AM	**End Time:**	1:30:00 PM
Personnel	Kim Balsillie, Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	507616	7164913		
Weather Conditions	smokey, sunny			

Transducer Information			
DL Model	ELF2 s/n 0023	**PT Serial #**	614004
Gain	3.5144	**Offset**	0.0141
Status	Okay	**Battery**	100%
# of Records	7809	**Memory Free**	28566
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 48	1.414	101.414		**100.000**	
BM 47			1.727	99.687	
BM 46			-	-	
BM 49			1.475	99.939	bad shot
BM 50			1.449	99.965	
WL			2.067	99.347	
PT			2.682	98.732	
TBM			2.188	99.226	
TBM	1.944	101.170		99.226	
BM 48			1.169	100.001	
BM 47			1.483	99.687	
BM 46			-	-	
BM 49			1.299	99.871	
BM 50			1.205	99.965	
WL			1.823	99.347	
PT			2.438	98.732	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 49	99.943	99.905	-0.038	
BM 47	99.685	99.687	0.002	
BM 50	99.980	99.965	-0.014	

Summary

Staff Gauge Reading (m)	0.452
Stage from WL Survey (m)	99.347
Pressure Transducer Reading (m)	0.625
Pressure Transducer Elevation (m)	98.722
Discharge (m^3/s)	**2.0**
Cross Sectional Area	14.603
Average Velocity	0.140

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	12:39	**End**	13:20	**Location**	same as last		
Method	Velocity-area (Mid-section)			**Instrument Model**	FH950			
Flow Meter Type	Currnet Meter			**Instrument Serial #**	141401001994			
Real Time Reading (m)	**Start**	**Reading**	0.625	**Time**	12:40	**Staff Gauge (m)**	**0.452**	
	End	**Reading**	0.625	**Time**	13:20	**Time of SG Reading**		

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	RB	8.00	0.00	0.0	0.93	0			0.000	0.0
2		11.00	0.62	3.0	1.24	0.07			0.087	4.2
3	between rocks	12.00	0.56	1.0	0.56	0.25			0.140	6.8
4		13.00	0.48	1.0	0.48	0.2			0.096	4.7
5		14.00	0.40	1.0	0.40	0.11			0.044	2.2
6		15.00	0.35	1.0	0.35	0.04			0.014	0.7
7		16.00	0.30	1.0	0.30	0.09			0.027	1.3
8	rock ahead	17.00	0.14	1.0	0.42	0.04			0.017	0.8
9	grass, shallow	22.00	0.26	5.0	1.11	0.03			0.033	1.6
10	grass, shallow	25.50	0.14	3.5	0.35	0.06			0.021	1.0
11		27.00	0.14	1.5	0.25	0.2			0.049	2.4
12		29.00	0.26	2.0	0.65	0.23			0.150	7.3
13	on rock	32.00	0.10	3.0	0.25	0.28			0.070	3.4
14		34.00	0.15	2.0	0.23	0.12			0.027	1.3
15	between rocks	35.00	0.21	1.0	0.63	0.07			0.044	2.2
16	between rocks	40.00	0.14	5.0	0.84	0.47			0.395	19.3
17	between rocks	47.00	0.57	7.0	2.28	0.24			0.547	26.8
18		48.00	0.26	1.0	0.26	0.36			0.094	4.6
19		49.00	0.13	1.0	0.13	0.25			0.033	1.6
20		50.00	0.07	1.0	0.11	0.1			0.011	0.5
21		52.00	0.16	2.0	0.24	0.01			0.002	0.1
22		53.00	0.32	1.0	0.32	0.1			0.032	1.6
23		54.00	0.40	1.0	0.40	0.06			0.024	1.2
24		55.00	0.21	1.0	0.32	0.12			0.038	1.8
25		57.00	0.00	2.0	0.00	0			0.000	0.0
26		59.25	0.00	2.3	0.00	0			0.000	0.0
27	on rock	60.00	0.10	0.8	0.09	0.11			0.010	0.5
28		61.00	0.16	1.0	0.16	0			0.000	0.0
29	rocks, grass	62.00	0.14	1.0	0.70	0.06			0.042	2.1
30	LB	71.00	0.00	9.0	0.63	0			0.000	0.0
31										
32										
33										
Total Q									**2.045**	**100.0**

General Notes

(continued)

Table 3.2-5. Manual Flow Measurements at Slipper–Lac de Gras, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Slipper-LdG			
Stream Name	Slipper-Lac de Gras			
Date Monitored	31-Jul-14			
Time at Site (24 hr)	**Start Time:**	9:29:00 AM	**End Time:**	
Personnel	Mike S., Catherine G.			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	507616	7164913		
Weather Conditions				

Transducer Information			
DL Model	ELF2 s/n 0023	**PT Serial #**	614004
Gain	3.5144	**Offset**	0.0141
Status	-	**Battery**	-
# of Records	-	**Memory Free**	-
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 48				**100.000**	Total Station Survey
BM 47				99.697	
BM 46				-	
BM 49				99.933	
BM 50				99.970	
WL				99.327	
PT				98.748	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 49	99.943	99.933	-0.010	
BM 47	99.685	99.697	0.012	
BM 50	99.980	99.970	-0.009	

Summary	
Staff Gauge Reading (m)	-
Stage from WL Survey (m)	99.327
Pressure Transducer Reading (m)	0.596
Pressure Transducer Elevation (m)	98.731
Discharge (m^3/s)	**1.1**
Cross Sectional Area	9.155
Average Velocity	0.125

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	9:29	**End**		**Location**	At wire, DS of PT	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Currnet Meter			**Instrument Serial #**		141401001994	
Real Time Reading (m)	**Start**	**Reading**	0.596	**Time**	9:30	**Staff Gauge (m)**	-
	End	**Reading**	0.596	**Time**	10:30	**Time of SG Reading**	-

No.	Notes	Station (m)	Depth (m)	Distance (m)	Area (m^2)	Velocity (m/s) 60%	20%	80%	Q (m^3/s)	% of Total Q %
1		0.00	0.00	0.0	0.06	0			0.00	0.0
2		0.50	0.23	0.5	0.12	0.03			0.00	0.3
3		1.00	0.30	0.5	0.23	0.27			0.06	5.3
4		2.00	0.54	1.0	0.54	0.27			0.15	12.7
5		3.00	0.46	1.0	0.46	0.13			0.06	5.2
6		4.00	0.36	1.0	0.36	0.11			0.04	3.5
7		5.00	0.32	1.0	0.32	-0.01			0.00	-0.3
8		6.00	0.26	1.0	0.26	0.05			0.01	1.1
9		7.00	0.08	1.0	0.08	0.06			0.00	0.4
10		8.00	0.00	1.0	0.00	0			0.00	0.0
11		9.50	0.06	1.5	0.11	0			0.00	0.0
12		11.50	0.14	2.0	0.18	0.03			0.01	0.5
13		12.00	0.18	0.5	0.23	0.12			0.03	2.4
14		14.00	0.10	2.0	0.20	0.08			0.02	1.4
15		16.00	0.24	2.0	0.48	0.07			0.03	2.9
16		18.00	0.08	2.0	0.16	0.26			0.04	3.6
17		20.00	0.10	2.0	0.20	0.05			0.01	0.9
18		22.00	0.15	2.0	0.30	0.26			0.08	6.8
19		24.00	0.13	2.0	0.26	0.09			0.02	2.0
20		26.00	0.24	2.0	0.48	0.09			0.04	3.8
21		28.00	0.17	2.0	0.34	0.19			0.06	5.6
22		30.00	0.16	2.0	0.32	0.44			0.14	12.3
23		32.00	0.12	2.0	0.24	0.04			0.01	0.8
24		34.00	0.10	2.0	0.20	0.14			0.03	2.4
25		36.00	0.06	2.0	0.12	0.18			0.02	1.9
26		38.00	0.18	2.0	0.36	0.36			0.13	11.3
27		40.00	0.08	2.0	0.16	0.06			0.01	0.8
28		42.00	0.08	2.0	0.16	0.01			0.00	0.1
29		44.00	0.28	2.0	0.56	0.16			0.09	7.8
30		46.00	0.30	2.0	0.60	0.07			0.04	3.7
31		48.00	0.00	2.0	0.00	0			0.00	0.0
32		49.50	0.00	1.5	0.00	0			0.00	0.0
33		50.00	0.16	0.5	0.20	0.01			0.00	0.2
34		52.00	0.09	2.0	0.11	0.06			0.01	0.6
35		52.50	0.08	0.5	0.40	0			0.00	0.0
36		62.00	0.00	9.5	0.38	0			0.00	0.0
Total Q									**1.148**	**100.0**

General Notes

Surveyed with total station.

(continued)

Table 3.2-5. Manual Flow Measurements at Slipper–Lac de Gras, 2014 (completed)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Slipper-LdG			
Stream Name	Slipper-Lac de Gras			
Date Monitored	3-Aug-14			
Time at Site (24 hr)	**Start Time:**	11:04	**End Time:**	12:30:00 PM
Personnel	Mike S., Catherine G.			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	507616	7164913		
Weather Conditions				

Transducer Information			
DL Model	ELF2 s/n 0023	**PT Serial #**	614004
Gain	3.5144	**Offset**	0.0141
Status	-	**Battery**	-
# of Records	-	**Memory Free**	-
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 48	1.799	101.799		**100.000**	
BM 47			2.113	99.686	
BM 46			-	-	
BM 49			1.856	99.943	
BM 50			1.835	99.964	
WL			2.495	99.304	
PT			3.064	98.735	
TBM			2.178	99.621	
TBM	2.208	101.829		99.621	
BM 48			1.826	100.003	
BM 47			2.142	99.687	
BM 46			-	-	
BM 49			1.885	99.944	
BM 50			1.863	99.966	
WL			2.529	99.300	
PT			3.093	98.736	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 49	99.943	99.944	0.000	
BM 47	99.685	99.687	0.002	
BM 50	99.980	99.965	-0.014	

Summary	
Staff Gauge Reading (m)	-
Stage from WL Survey (m)	99.302
Pressure Transducer Reading (m)	0.576
Pressure Transducer Elevation (m)	98.726
Discharge (m^3/s)	**0.8**
Cross Sectional Area	8.528
Average Velocity	0.098

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	11:04	**End**	12:30	**Location**	At wire, DS of PT	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Currnet Meter			**Instrument Serial #**		141401001994	
Real Time Reading (m)	**Start**	**Reading**	0.576	**Time**	11:00	**Staff Gauge (m)**	-
	End	**Reading**	0.576	**Time**	12:00	**Time of SG Reading**	-

No.	Notes	Station (m)	Depth (m)	Distance (m)	Area (m^2)	Velocity (m/s) 60%	20%	80%	Q (m^3/s)	% of Total Q %
1		0.00	0.00	0.0	0.05	0			0.000	0.0
2		0.50	0.20	0.5	0.10	0.02			0.002	0.2
3		1.00	0.27	0.5	0.20	0.17			0.034	4.1
4		2.00	0.50	1.0	0.50	0.32			0.160	19.2
5		3.00	0.41	1.0	0.41	0.12			0.049	5.9
6		4.00	0.30	1.0	0.30	0.12			0.036	4.3
7		5.00	0.28	1.0	0.28	0.02			0.006	0.7
8		6.00	0.21	1.0	0.21	0.04			0.008	1.0
9		7.00	0.08	1.0	0.14	0.04			0.006	0.7
10		9.50	0.04	2.5	0.09	-0.01			-0.001	-0.1
11		11.50	0.06	2.0	0.08	0.01			0.001	0.1
12		12.00	0.18	0.5	0.32	0			0.000	0.0
13		15.00	0.12	3.0	0.30	0			0.000	0.0
14		17.00	0.14	2.0	0.28	0.07			0.020	2.3
15		19.00	0.13	2.0	0.26	0.12			0.031	3.7
16		21.00	0.04	2.0	0.08	0.01			0.001	0.1
17		23.00	0.08	2.0	0.16	0.02			0.003	0.4
18		25.00	0.05	2.0	0.10	0.35			0.035	4.2
19		27.00	0.07	2.0	0.18	0.07			0.012	1.5
20		30.00	0.15	3.0	0.45	0.02			0.009	1.1
21		33.00	0.28	3.0	0.70	0.07			0.049	5.9
22		35.00	0.13	2.0	0.26	0.15			0.039	4.7
23		37.00	0.52	2.0	1.04	0.19			0.198	23.7
24		39.00	0.11	2.0	0.22	0.35			0.077	9.2
25		41.00	0.11	2.0	0.22	0.03			0.007	0.8
26		43.00	0.14	2.0	0.28	0			0.000	0.0
27		45.00	0.41	2.0	0.82	0.04			0.033	3.9
28		47.00	0.15	2.0	0.30	0.06			0.018	2.2
29		49.00	0.00	2.0	0.00	0			0.000	0.0
30		51.00	0.00	2.0	0.00	0			0.000	0.0
31		51.50	0.09	0.5	0.05	0			0.000	0.0
32		52.00	0.14	0.5	0.11	0.01			0.001	0.1
33		53.00	0.06	1.0	0.06	0.01			0.001	0.1
34		54.00	0.04	1.0	0.03	0.02			0.001	0.1
35		54.50	0.00	0.5	0.00	0			0.000	0.0
36		63.00	0.00	8.5	0.00	0			0.000	0.0
37		64.50	0.00	1.5	0.00	0			0.000	0.0
Total Q									**0.834**	**100.0**

General Notes

Table 3.2-6. Manual Flow Measurements at Cujo Outflow, 2014

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Cujo			
Stream Name	Cujo Outflow			
Date Monitored	31-May-14			
Time at Site (24 hr)	**Start Time:**	10:20:00 AM	**End Time:**	2:15:00 PM
Personnel	Kim Balsillie, Jalcyn Bowman, Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	538942	7162432		
Weather Conditions	sun & cloud			

Transducer Information			
DL Model		**PT Serial #**	
Gain		**Offset**	
Status		**Battery**	
# of Records		**Memory Free**	
Date Serviced		**Crest Gauges**	

Hydrometric Leveling Survey					
Stn	**BS**	**HI**	**FS**	**Elevation**	**Notes**
BM 42	1.491	101.491		**100.000**	
BM 41			1.580	99.911	
BM 45			1.281	100.210	
BM 44			1.523	99.968	
WL			1.633	99.858	
PT			2.092	99.399	
TBM			1.639	99.852	
TBM	1.777	101.629		99.852	
BM 42			1.629	100.000	
BM 41			1.718	99.911	
BM 45			1.417	100.212	
BM 44			1.658	99.971	
WL			1.768	99.861	
PT			2.229	99.400	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 42	100.000	100.000	0.000	
BM 41	99.906	99.911	0.005	
BM 45	100.202	100.211	0.009	

Summary	
Staff Gauge Reading (m)	0.428
Stage from WL Survey (m)	99.860
Pressure Transducer Reading (m)	-
Pressure Transducer Elevation (m)	-
Discharge (m^3/s)	**0.1**
Cross Sectional Area	0.622
Average Velocity	0.105

Discharge Measurement - Mid-Section Method										
Measurement Time	**Start**	13:25	**End**	14:01	**Location**	DS of PT ~50 m				
Method	Velocity-area (Mid-section)			**Instrument Model**	FH950					
Flow Meter Type	Current Meter			**Instrument Serial #**	131641001571					
Real Time Reading (m)	**Start**	**Reading**	-	**Time**	-	**Staff Gauge (m)**	**0.428**			
	End	**Reading**	-	**Time**	-	**Time of SG Reading**	10:25			
		Station	**Depth**	**Distance**	**Area**	**Velocity (m/s)**			**Q**	**% of Total Q**
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	LB	3.32	0.00	0.0	0.01	0			0.000	0.0
2		3.20	0.09	0.1	0.01	0			0.000	0.0
3		3.10	0.18	0.1	0.01	0.08			0.001	1.7
4		3.05	0.20	0.1	0.01	0.45			0.005	6.9
5		3.00	0.20	0.0	0.01	0.44			0.004	6.7
6		2.95	0.24	0.0	0.01	0.5			0.006	9.2
7		2.90	0.30	0.1	0.02	0.47			0.007	10.8
8		2.85	0.30	0.0	0.02	0.55			0.008	12.6
9		2.80	0.29	0.1	0.01	0.47			0.007	10.4
10		2.75	0.30	0.0	0.01	0.56			0.008	12.8
11		2.70	0.29	0.0	0.01	0.39			0.006	8.6
12		2.65	0.32	0.1	0.02	0.28			0.004	6.8
13		2.60	0.34	0.0	0.02	0.17			0.003	4.4
14		2.55	0.32	0.1	0.02	0.17			0.003	4.2
15		2.50	0.38	0.0	0.03	0.15			0.004	6.5
16		2.40	0.27	0.1	0.03	0.08			0.002	3.3
17		2.30	0.30	0.1	0.03	0.03			0.001	1.4
18		2.20	0.23	0.1	0.02	0.01			0.000	0.4
19		2.10	0.32	0.1	0.03	-0.02			-0.001	-1.0
20		2.00	0.27	0.1	0.03	-0.04			-0.001	-1.7
21		1.90	0.26	0.1	0.03	-0.03			-0.001	-1.2
22		1.80	0.24	0.1	0.02	-0.03			-0.001	-1.1
23		1.70	0.21	0.1	0.12	-0.01			-0.001	-1.8
24		0.70	0.00	1.0	0.11	0			0.000	0.0
25										
26										
27										
28										
29										
30										
31										
32										
33										
Total Q									**0.065**	**100.0**

General Notes

Serial cable malfunctioned and logger could not be started in the field. The station was installed but logging was not initiated. A grayling was observed at the station swimming upstream. The logger was started on June 2, 2014 16:07.

(continued)

Table 3.2-6. Manual Flow Measurements at Cujo Outflow, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Cujo			
Stream Name	Cujo Outflow			
Date Monitored	4-Jun-14			
Time at Site (24 hr)	**Start Time:**	9:06:00 AM	**End Time:**	
Personnel	Kim Balsillie, Jaclyn Bowman			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	538942	7162432		
Weather Conditions	overcast/cold			

Transducer Information			
DL Model	ELF-2	**PT Serial #**	426011
Gain	3.5253	**Offset**	0.0074
Status	Okay	**Battery**	100%
# of Records	254	**Memory Free**	32404
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 42	1.353	101.353		**100.000**	
BM 41			1.445	99.908	
BM 45			1.143	100.210	
BM 44			1.386	99.967	
WL			1.533	99.820	
PT			1.958	99.395	
TBM			1.529	99.824	
TBM	1.369	101.193		99.824	
BM 42			1.194	99.999	
BM 41			1.285	99.908	
BM 45			0.983	100.210	
BM 44			1.227	99.966	
WL			1.376	99.817	
PT			1.799	99.394	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 42	100.000	100.000	0.000	
BM 41	99.906	99.908	0.002	
BM 45	100.202	100.210	0.008	

Summary	
Staff Gauge Reading (m)	0.396
Stage from WL Survey (m)	99.819
Pressure Transducer Reading (m)	0.407
Pressure Transducer Elevation (m)	99.412
Discharge (m^3/s)	**0.1**
Cross Sectional Area	0.334
Average Velocity	0.166

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	9:26	**End**	10:08	**Location**	~50 m downstream of station		
Method	Velocity-area (Mid-section)			**Instrument Model**	FH950			
Flow Meter Type	Current Meter			**Instrument Serial #**	131641001571			
Real Time Reading (m)	**Start**	**Reading**	0.407	**Time**	10:23	**Staff Gauge (m)**	**0.396**	
	End	**Reading**	0.407	**Time**	9:27	**Time of SG Reading**	10:23	

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	LB	3.00	0.00	0.0	0.00	0			0.000	0.0
2		2.90	0.06	0.1	0.00	0.02			0.000	0.2
3		2.85	0.21	0.0	0.01	0.26			0.003	4.9
4	on rock	2.80	0.17	0.1	0.01	0.18			0.002	2.8
5	rock in front	2.75	0.15	0.0	0.01	0.28			0.002	3.8
6	rock in front	2.70	0.15	0.0	0.01	0.37			0.004	7.5
7		2.60	0.13	0.1	0.01	0.45			0.004	7.9
8	rock in front	2.55	0.27	0.1	0.01	0.12			0.002	2.9
9		2.50	0.27	0.0	0.01	0.14			0.002	3.4
10		2.45	0.27	0.0	0.01	0.38			0.005	9.3
11		2.40	0.24	0.1	0.01	0.45			0.005	9.7
12		2.35	0.24	0.0	0.01	0.46			0.006	10.0
13		2.30	0.27	0.1	0.01	0.41			0.006	10.0
14		2.25	0.31	0.0	0.02	0.31			0.005	8.7
15	on rock	2.20	0.06	0.0	0.00	0.19			0.001	1.0
16	on rock	2.15	0.06	0.1	0.00	0.18			0.001	1.0
17	on rock	2.10	0.04	0.0	0.00	0.15			0.000	0.5
18	on rock	2.05	0.05	0.1	0.00	0.14			0.000	0.6
19	on rock	2.00	0.04	0.0	0.00	0.13			0.000	0.5
20	on rock	1.95	0.12	0.1	0.01	0.14			0.001	1.5
21		1.90	0.20	0.1	0.01	0.13			0.001	2.3
22	rock in front	1.85	0.30	0.0	0.02	0			0.000	0.0
23		1.80	0.28	0.1	0.01	0.13			0.002	3.3
24		1.75	0.28	0.1	0.01	0.11			0.002	2.8
25		1.70	0.28	0.1	0.01	0.09			0.001	2.3
26		1.65	0.19	0.1	0.01	0.08			0.001	1.4
27		1.60	0.31	0.0	0.02	0.05			0.001	1.4
28		1.55	0.30	0.1	0.02	0.03			0.000	0.8
29		1.50	0.17	0.1	0.01	0.01			0.000	0.2
30		1.45	0.24	0.1	0.02	0			0.000	0.0
31		1.30	0.10	0.2	0.02	-0.02			0.000	-0.6
32	RB	1.10	0.00	0.2	0.01	0			0.000	0.0
33										
Total Q									**0.055**	**100.0**

General Notes

Logger started.

(continued)

Table 3.2-6. Manual Flow Measurements at Cujo Outflow, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Cujo			
Stream Name	Cujo Outflow			
Date Monitored	26-Jun-14			
Time at Site (24 hr)	**Start Time:**	8:48:00 AM	**End Time:**	
Personnel	C. Graydon, G. McNaughton			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	538942	7162432		
Weather Conditions	sunny, no clouds			

Transducer Information			
DL Model	ELF-2	**PT Serial #**	426011
Gain	3.5253	**Offset**	0.0074
Status	Ok	**Battery**	100%
# of Records	3413	**Memory Free**	30827
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 42	1.414	101.414		**100.000**	
BM 41			1.506	99.908	
BM 45			1.188	100.226	
BM 44			1.453	99.961	
BM 43			1.274	100.140	
WL			1.697	99.717	
PT			2.016	99.398	
TBM			1.469	99.945	
TBM	1.608	101.553		99.945	
BM 42			1.554	99.999	
BM 41			1.645	99.908	
BM 45			1.327	100.226	
BM 44			1.593	99.960	
BM 43			1.414	100.139	
WL			1.834	99.719	
PT			2.156	99.397	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 42	100.000	100.000	0.000	
BM 41	99.906	99.908	0.002	
BM 45	100.202	100.226	0.024	

Summary	
Staff Gauge Reading (m)	0.294
Stage from WL Survey (m)	99.718
Pressure Transducer Reading (m)	0.304
Pressure Transducer Elevation (m)	99.414
Discharge (m^3/s)	**0.0**
Cross Sectional Area	0.616
Average Velocity	0.018

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	9:48	**End**		**Location**	1.5 m upstream of last measurement		
Method	Velocity-area (Mid-section)			**Instrument Model**		Swoffer (3" propellor)		
Flow Meter Type	Current Meter			**Instrument Serial #**				
Real Time Reading (m)	**Start**	**Reading**	0.304	**Time**	9:47	**Staff Gauge (m)**	**0.294**	
	End	**Reading**	0.304	**Time**	10:47	**Time of SG Reading**	11:40	

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	LB	6.60	0.00	0.0	0.00	0.000			0.000	0.0
2	grass	6.70	0.09	0.1	0.01	0.000			0.000	0.0
3		6.80	0.27	0.1	0.03	0.000			0.000	0.0
4		6.90	0.30	0.1	0.03	0.000			0.000	0.0
5		7.00	0.33	0.1	0.03	0.000			0.000	0.0
6		7.10	0.34	0.1	0.03	0.000			0.000	0.0
7		7.20	0.31	0.1	0.03	0.003			0.000	0.8
8		7.30	0.31	0.1	0.03	0.000			0.000	0.0
9		7.40	0.34	0.1	0.03	0.000			0.000	0.0
10		7.50	0.34	0.1	0.03	0.000			0.000	0.0
11		7.60	0.34	0.1	0.03	0.000			0.000	0.0
12		7.70	0.34	0.1	0.03	0.000			0.000	0.0
13		7.80	0.33	0.1	0.03	0.000			0.000	0.0
14		7.90	0.31	0.1	0.02	0.011			0.000	2.3
15		7.95	0.31	0.0	0.02	0.020			0.000	2.7
16		8.00	0.32	0.0	0.02	0.049			0.001	6.8
17		8.05	0.33	0.1	0.02	0.092			0.002	13.3
18		8.10	0.33	0.0	0.02	0.132			0.002	19.1
19		8.15	0.32	0.1	0.02	0.126			0.002	17.7
20		8.20	0.31	0.0	0.02	0.105			0.002	14.2
21	grass	8.25	0.27	0.1	0.07	0.039			0.003	22.9
22	RB	8.70	0.00	0.4	0.06	0.000			0.000	0.0
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
Total Q									**0.011**	**100.0**

General Notes

(continued)

Table 3.2-6. Manual Flow Measurements at Cujo Outflow, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Cujo			
Stream Name	Cujo Outflow			
Date Monitored	7-Jul-14			
Time at Site (24 hr)	Start Time:	8:35:00 AM	End Time:	9:10:00 AM
Personnel	Catherine Graydon			
Station Cordinates	Easting	Northing	Elevation	
	538942	7162432		
Weather Conditions				

Transducer Information			
DL Model	ELF-2	PT Serial #	426011
Gain	3.5253	Offset	0.0074
Status	-	Battery	-
# of Records	-	Memory Free	-
Date Serviced	5/21/2014	Crest Gauges	n/a

Hydrometric Leveling Survey					
Stn	BS	HI	FS	Elevation	Notes

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes

Summary	
Staff Gauge Reading (m)	-
Stage from WL Survey (m)	-
Pressure Transducer Reading (m)	0.236
Pressure Transducer Elevation (m)	-
Discharge (m^3/s)	**0.0**
Cross Sectional Area	0.502
Average Velocity	0.007

Discharge Measurement - Mid-Section Method

Measurement Time	Start	8:35	End	9:10	Location			
Method	Velocity-area (Mid-section)				Instrument Model	FH950		
Flow Meter Type	Current Meter				Instrument Serial #	141401001994		
Real Time Reading (m)	Start	Reading	0.236		Time	8:37	Staff Gauge (m)	-
	End	Reading	0.236		Time	9:17	Time of SG Reading	-

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	Notes	(m)	(m)	(m)	(m^2)	60%	20%	80%	(m^3/s)	%
1	RB	4.60	0.00	0.0	0.03	0			0.000	0.0
2		4.30	0.22	0.3	0.04	0.02			0.001	22.1
3		4.25	0.22	0.0	0.01	0.04			0.000	12.6
4		4.20	0.25	0.0	0.01	0.05			0.001	17.9
5		4.15	0.27	0.0	0.01	0.03			0.000	11.6
6		4.10	0.28	0.1	0.01	0.02			0.000	8.0
7		4.05	0.28	0.0	0.01	0.02			0.000	8.0
8		4.00	0.28	0.0	0.01	0.02			0.000	8.0
9		3.95	0.28	0.0	0.01	0.01			0.000	4.0
10		3.90	0.28	0.1	0.01	0.01			0.000	4.0
11		3.85	0.28	0.0	0.01	0			0.000	0.0
12		3.80	0.25	0.1	0.01	0.01			0.000	3.6
13	behind large rock	3.75	0.25	0.0	0.01	0			0.000	0.0
14	behind large rock	3.70	0.33	0.0	0.02	0			0.000	0.0
15	behind large rock	3.65	0.33	0.1	0.02	0			0.000	0.0
16	behind large rock	3.60	0.31	0.0	0.02	0			0.000	0.0
17	behind large rock	3.55	0.31	0.1	0.02	0			0.000	0.0
18	behind large rock	3.50	0.30	0.0	0.01	0			0.000	0.0
19	behind large rock	3.45	0.30	0.0	0.02	0			0.000	0.0
20	behind large rock	3.40	0.29	0.1	0.01	0			0.000	0.0
21		3.35	0.28	0.0	0.01	0			0.000	0.0
22		3.30	0.27	0.1	0.02	0			0.000	0.0
23		3.20	0.28	0.1	0.03	0			0.000	0.0
24		3.10	0.30	0.1	0.03	0			0.000	0.0
25		3.00	0.28	0.1	0.03	0			0.000	0.0
26		2.90	0.28	0.1	0.04	0			0.000	0.0
27	LB	2.75	0.00	0.2	0.02	0			0.000	0.0
28										
29										
30										
31										
32										
33										
Total Q									**0.003**	**100.0**

General Notes

(continued)

Table 3.2-6. Manual Flow Measurements at Cujo Outflow, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Cujo			
Stream Name	Cujo Outflow			
Date Monitored	24-Jul-14			
Time at Site (24 hr)	**Start Time:**	3:35:00 PM	**End Time:**	4:35:00 PM
Personnel	Kimberly Balsallie, Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	538942	7162432		
Weather Conditions	sunny, light smoke			

Transducer Information			
DL Model	ELF-2	**PT Serial #**	426011
Gain	3.5253	**Offset**	0.0074
Status	Okay	**Battery**	100%
# of Records	7486	**Memory Free**	28790
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 42	1.475	101.475		**100.000**	
BM 41			1.563	99.912	
BM 45			1.276	100.199	
BM 44			1.514	99.961	
WL			1.802	99.673	
PT			2.074	99.401	
TBM			1.758	99.717	
TBM	1.679	101.396		99.717	
BM 42			1.397	99.999	
BM 41			1.483	99.913	
BM 45			1.198	100.198	
BM 44			1.435	99.961	
WL			1.723	99.673	
PT			1.994	99.402	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 42	100.000	100.000	0.000	
BM 41	99.906	99.913	0.007	
BM 45	100.202	100.199	-0.004	

Summary

Staff Gauge Reading (m)	0.231
Stage from WL Survey (m)	99.673
Pressure Transducer Reading (m)	0.247
Pressure Transducer Elevation (m)	99.426
Discharge (m^3/s)	**0.0**
Cross Sectional Area	0.482
Average Velocity	0.007

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	16:10	**End**	16:30	**Location**	at stake point	
Method	Velocity-area (Mid-section)			**Instrument Model**	FH950		
Flow Meter Type	Current Meter			**Instrument Serial #**			
Real Time Reading (m)	**Start**	**Reading**	0.248	**Time**	16:07	**Staff Gauge (m)**	**0.231**
	End	**Reading**	0.246	**Time**	16:37	**Time of SG Reading**	-

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	RB	1.10	0.00	0.0	0.01	0			0.000	0.0
2		1.20	0.13	0.1	0.01	0			0.000	0.0
3		1.25	0.18	0.1	0.01	0			0.000	0.0
4		1.30	0.18	0.1	0.01	0.01			0.000	2.5
5		1.35	0.18	0.1	0.01	0.01			0.000	2.5
6		1.40	0.26	0.0	0.01	0.03			0.000	8.7
7		1.43	0.28	0.0	0.01	0.04			0.000	7.8
8		1.45	0.28	0.0	0.01	0.05			0.000	7.8
9		1.47	0.28	0.0	0.01	0.03			0.000	5.8
10		1.50	0.28	0.0	0.01	0.04			0.000	9.3
11		1.53	0.28	0.0	0.01	0.02			0.000	3.9
12		1.55	0.28	0.0	0.01	0.04			0.000	6.2
13		1.57	0.28	0.0	0.01	0.02			0.000	3.1
14		1.59	0.28	0.0	0.00	0.02			0.000	2.3
15		1.60	0.28	0.0	0.01	0.04			0.000	9.3
16		1.65	0.28	0.0	0.01	0.04			0.001	15.6
17	Large rocks u/s	1.70	0.27	0.1	0.01	0.03			0.000	11.3
18		1.75	0.27	0.1	0.01	0.01			0.000	3.8
19		1.80	0.27	0.1	0.01	0			0.000	0.0
20		1.85	0.27	0.1	0.01	0			0.000	0.0
21		1.90	0.28	0.0	0.01	0			0.000	0.0
22		1.95	0.28	0.1	0.01	0			0.000	0.0
23		2.00	0.30	0.1	0.02	0			0.000	0.0
24		2.05	0.28	0.0	0.11	0			0.000	0.0
25		2.75	0.28	0.7	0.13	0			0.000	0.0
26	LB	2.95	0.00	0.2	0.03	0			0.000	0.0
27										
28										
29										
30										
31										
32										
33										
Total Q									**0.004**	**100.0**

General Notes

Stagnant zone on the left bank of the channel.

(continued)

Table 3.2-6. Manual Flow Measurements at Cujo Outflow, 2014 (completed)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Cujo			
Stream Name	Cujo Outflow			
Date Monitored	16-Aug-14			
Time at Site (24 hr)	**Start Time:**	11:45:00 AM	**End Time:**	2:45:00 PM
Personnel	Jaclyn B., Mike S.			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	538942	7162432		
Weather Conditions	overcast, windy			

Transducer Information			
DL Model	ELF-2	**PT Serial #**	426011
Gain	3.5253	**Offset**	0.0074
Status	Okay	**Battery**	100%
# of Records	10790	**Memory Free**	27135
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes

Summary	
Staff Gauge Reading (m)	0.176
Stage from WL Survey (m)	#DIV/0!
Pressure Transducer Reading (m)	0.185
Pressure Transducer Elevation (m)	#DIV/0!
Discharge (m^3/s)	**0.0**
Cross Sectional Area	0.024
Average Velocity	0.005

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	14:00	**End**	14:10	**Location**	~ 10 m downstream from the mouth of Cujo Lk.		
Method	Velocity-area (Mid-section)			**Instrument Model**	FH950			
Flow Meter Type	Current Meter			**Instrument Serial #**	141401001994			
Real Time Reading (m)	**Start**	**Reading**	0.187	**Time**	13:57	**Staff Gauge (m)**	**0.176**	
	End	**Reading**	0.184	**Time**	14:17	**Time of SG Reading**	14:17	

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	RB	1.00	0.00	0.0	0.00	0			0.000	0.0
2		1.16	0.05	0.2	0.01	0.01			0.000	57.0
3		1.25	0.05	0.1	0.00	0.01			0.000	43.0
4		1.35	0.05	0.1	0.01	0			0.000	0.0
5	LB	1.48	0.00	0.1	0.00	0			0.000	0.0
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
Total Q									**0.000**	**100.0**

General Notes

Very little flow. Temporary benchmark installed for total station set-up. Backsight to BM 42.

Table 3.2-7. Manual Flow Measurements at Christine-Lac du Sauvage, 2014

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Christine-LdS			
Stream Name	Christine Lac du Savage			
Date Monitored	31-May-14			
Time at Site (24 hr)	**Start Time:**	2:45:00 PM	**End Time:**	4:00:00 PM
Personnel	Jaclyn Bowman, Catherine Graydon, Kim Balsillie			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	540025	7163840		
Weather Conditions	sunny			

Transducer Information			
DL Model		**PT Serial #**	
Gain		**Offset**	
Status		**Battery**	
# of Records		**Memory Free**	
Date Serviced		**Crest Gauges**	

Hydrometric Leveling Survey					
Stn	**BS**	**HI**	**FS**	**Elevation**	**Notes**
BM 100	1.275	101.275		**100.000**	
BM 99			1.035	100.240	
BM 98			-	-	Buried in snow
WL			2.643	98.632	
PT			-	-	Not installed
TBM			2.258	99.017	
TBM	2.363	101.380		99.017	
BM 100			1.297	100.083	
BM 99			1.265	100.115	
BM 98				-	Buried in snow
WL			2.637	98.743	
PT				-	Not installed

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 100	100.000	100.042	0.042	
BM 99	100.029	100.178	0.149	
BM 98	99.042	-	-	

Summary	
Staff Gauge Reading (m)	Buried
Stage from WL Survey (m)	98.688
Pressure Transducer Reading (m)	-
Pressure Transducer Elevation (m)	-
Discharge (m^3/s)	**0.5**
Cross Sectional Area	2.673
Average Velocity	0.192

Discharge Measurement - Mid-Section Method										
Measurement Time	**Start**	15:13	**End**	15:56	**Location**	~10 m downstream of station				
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950				
Flow Meter Type	Current Meter			**Instrument Serial #**		131641001571				
Real Time Reading (m)	**Start**	**Reading**	-	**Time**	-	**Staff Gauge (m)**		**Buried**		
	End	**Reading**	-	**Time**	-	**Time of SG Reading**		-		
		Station	**Depth**	**Distance**	**Area**	**Velocity (m/s)**			**Q**	**% of Total Q**
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	LB	7.40	0.00	0.0	0.01	0			0.000	0.0
2		7.20	0.12	0.2	0.02	0.08			0.002	0.4
3		7.00	0.34	0.2	0.07	0.15			0.010	2.0
4		6.80	0.39	0.2	0.08	0.42			0.033	6.4
5		6.60	0.40	0.2	0.08	0.5			0.040	7.8
6	rock in front	6.40	0.51	0.2	0.10	0.13			0.013	2.6
7		6.20	0.45	0.2	0.09	0.19			0.017	3.3
8		6.00	0.33	0.2	0.07	0.31			0.020	4.0
9		5.80	0.39	0.2	0.08	0.3			0.023	4.6
10		5.60	0.41	0.2	0.08	0.29			0.024	4.6
11	rock in front	5.40	0.50	0.2	0.10	0.26			0.026	5.1
12	rock in front	5.20	0.68	0.2	0.14	0.21			0.029	5.6
13		5.00	0.69	0.2	0.14	0.21			0.029	5.6
14		4.80	0.73	0.2	0.11	0.21			0.023	4.5
15		4.70	0.70	0.1	0.07	0.25			0.018	3.4
16		4.60	0.75	0.1	0.08	0.22			0.017	3.2
17		4.50	0.73	0.1	0.07	0.23			0.017	3.3
18		4.40	0.51	0.1	0.05	0.26			0.013	2.6
19		4.30	0.66	0.1	0.10	0.23			0.023	4.4
20		4.10	0.75	0.2	0.11	0.22			0.025	4.8
21		4.00	0.70	0.1	0.11	0.2			0.021	4.1
22	on big rock	3.80	0.54	0.2	0.11	0.22			0.024	4.6
23		3.60	0.51	0.2	0.10	0.16			0.016	3.2
24		3.40	0.52	0.2	0.10	0.15			0.016	3.0
25		3.20	0.56	0.2	0.11	0.1			0.011	2.2
26	rock in front	3.00	0.65	0.2	0.16	0.05			0.008	1.6
27	on big rock	2.70	0.33	0.3	0.13	0.07			0.009	1.8
28		2.20	0.29	0.5	0.14	0.05			0.007	1.3
29	RB	1.75	0.00	0.5	0.07	0			0.000	0.0
30										
31										
32										
33										
Total Q									**0.513**	**100.0**

General Notes

The level was out during the survey and the survey was unsuccessful. The staff gauge and benchmark 98 could not be located in the snow Very large boulders in the channel. Ice upstream of the station location. The station was buried in snow and the logger was not installed during this visit.

(continued)

Table 3.2-7. Manual Flow Measurements at Christine-Lac du Sauvage, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Christine-LdS			
Stream Name	Christine Lac du Savage			
Date Monitored	4-Jun-14			
Time at Site (24 hr)	**Start Time:**	11:10:00 AM	**End Time:**	
Personnel	Jaclyn Bowman, Kim Balsillie			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	540025	7163840		
Weather Conditions	overcast and cold			

Transducer Information			
DL Model	ELF2 s/n 0020	**PT Serial #**	2517043
Gain	3.5434	**Offset**	0.0577
Status	logging	**Battery**	4.7V
# of Records	0	**Memory Free**	32535
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 100	1.269	101.269		**100.000**	
BM 99			1.243	100.026	
BM 98			2.228	99.041	
WL			2.615	98.654	
PT			2.217	99.052	rebar
SG			2.125	99.144	top of 2x4
PVC top			2.075	99.194	
TBM			2.237	99.032	
TBM	2.136	101.168		99.032	
BM 100			1.168	100.000	
BM 99			1.142	100.026	
BM 98			2.127	99.041	
WL			2.510	98.658	
PT			2.116	99.052	rebar
SG			2.023	99.145	top of 2x4
PVC top			1.974	99.194	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 100	100.000	100.000	0.000	
BM 99	100.029	100.026	-0.003	
BM 98	99.042	99.041	-0.001	

Summary

Staff Gauge Reading (m)	In ice
Stage from WL Survey (m)	98.656
Pressure Transducer Reading (m)	0.713
Pressure Transducer Elevation (m)	97.943
Discharge (m^3/s)	**0.3**
Cross Sectional Area	1.932
Average Velocity	0.178

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	13:08	**End**	13:58	**Location**	~10 m downstream of station		
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950		
Flow Meter Type	Current Meter			**Instrument Serial #**		131641001571		
Real Time Reading (m)	**Start**	**Reading**	0.714	**Time**	13:11	**Staff Gauge (m)**	**In ice**	
	End	**Reading**	0.712	**Time**	14:01	**Time of SG Reading**	-	

No.	Notes	Station (m)	Depth (m)	Distance (m)	Area (m^2)	Velocity (m/s) 60%	20%	80%	Q (m^3/s)	% of Total Q %
1	LB	7.10	0.00	0.0	0.05	0			0.000	0.0
2		6.80	0.30	0.3	0.08	0.15			0.011	3.3
3		6.60	0.32	0.2	0.06	0.4			0.026	7.5
4		6.40	0.34	0.2	0.07	0.4			0.027	7.9
5		6.20	0.36	0.2	0.07	0.28			0.020	5.9
6		6.00	0.11	0.2	0.02	0.21			0.005	1.3
7		5.80	0.22	0.2	0.04	0.28			0.012	3.6
8		5.60	0.27	0.2	0.05	0.28			0.015	4.4
9		5.40	0.24	0.2	0.05	0.31			0.015	4.3
10		5.20	0.19	0.2	0.04	0.29			0.011	3.2
11		5.00	0.22	0.2	0.04	0.29			0.013	3.7
12		4.80	0.50	0.2	0.08	0.19			0.014	4.1
13		4.70	0.46	0.1	0.05	0.22			0.010	2.9
14		4.60	0.72	0.1	0.07	0.17			0.012	3.6
15		4.50	0.62	0.1	0.06	0.19			0.012	3.4
16		4.40	0.66	0.1	0.07	0.18			0.012	3.5
17		4.30	0.72	0.1	0.11	0.19			0.021	6.0
18		4.10	0.68	0.2	0.14	0.21			0.029	8.3
19		3.90	0.44	0.2	0.09	0.18			0.016	4.6
20		3.70	0.40	0.2	0.08	0.16			0.013	3.7
21		3.50	0.42	0.2	0.08	0.15			0.013	3.7
22		3.30	0.42	0.2	0.08	0.12			0.010	2.9
23		3.10	0.44	0.2	0.09	0.11			0.010	2.8
24		2.90	0.48	0.2	0.10	0.06			0.006	1.7
25		2.70	0.64	0.2	0.21	0.05			0.010	3.0
26		2.25	0.06	0.5	0.04	0.05			0.002	0.6
27	RB	1.40	0.00	0.9	0.03	0			0.000	0.0
28										
29										
30										
31										
32										
33										
Total Q									**0.343**	**100.0**

General Notes

Installed transducer in PVC encased in ice.

(continued)

Table 3.2-7. Manual Flow Measurements at Christine-Lac du Sauvage, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Christine-LdS			
Stream Name	Christine Lac du Savage			
Date Monitored	7-Jun-14			
Time at Site (24 hr)	**Start Time:**	11:50:00 AM	**End Time:**	
Personnel	Jaclyn Bowman, Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	540025	7163840		
Weather Conditions	sunny			

Transducer Information			
DL Model	ELF2 s/n 0020	**PT Serial #**	2517043
Gain	3.5434	**Offset**	0.0577
Status	Okay	**Battery**	4.7V
# of Records	433	**Memory Free**	32314
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 100	1.279	101.279		**100.000**	
BM 99			1.256	100.023	
BM 98			2.237	99.042	
WL			2.681	98.598	
PT			3.261	98.018	
SG			2.133	99.146	0.0 = 98.146
PVC top			2.084	99.195	
TBM			2.122	99.157	
TBM	1.918	101.075		99.157	misread this shot (1.910)
BM 100			1.075	100.000	
BM 99			1.052	100.023	
BM 98			2.033	99.042	
WL			2.473	98.602	
PT			3.060	98.015	
SG			1.930	99.145	0.0 = 98.145
PVC top			1.882	99.193	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 100	100.000	100.000	0.000	
BM 99	100.029	100.023	-0.006	
BM 98	99.042	99.042	0.000	

Summary

Staff Gauge Reading (m)	0.462
Stage from WL Survey (m)	98.600
Pressure Transducer Reading (m)	0.660
Pressure Transducer Elevation (m)	97.940
Discharge (m^3/s)	**0.2**
Cross Sectional Area	1.638
Average Velocity	0.146

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	13:15	**End**	13:50	**Location**	~10 m downstream of station	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Current Meter			**Instrument Serial #**		13161001571	
Real Time Reading (m)	**Start**	**Reading**	0.659	**Time**	12:04	**Staff Gauge (m)**	**0.462**
	End	**Reading**	0.660	**Time**	13:51	**Time of SG Reading**	12:04

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	LB	6.65	0.00	0.0	0.04	0			0.000	0.0
2		6.40	0.28	0.3	0.06	0.2			0.013	5.3
3		6.20	0.38	0.2	0.08	0.25			0.019	7.9
4		6.00	0.36	0.2	0.07	0.33			0.024	9.9
5		5.80	0.33	0.2	0.07	0.18			0.012	5.0
6	on rock	5.60	0.35	0.2	0.07	0.24			0.017	7.0
7	on rock	5.40	0.12	0.2	0.02	0.19			0.005	1.9
8	on rock	5.20	0.16	0.2	0.03	0.26			0.008	3.5
9		5.00	0.20	0.2	0.04	0.3			0.012	5.0
10	on rock	4.80	0.12	0.2	0.02	0.22			0.005	2.2
11		4.60	0.15	0.2	0.03	0.27			0.007	3.0
12		4.45	0.45	0.1	0.07	0.19			0.013	5.4
13		4.30	0.42	0.2	0.06	0.18			0.011	4.7
14		4.15	0.44	0.1	0.07	0.18			0.012	5.0
15		4.00	0.66	0.2	0.10	0.1			0.010	4.1
16		3.85	0.68	0.2	0.10	0.11			0.011	4.7
17		3.70	0.62	0.2	0.11	0.13			0.014	5.9
18		3.50	0.38	0.2	0.08	0.13			0.010	4.1
19		3.30	0.36	0.2	0.07	0.11			0.008	3.3
20		3.10	0.36	0.2	0.07	0.1			0.007	3.0
21		2.90	0.36	0.2	0.07	0.07			0.005	2.1
22		2.70	0.40	0.2	0.08	0.07			0.006	2.3
23		2.50	0.44	0.2	0.09	0.06			0.005	2.2
24		2.30	0.48	0.2	0.10	0.04			0.004	1.6
25		2.10	0.10	0.2	0.05	0.04			0.002	0.8
26	RB	1.35	0.00	0.8	0.00	0			0.000	0.0
27										
28										
29										
30										
31										
32										
33										
Total Q									**0.239**	**100.0**

General Notes

Chipped the remaining ice around the station away and confirmed that the set-up was secure.

(continued)

Table 3.2-7. Manual Flow Measurements at Christine-Lac du Sauvage, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Christine-LdS			
Stream Name	Christine Lac du Savage			
Date Monitored	26-Jun-14			
Time at Site (24 hr)	**Start Time:**	12:20:00 PM	**End Time:**	
Personnel	Catherine Graydon, Gillian McNaughton			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	540025	7163840		
Weather Conditions	sunny, no clouds			

Transducer Information			
DL Model	ELF2 s/n 0020	**PT Serial #**	2517043
Gain	3.5434	**Offset**	0.0577
Status	Ok	**Battery**	100%
# of Records	3171	**Memory Free**	30948
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 100	1.378	101.378		**100.000**	
BM 99			1.394	99.984	
BM 98			2.342	99.036	
WL			2.945	98.433	
PT			3.365	98.013	
SG			-	-	
PVC top			-	-	
TBM			1.458	99.920	
TBM	1.399	101.319		99.920	
BM 100			1.319	100.000	
BM 99			1.334	99.985	
BM 98			2.282	99.037	
WL			2.885	98.434	
PT			3.306	98.013	
SG			-	-	
PVC top			-	-	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 100	100.000	100.000	0.000	
BM 99	100.029	99.985	-0.044	
BM 98	99.042	99.037	-0.005	

Summary

Staff Gauge Reading (m)	0.298
Stage from WL Survey (m)	98.434
Pressure Transducer Reading (m)	0.489
Pressure Transducer Elevation (m)	97.945
Discharge (m^3/s)	**0.0**
Cross Sectional Area	0.848
Average Velocity	0.059

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**		**End**		**Location**	10 m DS of station		
Method	Velocity-area (Mid-section)			**Instrument Model**		Swoffer (3" propellor)		
Flow Meter Type	Current Velocity Meter			**Instrument Serial #**				
Real Time Reading (m)	**Start**	**Reading**	0.489	**Time**	12:21	**Staff Gauge (m)**	**0.298**	
	End	**Reading**	0.489	**Time**	13:21	**Time of SG Reading**	12:38	

No.	Notes	Station (m)	Depth (m)	Distance (m)	Area (m^2)	Velocity (m/s) 60%	20%	80%	Q (m^3/s)	% of Total Q %
1	LB	10.25	0.00	0.0	0.00	0			0.000	0.0
2		10.10	0.03	0.2	0.00	0.143			0.001	1.8
3		9.95	0.17	0.2	0.03	0.152			0.006	11.1
4		9.80	0.14	0.1	0.02	0.124			0.004	7.5
5		9.65	0.14	0.2	0.02	0.135			0.004	8.1
6	behind rock	9.50	0.16	0.2	0.02	0.011			0.000	0.8
7	behind rock	9.35	0.08	0.2	0.01	0.064			0.001	2.2
8	on rock	9.20	0.00	0.2	0.00	0			0.000	0.0
9	on rock	9.05	0.00	0.1	0.00	0			0.000	0.0
10	on rock	8.90	0.00	0.2	0.00	0			0.000	0.0
11		8.75	0.05	0.2	0.01	0.151			0.002	3.2
12	on rock	8.60	0.00	0.2	0.00	0			0.000	0.0
13	on rock	8.45	0.00	0.2	0.00	0			0.000	0.0
14		8.30	0.04	0.1	0.01	0.128			0.001	2.2
15		8.15	0.30	0.2	0.04	0.127			0.007	13.7
16		8.05	0.26	0.1	0.03	0.1			0.004	7.5
17		7.95	0.26	0.1	0.03	0.082			0.003	6.1
18		7.85	0.45	0.1	0.05	0.009			0.001	1.2
19		7.75	0.42	0.1	0.04	0.015			0.001	1.8
20		7.65	0.52	0.1	0.05	0.02			0.001	3.0
21		7.55	0.45	0.1	0.05	0.035			0.002	4.5
22		7.45	0.50	0.1	0.05	0.054			0.004	7.7
23		7.35	0.45	0.1	0.06	0.018			0.001	2.9
24		7.20	0.18	0.1	0.03	0.087			0.003	6.7
25		7.05	0.15	0.2	0.02	0.071			0.002	4.6
26		6.90	0.15	0.1	0.02	0.028			0.001	1.8
27		6.75	0.17	0.2	0.03	0.008			0.000	0.6
28		6.60	0.20	0.2	0.04	0.003			0.000	0.3
29		6.35	0.25	0.3	0.07	0.003			0.000	0.6
30		6.05	0.23	0.3	0.05	0			0.000	0.0
31	RB	6.80	0.00	0.8	0.09	0			0.000	0.0
32										
33										
Total Q									**0.050**	**100.0**

General Notes

(continued)

Table 3.2-7. Manual Flow Measurements at Christine-Lac du Sauvage, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Christine-LdS			
Stream Name	Christine Lac du Savage			
Date Monitored	6-Jul-14			
Time at Site (24 hr)	**Start Time:**	10:30:00 AM	**End Time:**	1:30:00 PM
Personnel	Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	540025	7163840		
Weather Conditions				

Transducer Information			
DL Model	ELF2 s/n 0020	**PT Serial #**	2517043
Gain	3.5434	**Offset**	0.0577
Status	-	**Battery**	-
# of Records	-	**Memory Free**	-
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey					
Stn	**BS**	**HI**	**FS**	**Elevation**	**Notes**

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes

Summary	
Staff Gauge Reading (m)	-
Stage from WL Survey (m)	-
Pressure Transducer Reading (m)	0.375
Pressure Transducer Elevation (m)	-
Discharge (m^3/s)	**0.0**
Cross Sectional Area	0.792
Average Velocity	0.043

Discharge Measurement - Mid-Section Method								
Measurement Time	**Start**	11:30	**End**		**Location**	-		
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950		
Flow Meter Type	Current Meter			**Instrument Serial #**		141401001994		
Real Time Reading (m)	**Start**	**Reading**	0.376	**Time**	11:30	**Staff Gauge (m)**	-	
	End	**Reading**	0.374	**Time**	12:30	**Time of SG Reading**	-	

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	LB	5.70	0.00	0.0	0.01	0			0.000	0.0
2		5.60	0.10	0.1	0.01	0.05			0.001	1.5
3		5.50	0.06	0.1	0.01	0.04			0.000	0.7
4		5.40	0.08	0.1	0.01	0.13			0.001	3.1
5		5.30	0.06	0.1	0.01	0.08			0.000	1.4
6		5.20	0.00	0.1	0.00	0			0.000	0.0
7		3.80	0.18	1.4	0.14	0.08			0.011	31.9
8		3.70	0.14	0.1	0.01	0.09			0.001	3.7
9		3.60	0.15	0.1	0.02	0.08			0.001	3.5
10		3.50	0.30	0.1	0.03	0.06			0.002	5.3
11		3.40	0.32	0.1	0.03	0.06			0.002	5.7
12		3.30	0.34	0.1	0.03	0.05			0.002	5.0
13		3.20	0.40	0.1	0.04	0.04			0.002	4.7
14		3.10	0.36	0.1	0.04	0.06			0.002	6.4
15		3.00	0.37	0.1	0.04	0.07			0.003	7.7
16		2.90	0.13	0.1	0.01	0.06			0.001	2.3
17	large rock	2.80	0.10	0.1	0.01	0.06			0.001	1.8
18		2.70	0.10	0.1	0.01	0.06			0.001	1.8
19		2.60	0.10	0.1	0.01	0.06			0.001	1.8
20		2.50	0.09	0.1	0.01	0.06			0.001	1.6
21		2.40	0.10	0.1	0.01	0.04			0.000	1.2
22		2.30	0.11	0.1	0.01	0.04			0.000	1.3
23		2.20	0.11	0.1	0.01	0.02			0.000	0.7
24		2.10	0.12	0.1	0.01	0.01			0.000	0.4
25		2.00	0.15	0.1	0.02	0.01			0.000	0.4
26		1.90	0.16	0.1	0.02	0.03			0.000	1.4
27		1.80	0.19	0.1	0.02	0.02			0.000	1.1
28		1.70	0.19	0.1	0.12	0.01			0.001	3.7
29	RB	0.50	0.00	1.2	0.11	0			0.000	0.0
30										
31										
32										
33										
Total Q									**0.034**	**100.0**

General Notes

(continued)

Table 3.2-7. Manual Flow Measurements at Christine-Lac du Sauvage, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Christine-LdS			
Stream Name	Christine Lac du Savage			
Date Monitored	26-Jul-14			
Time at Site (24 hr)	**Start Time:**	10:35:00 AM	**End Time:**	11:45:00 AM
Personnel	Kim Balsillie, Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	540025	7163840		
Weather Conditions	sunny			

Transducer Information			
DL Model	ELF2 s/n 0020	**PT Serial #**	2517043
Gain	3.5434	**Offset**	0.0577
Status	Okay	**Battery**	100%
# of Records	7431	**Memory Free**	28790
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 100	1.524	101.524		**100.000**	
BM 99			1.556	99.968	
BM 98			2.494	99.030	
WL			3.213	98.311	
PT			3.515	98.009	
SG			-	-	
PVC top			-	-	
TBM			2.613	98.911	
TBM	2.284	101.195		98.911	
BM 100			1.198	99.997	
BM 99			1.228	99.967	
BM 98			2.167	99.028	
WL			2.883	98.312	
PT			3.188	98.007	
SG			-	-	
PVC top			-	-	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 100	100.000	99.999	-0.001	
BM 99	100.029	99.968	-0.061	
BM 98	99.042	99.029	-0.013	

Summary	
Staff Gauge Reading (m)	0.181
Stage from WL Survey (m)	98.312
Pressure Transducer Reading (m)	0.362
Pressure Transducer Elevation (m)	97.949
Discharge (m^3/s)	**0.1**
Cross Sectional Area	1.188
Average Velocity	0.050

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	11:14	**End**	11:36	**Location**	same as last	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Current Meter			**Instrument Serial #**		141401001994	
Real Time Reading (m)	**Start**	**Reading**	0.362	**Time**	11:11	**Staff Gauge (m)**	**0.181**
	End	**Reading**	0.362	**Time**	11:41	**Time of SG Reading**	-

No.	Notes	Station (m)	Depth (m)	Distance (m)	Area (m^2)	Velocity (m/s) 60%	20%	80%	Q (m^3/s)	% of Total Q %
1	LB	0.50	0.00	0.0	0.02	0			0.000	0.0
2	beside rock	0.90	0.08	0.4	0.08	0.05			0.004	6.6
3		2.45	0.19	1.6	0.16	0.1			0.016	26.6
4		2.55	0.17	0.1	0.01	0.09			0.001	1.9
5		2.60	0.14	0.1	0.01	0.1			0.001	1.2
6		2.65	0.14	0.0	0.01	0.09			0.001	1.1
7		2.70	0.14	0.1	0.01	0.09			0.001	1.1
8		2.75	0.14	0.0	0.01	0.09			0.001	1.1
9		2.80	0.14	0.0	0.01	0.09			0.001	1.1
10		2.85	0.30	0.1	0.02	0.08			0.001	2.0
11		2.90	0.31	0.0	0.02	0.06			0.001	2.4
12		3.00	0.32	0.1	0.03	0.04			0.001	2.2
13	small rocks in front	3.10	0.39	0.1	0.04	0.04			0.002	2.6
14		3.20	0.35	0.1	0.03	0.04			0.001	2.4
15		3.30	0.37	0.1	0.04	0.07			0.003	4.4
16		3.40	0.35	0.1	0.04	0.08			0.003	4.7
17		3.50	0.10	0.1	0.01	0.02			0.000	0.3
18		3.60	0.06	0.1	0.01	0.06			0.000	0.6
19		3.70	0.06	0.1	0.01	0.06			0.000	0.6
20		3.80	3.06	0.1	0.31	0.05			0.015	25.9
21		3.90	0.08	0.1	0.01	0.06			0.000	0.8
22		4.00	0.08	0.1	0.01	0.06			0.000	0.8
23		4.10	0.08	0.1	0.01	0.05			0.000	0.7
24		4.20	0.10	0.1	0.01	0.05			0.001	0.8
25		4.30	0.10	0.1	0.01	0.03			0.000	0.5
26		4.40	0.11	0.1	0.01	0.01			0.000	0.2
27		4.50	0.12	0.1	0.01	0.01			0.000	0.2
28		4.60	0.16	0.1	0.02	0.01			0.000	0.3
29	between rocks	4.70	0.21	0.1	0.14	0.03			0.004	6.9
30		5.90	0.00	1.2	0.13	0			0.000	0.0
31										
32										
33										
Total Q									**0.059**	**100.0**

General Notes

(continued)

Table 3.2-7. Manual Flow Measurements at Christine-Lac du Sauvage, 2014 (completed)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Christine-LdS			
Stream Name	Christine Lac du Savage			
Date Monitored	14-Aug-14			
Time at Site (24 hr)	**Start Time:**	8:30:00 AM	**End Time:**	4:40:00 PM
Personnel	Jaclyn B., Mike S.			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	540025	7163840		
Weather Conditions	overcast			

Transducer Information			
DL Model	ELF2 s/n 0020	**PT Serial #**	2517043
Gain	3.5434	**Offset**	0.0577
Status	Okay	**Battery**	100
# of Records	10251	**Memory Free**	27403
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 100	2.673	102.673		**100.000**	
BM 99			2.651	100.022	
BM 98			3.621	99.052	
WL			4.490	98.183	
PT			4.642	98.031	
SG			-	-	
PVC top			-	-	
BM1			0.465	102.208	
TBM			0.570	102.103	
TBM	0.268	102.371		102.103	
BM 100				-	
BM 99			2.370	100.001	
BM 98				-	
WL			-	-	
PT			-	-	
SG			-	-	
PVC top			-	-	
BM1			0.163	102.208	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 100	100.000	100.000	0.000	
BM 99	100.029	100.012	-0.017	
BM 98	99.042	99.052	0.010	

Summary

Staff Gauge Reading (m)	0.030
Stage from WL Survey (m)	98.183
Pressure Transducer Reading (m)	0.209
Pressure Transducer Elevation (m)	97.974
Discharge (m^3/s)	**0.0**
Cross Sectional Area	0.270
Average Velocity	0.022

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	16:05	**End**	16:18	**Location**	~ 30 m upstream of station	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Current Meter			**Instrument Serial #**		141401001994	
Real Time Reading (m)	**Start**	**Reading**	0.209	**Time**	16:01	**Staff Gauge (m)**	**0.030**
	End	**Reading**	0.209	**Time**	16:31	**Time of SG Reading**	10:09

No.	Notes	Station (m)	Depth (m)	Distance (m)	Area (m^2)	Velocity (m/s) 60%	20%	80%	Q (m^3/s)	% of Total Q %
1	RB	2.35	0.00	0.0	0.00	0			0.000	0.0
2		2.25	0.07	0.1	0.01	0.21			0.001	24.6
3		2.15	0.10	0.1	0.01	0.27			0.003	45.2
4		2.05	0.12	0.1	0.01	0.06			0.001	12.1
5		1.95	0.17	0.1	0.02	0.04			0.001	11.4
6		1.85	0.19	0.1	0.02	0.01			0.000	3.2
7		1.75	0.21	0.1	0.02	0.01			0.000	3.5
8		1.65	0.23	0.1	0.02	0			0.000	0.0
9		1.55	0.25	0.1	0.03	0			0.000	0.0
10		1.45	0.26	0.1	0.03	0			0.000	0.0
11		1.35	0.26	0.1	0.04	0			0.000	0.0
12		1.15	0.25	0.2	0.05	0			0.000	0.0
13	LB	0.98	0.00	0.2	0.02	0			0.000	0.0
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
Total Q									**0.006**	**100.0**

General Notes

Set up Total Station on BM1 at elevation 102.208 for hydraulic geometry survey.

Table 3.2-8. Manual Flow Measurements at Counts Outflow, 2014

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Counts			
Stream Name	Counts Outflow			
Date Monitored	3-Jun-14			
Time at Site (24 hr)	**Start Time:**	3:05:00 PM	**End Time:**	5:50:00 PM
Personnel	Jaclyn Bowman, Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	535280	7169713		
Weather Conditions	sunny, partly cloudy			

Transducer Information			
DL Model	ELF2 s/n 0017	**PT Serial #**	416006
Gain	3.5149	**Offset**	0.0111
Status	Okay	**Battery**	4.4V
# of Records	0	**Memory Free**	32656
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 56	1.153	101.153		**100.000**	
BM 57			1.119	100.034	
BM 58			1.151	100.002	
BM 55			1.517	99.636	
WL			1.776	99.377	
PT			2.368	98.785	
TBM			1.521	99.632	
TBM	1.394	101.026		99.632	
BM 56			1.026	100.000	
BM 57			0.992	100.034	
BM 58			1.023	100.003	
BM 55			1.389	99.637	
WL			1.648	99.378	
PT			2.240	98.786	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 56	100.000	100.000	0.000	
BM 57	100.037	100.034	-0.003	
BM 58	100.003	100.003	0.000	

Summary

Staff Gauge Reading (m)	0.622
Stage from WL Survey (m)	99.378
Pressure Transducer Reading (m)	0.634
Pressure Transducer Elevation (m)	98.743
Discharge (m^3/s)	**0.1**
Cross Sectional Area	1.425
Average Velocity	0.051

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	17:12	**End**	17:40	**Location**	~20 m DS of PT	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Current Meter			**Instrument Serial #**		131641001571	
Real Time Reading (m)	**Start**	**Reading**	0.634	**Time**	17:12	**Staff Gauge (m)**	**0.622**
	End	**Reading**	0.634	**Time**	17:42	**Time of SG Reading**	16:35

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	LB	1.50	0.00	0.0	0.01	0			0.000	0.0
2	weeds	1.65	0.08	0.2	0.01	0			0.000	0.0
3	weeds	1.80	0.11	0.2	0.02	0			0.000	0.0
4	weeds	1.95	0.15	0.2	0.02	0			0.000	0.0
5	weeds	2.10	0.16	0.2	0.02	0			0.000	0.0
6	weeds	2.25	0.24	0.2	0.04	0			0.000	0.0
7	weeds	2.40	0.25	0.2	0.04	0			0.000	0.0
8		2.55	0.26	0.2	0.04	0			0.000	0.0
9		2.70	0.27	0.2	0.05	0			0.000	0.0
10		2.90	0.42	0.2	0.06	0.02			0.001	1.7
11		3.00	0.42	0.1	0.04	0.02			0.001	1.2
12		3.10	0.44	0.1	0.04	0.06			0.003	3.6
13		3.20	0.46	0.1	0.05	0.06			0.003	3.8
14		3.30	0.48	0.1	0.05	0.13			0.006	8.5
15		3.40	0.48	0.1	0.05	0.13			0.006	8.5
16		3.50	0.49	0.1	0.05	0.13			0.006	8.7
17		3.60	0.50	0.1	0.05	0.11			0.006	7.5
18		3.70	0.50	0.1	0.05	0.11			0.005	7.5
19		3.80	0.50	0.1	0.05	0.11			0.005	7.5
20		3.90	0.49	0.1	0.05	0.09			0.004	6.0
21		4.00	0.48	0.1	0.05	0.09			0.004	5.9
22		4.10	0.49	0.1	0.05	0.08			0.004	5.4
23		4.20	0.50	0.1	0.05	0.08			0.004	5.5
24		4.30	0.50	0.1	0.05	0.06			0.003	4.1
25		4.40	0.49	0.1	0.05	0.06			0.003	4.0
26		4.50	0.49	0.1	0.05	0.05			0.002	3.4
27		4.60	0.48	0.1	0.05	0.04			0.002	2.6
28		4.70	0.46	0.1	0.05	0.03			0.001	1.9
29		4.80	0.45	0.1	0.09	0.02			0.002	2.5
30		5.10	0.37	0.3	0.11	0			0.000	0.0
31	LB	5.40	0.00	0.3	0.06	0			0.000	0.0
32										
33										
Total Q									**0.073**	**100.0**

General Notes

Staff guage is slightly tilted. Logger installed and started.

(continued)

Table 3.2-8. Manual Flow Measurements at Counts Outflow, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Counts			
Stream Name	Counts Outflow			
Date Monitored	7-Jun-14			
Time at Site (24 hr)	**Start Time:**	3:04:00 PM	**End Time:**	4:30:00 PM
Personnel	Jaclyn Bowman, Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	535280	7169713		
Weather Conditions	sun & cloud			

Transducer Information			
DL Model	ELF2 s/n 0017	**PT Serial #**	416006
Gain	3.5149	**Offset**	0.0111
Status	Okay	**Battery**	4.5V
# of Records	568	**Memory Free**	32247
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes

Summary	
Staff Gauge Reading (m)	0.601
Stage from WL Survey (m)	-
Pressure Transducer Reading (m)	0.614
Pressure Transducer Elevation (m)	-
Discharge (m^3/s)	**0.1**
Cross Sectional Area	1.522
Average Velocity	0.044

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	15:22	**End**	15:52	**Location**	~10 m DS of PT at rebar	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Current Meter			**Instrument Serial #**		131641001571	
Real Time Reading (m)	**Start**	**Reading**	0.614	**Time**	15:22	**Staff Gauge (m)**	**0.601**
	End	**Reading**	0.613	**Time**	15:52	**Time of SG Reading**	15:05

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	LB	5.40	0.00	0.0	0.00	0			0.000	0.0
2	weeds	5.25	0.06	0.2	0.01	0			0.000	0.0
3	weeds	5.10	0.09	0.2	0.01	0			0.000	0.0
4	weeds	4.95	0.13	0.1	0.02	0.01			0.000	0.3
5	weeds	4.80	0.17	0.2	0.03	0			0.000	0.0
6	weeds	4.65	0.28	0.1	0.04	0			0.000	0.0
7		4.50	0.29	0.2	0.04	0			0.000	0.0
8		4.35	0.40	0.2	0.07	0			0.000	0.0
9		4.15	0.43	0.2	0.08	0			0.000	0.0
10		4.00	0.44	0.2	0.06	0.02			0.001	1.6
11		3.90	0.44	0.1	0.04	0.02			0.001	1.3
12		3.80	0.46	0.1	0.05	0.07			0.003	4.8
13		3.70	0.48	0.1	0.05	0.09			0.004	6.4
14		3.60	0.50	0.1	0.05	0.12			0.006	8.9
15		3.50	0.51	0.1	0.05	0.11			0.006	8.3
16		3.40	0.51	0.1	0.05	0.11			0.006	8.3
17		3.30	0.51	0.1	0.05	0.11			0.006	8.3
18		3.20	0.51	0.1	0.05	0.11			0.006	8.3
19		3.10	0.51	0.1	0.05	0.09			0.005	6.8
20		3.00	0.52	0.1	0.05	0.09			0.005	6.9
21		2.90	0.51	0.1	0.05	0.08			0.004	6.0
22		2.80	0.50	0.1	0.05	0.07			0.004	5.2
23		2.70	0.50	0.1	0.05	0.05			0.003	3.7
24		2.60	0.50	0.1	0.05	0.06			0.003	4.4
25		2.50	0.50	0.1	0.05	0.06			0.003	4.4
26		2.40	0.50	0.1	0.05	0.03			0.002	2.2
27		2.30	0.50	0.1	0.05	0.03			0.002	2.2
28		2.20	0.49	0.1	0.05	0.02			0.001	1.5
29		2.10	0.49	0.1	0.15	0			0.000	0.0
30	RB	1.60	0.00	0.5	0.12	0			0.000	0.0
31										
32										
33										
Total Q									**0.067**	**100.0**

General Notes

Flow measurement only. No Survey.

(continued)

Table 3.2-8. Manual Flow Measurements at Counts Outflow, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Counts			
Stream Name	Counts Outflow			
Date Monitored	26-Jun-14			
Time at Site (24 hr)	**Start Time:**	3:06:00 PM	**End Time:**	
Personnel	Catherine Graydon, Gillian McNaughton			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	535280	7169713		
Weather Conditions	sunny, no clouds			

Transducer Information			
DL Model	ELF2 s/n 0017	**PT Serial #**	416006
Gain	3.5149	**Offset**	0.0111
Status	Ok	**Battery**	100%
# of Records	3304	**Memory Free**	30802
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 56	1.254	101.254		**100.000**	
BM 57			1.221	100.033	
BM 58			1.256	99.998	
BM 55			1.618	99.636	
WL			1.914	99.340	
PT			2.470	98.784	
TBM			1.320	99.934	
TBM	1.316	101.250		99.934	
BM 56			1.252	99.998	
BM 57			1.217	100.033	
BM 58			1.252	99.998	
BM 55			1.615	99.635	
WL			1.913	99.337	
PT			2.470	98.780	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 56	100.000	99.999	-0.001	
BM 57	100.037	100.033	-0.004	
BM 58	100.003	99.998	-0.005	

Summary

Staff Gauge Reading (m)	0.593
Stage from WL Survey (m)	-
Pressure Transducer Reading (m)	0.601
Pressure Transducer Elevation (m)	-
Discharge (m^3/s)	**0.1**
Cross Sectional Area	1.675
Average Velocity	0.034

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	-	**End**	-	**Location**	12 m ds of station	
Method	Velocity-area (Mid-section)			**Instrument Model**		Swoffer (3" propellor)	
Flow Meter Type	Current Velocity Meter			**Instrument Serial #**			
Real Time Reading (m)	**Start**	**Reading**	0.601	**Time**	15:32	**Staff Gauge (m)**	**0.593**
	End	**Reading**	0.601	**Time**	16:32	**Time of SG Reading**	15:26

No.	Notes	Station (m)	Depth (m)	Distance (m)	Area (m^2)	Velocity (m/s) 60%	20%	80%	Q (m^3/s)	% of Total Q %
1	RB	10.50	0.00	0.0	0.00	0			0.000	0.0
2	grass	10.40	0.10	0.1	0.01	0			0.000	0.0
3		10.30	0.36	0.1	0.04	0			0.000	0.0
4		10.20	0.46	0.1	0.05	0			0.000	0.0
5		10.10	0.44	0.1	0.04	0			0.000	0.0
6		10.00	0.41	0.1	0.04	0			0.000	0.0
7		9.90	0.47	0.1	0.05	0.001			0.000	0.1
8		9.80	0.46	0.1	0.05	0.009			0.000	0.7
9		9.70	0.46	0.1	0.05	0.035			0.002	2.8
10		9.60	0.45	0.1	0.04	0.057			0.003	4.5
11		9.50	0.45	0.1	0.04	0.036			0.002	2.8
12		9.40	0.46	0.1	0.05	0.087			0.004	7.0
13		9.30	0.46	0.1	0.05	0.12			0.006	9.6
14		9.20	0.50	0.1	0.05	0.111			0.006	9.7
15		9.10	0.45	0.1	0.03	0.123			0.004	7.2
16		9.05	0.47	0.0	0.02	0.122			0.003	5.0
17		9.00	0.47	0.0	0.02	0.116			0.003	4.7
18		8.95	0.51	0.1	0.03	0.113			0.003	5.0
19		8.90	0.52	0.0	0.03	0.104			0.003	4.7
20		8.85	0.50	0.1	0.02	0.089			0.002	3.9
21		8.80	0.51	0.0	0.03	0.102			0.003	4.5
22		8.75	0.48	0.1	0.02	0.106			0.003	4.4
23		8.70	0.45	0.0	0.03	0.115			0.004	6.8
24		8.60	0.47	0.1	0.05	0.105			0.005	8.6
25		8.50	0.46	0.1	0.05	0.069			0.003	5.5
26		8.40	0.46	0.1	0.05	0.032			0.001	2.6
27	grassy	8.30	0.45	0.1	0.38	0			0.000	0.0
28	LB	6.70	0.00	1.6	0.36	0			0.000	0.0
29										
30										
31										
32										
33										
Total Q									**0.057**	**100.0**

General Notes

Water level survey conducted the next day (June 27, 2014).

(continued)

Table 3.2-8. Manual Flow Measurements at Counts Outflow, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Counts			
Stream Name	Counts Outflow			
Date Monitored	6-Jul-14			
Time at Site (24 hr)	**Start Time:**	9:50:00 AM	**End Time:**	10:30:00 AM
Personnel	Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	535280	7169713		
Weather Conditions				

Transducer Information			
DL Model	ELF2 s/n 0017	**PT Serial #**	416006
Gain	3.5149	**Offset**	0.0111
Status		**Battery**	
# of Records		**Memory Free**	
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes

Summary	
Staff Gauge Reading (m)	-
Stage from WL Survey (m)	-
Pressure Transducer Reading (m)	0.584
Pressure Transducer Elevation (m)	-
Discharge (m^3/s)	**0.1**
Cross Sectional Area	1.500
Average Velocity	0.037

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	9:50	**End**	10:30	**Location**		
Method	Velocity-area (Mid-section)			**Instrument Model**	FH950		
Flow Meter Type	Current Meter			**Instrument Serial #**	141401001994		
Real Time Reading (m)	**Start**	**Reading**	0.584	**Time**	9:52	**Staff Gauge (m)**	-
	End	**Reading**	0.584	**Time**	10:32	**Time of SG Reading**	-

No.	Notes	Station (m)	Depth (m)	Distance (m)	Area (m^2)	Velocity (m/s) 60%	20%	80%	Q (m^3/s)	% of Total Q %
1	LB	5.70	0.00	0.0	0.03	0			0.000	0.0
2		5.30	0.13	0.4	0.03	0.01			0.000	0.6
3		5.20	0.18	0.1	0.02	-0.01			0.000	-0.3
4		5.10	0.38	0.1	0.04	0			0.000	0.0
5		5.00	0.43	0.1	0.04	-0.01			0.000	-0.8
6		4.90	0.46	0.1	0.05	-0.04			-0.002	-3.3
7		4.80	0.38	0.1	0.04	0			0.000	0.0
8		4.70	0.38	0.1	0.04	0			0.000	0.0
9		4.60	0.47	0.1	0.05	0			0.000	0.0
10		4.50	0.46	0.1	0.05	0			0.000	0.0
11		4.40	0.50	0.1	0.05	0			0.000	0.0
12		4.30	0.52	0.1	0.05	0.04			0.002	3.8
13		4.20	0.50	0.1	0.05	0.04			0.002	3.6
14		4.10	0.48	0.1	0.05	0.05			0.002	4.4
15		4.00	0.48	0.1	0.05	0.07			0.003	6.1
16		3.90	0.46	0.1	0.05	0.06			0.003	5.0
17		3.80	0.46	0.1	0.05	0.08			0.004	6.7
18		3.70	0.47	0.1	0.05	0.1			0.005	8.5
19		3.60	0.47	0.1	0.05	0.11			0.005	9.4
20		3.50	0.50	0.1	0.05	0.11			0.005	10.0
21		3.40	0.50	0.1	0.05	0.11			0.005	10.0
22		3.30	0.52	0.1	0.06	0.1			0.006	11.8
23		3.15	0.48	0.1	0.07	0.07			0.005	9.1
24		3.00	0.46	0.2	0.07	0.06			0.004	7.5
25		2.85	0.48	0.2	0.07	0.04			0.003	5.2
26		2.70	0.50	0.2	0.08	0.02			0.002	2.7
27		2.55	0.50	0.2	0.08	0			0.000	0.0
28		2.40	0.50	0.2	0.08	0			0.000	0.0
29		2.25	0.40	0.2	0.06	0			0.000	0.0
30	RB	2.10	0.00	0.2	0.03	0			0.000	0.0
31										
32										
33										
Total Q									**0.055**	**100.0**

General Notes

Lots of organic matter/sediment present at the bottom of the stream

Table 3.2-8. Manual Flow Measurements at Counts Outflow, 2014 (continued)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Counts			
Stream Name	Counts Outflow			
Date Monitored	24-Jul-14			
Time at Site (24 hr)	**Start Time:**	1:57:00 PM	**End Time:**	3:15:00 PM
Personnel	Kimberly Balsallie, Catherine Graydon			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	535280	7169713		
Weather Conditions	sunny, smokey			

Transducer Information			
DL Model	ELF2 s/n 0017	**PT Serial #**	416006
Gain	3.5149	**Offset**	0.0111
Status	Okay	**Battery**	100%
# of Records	7329	**Memory Free**	28867
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey

Stn	BS	HI	FS	Elevation	Notes
BM 56	0.723	100.723		**100.000**	
BM 57			0.692	100.031	
BM 58			0.725	99.998	
BM 55			1.089	99.634	
WL			1.362	99.361	
PT			1.950	98.773	
TBM			1.120	99.603	
TBM	1.027	100.630		99.603	
BM 56			0.632	99.998	
BM 57			0.601	100.029	
BM 58			0.634	99.996	
BM 55			0.999	99.631	
WL			1.278	99.352	
PT			1.858	98.772	

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 56	100.000	99.999	-0.001	
BM 57	100.037	100.030	-0.007	
BM 58	100.003	99.997	-0.006	

Summary

Staff Gauge Reading (m)	0.601
Stage from WL Survey (m)	99.357
Pressure Transducer Reading (m)	0.614
Pressure Transducer Elevation (m)	98.743
Discharge (m^3/s)	**0.1**
Cross Sectional Area	1.557
Average Velocity	0.038

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	14:48	**End**	15:10	**Location**	at rebar	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Current Meter			**Instrument Serial #**		141401001994	
Real Time Reading (m)	**Start**	**Reading**	0.614	**Time**	14:42	**Staff Gauge (m)**	**0.601**
	End	**Reading**	0.614	**Time**	15:12	**Time of SG Reading**	-

No.	Notes	Station (m)	Depth (m)	Distance (m)	Area (m^2)	Velocity (m/s) 60%	20%	80%	Q (m^3/s)	% of Total Q %
1	LB	1.10	0.00	0.0	0.04	0			0.000	0.0
2		1.60	0.16	0.5	0.05	0.01			0.001	0.9
3		1.75	0.17	0.2	0.03	-0.03			-0.001	-1.3
4		1.90	0.22	0.2	0.03	-0.02			-0.001	-1.1
5		2.05	0.28	0.2	0.04	0.01			0.000	0.7
6		2.20	0.28	0.2	0.04	0.01			0.000	0.7
7		2.35	0.32	0.2	0.05	0.01			0.000	0.8
8	eddy	2.50	0.46	0.2	0.07	0			0.000	0.0
9		2.65	0.48	0.2	0.07	-0.01			-0.001	-1.2
10		2.80	0.48	0.2	0.07	0.02			0.001	2.4
11		2.95	0.49	0.2	0.07	0.04			0.003	5.0
12		3.10	0.50	0.2	0.06	0.09			0.006	9.5
13		3.20	0.50	0.1	0.05	0.1			0.005	8.5
14		3.30	0.50	0.1	0.05	0.12			0.006	10.1
15		3.40	0.50	0.1	0.05	0.12			0.006	10.1
16		3.50	0.51	0.1	0.05	0.12			0.006	10.3
17		3.60	0.54	0.1	0.05	0.11			0.006	10.0
18		3.70	0.55	0.1	0.05	0.08			0.004	7.4
19		3.80	0.53	0.1	0.05	0.08			0.004	7.2
20		3.90	0.51	0.1	0.05	0.07			0.004	6.0
21		4.00	0.56	0.1	0.06	0.05			0.003	4.7
22		4.10	0.61	0.1	0.06	0.03			0.002	3.1
23		4.20	0.47	0.1	0.05	0.03			0.001	2.4
24		4.30	0.48	0.1	0.07	0.03			0.002	3.7
25		4.50	0.54	0.2	0.09	0			0.000	0.0
26		4.65	0.56	0.2	0.08	0			0.000	0.0
27		4.80	0.43	0.1	0.06	0			0.000	0.0
28	RB	4.95	0.00	0.2	0.03	0			0.000	0.0
29										
30										
31										
32										
33										
Total Q									**0.059**	**100.0**

General Notes

Heavy organic matter on bottom.

(continued)

Table 3.2-8. Manual Flow Measurements at Counts Outflow, 2014 (completed)

Site Information				
Project Name	Ekati Diamond Mine			
Station Identification	Counts			
Stream Name	Counts Outflow			
Date Monitored	15-Aug-14			
Time at Site (24 hr)	**Start Time:**	3:30:00 PM	**End Time:**	
Personnel	Jaclyn B., Mike S.			
Station Cordinates	**Easting**	**Northing**	**Elevation**	
	535280	7169713		
Weather Conditions				

Transducer Information			
DL Model	ELF2 s/n 0017	**PT Serial #**	416006
Gain	3.5149	**Offset**	0.0111
Status		**Battery**	
# of Records		**Memory Free**	
Date Serviced	5/21/2014	**Crest Gauges**	n/a

Hydrometric Leveling Survey					
Stn	**BS**	**HI**	**FS**	**Elevation**	**Notes**
BM 56	1.093	101.093		**100.000**	
BM 57			1.058	100.035	
BM 55			1.460	99.633	
WL				-	
PT				-	
BM1			1.052	100.041	total station ref.
BM 58			1.092	100.001	
BM 58	1.068	101.069		100.001	
BM 56			1.068	100.001	
BM 57				-	
BM 55				-	
WL				-	
PT				-	
BM1			1.029	100.040	total station ref.

BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes
BM 56	100.000	100.001	0.001	
BM 57	100.037	100.035	-0.002	
BM 58	100.003	100.001	-0.002	

Summary	
Staff Gauge Reading (m)	0.534
Stage from WL Survey (m)	-
Pressure Transducer Reading (m)	0.532
Pressure Transducer Elevation (m)	-
Discharge (m^3/s)	**0.0**
Cross Sectional Area	0.342
Average Velocity	0.068

Discharge Measurement - Mid-Section Method

Measurement Time	**Start**	16:00	**End**	16:21	**Location**	~70 m downstream of PT	
Method	Velocity-area (Mid-section)			**Instrument Model**		FH950	
Flow Meter Type	Current Meter			**Instrument Serial #**		141401001994	
Real Time Reading (m)	**Start**	**Reading**	0.532	**Time**	16:02	**Staff Gauge (m)**	**0.534**
	End	**Reading**	0.532	**Time**	16:22	**Time of SG Reading**	15:57

		Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
No.	**Notes**	**(m)**	**(m)**	**(m)**	**(m^2)**	**60%**	**20%**	**80%**	**(m^3/s)**	**%**
1	RB	2.70	0.00	0.0	0.01	0			0.000	0.0
2		2.60	0.23	0.1	0.02	0			0.000	0.0
3		2.50	0.22	0.1	0.02	0			0.000	0.0
4		2.40	0.20	0.1	0.02	0			0.000	0.0
5		2.30	0.20	0.1	0.02	0.05			0.001	4.3
6		2.20	0.18	0.1	0.02	0.04			0.001	3.1
7		2.10	0.18	0.1	0.02	0.12			0.002	9.2
8		2.00	0.17	0.1	0.02	0.14			0.002	10.2
9		1.90	0.16	0.1	0.02	0.14			0.002	9.6
10		1.80	0.16	0.1	0.02	0.13			0.002	8.9
11		1.70	0.16	0.1	0.02	0.09			0.001	6.2
12		1.60	0.17	0.1	0.02	0.09			0.002	6.5
13		1.50	0.17	0.1	0.02	0.12			0.002	8.7
14		1.40	0.17	0.1	0.02	0.17			0.003	12.3
15		1.30	0.17	0.1	0.02	0.14			0.002	10.2
16		1.20	0.17	0.1	0.02	0.12			0.002	8.7
17		1.10	0.17	0.1	0.02	0.03			0.001	2.2
18		1.00	0.17	0.1	0.02	0			0.000	0.0
19		0.90	0.17	0.1	0.02	0			0.000	0.0
20	LB	0.80	0.00	0.1	0.01	0			0.000	0.0
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
Total Q									**0.023**	**100.0**

General Notes

Flow measurement and auto level survey on August 15, 2014. Total station survey on August 16, 2014. Low stage, little flow, hard to see the direction of flow.

Table 3.2-9. Summary of Mean Daily Discharge (m^3/s) at Vulture–Polar Stream, 2014

	May	Jun	Jul	Aug	Sep	Oct
1	-	*0.038*	0.053	0.036	0.006	*0.001*
2	-	0.209	0.051	0.034	0.005	*0.001*
3	-	0.160	0.050	0.033	0.004	*0.001*
4	-	0.109	0.049	0.032	0.006	*0.001*
5	-	0.083	0.048	0.031	0.005	*0.001*
6	-	0.071	0.047	0.030	0.005	*0.000*
7	-	0.068	0.046	0.027	0.005	*0.000*
8	-	0.068	0.046	0.025	0.005	*0.000*
9	-	0.067	0.045	0.023	0.004	*0.000*
10	-	0.067	0.044	0.023	0.004	-
11	-	0.067	0.044	0.024	0.003	-
12	-	0.067	0.041	0.022	*0.003*	-
13	-	0.066	0.038	0.026	*0.003*	-
14	-	0.066	0.036	0.024	*0.003*	-
15	-	0.067	0.036	0.023	*0.003*	-
16	-	0.067	0.070	0.023	*0.003*	-
17	-	0.066	0.081	0.026	*0.003*	-
18	-	0.066	0.073	0.022	*0.002*	-
19	-	0.065	0.066	0.020	*0.002*	-
20	-	0.064	0.059	0.018	*0.002*	-
21	-	0.064	0.054	0.016	*0.002*	-
22	-	0.062	0.050	0.015	*0.002*	-
23	-	0.061	0.048	0.013	*0.002*	-
24	-	0.060	0.045	0.012	*0.002*	-
25	-	0.059	0.044	0.011	*0.002*	-
26	*0.000*	0.058	0.044	0.011	*0.002*	-
27	*0.000*	0.057	0.042	0.010	*0.001*	-
28	*0.000*	0.056	0.043	0.009	*0.001*	-
29	*0.000*	0.055	0.042	0.007	*0.001*	-
30	*0.001*	0.053	0.041	0.007	*0.001*	-
31	*0.007*		0.039	0.006		-
Mean	**0.001**	**0.073**	**0.049**	**0.021**	**0.003**	**0.001**
Max	**0.007**	**0.209**	**0.081**	**0.036**	**0.006**	**0.001**
Min	**0.000**	**0.038**	**0.036**	**0.006**	**0.001**	**0.000**
Total	**0.008**	**2.188**	**1.514**	**0.637**	**0.092**	**0.005**

Notes:
Drainage Area = 7.17 km^2
Estimated and modelled values are italicized.

Table 3.2-10. Summary of Mean Daily Discharge (m^3/s) at Lower PDC, 2014

	May	Jun	Jul	Aug	Sep	Oct
1	-	0.621	0.115	0.044	0.013	*0.002*
2	-	0.630	0.108	0.041	0.011	*0.002*
3	-	0.560	0.103	0.039	0.011	*0.002*
4	-	0.481	0.099	0.036	0.016	*0.001*
5	-	0.418	0.091	0.035	0.014	*0.001*
6	-	0.361	0.086	0.034	0.013	*0.001*
7	-	0.332	0.080	0.059	0.013	*0.001*
8	-	0.301	0.075	0.123	0.012	*0.000*
9	-	0.281	0.069	0.151	0.012	*0.000*
10	-	0.274	0.065	0.162	0.010	-
11	-	0.258	0.065	0.163	0.009	-
12	-	0.237	0.058	0.151	0.006	-
13	-	0.228	0.052	0.166	*0.006*	-
14	-	0.222	0.049	0.154	*0.006*	-
15	-	0.222	0.049	0.096	*0.006*	-
16	-	0.217	0.101	0.065	*0.005*	-
17	-	0.215	0.104	0.058	*0.005*	-
18	-	0.209	0.099	0.043	*0.005*	-
19	-	0.198	0.094	0.036	*0.005*	-
20	-	0.189	0.090	0.031	*0.005*	-
21	-	0.183	0.085	0.028	*0.004*	-
22	-	0.173	0.080	0.025	*0.004*	-
23	-	0.161	0.076	0.023	*0.004*	-
24	-	0.152	0.071	0.021	*0.004*	-
25	-	0.146	0.067	0.019	*0.003*	-
26	*0.000*	0.142	0.062	0.020	*0.003*	-
27	*0.000*	0.138	0.058	0.018	*0.003*	-
28	*0.008*	0.135	0.056	0.017	*0.003*	-
29	*1.000*	0.132	0.054	0.015	*0.003*	-
30	0.849	0.122	0.051	0.014	*0.002*	-
31	0.664		0.048	0.013		-
Mean	**0.420**	**0.265**	**0.076**	**0.061**	**0.007**	**0.001**
Max	**1.000**	**0.630**	**0.115**	**0.166**	**0.016**	**0.002**
Min	**0.000**	**0.122**	**0.048**	**0.013**	**0.002**	**0.000**
Total	**2.521**	**7.937**	**2.358**	**1.901**	**0.217**	**0.010**

Notes:
Drainage Area = 21.3 km^2
Estimated and modelled values are italicized.

Table 3.2-11. Summary of Mean Daily Discharge (m^3/s) at Nema-Martine, 2014

	May	Jun	Jul	Aug	Sep	Oct
1	-	*0.245*	0.403	0.182	0.166	*0.045*
2	-	1.940	0.375	0.178	0.164	*0.040*
3	-	1.845	0.352	0.181	0.160	*0.035*
4	-	1.664	0.333	0.182	0.167	*0.030*
5	-	1.516	0.308	0.184	0.155	*0.025*
6	-	1.394	0.295	0.190	0.155	*0.020*
7	-	1.295	0.260	0.191	0.158	*0.015*
8	-	1.208	0.252	0.191	0.154	*0.010*
9	-	1.131	0.239	0.193	0.151	*0.005*
10	-	1.070	0.232	0.200	0.145	-
11	-	1.031	0.230	0.210	0.145	-
12	-	0.956	0.214	0.209	*0.140*	-
13	-	0.887	0.200	0.222	*0.135*	-
14	-	0.830	0.197	0.222	*0.130*	-
15	-	0.806	0.198	0.222	*0.125*	-
16	-	0.783	0.249	0.221	*0.120*	-
17	-	0.741	0.267	0.235	*0.115*	-
18	-	0.692	0.258	0.219	*0.110*	-
19	-	0.667	0.254	0.213	*0.105*	-
20	-	0.638	0.251	0.209	*0.100*	-
21	-	0.599	0.244	0.204	*0.095*	-
22	-	0.546	0.237	0.197	*0.090*	-
23	-	0.492	0.231	0.193	*0.085*	-
24	-	0.482	0.225	0.188	*0.080*	-
25	-	0.471	0.227	0.184	*0.075*	-
26	*0.000*	0.461	0.224	0.187	*0.070*	-
27	*0.000*	0.451	0.218	0.183	*0.065*	-
28	*0.000*	0.465	0.216	0.176	*0.060*	-
29	*0.000*	0.465	0.212	0.170	*0.055*	-
30	*0.004*	0.416	0.206	0.166	*0.050*	-
31	*0.031*		0.201	0.166		-
Mean	**0.006**	**0.873**	**0.252**	**0.196**	**0.117**	**0.025**
Max	**0.031**	**1.940**	**0.403**	**0.235**	**0.167**	**0.045**
Min	**0.000**	**0.245**	**0.197**	**0.166**	**0.050**	**0.005**
Total	**0.035**	**26.188**	**7.807**	**6.069**	**3.521**	**0.224**

Notes:
Drainage Area = 114 km^2
Estimated and modelled values are italicized.

Table 3.2-12. Summary of Mean Daily Discharge (m^3/s) at Slipper-Lac de Gras, 2014

	May	Jun	Jul	Aug	Sep	Oct
1	-	7.144	1.781	0.958	0.298	*0.076*
2	-	7.056	1.684	0.889	0.294	*0.067*
3	-	6.488	1.591	0.858	0.280	*0.059*
4	-	5.717	1.454	0.798	0.336	*0.050*
5	-	4.887	1.338	0.762	0.269	*0.042*
6	-	4.320	1.273	0.720	0.294	*0.034*
7	-	3.882	1.130	0.649	0.282	*0.025*
8	-	3.547	1.055	0.571	0.282	*0.017*
9	-	3.257	0.946	0.535	0.274	*0.008*
10	-	3.103	0.892	0.551	0.242	-
11	-	2.955	0.889	0.578	0.244	-
12	-	2.740	0.753	0.517	*0.235*	-
13	-	2.575	0.676	0.536	*0.227*	-
14	-	2.466	0.678	0.496	*0.219*	-
15	-	2.377	0.681	0.472	*0.210*	-
16	-	2.349	1.620	0.454	*0.202*	-
17	-	2.248	2.252	0.530	*0.193*	-
18	-	2.171	2.324	0.431	*0.185*	-
19	-	2.092	2.222	0.401	*0.177*	-
20	-	1.998	2.083	0.380	*0.168*	-
21	-	1.902	1.952	0.364	*0.160*	-
22	-	1.788	1.866	0.342	*0.151*	-
23	-	1.678	1.789	0.339	*0.143*	-
24	-	1.636	1.709	0.328	*0.135*	-
25	-	1.571	1.692	0.326	*0.126*	-
26	*0.001*	1.542	1.625	0.351	*0.118*	-
27	*0.006*	1.515	1.518	0.335	*0.109*	-
28	*0.035*	1.503	1.426	0.304	*0.101*	-
29	*0.205*	1.633	1.333	0.285	*0.093*	-
30	*1.210*	1.758	1.212	0.274	*0.084*	-
31	*7.140*		1.168	0.275		-
Mean	**1.433**	**2.997**	**1.439**	**0.504**	**0.204**	**0.042**
Max	**7.140**	**7.144**	**2.324**	**0.958**	**0.336**	**0.076**
Min	**0.001**	**1.503**	**0.676**	**0.274**	**0.084**	**0.008**
Total	**8.597**	**89.896**	**44.614**	**15.610**	**6.130**	**0.378**

Notes:
Drainage Area = 185 km^2
Estimated and modelled values are italicized.

Table 3.2-13. Summary of Mean Daily Discharge (m^3/s) at Cujo Outflow, 2014

	May	Jun	Jul	Aug	Sep	Oct
1	-	*0.027*	0.007	0.001	-	-
2	-	0.059	0.007	0.001	-	-
3	-	0.055	0.006	0.001	-	-
4	-	0.050	0.005	0.000	-	-
5	-	0.046	0.004	0.000	-	-
6	-	0.042	0.003	0.000	-	-
7	-	0.039	0.003	0.000	-	-
8	-	0.037	0.002	0.000	-	-
9	-	0.035	0.002	0.000	-	-
10	-	0.033	0.001	0.000	-	-
11	-	0.031	0.002	0.000	-	-
12	-	0.029	0.002	0.000	-	-
13	-	0.028	0.001	0.000	-	-
14	-	0.027	0.001	0.000	-	-
15	-	0.027	0.001	0.000	-	-
16	-	0.026	0.004	0.000	-	-
17	-	0.025	0.007	0.000	-	-
18	-	0.025	0.006	0.000	-	-
19	-	0.023	0.006	0.000	-	-
20	-	0.022	0.005	0.000	-	-
21	-	0.020	0.005	0.000	-	-
22	-	0.018	0.005	0.000	-	-
23	-	0.016	0.004	0.000	-	-
24	-	0.015	0.004	0.000	-	-
25	*0.000*	0.014	0.003	-	-	-
26	*0.000*	0.014	0.003	-	-	-
27	*0.000*	0.012	0.003	-	-	-
28	*0.001*	0.011	0.002	-	-	-
29	*0.002*	0.009	0.002	-	-	-
30	*0.005*	0.008	0.002	-	-	-
31	*0.012*		0.001	-		-
Mean	**0.003**	**0.027**	**0.004**	**0.000**	**-**	**-**
Max	**0.012**	**0.059**	**0.007**	**0.001**	**-**	**-**
Min	**0.000**	**0.008**	**0.001**	**0.000**	**-**	**-**
Total	**0.022**	**0.825**	**0.111**	**0.005**	**-**	**-**

Notes:
Drainage Area = 3 km^2
Estimated and modelled values are italicized.

Table 3.2-14. Summary of Mean Daily Discharge (m^3/s) at Christine-Lac du Sauvage, 2014

	May	Jun	Jul	Aug	Sep	Oct
1	-	*0.476*	0.047	0.015	0.002	*0.000*
2	-	*0.442*	0.044	0.013	0.002	*0.000*
3	-	*0.410*	0.041	0.012	0.002	*0.000*
4	-	0.381	0.037	0.011	0.002	*0.000*
5	-	0.333	0.034	0.010	0.002	*0.000*
6	-	0.276	0.031	0.009	0.002	*0.000*
7	-	0.232	0.028	0.007	0.002	*0.000*
8	-	0.197	0.025	0.006	0.002	*0.000*
9	-	0.165	0.021	0.006	0.001	*0.000*
10	-	0.148	0.018	0.006	0.002	-
11	-	0.138	0.020	0.007	0.001	-
12	-	0.127	0.018	0.006	*0.001*	-
13	-	0.119	0.017	0.007	*0.001*	-
14	-	0.111	0.015	0.006	*0.001*	-
15	-	0.105	0.014	0.006	*0.001*	-
16	-	0.101	0.027	0.006	*0.001*	-
17	-	0.096	0.038	0.007	*0.001*	-
18	-	0.091	0.039	0.007	*0.001*	-
19	-	0.086	0.038	0.005	*0.001*	-
20	-	0.076	0.037	0.005	*0.001*	-
21	-	0.071	0.036	0.004	*0.001*	-
22	-	0.068	0.035	0.004	*0.001*	-
23	-	0.065	0.033	0.004	*0.001*	-
24	-	0.063	0.032	0.004	*0.001*	-
25	-	0.060	0.030	0.003	*0.001*	-
26	*0.000*	0.058	0.028	0.003	*0.001*	-
27	*0.000*	0.057	0.026	0.003	*0.001*	-
28	*0.001*	0.054	0.024	0.002	*0.001*	-
29	*0.007*	0.051	0.021	0.002	*0.001*	-
30	*0.059*	0.049	0.020	0.002	*0.000*	-
31	*0.513*		0.017	0.002		-
Mean	**0.097**	**0.157**	**0.029**	**0.006**	**0.001**	**0.000**
Max	**0.513**	**0.476**	**0.047**	**0.015**	**0.002**	**0.000**
Min	**0.000**	**0.049**	**0.014**	**0.002**	**0.000**	**0.000**
Total	**0.579**	**4.705**	**0.889**	**0.191**	**0.038**	**0.002**

Notes:
Drainage Area = 13 km^2
Estimated and modelled values are italicized.

Table 3.2-15. Summary of Mean Daily Discharge (m^3/s) at Counts Outflow, 2014

	May	Jun	Jul	Aug	Sep	Oct
1	-	*0.083*	0.051	0.046	0.007	*0.001*
2	-	*0.079*	0.051	0.041	0.006	*0.001*
3	-	0.076	0.050	0.038	0.006	*0.001*
4	-	0.073	0.049	0.037	0.006	*0.001*
5	-	0.068	0.046	0.035	0.006	*0.000*
6	-	0.066	0.045	0.033	0.005	*0.000*
7	-	0.062	0.044	0.030	0.004	*0.000*
8	-	0.060	0.041	0.028	0.004	*0.000*
9	-	0.059	0.039	0.026	0.003	*0.000*
10	-	0.058	0.037	0.026	0.003	*0.000*
11	-	0.058	0.040	0.026	0.003	-
12	-	0.057	0.038	0.024	*0.003*	-
13	-	0.058	0.036	0.024	*0.003*	-
14	-	0.058	0.034	0.022	*0.002*	-
15	-	0.060	0.033	0.021	*0.002*	-
16	-	0.061	0.068	0.020	*0.002*	-
17	-	0.061	0.077	0.020	*0.002*	-
18	-	0.062	0.075	0.019	*0.002*	-
19	-	0.062	0.073	0.017	*0.002*	-
20	-	0.062	0.071	0.016	*0.002*	-
21	-	0.061	0.069	0.015	*0.002*	-
22	-	0.060	0.067	0.014	*0.002*	-
23	-	0.059	0.065	0.013	*0.002*	-
24	-	0.057	0.063	0.012	*0.002*	-
25	-	0.056	0.062	0.011	*0.001*	-
26	*0.000*	0.056	0.060	0.011	*0.001*	-
27	*0.003*	0.055	0.058	0.010	*0.001*	-
28	*0.096*	0.055	0.057	0.009	*0.001*	-
29	*0.092*	0.053	0.055	0.008	*0.001*	-
30	*0.089*	0.052	0.053	0.008	*0.001*	-
31	*0.086*		0.049	0.007		-
Mean	**0.061**	**0.062**	**0.053**	**0.022**	**0.003**	**0.000**
Max	**0.096**	**0.083**	**0.077**	**0.046**	**0.007**	**0.001**
Min	**0.000**	**0.052**	**0.033**	**0.007**	**0.001**	**0.000**
Total	**0.366**	**1.845**	**1.658**	**0.667**	**0.087**	**0.004**

Notes:
Drainage Area = 4 km^2
Estimated and modelled values are italicized.

Table 3.2-16. Hydrological Summary of AEMP Flow Monitoring Stations, 2014

Station Number	Location	Observation Period in 2014	Maximum Daily Flow (m^3/s)	Maximum Daily Unit Yield ($L/s/km^2$)	Minimum Observed Daily Flow (m^3/s)	Minimum Daily Unit Yield ($L/s/km^2$)	Average Daily Flow[1] (m^3/s)
WGL-14	Vulture–Polar	1 Jun - 12 Sep	0.21 (Jun 2)	29.1	0.003 (Sep 11)	0.45	0.04
WGS-39	Lower PDC	30 May - 12 Sep	0.85 (May 30)	39.8	0.01 (Sep 12)	0.30	0.13
n/a	Nema-Martine	2 Jun - 12 Sep	1.94 (Jun 2)	17.0	0.145 (Sep 11)	1.27	0.41
WGL-24	Slipper–Lac de Gras	1 Jun - 12 Sep	7.14 (May 31)	38.6	0.24 (Sep 11)	1.31	1.49
WGL-46	Cujo Outflow	2 Jun - 12 Sep	0.06 (Jun 2)	19.8	0.0 (Aug 25)	0.0	0.01
n/a	Christine-Lac du Sauvage	4 Jun - 12 Sep	0.38 (Jun 4)	29.3	0.001 (Sep 11)	0.11	0.05
WGS-35	Counts Outflow	3 Jun - 12 Sep	0.096 (May 28)	23.9	0.002 (Sep 11)	0.685	0.040

[1] *Average daily flow calculated for the observation period.*

Table 3.2-17. Runoff Depth (mm) for the 2014 Open Water Season and Drainage Area Characteristics

Station Number	Location	Drainage Area (km^2)	Percent Lake Area	Runoff Depth[1] (mm)	Runoff Coefficient[2]
WGS-14	Vulture–Polar	7	27.6	54	0.20
WGS-39	Lower PDC	21	16.8	61	0.23
n/a	Nema-Martine	114	18.5	33	0.13
WGL-24	Slipper–Lac de Gras	185	17.7	77	0.29
WGL-46	Cujo Outflow	3	26.4	28	0.11
n/a	Christine-Lac du Sauvage	13	21.0	43	0.16
WGS-35	Counts Outflow	4	35.2	100	0.38

[1] *Runoff depths are for the entire 2014 open water season. Runoff depths were estimated for the periods before and after stations were mobilized/demobilized and added to values computed with continuous flow monitoring data.*
[2] *Runoff coefficient based on total precipitation corrected for wind-generated under catch, recorded at the Koala Station October 2013 to September 2014.*

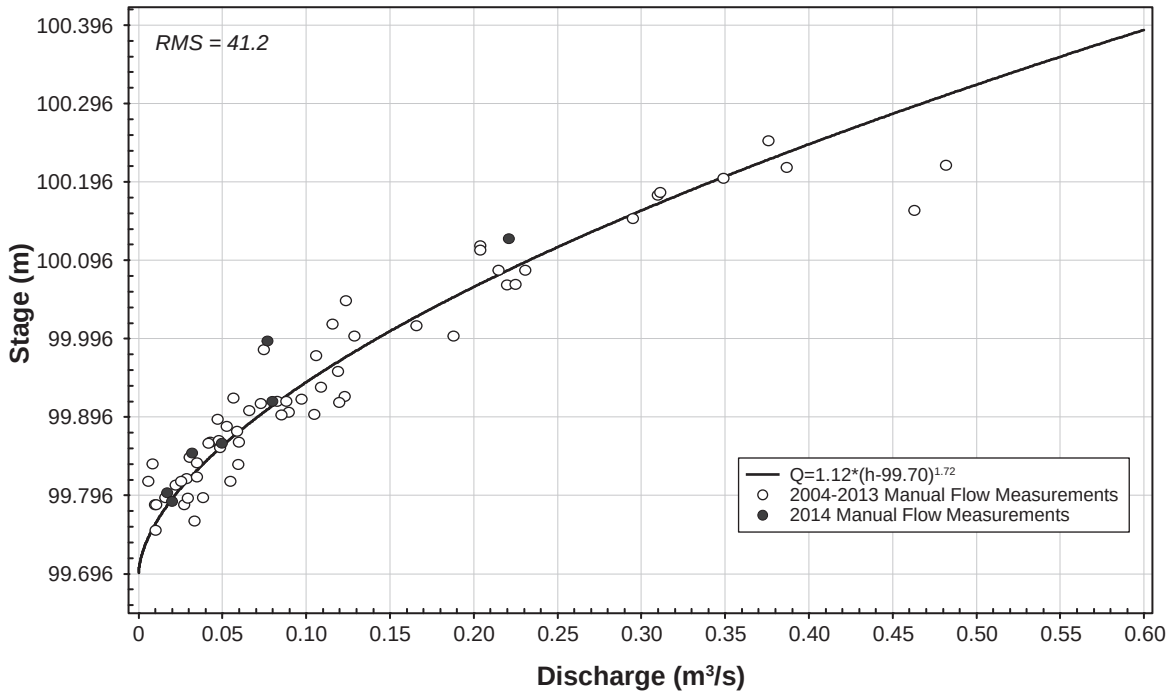
Table 3.2-18. Pumping Activities at Bearclaw Lake, KPSF, and LLCF, from October 1, 2013 to September 30, 2014

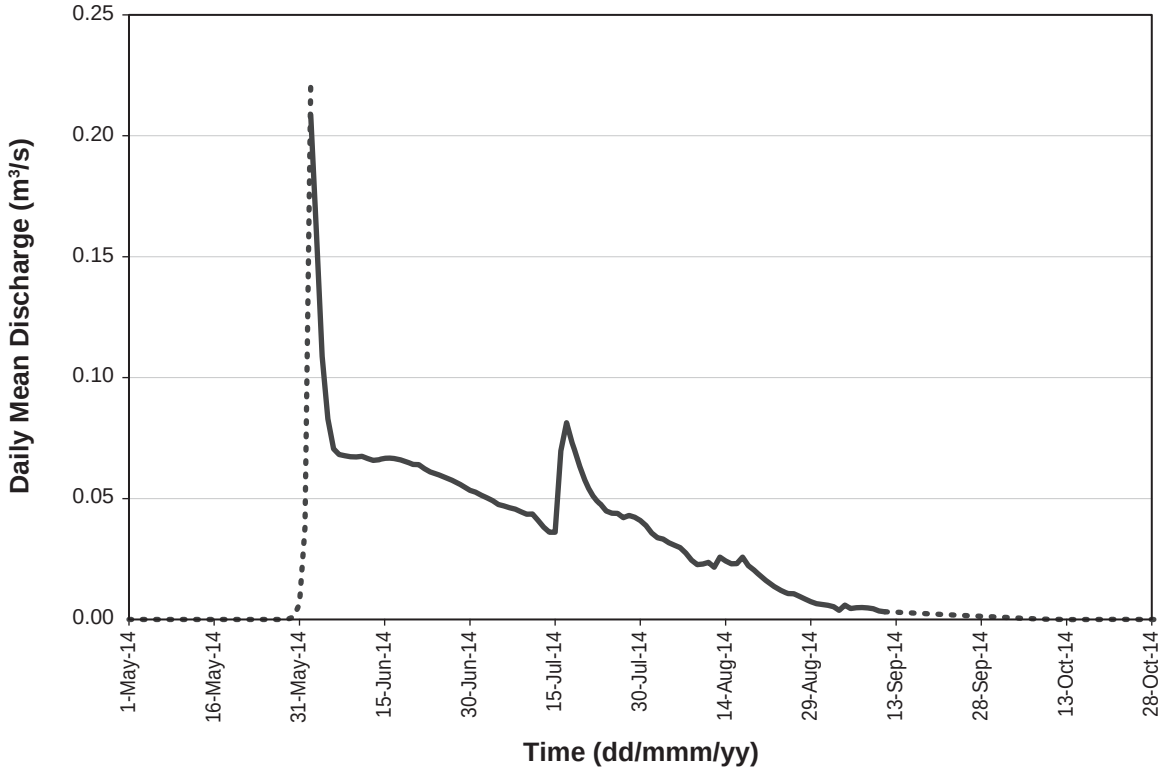
	Bearclaw Lake[1]			KPSF[2] (1616-43)			LLCF[2] (1616-30)		
Month	Monthly Discharge Volumes (m^3)	Monthly Mean Discharge (m^3/s)	Monthly Mean Unit Yield ($L/s/km^2$)	Monthly Discharge Volumes (m^3)	Monthly Mean Discharge (m^3/s)	Monthly Mean Unit Yield ($L/s/km^2$)	Monthly Discharge Volumes (m^3)	Monthly Mean Discharge (m^3/s)	Monthly Mean Unit Yield ($L/s/km^2$)
2013									
Oct	0	0	0	0	0	0	1,327,841	0.496	11.3
Nov	0	0	0	0	0	0	758,628	0.293	6.7
Dec	0	0	0	0	0	0	0	0	0
2014									
Jan	0	0	0	0	0	0	0	0	0
Feb	0	0	0	0	0	0	0	0	0
Mar	0	0	0	0	0	0	0	0	0
Apr	0	0	0	0	0	0	0	0	0
May	0	0	0	0	0	0	0	0	0
Jun	0	0	0	0	0	0	0	0	0
Jul	0	0	0	0	0	0	390,516	0.146	3.3
Aug	132,623	0.213	31.5	0	0	0	241,182	0.090	2.0
Sep	0	0	0	0	0	0	0	0	0
	Total	**Average**	**Runoff Depth (mm)**	**Total**	**Average**	**Runoff Depth (mm)**	**Total**	**Average**	**Runoff Depth (mm)**
	132,623	0.213	0	0	n/a	0	2,718,168	0.079	62

[1] *Water was pumped from Bearclaw to Upper Panda for seven days in August 2014.*
[2] *Average calculated for months where pumping occurred.*

Figure 3.2-1

Rating Curve and Hydrograph for Vulture-Polar Hydrology Station, 2014

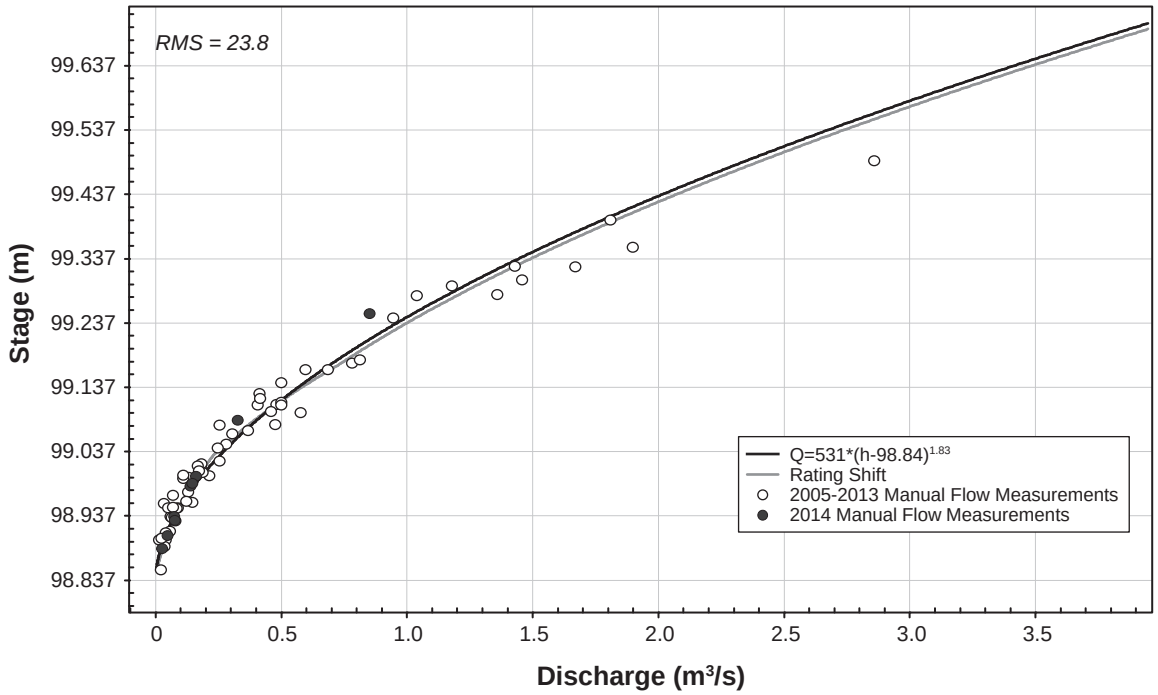


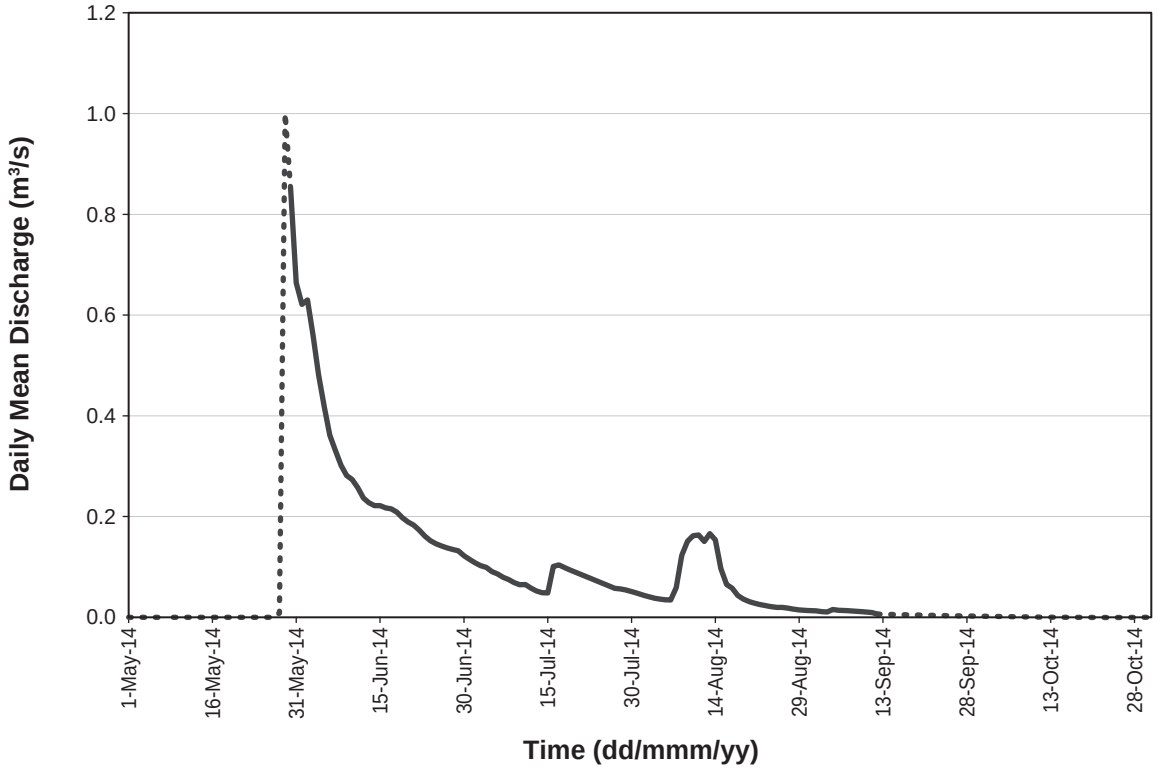


Note: Dotted line indicates estimated flows for the period prior to station mobilization in spring, and after demobilization in fall.

Figure 3.2-2

Rating Curve and Hydrograph for Lower PDC Hydrology Station, 2014

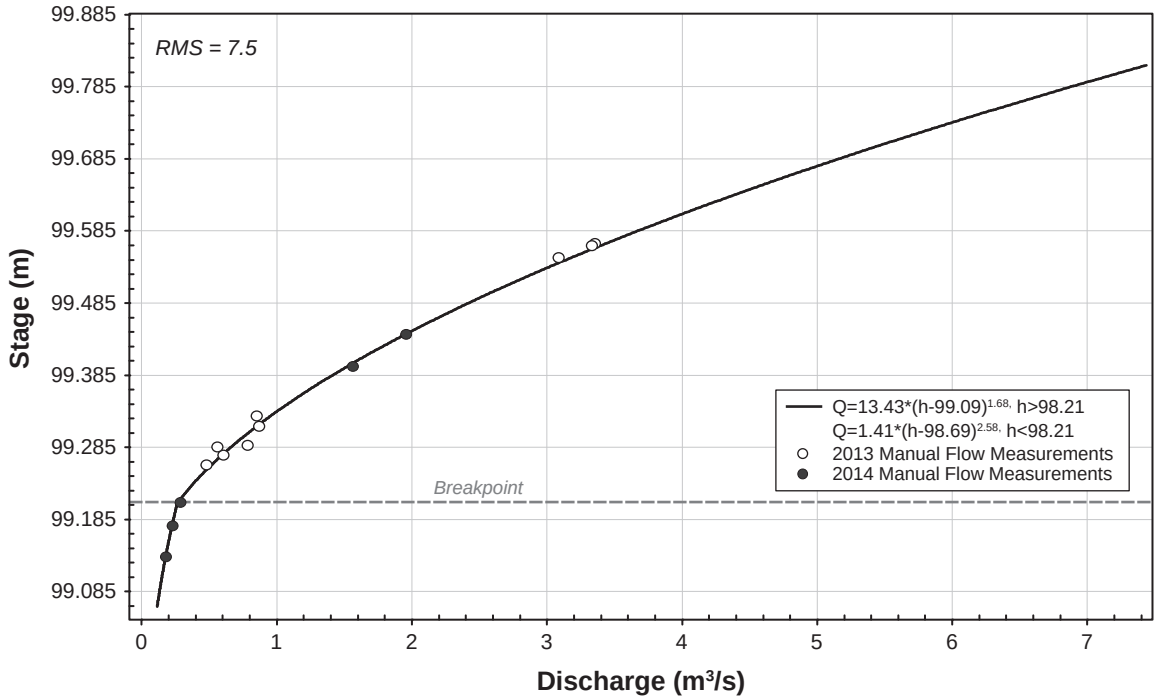


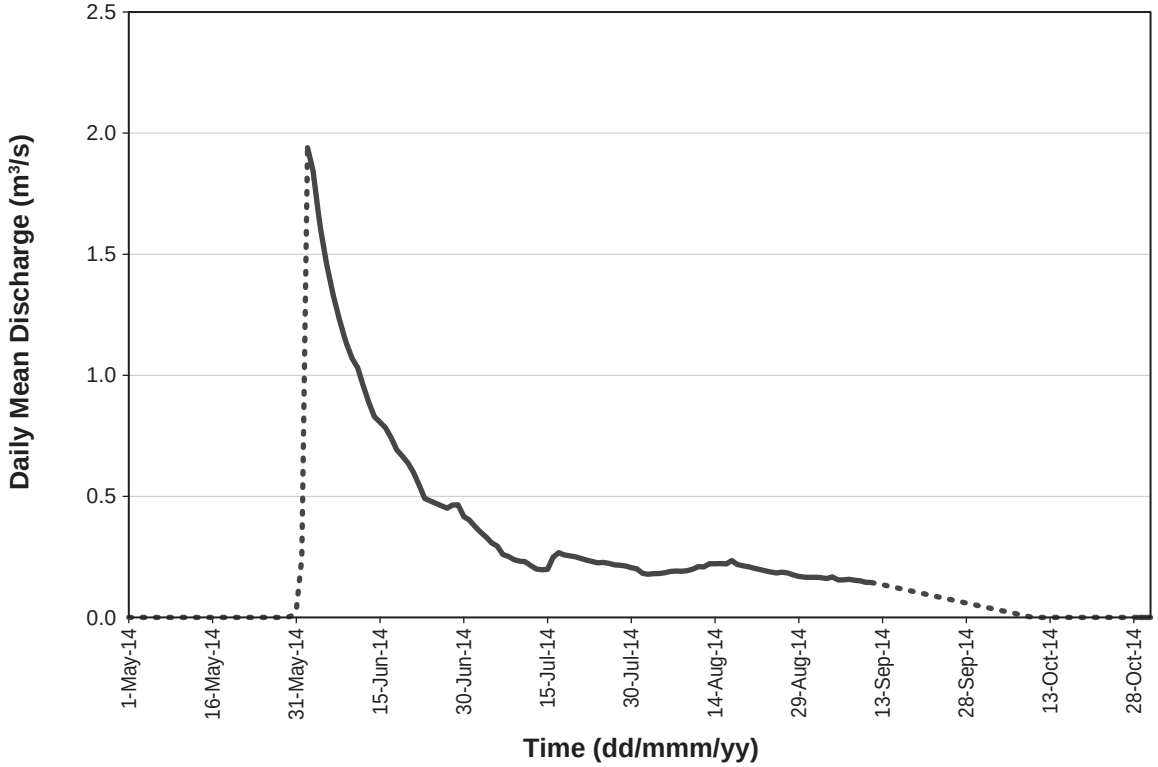


Note: Dotted line indicates estimated flows for the period prior to station mobilization in spring, and after demobilization in fall.

Figure 3.2-3

Rating Curve and Hydrograph for Nema-Martine Hydrology Station, 2014

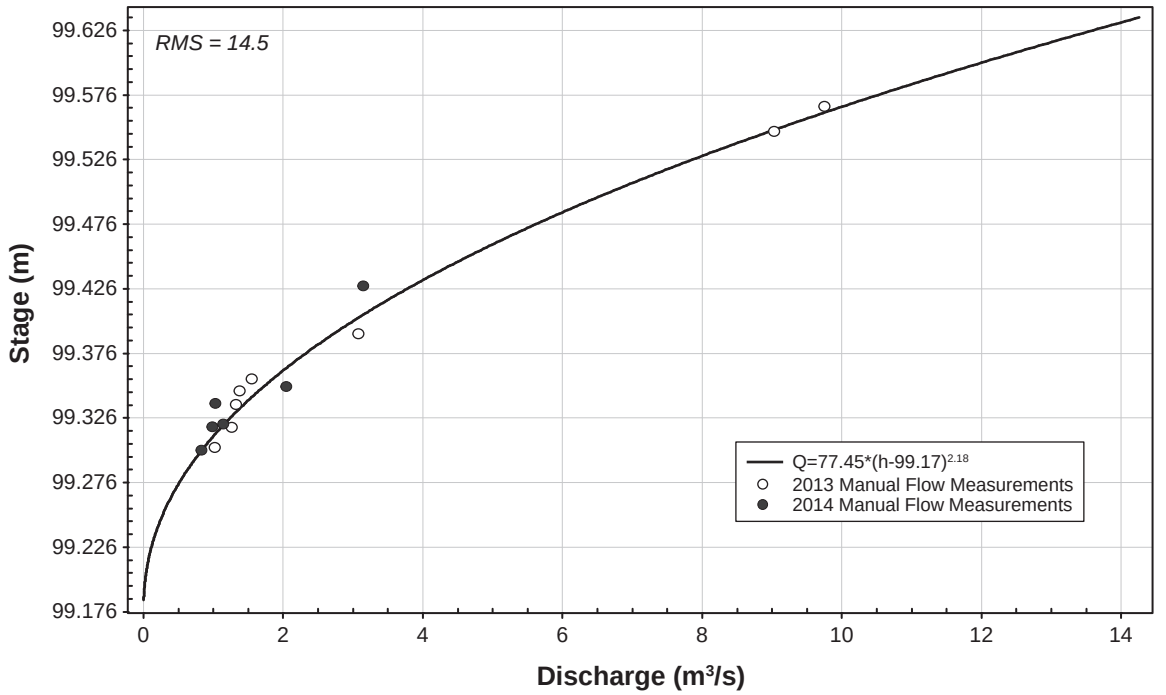


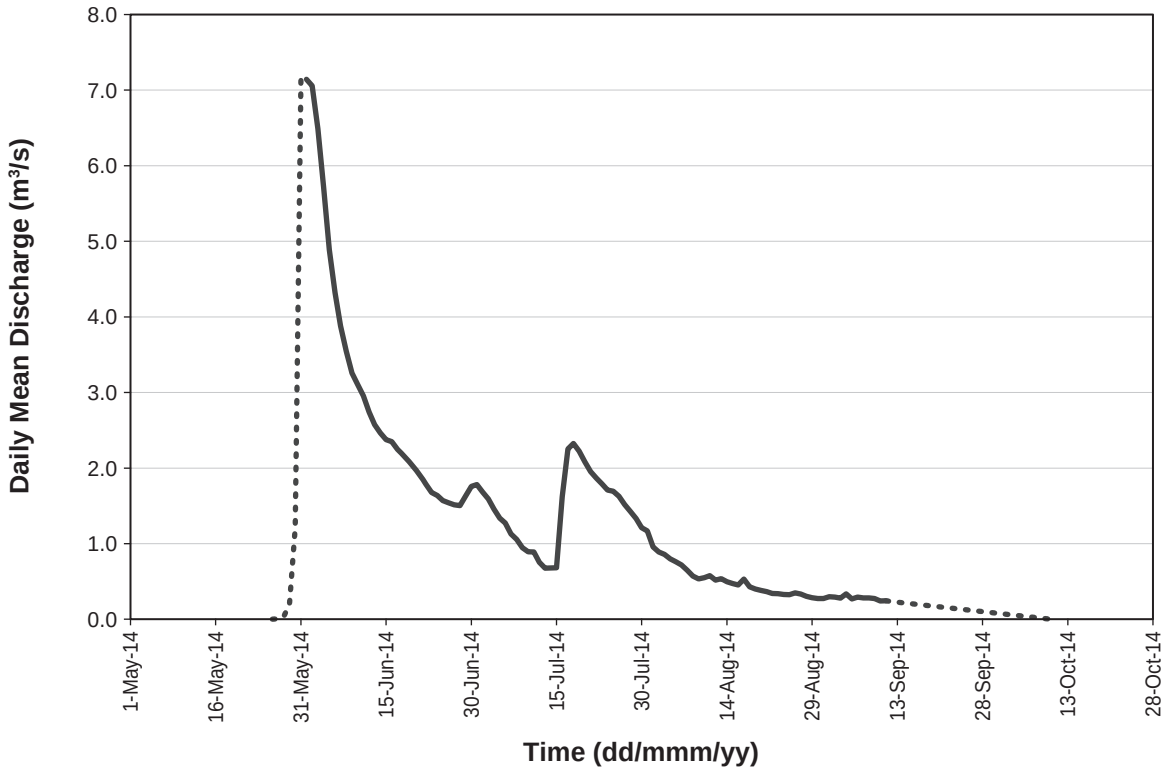


Note: Dotted line indicates estimated flows for the period prior to station mobilization in spring, and after demobilization in fall.

Figure 3.2-4

Rating Curve and Hydrograph for Slipper-Lac de Gras Hydrology Station, 2014

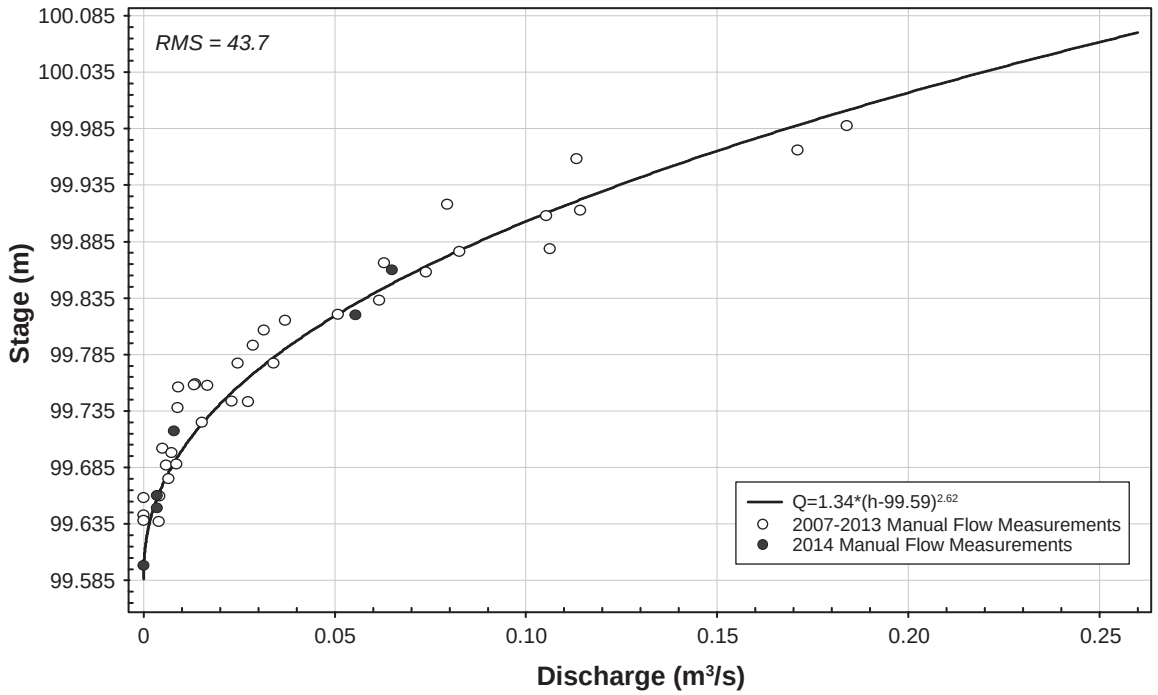


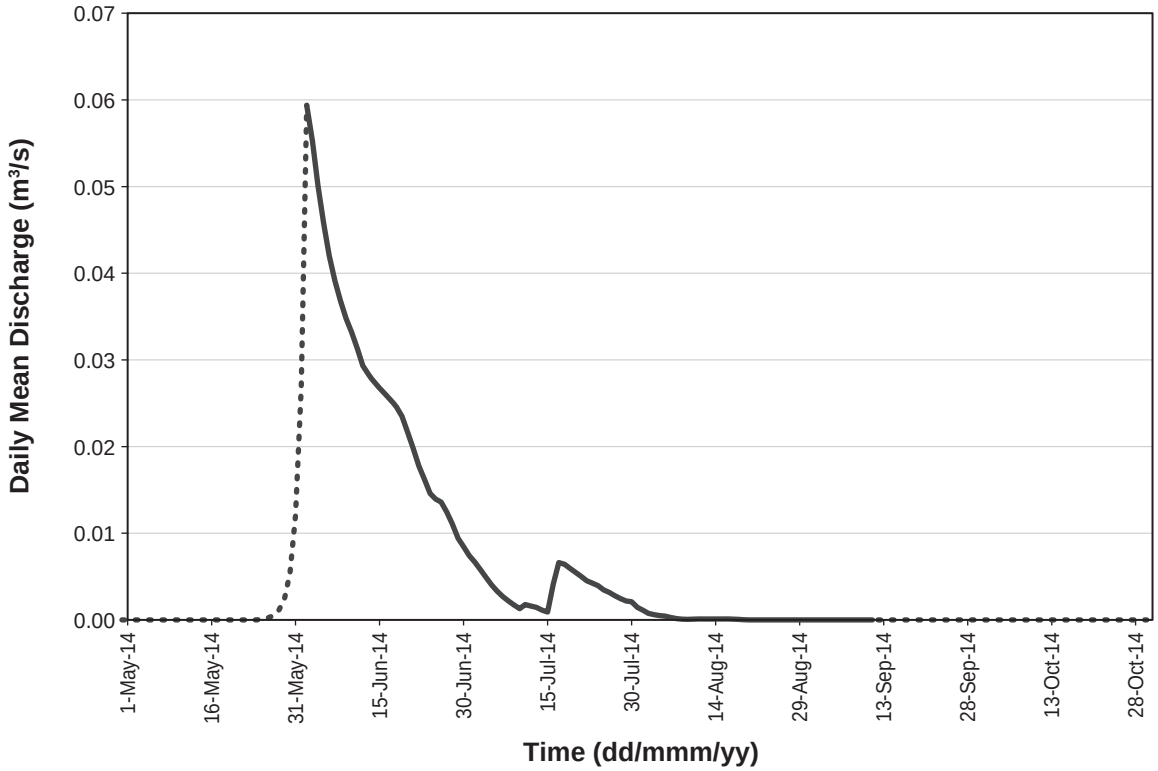


Note: Dotted line indicates estimated flows for the period prior to station mobilization in spring, and after demobilization in fall.

Figure 3.2-5

Rating Curve and Hydrograph for Cujo Outflow Hydrology Station, 2014

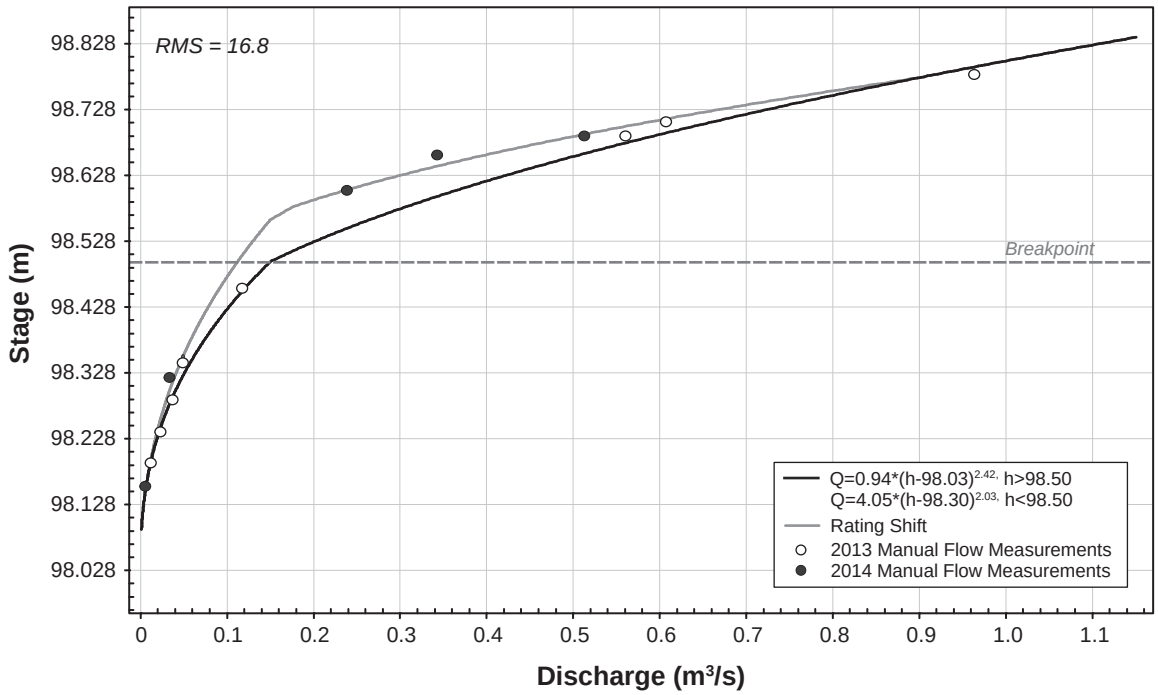


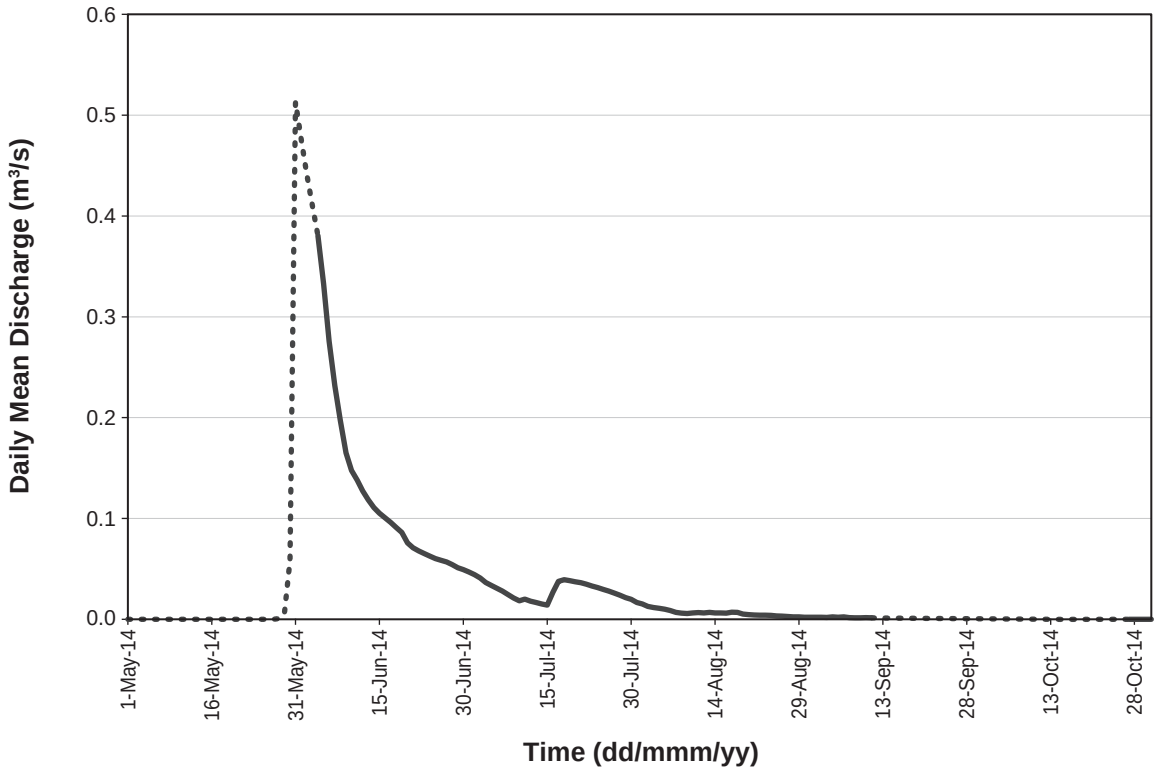


Note: Dotted line indicates estimated flows for the period prior to station mobilization in spring, and after demobilization in fall.

Figure 3.2-6

Rating Curve and Hydrograph for Christine-Lac du Sauvage Hydrology Station, 2014

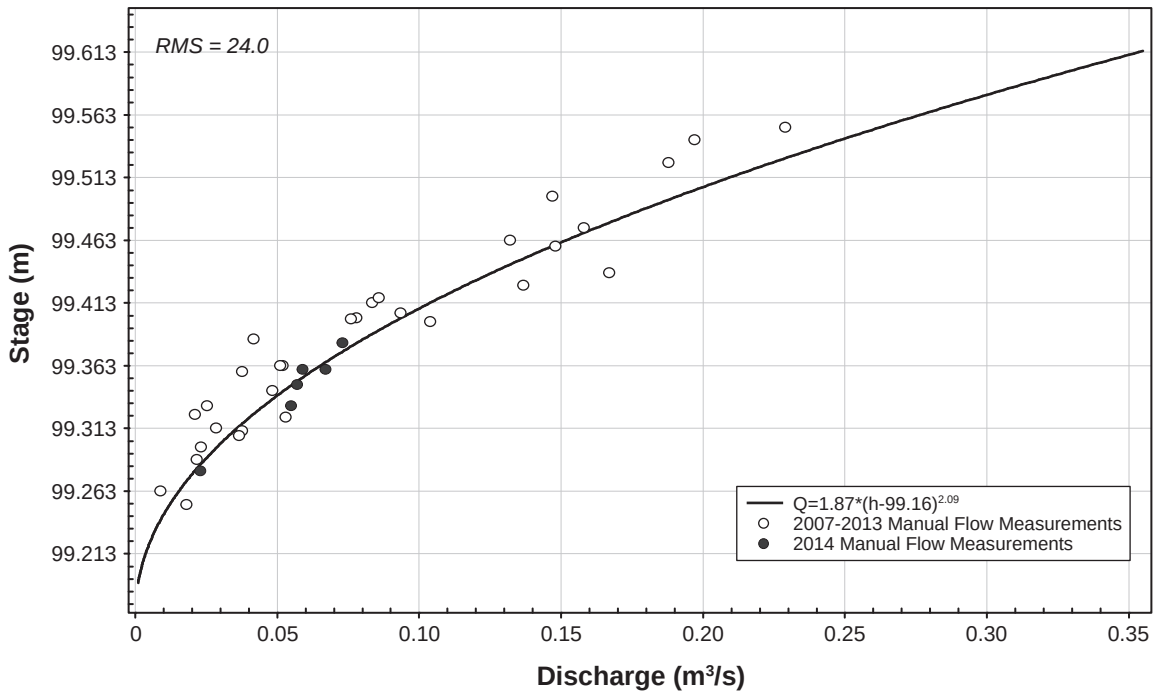


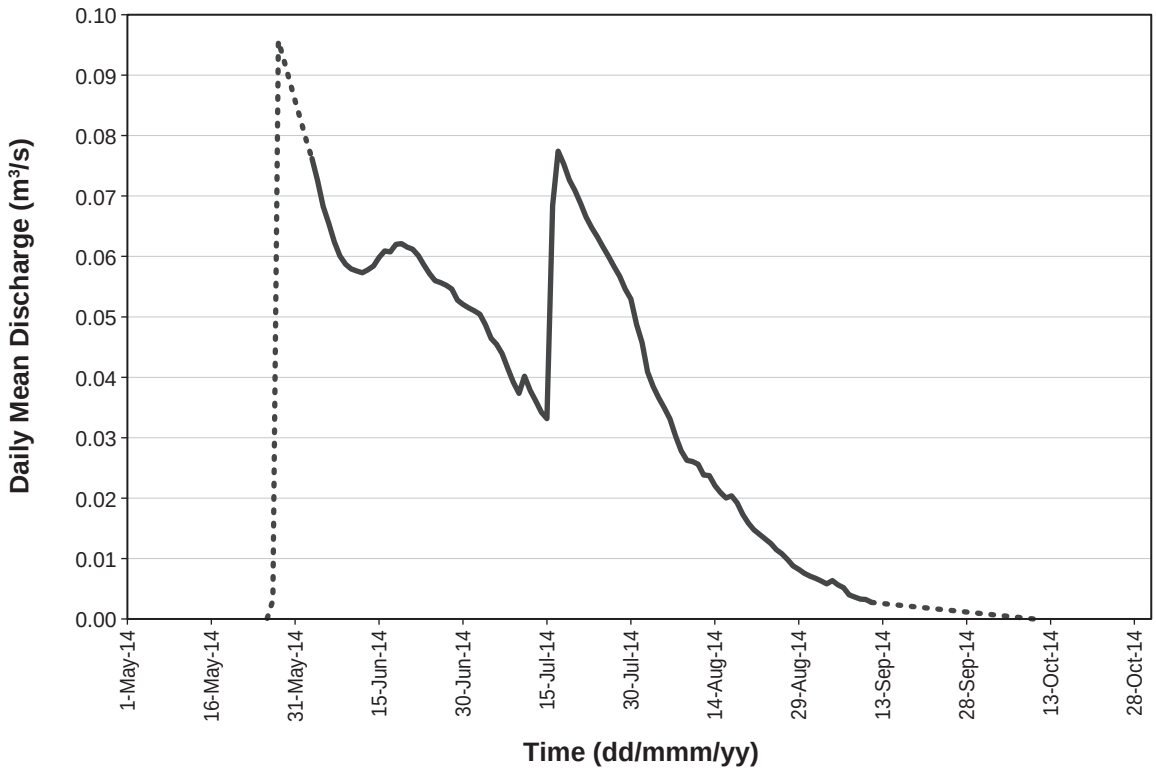


Note: Dotted line indicates estimated flows for the period prior to station mobilization in spring, and after demobilization in fall.

Figure 3.2-7

Rating Curve and Hydrograph for Counts Outflow Hydrology Station, 2014





Note: Dotted line indicates estimated flows for the period prior to station mobilization in spring, and after demobilization in fall.

Figure 3.2-8

Unit Yield for the 2014 Flow Monitoring Period

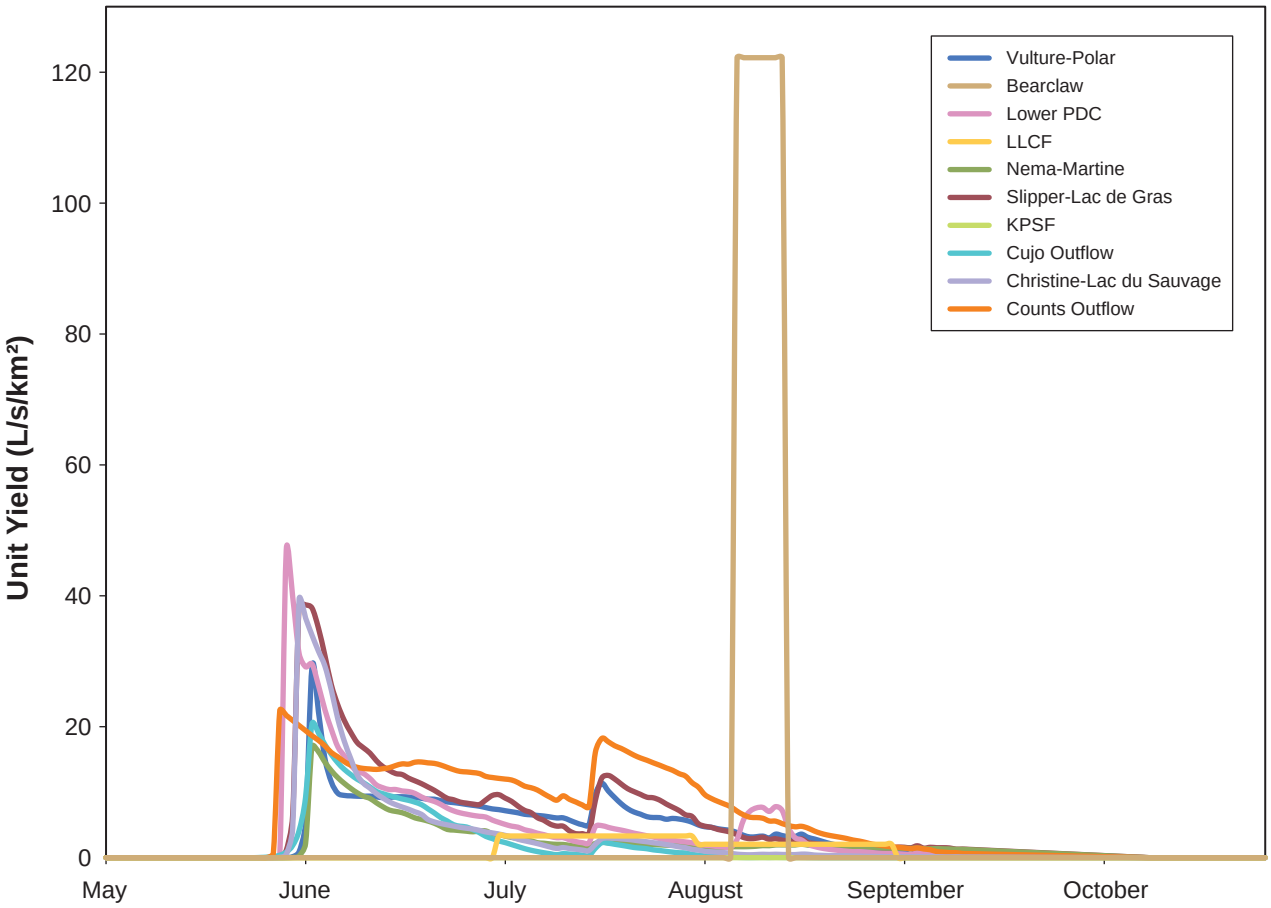


Figure 3.2-9

Hydraulic Geometry Survey at Station Vulture-Polar, 2014

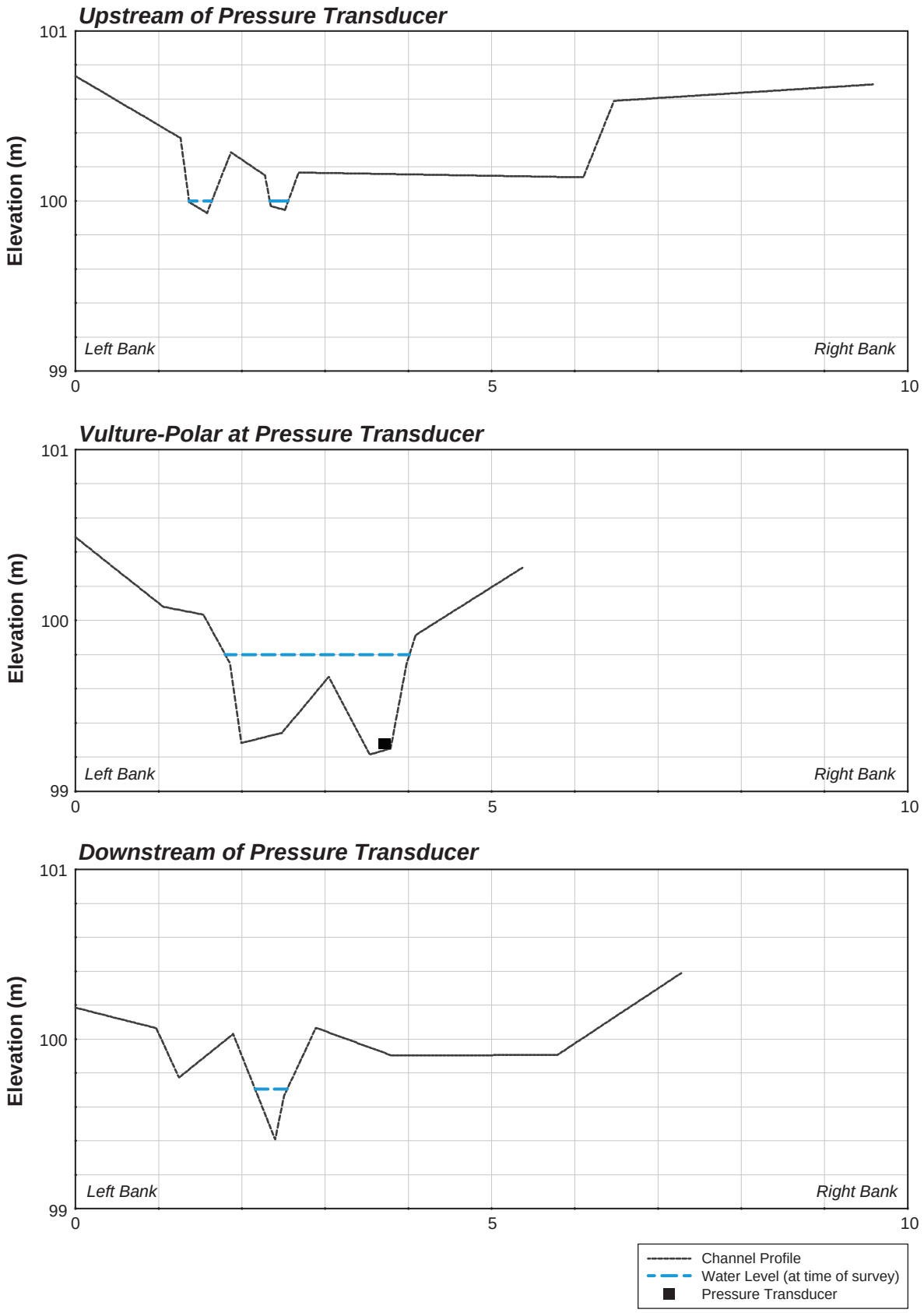


Figure 3.2-10

Hydraulic Geometry Survey at Station Lower PDC, 2014

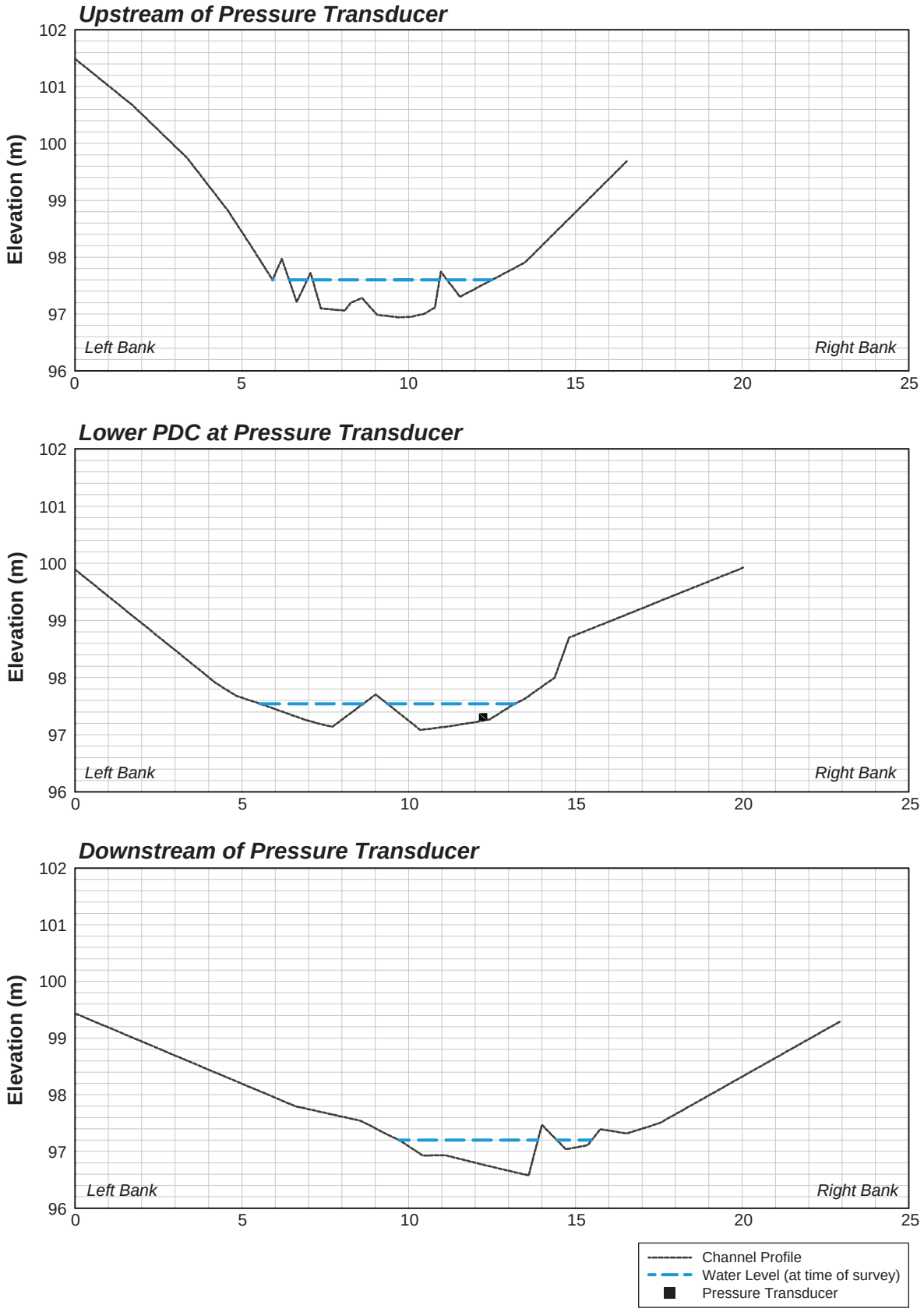


Figure 3.2-11

Hydraulic Geometry Survey at Station Nema-Martine, 2014

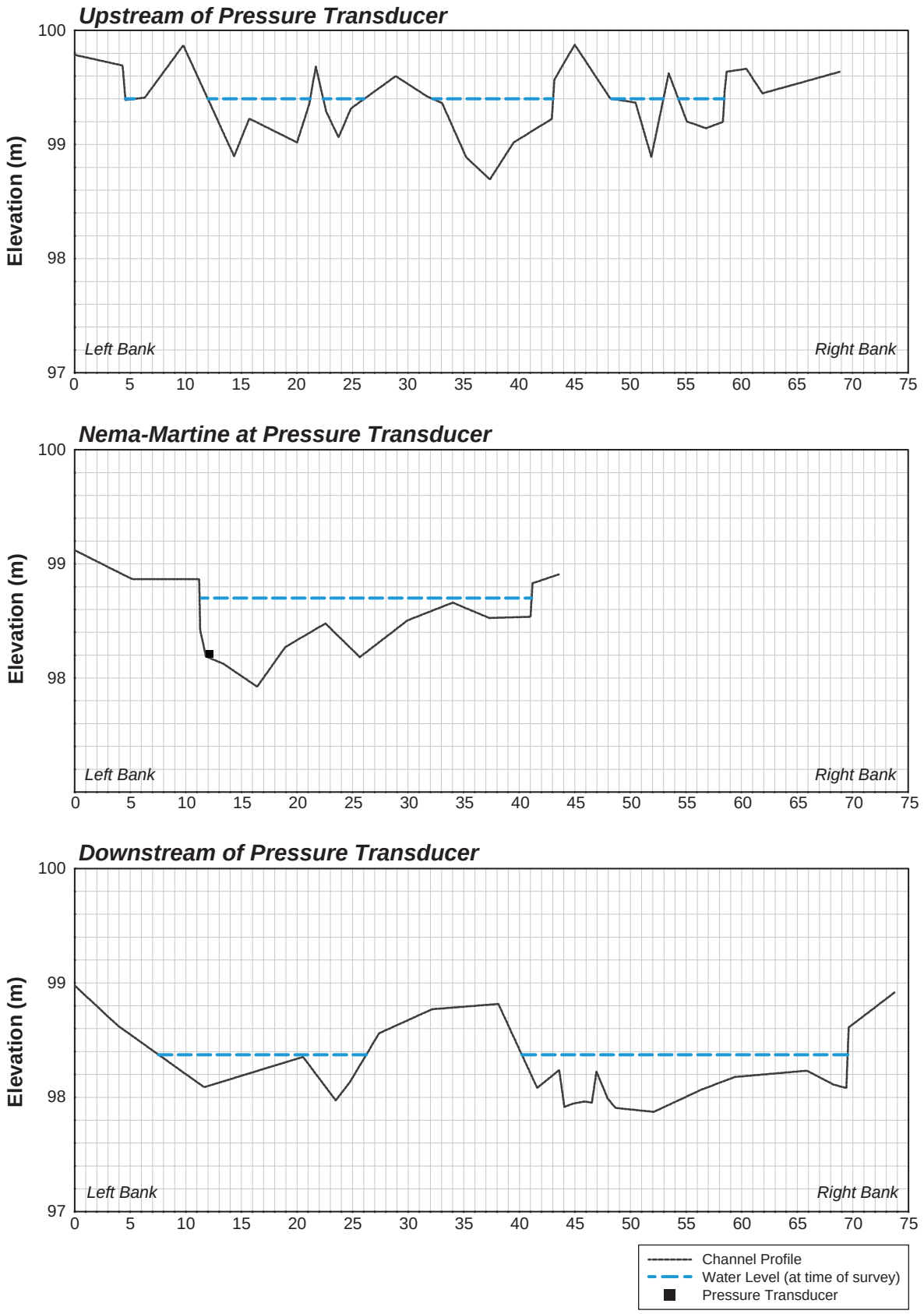
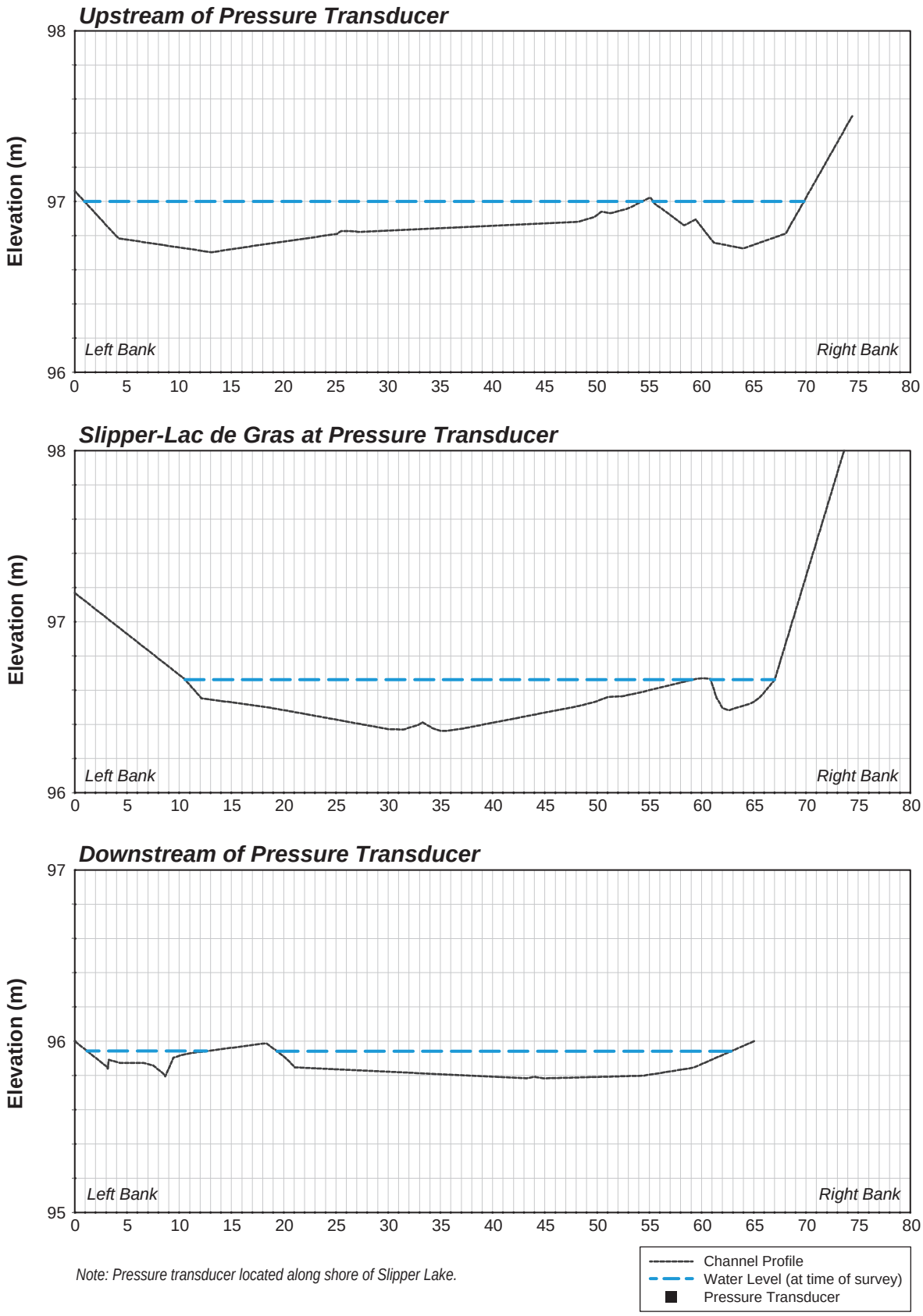


Figure 3.2-12

Hydraulic Geometry Survey at Station Slipper-Lac de Gras, 2014



Note: Pressure transducer located along shore of Slipper Lake.

Figure 3.2-13

Hydraulic Geometry Survey at Station Cujo Outflow, 2014

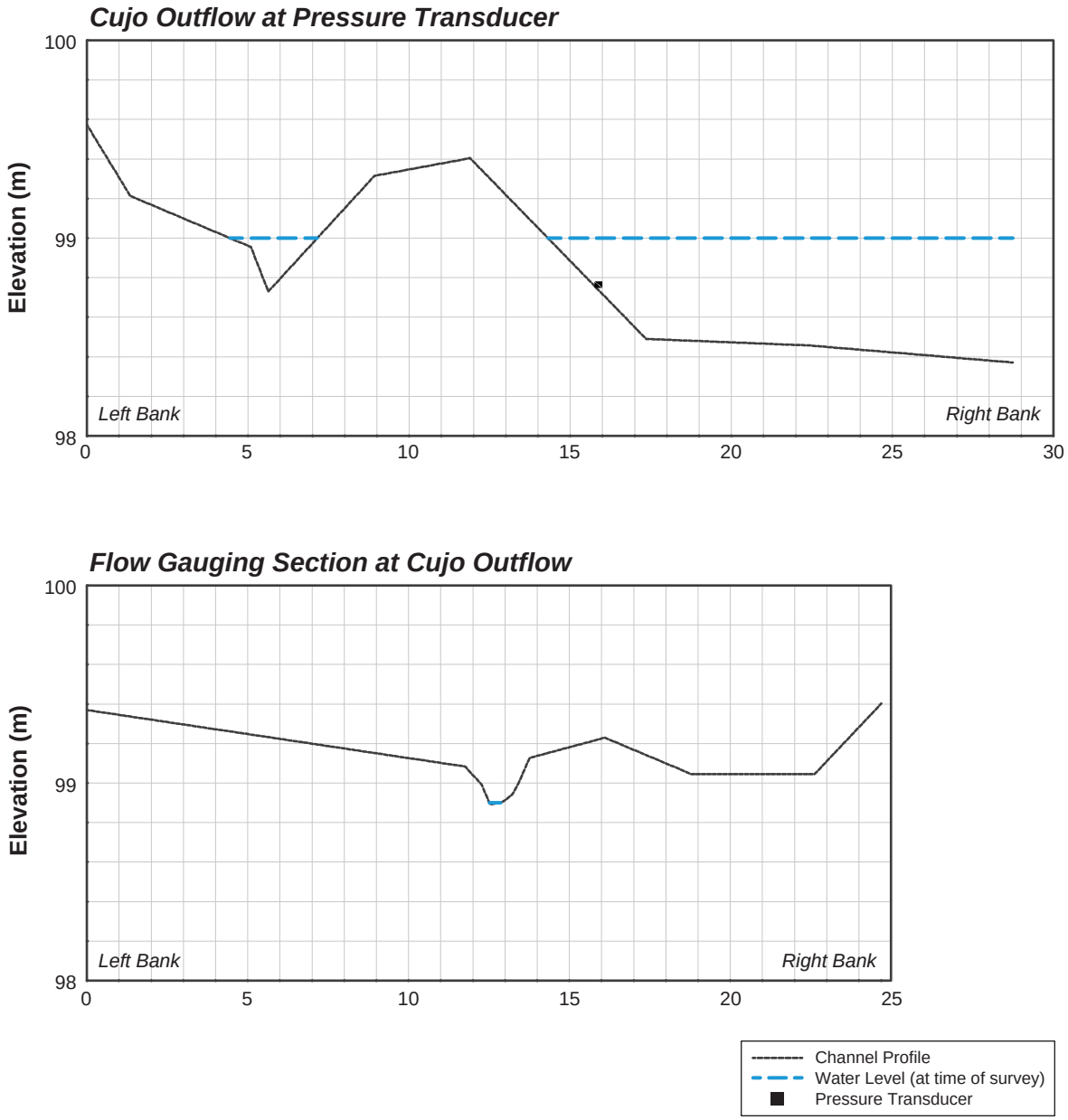


Figure 3.2-14

Hydraulic Geometry Survey at Station Christine-Lac du Sauvage, 2014

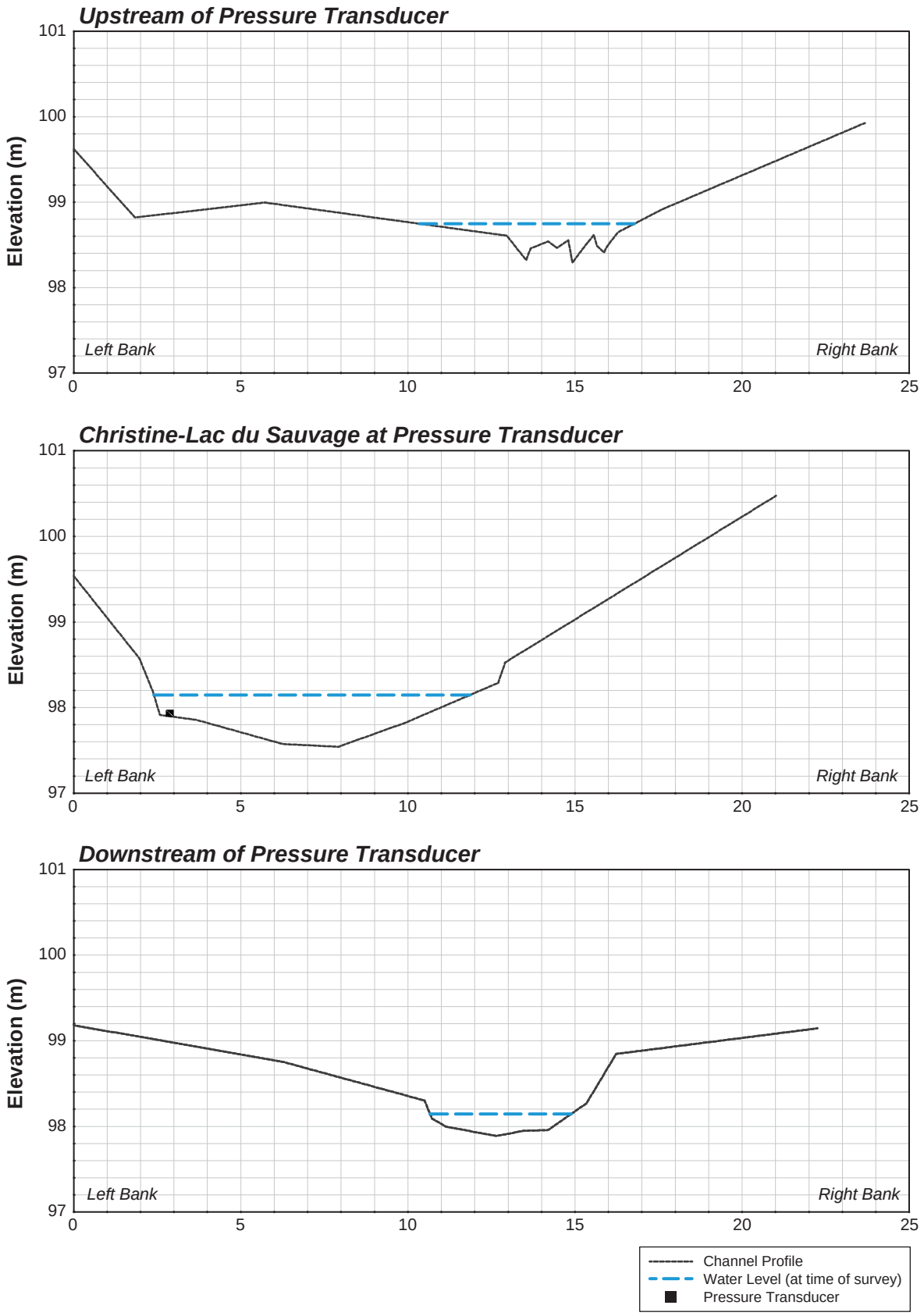
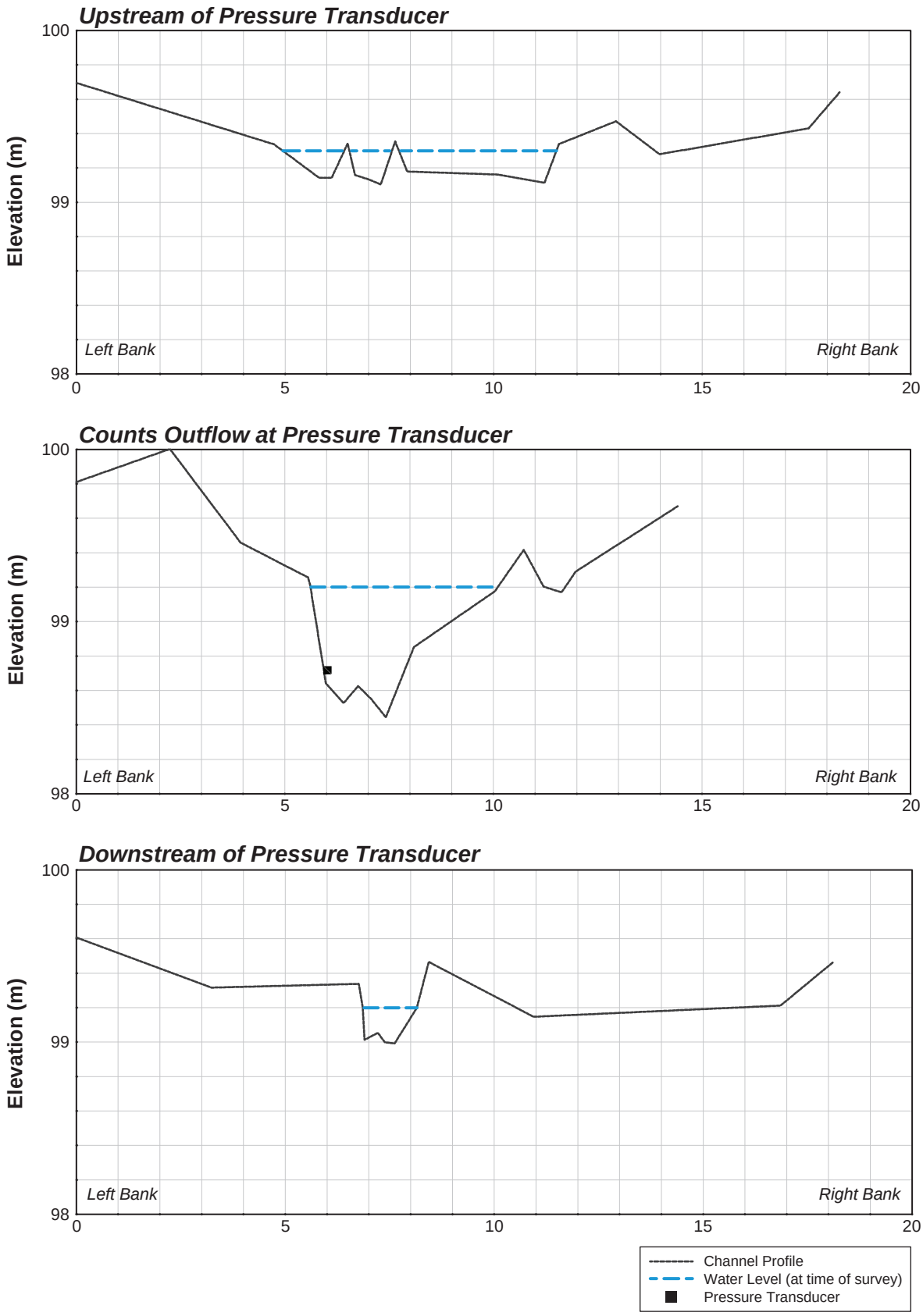


Figure 3.2-15

Hydraulic Geometry Survey at Station Counts Outflow, 2014



3.3 PHYSICAL LIMNOLOGY

3.3.1 Under-ice (April) Physical Limnology

Under-ice DO and temperature profiles were conducted in seven lakes within the Koala Watershed (Vulture (internal reference), Grizzly, Kodiak, Leslie, Moose, Nema, and Slipper), two sites within Lac de Gras (S2 and S3), one lake within the King-Cujo Watershed (Cujo), one site within Lac du Sauvage (LdS1), two sites within the Pigeon-Fay and Upper Exeter Watershed (Fay Bay and Upper Exeter Lake) and two external reference lakes (Nanuq and Counts). Sampling took place from March 31 to April 13 (Tables 3.3-1 and 3.3-2; Figure 3.3-1). April was selected because it is near the end of the under-ice season and DO concentrations are typically the lowest at this time. Cujo Lake was monitored more frequently (from January to April) because of historical low DO observations in this lake during winter.

All lakes exhibited inverse thermal stratification (i.e., water temperature increased with depth), although the temperature difference in Leslie Lake, Moose Lake, Lac de Gras site S2, and Lac du Sauvage was less pronounced (Figures 3.3-1b, 3.3-1c, and 3.3-1d, respectively).

Surface DO concentrations were high in most lakes, with super saturation (percent DO saturation greater than 100%) occurring in some of the deeper lakes (Nanuq and Vulture), the larger lakes (Lac de Gras, Lac du Sauvage, and Upper Exeter Lake), and Counts Lake (Table 3.3-2). This likely indicates that phytoplankton (and/or algae attached to the underside of the ice) had begun to photosynthesize at a rate greater than community respiration in the first few metres of the water column. Surface DO concentrations were lower in Grizzly, Kodiak, Leslie, Moose, Nema, Slipper, Cujo, and Slipper lakes where DO saturation was less than 100% (Table 3.3-2).

DO concentrations in most AEMP lakes declined with depth, reaching lows near the water-sediment interface; exceptions were Moose Lake, Lac de Gras (S2), and Lac du Sauvage (LdS1) where DO concentrations were similar throughout the water column (Figures 3.3-1a to 3.3-1e). Most lakes remained well oxygenated (greater than the CCME guideline of 6.5 mg/L) throughout the majority of the water column, except at Counts, Kodiak, and Cujo lakes where DO concentrations were less than the CCME guideline at depth (Figures 3.3-1a to 3.3-1e).

Additional monitoring of Cujo Lake indicated that DO concentrations were greatest in January when 2014 under-ice monitoring began. During February through April, DO concentrations fluctuated but remained lower than January concentrations (Figure 3.3-1d). By April, DO concentrations had begun to increase in both lakes, likely owing to the lengthening photo-period. Late winter DO in Cujo Lake may have also been positively influenced through mitigation. On April 21 a portion of the ice on the surface of Cujo Lake was cleared to allow increased light penetration and thus production of DO through photosynthesis. Although a decline in DO was observed through early winter, these results were not unexpected because during winter ice-cover excludes the dissolution of atmospheric oxygen into the water column and microbial decomposition of organic matter consumes oxygen. Temperature and light limitation from the short photo-period and ice and snow-cover also limit the potential for phytoplankton growth and oxygen production through photosynthesis.

3.3.2 Open Water (August) Physical Limnology

Secchi depths and profiles of DO and temperature were measured in seven lakes within the Koala Watershed (Vulture (internal reference), Grizzly, Kodiak, Leslie, Moose, Nema, and Slipper), two sites within Lac de Gras (S2 and S3), one lake within the King-Cujo Watershed (Cujo), two sites within Lac du Sauvage (LdS2 and LdS1), two sites within the Pigeon-Fay and Upper Exeter Watershed (Fay Bay and Upper Exeter Lake), and two external reference lakes (Nanuq and Counts). Secchi depths were used to describe the under-water light conditions by estimating the euphotic zone depth (Table 3.3-3). Sampling was conducted from late July to early August coincident with lake water quality sampling (Table 3.3-1).

The euphotic depth is ecologically important because it is the depth to which sufficient sunlight exists for net photosynthesis to occur. It is often defined as the depth to which one percent of surface irradiance penetrates the water column. Euphotic depth estimates exceeded the maximum depth of Counts and Leslie lakes, Lac de Gras (S2), Cujo Lake, Lac du Sauvage (LdS2 and LdS1), Fay Bay and Upper Exeter Lake, indicating that primary productivity could occur throughout the entire water column and at the sediment-water interface at these sites (Table 3.3-3; Figure 3.3-2). At the remaining sites (Nanuq, Vulture, Grizzly, Kodiak, Moose, Nema, and Slipper lakes, and Lac de Gras (S3)), the euphotic zone extended through more than half of the water column, except in Grizzly Lake where the euphotic depth was 13.4 m (maximum depth = 40.2 m; Table 3.3-3; Figure 3.3-2).

In early August, thermal stratification was observed in Nanuq, Vulture, Grizzly, Kodiak, Leslie, Moose and Slipper lakes, and in Lac de Gras (sites S2 and S3; Table 3.3-4; Figure 3.3-3). Thermal stratification was observed at Fay Bay and Upper Exeter during July sampling, but not during August or September sampling (Table 3.3-4; Figure 3.3-3).

DO concentrations varied little with depth at several lakes (Counts, Kodiak, Nema, Cujo, Lac du Sauvage (LdS2 and LdS1), Fay Bay, and Upper Exeter Lake), and concentrations were near 10 mg/L throughout the water column at each of these sites. Slipper Lake, while thermally stratified, had greater DO concentrations above the thermocline than below, possibly suggesting that this lake was supporting greater phytoplankton activity in the surface waters. The remaining AEMP lakes (Nanuq, Vulture, Grizzly, Leslie, and Moose lakes, and Lac de Gras (S2 and S3)) had notably higher DO concentrations near the sediments than at the surface. DO concentrations were greater than the CCME freshwater guideline of 6.5 mg/L for cold water non-early life stages at all depths in each of the lakes.

Supporting Tables and Figures

Table 3.3-1. Sampling Locations and Dates for Physical Limnology at AEMP Lake Sites, 2014

	Temperature & Dissolved Oxygen Profile; Secchi Depth[1]	
Lake	Under-ice Season Date	Open Water Season Date
Nanuq	7-Apr-14	5-Aug-14[1]
Counts	31-Mar-14	9-Aug-14[1]
Vulture	8-Apr-14	3-Aug-14[1]
Grizzly	5-Apr-14	10-Aug-14[1]
Kodiak	4-Apr-14	29-Jul-14[1]
Leslie	13-Apr-14	31-Jul-14[1]
Moose	13-Apr-14	31-Jul-14[1]
Nema	12-Apr-14	2-Aug-14[1]
Slipper	9-Apr-14	4-Aug-14[1]
S2	9-Apr-14	30-Jul-14[1]
S3	9-Apr-14	30-Jul-14[1]
Cujo	6-Apr-14	7-Aug-14[1]
LdS2	-	8-Aug-14[1]
LdS1	6-Apr-14	8-Aug-14[1]
Fay Bay	4-Apr-14	3-Jul-14, 1-Aug-14[1], 31-Aug-14
Upper Exeter	1-Apr-14	3-Jul-14, 1-Aug-14[1], 31-Aug-14

Note: Dashes (-) indicate that data are not collected in winter due to shallow depth.
[1] Secchi depth data was collected.

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014

Nanuq Lake, April 7, 2014

Ice Thickness (m): 2.00							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.8	0.24	99.8	14.50	8.6	1.29	98.1	13.83
2.0	0.28	101.4	14.70	8.8	1.30	97.6	13.76
2.2	0.33	102.8	14.88	8.9	1.31	97.1	13.68
2.4	0.39	104.3	15.08	9.3	1.31	96.7	13.63
2.5	0.46	105.2	15.19	9.7	1.33	96.3	13.57
2.7	0.53	105.9	15.25	10.1	1.37	95.9	13.50
2.8	0.58	106.7	15.35	10.4	1.40	95.5	13.43
3.0	0.62	107.2	15.40	10.6	1.42	94.9	13.34
3.1	0.66	107.7	15.46	10.9	1.44	94.4	13.26
3.2	0.72	107.8	15.45	11.1	1.46	93.7	13.16
3.4	0.80	107.3	15.34	11.3	1.48	93.2	13.07
3.5	0.84	107.1	15.29	11.5	1.49	92.5	12.98
3.7	0.90	106.2	15.14	11.7	1.50	92.0	12.91
3.9	0.92	105.7	15.06	12.0	1.52	91.5	12.82
4.3	0.97	105.3	14.99	12.3	1.57	90.8	12.71
4.5	1.00	104.9	14.92	12.6	1.60	90.2	12.61
4.7	1.03	104.4	14.83	12.7	1.62	89.6	12.52
4.9	1.05	103.9	14.75	12.9	1.64	89.0	12.43
5.1	1.07	103.4	14.68	13.2	1.66	88.5	12.35
5.4	1.08	103.0	14.62	13.4	1.68	87.9	12.26
5.6	1.11	102.6	14.54	13.8	1.71	87.4	12.19
6.0	1.13	102.1	14.46	14.1	1.73	86.8	12.10
6.2	1.16	101.7	14.39	14.5	1.76	86.3	12.01
6.5	1.17	101.2	14.32	15.0	1.79	85.7	11.92
6.8	1.18	100.9	14.27	15.3	1.81	85.2	11.84
7.0	1.19	100.6	14.22	15.6	1.82	84.6	11.76
7.2	1.21	100.1	14.15	15.8	1.83	84.1	11.69
7.4	1.22	99.9	14.12	16.0	1.84	83.7	11.62
7.6	1.23	99.5	14.06	16.3	1.86	83.2	11.55
7.8	1.24	99.3	14.03	16.4	1.86	82.8	11.50
7.9	1.26	99.0	13.98	16.8	1.88	82.3	11.42
8.1	1.26	98.8	13.95	17.0	1.89	81.9	11.36
8.3	1.27	98.4	13.89	17.3	1.91	81.5	11.30

(continued)

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014 (continued)

Nanuq Lake, April 7, 2014 (completed)

Ice Thickness (m): 2.00							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
17.6	1.92	81.1	11.24	22.7	2.18	66.9	9.21
18.0	1.93	80.6	11.16	22.9	2.19	66.2	9.10
18.3	1.95	80.0	11.09	23.2	2.21	65.3	8.98
18.6	1.97	79.4	11.00	23.5	2.23	64.4	8.85
18.9	1.98	79.0	10.93	23.7	2.25	63.3	8.70
19.1	1.99	78.5	10.86	24.0	2.26	62.3	8.56
19.3	1.99	77.9	10.78	24.2	2.27	61.5	8.44
19.7	2.01	77.3	10.69	24.3	2.28	60.6	8.32
20.0	2.02	76.8	10.62	24.5	2.29	59.7	8.20
20.3	2.03	76.3	10.54	24.6	2.30	58.8	8.06
20.6	2.05	75.5	10.43	24.8	2.32	57.7	7.91
20.8	2.06	74.8	10.33	24.9	2.34	56.7	7.77
21.1	2.08	74.1	10.22	25.1	2.36	55.5	7.61
21.3	2.09	73.3	10.11	25.3	2.38	54.4	7.45
21.5	2.10	72.5	10.00	25.4	2.38	53.2	7.28
21.6	2.11	71.7	9.89	25.6	2.38	52.2	7.14
21.8	2.12	70.9	9.77	25.7	2.41	51.0	6.98
22.0	2.13	70.1	9.67	25.8	2.42	49.9	6.83
22.1	2.15	69.3	9.55	25.9	2.45	48.8	6.67
22.3	2.16	68.6	9.44	26.0	2.47	47.6	6.50
22.5	2.17	67.9	9.34	26.2	2.47	46.4	6.34

Counts Lake, March 31, 2014

Ice Thickness (m): 1.55							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.7	0.18	114.1	16.59	2.5	1.02	117.1	16.64
1.9	0.29	115.1	16.70	2.6	1.12	116.6	16.52
2.1	0.49	116.3	16.78	2.7	1.21	115.8	16.36
2.2	0.66	116.8	16.76	2.8	1.33	114.6	16.14
2.3	0.71	117.1	16.79	2.9	1.44	113.2	15.89
2.4	0.82	117.0	16.72	3.0	1.50	112.3	15.74

(continued)

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014 (continued)

Counts Lake, March 31, 2014 (completed)

Ice Thickness (m): 1.55							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
3.1	1.59	110.8	15.50	7.5	2.55	60.5	8.24
3.2	1.68	108.5	15.13	7.6	2.57	59.0	8.04
3.3	1.72	105.3	14.68	7.7	2.57	57.5	art3
3.5	1.81	102.8	14.29	7.9	2.60	54.2	7.38
3.6	1.84	100.0	13.89	8.0	2.61	52.4	7.13
3.9	1.96	96.2	13.32	8.2	2.64	50.9	6.91
4.1	2.02	93.1	12.87	8.3	2.66	49.4	6.71
4.3	2.05	90.3	12.47	8.4	2.67	46.5	6.31
4.4	2.09	87.5	12.08	8.6	2.69	45.3	6.14
4.6	2.13	84.6	11.66	8.7	2.71	44.2	6.00
4.7	2.16	82.3	11.34	8.9	2.73	42.9	5.82
4.9	2.19	80.0	11.00	9.0	2.75	42.0	5.69
5.0	2.21	77.7	10.68	9.1	2.75	40.9	5.55
5.3	2.26	76.0	10.44	9.2	2.77	39.8	5.39
5.5	2.29	72.7	9.97	9.3	2.79	38.8	5.25
5.7	2.31	71.1	9.75	9.4	2.80	38.0	5.14
5.8	2.32	69.8	9.57	9.5	2.81	37.3	5.04
5.9	2.34	69.2	9.48	9.6	2.85	36.7	4.95
6.0	2.35	68.8	9.42	9.7	2.88	35.8	4.84
6.2	2.38	68.0	9.31	9.9	2.93	34.8	4.70
6.4	2.40	67.0	9.17	10.0	2.96	33.9	4.57
6.5	2.41	66.0	9.03	10.1	2.98	33.2	4.48
6.7	2.44	65.2	8.91	10.3	3.01	32.9	4.42
6.8	2.46	64.5	8.81	10.4	3.04	31.7	4.26
6.9	2.48	63.3	8.64	10.5	3.09	30.8	4.14
7.1	2.50	62.4	8.52	10.6	3.11	29.3	3.93
7.3	2.52	61.5	8.39	10.7	3.12	28.3	3.80

(continued)

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014 (continued)

Vulture Lake, April 8, 2014

Ice Thickness (m): 1.60							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.7	0.44	108.0	15.60	9.0	1.16	95.0	13.45
2.0	0.65	108.9	15.63	9.2	1.16	94.7	13.40
2.3	0.80	109.0	15.59	9.4	1.16	94.4	13.36
2.6	0.88	108.7	15.51	9.7	1.17	94.1	13.32
2.9	0.91	108.3	15.43	9.9	1.17	93.8	13.28
3.1	0.94	107.6	15.32	10.2	1.17	93.6	13.24
3.4	0.97	107.0	15.22	10.5	1.17	93.3	13.21
3.7	0.99	106.3	15.11	10.8	1.17	93.0	13.16
3.9	1.00	105.6	15.01	11.0	1.18	92.9	13.14
4.2	1.01	105.0	14.92	11.3	1.18	92.6	13.10
4.5	1.02	104.4	14.83	11.6	1.18	92.4	13.06
4.7	1.03	103.8	14.74	11.9	1.19	92.2	13.03
5.0	1.04	103.2	14.65	12.2	1.20	91.9	13.00
5.3	1.05	102.7	14.58	12.4	1.20	91.8	12.97
5.6	1.05	102.2	14.51	12.6	1.21	91.6	12.94
5.8	1.05	101.8	14.46	12.9	1.22	91.4	12.91
6.0	1.06	101.5	14.40	13.2	1.23	91.2	12.88
6.2	1.07	101.0	14.33	13.5	1.24	91.0	12.85
6.4	1.08	100.6	14.27	13.8	1.25	90.8	12.82
6.6	1.09	100.1	14.20	14.0	1.26	90.6	12.79
6.8	1.09	99.6	14.13	14.2	1.28	90.4	12.75
6.9	1.09	99.2	14.06	14.4	1.28	90.2	12.73
7.0	1.10	98.7	13.99	14.5	1.29	90.1	12.71
7.1	1.10	98.3	13.94	14.6	1.29	89.9	12.68
7.2	1.11	97.9	13.88	14.8	1.29	89.7	12.65
7.4	1.12	97.6	13.83	15.0	1.29	89.5	12.62
7.5	1.12	97.2	13.78	15.1	1.29	89.3	12.59
7.6	1.12	97.0	13.74	15.3	1.29	89.2	12.58
7.8	1.12	96.5	13.68	15.5	1.30	89.1	12.57
8.0	1.12	96.2	13.64	15.7	1.31	88.9	12.53
8.2	1.13	95.9	13.59	15.9	1.32	88.7	12.50
8.5	1.14	95.6	13.54	16.1	1.33	88.7	12.49
8.8	1.15	95.3	13.49	16.5	1.34	88.5	12.47

(continued)

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014 (continued)

Vulture Lake, April 8, 2014 (cont'd)

Ice Thickness (m): 1.60							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
16.7	1.35	88.4	12.44	21.8	1.58	86.0	12.03
16.8	1.36	88.2	12.41	22.0	1.60	85.9	12.02
16.9	1.36	88.1	12.40	22.2	1.61	85.9	12.00
17.1	1.37	88.0	12.39	22.4	1.62	85.9	12.00
17.4	1.38	88.0	12.37	22.5	1.64	85.8	11.99
17.6	1.39	87.8	12.35	22.7	1.65	85.8	11.98
17.8	1.41	87.7	12.33	22.9	1.65	85.8	11.98
18.0	1.42	87.6	12.31	23.1	1.67	85.8	11.97
18.2	1.43	87.6	12.30	23.3	1.68	85.7	11.96
18.4	1.43	87.5	12.29	23.5	1.69	85.7	11.95
18.5	1.44	87.4	12.28	23.6	1.70	85.6	11.94
18.7	1.44	87.3	12.26	23.7	1.70	85.6	11.94
18.9	1.46	87.2	12.25	23.8	1.71	85.5	11.92
19.1	1.46	87.2	12.23	24.0	1.71	85.5	11.92
19.3	1.48	87.1	12.22	24.1	1.72	85.4	11.91
19.5	1.48	87.0	12.20	24.3	1.73	85.4	11.90
19.6	1.49	86.9	12.19	24.4	1.74	85.3	11.89
19.7	1.49	86.9	12.19	24.6	1.74	85.3	11.88
19.8	1.50	86.8	12.17	24.8	1.75	85.1	11.86
19.8	1.50	86.7	12.16	25.0	1.77	85.1	11.85
19.9	1.50	86.6	12.15	25.1	1.77	84.9	11.82
20.0	1.50	86.6	12.14	25.3	1.78	84.8	11.80
20.2	1.51	86.5	12.13	25.5	1.78	84.8	11.79
20.3	1.52	86.5	12.12	25.7	1.78	84.7	11.78
20.4	1.52	86.4	12.11	26.0	1.80	84.6	11.77
20.6	1.52	86.4	12.10	26.3	1.81	84.4	11.74
20.7	1.53	86.3	12.09	26.6	1.82	84.3	11.71
20.9	1.54	86.2	12.07	26.8	1.83	84.1	11.69
21.0	1.54	86.2	12.07	26.9	1.83	84.0	11.67
21.2	1.55	86.2	12.07	27.1	1.83	83.8	11.64
21.4	1.57	86.1	12.05	27.2	1.84	83.6	11.62
21.5	1.57	86.1	12.04	27.3	1.85	83.5	11.59
21.6	1.58	86.1	12.04	27.5	1.86	83.2	11.56

(continued)

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014 (continued)

Vulture Lake, April 8, 2014 (completed)

Ice Thickness (m): 1.60							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
27.6	1.86	83.1	11.54	31.8	2.04	77.2	10.67
27.8	1.87	82.9	11.51	32.2	2.06	76.8	10.60
28.0	1.87	82.7	11.47	32.5	2.09	76.3	10.53
28.1	1.88	82.5	11.44	32.9	2.11	75.8	10.45
28.3	1.89	82.2	11.41	33.1	2.14	75.2	10.37
28.5	1.90	82.1	11.38	33.4	2.17	74.7	10.29
28.7	1.91	81.7	11.33	33.6	2.19	73.9	10.17
28.9	1.91	81.4	11.29	33.8	2.21	73.3	10.08
29.1	1.91	81.2	11.25	34.2	2.24	72.5	9.96
29.2	1.92	80.9	11.22	34.5	2.28	71.5	9.82
29.5	1.93	80.6	11.18	34.8	2.31	70.5	9.67
29.8	1.95	80.4	11.14	34.9	2.33	69.4	9.51
30.3	1.97	80.1	11.09	35.1	2.36	68.5	9.39
30.7	1.99	79.7	11.03	35.5	2.40	67.5	9.23
31.0	2.01	79.2	10.95	35.8	2.45	66.5	9.09
31.1	2.02	78.8	10.89	36.0	2.49	65.3	8.91
31.3	2.02	78.3	10.82	36.2	2.51	63.9	8.72
31.4	2.03	77.7	10.74	36.3	2.53	62.6	8.53

Grizzly Lake, April 5, 2014

Ice Thickness (m): 1.65							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.4	0.14	86.8	12.64	5.7	1.74	98.7	13.75
1.9	0.21	90.9	13.21	6.1	1.75	98.5	13.71
2.4	0.83	94.3	13.46	6.5	1.75	98.0	13.65
2.9	1.21	96.3	13.62	6.8	1.76	97.6	13.58
3.4	1.45	97.9	13.75	7.1	1.77	97.1	13.51
3.8	1.59	98.8	13.82	7.5	1.77	96.6	13.45
4.4	1.66	99.2	13.85	7.8	1.78	96.2	13.39
4.8	1.70	99.2	13.82	8.1	1.79	95.8	13.33
5.3	1.73	99.0	13.80	8.4	1.79	95.5	13.28

(continued)

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014 (continued)

Grizzly Lake, April 5, 2014 (continued)

Ice Thickness (m): 1.65							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
8.8	1.79	95.0	13.21	18.9	2.16	86.5	11.91
9.0	1.80	94.6	13.15	19.2	2.18	86.5	11.90
9.2	1.81	94.2	13.09	19.5	2.19	86.4	11.89
9.5	1.81	93.8	13.03	19.8	2.21	86.3	11.87
9.8	1.82	93.3	12.97	20.2	2.23	86.3	11.86
10.2	1.82	92.9	12.90	20.6	2.25	86.2	11.84
10.5	1.83	92.7	12.88	21.0	2.27	86.2	11.83
10.8	1.84	92.2	12.81	21.4	2.29	86.1	11.82
11.1	1.84	91.8	12.75	21.7	2.31	86.1	11.80
11.5	1.85	91.5	12.70	22.2	2.33	86.0	11.78
11.9	1.86	91.1	12.64	22.5	2.35	85.9	11.77
12.1	1.88	90.7	12.58	22.8	2.37	85.9	11.77
12.4	1.89	90.3	12.53	23.1	2.38	85.9	11.75
12.7	1.89	90.0	12.49	23.4	2.39	85.8	11.74
13.0	1.90	89.6	12.43	23.7	2.41	85.8	11.73
13.2	1.91	89.3	12.38	24.2	2.43	85.7	11.72
13.6	1.92	89.0	12.34	24.5	2.44	85.6	11.69
13.9	1.93	88.7	12.29	24.7	2.45	85.5	11.68
14.2	1.94	88.4	12.25	25.4	2.48	85.1	11.62
14.6	1.95	88.2	12.22	25.5	2.49	84.9	11.59
14.9	1.96	88.1	12.20	25.7	2.49	84.8	11.57
15.2	1.97	87.9	12.16	25.9	2.50	84.6	11.55
15.6	1.98	87.7	12.13	26.1	2.50	84.4	11.52
15.8	1.99	87.6	12.12	26.2	2.51	84.3	11.50
16.1	2.01	87.5	12.10	26.4	2.51	84.1	11.47
16.3	2.01	87.4	12.08	26.6	2.52	83.9	11.44
16.6	2.03	87.2	12.06	26.8	2.53	83.8	11.42
17.0	2.04	87.1	12.03	27.0	2.54	83.5	11.38
17.3	2.06	86.9	12.00	27.1	2.55	83.2	11.34
17.7	2.08	86.9	11.99	27.3	2.56	83.0	11.30
18.0	2.10	86.7	11.96	27.6	2.56	82.7	11.26
18.3	2.13	86.7	11.94	27.9	2.57	82.4	11.22
18.6	2.14	86.6	11.93	28.1	2.57	82.0	11.16

(continued)

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014 (continued)

Grizzly Lake, April 5, 2014 (completed)

Ice Thickness (m): 1.65							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
28.3	2.58	81.6	11.11	33.6	2.68	68.1	9.24
28.5	2.58	81.2	11.06	34.0	2.69	67.2	9.12
28.8	2.59	80.9	11.01	34.4	2.70	66.1	8.97
29.1	2.60	80.4	10.94	34.7	2.71	65.0	8.83
29.4	2.60	79.9	10.88	35.1	2.71	64.1	8.70
29.6	2.61	79.4	10.80	35.7	2.73	63.0	8.54
29.8	2.61	78.9	10.73	36.2	2.75	61.8	8.38
30.0	2.62	78.2	10.63	36.6	2.76	60.6	8.21
30.2	2.62	77.6	10.55	37.0	2.78	59.3	8.03
30.4	2.63	76.9	10.46	37.4	2.80	57.9	7.84
30.6	2.63	76.3	10.38	37.8	2.83	56.4	7.62
30.9	2.63	75.6	10.28	38.2	2.86	54.6	7.37
31.1	2.64	74.9	10.18	38.6	2.89	52.6	7.10
31.4	2.64	74.2	10.08	39.1	2.92	50.6	6.83
31.7	2.65	73.4	9.98	39.6	2.95	48.0	6.47
32.0	2.65	72.6	9.86	39.9	2.98	45.4	6.12
32.3	2.66	71.8	9.75	40.1	3.00	42.7	5.75
32.6	2.67	70.9	9.63	40.2	3.01	40.1	5.40
32.9	2.67	70.0	9.51	40.3	3.02	37.8	5.08
33.2	2.68	69.1	9.38				

Kodiak Lake, April 4, 2014

Ice Thickness (m): 1.64							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.6	0.34	65.8	9.53	3.4	2.41	63.5	8.69
1.9	0.65	66.4	9.52	3.7	2.51	62.3	8.49
2.1	1.04	66.5	9.43	3.9	2.58	61.0	8.30
2.3	1.42	66.4	9.33	4.1	2.62	59.7	8.11
2.6	1.70	66.0	9.20	4.2	2.64	58.4	7.93
2.8	1.96	65.3	9.04	4.4	2.65	57.3	7.78
3.1	2.22	64.7	8.89	4.6	2.66	56.2	7.64

(continued)

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014 (continued)

Kodiak Lake, April 4, 2014 (completed)

Ice Thickness (m): 1.64							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
4.9	2.67	55.3	7.50	9.2	2.83	45.0	6.08
5.1	2.68	54.4	7.38	9.4	2.84	44.5	6.02
5.3	2.69	53.5	7.25	9.5	2.84	44.1	5.96
5.6	2.70	52.7	7.14	9.7	2.86	43.7	5.90
5.8	2.71	52.0	7.04	9.9	2.89	43.2	5.84
6.1	2.71	51.3	6.95	10.2	2.92	42.8	5.77
6.4	2.72	50.7	6.87	10.6	2.95	42.2	5.69
6.7	2.73	50.1	6.80	10.8	3.00	41.5	5.59
6.9	2.74	49.6	6.72	11.1	3.02	40.8	5.48
7.2	2.75	49.1	6.65	11.3	3.06	40.0	5.37
7.5	2.76	48.6	6.58	11.6	3.12	39.1	5.25
7.8	2.77	48.1	6.52	11.9	3.16	38.1	5.11
8.0	2.78	47.7	6.45	12.1	3.18	37.2	4.98
8.2	2.79	47.3	6.39	12.4	3.22	36.3	4.86
8.4	2.79	46.8	6.33	12.5	3.26	35.2	4.70
8.6	2.80	46.4	6.27	12.6	3.28	34.1	4.55
8.8	2.82	45.8	6.20	12.7	3.30	32.9	4.40
9.0	2.83	45.4	6.14	12.8	3.31	32.0	4.27

Leslie Lake, April 13, 2014

Ice Thickness (m): 1.85							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.8	0.47	69.2	9.94	3.4	0.64	69.3	9.91
1.9	0.51	69.3	9.94	3.7	0.66	69.3	9.90
2.1	0.55	69.3	9.94	4.0	0.68	69.3	9.90
2.2	0.58	69.3	9.92	4.2	0.69	69.3	9.89
2.4	0.60	69.3	9.91	4.5	0.71	69.3	9.89
2.6	0.61	69.3	9.92	4.7	0.72	69.1	9.86
2.7	0.61	69.4	9.92	5.0	0.74	69.0	9.84
2.9	0.62	69.3	9.91	5.2	0.75	68.9	9.81
3.0	0.62	69.4	9.92	5.4	0.75	68.6	9.78
3.2	0.62	69.3	9.91	5.6	0.75	68.4	9.75

(continued)

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014 (continued)

Leslie Lake, April 13, 2014 (completed)

Ice Thickness (m): 1.85							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
5.8	0.75	68.2	9.72	9.3	0.90	65.4	9.28
6.0	0.75	68.1	9.70	9.5	0.90	65.2	9.26
6.2	0.76	67.9	9.68	9.7	0.90	65.0	9.23
6.4	0.77	67.8	9.65	10.0	0.92	64.9	9.19
6.6	0.79	67.6	9.62	10.3	0.95	64.6	9.15
6.8	0.82	67.5	9.59	10.6	0.99	64.3	9.10
6.9	0.84	67.4	9.58	11.0	1.04	63.9	9.03
7.1	0.85	67.2	9.55	11.2	1.06	63.5	8.96
7.3	0.87	67.1	9.53	11.5	1.09	62.7	8.84
7.6	0.89	66.9	9.50	11.8	1.11	61.9	8.73
7.9	0.90	66.8	9.47	12.0	1.11	61.1	8.62
8.1	0.90	66.6	9.45	12.2	1.10	60.3	8.51
8.3	0.90	66.3	9.41	12.4	1.13	59.8	8.43
8.5	0.90	66.1	9.37	12.5	1.16	59.3	8.35
8.7	0.90	65.9	9.36	12.6	1.18	58.8	8.28
8.9	0.90	65.8	9.33	12.7	1.22	58.4	8.21
9.0	0.90	65.6	9.31				

Moose Lake, April 13, 2014

Ice Thickness (m): 1.92							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.8	0.23	72.1	10.43	3.6	0.32	74.0	10.67
2.0	0.27	72.5	10.47	3.7	0.32	74.2	10.69
2.2	0.30	72.8	10.50	3.9	0.32	74.3	10.71
2.3	0.31	73.0	10.53	4.1	0.32	74.4	10.73
2.5	0.31	73.2	10.56	4.3	0.33	74.4	10.73
2.7	0.32	73.2	10.56	4.7	0.32	74.6	10.76
3.0	0.32	73.4	10.59	4.9	0.32	74.7	10.77
3.2	0.32	73.5	10.61	5.2	0.33	74.9	10.80
3.3	0.32	73.7	10.63	5.5	0.33	75.0	10.82
3.5	0.32	73.9	10.66	5.8	0.33	75.1	10.82

(continued)

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014 (continued)

Moose Lake, April 13, 2014 (completed)

Ice Thickness (m): 1.92							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
6.1	0.33	75.2	10.85	8.2	0.63	76.0	10.87
6.5	0.33	75.4	10.87	8.4	0.68	76.0	10.86
6.8	0.36	75.5	10.87	8.6	0.77	76.0	10.82
7.0	0.39	75.6	10.89	8.8	0.88	76.1	10.80
7.3	0.42	75.8	10.91	9.0	0.97	76.1	10.78
7.5	0.44	75.9	10.92	9.1	1.03	75.9	10.74
7.7	0.50	76.0	10.91	9.3	1.07	75.7	10.69
7.9	0.55	76.0	10.90	9.4	1.10	75.3	10.63

Nema Lake, April 12, 2014

Ice Thickness (m): 1.40							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.2	0.13	54.8	7.96	5.5	1.25	53.7	7.56
1.5	0.14	55.0	7.99	5.8	1.26	53.5	7.52
1.7	0.37	55.2	7.97	6.0	1.27	53.1	7.47
2.0	0.62	55.4	7.93	6.2	1.28	52.7	7.41
2.2	0.86	55.5	7.89	6.4	1.29	52.3	7.35
2.5	1.00	55.5	7.87	6.6	1.31	51.9	7.30
2.7	1.08	55.6	7.86	6.9	1.33	51.5	7.24
2.9	1.13	55.5	7.83	7.1	1.35	51.1	7.18
3.3	1.16	55.3	7.81	7.4	1.39	50.6	7.10
3.6	1.19	55.2	7.78	7.8	1.42	50.1	7.02
3.9	1.19	55.0	7.75	8.2	1.44	49.6	6.94
4.2	1.20	54.8	7.72	8.6	1.47	49.0	6.86
4.5	1.20	54.6	7.70	8.9	1.48	48.5	6.78
4.9	1.21	54.3	7.66	9.1	1.52	48.0	6.70
5.2	1.23	54.0	7.60	9.3	1.63	47.6	6.63

(continued)

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014 (continued)

Slipper Lake, April 9, 2014

Ice Thickness (m): 1.45							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.3	0.15	91.3	13.27	8.2	1.29	87.6	12.34
1.6	0.16	91.2	13.26	8.6	1.30	87.2	12.28
1.8	0.34	91.5	13.23	8.9	1.32	86.8	12.22
2.1	0.58	91.9	13.20	9.2	1.34	86.3	12.14
2.4	0.79	92.0	13.13	9.5	1.35	85.9	12.07
2.7	0.93	92.0	13.09	9.8	1.35	85.5	12.02
3.1	0.99	92.1	13.08	10.1	1.37	85.0	11.95
3.4	1.05	91.9	13.03	10.4	1.38	84.4	11.86
3.6	1.08	91.7	13.00	10.7	1.40	83.9	11.78
3.7	1.09	91.6	12.97	11.0	1.41	83.3	11.69
4.0	1.10	91.5	12.95	11.3	1.41	82.8	11.62
4.3	1.12	91.4	12.93	11.6	1.42	82.2	11.53
4.9	1.15	91.2	12.89	12.0	1.43	81.6	11.45
5.4	1.18	90.9	12.84	12.4	1.44	81.0	11.36
5.9	1.19	90.5	12.78	12.8	1.46	80.5	11.29
6.4	1.20	90.2	12.73	13.3	1.48	79.9	11.19
6.8	1.22	89.8	12.68	13.7	1.51	79.2	11.09
7.1	1.24	89.5	12.63	14.0	1.54	78.5	10.98
7.3	1.26	89.1	12.57	14.2	1.56	77.8	10.87
7.6	1.27	88.7	12.50	14.3	1.57	77.1	10.77
7.8	1.28	88.3	12.45	14.4	1.58	76.3	10.65
8.0	1.28	88.0	12.40				

S2, April 9, 2014

Ice Thickness (m): 1.70							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.4	0.04	104.3	15.24	2.8	0.29	107.3	15.56
1.7	0.06	105.0	15.33	3.0	0.33	107.7	15.60
2.0	0.09	105.7	15.41	3.2	0.36	107.9	15.62
2.3	0.15	106.3	15.48	3.4	0.37	108.1	15.64
2.5	0.25	106.8	15.51	3.7	0.38	108.3	15.67

(continued)

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014 (continued)

S2, April 9, 2014 (completed)

Ice Thickness (m): 1.70							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
4.0	0.40	108.5	15.69	5.5	0.71	109.6	15.71
4.3	0.42	108.8	15.72	5.8	0.77	109.6	15.68
4.5	0.48	109.2	15.75	6.0	0.82	109.4	15.63
4.8	0.56	109.3	15.73	6.1	0.86	108.8	15.53
5.2	0.63	109.5	15.74	6.2	0.87	107.5	15.34

S3, April 9, 2014

Ice Thickness (m): 1.85							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.8	0.13	105.6	15.39	7.6	0.62	105.4	15.15
2.2	0.17	106.1	15.45	7.9	0.66	105.3	15.11
2.7	0.20	106.6	15.49	8.2	0.72	105.1	15.06
2.9	0.25	106.9	15.52	8.3	0.75	104.9	15.01
3.2	0.26	107.2	15.55	8.5	0.78	104.6	14.97
3.4	0.28	107.5	15.59	8.7	0.81	104.4	14.92
3.7	0.32	107.6	15.59	8.9	0.86	104.2	14.87
3.9	0.33	107.5	15.57	9.4	1.00	104.3	14.83
4.1	0.36	107.6	15.57	9.6	1.16	103.9	14.71
4.4	0.39	107.5	15.55	9.8	1.16	103.5	14.65
4.6	0.41	107.4	15.53	10.1	1.33	103.0	14.51
4.9	0.43	107.3	15.50	10.3	1.48	102.1	14.32
5.2	0.45	107.1	15.47	10.6	1.59	100.9	14.11
5.4	0.46	107.0	15.44	10.9	1.68	99.4	13.86
5.6	0.46	106.7	15.40	11.2	1.76	97.9	13.63
5.9	0.47	106.4	15.36	11.5	1.82	96.5	13.41
6.2	0.50	106.2	15.32	11.8	1.90	95.0	13.17
6.7	0.53	106.1	15.29	12.0	1.95	93.5	12.95
7.0	0.56	106.0	15.26	12.2	1.97	92.1	12.75
7.2	0.59	105.8	15.22	7.9	0.66	105.3	15.11
7.4	0.61	105.6	15.17	8.2	0.72	105.1	15.06

(continued)

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014 (continued)

Cujo Lake, January 30, 2014

Ice Thickness (m): 1.26							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.0	0.40	73.5	10.68	4.0	1.90	59.3	8.14
1.5	0.50	74.3	10.72	4.5	2.10	56.0	7.61
2.0	0.70	73.8	10.35	5.0	2.30	60.2	6.80
2.5	1.20	66.1	9.28	5.5	2.40	48.9	6.59
3.0	1.40	64.3	8.83	5.8	2.60	46.5	6.28
3.5	1.70	62.3	8.62				

Cujo Lake, January 30, 2014

Ice Thickness (m): 1.24							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.1	0.19	62.3	9.04	4.0	2.36	45.5	6.22
1.2	0.19	62.3	9.04	4.1	2.41	44.3	6.05
1.4	0.38	62.8	9.07	4.3	2.48	44.2	6.03
1.5	0.61	62.1	8.91	4.4	2.52	44.2	6.02
1.6	0.98	56.9	8.08	4.5	2.64	40.3	5.47
2.0	1.50	51.8	7.26	4.7	2.67	40.2	5.45
2.1	1.56	50.1	7.00	4.8	2.68	40.1	5.44
2.3	1.64	50.1	6.98	4.9	2.70	39.2	5.32
2.4	1.74	50.0	6.96	5.0	2.74	35.9	4.86
2.5	1.81	49.9	6.93	5.1	2.74	35.8	4.84
2.6	1.88	49.8	6.90	5.2	2.74	35.6	4.82
2.7	2.06	47.7	6.58	5.3	2.73	34.9	4.73
2.8	2.08	47.8	6.59	5.4	2.73	34.5	4.67
2.9	2.09	48.0	6.61	5.4	2.74	34.2	4.63
2.9	2.08	48.0	6.62	5.5	2.74	34.0	4.61
3.0	2.08	48.1	6.64	5.6	2.67	32.0	4.34
3.1	2.06	48.2	6.65	5.7	2.69	31.8	4.31
3.2	2.06	48.0	6.62	5.8	2.67	31.8	4.31
3.3	2.07	48.1	6.63	5.9	2.68	31.5	4.27
3.4	2.10	48.1	6.63	6.0	2.68	31.5	4.28
3.5	2.10	48.1	6.62				

(continued)

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014 (continued)

Cujo Lake, March 1, 2014

Ice Thickness (m): 1.45							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.2	0.19	62.2	9.03	4.5	2.40	50.7	6.93
1.4	0.18	61.5	8.94	4.9	2.54	48.8	6.64
1.8	0.29	61.3	8.88	5.2	2.60	46.4	6.31
2.2	0.78	60.9	8.70	5.5	2.64	44.1	5.98
2.6	1.01	59.3	8.41	5.8	2.65	41.9	5.68
2.9	1.23	57.8	8.16	6.0	2.63	40.3	5.47
3.4	1.59	56.0	7.83	6.1	2.61	38.9	5.29
3.7	1.96	54.3	7.51	6.2	2.61	37.7	5.12
4.1	2.14	52.5	7.23	6.3	2.61	36.7	4.99

Cujo Lake, March 14, 2014

Ice Thickness (m): 1.55							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.5	0.24	55.7	8.08	3.8	2.34	34.9	4.78
1.6	0.30	55.7	8.06	3.9	2.38	34.3	4.69
1.7	0.39	55.8	8.05	4.0	2.45	32.8	4.48
1.8	0.58	56.3	8.09	4.1	2.45	31.3	4.28
2.0	0.93	56.4	8.03	4.2	2.46	31.1	4.24
2.1	1.29	56.8	8.00	4.3	2.47	30.9	4.21
2.2	1.67	55.6	7.75	4.4	2.49	30.7	4.19
2.3	1.70	54.5	7.60	4.5	2.50	30.5	4.16
2.4	1.73	54.3	7.56	4.6	2.49	30.5	4.15
2.5	1.75	53.2	7.40	4.7	2.49	29.3	4.00
2.6	1.92	51.3	7.10	4.8	2.49	29.3	3.99
2.7	1.93	50.6	7.01	4.9	2.48	29.1	3.97
2.8	1.99	49.6	6.86	5.0	2.48	29.0	3.95
2.9	2.04	47.9	6.61	5.1	2.45	28.2	3.85
3.0	2.08	40.7	5.61	5.2	2.43	28.2	3.85
3.1	2.10	40.3	5.55	5.3	2.43	28.1	3.84
3.2	2.11	40.0	5.51	5.5	2.42	28.0	3.82

(continued)

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014 (continued)

Cujo Lake, March 14, 2014 (completed)

Ice Thickness (m): 1.55							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
3.3	2.12	39.5	5.44	5.6	2.46	27.7	3.79
3.4	2.13	39.0	5.37	5.7	2.46	27.4	3.74
3.5	2.26	36.5	5.01	5.8	2.46	27.2	3.71
3.7	2.29	35.6	4.88	5.9	2.47	27.0	3.68

Cujo Lake, April 6, 2014

Ice Thickness (m): 1.89							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.7	0.41	48.0	6.93	3.8	1.95	49.1	6.79
1.9	0.47	48.1	6.92	4.0	2.06	49.1	6.78
2.0	0.50	48.4	6.96	4.2	2.13	49.2	6.77
2.2	0.65	48.5	6.95	4.4	2.24	49.1	6.74
2.4	0.95	48.6	6.90	4.6	2.31	49.1	6.73
2.5	1.18	48.7	6.88	4.9	2.35	48.9	6.69
2.7	1.37	48.8	6.86	5.2	2.37	48.7	6.66
2.9	1.48	48.9	6.85	5.4	2.37	48.5	6.63
3.1	1.59	49.0	6.84	5.6	2.38	48.2	6.59
3.3	1.70	49.0	6.83	5.8	2.40	48.0	6.55
3.5	1.84	49.1	6.81				

Cujo Lake, April 19, 2014

Ice Thickness (m): 1.61							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.3	0.24	60.1	8.72	4.2	2.19	51.2	7.03
1.7	0.30	58.4	8.45	4.5	2.26	50.3	6.90
2.3	0.61	57.2	8.20	4.8	2.38	49.4	6.75
2.7	1.02	55.9	7.94	5.2	2.46	48.5	6.61
3.1	1.39	55.0	7.72	5.5	2.48	47.5	6.47
3.4	1.72	53.9	7.50	5.6	2.47	46.5	6.34
3.7	1.95	53.0	7.33	5.7	2.48	45.5	6.21
4.0	2.09	52.0	7.17	5.8	2.49	43.1	5.87

(continued)

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014 (continued)

LdS1, April 6, 2014

Ice Thickness (m): 1.75							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.6	0.12	120.3	17.53	4.1	0.86	124.6	17.79
1.9	0.11	120.7	17.59	4.5	0.90	124.8	17.80
2.1	0.21	121.0	17.59	4.8	0.92	124.9	17.80
2.3	0.29	121.5	17.62	5.1	0.94	124.9	17.79
2.6	0.40	122.4	17.69	5.4	0.97	125.0	17.79
2.8	0.55	123.0	17.70	5.7	0.99	125.1	17.79
3.0	0.63	123.4	17.73	6.1	1.00	125.3	17.81
3.2	0.67	123.9	17.77	6.3	1.03	125.5	17.82
3.4	0.72	124.2	17.80	6.6	1.06	125.6	17.82
3.6	0.77	124.4	17.80	6.7	1.07	125.4	17.80
3.8	0.81	124.6	17.80	6.8	1.09	125.1	17.74

Fay Bay, April 4, 2014

Ice Thickness (m): 1.95							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.9	1.02	71.9	10.22	4.5	3.11	63.2	8.48
2.1	1.32	72.3	10.19	5.1	3.21	60.7	8.12
2.4	1.82	72.8	10.11	5.7	3.31	58.1	7.75
2.7	2.33	72.2	9.90	6.2	3.39	55.5	7.39
2.9	2.55	71.1	9.68	6.4	3.44	52.6	7.00
3.2	2.74	69.6	9.44	6.5	3.47	49.9	6.63
3.5	2.83	67.8	9.17	6.6	3.49	47.5	6.31
4.0	2.99	65.7	8.84	6.7	3.49	45.4	6.02

Table 3.3-2. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014 (completed)

Upper Exeter Lake, April 1, 2014

Ice Thickness (m): 2.20							
Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
2.1	0.28	107.2	15.55	6.6	1.68	88.8	12.38
2.6	0.57	108.5	15.62	7.1	1.74	87.3	12.16
3.1	0.89	108.0	15.40	7.6	1.81	85.7	11.91
3.6	1.15	105.7	14.96	8.0	1.88	83.8	11.62
4.2	1.32	102.4	14.42	8.4	1.95	81.6	11.31
4.7	1.44	99.2	13.93	8.9	2.00	79.6	11.00
5.2	1.52	96.3	13.49	9.1	2.03	77.4	10.69
5.6	1.58	93.9	13.14	9.2	2.04	74.6	10.31
5.9	1.62	91.9	12.85	9.3	2.04	73.4	10.14
6.2	1.65	90.2	12.59				

Table 3.3-3. Secchi Depths and Estimated Euphotic Zone Depths at AEMP Lake Sites, August 2014

Lake	Date	Secchi Depth (m)	Light Attenuation Coefficient (k)	Estimated Euphotic Depth[1] (m)	Maximum Depth (m)
Nanuq	5-Aug-14	6.7	3.9	18.0	28.4
Counts	9-Aug-14	4.9	2.9	bottom	10.8
Vulture	3-Aug-14	7.6	4.5	20.6	38.9
Grizzly	10-Aug-14	5.0	2.9	13.4	40.2
Kodiak	29-Jul-14	4.2	2.4	11.2	14
Leslie	31-Jul-14	5.3	3.1	bottom	12.0
Moose	31-Jul-14	3.1	1.8	8.5	9.5
Nema	2-Aug-14	3.3	1.9	8.8	9.5
Slipper	4-Aug-14	2.6	1.5	7.1	14.7
S2	30-Jul-14	bottom	-	bottom	5.1
S3	30-Jul-14	4.8	2.8	12.9	13.2
Cujo	7-Aug-14	3.3	1.9	bottom	5.7
LdS2	1-Aug-14	bottom	-	bottom	2.1
LdS1	10-Aug-14	6.1	3.6	bottom	7.4
Fay Bay	8-Aug-14	3.5	2.1	bottom	6.8
Upper Exeter	8-Aug-14	6.6	3.9	bottom	9.4

[1] *Euphotic zone depth is defined as the depth to which 1% of surface irradiance penetrates.*

Table 3.3-4. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, August 2014

Nanuq Lake, August 5, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	13.8	96.4	9.98	14.0	11.4	97.7	10.68
1.0	13.8	97.0	10.05	15.0	10.8	95.5	10.58
2.0	13.8	97.4	10.08	16.0	10.2	94.8	10.65
3.0	13.8	97.6	10.10	17.0	9.2	94.8	10.91
4.0	13.8	97.6	10.10	18.0	8.2	96.3	11.34
5.0	13.8	97.5	10.09	19.0	7.7	96.0	11.45
6.0	13.8	97.5	10.09	20.0	6.8	96.1	11.72
7.0	13.8	97.5	10.09	21.0	6.5	95.5	11.74
8.0	13.8	97.4	10.09	22.0	6.4	95.3	11.75
9.0	13.8	97.2	10.09	23.0	6.2	94.9	11.76
10.0	13.8	97.1	10.09	24.0	6.1	94.8	11.78
11.0	13.8	97.1	10.05	25.0	6.1	94.7	11.76
12.0	13.1	97.2	10.21	26.0	6.0	93.8	11.68
13.0	12.3	96.8	10.39				

Count Lake, August 9, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	13.3	96.3	10.06	6.0	13.2	95.5	10.02
1.0	13.3	96.4	10.08	7.0	13.2	95.3	10.00
2.0	13.3	96.4	10.09	8.0	13.2	95.1	9.98
3.0	13.3	96.3	10.08	9.0	13.1	95.1	9.99
4.0	13.3	96.1	10.07	10.0	13.1	93.1	9.80
5.0	13.2	95.9	10.05				

Vulture Lake, August 3, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	13.0	97.0	10.22	7.0	12.8	97.5	10.33
1.0	12.9	98.6	10.40	8.0	12.8	97.3	10.32
2.0	12.9	98.3	10.37	9.0	12.7	97.3	10.31
3.0	12.1	98.1	10.36	10.0	12.7	97.1	10.30
4.0	12.9	98.0	10.36	11.0	12.7	96.9	10.29
5.0	12.9	97.9	10.35	12.0	12.6	96.6	10.27
6.0	12.9	97.8	10.34	13.0	10.9	97.3	10.77

(continued)

Table 3.3-4. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, August 2014 (continued)

Vulture Lake, August 3, 2014 (completed)

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
14.0	9.5	98.5	11.26	25.0	6.0	98.2	12.21
15.0	8.5	98.8	11.58	26.0	6.0	98.0	12.19
16.0	7.7	99.9	11.93	27.0	6.0	97.7	12.16
17.0	7.2	99.8	12.06	28.0	5.9	97.5	12.16
18.0	6.9	99.8	12.17	29.0	5.9	97.2	12.13
19.0	6.6	99.5	12.20	30.0	5.9	97.1	12.13
20.0	6.4	99.3	12.23	31.0	5.9	97.1	12.12
21.0	6.3	99.1	12.25	32.0	5.9	97.0	12.10
22.0	6.2	99.0	12.26	33.0	5.9	96.9	12.10
23.0	6.2	98.9	12.26	34.0	5.9	96.8	12.08
24.0	6.1	98.5	12.24	35.0	5.9	96.7	12.06

Grizzly Lake, August 10, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	12.9	97.5	10.29	21.0	4.6	92.7	11.98
1.0	12.9	97.5	10.29	22.0	4.5	92.5	11.96
2.0	12.9	97.4	10.28	23.0	4.5	92.0	11.90
3.0	12.9	97.3	10.28	24.0	4.4	91.3	11.83
4.0	12.8	97.1	10.28	25.0	4.4	90.5	11.75
5.0	12.8	97.0	10.28	26.0	4.4	89.9	11.66
6.0	12.7	96.9	10.26	27.0	4.4	89.3	11.59
7.0	12.7	96.8	10.25	28.0	4.4	88.5	11.50
8.0	12.4	96.1	10.26	29.0	4.4	88.2	11.46
9.0	11.4	95.9	10.46	30.0	4.3	87.4	11.37
10.0	6.8	94.6	11.48	31.0	4.3	86.6	11.26
11.0	6.1	96.4	11.99	32.0	4.3	86.1	11.20
12.0	5.4	95.8	12.09	33.0	4.3	85.3	11.10
13.0	5.2	95.0	12.13	34.0	4.3	84.3	10.98
14.0	5.0	95.1	12.13	35.0	4.3	83.6	10.89
15.0	4.9	94.7	12.12	36.0	4.3	82.8	10.78
16.0	4.9	94.4	12.10	37.0	4.3	82.0	10.68
17.0	4.8	93.8	12.05	38.0	4.3	81.4	10.62
18.0	4.7	93.6	12.03	39.0	4.4	79.7	10.34
19.0	4.7	93.3	12.02	40.0	4.4	78.5	10.19
20.0	4.6	93.0	12.01				

Table 3.3-4. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, August 2014 (continued)

Kodiak Lake, July 29, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	20.7	102.4	9.19	6.0	13.5	90.5	9.40
0.5	20.5	102.2	9.21	6.5	13.3	87.1	9.13
1.0	20.4	102.0	9.20	7.0	13.1	83.1	8.77
1.5	20.2	101.5	9.20	7.5	12.9	81.2	8.56
2.0	20.2	101.2	9.17	8.0	12.7	79.2	8.40
2.5	19.9	94.7	8.64	8.5	12.6	77.5	8.24
3.0	19.2	100.5	9.29	9.0	12.5	75.6	8.07
3.5	17.7	99.4	9.48	9.5	12.4	73.5	7.88
4.0	16.7	97.0	9.49	10.0	12.2	70.1	7.52
4.5	15.7	93.9	9.32	11.0	12.0	66.7	7.18
5.0	15.0	94.7	9.55	12.0	11.7	60.3	6.55
5.5	14.1	92.2	9.51	13.0	11.6	57.8	6.29

Leslie Lake, July 31, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	17.7	96.8	9.20	5.5	15.6	104.8	10.60
0.5	17.9	96.5	9.16	6.0	14.1	104.7	10.77
1.0	18.0	96.6	9.15	6.5	13.8	102.7	10.67
1.5	18.0	96.5	9.13	7.0	13.5	101.5	10.62
2.0	18.1	96.7	9.14	7.5	13.0	98.5	10.45
2.5	18.1	96.7	9.14	8.0	11.5	99.8	10.82
3.0	18.1	96.7	9.14	8.5	8.6	127.6	14.85
3.5	18.1	96.8	9.14	9.0	8.2	120.5	14.84
4.0	17.0	101.8	9.84	9.5	5.9	118.2	14.73
4.5	16.8	102.8	10.00	10.0	5.1	115.6	14.72
5.0	16.1	105.8	10.39	11.0	4.7	110.2	14.19

Table 3.3-4. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, August 2014 (continued)

Moose Lake, July 31, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	17.4	98.0	9.38	4.5	12.6	105.0	11.17
0.5	17.4	98.0	9.37	5.0	11.0	102.1	11.04
1.0	17.4	97.8	9.38	5.5	8.8	118.1	13.46
1.5	17.4	97.8	9.36	6.0	7.3	133.1	15.94
2.0	17.2	98.3	9.43	6.5	6.1	133.7	16.42
2.5	17.1	98.9	9.53	7.0	5.1	130.8	16.59
3.0	16.9	99.5	9.60	7.5	4.4	124.2	16.05
3.5	14.9	107.4	10.70	8.0	4.2	114.2	14.87
4.0	13.6	105.7	10.97	8.5	4.2	107.0	14.18

Nema Lake, August 2, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	14.8	95.9	9.72	4.5	14.7	95.3	9.68
0.5	14.8	96.0	9.72	5.0	14.7	95.2	9.67
1.0	14.8	95.8	9.71	5.5	14.7	95.2	9.66
1.5	14.8	95.8	9.71	6.0	14.7	95.1	9.66
2.0	14.8	95.8	9.71	6.5	14.7	95.0	9.65
2.5	14.8	95.8	9.70	7.0	14.6	94.6	9.62
3.0	14.8	95.7	9.69	7.5	14.5	93.2	9.53
3.5	14.8	95.7	9.69	8.0	14.3	90.3	9.22
4.0	14.7	95.4	9.68	8.5	14.0	86.6	8.85

Slipper Lake, August 4, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	15.0	97.0	9.76	8.0	13.0	76.4	8.30
1.0	15.0	97.4	9.81	9.0	8.3	74.9	8.75
2.0	15.0	97.3	9.82	10.0	5.9	72.9	9.07
3.0	14.9	97.5	9.83	11.0	5.3	70.8	8.95
4.0	14.9	97.4	9.83	12.0	5.1	69.8	8.88
5.0	14.9	97.2	9.82	13.0	4.9	68.4	8.75
6.0	14.9	97.0	9.81	14.0	4.8	65.3	8.40
7.0	14.8	96.2	9.73				

Table 3.3-4. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, August 2014 (continued)

S2, July 30, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	17.8	107.3	10.20	2.5	14.9	107.5	10.75
0.5	17.8	107.4	10.20	3.0	12.5	110.4	11.76
1.0	17.8	107.5	10.22	3.5	11.6	109.0	11.88
1.5	17.8	107.5	10.22	4.0	11.3	107.9	11.79
2.0	17.7	107.5	10.23	4.5	11.0	108.6	11.95

S3, July 30, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	17.7	106.4	10.14	6.0	10.3	104.8	11.79
0.5	17.6	106.5	10.16	6.5	9.8	104.6	11.89
1.0	17.6	106.5	10.17	7.0	9.1	103.8	11.97
1.5	17.5	106.6	10.18	7.5	8.8	103.1	11.97
2.0	17.3	107.1	10.25	8.0	8.4	102.6	12.02
2.5	14.2	108.5	11.17	8.5	8.4	102.3	12.00
3.0	13.3	108.4	11.38	9.0	8.2	101.9	12.02
3.5	12.5	108.4	11.57	9.5	8.2	101.7	11.99
4.0	12.4	108.8	11.63	10.0	8.1	101.4	11.97
5.0	11.1	106.8	11.70	11.0	8.0	101.0	11.96
5.5	10.8	105.6	11.73	12.0	8.0	100.8	11.93

Cujo Lake, August 7, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	12.4	94.5	10.08	3.0	12.6	95.8	10.18
0.5	12.5	94.9	10.11	3.5	12.6	95.8	10.18
1.0	12.5	95.2	10.14	4.0	12.6	95.8	10.19
1.5	12.5	95.4	10.17	4.5	12.6	95.9	10.19
2.0	12.5	95.6	10.19	5.0	12.5	96.2	10.25
2.5	12.5	95.6	10.19	5.5	12.5	96.3	10.26

Table 3.3-4. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, August 2014 (continued)

LdS2, August 8, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	10.7	95.5	10.61	1.0	10.6	95.0	10.57
0.5	10.7	95.2	10.58	1.5	10.6	95.0	10.57

LdS1, August 8, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	12.2	97.1	10.40	4.0	12.2	96.7	10.37
0.5	12.2	97.0	10.40	4.5	12.1	96.6	10.37
1.0	12.2	96.9	10.40	5.0	12.2	96.4	10.36
1.5	12.2	96.9	10.40	5.5	12.1	96.5	10.36
2.0	12.2	96.9	10.39	6.0	12.1	96.3	10.35
2.5	12.2	96.7	10.38	6.5	12.1	96.3	10.35
3.0	12.2	96.7	10.37	7.0	12.1	96.3	10.36
3.5	12.2	96.6	10.37				

Fay Bay, July 3, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	17.7	98.4	9.37	2.7	16.8	96.4	9.35
0.1	17.7	98.5	9.38	3.0	16.7	95.7	9.30
0.3	17.7	98.6	9.39	3.4	16.2	94.7	9.30
0.5	17.7	98.6	9.39	3.8	15.7	94.5	9.39
0.7	17.7	98.5	9.39	4.1	15.3	94.5	9.47
0.8	17.6	98.4	9.39	4.4	15.0	94.3	9.50
0.9	17.6	98.5	9.40	4.8	14.9	94.3	9.52
1.0	17.6	98.5	9.41	5.0	14.8	94.1	9.52
1.1	17.5	98.6	9.42	5.3	14.8	93.9	9.52
1.2	17.5	98.5	9.42	5.6	14.7	93.8	9.52
1.5	17.4	98.2	9.42	5.9	14.6	93.2	9.48
1.7	17.3	98.2	9.44	6.2	14.5	92.6	9.43
1.9	17.2	98.0	9.43	6.4	14.4	91.7	9.37
2.1	17.1	97.9	9.44	6.6	14.3	90.9	9.30
2.3	17.0	97.5	9.41	6.7	14.3	90.3	9.25
2.4	16.9	97.1	9.39	6.8	14.2	89.2	9.15
2.6	16.9	96.7	9.37				

Table 3.3-4. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, August 2014 (continued)

Fay Bay, August 1, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	15.3	94.1	9.42	3.5	15.5	93.5	9.32
0.5	15.4	94.0	9.40	4.0	15.5	93.5	9.33
1.0	15.4	93.9	9.39	4.5	15.5	93.5	9.33
1.5	15.4	93.8	9.37	5.0	15.5	93.5	9.32
2.0	15.4	93.7	9.36	5.5	15.4	93.6	9.36
2.5	15.4	93.7	9.37	6.0	15.3	93.7	9.40
3.0	15.5	93.6	9.34	6.5	15.2	94.0	9.45

Fay Bay, August 31, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.1	9.91	93.6	10.59	2.4	9.89	94.0	10.64
0.2	9.90	94.1	10.64	2.5	9.88	94.0	10.64
0.3	9.89	94.0	10.64	2.6	9.88	94.0	10.64
0.4	9.89	94.0	10.64	2.7	9.88	94.0	10.64
0.5	9.89	94.0	10.64	2.8	9.88	94.0	10.64
0.6	9.90	94.1	10.64	2.9	9.88	93.9	10.63
0.7	9.90	94.1	10.64	3.0	9.88	93.9	10.63
0.8	9.90	94.1	10.64	3.1	9.87	93.9	10.63
0.9	9.91	94.1	10.64	3.2	9.87	93.9	10.63
1.0	9.91	94.1	10.64	3.3	9.87	93.9	10.63
1.1	9.91	94.1	10.64	3.4	9.87	93.9	10.63
1.2	9.90	94.1	10.64	3.5	9.87	93.9	10.63
1.3	9.90	94.0	10.64	3.6	9.87	93.9	10.63
1.4	9.89	94.0	10.64	3.7	9.87	93.8	10.62
1.5	9.88	94.0	10.64	3.8	9.88	93.8	10.62
1.6	9.88	94.0	10.64	3.9	9.88	93.8	10.62
1.7	9.87	94.0	10.64	4.0	9.88	93.8	10.62
1.8	9.87	94.0	10.64	4.1	9.88	93.8	10.62
1.9	9.87	94.0	10.64	4.2	9.88	93.8	10.62
2.0	9.88	94.0	10.64	4.3	9.88	93.8	10.62
2.1	9.88	94.0	10.64	4.4	9.88	93.8	10.62
2.2	9.88	94.0	10.64	4.5	9.88	93.8	10.62
2.3	9.89	94.0	10.64	4.6	9.88	93.8	10.62

(continued)

Table 3.3-4. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, August 2014 (continued)

Fay Bay, August 31, 2014 (completed)

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
4.7	9.87	93.7	10.61	5.8	9.87	93.6	10.6
4.8	9.87	93.7	10.61	5.9	9.87	93.6	10.6
4.9	9.87	93.7	10.61	6.0	9.87	93.6	10.6
5.0	9.87	93.7	10.61	6.1	9.87	93.6	10.6
5.1	9.87	93.7	10.61	6.2	9.87	93.6	10.6
5.2	9.87	93.7	10.61	6.3	9.86	93.5	10.59
5.3	9.87	93.7	10.61	6.4	9.86	93.4	10.58
5.4	9.87	93.7	10.6	6.5	9.86	86.1	9.75
5.5	9.87	93.6	10.6	6.6	9.87	85.3	9.66
5.6	9.87	93.6	10.6	6.7	9.87	74.4	8.42
5.7	9.87	93.6	10.6	6.8	9.87	68.3	7.73

Upper Exeter, July 3, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	15.5	100.6	10.03	3.4	9.9	101.6	11.49
0.0	15.4	108.3	10.82	3.5	9.8	101.2	11.49
0.1	15.2	107.4	10.78	3.7	9.6	100.9	11.50
0.4	14.6	106.8	10.86	3.9	9.5	101.0	11.53
0.8	14.2	106.6	10.93	4.1	9.5	101.2	11.56
1.0	14.0	106.3	10.96	4.3	9.5	101.4	11.59
1.1	13.7	106.1	11.01	4.5	9.4	101.3	11.59
1.3	13.5	105.9	11.03	4.7	9.3	101.0	11.59
1.5	13.4	105.9	11.05	4.9	9.1	100.8	11.62
1.6	13.4	105.8	11.06	5.1	8.9	100.9	11.69
1.7	13.3	106.0	11.08	5.4	8.8	101.1	11.75
1.9	13.3	105.8	11.08	5.5	8.7	101.2	11.77
2.1	13.2	105.8	11.09	5.7	8.7	101.2	11.78
2.3	13.1	105.6	11.10	5.9	8.7	101.1	11.78
2.6	13.0	105.4	11.11	6.2	8.6	100.9	11.77
2.9	12.7	104.4	11.08	6.5	8.5	100.6	11.78
3.1	11.9	103.6	11.19	6.8	8.3	100.7	11.84
3.2	10.5	102.5	11.45	7.2	8.2	100.9	11.89

(continued)

Table 3.3-4. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, August 2014 (continued)

Upper Exeter, July 3, 2014 (completed)

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
7.5	8.2	100.9	11.89	8.6	8.0	101.0	11.96
7.8	8.1	100.9	11.90	8.9	8.0	100.9	11.96
8.1	8.1	100.8	11.92	9.1	8.0	101.0	11.97
8.4	8.0	100.8	11.94	9.3	8.0	101.0	11.96

Upper Exeter, August 10, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	13.3	95.9	9.98	5.0	13.3	95.0	9.95
0.5	13.3	95.7	10.01	5.5	13.3	95.0	9.95
1.0	13.3	95.8	10.01	6.0	13.3	94.9	9.93
1.5	13.4	95.8	10.01	6.5	13.3	95.0	9.94
2.0	13.4	95.7	10.00	7.0	13.3	94.9	9.93
2.5	13.4	95.6	10.00	7.5	13.3	94.8	9.93
3.0	13.3	95.6	9.99	8.0	13.3	94.7	9.91
3.5	13.3	95.4	9.98	8.5	13.3	94.6	9.91
4.0	13.3	95.3	9.97	9.0	13.3	94.5	9.91
4.5	13.3	95.1	9.95				

Upper Exeter, August 31, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.1	10.83	94.2	10.43	2.1	10.80	94.0	10.41
0.2	10.84	94.2	10.43	2.9	10.80	94.0	10.41
1.1	10.84	94.2	10.42	3.0	10.80	93.9	10.41
1.2	10.84	94.2	10.42	3.1	10.79	93.9	10.41
1.3	10.83	94.1	10.42	3.2	10.79	93.9	10.41
1.5	10.83	94.1	10.42	3.3	10.79	93.9	10.41
1.6	10.83	94.1	10.42	3.4	10.77	93.9	10.40
1.7	10.82	94.1	10.42	3.5	10.76	93.8	10.40
1.8	10.82	94.0	10.41	3.6	10.75	93.8	10.40
1.9	10.81	94.0	10.41	3.7	10.75	93.8	10.40
2.0	10.81	94.0	10.41	3.8	10.74	93.8	10.40

(continued)

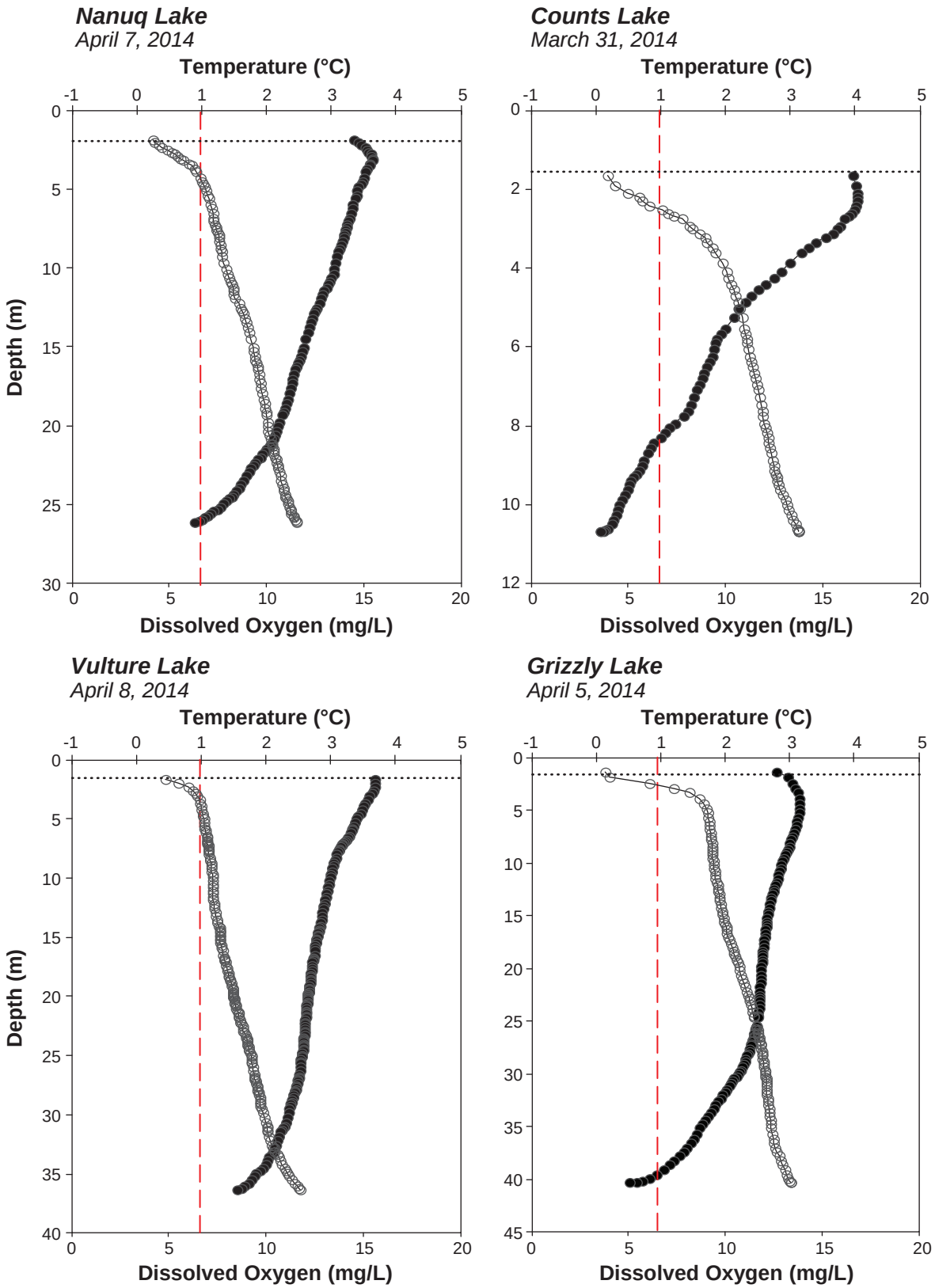
Table 3.3-4. Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, August 2014 (completed)

Upper Exeter, August 31, 2014 (completed)

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
4.6	10.74	93.8	10.40	6.5	10.73	93.5	10.38
4.6	10.74	93.7	10.40	7.5	10.73	93.5	10.38
4.7	10.73	93.7	10.40	7.6	10.72	93.5	10.38
4.8	10.73	93.7	10.40	7.9	10.72	93.5	10.38
4.9	10.73	93.7	10.40	8.0	10.71	93.4	10.37
5.0	10.72	93.7	10.40	8.1	10.71	93.4	10.37
5.1	10.72	93.7	10.40	8.2	10.71	93.4	10.37
5.2	10.72	93.7	10.40	8.3	10.70	93.4	10.37
6.0	10.73	93.7	10.39	8.4	10.70	93.4	10.37
6.1	10.73	93.7	10.39	8.5	10.70	93.3	10.37
6.2	10.73	93.6	10.39	8.6	10.70	93.3	10.37
6.3	10.73	93.6	10.39	9.4	10.70	93.3	10.36
6.4	10.73	93.6	10.38	9.5	10.70	92.6	10.28

Figure 3.3-1a

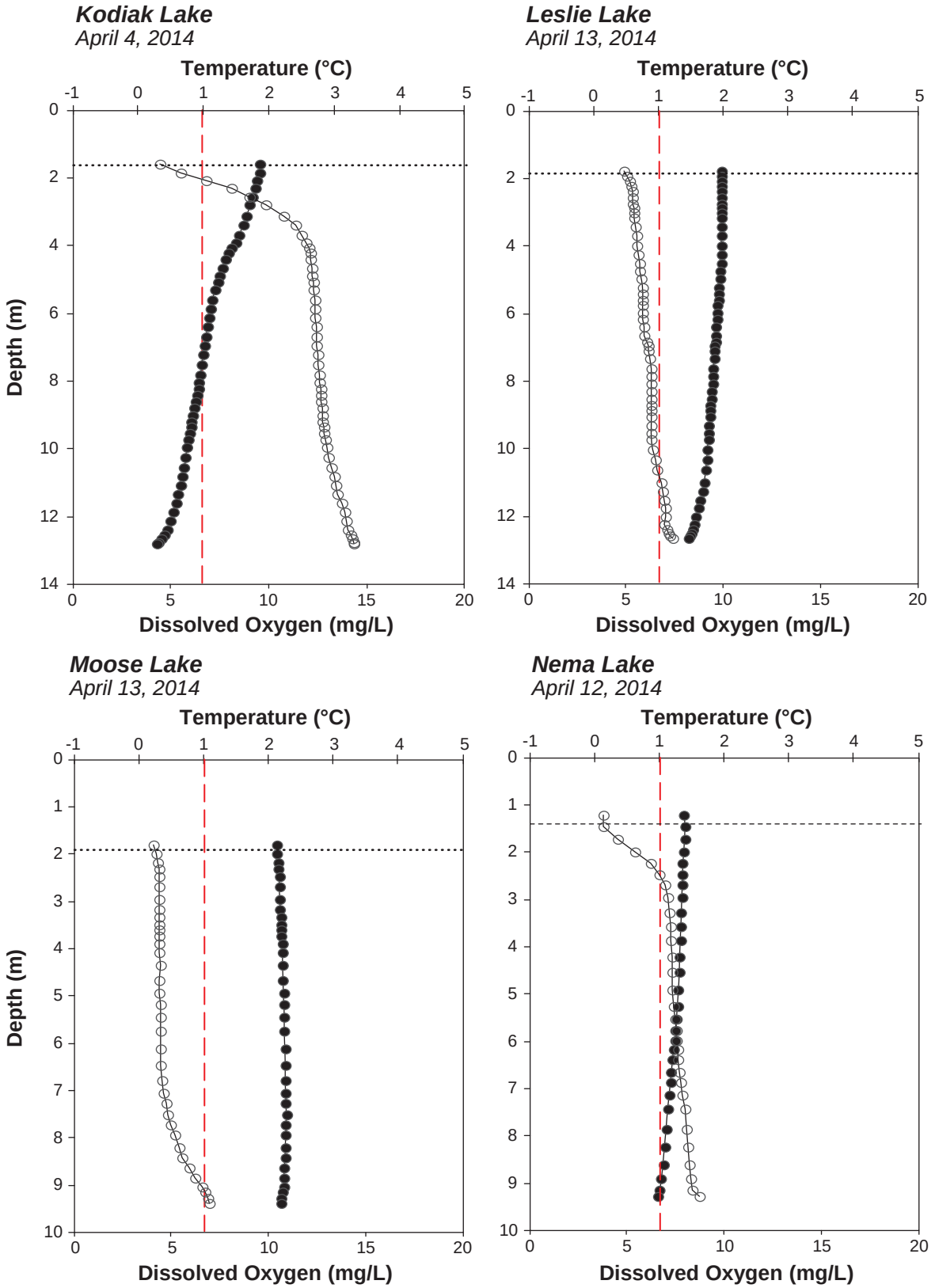
Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014



Notes: Horizontal dotted line represents ice thickness.
Vertical dashed line represents the CCME guideline for dissolved oxygen for non-early life stages (6.5 mg/L).

Figure 3.3-1b

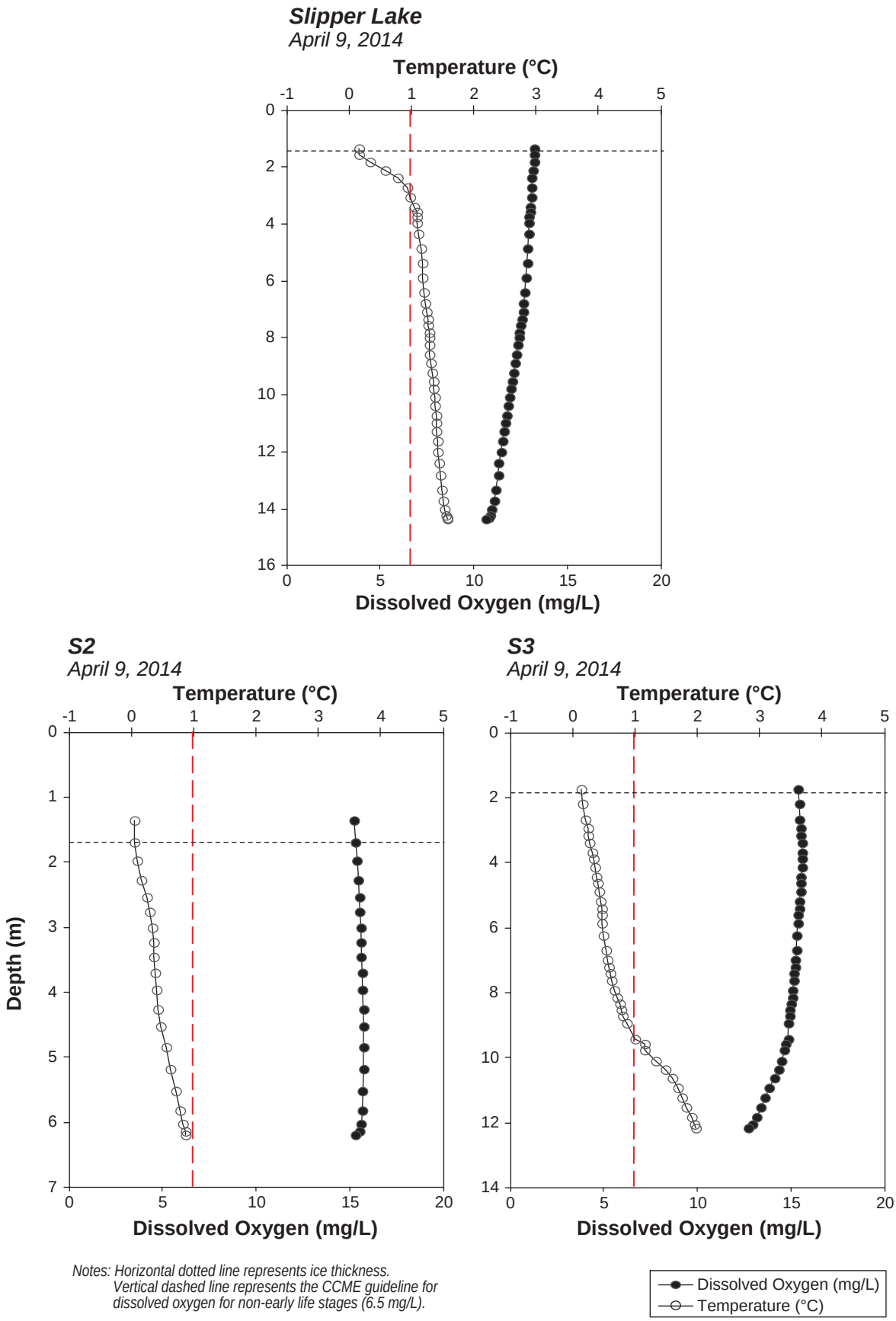
Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014



Notes: Horizontal dotted line represents ice thickness.
Vertical dashed line represents the CCME guideline for dissolved oxygen for non-early life stages (6.5 mg/L).

Figure 3.3-1c

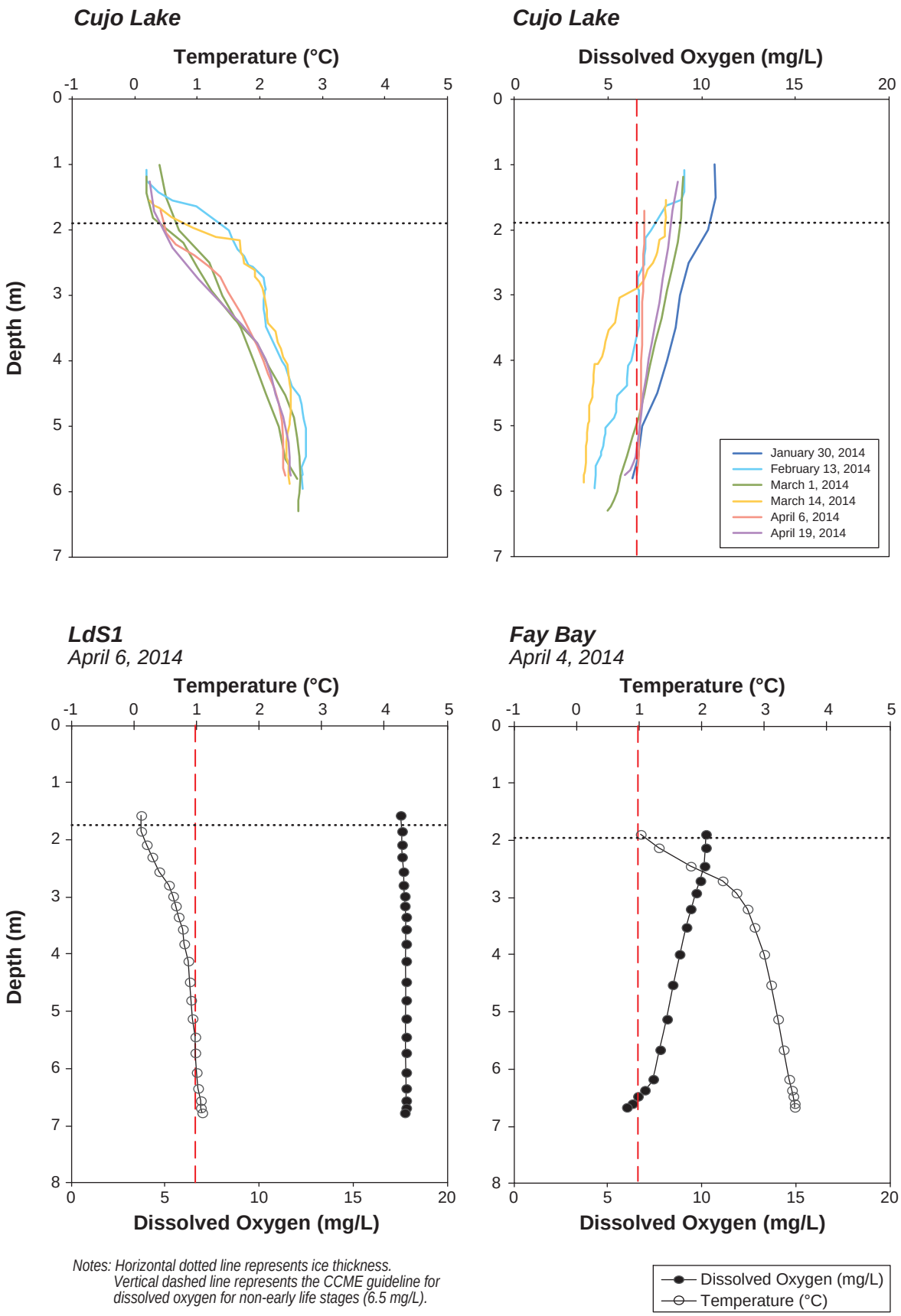
Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014



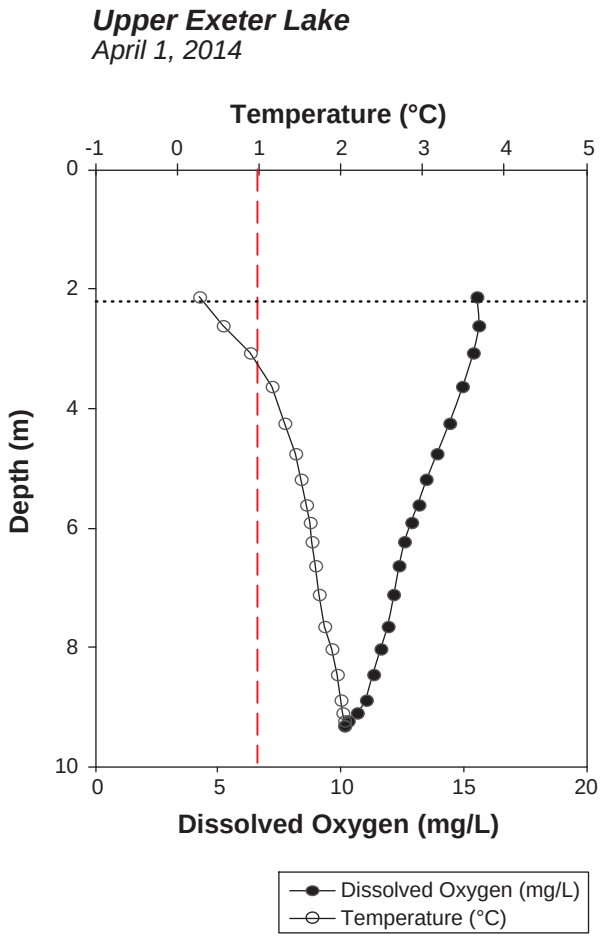
Notes: Horizontal dotted line represents ice thickness.
Vertical dashed line represents the CCME guideline for dissolved oxygen for non-early life stages (6.5 mg/L).

Figure 3.3-1d

Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Under-ice Season 2014



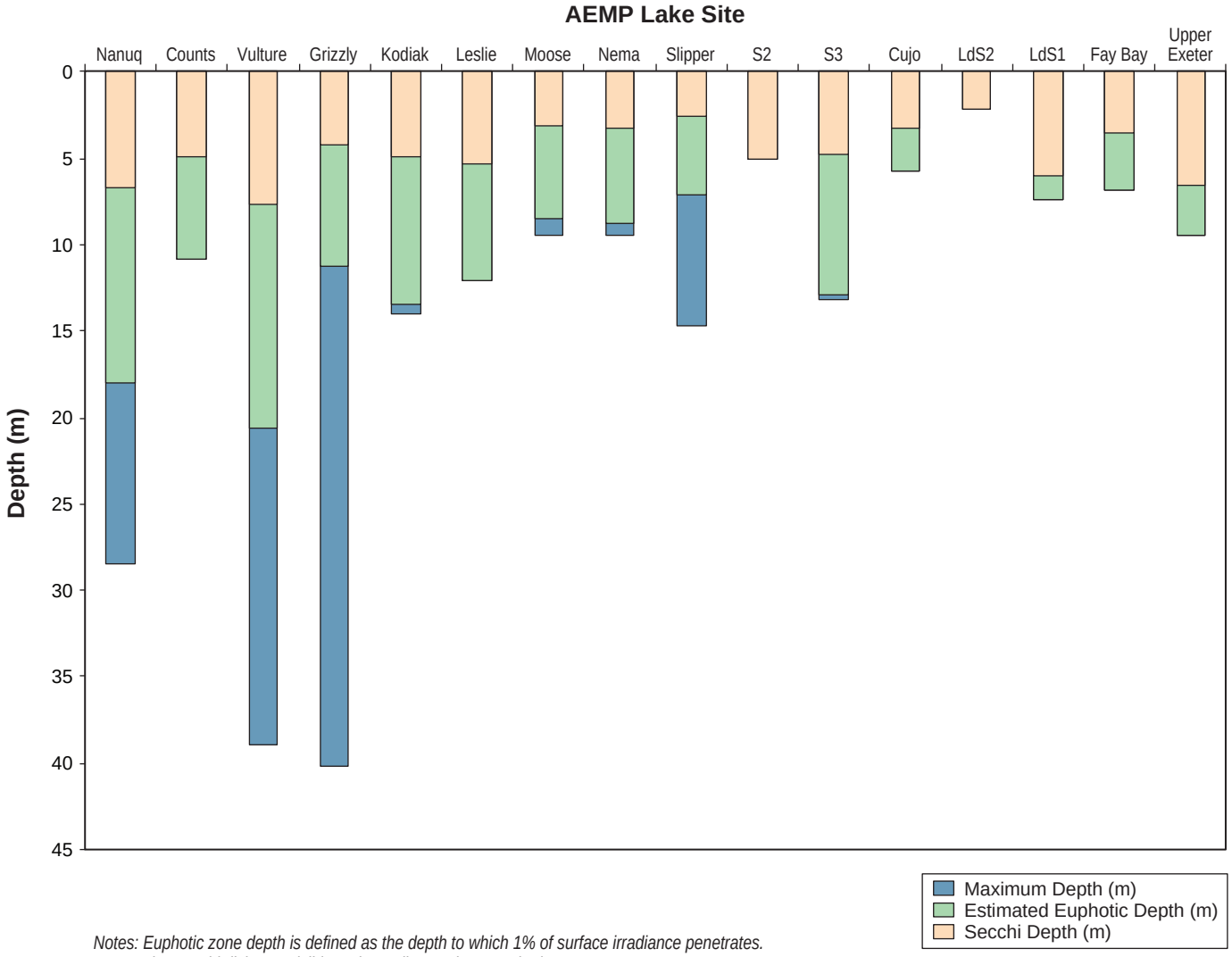
Notes: Horizontal dotted line represents ice thickness.
Vertical dashed line represents the CCME guideline for dissolved oxygen for non-early life stages (6.5 mg/L).



Notes: Horizontal dotted line represents ice thickness.
Vertical dashed line represents the CCME guideline for dissolved oxygen for non-early life stages (6.5 mg/L).

Figure 3.3-2

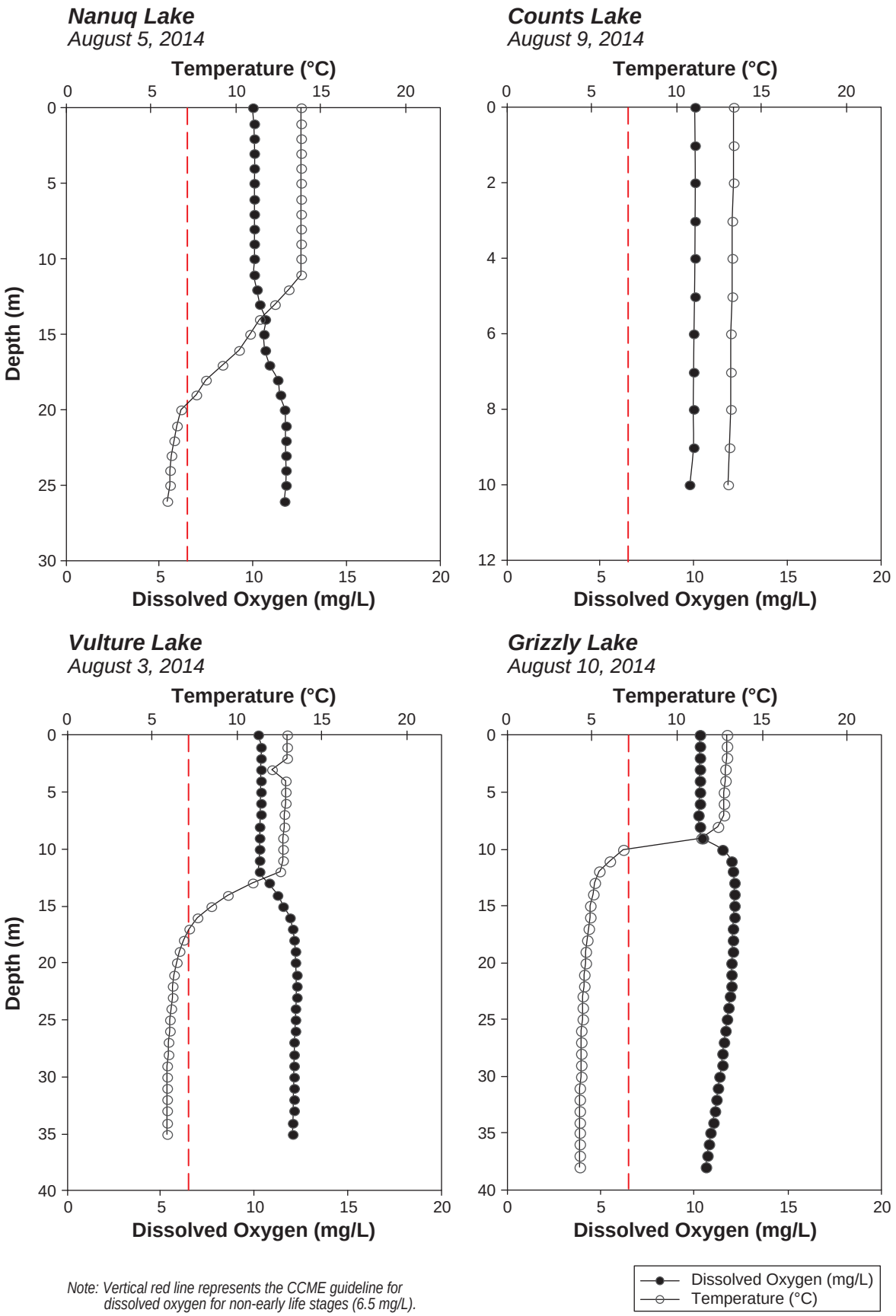
Secchi Depths, Estimated Euphotic Depths, and Maximum Depths at AEMP Lake Sites, 2014



Notes: Euphotic zone depth is defined as the depth to which 1% of surface irradiance penetrates.
The Secchi disk was visible at the sediments in S2 and LdS2.

Figure 3.3-3a

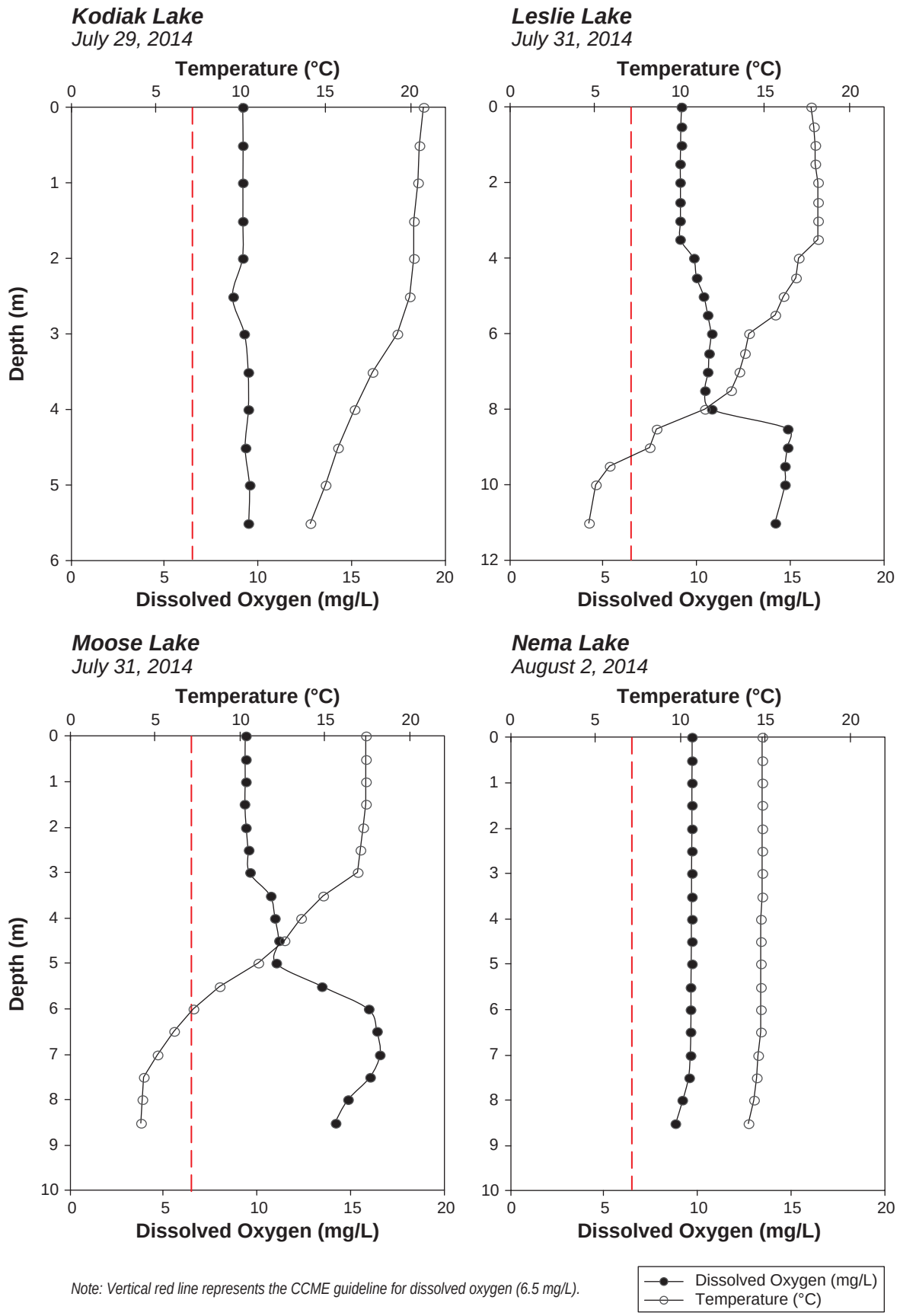
Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Open Water Season 2014



Note: Vertical red line represents the CCME guideline for dissolved oxygen for non-early life stages (6.5 mg/L).

Figure 3.3-3b

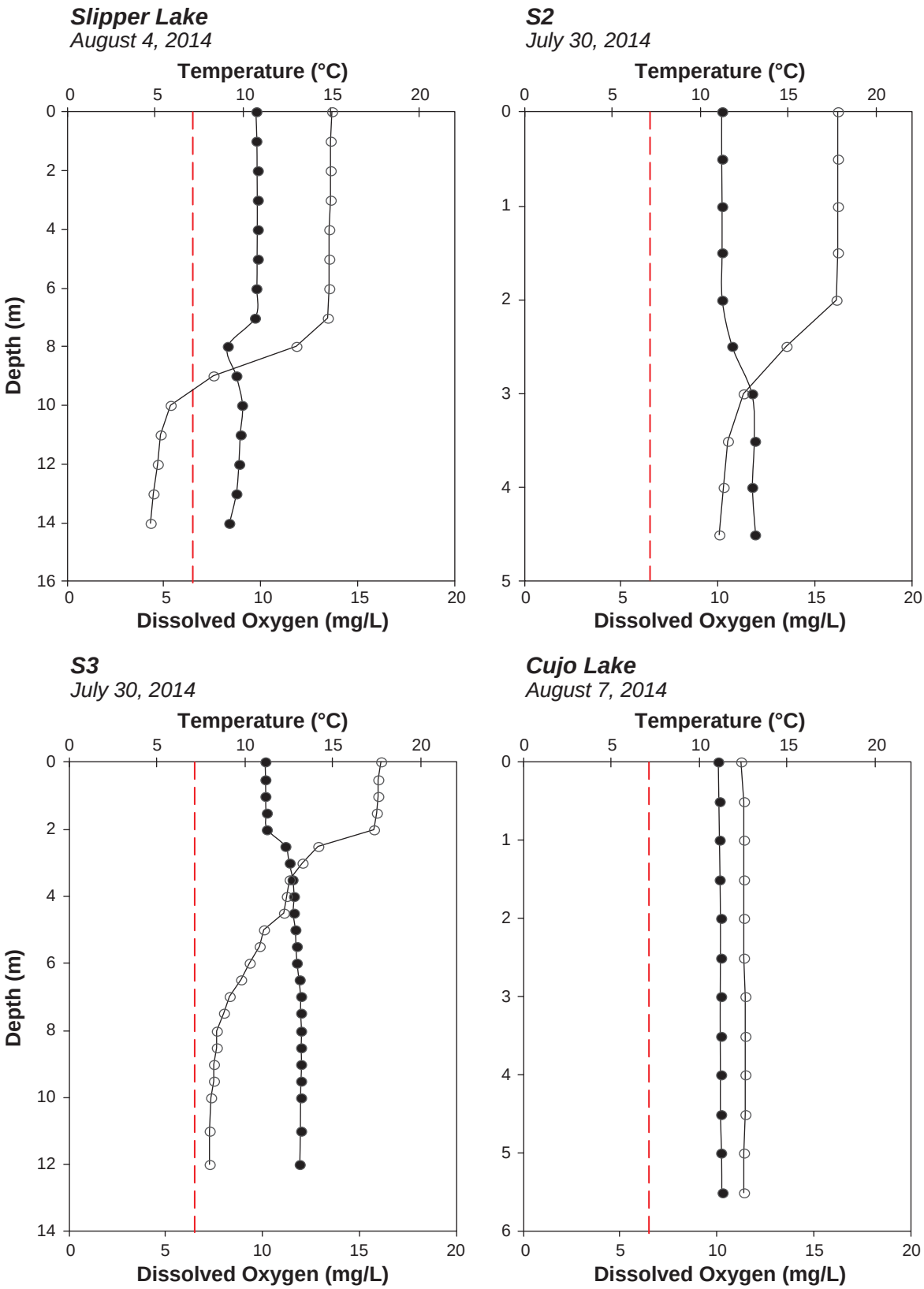
Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Open Water Season 2014



Note: Vertical red line represents the CCME guideline for dissolved oxygen (6.5 mg/L).

Figure 3.3-3c

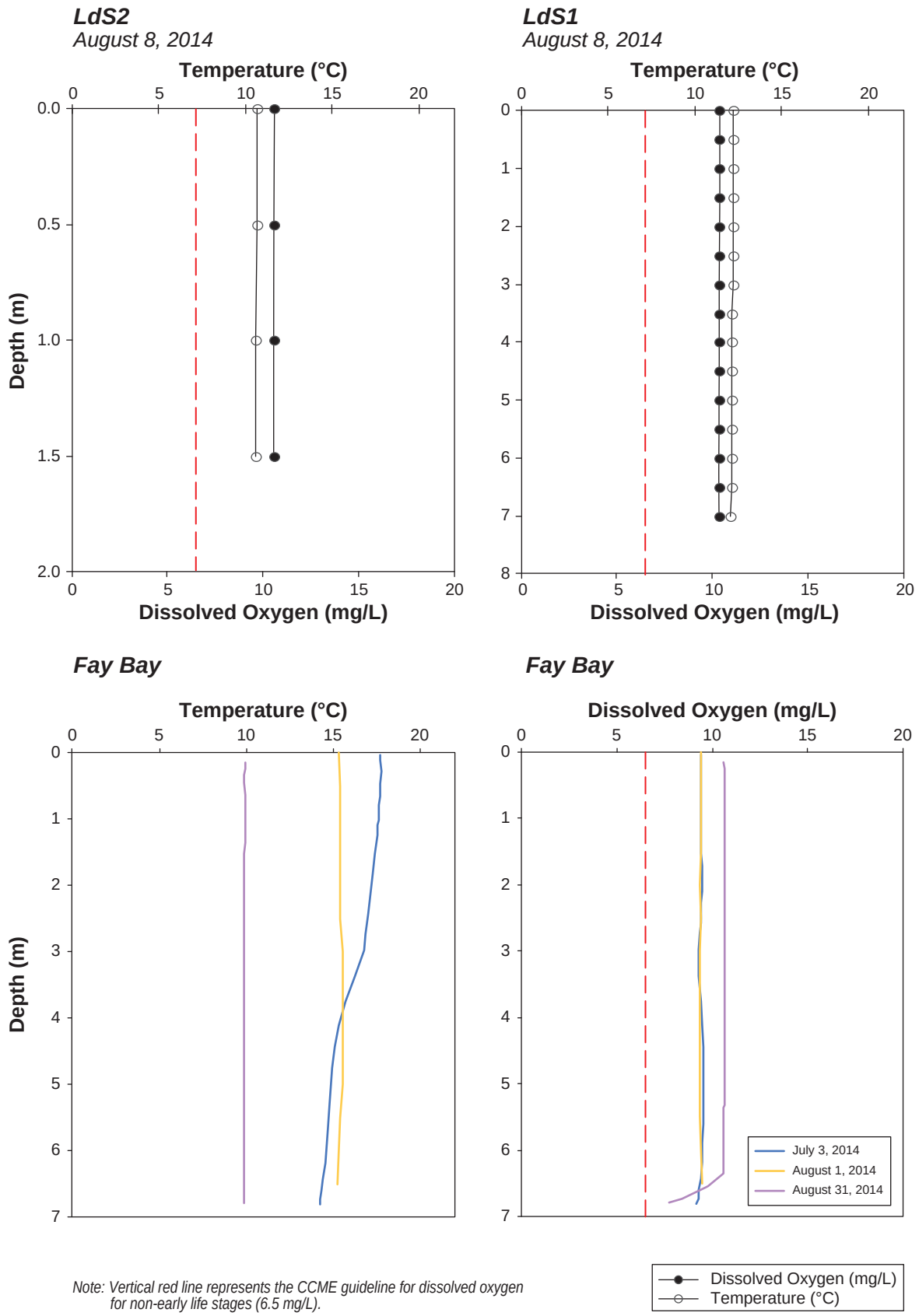
Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Open Water Season 2014



Note: Vertical red line represents the CCME guideline for dissolved oxygen (6.5 mg/L).

Figure 3.3-3d

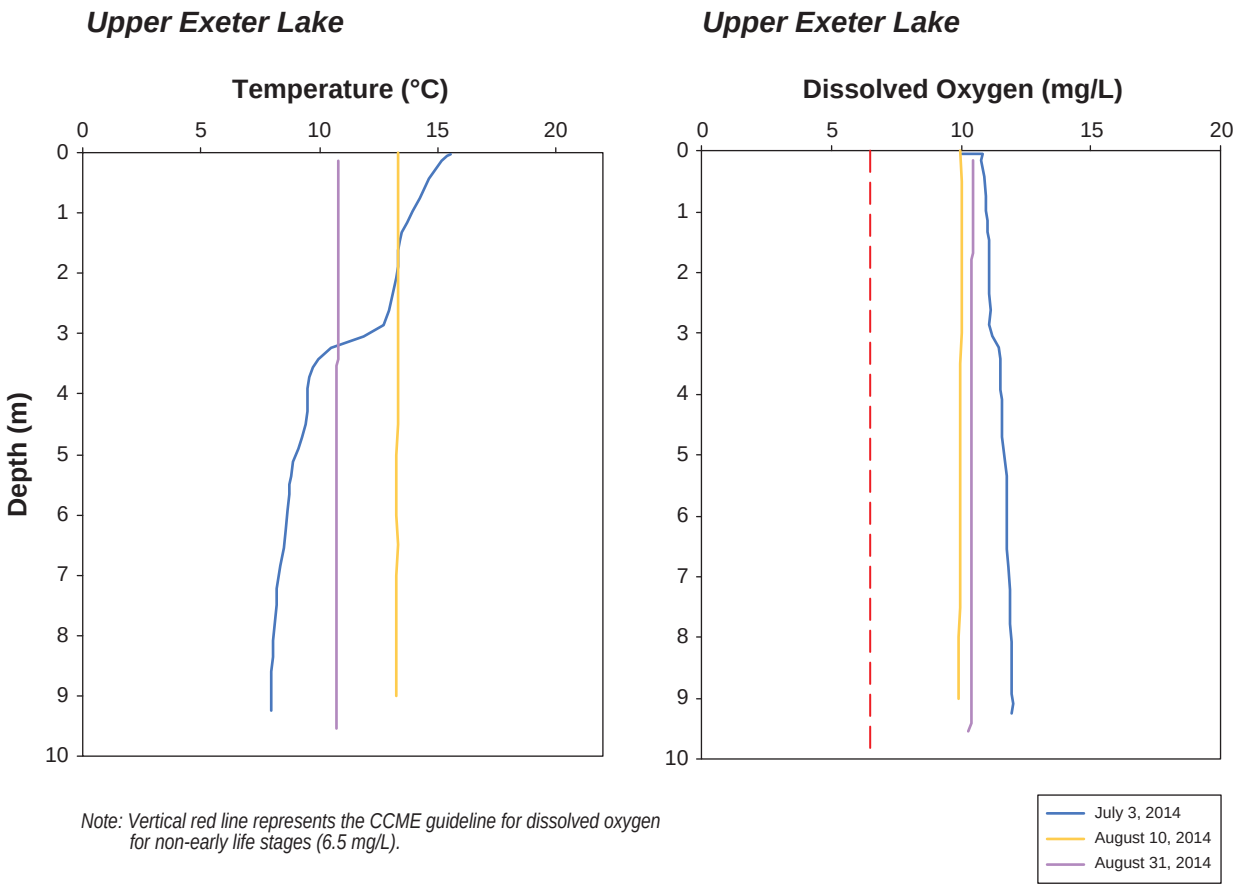
Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Open Water Season 2014



Note: Vertical red line represents the CCME guideline for dissolved oxygen for non-early life stages (6.5 mg/L).

Figure 3.3-3e

Temperature and Dissolved Oxygen Profiles at AEMP Lake Sites, Open Water Season 2014



Note: Vertical red line represents the CCME guideline for dissolved oxygen for non-early life stages (6.5 mg/L).

3.4 WATER QUALITY

3.4.1 Lake Under-ice (April) and Open Water (August) Water Quality

Lake water quality samples were collected from seven lakes within the Koala Watershed including Vulture (an internal reference lake), Grizzly, Kodiak, Leslie, Moose, Nema and Slipper lakes, two sites within Lac de Gras (S2 and S3), one lake within the King-Cujo Watershed (Cujo), two sites within Lac du Sauvage (LdS2 (August only) and LdS1), two sites within the Pigeon-Fay and Upper Exeter Watershed (Fay Bay and Upper Exeter Lake), and two external reference lakes (Nanuq and Counts). Duplicate samples were collected at all AEMP lake sites (excluding LdS2) during the under-ice season in early-April at both the middle of the water column (mid-depth) and 2 m above the water-sediment interface (deep depth; Table 3.4-1). Site LdS2 is not sampled during the under-ice season because of its shallow water depth. Duplicate samples were also collected at all AEMP lake sites during the open water season in early August at both 1 m below the water surface and at mid-depth. Additional duplicate samples were collected at deep depth in Leslie Lake. Duplicate samples at 1 m and mid-depth were also collected in July and September (late August) in Fay Bay and Upper Exeter Lake (Table 3.4-1).

Solutes are typically excluded from lake-ice during formation, thus solute concentrations tend to be greater in under-ice waters when compared to the open water season. Therefore, under-ice water samples collected during late winter are useful because they typically provide the maximums with regard to water chemistry variables. Results of the laboratory analyses for under-ice lake water quality samples are presented in Table 3.4-2.

Open water sampling was conducted in August to coincide with biological sampling (phytoplankton, zooplankton, and benthos), and because historical data collected for the AEMP indicates that August water quality results generally exhibit less year to year variability than other months. Fay Bay and Upper Exeter Lake were also sampled in July and September to capture potential short-term changes in water quality that may have occurred following the opening of the Pigeon Stream Diversion prior to the freshet of 2014. Results of the laboratory analyses for open water season lake water quality samples are presented in Table 3.4-3. A summary of the analytical detection limits achieved for under-ice and open water samples are presented in Tables 3.4-4 and 3.4-5, respectively.

Since many water quality variables are simply concentrated under-ice by solute freeze-out, the spatial trends for under-ice and open water samples tend to be similar, and will be discussed together in the following sections. However, there are some water quality variables (e.g., nutrients) that can be strongly influenced by under-ice processes, which may vary from lake to lake, causing differences in the spatial trends observed. In addition, the volume of the lake plays a significant role in relative solute concentration increases, where lakes with lower water volumes tend to experience greater increases in solute concentrations as a result of solute freeze-out.

3.4.1.1 Lake Physical Variables and Ions

Examination of the evaluated physical variables and ions (pH, alkalinity, hardness, and concentrations of chloride, sulphate, potassium, and TSS) indicated that most variables decreased

with downstream distance of the LLCF to Lac de Gras and with downstream distance of the KPSF to Lac du Sauvage (Figures 3.4-1 to 3.4-6). TSS concentrations did not exhibit a spatial or temporal trend and concentrations were near, or less than, the analytical detection limit of 3 mg/L at all lake sites during under-ice and open water seasons (Figure 3.4-7).

The evaluated physical variables and ions also exhibited greater concentrations during the under-ice sampling in most cases, except for pH, TSS, and for most variables at Lac de Gras (S2; Figures 3.4-1 to 3.4-7). The observed lower pH values under-ice are likely related to reduced primary productivity and no atmospheric exchange of carbon dioxide due to ice-cover. Thus, biological and microbial respiration which causes the release of hydrogen protons (H^+) may cause a decrease in pH. Slipper Lake, Lac de Gras (S2 and S3), Fay Bay, and Upper Exeter were the only sites that did not exhibit lower pH during under-ice sampling (Figure 3.4-1).

Water hardness is important to the interpretation of AEMP results because the CCME guidelines for the protection of aquatic life (CCME 2014b) for total cadmium, total copper, and total nickel; and the SSWQO for chloride, nitrate-N, and sulphate are hardness dependent, meaning toxicity of these variables decreases with increasing hardness (Elphick, Bergh, and Bailey 2011; Rescan 2012c, 2012e). Leslie and Moose lakes had the greatest mean water hardness levels during the under-ice (191 mg/L and 182 mg/L, respectively) and open water (117 mg/L and 65 mg/L, respectively) sampling periods (Figure 3.4-3). Mean water hardness levels at Nema, Slipper and Cujo lakes ranged from 73 mg/L to 180 mg/L during the under-ice sampling period and from 30 mg/L to 68 mg/L during the open water sampling period (Figure 3.4-3). All other lakes had mean hardness levels below 30 mg/L during both the under-ice and open water sampling periods (Figure 3.4-3).

In the Koala Watershed, water quality data indicated that August lake water quality monitoring reflected the effects related to the discharge of effluent from the LLCF, though concentrations of physical variables and ions in Leslie Lake and often in Moose Lake were greater than observed concentrations during much of the open water season at 1616-30 (Figures 3.4-1 to 3.4-7). In the King-Cujo Watershed, water quality data indicated that August lake water quality monitoring sufficiently described the effects related to the discharge of effluent from the KPSF for physical variables and ions, though no water was discharged from the KPSF to the receiving environment in 2014. In the Pigeon-Fay and Upper Exeter Watershed, lake water quality data indicate no apparent effects to physical variables and ions related to the PSD (Figures 3.4-1 to 3.4-7).

3.4.1.2 Lake Nutrients

The relationship between nitrogen species is complex due to mechanisms allowing the oxidation of ammonia to nitrate to nitrite (nitrification) and the reduction of nitrate and nitrite to nitrogen gas (denitrification). Additionally, ammonia is primarily produced through microbial degradation, yet is assimilated by microbes and primary producers. The interaction of these processes makes generalizations about observed patterns difficult; however, concentrations of these variables were generally greater in lakes downstream of the LLCF when compared to reference lakes.

Total ammonia-N concentrations were generally low at AEMP lake sites, although under-ice concentrations were greater than open water, particularly for lakes downstream of the LLCF (Leslie, Nema, and Slipper lakes), KPSF (Cujo Lake) and in Fay Bay (Figure 3.4-8). Nitrate-N and nitrite-N

concentrations were greater at Leslie, Moose, and Nema lakes in both April and August than observed at other AEMP lakes and concentrations decreased with downstream distance from the LLCF. Under-ice nitrate-N concentrations were high in comparison to open water concentrations while under-ice nitrite-N concentrations, when detectable, were typically low in comparison to open water concentrations (Figures 3.4-9 and 3.4-10). Analytical detection limits were variable for both nitrate-N and nitrite-N for both under-ice and open water season samples. Open water nitrite-N concentrations were generally above detection in Leslie, Moose, and Nema lakes during August (Figure 3.4-10).

Mean total phosphate-P concentrations were generally low (less than 0.01 mg/L) except at Moose Lake under-ice and Counts and Cujo lakes during the open water season. Mean total phosphate-P concentrations were slightly lower under-ice than during open water, except in Leslie and Moose Lakes, and Lac du Sauvage (LdS1; Figure 3.4-11). In accordance with Environment Canada (2004a), phosphorus concentrations less than 0.004 mg/L are representative of an ultra-oligotrophic freshwater system, those ranging from 0.004 mg/L to 0.01 mg/L are oligotrophic, and those ranging from 0.01 mg/L to 0.02 mg/L are mesotrophic (Table 2.5-3). Based on these criteria (using annual mean total phosphate-P concentrations) all lakes were oligotrophic or ultra-oligotrophic in 2014.

Total organic carbon (TOC) concentrations varied from mean concentrations of 1.80 mg/L to 9.90 mg/L in April and 2.05 mg/L to 5.91 mg/L in open-water season. There was no clear spatial trend despite concentrations in lakes of the Koala, King-Cujo, and Fay Bay and Upper-Exeter watersheds generally being greater than reference lake concentrations. Excluding the reference lakes and Grizzly Lake, TOC concentrations were greater in April than during the open water season. Mean TOC concentrations in April in Cujo Lake (9.90 mg/L), Fay Bay (7.46 mg/L), Kodiak Lake (7.22 mg/L), and Nema Lake (7.07 mg/L) were relatively high compared to other lakes (Figure 3.4-12).

In the Koala and King-Cujo watersheds, water quality data indicated that August lake water quality monitoring reflected the effects related to the discharge of effluent from the LLCF and KPSF for nutrients, though no water was discharged from the KPSF to the receiving environment in 2014. In the Pigeon-Fay and Upper Exeter Watershed, lake water quality data indicate no apparent effects to nutrient variables related to the PSD (Figures 3.4-8 to 3.4-12).

3.4.1.3 Lake Total Metals

Concentrations of total antimony, total arsenic, total barium, total boron, total molybdenum, total nickel, total selenium, total strontium, total uranium, and total vanadium generally decreased with downstream distance of the LLCF to Lac de Gras (Figures 3.4-13 to 3.4-24). Similar trends occurred downstream of the KPSF to Lac du Sauvage for these variables, except for total antimony and total vanadium which were generally below analytical detection (Figures 3.4-13 to 3.4-24). Total metal concentrations, where detectable, were typically greater in Fay Bay compared to downstream at Upper Exeter Lake. Cadmium concentrations were below analytical detection in all lakes (except a single sample in August in Moose Lake; Figure 3.4-17). Detection limits for cadmium in Leslie, Moose and Nema lakes were higher than all other lakes due to matrix interferences during the analysis of these samples (Tables 3.4-4 and 3.4-5). Matrix interferences are generally caused by other compounds in the water sample that interfere with instrument detection. To remove the interference, samples must be diluted prior to analysis. However, when samples are diluted,

detection limits are increased accordingly. Thus, detection limits are often variable among samples particularly for lakes with higher dissolved compounds such as those directly downstream of the LLCF. There were no clear spatial or temporal trends for total copper concentrations in AEMP lakes, though concentrations were consistently lowest in the reference lakes.

Temporally, concentrations of most metals were higher during the under-ice season when compared to open water (Figures 3.4-13 and 3.4-24). This pattern was most notable at lakes immediately downstream of the LLCF (Leslie, Moose, and Nema) and downstream of the KPSF (Cujo, LdS2, and LdS1), and was less consistent at the remaining monitored and reference lakes where concentrations were often lower and/or below analytical detection. In the Pigeon-Fay and Upper Exeter Watershed concentrations of some metals were highest in April when compared to the open water months, with concentrations gradually increasing from July to September for arsenic and strontium and decreasing from July to September for barium, nickel, and uranium, particularly in Fay Bay. Boron concentrations in Fay Bay and Upper Exeter were notably higher in July than all other sampling dates (Figure 3.4-16).

In the Koala and King-Cujo watersheds, water quality data indicated that August lake water quality monitoring sufficiently described the effects related to the discharge of effluent from the LLCF and KPSF for total metals, though no water was discharged from the KPSF to the receiving environment in 2014. In the Pigeon-Fay and Upper Exeter Watershed, lake water quality data indicate no apparent effects to metals variables related to the PSD (Figures 3.4-13 and 3.4-24).

3.4.2 Stream Water Quality

Stream water quality samples were collected from seven streams within the Koala Watershed including Vulture-Polar (an internal reference stream), the Lower PDC, Kodiak-Little, Leslie-Moose, Moose-Nero, Nema-Martine, and Slipper-Lac de Gras), two streams within the King-Cujo Watershed (Cujo Outflow and Christine-Lac du Sauvage), two streams within the Pigeon-Fay and Upper Exeter Watershed (Pigeon Reach 7 and Pigeon Reach 1), one stream within the Carrie Pond drainage system (Mossing Outflow), and two external reference streams (Nanuq Outflow and Counts Outflow).

Duplicate samples were collected four times during the open water season (at freshet [June], July, August, and September) at each AEMP stream (Table 3.4-1). In addition, samples were collected multiple times throughout the open water season at the LLCF (1616-30) and KPSF (1616-43) and Pigeon Reach 1. Results of water quality laboratory analyses for all stream samples are presented in Table 3.4-6. A summary of the analytical detection limits achieved for these samples is presented in Table 3.4-7.

3.4.2.1 Stream Physical Variables and Ions

Stream water collected during all four sampling periods had pH, alkalinity, hardness, and concentrations of chloride, sulphate, and potassium that generally decreased with downstream distance of the LLCF to Slipper-Lac de Gras and with downstream distance of the KPSF to Christine-Lac du Sauvage (Figures 3.4-1 to 3.4-6). For these six physical variables and ions, values were often slightly greater at Leslie-Moose (July, August, and September) compared to the LLCF and slightly

greater at Nema-Martine (June, July, and August) and Slipper-Lac de Gras (June) compared to Moose-Nero.

Alkalinity, hardness, and concentrations of chloride, sulphate and potassium were for the most part greater in the Koala Watershed, particularly in the stream immediately downstream of the LLCF (Leslie-Moose), when compared to Cujo Outflow (the stream located immediately downstream of the KPSF). For the Carrie Pond drainage system (Mossing Outflow) and Pigeon-Fay and Upper Exeter Watershed (Pigeon Reach 7 and Pigeon Reach 1), concentrations of these variables were generally low, often slightly greater than at reference streams. Concentrations of these physical variables and ions were similar between the reference Pigeon Stream sampling site (Pigeon Reach 7) and downstream Pigeon Reach 1. Concentrations of TSS were low at most sites, and often below the analytical detection limit. At Pigeon Reach 1 concentrations of TSS on June 21 were elevated relative to June 10 samples, samples collected during the other months, and to observed concentrations in reference streams (14.0 mg/L; Figure 3.4-7).

There were no clear temporal trends of pH values. Values were generally greatest in June at the reference stations, Lower PDC and Mossing Outflow but varied at all other sites (Figures 3.4-1). Within, and downstream of, the LLCF and KPSF, alkalinity values generally increased from June to September, but remained low through all months at the reference sites (Figures 3.4-2).

Water hardness and concentrations of chloride, sulphate and potassium were also generally lowest during freshet and increased throughout the open water season, which may be partially driven by evaporative concentration (Figures 3.4-3 to 3.4-6). The increases observed from June to September were most notable at streams downstream of the LLCF and KPSF, while there was less variation at reference streams.

Water hardness is an important water quality variable because it effects the toxicity of some ions and metals (e.g., chloride, sulphate, nitrate, copper, and nickel) thus CCME guidelines and SSWQO for these variables are based on water hardness. Mean water hardness was generally lowest in June at all stream sites (range 3.4 mg/L to 32.3 mg/L) and increased to (range 3.9 mg/L to 99.0 mg/L) by September (Figure 3.4-3).

3.4.2.2 Stream Nutrients

Total ammonia-N concentrations were generally low at all AEMP stream sites, although concentrations were greater just downstream of the LLCF and KPSF compared to reference streams and increased slightly with downstream distance from the LLCF during July, August, and September (Figure 3.4-8). Cujo Outflow in September notably higher average ammonia-N concentration compared to all streams and months (0.1135 mg/L), followed by Mossing Outflow in September (0.3730 mg/L; Figure 3.4-8). Nitrate-N concentrations generally decreased downstream of the LLCF to Slipper-Lac de Gras and downstream of the KPSF to Cujo Outflow, except for September concentrations in Cujo Outflow which were greater compared to the KPSF (Figure 3.4-9). Nitrite-N concentrations also decreased downstream of the LLCF, but were generally below the analytical detection limit downstream of the KPSF (excluding Cujo Outflow in September), in Kodiak-Little, Mossing Outflow, Pigeon Stream, and in reference streams (Figure 3.4-10). Both nitrate-N and nitrite-N concentrations increased from lows at freshet to highs during July, August,

or September in streams downstream of the LLCF. Temporal patterns for nitrate-N and nitrite-N were not evident or as consistent at the remaining streams where concentrations were generally much lower and/or below analytical detection.

Mean total phosphate-P concentrations were low (most concentrations were < 0.010 mg/L) with the exception of some freshet (June) concentrations, August concentrations in Slipper-Lac de Gras, September concentrations in Cujo Outflow, and concentration throughout the open water season in the KPSF at 1616-43. Most concentrations were equivalent to trigger ranges for oligotrophic freshwater systems (0.004 mg/L to 0.01 mg/L), otherwise ultraoligotrophic (< 0.004 mg/L) or mesotrophic (0.01 mg/L to 0.02 mg/L) systems. Phosphate concentrations were generally highest during freshet, except at Slipper-Lac de Gras and Cujo Outflow, where the highest concentrations occurred in August and September, respectively. Concentrations were generally greater in the King-Cujo Watershed, compared to the Koala Watershed and decreased with downstream distance from the KPSF (except Cujo Outflow in September). Phosphate concentrations were similar between Pigeon Reach 7 and Reach 1 (Figure 3.4-11).

TOC concentrations were generally greater in the King-Cujo Watershed and Mossing Outflow compared to the Koala Watershed and reference streams, but did not show any clear temporal trends. AEMP streams had average monthly TOC concentrations ranging from 1.81 mg/L (Nanuq Outflow) to 8.65 mg/L (KPSF; Figure 3.4-12).

3.4.2.3 Stream Total Metals

Concentrations of total antimony, total arsenic, total barium, total boron, total molybdenum, total nickel, total selenium, total strontium, total uranium and total vanadium in streams generally decreased with downstream distance of the LLCF to Slipper-Lac de Gras. Similar trends occurred downstream of the KPSF to Christine-Lac du Sauvage for these variables except total antimony which was consistently below analytical detection downstream of the KPSF (Figures 3.4-13 to 3.4-24). Concentrations of these variables were generally low or below analytical detection in the reference streams, the Lower PDC, Kodiak-Little, Mossing Outflow, and at Pigeon Reach 1.

Cadmium concentrations were generally below analytical detection in most streams (Figure 3.4-17), although analytical detection limits for cadmium in some samples from 1616-30, Leslie-Moose, and Nema-Martine were higher than all other streams due to matrix interferences during the analysis of these samples (Figure 3.4-17).

Typically, spatial trends of total metal concentrations in streams followed similar trends in concentrations in their upstream lake during the August sampling period (Figures 3.4-13 to 3.4-24). For the Carrie Pond drainage system, Mossing Outflow is the only AEMP sampling location and concentrations of total metals at this station, while generally low, were usually greater than at reference streams. Total arsenic concentrations were greater at Mossing Outflow in September (0.00244 mg/L) than all other streams and dates (Figure 3.4-14). Total antimony, total cadmium, and total selenium were consistently below analytical detection in Mossing Outflow, although the detection limit for selenium in Mossing Outflow varied over the open water season (Table 3.4-7). Total metal concentrations were typically similar at Reach 7 and Reach 1 of Pigeon Stream.

Concentrations of total antimony, total barium, total boron, total molybdenum, total selenium, and total strontium were greater in streams downstream of the LLCF in comparison to streams downstream of the KPSF, whereas total arsenic tended to be greater in streams downstream of the KPSF (Figures 3.4-13 to 3.4-24). Total copper and uranium concentrations were similar in and downstream of the LLCF and KPSF, although total copper concentrations were highest in the Lower PDC (Figures 3.4-18 and 3.4-24).

Temporally, total antimony, total arsenic, total barium, total boron, total molybdenum, total selenium, total strontium, and total uranium concentrations generally increased throughout the open water season, although this pattern was not consistently observed at all sites (Figures 3.4-13 to 3.4-16, 3.4-19, and 3.4-21 to 3.4-23). Total copper, total nickel and total vanadium concentrations did not show clear temporal trends but were more often highest during freshet (Figures 3.4-18, 3.4-20, and 3.4-24).

3.4.3 Water Quality Guidelines and Site Specific Water Quality Objectives

3.4.3.1 Lake Water Quality Benchmarks

Observed pH, chloride, sulphate, TSS, ammonia-N, nitrate-N, nitrite-N, total antimony, total arsenic, total barium, total boron, total cadmium, total molybdenum, total nickel, total selenium, total strontium, total uranium, and total vanadium concentrations were less than the applicable benchmark values at all lakes during the under-ice and open water seasons (Table 3.4-8).

Concentrations of potassium in all under-ice samples at Leslie and Moose lakes and in two open water samples at Leslie Lake were greater than the SSWQO for potassium (41 mg/L); concentrations were greater than the SSWQO by factors of 1.36, 1.30, and 0.80, respectively (Table 3.4-8).

Phosphate concentrations were greater than the calculated total phosphate-P benchmark concentrations at Nanuq, Moose, and Cujo lakes, as well as Lac du Sauvage (LdS1) during the under-ice season (Table 3.4-8). In April, three of the four samples at Nanuq Lake, all of the samples at Moose Lake, one of the four samples at Cujo Lake, and two of the four samples at LdS1 were greater than their respective benchmarks by 1.22, 1.86, 0.84, and 1.00 times, respectively (Tables 2.5-4 and 3.4-8). Four samples at Nanuq Lake, one sample at both Counts and Moose Lake, three samples at Cujo Lake, and two samples at Upper Exeter were greater than their respective phosphate-P benchmark concentrations during the open water by average factors of 1.61, 1.11, 0.79, 1.27, and 0.88 (Table 3.4-8).

During the under-ice season, all samples from Kodiak Lake were greater than the CCME guideline for total copper by an average factor of 1.06. Two August samples at Nema Lake were greater than the guideline by an average factor of 0.92 (Table 3.4-8).

3.4.3.2 Stream Water Quality Benchmarks

Observed concentrations of water quality variables in AEMP streams during the open water season were lower than the water quality benchmarks for pH, chloride, sulphate, potassium, total ammonia-N, nitrate-N, nitrite-N, total antimony, total arsenic, total barium, total boron, total cadmium, total molybdenum, total nickel, total selenium, total strontium, total uranium, and total vanadium (Table 3.4-9).

Two samples in June at Pigeon Reach 1 had TSS concentrations greater than the CCME guideline by an average factor of 1.14 (Table 3.4-9). One sample in June at Moose-Nero had a greater concentration of cadmium than the hardness dependent total cadmium CCME guideline value (0.00004 mg/L) by a factor of 1.98 (Table 3.4-9). All samples were greater than the hardness dependent total copper CCME guideline value (minimum = 0.002 mg/L) in June, July, August, and September at the Lower PDC by factors of 1.02, 1.21, 1.34, and 1.37, respectively (Table 3.4-9).

3.4.4 Water Quality QA/QC

3.4.4.1 Lake QA/QC

Field, travel, and equipment blanks were collected as part of the AEMP QA/QC program. A total of three field, three travel, and two equipment blanks were processed during the under-ice season (Table 3.4-10). Overall, sample contamination from field conditions (e.g., airborne contaminants), and travel conditions (e.g., handling) was minimal. All field and travel blanks had water quality concentrations less than applicable analytical detection limits except for total boron in all samples and total chromium in two of the three travel blanks (Table 3.4-10). Detectable concentrations of total boron in all field and travel blank samples suggests that the laboratory supplied double distilled water (DDW) contained impurities. Of the 23 evaluated water quality variables, total copper (0.00021 mg/L) and total nickel (0.0011 mg/L) were greater than their detection limits in one or both of the equipment blanks (Table 3.4-10). Concentrations of some non-evaluated variables were also detectable in one or both equipment blanks (Table 3.4-10). There was no evidence that the detectable concentrations in the equipment blanks contributed to a significant level of contamination in any of the field collected samples. The source of these detectable variables was likely acid residue left after the Niskin washing procedure and likely any remaining residue was rinsed from the equipment prior to lake sampling collection.

During the open water sampling period, six field, three travel, and five equipment blanks were processed as part of the AEMP QA/QC program (Table 3.4-11). Of the 23 water quality variables evaluated, total boron concentrations (0.0067 mg/L to 0.0087 mg/L) were greater than the detection limit in four of the field blanks (Table 3.4-11). All three travel blanks had detectable levels of boron (0.0053 mg/L to 0.0082 mg/L) and two travel blanks had detectable levels of chromium (0.00011 mg/L and 0.00016 mg/L; Table 3.4-11). There was no evidence that the detectable concentrations listed above in the field and travel blanks were a significant level of contamination in lake samples collected. All five equipment blanks had detectable levels of more than one evaluated water quality variable, including chloride, total ammonia-N, nitrate-N, TOC, total arsenic, total barium, total boron, total copper, total molybdenum, total nickel, total strontium, and/or total vanadium (Table 3.4-11). In addition, the equipment blanks had detectable concentrations of several non-evaluated variables (Table 3.4-11).

Although the results from the equipment blanks indicated elevated concentrations of a large number of variables, there was no evidence of systematic contamination (elevated levels in samples collected immediately following the equipment blank) in four of the five samples that would be expected if the sampling equipment were a significant source of contamination. As suggested for the April equipment blank, acid residue was the likely source of contamination, and acid contamination was likely reduced or eliminated with further rinsing and sampling. Though three of the four equipment blanks were excluded as a significant source of contamination, the August 2 equipment blank

qualified as a significant source of contamination based on elevated concentrations detected in the first lake sampled after the equipment blank (Nema Lake, shallow sample replicate 1). The August 2 equipment blank contamination most likely occurred due to acid residue and contaminated the first Nema Lake sample due to insufficient rinsing. Nema Lake sample L1497511-3 was removed from all figures and analyses in the data report and evaluation of effects report (Part 1 – Evaluation of Effects) as a result of the equipment blank contamination; however, these data were retained in Table 3.4-6. See Section 3.9 for further details.

3.4.4.2 Stream QA/QC

In total, ten field and eight travel blanks were processed as part of the stream water quality sampling program (at least one field and travel blank for each of the four stream sampling periods; Table 3.4-12). Concentrations of all evaluated variables were below the analytical detection limits in travel and field blanks with the exception of ammonia-N which was detected in two of ten field blanks and three of eight travel blanks, and total boron which was detected in seven field and five travel blanks (Table 3.4-12). Ammonia-N and total boron concentrations represent very low level contamination (or laboratory error) and are not expected to influence the results or the interpretation of the results for the purposes of the AEMP. Detectable concentrations of total boron across field and travel blank samples suggest the laboratory supplied DDW contained impurities that were also seen in lake under-ice and open water blanks. (Tables 3.4-10 and 3.4-11).

Supporting Tables and Figures

Table 3.4-1. Locations and Dates for Water Quality Sampling at AEMP Lake and Stream Sites, 2014

Lake	Sampling Date		Sampling Depth					Number of Replicates (per depth/date)	
			Shallow-depth (m)	Mid-depth (m)		Deep-depth (m)			
	Under-ice Season	Open Water Season	Open Water Season	Under-ice Season	Open Water Season	Under-ice Season	Open Water Season	Under-ice Season	Open Water Season
Nanuq	April 7	August 3	1	14	14	26	-	2	2
Counts	March 31	August 9	1	4	5.5	8	-	2	2
Vulture	April 8	August 3	1	18.5	17.5	35	-	2	2
Grizzly	April 5	August 10	1	20	20	38	-	2	3
Kodiak	April 4	July 29	1	6.5	7	11	-	2	2
Leslie	April 13	July 31	1	5.5	6	11	11	2	2
Moose	April 13	July 31	1	5	4.5	8	-	2	2
Nema	April 12	August 2	1	4.5	4.75	7	-	2	2
Slipper	April 9	August 4	1	8	7.5	14	-	2	2
S2	April 9	July 30	1	3.5	2.5	5	-	2	2
S3	April 9	July 30	1	7	6.5	12	-	2	2
Cujo	April 6	August 7	1	4	2.75	6	-	2	2
LdS2	-	August 8	1	-	-	-	-	-	2
LdS1	April 6	August 8	1	4	3.5	6	-	2	2
Fay Bay	April 4	July 3, August 1, August 31	1	4	3.4, 3.5, 3.4	6	-	2	2
Upper Exeter	April 1	July 3, August 10, August 31	1	5.5	4.7, 4.5, 4.5	7	-	2	2
Stream									
Nanuq Outflow	-	June 7, July 5, August 1, September 2	-	-	-	-	-	-	2
Counts Outflow	-	June 7, July 5, August 4, September 4	-	-	-	-	-	-	2
Vulture-Polar	-	June 7, July 5, August 1, September 2	-	-	-	-	-	-	2
Pigeon Reach 7	-	June 7, July 3, August 3, September 4, September 28	-	-	-	-	-	-	2
Lower PDC (LPDC)	-	June 6, July 6, August 2, September 5	-	-	-	-	-	-	2
Kodiak-Little	-	June 7, July 5, August 4, September 5	-	-	-	-	-	-	2
1616-30 (LLCF)[1]	-	June 6, June 16, July 1, July 6, July 14, July 21, July 28, August 2, August 4, August 6, August 25, September 7	-	-	-	-	-	-	2: (June 6, 16; July 1, 6; August 2, 6, 25; Sept 7) 1: (July 14, 21, 28; August 4)
Leslie-Moose	-	June 7, July 5, August 4, September 2	-	-	-	-	-	-	2
Moose-Nero	-	June 7, July 5, August 2, September 3	-	-	-	-	-	-	2
Nema-Martine	-	June 7, July 5, August 4, September 5	-	-	-	-	-	-	2
Slipper-Lac de Gras	-	June 7, July 5, August 4, September 3	-	-	-	-	-	-	2
Mossing Outflow	-	June 7, July 5, August 4, September 4	-	-	-	-	-	-	2
1616-43 (KPSF)[1]	-	June 6, July 5, July 8, August 1, September 2	-	-	-	-	-	-	2: (June 6, July 5, August 1, Sept 2) 1: (July 8)
Cujo Outflow	-	June 7, July 5, August 4, September 4	-	-	-	-	-	-	2
Christine-Lac du Sauvage	-	June 7, July 5, August 4, September 4	-	-	-	-	-	-	2
Pigeon Reach 1	-	June 21, July 3, July 18, August 3, August 14, September 4, September 18, September 28	-	-	-	-	-	-	2

Note: Dashes (-) indicate no data collected.

[1] *Samples were collected as part of the AEMP and SNP.*

Table 3.4-2. Analytical Results for AEMP Lake Water Quality Variables, Under-ice Season 2014

Lake		Nanuq				Counts			
Date		7-Apr-14				31-Mar-14			
Depth Strata		Mid		Deep		Mid		Deep	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1442154-3	L1442154-4	L1442154-1	L1442154-2	L1440769-2	L1440769-3	L1440769-4	L1440769-5
Physical Tests	**Units**								
Conductivity	uS/cm	13.1	13.2	14.5	14.3	20.1	19.8	18.4	18.1
Hardness (as $CaCO_3$)	mg/L	4.20	4.15	4.58	4.51	6.21	6.24	5.80	5.77
pH	pH	6.68	6.67	6.56	6.57	6.92	6.88	6.79	6.68
Total Suspended Solids	mg/L	<3.0	3.3	3.3	<3.0	3.3	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	8.5	8.3	8.9	9.0	11.7	12.1	10.6	10.5
Turbidity	NTU	0.17	0.18	0.20	0.19	0.24	0.23	0.23	0.23
Anions									
Anion Sum	meq/L	0.11	0.11	0.12	0.12	0.16	0.17	0.14	0.15
Cation Sum	meq/L	0.12	0.12	0.13	0.13	0.18	0.18	0.17	0.17
Cation - Anion Balance	%	3.6	1.8	4.3	2.4	6.4	2.9	8.6	6.1
Alkalinity, Total (as $CaCO_3$)	mg/L	3.6	3.8	3.8	3.9	5.8	6.4	5.1	5.3
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	3.6	3.8	3.8	3.9	5.8	6.4	5.1	5.3
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)	mg/L	1.79	1.79	1.87	1.88	1.93	1.97	1.74	1.65
Nutrients									
Total Ammonia-N	mg/L	0.0139	0.0140	0.0135	0.0137	0.0117	0.0101	0.0055	<0.0050
Nitrate-N	mg/L	0.0158	0.0159	0.0599	0.0557	0.0216	0.0197	0.045	0.0934
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.114	0.109	0.112	0.110	0.181	0.179	0.164	0.138
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0023	0.0033	0.0032	0.0034	0.0052	0.0053	0.0056	0.0068
Organic Carbon									
Total Organic Carbon	mg/L	2.17	1.89	2.03	2.10	2.62	2.71	2.36	2.07

(continued)

Table 3.4-2. Analytical Results for AEMP Lake Water Quality Variables, Under-ice Season 2014 (continued)

Lake		Vulture				Grizzly			
Date		8-Apr-14				5-Apr-14			
Depth Strata		Mid		Deep		Mid		Deep	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1442298-3	L1442298-4	L1442298-1	L1442298-2	L1441130-10	L1441130-11	L1441130-8	L1441130-9
Physical Tests	**Units**								
Conductivity	uS/cm	12.3	12.3	13.3	13.4	14.5	14.6	17.3	17.3
Hardness (as $CaCO_3$)	mg/L	4.12	4.16	4.25	4.44	4.89	5.03	5.78	5.83
pH	pH	6.79	6.80	6.62	6.61	6.75	6.77	6.56	6.56
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	8.1	8.2	8.6	8.6	10.2	10.5	11.6	11.5
Turbidity	NTU	0.16	0.16	0.17	0.17	0.16	0.15	0.17	0.18
Anions									
Anion Sum	meq/L	0.12	0.12	0.13	0.12	0.11	0.12	0.14	0.13
Cation Sum	meq/L	0.11	0.12	0.12	0.12	0.14	0.14	0.16	0.16
Cation - Anion Balance	%	-2.3	-1.9	-3.8	0.1	9.9	10.0	8.5	10.7
Alkalinity, Total (as $CaCO_3$)	mg/L	4.4	4.5	4.5	4.1	3.4	3.5	3.9	3.7
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	4.4	4.5	4.5	4.1	3.4	3.5	3.9	3.7
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)	mg/L	1.50	1.45	1.49	1.51	2.14	2.14	2.48	2.50
Nutrients									
Total Ammonia-N	mg/L	0.0122	0.0127	0.0144	0.0134	0.0160	0.0160	0.0076	0.0073
Nitrate-N	mg/L	0.0058	0.0057	0.0827	0.0890	0.0166	0.0167	0.099	0.103
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.108	0.106	0.099	0.102	0.116	0.110	0.123	0.121
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	<0.0020	<0.0020	0.0020	0.0031	0.0026	0.0025	0.0037	0.0039
Organic Carbon									
Total Organic Carbon	mg/L	1.76	1.78	1.81	1.87	3.31	3.45	3.28	3.23

(continued)

Table 3.4-2. Analytical Results for AEMP Lake Water Quality Variables, Under-ice Season 2014 (continued)

Lake		Kodiak				Leslie			
Date		4-Apr-14				13-Apr-14			
Depth Strata		Mid		Deep		Mid		Deep	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1441130-12	L1441130-13	L1441130-14	L1441130-15	L1443647-5	L1443647-6	L1443647-7	L1443647-8
Physical Tests	**Units**								
Conductivity	uS/cm	57.8	58.2	63.8	62.9	1350	1380	1520	1520
Hardness (as $CaCO_3$)	mg/L	18.8	19.0	20.6	20.4	187	184	197	197
pH	pH	6.95	7.00	6.95	7.00	7.81	7.79	7.81	7.80
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	37.5	36.4	40.2	39.5	865	887	929	933
Turbidity	NTU	0.21	0.20	0.21	0.21	0.23	0.23	0.24	0.25
Anions									
Anion Sum	meq/L	0.53	0.52	0.58	0.56	13.8	14.1	14.9	14.9
Cation Sum	meq/L	0.52	0.53	0.57	0.56	13.4	13.8	14.3	14.4
Cation - Anion Balance	%	-0.6	1.0	-0.8	0.0	-1.2	-1.2	-1.8	-1.9
Alkalinity, Total (as $CaCO_3$)	mg/L	13.0	12.4	14.1	13.5	106.0	107.0	115.0	116
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	13.0	12.4	14.1	13.5	106.0	107.0	115.0	116
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	2.44	2.43	2.64	2.62	219	224	236	236
Sulphate (SO_4)	mg/L	9.30	9.31	10.30	10.20	244	251	263	265
Nutrients									
Total Ammonia-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0689	0.0677	0.0517	0.0546
Nitrate-N	mg/L	0.107	0.108	0.120	0.119	5.63	5.74	5.90	5.95
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.013	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	mg/L	0.245	0.247	0.275	0.267	<1.2	<1.2	<1.2	<1.2
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	0.0012	0.0011	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0053	0.0061	0.0066	0.0056	0.0055	0.0052	0.0057	0.0065
Organic Carbon									
Total Organic Carbon	mg/L	7.51	6.67	7.40	7.30	6.57	5.74	6.19	6.01

(continued)

Table 3.4-2. Analytical Results for AEMP Lake Water Quality Variables, Under-ice Season 2014 (continued)

Lake		Moose				Nema			
Date		13-Apr-14				12-Apr-14			
Depth Strata		Mid		Deep		Mid		Deep	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1443647-9	L1443647-10	L1443647-11	L1443647-12	L1443647-1	L1443647-2	L1443647-3	L1443647-4
Physical Tests	**Units**								
Conductivity	uS/cm	1330	1380	1370	1340	980	980	979	1010
Hardness (as $CaCO_3$)	mg/L	178	177	183	190	153	149	149	151
pH	pH	7.85	7.85	7.85	7.84	7.56	7.57	7.56	7.57
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	836	833	853	852	584	579	590	594
Turbidity	NTU	0.57	0.56	0.56	0.56	0.35	0.33	0.36	0.35
Anions									
Anion Sum	meq/L	13.3	13.3	13.5	13.4	9.46	9.38	9.62	9.56
Cation Sum	meq/L	12.9	12.8	13.4	13.6	9.18	9.10	9.12	9.34
Cation - Anion Balance	%	-1.5	-1.9	-0.3	0.8	-1.5	-1.5	-2.7	-1.1
Alkalinity, Total (as $CaCO_3$)	mg/L	103.0	106.0	104.0	103.0	85.6	83.7	84.5	79.7
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	103.0	106.0	104.0	103.0	85.6	83.7	84.5	79.7
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	212	212	215	214	153	152	156	157
Sulphate (SO_4)	mg/L	236	235	238	236	160	159	164	165
Nutrients									
Total Ammonia-N	mg/L	0.0295	0.0294	0.0315	0.0286	0.0599	0.0597	0.0541	0.0561
Nitrate-N	mg/L	5.18	5.15	5.21	5.18	1.57	1.58	1.55	1.56
Nitrite-N	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	mg/L	<1.1	<1.1	<1.1	<1.1	0.57	0.52	0.48	0.44
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0213	0.0191	0.0085	0.0084	0.0069	0.0064	0.0066	0.0066
Organic Carbon									
Total Organic Carbon	mg/L	5.70	6.08	5.93	5.77	6.90	7.00	7.11	7.26

(continued)

Table 3.4-2. Analytical Results for AEMP Lake Water Quality Variables, Under-ice Season 2014 (continued)

Lake		Slipper				S2			
Date		9-Apr-14				9-Apr-14			
Depth Strata		Mid		Deep		Mid		Deep	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1443111-3	L1443111-4	L1443111-1	L1443111-2	L1443111-3	L1443111-4	L1443111-5	L1443111-6
Physical Tests	**Units**								
Conductivity	uS/cm	461	461	466	469	30.5	30.4	34.6	34.8
Hardness (as $CaCO_3$)	mg/L	71.9	71.4	71.8	75.4	8.7	8.5	9.1	9.2
pH	pH	7.74	7.72	7.64	7.70	7.11	7.12	7.18	7.13
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	254	256	261	260	18.6	18.2	20.1	20.4
Turbidity	NTU	0.30	0.29	0.33	0.39	0.15	0.14	0.15	0.15
Anions									
Anion Sum	meq/L	4.15	4.16	4.23	4.22	0.27	0.27	0.30	0.31
Cation Sum	meq/L	3.93	3.99	4.08	4.09	0.27	0.27	0.29	0.30
Cation - Anion Balance	%	-2.8	-2.1	-1.8	-1.6	-0.5	0.1	-1.1	-2.1
Alkalinity, Total (as $CaCO_3$)	mg/L	39.8	40.2	39.9	40.2	6.4	6.0	6.6	6.7
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	39.8	40.2	39.9	40.2	6.4	6.0	6.6	6.7
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	68.0	68.0	69.5	69.3	2.10	2.08	2.53	2.61
Sulphate (SO_4)	mg/L	68.0	68.0	69.6	69.2	4.17	4.13	4.62	4.76
Nutrients									
Total Ammonia-N	mg/L	0.0290	0.0244	0.0231	0.0238	0.0102	0.0102	0.0082	0.0079
Nitrate-N	mg/L	0.325	0.326	0.328	0.326	0.0055	0.0053	0.0133	0.0154
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.35	0.34	0.34	0.35	0.165	0.161	0.161	0.164
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0044	0.0048	0.0052	0.0055	0.0028	<0.0020	0.0023	0.0023
Organic Carbon									
Total Organic Carbon	mg/L	5.51	5.41	5.59	5.41	3.07	3.02	3.01	3.00

(continued)

Table 3.4-2. Analytical Results for AEMP Lake Water Quality Variables, Under-ice Season 2014 (continued)

Lake		S3				Cujo			
Date		9-Apr-14				6-Apr-14			
Depth Strata		Mid		Deep		Mid		Deep	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1443111-9	L1443109-1	L1443111-10	L1443111-11	L1441130-3	L1441130-4	L1441130-1	L1441130-2
Physical Tests	**Units**								
Conductivity	uS/cm	31.1	31.0	95.3	90.1	453	453	455	454
Hardness (as $CaCO_3$)	mg/L	7.99	8.09	15.90	15.40	179	177	181	182
pH	pH	7.10	7.06	7.18	7.19	7.50	7.53	7.50	7.51
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	3.3
Total Dissolved Solids	mg/L	18.1	18.2	49.7	47.4	293	290	291	295
Turbidity	NTU	0.14	0.13	0.14	0.13	0.51	0.48	0.55	0.75
Anions									
Anion Sum	meq/L	0.27	0.27	0.81	0.77	4.84	4.77	4.79	4.85
Cation Sum	meq/L	0.26	0.26	0.73	0.70	4.48	4.42	4.51	4.58
Cation - Anion Balance	%	-1.7	-0.2	-5.1	-4.8	-3.8	-3.8	-3.0	-2.8
Alkalinity, Total (as $CaCO_3$)	mg/L	5.8	5.8	8.9	8.9	74.1	70.7	71.2	73.8
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	5.8	5.8	8.9	8.9	74.1	70.7	71.2	73.8
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	2.35	2.27	12.20	11.30	9.57	9.54	9.59	9.59
Sulphate (SO_4)	mg/L	4.23	4.11	13.4	12.6	148	148	149	149
Nutrients									
Total Ammonia-N	mg/L	0.0121	0.0119	0.0154	0.0130	0.0492	0.0489	0.0426	0.0415
Nitrate-N	mg/L	0.0101	0.0089	0.0920	0.0895	0.0232	0.0241	0.0294	0.0301
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0014	0.0012	<0.0010	0.0010
Total Kjeldahl Nitrogen	mg/L	0.144	0.140	0.155	0.152	0.582	0.569	0.561	0.569
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	<0.0020	<0.0020	0.0029	0.0030	0.0071	0.0077	0.0082	0.0106
Organic Carbon									
Total Organic Carbon	mg/L	2.77	3.03	2.70	2.75	10.0	10.2	9.19	10.2

(continued)

Table 3.4-2. Analytical Results for AEMP Lake Water Quality Variables, Under-ice Season 2014 (continued)

Lake		LdS1				Fay Bay			
Date		6-Apr-14				2-Apr-14			
Depth Strata		Mid		Deep		Mid		Deep	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1441130-18	L1441130-5	L1441130-6	L1441130-7	L1440090-7	L1440090-8	L1440090-5	L1440090-6
Physical Tests	**Units**								
Conductivity	uS/cm	22.5	22.6	22.4	22.3	70.5	72.0	78.0	79.7
Hardness (as $CaCO_3$)	mg/L	7.44	7.58	7.26	7.25	24.5	25.0	27.1	28.0
pH	pH	7.03	7.09	7.03	7.01	7.13	7.11	7.13	7.10
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	15.5	15.1	16.1	14.8	42.4	43.4	47.1	48.4
Turbidity	NTU	0.31	0.35	0.37	0.41	0.35	0.33	0.47	0.50
Anions									
Anion Sum	meq/L	0.20	0.19	0.20	0.20	0.63	0.65	0.71	0.73
Cation Sum	meq/L	0.21	0.22	0.21	0.21	0.65	0.66	0.73	0.75
Cation - Anion Balance	%	2.2	5.9	2.4	2.4	0.9	0.4	1.2	1.4
Alkalinity, Total (as $CaCO_3$)	mg/L	6.9	6.4	6.7	6.6	16.5	17.4	18.9	19.7
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	6.9	6.4	6.7	6.6	16.5	17.4	18.9	19.7
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	0.67	0.66	0.65	0.65	3.38	3.43	3.79	3.81
Sulphate (SO_4)	mg/L	2.24	2.23	2.20	2.20	9.84	9.88	10.40	10.70
Nutrients									
Total Ammonia-N	mg/L	<0.0050	<0.0050	0.0081	0.0066	0.0146	0.0166	0.0374	0.0351
Nitrate-N	mg/L	0.0092	0.0079	0.0147	0.0146	0.0621	0.0643	0.0677	0.0686
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0025
Total Kjeldahl Nitrogen	mg/L	0.204	0.241	0.232	0.229	0.350	0.350	0.396	0.398
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0106	0.0065	0.0061	0.0074	0.0051	0.0053	0.0062	0.0062
Organic Carbon									
Total Organic Carbon	mg/L	4.16	4.06	5.10	3.90	7.13	7.11	7.73	7.85

(continued)

Table 3.4-2. Analytical Results for AEMP Lake Water Quality Variables, Under-ice Season 2014 (continued)

Lake		Upper Exeter			
Date		6-Apr-14			
Depth Strata		Mid		Deep	
Replicate No.		1	2	1	2
Sample ID		L1440090-1	L1440090-2	L1440090-3	L1440090-4
Physical Tests	**Units**				
Conductivity	uS/cm	28.1	25.7	27.4	27.7
Hardness (as $CaCO_3$)	mg/L	8.54	8.04	8.99	9.07
pH	pH	7.11	6.96	6.94	6.94
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	16.1	15.6	16.5	16.8
Turbidity	NTU	0.23	0.16	0.19	0.19
Anions					
Anion Sum	meq/L	0.22	0.22	0.23	0.24
Cation Sum	meq/L	0.23	0.22	0.24	0.24
Cation - Anion Balance	%	2.0	-1.4	2.5	0.9
Alkalinity, Total (as $CaCO_3$)	mg/L	5.6	5.8	5.8	6.2
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	5.6	5.8	5.8	6.2
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	0.59	0.53	0.57	0.58
Sulphate (SO_4)	mg/L	4.40	4.28	4.56	4.62
Nutrients					
Total Ammonia-N	mg/L	0.0157	<0.0050	0.0152	0.0147
Nitrate-N	mg/L	0.0110	0.0159	0.0250	0.0281
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.179	0.174	0.181	0.173
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0033	0.0034	0.0040	0.0043
Organic Carbon					
Total Organic Carbon	mg/L	3.41	3.09	3.26	3.18

Table 3.4-2. Analytical Results for AEMP Lake Water Quality Variables, Under-ice Season 2014 (continued)

Lake		Nanuq				Counts			
Date		7-Apr-14				31-Mar-14			
Depth Strata		Mid		Deep		Mid		Deep	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1442154-3	L1442154-4	L1442154-1	L1442154-2	L1440769-2	L1440769-3	L1440769-4	L1440769-5
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0032	0.0024	0.0036	0.0034	0.0027	0.0020	0.0019	0.0022
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000098	0.000096	0.000083	0.000079	0.000212	0.000221	0.000175	0.000178
Barium (Ba)-Total	mg/L	0.00160	0.00164	0.00228	0.00214	0.00192	0.00190	0.00195	0.00228
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	0.800	0.793	0.891	0.878	1.030	1.010	0.96	0.98
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00033	0.00034	0.00034	0.00031	0.00055	0.00058	0.00053	0.00049
Iron (Fe)-Total	mg/L	<0.010	<0.010	0.013	<0.010	<0.010	<0.010	<0.010	0.020
Lead (Pb)-Total	mg/L	<0.000010	<0.000010	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	0.534	0.527	0.572	0.563	0.884	0.903	0.830	0.809
Manganese (Mn)-Total	mg/L	0.000958	0.000882	0.01420	0.00912	0.0016	0.0013	0.002	0.0209
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.000194	0.000209	0.000305	0.000226	0.000342	0.000365	0.000339	0.001070
Potassium (K)-Total	mg/L	0.410	0.405	0.425000	0.411000	0.736	0.737	0.684	0.647
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.134	0.127	0.238	0.223	0.158	0.148	0.173	0.337
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	0.546	0.543	0.561	0.553	0.830	0.836	0.770	0.723
Strontium (Sr)-Total	mg/L	0.00533	0.00534	0.006	0.006	0.00658	0.00652	0.00617	0.00644
Uranium (U)-Total	mg/L	0.000015	0.000013	0.00001	0.00001	0.000011	0.000013	<0.000010	<0.000010
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	0.0013	<0.0010	0.0014	0.0019	0.0012	0.0026

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Table 3.4-2. Analytical Results for AEMP Lake Water Quality Variables, Under-ice Season 2014 (continued)

Lake		Vulture				Grizzly			
Date		8-Apr-14				5-Apr-14			
Depth Strata		Mid		Deep		Mid		Deep	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1442298-3	L1442298-4	L1442298-1	L1442298-2	L1441130-10	L1441130-11	L1441130-8	L1441130-9
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0053	0.0047	0.0054	0.0058	0.0270	0.0272	0.0296	0.0319
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000127	0.000113	0.000108	0.000103	0.000108	0.000124	0.000119	0.000127
Barium (Ba)-Total	mg/L	0.00221	0.00212	0.00238	0.00243	0.00380	0.00389	0.00448	0.00460
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000019	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	0.734	0.736	0.744	0.798	0.893	0.920	1.05	1.03
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00013	0.00012	0.00013
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00045	0.00042	0.00039	0.00039	0.00133	0.00136	0.00143	0.00145
Iron (Fe)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.016	0.022
Lead (Pb)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	0.556	0.563	0.582	0.594	0.645	0.663	0.765	0.790
Manganese (Mn)-Total	mg/L	0.000493	0.000470	0.001060	0.001320	0.00130	0.00139	0.0088	0.0115
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.000328	0.000323	0.000280	0.000303	0.000832	0.000815	0.000840	0.000878
Potassium (K)-Total	mg/L	0.460	0.466	0.465	0.461	0.554	0.570	0.601	0.632
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.128	0.122	0.325	0.362	0.680	0.684	1.03	1.05
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	0.425	0.432	0.424	0.423	0.514	0.527	0.561	0.587
Strontium (Sr)-Total	mg/L	0.00522	0.00523	0.00526	0.00571	0.00762	0.00798	0.0092	0.0092
Uranium (U)-Total	mg/L	0.000020	0.000019	0.000017	0.000018	0.000065	0.000073	0.000063	0.000065
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000063	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0019	<0.0010	0.0029	0.0011

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Table 3.4-2. Analytical Results for AEMP Lake Water Quality Variables, Under-ice Season 2014 (continued)

Lake		Kodiak				Leslie			
Date		4-Apr-14				13-Apr-14			
Depth Strata		Mid		Deep		Mid		Deep	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1441130-12	L1441130-13	L1441130-14	L1441130-15	L1443647-5	L1443647-6	L1443647-7	L1443647-8
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0211	0.0201	0.0228	0.0224	0.0054	0.0051	0.0052	0.0050
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00179	0.00187	0.00205	0.00198
Arsenic (As)-Total	mg/L	0.000266	0.000271	0.000246	0.000258	0.000694	0.000729	0.000717	0.000666
Barium (Ba)-Total	mg/L	0.0174	0.0174	0.0194	0.0187	0.123	0.129	0.137	0.137
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000018	0.000018	0.000013
Boron (B)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0587	0.0586	0.0630	0.0616
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000020	<0.000020	<0.000020	<0.000020
Calcium (Ca)-Total	mg/L	3.44	3.44	3.73	3.65	43.9	43.7	47.0	47.0
Chromium (Cr)-Total	mg/L	0.00017	0.00018	0.00020	0.00018	0.00020	0.00019	0.00019	0.00019
Cobalt (Co)-Total	mg/L	0.00010	<0.00010	0.00014	0.00012	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00201	0.00206	0.00222	0.00219	0.00131	0.00129	0.00130	0.00133
Iron (Fe)-Total	mg/L	0.054	0.052	0.060	0.059	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Total	mg/L	0.000014	0.00001	<0.000010	0.000018	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	2.49	2.53	2.73	2.73	18.8	18.2	19.4	19.3
Manganese (Mn)-Total	mg/L	0.0090	0.0089	0.0107	0.0104	0.00304	0.00314	0.00426	0.00435
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.000087	0.000080	0.000083	0.000082	0.127	0.127	0.134	0.136
Nickel (Ni)-Total	mg/L	0.00372	0.00382	0.00427	0.00431	0.00668	0.00685	0.00698	0.00690
Potassium (K)-Total	mg/L	1.81	1.85	1.98	1.97	52.7	55.0	57.0	57.9
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	0.000526	0.000519	0.000531	0.000517
Silicon (Si)-Total	mg/L	0.716	0.713	0.887	0.875	0.805	0.826	0.810	0.820
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	2.18	2.18	2.35	2.33	192	199	205	206
Strontium (Sr)-Total	mg/L	0.0285	0.0286	0.0311	0.0301	0.96	0.99	1.06	1.05
Uranium (U)-Total	mg/L	0.000091	0.000091	0.000099	0.000097	0.000908	0.000935	0.001090	0.001060
Vanadium (V)-Total	mg/L	0.000061	<0.000050	0.000060	<0.000050	0.000244	0.000207	0.000182	0.000182
Zinc (Zn)-Total	mg/L	0.0043	0.0044	0.0037	0.0058	<0.0010	<0.0010	<0.0010	<0.0010

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Table 3.4-2. Analytical Results for AEMP Lake Water Quality Variables, Under-ice Season 2014 (continued)

Lake		Moose				Nema			
Date		13-Apr-14				12-Apr-14			
Depth Strata		Mid		Deep		Mid		Deep	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1443647-9	L1443647-10	L1443647-11	L1443647-12	L1443647-1	L1443647-2	L1443647-3	L1443647-4
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0065	0.0066	0.0070	0.0062	0.0050	0.0043	0.0054	0.0048
Antimony (Sb)-Total	mg/L	0.00176	0.00176	0.00182	0.00189	0.00094	0.00092	0.00092	0.00093
Arsenic (As)-Total	mg/L	0.000664	0.000639	0.000691	0.000741	0.000458	0.000434	0.000417	0.000449
Barium (Ba)-Total	mg/L	0.115	0.112	0.121	0.126	0.096	0.100	0.096	0.096
Beryllium (Be)-Total	mg/L	0.000012	0.000014	0.000013	0.000012	0.000034	0.000028	0.000031	0.000024
Boron (B)-Total	mg/L	0.0558	0.0566	0.0568	0.0612	0.0339	0.0344	0.0335	0.0337
Cadmium (Cd)-Total	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Calcium (Ca)-Total	mg/L	42.3	42.4	43.7	46.0	36.6	35.3	35.0	34.4
Chromium (Cr)-Total	mg/L	0.00017	0.00016	0.00017	0.00016	0.00014	0.00012	0.00011	0.00012
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00137	0.00127	0.00141	0.00138	0.00160	0.00153	0.00155	0.00149
Iron (Fe)-Total	mg/L	0.013	0.011	0.014	0.015	0.019	0.011	0.016	0.012
Lead (Pb)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	17.5	17.4	17.9	18.2	15.0	14.9	14.9	15.7
Manganese (Mn)-Total	mg/L	0.00526	0.00512	0.00582	0.00594	0.0099	0.0096	0.0101	0.0108
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.123	0.123	0.121	0.129	0.0552	0.0552	0.0532	0.0525
Nickel (Ni)-Total	mg/L	0.00549	0.00545	0.00569	0.00567	0.00377	0.00379	0.00377	0.00391
Potassium (K)-Total	mg/L	51.6	51.2	54.8	55.0	34.0	33.7	33.9	35.1
Selenium (Se)-Total	mg/L	0.000501	0.000493	0.000470	0.000526	0.000170	0.000162	0.000183	0.000151
Silicon (Si)-Total	mg/L	0.596	0.608	0.589	0.605	0.459	0.455	0.465	0.459
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	185	184	192	192	121	121	121	125
Strontium (Sr)-Total	mg/L	0.92	0.93	0.95	1.01	0.699	0.707	0.712	0.708
Uranium (U)-Total	mg/L	0.000934	0.000944	0.000966	0.001040	0.000447	0.000428	0.000417	0.000411
Vanadium (V)-Total	mg/L	0.000167	0.000155	0.000157	0.000155	0.000054	0.000060	0.000090	0.000059
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0017	0.0011

(continued)

Table 3.4-2. Analytical Results for AEMP Lake Water Quality Variables, Under-ice Season 2014 (continued)

Lake		Slipper				S2			
Date		9-Apr-14				9-Apr-14			
Depth Strata		Mid		Deep		Mid		Deep	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1443111-3	L1443111-4	L1443111-1	L1443111-2	L1443111-3	L1443111-4	L1443111-5	L1443111-6
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0031	0.0038	0.0043	0.0037	0.0029	0.0028	0.0024	0.0026
Antimony (Sb)-Total	mg/L	0.00028	0.00027	0.00025	0.00026	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000315	0.000310	0.000305	0.000307	0.000237	0.000226	0.000229	0.000250
Barium (Ba)-Total	mg/L	0.0317	0.0322	0.0325	0.0317	0.00272	0.00272	0.00295	0.00301
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	0.0139	0.0136	0.0133	0.0137	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	16.2	15.4	15.9	17.0	1.68	1.62	1.78	1.81
Chromium (Cr)-Total	mg/L	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00118	0.00121	0.00120	0.00120	0.00068	0.00065	0.00067	0.00068
Iron (Fe)-Total	mg/L	0.025	0.027	0.032	0.030	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	7.66	7.99	7.82	8.02	1.08	1.08	1.13	1.14
Manganese (Mn)-Total	mg/L	0.00816	0.00831	0.01060	0.01050	0.00075	0.00069	0.00093	0.00109
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.0173	0.0172	0.0158	0.0158	0.000308	0.000278	0.000390	0.000371
Nickel (Ni)-Total	mg/L	0.00134	0.00135	0.00130	0.00130	0.00114	0.00114	0.00112	0.00109
Potassium (K)-Total	mg/L	14.7	14.8	15.3	15.5	0.96	0.97	1.04	1.06
Selenium (Se)-Total	mg/L	0.000063	0.000057	0.000062	0.000052	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.372	0.380	0.506	0.491	<0.050	<0.050	<0.050	<0.050
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	48.6	50.2	51.7	50.2	1.67	1.64	1.95	1.93
Strontium (Sr)-Total	mg/L	0.281	0.280	0.297	0.290	0.0155	0.0140	0.0167	0.0175
Uranium (U)-Total	mg/L	0.000117	0.000112	0.000105	0.000107	0.000028	0.000029	0.000028	0.000031
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	<0.0010	0.0016	<0.0010	<0.0010	<0.0010	<0.0010

(continued)

Table 3.4-2. Analytical Results for AEMP Lake Water Quality Variables, Under-ice Season 2014 (continued)

Lake		S3				Cujo			
Date		9-Apr-14				6-Apr-14			
Depth Strata		Mid		Deep		Mid		Deep	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1443111-9	L1443109-1	L1443111-10	L1443111-11	L1441130-3	L1441130-4	L1441130-1	L1441130-2
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0025	0.0023	0.0025	0.0028	0.0021	0.0027	0.0019	0.0160
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000213	0.000208	0.000159	0.000170	0.000951	0.000902	0.000922	0.000933
Barium (Ba)-Total	mg/L	0.00266	0.00254	0.00439	0.00444	0.03750	0.03730	0.0380	0.0396
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000011	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0132	0.0127	0.0139	0.0134
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	1.52	1.58	3.29	3.19	26.7	25.3	26.1	25.5
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00016	0.00016	0.00018	0.00019
Copper (Cu)-Total	mg/L	0.00072	0.00059	0.00057	0.00057	0.00089	0.00085	0.00099	0.00096
Iron (Fe)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	0.098	0.1	0.127	0.143
Lead (Pb)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000011
Magnesium (Mg)-Total	mg/L	1.02	1.01	1.86	1.81	27.2	27.6	28.0	28.7
Manganese (Mn)-Total	mg/L	0.000847	0.000867	0.00133	0.001230	0.047800	0.047300	0.0492	0.051
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.000350	0.000339	0.002090	0.001970	0.001500	0.001420	0.00140	0.00135
Nickel (Ni)-Total	mg/L	0.00102	0.00108	0.000687	0.000691	0.002280	0.002230	0.00228	0.00240
Potassium (K)-Total	mg/L	0.95	0.94	2.62	2.51	14.9	14.3	14.4	14.9
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	0.00009	0.000092	0.000085	0.000077
Silicon (Si)-Total	mg/L	<0.050	<0.050	0.189	0.178	0.322	0.324	0.330	0.336
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	1.76	1.78	7.89	7.41	12.0	11.7	12.1	12.8
Strontium (Sr)-Total	mg/L	0.0150	0.0152	0.0464	0.0448	0.2560	0.2440	0.267	0.257
Uranium (U)-Total	mg/L	0.000025	0.000025	0.000028	0.000029	0.000147	0.000154	0.000143	0.000148
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000057
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	0.001

(continued)

Table 3.4-2. Analytical Results for AEMP Lake Water Quality Variables, Under-ice Season 2014 (continued)

Lake		LdS1				Fay Bay			
Date		6-Apr-14				2-Apr-14			
Depth Strata		Mid		Deep		Mid		Deep	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1441130-18	L1441130-5	L1441130-6	L1441130-7	L1440090-7	L1440090-8	L1440090-5	L1440090-6
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0100	0.0062	0.0070	0.0125	0.0145	0.0157	0.0167	0.0173
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000372	0.000372	0.000375	0.000362	0.000366	0.000371	0.000403	0.000418
Barium (Ba)-Total	mg/L	0.00146	0.00149	0.00160	0.00151	0.01720	0.01770	0.02030	0.02070
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	1.36	1.42	1.33	1.35	4.47	4.61	5.15	5.21
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00016	0.00019	0.00018	0.00018
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	0.00014	0.00044	0.00053
Copper (Cu)-Total	mg/L	0.00078	0.00085	0.00078	0.00077	0.00100	0.00105	0.00104	0.00102
Iron (Fe)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	0.182	0.218	0.4	0.394
Lead (Pb)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000013	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	0.99	0.98	0.955	0.944	3.23	3.28	3.460	3.650
Manganese (Mn)-Total	mg/L	0.00096	0.00098	0.00114	0.00117	0.03310	0.03770	0.06400	0.07200
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000115	0.000125	0.000099	0.0001
Nickel (Ni)-Total	mg/L	0.000372	0.000355	0.000400	0.000345	0.004540	0.004570	0.004950	0.005180
Potassium (K)-Total	mg/L	0.872	0.909	0.853	0.829	1.640	1.700	1.830	1.920
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.056	0.059	0.059	0.055	0.759	0.795	0.879	0.895
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	0.96	0.955	0.919	0.905	2.33	2.330	2.490	2.610
Strontium (Sr)-Total	mg/L	0.00833	0.00844	0.00810	0.00819	0.03900	0.03980	0.04530	0.04580
Uranium (U)-Total	mg/L	0.000027	0.000029	0.000027	0.000027	0.000052	0.000044	0.000043	0.000044
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000065	0.000070	0.000065	0.000083
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0015	0.0056	0.0015	0.0016

(continued)

Table 3.4-2. Analytical Results for AEMP Lake Water Quality Variables, Under-ice Season 2014 (completed)

Lake		Upper Exeter			
Date		6-Apr-14			
Depth Strata		Mid		Deep	
Replicate No.		1	2	1	2
Sample ID		L1440090-1	L1440090-2	L1440090-3	L1440090-4
Total Metals	**Units**				
Aluminum (Al)-Total	mg/L	0.0055	0.0041	0.0052	0.0055
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000172	0.000166	0.000180	0.000170
Barium (Ba)-Total	mg/L	0.00276	0.00279	0.00312	0.00315
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	1.43	1.36	1.50	1.46
Chromium (Cr)-Total	mg/L	0.00025	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00075	0.00069	0.00072	0.00073
Iron (Fe)-Total	mg/L	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Total	mg/L	0.000018	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	1.21	1.13	1.270	1.310
Manganese (Mn)-Total	mg/L	0.00100	0.00094	0.00154	0.00141
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.001260	0.000990	0.001100	0.001110
Potassium (K)-Total	mg/L	0.838	0.810	0.884	0.900
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.128	0.113	0.133	0.126
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	0.81	0.780	0.841	0.845
Strontium (Sr)-Total	mg/L	0.01040	0.01030	0.01120	0.01100
Uranium (U)-Total	mg/L	0.000014	<0.000010	0.000012	0.000012
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	0.0055	0.0011	<0.0010	<0.0010

Notes:

All variables analyzed by ALS Environmental (Burnaby, BC).

< = less than the analytical detection limit indicated

Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014

Lake		Nanuq				Counts			
Date		5-Aug-14				9-Aug-14			
Depth Strata (Depth (m))		Shallow (1 m)		Mid (14 m)		Shallow (1 m)		Mid (5.5 m)	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1501005-1	L1501005-2	L1501005-4	L1501005-5	L1501595-1	L1501595-2	L1501595-4	L1501595-5
Physical Tests	**Units**								
Conductivity	uS/cm	12.3	11.8	11.8	11.7	14.1	14.1	14.1	14.1
Hardness (as $CaCO_3$)	mg/L	3.96	3.86	3.85	3.82	4.30	4.30	4.39	4.40
pH	pH	6.84	6.62	6.75	6.77	7.65	7.64	7.58	7.56
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	4.3	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	8.4	8.3	7.5	7.7	9.1	8.9	9.3	9.1
Turbidity	NTU	0.35	0.34	0.31	0.33	0.72	1.05	1.08	0.75
Anions									
Anion Sum	meq/L	0.11	0.10	<0.10	<0.10	0.12	0.11	0.12	0.11
Cation Sum	meq/L	0.11	0.11	0.11	0.11	0.13	0.13	0.13	0.13
Cation - Anion Balance	%	0.3	2.7	10.3	09.6	6.4	10.1	6.5	9.6
Alkalinity, Total (as $CaCO_3$)	mg/L	3.8	3.5	2.7	2.7	4.3	3.9	4.4	4.1
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	3.8	3.5	2.7	2.7	4.3	3.9	4.4	4.1
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)	mg/L	1.70	1.70	1.70	1.70	1.39	1.39	1.39	1.39
Nutrients									
Total Ammonia-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0051	<0.0050
Nitrate-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.138	0.129	0.123	0.127	0.203	0.195	0.201	0.198
Dissolved Orthophosphate-P	mg/L	<0.0010	0.0012	<0.0010	0.0011	0.0013	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0064	0.0041	0.0026	0.0030	0.0086	0.0093	0.0187	0.0078
Organic Carbon									
Total Organic Carbon	mg/L	2.20	2.37	2.07	2.28	2.58	2.60	2.61	2.60

(continued)

Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		Vulture				Grizzly			
Date		3-Aug-14				10-Aug-14			
Depth Strata (Depth (m))		Shallow (1 m)		Mid (17.5 m)		Shallow (1 m)		Mid (20 m)	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1498728-1	L1498728-2	L1498728-4	L1498728-5	L1501540-1	L1501540-2	L1501540-4	L1501540-5
Physical Tests	**Units**								
Conductivity	uS/cm	13.5	12.6	12.4	11.8	17.6	15.2	14.8	14.8
Hardness (as $CaCO_3$)	mg/L	4.13	4.12	4.09	4.11	4.73	4.82	4.70	4.64
pH	pH	7.26	7.09	6.99	6.60	7.91	7.67	7.58	7.54
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	3.6	<3.0	<3.0
Total Dissolved Solids	mg/L	8.3	7.9	7.9	7.9	10.1	10.9	10.0	10.1
Turbidity	NTU	0.35	0.27	0.29	0.41	0.48	0.70	0.22	0.28
Anions									
Anion Sum	meq/L	0.11	0.11	0.11	0.10	0.12	0.12	0.12	0.12
Cation Sum	meq/L	0.12	0.11	0.11	0.11	0.13	0.14	0.13	0.13
Cation - Anion Balance	%	2.1	3.4	3.0	4.0	7.8	5.3	4.7	07.2
Alkalinity, Total (as $CaCO_3$)	mg/L	4.0	3.8	3.8	3.7	3.7	4.1	4.0	3.7
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	4.0	3.8	3.8	3.7	3.7	4.1	4.0	3.7
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)	mg/L	1.48	1.42	1.44	1.42	2.02	2.02	2.04	2.03
Nutrients									
Total Ammonia-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0058	0.0066	0.0110	0.0180
Nitrate-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0054	0.0053
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.136	0.118	0.100	0.109	0.155	0.165	0.141	0.135
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0030	0.0024	<0.0020	0.0029	0.0040	0.0041	0.0027	0.0034
Organic Carbon									
Total Organic Carbon	mg/L	2.13	2.02	2.00	2.04	3.34	3.79	3.02	3.26

(continued)

Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		Kodiak				Leslie					
Date		29-Jul-14				31-Jul-14					
Depth Strata (Depth (m))		Shallow (1 m)		Mid (7 m)		Shallow (1 m)		Mid (6 m)		Deep (10 m)	
Replicate No.		1	2	1	2	1	2	1	2	1	2
Sample ID		L1497563-3	L1497563-4	L1497563-6	L1497563-7	L1497388-3	L1497388-4	L1497388-6	L1497388-7	L1497388-9	L1497388-10
Physical Tests	**Units**										
Conductivity	uS/cm	31.6	29.5	28.8	28.8	830	831	846	842	1290	1280
Hardness (as $CaCO_3$)	mg/L	9.18	9.08	8.77	8.83	95.0	97.8	99.8	99.1	157	155
pH	pH	6.83	6.98	6.99	7.00	8.00	8.10	8.09	8.10	7.95	7.96
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	3.5	3.5	3.6	3.1
Total Dissolved Solids	mg/L	20.5	19.8	19.2	19.8	469.0	477.0	487.0	487.0	760	790
Turbidity	NTU	0.74	0.71	0.69	0.69	0.45	0.43	0.61	0.45	1.19	0.89
Anions											
Anion Sum	meq/L	0.26	0.26	0.26	0.27	7.81	7.89	8.00	7.98	12.40	13.30
Cation Sum	meq/L	0.28	0.27	0.26	0.26	6.98	7.16	7.22	7.25	11.40	11.10
Cation - Anion Balance	%	2.8	1.4	1.0	-1.9	-5.6	-4.9	-5.1	-4.8	-4.0	-8.9
Alkalinity, Total (as $CaCO_3$)	mg/L	6.3	6.8	6.6	7.5	63.9	64.7	65.9	67.5	98.3	100.0
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	6.3	6.8	6.6	7.5	63.9	64.7	65.9	67.5	98.3	100.0
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	1.45	1.28	1.23	1.23	125	125	127	126	195	212
Sulphate (SO_4)	mg/L	4.43	4.43	4.35	4.31	137	139	142	141	221	239
Nutrients											
Total Ammonia-N	mg/L	0.0074	0.0094	0.0062	<0.0050	0.045	0.0455	0.0338	0.039	0.0194	0.0207
Nitrate-N	mg/L	0.07	<0.0050	<0.0050	<0.0050	2.13	2.15	2.25	2.2	4.09	4.43
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.024	0.022	0.014	0.018	<0.010	<0.010
Total Kjeldahl Nitrogen	mg/L	0.279	0.308	0.273	0.265	<0.50	<0.52	<0.53	<0.52	4.39	4.35
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0067	0.0073	0.0052	0.0084	0.0041	0.0039	0.0032	0.0053	0.0065	0.0066
Organic Carbon											
Total Organic Carbon	mg/L	5.00	4.71	4.49	4.55	-	-	4.38	4.37	5.72	5.75

(continued)

Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		Moose				Nema			
Date		31-Jul-14				2-Aug-14			
Depth Strata (Depth (m))		Shallow (1 m)		Mid (4.5 m)		Shallow (1 m)		Mid (4.75 m)	
Replicate No.		1	2	1	2	1	3	1	3
Sample ID		L1497388-12	L1497388-13	L1497388-15	L1497388-16	L1497511-3	L1497511-4	L1497511-6	L1497511-7
Physical Tests	**Units**								
Conductivity	uS/cm	527	525	545	539	409	406	412	406
Hardness (as $CaCO_3$)	mg/L	64.3	64.0	65.9	65.7	55.0	54.5	54.9	54.9
pH	pH	7.91	7.93	7.92	7.92	7.59	7.81	7.85	7.68
Total Suspended Solids	mg/L	<3.0	<3.0	3	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	288	288	303	300	226	225	224	225
Turbidity	NTU	0.62	0.62	0.71	0.75	1.34	0.74	0.75	0.79
Anions									
Anion Sum	meq/L	4.77	4.77	4.93	4.88	3.68	3.68	3.67	3.68
Cation Sum	meq/L	4.41	4.40	4.53	4.47	3.43	3.40	3.42	3.44
Cation - Anion Balance	%	-3.8	-4.0	-4.3	-4.3	-3.5	-3.9	-3.5	-3.5
Alkalinity, Total (as $CaCO_3$)	mg/L	42.3	42.2	43.0	42.2	33.8	35.7	35.5	35.8
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	42.3	42.2	43.0	42.2	33.8	35.7	35.5	35.8
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	75.5	75.6	78.3	77.5	60.8	59.3	59.2	59.3
Sulphate (SO_4)	mg/L	82.6	82.7	85.8	85.0	61.4	61.5	61.5	61.6
Nutrients									
Total Ammonia-N	mg/L	0.0372	0.0393	0.0255	0.0360	0.0173	0.0146	0.0102	0.0088
Nitrate-N	mg/L	0.995	0.997	1.08	1.06	0.130	0.129	0.129	0.130
Nitrite-N	mg/L	0.0099	0.0097	0.0087	0.0085	0.0024	0.0024	0.0025	0.0022
Total Kjeldahl Nitrogen	mg/L	0.52	0.49	0.48	0.52	0.42	0.41	0.41	0.414
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0060	0.0055	0.0046	0.0082	0.0081	0.0059	0.0074	0.0063
Organic Carbon									
Total Organic Carbon	mg/L	-	-	5.59	5.92	6.16	5.35	5.01	5.18

(continued)

Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		Slipper				S2			
Date		4-Aug-14				30-Jul-14			
Depth Strata (Depth (m))		Shallow (1 m)		Mid (7.5 m)		Shallow (1 m)		Mid (2.5 m)	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1498728-7	L1498728-8	L1498728-10	L1498728-11	L1497563-9	L1497563-10	L1497563-12	L1497563-13
Physical Tests	**Units**								
Conductivity	uS/cm	193	194	195	195	56.7	56.1	55.7	56.0
Hardness (as $CaCO_3$)	mg/L	29.9	29.7	29.9	29.8	11.00	10.80	10.6	10.7
pH	pH	7.47	7.55	7.57	7.58	7.03	7.06	7.05	7.09
Total Suspended Solids	mg/L	<3.0	<3.0	3.1	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	106	105	106	106	32.0	31.7	31.2	31.6
Turbidity	NTU	1.38	1.23	1.12	1.02	0.45	0.46	0.39	0.40
Anions									
Anion Sum	meq/L	1.74	1.73	1.76	1.74	0.49	0.49	0.48	0.49
Cation Sum	meq/L	1.55	1.54	1.55	1.55	0.48	0.47	0.46	0.47
Cation - Anion Balance	%	-5.9	-6.0	-6.3	-5.9	-0.6	-1.4	-1.7	-1.6
Alkalinity, Total (as $CaCO_3$)	mg/L	19.8	19.9	20.6	19.9	6.8	6.9	7.0	7.0
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	19.8	19.9	20.6	19.9	6.8	6.9	07.0	07.0
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	27.4	27.1	27.3	27.3	6.49	6.40	6.29	6.39
Sulphate (SO_4)	mg/L	27.6	27.5	27.7	27.7	8.09	8.01	7.91	7.99
Nutrients									
Total Ammonia-N	mg/L	<0.0050	0.007	<0.0050	<0.0050	<0.0050	0.0114	0.0076	0.0055
Nitrate-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0117	<0.0050	<0.0050	<0.0050
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.331	0.331	0.327	0.361	0.175	0.181	0.183	0.170
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0064	0.0047	0.0061	0.0064	0.0026	<0.0020	0.0026	0.0031
Organic Carbon									
Total Organic Carbon	mg/L	4.96	4.84	4.72	4.71	3.02	3.06	2.94	3.00

(continued)

Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		S3				Cujo			
Date		30-Jul-14				7-Aug-14			
Depth Strata (Depth (m))		Shallow (1 m)		Mid (6.5 m)		Shallow (1 m)		Mid (2.75 m)	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1497563-15	L1497563-16	L1497563-18	L1497563-19	L1501540-7	L1501540-8	L1501540-10	L1501540-11
Physical Tests	**Units**								
Conductivity	uS/cm	50.3	48.3	35.2	33.4	185	185	185	185
Hardness (as $CaCO_3$)	mg/L	9.76	9.27	7.88	7.61	67.2	67.5	67.5	67.8
pH	pH	7.04	7.05	6.96	6.95	7.69	7.79	7.83	7.83
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	3.7	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	28.6	27.7	20.6	19.4	111	111	111	111
Turbidity	NTU	0.43	0.34	0.36	0.30	0.81	0.84	1.00	0.75
Anions									
Anion Sum	meq/L	0.45	0.43	0.31	0.29	1.76	1.77	1.77	1.77
Cation Sum	meq/L	0.42	0.40	0.30	0.28	1.70	1.71	1.71	1.72
Cation - Anion Balance	%	-2.9	-3.6	-2.0	-1.9	-1.6	-1.6	-1.7	-1.4
Alkalinity, Total (as $CaCO_3$)	mg/L	6.9	6.7	5.6	5.2	26.0	26.3	26.3	26.1
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	6.9	6.7	5.6	5.2	26.0	26.3	26.3	26.1
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	5.64	5.29	3.46	3.18	3.8	3.73	3.73	3.72
Sulphate (SO_4)	mg/L	7.12	6.90	5.05	4.78	54.4	54.5	54.5	54.6
Nutrients									
Total Ammonia-N	mg/L	0.0171	0.006	0.0193	<0.0050	0.0061	0.0062	<0.0050	<0.0050
Nitrate-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.174	0.167	0.156	0.136	0.376	0.376	0.378	0.374
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0027	<0.0010	<0.0010	0.0013
Total Phosphate-P	mg/L	0.0025	0.0022	0.0021	<0.0020	0.0111	0.0197	0.0104	0.0094
Organic Carbon									
Total Organic Carbon	mg/L	2.83	3.09	2.47	2.42	6.25	5.85	5.79	5.74

(continued)

Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		LdS2		LdS1			
Date		8-Aug-14		8-Aug-14			
Depth Strata (Depth (m))		Shallow (1 m)		Shallow (1 m)		Mid (3.5 m)	
Replicate No.		1	2	1	2	1	2
Sample ID		L1501595-10	L1501595-11	L1501540-13	L1501540-14	L1501595-7	L1501595-8
Physical Tests	**Units**						
Conductivity	uS/cm	15.1	15.2	14.9	14.6	14.6	14.6
Hardness (as $CaCO_3$)	mg/L	4.86	4.85	4.61	4.59	4.71	4.71
pH	pH	7.55	6.85	7.82	7.65	7.55	7.55
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	09.5	10.5	9.6	9.6	9.6	09.4
Turbidity	NTU	0.50	0.50	0.58	0.64	0.64	0.53
Anions							
Anion Sum	meq/L	0.12	0.14	0.12	0.12	0.12	0.12
Cation Sum	meq/L	0.14	0.14	0.13	0.13	0.14	0.14
Cation - Anion Balance	%	9.3	-0.3	4.4	6.3	7.2	9.3
Alkalinity, Total (as $CaCO_3$)	mg/L	4.3	5.7	4.7	4.4	4.5	4.3
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	4.3	5.7	4.7	4.4	4.5	4.3
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)	mg/L	1.50	1.50	1.38	1.37	1.37	1.37
Nutrients							
Total Ammonia-N	mg/L	<0.0050	0.0479	<0.0050	<0.0050	<0.0050	0.0383
Nitrate-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.169	0.213	0.170	0.170	0.173	0.205
Dissolved Orthophosphate-P	mg/L	0.001	0.0011	0.0011	0.0014	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0056	0.0050	0.0045	0.0047	0.0055	0.0054
Organic Carbon							
Total Organic Carbon	mg/L	2.72	2.79	2.77	2.93	2.86	2.74

(continued)

Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		Fay Bay				Fay Bay			
Date		3-Jul-14				1-Aug-14			
Depth Strata (Depth (m))		Shallow (1 m)		Mid (3.4 m)		Shallow (1 m)		Mid (3.5 m)	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1482182-4	L1482182-5	L1482182-1	L1482182-6	L1497511-15	L1497511-16	L1497511-18	L1497511-19
Physical Tests	**Units**								
Conductivity	uS/cm	27.6	27.9	27.6	27.6	30.0	30.1	29.9	29.8
Hardness (as $CaCO_3$)	mg/L	10.2	10.2	10.4	10.2	9.93	9.92	9.93	9.80
pH	pH	7.05	7.07	7.05	7.06	7.00	6.99	7.00	7.00
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	18.5	18.5	18.6	18.5	20.0	20.4	19.9	19.8
Turbidity	NTU	0.55	0.48	0.57	0.70	0.88	0.87	0.91	0.90
Anions									
Anion Sum	meq/L	0.25	0.25	0.25	0.25	0.27	0.29	0.27	0.27
Cation Sum	meq/L	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.27
Cation - Anion Balance	%	6.3	5.9	6.3	6.2	1.2	-1.6	1.4	1.1
Alkalinity, Total (as $CaCO_3$)	mg/L	6.2	6.2	6.5	6.3	7.0	7.8	7.0	6.8
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	6.2	6.2	6.5	6.3	7.0	7.8	7.0	6.8
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	1.48	1.51	1.47	1.47	1.68	1.68	1.68	1.67
Sulphate (SO_4)	mg/L	3.81	3.80	3.80	3.76	3.98	3.98	3.98	3.97
Nutrients									
Total Ammonia-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0063	0.0071	<0.0050	0.0085
Nitrate-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.247	0.388	0.246	0.386	0.316	0.368	0.296	0.306
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0063	0.0067	0.0084	0.0070	0.0071	0.0074	0.0057	0.0072
Organic Carbon									
Total Organic Carbon	mg/L	4.28	4.28	4.12	4.21	4.92	4.91	4.92	4.98

(continued)

Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		Fay Bay				Upper Exeter			
Date		31-Aug-14				3-Jul-14			
Depth Strata (Depth (m))		Shallow (1 m)		Mid (3.4 m)		Shallow (1 m)		Mid (4.7 m)	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1511813-1	L1511813-3	L1511813-4	L1511813-5	L1482182-7	L1482182-8	L1482182-2	L1482182-3
Physical Tests	**Units**								
Conductivity	uS/cm	31.7	31.4	31.4	31.3	20.1	20.2	20.0	20.0
Hardness (as $CaCO_3$)	mg/L	10.80	-	10.90	10.90	7.37	7.52	7.43	7.35
pH	pH	7.21	-	7.18	7.15	6.97	6.96	6.95	6.95
Total Suspended Solids	mg/L	<3.0	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	18.5	-	18.2	18.0	13.1	13.5	13.0	12.9
Turbidity	NTU	0.68	0.62	0.62	0.63	0.34	0.33	0.34	0.34
Anions									
Anion Sum	meq/L	0.28	-	0.27	0.27	0.17	0.17	0.17	0.16
Cation Sum	meq/L	0.22	-	0.22	0.22	0.20	0.20	0.20	0.20
Cation - Anion Balance	%	-12.2	-	-10.4	-9.1	8.7	7.3	8.6	9.5
Alkalinity, Total (as $CaCO_3$)	mg/L	7.2	-	6.9	6.5	4.8	5.2	5.0	4.8
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	7.2	-	6.9	6.5	4.8	5.2	5.0	4.8
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	-	<1.0	<1.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	-	<1.0	<1.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	1.78	1.77	1.77	1.77	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)	mg/L	4.15	4.15	4.13	4.13	3.35	3.32	3.29	3.30
Nutrients									
Total Ammonia-N	mg/L	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.305	-	0.317	0.315	0.158	0.161	0.163	0.162
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0069	-	0.0071	0.0062	0.0040	0.0043	0.0059	0.0054
Organic Carbon									
Total Organic Carbon	mg/L	4.82	-	4.78	4.76	3.11	3.19	2.89	3.03

(continued)

Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		Upper Exeter				Upper Exeter			
Date		10-Aug-14				31-Aug-14			
Depth Strata (Depth (m))		Shallow (1 m)		Mid (4.5 m)		Shallow (1 m)		Mid (4.5 m)	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1501595-13	L1501595-14	L1501595-15	L1501595-16	L1511813-7	L1511813-8	L1511813-10	L1511813-11
Physical Tests	**Units**								
Conductivity	uS/cm	20.5	20.5	20.3	20.3	20.4	20.1	20.6	20.6
Hardness (as $CaCO_3$)	mg/L	6.79	6.64	6.66	6.63	7.25	7.02	7.11	7.16
pH	pH	6.87	6.87	6.88	6.88	7.00	6.95	7.43	7.44
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	13.7	13.3	13.2	13.3	11.9	11.9	11.7	11.9
Turbidity	NTU	0.51	0.49	0.43	0.45	0.54	0.36	0.40	0.34
Anions									
Anion Sum	meq/L	0.19	0.19	0.18	0.19	0.17	0.18	0.17	0.17
Cation Sum	meq/L	0.19	0.18	0.18	0.18	0.15	0.14	0.14	0.14
Cation - Anion Balance	%	-1.5	-1.2	0.4	-1.5	-8.1	-10.8	-8.8	-7.1
Alkalinity, Total (as $CaCO_3$)	mg/L	6.1	5.9	5.5	5.8	5.0	5.2	5.0	4.8
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	6.1	5.9	5.5	5.8	5.0	5.2	5.0	4.8
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)	mg/L	3.39	3.39	3.39	3.40	3.41	3.41	3.42	3.40
Nutrients									
Total Ammonia-N	mg/L	0.0127	0.0194	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.181	0.189	0.179	0.176	0.259	0.186	0.181	0.188
Dissolved Orthophosphate-P	mg/L	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0047	0.0042	0.0048	0.0049	0.0047	0.0045	0.0045	0.0041
Organic Carbon									
Total Organic Carbon	mg/L	3.13	2.94	3.06	3.01	3.22	3.25	3.06	3.40

(continued)

Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		Nanuq				Counts			
Date		5-Aug-14				9-Aug-14			
Depth Strata (Depth (m))		Shallow (1 m)		Mid (14 m)		Shallow (1 m)		Mid (5.5 m)	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1501005-1	L1501005-2	L1501005-4	L1501005-5	L1501595-1	L1501595-2	L1501595-4	L1501595-5
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0061	0.0066	0.0084	0.0057	0.0103	0.0084	0.0100	0.0089
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000077	0.000095	0.000093	0.000092	0.000201	0.000211	0.000214	0.000288
Barium (Ba)-Total	mg/L	0.00159	0.00159	0.00160	0.00155	0.00149	0.00153	0.00155	0.00158
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	0.765	0.732	0.729	0.724	0.708	0.689	0.707	0.723
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00038	0.00042	0.00037	0.00036	0.00056	0.00054	0.00052	0.00060
Iron (Fe)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	0.037	0.036	0.037	0.035
Lead (Pb)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000015
Magnesium (Mg)-Total	mg/L	0.499	0.493	0.494	0.489	0.615	0.625	0.637	0.630
Manganese (Mn)-Total	mg/L	0.00156	0.00149	0.00140	0.00135	0.00458	0.00477	0.00484	0.00476
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.000175	0.000196	0.000182	0.000181	0.000321	0.000339	0.000326	0.000410
Potassium (K)-Total	mg/L	0.387	0.398	0.390	0.385	0.567	0.580	0.581	0.589
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.072	0.078	0.074	0.069	0.077	0.081	0.086	0.086
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	0.518	0.511	0.505	0.498	0.621	0.630	0.634	0.648
Strontium (Sr)-Total	mg/L	0.00516	0.00487	0.00494	0.00489	0.00482	0.00476	0.00482	0.00487
Uranium (U)-Total	mg/L	0.000019	0.000017	0.000018	0.000017	0.000015	0.000016	0.000016	0.000016
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	0.0012

(continued)

Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		Vulture				Grizzly			
Date		3-Aug-14				10-Aug-14			
Depth Strata (Depth (m))		Shallow (1 m)		Mid (17.5 m)		Shallow (1 m)		Mid (20 m)	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1498728-1	L1498728-2	L1498728-4	L1498728-5	L1501540-1	L1501540-2	L1501540-4	L1501540-5
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0099	0.0078	0.0077	0.0094	0.0294	0.0303	0.0312	0.0323
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000141	0.000127	0.000134	0.000133	0.000110	0.000099	0.000098	0.000079
Barium (Ba)-Total	mg/L	0.00224	0.00218	0.00226	0.00217	0.00382	0.00383	0.00383	0.00382
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	0.719	0.717	0.719	0.721	0.851	0.865	0.844	0.836
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	0.0001	0.00013	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00046	0.00048	0.00043	0.00041	0.00135	0.00137	0.00129	0.00129
Iron (Fe)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	0.012	0.012	<0.010	0.011
Lead (Pb)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	0.566	0.566	0.558	0.562	0.633	0.646	0.628	0.621
Manganese (Mn)-Total	mg/L	0.00108	0.00125	0.00107	0.00110	0.00246	0.00259	0.00397	0.00426
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.000061	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.000350	0.000314	0.000340	0.000311	0.000827	0.000847	0.00087	0.000831
Potassium (K)-Total	mg/L	0.486	0.471	0.468	0.462	0.549	0.562	0.544	0.540
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.087	0.085	0.089	0.089	0.539	0.537	0.629	0.638
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	0.459	0.416	0.407	0.409	0.500	0.510	0.494	0.489
Strontium (Sr)-Total	mg/L	0.00538	0.00515	0.00521	0.00516	0.00741	0.00740	0.00734	0.00736
Uranium (U)-Total	mg/L	0.000022	0.000019	0.000019	0.000020	0.000068	0.000065	0.000070	0.000069
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	0.0015	<0.0010	0.0011	<0.0010	<0.0010	0.0012	<0.0010	<0.0010

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Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		Kodiak				Leslie					
Date		29-Jul-14				31-Jul-14					
Depth Strata (Depth (m))		Shallow (1 m)		Mid (7 m)		Shallow (1 m)		Mid (6 m)		Deep (10 m)	
Replicate No.		1	2	1	2	1	2	1	2	1	2
Sample ID		L1497563-3	L1497563-4	L1497563-6	L1497563-7	L1497388-3	L1497388-4	L1497388-6	L1497388-7	L1497388-9	L1497388-10
Total Metals	**Units**										
Aluminum (Al)-Total	mg/L	0.0274	0.0270	0.0261	0.0262	0.0201	0.0192	0.0186	0.0216	0.0097	0.0102
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00106	0.00104	0.0011	0.00109	0.00158	0.00154
Arsenic (As)-Total	mg/L	0.000244	0.000250	0.000263	0.000243	0.000476	0.000483	0.000428	0.000441	0.000507	0.000499
Barium (Ba)-Total	mg/L	0.00767	0.00773	0.00769	0.00760	0.05830	0.05970	0.06050	0.05940	0.1020	0.0985
Beryllium (Be)-Total	mg/L	0.000011	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000016	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0353	0.0346	0.034	0.0322	0.0480	0.0493
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	1.610	1.620	1.54	1.55	21.900	22.600	23.100	22.700	35.6	36.0
Chromium (Cr)-Total	mg/L	0.00072	0.00013	<0.00010	0.00012	0.00015	0.00015	0.0001	0.00012	0.00017	0.00018
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00189	0.00156	0.00142	0.00142	0.00122	0.00125	0.00110	0.00117	0.00135	0.00134
Iron (Fe)-Total	mg/L	0.047	0.046	0.047	0.046	0.021	0.022	0.015	0.019	0.013	0.012
Lead (Pb)-Total	mg/L	0.000029	<0.000010	<0.000010	<0.000010	0.000011	<0.000010	<0.000010	0.000017	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	1.250	1.220	1.20	1.20	9.800	10.100	10.200	10.300	16.5	15.9
Manganese (Mn)-Total	mg/L	0.00336	0.00326	0.00259	0.00264	0.00443	0.00471	0.00375	0.00419	0.01040	0.01020
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.000167	0.000144	0.000139	0.000139	0.0745	0.0737	0.0755	0.0747	0.1060	0.1050
Nickel (Ni)-Total	mg/L	0.001940	0.001630	0.00162	0.00164	0.002950	0.002950	0.003060	0.002990	0.00532	0.00514
Potassium (K)-Total	mg/L	1.160	1.140	1.11	1.13	26.900	27.500	27.600	27.600	44.0	42.8
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	0.000255	0.000268	0.000283	0.000276	0.000418	0.000439
Silicon (Si)-Total	mg/L	0.121	0.127	0.120	0.127	0.099	0.109	0.091	0.097	0.259	0.258
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	1.370	1.260	1.22	1.23	101.000	103.000	104.000	105.000	165.0	159.0
Strontium (Sr)-Total	mg/L	0.01420	0.01440	0.0138	0.0138	0.53400	0.53100	0.54200	0.53500	0.835	0.842
Uranium (U)-Total	mg/L	0.000075	0.000073	0.000075	0.000072	0.000621	0.000626	0.000632	0.000646	0.000946	0.000947
Vanadium (V)-Total	mg/L	0.000099	0.00008	0.000079	0.000072	0.000129	0.000115	0.000091	0.000118	0.000103	0.000115
Zinc (Zn)-Total	mg/L	0.0039	0.0016	0.0023	<0.0010	0.0024	0.0021	0.0012	0.0017	<0.0010	0.0011

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Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		Moose				Nema			
Date		31-Jul-14				2-Aug-14			
Depth Strata (Depth (m))		Shallow (1 m)		Mid (4.5 m)		Shallow (1 m)		Mid (4.75 m)	
Replicate No.		1	2	1	2	1	3	1	3
Sample ID		L1497388-12	L1497388-13	L1497388-15	L1497388-16	L1497511-3	L1497511-4	L1497511-6	L1497511-7
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0210	0.0194	0.0191	0.0187	0.0610	0.0205	0.0227	0.0289
Antimony (Sb)-Total	mg/L	0.00065	0.00064	0.00065	0.00064	0.00038	0.0004	0.00039	0.00038
Arsenic (As)-Total	mg/L	0.000449	0.000448	0.000420	0.000402	0.000357	0.000352	0.000341	0.000353
Barium (Ba)-Total	mg/L	0.03920	0.03910	0.0406	0.0406	0.03010	0.03020	0.0298	0.0300
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.00002	<0.000010	<0.000010
Boron (B)-Total	mg/L	0.0223	0.0227	0.0230	0.0234	0.0168	0.0167	0.0164	0.0162
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	0.000015	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	14.7	14.6	15.0	14.9	12.3	12.1	12.2	12.2
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	0.00011	<0.00010	0.012	0.00163	<0.00010	0.00023
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00021	0.0001	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00136	0.00139	0.00132	0.00133	0.00380	0.00311	0.00118	0.00124
Iron (Fe)-Total	mg/L	0.031	0.032	0.028	0.027	0.108	0.039	0.031	0.032
Lead (Pb)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	0.000112	0.000017	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	6.70	6.71	6.88	6.93	5.90	5.90	5.92	5.93
Manganese (Mn)-Total	mg/L	0.00636	0.00630	0.00609	0.00551	0.01210	0.01090	0.01100	0.01080
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.0445	0.0451	0.0463	0.0461	0.0284	0.0282	0.0279	0.0276
Nickel (Ni)-Total	mg/L	0.002210	0.002120	0.00221	0.00224	0.009450	0.002530	0.00161	0.00166
Potassium (K)-Total	mg/L	17.0	17.0	17.3	17.4	12.8	12.7	12.8	12.8
Selenium (Se)-Total	mg/L	0.000164	0.000182	0.000150	0.000184	0.000067	0.000084	0.000068	0.000083
Silicon (Si)-Total	mg/L	0.091	0.089	0.097	0.081	0.092	0.095	0.088	0.097
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	61.8	61.7	63.5	62.3	45.7	45.6	45.8	46.1
Strontium (Sr)-Total	mg/L	0.32500	0.33100	0.346	0.342	0.26500	0.26500	0.263	0.262
Uranium (U)-Total	mg/L	0.000339	0.000344	0.000365	0.000357	0.000217	0.000218	0.000217	0.000221
Vanadium (V)-Total	mg/L	0.000108	0.000091	0.000084	0.000093	0.000129	0.000075	0.000058	0.000064
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0034	<0.0010	<0.0010	<0.0010

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Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		Slipper				S2			
Date		4-Aug-14				30-Jul-14			
Depth Strata (Depth (m))		Shallow (1 m)		Mid (7.5 m)		Shallow (1 m)		Mid (2.5 m)	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1498728-7	L1498728-8	L1498728-10	L1498728-11	L1497563-9	L1497563-10	L1497563-12	L1497563-13
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0388	0.0111	0.0133	0.0178	0.0088	0.0085	0.0084	0.0090
Antimony (Sb)-Total	mg/L	0.00016	0.00015	0.00017	0.00016	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000412	0.000404	0.000429	0.000420	0.000229	0.000248	0.000231	0.000247
Barium (Ba)-Total	mg/L	0.01420	0.01440	0.0144	0.0145	0.00854	0.00938	0.00918	0.00983
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	0.0084	0.0079	0.0083	0.0081	<0.0050	<0.0050	<0.0050	0.0054
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	6.80	6.76	6.80	6.75	4.30	4.60	4.70	5.05
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00121	0.00109	0.00104	0.00112	0.00089	0.00080	0.00081	0.00083
Iron (Fe)-Total	mg/L	0.076	0.06	0.062	0.066	0.018	0.02	0.019	0.020
Lead (Pb)-Total	mg/L	0.000132	0.000026	<0.000010	0.000022	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	3.14	3.11	3.14	3.15	2.29	2.42	2.46	2.56
Manganese (Mn)-Total	mg/L	0.02750	0.02710	0.0282	0.0280	0.00478	0.00519	0.00529	0.00563
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.00995	0.00994	0.01010	0.00993	0.00433	0.00479	0.00496	0.00550
Nickel (Ni)-Total	mg/L	0.000968	0.000894	0.000868	0.000878	0.000973	0.000867	0.000878	0.000885
Potassium (K)-Total	mg/L	6.03	6.04	5.98	6.01	3.49	3.79	3.80	4.06
Selenium (Se)-Total	mg/L	0.000042	0.000043	0.000043	0.000044	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.104	0.092	0.085	0.086	<0.050	<0.050	<0.050	<0.050
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	18.1	18.0	18.2	18.2	10.6	11.8	11.9	12.8
Strontium (Sr)-Total	mg/L	0.13200	0.13100	0.132	0.131	0.0735	0.0805	0.0795	0.0917
Uranium (U)-Total	mg/L	0.000096	0.000091	0.000093	0.000097	0.000050	0.000047	0.000049	0.000059
Vanadium (V)-Total	mg/L	0.000062	0.000053	0.000053	0.000053	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	0.0015	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

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Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		S3				Cujo			
Date		30-Jul-14				7-Aug-14			
Depth Strata (Depth (m))		Shallow (1 m)		Mid (6.5 m)		Shallow (1 m)		Mid (2.75 m)	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1497563-15	L1497563-16	L1497563-18	L1497563-19	L1501540-7	L1501540-8	L1501540-10	L1501540-11
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0096	0.0089	0.0070	0.0071	0.0166	0.0079	0.0086	0.0074
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000203	0.000202	0.000184	0.000179	0.000770	0.000789	0.000783	0.000784
Barium (Ba)-Total	mg/L	0.00369	0.00358	0.00274	0.00249	0.01210	0.01210	0.0121	0.0129
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0055	0.0057	0.0059	0.0054
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	1.98	1.81	1.55	1.49	9.640	9.630	09.7	09.7
Chromium (Cr)-Total	mg/L	0.00107	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00172	0.00076	0.00055	0.00054	0.00067	0.00064	0.00061	0.00059
Iron (Fe)-Total	mg/L	0.028	0.015	<0.010	<0.010	0.049	0.047	0.045	0.045
Lead (Pb)-Total	mg/L	0.000063	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	1.17	1.16	0.97	0.94	10.500	10.600	10.5	10.6
Manganese (Mn)-Total	mg/L	0.00362	0.00297	0.00244	0.00240	0.00722	0.00715	0.00720	0.00688
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.00138	0.00121	0.000721	0.000635	0.00123	0.00124	0.00123	0.00124
Nickel (Ni)-Total	mg/L	0.003450	0.000953	0.000873	0.000857	0.001060	0.000957	0.00094	0.00091
Potassium (K)-Total	mg/L	1.49	1.44	1.08	1.01	5.810	5.820	5.81	5.86
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	0.000045	<0.000040	0.000040	0.000044
Silicon (Si)-Total	mg/L	0.057	0.059	<0.050	<0.050	0.080	0.063	0.069	0.055
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	4.21	3.99	2.64	2.38	4.740	4.750	4.75	4.77
Strontium (Sr)-Total	mg/L	0.02660	0.02400	0.0183	0.0173	0.09860	0.09830	0.099	0.099
Uranium (U)-Total	mg/L	0.000030	0.000028	0.000024	0.000026	0.000124	0.000128	0.000126	0.000127
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000051
Zinc (Zn)-Total	mg/L	0.0023	0.0011	<0.0010	0.0025	0.0010	<0.0010	<0.0010	<0.0010

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Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		LdS2		LdS1			
Date		8-Aug-14		8-Aug-14			
Depth Strata (Depth (m))		Shallow (1 m)		Shallow (1 m)		Mid (3.5 m)	
Replicate No.		1	2	1	2	1	2
Sample ID		L1501595-10	L1501595-11	L1501540-13	L1501540-14	L1501595-7	L1501595-8
Total Metals	**Units**						
Aluminum (Al)-Total	mg/L	0.0096	0.0082	0.0091	0.0075	0.0085	0.0078
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000262	0.000274	0.000258	0.000252	0.000255	0.000261
Barium (Ba)-Total	mg/L	0.00116	0.00122	0.00110	0.00107	0.00108	0.00115
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	0.870	0.855	0.849	0.848	0.863	0.856
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00061	0.00065	0.00059	0.00054	0.00053	0.00051
Iron (Fe)-Total	mg/L	0.013	0.013	0.014	0.011	0.011	0.011
Lead (Pb)-Total	mg/L	<0.000010	0.000025	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	0.652	0.659	0.604	0.601	0.620	0.624
Manganese (Mn)-Total	mg/L	0.00236	0.00232	0.00311	0.00296	0.00299	0.00296
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.000308	0.000321	0.000296	0.000288	0.000275	0.000273
Potassium (K)-Total	mg/L	0.569	0.573	0.541	0.541	0.553	0.558
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.055	0.057	0.055	<0.050	0.056	0.052
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	0.620	0.626	0.592	0.586	0.602	0.604
Strontium (Sr)-Total	mg/L	0.00550	0.00540	0.00536	0.00537	0.00536	0.00533
Uranium (U)-Total	mg/L	0.000021	0.000021	0.000027	0.000026	0.000023	0.000023
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

(continued)

Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		Fay Bay				Fay Bay			
Date		3-Jul-14				1-Aug-14			
Depth Strata (Depth (m))		Shallow (1 m)		Mid (3.4 m)		Shallow (1 m)		Mid (3.5 m)	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1482182-4	L1482182-5	L1482182-1	L1482182-6	L1497511-15	L1497511-16	L1497511-18	L1497511-19
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0233	0.0273	0.0280	0.0236	0.0175	0.0169	0.0176	0.0174
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000256	0.000259	0.000240	0.000253	0.000303	0.000301	0.000312	0.000310
Barium (Ba)-Total	mg/L	0.00719	0.00724	0.00754	0.00732	0.00695	0.00715	0.00711	0.00694
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000016	<0.000010
Boron (B)-Total	mg/L	0.0111	0.0114	<0.0050	0.0107	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	1.61	1.60	1.57	1.60	1.70	1.71	1.68	1.70
Chromium (Cr)-Total	mg/L	0.00011	0.00012	<0.00010	0.00012	<0.00010	<0.00010	0.00011	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00076	0.00077	0.00072	0.00076	0.00074	0.00099	0.00076	0.00072
Iron (Fe)-Total	mg/L	0.062	0.063	0.058	0.074	0.088	0.09	0.09	0.091
Lead (Pb)-Total	mg/L	<0.000010	0.000025	<0.000010	<0.000010	<0.000010	<0.000010	0.00002	0.000012
Magnesium (Mg)-Total	mg/L	1.26	1.28	1.30	1.27	1.38	1.37	1.39	1.35
Manganese (Mn)-Total	mg/L	0.00388	0.00393	0.00361	0.00394	0.00708	0.00699	0.00742	0.00715
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.000064	0.000083	0.000071	0.000072	0.000103	0.000102	0.00011	0.000099
Nickel (Ni)-Total	mg/L	0.001720	0.001670	0.001680	0.001660	0.001530	0.001540	0.001570	0.001510
Potassium (K)-Total	mg/L	0.797	0.821	0.809	0.808	0.848	0.854	0.863	0.837
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.147	0.154	0.143	0.153	0.176	0.177	0.176	0.176
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	1.04	1.04	1.04	1.03	1.14	1.12	1.13	1.10
Strontium (Sr)-Total	mg/L	0.01530	0.01520	0.01490	0.01510	0.01660	0.01670	0.01640	0.01670
Uranium (U)-Total	mg/L	0.000030	0.000030	0.000030	0.000030	0.000031	0.000030	0.000027	0.000028
Vanadium (V)-Total	mg/L	0.000077	0.000079	0.000075	0.000083	0.000071	0.000072	0.00008	0.000067
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0022	<0.0010

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Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (continued)

Lake		Fay Bay				Upper Exeter			
Date		31-Aug-14				3-Jul-14			
Depth Strata (Depth (m))		Shallow (1 m)		Mid (3.4 m)		Shallow (1 m)		Mid (4.7 m)	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1511813-1	L1511813-3	L1511813-4	L1511813-5	L1482182-7	L1482182-8	L1482182-2	L1482182-3
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0149	-	0.0149	0.0147	0.0123	0.0121	0.0101	0.0113
Antimony (Sb)-Total	mg/L	<0.00010	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000325	-	0.000296	0.000301	0.000145	0.000150	0.000135	0.000137
Barium (Ba)-Total	mg/L	0.00633	-	0.00623	0.00635	0.00288	0.00290	0.00274	0.00277
Beryllium (Be)-Total	mg/L	<0.000010	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	0.0056	-	0.0051	<0.0050	0.0109	0.0104	<0.0050	0.005
Cadmium (Cd)-Total	mg/L	<0.000010	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	1.93	-	1.79	1.82	1.14	1.14	1.14	1.14
Chromium (Cr)-Total	mg/L	0.00014	-	0.00012	0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	-	<0.00010	0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00087	-	0.00075	0.00076	0.00067	0.00071	0.00063	0.00062
Iron (Fe)-Total	mg/L	0.053	-	0.054	0.052	0.021	0.022	0.02	0.025
Lead (Pb)-Total	mg/L	0.000015	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	1.46	-	1.45	1.45	0.94	0.94	0.94	0.95
Manganese (Mn)-Total	mg/L	0.00357	-	0.00352	0.00349	0.00354	0.00339	0.00396	0.00411
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.000111	-	0.000109	0.0001	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.001440	-	0.001440	0.001420	0.001100	0.001100	0.001060	0.001140
Potassium (K)-Total	mg/L	0.876	-	0.896	0.898	0.704	0.695	0.688	0.688
Selenium (Se)-Total	mg/L	<0.000040	-	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.138	-	0.133	0.135	0.083	0.079	0.068	0.065
Silver (Ag)-Total	mg/L	<0.000010	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	1.21	-	1.21	1.21	0.69	0.69	0.67	0.67
Strontium (Sr)-Total	mg/L	0.01840	-	0.01700	0.01730	0.00877	0.00869	0.00877	0.00879
Uranium (U)-Total	mg/L	0.000026	-	0.000024	0.000024	0.000012	0.000013	0.000013	0.000012
Vanadium (V)-Total	mg/L	0.00005	-	0.000059	0.000073	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0010	-	<0.0010	<0.0010	0.0026	<0.0010	<0.0010	<0.0010

(continued)

Table 3.4-3. Analytical Results for AEMP Lake Water Quality Variables, Open Water Season 2014 (completed)

Lake		Upper Exeter				Upper Exeter			
Date		10-Aug-14				31-Aug-14			
Depth Strata (Depth (m))		Shallow (1 m)		Mid (4.5 m)		Shallow (1 m)		Mid (4.5 m)	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1501595-13	L1501595-14	L1501595-15	L1501595-16	L1511813-7	L1511813-8	L1511813-10	L1511813-11
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0078	0.0078	0.0082	0.0073	0.0104	0.0064	0.0065	0.0064
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000124	0.000159	0.000151	0.000149	0.000194	0.000196	0.000171	0.000175
Barium (Ba)-Total	mg/L	0.00234	0.00232	0.00232	0.00234	0.00256	0.00220	0.00209	0.00217
Beryllium (Be)-Total	mg/L	<0.000010	0.000016	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	1.11	1.09	1.10	1.09	1.12	1.09	1.09	1.08
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00065	0.00063	0.00059	0.00061	0.00098	0.00061	0.00063	0.00061
Iron (Fe)-Total	mg/L	0.018	0.018	0.019	0.018	0.019	0.015	0.017	0.017
Lead (Pb)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	0.000011	<0.000010	0.000013	<0.000010
Magnesium (Mg)-Total	mg/L	0.98	0.95	0.95	0.95	1.14	1.01	0.99	1.00
Manganese (Mn)-Total	mg/L	0.00314	0.00319	0.00312	0.00317	0.00347	0.00306	0.00311	0.00314
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.000906	0.000910	0.000868	0.000902	0.000973	0.000803	0.000813	0.000768
Potassium (K)-Total	mg/L	0.713	0.702	0.690	0.693	0.823	0.723	0.701	0.719
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.056	0.067	0.062	0.060	0.062	0.059	0.060	0.063
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	0.70	0.69	0.68	0.68	0.79	0.70	0.68	0.69
Strontium (Sr)-Total	mg/L	0.00834	0.00841	0.00847	0.00842	0.00846	0.00836	0.00844	0.00838
Uranium (U)-Total	mg/L	0.000012	0.000013	0.000013	0.000012	0.000011	0.000011	0.000011	0.000011
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0032	<0.0010	<0.0010	<0.0010

Notes:

All variables analyzed by ALS Environmental (Burnaby, BC).

< = less than the analytical detection limit indicated

Table 3.4-4. Analytical Detection Limits for Evaluated Lake Water Quality Variables, Under-ice Season 2014

Variable	pH	Total Alkalinity	Hardness	Chloride	Sulphate	Potassium	Total Suspended Solids	Total Ammonia-N	Nitrate-N	Nitrite-N	Total Phosphate-P	Total Organic Carbon	Total Antimony
Target Detection Limit	0.10	2.0	0.5	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Lake													
Nanuq	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Counts	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Vulture	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Grizzly	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Kodiak	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Leslie	0.10	2.0	0.50	5.0	5.0	0.050	3.0	0.0050	0.050	0.0100	0.0020	0.50	0.00010
Moose	0.10	2.0	0.50	5.0	5.0	0.050	3.0	0.0050	0.050	0.0100	0.0020	0.50	0.00010
Nema	0.10	2.0	0.50	5.0	5.0	0.050	3.0	0.0050	0.050	0.0100	0.0020	0.50	0.00010
Slipper	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
S2	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
S3	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Cujo	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
LdS2	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
LdS1	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Fay Bay	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Upper Exeter	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010

Variable	Total Arsenic	Total Barium	Total Boron	Total Cadmium	Total Copper	Total Molybdenum	Total Nickel	Total Selenium	Total Strontium	Total Uranium	Total Vanadium
Target Detection Limit	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Lake											
Nanuq	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Counts	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Vulture	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Grizzly	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Kodiak	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Leslie	0.000020	0.000050	0.0050	0.000020	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Moose	0.000020	0.000050	0.0050	0.000020	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Nema	0.000020	0.000050	0.0050	0.000020	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Slipper	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
S2	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
S3	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Cujo	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
LdS2	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
LdS1	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Fay Bay	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Upper Exeter	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050

Note:

All units are mg/L except for pH (no units).

Table 3.4-5. Analytical Detection Limits for Evaluated Lake Water Quality Variables, Open Water Season 2014

Variable	pH	Total Alkalinity	Hardness	Chloride	Sulphate	Potassium	Total Suspended Solids	Total Ammonia-N	Nitrate-N	Nitrite-N	Total Phosphate-P	Total Organic Carbon	Total Antimony
Target Detection Limit	0.10	2.0	0.5	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Lake													
Nanuq	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Counts	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Vulture	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Grizzly	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Kodiak	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Leslie	0.10	2.0	0.50	5.0	5.0	0.050	3.0	0.0050	0.050	0.010	0.0020	0.50	0.00010
Moose	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Nema	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Slipper	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
S2	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
S3	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Cujo	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
LdS2	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
LdS1	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Fay Bay	0.10	2.0/1.0 (2)	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010
Upper Exeter	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050	0.0010	0.0020	0.50	0.00010

Variable	Total Arsenic	Total Barium	Total Boron	Total Cadmium	Total Copper	Total Molybdenum	Total Nickel	Total Selenium	Total Strontium	Total Uranium	Total Vanadium
Target Detection Limit	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Lake											
Nanuq	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Counts	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Vulture	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Grizzly	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Kodiak	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Leslie	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Moose	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Nema	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Slipper	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
S2	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
S3	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Cujo	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
LdS2	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
LdS1	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Fay Bay	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Upper Exeter	0.000020	0.000050	0.0050	0.000010	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050

Note:

All units are mg/L except for pH (no units).

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014

Stream		Nanuq Outflow							
Date		7-Jun-14		5-Jul-14		1-Aug-14		2-Sep-14	
Sample ID		L1468897-10	L1468897-9	L1483805-16	L1483805-17	L1497420-9	L1497420-10	L1514553-7	L1514553-8
Physical Tests	**Units**								
Conductivity	uS/cm	10.9	10.9	11.4	12.1	11.5	11.3	17.5	12.2
Hardness (as $CaCO_3$)	mg/L	3.37	3.34	3.58	3.57	3.56	3.55	3.92	3.92
pH	pH	7.71	7.77	6.79	6.78	6.73	6.67	6.93	6.81
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	7.0	7.2	7.5	7.7	8.4	8.0	8.0	8.2
Turbidity	NTU	0.45	0.41	0.32	0.27	0.53	0.32	0.34	0.27
Anions									
Anion Sum	meq/L	<0.10	<0.10	<0.10	<0.10	0.11	<0.10	0.1	0.11
Cation Sum	meq/L	<0.10	<0.10	0.10	0.10	0.11	0.10	0.11	0.11
Cation - Anion Balance	%	4.9	-0.1	3.4	4.1	-2.1	4.1	4.2	2.5
Alkalinity, Total (as $CaCO_3$)	mg/L	3.0	3.4	3.2	3.1	3.7	3.1	3.5	3.6
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	3.0	3.4	3.2	3.1	3.7	3.1	3.5	3.6
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)	mg/L	1.46	1.45	1.66	1.66	1.66	1.66	1.65	1.65
Nutrients									
Total Ammonia-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0069	0.0062	<0.0050	<0.0050
Nitrate-N	mg/L	0.0054	<0.0050	<0.0050	<0.0050	0.0053	<0.0050	0.0100	0.0104
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.117	0.216	0.108	0.105	0.125	0.127	0.133	0.137
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0047	0.0066	0.0031	0.0031	0.0031	0.0023	0.0024	0.0023
Organic Carbon									
Total Organic Carbon	mg/L	1.81	1.80	1.87	2.11	2.45	2.42	2.01	2.18

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Counts Outflow							
Date		7-Jun-14		5-Jul-14		4-Aug-14		4-Sep-14	
Sample ID		L1468897-25	L1468897-24	L1483805-5	L1483805-6	L1498383-3	L1498383-4	L1514529-3	L1514529-4
Physical Tests	**Units**								
Conductivity	uS/cm	12.2	12.4	13.6	13.5	14.3	14.2	14.9	14.8
Hardness (as $CaCO_3$)	mg/L	3.71	3.78	4.40	4.37	4.46	4.51	4.76	4.82
pH	pH	7.66	7.73	6.96	6.94	7.08	7.03	6.82	6.81
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	9.2	9.4	9.2	9.3	9.8	9.8	10.3	10.4
Turbidity	NTU	0.92	0.96	0.65	0.50	0.57	0.62	0.68	0.60
Anions									
Anion Sum	meq/L	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.13
Cation Sum	meq/L	0.12	0.12	0.13	0.13	0.14	0.14	0.15	0.15
Cation - Anion Balance	%	4.6	-0.5	5.5	2.9	4.7	5.7	10.3	8.1
Alkalinity, Total (as $CaCO_3$)	mg/L	4.2	4.9	4.6	4.9	4.8	4.8	4.7	5.0
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	4.2	4.9	4.6	4.9	4.8	4.8	4.7	5.0
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)	mg/L	1.07	1.07	1.29	1.29	1.31	1.31	1.34	1.34
Nutrients									
Total Ammonia-N	mg/L	<0.0050	<0.0050	0.0055	0.0057	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.262	0.242	0.176	0.176	0.218	0.216	0.311	0.238
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0099	0.0103	0.0075	0.0071	0.0059	0.0070	0.0096	0.0098
Organic Carbon									
Total Organic Carbon	mg/L	3.31	3.08	2.52	2.47	2.89	2.90	3.27	3.10

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Vulture-Polar							
Date		7-Jun-14		5-Jul-14		1-Aug-14		2-Sep-14	
Sample ID		L1468897-16	L1468897-15	L1483805-28	L1483805-29	L1497420-11	L1497420-12	L1514553-10	L1514553-11
Physical Tests	**Units**								
Conductivity	uS/cm	12.7	12.8	14.6	14.5	14.4	14.5	15.5	15.4
Hardness (as $CaCO_3$)	mg/L	4.47	4.46	5.00	5.04	4.99	4.99	5.24	5.37
pH	pH	7.36	7.59	6.94	6.92	6.80	6.76	6.92	6.91
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	13.0	12.8	10.6	10.8	11.4	11.3	10.7	10.9
Turbidity	NTU	0.56	0.68	0.36	0.34	0.72	0.66	0.43	0.66
Anions									
Anion Sum	meq/L	0.1	<0.10	0.12	0.12	0.13	0.13	0.13	0.13
Cation Sum	meq/L	0.14	0.14	0.14	0.14	0.15	0.15	0.15	0.15
Cation - Anion Balance	%	15.5	18.2	10.3	7.8	8.0	7.0	8.0	8.0
Alkalinity, Total (as $CaCO_3$)	mg/L	3.6	3.3	4.0	4.4	4.6	4.8	4.6	4.7
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	3.6	3.3	4.0	4.4	4.6	4.8	4.6	4.7
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)	mg/L	1.35	1.36	1.67	1.69	1.61	1.59	1.67	1.67
Nutrients									
Total Ammonia-N	mg/L	<0.0050	0.0094	0.0052	0.0081	0.0127	0.0256	0.0132	0.0134
Nitrate-N	mg/L	<0.0050	<0.0050	0.009	0.0086	0.0093	0.0087	0.0235	0.0238
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.307	0.310	0.210	0.322	0.229	0.248	0.262	0.252
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0116	0.0120	0.0059	0.0057	0.0057	0.0053	0.0058	0.0064
Organic Carbon									
Total Organic Carbon	mg/L	6.96	6.93	3.76	3.71	4.23	4.03	3.34	3.35

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Pigeon Reach 7							
Date		7-Jun-14		3-Jul-14		3-Aug-14		4-Sep-14	
Sample ID		L1468769-1	L1468769-2	L1482177-1	L1482177-2	L1497440-1	L1497440-2	L1514512-1	L1514512-2
Physical Tests	**Units**								
Conductivity	uS/cm	14.4	14.7	21.7	21.7	23.1	23.1	26.8	26.0
Hardness (as $CaCO_3$)	mg/L	4.98	4.97	7.12	7.13	7.50	7.51	8.52	8.59
pH	pH	7.50	7.57	6.92	6.90	6.86	6.84	6.96	6.90
Total Suspended Solids	mg/L	<3.0	<3.0	3.7	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	12.9	12.9	14.7	14.4	16.6	16.2	17.5	17.4
Turbidity	NTU	0.75	0.85	1.50	1.47	1.21	1.02	0.75	0.74
Anions									
Anion Sum	meq/L	0.12	0.11	0.19	0.18	0.20	0.19	0.23	0.23
Cation Sum	meq/L	0.15	0.16	0.20	0.21	0.22	0.22	0.23	0.24
Cation - Anion Balance	%	12.3	15.7	3.6	06.7	3.0	5.2	1.7	2.7
Alkalinity, Total (as $CaCO_3$)	mg/L	4.2	3.6	5.0	4.4	4.8	4.3	4.3	4.4
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	4.2	3.6	5.0	4.4	4.8	4.3	4.3	4.4
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	<0.50	<0.50	1.35	1.36	1.64	1.65	1.62	1.62
Sulphate (SO_4)	mg/L	1.72	1.71	2.41	2.42	2.92	2.94	4.51	4.50
Nutrients									
Total Ammonia-N	mg/L	<0.0050	<0.0050	0.0101	0.0097	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate-N	mg/L	<0.0050	0.0918	0.0315	0.0318	<0.0050	<0.0050	0.0169	<0.0050
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.746	0.256	0.243	0.238	0.393	0.361	0.311	0.323
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0118	0.0118	0.0083	0.0087	0.0084	0.0063	0.0061	0.0055
Organic Carbon									
Total Organic Carbon	mg/L	5.73	5.74	4.00	3.93	5.13	4.93	4.34	4.24

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Lower PDC							
Date		6-Jun-14		6-Jul-14		2-Aug-14		5-Sep-14	
Sample ID		L1468897-32	L1468897-31	L1483805-11	L1483805-25	L1497420-5	L1497420-6	L1515273-5	L1515273-6
Physical Tests	**Units**								
Conductivity	uS/cm	14.4	14.7	22.1	21.5	24.0	24.0	35.5	35.8
Hardness (as $CaCO_3$)	mg/L	4.98	4.97	7.64	7.56	8.13	8.10	11.7	11.3
pH	pH	7.50	7.57	7.10	7.07	7.06	6.99	6.93	7.05
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	12.9	12.9	15.4	15.1	17.8	17.6	23.8	23.7
Turbidity	NTU	0.75	0.85	0.93	0.78	1.02	1.03	0.78	0.86
Anions									
Anion Sum	meq/L	0.12	0.11	0.19	0.18	0.22	0.21	0.32	0.32
Cation Sum	meq/L	0.15	0.16	0.21	0.21	0.24	0.24	0.34	0.32
Cation - Anion Balance	%	12.3	15.7	6.8	8.1	3.7	6.3	2.4	-0.6
Alkalinity, Total (as $CaCO_3$)	mg/L	4.2	3.6	6.1	5.8	6.9	6.3	7.4	7.4
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	4.2	3.6	6.1	5.8	6.9	6.3	7.4	7.4
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.79	0.79
Sulphate (SO_4)	mg/L	1.72	1.71	2.91	2.90	3.64	3.64	6.71	6.70
Nutrients									
Total Ammonia-N	mg/L	<0.0050	<0.0050	0.0056	0.0064	0.0092	0.0088	0.0118	0.0124
Nitrate-N	mg/L	<0.0050	0.0918	0.0570	0.0535	0.0861	0.0863	0.1450	0.1440
Nitrite-N	mg/L	<0.0010	<0.0010	0.001	<0.0010	<0.0010	0.001	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.746	0.256	0.204	0.214	0.241	0.240	0.240	0.224
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0053	0.0056
Total Phosphate-P	mg/L	0.0118	0.0118	0.0064	0.0067	0.0062	0.0066	0.0052	0.0053
Organic Carbon									
Total Organic Carbon	mg/L	5.73	5.74	4.41	4.37	5.09	5.29	4.85	5.06

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Kodiak-Little							
Date		7-Jun-14		5-Jul-14		4-Aug-14		5-Sep-14	
Sample ID		L1468897-29	L1468897-28	L1483805-23	L1483805-24	L1498383-7	L1498383-8	L1515273-3	L1515273-4
Physical Tests	**Units**								
Conductivity	uS/cm	24.0	24.1	26.9	26.7	28.5	28.9	30.6	30.5
Hardness (as $CaCO_3$)	mg/L	8.34	8.33	8.53	8.47	8.97	8.89	9.16	9.10
pH	pH	7.69	7.75	7.18	7.16	6.81	7.08	7.16	7.09
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	17.1	17.1	18.1	17.9	19.7	19.6	20.5	20.1
Turbidity	NTU	2.33	2.17	0.48	0.55	0.79	0.71	0.44	0.46
Anions									
Anion Sum	meq/L	0.21	0.21	0.23	0.23	0.26	0.26	0.27	0.26
Cation Sum	meq/L	0.26	0.26	0.25	0.25	0.26	0.26	0.27	0.27
Cation - Anion Balance	%	10.1	09.7	3.2	4.2	0.1	0	0.6	2.9
Alkalinity, Total (as $CaCO_3$)	mg/L	6.1	6.2	6.4	6.1	7.0	6.9	6.9	6.2
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	6.1	6.2	6.4	6.1	7.0	6.9	6.9	6.2
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	0.95	0.95	1.04	1.04	1.24	1.24	1.31	1.29
Sulphate (SO_4)	mg/L	3.02	3.01	3.66	3.68	4.30	4.28	4.65	4.62
Nutrients									
Total Ammonia-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0074	0.0082	0.0062	0.0070
Nitrate-N	mg/L	0.0054	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.252	0.287	0.227	0.227	0.331	0.341	0.291	0.290
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0013	0.0013
Total Phosphate-P	mg/L	0.0121	0.0118	0.0069	0.0058	0.0062	0.0059	0.0065	0.0061
Organic Carbon									
Total Organic Carbon	mg/L	4.50	4.58	4.59	4.56	4.79	4.82	5.01	5.08

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		1616-30 (LLCF)									
Date		6-Jun-14		16-Jun-14		1-Jul-14		6-Jul-14		14-Jul-14	21-Jul-14
Sample ID		L1468897-1	L1468897-21	L1471723-1	L1471723-2	L1480511-2	L1480511-5	L1483805-21	L1483805-22	L1488560-1	L1491709
Physical Tests	**Units**										
Conductivity	uS/cm	32.6	32.2	167	171	657	659	639	638	653	697
Hardness (as $CaCO_3$)	mg/L	09.0	09.2	19.5	20.0	78.0	76.3	74.8	73.6	80.2	82.6
pH	pH	7.62	6.91	7.37	7.43	7.90	7.85	7.94	7.93	7.92	7.84
Total Suspended Solids	mg/L	6.2	7.9	<3.0	<3.0	<3.0	3.3	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	23.0	22.6	107	85	380	364	374	372	349	406
Turbidity	NTU	6.49	6.52	2.55	2.45	1.08	0.90	0.76	0.87	0.56	1.08
Anions											
Anion Sum	meq/L	0.28	0.27	-	-	-	-	5.90	5.90	-	-
Cation Sum	meq/L	0.47	0.48	-	-	-	-	5.80	5.72	-	-
Cation - Anion Balance	%	24.5	26.8	-	-	-	-	-0.8	-1.6	-	-
Alkalinity, Total (as $CaCO_3$)	mg/L	5.9	5.5	13.8	14.3	47.0	46.5	45.0	45.0	47.5	54.4
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	5.9	5.5	-	-	-	-	45.0	45.0	-	-
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	-	-	-	-	<2.0	<2.0	-	-
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	-	-	-	-	<2.0	<2.0	-	-
Chloride (Cl)	mg/L	2.81	2.80	22.1	22.4	91.8	90.7	92.5	92.5	96.6	101
Sulphate (SO_4)	mg/L	4.05	4.03	25.5	25.9	104	104	106	106	111	117
Nutrients											
Total Ammonia-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0477	0.0218
Nitrate-N	mg/L	0.024	0.023	0.531	0.537	2.54	2.53	2.54	2.54	2.60	2.71
Nitrite-N	mg/L	<0.0010	<0.0010	0.0011	<0.0010	0.0075	0.0059	0.0077	0.0080	0.0105	0.0112
Total Kjeldahl Nitrogen	mg/L	0.209	0.211	0.275	0.287	0.404	0.402	2.77	2.68	0.514	0.478
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0230	0.0196	0.0071	0.0067	0.0057	0.0054	0.0062	0.0059	0.0042	0.0068
Organic Carbon											
Total Organic Carbon	mg/L	3.40	3.34	4.84	3.27	3.31	3.42	3.40	3.64	3.80	3.67

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		1616-30 (LLCF)									
Date		28-Jul-14	2-Aug-14		4-Aug-14	6-Aug-14		25-Aug-14		7-Sep-14	
Sample ID		L1495238	L1497420-1	L1497420-2	L1498719	L1500998-1	L1500998-4	L1507895-1	L1507895-4	L1515273-1	L1515273-2
Physical Tests	**Units**										
Conductivity	uS/cm	711	715	715	710	728	728			821	818
Hardness (as $CaCO_3$)	mg/L	84.4	79.6	80.2	84.2	82.8	82.4	92.9	87.5	90.3	91.9
pH	pH	7.96	8.02	8.02	8.04	7.93	7.96	7.88	7.97	8.06	8.05
Total Suspended Solids	mg/L	3.5	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	6.4	<3.0
Total Dissolved Solids	mg/L	413	414	411	420	424	437	-	-	467	463
Turbidity	NTU	1.26	0.87	0.73	0.73	0.67	0.74	-	-	0.98	0.96
Anions											
Anion Sum	meq/L	-	6.6	6.5	-	-	-	-	-	7.6	7.6
Cation Sum	meq/L	-	6.3	6.3	-	-	-	-	-	6.9	6.8
Cation - Anion Balance	%	-	-2.4	-2.1	-	-	-	-	-	-5.0	-5.7
Alkalinity, Total (as $CaCO_3$)	mg/L	49.4	51.9	50.0	49.4	55.2	53.6	-	-	63.3	60.6
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	-	51.9	50.0	-	-	-	-	-	63.3	60.6
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	-	<2.0	<2.0	-	-	-	-	-	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	-	<2.0	<2.0	-	-	-	-	-	<2.0	<2.0
Chloride (Cl)	mg/L	102	103	102	102	104	105	-	-	118	118
Sulphate (SO_4)	mg/L	118	119	118	117	120	121	-	-	135	136
Nutrients											
Total Ammonia-N	mg/L	0.0213	0.0234	0.0211	0.0172	0.0158	0.0157	0.0068	0.0072	0.0053	0.0068
Nitrate-N	mg/L	2.62	2.59	2.58	2.59	2.63	2.64	2.75	2.79	2.95	2.97
Nitrite-N	mg/L	0.0182	0.0127	0.0138	0.0145	0.0110	0.0132	0.0134	0.0150	<0.010	<0.010
Total Kjeldahl Nitrogen	mg/L	0.497	2.93	2.91	0.54	0.42	0.43	0.50	0.55	3.30	3.25
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0015	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0041	0.0056	0.0084	0.0045	0.0059	0.0056	0.0042	0.0036	0.0062	0.0049
Organic Carbon											
Total Organic Carbon	mg/L	3.89	4.43	4.52	3.76	3.90	4.05	4.32	4.48	4.39	4.34

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Leslie-Moose							
Date		7-Jun-14		5-Jul-14		4-Aug-14		2-Sep-14	
Sample ID		L1468897-4	L1468897-30	L1483805-9	L1483805-10	L1498383-9	L1498383-10	L1514553-3	L1514553-4
Physical Tests	**Units**								
Conductivity	uS/cm	067	067	749	755	834	836	844	850
Hardness (as $CaCO_3$)	mg/L	8.09	8.09	91.3	90.8	95.8	97.0	101	96.9
pH	pH	7.71	7.74	7.99	8.01	8.00	8.06	8.02	7.96
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	37.3	36.9	435	429	483	478	452	482
Turbidity	NTU	0.91	0.91	0.50	0.51	0.36	0.55	0.58	0.64
Anions									
Anion Sum	meq/L	0.59	0.58	7.02	6.85	8.09	7.91	7.20	7.99
Cation Sum	meq/L	0.54	0.54	6.74	6.69	6.84	6.93	7.21	7.02
Cation - Anion Balance	%	-4.2	-3.3	-2.1	-1.2	-8.4	-6.6	0	-6.5
Alkalinity, Total (as $CaCO_3$)	mg/L	7.5	6.8	64.5	57.8	65.2	63.2	68.7	67.8
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	07.5	06.8	64.5	57.8	65.2	63.2	68.7	67.8
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	8.5	8.5	109	108	129	127	112	127
Sulphate (SO_4)	mg/L	9.1	9.2	121	120	143	140	122	141
Nutrients									
Total Ammonia-N	mg/L	0.0070	0.0071	0.0143	0.0123	0.0183	0.0230	0.0117	0.0167
Nitrate-N	mg/L	0.138	0.126	2.03	2.03	2.27	2.21	1.67	1.88
Nitrite-N	mg/L	0.0015	0.0011	0.0102	0.0115	0.017	0.015	<0.010	<0.010
Total Kjeldahl Nitrogen	mg/L	0.17	0.16	<0.46	<0.47	<0.52	<0.53	0.63	<0.47
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	0.0021	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0082	0.0085	0.0068	0.0077	0.0062	0.0040	0.0058	0.0047
Organic Carbon									
Total Organic Carbon	mg/L	2.21	2.25	3.84	3.89	4.70	4.52	4.40	4.22

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Moose-Nero							
Date		7-Jun-14		5-Jul-14		2-Aug-14		3-Sep-14	
Sample ID		L1468897-6	L1468897-5	L1483805-12	L1483805-13	L1497420-7	L1497420-8	L1514553-5	L1514553-6
Physical Tests	**Units**								
Conductivity	uS/cm	50.6	50.3	255	255	285	285	453	455
Hardness (as $CaCO_3$)	mg/L	10.3	10.6	34.7	34.5	37.7	38.0	58.5	56.7
pH	pH	7.70	7.72	7.62	7.65	7.48	7.62	7.83	7.85
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	31.2	31.3	144	143	161	160	258	252
Turbidity	NTU	1.24	1.49	0.39	0.32	0.56	0.57	0.41	0.41
Anions									
Anion Sum	meq/L	0.45	0.45	2.26	2.24	2.56	2.56	4.15	4.14
Cation Sum	meq/L	0.46	0.47	2.25	2.24	2.44	2.43	3.98	3.73
Cation - Anion Balance	%	1.8	2.5	-0.2	0.0	-2.3	-2.7	-2.1	-5.2
Alkalinity, Total (as $CaCO_3$)	mg/L	7.8	7.9	22.7	22.1	26.8	26.8	38.3	38.2
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	7.8	7.9	22.7	22.1	26.8	26.8	38.3	38.2
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	5.09	5.08	34.6	34.5	39.7	39.7	65.4	65.3
Sulphate (SO_4)	mg/L	6.84	6.83	38.7	38.6	42.2	42.2	71.5	71.5
Nutrients									
Total Ammonia-N	mg/L	<0.0050	<0.0050	0.0147	0.0151	0.0203	0.0266	0.0182	0.0221
Nitrate-N	mg/L	0.0467	0.0462	0.339	0.338	0.364	0.355	0.664	0.662
Nitrite-N	mg/L	<0.0010	<0.0010	0.0019	0.0017	0.0028	0.0028	0.0027	0.0027
Total Kjeldahl Nitrogen	mg/L	0.262	0.262	0.280	0.280	0.410	0.420	0.400	0.430
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0110	0.0128	0.0067	0.0061	0.0063	0.0070	0.0044	0.0049
Organic Carbon									
Total Organic Carbon	mg/L	4.53	4.41	4.41	4.30	5.93	5.96	4.68	4.64

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Nema-Martine							
Date		7-Jun-14		5-Jul-14		4-Aug-14		5-Sep-14	
Sample ID		L1468897-12	L1468897-11	L1483805-18	L1483805-19	L1498383-13	L1498383-14	L1515273-7	L1515273-8
Physical Tests	**Units**								
Conductivity	uS/cm	097	097	378	372	405	407	434	428
Hardness (as $CaCO_3$)	mg/L	14.8	14.7	54.4	54.4	52.9	53.1	54.9	57.0
pH	pH	7.70	7.60	7.75	7.87	7.78	7.81	7.82	7.87
Total Suspended Solids	mg/L	<3.0	3.7	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	55.8	55.1	213	213	222	221	235	234
Turbidity	NTU	1.39	1.70	0.77	0.50	0.83	0.80	0.68	0.74
Anions									
Anion Sum	meq/L	0.85	0.84	3.40	3.40	3.72	3.70	3.88	3.87
Cation Sum	meq/L	0.83	0.82	3.39	3.40	3.24	3.20	3.50	3.52
Cation - Anion Balance	%	-0.7	-1.3	-0.1	0.1	-7.0	-7.3	-5.2	-4.8
Alkalinity, Total (as $CaCO_3$)	mg/L	10.1	09.8	32.3	32.3	36.7	36.3	37.5	37.4
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	10.1	09.8	32.3	32.3	36.7	36.3	37.5	37.4
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	12.2	12.2	54.7	54.7	59.9	59.7	62.8	62.7
Sulphate (SO_4)	mg/L	14.0	14.0	57.5	57.5	61.9	61.7	64.9	64.8
Nutrients									
Total Ammonia-N	mg/L	<0.0050	<0.0050	0.0211	0.0219	0.0234	0.0255	0.0192	0.0240
Nitrate-N	mg/L	0.103	0.108	0.199	0.201	0.109	0.117	0.082	0.083
Nitrite-N	mg/L	<0.0010	<0.0010	0.0023	0.0023	0.0019	0.0021	<0.0010	0.0011
Total Kjeldahl Nitrogen	mg/L	0.260	0.271	0.320	0.370	0.467	0.425	0.446	0.443
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0013	0.0015
Total Phosphate-P	mg/L	0.0132	0.0146	0.0071	0.0080	0.0050	0.0049	0.0084	0.0071
Organic Carbon									
Total Organic Carbon	mg/L	4.49	4.49	4.34	4.33	5.05	5.21	5.42	5.17

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Slipper-Lac de Gras							
Date		7-Jun-14		5-Jul-14		4-Aug-14		3-Sep-14	
Sample ID		L1468897-14	L1468897-13	L1483805-26	L1483805-27	L1498383-15	L1498383-16	L1514553-9	L1514553-14
Physical Tests	**Units**								
Conductivity	uS/cm	141	140	204	206	195	195	193	192
Hardness (as $CaCO_3$)	mg/L	21.4	21.6	32.7	32.2	29.6	29.7	29.9	29.9
pH	pH	7.59	6.76	7.58	7.61	7.63	7.62	7.54	7.54
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	78.4	78.8	117	115	105	105	106	106
Turbidity	NTU	1.30	1.00	0.87	0.71	0.98	0.75	0.64	0.58
Anions									
Anion Sum	meq/L	1.24	1.24	1.84	1.84	1.73	1.74	1.72	1.72
Cation Sum	meq/L	1.18	1.19	1.85	1.82	1.53	1.54	1.59	1.60
Cation - Anion Balance	%	-2.7	-2.3	0.2	-0.4	-6.1	-6.1	-4.0	-3.4
Alkalinity, Total (as $CaCO_3$)	mg/L	13.8	13.8	19.4	19.0	20.0	19.9	20.7	20.4
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	13.8	13.8	19.4	19.0	20.0	19.9	20.7	20.4
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	18.8	18.8	29.2	29.2	27.1	27.2	26.7	26.8
Sulphate (SO_4)	mg/L	20.6	20.6	30.4	30.4	27.4	27.4	26.6	26.5
Nutrients									
Total Ammonia-N	mg/L	0.0084	0.0085	<0.0050	<0.0050	0.0096	0.0106	0.0131	0.0329
Nitrate-N	mg/L	0.118	0.119	0.0101	0.0098	<0.0050	<0.0050	0.0167	0.016
Nitrite-N	mg/L	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.285	0.276	0.274	0.277	0.346	0.344	0.323	0.342
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0118	0.0122	0.0082	0.0077	0.0047	0.0052	0.0073	0.0061
Organic Carbon									
Total Organic Carbon	mg/L	4.25	4.41	4.21	3.95	4.66	4.76	4.71	4.74

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Mossing Outflow							
Date		7-Jun-14		5-Jul-14		4-Aug-14		4-Sep-14	
Sample ID		L1468897-8	L1468897-7	L1483805-14	L1483805-15	L1498383-11	L1498383-12	L1514529-7	L1514529-8
Physical Tests	**Units**								
Conductivity	uS/cm	33.9	34.0	47.0	47.6	44.0	43.0	31.4	31.6
Hardness (as $CaCO_3$)	mg/L	11.7	11.5	16.2	16.3	14.7	14.7	9.39	9.32
pH	pH	7.70	7.68	7.35	7.30	7.27	7.20	6.70	6.65
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	4.7
Total Dissolved Solids	mg/L	23.4	23.4	30.4	30.6	29.5	29.2	25.0	25.2
Turbidity	NTU	1.02	1.01	0.74	0.75	0.89	0.83	2.53	3.72
Anions									
Anion Sum	meq/L	0.29	0.30	0.43	0.43	0.40	0.40	0.27	0.27
Cation Sum	meq/L	0.33	0.33	0.45	0.45	0.46	0.45	0.43	0.43
Cation - Anion Balance	%	5.8	4.1	2.6	2.9	6.5	6.7	22.0	22.1
Alkalinity, Total (as $CaCO_3$)	mg/L	8.1	7.7	11.5	11.6	12.4	12.2	8.5	8.3
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	8.1	7.7	11.5	11.6	12.4	12.2	8.5	8.3
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	<0.50	0.51	0.68	0.67	0.72	0.73	0.80	0.80
Sulphate (SO_4)	mg/L	6.30	6.29	8.54	8.53	6.37	6.37	4.00	4.01
Nutrients									
Total Ammonia-N	mg/L	<0.0050	<0.0050	0.0068	0.006	0.0094	0.0086	0.0372	0.0374
Nitrate-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0053
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.293	0.282	0.296	0.300	0.325	0.352	0.364	0.357
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0093	0.0088	0.0075	0.0082	0.0083	0.0054	0.0087	0.0075
Organic Carbon									
Total Organic Carbon	mg/L	6.05	5.88	5.80	5.91	6.39	6.26	6.86	7.19

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		1616-43 (KPSF)								
Date		6-Jun-14		5-Jul-14		8-Jul-14	1-Aug-14		2-Sep-14	
Sample ID		L1468897-22	L1468897-23	L1483805-1	L1483805-2	L1484307-2	L1497420-3	L1497420-4	L1514553-1	L1514553-2
Physical Tests	**Units**									
Conductivity	uS/cm	85.5	85.6	190	190	191	207	206	237	235
Hardness (as $CaCO_3$)	mg/L	30.3	31.2	67.2	65.7	68.1	73.7	74.4	83.6	87.3
pH	pH	7.53	7.71	7.79	7.80	7.89	7.86	7.81	7.81	7.82
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	3.4	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	51.7	52.4	112	111	143	125	125	144	145
Turbidity	NTU	2.42	2.66	1.33	1.34	1.99	1.43	1.44	0.91	0.99
Anions										
Anion Sum	meq/L	0.79	0.80	1.80	1.78		1.99	1.99	2.31	2.30
Cation Sum	meq/L	0.81	0.83	1.75	1.71		1.94	1.95	2.17	2.27
Cation - Anion Balance	%	0.9	1.7	-1.3	-1.9		-1.4	-0.9	-3.1	-0.5
Alkalinity, Total (as $CaCO_3$)	mg/L	16.0	16.6	33.5	32.7	34.9	37.4	37.6	33.7	33.3
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	16.0	16.6	33.5	32.7		37.4	37.6	33.7	33.3
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0		<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0		<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	2.27	2.26	4.41	4.40	4.51	5.20	5.19	5.94	5.95
Sulphate (SO_4)	mg/L	19.5	19.4	47.6	47.4	47.8	52.7	52.3	70.4	70.3
Nutrients										
Total Ammonia-N	mg/L	0.0086	0.0087	0.0173	0.0142	0.0102	0.0175	0.0194	0.0065	0.0066
Nitrate-N	mg/L	0.0349	0.0324	0.1900	0.1700	0.0652	0.0137	0.0313	0.0058	<0.0050
Nitrite-N	mg/L	0.0011	<0.0010	0.0045	0.0044	0.0016	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.449	0.441	0.491	0.494	0.5980	0.917	0.612	0.611	0.627
Dissolved Orthophosphate-P	mg/L	0.0016	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0261	0.0259	0.0200	0.0170	0.0125	0.0208	0.0155	0.0192	0.0187
Organic Carbon										
Total Organic Carbon	mg/L	5.38	5.23	6.74	6.71	8.28	8.65	8.64	7.11	7.07

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Cujo Outflow							
Date		7-Jun-14		5-Jul-14		4-Aug-14		4-Sep-14	
Sample ID		L1468897-26	L1468897-27	L1483805-7	L1483805-8	L1498383-5	L1498383-6	L1514529-5	L1514529-6
Physical Tests	**Units**								
Conductivity	uS/cm	92.8	92.8	179	180	185	185	246	248
Hardness (as $CaCO_3$)	mg/L	31.7	32.8	65.9	65.7	61.8	62.3	91.2	94.1
pH	pH	7.56	7.71	7.57	7.67	7.55	7.59	7.25	7.22
Total Suspended Solids	mg/L	<3.0	3.5	<3.0	<3.0	<3.0	<3.0	3.0	5.8
Total Dissolved Solids	mg/L	55.4	55.7	106	105	109	109	148	150
Turbidity	NTU	1.24	1.05	1.09	0.65	0.74	1.06	2.17	3.37
Anions									
Anion Sum	meq/L	0.85	0.85	1.67	1.67	1.77	1.78	2.44	2.47
Cation Sum	meq/L	0.81	0.84	1.67	1.66	1.56	1.58	2.29	2.35
Cation - Anion Balance	%	-2.7	-0.7	0.1	-0.1	-6.5	-5.8	-3.2	-2.5
Alkalinity, Total (as $CaCO_3$)	mg/L	13.2	12.9	24.9	24.9	27.2	27.4	38.4	40.3
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	13.2	12.9	24.9	24.9	27.2	27.4	38.4	40.3
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	1.77	1.77	3.48	3.46	3.71	3.71	4.17	4.15
Sulphate (SO_4)	mg/L	26.0	25.9	51.6	51.5	54.0	54.0	74.6	74.3
Nutrients									
Total Ammonia-N	mg/L	<0.0050	<0.0050	0.0125	0.0129	0.0174	0.0204	0.1160	0.1110
Nitrate-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0210	0.0267
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.002	0.0021
Total Kjeldahl Nitrogen	mg/L	0.475	0.380	0.336	0.339	0.468	0.461	0.731	0.649
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	<0.0010
Total Phosphate-P	mg/L	0.0139	0.0196	0.0107	0.0097	0.0104	0.0117	0.0243	0.0364
Organic Carbon									
Total Organic Carbon	mg/L	5.13	5.17	5.39	5.46	6.41	6.19	5.35	5.71

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Christine-Lac du Sauvage							
Date		7-Jun-14		5-Jul-14		4-Aug-14		4-Sep-14	
Sample ID		L1468897-3	L1468897-2	L1483805-3	L1483805-4	L1498383-1	L1498383-2	L1514529-1	L1514529-2
Physical Tests	**Units**								
Conductivity	uS/cm	39.4	39.4	50.2	50.4	51.4	50.9	51.9	52.0
Hardness (as $CaCO_3$)	mg/L	12.6	12.8	16.3	16.5	16.6	16.4	17.7	16.9
pH	pH	7.67	7.54	7.20	7.19	7.35	7.24	7.05	7.06
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	26.8	26.6	31.4	31.3	31.7	32.3	32.8	32.3
Turbidity	NTU	0.64	0.72	0.64	0.46	0.57	0.57	1.07	0.99
Anions									
Anion Sum	meq/L	0.36	0.35	0.44	0.44	0.45	0.46	0.46	0.46
Cation Sum	meq/L	0.35	0.35	0.44	0.45	0.44	0.44	0.48	0.46
Cation - Anion Balance	%	-1.7	0.0	-0.1	0.8	-0.7	-2.5	1.4	-0.3
Alkalinity, Total (as $CaCO_3$)	mg/L	7.3	6.9	7.9	7.8	7.9	8.4	8.3	8.1
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	7.3	6.9	7.9	7.8	7.9	8.4	8.3	8.1
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	0.66	0.66	0.86	0.85	0.89	0.89	0.96	0.94
Sulphate (SO_4)	mg/L	09.3	09.3	12.4	12.4	12.8	12.8	13.0	13.0
Nutrients									
Total Ammonia-N	mg/L	<0.0050	<0.0050	0.0132	0.0128	0.0187	0.0173	0.0135	0.0130
Nitrate-N	mg/L	<0.0050	<0.0050	0.0053	<0.0050	0.0149	0.0142	0.0215	0.0193
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.286	0.298	0.257	0.261	0.308	0.315	0.306	0.313
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0091	0.0085	0.0055	0.0075	0.0041	0.0043	0.0071	0.0077
Organic Carbon									
Total Organic Carbon	mg/L	6.01	5.90	5.24	5.01	4.96	5.32	4.95	4.83

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Pigeon Reach 1									
Date		10-Jun-14		21-Jun-14		3-Jul-14		18-Jul-14		3-Aug-14	
Sample ID		L1470221-1	L1470221-2	L1476113-1	L1476113-2	L1482177-7	L1482177-8	L1490981-1	L1490981-2	L1497440-7	L1497440-8
Physical Tests	**Units**										
Conductivity	uS/cm	19.1	18.5	20.7	20.8	20.0	20.0	27.7	27.0	27.2	27.2
Hardness (as $CaCO_3$)	mg/L	6.12	6.42	7.63	7.66	6.44	6.33	8.91	9.42	8.86	8.99
pH	pH	7.24	7.04	6.83	6.82	6.86	6.85	7.15	7.01	6.88	6.88
Total Suspended Solids	mg/L	3.2	<3.0	24.2	27	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	13.4	13.8	15.7	15.5	13.7	13.9	20.0	20.1	18.7	19.0
Turbidity	NTU	1.5	1.41	11.3	7.83	0.57	0.48	1.54	1.41	1.07	1.08
Anions											
Anion Sum	meq/L	0.16	0.17	0.19	0.18	0.16	0.17	0.23	0.25	0.25	0.25
Cation Sum	meq/L	0.19	0.19	0.28	0.28	0.18	0.18	0.26	0.28	0.26	0.27
Cation - Anion Balance	%	7.6	8.1	19.5	21.0	5.8	3.4	6.1	5.4	2.7	3.7
Alkalinity, Total (as $CaCO_3$)	mg/L	4.2	4.5	4.9	4.6	3.6	4.0	4.9	5.6	6.5	6.6
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	4.2	4.5	4.9	4.6	3.6	4.0	4.9	5.6	6.5	6.6
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	0.98	0.98	1.21	1.21	1.49	1.37	1.54	1.55	1.65	1.67
Sulphate (SO_4)	mg/L	2.30	2.28	2.53	2.53	2.44	2.44	4.26	4.27	3.24	3.25
Nutrients											
Total Ammonia-N	mg/L	0.0061	<0.0050	0.0079	0.0084	0.0056	0.0053	0.0088	0.0088	0.0091	0.0119
Nitrate-N	mg/L	<0.0050	<0.0050	0.0150	0.0127	<0.0050	<0.0050	0.0382	0.0423	0.0424	0.0413
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.232	0.226	0.217	0.216	0.260	0.274	0.425	0.317	0.288	0.361
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0101	0.0063	0.0215	0.0207	0.0066	0.0068	0.0092	0.0089	0.0076	0.0100
Organic Carbon											
Total Organic Carbon	mg/L	4.18	4.25	4.20	4.20	4.04	4.13	6.18	5.57	4.87	4.93

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Pigeon Reach 1							
Date		14-Aug-14		4-Sep-14		18-Sep-14		28-Sep-14	
Sample ID		L1504432-1	L1504432-2	L1514512-3	L1514512-4	L1523223-1	L1523223-2	L1526461-5	L1526461-6
Physical Tests	**Units**								
Conductivity	uS/cm	32.1	31.9	41.3	41.1	46.8	46.9	31.7	31.5
Hardness (as $CaCO_3$)	mg/L	10.0	9.80	13.4	13.3	16.2	16.6	10.5	10.4
pH	pH	7.53	7.49	6.92	6.96	6.72	6.76	6.83	6.83
Total Suspended Solids	mg/L	<3.0	<3.0	3.1	4	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	20.5	20.1	26.5	26.5	27.6	27.9	20.3	20.0
Turbidity	NTU	0.82	0.96	1.82	2.10	0.84	0.75	0.61	0.69
Anions									
Anion Sum	meq/L	0.27	0.27	0.36	0.37	0.42	0.42	0.27	0.26
Cation Sum	meq/L	0.29	0.29	0.40	0.40	0.35	0.36	0.28	0.27
Cation - Anion Balance	%	3.5	3.3	5.2	3.6	-9.2	-6.8	2.1	2.2
Alkalinity, Total (as $CaCO_3$)	mg/L	6.7	6.5	7.6	8.0	8.0	7.8	4.4	4.3
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	6.7	6.5	7.6	8.0	8.0	7.8	4.4	4.3
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	1.71	1.71	1.81	1.82	1.65	1.65	1.57	1.57
Sulphate (SO_4)	mg/L	4.14	4.13	7.29	7.29	10.00	10.00	6.36	6.37
Nutrients									
Total Ammonia-N	mg/L	0.0120	0.0119	0.0419	0.0103	0.0278	0.0285	0.0050	0.0051
Nitrate-N	mg/L	0.0642	0.0646	0.104	0.103	0.0855	0.086	<0.0050	<0.0050
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.344	0.358	0.315	0.284	0.271	0.272	0.278	0.288
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0068	0.0085	0.0107	0.0096	0.0049	0.0085	0.0074	0.0045
Organic Carbon									
Total Organic Carbon	mg/L	4.90	4.73	4.74	4.70	5.28	5.42	4.67	4.54

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Nanuq Outflow							
Date		7-Jun-14		5-Jul-14		1-Aug-14		2-Sep-14	
Sample ID		L1468897-10	L1468897-9	L1483805-16	L1483805-17	L1497420-9	L1497420-10	L1514553-7	L1514553-8
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0140	0.0137	0.0057	0.0058	0.0048	0.0047	0.0044	0.0042
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000122	0.000117	0.000094	0.000159	0.000112	0.000110	0.000093	0.000111
Barium (Ba)-Total	mg/L	0.00177	0.00168	0.00152	0.00157	0.00133	0.00132	0.00143	0.00144
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	0.000011	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	0.0054	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	0.656	0.666	0.682	0.693	0.665	0.662	0.733	0.746
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00037	0.00037	0.00038	0.00039	0.00037	0.00037	0.00033	0.00036
Iron (Fe)-Total	mg/L	0.020	0.023	0.014	0.012	0.021	0.023	0.019	0.020
Lead (Pb)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	0.421	0.407	0.453	0.462	0.462	0.461	0.507	0.499
Manganese (Mn)-Total	mg/L	0.00495	0.00494	0.00158	0.00175	0.00200	0.00223	0.00237	0.00244
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.000300	0.000292	0.000163	0.000158	0.000151	0.000158	0.000151	0.000147
Potassium (K)-Total	mg/L	0.357	0.343	0.373	0.385	0.365	0.359	0.397	0.391
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.108	0.114	0.093	0.093	0.079	0.080	0.070	0.075
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	0.455	0.448	0.528	0.522	0.509	0.506	0.532	0.521
Strontium (Sr)-Total	mg/L	0.00456	0.00449	0.00465	0.00470	0.00454	0.00450	0.00499	0.00506
Uranium (U)-Total	mg/L	0.000016	0.000017	0.000014	0.000019	0.000015	0.000015	0.000013	0.000013
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	0.0014	<0.0010	<0.0010	0.0024	<0.0010	0.0014	<0.0010	0.0012

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Counts Outflow							
Date		7-Jun-14		5-Jul-14		4-Aug-14		4-Sep-14	
Sample ID		L1468897-25	L1468897-24	L1483805-5	L1483805-6	L1498383-3	L1498383-4	L1514529-3	L1514529-4
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0407	0.0421	0.0141	0.0139	0.0142	0.0153	0.0194	0.0196
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000218	0.000233	0.000202	0.000201	0.000270	0.000274	0.000262	0.000272
Barium (Ba)-Total	mg/L	0.00214	0.00219	0.00173	0.00176	0.00164	0.00155	0.00172	0.00167
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	0.0068	0.0058	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	0.645	0.636	0.744	0.753	0.737	0.738	0.781	0.790
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00060	0.00062	0.00046	0.00046	0.00051	0.00050	0.00060	0.00058
Iron (Fe)-Total	mg/L	0.058	0.057	0.059	0.057	0.077	0.084	0.111	0.111
Lead (Pb)-Total	mg/L	<0.000010	0.000011	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	0.510	0.533	0.612	0.617	0.637	0.648	0.682	0.692
Manganese (Mn)-Total	mg/L	0.00451	0.00458	0.00411	0.00411	0.00414	0.00404	0.00554	0.00543
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.000576	0.000586	0.000334	0.000344	0.000363	0.000379	0.000448	0.000454
Potassium (K)-Total	mg/L	0.469	0.479	0.509	0.519	0.557	0.567	0.665	0.666
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.187	0.210	0.081	0.082	0.116	0.115	0.157	0.152
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	0.521	0.536	0.622	0.633	0.617	0.628	0.650	0.650
Strontium (Sr)-Total	mg/L	0.00453	0.00447	0.00501	0.00501	0.00488	0.00489	0.00530	0.00534
Uranium (U)-Total	mg/L	0.000026	0.000026	0.000014	0.000017	0.000017	0.000017	0.000019	0.000021
Vanadium (V)-Total	mg/L	0.000077	0.000079	<0.000050	<0.000050	<0.000050	<0.000050	0.000052	<0.000050
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

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Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Vulture-Polar							
Date		7-Jun-14		5-Jul-14		1-Aug-14		2-Sep-14	
Sample ID		L1468897-16	L1468897-15	L1483805-28	L1483805-29	L1497420-11	L1497420-12	L1514553-10	L1514553-11
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.1100	0.1090	0.0331	0.0351	0.0271	0.0226	0.0185	0.0188
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000194	0.000189	0.000209	0.000218	0.000241	0.000230	0.000206	0.000212
Barium (Ba)-Total	mg/L	0.00494	0.00506	0.00361	0.00355	0.00318	0.00339	0.00356	0.00352
Beryllium (Be)-Total	mg/L	0.000011	0.000014	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	0.005	0.0051	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	0.727	0.727	0.769	0.779	0.780	0.778	0.835	0.880
Chromium (Cr)-Total	mg/L	0.00026	0.00027	0.00012	0.00013	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	0.00018	0.00018	0.00011	0.00011	0.00012	0.00014	0.00012	0.00012
Copper (Cu)-Total	mg/L	0.00162	0.00163	0.00097	0.00101	0.00084	0.00082	0.00089	0.00092
Iron (Fe)-Total	mg/L	0.093	0.094	0.104	0.107	0.151	0.163	0.096	0.098
Lead (Pb)-Total	mg/L	0.000011	0.000011	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	0.646	0.643	0.742	0.750	0.739	0.739	0.767	0.771
Manganese (Mn)-Total	mg/L	0.00523	0.00509	0.00400	0.00412	0.00480	0.00539	0.00420	0.00439
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000077	<0.000050
Nickel (Ni)-Total	mg/L	0.00173	0.00170	0.000719	0.000746	0.000630	0.000633	0.000544	0.000567
Potassium (K)-Total	mg/L	0.467	0.464	0.504	0.508	0.511	0.512	0.546	0.546
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.536	0.515	0.248	0.255	0.244	0.252	0.144	0.137
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	0.421	0.417	0.578	0.577	0.532	0.533	0.560	0.560
Strontium (Sr)-Total	mg/L	0.00588	0.00575	0.00610	0.00619	0.00607	0.00616	0.00648	0.00656
Uranium (U)-Total	mg/L	0.000090	0.000092	0.000040	0.000040	0.000032	0.000031	0.000033	0.000032
Vanadium (V)-Total	mg/L	0.000115	0.000120	0.000057	0.000071	0.000068	0.000078	0.000056	0.000059
Zinc (Zn)-Total	mg/L	0.0012	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0014

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Pigeon Reach 7							
Date		7-Jun-14		3-Jul-14		3-Aug-14		4-Sep-14	
Sample ID		L1468769-1	L1468769-2	L1482177-1	L1482177-2	L1497440-1	L1497440-2	L1514512-1	L1514512-2
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.1040	0.1160	0.0714	0.0695	0.0232	0.0234	0.0203	0.0380
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000176	0.000192	0.000292	0.000301	0.000262	0.000269	0.000224	0.000219
Barium (Ba)-Total	mg/L	0.00572	0.00602	0.00570	0.00570	0.00339	0.00344	0.00370	0.00427
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	0.901	0.884	1.23	1.23	1.24	1.22	1.42	1.41
Chromium (Cr)-Total	mg/L	0.00028	0.00030	0.00021	0.00016	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	0.00018	0.00019	0.00022	0.00022	0.00018	0.00018	0.00015	0.00018
Copper (Cu)-Total	mg/L	0.00202	0.00208	0.00086	0.00086	0.00073	0.00074	0.00074	0.00080
Iron (Fe)-Total	mg/L	0.121	0.120	0.197	0.198	0.141	0.144	0.088	0.121
Lead (Pb)-Total	mg/L	0.000028	0.000029	0.000029	0.000026	<0.000010	<0.000010	<0.000010	0.000014
Magnesium (Mg)-Total	mg/L	0.662	0.671	1.01	0.990	1.07	1.08	1.21	1.23
Manganese (Mn)-Total	mg/L	0.00624	0.00630	0.00965	0.00958	0.01220	0.01190	0.00511	0.00651
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.00179	0.00182	0.00136	0.00138	0.00125	0.00125	0.00165	0.00172
Potassium (K)-Total	mg/L	0.626	0.622	0.675	0.659	0.72	0.720	0.725	0.729
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.625	0.618	0.272	0.285	0.159	0.166	0.126	0.147
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	0.467	0.467	0.768	0.763	0.847	0.843	0.88	0.879
Strontium (Sr)-Total	mg/L	0.00748	0.00742	0.0094	0.0094	0.00926	0.0092	0.0102	0.0103
Uranium (U)-Total	mg/L	0.000118	0.000117	0.000042	0.000046	0.000027	0.000025	0.000019	0.000025
Vanadium (V)-Total	mg/L	0.000160	0.000181	0.000246	0.000248	<0.000050	<0.000050	<0.000050	0.000075
Zinc (Zn)-Total	mg/L	0.0029	0.0029	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	0.0029

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Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Lower PDC							
Date		6-Jun-14		6-Jul-14		2-Aug-14		5-Sep-14	
Sample ID		L1468897-32	L1468897-31	L1483805-11	L1483805-25	L1497420-5	L1497420-6	L1515273-5	L1515273-6
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.1040	0.1160	0.0487	0.0495	0.0517	0.0507	0.0396	0.0394
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000176	0.000192	0.000238	0.000274	0.000250	0.000268	0.000232	0.000235
Barium (Ba)-Total	mg/L	0.00572	0.00602	0.00745	0.00745	0.00746	0.00737	0.01050	0.00967
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	0.0068	0.0053	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000012	<0.000010
Calcium (Ca)-Total	mg/L	0.901	0.884	1.40	1.37	1.46	1.46	2.15	2.15
Chromium (Cr)-Total	mg/L	0.00028	0.00030	0.00015	0.00022	0.00020	0.00019	0.00019	0.00018
Cobalt (Co)-Total	mg/L	0.00018	0.00019	<0.00010	<0.00010	<0.00010	<0.00010	0.00016	0.00015
Copper (Cu)-Total	mg/L	0.00202	0.00208	0.00239	0.00246	0.00270	0.00264	0.00288	0.00258
Iron (Fe)-Total	mg/L	0.121	0.120	0.102	0.102	0.137	0.142	0.170	0.172
Lead (Pb)-Total	mg/L	0.000028	0.000029	0.000026	0.000031	0.000031	0.000035	0.000036	0.000027
Magnesium (Mg)-Total	mg/L	0.662	0.671	1.01	1.01	1.09	1.08	1.55	1.44
Manganese (Mn)-Total	mg/L	0.00624	0.00630	0.00348	0.00351	0.00390	0.00397	0.00725	0.00679
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	0.000219	0.000146	0.000102	0.000114	0.000110	0.000105
Nickel (Ni)-Total	mg/L	0.00179	0.00182	0.00148	0.00149	0.00154	0.00151	0.00185	0.00171
Potassium (K)-Total	mg/L	0.626	0.622	0.846	0.850	0.89	0.901	1.23	1.11
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.625	0.618	0.430	0.416	0.509	0.498	0.599	0.603
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	0.467	0.467	0.798	0.773	0.854	0.838	1.23	1.09
Strontium (Sr)-Total	mg/L	0.00748	0.00742	0.0110	0.0107	0.01140	0.0114	0.0162	0.0164
Uranium (U)-Total	mg/L	0.000118	0.000117	0.000151	0.000148	0.000176	0.000174	0.000180	0.000177
Vanadium (V)-Total	mg/L	0.000160	0.000181	0.000124	0.000140	0.000141	0.000153	0.000126	0.000128
Zinc (Zn)-Total	mg/L	0.0029	0.0029	0.0043	0.0045	0.0050	0.0056	0.0095	0.0086

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Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Kodiak-Little							
Date		7-Jun-14		5-Jul-14		4-Aug-14		5-Sep-14	
Sample ID		L1468897-29	L1468897-28	L1483805-23	L1483805-24	L1498383-7	L1498383-8	L1515273-3	L1515273-4
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.144	0.141	0.0321	0.0328	0.0240	0.0238	0.0135	0.0134
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000220	0.000220	0.000234	0.000244	0.000249	0.000253	0.000218	0.000210
Barium (Ba)-Total	mg/L	0.0099	0.0097	0.00754	0.00768	0.00751	0.00744	0.00719	0.00724
Beryllium (Be)-Total	mg/L	<0.00010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.010	<0.010	0.0062	0.0055	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	1.45	1.45	1.54	1.52	1.57	1.57	1.57	1.55
Chromium (Cr)-Total	mg/L	0.00053	0.00052	0.00013	<0.00010	0.00011	0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	0.00023	0.00024	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00163	0.00154	0.00142	0.00142	0.00150	0.00147	0.00138	0.00138
Iron (Fe)-Total	mg/L	0.169	0.167	0.053	0.050	0.061	0.061	0.029	0.031
Lead (Pb)-Total	mg/L	0.000056	0.000053	0.000011	<0.000010	<0.000010	<0.000010	<0.000010	0.000017
Magnesium (Mg)-Total	mg/L	1.15	1.15	1.13	1.14	1.23	1.21	1.27	1.27
Manganese (Mn)-Total	mg/L	0.0124	0.0125	0.00382	0.00360	0.00523	0.00535	0.00291	0.00291
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.000101	0.000113	0.000215	0.000145	0.000141	0.000139	0.000146	0.000141
Nickel (Ni)-Total	mg/L	0.00322	0.00319	0.00179	0.00176	0.00154	0.00152	0.00147	0.00148
Potassium (K)-Total	mg/L	1.05	1.03	1.080	1.090	1.18	1.16	1.17	1.17
Selenium (Se)-Total	mg/L	<0.00010	<0.00010	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.545	0.545	0.124	0.115	0.114	0.114	0.055	0.060
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	0.947	0.942	1.090	1.090	1.11	1.09	1.33	1.30
Strontium (Sr)-Total	mg/L	0.0127	0.0127	0.0135	0.0135	0.0145	0.0143	0.0138	0.0137
Uranium (U)-Total	mg/L	0.000098	0.000099	0.000074	0.000077	0.000067	0.000065	0.000056	0.000057
Vanadium (V)-Total	mg/L	<0.0010	<0.0010	0.000082	0.000066	0.000079	0.000086	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0030	<0.0030	0.0013	<0.0010	<0.0010	0.0011	<0.0010	0.0018

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Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		1616-30 (LLCF)									
Date		6-Jun-14		16-Jun-14		1-Jul-14		6-Jul-14		14-Jul-14	21-Jul-14
Sample ID		L1468897-1	L1468897-21	L1471723-1	L1471723-2	L1480511-2	L1480511-5	L1483805-21	L1483805-22	L1488560-1	L1491709
Total Metals	**Units**										
Aluminum (Al)-Total	mg/L	0.635	0.690	-	-	0.0449	0.0458	0.0457	0.0368	0.0261	0.0345
Antimony (Sb)-Total	mg/L	0.00010	<0.00010	-	-	0.00087	0.00085	0.00087	0.00087	0.00093	0.00095
Arsenic (As)-Total	mg/L	0.000280	0.000280	-	-	0.000520	0.000510	0.000529	0.000543	0.00059	0.00059
Barium (Ba)-Total	mg/L	0.0173	0.0179	-	-	0.0461	0.0452	0.0477	0.0480	0.0491	0.0523
Beryllium (Be)-Total	mg/L	<0.00010	<0.00010	-	-	<0.00010	<0.00010	<0.000010	<0.000010	<0.00010	<0.00010
Boron (B)-Total	mg/L	<0.010	<0.010	-	-	0.0280	0.0280	0.0310	0.0310	0.031	0.036
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	-	-	<0.000020	<0.000020	0.000015	0.000017	<0.000030	<0.000040
Calcium (Ca)-Total	mg/L	1.56	1.57	4.55	4.82	18.2	17.8	17.7	17.8	18.8	19.3
Chromium (Cr)-Total	mg/L	0.00213	0.00242	-	-	0.00024	0.00023	0.00021	0.00011	0.0002	0.0002
Cobalt (Co)-Total	mg/L	0.00051	0.00055	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00135	0.00135	-	-	0.00098	0.00098	0.00090	0.00088	0.00125	0.00107
Iron (Fe)-Total	mg/L	0.665	0.675	-	-	0.038	0.040	0.031	0.023	<0.030	<0.030
Lead (Pb)-Total	mg/L	0.000108	0.000104	-	-	<0.000050	<0.000050	<0.000010	<0.000010	<0.000050	<0.000050
Magnesium (Mg)-Total	mg/L	1.25	1.27	2.17	2.28	7.90	7.73	7.44	7.30	8.05	8.34
Manganese (Mn)-Total	mg/L	0.0206	0.0209	-	-	0.0060	0.0062	0.0060	0.0056	0.00441	0.00430
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.00409	0.00405	-	-	0.0593	0.0579	0.0601	0.0603	0.0676	0.0697
Nickel (Ni)-Total	mg/L	0.00510	0.00529	-	-	0.00356	0.00342	0.00343	0.00332	0.00365	0.00350
Potassium (K)-Total	mg/L	1.84	1.78	6.10	6.30	23.3	22.7	23.7	23.1	24.5	25.6
Selenium (Se)-Total	mg/L	<0.00010	<0.00010	-	-	0.000300	0.000280	0.000257	0.000277	0.00039	0.00032
Silicon (Si)-Total	mg/L	1.76	1.870	-	-	0.398	0.403	0.376	0.328	0.292	0.312
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	3.06	3.06	21.00	21.70	89.6	87.7	79.4	79.7	89.5	96.3
Strontium (Sr)-Total	mg/L	0.0284	0.0279	-	-	0.392	0.393	0.408	0.415	0.436	0.444
Uranium (U)-Total	mg/L	0.000121	0.000119	-	-	0.000537	0.000515	0.000527	0.000547	0.000578	0.000588
Vanadium (V)-Total	mg/L	0.001700	0.001700	-	-	<0.0010	<0.0010	0.000323	0.000279	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	<0.0030	<0.0030	-	-	<0.0030	<0.0030	<0.0010	<0.0010	<0.0030	<0.0030

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Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream			1616-30 (LLCF)								
Date		28-Jul-14	2-Aug-14		4-Aug-14	6-Aug-14		25-Aug-14		7-Sep-14	
Sample ID		L1495238	L1497420-1	L1497420-2	L1498719	L1500998-1	L1500998-4	L1507895-1	L1507895-4	L1515273-1	L1515273-2
Total Metals	**Units**										
Aluminum (Al)-Total	mg/L	0.135	0.0333	0.0243	0.0262	0.0227	0.0230	-	-	0.0213	0.0235
Antimony (Sb)-Total	mg/L	0.00101	0.00093	0.00099	0.00093	0.00100	0.00097	-	-	0.00108	0.00112
Arsenic (As)-Total	mg/L	0.00065	0.00060	0.00059	0.00065	0.00062	0.00063	-	-	0.00058	0.00057
Barium (Ba)-Total	mg/L	0.0506	0.0507	0.0502	0.0495	0.0512	0.0517	-	-	0.0565	0.0569
Beryllium (Be)-Total	mg/L	<0.00010	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	-	-	<0.000010	<0.000010
Boron (B)-Total	mg/L	0.033	0.028	0.028	0.034	0.038	0.037	-	-	0.034	0.034
Cadmium (Cd)-Total	mg/L	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	-	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	19.9	18.6	18.8	19.6	19.5	19.3	21.7	20.5	21.7	22.1
Chromium (Cr)-Total	mg/L	0.00053	0.00016	0.0001	0.00014	0.00015	0.00028	-	-	0.00012	0.00013
Cobalt (Co)-Total	mg/L	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00511	0.00142	0.00136	0.00137	0.00119	0.00124	-	-	0.00100	0.00102
Iron (Fe)-Total	mg/L	0.146	0.048	0.036	<0.030	<0.030	<0.030	-	-	0.013	0.014
Lead (Pb)-Total	mg/L	0.00630	0.00101	0.00077	0.00065	<0.000050	<0.000050	-	-	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	8.45	8.03	8.10	8.58	8.31	8.28	9.39	8.80	8.79	8.91
Manganese (Mn)-Total	mg/L	0.00656	0.00694	0.00671	0.00716	0.00716	0.00727	-	-	0.00497	0.00520
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	-	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.0684	0.0672	0.0668	0.0696	0.0723	0.0714	-	-	0.0778	0.0774
Nickel (Ni)-Total	mg/L	0.00377	0.00323	0.00320	0.00340	0.00330	0.00328	-	-	0.00337	0.00334
Potassium (K)-Total	mg/L	25.4	24.5	24.7	26.4	25.3	25.2	-	-	26.8	26.8
Selenium (Se)-Total	mg/L	0.00031	0.00032	0.00032	0.00031	0.00031	0.00032	-	-	0.00035	0.00034
Silicon (Si)-Total	mg/L	0.407	0.180	0.174	0.167	0.146	0.152	-	-	0.129	0.138
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	-	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	97.4	93.4	92.6	96.4	94.3	94.3	-	-	101	97.4
Strontium (Sr)-Total	mg/L	0.431	0.430	0.424	0.440	0.462	0.460	-	-	0.481	0.482
Uranium (U)-Total	mg/L	0.000582	0.000556	0.000554	0.000610	0.000591	0.000596	-	-	0.000667	0.000656
Vanadium (V)-Total	mg/L	<0.0010	0.000246	0.000255	<0.0010	<0.0010	<0.0010	-	-	0.000191	0.000213
Zinc (Zn)-Total	mg/L	0.0095	0.006	0.0038	0.0049	<0.0030	<0.0030	-	-	<0.0010	<0.0010

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Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Leslie-Moose							
Date		7-Jun-14		5-Jul-14		4-Aug-14		2-Sep-14	
Sample ID		L1468897-4	L1468897-30	L1483805-9	L1483805-10	L1498383-9	L1498383-10	L1514553-3	L1514553-4
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0442	0.0484	0.0182	0.0181	0.0186	0.0189	0.0133	0.0162
Antimony (Sb)-Total	mg/L	0.00015	0.00015	0.00088	0.00095	0.00109	0.00110	0.00109	0.00104
Arsenic (As)-Total	mg/L	0.000161	0.000168	0.000455	0.000426	0.000501	0.000481	0.000448	0.000455
Barium (Ba)-Total	mg/L	0.0093	0.0094	0.0521	0.0515	0.0601	0.0601	0.0539	0.0541
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	0.0052	0.0054	0.0281	0.0327	0.0358	0.0366	0.0331	0.0328
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000050	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	1.91	1.90	19.7	22.2	22.5	22.5	24.1	23.2
Chromium (Cr)-Total	mg/L	0.00016	0.00016	0.00012	0.00010	0.00011	<0.00010	0.00018	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00045	0.00045	0.00096	0.00094	0.00112	0.00115	0.00105	0.00107
Iron (Fe)-Total	mg/L	0.057	0.050	0.024	0.023	0.024	0.022	0.016	0.022
Lead (Pb)-Total	mg/L	0.000015	0.000013	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	0.808	0.815	9.12	9.24	9.64	9.90	10.0	9.45
Manganese (Mn)-Total	mg/L	0.0060	0.0061	0.00592	0.00536	0.00622	0.00555	0.00314	0.00745
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.0060	0.0061	0.0582	0.0665	0.0799	0.0802	0.0798	0.0766
Nickel (Ni)-Total	mg/L	0.00115	0.00118	0.00273	0.00263	0.00279	0.00289	0.00262	0.00264
Potassium (K)-Total	mg/L	2.39	2.43	25.4	26.5	28.5	29.2	27.8	27.8
Selenium (Se)-Total	mg/L	0.000055	0.000057	0.000197	0.000219	0.000276	0.000264	0.000243	0.000224
Silicon (Si)-Total	mg/L	0.176	0.173	0.129	0.138	0.088	0.084	<0.050	0.051
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	7.15	7.03	92.9	88.4	96.3	97.5	103	100
Strontium (Sr)-Total	mg/L	0.044	0.045	0.449	0.499	0.578	0.578	0.520	0.496
Uranium (U)-Total	mg/L	0.000064	0.000063	0.000502	0.000563	0.000634	0.000632	0.000683	0.000657
Vanadium (V)-Total	mg/L	0.000150	0.000154	0.000109	0.000093	0.000114	0.000107	0.000088	0.000087
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

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Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Moose-Nero							
Date		7-Jun-14		5-Jul-14		2-Aug-14		3-Sep-14	
Sample ID		L1468897-6	L1468897-5	L1483805-12	L1483805-13	L1497420-7	L1497420-8	L1514553-5	L1514553-6
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0930	0.0956	0.0143	0.0163	0.0147	0.0131	0.0151	0.0165
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	0.00033	0.00032	0.00036	0.00036	0.00050	0.00054
Arsenic (As)-Total	mg/L	0.000220	0.000200	0.000310	0.000307	0.000411	0.000403	0.000401	0.000381
Barium (Ba)-Total	mg/L	0.0100	0.0101	0.0223	0.0221	0.0224	0.0227	0.0308	0.0307
Beryllium (Be)-Total	mg/L	<0.00010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.010	<0.010	0.0156	0.0144	0.0121	0.0126	0.0188	0.0186
Cadmium (Cd)-Total	mg/L	0.000079	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	2.11	2.16	8.03	8.03	8.61	8.65	13.4	13.2
Chromium (Cr)-Total	mg/L	0.00038	0.00039	<0.00010	<0.00010	0.00010	0.00012	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	0.00011	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00134	0.00135	0.00122	0.00122	0.00154	0.00149	0.00114	0.00116
Iron (Fe)-Total	mg/L	0.121	0.128	0.030	0.032	0.047	0.045	0.034	0.043
Lead (Pb)-Total	mg/L	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	1.23	1.26	3.66	3.61	3.94	3.99	6.09	5.75
Manganese (Mn)-Total	mg/L	0.0075	0.0074	0.00441	0.00464	0.01500	0.01470	0.00989	0.01310
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.00314	0.00315	0.0225	0.0226	0.0253	0.0250	0.0372	0.0371
Nickel (Ni)-Total	mg/L	0.00204	0.00200	0.00146	0.00141	0.00176	0.00175	0.00174	0.00177
Potassium (K)-Total	mg/L	1.97	2.05	8.71	8.67	9.40	9.40	15.6	14.2
Selenium (Se)-Total	mg/L	<0.00010	<0.00010	0.000087	0.000086	0.000114	0.000104	0.000128	0.000122
Silicon (Si)-Total	mg/L	0.411	0.423	0.144	0.146	0.127	0.103	0.067	0.065
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	4.33	4.30	28.2	28.2	33.2	32.7	55.3	51.2
Strontium (Sr)-Total	mg/L	0.0347	0.0351	0.164	0.167	0.182	0.174	0.282	0.266
Uranium (U)-Total	mg/L	0.000121	0.000125	0.000160	0.000162	0.000169	0.000172	0.000333	0.000335
Vanadium (V)-Total	mg/L	<0.0010	<0.0010	0.000069	0.000074	0.000080	0.000079	0.000057	0.000088
Zinc (Zn)-Total	mg/L	<0.0030	<0.0030	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

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Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Nema-Martine							
Date		7-Jun-14		5-Jul-14		4-Aug-14		5-Sep-14	
Sample ID		L1468897-12	L1468897-11	L1483805-18	L1483805-19	L1498383-13	L1498383-14	L1515273-7	L1515273-8
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0886	0.0832	0.0178	0.0183	0.0148	0.0151	0.0094	0.0085
Antimony (Sb)-Total	mg/L	0.00013	0.00013	0.00037	0.00035	0.00038	0.00038	0.00033	0.00036
Arsenic (As)-Total	mg/L	0.000210	0.000200	0.000333	0.000278	0.000391	0.000390	0.000380	0.000354
Barium (Ba)-Total	mg/L	0.0123	0.0122	0.0304	0.0297	0.0302	0.0300	0.0269	0.0268
Beryllium (Be)-Total	mg/L	<0.00010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.010	<0.010	0.0144	0.0169	0.0156	0.0158	0.0141	0.0156
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	3.22	3.21	12.5	12.4	12.0	12.2	12.1	13.0
Chromium (Cr)-Total	mg/L	0.00033	0.00031	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	0.00031	0.00030	<0.00010	<0.00010	<0.00010	0.0001	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00129	0.00117	0.00110	0.00108	0.00109	0.00108	0.00094	0.00093
Iron (Fe)-Total	mg/L	0.122	0.118	0.039	0.040	0.051	0.052	0.038	0.037
Lead (Pb)-Total	mg/L	0.000056	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	1.63	1.62	5.59	5.71	5.58	5.50	6.00	5.94
Manganese (Mn)-Total	mg/L	0.0210	0.0205	0.0103	0.0103	0.01880	0.02910	0.01610	0.01670
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.00657	0.00652	0.0249	0.0247	0.0284	0.0287	0.0256	0.0278
Nickel (Ni)-Total	mg/L	0.00220	0.00220	0.00151	0.00153	0.00157	0.00165	0.00144	0.00146
Potassium (K)-Total	mg/L	3.48	3.41	12.7	12.7	13.1	12.8	13.4	13.3
Selenium (Se)-Total	mg/L	<0.00010	<0.00010	0.000071	0.000067	0.000079	0.000073	0.000084	0.000070
Silicon (Si)-Total	mg/L	0.343	0.322	0.0790	0.0840	0.0980	0.100	0.0570	0.0510
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	10.0	9.66	43.7	41.4	42.2	41.4	47.2	46.7
Strontium (Sr)-Total	mg/L	0.0628	0.0626	0.257	0.253	0.276	0.276	0.237	0.251
Uranium (U)-Total	mg/L	0.000129	0.000128	0.000217	0.000212	0.000210	0.000226	0.000228	0.000239
Vanadium (V)-Total	mg/L	<0.0010	<0.0010	0.000098	0.000057	0.000069	0.000071	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0030	<0.0030	<0.0010	<0.0010	<0.0010	0.0013	<0.0010	<0.0010

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Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Slipper-Lac de Gras							
Date		7-Jun-14		5-Jul-14		4-Aug-14		3-Sep-14	
Sample ID		L1468897-14	L1468897-13	L1483805-26	L1483805-27	L1498383-15	L1498383-16	L1514553-9	L1514553-14
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0710	0.0708	0.0184	0.0188	0.0109	0.0112	0.0044	0.0050
Antimony (Sb)-Total	mg/L	0.00012	0.00011	0.00016	0.00014	0.00015	0.00015	0.00014	0.00015
Arsenic (As)-Total	mg/L	0.000240	0.000240	0.000302	0.000258	0.000430	0.000427	0.000378	0.000386
Barium (Ba)-Total	mg/L	0.0132	0.0136	0.0151	0.0148	0.0140	0.0140	0.0126	0.0125
Beryllium (Be)-Total	mg/L	<0.00010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.010	<0.010	0.0103	0.0101	0.0083	0.0085	0.0085	0.0083
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	4.69	4.72	7.22	7.17	6.74	6.77	6.46	6.51
Chromium (Cr)-Total	mg/L	0.00025	0.00025	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	0.00015	0.00014	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00101	0.00101	0.00099	0.00094	0.00104	0.00101	0.00098	0.00098
Iron (Fe)-Total	mg/L	0.113	0.113	0.0590	0.0540	0.0680	0.0640	0.0310	0.0320
Lead (Pb)-Total	mg/L	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	2.36	2.39	3.58	3.57	3.10	3.10	3.34	3.31
Manganese (Mn)-Total	mg/L	0.0206	0.0211	0.00949	0.00919	0.01770	0.01690	0.0180	0.0207
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.00572	0.00570	0.00915	0.00900	0.01000	0.0101	0.0091	0.0090
Nickel (Ni)-Total	mg/L	0.00132	0.00132	0.000833	0.000798	0.000806	0.000853	0.000812	0.000823
Potassium (K)-Total	mg/L	4.43	4.54	6.80	6.81	6.08	6.01	5.99	6.01
Selenium (Se)-Total	mg/L	<0.00010	<0.00010	0.000047	<0.000040	0.000045	0.000042	0.000042	<0.000040
Silicon (Si)-Total	mg/L	0.315	0.312	0.062	0.061	0.087	0.088	0.089	0.083
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	14.3	14.3	21.4	21.5	18.0	18.0	19.3	19.4
Strontium (Sr)-Total	mg/L	0.088	0.089	0.134	0.133	0.130	0.131	0.116	0.114
Uranium (U)-Total	mg/L	0.000121	0.000119	0.000100	0.000098	0.000088	0.000088	0.000076	0.000074
Vanadium (V)-Total	mg/L	<0.0010	<0.0010	0.000053	0.000050	0.000059	0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0030	<0.0030	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Mossing Outflow							
Date		7-Jun-14		5-Jul-14		4-Aug-14		4-Sep-14	
Sample ID		L1468897-8	L1468897-7	L1483805-14	L1483805-15	L1498383-11	L1498383-12	L1514529-7	L1514529-8
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0703	0.0765	0.0381	0.0323	0.0361	0.0354	0.0705	0.0703
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000350	0.000370	0.000578	0.000566	0.001250	0.001270	0.00243	0.00246
Barium (Ba)-Total	mg/L	0.00474	0.00506	0.00485	0.00474	0.00616	0.00611	0.0101	0.0101
Beryllium (Be)-Total	mg/L	<0.00010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.010	<0.010	<0.0050	0.0088	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	1.80	1.76	2.47	2.44	2.28	2.27	1.75	1.71
Chromium (Cr)-Total	mg/L	0.00023	0.00024	0.00015	<0.00010	0.00013	0.00015	0.00024	0.00027
Cobalt (Co)-Total	mg/L	0.00018	0.00018	0.00014	0.00015	0.00034	0.00034	0.00119	0.00119
Copper (Cu)-Total	mg/L	0.00128	0.00129	0.00130	0.00132	0.00101	0.00097	0.00054	0.00048
Iron (Fe)-Total	mg/L	0.099	0.103	0.190	0.193	0.939	0.942	2.41	2.43
Lead (Pb)-Total	mg/L	<0.000050	<0.000050	0.000021	0.000013	0.000026	0.000025	0.000030	0.000029
Magnesium (Mg)-Total	mg/L	1.75	1.74	2.48	2.51	2.18	2.18	1.22	1.22
Manganese (Mn)-Total	mg/L	0.01390	0.01380	0.01480	0.01450	0.02930	0.02910	0.078	0.076
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.000053	0.000056	0.000220	0.000094	0.000058	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.00164	0.00165	0.00120	0.00128	0.00135	0.00136	0.00215	0.00210
Potassium (K)-Total	mg/L	1.23	1.23	1.68	1.67	1.50	1.49	0.886	0.876
Selenium (Se)-Total	mg/L	<0.00010	<0.00010	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.288	0.296	0.138	0.148	0.440	0.435	1.73	1.71
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	1.16	1.14	1.67	1.66	1.58	1.55	1.76	1.75
Strontium (Sr)-Total	mg/L	0.0125	0.0125	0.0180	0.0178	0.0176	0.0176	0.0135	0.0136
Uranium (U)-Total	mg/L	0.000131	0.000132	0.000093	0.000090	0.000068	0.000068	0.000065	0.000068
Vanadium (V)-Total	mg/L	<0.0010	<0.0010	0.000090	0.000069	0.000224	0.000196	0.000388	0.000368
Zinc (Zn)-Total	mg/L	<0.0030	<0.0030	0.0024	<0.0010	0.0018	0.0011	0.0031	0.0021

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		1616-43 (KPSF)								
Date		6-Jun-14		5-Jul-14		8-Jul-14	1-Aug-14		2-Sep-14	
Sample ID		L1468897-22	L1468897-23	L1483805-1	L1483805-2	L1484307-2	L1497420-3	L1497420-4	L1514553-1	L1514553-2
Total Metals	**Units**									
Aluminum (Al)-Total	mg/L	0.1270	0.1370	0.0215	0.0220	0.0325	0.0176	0.0240	0.0072	0.0076
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.00101	0.00107	0.00147	0.00138	0.00149	0.00181	0.00176	0.00117	0.00121
Barium (Ba)-Total	mg/L	0.0118	0.0123	0.0144	0.0141	0.0138	0.0175	0.0173	0.0155	0.0158
Beryllium (Be)-Total	mg/L	<0.00010	<0.00010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.010	<0.010	0.0175	0.0171	0.012	0.0130	0.0131	0.0146	0.0146
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	04.8	04.9	10.7	10.7	10.4	11.2	11.2	13.1	13.0
Chromium (Cr)-Total	mg/L	0.00041	0.00043	0.00011	<0.00010	0.00019	<0.00010	0.00014	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	0.00047	0.00048	0.00025	0.00025	0.00031	0.00037	0.00036	0.00020	0.00022
Copper (Cu)-Total	mg/L	0.00097	0.00126	0.00088	0.00085	0.00091	0.00083	0.00088	0.00058	0.00061
Iron (Fe)-Total	mg/L	0.282	0.294	0.242	0.234	0.293	0.330	0.326	0.179	0.178
Lead (Pb)-Total	mg/L	0.000083	0.000091	0.000022	0.000021	<0.000050	0.000024	0.000025	0.000017	0.000014
Magnesium (Mg)-Total	mg/L	04.5	04.6	10.1	09.9	10.2	11.1	11.3	12.4	13.3
Manganese (Mn)-Total	mg/L	0.0403	0.0430	0.0218	0.0219	0.0244	0.0336	0.0313	0.0105	0.0113
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.00231	0.00239	0.00519	0.00514	0.00490	0.00541	0.00532	0.00542	0.00538
Nickel (Ni)-Total	mg/L	0.00406	0.00420	0.00298	0.00269	0.00297	0.00361	0.00365	0.00332	0.00336
Potassium (K)-Total	mg/L	3.13	3.27	6.95	6.95	6.8	7.38	7.37	8.29	8.78
Selenium (Se)-Total	mg/L	<0.00010	<0.00010	0.000086	0.000079	<0.00010	0.000097	0.000087	0.000091	0.000082
Silicon (Si)-Total	mg/L	0.476	0.512	0.164	0.166	0.182	0.193	0.200	<0.050	<0.050
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	2.04	2.08	4.71	4.64	5.20	5.89	5.88	6.27	6.71
Strontium (Sr)-Total	mg/L	0.051	0.050	0.114	0.109	0.105	0.116	0.118	0.128	0.134
Uranium (U)-Total	mg/L	0.000507	0.000510	0.000606	0.000597	0.000594	0.000495	0.000513	0.000431	0.000423
Vanadium (V)-Total	mg/L	<0.0010	<0.0010	0.000093	0.000080	<0.0010	0.000128	0.000114	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0030	<0.0030	0.0016	<0.0010	<0.0030	<0.0010	0.0015	<0.0010	0.0017

(continued)

Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Cujo Outflow							
Date		7-Jun-14		5-Jul-14		4-Aug-14		4-Sep-14	
Sample ID		L1468897-26	L1468897-27	L1483805-7	L1483805-8	L1498383-5	L1498383-6	L1514529-5	L1514529-6
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0474	0.0476	0.0130	0.0130	0.0107	0.0187	0.0269	0.0300
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000470	0.000490	0.000895	0.000910	0.000895	0.000975	0.001420	0.001580
Barium (Ba)-Total	mg/L	0.0093	0.0092	0.0126	0.0128	0.0123	0.0125	0.0237	0.0240
Beryllium (Be)-Total	mg/L	<0.00010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.010	<0.010	0.0095	0.0092	0.0055	0.0055	0.0060	0.0059
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	4.63	4.73	9.76	09.7	08.8	08.9	14.4	14.6
Chromium (Cr)-Total	mg/L	0.00019	0.00018	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	0.00012
Cobalt (Co)-Total	mg/L	0.00023	0.00022	0.00013	0.00013	0.00011	0.00014	0.00173	0.00204
Copper (Cu)-Total	mg/L	0.00078	0.00073	0.00059	0.00059	0.00066	0.00076	0.00059	0.00059
Iron (Fe)-Total	mg/L	0.140	0.140	0.223	0.222	0.136	0.232	1.260	1.510
Lead (Pb)-Total	mg/L	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	0.000016	0.00003	0.000031
Magnesium (Mg)-Total	mg/L	4.89	5.10	09.5	09.9	09.6	09.7	13.4	14.0
Manganese (Mn)-Total	mg/L	0.0317	0.0320	0.0116	0.0116	0.0117	0.0149	0.2490	0.2810
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.000474	0.000486	0.00096	0.00099	0.00116	0.00115	0.00046	0.00047
Nickel (Ni)-Total	mg/L	0.00127	0.00125	0.00094	0.00103	0.001040	0.00122	0.002170	0.002290
Potassium (K)-Total	mg/L	2.79	2.90	5.28	5.44	5.35	5.44	6.14	6.12
Selenium (Se)-Total	mg/L	<0.00010	<0.00010	0.000045	0.000046	0.000060	0.000059	0.000055	0.000046
Silicon (Si)-Total	mg/L	0.191	0.202	0.086	0.089	0.078	0.089	0.390	0.434
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	2.07	2.10	4.05	4.18	4.05	4.12	5.01	4.90
Strontium (Sr)-Total	mg/L	0.0457	0.0458	0.0975	0.097	0.102	0.103	0.137	0.140
Uranium (U)-Total	mg/L	0.000096	0.000099	0.000115	0.000111	0.000123	0.000136	0.000162	0.000176
Vanadium (V)-Total	mg/L	<0.0010	<0.0010	0.000065	0.000062	0.000058	0.000085	0.000122	0.000137
Zinc (Zn)-Total	mg/L	<0.0030	<0.0030	<0.0010	<0.0010	<0.0010	<0.0010	0.0038	0.004

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Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Christine-Lac du Sauvage							
Date		7-Jun-14		5-Jul-14		4-Aug-14		4-Sep-14	
Sample ID		L1468897-3	L1468897-2	L1483805-3	L1483805-4	L1498383-1	L1498383-2	L1514529-1	L1514529-2
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0445	0.0461	0.0340	0.0186	0.0126	0.0157	0.0107	0.0148
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000276	0.000299	0.000364	0.000366	0.000420	0.000438	0.000376	0.000433
Barium (Ba)-Total	mg/L	0.00560	0.00570	0.00503	0.00494	0.00446	0.00455	0.00447	0.00465
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	0.0062	0.0068	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	1.94	1.96	2.43	2.44	2.37	2.36	2.55	2.43
Chromium (Cr)-Total	mg/L	0.00012	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	0.00016	0.00016	0.00012	0.00013	0.00012	0.00014	0.00014	0.00024
Copper (Cu)-Total	mg/L	0.00094	0.00098	0.00087	0.00082	0.00083	0.00080	0.00078	0.00081
Iron (Fe)-Total	mg/L	0.077	0.072	0.056	0.060	0.064	0.077	0.069	0.088
Lead (Pb)-Total	mg/L	0.000011	0.000011	<0.000010	<0.000010	<0.000010	<0.000010	0.000012	<0.000010
Magnesium (Mg)-Total	mg/L	1.88	1.92	2.56	2.57	2.61	2.55	2.75	2.64
Manganese (Mn)-Total	mg/L	0.0160	0.0165	0.0125	0.0130	0.01400	0.01620	0.01910	0.02680
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	0.000067	0.000052	0.000057	0.000055	0.000078	0.000053
Nickel (Ni)-Total	mg/L	0.00126	0.00129	0.000779	0.000756	0.000751	0.000750	0.000732	0.000820
Potassium (K)-Total	mg/L	1.41	1.43	1.78	1.76	1.82	1.78	1.80	1.76
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.190	0.203	0.093	0.094	0.101	0.110	0.092	0.092
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	1.10	1.12	1.45	1.45	1.35	1.32	1.63	1.53
Strontium (Sr)-Total	mg/L	0.0157	0.0158	0.0198	0.0198	0.0200	0.0200	0.0218	0.0192
Uranium (U)-Total	mg/L	0.000036	0.000034	0.000023	0.000024	0.000022	0.000022	0.000019	0.000020
Vanadium (V)-Total	mg/L	<0.000050	0.000074	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	0.0019	<0.0010

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Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (continued)

Stream		Pigeon Reach 1									
Date		10-Jun-14		21-Jun-14		3-Jul-14		18-Jul-14		3-Aug-14	
Sample ID		L1470221-1	L1470221-2	L1476113-1	L1476113-2	L1482177-7	L1482177-8	L1490981-1	L1490981-2	L1497440-7	L1497440-8
Total Metals	**Units**										
Aluminum (Al)-Total	mg/L	0.108	0.106	0.420	0.416	0.0230	0.0223	0.0656	0.0404	0.0382	0.0587
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000220	0.000220	0.000450	0.000450	0.000221	0.000222	0.000320	0.000310	0.000324	0.000348
Barium (Ba)-Total	mg/L	0.00503	0.00515	0.00943	0.00897	0.00345	0.00352	0.00647	0.00582	0.00545	0.00581
Beryllium (Be)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.000010	<0.000010	<0.00010	<0.00010	0.000011	<0.000010
Boron (B)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.0050	<0.010	<0.010	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	1.04	1.09	1.31	1.30	1.14	1.13	1.60	1.29	1.50	1.51
Chromium (Cr)-Total	mg/L	0.00047	0.00062	0.00145	0.00142	<0.00010	<0.00010	0.00024	0.00017	0.00013	0.0002
Cobalt (Co)-Total	mg/L	0.00016	0.00016	0.00045	0.00042	0.00015	0.00015	0.00029	<0.00010	0.00025	0.00031
Copper (Cu)-Total	mg/L	0.00092	0.00096	0.00158	0.00152	0.00077	0.00078	0.00101	0.00090	0.00078	0.00088
Iron (Fe)-Total	mg/L	0.154	0.153	0.411	0.442	0.108	0.106	0.207	0.111	0.218	0.268
Lead (Pb)-Total	mg/L	<0.000050	<0.000050	0.000162	0.000157	<0.000010	<0.000010	<0.000050	<0.000050	0.000018	0.000024
Magnesium (Mg)-Total	mg/L	0.85	0.90	1.06	1.07	0.940	0.951	1.28	1.12	1.24	1.27
Manganese (Mn)-Total	mg/L	0.0056	0.0057	0.0113	0.0111	0.0107	0.0108	0.0127	0.0033	0.01720	0.01890
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.000054	0.000074	0.000054	0.000080	<0.000050	<0.000050	0.000144	0.000149	0.000152	0.000130
Nickel (Ni)-Total	mg/L	0.00141	0.00165	0.00206	0.00196	0.001220	0.001140	0.001910	0.001710	0.001410	0.001540
Potassium (K)-Total	mg/L	0.590	0.640	0.770	0.760	0.678	0.687	0.750	0.730	0.811	0.855
Selenium (Se)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.000040	<0.000040	<0.00010	<0.00010	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.343	0.343	0.546	0.788	0.103	0.099	0.563	0.524	0.395	0.389
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	0.650	0.678	0.767	0.741	0.758	0.769	1.07	1.10	1.03	1.03
Strontium (Sr)-Total	mg/L	0.0079	0.0082	0.0098	0.0096	0.0083	0.0085	0.0122	0.0120	0.0119	0.0119
Uranium (U)-Total	mg/L	0.000053	0.000049	0.000119	0.000115	0.000024	0.000023	0.000058	0.000050	0.000047	0.000051
Vanadium (V)-Total	mg/L	<0.0010	<0.0010	0.001500	0.001400	<0.000050	<0.000050	<0.0010	<0.0010	0.000178	0.000239
Zinc (Zn)-Total	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	0.0013	<0.0010	0.0035	<0.0030	0.0018	0.0024

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Table 3.4-6. Analytical Results for AEMP Stream Water Quality Variables, Open Water Season 2014 (completed)

Stream		Pigeon Reach 1							
Date		14-Aug-14		4-Sep-14		18-Sep-14		28-Sep-14	
Sample ID		L1504432-1	L1504432-2	L1514512-3	L1514512-4	L1523223-1	L1523223-2	L1526461-5	L1526461-6
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0415	0.0390	0.0756	0.0779	0.0385	0.0515	0.0193	0.0190
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000314	0.000321	0.000333	0.000340	0.000342	0.000352	0.000203	0.000230
Barium (Ba)-Total	mg/L	0.00578	0.00567	0.00801	0.00819	0.00789	0.00829	0.00429	0.00440
Beryllium (Be)-Total	mg/L	<0.000010	0.000017	<0.000010	<0.000010	<0.000010	0.000017	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0099	0.0095	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	1.72	1.72	2.38	2.32	2.31	2.66	1.70	1.68
Chromium (Cr)-Total	mg/L	0.00015	0.00013	0.00026	0.00023	0.00029	0.00029	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	0.00031	0.00031	0.00054	0.00056	0.00054	0.0006	0.00014	0.00015
Copper (Cu)-Total	mg/L	0.00074	0.00074	0.00089	0.00086	0.00083	0.00086	0.00082	0.00081
Iron (Fe)-Total	mg/L	0.205	0.209	0.359	0.362	0.345	0.463	0.088	0.087
Lead (Pb)-Total	mg/L	0.000022	0.000019	0.00004	0.000039	<0.000010	0.000021	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	1.38	1.34	1.82	1.82	2.13	2.24	1.52	1.51
Manganese (Mn)-Total	mg/L	0.02110	0.02070	0.03820	0.03800	0.03510	0.03670	0.00473	0.00488
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.000261	0.000294	0.000447	0.000436	0.000589	0.000656	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.001460	0.001470	0.002230	0.002180	0.003010	0.002990	0.001970	0.001960
Potassium (K)-Total	mg/L	0.918	0.894	1.27	1.23	1.18	1.20	0.75	0.75
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	0.000056	0.000059
Silicon (Si)-Total	mg/L	0.493	0.478	0.899	0.909	1.140	1.220	0.175	0.176
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	1.19	1.17	1.62	1.59	1.76	1.78	0.921	0.911
Strontium (Sr)-Total	mg/L	0.0137	0.0140	0.0193	0.0191	0.0191	0.0225	0.0117	0.0115
Uranium (U)-Total	mg/L	0.000060	0.000063	0.000100	0.000096	0.000102	0.000117	0.000019	0.000018
Vanadium (V)-Total	mg/L	0.000142	0.000134	0.000247	0.000256	0.000255	0.000298	0.000051	<0.000050
Zinc (Zn)-Total	mg/L	0.0023	0.0021	0.0027	0.0026	0.0062	0.0045	0.0011	<0.0010

Notes:

All variables analyzed by ALS Environmental (Burnaby, BC).

< = less than the analytical detection limit indicated

Table 3.4-7. Analytical Detection Limits for Evaluated Stream Water Quality Variables, Open Water Season 2014

Variable	pH	Total Alkalinity	Hardness	Chloride	Sulphate	Potassium	Total Suspended Solids	Total Ammonia-N	Nitrate-N
Target Detection Limits	**0.10**	**2.0**	**0.50**	**0.50**	**0.50**	**0.050**	**3.0**	**0.0050**	**0.0050**
Stream									
Nanuq Outflow	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050
Counts Outflow	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050
Vulture-Polar	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050
Pigeon Reach 7	0.10	2.0	0.50	0.50	0.50	0.10 (June) 0.050 (July/Aug/Sept)	3.0	0.0050	0.0050
Lower PDC	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050
Kodiak-Little	0.10	2.0	0.50	0.50	0.50	0.10 (June) 0.050 (July/Aug/Sept)	3.0	0.0050	0.0050
1616-30 (LLCF)	0.10	2.0	0.50 (June/July) 0.50/0.10 (Aug) 0.50 (Sept)	0.50 (June) 0.50/2.5 (July) 2.5 (Aug) 5.0 (Sept)	0.50 (June) 0.50/2.5 (July) 2.5 (Aug) 5.0 (Sept)	0.10/2.0 (June) 0.050/2.0 (July/Aug/Sept)	3.0	0.0050	0.0050 (June/July) 0.0050/0.025 (July) 0.025/0.050 (Aug) 0.050 (Sept)
Leslie-Moose	0.10	2.0	0.50	0.50 (June) 2.5 (July) 5.0 (Aug/Sept)	0.50 (June) 2.5 (July) 5.0 (Aug/Sept)	0.050	3.0	0.0050	0.0050 (June) 0.025 (July) 0.050 (Aug/Sept)
Moose-Nero	0.10	2.0	0.50	0.50	0.50	0.10 (June) 0.050 (July/Aug/Sept)	3.0	0.0050	0.0050
Nema-Martine	0.10	2.0	0.50	0.50	0.50	0.10 (June) 0.050 (July/Aug/Sept)	3.0	0.0050	0.0050
Slipper-Lac de Gras	0.10	2.0	0.50	0.50	0.50	0.10 (June) 0.050 (July/Aug/Sept)	3.0	0.0050	0.0050
Mossing Outflow	0.10	2.0	0.50	0.50	0.50	0.10 (June) 0.050 (July/Aug/Sept)	3.0	0.0050	0.0010
1616-43 (KPSF)	0.10	2.0	0.50	0.50	0.50	0.10 (June) 0.050 (July/Aug/Sept)	3.0	0.0050	0.0050
Cujo Outflow	0.10	2.0	0.50	0.50	0.50	0.10 (June) 0.050 (July/Aug/Sept)	3.0	0.0050	0.0050
Christine-Lac du Sauvage	0.10	2.0	0.50	0.50	0.50	0.050	3.0	0.0050	0.0050
Pigeon Reach 1	0.10	2.0	0.50	0.50	0.50	0.10 (June) 0.050/0.1 (July) 0.050 (Aug/Sept)	3.0	0.0050	0.0050

(continued)

Table 3.4-7. Analytical Detection Limits for Evaluated Stream Water Quality Variables, Open Water Season 2014 (continued)

Variable	Nitrite-N	Total Phosphate-P	Total Organic Carbon	Total Anitmony	Total Arsenic	Total Barium	Total Boron	Total Cadmium
Target Detection Limits	0.0010	0.0020	0.50	0.00010	0.000020	0.000050	0.0050	0.000010
Lake								
Nanuq Outflow	0.0010	0.0020	0.50	0.00010	0.000020	0.000050	0.0050	0.000010
Counts Outflow	0.0010	0.0020	0.50	0.00010	0.000020	0.000050	0.0050	0.000010
Vulture-Polar	0.0010	0.0020	0.50	0.00010	0.000020	0.000050	0.0050	0.000010
Pigeon Reach 7	0.0010	0.0020	0.50 (June) 0.50/1.0 (July) 0.50 (Aug/Sept)	0.00010	0.00010 (June) 0.000020 (July/Aug/Sept)	0.000050	0.010 (June) 0.0050 (July/Aug/Sept)	0.000010
Lower PDC	0.0010	0.0020	0.50	0.00010	0.000020	0.000050	0.0050	0.000010
Kodiak-Little	0.0010	0.0020	0.50	0.00010	0.00010 (June) 0.000020 (July/Aug/Sept)	0.000050	0.010 (June) 0.0050 (July/Aug/Sept)	0.000010
1616-30 (LLCF)	0.0010 (June) 0.0010/0.0050 (July) 0.0050/0.010 (Aug) 0.010 (Sept)	0.0020	0.50	0.00010	0.00010 (June/July/Aug) 0.000020 (July/Aug/Sept)	0.000050	0.010 (June/July/Aug) 0.0050 (July/Aug/Sept)	0.000010 (June) 0.000010/0.000020/0.000030/ 0.000040/0.000050 (July) 0.000010 (Aug) 0.000010 (Sept)
Leslie-Moose	0.0010 (June) 0.0025 (July) 0.010 (Aug/Sept)	0.0020	0.50	0.00010	0.000020	0.000050	0.0050	0.000010 (June) 0.000020/0.000050 (July) 0.000010 (Aug/Sept)
Moose-Nero	0.0010	0.0020	0.50	0.00010	0.00010 (June) 0.000020 (July/Aug/Sept)	0.000050	0.010 (June) 0.0050 (July/Aug/Sept)	0.000010
Nema-Martine	0.0010	0.0020	0.50	0.00010	0.00010 (June) 0.000020 (July/Aug/Sept)	0.000050	0.010 (June) 0.0050 (July/Aug/Sept)	0.000010 (June) 0.000010/0.000050 (July) 0.000010 (Aug/Sept)
Slipper-Lac de Gras	0.0010	0.0020	0.50	0.00010	0.00010 (June) 0.000020 (July/Aug/Sept)	0.000050	0.010 (June) 0.0050 (July/Aug/Sept)	0.000010
Mossing Outflow	0.0010	0.0020	0.50	0.00010	0.00010 (June) 0.000020 (July/Aug/Sept)	0.000050	0.010 (June) 0.0050 (July/Aug/Sept)	0.000010
1616-43 (KPSF)	0.0010	0.0020	0.50	0.00010	0.0001 (June) 0.000020 (July/Aug/Sept)	0.000050	0.010 (June) 0.0050 (July/Aug/Sept)	0.000010
Cujo Outflow	0.0010	0.0020	0.50	0.00010	0.0001 (June) 0.000020 (July/Aug/Sept)	0.000050	0.010 (June) 0.0050 (July/Aug/Sept)	0.000010
Christine-Lac du Sauvage	0.0010	0.0020	0.50	0.00010	0.000020	0.000050	0.0050	0.000010
Pigeon Reach 1	0.0010	0.0020	0.50	0.00010	0.00010 (June) 0.000020/0.00010 (July) 0.000020 (Aug/Sept)	0.000050	0.010 (June) 0.0050/0.010 (July) 0.0050 (Aug/Sept)	0.000010

(continued)

Table 3.4-7. Analytical Detection Limits for Evaluated Stream Water Quality Variables, Open Water Season 2014 (completed)

Variable	Total Copper	Total Molybdenum	Total Nickel	Total Selenium	Total Strontium	Total Uranium	Total Vanadium
Target Detection Limits	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Lake							
Nanuq Outflow	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Counts Outflow	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Vulture-Polar	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Pigeon Reach 7	0.00050 (June) 0.00010 (July/Aug/Sept)	0.000050	0.00050 (June) 0.000050 (July/Aug/Sept)	0.00010 (June) 0.000040 (July/Aug/Sept)	0.00020 (June) 0.00010 (July/Aug/Sept)	0.000010	0.0010 (June) 0.000050 (July/Aug/Sept)
Lower PDC	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Kodiak-Little	0.00050 (June) 0.00010 (July/Aug/Sept)	0.000050	0.00050 (June) 0.000050 (July/Aug/Sept)	0.00010 (June) 0.000040 (July/Aug/Sept)	0.00020 (June) 0.00010 (July/Aug/Sept)	0.000010	0.0010 (June) 0.000050 (July/Aug/Sept)
1616-30 (LLCF)	0.00050 (June) 0.00050/0.00010 (July/Aug/Sept)	0.000050	0.00050 (June) 0.00050/0.000050 (July/Aug/Sept)	0.00010 (June) 0.00010/0.000040 (July/Aug/Sept)	0.00020 (June) 0.00020/0.00010 (July/Aug/Sept)	0.000010	0.0010 (June) 0.0010/0.000050 (July/Aug/Sept)
Leslie-Moose	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Moose-Nero	0.00050 (June) 0.00010 (July/Aug/Sept)	0.000050	0.00050 (June) 0.000050 (July/Aug/Sept)	0.00010 (June) 0.000040 (July/Aug/Sept)	0.00020 (June) 0.00010 (July/Aug/Sept)	0.000010	0.0010 (June) 0.000050 (July/Aug/Sept)
Nema-Martine	0.00050 (June) 0.00010 (July/Aug/Sept)	0.000050	0.00050 (June) 0.000050 (July/Aug/Sept)	0.00010 (June) 0.000040 (July/Aug/Sept)	0.00020 (June) 0.00010 (July/Aug/Sept)	0.000010	0.0010 (June) 0.000050 (July/Aug/Sept)
Slipper-Lac de Gras	0.00050 (June) 0.00010 (July/Aug/Sept)	0.000050	0.00050 (June) 0.000050 (July/Aug/Sept)	0.00010 (June) 0.000040 (July/Aug/Sept)	0.00020 (June) 0.00010 (July/Aug/Sept)	0.000010	0.0010 (June) 0.000050 (July/Aug/Sept)
Mossing Outflow	0.00050 (June) 0.00010 (July/Aug/Sept)	0.000050	0.00050 (June) 0.000050 (July/Aug/Sept)	0.00010 (June) 0.000040 (July/Aug/Sept)	0.00020 (June) 0.00010 (July/Aug/Sept)	0.000010	0.0010 (June) 0.000050 (July/Aug/Sept)
1616-43 (KPSF)	0.00050 (June) 0.00010 (July/Aug/Sept)	0.000050	0.00050 (June) 0.000050 (July/Aug/Sept)	0.00010 (June) 0.000040 (July/Aug/Sept)	0.00020 (June) 0.00010 (July/Aug/Sept)	0.000010	0.0010 (June) 0.000050 (July/Aug/Sept)
Cujo Outflow	0.00050 (June) 0.00010 (July/Aug/Sept)	0.000050	0.00050 (June) 0.000050 (July/Aug/Sept)	0.00010 (June) 0.000040 (July/Aug/Sept)	0.00020 (June) 0.00010 (July/Aug/Sept)	0.000010	0.0010 (June) 0.000050 (July/Aug/Sept)
Christine-Lac du Sauvage	0.00010	0.000050	0.000050	0.000040	0.00010	0.000010	0.000050
Pigeon Reach 1	0.00050 (June) 0.00010/0.00050 (July) 0.00010 (Aug/Sept)	0.000050	0.00050 (June) 0.000050/0.00050 (July) 0.000050 (Aug/Sept)	0.00010 (June) 0.000040/0.00010 (July) 0.000040 (Aug/Sept)	0.00020 (June) 0.00010/0.00020 (July) 0.00010 (Aug/Sept)	0.000010	0.0010 (June) 0.000050/0.0010 (July) 0.000050 (Aug/Sept)

Note:
All units are mg/L except for pH (no units).

Table 3.4-8. Percent of Water Samples and Factor by which Mean Concentrations are Greater than Water Quality Benchmarks, AEMP Lakes 2014

Lake	Total Number of Samples Collected	Benchmark Value:	pH	Chloride	Sulphate	Potassium	Total Suspended Solids	Total Ammonia-N	Nitrate-N	Nitrite-N	Total Phosphate-P	Total Antimony
			6.5-9.0	*hardness dependent* [1]	*hardness dependent* [2]	*41 mg/L* [3]	*dependent on background levels* [4]	*pH and temperature dependent*	*hardness dependent* [5]	*0.06 mg/L*	*variable see Table 2.5-4*	*0.02 mg/L* [6]
Under-ice												
Nanuq	4		-	-	-	-	-	-	-	-	75% (1.22)	-
Counts	4		-	-	-	-	-	-	-	-	-	-
Vulture	4		-	-	-	-	-	-	-	-	-	-
Grizzly	4		-	-	-	-	-	-	-	-	-	-
Kodiak	4		-	-	-	-	-	-	-	-	-	-
Leslie	4		-	-	-	100% (1.36)	-	-	-	-	-	-
Moose	4		-	-	-	100% (1.30)	-	-	-	-	100% (1.86)	-
Nema	4		-	-	-	-	-	-	-	-	-	-
Slipper	4		-	-	-	-	-	-	-	-	-	-
S2	4		-	-	-	-	-	-	-	-	-	-
S3	4		-	-	-	-	-	-	-	-	-	-
Cujo	4		-	-	-	-	-	-	-	-	25% (0.84)	-
LdS1	4		-	-	-	-	-	-	-	-	50% (1.00)	-
Fay Bay	4		-	-	-	-	-	-	-	-	-	-
Upper Exeter	4		-	-	-	-	-	-	-	-	-	-
Open Water Season												
Nanuq	4		-	-	-	-	-	-	-	-	100% (1.61)	-
Counts	4		-	-	-	-	-	-	-	-	25% (1.11)	-
Vulture	4		-	-	-	-	-	-	-	-	-	-
Grizzly	4		-	-	-	-	-	-	-	-	-	-
Kodiak	4		-	-	-	-	-	-	-	-	-	-
Leslie	6		-	-	-	33% (0.80)	-	-	-	-	-	-
Moose	4		-	-	-	-	-	-	-	-	25% (0.79)	-
Nema	4[a]		-	-	-	-	-	-	-	-	-	-
Slipper	4		-	-	-	-	-	-	-	-	-	-
S2	4		-	-	-	-	-	-	-	-	-	-
S3	4		-	-	-	-	-	-	-	-	-	-
Cujo	4		-	-	-	-	-	-	-	-	75% (1.27)	-
LdS2	2		-	-	-	-	-	-	-	-	-	-
LdS1	4		-	-	-	-	-	-	-	-	-	-
Fay Bay	12		-	-	-	-	-	-	-	-	-	-
Upper Exeter	12		-	-	-	-	-	-	-	-	17% (0.88)	-
Number of Sites where Average Concentrations > Benchmarks			**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**9**	**0**

Note: Values represent the percent and factor () by which the values were greater than the benchmark value. *(continued)*

[a] *Four samples were collected however one was considered contaminated and therefore only three samples were used in the evaluation.*

[1] *Hardness-dependent, where SSWQO = 116.63 × ln(hardness) - 204.09, for hardness greater than 10 mg/L and less than or equal to 160 mg/L (Elphick, Bergh and Bailey 2011).*

[2] *Hardness-dependent, where SSWQO =* $e^{0.9116[\ln(hardness)]+1.712}$ *, for hardness less than or equal to 160 mg/L (Rescan 2012e).*

[3] *Long-term guideline, short-term guideline is 112 mg/L (Rescan 2012d).*

[4] *Maximum average increase of 5 mg/L from background levels (long-term exposures).*

[5] *Hardness-dependent, where SSWQO =* $e^{0.9518[\ln(hardness)]-2.032}$ *, for hardness less than or equal to 160 mg/L, at hardness greater than 160 mg/L the guideline at hardness 160 mg/L applies (Rescan 2012c).*

[6] *Fletcher et al. (1996)*

[7] *Haywood and Drinnan (1983)*

Table 3.4-8. Percent of Water Samples and Factor by which Mean Concentrations are Greater than Water Quality Benchmarks, AEMP Lakes 2014 (completed)

Lake	Total Number of Samples Collected	Benchmark Value:	Total Arsenic	Total Barium	Total Boron	Total Cadmium	Total Copper	Total Molybdenum	Total Nickel	Total Selenium	Total Strontium	Total Uranium	Total Vanadium
			0.005 mg/L	*1 mg/L* [7]	*1.5 mg/L*	*hardness dependent* [8]	*hardness dependent* [9]	*19.38 mg/L* [10]	*hardness dependent* [11]	*0.001 mg/L*	*6.242 mg/L* [12]	*0.015 mg/L*	*0.03 mg/L* [13]
Under-ice													
Nanuq	4		-	-	-	-	-	-	-	-	-	-	-
Counts	4		-	-	-	-	-	-	-	-	-	-	-
Vulture	4		-	-	-	-	-	-	-	-	-	-	-
Grizzly	4		-	-	-	-	-	-	-	-	-	-	-
Kodiak	4		-	-	-	-	100% (1.06)	-	-	-	-	-	-
Leslie	4		-	-	-	-	-	-	-	-	-	-	-
Moose	4		-	-	-	-	-	-	-	-	-	-	-
Nema	4		-	-	-	-	-	-	-	-	-	-	-
Slipper	4		-	-	-	-	-	-	-	-	-	-	-
S2	4		-	-	-	-	-	-	-	-	-	-	-
S3	4		-	-	-	-	-	-	-	-	-	-	-
Cujo	4		-	-	-	-	-	-	-	-	-	-	-
LdS1	4		-	-	-	-	-	-	-	-	-	-	-
Fay Bay	4		-	-	-	-	-	-	-	-	-	-	-
Upper Exeter	4		-	-	-	-	-	-	-	-	-	-	-
Open Water Season													
Nanuq	4		-	-	-	-	-	-	-	-	-	-	-
Counts	4		-	-	-	-	-	-	-	-	-	-	-
Vulture	4		-	-	-	-	-	-	-	-	-	-	-
Grizzly	4		-	-	-	-	-	-	-	-	-	-	-
Kodiak	4		-	-	-	-	-	-	-	-	-	-	-
Leslie	6		-	-	-	-	-	-	-	-	-	-	-
Moose	4		-	-	-	-	-	-	-	-	-	-	-
Nema	4[a]		-	-	-	-	33% (0.92)	-	-	-	-	-	-
Slipper	4		-	-	-	-	-	-	-	-	-	-	-
S2	4		-	-	-	-	-	-	-	-	-	-	-
S3	4		-	-	-	-	-	-	-	-	-	-	-
Cujo	4		-	-	-	-	-	-	-	-	-	-	-
LdS2	2		-	-	-	-	-	-	-	-	-	-	-
LdS1	4		-	-	-	-	-	-	-	-	-	-	-
Fay Bay	12		-	-	-	-	-	-	-	-	-	-	-
Upper Exeter	12		-	-	-	-	-	-	-	-	-	-	-
Number of Sites where Average Concentrations > Benchmarks			**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**

[8] *Hardness dependent, where CCME guideline =* $10^{0.83 \times (\log(hardness))-2.46}$ */1000 for hardness greater than 17 mg/L and less than 280 mg/L, with a minimum value of 0.0004 mg/L below hardness 17 mg/L and a maximum value of 0.00037 mg/L at hardness values greater than 280 mg/L (CCME 2014).*

[9] *Hardness dependent, where CCME guideline =* $e^{0.8545[\ln(hardness)]-1.465}$ *× 0.2/1000, with a minimum value of 0.002 mg/L below a hardness of 82 mg/L and a maximum of 0.004 mg/L at hardness values greater than 180 mg/L (CCME 1987).*

[10] *Benchmark is the SSWQO (Rescan 2012b).*

[11] *Hardness-dependent, where CCME guideline =* $e^{0.76[\ln(hardness)]+1.06}$ */1000, with a minimum value of 0.025mg/L and a maximum of 0.15 mg/L above hardness values of 180 mg/L (CCME 1987).*

[12] *Golder (2011)*

[13] *Benchmark is the SSWQO (Rescan 2012g).*

Table 3.4-9. Percent of Water Samples and Factor by which Mean Concentrations are Greater than Water Quality Benchmarks, AEMP Streams 2014

Stream	Date	Total Number of Samples Collected	Benchmark Value:	pH	Chloride	Sulphate	Potassium	Total Suspended Solids	Total Ammonia-N	Nitrate-N	Nitrite-N	Total Antimony
				6.5-9.0	*hardness dependent* [1]	*hardness dependent* [2]	*41 mg/L* [3]	*dependent on background levels* [4]	*pH and temperature dependent*	*hardness dependent* [5]	*0.06 mg/L*	*0.02 mg/L* [6]
Nanuq Outflow	June	2		-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-
Counts Outflow	June	2		-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-
Vulture-Polar	June	2		-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-
Pigeon Reach 7	June	2		-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-
Lower PDC	June	2		-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-
Kodiak-Little	June	2		-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-
Leslie-Moose	June	2		-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-
Moose-Nero	June	2		-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-

(continued)

Table 3.4-9. Percent of Water Samples and Factor by which Mean Concentrations are Greater than Water Quality Benchmarks, AEMP Streams 2014 (continued)

Stream	Date	Total Number of Samples Collected	Benchmark Value:	Total Arsenic	Total Barium	Total Boron	Total Cadmium	Total Copper	Total Molybdenum	Total Nickel	Total Selenium	Total Strontium	Total Uranium	Total Vanadium
				0.005 mg/L	*1 mg/L* [7]	*1.5 mg/L*	*hardness dependent* [8]	*hardness dependent* [9]	*19.38 mg/L* [10]	*hardness dependent* [11]	*0.001 mg/L*	*6.242 mg/L* [12]	*0.015 mg/L*	*0.03 mg/L* [13]
Nanuq Outflow	June	2		-	-	-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-	-	-
Counts Outflow	June	2		-	-	-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-	-	-
Vulture-Polar	June	2		-	-	-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-	-	-
Pigeon Reach 7	June	2		-	-	-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-	-	-
Lower PDC	June	2		-	-	-	-	100% (1.02)	-	-	-	-	-	-
	July	2		-	-	-	-	100% (1.21)	-	-	-	-	-	-
	August	2		-	-	-	-	100% (1.34)	-	-	-	-	-	-
	September	2		-	-	-	-	100% (1.37)	-	-	-	-	-	-
Kodiak-Little	June	2		-	-	-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-	-	-
Leslie-Moose	June	2		-	-	-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-	-	-
Moose-Nero	June	2		-	-	-	50% (1.98)	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-	-	-

(continued)

Table 3.4-9. Percent of Water Samples and Factor by which Mean Concentrations are Greater than Water Quality Benchmarks, AEMP Streams 2014 (continued)

Stream	Month	Total Number of Samples Collected	Benchmark Value:	pH	Chloride	Sulphate	Potassium	Total Suspended Solids	Ammonia-N	Nitrate-N	Nitrite-N	Total Antimony
				6.5-9.0	*hardness dependent* [1]	*hardness dependent* [2]	*41 mg/L* [3]	*dependent on background levels* [4]	*pH and temperature dependent*	*hardness dependent* [5]	*0.06 mg/L*	*0.02 mg/L* [6]
Nema-Martine	June	2		-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-
Mossing Outflow	June	2		-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-
Slipper-Lac de Gras	June	2		-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-
Cujo Outflow	June	2		-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-
Christine-Lac du Sauvage	June	2		-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-
Pigeon Reach 1	June	4		-	-	-	-	50% (1.41)	-	-	-	-
	July	4		-	-	-	-	-	-	-	-	-
	August	4		-	-	-	-	-	-	-	-	-
	September	6		-	-	-	-	-	-	-	-	-
Number of Site/Dates where Average Concentrations > Benchmarks				**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**

(continued)

Table 3.4-9. Percent of Water Samples and Factor by which Mean Concentrations are Greater than Water Quality Benchmarks, AEMP Streams 2014 (completed)

Stream	Date	Total Number of Samples Collected	Benchmark Value:	Total Arsenic	Total Barium	Total Boron	Total Cadmium	Total Copper	Total Molybdenum	Total Nickel	Total Selenium	Total Strontium	Total Uranium	Total Vanadium
				0.005 mg/L	*1 mg/L* [7]	*1.5 mg/L*	*hardness dependent* [8]	*hardness dependent* [9]	*19 mg/L* [10]	*hardness dependent* [11]	*0.001 mg/L*	*6.242 mg/L* [12]	*0.015 mg/L*	*0.03 mg/L* [13]
Nema-Martine	June	2		-	-	-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-	-	-
Mossing Outflow	June	2		-	-	-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-	-	-
Slipper-Lac de Gras	June	2		-	-	-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-	-	-
Cujo Outflow	June	2		-	-	-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-	-	-
Christine-Lac du Sauvage	June	2		-	-	-	-	-	-	-	-	-	-	-
	July	2		-	-	-	-	-	-	-	-	-	-	-
	August	2		-	-	-	-	-	-	-	-	-	-	-
	September	2		-	-	-	-	-	-	-	-	-	-	-
Pigeon Reach 1	June	2		-	-	-	-	-	-	-	-	-	-	-
	July	4		-	-	-	-	-	-	-	-	-	-	-
	August	4		-	-	-	-	-	-	-	-	-	-	-
	September	6		-	-	-	-	-	-	-	-	-	-	-
Number of Site/Dates where Average Concentrations > Benchmarks				**0**	**0**	**0**	**1**	**4**	**0**	**0**	**0**	**0**	**0**	**0**

Note: Values represent the percent and factor () by which the values were greater than the benchmark value.

[1] *Hardness-dependent, where SSWQO = 116.63 × ln(hardness) - 204.09, for hardness greater than 10 mg/L and less than or equal to 160 mg/L (Elphick, Bergh and Bailey 2011).*

[2] *Hardness-dependent, where SSWQO =* $e^{0.9116[\ln(hardness)]+1.712}$*, for hardness less than or equal to 160 mg/L (Rescan 2012e).*

[3] *Long-term guideline, short-term guideline is 112 mg/L (Rescan 2012d).*

[4] *Maximum average increase of 5 mg/L from background levels (long-term exposures).*

[5] *Hardness-dependent, where SSWQO =* $e^{0.9518[\ln(hardness)]-2.032}$*, for hardness less than or equal to 160 mg/L, at hardness greater than 160 mg/L the guideline at hardness 160 mg/L applies (Rescan 2012c).*

[6] *Fletcher et al. (1996)*

[7] *Haywood and Drinnan (1983)*

[8] *Hardness dependent, where CCME guideline =* $10^{0.83 \times (\log(hardness))-2.46}$*/1000 for hardness greater than 17 mg/L and less than 280 mg/L, with a minimum value of 0.0004 mg/L below hardness 17 mg/L and a maximum value of 0.00037 mg/L at hardness values greater than 280 mg/L (CCME 2014).*

[9] *Hardness dependent, where CCME guideline =* $e^{0.8545[\ln(hardness)]-1.465}$ *× 0.2/1000, with a minimum value of 0.002 mg/L below a hardness of 82 mg/L and a maximum of 0.004 mg/L at hardness values > 180 mg/L (CCME 1987).*

[10] *Benchmark is the SSWQO (Rescan 2012b).*

[11] *Hardness-dependent, where CCME guideline =* $e^{0.76[\ln(hardness)]+1.06}$*/1000, with a minimum value of 0.025mg/L and a maximum of 0.15 mg/L above hardness values of 180 mg/L (CCME 1987).*

[12] *Golder (2011)*

[13] *Benchmark is the SSWQO (Rescan 2012g).*

Table. 3.4-10. Analytical Results for AEMP Lake Water Quality QA/QC Blanks, Under-ice Season 2014

Blank Type		Equipment	Equipment	Field	Field	Field	Travel	Travel	Travel
Date		29-May-14	1-Apr-14	6-Apr-14	9-Apr-14	12-Apr-14	6-Apr-14	9-Apr-14	12-Apr-14
Sample ID		L1438630-1	L1440090-9	L1441130-16	L1443111-19	L1443647-13	L1441130-17	L1443111-20	L1443647-14
Physical Tests	**Units**								
Conductivity	uS/cm	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Hardness (as $CaCO_3$)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
pH	pH	5.47	5.36	5.66	5.66	5.76	5.64	5.65	5.74
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Turbidity	NTU	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Anions									
Anion Sum	meq/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cation Sum	meq/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cation - Anion Balance	%	0	0	0	0	0	0	0	0
Alkalinity, Total (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Nutrients									
Ammonia, Total (as N)	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0225	<0.0050
Nitrate (as N)	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Orthophosphate-Dissolved (as P)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphate, Total (as P)	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Organic / Inorganic Carbon									
Total Organic Carbon	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total Metals									
Aluminum (Al)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Barium (Ba)-Total	mg/L	<0.000050	0.000074	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	0.000013	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	**0.0099**	**0.0054**	**0.0059**	**0.0093**	**0.0061**	**0.0070**
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	<0.020	**0.029**	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Chromium (Cr)-Total	mg/L	<0.00010	**0.00016**	<0.00010	<0.00010	<0.00010	**0.00017**	<0.00010	**0.00016**
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	**0.00021**	**0.00021**	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Iron (Fe)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Total	mg/L	**0.000039**	**0.000102**	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Manganese (Mn)-Total	mg/L	<0.000050	**0.000194**	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	<0.000050	**0.0011**	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Potassium (K)-Total	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.061	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Strontium (Sr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	**0.0063**	**0.0079**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

Notes:

All variables analyzed by ALS Environmental (Burnaby, BC).

< = less than the analytical detection limit indicated

Bold/shaded values indicate above analytical detection levels.

Table. 3.4-11. Analytical Results for AEMP Lake Water Quality QA/QC Blanks, Open Water Season 2014

Sample ID		Equipment	Equipment	Equipment	Equipment	Equipment	Field	Field
Date		3-Jul-14	28-Jul-14	30-Jul-14	2-Aug-14	31-Aug-14	29-Jul-14	31-Jul-14
ALS Sample ID		L1482182-9	L1497563-1	L1497563-21	L1497511-1	L1511813-13	L1497563-2	L1497388-1
Physical Tests	**Units**							
Conductivity	uS/cm	<2.0	<2.0	**2.2**	**13.7**	**18.9**	<2.0	<2.0
Hardness (as $CaCO_3$)	mg/L	<0.50	<0.50	<0.50	**0.63**	<0.50	<0.50	<0.50
pH	pH	6.17	5.42	5.61	4.60	4.42	5.45	5.69
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	<1.0	<1.0	<1.0	**3.4**	**2.7**	<1.0	<1.0
Turbidity	NTU	**0.17**	<0.10	<0.10	**0.12**	<0.10	<0.10	<0.10
Anions								
Anion Sum	meq/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cation Sum	meq/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cation - Anion Balance	%	0	30	0	2.4	-11.5	0	0
Alkalinity, Total (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	<0.50	<0.50	<0.50	**2.11**	**2.48**	<0.50	<0.50
Sulphate (SO_4)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Nutrients								
Ammonia, Total (as N)	mg/L	<0.0050	**0.0051**	0.0075	**0.0067**	<0.0050	<0.0050	<0.0050
Nitrate (as N)	mg/L	<0.0050	**0.0627**	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	<0.050	**0.079**	<0.050	<0.050	<0.050	<0.050	<0.050
Orthophosphate-Dissolved (as P)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphate, Total (as P)	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Organic / Inorganic Carbon								
Total Organic Carbon	mg/L	<0.50	<0.50	<0.50	**0.64**	<0.50	<0.50	-
Total Metals								
Aluminum (Al)-Total	mg/L	**0.0039**	**0.0062**	**0.0240**	**0.0426**	**0.129**	<0.0010	-
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Arsenic (As)-Total	mg/L	<0.000020	<0.000020	<0.000020	**0.000049**	<0.000020	<0.000020	-
Barium (Ba)-Total	mg/L	<0.000050	<0.000050	<0.000050	**0.000179**	**0.000129**	<0.000050	-
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Boron (B)-Total	mg/L	**0.0079**	<0.0050	<0.0050	<0.0050	<0.0050	**0.0079**	-
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Calcium (Ca)-Total	mg/L	<0.020	<0.020	<0.020	**0.234**	**0.021**	<0.020	-
Chromium (Cr)-Total	mg/L	**0.00184**	<0.00010	<0.00010	**0.0681**	**0.00014**	<0.00010	-
Cobalt (Co)-Total	mg/L	**0.00012**	<0.00010	<0.00010	**0.00109**	<0.00010	<0.00010	-
Copper (Cu)-Total	mg/L	**0.00221**	**0.00018**	<0.00010	**0.00259**	<0.00010	<0.00010	-
Iron (Fe)-Total	mg/L	**0.014**	<0.010	<0.010	**0.342**	**0.032**	<0.010	-
Lead (Pb)-Total	mg/L	**0.000030**	**0.000019**	0.000059	**0.000014**	**0.000016**	<0.000010	-
Magnesium (Mg)-Total	mg/L	<0.0050	**0.01**	<0.0050	**0.01**	**0.0072**	<0.0050	-
Manganese (Mn)-Total	mg/L	**0.000166**	<0.000050	0.000187	**0.00159**	**0.000572**	<0.000050	-
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Molybdenum (Mo)-Total	mg/L	**0.000075**	<0.000050	<0.000050	**0.00246**	<0.000050	<0.000050	-
Nickel (Ni)-Total	mg/L	**0.00343**	<0.000050	<0.000050	**0.0314**	**0.00007**	<0.000050	-
Potassium (K)-Total	mg/L	<0.050	<0.050	<0.050	**<0.050**	<0.050	<0.050	-
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	-
Silicon (Si)-Total	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Sodium (Na)-Total	mg/L	<0.010	**0.062**	<0.010	**0.024**	**0.017**	<0.010	-
Strontium (Sr)-Total	mg/L	<0.00010	<0.00010	<0.00010	**0.00019**	<0.00010	<0.00010	-
Uranium (U)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	**0.000313**	<0.000050	<0.000050	-
Zinc (Zn)-Total	mg/L	<0.0010	**0.0017**	**0.0026**	**0.0012**	**0.0072**	<0.0010	-

(continued)

Table. 3.4-11. Analytical Results for AEMP Lake Water Quality QA/QC Blanks, Open Water Season 2014 (completed)

Sample ID		Field	Field	Field	Field	Travel	Travel	Travel
Date		2-Aug-14	9-Aug-14	10-Aug-14	31-Aug-14	31-Jul-14	9-Aug-14	31-Aug-14
ALS Sample ID		L1497511-2	L1501595-18	L1501595-20	L1511813-14	L1497388-2	L1501595-19	L1511813-15
Physical Tests	**Units**							
Conductivity	uS/cm	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Hardness (as $CaCO_3$)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
pH	pH	5.47	5.44	5.99	5.36	5.58	5.46	5.38
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Turbidity	NTU	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Anions								
Anion Sum	meq/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cation Sum	meq/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cation - Anion Balance	%	0	0	0	0	0	0	0
Alkalinity, Total (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Nutrients								
Ammonia, Total (as N)	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	**0.0095**	**0.0138**	<0.0050
Nitrate (as N)	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Orthophosphate-Dissolved (as P)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphate, Total (as P)	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Organic / Inorganic Carbon								
Total Organic Carbon	mg/L	<0.50	<0.50	<0.50	<0.50	-	<0.50	<0.50
Total Metals								
Aluminum (Al)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Barium (Ba)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	**0.0087**	**0.0076**	<0.0050	**0.0067**	**0.0082**	**0.0053**	**0.0053**
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	**0.00016**	<0.00010	**0.00011**
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Iron (Fe)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Manganese (Mn)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Potassium (K)-Total	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Strontium (Sr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

Notes:

All variables analyzed by ALS Environmental (Burnaby, BC).

< = less than the analytical detection limit indicated

Bold/shaded values indicate above analytical detection levels.

Table. 3.4-12. Analytical Results for AEMP Stream Water Quality QA/QC Blanks, Open Water Season 2014

Sample ID		Field	Field	Field	Field	Field	Field	Field	Field	Field
Date		6-Jun-14	7-Jun-14	7-Jun-14	5-Jul-14	6-Jul-14	2-Aug-14	1-Aug-14	4-Aug-14	3-Sep-14
ALS Sample ID		L1468897-33	L1468897-17	L1468897-18	L1483805-30	L1483805-20	L1497420-13	L1497420-14	L1498383-17	L1514553-12
Physical Tests	**Units**									
Conductivity	uS/cm	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Hardness (as $CaCO_3$)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
pH	pH	5.45	5.92	5.45	5.73	5.74	5.48	5.42	5.57	5.41
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Turbidity	NTU	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Anions										
Anion Sum	meq/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cation Sum	meq/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cation - Anion Balance	%	0	0	0	0	0	0	0	0	0
Alkalinity, Total (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Nutrients										
Ammonia, Total (as N)	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	**0.045**	<0.0050	<0.0050
Nitrate (as N)	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Orthophosphate-Dissolved (as P)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphate, Total (as P)	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Organic / Inorganic Carbon										
Total Organic Carbon	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total Metals										
Aluminum (Al)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Barium (Ba)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	<0.0050	**0.0091**	**0.0075**	**0.0068**	**0.007**	**0.0053**	**0.0058**
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Iron (Fe)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	**0.000016**	<0.000010
Magnesium (Mg)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Manganese (Mn)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Potassium (K)-Total	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Strontium (Sr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	**0.0012**	<0.0010

(continued)

Table. 3.4-12. Analytical Results for AEMP Stream Water Quality QA/QC Blanks, Open Water Season 2014 (completed)

Sample ID		Field	Travel	Travel	Travel	Travel	Travel	Travel	Travel	Travel
Date		5-Sep-14	6-Jun-14	7-Jun-14	7-Jun-14	5-Jul-14	6-Jul-14	4-Aug-14	3-Sep-14	5-Sep-14
ALS Sample ID		L1515273-9	L1468897-34	L1468897-19	L1468897-20	L1483805-32	L1483805-31	L1498383-18	L1514553-13	L1515273-10
Physical Tests	**Units**									
Conductivity	uS/cm	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Hardness (as $CaCO_3$)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
pH	pH	5.37	5.43	5.45	5.46	5.61	5.66	5.52	5.47	5.42
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Turbidity	NTU	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Anions										
Anion Sum	meq/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cation Sum	meq/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cation - Anion Balance	%	0	0	0	0	0	0	0	0	0
Alkalinity, Total (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Nutrients										
Ammonia, Total (as N)	mg/L	**0.0090**	<0.0050	0.0185	0.0076	0.0068	**0.0104**	**0.0234**	**0.0247**	<0.0050
Nitrate (as N)	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Orthophosphate-Dissolved (as P)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphate, Total (as P)	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Organic / Inorganic Carbon										
Total Organic Carbon	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total Metals										
Aluminum (Al)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Barium (Ba)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron (B)-Total	mg/L	**0.0094**	<0.0050	<0.0050	<0.0050	**0.0073**	**0.0090**	**0.0089**	**0.0071**	**0.0097**
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Chromium (Cr)-Total	mg/L	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0002	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Iron (Fe)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Manganese (Mn)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Potassium (K)-Total	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Strontium (Sr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

Notes:

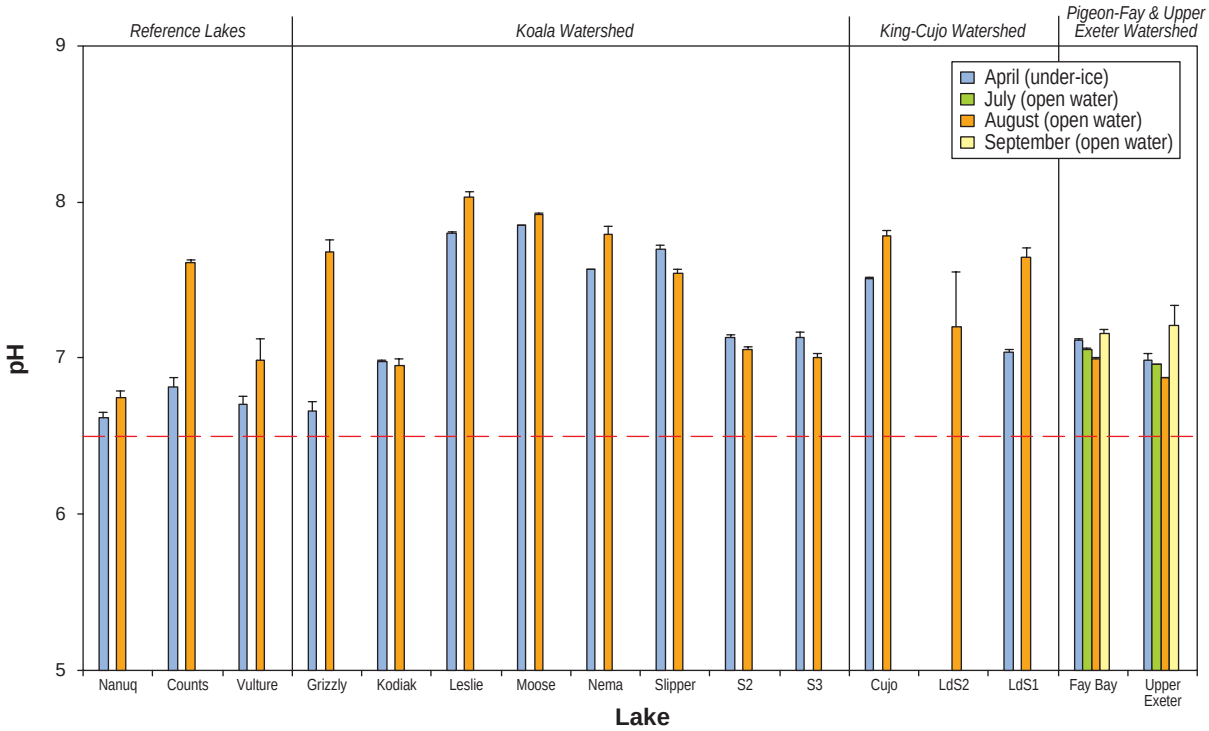
All variables analyzed by ALS Environmental (Burnaby, BC).

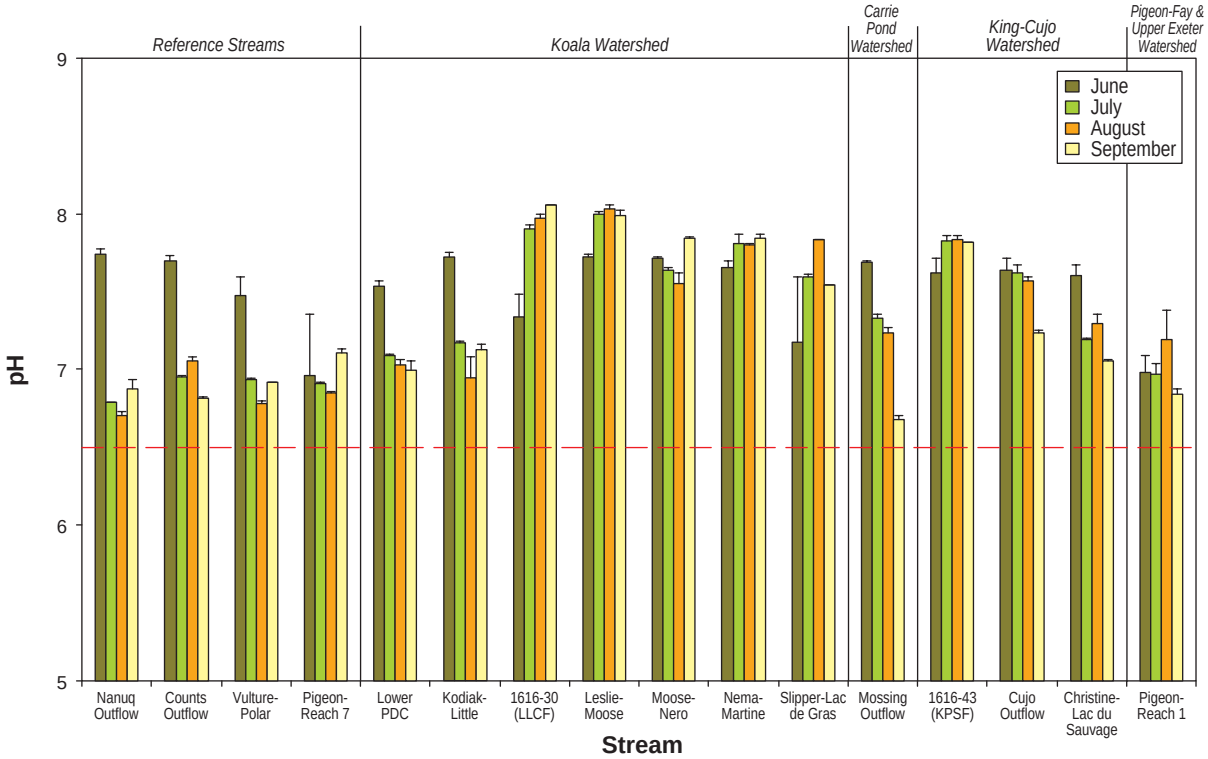
< = less than the analytical detection limit indicated

Bold/shaded values indicate above analytical detection levels.

Figure 3.4-1

Under-ice and Open Water pH Levels at AEMP Lake Sites, and Monthly pH Levels at AEMP Stream Sites, 2014

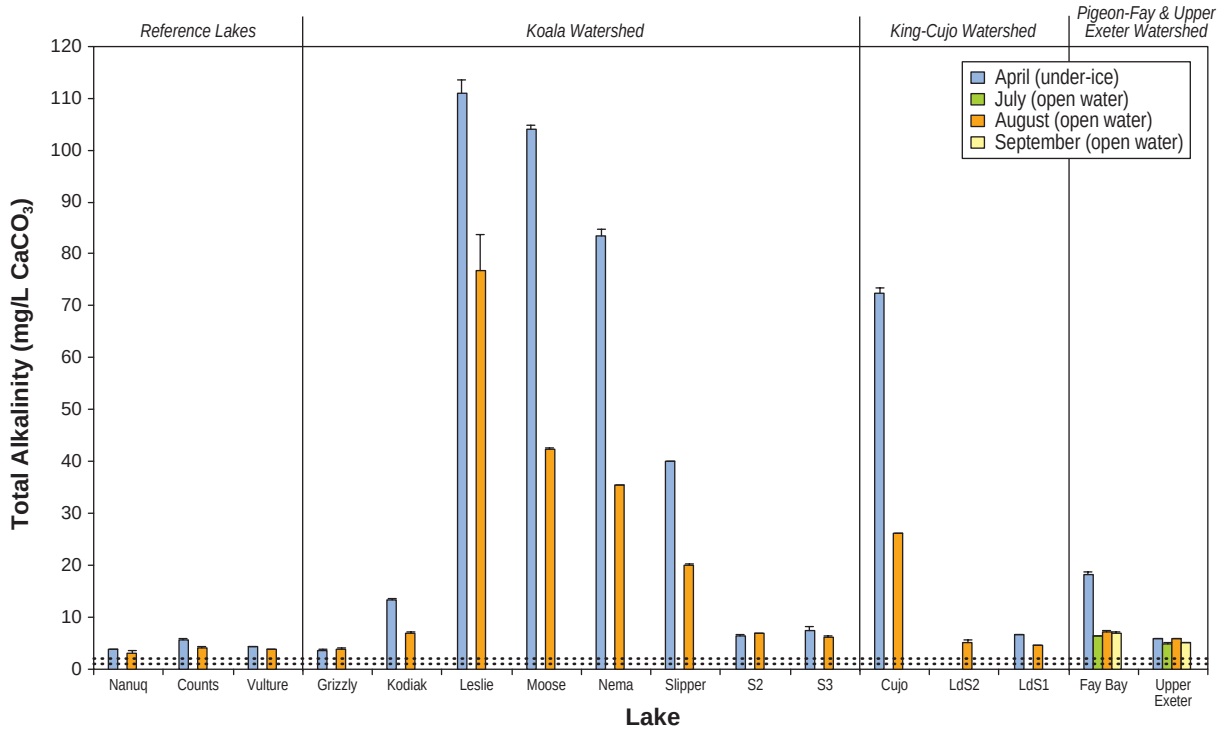


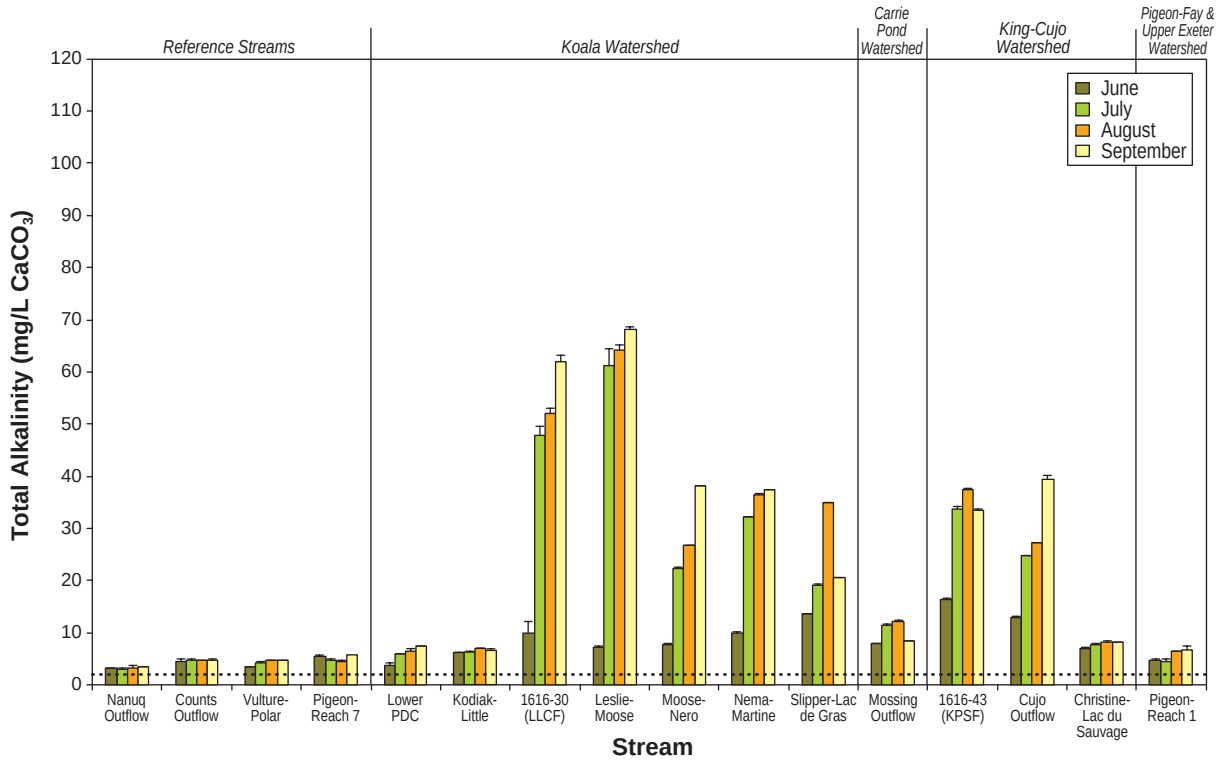


Notes: Error bars represent the standard error of the mean.
Analytical detection limit of 0.10 not shown.
Red dashed lines indicate CCME guidelines = 6.5 to 9.0.

Figure 3.4-2

Under-ice and Open Water Total Alkalinity Levels at AEMP Lake Sites, and Monthly Total Alkalinity Levels at AEMP Stream Sites, 2014

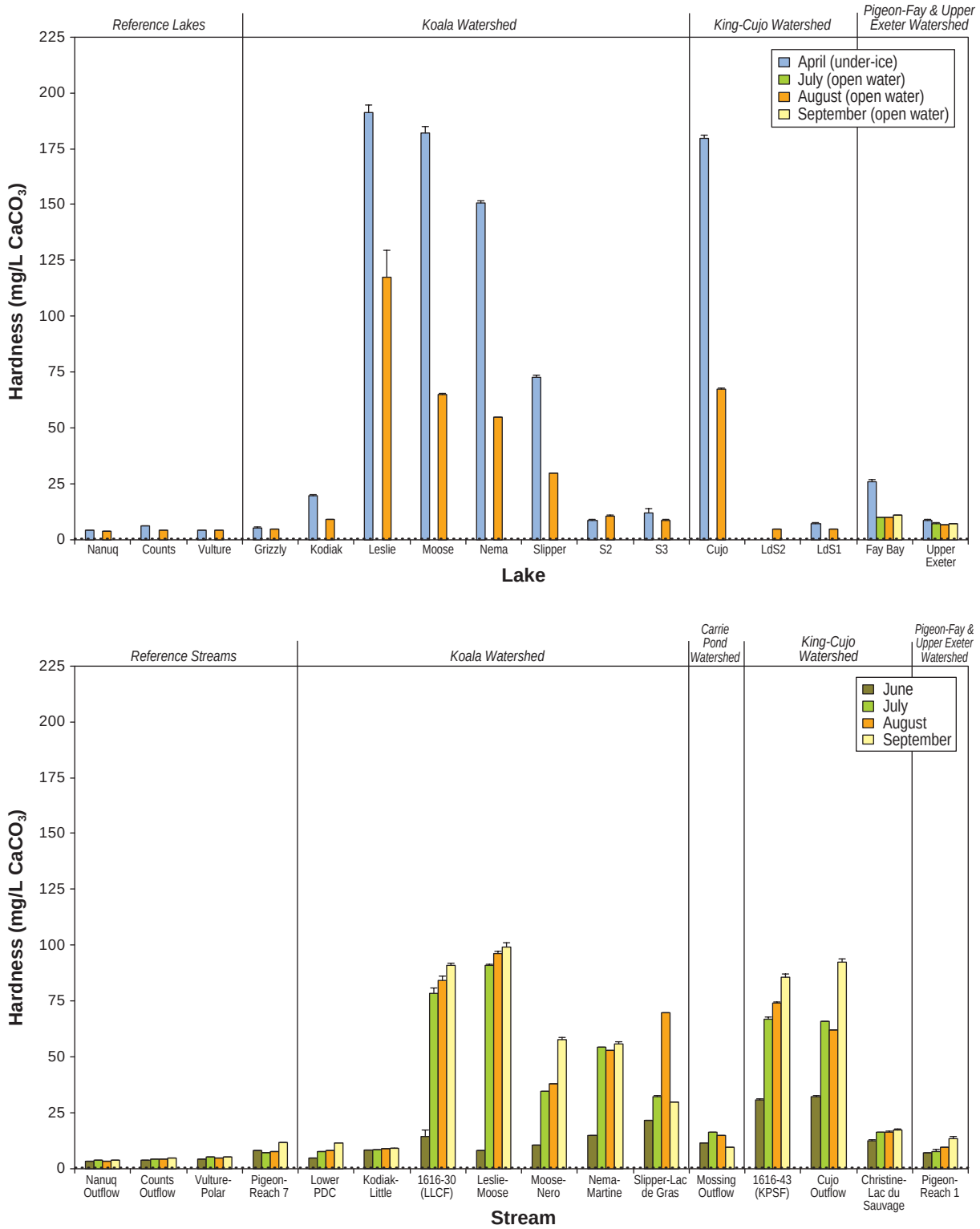




Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 1.0 mg/L and 2.0 mg/L (see Tables 3.4-4, 3.4-5 and 3.4-7).

Figure 3.4-3

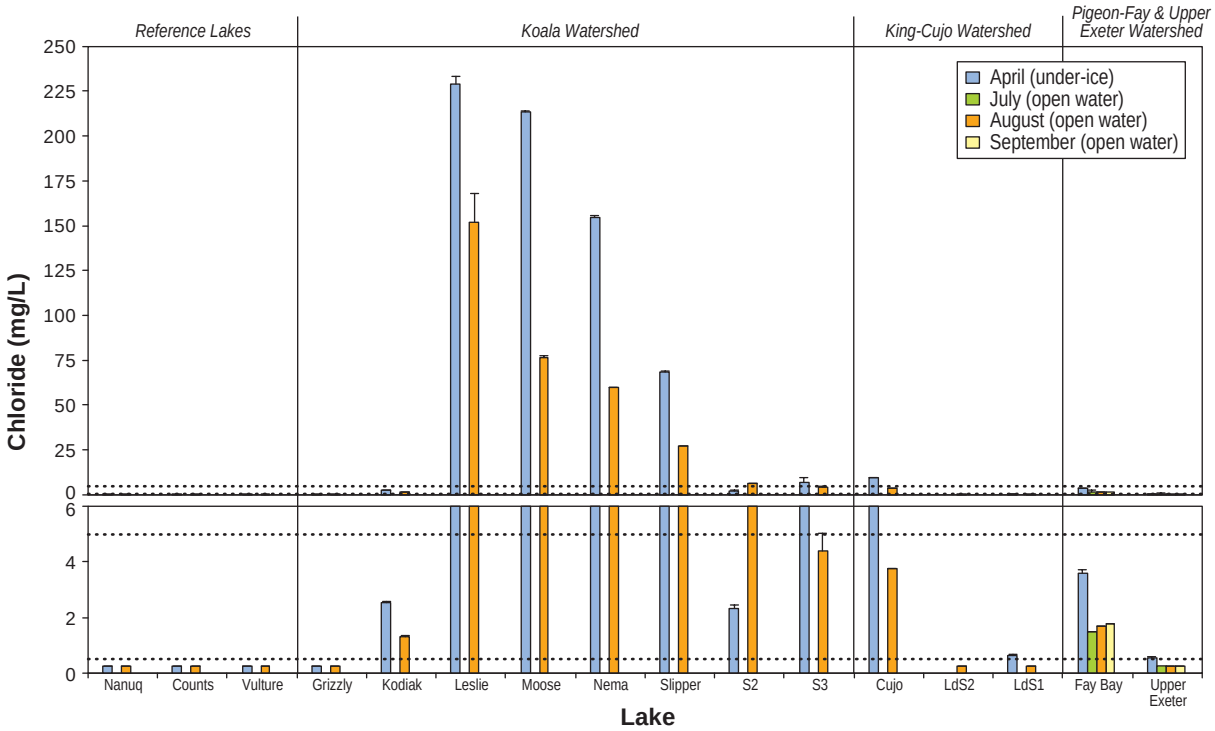
Under-ice and Open Water Hardness Levels at AEMP Lake Sites, and Monthly Hardness Levels at AEMP Stream Sites, 2014

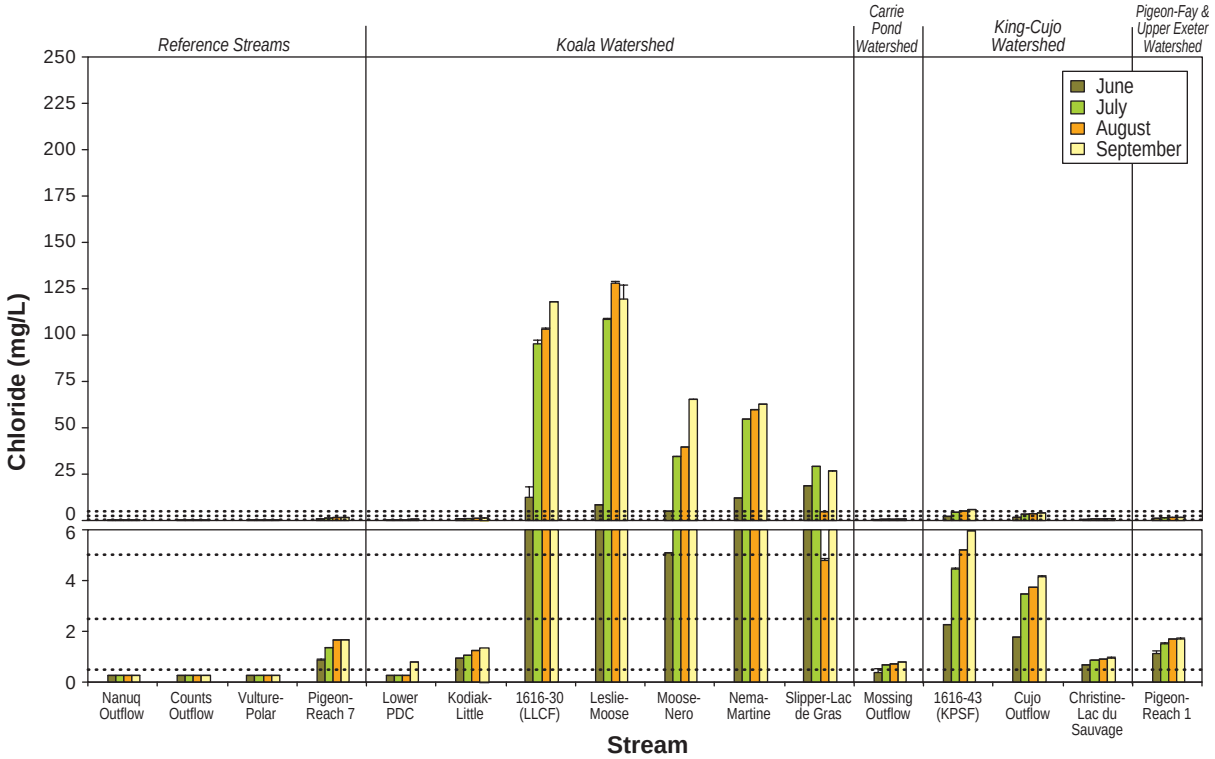


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.10 mg/L (not shown) and 0.50 mg/L (see Tables 3.4-4, 3.4-5 and 3.4-7).

Figure 3.4-4

Under-ice and Open Water Chloride Concentrations at AEMP Lake Sites, and Monthly Chloride Concentrations at AEMP Stream Sites, 2014

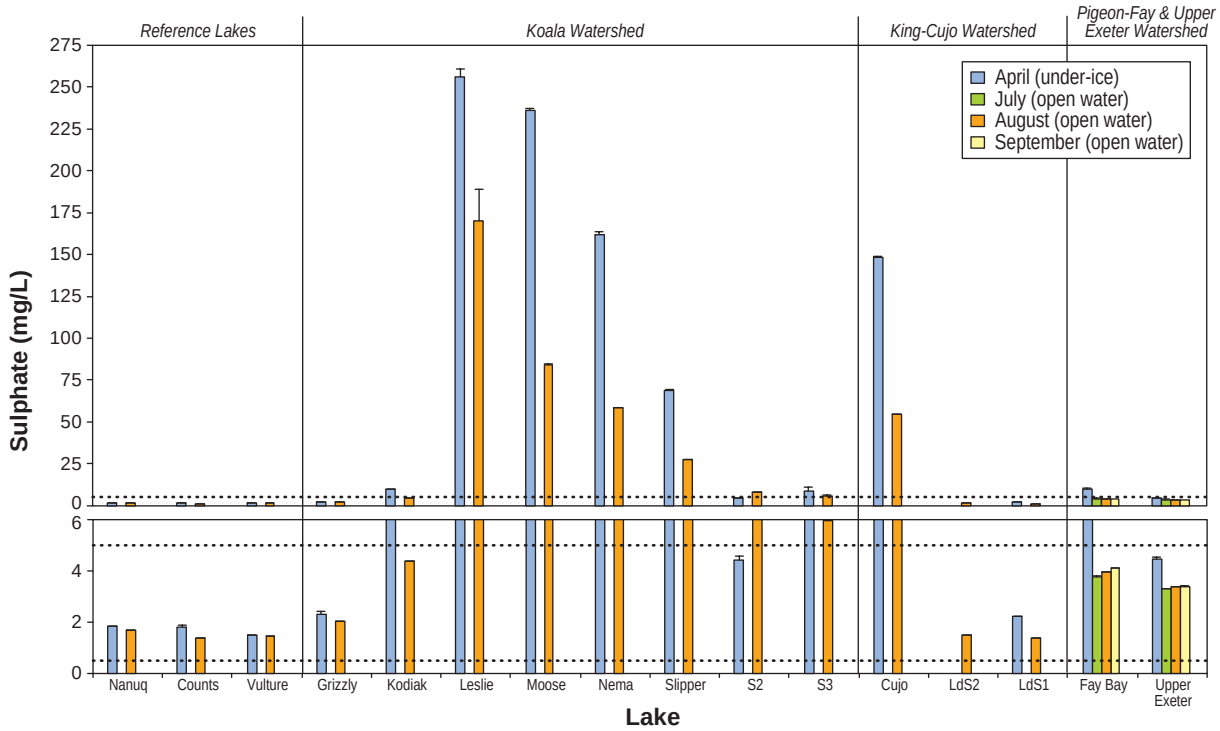


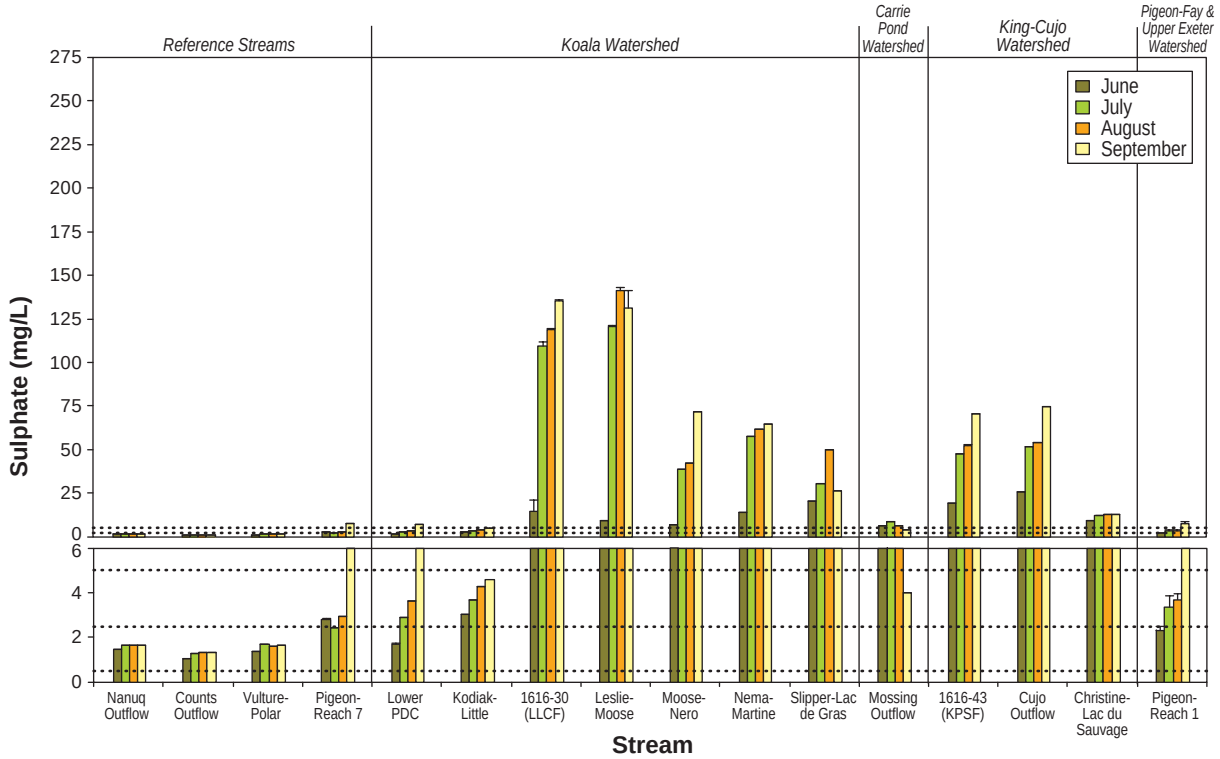


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.50 mg/L and 2.5 mg/L, and 5.0 mg/L (see Tables 3.4-4, 3.4-5 and 3.4-7).
SSWQO = 116.63 x ln(hardness) - 204.09, for hardness greater than 10 mg/L $CaCO_3$. and less than or equal to 160 mg/L $CaCO_3$.

Figure 3.4-5

Under-ice and Open Water Sulphate Concentrations at AEMP Lake Sites, and Monthly Sulphate Concentrations at AEMP Stream Sites, 2014

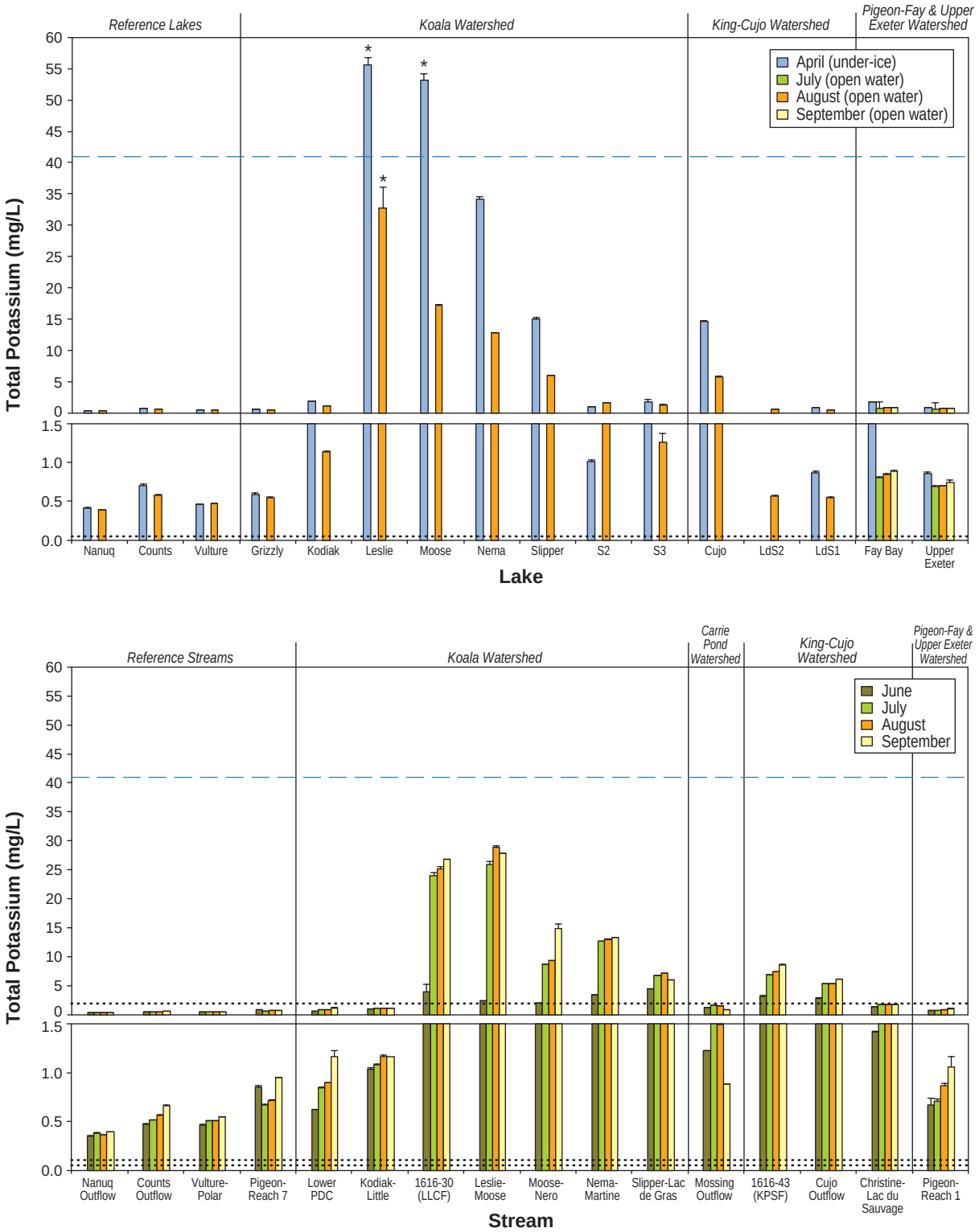




Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.50 mg/L, 2.5 mg/L, and 5.0 mg/L (see Tables 3.4-4, 3.4-5 and 3.4-7).
SSWQO = $e^{0.9116[\ln(hardness)]+1.712}$, for hardness less than or equal to 160 mg/L $CaCO_3$.

Figure 3.4-6

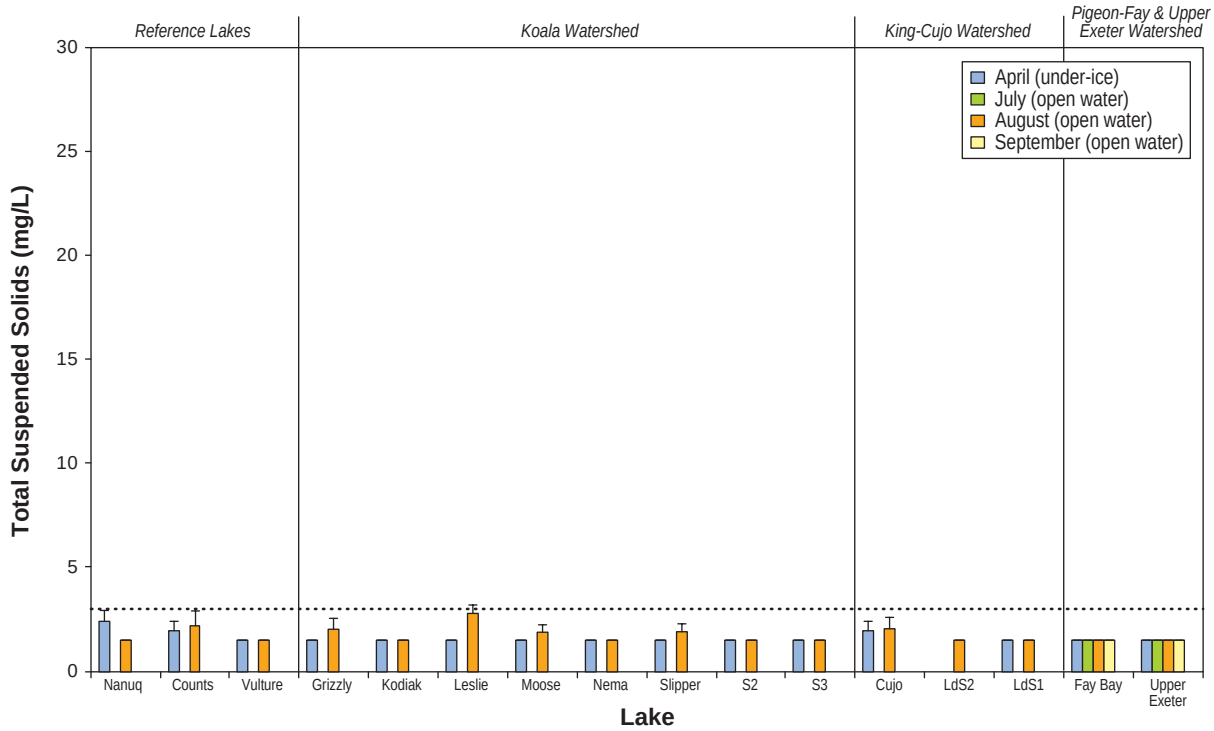
Under-ice and Open Water Potassium Concentrations at AEMP Lake Sites, and Monthly Potassium Concentrations at AEMP Stream Sites, 2014

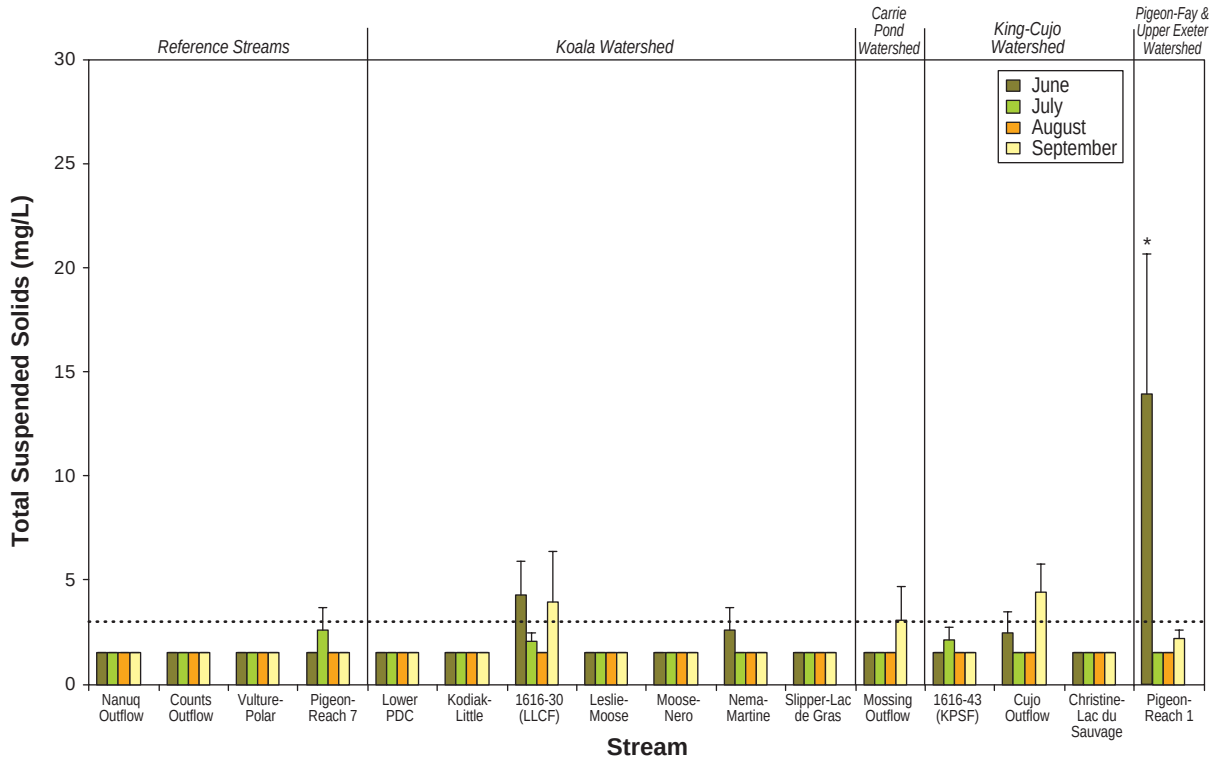


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.050 mg/L, 0.10 mg/L, and 2.0 mg/L (see Tables 3.4-4, 3.4-5 and 3.4-7).
Blue dashed lines indicate SSWQO = 41 mg/L.
** Indicates one or more samples exceeded the SSWQO (see Tables 3.4-8 and 3.4-9).*

Figure 3.4-7

Under-ice and Open Water Total Suspended Solids Concentrations at AEMP Lake Sites, and Monthly Total Suspended Solids Concentrations at AEMP Stream Sites, 2014

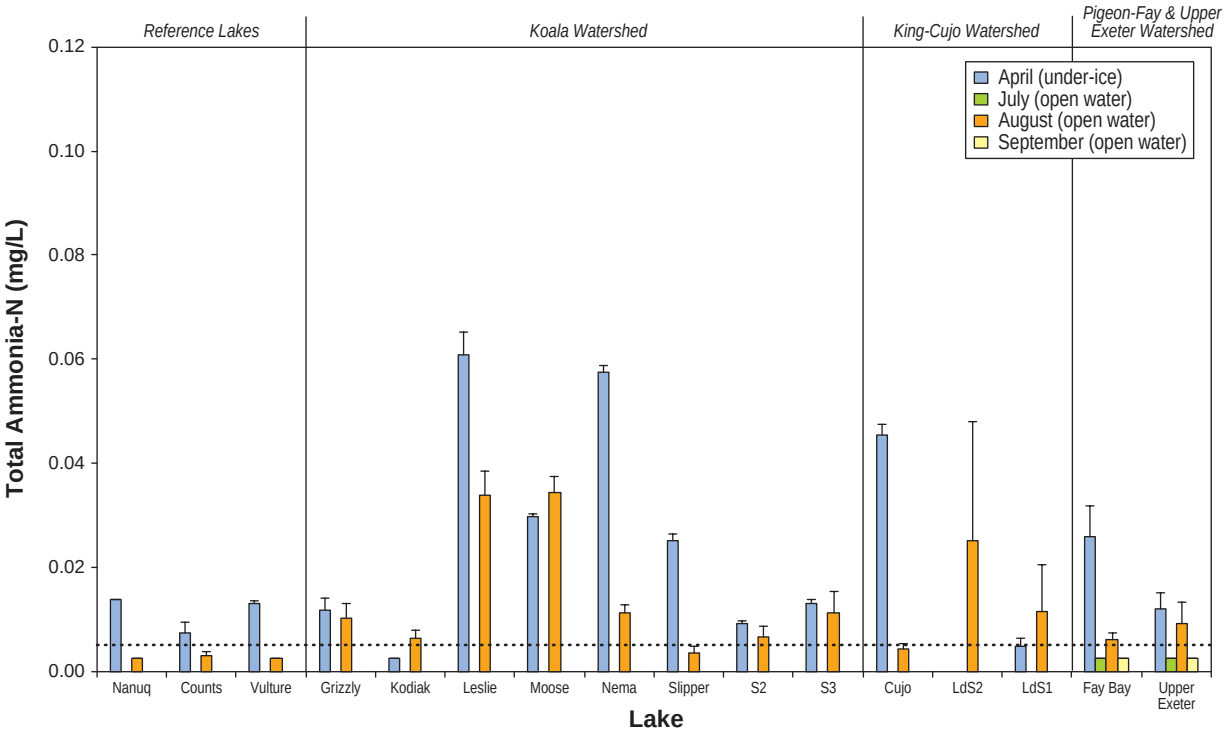


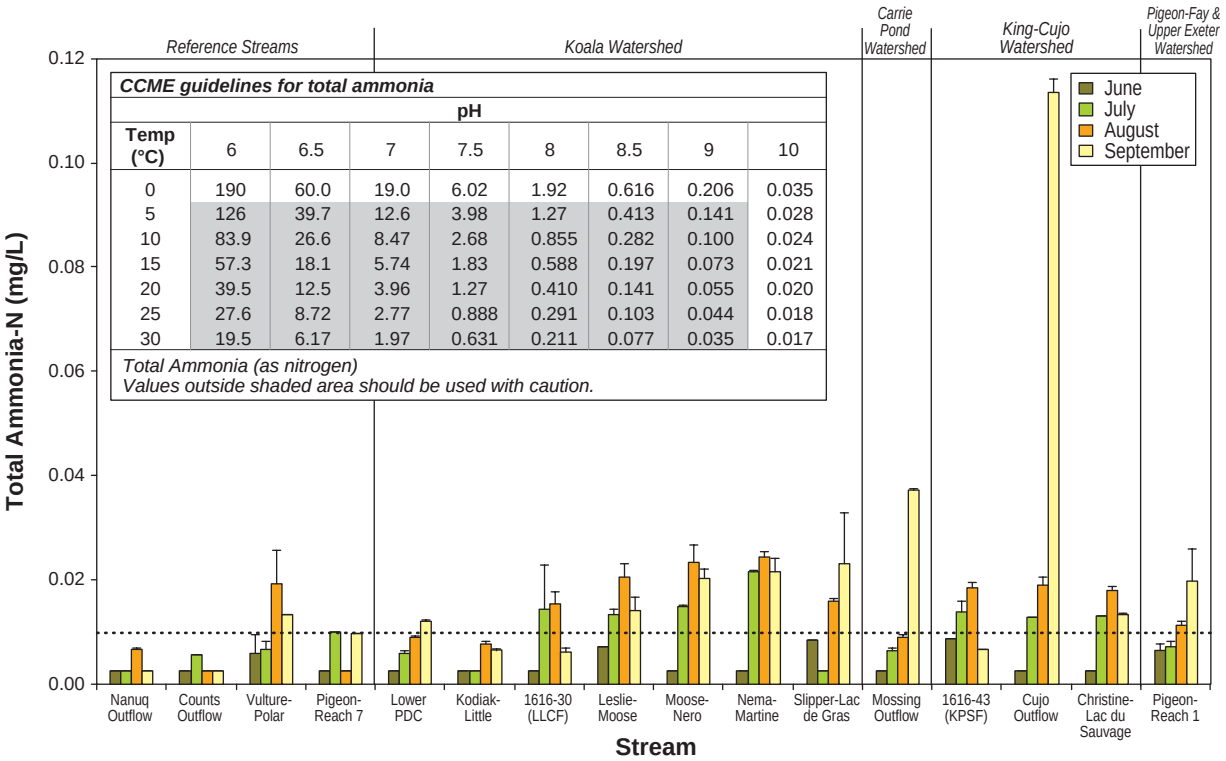


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 3.0 mg/L.
CCME guideline = Maximum average increase from background levels of 5 mg/L (long-term exposures; not shown).
** Indicates one or more samples exceeded the CCME guideline (see Tables 3.4-8 and 3.4-9).*

Figure 3.4-8

Under-ice and Open Water Total Ammonia-N Concentrations at AEMP Lake Sites, and Monthly Total Ammonia-N Concentrations at AEMP Stream Sites, 2014





CCME guidelines for total ammonia

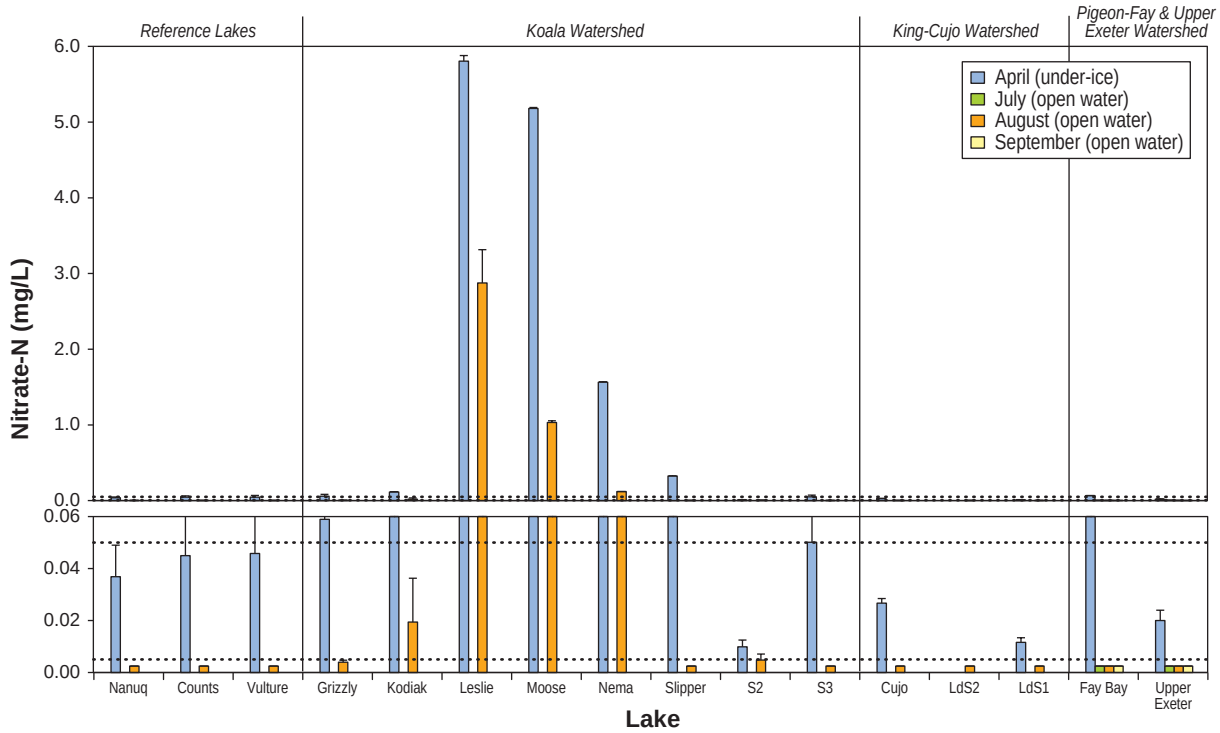
Temp (°C)	pH 6	6.5	7	7.5	8	8.5	9	10
0	190	60.0	19.0	6.02	1.92	0.616	0.206	0.035
5	126	39.7	12.6	3.98	1.27	0.413	0.141	0.028
10	83.9	26.6	8.47	2.68	0.855	0.282	0.100	0.024
15	57.3	18.1	5.74	1.83	0.588	0.197	0.073	0.021
20	39.5	12.5	3.96	1.27	0.410	0.141	0.055	0.020
25	27.6	8.72	2.77	0.888	0.291	0.103	0.044	0.018
30	19.5	6.17	1.97	0.631	0.211	0.077	0.035	0.017

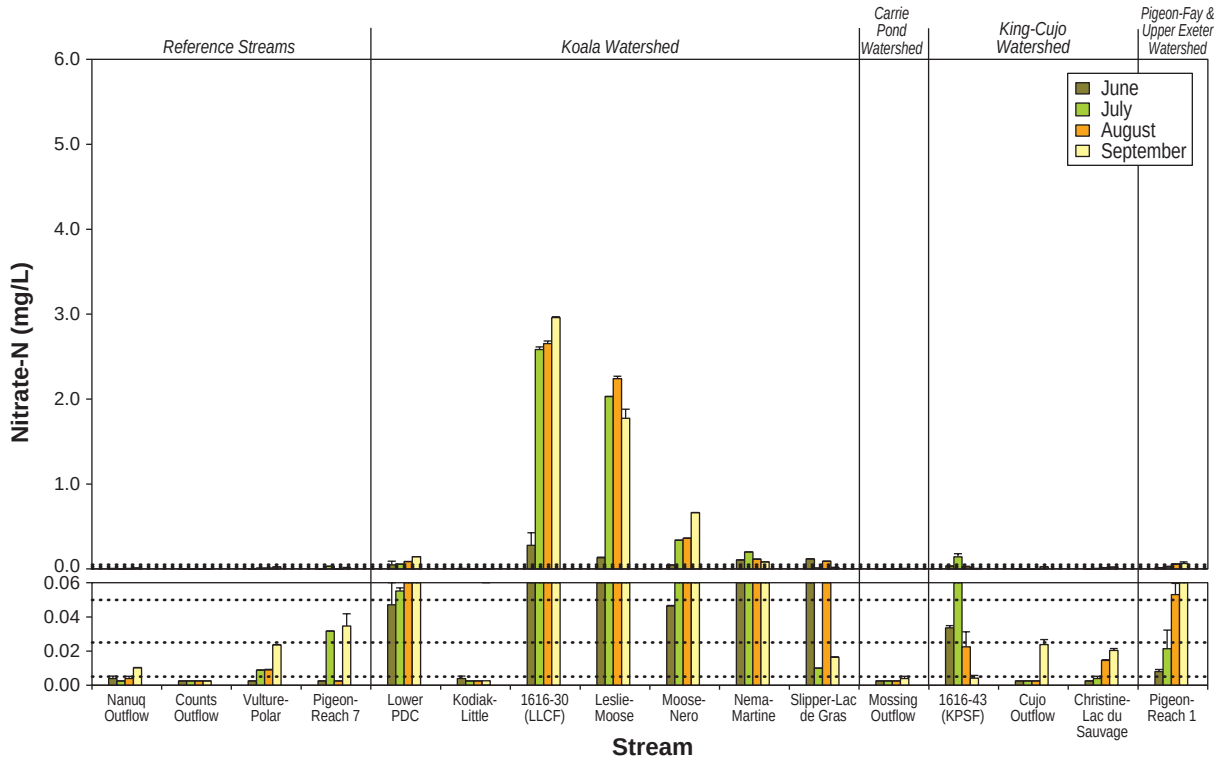
Total Ammonia (as nitrogen)
Values outside shaded area should be used with caution.

Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.0050 mg/L.
CCME guideline is pH and temperature dependent (see inset table).

Figure 3.4-9

Under-ice and Open Water Nitrate-N Concentrations at AEMP Lake Sites, and Monthly Nitrate-N Concentrations at AEMP Stream Sites, 2014

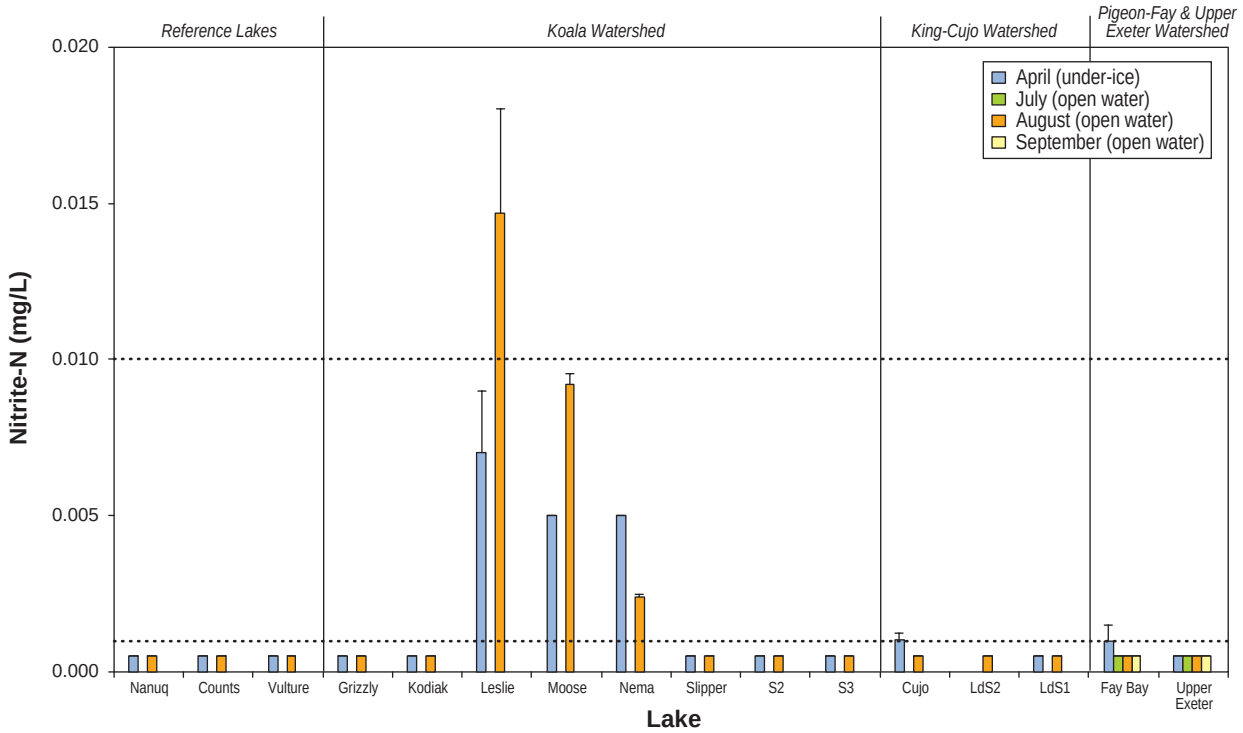


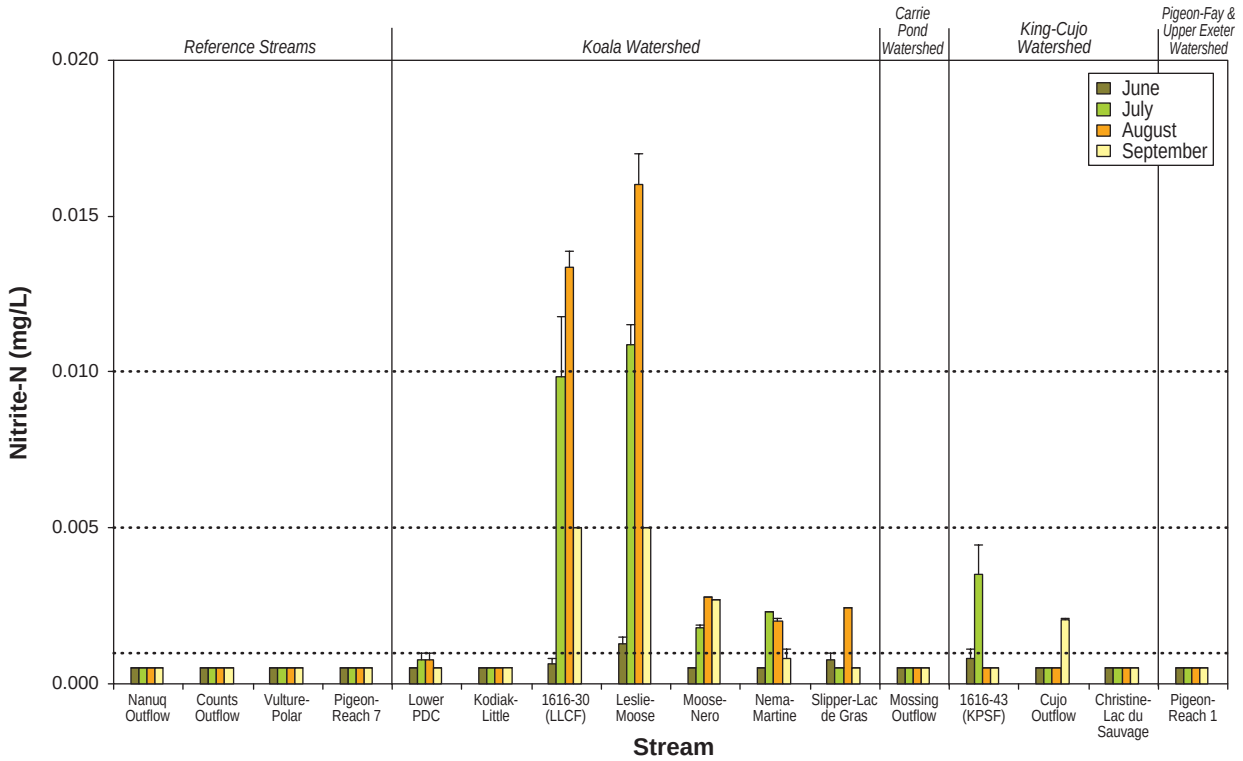


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.0050 mg/L and 0.0250 mg/L, and 0.050 mg/L (see Tables 3.4-4, 3.4-5 and 3.4-7).
SSWQO = $e^{0.9518[\ln(hardness)]-2.032}$, for hardness less than or equal to 160 mg/L $CaCO_3$, at hardness greater than 160 mg/L $CaCO_3$ the guideline at hardness 160 mg/L $CaCO_3$ applies.

Figure 3.4-10

Under-ice and Open Water Nitrite-N Concentrations at AEMP Lake Sites, and Monthly Nitrite-N Concentrations at AEMP Stream Sites, 2014

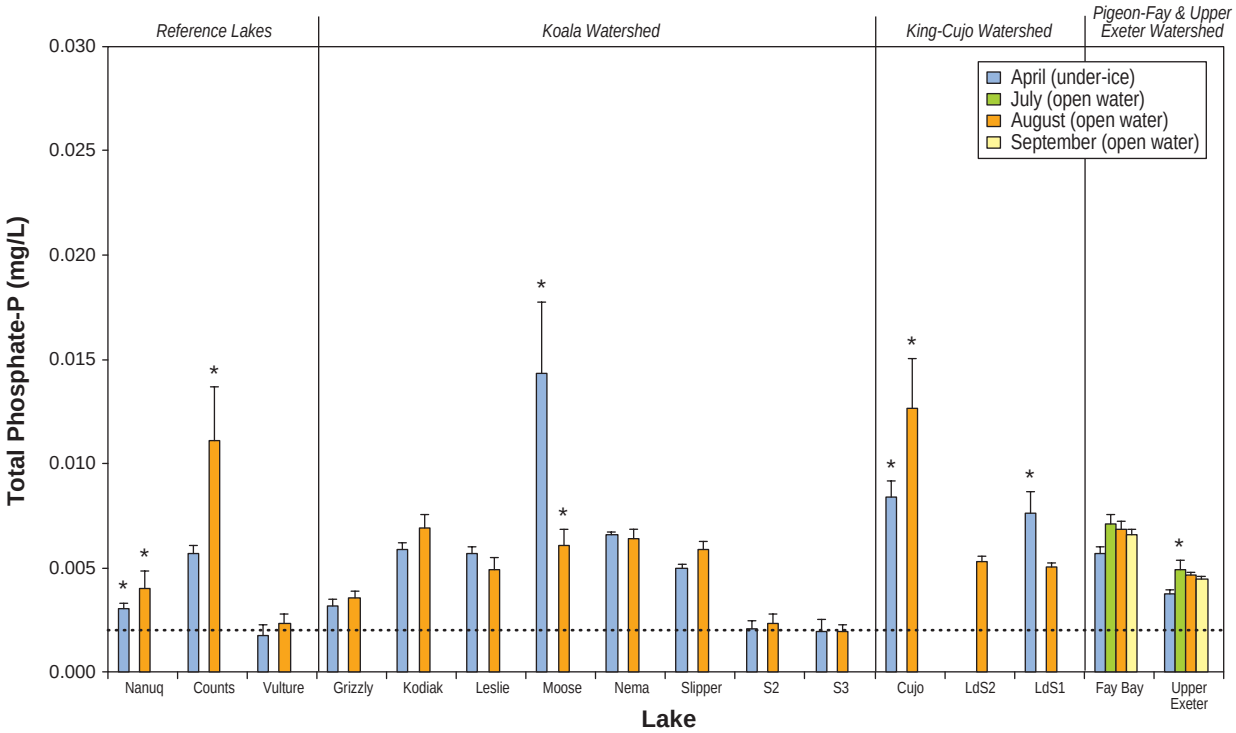


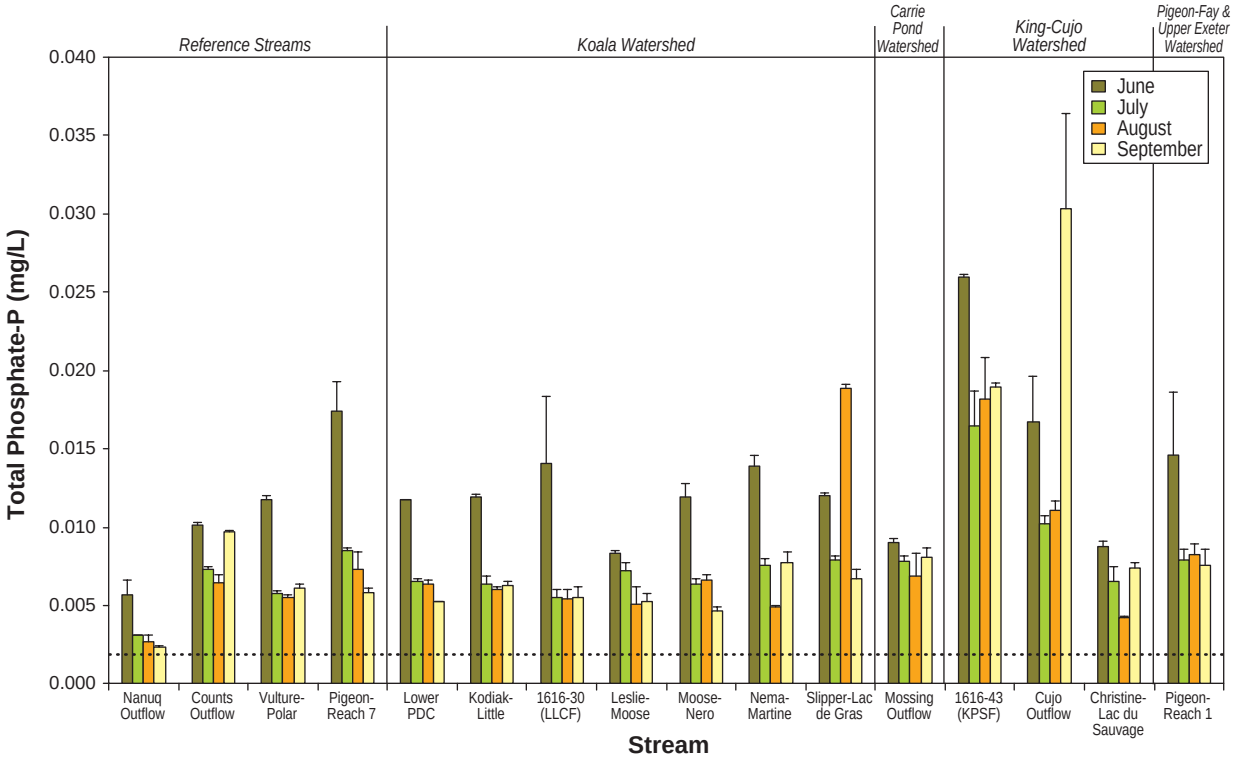


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.0010 mg/L, 0.0050 mg/L, and 0.010 mg/L (see Tables 3.4-4, 3.4-5 and 3.4-7).
CCME guideline = 0.06 mg/L (not shown).

Figure 3.4-11

Under-ice and Open Water Total Phosphate-P Concentrations at AEMP Lake Sites, and Monthly Total Phosphate-P Concentrations at AEMP Stream Sites, 2014

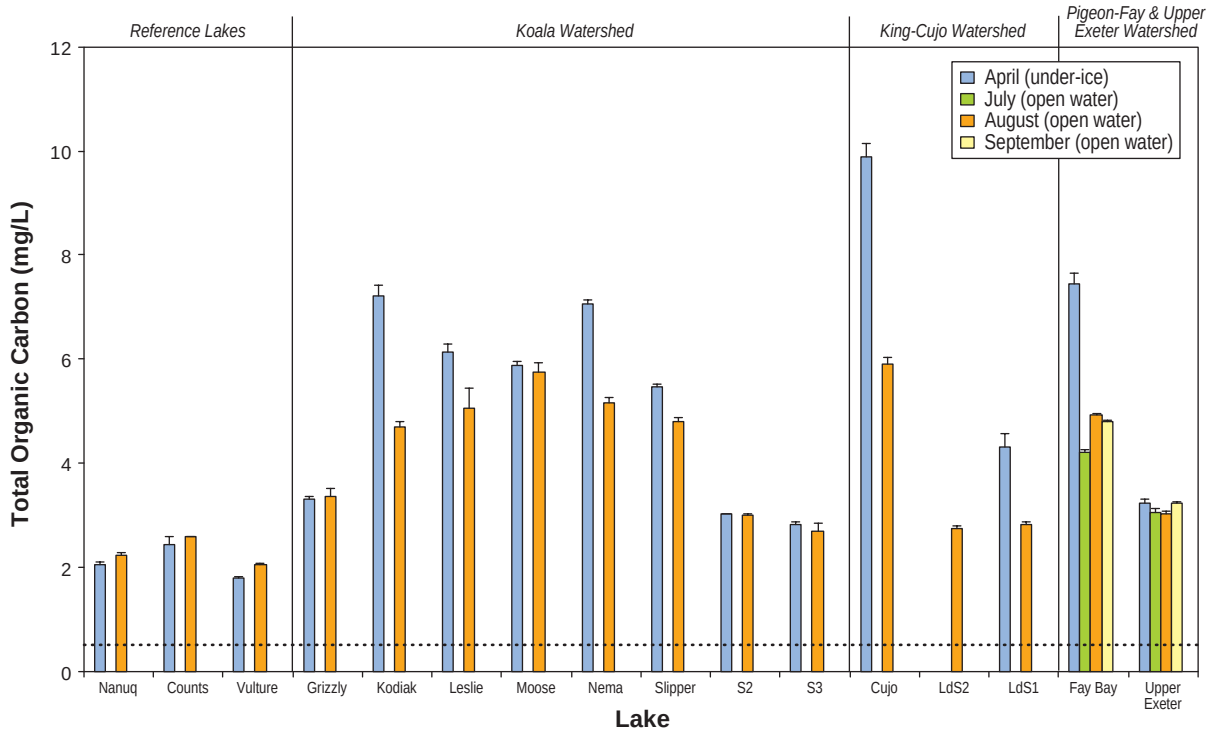


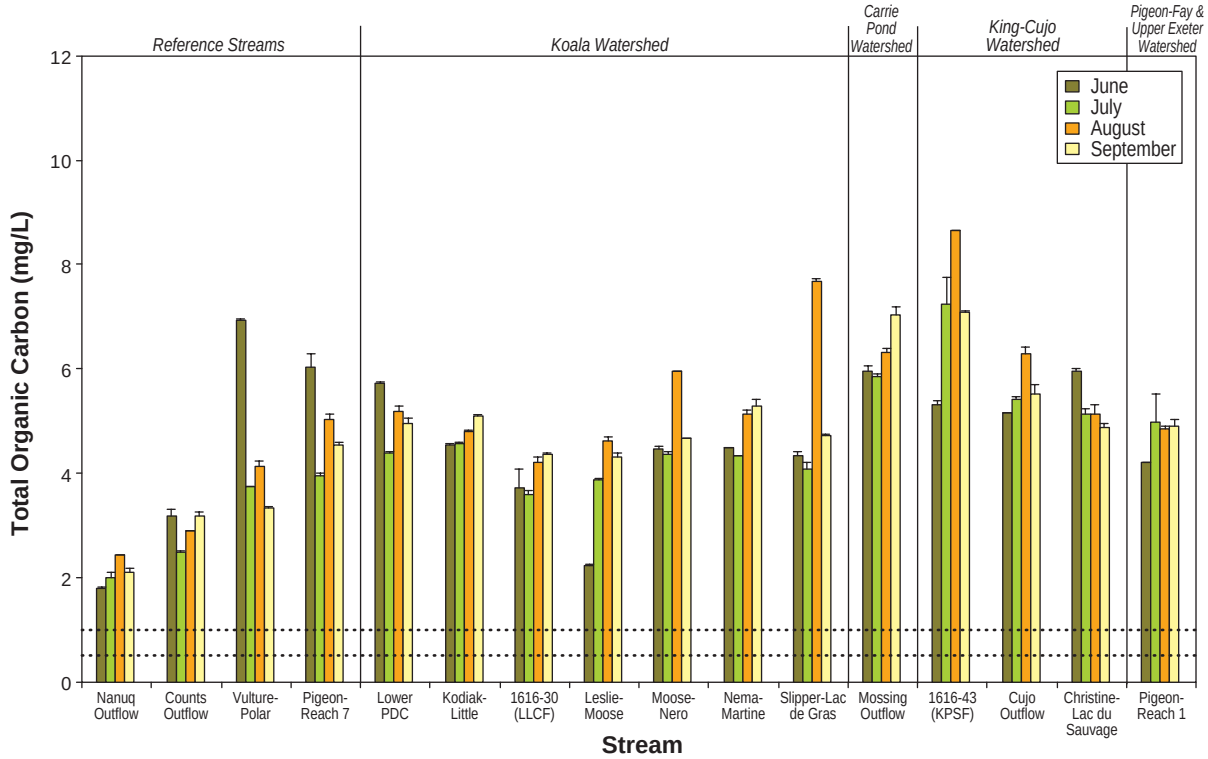


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.0020 mg/L.
CCME guideline is upper range of trigger value or if total phosphate-P concentrations increase more than 50% over the mean baseline concentration (Table 2.5-4).
** Indicates one or more samples exceeded their corresponding benchmark concentration (see Tables 3.4-8 and 3.4-9).*

Figure 3.4-12

Under-ice and Open Water Total Organic Carbon Concentrations at AEMP Lake Sites, and Monthly Total Organic Carbon Concentrations at AEMP Stream Sites, 2014

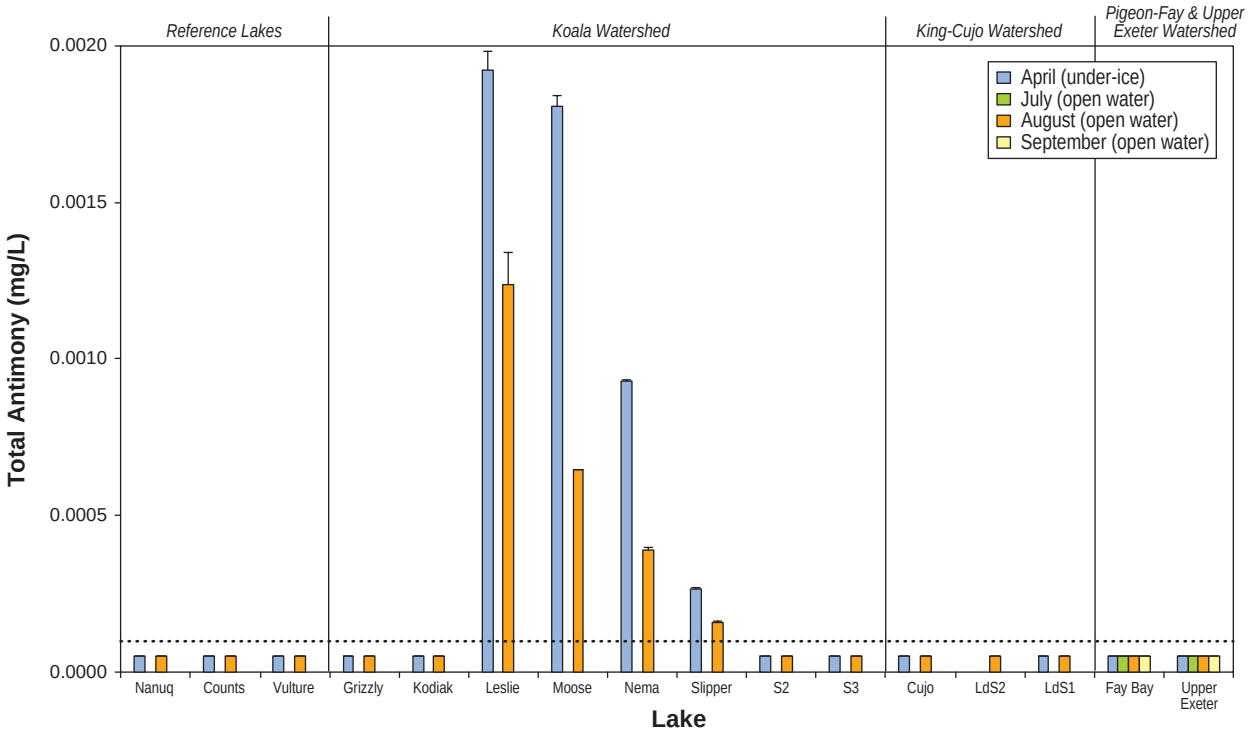


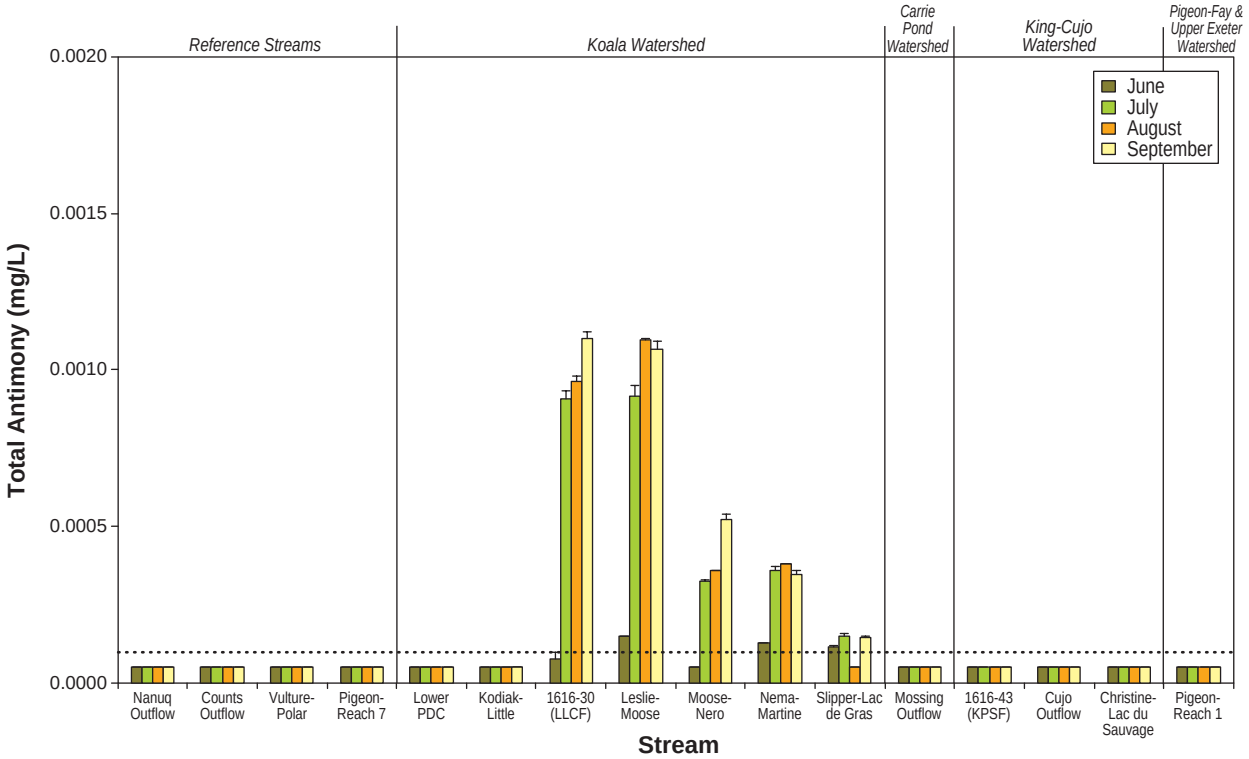


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.50 mg/L and 1.0 mg/L (see Tables 3.4-4, 3.4-5 and 3.4-7).

Figure 3.4-13

Under-ice and Open Water Total Antimony Concentrations at AEMP Lake Sites, and Monthly Total Antimony Concentrations at AEMP Stream Sites, 2014

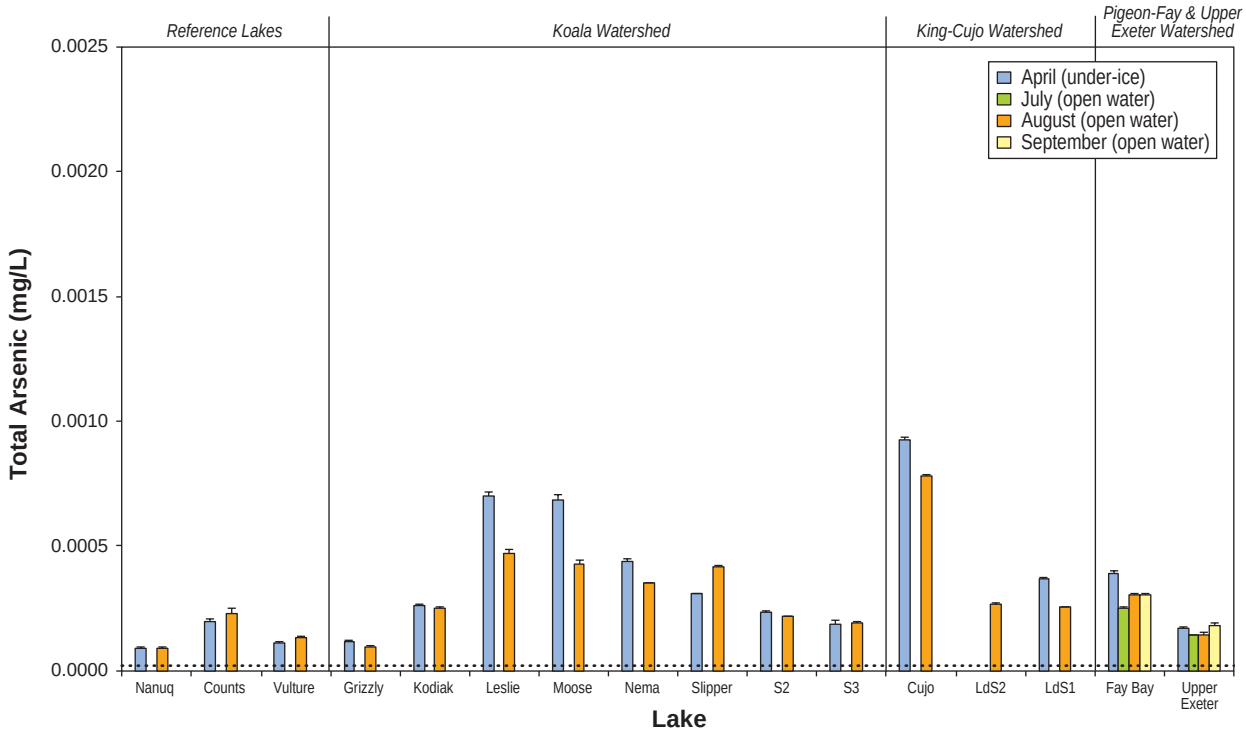


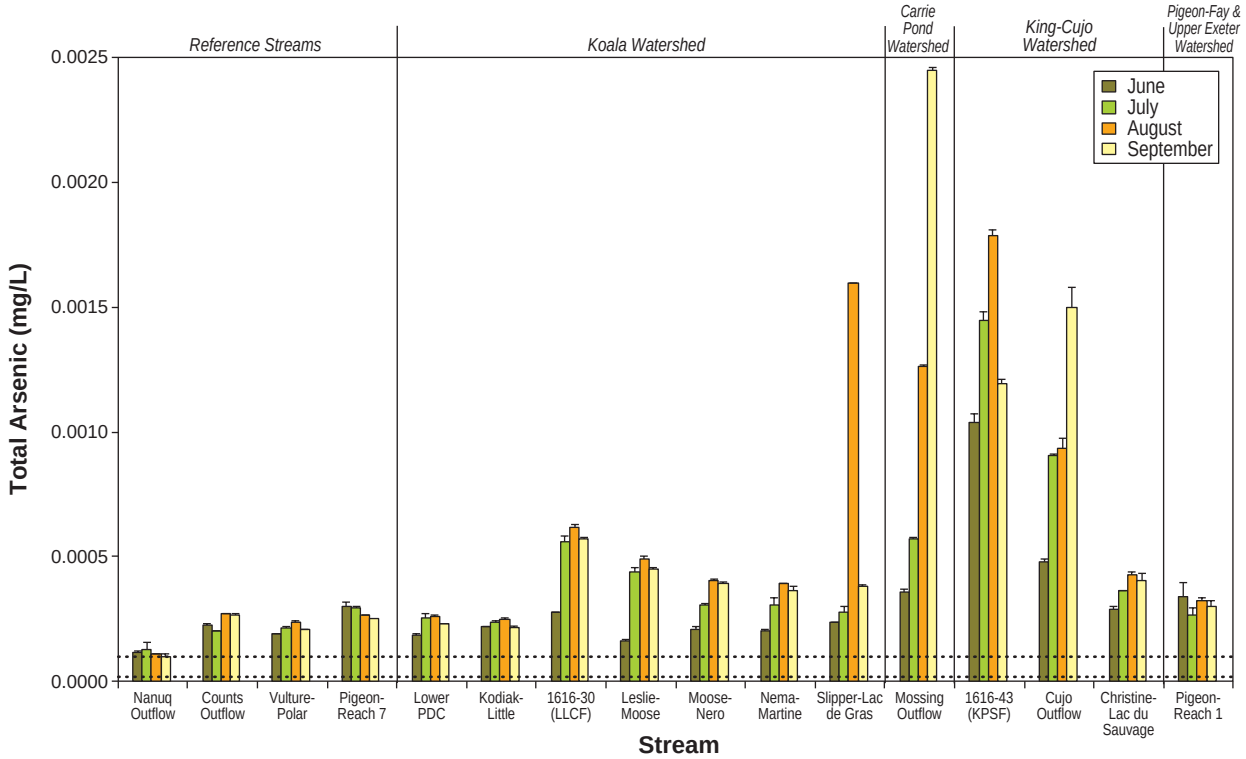


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.00010 mg/L.
Benchmark = 0.02 mg/L (not shown).

Figure 3.4-14

Under-ice and Open Water Total Arsenic Concentrations at AEMP Lake Sites, and Monthly Total Arsenic Concentrations at AEMP Stream Sites, 2014

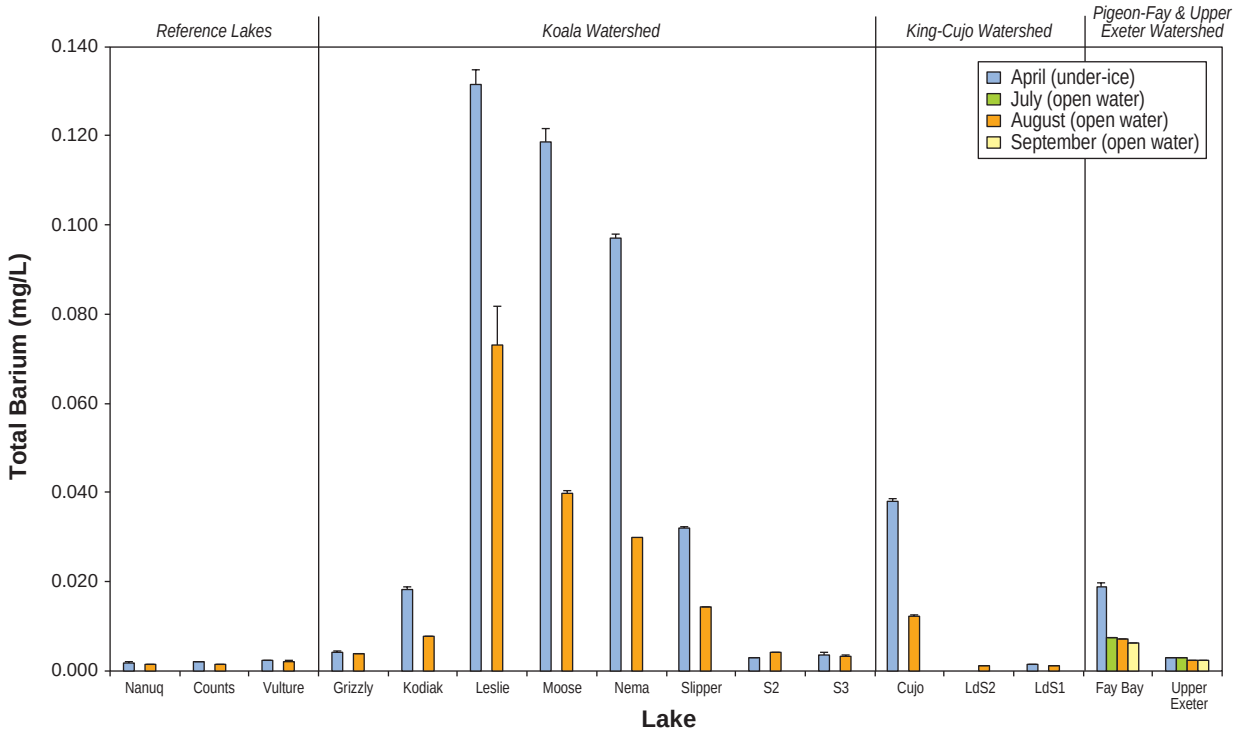


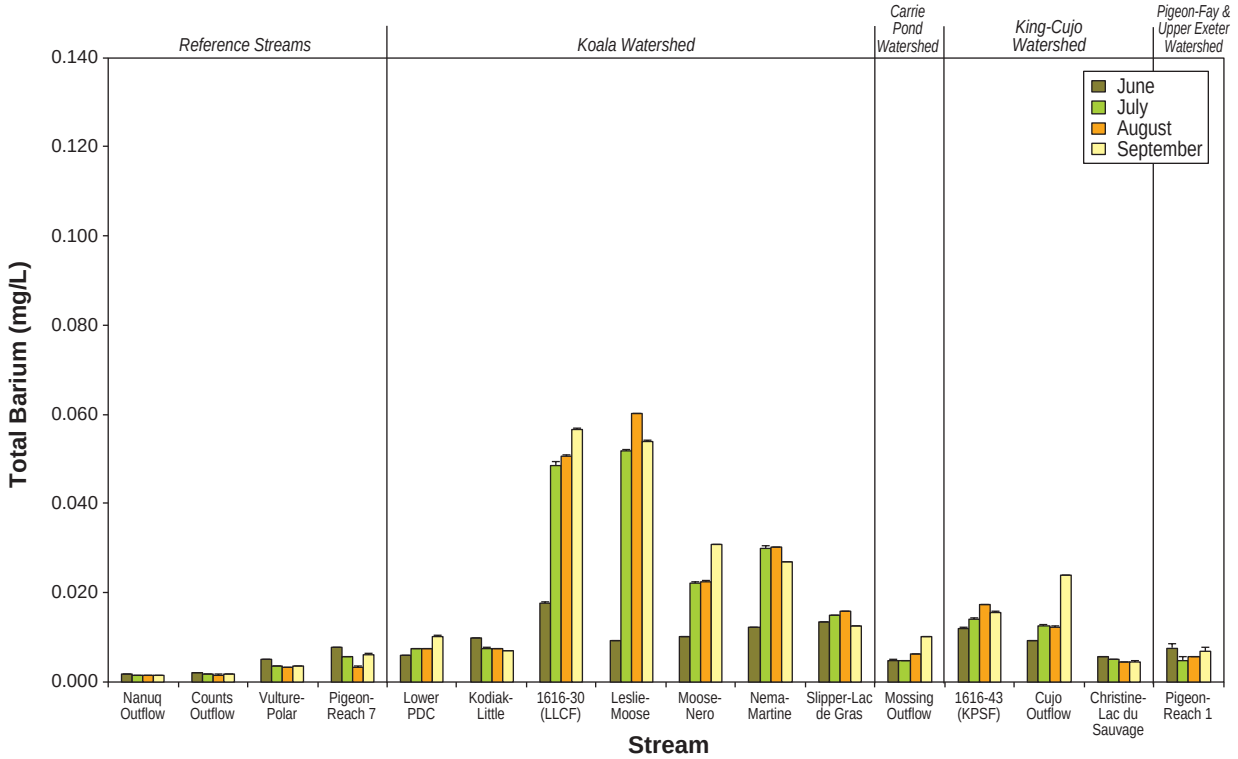


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.000020 mg/L and 0.00010 mg/L (see Tables 3.4-4, 3.4-5 and 3.4-7).
CCME guideline = 0.005 mg/L (not shown).

Figure 3.4-15

Under-ice and Open Water Total Barium Concentrations at AEMP Lake Sites, and Monthly Total Barium Concentrations at AEMP Stream Sites, 2014

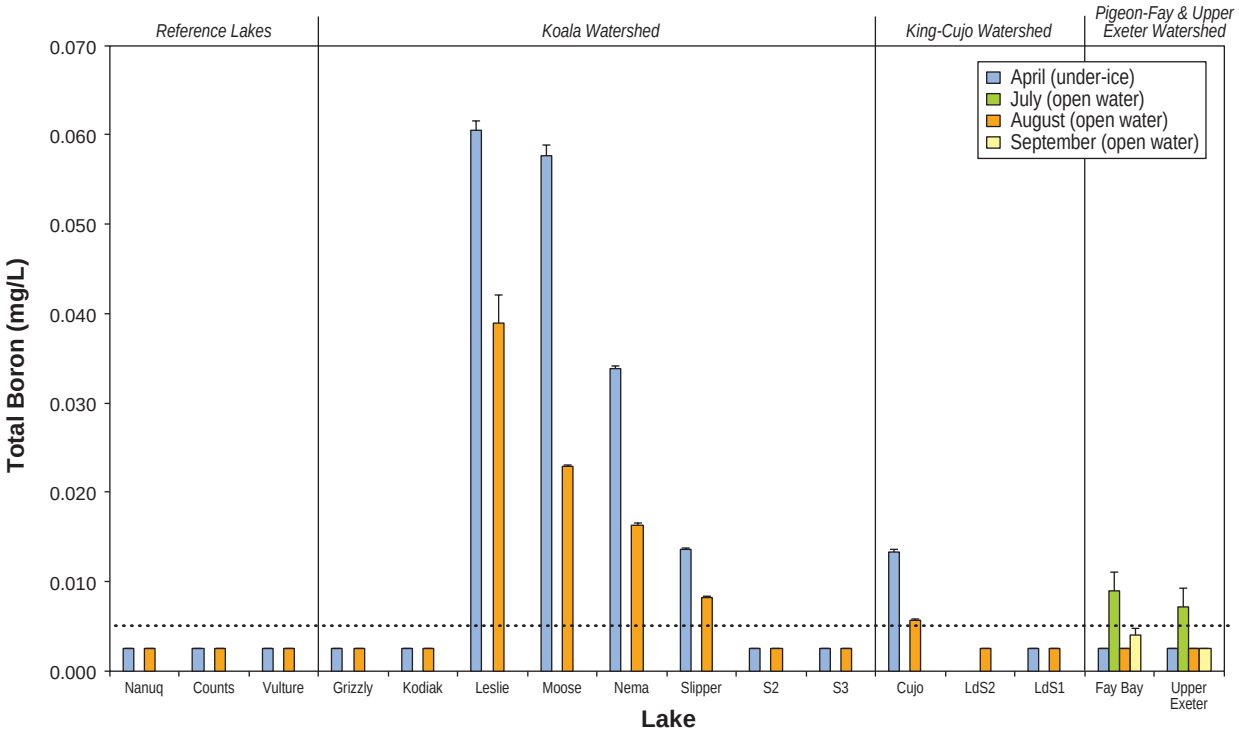


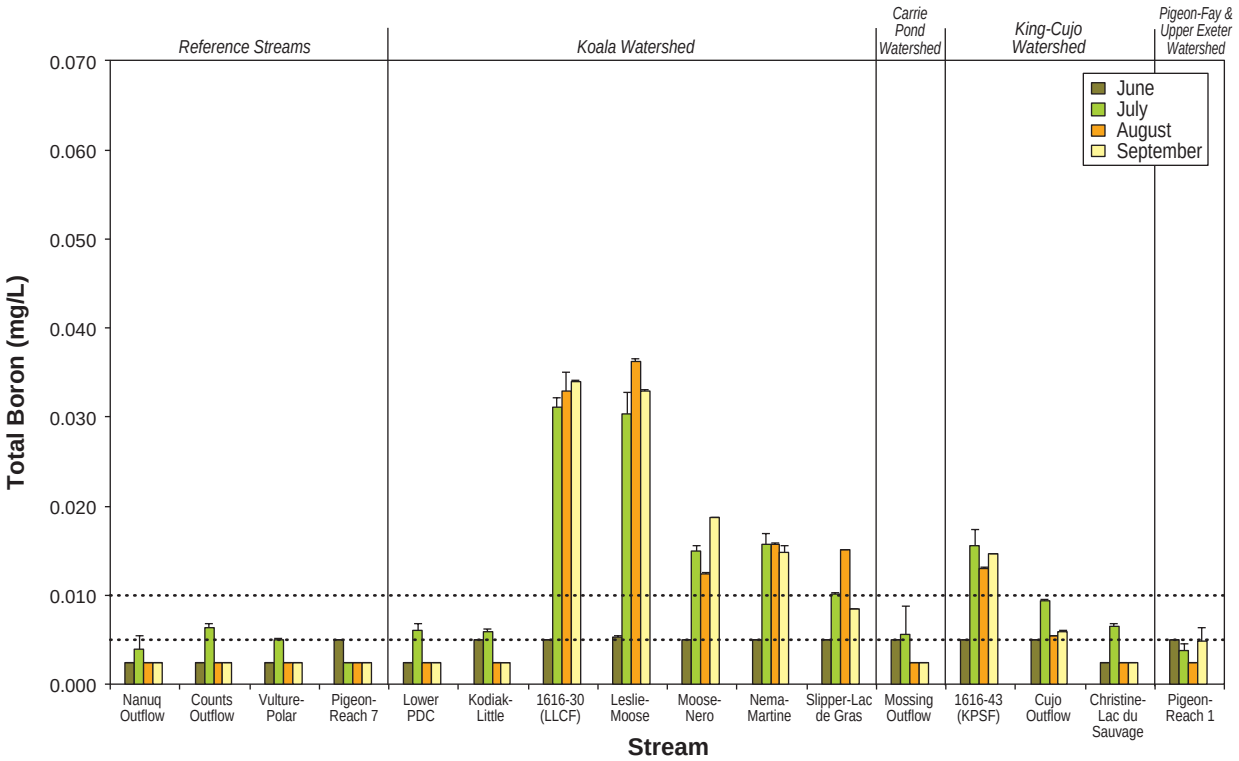


Notes: Error bars represent the standard error of the mean.
Analytical detection limits = 0.00005 mg/L (not shown).
Benchmark = 1 mg/L (not shown).

Figure 3.4-16

Under-ice and Open Water Total Boron Concentrations at AEMP Lake Sites, and Monthly Total Boron Concentrations at AEMP Stream Sites, 2014

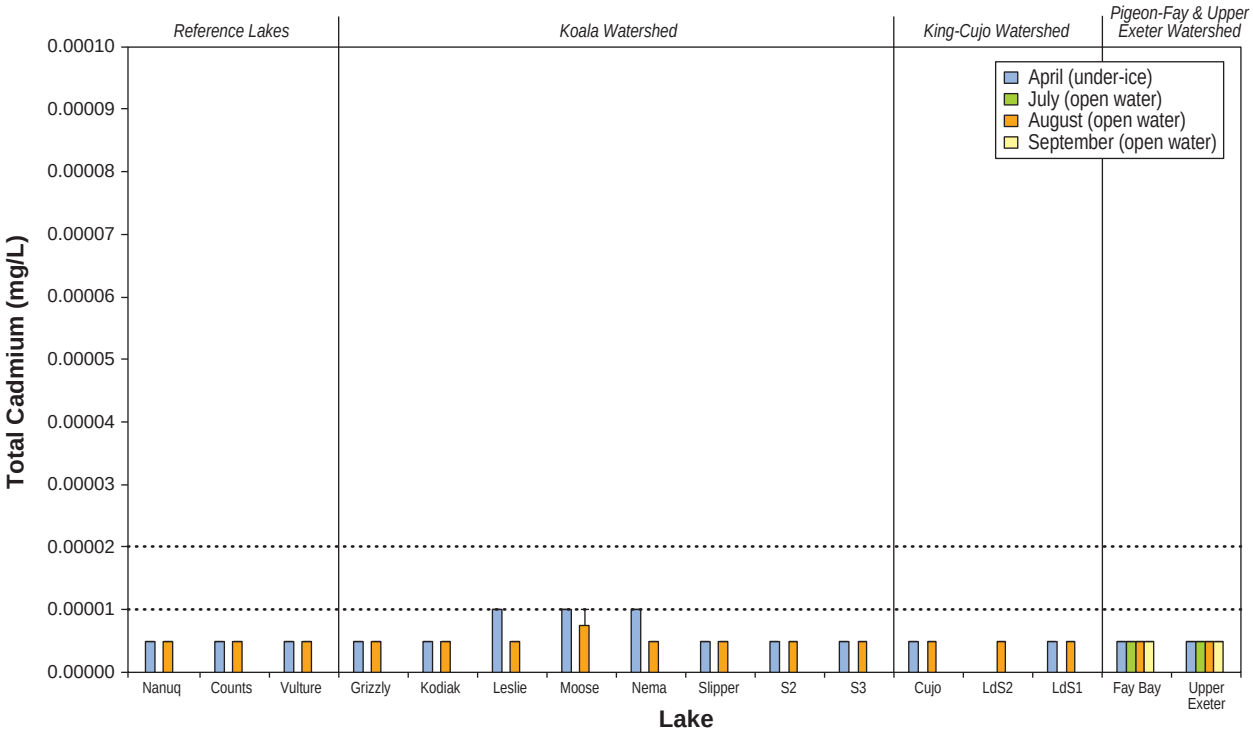


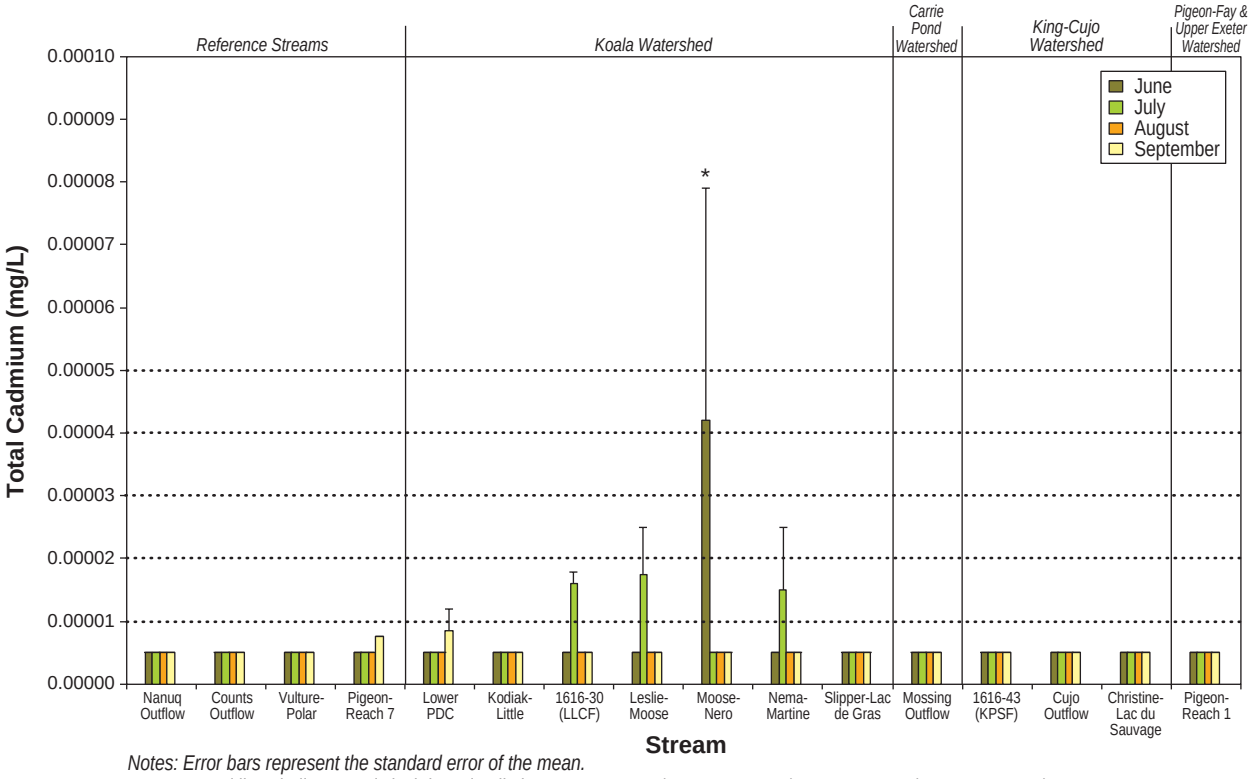


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.0050 mg/L and 0.010 mg/L (see Tables 3.4-4, 3.4-5 and 3.4-7).
CCME guideline = 1.5 mg/L (not shown).

Figure 3.4-17

Under-ice and Open Water Total Cadmium Concentrations at AEMP Lake Sites, and Monthly Total Cadmium Concentrations at AEMP Stream Sites, 2014





Notes: Error bars represent the standard error of the mean.

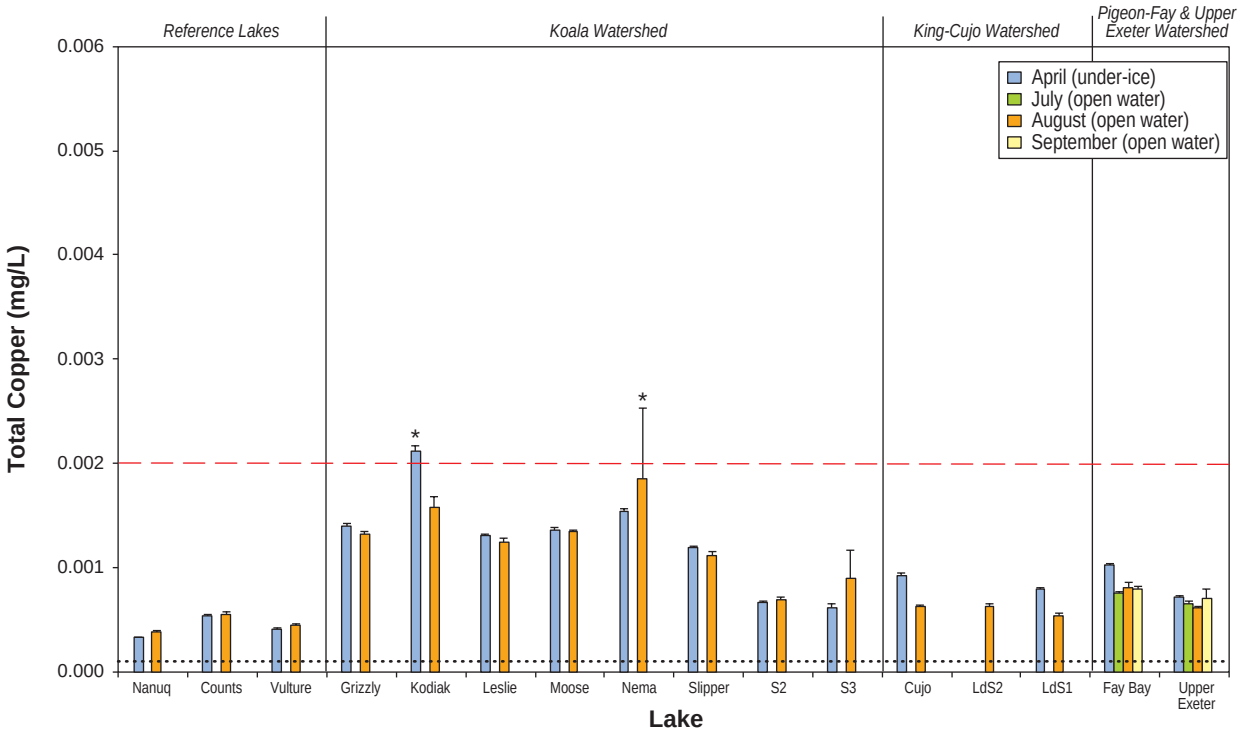
Dotted lines indicate analytical detection limits = 0.000010 mg/L, 0.000020 mg/L, 0.000030 mg/L, 0.000040 mg/L, and 0.000050 mg/L (see Tables 3.4-4, 3.4-5 and 3.4-7).

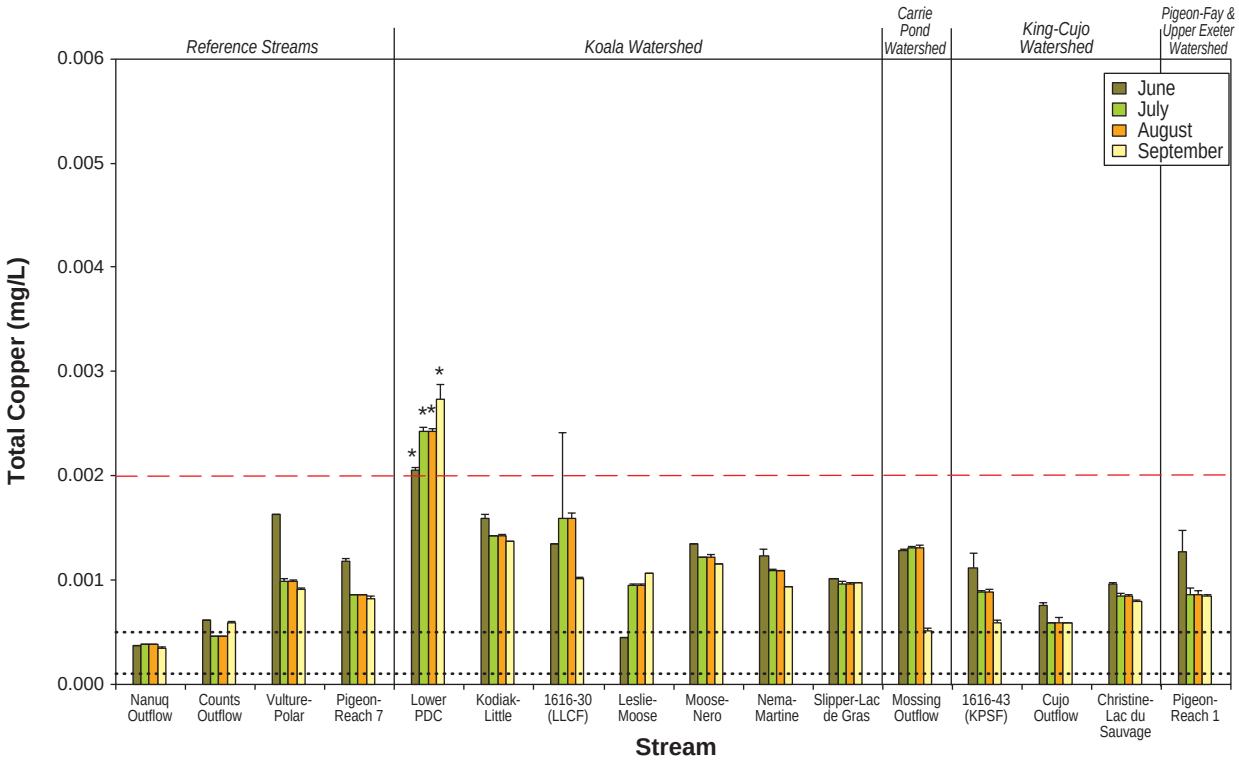
CCME guideline = $10^{(0.83[\log10(hardness)]-2.46)}$/1000 mg/L, minimum of 0.00004 mg/L applicable to hardness 0-16 mg/L CaCO3, maximum of 0.00037 mg/L applicable to hardness greater than 280 mg/L $CaCO_3$ (not shown).

** Indicates one or more samples exceeded their corresponding CCME guideline (see Tables 3.4-8 and 3.4-9).*
Samples from sites where hardness was low may have guideline concentrations below analytical detection limits.

Figure 3.4-18

Under-ice and Open Water Total Copper Concentrations at AEMP Lake Sites, and Monthly Total Copper Concentrations at AEMP Stream Sites, 2014

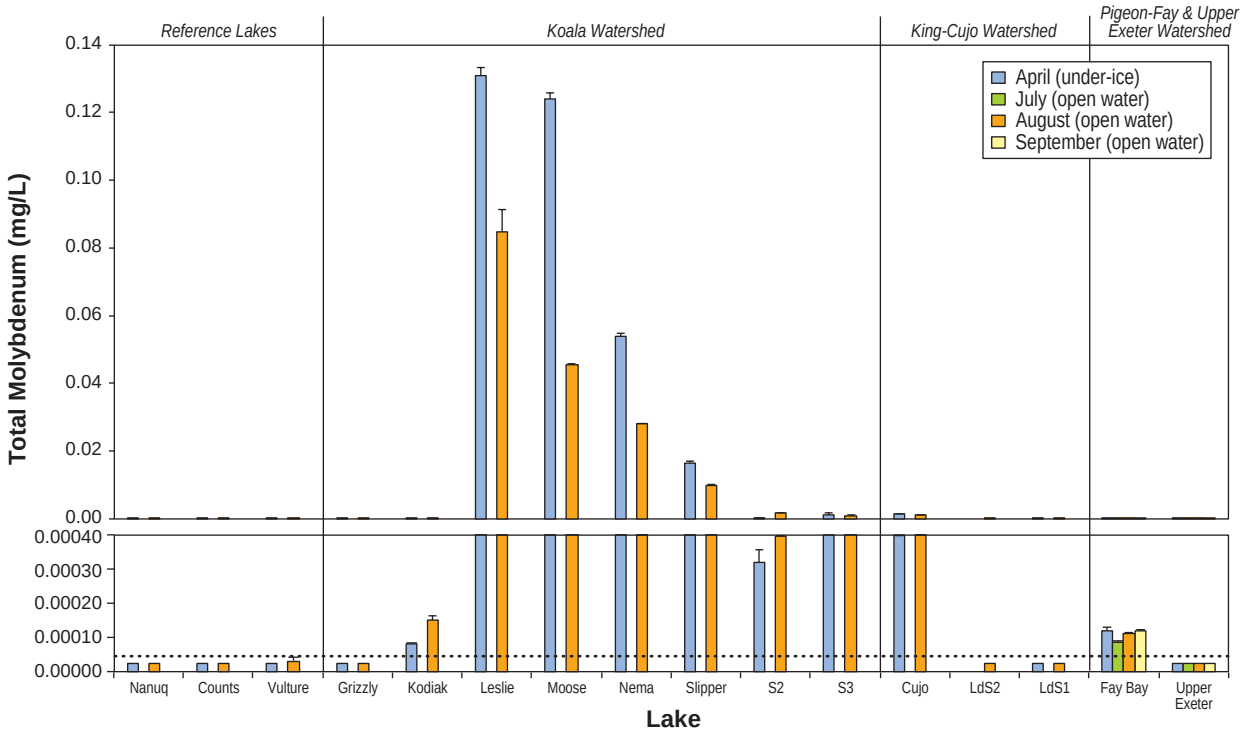


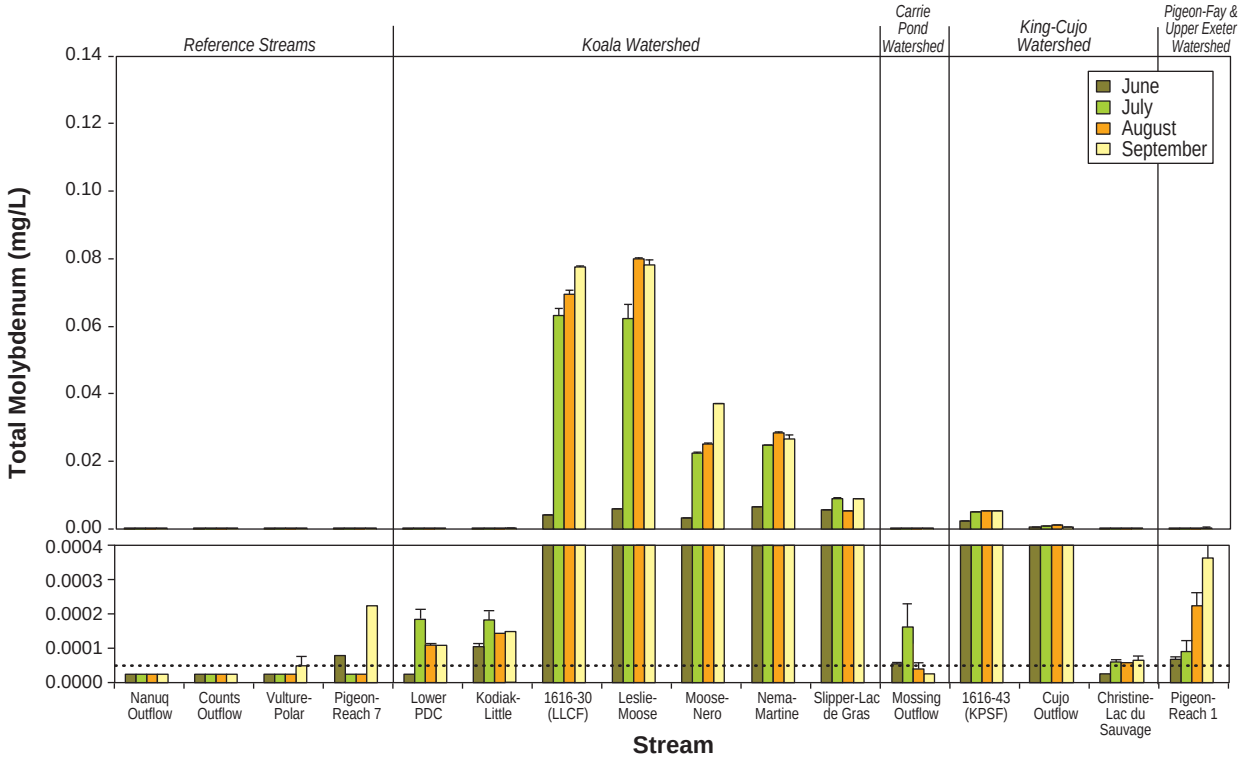


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.00010 mg/L and 0.00050 mg/L (see Tables 3.4-4, 3.4-5 and 3.4-7).
Red dashed lines indicate CCME guideline = $0.2*e^{(0.8545[\ln(hardness)]-1.465)}/1{,}000$, minimum of 0.0020 mg/L applicable to hardness 0-82 mg/L $CaCO_3$, maximum of 0.004 mg/L applicable to hardness greater than 180 mg/L $CaCO_3$.
** Indicates one or more samples exceeded their corresponding CCME guideline (see Tables 3.4-8 and 3.4-9).*

Figure 3.4-19

Under-ice and Open Water Total Molybdenum Concentrations at AEMP Lake Sites, and Monthly Total Molybdenum at AEMP Stream Sites, 2014

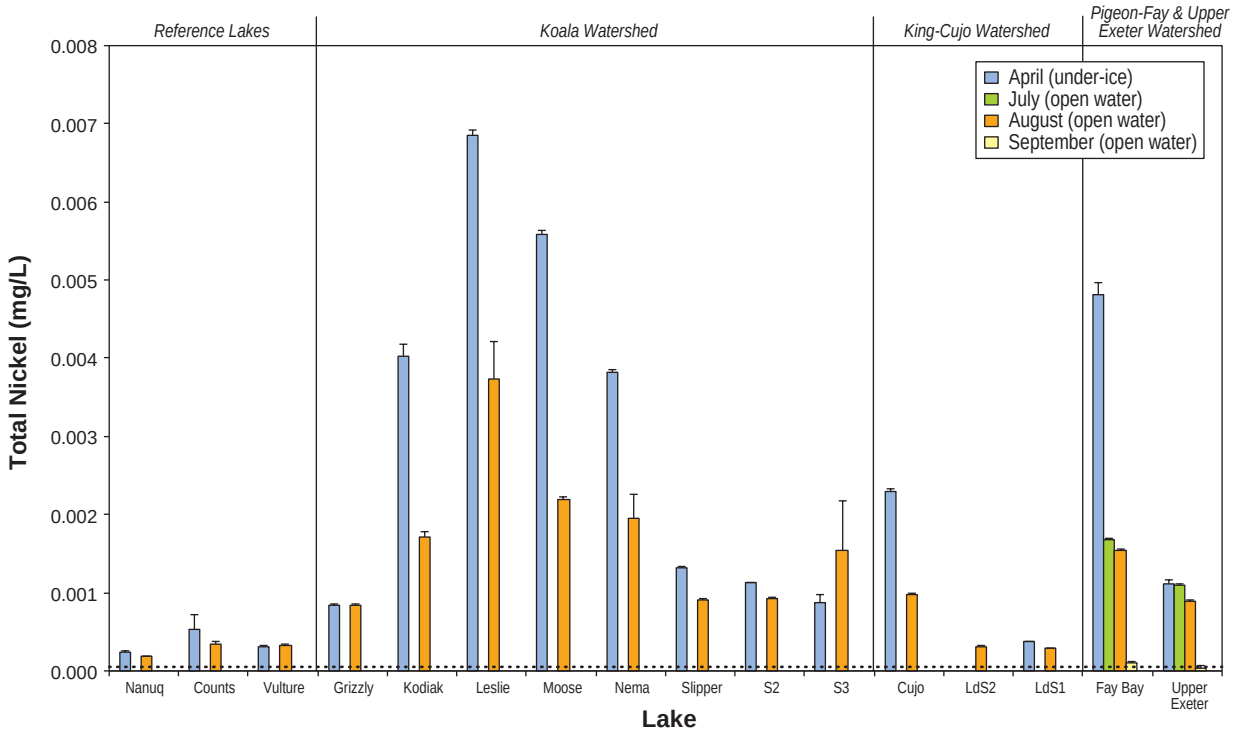


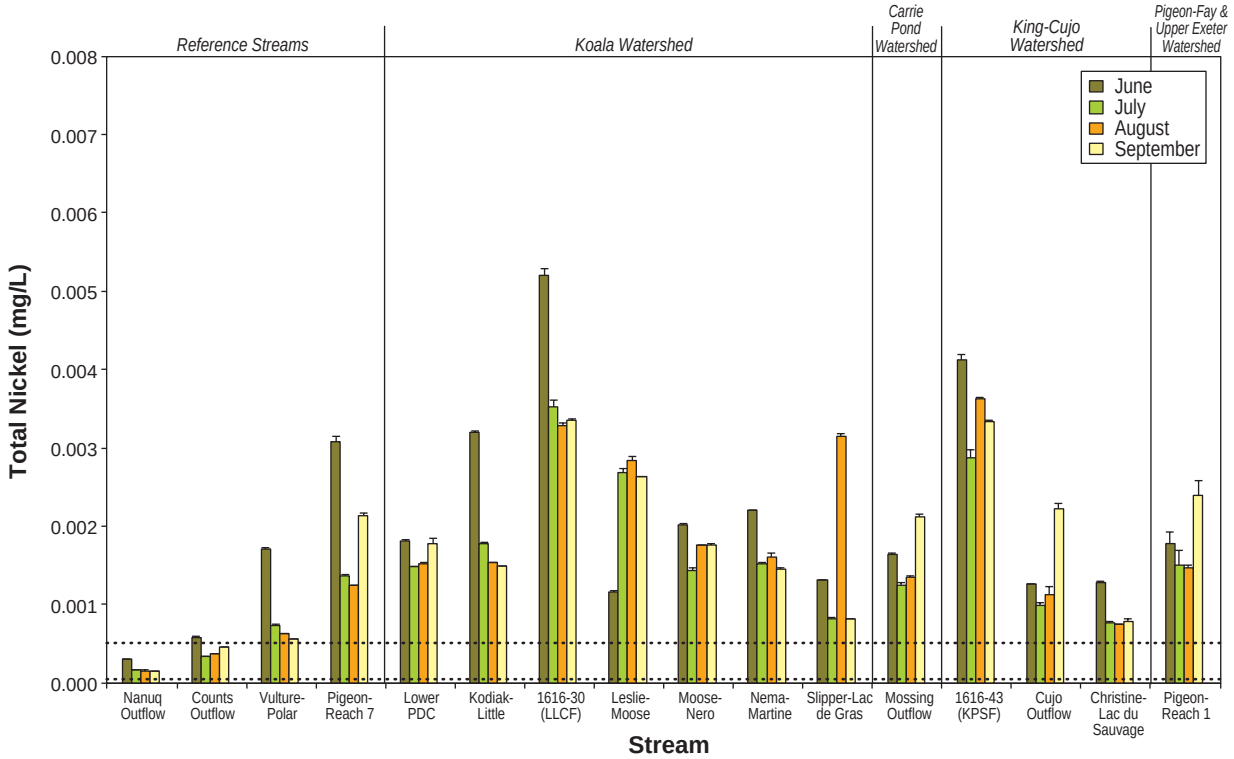


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.000050 mg/L.
SSWQO = 19.38 mg/L (not shown).

Figure 3.4-20

Under-ice and Open Water Total Nickel Concentrations at AEMP Lake Sites, and Monthly Total Nickel at AEMP Stream Sites, 2014

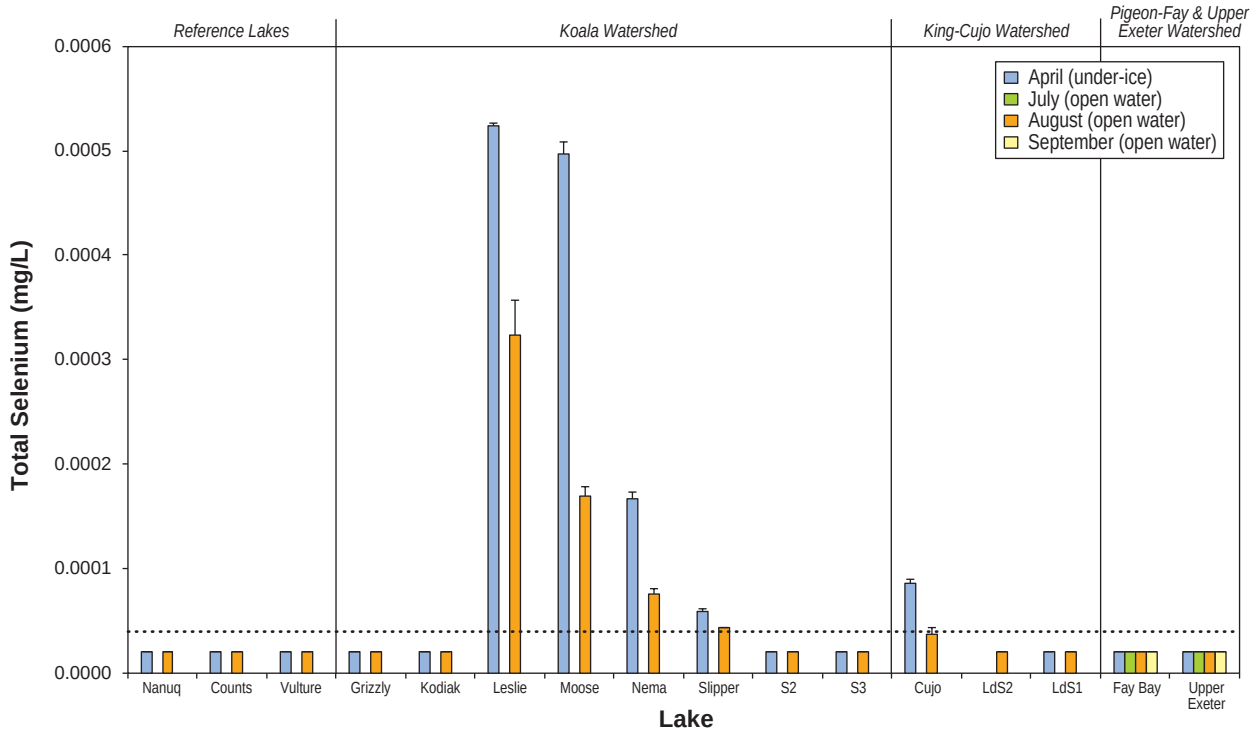


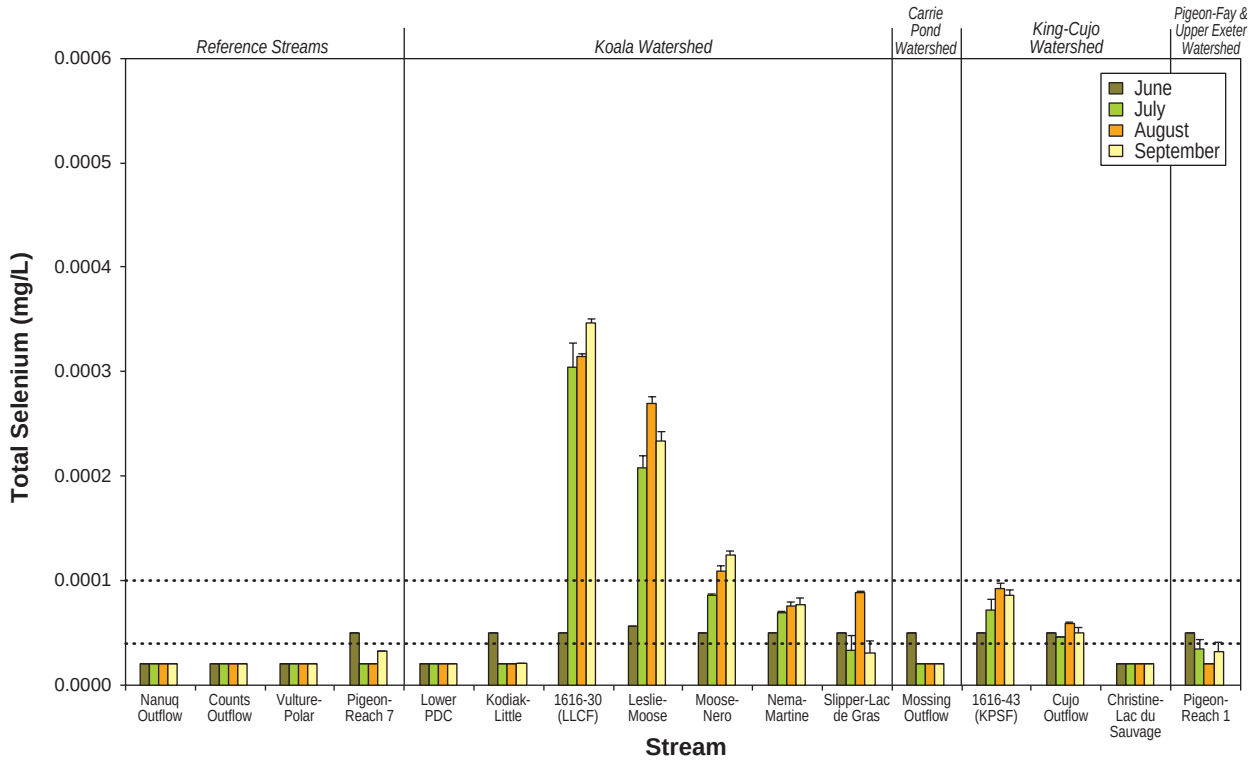


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.000050 mg/L and 0.00050 mg/L (see Tables 3.4-4, 3.4-5 and 3.4-7).
CCME guidelines = $e^{(0.76[\ln(hardness)]+1.06)}/1{,}000$, minimum of 0.025 mg/L applicable to hardness 0-60 mg/L $CaCO_3$, maximum of 0.15 mg/L at hardness greater than 180 mg/L $CaCO_3$ (not shown).

Figure 3.4-21

Under-ice and Open Water Total Selenium Concentrations at AEMP Lake Sites, and Monthly Total Selenium at AEMP Stream Sites, 2014

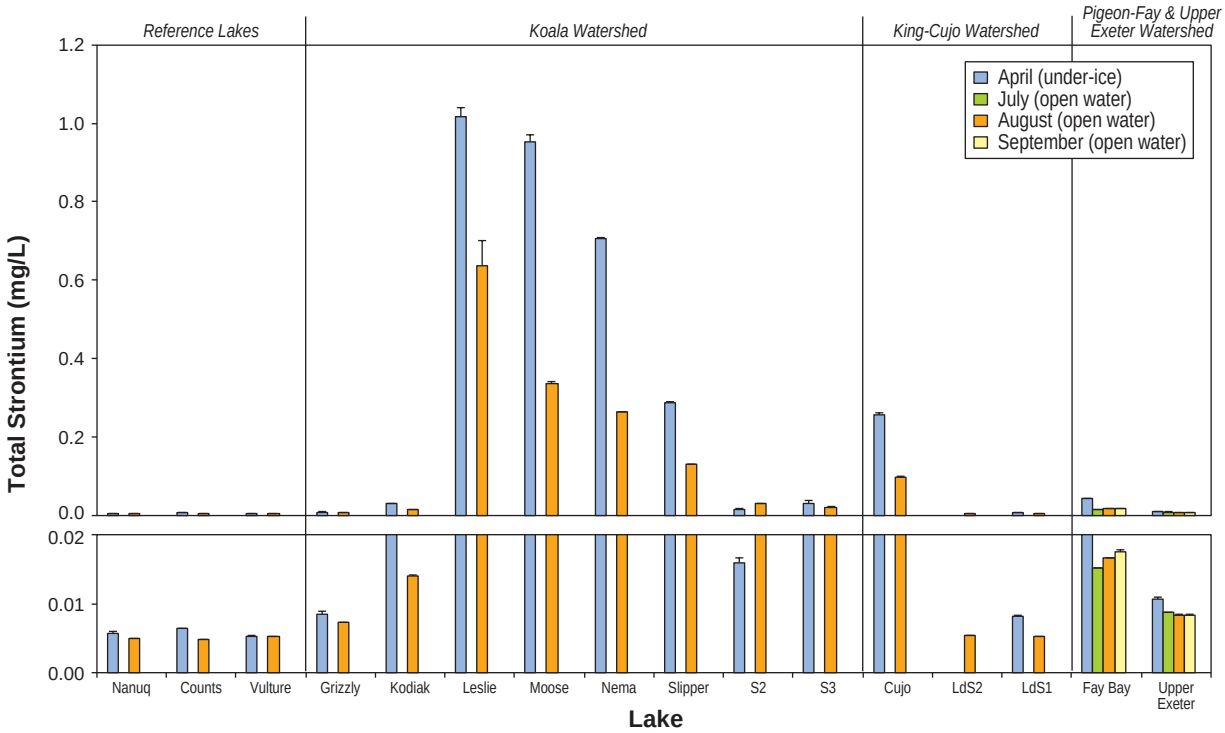


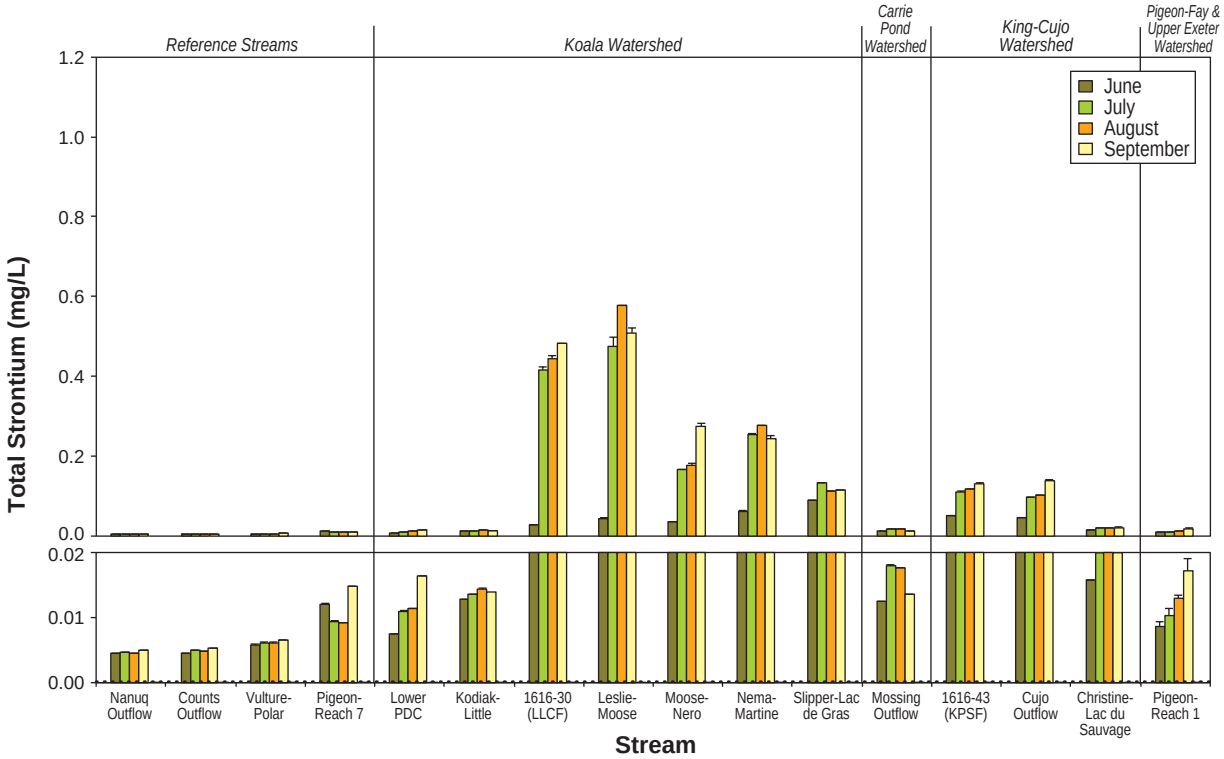


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.000040 mg/L and 0.00010 mg/L (see Tables 3.4-4, 3.4-5 and 3.4-7).
CCME guideline = 0.001 mg/L (not shown).

Figure 3.4-22

Under-ice and Open Water Total Strontium Concentrations at AEMP Lake Sites, and Monthly Total Strontium at AEMP Stream Sites, 2014

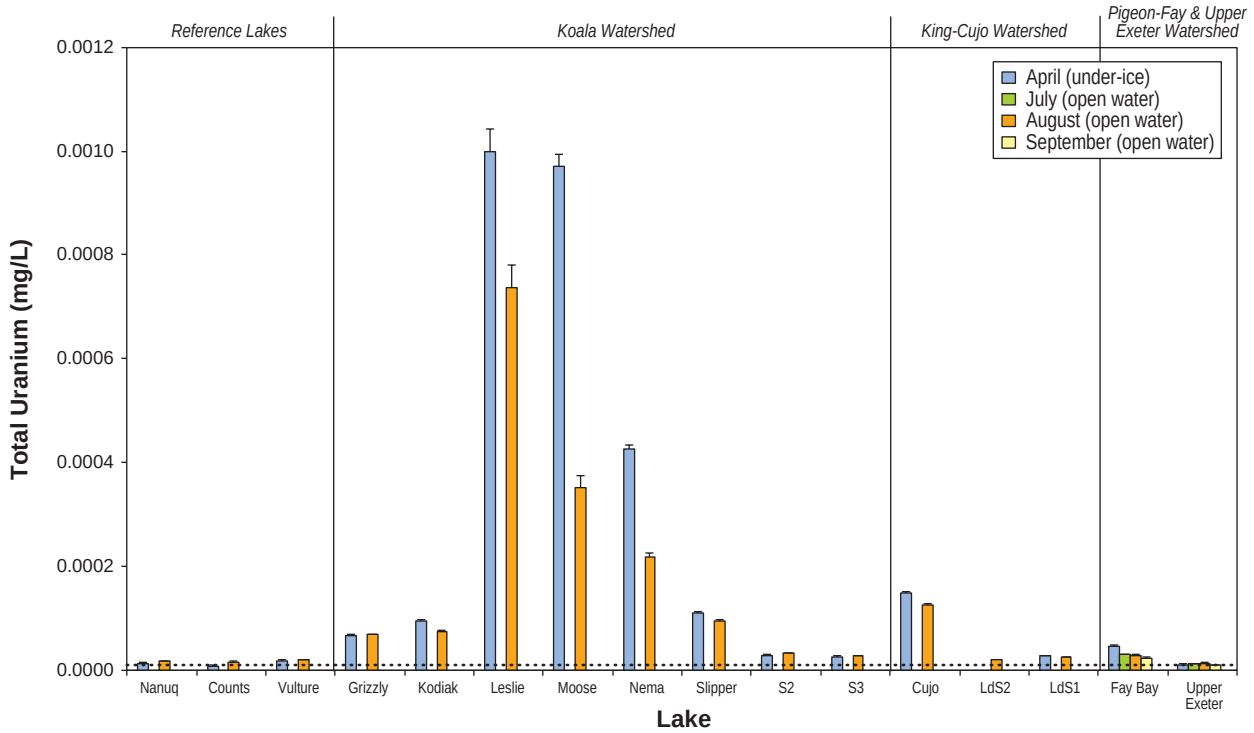


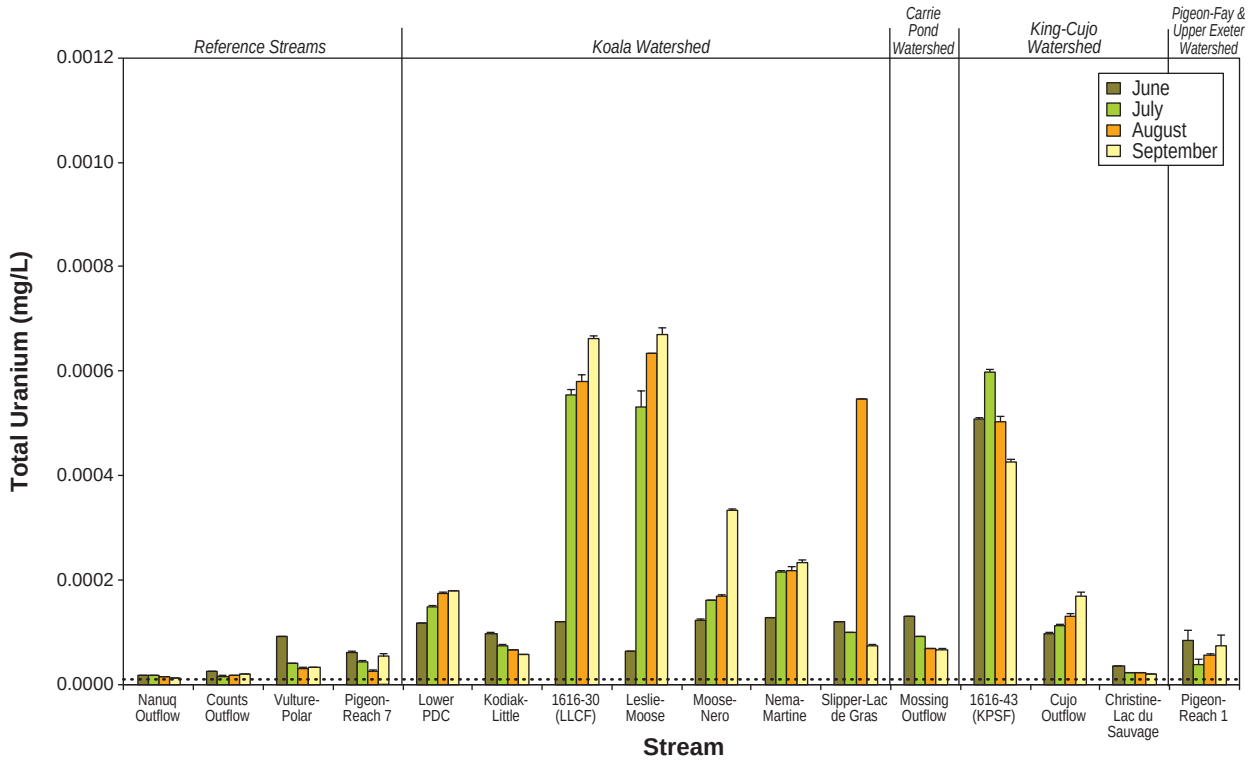


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.00010 mg/L (not shown) and 0.00020 mg/L (see Tables 3.4-4, 3.4-5 and 3.4-7).
Benchmark = 6.242 (not shown).

Figure 3.4-23

Under-ice and Open Water Total Uranium Concentrations at AEMP Lake Sites, and Monthly Total Uranium at AEMP Stream Sites, 2014

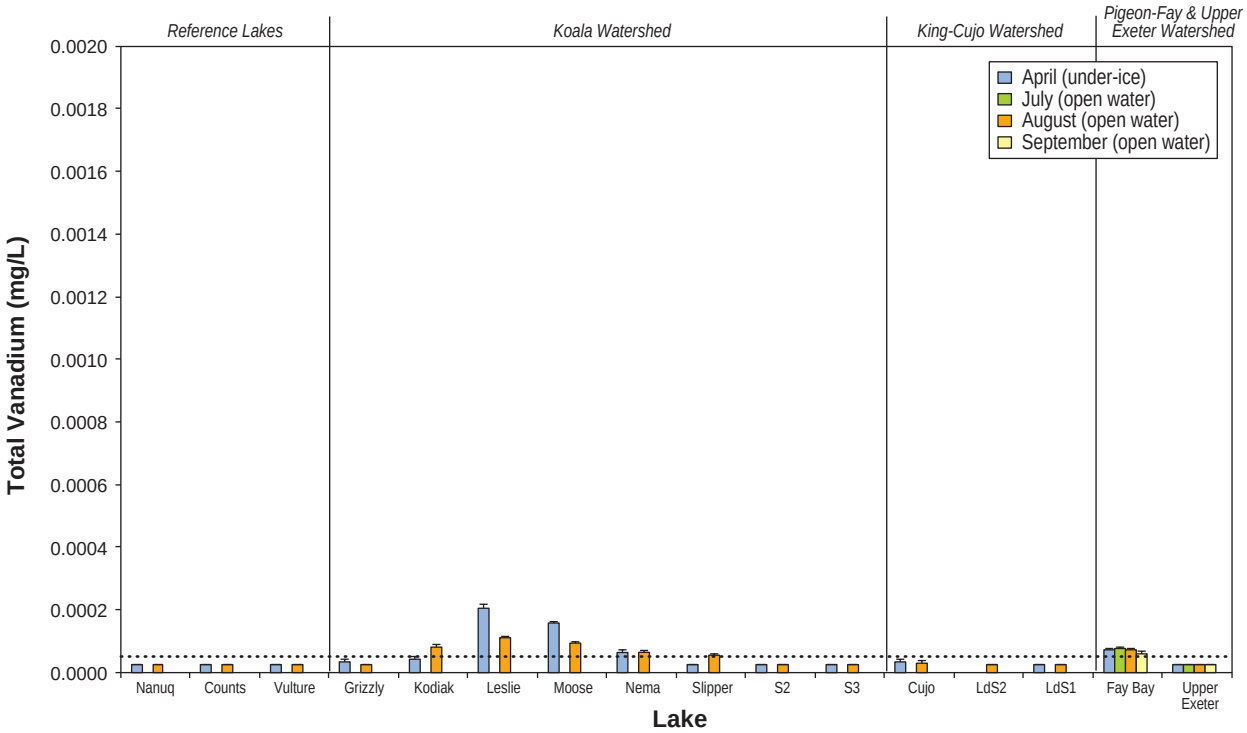


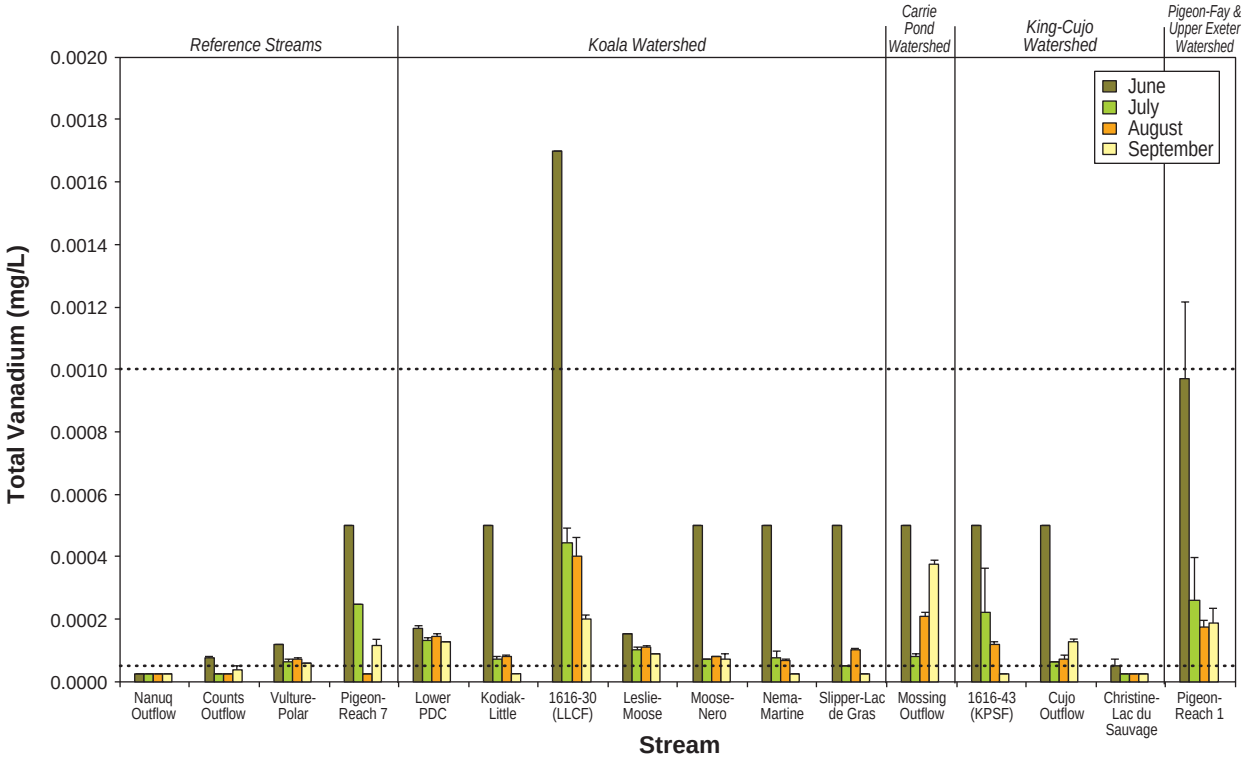


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.000010 mg/L.
CCME guideline = 0.015 mg/L (not shown).

Figure 3.4-24

Under-ice and Open Water Total Vanadium Concentrations at AEMP Lake Sites, and Monthly Total Vanadium at AEMP Stream Sites, 2014





Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits = 0.000050 mg/L and 0.00010 mg/L (see Tables 3.4-4, 3.4-5 and 3.4-7).
SSWQO = 0.03 mg/L (not shown).

3.5 PHYTOPLANKTON

3.5.1 Chlorophyll *a*, Phytoplankton Density and Community Composition

Phytoplankton samples were collected from two external reference lakes (Nanuq and Counts), six lakes within the Koala Watershed (Vulture (internal reference), Kodiak, Leslie, Moose, Nema, and Slipper), two sites within Lac de Gras (S2 and S3), one lake within the King-Cujo Watershed (Cujo), one site within Lac du Sauvage (LdS1), and two sites within the Pigeon-Fay and Upper Exeter Watershed (Fay Bay and Upper Exeter).

Chlorophyll *a* concentrations and phytoplankton densities were examined (Table 3.5-1; Figure 3.5-1), as well as the relative densities of phytoplankton major taxonomic groups in each of the monitored and reference lakes (Figure 3.5-2). In addition, the dominant phytoplankton taxa (percent community composition > 5%) were identified for each lake (Table 3.5-2). For each dominant taxa, size and ecology of the taxa were used to assess whether the taxa would be potentially edible to zooplankton (Table 3.5-2). Taxa smaller than 20 µm in their greatest dimension were deemed edible and taxa greater than 20 µm were deemed inedible (Masson, Pinel-Alloul, and Smith 2000). Additional phytoplankton characteristics, such as if the taxa were colonial, had significant mucilage, or had spines, were also used to assess whether taxa would be edible to zooplankton. This information was taken from Prescott (1982). Genus richness, dominance, and diversity were also assessed for each site (Table 3.5-3; Figure 3.5-3). Results of the taxonomic analysis for each replicate sample are presented in Table 3.5-4.

Chlorophyll *a* concentrations were typical of oligotrophic (low productivity) sub-Arctic, tundra lakes (Pienitz, Smol, and Lean. 1997). Average chlorophyll *a* concentrations were lowest at site LdS1 (0.24 µg/L) and in Nanuq and Vulture reference lakes (0.38 µg/L and 0.46 µg/L), and in Upper Exeter (0.59 µg/L; Table 3.5-1 and Figure 3.5-1). The remaining lakes had chlorophyll *a* concentrations between 0.82 µg/L (S2) and 2.07 µg/L (Fay Bay; Figure 3.5-1). Chlorophyll *a* concentrations were reflective of total phosphate-P concentrations observed in AEMP lakes (see Figure 3.4-11). Phytoplankton densities generally reflected chlorophyll *a* concentrations in the lakes (i.e., high phytoplankton densities indicated high concentrations of chlorophyll *a*; Figure 3.5-1). Average phytoplankton densities were notably higher in Kodiak Lake (22,912 cells/mL) and Fay Bay (15,307 cells/mL) compared to other lake sites where densities were less than 5,000 cells/mL (Figure 3.5-1). In the Koala Watershed chlorophyll *a* concentrations and phytoplankton densities did not exhibit a clear spatial trend. In the King-Cujo Watershed, chlorophyll *a* concentrations and phytoplankton densities were greater in Cujo Lake than in Lac du Sauvage (LdS1). Cujo Lake had low phytoplankton densities compared to chlorophyll *a* concentrations (Figure 3.5-1). In the Pigeon-Fay and Upper Exeter Watershed, chlorophyll *a* concentrations and phytoplankton densities were greater in Fay Bay than in Upper Exeter (Figure 3.5-1).

Phytoplankton assemblages at AEMP lake sites consisted mainly of cells from four phyla including the Myxophyceae (blue-green algae), Chlorophyceae (green algae), Chrysophyceae (golden algae) and Bacillariophyceae (diatoms). Relative densities of the major groups are presented in Figure 3.5-2. Kodiak Lake was dominated by blue-green algae (Myxophyceae; 97%). Other lakes within the Koala Watershed and Lac de Gras had phytoplankton assemblages largely dominated by Chlorophyceae (10% to 60%), Bacillariophyceae (4% to 40%) and Chrysophyceae (4% to 79; Figure 3.5-2).

Downstream of the LLCF from Leslie Lake to Slipper Lake, phytoplankton assemblages shifted from being dominated by green algae (Chlorophyceae) to being dominated by diatoms (Bacillariophyceae) and blue-green algae (Myxophyceae). Sites in Lac de Gras were dominated by golden algae (Chrysophyceae; Figure 3.5-2). In the King-Cujo Watershed, the Cujo Lake phytoplankton density was largely Myxophyceae (45%). In Lac du Sauvage (LdS1) the community assemblage was more even (Cyrptophyceae (29%), Chrysophyceae (20%), Chlorophyceae (19%), Myxophyceae (18%), and Bacillariophyceae (12%). Phytoplankton in Fay Bay and Upper Exeter were largely comprised of blue-green algae (Myxophyceae; 89% and 80%, respectively). Similarly, the reference lakes (Nanuq, Counts, and Vulture lakes), were dominated by Myxophyceae (45%, 46%, and 74%), Chrysophyceae (35%, 15%, and 13%). and Chlorophyceae (20%, 13%, and 13%; Figure 3.5-2).

Phytoplankton communities in AEMP lakes were often dominated by a few key species and genera (Table 3.5-2). The proportions of edible and inedible species were examined. Nanuq Lake was dominated by the genera *Leptolyngbya* and *Ochromonas; Leptolyngbya* was also prevalent in the phytoplankton communities of Vulture, Moose, Nema, and Slipper lakes, and *Ochromonas* was also prevalent at Vulture Lake, Lac de Gras (S2 and S3), and Cujo Lake. *Leptolyngbya* species form long, thin filaments which are generally inedible to zooplankton, while *Ochromonas*, a golden single-celled algae is edible (Prescott 1982). Dominant genera at Counts, Vulture, Kodiak and Slipper lakes, Lac de Gras (S3), Cujo Lake, Lac du Sauvage (LdS1), Fay Bay, and Upper Exeter Lake included *Aphanocapsa* and/or *Aphanothece*, which are blue-green algae composed of colonial species that are scattered throughout a shapeless or globular mucilage. The mucilage may make species of both these genus inedible to zooplankton (Table 3.5-3). *Cyclotella*, a genus of diatom composed of both solitary and colonial species was among the dominant genera in Nanuq, Counts, Leslie, Moose, Nema, Slipper and Cujo lakes. *Cyclotella* are rarely united by mucilage (which may make them edible to zooplankton), however certain species have long, chitinous bristles which may protect the cells from herbivores making them inedible. *Komma caudata*, a single cell Cryptomonad that may be also be edible, was among the dominant species in Lac de Gras (S3), Cujo Lake, Lac du Sauvage (LdS1) and Upper Exeter Lake. The non-edible *Chrysocapsella planctonica* was among the dominant species at Nanuq and Leslie lakes and Lac du Sauvage (LdS1). *Woronichinia naegeliana,* which is also non-edible, was among the dominant species of several lakes including Counts, Leslie, Moose and Nema (Table 3.5-2). Other dominant species were not common to three or more lakes and are not discussed here but are presented in Table 3.5-2.

3.5.2 Phytoplankton Richness and Diversity

Phytoplankton genus richness was highest at Lac du Sauvage (LdS1: mean of 32 genera/sample) and lowest at Lac de Gras (site S2; mean of 12 genera/sample; Table 3.5-3). The number of genera (G) that contributed 90% of the phytoplankton density ranged from three (Kodiak) to 16 (LdS1). Generally, Shannon and Simpson's diversity indices mirrored one another, with lower indices at Kodiak Lake, S2, and Fay Bay; diversity was moderate to high at all other sites (Figure 3.5-3). Phytoplankton diversity showed no spatial pattern with downstream distance from the LLCF (from Leslie Lake to Lac de Gras), but increased slightly with downstream distance from the KPSF (Shannon Diversity; Cujo Lake to Lac du Sauvage; Figure 3.5-3). Average Shannon diversity indices ranged from 1.08 (Kodiak Lake) to 2.68 (LdS1; Table 3.5-2 and Figure 3.5-3). Average Simpson's

diversity indices ranged from 0.49 (Kodiak Lake) to 0.88 (Cujo, LdS1, and Upper Exeter; Table 3.5-2 and Figure 3.5-3).

3.5.3 Phytoplankton QA/QC

For the 2014 AEMP, phytoplankton QA/QC was completed on approximately 10% of samples collected (5 of 42 samples; Table 3.5-5). Five samples were analyzed by two different taxonomists to ensure taxonomic accuracy and reproducibility of the processing and analysis. The differences in density were tested by calculating the RPD and differences in species richness were assessed using Jaccard's similarity index (S_j).

The RPD of the QA/QC samples ranged from 18.18 to 74.77% (mean = 38.77%; Table 3.5-5). The calculated Jaccard's similarity index for the species identified ranged from 0.33 to 0.55 (Table 3.5-5). A value of 1.00 would indicate that taxonomic identification of samples was identical. Differences in species present in QA/QC samples were due mostly to subsampling variance, and explain the low Jaccard index. Taxonomic accuracy and reproducibility of the processing and analysis methods were ensured by taxonomists through discussions and re-examination of digital images or specimens. If discrepancies still existed in the identification, samples were re-analysed.

Table 3.5-1. Phytoplankton Density and Chlorophyll *a* Concentrations at AEMP Lake Sites, 2014

Lake	Date	Replicate No.	Chlorophyll *a* (µg/L)	Density (cells/mL)
Nanuq	5-Aug-14	1	0.11	692
		2	0.24	1,090
		3	0.80	1,382
		Mean	**0.38**	**1,055**
		SE	**0.21**	**200**
Counts	9-Aug-14	1	0.54	2,476
		2	1.03	2,231
		3	1.23	1,064
		Mean	**0.93**	**1,924**
		SE	**0.20**	**436**
Vulture	3-Aug-14	1	0.39	1,023
		2	0.72	1,775
		3	0.26	1,175
		Mean	**0.46**	**1,324**
		SE	**0.14**	**230**
Kodiak	29-Jul-14	1	1.32	31,307
		2	1.73	18,801
		3	2.48	18,630
		Mean	**1.84**	**22,912**
		SE	**0.34**	**4,198**
Leslie	31-Jul-14	1	1.05	1,223
		2	1.16	1,090
		3	0.97	1,324
		Mean	**1.06**	**1,212**
		SE	**0.06**	**68**
Moose	31-Jul-14	1	1.14	1,270
		2	1.08	1,022
		3	0.50	755
		Mean	**0.91**	**1,016**
		SE	**0.21**	**149**
Nema	2-Aug-14	1	1.44	1,585
		2	0.25	2,159
		3	2.88	3,110
		Mean	**1.52**	**2,285**
		SE	**0.76**	**445**
Slipper	4-Aug-14	1	0.58	2,028
		2	2.91	1,156
		3	0.12	1,171
		Mean	**1.20**	**1,452**
		SE	**0.86**	**288**
S2	30-Jul-14	1	1.56	1,142
		2	0.52	1,045
		3	0.38	1,023
		Mean	**0.82**	**1,070**
		SE	**0.37**	**37**
S3	30-Jul-14	1	0.87	985
		2	0.92	810
		3	0.85	700
		Mean	**0.88**	**832**
		SE	**0.02**	**83**
Cujo	7-Aug-14	1	0.39	2,140
		2	2.38	1,490
		3	2.21	4,666
		Mean	**1.66**	**2,765**
		SE	**0.64**	**969**
LdS1	8-Aug-14	1	0.22	798
		2	0.28	690
		3	0.22	598
		Mean	**0.24**	**696**
		SE	**0.02**	**58**
Fay Bay	1-Aug-14	1	3.61	19,287
		2	1.49	20,320
		3	1.12	6,314
		Mean	**2.07**	**15,307**
		SE	**0.78**	**4,506**
Upper Exeter	1-Aug-14	1	1.03	2,095
		2	0.56	1,303
		3	0.19	1,310
		Mean	**0.59**	**1,569**
		SE	**0.24**	**263**

SE = standard error of the mean

Table 3.5-2. Dominant Phytoplankton Taxa at AEMP Lake Sites, 2014

	Nanuq 5-Aug-14	Counts 9-Aug-14	Vulture 3-Aug-14	Kodiak 29-Jul-14	Leslie 31-Jul-14	Moose 31-Jul-14	Nema 2-Aug-14	Slipper 4-Aug-14
Bacillariophyceae								
Centrales								
Cyclotella sp.	6.5%	15.1%	-	-	18.1%	26.5%	26.0%	35.4%
Pennales								
Achnanthidium sp.	-	-	-	-	-	-	-	-
Chlorophyceae								
Chlorococcales								
Botryococcus braunii	-	-	-	-	-	-	-	-
Chlorella vulgaris	-	-	-	-	-	-	-	-
Oocystis naegli	-	-	-	-	11.3%	-	-	-
Tetrastrum komarekii	-	-	-	-	18.1%	-	-	-
Tetrasporales								
Elakatothrix gelatinosa	-	-	-	-	8.8%	8.9%	-	-
Volvocales								
Fusola viridis	-	-	-	-	10.6%	-	-	-
Chrysophyceae								
Chromulinales								
Chrysocapsella planctonica	6.5%	-	-	-	12.0%	-	-	-
Chrysococcales								
Chrysococcus rufescens	-	-	-	-	-	-	15.1%	7.0%
Chrysomonadales								
Dinobryon divergens	-	-	-	-	-	-	-	-
Pseudokephyrion sp.	-	-	-	-	-	-	-	-
Ochromonadales								
Ochromonas sp.	-	-	7.0%	-	-	-	-	-
Ochromonas spp.	23.9%	-	-	-	-	-	-	-
Cryptophyceae								
Cryptomonadales								
Komma caudata	-	-	-	-	-	-	-	-
Myxophyceae								
Chroococcales								
Aphanocapsa delicatissima	-	24.9%	-	-	-	-	-	17.1%
Aphanocapsa elachista	-	5.4%	-	-	-	-	-	-
Aphanocapsa sp.	-	-	19.5%	62.0%	-	-	-	-
Aphanothece clathrata	-	-	9.4%	-	-	-	-	-
Aphanothece paralleliformis	-	-	13.0%	5.4%	-	-	-	-
Chroococcus dispersus	7.8%	-	-	-	-	-	-	-
Coelosphaerium subarcticum	-	-	-	-	-	-	-	-
Merismopedia punctata	-	-	-	-	-	-	-	-
Merismopedia sp.	-	-	-	12.2%	-	-	-	-
Synechococcus sp.	-	-	-	-	-	-	-	-
Woronichinia naegeliana	-	8.8%	-	-	5.4%	14.1%	5.2%	-
Oscillatoriales								
Leptolyngbya spp.	30.2%	-	24.9%	-	-	13.1%	7.4%	9.0%
TOTAL	**74.9%**	**54.1%**	**73.8%**	**79.6%**	**84.3%**	**62.6%**	**53.7%**	**68.6%**

(continued)

Table 3.5-2. Dominant Phytoplankton Taxa at AEMP Lake Sites, 2014 (completed)

	S2 30-Jul-14	S3 30-Jul-14	Cujo Lake 7-Aug-14	LdS1 8-Aug-14	Fay Bay 1-Aug-14	Upper Exeter 10-Aug-14	Edible to Zooplankton[1]
Bacillariophyceae							
Centrales							
Cyclotella sp.	-	-	10.1%	-	-	-	possibly
Pennales							
Achnanthidium sp.	-	-	-	-	-	5.3%	yes
Chlorophyceae							
Chlorococcales							
Botryococcus braunii	-	-	-	-	-	10.1%	no
Chlorella vulgaris	-	-	5.5%	-	-	-	yes
Oocystis naegli	-	-	-	-	-	-	possibly
Tetrastrum komarekii	-	-	-	-	-	-	yes
Tetrasporales							
Elakatothrix gelatinosa	-	-	-	-	-	-	no
Volvocales							
Fusola viridis	-	-	-	-	-	-	no
Chrysophyceae							
Chromulinales							
Chrysocapsella planctonica	-	-	-	5.6%	-	-	no
Chrysococcales							
Chrysococcus rufescens	-	-	-	-	-	-	possibly
Chrysomonadales							
Dinobryon divergens	-	-	-	-	-	8.4%	no
Pseudokephyrion sp.	-	8.0%	-	-	-	-	unknown
Ochromonadales							
Ochromonas sp.	-	23.7%	9.3%	-	-	-	yes
Ochromonas spp.	72.7%	-	-	-	-	-	yes
Cryptophyceae							
Cryptomonadales							
Komma caudata	-	5.7%	13.6%	27.0%	-	10.9%	possibly
Myxophyceae							
Chroococcales							
Aphanocapsa delicatissima	-	-	-	7.0%	-	-	no
Aphanocapsa elachista	-	-	-	-	-	-	no
Aphanocapsa sp.	-	10.1%	11.5%	-	68.2%	17.0%	no
Aphanothece clathrata	-	-	-	-	-	-	no
Aphanothece paralleliformis	-	-	-	-	-	-	no
Chroococcus dispersus	-	-	-	-	-	-	possibly
Coelosphaerium subarcticum	-	-	16.2%	-	-	-	no
Merismopedia punctata	-	-	-	-	11.9%	14.4%	no
Merismopedia sp.	-	-	-	-	-	-	no
Synechococcus sp.	-	6.2%	9.6%	-	-	-	yes
Woronichinia naegeliana	-	-	-	-	-	-	no
Oscillatoriales							
Leptolyngbya spp.	-	-	-	-	-	-	possibly
TOTAL	**72.7%**	**53.8%**	**75.8%**	**39.7%**	**80.1%**	**66.2%**	

Notes:

Values represent relative density of taxa when taxa contributed at least 5% of the phytoplankton community.

Dashes (-) represent relative density of taxa was less than 5%.

[1] *Phytoplankton were considered to be edible if size was < 20 µm and inedible if > 20 µm. Inedible or possibly inedible phytoplankton were also classified based on phytoplankton ecology (colonial forms, mucilage, spines).*

Size data from Prescott (1982).

Table 3.5-3. Phytoplankton Taxonomic Richness and Diversity Indices at AEMP Lake Sites, 2014

Lake	Date	Replicate No.	Genus Richness	G (90%)	Maximum Dominance (%)	Shannon Diversity Index	Simpson Diversity Index
Nanuq	5-Aug-14	1	18	10	32.3	2.28	0.85
		2	18	7	37.2	1.92	0.77
		3	21	7	33.1	2.01	0.81
		Mean	**19.0**	**8.0**	**34.2**	**2.07**	**0.81**
		SE	**1.0**	**1.0**	**1.5**	**0.11**	**0.02**
Counts	9-Aug-14	1	23	10	43.7	2.05	0.77
		2	22	11	22.0	2.45	0.88
		3	19	10	31.4	2.24	0.84
		Mean	**21.3**	**10.3**	**32.4**	**2.25**	**0.83**
		SE	**1.2**	**0.3**	**6.3**	**0.11**	**0.03**
Vulture	3-Aug-14	1	26	9	30.9	2.20	0.83
		2	29	8	29.7	2.06	0.80
		3	26	9	36.4	2.00	0.78
		Mean	**27.0**	**8.7**	**32.3**	**2.09**	**0.81**
		SE	**1.0**	**0.3**	**2.1**	**0.06**	**0.01**
Kodiak	29-Jul-14	1	19	3	65.7	1.15	0.53
		2	19	3	73.2	0.97	0.44
		3	24	4	69.2	1.11	0.49
		Mean	**20.7**	**3.3**	**69.3**	**1.08**	**0.49**
		SE	**1.7**	**0.3**	**2.2**	**0.05**	**0.03**
Leslie	31-Jul-14	1	16	8	19.8	2.19	0.87
		2	16	6	20.6	2.03	0.85
		3	22	10	16.5	2.46	0.89
		Mean	**18.0**	**8.0**	**19.0**	**2.23**	**0.87**
		SE	**2.0**	**1.2**	**1.3**	**0.13**	**0.01**
Moose	31-Jul-14	1	22	10	21.5	2.35	0.87
		2	17	9	26.2	2.26	0.86
		3	20	10	35.3	2.17	0.82
		Mean	**19.7**	**9.7**	**27.7**	**2.26**	**0.85**
		SE	**1.5**	**0.3**	**4.1**	**0.05**	**0.02**
Nema	2-Aug-14	1	28	13	20.8	2.63	0.90
		2	28	12	23.5	2.57	0.89
		3	19	8	37.5	1.99	0.79
		Mean	**25.0**	**11.0**	**27.3**	**2.40**	**0.86**
		SE	**3.0**	**1.5**	**5.2**	**0.20**	**0.04**
Slipper	4-Aug-14	1	18	8	25.6	2.07	0.82
		2	19	7	54.1	1.77	0.68
		3	16	8	34.1	2.04	0.81
		Mean	**17.7**	**7.7**	**37.9**	**1.96**	**0.77**
		SE	**0.9**	**0.3**	**8.4**	**0.09**	**0.05**
S2	30-Jul-14	1	13	7	66.7	1.40	0.54
		2	12	5	77.0	1.03	0.40
		3	11	4	75.1	1.04	0.43
		Mean	**12.0**	**5.3**	**72.9**	**1.16**	**0.46**
		SE	**0.6**	**0.9**	**3.2**	**0.12**	**0.04**

(continued)

Table 3.5-3. Phytoplankton Taxonomic Richness and Diversity Indices at AEMP Lake Sites, 2014 (completed)

Lake	Date	Replicate No.	Genus Richness	G (90%)	Maximum Dominance (%)	Shannon Diversity Index	Simpson Diversity Index
S3	30-Jul-14	1	19	11	25.4	2.42	0.88
		2	23	11	24.3	2.47	0.88
		3	27	12	25.1	2.44	0.86
		Mean	**23.0**	**11.3**	**24.9**	**2.44**	**0.87**
		SE	**2.3**	**0.3**	**0.3**	**0.01**	**0.01**
Cujo	7-Aug-14	1	23	8	20.8	2.27	0.87
		2	21	9	21.5	2.33	0.88
		3	21	10	17.2	2.43	0.89
		Mean	**21.7**	**9.0**	**19.8**	**2.34**	**0.88**
		SE	**0.7**	**0.6**	**1.3**	**0.05**	**0.01**
LdS1	8-Aug-14	1	38	17	20.1	2.80	0.90
		2	33	17	28.8	2.77	0.89
		3	25	14	34.4	2.47	0.85
		Mean	**32.0**	**16.0**	**27.8**	**2.68**	**0.88**
		SE	**3.8**	**1.0**	**4.2**	**0.11**	**0.02**
Fay Bay	1-Aug-14	1	27	4	76.1	1.03	0.41
		2	24	4	76.4	1.03	0.40
		3	27	7	51.6	1.75	0.69
		Mean	**26.0**	**5.0**	**68.0**	**1.27**	**0.50**
		SE	**1.0**	**1.0**	**8.2**	**0.24**	**0.09**
Upper Exeter	1-Aug-14	1	30	10	24.0	2.33	0.86
		2	31	12	23.9	2.52	0.88
		3	28	15	18.8	2.71	0.91
		Mean	**29.7**	**12.3**	**22.2**	**2.52**	**0.88**
		SE	**0.9**	**1.5**	**1.7**	**0.11**	**0.01**

Notes:

G (90%) is the number of genera comprising 90% of the density.

Maximum Dominance (%) is the maximum dominance accounted for by a single genus.

SE = standard error of the mean

Table 3.5-4. Taxonomic Density Results for Phytoplankton at AEMP Lake Sites, 2014

Lake	Nanuq			Counts			Vulture		
Date	5-Aug-14			9-Aug-14			3-Aug-14		
Replicate No.	1	2	3	1	2	3	1	2	3
Sample ID	6820.02-01	6820.02-02	6820.02-03	6820.02-04	6820.02-05	6820.02-06	6820.01-01	6820.01-02	6820.01-03
Species/Group (cells/mL)									
Bacillariophyceae									
Centrales									
Aulacoseira sp.	-	-	-	-	-	-	-	-	-
Cyclotella sp.	57	52	95	336	323	215	34	42	19
Rhizosolenia sp.	-	-	-	-	-	-	-	-	-
Pennales									
Achnanthes sp.	-	-	-	-	-	-	-	-	-
Achnanthidium sp.	2	-	-	-	-	-	10	18	9
Amphora sp.	-	-	-	-	-	-	-	-	-
Asterionella formosa	-	-	-	19	98	12	-	-	-
Cocconeis sp.	-	-	-	-	-	-	-	5	-
Cymbella sp.	-	-	-	-	-	-	-	-	-
Diatoma sp.	-	-	-	-	-	-	-	-	-
Fragilaria crotonensis	-	-	-	-	-	-	-	-	-
Fragilaria sp.	-	-	-	-	-	-	1	1	1
Gomphonema sp.	-	-	-	-	-	-	-	-	-
Navicula sp.	-	-	-	4	-	-	-	1	-
Nitzschia sp.	-	5	-	-	-	-	-	-	-
Surirella sp.	-	-	-	-	-	-	-	-	-
Synedra sp.	-	-	-	-	-	-	-	-	1
Tabellaria flocculosa	-	14	19	4	46	-	-	-	-
Tabellaria spp.	-	-	-	-	-	-	4	-	-
Chlorophyceae									
Chlorococcales									
Acutodesmus acutiformis	-	-	-	-	-	-	-	-	-
Ankistrodesmus falcatus	-	-	-	4	3	12	-	-	-
Botryococcus braunii	38	-	39	-	-	27	38	49	15
Botryococcus protuberans	-	-	-	-	-	-	28	-	-
Chlorella ellipsoidea	6	-	4	86	55	12	-	-	-
Chlorella vulgaris	35	-	9	45	9	5	19	-	10
Coelastrum microporum	-	-	-	-	-	-	-	-	-
Crucigenia fenestrata	-	-	-	-	-	-	-	-	-
Crucigenia tetrapedia	-	-	-	-	-	-	-	-	-
Crucigeniella irregularis	-	-	-	-	-	-	-	-	-
Crucigeniella rectangularis	-	-	-	60	-	-	-	-	-
Desmodesmus asymmetricus	-	-	-	-	-	-	-	-	-
Desmodesmus communis	-	-	-	-	-	-	-	-	-
Dictyosphaerium ehrenbergianum	6	-	-	-	-	-	-	-	-
Dictyosphaerium sp.	-	-	-	-	-	-	-	-	-
Kirchneriella sp.	-	-	-	-	-	-	-	-	-
Lagerheimia genevensis	-	-	-	-	-	-	-	-	-
Monoraphidium arcuatum	-	-	-	-	-	-	-	-	-
Monoraphidium contortum	-	-	-	-	-	-	-	-	-
Monoraphidium irregulare	-	-	5	-	-	-	-	-	-
Monoraphidium komarkovae	-	-	-	-	-	-	-	2	-
Monoraphidium minutum	-	-	-	7	-	2	-	-	-
Monoraphidium tortile	-	19	25	75	40	11	-	-	-
Oocystis borgei	-	-	-	-	-	-	-	5	-
Oocystis elliptica	-	-	-	-	-	-	-	-	-
Oocystis marssonii	-	-	-	-	-	-	-	-	-
Oocystis naegli	-	-	-	-	-	-	-	-	-
Oocystis solitaria	-	-	-	-	-	-	-	-	-
Oocystis sp.	-	-	-	-	-	-	4	-	8
Pediastrum boryanum	-	-	-	-	-	-	-	-	-
Quadrigula closterioides	-	-	-	90	86	79	-	-	-
Quadrigula sp.	-	-	-	-	-	-	-	-	-
Scenedesmus obtusus	-	-	-	-	-	-	-	-	-
Scenedesmus sp.	-	-	-	-	-	-	-	-	-
Stauridium tetras	-	-	-	-	-	-	-	-	-

(continued)

Table 3.5-4. Taxonomic Density Results for Phytoplankton at AEMP Lake Sites, 2014 (continued)

Lake	Nanuq			Counts			Vulture		
Date	5-Aug-14			9-Aug-14			3-Aug-14		
Replicate No.	1	2	3	1	2	3	1	2	3
Sample ID	6820.02-01	6820.02-02	6820.02-03	6820.02-04	6820.02-05	6820.02-06	6820.01-01	6820.01-02	6820.01-03
Species/Group (cells/mL)									
Chlorococcales *(cont'd)*							-	-	-
Tetraedron caudatum	-	-	-	-	-	-	-	-	-
Tetraedron minimum	-	-	-	-	-	-	-	1	-
Tetraedron muticum	-	-	-	-	-	-	-	-	-
Tetraselmis cordiformis	-	-	-	-	-	-	-	-	-
Tetrastrum komarekii	-	-	-	-	-	-	-	-	-
Tetrastrum triangulare	-	-	-	-	-	-	-	-	1
Sphaeropleales									
Chlorotetraedron incus	-	-	-	-	-	-	-	-	-
Tetrasporales									
Elakatothrix gelatinosa	-	-	-	-	-	24	27	7	21
Elakatothrix sp.	-	-	-	-	-	-	-	2	-
Gloeocystis sp.	-	-	-	-	-	-	1	12	5
Volvocales									
Fusola viridis	-	-	-	-	-	59	-	-	-
Zygnematales									
Closterium sp.	-	-	-	-	-	-	-	-	-
Cosmarium angulosum	-	-	-	-	-	-	-	-	-
Cosmarium bioculatum	-	-	-	-	-	-	-	-	-
Cosmarium exiguum	-	-	-	-	-	-	-	-	-
Cosmarium formosulum	-	-	-	-	-	-	-	-	-
Cosmarium garrolense	-	-	-	-	-	-	-	-	-
Cosmarium minimum	-	-	-	-	-	-	-	-	-
Cosmarium sp.	-	-	-	-	-	-	3	1	6
Euastrum pulchellum	-	-	-	-	-	-	-	-	-
Mougeotia sp.	-	-	-	-	-	-	-	-	-
Roya sp.	-	-	2	52	52	14	-	-	-
Spondylosium sp.	-	-	-	-	-	-	-	-	-
Staurastrum sp.	-	-	-	-	-	-	-	-	-
Staurodesmus sp.	-	-	-	-	-	-	4	8	-
Staurodesmus triangularis	2	2	-	4	-	-	-	-	-
Staurodesmus triangularis var. subparallelus	10	2	4	-	-	-	-	-	-
Teilingia granulata	2	-	18	-	3	-	-	-	-
Xanthidium antilopaeum var. hebridarum	-	-	-	-	-	-	-	-	-
Xanthidium johnsonii	5	3	2	-	-	-	-	-	-
Xanthidium sp.	2	3		-	-	-	-	1	-
Zygnema sp.	-	-	-	-	-	-	-	-	-
Chrysophyceae									
Chromulinales									
Chrysocapsella planctonica	37	35	134	67	111	48	12	57	10
Synuropsis janei	-	-	-	-	-	-	-	-	-
Chrysococcales									
Chrysococcus rufescens	-	-	-	-	-	-	-	-	1
Chrysomonadales									
Dinobryon bavaricum	10	17	9	172	83	21	-	-	-
Dinobryon borgei	-	2	4	-	6	-	-	-	-
Dinobryon divergens	21	5	7	26	18	8	-	-	-
Dinobryon spp.	-	-	-	-	-	-	22	20	17
Mallomonas insignis	-	5	2	15	3	3	-	-	-
Mallomonas sp.	-	-	-	-	-	-	4	-	2
Pseudokephyrion ellipsoideum	3	-	-	-	-	-	11	6	7
Pseudokephyrion pseudospirale	-	-	-	-	-	-	-	-	-
Pseudokephyrion sp.	14	30	11	7	-	-	4	8	9
Hibberdiales									
Bitrichia chodatii	-	-	-	-	-	-	15	13	13
Ochromonadales									
Ochromonas sp.	-	-	-	-	-	-	90	118	70
Ochromonas spp.	224	289	243	104	120	62	1	-	-

(continued)

Table 3.5-4. Taxonomic Density Results for Phytoplankton at AEMP Lake Sites, 2014 (continued)

Lake	Nanuq			Counts			Vulture		
Date	5-Aug-14			9-Aug-14			3-Aug-14		
Replicate No.	1	2	3	1	2	3	1	2	3
Sample ID	6820.02-01	6820.02-02	6820.02-03	6820.02-04	6820.02-05	6820.02-06	6820.01-01	6820.01-02	6820.01-03
Species/Group (cells/mL)									
Cryptophyceae									
Cryptomonadales									
Cryptomonas erosa	-	-	-	-	-	-	-	-	-
Cryptomonas marssonii	-	-	-	-	-	-	-	-	-
Cryptomonas ovata	-	-	-	15	-	-	-	-	-
Cryptomonas sp.	11	7	2	11	25	9	-	-	-
Cryptomonas spp.	-	-	-	-	-	-	3	7	7
Komma caudata	35	10	39	22	61	11	13	12	18
Rhodomonas sp.	-	-	-	-	-	-	-	-	-
Dinophyceae									
Gymnodiniales									
Amphidinium sp.	8	12	4	19	9	8	-	-	-
Gymnodinium fuscum	-	-	-	-	-	-	-	-	-
Gymnodinium sp.	10	3	2	19	12	-	1	4	-
Gyrodinium helveticum	-	-	2	-	-	-	-	-	-
Peridiniales									
Peridinium inconspicuum	-	-	-	-	-	-	-	-	-
Peridinium sp.	-	-	-	-	-	-	5	-	2
Peridinium willei	-	-	-	-	-	-	-	-	-
Euglenophyceae									
Euglenales									
Trachelomonas sp.	-	-	-	-	-	-	4	4	-
Trachelomonas sp. 2 ?	-	-	-	-	-	-	-	1	-
Myxophyceae									
Chroococcales									
Aphanocapsa delicatissima	-	85	-	895	369	181	39	41	-
Aphanocapsa elachista	64	-	-	186	123	2	-	-	-
Aphanocapsa holsatica	-	-	-	-	-	-	-	-	-
Aphanocapsa planctonica	-	-	-	-	-	151	-	-	-
Aphanocapsa sp.	-	-	-	-	-	-	130	474	170
Aphanothece clathrata	-	-	-	-	-	-	-	59	316
Aphanothece elebens	-	-	-	-	-	-	76	-	-
Aphanothece paralleliformis	-	-	-	-	-	-	239	165	112
Aphanothece sp.	-	-	-	-	-	-	-	-	-
Chroococcus dispersus	-	-	248	-	249	-	-	-	-
Chroococcus sp.	-	-	-	-	-	-	-	2	-
Coelosphaerium subarcticum	-	-	-	-	-	-	-	-	-
Gloeocapsa sp.	-	-	-	-	-	-	-	-	-
Gloeothece rupestris	-	-	-	-	-	-	-	-	-
Merismopedia punctata	-	-	-	-	-	-	-	89	-
Merismopedia sp.	-	-	-	-	-	-	-	-	33
Rhabdoderma lineare	-	-	-	-	-	-	-	-	-
Synechococcus sp.	-	-	-	-	-	-	-	12	-
Woronichinia naegeliana	-	-	-	112	307	91	-	-	-
Woronichinia sp.	-	85	-	-	-	-	-	-	-
Nostocales									
Anabaena sp.	-	-	-	-	-	-	4	-	8
Anabaena sp. 2 ?	-	-	-	-	-	-	-	-	-
Oscillatoriales									
Leptolyngbya spp.	94	406	458	-	-	-	178	527	283
Pseudanabaena sp.	-	-	-	-	15	-	-	-	-
Xanthophyceae									
Heterococcales									
Ophiocytium sp.	-	-	-	-	-	-	-	-	-
Tetraedriella jovetti	-	-	-	22	3	-	-	-	-
TOTAL	**692**	**1,090**	**1,382**	**2,476**	**2,231**	**1,064**	**1,023**	**1,775**	**1,175**

(continued)

Table 3.5-4. Taxonomic Density Results for Phytoplankton at AEMP Lake Sites, 2014 (continued)

Lake	Kodiak			Leslie			Moose		
Date	29-Jul-14			31-Jul-14			31-Jul-14		
Replicate No.	1	2	3	1	2	3	1	2	3
Sample ID	6820.01-07	6820.01-08	6820.01-09	6820.02-07	6820.02-08	6820.02-09	6820.02-10	6820.02-11	6820.02-12
Species/Group (cells/mL)									
Bacillariophyceae									
Centrales									
Aulacoseira sp.	-	-	-	-	-	-	-	-	-
Cyclotella sp.	38	12	-	243	219	196	272	268	267
Rhizosolenia sp.	-	-	-	-	-	-	-	-	-
Pennales									
Achnanthes sp.	-	-	-	-	-	-	23	7	7
Achnanthidium sp.	25	4	28	-	-	64	-	-	-
Amphora sp.	-	-	-	-	-	-	-	-	-
Asterionella formosa	-	-	-	-	-	-	-	-	-
Cocconeis sp.	-	-	-	-	-	-	-	-	-
Cymbella sp.	-	-	-	-	2	2	-	-	-
Diatoma sp.	-	-	-	15	14	15	18	-	9
Fragilaria crotonensis	-	-	-	-	-	-	-	-	-
Fragilaria sp.	-	-	-	-	-	-	-	-	-
Gomphonema sp.	-	-	-	-	-	-	-	-	-
Navicula sp.	-	-	-	5	8	9	-	-	-
Nitzschia sp.	6	-	-	-	-	2	-	7	-
Surirella sp.	-	-	-	-	-	-	-	-	-
Synedra sp.	-	-	-	-	-	-	-	-	-
Tabellaria flocculosa	-	-	-	-	-	-	-	-	-
Tabellaria spp.	-	-	-	-	-	-	-	-	-
Chlorophyceae									
Chlorococcales									
Acutodesmus acutiformis	-	-	-	-	-	-	-	7	18
Ankistrodesmus falcatus	-	-	-	-	-	-	-	-	3
Botryococcus braunii	-	-	-	-	-	-	25	-	-
Botryococcus protuberans	-	-	-	-	-	-	-	-	-
Chlorella ellipsoidea	-	-	-	6	5	9	70	49	21
Chlorella vulgaris	-	-	-	-	-	-	35	47	33
Coelastrum microporum	-	-	-	25	-	58	-	-	-
Crucigenia fenestrata	-	-	-	-	-	-	-	7	-
Crucigenia tetrapedia	-	4	4	-	-	-	8	7	-
Crucigeniella irregularis	-	-	-	-	-	-	-	-	-
Crucigeniella rectangularis	-	-	-	-	-	-	-	-	-
Desmodesmus asymmetricus	-	-	-	-	-	-	20	7	12
Desmodesmus communis	-	-	-	-	-	-	-	22	12
Dictyosphaerium ehrenbergianum	-	-	-	-	-	-	-	-	-
Dictyosphaerium sp.	-	-	-	-	-	-	-	-	-
Kirchneriella sp.	-	-	-	-	-	-	-	-	-
Lagerheimia genevensis	-	-	-	-	-	-	-	-	-
Monoraphidium arcuatum	-	-	-	-	-	-	-	-	-
Monoraphidium contortum	13	8	12	-	-	-	-	-	-
Monoraphidium irregulare	-	-	-	-	-	-	-	-	-
Monoraphidium komarkovae	-	-	-	-	-	-	-	-	-
Monoraphidium minutum	-	-	-	-	-	-	27	49	19
Monoraphidium tortile	-	-	-	-	-	-	35	-	15
Oocystis borgei	-	-	-	-	-	-	-	-	-
Oocystis elliptica	-	-	-	-	-	-	-	-	-
Oocystis marssonii	-	-	-	-	-	-	4	37	6
Oocystis naegli	-	-	-	86	186	138	8	-	24
Oocystis solitaria	-	-	-	9	8	7	-	6	-
Oocystis sp.	-	-	-	-	-	-	-	45	12
Pediastrum boryanum	-	-	-	-	-	-	-	-	-
Quadrigula closterioides	-	-	-	-	-	-	-	-	-
Quadrigula sp.	-	-	24	-	-	-	-	-	-
Scenedesmus obtusus	-	-	-	-	-	-	33	30	6
Scenedesmus sp.	-	-	-	-	-	22	-	15	-
Stauridium tetras	-	-	-	-	-	-	-	-	-

(continued)

Table 3.5-4. Taxonomic Density Results for Phytoplankton at AEMP Lake Sites, 2014 (continued)

Lake	Kodiak			Leslie			Moose		
Date	29-Jul-14			31-Jul-14			31-Jul-14		
Replicate No.	1	2	3	1	2	3	1	2	3
Sample ID	6820.01-07	6820.01-08	6820.01-09	6820.02-07	6820.02-08	6820.02-09	6820.02-10	6820.02-11	6820.02-12
Species/Group (cells/mL)									
Chlorococcales *(cont'd)*	-	-	-						
Tetraedron caudatum	-	-	-	-	-	-	-	-	-
Tetraedron minimum	-	-	-				2		
Tetraedron muticum	-	-	-	-	-	-	-	-	-
Tetraselmis cordiformis	-	-	-	-	10	4	-	-	-
Tetrastrum komarekii	-	-	-	243	225	189	74	-	-
Tetrastrum triangulare	-	-	-	-	-	-	-	-	-
Sphaeropleales									
Chlorotetraedron incus	-	-	-	-	-	-	-	-	-
Tetrasporales									
Elakatothrix gelatinosa	76	36	16	161	109	51	98	142	30
Elakatothrix sp.	-	24	-	-	-	-	-	-	-
Gloeocystis sp.	-	-	-	-	-	-	-	-	-
Volvocales									
Fusola viridis	-	-	-	141	129	116	33	-	24
Zygnematales									
Closterium sp.	-	-	-	-	2	-	-	-	-
Cosmarium angulosum	-	-	-	-	-	-		4	1
Cosmarium bioculatum	-	-	-	-	-	-	2	-	-
Cosmarium exiguum	-	-	-	-	-	-	2	6	3
Cosmarium formosulum	-	-	-	2	2	-	-	-	-
Cosmarium garrolense	-	-	-	-	-	-	-	-	-
Cosmarium minimum	-	-	-	-	-	-	-	6	-
Cosmarium sp.	-	-	-	-	-	2	-	-	-
Euastrum pulchellum	-	-	-	-	-	-	-	-	-
Mougeotia sp.	-	-	-	-	-	-	-	-	-
Roya sp.	-	-	-	-	-	-	-	-	-
Spondylosium sp.	-	-	8	-	-	-	-	-	-
Staurastrum sp.	-	-	-	-	-	-	-	-	-
Staurodesmus sp.	-	-	-	-	-	-	-	-	-
Staurodesmus triangularis	-	-	-	-	-	-	-	-	-
Staurodesmus triangularis var. subparallelus	-	-	-	-	-	-	-	-	-
Teilingia granulata	-	-	-	-	-	-	-	-	3
Xanthidium antilopaeum var. hebridarum	-	-	-	-	-	-	-	-	-
Xanthidium johnsonii	-	-	-	-	-	-	-	-	-
Xanthidium sp.	-	-	-	-	-	-	-	-	-
Zygnema sp.	-	-	-	-	-	-	-	-	-
Chrysophyceae									
Chromulinales									
Chrysocapsella planctonica	-	-	16	86	132	218	2	-	57
Synuropsis janei	-	-	-	-	-	-	-	-	-
Chrysococcales									
Chrysococcus rufescens	-	-	4	-	-	-	-	-	-
Chrysomonadales									
Dinobryon bavaricum	-	-	-	-	-	-	-	-	-
Dinobryon borgei	-	-	-	-	-	-	-	-	-
Dinobryon divergens	-	-	-	-	-	-	-	-	-
Dinobryon spp.	38	65	56	-	-	-	-	-	-
Mallomonas insignis	-	-	-	-	-	-	-	-	-
Mallomonas sp.	-	-	-	-	-	-	-	-	-
Pseudokephyrion ellipsoideum	-	-	-	-	-	-	-	11	4
Pseudokephyrion pseudospirale	-	-	-	-	-	-	-	-	-
Pseudokephyrion sp.	-	-	-	-	-	-	6	-	-
Hibberdiales									
Bitrichia chodatii	6	8	8	-	-	-	-	-	-
Ochromonadales									
Ochromonas sp.	580	464	273	-	-	-	-	-	-
Ochromonas spp.	-	4	8	17	27	18	18	6	13

(continued)

Table 3.5-4. Taxonomic Density Results for Phytoplankton at AEMP Lake Sites, 2014 (continued)

Lake	Kodiak			Leslie			Moose		
Date	29-Jul-14			31-Jul-14			31-Jul-14		
Replicate No.	1	2	3	1	2	3	1	2	3
Sample ID	6820.01-07	6820.01-08	6820.01-09	6820.02-07	6820.02-08	6820.02-09	6820.02-10	6820.02-11	6820.02-12
Species/Group (cells/mL)									
Cryptophyceae									
Cryptomonadales									
Cryptomonas erosa	-	-	-	-	-	-	-	-	-
Cryptomonas marssonii	-	-	-	-	-	-	-	-	-
Cryptomonas ovata	-	-	-	-	6	-	-	-	-
Cryptomonas sp.	-	-	-	5	5	9	-	-	1
Cryptomonas spp.	64	16	40	-	-	-	-	-	-
Komma caudata	51	24	12	-	2	9	2	-	-
Rhodomonas sp.	-	8	4	-	-	-	-	-	-
Dinophyceae									
Gymnodiniales									
Amphidinium sp.	-	-	-	2	-	-	-	6	-
Gymnodinium fuscum	-	-	-	-	-	-	-	-	-
Gymnodinium sp.	-	12	16	-	-	-	-	-	6
Gyrodinium helveticum	-	-	-	-	-	-	-	-	-
Peridiniales									
Peridinium inconspicuum	-	-	-	-	-	-	-	-	-
Peridinium sp.	-	4	12	-	-	4	-	-	-
Peridinium willei	-	-	-	-	-	-	-	-	-
Euglenophyceae									
Euglenales									
Trachelomonas sp.	13	-	-	-	-	-	-	-	-
Trachelomonas sp. 2 ?	-	-	-	-	-	-	-	-	-
Myxophyceae									
Chroococcales									
Aphanocapsa delicatissima	-	-	3,291	-	-	-	-	-	-
Aphanocapsa elachista	-	-	1,308	-	-	-	-	-	-
Aphanocapsa holsatica	-	-	-	-	-	-	-	-	-
Aphanocapsa planctonica	-	-	-	-	-	-	-	-	-
Aphanocapsa sp.	20,559	13,762	8,287	-	-	-	-	-	-
Aphanothece clathrata	-	-	-	-	-	-	-	-	-
Aphanothece elebens	-	-	-	-	-	-	-	-	-
Aphanothece paralleliformis	3,704	-	-	-	-	-	-	-	-
Aphanothece sp.	956	807	823	-	-	-	-	-	-
Chroococcus dispersus	-	-	883	-	-	-	-	-	-
Chroococcus sp.	51	-	24	-	-	-	-	-	-
Coelosphaerium subarcticum	-	-	-	-	-	-	-	-	-
Gloeocapsa sp.	-	-	-	-	-	-	-	-	-
Gloeothece rupestris	-	-	-	-	-	-	-	-	-
Merismopedia punctata	-	-	1,284	-	-	-	-	-	-
Merismopedia sp.	3,825	2,874	1,686	-	-	-	-	-	-
Rhabdoderma lineare	83	-	-	-	-	-	-	-	-
Synechococcus sp.	127	44	52	-	-	-	-	-	-
Woronichinia naegeliana	331	303	373	123	-	73	205	75	149
Woronichinia sp.	-	-	-	-	-	-	-	-	-
Nostocales									
Anabaena sp.	-	-	-	-	-	-	-	-	-
Anabaena sp. 2 ?	-	-	-	-	-	-	-	-	-
Oscillatoriales									
Leptolyngbya spp.	759	315	16	55	-	109	246	154	-
Pseudanabaena sp.	-	-	60	-	-	-	2	-	-
Xanthophyceae									
Heterococcales									
Ophiocytium sp.	-	-	-	-	-	-	-	-	-
Tetraedriella jovetti	-	-	-	-	-	-	-	-	-
TOTAL	**31,307**	**18,801**	**18,630**	**1,223**	**1,090**	**1,324**	**1,270**	**1,022**	**755**

(continued)

Table 3.5-4. Taxonomic Density Results for Phytoplankton at AEMP Lake Sites, 2014 (continued)

Lake	Nema			Slipper			S2		
Date	2-Aug-14			4-Aug-14			30-Jul-14		
Replicate No.	1	2	3	1	2	3	1	2	3
Sample ID	6820.02-13	6820.02-14	6820.02-15	6820.02-16	6820.02-17	6820.02-18	6820.02-19	6820.02-20	6820.02-21
Species/Group (cells/mL)									
Bacillariophyceae									
Centrales									
Aulacoseira sp.	-	-	-	-	-	-	-	-	-
Cyclotella sp.	329	286	1167	519	625	399	36	24	56
Rhizosolenia sp.	-	-	-	-	-	-	-	-	-
Pennales									
Achnanthes sp.	8	6	27	-	-	-	-	-	-
Achnanthidium sp.	-	-	-	-	-	-	-	-	-
Amphora sp.	-	-	-	6	3	-	-	-	-
Asterionella formosa	-	-	-	19	-	-	-	-	40
Cocconeis sp.	-	-	-	-	3	-	-	-	-
Cymbella sp.	-	-	-	-	-	-	-	-	-
Diatoma sp.	50	19	125	12	12	12	-	3	-
Fragilaria crotonensis	3	-	27	31	12	10	-	-	-
Fragilaria sp.	-	19	-	-	-	-	-	-	-
Gomphonema sp.	-	-	9	-	-	-	-	-	-
Navicula sp.	-	-	9	-	-	12	-	-	-
Nitzschia sp.	-	-	9	-	3	-	-	-	-
Surirella sp.	-	-	-	-	-	-	-	-	-
Synedra sp.	-	-	-	-	-	-	-	-	-
Tabellaria flocculosa	33	-	-	-	41	22	-	-	-
Tabellaria spp.	-	-	-	-	-	-	-	-	-
Chlorophyceae									
Chlorococcales									
Acutodesmus acutiformis	55	25	107	-	-	-	15		
Ankistrodesmus falcatus	-	16	-	-	3	-	-	-	-
Botryococcus braunii	66	-	-	-	-	-	-	-	-
Botryococcus protuberans	-	-	-	-	-	-	-	-	-
Chlorella ellipsoidea	44	19	27	-	-	12	22	-	-
Chlorella vulgaris	-	83	107	34	16	22	22	-	-
Coelastrum microporum	22	51	-	-	-	-	-	-	-
Crucigenia fenestrata	-	-	-	-	-	-	-	-	-
Crucigenia tetrapedia	-	-	-	25	6	-	7	-	-
Crucigeniella irregularis	-	203	-	137	-	-	-	-	-
Crucigeniella rectangularis	-	-	-	-	-	-	-	-	-
Desmodesmus asymmetricus	6	-	-	-	-	-	-	-	-
Desmodesmus communis	-	13	-	-	-	-	-	-	-
Dictyosphaerium ehrenbergianum	-	-	-	-	-	-	-	-	-
Dictyosphaerium sp.	-	-	160	-	-	-	-	-	-
Kirchneriella sp.	-	-	-	-	-	-	-	-	-
Lagerheimia genevensis	-	-	-	-	-	-	-	-	-
Monoraphidium arcuatum	-	-	-	-	-	-	-	-	-
Monoraphidium contortum	-	-	-	-	-	-	-	-	-
Monoraphidium irregulare	-	-	36	3	22	2	-	7	-
Monoraphidium komarkovae	11	-	18	-	6	10	-	3	23
Monoraphidium minutum	58	83	107	100	59	58	58	41	-
Monoraphidium tortile	19	16	125	-	6	-	-	-	-
Oocystis borgei	-	-	-	-	-	-	-	-	-
Oocystis elliptica	-	-	-	-	-	-	-	-	-
Oocystis marssonii	-	-	-	-	-	-	-	-	-
Oocystis naegli	-	-	36	-	-	-	-	-	-
Oocystis solitaria	-	3	-	-	-	-	-	-	-
Oocystis sp.	11	25	-	-	-	-	-	14	-
Pediastrum boryanum	22	48	214	50	-	-	-	-	-
Quadrigula closterioides	-	-	-	-	-	-	-	-	-
Quadrigula sp.	-	-	-	-	-	-			
Scenedesmus obtusus	-	13	-	-	-	-	-	-	-
Scenedesmus sp.	-	-	-	-	-	-	-	-	-
Stauridium tetras	-	-	-	-	-	-	-	-	-

(continued)

Table 3.5-4. Taxonomic Density Results for Phytoplankton at AEMP Lake Sites, 2014 (continued)

Lake	Nema			Slipper			S2		
Date	2-Aug-14			4-Aug-14			30-Jul-14		
Replicate No.	1	2	3	1	2	3	1	2	3
Sample ID	6820.02-13	6820.02-14	6820.02-15	6820.02-16	6820.02-17	6820.02-18	6820.02-19	6820.02-20	6820.02-21
Species/Group (cells/mL)									
Chlorococcales (cont'd)									
Tetraedron caudatum	3	6	9	22	-	2	-	-	-
Tetraedron minimum	-	-	-	-	-	-	-	-	-
Tetraedron muticum	-	-	-	-	-	-	-	-	-
Tetraselmis cordiformis	-	3	-	-	-	-	-	-	-
Tetrastrum komarekii	-	-	-	-	-	-	-	-	-
Tetrastrum triangulare	-	-	-	-	-	-	-	-	-
Sphaeropleales	-	-	-						
Chlorotetraedron incus	-	-	-	-	-	-	11	-	3
Tetrasporales									
Elakatothrix gelatinosa	11	25	18	25	25	29	58	34	-
Elakatothrix sp.	-	-	-	-	-	-	-	-	-
Gloeocystis sp.	-	-	-	-	-	-	-	-	-
Volvocales									
Fusola viridis	-	-	-	-	-	-	-	7	-
Zygnematales									
Closterium sp.	-	-	-	-	-	-	-	-	-
Cosmarium angulosum	3	-	-	-	-	-	-	-	-
Cosmarium bioculatum	8	13	-	9	-	-	-	-	3
Cosmarium exiguum	-	-	-	-	-	-	-	-	-
Cosmarium formosulum	3	-	18	-	9	-	-	-	-
Cosmarium garrolense	-	-	-	-	-	-	-	-	-
Cosmarium minimum	-	-	-	-	-	-	-	-	-
Cosmarium sp.	-	-	-	-	-	-	-	-	-
Euastrum pulchellum	-	-	-	-	-	-	-	-	-
Mougeotia sp.	-	-	-	-	-	-	-	-	-
Roya sp.	-	-	-	-	-	-	-	-	-
Spondylosium sp.	-	-	-	-	-	-	-	-	-
Staurastrum sp.	3	-	-	-	-	-	-	-	-
Staurodesmus sp.	-	-	-	-	-	-	-	-	-
Staurodesmus triangularis	-	-	-	-	-	-	-	-	-
Staurodesmus triangularis var. subparallelus	-	-	-	-	-	-	-	-	-
Teilingia granulata	-	-	-	-	-	-	-	-	-
Xanthidium antilopaeum var. hebridarum	3	-	-	-	-	-	-	-	-
Xanthidium johnsonii	-	-	-	-	-	-	4	-	-
Xanthidium sp.	-	16	-	-	-	-	-	-	-
Zygnema sp.	-	-	-	-	-	-	-	-	-
Chrysophyceae									
Chromulinales									
Chrysocapsella planctonica	100	133	-	-	81	77	-	-	-
Synuropsis janei	-	-	-	-	-	-	-	-	-
Chrysococcales									
Chrysococcus rufescens	133	213	686	125	75	106	44	34	26
Chrysomonadales									
Dinobryon bavaricum	-	-	-	-	-	-	-	-	3
Dinobryon borgei	-	-	-	-	-	-	-	-	-
Dinobryon divergens	-	-	-	-	-	-	-	3	-
Dinobryon spp.	-	-	-	-	-	-	-	-	-
Mallomonas insignis	-	-	-	-	-	-	-	-	-
Mallomonas sp.	-	-	-	-	-	-	-	-	-
Pseudokephyrion ellipsoideum	-	3	-	-	-	12	15	3	3
Pseudokephyrion pseudospirale	-	-	-	-	-	-	-	-	-
Pseudokephyrion sp.	3	3	-	-	-	2	33	17	30
Hibberdiales									
Bitrichia chodatii	-	-	-	-	-	-	-	-	-
Ochromonadales									
Ochromonas sp.	-	-	-	-	-	-	-	-	-
Ochromonas spp.	-	10	62	-	22	-	761	805	768

(continued)

Table 3.5-4. Taxonomic Density Results for Phytoplankton at AEMP Lake Sites, 2014 (continued)

Lake	Nema			Slipper			S2		
Date	2-Aug-14			4-Aug-14			30-Jul-14		
Replicate No.	1	2	3	1	2	3	1	2	3
Sample ID	6820.02-13	6820.02-14	6820.02-15	6820.02-16	6820.02-17	6820.02-18	6820.02-19	6820.02-20	6820.02-21
Species/Group (cells/mL)									
Cryptophyceae									
Cryptomonadales									
Cryptomonas erosa	-	-	-	-	-	-	-	-	3
Cryptomonas marssonii	25	3	-	9	3	5	40	34	40
Cryptomonas ovata	28	3	-	-	12	7	-	3	20
Cryptomonas sp.	-	-	-	-	-	-	-	-	-
Cryptomonas spp.	-	-	-	-	-	-	-	-	-
Komma caudata	-	6	-	9	9	-	18	14	-
Rhodomonas sp.	-	-	-	-	-	-	-	-	-
Dinophyceae									
Gymnodiniales									
Amphidinium sp.	3	-	-	-	-	-	-	-	-
Gymnodinium fuscum	-	-	-	-	-	-	-	-	-
Gymnodinium sp.	22	-	-	-	-	-	-	-	-
Gyrodinium helveticum	-	-	-	-	-	-	-	-	-
Peridiniales									
Peridinium inconspicuum	-	-	-	-	-	7	-	-	3
Peridinium sp.	-	-	-	-	-	-	-	-	-
Peridinium willei	3	-	9	-	-	-	-	-	-
Euglenophyceae									
Euglenales									
Trachelomonas sp.	-	-	-	-	-	-	-	-	-
Trachelomonas sp. 2 ?	-	-	-	-	-	-	-	-	-
Myxophyceae									
Chroococcales									
Aphanocapsa delicatissima	-	-	-	500	-	247	-	-	-
Aphanocapsa elachista	-	-	-	-	-	-	-	-	-
Aphanocapsa holsatica	-	-	-	-	-	-	-	-	-
Aphanocapsa planctonica	-	-	-	-	-	-	-	-	-
Aphanocapsa sp.	-	-	-	-	-	-	-	-	-
Aphanothece clathrata	-	-	-	-	-	-	-	-	-
Aphanothece elebens	-	-	-	-	-	-	-	-	-
Aphanothece paralleliformis	-	-	-	-	-	-	-	-	-
Aphanothece sp.	-	-	-	-	-	-	-	-	-
Chroococcus dispersus	111	-	-	-	-	-	-	-	-
Chroococcus sp.	-	-	-	-	-	-	-	-	-
Coelosphaerium subarcticum	-	-	-	-	-	-	-	-	-
Gloeocapsa sp.	-	-	-	-	-	-	-	-	-
Gloeothece rupestris	-	-	-	-	100	116	-	-	-
Merismopedia punctata	-	-	-	-	-	-	-	-	-
Merismopedia sp.	221	-	-	-	-	-	-	-	-
Rhabdoderma lineare	-	-	-	-	-	-	-	-	-
Synechococcus sp.	-	95	-	-	-	-	-	-	-
Woronichinia naegeliana	166	191	-	-	-	-	-	-	-
Woronichinia sp.	-	-	-	-	-	-	-	-	-
Nostocales									
Anabaena sp.	-	-	-	-	-	-	-	-	-
Anabaena sp. 2 ?	-	-	-	-	-	-	-	-	-
Oscillatoriales									
Leptolyngbya spp.	-	508	-	391	-	-	-	-	-
Pseudanabaena sp.	-	-	-	-	-	-	-	-	-
Xanthophyceae									
Heterococcales									
Ophiocytium sp.	-	-	-	-	-	-	-	-	-
Tetraedriella jovetti	-	-	-	-	-	-	-	-	-
TOTAL	**1,585**	**2,159**	**3,110**	**2,028**	**1,156**	**1,171**	**1,142**	**1,045**	**1,023**

(continued)

Table 3.5-4. Taxonomic Density Results for Phytoplankton at AEMP Lake Sites, 2014 (continued)

Lake	S3			Cujo			LdS1		
Date	30-Jul-14			7-Aug-14			8-Aug-14		
Replicate No.	1	2	3	1	2	3	1	2	3
Sample ID	6820.01-10	6820.01-11	6820.01-12	6820.01-13	6820.01-14	6820.01-15	6820.01-16	6820.01-17	6820.01-18
Species/Group (cells/mL)									
Bacillariophyceae									
Centrales									
Aulacoseira sp.	-	-	-	-	-	-	-	-	-
Cyclotella sp.	20	41	16	117	130	592	40	32	23
Rhizosolenia sp.	-	-	-	-	-	-	-	-	-
Pennales									
Achnanthes sp.	-	-	-	-	-	-	-	-	-
Achnanthidium sp.	-	-	-	73	106	235	12	12	11
Amphora sp.	-	-	-	-	-	-	-	-	-
Asterionella formosa	-	-	6	-	-	-	4	35	18
Cocconeis sp.	-	-	-	-	-	9	1	4	-
Cymbella sp.	-	-	-	-	3	-	1	2	-
Diatoma sp.	-	-	-	-	-	-	13	11	4
Fragilaria crotonensis	-	-	-	-	-	-	-	-	-
Fragilaria sp.	-	-	3	18	-	17	-	4	-
Gomphonema sp.	-	-	-	-	-	-	-	-	-
Navicula sp.	-	-	-	3	-	-	-	-	-
Nitzschia sp.	-	-	-	-	-	-	-	-	2
Surirella sp.	-	-	-	-	-	-	-	-	-
Synedra sp.	7	2	4	-	6	-	-	-	-
Tabellaria flocculosa	-	-	-	-	-	-	-	-	-
Tabellaria spp.	-	-	6	-	-	9	15	5	-
Chlorophyceae									
Chlorococcales									
Acutodesmus acutiformis	-	-	-	-	-	-	-	-	-
Ankistrodesmus falcatus	-	-	-	-	-	-	-	-	-
Botryococcus braunii	-	-	-	-	-	-	59	43	-
Botryococcus protuberans	-	-	-	-	-	-	-	-	-
Chlorella ellipsoidea	-	-	-	-	-	-	-	-	-
Chlorella vulgaris	35	56	7	-	-	453	32	18	39
Coelastrum microporum	-	-	-	15	-	104	6	-	-
Crucigenia fenestrata	-	-	-	-	-	-	-	-	-
Crucigenia tetrapedia	2	-	-	3	9	-	-	-	-
Crucigeniella irregularis	-	-	-	-	-	-	-	-	-
Crucigeniella rectangularis	-	-	-	-	-	-	4	-	-
Desmodesmus asymmetricus	-	-	-	-	-	-	-	-	-
Desmodesmus communis	-	-	-	-	-	-	-	-	-
Dictyosphaerium ehrenbergianum	-	-	-	-	-	-	-	-	-
Dictyosphaerium sp.	-	-	6	-	-	-	-	-	-
Kirchneriella sp.	-	-	-	-	-	-	-	-	-
Lagerheimia genevensis	-	-	-	-	-	-	3	4	-
Monoraphidium arcuatum	18	-	6	21	6	26	1	-	-
Monoraphidium contortum	11	2	6	53	50	226	-	-	-
Monoraphidium irregulare	-	-	-	-	-	-	-	-	-
Monoraphidium komarkovae	38	12	16	9	3	-	3	12	35
Monoraphidium minutum	-	-	-	-	-	-	-	-	-
Monoraphidium tortile	-	-	-	-	-	-	-	-	-
Oocystis borgei	-	-	-	-	-	-	-	-	-
Oocystis elliptica	-	-	-	-	-	-	-	-	-
Oocystis marssonii	-	-	-	-	-	-	-	-	-
Oocystis naegli	-	-	-	-	-	-	-	-	-
Oocystis solitaria	-	-	-	-	-	-	-	-	-
Oocystis sp.	-	-	-	-	-	-	-	-	-
Pediastrum boryanum	-	-	-	-	-	-	-	-	-
Quadrigula closterioides	-	-	-	-	-	-	-	-	-
Quadrigula sp.				-	-	-	-	-	-
Scenedesmus obtusus	-	-	-	-	-	-	-	-	-
Scenedesmus sp.	-	-	-	-	12	-	-	-	-
Stauridium tetras	-	-	-	-	-	-	-	-	-

(continued)

Table 3.5-4. Taxonomic Density Results for Phytoplankton at AEMP Lake Sites, 2014 (continued)

Lake	S3			Cujo			LdS1		
Date	30-Jul-14			7-Aug-14			8-Aug-14		
Replicate No.	1	2	3	1	2	3	1	2	3
Sample ID	6820.01-10	6820.01-11	6820.01-12	6820.01-13	6820.01-14	6820.01-15	6820.01-16	6820.01-17	6820.01-18
Species/Group (cells/mL)									
Chlorococcales (cont'd)									
Tetraedron caudatum	-	-	-	-	-	-	-	-	-
Tetraedron minimum	-	4	-	-	-	-	-	-	-
Tetraedron muticum	-	-	-	-	-	-	-	-	4
Tetraselmis cordiformis	-	-	-	-	-	-	-	-	-
Tetrastrum komarekii	-	-	-	-	-	-	-	-	-
Tetrastrum triangulare	-	-	-	-	-	-	-	4	2
Sphaeropleales									
Chlorotetraedron incus	-	-	-	-	-	-	-	-	-
Tetrasporales									
Elakatothrix gelatinosa	22	-	10	15	40	96	22	28	7
Elakatothrix sp.				-	-	-	-	-	-
Gloeocystis sp.	-	8	3	-	-	-	3	9	9
Volvocales									
Fusola viridis	-	-	-	-	-	-	-	-	-
Zygnematales									
Closterium sp.	-	-	-	-	-	-	-	-	-
Cosmarium angulosum	-	-	-	-	-	-	-	-	-
Cosmarium bioculatum	-	-	-	-	-	-	-	-	-
Cosmarium exiguum	-	-	-	-	-	-	-	-	-
Cosmarium formosulum	-	-	-	-	-	-	-	-	-
Cosmarium garrolense	-	-	-	-	-	-	-	-	-
Cosmarium minimum	-	-	-	-	-	-	-	-	-
Cosmarium sp.	2	-	10	-	-	9	3	2	-
Euastrum pulchellum	-	-	-	-	-	-	-	-	-
Mougeotia sp.	-	-	-	-	-	-	4	-	-
Roya sp.	-	-	-	-	-	-	-	-	-
Spondylosium sp.	-	-	-	-	-	-	-	21	16
Staurastrum sp.	-	-	-	-	-	-	1	-	-
Staurodesmus sp.	-	-	-	-	-	-	-	-	4
Staurodesmus triangularis	-	-	-	-	-	-	3	-	-
Staurodesmus triangularis var. subparallelus	-	-	-	-	-	-	-	-	-
Teilingia granulata	-	-	-	-	-	-	-	-	-
Xanthidium antilopaeum var. hebridarum	-	-	-	-	-	-	-	-	-
Xanthidium johnsonii	-	-	-	-	-	-	-	-	-
Xanthidium sp.	-	2	-	-	-	-	1	2	-
Zygnema sp.	-	-	-	9	-	-	-	-	-
Chrysophyceae									
Chromulinales									
Chrysocapsella planctonica	35	12	41	9	47	9	40	30	48
Synuropsis janei	-	-	1	3	-	-	-	-	-
Chrysococcales									
Chrysococcus rufescens	9	10	3	3	3	35	-	2	-
Chrysomonadales									
Dinobryon bavaricum	-	-	-	-	-	-	-	-	-
Dinobryon borgei	-	-	-	-	-	-	-	-	-
Dinobryon divergens	-	-	-	-	-	-	27	5	-
Dinobryon spp.	31	25	19	-	-	-	32	20	20
Mallomonas insignis	-	-	-	-	-	-	-	-	-
Mallomonas sp.	-	-	3	-	-	-	13	27	14
Pseudokephyrion ellipsoideum	4	50	29	-	-	-	1	7	7
Pseudokephyrion pseudospirale	7	-	-	-	-	-	-	-	-
Pseudokephyrion sp.	106	68	25	-	-	-	-	-	5
Hibberdiales									
Bitrichia chodatii	7	4	-	9	12	17	3	2	5
Ochromonadales									
Ochromonas sp.	250	184	156	226	199	348	35	23	34
Ochromonas spp.	-	12	-	3	6	-	3	5	2

(continued)

Table 3.5-4. Taxonomic Density Results for Phytoplankton at AEMP Lake Sites, 2014 (continued)

Lake	S3			Cujo			LdS1		
Date	30-Jul-14			7-Aug-14			8-Aug-14		
Replicate No.	1	2	3	1	2	3	1	2	3
Sample ID	6820.01-10	6820.01-11	6820.01-12	6820.01-13	6820.01-14	6820.01-15	6820.01-16	6820.01-17	6820.01-18
Species/Group (cells/mL)									
Cryptophyceae									
Cryptomonadales									
Cryptomonas erosa	-	-	-	-	-	-	-	-	-
Cryptomonas marssonii	-	-	-	-	-	-	-	-	-
Cryptomonas ovata	-	-	-	-	-	-	-	-	-
Cryptomonas sp.	-	-	-	-	-	-	-	-	-
Cryptomonas spp.	31	31	23	3	3	17	10	21	9
Komma caudata	31	64	48	302	320	505	161	199	206
Rhodomonas sp.	-	2	3	-	6	-	-	2	-
Dinophyceae									
Gymnodiniales									
Amphidinium sp.	-	-	-	-	-	-	-	-	-
Gymnodinium fuscum	-	-	-	-	-	-	1	-	-
Gymnodinium sp.	-	4	3	6	6	9	1	2	-
Gyrodinium helveticum	-	-	-	-	-	-	-	-	-
Peridiniales									
Peridinium inconspicuum	-	-	-	-	-	-	-	-	-
Peridinium sp.	-	6	-	-	3	-	6	14	9
Peridinium willei	-	-	-	-	-	-	-	-	-
Euglenophyceae									
Euglenales									
Trachelomonas sp.	-	2	3	-	-	-	3	2	-
Trachelomonas sp. 2 ?	-	-	-	-	-	-	-	-	-
Myxophyceae									
Chroococcales									
Aphanocapsa delicatissima	-	-	58	-	-	305	147	-	-
Aphanocapsa elachista	-	-	-	-	-	-	-	-	-
Aphanocapsa holsatica	-	-	-	-	-	-	-	-	-
Aphanocapsa planctonica	-	-	-	-	-	-	-	-	-
Aphanocapsa sp.	111	25	117	446	155	357	-	-	-
Aphanothece clathrata	-	-	-	-	-	-	-	-	-
Aphanothece elebens	-	-	-	-	-	-	-	-	-
Aphanothece paralleliformis	-	-	-	-	-	-	-	-	-
Aphanothece sp.	-	104	-	-	-	-	-	-	-
Chroococcus dispersus	-	-	-	-	-	-	-	-	-
Chroococcus sp.	-	-	-	-	-	-	12	-	-
Coelosphaerium subarcticum	-	50	-	410	130	801	-	-	-
Gloeocapsa sp.	-	-	-	-	-	-	12	-	-
Gloeothece rupestris	-	-	-	-	-	-	-	-	-
Merismopedia punctata	-	-	-			139	-	-	-
Merismopedia sp.	20	-	-	141	-	-	-	-	-
Rhabdoderma lineare	-	-	-	-	-	-	-	-	-
Synechococcus sp.	82	27	47	220	227	348	10	27	59
Woronichinia naegeliana	-	-	19	-	-	-	-	-	-
Woronichinia sp.	-	-	-	-	-	-	-	-	-
Nostocales									
Anabaena sp.	-	-	-	-	6	-	18	-	7
Anabaena sp. 2 ?	-	-	-	-	-	-	-	-	-
Oscillatoriales									
Leptolyngbya spp.	106	-	1	3	-	-	27	57	-
Pseudanabaena sp.	-	-	-	23	-	-	-	-	-
Xanthophyceae									
Heterococcales									
Ophiocytium sp.	-	-	-	-	-	-	1	-	2
Tetraedriella jovetti	-	-	-	-	-	-	-	-	-
TOTAL	**985**	**810**	**700**	**2,140**	**1,490**	**4,666**	**798**	**690**	**598**

(continued)

Table 3.5-4. Taxonomic Density Results for Phytoplankton at AEMP Lake Sites, 2014 (continued)

Lake	Fay Bay			Upper Exeter		
Date	1-Aug-14			10-Aug-14		
Replicate No.	1	2	3	1	2	3
Sample ID	6820.01-22	6820.01-23	6820.01-24	6820.01-19	6820.01-20	6820.01-21
Species/Group (cells/mL)						
Bacillariophyceae						
Centrales						
Aulacoseira sp.	-	-	-	4	-	-
Cyclotella sp.	89	269	231	22	21	20
Rhizosolenia sp.	-	-	-	-	-	-
Pennales						
Achnanthes sp.	-	-	-	-	-	-
Achnanthidium sp.	477	530	496	76	85	87
Amphora sp.	7	8	-	-	-	-
Asterionella formosa	-	-	-	-	2	-
Cocconeis sp.	30	-	-	-	-	-
Cymbella sp.	-	-	-	-	-	-
Diatoma sp.	-	-	11	-	-	-
Fragilaria crotonensis	-	-	-	-	-	-
Fragilaria sp.	-	-	6	2	-	-
Gomphonema sp.	-	-	-	-	-	-
Navicula sp.	-	-	6	-	-	-
Nitzschia sp.	-	-	-	-	2	-
Surirella sp.	-	-	-	-	-	2
Synedra sp.	-	-	-	-	-	2
Tabellaria flocculosa	-	-	-	-	-	-
Tabellaria spp.	-	-	-	-	-	-
Chlorophyceae						
Chlorococcales						
Acutodesmus acutiformis	-	-	-	-	-	-
Ankistrodesmus falcatus	-	-	-	-	-	-
Botryococcus braunii	223	-	-	279	61	136
Botryococcus protuberans	-	-	-	-	-	-
Chlorella ellipsoidea	-	-	-	-	-	-
Chlorella vulgaris	37	15	17	56	24	4
Coelastrum microporum	-	-	-	-	-	-
Crucigenia fenestrata	-	-	-	-	-	-
Crucigenia tetrapedia	15	31	28	2	5	4
Crucigeniella irregularis	-	-	-	-	-	18
Crucigeniella rectangularis	-	-	-	-	-	-
Desmodesmus asymmetricus	-	-	-	-	-	-
Desmodesmus communis	-	-	-	-	-	-
Dictyosphaerium ehrenbergianum	-	-	-	-	-	-
Dictyosphaerium sp.	-	-	-	-	-	-
Kirchneriella sp.	-	-	-	-	-	-
Lagerheimia genevensis	-	-	-	-	-	-
Monoraphidium arcuatum	22	-	-	-	-	-
Monoraphidium contortum	7	-	-	-	-	-
Monoraphidium irregulare	-	-	-	-	-	-
Monoraphidium komarkovae	-	-	-	2	2	18
Monoraphidium minutum	-	-	-	-	-	-
Monoraphidium tortile	-	-	-	-	-	-
Oocystis borgei	-	-	-	-	-	-
Oocystis elliptica	-	-	-	-	-	-
Oocystis marssonii	-	-	-	-	-	-
Oocystis naegli	-	-	-	-	-	-
Oocystis solitaria	-	-	-	-	-	-
Oocystis sp.	45	61	66	-	-	22
Pediastrum boryanum	-	-	-	-	-	-
Quadrigula closterioides	-	-	-	-	-	-
Quadrigula sp.	-	-	-	9	3	-
Scenedesmus obtusus	-	-	-	-	-	-
Scenedesmus sp.	60	177	66	-	7	-
Stauridium tetras	-	-	-	-	2	-

(continued)

Table 3.5-4. Taxonomic Density Results for Phytoplankton at AEMP Lake Sites, 2014 (continued)

Lake	Fay Bay			Upper Exeter		
Date	1-Aug-14			10-Aug-14		
Replicate No.	1	2	3	1	2	3
Sample ID	6820.01-22	6820.01-23	6820.01-24	6820.01-19	6820.01-20	6820.01-21
Species/Group (cells/mL)						
Chlorococcales (cont'd)						
Tetraedron caudatum	-	-	-	-	-	-
Tetraedron minimum	-	-	-	-	-	-
Tetraedron muticum	-	-	-	-	-	-
Tetraselmis cordiformis	-	-	-	-	-	-
Tetrastrum komarekii	-	-	-	-	-	-
Tetrastrum triangulare	-	-	-	-	-	-
Sphaeropleales						
Chlorotetraedron incus	-	-	-	-	-	-
Tetrasporales						
Elakatothrix gelatinosa	-	31	17	-	5	-
Elakatothrix sp.	15	-	-	16	-	24
Gloeocystis sp.	45	-	17	9	2	13
Volvocales						
Fusola viridis	-	-	-	-	-	-
Zygnematales						
Closterium sp.	-	-	-	-	-	-
Cosmarium angulosum	-	-	-	-	-	-
Cosmarium bioculatum	-	-	-	-	-	-
Cosmarium exiguum	-	-	-	-	-	-
Cosmarium formosulum	-	-	-	-	-	-
Cosmarium garrolense	-	8	6	-	-	-
Cosmarium minimum	-	-	11	-	-	-
Cosmarium sp.	22	8	6	-	-	-
Euastrum pulchellum	-	-	-	2	-	-
Mougeotia sp.	-	-	-	-	2	-
Roya sp.	-	-	-	-	-	-
Spondylosium sp.	-	-	-	7	-	-
Staurastrum sp.	-	-	-	-	-	-
Staurodesmus sp.	-	-	-	-	2	-
Staurodesmus triangularis	-	-	-	-	-	-
Staurodesmus triangularis var. subparallelus	-	-	-	-	-	-
Teilingia granulata	-	-	-	-	-	-
Xanthidium antilopaeum var. hebridarum	-	-	-	-	-	-
Xanthidium johnsonii	-	-	-	-	-	-
Xanthidium sp.	-	-	-	-	-	-
Zygnema sp.	-	-	-	-	-	-
Chrysophyceae						
Chromulinales						
Chrysocapsella planctonica	89	361	226	136	36	62
Synuropsis janei	-	-	-	11	12	22
Chrysococcales						
Chrysococcus rufescens	7	-	6	-	-	-
Chrysomonadales						
Dinobryon bavaricum	-	-	-	-	-	-
Dinobryon borgei	-	-	-	-	-	-
Dinobryon divergens	37	-	22	85	87	225
Dinobryon spp.	22	15	50	25	12	22
Mallomonas insignis	-	-	-	-	-	-
Mallomonas sp.	-	8	17	4	9	11
Pseudokephyrion ellipsoideum				9	2	4
Pseudokephyrion pseudospirale	-	-	-	-	-	-
Pseudokephyrion sp.	-	-	6	4	2	9
Hibberdiales						
Bitrichia chodatii	7	31	-	4	3	4
Ochromonadales						
Ochromonas sp.	45	46	83	58	35	56
Ochromonas spp.	-	8	-	4	3	-

(continued)

Table 3.5-4. Taxonomic Density Results for Phytoplankton at AEMP Lake Sites, 2014 (completed)

Lake	Fay Bay			Upper Exeter		
Date	1-Aug-14			10-Aug-14		
Replicate No.	1	2	3	1	2	3
Sample ID	6820.01-22	6820.01-23	6820.01-24	6820.01-19	6820.01-20	6820.01-21
Species/Group (cells/mL)						
Cryptophyceae						
Cryptomonadales						
Cryptomonas erosa	-	-	-	-	-	-
Cryptomonas marssonii	-	-	-	-	-	-
Cryptomonas ovata	-	-	-	-	-	-
Cryptomonas sp.	-	-	-	-	-	-
Cryptomonas spp.	22	15	39	51	55	69
Komma caudata	223	238	138	203	140	171
Rhodomonas sp.	-	-	-	2	-	-
Dinophyceae						
Gymnodiniales						
Amphidinium sp.	-	-	-	-	-	-
Gymnodinium fuscum	-	-	-	-	-	-
Gymnodinium sp.	7	8	11	4	3	7
Gyrodinium helveticum	-	-	-	-	-	-
Peridiniales						
Peridinium inconspicuum						
Peridinium sp.	15	15	11	4	2	16
Peridinium willei	-	-	-	-	-	-
Euglenophyceae						
Euglenales						
Trachelomonas sp.	-	-	-	7	-	-
Trachelomonas sp. 2 ?	-	-	-	-	-	-
Myxophyceae						
Chroococcales						
Aphanocapsa delicatissima	-	2,151	-	78	-	-
Aphanocapsa elachista	-	-	-	-	-	-
Aphanocapsa holsatica	-	-	-	-	-	-
Aphanocapsa planctonica	-	-	-	-	-	-
Aphanocapsa sp.	14,683	13,375	3,256	424	312	67
Aphanothece clathrata	-	-	-	-	-	-
Aphanothece elebens	-	-	-	-	-	-
Aphanothece paralleliformis		230	165	-	-	-
Aphanothece sp.	-	-	-	-	-	-
Chroococcus dispersus	-	-	-	-	-	-
Chroococcus sp.	-	-	-	-	-	27
Coelosphaerium subarcticum	-	-	-	-	78	-
Gloeocapsa sp.	-	-	-	-	-	-
Gloeothece rupestris	-	-	-	-	-	-
Merismopedia punctata	2,146	2,120	1,196	312	213	153
Merismopedia sp.	-	-	-	143	-	-
Rhabdoderma lineare	-	46	-	-	-	-
Synechococcus sp.	82	131	28	22	26	11
Woronichinia naegeliana	-	-	-	-	-	-
Woronichinia sp.	-	-	-	-	-	-
Nostocales						
Anabaena sp.	298	215	83	16	49	22
Anabaena sp. 2 ?	-	169	-	-	-	-
Oscillatoriales						
Leptolyngbya spp.	507	-	-	-	-	-
Pseudanabaena sp.	-	-	-	-	-	-
Xanthophyceae						
Heterococcales						
Ophiocytium sp.	-	-	-	-	-	-
Tetraedriella jovetti	-	-	-	-	-	-
TOTAL	**19,287**	**20,320**	**6,314**	**2,095**	**1,303**	**1,310**

Note:

Taxonomic identification by EcoAnalysts Inc.

Table 3.5-5. Phytoplankton Taxonomy QA/QC Percent Similarity Results for AEMP Lake Samples, 2014

Lake		Leslie		Nema		S3		Upper Exeter		Grizzly	
Date		31-Jul-14		2-Aug-14		30-Jul-14		10-Aug-14		10-Aug-14	
Replicate No.		3		2		2		2		3	
Sample ID		6820.02-09		6820.02-14		6820.01-11		6820.01-20		6820.01-06	
Taxonomist		A	B	A	B	A	B	A	B	A	B
Relative Percent Difference		37.52		18.18		37.29		74.77		26.09	
Jaccard's Similarity Index		0.59		0.33		0.47		0.46		0.55	
Species/Group (cells/mL)											
Bacillariophyceae											
Centrales	*Cyclotella sp.*	196.37	132.65	285.79	230.22	33.14	29.83	18.84	8.97	22.54	1.58
	Rhizosolenia sp.	-	-	-	-	-	-	-	-	2.05	0.00
Pennales	*Achnanthes sp.*	-	-	6.35	0.00	-	-	-	-	-	-
	Achnanthidium sp.	63.64	42.15	0.00	42.34	-	-	83.94	50.83	6.15	0.00
	Asterionella formosa	-	-	-	-	0.00	4.26	1.71	1.99	-	-
	Cymbella sp.	1.82	1.24	-	-	-	-	-	-	-	-
	Diatoma sp.	14.55	9.92	19.05	7.94	0.00	7.10	-	-	-	-
	Fragilaria sp.	0.00	2.48	19.05	15.88	-	-	-	-	-	-
	Navicula sp.	9.09	7.44	0.00	2.65	-	-	-	-	-	-
	Nitzschia sp.	1.82	1.24	0.00	2.65	-	-	1.71	1.00	0.00	3.15
	Synedra sp.	-	-	-	-	2.07	4.26	-	-	2.05	4.73
	Tabellaria sp.	-	-	-	-	-	-	-	-	2.05	0.00
Chlorophyceae											
Chlorococcales	*Acutodesmus acutiformis*	-	-	6.35	0.00	-	-	-	-	-	-
	Ankistrodesmus falcatus	-	-	15.88	0.00	0.00	1.42	-	-	-	-
	Botryococcus braunii	-	-	-	-	-	-	3.43	0.00	-	-
	Chlorella ellipsoidea	-	-	19.05	5.29	-	-	23.98	12.96	-	-
	Chlorella vulgaris	9.09	11.16	82.56	55.57	55.92	44.03	-	-	-	-
	Coelastrum microporum	3.64	1.24	3.18	0.00	-	-	-	-	-	-
	Crucigenia fenestrata	-	-	0.00	7.94	-	-	-	-	-	-
	Crucigenia tetrapedia	-	-	-	-	-	-	5.14	1.00	-	-
	Crucigeniella irregularis	-	-	3.18	0.00	-	-	-	-	-	-
	Desmodesmus communis	-	-	3.18	0.00	-	-	-	-	-	-
	Desmodesmus sp.	0.00	1.24	-	-	-	-	-	-	-	-
	Kirchneriella sp.	-	-	-	-	0.00	2.84	0.00	1.00	4.10	0.00
	Monoraphidium contortum	-	-	0.00	5.29	2.07	5.68	-	-	2.05	1.58
	Monoraphidium irregulare	-	-	0.00	5.29			-	-	-	-
	Monoraphidium komarkovae	-	-	0.00	7.94	12.43	9.94	1.71	0.00	6.15	3.15
	Monoraphidium minutum	-	-	82.56	0.00	0.00	5.68	-	-	-	-
	Monoraphidium tortile	-	-	15.88	15.88	-	-	0.00	1.99	-	-
	Oocystis naegli	34.55	0.00	-	-	-	-	-	-	-	-
	Oocystis parva	0.00	16.12	0.00	5.29	-	-	-	-	-	-
	Oocystis solitaria	7.27	7.44	3.18	5.29	-	-	-	-	-	-
	Oocystis sp.	0.00	4.96	6.35	0.00	-	-	-	-	0.00	6.30
	Quadrigula closterioides	-	-	-	-	-	-	-	-	0.00	4.73
	Quadrigula sp.	0.00	1.24	-	-	-	-	1.71	2.99	-	-
	Pediastrum boryanum	-	-	3.18	0.00	-	-	-	-	-	-
	Scenedesmus ellipticus	0.00	1.24	-	-	-	-	-	-	-	-
	Scenedesmus obtusus	0.00	1.24	3.18	0.00	-	-	-	-	-	-
	Scenedesmus sp.	5.45	0.00	0.00	21.17	-	-	1.71	1.00	-	-
	Stauridium tetras	-	-	-	-	-	-	1.71	0.00	-	-
	Tetraedron caudatum	-	-	6.35	0.00	0.00	1.42	-	-	-	-
	Tetraedron minimum	-	-	0.00	5.29	4.14	0.00	-	-	-	-
	Tetraselmis cordiformis	3.64	3.72	3.18	7.94	-	-	-	-	-	-
	Tetrastrum komarekii	47.27	26.03	-	-	-	-	0.00	3.99	-	-
Tetrasporales	*Elakatothrix gelatinosa*	30.91	7.44	6.35	21.17	0.00	4.26	3.43	1.99	18.44	12.61
	Gloeocystis sp.	-	-	0.00	10.58	8.29	0.00	1.71	0.00	-	-
Volvocales	*Fusola viridis*	47.27	42.15	-	-	-	-	0.00	4.98	-	-

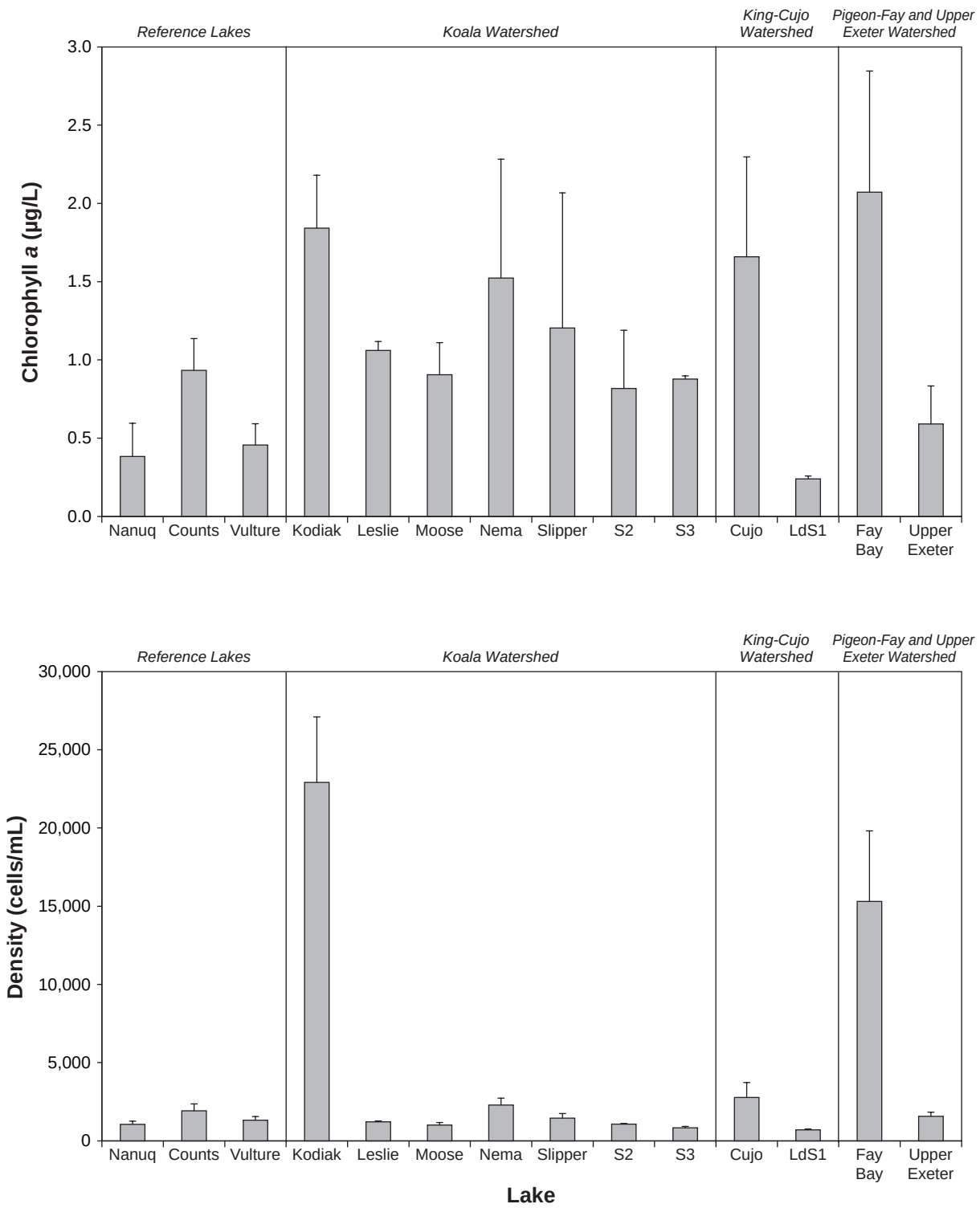
(continued)

Table 3.5-5. Phytoplankton Taxonomy QA/QC Percent Similarity Results for AEMP Lake Samples, 2014 (completed)

Lake		Leslie		Nema		S3		Upper Exeter		Grizzly	
Date		31-Jul-14		2-Aug-14		30-Jul-14		10-Aug-14		10-Aug-14	
Replicate No.		3		2		2		2		3	
Sample ID		6820.02-09		6820.02-14		6820.01-11		6820.01-20		6820.01-06	
Taxonomist		A	B	A	B	A	B	A	B	A	B
Relative Percent Difference		0.59		0.33		0.47		0.46		0.55	
Jaccard's Similarity Index		37.52		18.18		37.29		74.77		26.09	
Species/Group (cells/mL)											
Zygnematales	*Cosmarium bioculatum*	-	-	12.70	0.00	-	-	-	-	-	-
	Cosmarium sp.	1.82	2.48	0.00	13.23	-	-	-	-	-	-
	Mougeotia sp.	-	-	-	-	-	-	1.71	0.00	-	-
	Staurodesmus sp.	-	-	-	-	-	-	1.71	0.00	0.00	3.15
	Staurodesmus triangularis	-	-	-	-	-	-	0.00	1.00	-	-
	Staurodesmus triangularis var. subparallelus	-	-	-	-	-	-	0.00	1.00	-	-
	Teilingia granulata	-	-	-	-	-	-	0.00	2.99	-	-
	Xanthidium sp.	-	-	15.88	10.58	2.07	0.00	-	-	-	-
Chrysophyceae											
Chromulinales	*Chrysocapsella planctonica*	20.00	3.72	12.70	10.58	4.14	4.26	15.42	10.96	22.54	11.03
Chrysococcales	*Chrysococcus rufescens*	-	-	212.76	150.83	10.36	0.00	-	-	20.49	9.46
	Chrysococcus sp.	-	-	-	-	0.00	9.94	-	-	-	-
	Dinobryon spp.	-	-	-	-	24.86	21.30	-	-	14.34	20.49
	Synuropsis janei	-	-	-	-	-	-	11.99	0.00	-	-
Chrysomonadales	*Dinobryon divergens*	-	-	-	-	-	-	11.99	23.92	-	-
	Dinobryon spp.	-	-	-	-	-	-	11.99	7.97	-	-
	Mallomonas sp.	-	-	-	-	-	-	8.57	0.00	2.05	0.00
	Pseudokephyrion ellipsoideum	-	-	3.18	13.23	49.71	38.35	1.71	0.00	-	-
	Pseudokephyrion sp.	-	-	3.18	0.00	68.35	51.13	1.71	0.00	-	-
Hibberdiales	*Bitrichia chodatii*	0.00	3.72	0.00	5.29	4.14	4.26	3.43	0.00	43.02	25.21
Ochromonadales	*Ochromonas sp.*	-	-	-	-	196.77	113.62	37.69	25.91	-	-
	Ochromonas spp.	18.18	7.44	9.53	0.00	-	-	-	-	241.74	215.90
Cryptophyceae											
Cryptomonadales	*Cryptomonas marssonii*	-	-	3.18	0.00	-	-	-	-	-	-
	Cryptomonas ovata	-	-	3.18	0.00	-	-	-	-	-	-
	Cryptomonas sp.	9.09	9.92	-	-	-	-	-	-	-	-
	Cryptomonas spp.	-	-	0.00	18.52	31.07	24.15	54.82	24.92	8.19	23.64
	Komma caudata	9.09	7.44	6.35	5.29	64.21	29.83	138.76	87.71	20.49	26.79
	Rhodomonas sp.	-	-	-	-	2.07	0.00	-	-	-	-
Dinophyceae											
Gymnodiniales	*Amphidinium sp.*	-	-	-	-	0.00	1.42	-	-	0.00	3.15
	Gymnodinium sp.	-	-	0.00	18.52	4.14	4.26	3.43	2.99	-	-
Peridiniales	*Peridinium sp.*	3.64	1.24	0.00	2.65	6.21	1.42	1.71	0.00	4.10	0.00
Myxophyceae											
Chroococcales	*Aphanocapsa delicatissima*	0.00	1.24	0.00	2.65	-	-	-	-	-	-
	Aphanocapsa sp.	-	-	-	-	2.07	1.42	5.14	1.99	63.51	44.13
	Aphanothece sp.	-	-	-	-	2.07	0.00	-	-	26.63	11.03
	Coelosphaerium subarcticum	-	-	-	-	2.07	0.00	1.71	0.00	-	-
	Coelosphaerium sp.	0.00	1.24	-	-	-	-	-	-	-	-
	Merismopedia punctata	-	-	0.00	5.29	-	-	8.57	0.00	-	-
	Merismopedia sp.	-	-	-	-	-	-	0.00	6.98	61.46	37.82
	Rhabdoderma lineare	-	-	-	-	-	-	-	-	8.19	0.00
	Synechococcus sp.	0.00	8.68	47.63	34.40	26.93	0.00	25.70	8.97	-	-
	Woronichinia naegeliana	1.82	0.00	3.18	2.65	-	-	-	-	0.00	1.58
Nostocales	*Anabaena sp.*	-	-	-	-	-	-	15.42	11.96	-	-
Oscillatoriales	*Leptolyngbya spp.*	7.27	4.96	25.40	18.52	-	-	-	-	12.29	1.58
Euglenophyceae		-	-	-	-	-	-	-	-	-	-
Euglenales	*Trachelomonas sp.*	-	-	-	-	2.07	0.00	-	-	-	-

Figure 3.5-1

Average Chlorophyll *a* Concentrations and Phytoplankton Density at AEMP Lake Sites, 2014



Note: Error bars represent the standard error of the mean.

Figure 3.5-2a

Relative Densities of Phytoplankton Taxa at AEMP Lake Sites, 2014

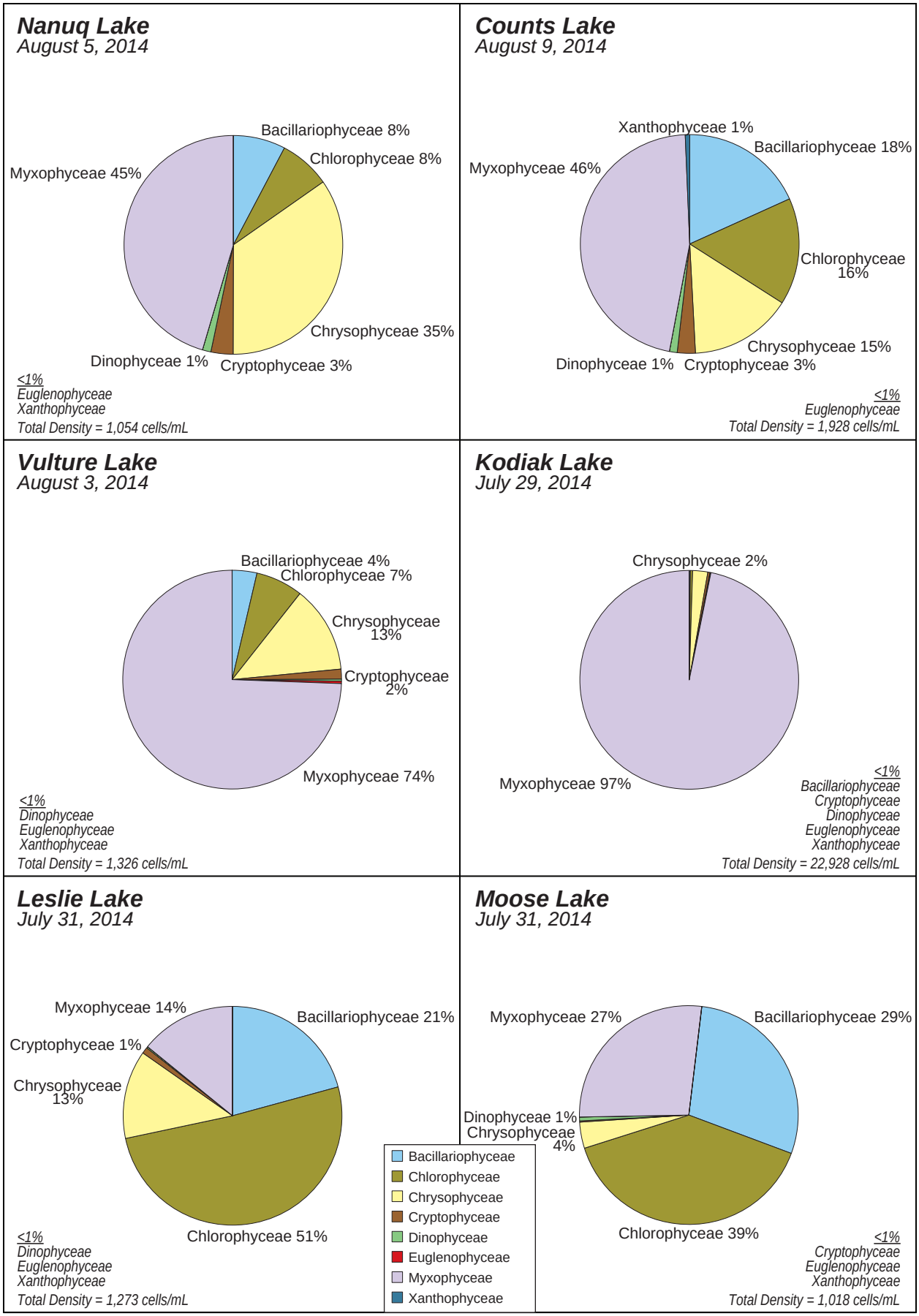


Figure 3.5-2b

Relative Densities of Phytoplankton Taxa at AEMP Lake Sites, 2014

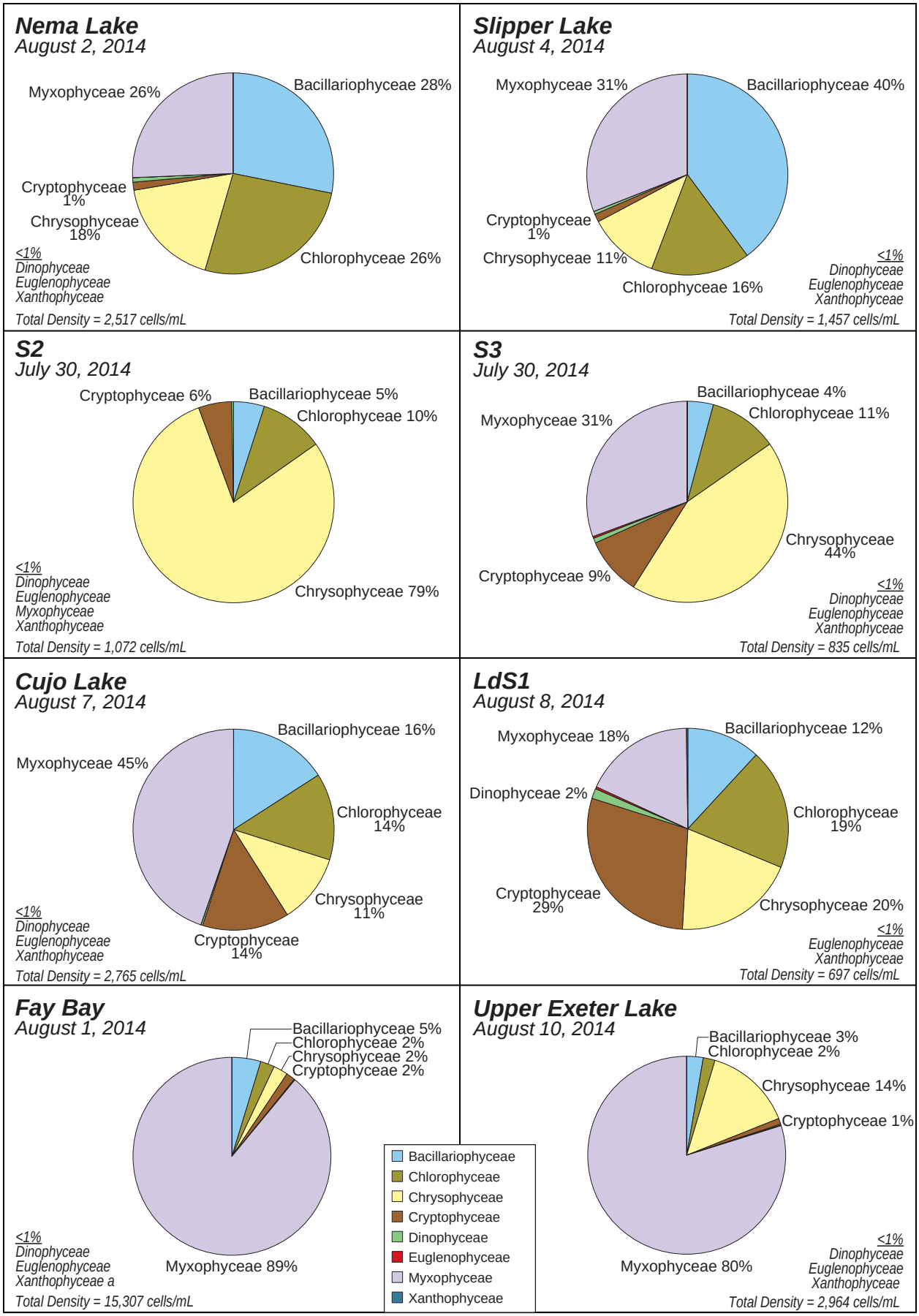
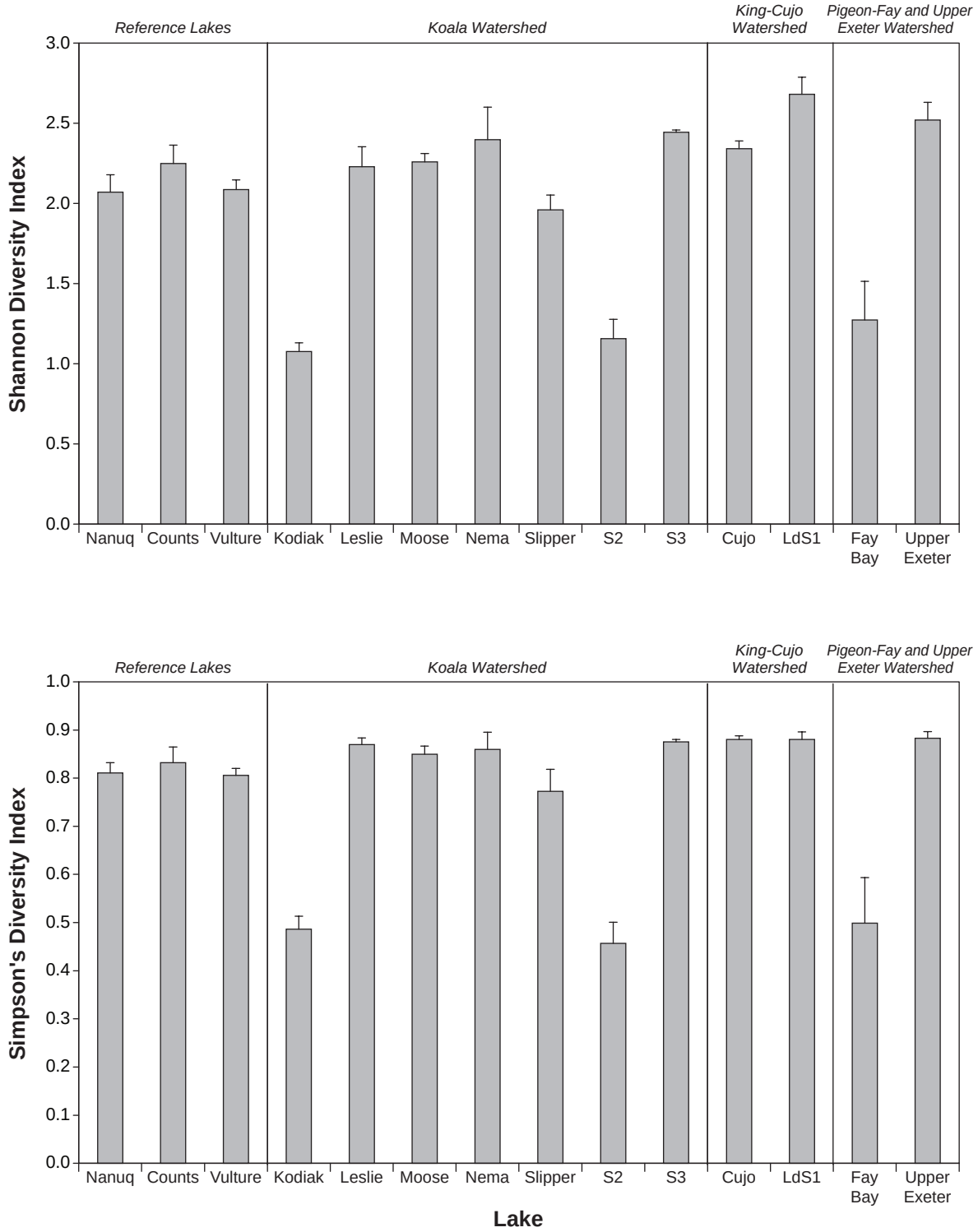


Figure 3.5-3

Average Diversity Indices for Phytoplankton at AEMP Lake Sites, 2014



Note: Error bars represent the standard error of the mean.

3.6 ZOOPLANKTON

3.6.1 Zooplankton Biomass, Density and Community Composition

Zooplankton samples were collected from six lakes within the Koala Watershed: Vulture (internal reference), Kodiak, Leslie, Moose, Nema, and Slipper, two sites within Lac de Gras (S2 and S3), one lake (Cujo) within the King-Cujo Watershed, one site within Lac du Sauvage (LdS1) and two external reference lakes (Nanuq and Counts).

Zooplankton biomass and density, including relative densities of the major taxa groups were calculated for each of the AEMP lakes (Table 3.6-1; Figures 3.6-1 and 3.6-2). In addition, the dominant zooplankton taxa (percent community composition > 5%) were identified for each lake (Table 3.6-2). Genus richness, dominance, and diversity were calculated and are presented in Table 3.6-3 and Figure 3.6-3. Results of the taxonomic analysis for each replicate sample are presented in Table 3.6-4.

Average zooplankton biomass was greatest in Lac du Sauvage (LdS1) and Counts Lake and lowest in Vulture Lake and Lac de Gras (S3; average biomass range: 50.9 mg dry weight/m^3 to 304.4 mg dry weight/m^3; Figure 3.6-1). Biomass varied among the reference lakes, as well as between and within the watersheds with no clear spatial trends. Within the Koala Watershed, Slipper and Leslie lakes had the greatest zooplankton biomass (averages of 193.9 mg dry weight/m^3 and 182.7 mg dry weight/m^3, respectively). Zooplankton biomass in the King-Cujo Watershed increased from Cujo Lake to Lac du Sauvage (LdS1; Figure 3.6-1).

Average zooplankton density at the monitored and reference lakes ranged from 30,683 organisms/m^3 at Nema Lake to 112,912 organisms/m^3 at Lac de Gras (S2). At the reference lakes, zooplankton densities showed similar patterns to zooplankton biomass (Figure 3.6-1). Higher zooplankton densities (with relatively low biomass) were observed in Kodiak Lake and S2, which may be explained by the high relative abundance of small taxa such as Copepoda nauplii in Kodiak Lake and rotifers, in particular *Conochilus unicornis,* at S2 in Lac de Gras (Figure 3.6-2 and Table 3.6-2).

Collectively, Copepoda nauplii and copepodites (Calanoida and Cyclopoida) were the most dominant taxonomic groups at most lakes (excluding Lac de Gras (S2 and S3) and Lac du Sauvage), representing between 50% (Vulture Lake) and 95% (Moose and Nema lakes) of the dominant zooplankton taxa (Figure 3.6-2). Cladoceran density was generally low among lakes (< 5%) except at S2 (8%), Cujo Lake (8%), and LdS1 (55%; Figure 3.6-2). *Holopedium gibberum* was the most prevalent cladoceran species at S2, *Eubosmina longipsina* was most prevalent at Cujo Lake, and *Daphnia longiremis* and *Holopedium gibberum* were most prevalent at LdS1 (Table 3.6-2). Cladocerans are almost always favoured in competition, due to higher clearance rates and the size efficiency hypothesis (Fussmann 1996; Wetzel 2001). Copepods also often outcompete other zooplankton for these same reasons, in particular cyclopoids which can ingest larger prey sizes than calanoids. Thus when system productivity is high, cyclopoids and cladocerans are often more abundant than calanoid copepods.

The rotifers were strongly represented at each of the reference lakes, Kodiak and Slipper lakes, Lac de Gras (S2 and S3), Cujo Lake, and Lac du Sauvage (Figure 3.6-2). Of the rotifer species, *Kellicottia longispina* and *Conochilus unicornis* were co-domininat at each of these lakes, except at Slipper and Cujo lakes and Lac du Sauvage where only *K. longispina* was dominant (Table 3.6-2). Rotifers made up less than 5% of the relative zooplankton density in Leslie, Moose and Nema lakes (Figure 3.6-2). Particularly high rotifer abundance at the Lac de Gras sites (S2 = 85% and S3 = 77%) may be related to the phytoplankton community composition of these lakes. These lakes were dominated by golden algae, blue-green algae, and green algae (see Section 3.5). The dominant golden algae genera present (*Ochromonas*) were likely edible to zooplankton (see Table 3.5-2). The dominant blue-green algae were primarily colonial or filamentous and therefore could possibly be inedible despite individual cell sizes being in the edible range (see Table 3.5-2). It is possible that some rotifers may be able to rupture larger colonies and ingest the smaller particles within (Wetzel 2001), which may give rotifers a competitive advantage in lakes dominated by typically inedible algal species (i.e., species that are colonial or filamentous). Alternatively, colonial and filamentous blue-green algae may interfere with cladoceran feeding which would also favour rotifers. Other factors including predation, nauplii density, food distribution and water temperature can influence zooplankton populations.

3.6.2 Zooplankton Richness and Diversity

Average zooplankton genus richness was highest at LdS1 (13 genera/sample) and lowest at Cujo Lake (7 genera/sample; Table 3.6-3). The average number of genera (G) that contributed 90% of the zooplankton density ranged from two genera (Nanuq Lake and S3) to five genera (Nema Lake and LdS1). Generally, the spatial trends in Shannon and Simpson's diversity indices mirrored one another (Figure 3.6-3). Zooplankton diversity was lowest in Cujo Lake and highest in Lac du Sauvage but overall diversity was moderate to low.

3.6.3 Zooplankton QA/QC

QC of taxonomic identification was assessed on approximately 10% of zooplankton samples (four of the 36 samples); results are included in Table 3.6-5. The percent similarities between the original and QC counts were similar between replicates, ranging from 78% to 96%. When discrepancies were observed, appropriate adjustments were made to the dataset following a discussion amongst qualified taxonomists.

Supporting Tables and Figures

Table 3.6-1. Zooplankton Biomass and Density at AEMP Lake Sites, 2014

Lake	Date	Replicate No.	Biomass (mg dry weight/m³)	Density (organisms/m³)
Nanuq	5-Aug-14	1	69.0	72,026.4
		2	67.3	57,001.8
		3	60.3	56,060.3
		Mean	**65.5**	**61,696.2**
		SE	**2.7**	**5,172.2**
Counts	9-Aug-14	1	256.2	97,300.5
		2	230.1	97,519.7
		3	288.0	92,795.7
		Mean	**258.1**	**95,872.0**
		SE	**16.8**	**1,539.4**
Vulture	8-Aug-14	1	47.0	47,166.0
		2	49.0	56,180.1
		3	56.7	39,781.8
		Mean	**50.9**	**47,709.3**
		SE	**3.0**	**4,741.6**
Kodiak	29-Jul-14	1	87.7	111,964.3
		2	96.5	77,552.3
		3	101.4	89,850.9
		Mean	**95.2**	**93,122.5**
		SE	**4.0**	**10,067.7**
Leslie	31-Jul-14	1	149.4	48,624.5
		2	206.0	39,076.1
		3	192.8	56,053.7
		Mean	**182.7**	**47,918.1**
		SE	**17.1**	**4,913.7**
Moose	31-Jul-14	1	105.5	60,048.9
		2	90.7	38,494.5
		3	97.5	48,786.7
		Mean	**97.9**	**49,110.0**
		SE	**4.3**	**6,224.3**

(continued)

Table 3.6-1. Zooplankton Biomass and Density at AEMP Lake Sites, 2014 (completed)

Lake	Date	Replicate No.	Biomass (mg dry weight/m³)	Density (organisms/m³)
Nema	2-Aug-14	1	95.7	29,941.1
		2	130.6	30,002.0
		3	123.7	32,105.3
		Mean	**116.7**	**30,682.8**
		SE	**10.7**	**711.5**
Slipper	4-Aug-14	1	212.3	52,608.8
		2	183.4	41,136.6
		3	185.9	35,407.8
		Mean	**193.9**	**43,051.1**
		SE	**9.2**	**5,056.9**
S2	30-Jul-14	1	96.7	153,270.0
		2	133.0	81,580.7
		3	78.3	103,886.1
		Mean	**102.6**	**112,912.3**
		SE	**16.1**	**21,181.3**
S3	30-Jul-14	1	63.6	36,932.0
		2	67.6	56,782.1
		3	74.4	37,325.5
		Mean	**68.5**	**43,679.8**
		SE	**3.1**	**6,552.1**
Cujo	7-Aug-14	1	231.0	111,869.1
		2	226.8	85,850.6
		3	226.5	111,697.4
		Mean	**228.1**	**103,139.0**
		SE	**1.5**	**8,644.3**
LdS1	8-Aug-14	1	371.5	124,298.9
		2	236.6	98,464.3
		3	305.0	101,990.3
		Mean	**304.4**	**108,251.2**
		SE	**38.9**	**8,088.2**

SE = standard error of the mean

Table 3.6-2. Dominant Zooplankton Taxa at AEMP Lake Sites, 2014

	Nanuq	Counts	Vulture	Kodiak	Leslie	Moose	Nema	Slipper	S2	S3	Cujo	LdS1
	5-Aug	9-Aug	8-Aug	29-Jul	31-Jul	31-Jul	2-Aug	4-Aug	30-Jul	30-Jul	7-Aug	8-Aug
Rotifera												
Conochilus unicornis	18.9%	13.7%	23.6%	11.3%	-	-	-	-	65.5%	34.2%	-	-
Kellicottia longispina	15.8%	18.2%	24.5%	9.6%	-	-	-	12.5%	19.5%	42.6%	34.4%	24.6%
Cladocera												
Daphnia longiremis	-	-	-	-	-	-	-	-	-	-	-	32.2%
Eubosmina longispina	-	-	-	-	-	-	-	-	-	-	7.6%	-
Holopedium gibberum	-	-	-	-	-	-	-	-	6.2%	-	-	20.3%
Copepoda												
Calanoida - copepodites	15.6%	31.5%		9.2%	15.9%	9.0%	33.6%	28.0%		10.1%	20.5%	
Leptodiaptomus pribilofensis	-	5.0%			5.7%		7.0%					
Leptodiaptomus sicilis	-											
Cyclopoida - copepodites	33.0%		34.5%	8.9%	9.6%			27.4%		8.7%		5.5%
Copepoda - nauplii	15.1%	30.3%	8.7%	57.9%	62.5%	78.1%	52.4%	25.4%			30.5%	
TOTAL	**98.4%**	**98.6%**	**91.3%**	**96.9%**	**93.7%**	**87.1%**	**93.0%**	**93.3%**	**91.2%**	**95.5%**	**93.0%**	**82.6%**

Notes:
Values represent relative density of taxa when taxa contributed at least 5% of the zooplankton community.
Dashes (-) represent relative density of taxa that was less than 5%.

Table 3.6-3. Zooplankton Taxonomic Richness and Diversity Indices at AEMP Lake Sites, 2014

Lake	Date	Replicate No.	Genus Richness	G (90%)	Max Dominance (%)	Shannon Diversity Index	Simpson Diversity Index
Nanuq	5-Aug-14	1	10	2	58	0.96	0.54
		2	10	2	51	0.92	0.54
		3	8	2	50	0.77	0.51
		Mean	**9**	**2.0**	**53.00**	**0.88**	**0.53**
		SE	**0.7**	**0.0**	**2.52**	**0.06**	**0.01**
Counts	9-Aug-14	1	10	3	46	1.16	0.63
		2	9	3	44	1.15	0.63
		3	9	3	13	1.02	0.52
		Mean	**9**	**3.0**	**34.33**	**1.11**	**0.59**
		SE	**0.3**	**0.0**	**10.68**	**0.04**	**0.04**
Vulture	8-Aug-14	1	9	3	57	1.09	0.57
		2	9	2	57	1.02	0.55
		3	10	5	45	1.21	0.63
		Mean	**9**	**3.3**	**53.00**	**1.11**	**0.58**
		SE	**0.3**	**0.9**	**4.00**	**0.05**	**0.02**
Kodiak	29-Jul-14	1	9	3	44	1.16	0.62
		2	9	3	43	1.20	0.63
		3	9	3	55	1.06	0.58
		Mean	**9**	**3.0**	**47.33**	**1.14**	**0.61**
		SE	**0.0**	**0.0**	**3.84**	**0.04**	**0.02**
Leslie	31-Jul-14	1	11	3	56	1.23	0.62
		2	13	4	44	1.43	0.70
		3	12	4	45	1.37	0.68
		Mean	**12**	**3.7**	**48.33**	**1.35**	**0.67**
		SE	**0.6**	**0.3**	**3.84**	**0.06**	**0.02**
Moose	31-Jul-14	1	10	4	39	1.40	0.68
		2	11	5	43	1.49	0.70
		3	12	5	37	1.57	0.71
		Mean	**11**	**4.7**	**39.67**	**1.49**	**0.70**
		SE	**0.6**	**0.3**	**1.76**	**0.05**	**0.01**
Nema	2-Aug-14	1	12	5	64	1.31	0.57
		2	11	5	50	1.48	0.68
		3	12	5	49	1.46	0.67
		Mean	**12**	**5.0**	**54.33**	**1.41**	**0.64**
		SE	**0.3**	**0.0**	**4.84**	**0.05**	**0.04**

(continued)

Table 3.6-3. Zooplankton Taxonomic Richness and Diversity Indices at AEMP Lake Sites, 2014 (completed)

Lake	Date	Replicate No.	Genus Richness	G (90%)	Max Dominance (%)	Shannon Diversity Index	Simpson Diversity Index
Slipper	4-Aug-14	1	11	4	67	1.15	0.52
		2	10	4	68	1.16	0.51
		3	11	4	57	1.22	0.59
		Mean	**11**	**4.0**	**64.00**	**1.18**	**0.54**
		SE	**0.3**	**0.0**	**3.51**	**0.02**	**0.02**
S2	30-Jul-14	1	11	2	76	0.78	0.39
		2	11	3	68	0.98	0.49
		3	11	2	62	0.97	0.53
		Mean	**11**	**2.3**	**68.67**	**0.91**	**0.47**
		SE	**0.0**	**0.3**	**4.06**	**0.06**	**0.04**
S3	30-Jul-14	1	12	2	58	0.95	0.54
		2	11	2	55	0.83	0.52
		3	10	2	67	0.83	0.47
		Mean	**11**	**2.0**	**60.00**	**0.87**	**0.51**
		SE	**0.6**	**0.0**	**3.61**	**0.04**	**0.02**
Cujo	7-Aug-14	1	7	2	81	0.64	0.33
		2	6	3	68	0.87	0.49
		3	7	2	71	0.88	0.45
		Mean	**7**	**2.3**	**73.33**	**0.80**	**0.42**
		SE	**0.3**	**0.3**	**3.93**	**0.08**	**0.05**
LdS1	8-Aug-14	1	12	5	37	1.64	0.75
		2	14	5	36	1.64	0.75
		3	13	5	32	1.66	0.76
		Mean	**13**	**5.0**	**35.00**	**1.65**	**0.75**
		SE	**0.6**	**0.0**	**1.53**	**0.01**	**0.00**

Notes:
G (90%) is the number of genera comprising 90% of the density.
Maximum Dominance (%) is the maximum dominance accounted for by a single genus.
SE = standard error of the mean

Table 3.6-4. Taxonomic Density Results for Zooplankton at AEMP Lake Sites, 2014

Lake	Nanuq			Counts		
Date	5-Aug-14			9-Aug-14		
Replicate No.	1	2	3	1	2	3
Sample ID	6823.03-10	6823.03-11	6823.03-12	6823.03-1	6823.03-2	6823.03-3
Percent Counted Fine-Fraction	1.25%	1.25%	1.25%	1.67%	2.50%	3.33%
Percent Counted Coarse-Fraction	1.25%	1.25%	1.25%	1.67%	2.50%	1.67%
Species/Group (organisms/m^3)						
Arachnida						
Acari	-	-	-	-	-	-
Cladocera						
Diplostraca						
Bosmina longirostris	-	-	-	-	-	-
Ceriodaphnia lacustris	-	-	-	-	-	-
Chydorus sphaericus	-	-	-	-	-	-
Daphnia longiremis	-	-	-	-	-	-
Daphnia middendorffiana	-	-	-	-	-	-
Daphnia sp.	-	-	-	159	-	164
Eubosmina longispina	100	188	-	159	-	-
Holopedium gibberum	100	94	-	159	409	164
Rotifera						
Bdelloidea	-	-	-	-	-	-
Collothecacea						
Collotheca sp.	-	-	-	-	-	-
Flosculariaceae						
Conochilus unicornis	16,306	8,480	10,201	18,889	15,947	4,337
Testudinella sp.	-	-	-	-	-	-
Ploima						
Asplanchna priodonta	-	-	-	-	-	-
Brachionus quadridentatus	-	-	-	-	-	-
Kellicottia longispina	9,704	9,893	9,733	15,714	14,822	21,440
Keratella cochlearis	-	-	-	-	-	-
Keratella hiemalis	-	-	-	-	-	-
Keratella quadrata	-	-	-	-	-	-
Keratella serrulata	-	-	-	-	-	-
Keratella sp.	600	-	94	159	204	491
Lecane mira	-	94	-	-	-	-
Lecane sp.	-	-	-	-	-	-
Monostyla lunaris	-	-	-	-	-	-
Mytilina sp.	-	-	-	-	-	-
Notholca acuminata	-	-	-	-	-	-
Trichotria tetractis	-	-	-	-	-	-
Insecta						
Diptera						
Chironomidae	-	-	-	-	-	-
Copepoda						
Copepoda - nauplii	10,504	11,495	5,896	25,873	31,075	29,704
Calanoida						
Diaptomidae	-	-	-	-	-	-
Epischura nevadensis	-	-	-	-	-	-
Heterocope septentrionalis	100	94	94	159	102	164
Leptodiaptomus ashlandi	-	-	-	-	613	655
Leptodiaptomus minutus	-	-	-	-	-	-
Leptodiaptomus pribilofensis	100	188	-	5,238	3,884	5,237
Leptodiaptomus sicilis	-	-	-	-	-	-
Calanoida - copepodites	11,904	7,349	9,546	30,158	29,644	30,277
Cyclopoida						
Cyclops sp.	900	188	94	635	613	164
Diacyclops thomasi	-	-	-	-	-	-
Cyclopoida - copepodites	21,708	18,938	20,403	-	204	-
TOTAL	**6,548**	**5,182**	**7,008**	**8,845**	**8,865**	**8,436**

(continued)

Table 3.6-4. Taxonomic Density Results for Zooplankton at AEMP Lake Sites, 2014 (continued)

Lake	Vulture			Kodiak		
Date	8-Aug-14			29-Jul-14		
Replicate No.	1	2	3	1	2	3
Sample ID	6823.03-37	6823.03-38	6823.03-39	6823.03-28	6823.03-29	6823.03-30
Percent Counted Fine-Fraction	0.83%	1.00%	1.00%	2.50%	2.50%	2.50%
Percent Counted Coarse-Fraction	1.67%	1.00%	1.00%	5.00%	2.50%	2.50%
Species/Group (organisms/m^3)						
Arachnida						
Acari	-	-	-	-	-	-
Cladocera						
Diplostraca						
Bosmina longirostris	-	-	-	-	-	-
Ceriodaphnia lacustris	-	-	-	-	-	-
Chydorus sphaericus	-	-	-	-	-	-
Daphnia longiremis	-	-	-	-	-	-
Daphnia middendorffiana	-	98	92	45	-	-
Daphnia sp.	-	-	-	-	-	-
Eubosmina longispina	-	-	92	-	-	-
Holopedium gibberum	550	491	459	134	341	285
Rotifera						
Bdelloidea	-	-	-	-	-	-
Collothecacea						
Collotheca sp.	-	-	-	717	750	142
Flosculariaceae						
Conochilus unicornis	8,187	17,286	8,361	9,857	8,859	12,877
Testudinella sp.	-	-	-	-	-	-
Ploima						
Asplanchna priodonta	-	-	-	-	-	-
Brachionus quadridentatus	-	-	-	-	-	-
Kellicottia longispina	15,152	10,804	9,096	10,215	8,723	7,897
Keratella cochlearis	-	393	92	-	-	-
Keratella hiemalis	-	-	-	-	-	-
Keratella quadrata	-	-	-	-	-	-
Keratella serrulata	-	-	-	-	-	-
Keratella sp.	-	-	-	-	-	-
Lecane mira	-	-	-	-	-	-
Lecane sp.	-	-	-	-	-	-
Monostyla lunaris	-	-	-	-	-	-
Mytilina sp.	-	-	-	-	-	-
Notholca acuminata	-	-	-	-	-	-
Trichotria tetractis	-	-	-	-	-	-
Insecta						
Diptera						
Chironomidae	-	-	-	-	-	-
Copepoda						
Copepoda - nauplii	4,643	4,813	2,940	65,951	44,024	51,791
Calanoida						
Diaptomidae	-	-	-	-	-	-
Epischura nevadensis	-	-	-	-	-	-
Heterocope septentrionalis	1,466	98	92	896	886	711
Leptodiaptomus ashlandi	-	-	-	-	-	-
Leptodiaptomus minutus	-	-	-	-	-	-
Leptodiaptomus pribilofensis	550	786	1,470	1,344	1,022	1,423
Leptodiaptomus sicilis	-	-	-	-	-	-
Calanoida - copepodites	733	1,277	1,837	11,156	7,428	7,043
Cyclopoida						
Cyclops sp.	611	589	643	-	-	-
Diacyclops thomasi	-	-	-	-	-	-
Cyclopoida - copepodites	15,274	19,545	14,608	11,649	5,520	7,683
TOTAL	**5,241**	**5,107**	**3,315**	**11,196**	**8,617**	**9,983**

(continued)

Table 3.6-4. Taxonomic Density Results for Zooplankton at AEMP Lake Sites, 2014 (continued)

Lake	Leslie			Moose		
Date	31-Jul-14			31-Jul-14		
Replicate No.	1	2	3	1	2	3
Sample ID	6823.03-4	6823.03-5	6823.03-6	6823.03-7	6823.03-8	6823.03-9
Percent Counted Fine-Fraction	100.00%	100.00%	100.00%	25.00%	25.00%	20.00%
Percent Counted Coarse-Fraction	2.50%	5.00%	2.50%	10.00%	5.00%	5.00%
Species/Group (organisms/m^3)						
Arachnida						
Acari	-	-	-	27	-	-
Cladocera						
Diplostraca						
Bosmina longirostris	-	-	-	-	-	-
Ceriodaphnia lacustris	70	65	71	-	-	-
Chydorus sphaericus	-	33	142	21	-	45
Daphnia longiremis	-	-	-	-	-	-
Daphnia middendorffiana	1,046	1,308	2,134	318	257	499
Daphnia sp.	-	-	-	-	-	-
Eubosmina longispina	-	-	-	-	-	-
Holopedium gibberum	-	-	-	-	-	-
Rotifera						
Bdelloidea	2	5	-	-	9	23
Collothecacea						
Collotheca sp.	-	-	-	-	-	-
Flosculariaceae						
Conochilus unicornis	-	-	-	-	-	-
Testudinella sp.	-	3	2	86	111	91
Ploima						
Asplanchna priodonta	-	-	-	-	-	-
Brachionus quadridentatus	-	2	2	-	26	68
Kellicottia longispina	2	-	-	2,106	1,464	2,008
Keratella cochlearis	-	-	-	-	-	-
Keratella hiemalis	-	3	-	-	9	23
Keratella quadrata	2	2	-	-	-	-
Keratella serrulata	-	-	-	-	-	-
Keratella sp.	17	49	57	11	68	57
Lecane mira	-	2	-	-	-	-
Lecane sp.	-	-	-	-	-	-
Monostyla lunaris	-	2	5	-	-	-
Mytilina sp.	-	-	-	-	-	-
Notholca acuminata	2	-	-	-	-	-
Trichotria tetractis	-	-	-	-	-	-
Insecta						
Diptera						
Chironomidae	70	33	71	27	43	-
Copepoda						
Copepoda - nauplii	30,401	25,570	33,792	48,743	28,419	37,849
Calanoida						
Diaptomidae	-	-	-	-	-	-
Epischura nevadensis	-	-	-	-	-	-
Heterocope septentrionalis	70	163	71	53	43	136
Leptodiaptomus ashlandi	-	-	-	-	128	-
Leptodiaptomus minutus	-	-	-	-	-	-
Leptodiaptomus pribilofensis	2,650	2,420	3,130	2,058	1,883	2,042
Leptodiaptomus sicilis	-	-	-	-	-	-
Calanoida - copepodites	7,809	5,722	9,319	4,596	4,408	4,175
Cyclopoida						
Cyclops sp.	209	262	356	401	385	318
Diacyclops thomasi	697	1,177	996	294	257	182
Cyclopoida - copepodites	5,578	2,256	5,905	1,309	984	1,271
TOTAL	**3,242**	**2,057**	**3,737**	**4,289**	**2,406**	**3,252**

(continued)

Table 3.6-4. Taxonomic Density Results for Zooplankton at AEMP Lake Sites, 2014 (continued)

Lake	Nema			Slipper		
Date	2-Aug-14			4-Aug-14		
Replicate No.	1	2	3	1	2	3
Sample ID	6823.03-13	6823.03-14	6823.03-15	6823.03-19	6823.03-20	6823.03-21
Percent Counted Fine-Fraction	100.00%	40.00%	25.00%	4.00%	5.00%	7.50%
Percent Counted Coarse-Fraction	5.00%	5.00%	5.00%	1.00%	1.25%	1.25%
Species/Group (organisms/m^3)						
Arachnida						
Acari	-	-	8	-	-	-
Cladocera						
Diplostraca						
Bosmina longirostris	-	-	-	-	-	-
Ceriodaphnia lacustris	-	-	-	-	-	-
Chydorus sphaericus	-	-	39	-	-	-
Daphnia longiremis	-	-	-	142	-	89
Daphnia middendorffiana	228	211	116	426	317	89
Daphnia sp.	-	-	-	-	-	-
Eubosmina longispina	228	548	232	-	-	-
Holopedium gibberum	-	-	-	-	-	-
Rotifera						
Bdelloidea	-	-	-	35	-	15
Collothecacea						
Collotheca sp.	-	-	-	-	-	-
Flosculariaceae						
Conochilus unicornis	-	-	-	35	106	15
Testudinella sp.	100	89	108	35	-	30
Ploima						
Asplanchna priodonta	-	-	-	-	-	-
Brachionus quadridentatus	18	26	77	-	-	-
Kellicottia longispina	458	1,027	1,277	6,953	6,005	3,176
Keratella cochlearis	-	-	-	-	-	-
Keratella hiemalis	-	-	-	-	-	-
Keratella quadrata	-	-	-	-	-	-
Keratella serrulata	5	5	8	35	26	45
Keratella sp.	-	-	-	35	106	74
Lecane mira	5	-	-	-	-	-
Lecane sp.	-	5	-	-	-	-
Monostyla lunaris	-	-	-	-	-	-
Mytilina sp.	-	-	8	-	-	-
Notholca acuminata	-	-	-	-	-	-
Trichotria tetractis	2	-	-	-	26	-
Insecta						
Diptera						
Chironomidae	-	42	-	-	-	-
Copepoda						
Copepoda - nauplii	15,087	15,583	17,535	11,281	10,211	11,308
Calanoida						
Diaptomidae	-	-	-	-	-	-
Epischura nevadensis	-	-	-	426	741	178
Heterocope septentrionalis	91	126	194	142	106	89
Leptodiaptomus ashlandi	137	-	-	-	-	-
Leptodiaptomus minutus	-	-	-	-	-	-
Leptodiaptomus pribilofensis	2,097	2,274	2,090	1,561	952	1,603
Leptodiaptomus sicilis	-	-	-	-	-	-
Calanoida - copepodites	11,304	9,687	9,948	14,474	10,688	11,041
Cyclopoida						
Cyclops sp.	91	126	155	568	423	178
Diacyclops thomasi	46	84	-	-	-	-
Cyclopoida - copepodites	46	168	310	16,460	11,428	7,479
TOTAL	**1,871**	**2,000**	**2,140**	**3,507**	**3,164**	**2,361**

(continued)

Table 3.6-4. Taxonomic Density Results for Zooplankton at AEMP Lake Sites, 2014 (continued)

Lake	S2			S3		
Date	30-Jul-14			30-Jul-14		
Replicate No.	1	2	3	1	2	3
Sample ID	6823.03-16	6823.03-17	6823.03-18	6823.03-34	6823.03-35	6823.03-36
Percent Counted Fine-Fraction	2.50%	2.50%	1.67%	2.50%	2.50%	2.50%
Percent Counted Coarse-Fraction	10.00%	5.00%	6.67%	5.00%	5.00%	5.00%
Species/Group (organisms/m^3)						
Arachnida						
Acari	-	-	-	-	-	-
Cladocera						
Diplostraca						
Bosmina longirostris	-	-	-	-	-	-
Ceriodaphnia lacustris	-	-	-	-	-	-
Chydorus sphaericus	-	-	-	-	-	-
Daphnia longiremis	1,705	2,005	1,100	-	41	-
Daphnia middendorffiana	-	-	-	40	41	90
Daphnia sp.	-	-	-	-	-	-
Eubosmina longispina	-	-	-	-	-	-
Holopedium gibberum	7,571	7,234	6,214	324	369	362
Rotifera						
Bdelloidea	-	-	-	-	-	-
Collothecacea						
Collotheca sp.	-	-	-	81	-	-
Flosculariaceae						
Conochilus unicornis	109,901	52,573	59,290	9,800	26,875	8,134
Testudinella sp.	-	-	-	-	-	-
Ploima						
Asplanchna priodonta	401	286	259	-	-	-
Brachionus quadridentatus	-	-	-	-	-	-
Kellicottia longispina	24,066	14,325	27,703	15,793	20,812	19,160
Keratella cochlearis	-	-	-	-	82	-
Keratella hiemalis	-	-	-	-	-	-
Keratella quadrata	-	-	-	-	-	-
Keratella serrulata	-	-	-	-	-	-
Keratella sp.	-	-	-	-	-	-
Lecane mira	-	-	-	-	-	-
Lecane sp.	-	-	-	-	-	-
Monostyla lunaris	-	-	-	-	-	-
Mytilina sp.	-	-	-	-	-	-
Notholca acuminata	-	-	-	-	-	-
Trichotria tetractis	-	-	-	-	-	-
Insecta						
Diptera						
Chironomidae	-	-	-	-	-	-
Copepoda						
Copepoda - nauplii	1,003	430	1,036	324	410	633
Calanoida						
Diaptomidae	-	-	-	121	41	-
Epischura nevadensis	301	286	453	81	41	90
Heterocope septentrionalis	401	286	259	81	123	45
Leptodiaptomus ashlandi	-	-	-	-	-	-
Leptodiaptomus minutus	-	-	129	-	-	-
Leptodiaptomus pribilofensis	-	-	-	-	-	-
Leptodiaptomus sicilis	-	-	-	-	-	-
Calanoida - copepodites	4,362	2,292	5,437	4,495	3,974	4,745
Cyclopoida						
Cyclops sp.	552	358	259	1,093	574	813
Diacyclops thomasi	-	-	-	-	-	-
Cyclopoida - copepodites	3,008	1,504	1,748	4,697	3,400	3,254
TOTAL	**13,934**	**7,416**	**8,657**	**3,078**	**4,368**	**3,733**

(continued)

Table 3.6-4. Taxonomic Density Results for Zooplankton at AEMP Lake Sites, 2014 (completed)

Lake	Cujo			LdS1		
Date	7-Aug-14			8-Aug-14		
Replicate No.	1	2	3	1	2	3
Sample ID	6823.03-22	6823.03-23	6823.03-24	6823.03-31	6823.03-32	6823.03-33
Percent Counted Fine-Fraction	2.50%	5.00%	2.50%	2.00%	2.00%	2.50%
Percent Counted Coarse-Fraction	2.50%	2.50%	2.50%	1.00%	1.00%	1.25%
Species/Group (organisms/m^3)						
Arachnida						
Acari	-	-	-	-	-	-
Cladocera						
Diplostraca						
Bosmina longirostris	-	-	-	2,600	1,625	2,030
Ceriodaphnia lacustris	-	-	-	-	-	-
Chydorus sphaericus	-	-	-	-	325	-
Daphnia longiremis	-	-	-	44,195	32,821	27,400
Daphnia middendorffiana	-	-	-	-	-	-
Daphnia sp.	-	-	-	-	-	-
Eubosmina longispina	5,557	6,659	11,139	1,625	325	254
Holopedium gibberum	-	-	-	28,272	16,898	20,804
Rotifera						
Bdelloidea	-	-	-	-	-	-
Collothecacea						
Collotheca sp.	-	-	-	325	325	634
Flosculariaceae						
Conochilus unicornis	-	-	-	6,174	5,524	4,186
Testudinella sp.	-	-	-	-	-	-
Ploima						
Asplanchna priodonta	-	-	-	650	325	254
Brachionus quadridentatus	-	-	-	-	-	-
Kellicottia longispina	38,313	26,637	41,352	25,835	24,697	29,430
Keratella cochlearis	-	-	-	325	162	761
Keratella hiemalis	-	-	-	-	-	-
Keratella quadrata	-	-	-	-	-	-
Keratella serrulata	-	-	-	-	-	-
Keratella sp.	-	180	1,221	-	-	-
Lecane mira	-	-	-	-	-	-
Lecane sp.	-	-	-	-	-	-
Monostyla lunaris	-	-	-	-	-	-
Mytilina sp.	-	-	-	-	-	-
Notholca acuminata	-	-	-	-	-	-
Trichotria tetractis	-	-	-	-	-	-
Insecta						
Diptera						
Chironomidae	146	180	153	-	-	-
Copepoda						
Copepoda - nauplii	40,214	23,397	30,671	650	1,137	1,015
Calanoida						
Diaptomidae	-	-	-	-	-	-
Epischura nevadensis	-	-	-	-	650	254
Heterocope septentrionalis	292	-	1,221	-	-	-
Leptodiaptomus ashlandi	-	-	-	-	-	-
Leptodiaptomus minutus	-	-	-	3,250	4,225	3,044
Leptodiaptomus pribilofensis	3,363	5,579	3,204	-	-	-
Leptodiaptomus sicilis	-	-	-	-	-	-
Calanoida - copepodites	22,666	20,158	20,600	975	650	507
Cyclopoida						
Cyclops sp.	-	-	-	-	-	-
Diacyclops thomasi	-	-	-	5,199	2,275	4,313
Cyclopoida - copepodites	1,316	3,060	2,136	4,225	6,499	7,104
TOTAL	**13,984**	**10,731**	**12,411**	**8,878**	**6,154**	**6,799**

Note: Taxonomic identification by EcoAnalysts Inc.

Table 3.6-5. Zooplankton Taxonomy QA/QC Percent Similarity Results for AEMP Lake Samples, 2014

Leslie Lake (Rep 2) Sample 6823.03-5

Component	Species/Group	Original Count	% Total	QC Count	% Total	Absolute Difference
Coarse Fraction	Calanoida - copepodites	175	14.3	170	14.5	0.2
	Ceriodaphnia lacustris	2	0.2	2	0.2	0.0
	Chironomidae	1	0.1	0	0.0	0.1
	Chydorus sphaericus [1]	0	0.0	0	0.0	0.0
	Copepoda - nauplii	782	63.7	749	63.7	0.0
	Cyclopoida - copepodites	69	5.6	104	8.8	3.2
	Cyclops sp.	8	0.7	6	0.5	0.1
	Daphnia middendorffiana	40	3.3	40	3.4	0.1
	Diacyclops thomasi	36	2.9	4	0.3	2.6
	Heterocope septentrionalis	5	0.4	5	0.4	0.0
	Leptodiaptomus pribilofensis	74	6.0	69	5.9	0.2
Fine Fraction	Bdelloidea	3	0.2	3	0.3	0.0
	Brachionus quadridentatus	0	0.0	1	0.1	0.1
	Keratella sp.	30	2.4	20	1.7	0.7
	Keratella hiemalis	1	0.1	2	0.2	0.1
	Keratella quadrata	1	0.1	0	0.0	0.1
	Lecane mira [1]	0	0.0	0	0.0	0.0
	Monostyla lunaris [1]	0	0.0	0	0.0	0.0
	Testudinella sp.	1	0.1	1	0.1	0.0
Total		**1,228**	**100**	**1,176**	**100**	**7.6**
% Similarity				**96.20**		

Nema Lake (Rep 1) Sample 6823.03-13

Component	Species/Group	Original Count	% Total	QC Count	% Total	Absolute Difference
Coarse Fraction	Calanoida - copepodites	248	27.6	238	31.9	4.3
	Copepoda - nauplii	331	36.8	288	38.6	1.8
	Cyclopoida - copepodites	1	0.1	5	0.7	0.6
	Cyclops sp.	2	0.2	0	0.0	0.2
	Daphnia middendorffiana	5	0.6	5	0.7	0.1
	Diacyclops thomasi	1	0.1	0	0.0	0.1
	Eubosmina longispina	5	0.6	5	0.7	0.1
	Heterocope septentrionalis	2	0.2	2	0.3	0.0
	Leptodiaptomus ashlandi	3	0.3	2	0.3	0.1
	Leptodiaptomus pribilofensis	46	5.1	40	5.4	0.2
Fine Fraction	*Brachionus quadridentatus*	8	0.9	6	0.8	0.1
	Kellicottia longispina	201	22.3	128	17.1	5.2
	Keratella serrulata	1	0.1	2	0.3	0.2
	Lecane mira	2	0.2	2	0.3	0.0
	Testudinella	44	4.9	24	3.2	1.7
	Trichotria tetractis [1]	0	0.0	0	0.0	0.0
Total		**900**	**100**	**747**	**100**	**14.7**
% Similarity				**92.64**		

(continued)

Table 3.6-5. Zooplankton Taxonomy QA/QC Percent Similarity Results for AEMP Lake Samples, 2014 (completed)

Cujo (Rep 3) Sample 6823.03-24

Component	Species/Group	Original Count	% Total	QC Count	% Total	Absolute Difference
Coarse Fraction	Calanoida - copepodites	135	18.6	109	15.4	3.2
	Chironomidae	1	0.1	0	0.0	0.1
	Cyclopoida - copepodites	14	1.9	10	1.4	0.5
	Cyclops sp.	0	0.0	2	0.3	0.3
	Eubosmina longispina	73	10.1	62	8.8	1.3
	Leptodiaptomus pribilofensis	21	2.9	28	4.0	1.1
Fine Fraction	Copepoda - nauplii	201	27.8	178	25.2	2.6
	Kellicottia longispina	271	37.4	311	44.0	6.6
	Keratella sp.	8	1.1	7	1.0	0.1
Total		**724**	**100**	**707**	**100**	**15.8**
% Similarity				**92.10**		

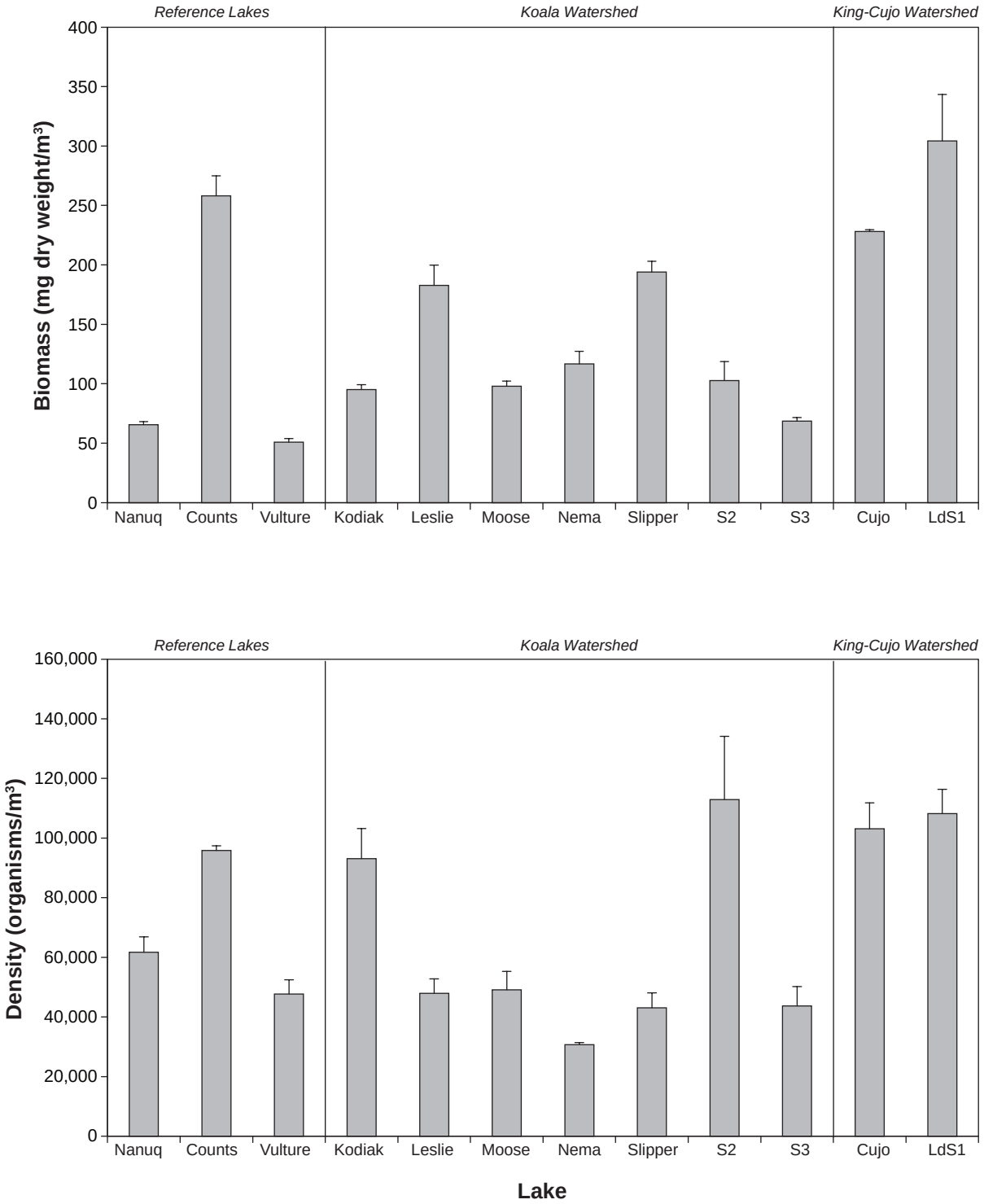
Vulture (Rep 1) Sample 6823.03-37

Component	Species/Group	Original Count	% Total	QC Count	% Total	Absolute Difference
Coarse Fraction	Calanoida - copepodites	12	2.3	8	1.9	0.4
	Cyclopoida - copepodites	250	48.2	121	29.4	18.7
	Cyclops sp.	10	1.9	3	0.7	1.2
	Holpedium gibberum	9	1.7	4	1.0	0.8
	Leptodiaptomus pribilofensis	9	1.7	4	1.0	0.8
Fine Fraction	*Conochilus unicornis*	67	12.9	113	27.5	14.6
	Copepoda - nauplii	38	7.3	47	11.4	4.1
	Kellicottia longispina	124	23.9	111	27.0	3.1
Total		**519**	**100**	**411**	**100**	**43.6**
% Similarity				**78.19**		

[1] *The individual representing the species was removed for the reference collection.*

Figure 3.6-1

Average Zooplankton Biomass and Density at AEMP Lake Sites, 2014



Note: Error bars represent the standard error of the mean.

Figure 3.6-2a

Relative Densities of Zooplankton Taxa at AEMP Lake Sites, 2014

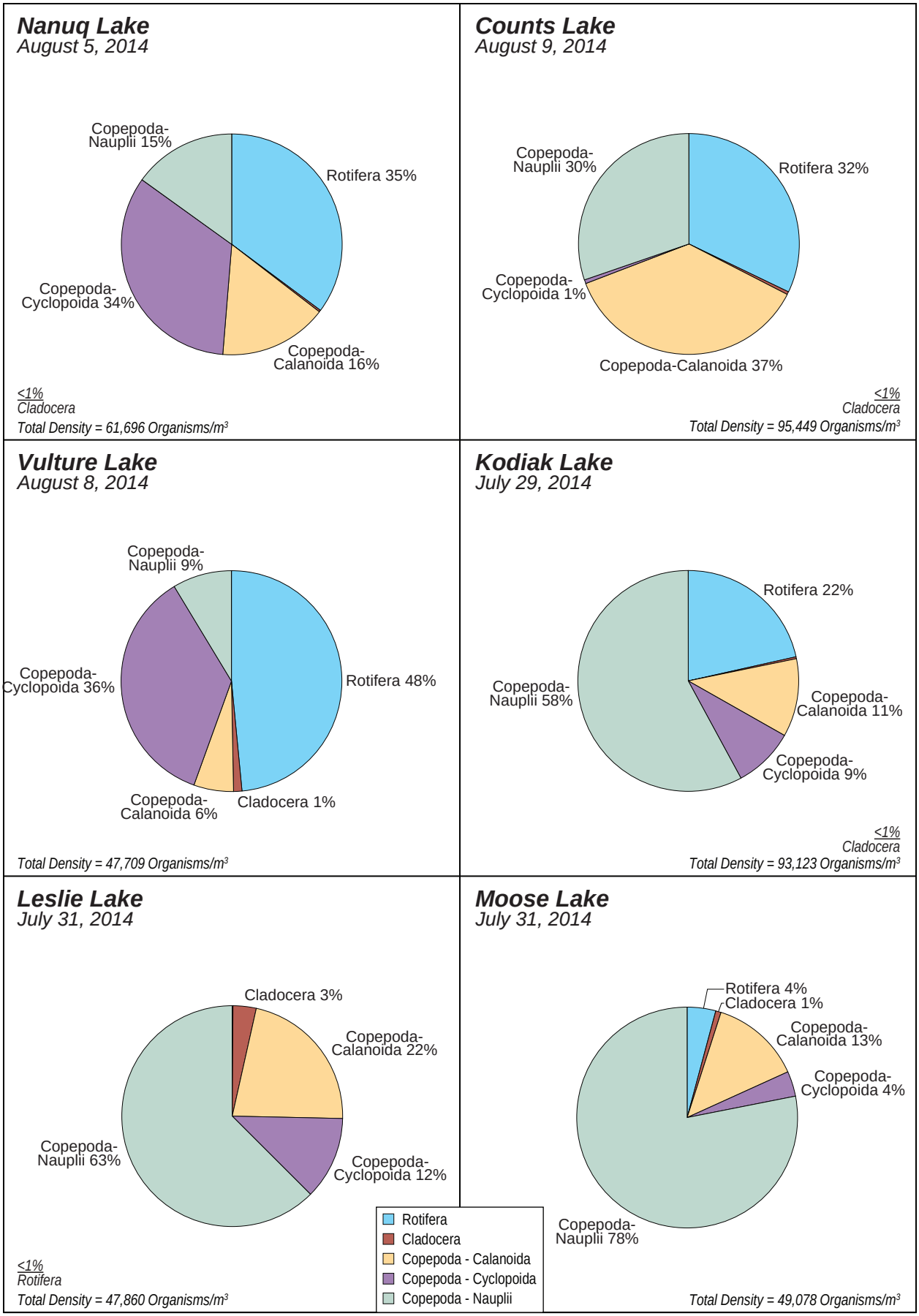


Figure 3.6-2b

Relative Densities of Zooplankton Taxa at AEMP Lake Sites, 2014

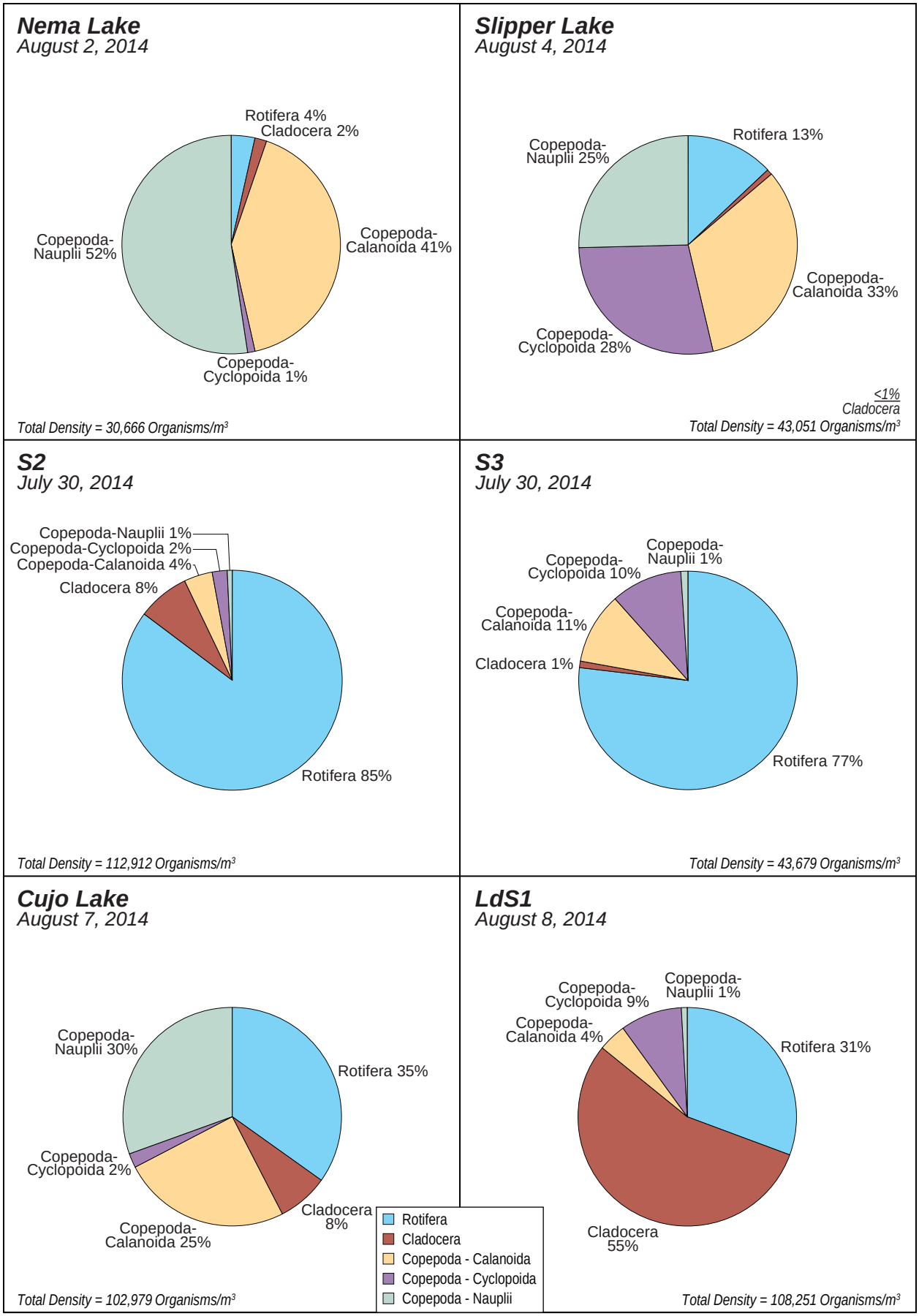
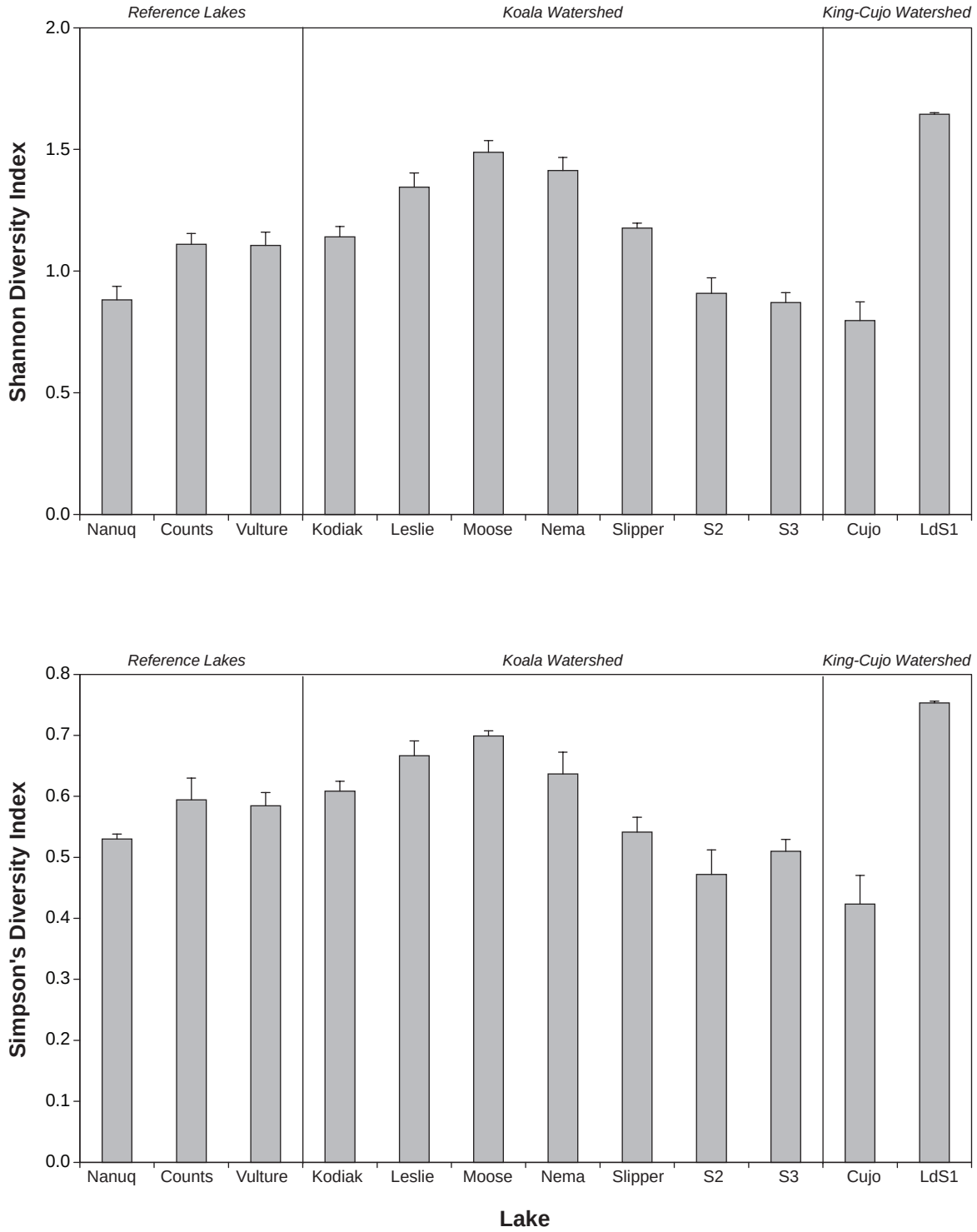


Figure 3.6-3

Average Diversity Indices for Zooplankton at AEMP Lake Sites, 2014



Note: Error bars represent the standard error of the mean.

3.7 BENTHIC INVERTEBRATES (BENTHOS)

3.7.1 Lake Benthos

3.7.1.1 Lake Benthos Density and Community Composition

Lake benthos samples were collected from six lakes within the Koala Watershed (Vulture (internal reference), Kodiak, Leslie, Moose, Nema and Slipper), one site within Lac de Gras (S2), one lake within the King-Cujo Watershed (Cujo), one site within Lac du Sauvage (LdS1), and two external reference lakes (Nanuq and Counts; Table 3.7-1).

Mean benthos density (organisms/m^2) was calculated for each of the lakes (Figure 3.7-1). In addition genus richness, dominance, and diversity calculations were calculated for benthic dipteran communities (Table 3.7-2). Results of the taxonomic analysis for each replicate sample are presented in Table 3.7-3.

Cujo Lake had the greatest mean benthos density (mean: 46,594 organisms/m^2), followed by Leslie Lake which had a mean density of 7,619 organisms/m^2 (Figure 3.7-1). The variability among replicates at Cujo Lake was high (8,490 to 113,514 organisms/m^2). Lac de Gras (S2) had the lowest density (1,901 organisms/m^2; Figure 3.7-1). Mean densities at the remaining lakes ranged from 2,508 organisms/m^2 (Moose Lake) to 6,594 organisms/m^2 (Counts Lake).

Dipterans dominated the majority of AEMP lake benthic invertebrate communities (54% to 90%) but molluscs were most dominant in Leslie and Nema lakes (59% and 71%, respectively). At lakes where Diptera were dominant, Mollusca were the second most dominant group. At lakes where Mollusca were dominant (Leslie and Nema), Diptera were the second most dominant group. No other group, except Branchiopoda (6% at LdS1), contributed 5% or more of the relative lake benthos density at any site (Figure 3.7-2).

3.7.1.2 Lake Benthos Diptera Richness and Diversity

Average dipteran genus richness was highest at Vulture Lake (18 genera/sample) and lowest at Nema Lake (12 genera/sample; Table 3.7-2). The average number of genera (G) that contributed 90% of the dipteran density ranged from four genera (Leslie Lake) to 10 genera (Vulture Lake; Table 3.7-2). Spatial patterns were similar for the Shannon and Simpson's diversity indices. Two exceptions were that Vulture Lake had the highest Shannon diversity index and the lowest Simpson's diversity index, while Leslie had the lowest Shannon diversity index and the highest Simpson's diversity index (Figure 3.7-3). Average Shannon dipteran diversity ranged from 1.35 (Leslie Lake) to 2.38 (Vulture Lake), and average Simpson dipteran diversity ranged from 0.52 (Vulture Lake) to 0.71 (Leslie Lake; Table 3.7-2; Figure 3.7-3).

3.7.1.3 Lake Benthos QA/QC

In 2014, all lake benthos samples were re-sorted by a second analyst to assess sorting efficiency. Sorting efficiencies were 100% in all samples, except one Moose Lake replicate (Table 3.7-4). Sorting efficiencies of 90% or greater are considered acceptable under the EEM guidelines, while groups of samples containing greater error require re-sorting (Environment Canada 2002). This is consistent

with laboratory sorting efficiencies by EcoAnalysts for the Ekati Diamond Mine thus, no re-sorting was necessary.

Quality control of taxonomic identifications was assessed on three of the 33 lake samples (Table 3.7-5). The percent similarities between the original and QC counts were between 93% and 98%. All discrepancies were discussed between the taxonomists and decisions were incorporated into the final dataset.

3.7.2 Stream Benthos

3.7.2.1 Stream Benthos Density and Community Composition

Stream benthos samples were collected from four streams within the Koala Watershed (Kodiak-Little, Moose-Nero, Nema-Martine and Slipper-Lac de Gras), one stream within the King-Cujo Watershed (Cujo Outflow), two external reference streams (Nanuq and Counts Outflow), and one internal reference (Vulture-Polar; Table 3.7-6).

Hester-Dendy artificial substrate samplers were placed within each stream in early August (August 1, 2 and 4) and retrieved in early September (September 2 to 5; Table 3.7-6). Five replicates were collected within each stream (except for Cujo Outflow where only three were still submerged upon retrieval) for taxonomic analysis. Mean benthos density (organisms/m^2) was calculated for each of the streams sampled (Figure 3.7-4). In addition genus richness, dominance, and diversity calculations were calculated for Diptera and EPT taxa (Tables 3.7-7 and 3.7-8; Figure 3.7-7). Results of the taxonomic analysis for each replicate sample are presented in Table 3.7-9.

Mean stream benthos densities were greatest in Slipper-Lac de Gras and Nanuq Outflow (7,833 organisms/m^2 and 4,569 organisms/m^2, respectively), although the variation among replicates was also highest in these two streams (Figure 3.7-4). Benthos densities were similar among the other streams ranging from 1,851 organisms/m^2 in Vulture-Polar to 3,243 organisms/m^2 in Cujo Outflow.

Benthos communities in most AEMP streams were dominated by Diptera, except Cujo Outflow which was dominated by Mollusca (Figure 3.7-5). Diptera contributed between 18% and 83% of community density (Figure 3.7-5). Mollusca were prevalent ($\geq$ 5%) in five streams (Kodiak-Little, Moose-Nero, Nema-Martine, Slipper-Lac de Gras, and Cujo Outflow). The contribution of other benthos groups to community density was variable between remaining streams. Copepoda contributed substantially (> 5%) to benthos communities in four streams (Nanuq Outflow, Counts Outflow, Moose-Nero, and Nema-Martine; Figure 3.7-5). Plecoptera contributed substantially (26%) to the benthos community in Slipper-Lac de Gras and Ostracoda (24%) in Cujo Outflow, but both groups were less significant ($\leq$ 5%) in all other streams (Figure 3.7-5). The remaining groups Arachnida, Cladocera, Coleoptera, Collembola, Ephemeroptera, Hemiptera, Trichoptera, Coelentrata, Oligochaeta, and Nematoda made up much smaller proportions of the benthic communities (Figure 3.7-5).

Ephemeroptera, Plecoptera, and Trichoptera (together termed EPT) are pollution sensitive taxa often used as an indicator of ecosystem health. On average EPT made up between 2% (Counts Outflow

and Cujo Outflow) and 28% (Slipper-Lac de Gras) of the stream benthos community sampled (Figure 3.7-5).

3.7.2.2 Stream Benthos Dipteran and EPT Richness and Diversity

Average dipteran genus richness was highest at Counts Outflow and Vulture-Polar (13.8 genera/sample) and lowest at Moose-Nero (9.8 genera/sample; Table 3.7-7). The average number of genera (G) that contributed 90% of the stream benthos dipteran density ranged from 4.4 genera (Counts Outflow and Kodiak-Little) to 7.3 genera (Cujo Outflow). Mean Shannon dipteran diversity was greatest at Cujo Outflow (1.96), and lowest at Nanuq Outflow (1.41). Mean Simpson dipteran diversity was greatest at Cujo Outflow (0.81) and lowest in Kodiak-Little (0.66; Table 3.7-7 and Figure 3.7-6). No clear spatial patterns were evident among sites for dipteran genus richness or diversity (Table 3.7-7; Figure 3.7-6).

Average benthos EPT genus richness was highest at Vulture-Polar (3.0 genera/sample) and lowest at Moose-Nero (1.4 genera/sample; Table 3.7-8). The average number of genera (G) that contributed 90% of the stream benthos EPT density ranged from 1.2 genera (Moose-Nero) to 3.0 genera (Vulture-Polar; Table 3.7-8). Mean Shannon dipteran diversity was greatest at Kodiak-Little (0.95), and lowest at Moose-Nero (0.14). Mean Simpson dipteran diversity was greatest at Vulture-Polar (0.54) and lowest at Moose-Nero (0.08; Table 3.7-8 and Figure 3.7-7). Mean genus richness and diversity indices (Shannon and Simpson) for EPT were variable among streams, but showed a clear spatial pattern where values increased from Moose-Nero to Nema-Martine and to Slipper-Lac de Gras (Table 3.7-8; Figure 3.7-7).

3.7.2.3 Stream Benthos QA/QC

In 2014, all stream benthos samples (38 samples) were re-sorted by a second analyst to assess sorting efficiency. Sorting efficiencies were 100% in all of samples (Table 3.7-10). Sorting efficiencies of 90% or greater are considered acceptable under the EEM guidelines, while groups of samples containing greater error require resorting (Environment Canada 2002). This is consistent with laboratory sorting efficiencies (by EcoAnalysts) for the Ekati Diamond Mine and therefore, re-sorting was not necessary.

Quality control of taxonomic identifications was assessed on four of the 38 stream samples. Assessment results are included in Table 3.7-11. The percent similarities between the original and QC counts were similar between replicates, ranging from 92.2% to 96.6%. All discrepancies were discussed between taxonomists and decisions were incorporated into the final dataset.

Supporting Tables and Figures

Table 3.7-1. Locations, Depths, and Dates for Benthos Sampling at AEMP Lake Sites, 2014

Lake	Date	Mean Sample Depth (m)	Replicates	Number of Composite Samples (per replicate)
Nanuq	5-Aug-14	7.1	3	3
Counts	9-Aug-14	5.5	3	3
Vulture	3-Aug-14	9.5	3	3
Kodiak	29-Jul-14	6.2	3	3
Leslie	31-Jul-14	7.0	3	3
Moose	31-Jul-14	9.5	3	3
Nema	2-Aug-14	9.5	3	3
Slipper	4-Aug-14	5.6	3	3
S2	3-Aug-14	5.9	3	3
Cujo	7-Aug-14	5.5	3	3
LdS1	8-Aug-14	7.3	3	3

Table 3.7-2. Benthic Dipteran Taxonomic Richness and Diversity Indices at AEMP Lake Sites, 2014

Lake	Depth	Date	Replicate No.	Genus Richness	G (90%)	Maximum Dominance (%)	Shannon Diversity Index	Simpson Diversity Index
Nanuq	Mid	5-Aug-14	1	14	6	39.4	1.77	0.57
			2	12	6	57.4	1.56	0.71
			3	15	4	51.4	1.47	0.65
			Mean	**13.7**	**5.3**	**49.4**	**1.60**	**0.64**
			SE	**0.9**	**0.7**	**5.3**	**0.09**	**0.04**
Counts	Mid	9-Aug-14	1	15	6	54.4	1.62	0.69
			2	16	7	55.3	1.67	0.70
			3	18	7	57.9	1.63	0.72
			Mean	**16.3**	**6.7**	**55.8**	**1.64**	**0.70**
			SE	**0.9**	**0.3**	**1.0**	**0.02**	**0.01**
Vulture	Mid	3-Aug-14	1	18	10	15.7	2.42	0.51
			2	19	11	20.7	2.46	0.52
			3	16	9	22.8	2.27	0.51
			Mean	**17.7**	**10.0**	**19.7**	**2.38**	**0.52**
			SE	**0.9**	**0.6**	**2.1**	**0.06**	**0.00**
Kodiak	Mid	29-Jul-14	1	16	9	24.6	2.27	0.53
			2	14	8	23.3	2.13	0.51
			3	17	9	36.1	2.10	0.57
			Mean	**15.7**	**8.7**	**28.0**	**2.17**	**0.54**
			SE	**0.9**	**0.3**	**4.1**	**0.05**	**0.02**

(continued)

Table 3.7-2. Benthic Dipteran Taxonomic Richness and Diversity Indices at AEMP Lake Sites, 2014 (completed)

Lake	Depth	Date	Replicate No.	Genus Richness	G (90%)	Maximum Dominance (%)	Shannon Diversity Index	Simpson Diversity Index
Leslie	Mid	31-Jul-14	1	13	4	57.3	1.34	0.70
			2	13	5	59.3	1.39	0.71
			3	13	4	61.0	1.32	0.72
			Mean	**13.0**	**4.3**	**59.2**	**1.35**	**0.71**
			SE	**0.0**	**0.3**	**1.1**	**0.02**	**0.01**
Moose	Mid	31-Jul-14	1	16	8	47.3	1.91	0.64
			2	16	9	39.8	2.05	0.59
			3	20	11	31.7	2.35	0.56
			Mean	**17.3**	**9.3**	**39.6**	**2.11**	**0.60**
			SE	**1.3**	**0.9**	**4.5**	**0.13**	**0.02**
Nema	Mid	2-Aug-14	1	11	6	27.9	1.82	0.52
			2	11	5	38.1	1.70	0.55
			3	13	6	30.0	1.87	0.53
			Mean	**11.7**	**5.7**	**32.0**	**1.80**	**0.53**
			SE	**0.7**	**0.3**	**3.1**	**0.05**	**0.01**
Slipper	Mid	4-Aug-14	1	13	7	32.1	1.90	0.56
			2	12	6	47.8	1.68	0.62
			3	13	6	37.9	1.68	0.59
			Mean	**12.7**	**6.3**	**39.2**	**1.75**	**0.59**
			SE	**0.3**	**0.3**	**4.6**	**0.07**	**0.02**
S2	Mid	3-Aug-14	1	15	9	34.0	2.09	0.55
			2	9	5	35.5	1.62	0.56
			3	13	7	36.1	1.99	0.55
			Mean	**12.3**	**7.0**	**35.2**	**1.90**	**0.56**
			SE	**1.8**	**1.2**	**0.6**	**0.14**	**0.00**
Cujo	Mid	7-Aug-14	1	15	7	31.6	2.02	0.54
			2	15	6	44.1	1.77	0.62
			3	18	7	25.7	2.08	0.53
			Mean	**16.0**	**6.7**	**33.8**	**1.96**	**0.56**
			SE	**1.0**	**0.3**	**5.4**	**0.09**	**0.03**
LdS1	Mid	8-Aug-14	1	16	6	25.0	1.98	0.53
			2	18	8	33.9	2.03	0.57
			3	18	9	38.3	2.00	0.61
			Mean	**17.3**	**7.7**	**32.4**	**2.01**	**0.57**
			SE	**0.7**	**0.9**	**3.9**	**0.02**	**0.02**

Notes: G (90%) is the number of genera comprising 90% of the density.
Maximum Dominance (%) is the maximum dominance accounted for by a single genus.
SE = standard error of the mean

Table 3.7-3. Taxonomic Density Results for Benthic Invertebrates at AEMP Lake Sites, 2014

Lake	Nanuq			Counts			Vulture			Kodiak		
Date	5-Aug-14			9-Aug-14			3-Aug-14			29-Jul-14		
Replicate No.	1	2	3	1	2	3	1	2	3	1	2	3
Sample ID	6823.02-1	6823.02-2	6823.02-3	6823.02-4	6823.02-5	6823.02-6	6823.02-7	6823.02-8	6823.02-9	6823.02-10	6823.02-11	6823.02-12
Area Sampled (m^2)	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675
Percent Subsampled	100.00	100.00	100.00	87.50	75.00	100.00	100.00	100.00	100.00	100.00	87.50	75.00
Species/Group (organisms/m^2)												
Nematoda	119	74	-	-	40	-	-	59	-	15	119	-
Arachnida	-	30	-	34	-	15	15	30	74	74	17	20
Acari	-	-	-	-	-	-	-	-	-	-	-	-
Arrenurus sp.	-	-	-	-	-	-	-	-	-	-	-	-
Aturidae	-	-	-	-	-	-	-	-	-	-	-	-
Hygrobates sp.	-	15	-	-	-	-	-	-	-	-	-	-
Lebertia sp.	-	15	-	34	-	15	15	30	59	59	17	20
Oxus sp.	-	-	-	-	-	-	-	-	-	15	-	-
Pionidae	-	-	-	-	-	-	-	-	15	-	-	-
Piona sp.	-	-	-	-	-	-	-	-	-	-	-	-
Branchiopoda												
Cladocera	15	74	-	34	59	44	-	15	-	15	-	-
Lepidurus arcticus	15	-	-			-	-	-	-	-	-	-
Oligochaeta												
Lumbriculidae	44	-	15	34	20	15	30	30	15	89	102	198
Dero digitata	-	-	-	-	-	-	-	-	-	-	-	-
Nais sp.	-	-	-	-	-	-	-	-	-	-	-	-
Specaria sp.	-	-	-	-	-	-	-	-	-	-	-	-
Uncinais uncinata	-	-	-	-	-	-	-	-	-	-	-	-
Limnodrilus hoffmeisteri	-	-	-	-	-	-	-	-	-	-	-	-
Rhyacodrilus coccineus	15	-	-	-	-	-	15	-	15	44	-	-
Tasserkidrilus americanus	-	-	-	-	-	-	-	15	-	15	-	-
Tubificidae w/ cap setae sp.	30	30	44	17	-	-	44	89	15	-	85	59
Tubificidae w/o cap setae sp.	-	-	-	-	-	-	-	-	-	-	-	-
Coleoptera	-	-	-	-	-	-	-	-	-	-	-	-
Diptera	2,059	3,867	-	863	988	-	15	119	193	-	34	79
Abiskomyia sp.	-	-	-	-	-	-	-	15	-	-	-	-
Ablabesmyia (Karelia) sp.	-	-	-	-	-	-	-	-	-	-	-	-
Ablabesmyia monilis	-	-	-	-	-	-	-	-	-	-	-	-
Ablabesmyia sp.	-	-	-	-	-	-	44	-	-	15	-	-
Chironomini	-	-	-	-	-	-	-	-	-	-	17	-
Chironomus sp.	-	-	-	-	-	-	-	-	-	-	-	-
Cladopelma sp.	-	-	-	-	-	-	-	-	-	59	34	59
Cladotanytarsus sp.	-	-	-	17	20	15	-	30	-	15	-	20
Constempellina sp.	-	-	-	-	-	-	-	-	-	-	-	-
Corynocera sp.	119	30	44	220	277	104	-	-	15	89	17	20
Cricotopus sp.	15	-	-	-	-	-	-	-	-	-	372	257
Cryptochironomus sp.	-	-	-	-	20	-	-	-	-	15	-	-
Demicryptochironomus sp.	-	-	-	-	-	-	-	-	30	-	-	-
Dicrotendipes fumidus	-	15	-	102	158	89	-	-	-	30	-	59
Dicrotendipes lobiger	-	-	-	-	-	-	-	-	-	-	-	-
Dicrotendipes sp.	-	-	-	-	-	-	-	-	-	30	-	20
Endochironomus sp.	-	-	-	-	-	-	-	-	-	-	-	-
Glyptotendipes sp.	-	-	-	-	-	-	-	-	-	44	-	79
Heterotanytarsus sp.	119	-	30	-	-	-	15		-	-	-	-
Heterotrissocladius marcidus gr.	15	30	-	17	-	15	281	119	30	-	34	-
Heterotrissocladius subpilosus gr.	-	-	-	-	-	-	15	-	-	-	-	20
Hydrobaenus sp.	-	-	-	-	-	-	-	-	-	15	-	-
Micropsectra sp.	-	-	-	2,607	2,904	2,237	104	74	59	-	-	-
Microtendipes pedellus gr.	-	-	-	51	79	30	148	119	281	148	68	-
Monodiamesa sp.	15	15	44	152	99	89	44	104	44	148	152	99

(continued)

Table 3.7-3. Taxonomic Density Results for Benthic Invertebrates at AEMP Lake Sites, 2014 (continued)

Lake	Nanuq			Counts			Vulture			Kodiak		
Date	5-Aug-14			9-Aug-14			3-Aug-14			29-Jul-14		
Replicate No.	1	2	3	1	2	3	1	2	3	1	2	3
Sample ID	6823.02-1	6823.02-2	6823.02-3	6823.02-4	6823.02-5	6823.02-6	6823.02-7	6823.02-8	6823.02-9	6823.02-10	6823.02-11	6823.02-12
Area Sampled (m^2)	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675
Percent Subsampled	100.00	100.00	100.00	87.50	75.00	100.00	100.00	100.00	100.00	100.00	87.50	75.00
Species/Group (organisms/m^2)												
Diptera ***(cont'd)***												
Orthocladiinae	-	-	-	-	-	-	15	15	-	-	-	-
Pagastiella sp.	-	-	-	102	178	163	-	-	-	74	-	-
Parachironomus sp.	-	-	-	-	20	-	-	-	-	-	-	-
Parakiefferiella sp.	-	-	-	17	-	-	30	15	15	-	-	-
Paratanytarsus sp.	267	59	296	423	356	281	44	104	133	178	152	237
Polypedilum scalaenum gr.	-	15	-	34	79	30	-	-	-	356	51	40
Polypedilum sp.	-	-	-	-	-	-	-	-	-	-	119	59
Potthastia longimana gr.	-	-	-	-	-	-	-	-	-	-	-	20
Procladius sp.	89	89	30	169	217	281	119	74	89	889	626	1,304
Protanypus sp.	-	-	-	-	-	30	30	30	44	-	-	-
Psectrocladius sp.	548	59	237	-	-	15	148	207	267	756	254	316
Pseudochironomus sp.	-	-	-	-	-	-	-	-	-	44	-	79
Sergentia sp.	-	-	-	-	-	-	-	-	-	-	-	-
Stempellinella sp.	74	15	-	51	40	15	311	370	207	-	-	-
Stictochironomus sp.	993	459	1,378	762	711	400	326	89	430	356	203	257
Tanytarsini	-	-	15	-	79	30	59	15	15	-	119	-
Tanytarsus sp.	267	-	563	68	79	30	311	311	207	356	593	652
Thienemannimyia gr. sp.	-	-	30	-	-	-	15	44	30	-	17	20
Tvetenia bavarica gr.	-	-	-	-	-	-	-	-	-	-	-	-
Xylotopus par	-	-	15	-	-	15	-	-	-	-	-	-
Zalutschia sp.	-	15	15	-	20	30	74	74	-	-	-	-
Empididae	-	-	-	-	20	-	-	-	-	-	-	-
Neoplasta sp.	-	-	-	-	-	-	-	-	-	-	-	-
Hemiptera	-	-	-	17			-	-	-	-	-	-
Hymenoptera	-	-	-	-	-	-	-		15	-	-	-
Trichoptera	15	-		34	-	-	-	-	-	-	-	-
Leptoceridae	-	-	-	17	-	-	-	-	-	15	-	-
Oecetis sp.	-	-	-	17	-	-	-	-	-	15	-	-
Phryganeidae	-	-	-	-	-	-	-	-	-	-	-	-
Agrypnia sp.	-	-	-	-	-	-	-	-	-	-	-	-
Copepoda	15	15	15	-	119	104	30	44	44	-	-	20
Calanoida	-	-	-	-	-	-	-		-	-	-	20
Cyclopoida	15	15	15	-	119	104	30	44	44	-	-	-
Ostracoda	15	89		-	-	-	-	-	-	-	-	-
Cnidaria	-	-	-	-	-	-	-	-	-	-	-	-
Hydra sp.	-	-	-	-	-	-	-	-	-	-	-	-
Ectoprocta	15			68			-	-	-	15	34	79
Mollusca												
Bivalvia	-	-	-		-	15	-	-	15	30	17	40
Pisidium sp.	44	15	59	85	158	148	15	44	59	548	305	415
Sphaeriidae	148	163	193	880	494	1,378	1,170	1,141	815	2,489	1,829	1,896
Sphaerium sp.	-	-	-	-	-	-	15	30	-	-	-	-
Gastropoda	-	-	-	34	-	30		15	15	-	-	-
Planorbidae	-	-	-	-	-	-	-	-	-	-	-	-
Valvata sp.	-	-	-	-	-	-	-	-	-	15	-	-
Turbellaria		-	15	-	-	-	-	-	-	44	-	-
TOTAL	**5,067**	**5,156**	**3,037**	**6,908**	**7,230**	**5,644**	**3,481**	**3,437**	**3,170**	**7,022**	**5,367**	**6,420**

(continued)

Table 3.7-3. Taxonomic Density Results for Benthic Invertebrates at AEMP Lake Sites, 2014 (continued)

Lake	Leslie			Moose			Nema			Slipper		
Date	31-Jul-14			31-Jul-14			2-Aug-14			4-Aug-14		
Replicate No.	1	2	3	1	2	3	1	2	3	1	2	3
Sample ID	6823.02-16	6823.02-17	6823.02-18	6823.02-13	6823.02-14	6823.02-15	6823.02-19	6823.02-20	6823.02-21	6823.02-22	6823.02-23	6823.02-24
Area Sampled (m^2)	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675
Percent Subsampled	100.00	100.00	75.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Species/Group (organisms/m^2)												
Nematoda	15	15	20	-	15	-	-	15	-	-	-	-
Arachnida	15	-	20	163	44	59	-	-	-	-	-	15
Acari	-	-	-	15	-	-	-	-	-	-	-	-
Arrenurus sp.	-	-	-	15	-	15	-	-	-	-	-	-
Aturidae	-	-	-	-	-	15	-	-	-	-	-	-
Hygrobates sp.	-	-	-	44	15	-	-	-	-	-	-	-
Lebertia sp.	15	-	-	89	30	30	-	-	-	-	-	15
Oxus sp.	-	-	20	-	-	-	-	-	-	-	-	-
Pionidae	-	-	-	-	-	-	-	-	-	-	-	-
Piona sp.	-	-	-	-	-	-	-	-	-	-	-	-
Branchiopoda												
Cladocera	-	-	-	30	-	-	-	-	-	-	-	15
Lepidurus arcticus	-	-	-	-	-	-	-	-	-	-	-	-
Oligochaeta												
Lumbriculidae	370	415	336	-	-	-	-	-	-	-	-	-
Dero digitata	-	-	-	-	-	15	-	-	-	-	-	-
Nais sp.	-	-	-	30	-	15	-	-	-	-	-	-
Specaria sp.	-	-	-	-	-	-	-	-	-	-	-	-
Uncinais uncinata	-	-	-	-	-	-	-	-	-	15		-
Limnodrilus hoffmeisteri	-	-	-	-	30	59	-	-	-	15	30	30
Rhyacodrilus coccineus	-	-	-	30	30	-	-	-	-	-	15	-
Tasserkidrilus americanus	-	-	-	-	-	-	-	-	-	-	-	-
Tubificidae w/ cap setae sp.	-	-	-		74	15	-	-	-	-	-	15
Tubificidae w/o cap setae sp.	-	15	-	15	59	-	-	-	-	-	15	44
Coleoptera	-	-	-	-	-	-	15	-	-	-	-	-
Diptera	30	89	20	326	15	89	-	222	15	1,333	1,748	15
Abiskomyia sp.	-	-	-	-	-	-	-	-	-	-	-	-
Ablabesmyia (Karelia) sp.	-	-	-	-	-	-	-	-	-	-	-	-
Ablabesmyia monilis	-	-	20	-	59	-	-	-	-	-	-	-
Ablabesmyia sp.	-	15	20	104	59	44	-	-	-	-	-	-
Chironomini	-	-	-	-	-	-	15	-	-	-	-	-
Chironomus sp.	-	-	-	-	-	-	-	-	-	15	-	-
Cladopelma sp.	-	-	-	-	-	-	-	-	-		-	15
Cladotanytarsus sp.	59	-	-	15	-	59	59	15	311	15	15	44
Constempellina sp.	-	-	-	-	-	-	-	-	-	-	-	-
Corynocera sp.	-	-	-	44	44	222	-	-	-	-	59	30
Cricotopus sp.	-	-	-	30	30	44	-	-	-	-	-	-
Cryptochironomus sp.	-	-	-	-	-	-	15	-	15	-	-	-
Demicryptochironomus sp.	-	-	-	-	-	-	-	-	-	-	-	-
Dicrotendipes fumidus	-	-	-	-	15	-	-	-	-	-	-	-
Dicrotendipes lobiger	-	-	-	30	15	15	-	-	-	-	-	-
Dicrotendipes sp.	-	-	-	-	-	-	-	-	-	-	-	-
Endochironomus sp.	-	-	-	-	-	15	-	-	-	-	-	-
Glyptotendipes sp.	-	-	-	-	-	-	-	-	-	-	-	-
Heterotanytarsus sp.	-	-	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius marcidus gr.	-	-	-	-	-	15	-	-	-	15	89	-
Heterotrissocladius subpilosus gr.	-	-	-	15	-	-	-	-	-	-	-	-
Hydrobaenus sp.	-	-	-	15	-	-	-	-	-	-	-	-
Micropsectra sp.	1,111	1,837	1,640	-	89	30	-	15	193	30	-	15
Microtendipes pedellus gr.	-	-	-	-	-	311	-	-	-	-	-	-
Monodiamesa sp.	-	30	20	178	74	104	89	-	30	74	59	59

(continued)

Table 3.7-3. Taxonomic Density Results for Benthic Invertebrates at AEMP Lake Sites, 2014 (continued)

Lake	Leslie			Moose			Nema			Slipper		
Date	31-Jul-14			31-Jul-14			2-Aug-14			4-Aug-14		
Replicate No.	1	2	3	1	2	3	1	2	3	1	2	3
Sample ID	6823.02-16	6823.02-17	6823.02-18	6823.02-13	6823.02-14	6823.02-15	6823.02-19	6823.02-20	6823.02-21	6823.02-22	6823.02-23	6823.02-24
Area Sampled (m^2)	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675
Percent Subsampled	100.00	100.00	75.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Species/Group (organisms/m^2)												
Diptera ***(cont'd)***												
Orthocladiinae	-	-	-	-	-	-	-	-	-	-	-	-
Pagastiella sp.	30	30	-	-	-	15	252	119	400	-	30	-
Parachironomus sp.	-	-	-	-	-	-	-	-	-	-	-	-
Parakiefferiella sp.	59	89	59	119	89	163	-	-	-	-	-	-
Paratanytarsus sp.	-	15	178	15	-	119	-	-	-	-	-	-
Polypedilum scalaenum gr.	-	15		15	44	30	-	-	-	30	-	15
Polypedilum sp.	-	-	-	-	-	-	-	-	-	-	-	-
Potthastia longimana gr.	-	-	-	-	-	-	-	-	-	-	-	-
Procladius sp.	400	444	356	59	193	252	133	44	104	222	163	296
Protanypus sp.	74	133	20	-	15	-	74	30	74	59	44	30
Psectrocladius sp.	-	-	-	-	-	15	-	-	-	-	-	-
Pseudochironomus sp.	-	-	-	-	-	15	-	-	-	-	-	-
Sergentia sp.	-	-	-	-	-	15	-	-	-	-	-	-
Stempellinella sp.	15	-	20	59	15	-	-	-	44	44	-	-
Stictochironomus sp.	-	-	-	-	15	30	44	30	74	252	474	370
Tanytarsini	44	-	59	30	15	15	119	-	-	-	15	-
Tanytarsus sp.	178	193	316	785	637	770	237	59	533	30	59	104
Thienemannimyia gr. sp.	15	296	40	163	193	133	-	-	-	-	-	-
Tvetenia bavarica gr.	-	-	-	-	15	-	-	-	-	-	-	-
Xylotopus par	-	-	-	-	-	-	-	-	-	-	-	-
Zalutschia sp.	-	-	-	15	-	-	-	-	-	-	-	-
Empididae	-	-	-	-	-	-	-	-	-	-	-	-
Neoplasta sp.	-	-	-		-	15	-	-	-	-	-	-
Hemiptera	-	-	-	-	-	-	-	-	-	-	-	-
Hymenoptera	-	-	-	-	-	-	-	-	-	-	-	-
Trichoptera	-	-	-	-	-	-	-	15	15	-	-	-
Leptoceridae	-	-	-	-	-	-	-	-	-	-	-	-
Oecetis sp.	-	-	-	-	-	-	-	-	-	-	-	-
Phryganeidae	-	-	-	-	-	-	-	-	-	-	-	-
Agrypnia sp.	-	-	-	-	-	-	-	-	-	-	-	-
Copepoda	15	-	59	74	44	-	15	-	-	74	15	15
Calanoida	-	-	-	15	30	-	15	-	-	74	-	15
Cyclopoida	15	-	59	59	15	-	-	-	-	-	15	-
Ostracoda	-	-	-		15		-	-	-	-	-	-
Cnidaria	-	15	-	-	-	-	-	-	-	-	-	-
Hydra sp.	-	15	-	-	-	-	-	-	-	-	-	-
Ectoprocta		-	20	15	30	-	15	-	-	-	-	-
Mollusca												
Bivalvia	-	-	20	-	-	-	-	-	-	-	15	-
Pisidium sp.	133	119	178	-	-	74	652	548	400	119	30	44
Sphaeriidae	2,904	4,889	2,133	-	30	267	3,496	1,126	2,015	637	356	444
Sphaerium sp.	-	-	-	-	-	-	74	15	74	-	-	-
Gastropoda	15	163	20	-	-	-	-	-	-	-	-	-
Planorbidae	30	178	59	-	-	30	-	-	-	-	-	-
Valvata sp.	933	963	830	15	59	15	15	-	30	-	-	-
Turbellaria	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	**6,444**	**9,956**	**6,459**	**2,385**	**2,059**	**3,081**	**5,319**	**2,252**	**4,326**	**2,978**	**3,230**	**1,615**

(continued)

Table 3.7-3. Taxonomic Density Results for Benthic Invertebrates at AEMP Lake Sites, 2014 (continued)

Lake	S2			Cujo			LdS1		
Date	3-Aug-14			7-Aug-14			8-Aug-14		
Replicate No.	1	2	3	1	2	3	1	2	3
Sample ID	6823.02-25	6823.02-26	6823.02-27	6823.02-28	6823.02-29	6823.02-30	6823.02-31	6823.02-32	6823.02-33
Area Sampled (m^2)	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675
Percent Subsampled	100.00	100.00	100.00	68.75	33.33	5.63	100.00	75.00	100.00
Species/Group (organisms/m^2)									
Nematoda	-	30	-	-	133	1,580	15	-	44
Arachnida	15	15	-	-	133	263	44	79	74
Acari	-	-	-	-	-	-	-	20	-
Arrenurus sp.	-	-	-	-	89	263	-	-	-
Aturidae	-	-	-	-	-	-	-	-	-
Hygrobates sp.	-	-	-	-	-	-	30	20	-
Lebertia sp.	-	15	-	-	44	-	-	40	30
Oxus sp.	15	-	-	-	-	-	-	-	15
Pionidae	-	-	-	-	-	-	15	-	-
Piona sp.	-	-	-	-	-	-	-	-	30
Branchiopoda									
Cladocera	-	-	-	-	-	-	504	178	178
Lepidurus arcticus	-	-	-	-	-	-	-	-	-
Oligochaeta									
Lumbriculidae	-	-	-	65	44	-	74	20	89
Dero digitata	-	-	-	-	-	-	-	-	-
Nais sp.	-	-	-	43	-	-	-	-	-
Specaria sp.	-	-	-	-	-	263	-	-	-
Uncinais uncinata	-	-	-	-	-	-	-	-	-
Limnodrilus hoffmeisteri	-	15	-	-	-	-	44	-	74
Rhyacodrilus coccineus	-	-	30	22	44	263	-	-	-
Tasserkidrilus americanus	15	-	-	-	-	-	-	-	-
Tubificidae w/ cap setae sp.	15	30	44	-	356	-	59	119	59
Tubificidae w/o cap setae sp.	-	-	-	-	-	-	-	-	15
Coleoptera	-	-	-	-	-	-	-	-	-
Diptera	-	-	-	65	89	13,695	74	40	89
Abiskomyia sp.	-	-	-	-	-	-	-	-	-
Ablabesmyia (Karelia) sp.	-	-	-	-	44	-	-	-	-
Ablabesmyia monilis	15	15	15	151	-	1,317	-	-	-
Ablabesmyia sp.	15	-	-	-	44	-	59	59	59
Chironomini	-	-	-	-	-	-	15	-	
Chironomus sp.	-	-	15	-	-	263	15	20	15
Cladopelma sp.	-	-	-	-	44	263	-	-	-
Cladotanytarsus sp.	30	-	-	323	178	2,107	15	296	30
Constempellina sp.	-	-	-	-	-	-	30	-	
Corynocera sp.	-	-	-	1,164	2,667	17,119	-	-	-
Cricotopus sp.	-	-	-	129	89	263	-	-	-
Cryptochironomus sp.	-	-	-	22	133	-	-	-	-
Demicryptochironomus sp.	-	-	-	-	-	-	-	-	-
Dicrotendipes fumidus	-	-	-	-	-	-	-	79	59
Dicrotendipes lobiger	-	-	-	151	400	790	-	-	-
Dicrotendipes sp.		-	15	43	267	-	-	-	-
Endochironomus sp.	-	-	-	-	-	-	-	-	-
Glyptotendipes sp.	-	-	-	22	-	263	-	-	-
Heterotanytarsus sp.	-	-	-	-	-	-	-	-	-
Heterotrissocladius marcidus gr.	-	-	-	22	44	263	-	40	30
Heterotrissocladius subpilosus gr.	-	-	-	-	-	-	-	-	-
Hydrobaenus sp.	15	-	-	-	-	-	-	-	-
Micropsectra sp.	74	-	-	-	-	-	-	-	59
Microtendipes pedellus gr.	74	30	30	1,961	5,467	16,066	15	20	15
Monodiamesa sp.	133	44	163	-	-	263	267	375	89

(continued)

Table 3.7-3. Taxonomic Density Results for Benthic Invertebrates at AEMP Lake Sites, 2014 (completed)

Lake	S2			Cujo			LdS1		
Date	3-Aug-14			7-Aug-14			8-Aug-14		
Replicate No.	1	2	3	1	2	3	1	2	3
Sample ID	6823.02-25	6823.02-26	6823.02-27	6823.02-28	6823.02-29	6823.02-30	6823.02-31	6823.02-32	6823.02-33
Area Sampled (m^2)	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675	0.0675
Percent Subsampled	100.00	100.00	100.00	68.75	33.33	5.63	100.00	75.00	100.00
Species/Group (organisms/m^2)									
Diptera ***(cont'd)***									
Orthocladiinae	-	-	-	-	-	-	-	-	-
Pagastiella sp.	-	-	-	-	-	527	-	-	-
Parachironomus sp.	-	-	-	43	267	-	-	-	-
Parakiefferiella sp.	89	-	30	-	-	-	15	40	44
Paratanytarsus sp.	252	59	30	453	844	5,531	15	20	30
Polypedilum scalaenum gr.	-	-	-	-	178	2,370	119	178	89
Polypedilum sp.	-	-	-	-	-	-	-	-	-
Potthastia longimana gr.	-	-	-	-	-	-	-	20	-
Procladius sp.	341	133	89	797	-	10,535	519	672	726
Protanypus sp.	74	-	133	-	-	-	89	119	133
Psectrocladius sp.	-	-	-	-	-	263	15	20	44
Pseudochironomus sp.	-	-	-	22	89	-	-	-	-
Sergentia sp.	-	-	-	22	133	263	-	-	-
Stempellinella sp.	104	15	59	-	-	-	207	59	104
Stictochironomus sp.	163	-	104	43	44	527	667	1,086	1,141
Tanytarsini	119	-	-	43	-	263	89	20	15
Tanytarsus sp.	711	163	385	819	1,422	7,111	681	1,659	281
Thienemannimyia gr. sp.	-	-	-	22	44	527	-	59	15
Tvetenia bavarica gr.	-	-	-	-	-	-	-	-	-
Xylotopus par	-	-	-	-	-	-	-	-	-
Zalutschia sp.	-	-	-	-	-	-	-	79	-
Empididae	-	-	-	-	-	-	-	-	-
Neoplasta sp.	-	-	-	-	-	-		-	15
Hemiptera	-	-	-	-	-	-	-	-	-
Hymenoptera	-	-	-	-	-	-	-	-	-
Trichoptera	-	-	-	-	-	-	-	-	-
Leptoceridae	-	-	-	-	-	-	-	-	-
Oecetis sp.	-	-	-	-	-	-	-	-	-
Phryganeidae	-	-	-	-	-	-	30	-	15
Agrypnia sp.	-	-	-	-	-	-	30	-	15
Copepoda	296	30	30	43	444	5,004	281	237	193
Calanoida	-	-	-	-	89	263	-	20	-
Cyclopoida	296	30	30	43	356	4,741	281	217	193
Ostracoda	-	-	-		444				30
Cnidaria	-	-	-	-	-	-	-	-	-
Hydra sp.	-	-	-	-	-	-	-	-	-
Ectoprocta	-	-	-	-	-	-	-	-	-
Mollusca									
Bivalvia	-	-	-	-	-	-	-	-	-
Pisidium sp.	163	74	119	215	444	3,424	326	237	222
Sphaeriidae	430	252	281	1,681	3,111	21,597	741	790	593
Sphaerium sp.	30	-	15	22	-	-		59	-
Gastropoda	-	-	-	65	-	263	-	-	-
Planorbidae	-	-	-	22	133	263	15	-	-
Valvata sp.	30	-	15	-	-	-	-	-	-
Turbellaria	-	-	-	-	-	-	-	-	-
TOTAL	**3,200**	**904**	**1,600**	**8,490**	**17,778**	**113,514**	**5,037**	**6,677**	**4,667**

Note:

Taxonomic identification by EcoAnalysts Inc.

Table 3.7-4. Benthos Taxonomy QA/QC Sorting Efficiency Results for AEMP Lake Samples, 2014

Lake	Replicate No.	Sample ID	Total Organisms in Sample	Sorting Efficiency (%)
Nanuq	1	6823.02-1	342	100
	2	6823.02-2	348	100
	3	6823.02-3	205	100
Counts	1	6823.02-4	408	100
	2	6823.02-5	366	100
	3	6823.02-6	381	100
Vulture	1	6823.02-7	235	100
	2	6823.02-8	232	100
	3	6823.02-9	214	100
Kodiak	1	6823.02-10	474	100
	2	6823.02-11	317	100
	3	6823.02-12	325	100
Leslie	1	6823.02-16	435	100
	2	6823.02-17	672	100
	3	6823.02-18	327	100
Moose	1	6823.02-13	161	98
	2	6823.02-14	139	100
	3	6823.02-15	208	100
Nema	1	6823.02-19	359	100
	2	6823.02-20	152	100
	3	6823.02-21	292	100
Slipper	1	6823.02-22	201	100
	2	6823.02-23	218	100
	3	6823.02-24	109	100
S2	1	6823.02-25	216	100
	2	6823.02-26	61	100
	3	6823.02-27	108	100
Cujo	1	6823.02-28	394	100
	2	6823.02-29	400	100
	3	6823.02-30	431	100
LdS1	1	6823.02-31	340	100
	2	6823.02-32	338	100
	3	6823.02-33	315	100

Table 3.7-5. Benthos Taxonomy QA/QC Percent Similarity Results for AEMP Lake Samples, 2014

Counts (Rep 2) Sample 6823.2-5

Component	Species/Group	Original Count	% Total	QC Count	% Total	Absolute Difference
Chironomidae	*Cladotanytarsus sp.*	1	0.3	1	0.3	0.0
	Corynocera sp.	13	3.6	14	3.9	0.3
	Cryptochironomus sp.	0	0.0	1	0.3	0.3
	Dicrotendipes fumidus	8	2.2	8	2.2	0.0
	Micropsectra sp.	147	40.9	147	40.7	0.2
	Microtendipes pedellus gr.	2	0.6	1	0.3	0.3
	Monodiamesa sp.	5	1.4	5	1.4	0.0
	Pagastiella sp.	9	2.5	9	2.5	0.0
	Parachironomus sp.[1]	0	0.0	0	0.0	0.0
	Paratanytarsus sp.	17	4.7	18	5.0	0.3
	Polypedilum scalaenum gr.	1	0.3	4	1.1	0.8
	Procladius sp.	12	3.3	11	3.0	0.3
	Stempellinella sp.	2	0.6	2	0.6	0.0
	Stictochironomus sp.	38	10.6	35	9.7	0.9
	Tanytarsini	4	1.1	4	1.1	0.0
	Tanytarsus sp.	4	1.1	4	1.1	0.0
	Zalutschia sp.	1	0.3	1	0.3	0.0
General	Calanoida	0	0.0	1	0.3	0.3
	Cladocera	3	0.8	3	0.8	0.0
	Cyclopoida	6	1.7	5	1.4	0.3
	Diptera	50	13.9	50	13.9	0.1
	Empididae[1]	0	0.0	0	0.0	0.0
	Nematoda	2	0.6	1	0.3	0.3
	Pisidium sp.	8	2.2	10	2.8	0.5
	Sphaeriidae	25	7.0	25	6.9	0.0
Oligochaete	Lumbriculidae	1	0.3	1	0.3	0.0
Total		**359**	**100**	**361**	**100**	**4.9**
% Similarity				**97.57**		

(continued)

Table 3.7-5. Benthos Taxonomy QA/QC Percent Similarity Results for AEMP Lake Samples, 2014 (continued)

Moose (Rep 3) Sample 6823.2-15

Component	Species/Group	Original Count	% Total	QC Count	% Total	Absolute Difference
Chironomidae	*Ablabesmyia sp.*	3	1.5	3	1.5	0.0
	Cladotanytarsus sp.	2	1.0	4	2.0	1.0
	Corynocera sp.	10	5.0	15	7.4	2.3
	Cricotopus	3	1.5	3	1.5	0.0
	Dicrotendipes lobiger	0	0.0	0	0.0	0.0
	Endochironomus sp.[1]	0	0.0	0	0.0	0.0
	Heterotrissocladius marcidus gr.	0	0.0	1	0.5	0.5
	Heterotrissocladius subpilosus gr.	1	0.5	0	0.0	0.5
	Micropsectra sp.	2	1.0	1	0.5	0.5
	Microtendipes pedellus gr.	21	10.6	22	10.8	0.2
	Monodiamesa sp.	7	3.5	7	3.4	0.1
	Pagastiella sp.	1	0.5	1	0.5	0.0
	Parakiefferiella sp.	11	5.5	10	4.9	0.6
	Paratanytarsus sp.	8	4.0	11	5.4	1.4
	Polypedilum scalaenum gr.	2	1.0	2	1.0	0.0
	Procladius sp.	19	9.5	17	8.3	1.2
	Psectrocladius sp.	1	0.5	1	0.5	0.0
	Pseusdochironomus sp.	1	0.5	1	0.5	0.0
	Sergentia sp.	0	0.0	1	0.5	0.5
	Stictochironomus sp.	2	1.0	2	1.0	0.0
	Tanytarsini	0	0.0	1	0.5	0.5
	Tanytarsus sp.	57	28.6	52	25.5	3.2
	Thienemannimyia gr.	9	4.5	9	4.4	0.1
General	*Arrenurus sp.*	1	0.5	1	0.5	0.0
	Aturidae[1]	0	0.0	0	0.0	0.0
	Diptera	6	3.0	6	2.9	0.1
	Lebertia sp.	2	1.0	2	1.0	0.0
	Neoplasta sp.[1]	0	0.0	0	0.0	0.0
	Pisidium sp.	5	2.5	5	2.5	0.1
	Planorbidae[1]	0	0.0	0	0.0	0.0
	Sphaeriidae	18	9.0	18	8.8	0.2
	Valvata sp.	1	0.5	1	0.5	0.0
Oligochaete	*Dero digitata*[1]	0	0.0	0	0.0	0.0
	Limnodrilus hoffmeisteri	4	2.0	4	2.0	0.0
	Nais sp.	1	0.5	1	0.5	0.0
	Tubificidae w/ cap setae	1	0.5	2	1.0	0.5
Total		**199**	**100**	**204**	**100**	**13.6**
% Similarity				**93.18**		

(continued)

Table 3.7-5. Benthos Taxonomy QA/QC Percent Similarity Results for AEMP Lake Samples, 2014 (completed)

S2 (Rep 1) Sample 6823.2-25

Component	Species/Group	Original Count	% Total	QC Count	% Total	Absolute Difference
Chironomidae	*Ablabesmyia sp.*[1]	0	0.0	0	0.0	0.0
	Ablabesmyia monilis[1]	0	0.0	0	0.0	0.0
	Cladotanytarsus sp.	0	0.0	2	1.0	1.0
	Hydrobaenus sp.[1]	0	0.0	0	0.0	0.0
	Micropsectra sp.	0	0.0	1	0.5	0.5
	Microtendipes pedellus gr.	3	1.5	2	1.0	0.5
	Monodiamesa sp.	9	4.6	9	4.7	0.0
	Parakiefferiella sp.	2	1.0	2	1.0	0.0
	Paratanytarsus sp.	14	7.2	15	7.8	0.6
	Procladius sp.	23	11.9	23	11.9	0.1
	Protanypus sp.	5	2.6	5	2.6	0.0
	Stempellinella sp.	5	2.6	5	2.6	0.0
	Stictochironomus sp.	11	5.7	11	5.7	0.0
	Tanytarsini	5	2.6	5	2.6	0.0
	Tanytarsus sp.	50	25.8	47	24.4	1.4
General	Cyclopoida	20	10.3	20	10.4	0.1
	Oxus sp.	1	0.5	1	0.5	0.0
	Pisidium sp.	11	5.7	11	5.7	0.0
	Sphaeriidae	29	14.9	28	14.5	0.4
	Sphaerium sp.	2	1.0	2	1.0	0.0
	Valvata sp.	2	1.0	2	1.0	0.0
Oligochaete	*Tasserkidrilus americanus*	1	0.5	1	0.5	0.0
	Tubificidae w/ cap setae	1	0.5	1	0.5	0.0
TOTAL		**194**	**100**	**193**	**100**	**4.7**
% Similarity				**97.63**		

[1] *The individual representing the species was removed for the reference collection.*

Table 3.7-6. Locations and Dates for Benthos Sampling at AEMP Stream Sites, 2014

Stream	Sampler Dates		Number of Replicates Retrieved
	Installed	Retrieved	
Nanuq Outflow	1-Aug-14	2-Sep-14	5
Counts Outflow	4-Aug-14	4-Sep-14	5
Vulture-Polar	1-Aug-14	2-Sep-14	5
Kodiak-Little	4-Aug-14	5-Sep-14	5
Moose-Nero	2-Aug-14	3-Sep-14	5
Nema-Martine	4-Aug-14	5-Sep-14	5
Slipper-Lac de Gras	4-Aug-14	3-Sep-14	5
Cujo Outflow	4-Aug-14	4-Sep-14	3*

** Only 3 Hester-Dendy samplers were retrieved due to low water.*

Table 3.7-7. Benthic Dipteran Taxonomic Richness and Diversity Indices at AEMP Stream Sites, 2014

Stream	Date	Replicate No.	Genus Richness	G (90%)	Maximum Dominance (%)	Shannon Diversity Index	Simpson Diversity Index
Nanuq Outflow	1-Aug-14	1	12	30	6.0	1.94	0.82
	to	2	10	63	3.0	1.14	0.56
	2-Sep-14	3	7	40	4.0	1.40	0.73
		4	11	63	5.0	1.27	0.57
		5	11	51	4.0	1.33	0.65
		Mean	**10.2**	**49.2**	**4.40**	**1.41**	**0.67**
		SE	**0.9**	**6.4**	**0.51**	**0.14**	**0.05**
Counts Outflow	4-Aug-14	1	16	34	6.0	1.80	0.78
	to	2	12	64	3.0	1.16	0.54
	4-Sep-14	3	11	43	4.0	1.54	0.71
		4	17	47	7.0	1.80	0.73
		5	13	65	6.0	1.37	0.56
		Mean	**13.8**	**50.7**	**5.20**	**1.54**	**0.66**
		SE	**1.2**	**6.1**	**0.73**	**0.12**	**0.05**
Vulture-Polar	1-Aug-14	1	12	29	6.0	1.93	0.82
	to	2	12	29	6.0	1.88	0.81
	2-Sep-14	3	14	38	6.0	1.77	0.76
		4	13	26	6.0	1.98	0.84
		5	18	37	8.0	1.96	0.79
		Mean	**13.8**	**32.0**	**6.40**	**1.90**	**0.80**
		SE	**1.1**	**2.3**	**0.40**	**0.04**	**0.01**

(continued)

Table 3.7-7. Benthic Dipteran Taxonomic Richness and Diversity Indices at AEMP Stream Sites, 2014 (completed)

Stream	Date	Replicate No.	Genus Richness	G (90%)	Maximum Dominance (%)	Shannon Diversity Index	Simpson Diversity Index
Kodiak-Little	4-Aug-14	1	17	43	7.0	1.84	0.75
	to	2	11	62	3.0	1.08	0.54
	5-Sep-14	3	9	41	3.0	1.26	0.65
		4	11	36	5.0	1.73	0.77
		5	12	59	4.0	1.35	0.60
		Mean	**12.0**	**48.4**	**4.40**	**1.45**	**0.66**
		SE	**1.3**	**5.2**	**0.75**	**0.14**	**0.04**
Moose-Nero	2-Aug-14	1	9	34	5.0	1.61	0.75
	to	2	8	38	4.0	1.51	0.74
	3-Sep-14	3	10	47	5.0	1.57	0.71
		4	11	38	4.0	1.52	0.73
		5	11	33	6.0	1.82	0.79
		Mean	**9.8**	**37.8**	**4.80**	**1.61**	**0.74**
		SE	**0.6**	**2.4**	**0.37**	**0.06**	**0.01**
Nema-Martine	4-Aug-14	1	13	19	8.0	2.15	0.86
	to	2	14	25	8.0	2.18	0.86
	5-Sep-14	3	12	27	8.0	2.05	0.84
		4	15	48	6.0	1.72	0.72
		5	13	44	5.0	1.62	0.73
		Mean	**13.4**	**32.8**	**7.00**	**1.94**	**0.80**
		SE	**0.5**	**5.7**	**0.63**	**0.11**	**0.03**
Slipper-Lac de Gras	4-Aug-14	1	9	48	3.0	1.26	0.66
	to	2	15	51	8.0	1.84	0.71
	3-Sep-14	3	13	47	4.0	1.38	0.68
		4	16	26	10.0	2.21	0.84
		5	14	39	5.0	1.72	0.76
		Mean	**13.4**	**42.3**	**6.00**	**1.68**	**0.73**
		SE	**1.2**	**4.5**	**1.30**	**0.17**	**0.03**
Cujo Outflow	4-Aug-14	1	15	29	8.0	2.12	0.84
	to	2	13	37	8.0	1.87	0.78
	4-Sep-14	3	10	31	6.0	1.89	0.82
		Mean	**12.7**	**32.2**	**7.3**	**1.96**	**0.81**
		SE	**1.5**	**2.5**	**0.7**	**0.08**	**0.02**

Notes:
G (90%) is the number of genera comprising 90% of the density.
Maximum Dominance (%) is the maximum dominance accounted for by a single genus.
SE = standard error of the mean

Table 3.7-8. Benthic EPT Taxonomic Richness and Diversity Indices at AEMP Stream Sites, 2014

Stream	Date	Replicate No.	Genus Richness	G (90%)	Maximum Dominance (%)	Shannon Diversity Index	Simpson Diversity Index
Nanuq Outflow	1-Aug-14	1	2	50	2.0	0.69	0.50
	to	2	3	63	3.0	0.90	0.53
	2-Sep-14	3	4	25	4.0	1.39	0.75
		4	2	80	2.0	0.50	0.32
		5	1	100	1.0	0	0
		Mean	**2.4**	**63.5**	**2.40**	**0.70**	**0.42**
		SE	**0.5**	**12.8**	**0.51**	**0.23**	**0.13**
Counts Outflow	4-Aug-14	1	4	50	4.0	1.24	0.67
	to	2	2	75	2.0	0.56	0.38
	4-Sep-14	3	0	0	6.0	0	1.00
		4	1	100	1.0	0	0
		5	1	100	1.0	0	0
		Mean	**1.6**	**65.0**	**2.80**	**0.36**	**0.41**
		SE	**0.7**	**18.7**	**0.97**	**0.25**	**0.19**
Vulture-Polar	1-Aug-14	1	2	67	2.0	0.64	0.44
	to	2	2	50	2.0	0.69	0.50
	2-Sep-14	3	5	43	5.0	1.48	0.73
		4	4	56	4.0	1.15	0.62
		5	2	71	2.0	0.60	0.41
		Mean	**3.0**	**57.3**	**3.00**	**0.91**	**0.54**
		SE	**0.6**	**5.3**	**0.63**	**0.17**	**0.06**
Kodiak-Little	4-Aug-14	1	5	56	3.0	1.15	0.60
	to	2	2	83	2.0	0.45	0.28
	5-Sep-14	3	5	46	3.0	1.22	0.65
		4	4	64	3.0	1.01	0.54
		5	3	60	2.0	0.90	0.54
		Mean	**3.8**	**61.8**	**2.60**	**0.95**	**0.52**
		SE	**0.6**	**6.1**	**0.24**	**0.14**	**0.06**
Moose-Nero	2-Aug-14	1	1	100	1.0	0	0
	to	2	2	92	1.0	0.29	0.15
	3-Sep-14	3	1	100	1.0	0	0.00
		4	2	86	2.0	0.40	0.24
		5	1	100	1.0	0	0
		Mean	**1.4**	**95.6**	**1.20**	**0.14**	**0.08**
		SE	**0.2**	**2.8**	**0.20**	**0.09**	**0.05**

(continued)

Table 3.7-8. Benthic EPT Taxonomic Richness and Diversity Indices at AEMP Stream Sites, 2014 (completed)

Stream	Date	Replicate No.	Genus Richness	G (90%)	Maximum Dominance (%)	Shannon Diversity Index	Simpson Diversity Index
Nema-Martine	4-Aug-14	1	1	100	1.0	0	0
	to	2	2	88	2.0	0.36	0.21
	5-Sep-14	3	3	86	2.0	0.51	0.26
		4	2	70	2.0	0.61	0.42
		5	1	100	1.0	0	0
		Mean	**1.8**	**88.8**	**1.60**	**0.30**	**0.18**
		SE	**0.4**	**5.5**	**0.24**	**0.13**	**0.08**
Slipper-Lac de Gras	4-Aug-14	1	4	70	2.0	0.81	0.46
	to	2	5	92	1.0	0.38	0.15
	3-Sep-14	3	5	62	2.0	0.91	0.52
		4	2	96	1.0	0.18	0.08
		5	3	89	2.0	0.37	0.20
		Mean	**3.8**	**81.8**	**1.60**	**0.53**	**0.28**
		SE	**0.6**	**6.6**	**0.24**	**0.14**	**0.09**
Cujo Outflow	4-Aug-14	1	3	75	2.0	0.72	0.40
	to	2	2	67	2.0	0.64	0.44
	4-Sep-14	3	3	33	3.0	1.10	0.67
		Mean	**2.7**	**58.3**	**2.3**	**0.82**	**0.50**
		SE	**0.3**	**12.7**	**0.3**	**0.14**	**0.08**

Notes:
G (90%) is the number of genera comprising 90% of the density.
Maximum Dominance (%) is the maximum dominance accounted for by a single genus.
SE = standard error of the mean

Table 3.7-9. Taxonomic Density Results for Benthic Invertebrates at AEMP Stream Sites, 2014

Stream	Nanuq Outflow					Counts Outflow				
Date	2-Sep-14					4-Sep-14				
Replicate No.	1	2	3	4	5	1	2	3	4	5
Sample ID	6823.01-6	6823.01-7	6823.01-8	6823.01-9	6823.01-10	6823.01-18	6823.01-19	6823.01-20	6823.01-21	6823.01-22
Area Sampled (m^2)	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Percent Sampled	100.00	25.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Species/Group (organisms/m^2)										
Nematoda	11	-	-	-	11	22	500	311	189	-
Arachnida										
Acari	-	-	-	-	-	-	-	-	11	-
Oribatei	-	-	-	-	-	11	-	44	-	22
Trombidiformes										
Atractides sp.	-	44	-	-	-	-	-	-	-	-
Hygrobates sp.	-	-	11	44	78	-	-	-	11	-
Lebertia sp.	11	-	22	-	-	-	-	-	-	-
Limnesia sp.	-	-	-	-	-	-	-	-	-	-
Sperchon sp.	-	-	-	11	-	-	-	-	-	-
Sperchonopsis sp.	-	-	-	-	-	33	-	-	33	11
Mollusca										
Bivalvia										
Veneroida										
Pisidium sp.	-	-	-	-	-	-	-	-	-	-
Sphaeriidae	-	-	-	-	-	-	-	-	-	-
Sphaerium sp.	-	-	-	-	-	-	-	-	-	-
Gastropoda										
Gastropoda	-	-	-	-	-	-	-	-	-	-
Basommatophora										
Gyraulus sp.	-	-	-	-	-	-	11	-	11	-
Physa sp.	-	-	-	-	-	-	-	-	-	-
Planorbidae	-	-	-	-	-	-	-	-	-	-
Heterostropha										
Valvata lewisi	-	-	-	-	-	-	-	-	-	-
Valvata sp.	-	-	-	-	-	-	-	-	-	-
Coelentrata										
Hydrozoa										
Hydra sp.	-	-	-	-	-	-	-	-	-	-
Oligochaeta										
Lumbriculida										
Lumbriculidae	-	-	-	-	-	-	-	-	-	-
Tubificida										
Chaetogaster diaphanus	-	-	-	-	-	-	-	-	-	-
Nais sp.	-	-	-	-	-	-	-	-	-	-
Tubificidae w/ cap setae sp.	-	-	-	-	-	-	-	-	-	-
Cladocera	-	-	-	-	100	-	-	22	-	22
Coleoptera										
Hydroporus sp.	-	-	-	-	-	-	-	-	-	-
Collembola	-	-	-	-	-	-	-	-	-	-
Diptera										
Ablabesmyia (Karelia) sp.	-	-	-	-	-	-	-	-	-	-
Ablabesmyia sp.	11	-	-	-	-	-	67	11	33	-
Bezzia/Palpomyia sp.	-	-	-	22	-	67	122	67	244	89
Chironomini	-	-	-	-	-	-	-	-	-	-
Chironomus sp.	-	-	-	-	-	-	-	-	-	-
Cladotanytarsus sp.	-	-	-	-	-	-	11	-	22	-
Corynoneura sp.	111	2,622	122	189	578	778	1,167	422	1,156	1,011
Cricotopus sp.	-	8,800	233	2,122	1,122	244	-	278	322	89
Dicrotendipes fumidus	-	-	-	-	-	-	-	-	-	-
Dicrotendipes sp.	-	-	-	-	-	-	-	-	-	-
Diptera	-	44	-	44	-	-	-	-	-	-
Endochironomus sp.	-	-	-	-	-	-	-	-	-	-
Eukiefferiella claripennis gr.	-	-	-	-	-	11	-	-	-	-
Heterotrissocladius marcidus gr.	-	-	-	-	-	-	-	-	-	-
Limnophyes sp.	-	-	-	-	-	-	-	-	-	11
Micropsectra sp.	-	-	-	-	-	-	-	-	-	-
Microtendipes pedellus gr.	-	-	-	-	-	-	-	-	-	-
Nanocladius sp.	11	-	-	-	-	644	-	22	44	78

(continued)

Table 3.7-9. Taxonomic Density Results for Benthic Invertebrates at AEMP Stream Sites, 2014 (continued)

Stream	Nanuq Outflow					Counts Outflow				
Date	2-Sep-14					4-Sep-14				
Replicate No.	1	2	3	4	5	1	2	3	4	5
Sample ID	6823.01-6	6823.01-7	6823.01-8	6823.01-9	6823.01-10	6823.01-18	6823.01-19	6823.01-20	6823.01-21	6823.01-22
Area Sampled (m^2)	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Percent Sampled	100.00	25.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Species/Group (organisms/m^2)										
Diptera (continued)										
Orthocladiinae	-	44	-	-	-	-	-	-	-	-
Orthocladius annectens	56	1,600	100	422	122	111	-	22	33	22
Orthocladius Complex	144	44	-	78	11	-	-	-	11	11
Orthocladius sp.	-	-	-	-	-	-	-	-	-	-
Parachironomus sp.	-	-	-	-	-	-	-	-	-	-
Parakiefferiella sp.	-	89	-	-	-	11	11	-	44	22
Paratanytarsus sp.	89	133	11	200	22	22	11	-	11	-
Pentaneurini	11	-	-	-	-	-	-	-	-	-
Phaenopsectra sp.	11	-	-	-	-	-	22	-	11	-
Polypedilum sp.	11	-	-	-	-	-	-	-	22	-
Potthastia longimana gr.	-	-	-	-	11	-	-	-	-	-
Psectrocladius sp.	56	-	122	167	256	11	-	11	11	44
Rheotanytarsus sp.	-	267	-	-	33	233	11	-	44	11
Simuliidae	-	178	-	-	-	-	-	-	11	-
Simulium sp.	-	400	-	11	22	-	-	-	11	-
Synorthocladius sp.	-	-	-	-	-	11	-	11	-	-
Tanytarsus sp.	122	-	-	167	11	11	367	122	278	89
Thienemanniella sp.	-	-	-	-	-	-	-	-	-	-
Thienemannimyia gr. sp.	33	89	-	11	-	122	33	-	156	67
Tipula sp.	-	-	-	-	-	-	-	-	-	-
Tribelos sp.	-	-	-	-	-	-	-	-	-	-
Tvetenia bavarica gr.	-	-	-	-	-	11	-	11	-	-
Zalutschia sp.	-	-	-	-	-	-	-	-	-	-
Ephemeroptera										
Baetis sp.	-	-	-	-	-	-	-	-	-	-
Ephemerella aurivillii	-	-	-	-	-	-	-	-	-	-
Ephemerella sp.	-	-	11	-	-	-	-	-	-	-
Leptophlebiidae	-	-	-	-	-	11	11	-	-	-
Paraleptophlebia sp.	22	-	11	-	-	-	-	-	-	-
Rhithrogena sp.	-	-	-	-	-	-	-	-	-	-
Hemiptera										
Corixidae	-	-	-	-	11	-	-	-	-	-
Hemiptera	11	-	-	11	-	-	-	-	-	-
Plecoptera										
Diura sp.	-	-	-	-	-	11	-	-	-	-
Nemoura sp.	-	-	-	-	-	33	33	-	167	11
Nemouridae	-	-	-	-	-	-	-	-	-	-
Trichoptera										
Agraylea sp.	-	-	11	-	-	-	-	-	-	-
Agrypnia sp.	-	-	-	-	-	-	-	-	-	-
Brachycentridae	-	44	-	-	-	-	-	-	-	-
Brachycentrus americanus	-	89	-	-	-	11	-	-	-	-
Brachycentrus sp.	-	-	-	-	-	-	-	-	-	-
Hydroptilidae	-	-	-	11	-	-	-	-	-	-
Limnephilidae	-	-	-	-	-	-	-	-	-	-
Micrasema sp.	-	-	-	-	-	-	-	-	-	-
Molannidae	-	-	-	-	-	-	-	-	-	-
Oxyethira sp.	22	222	11	44	78	-	-	-	-	-
Rhyacophila mongolica	-	-	-	-	-	-	-	-	-	-
Copepoda										
Calanoida	-	-	-	-	-	-	-	-	11	-
Cyclopoida	200	-	111	111	11	-	67	33	22	11
Harpacticoida	22	-	11	122	-	33	1,133	1,244	1,122	67
Ostracoda	56	-	22	11	22	-	78	133	22	-
TOTAL	**1,022**	**14,711**	**811**	**3,800**	**2,500**	**2,456**	**3,656**	**2,767**	**4,067**	**1,689**

(continued)

Table 3.7-9. Taxonomic Density Results for Benthic Invertebrates at AEMP Stream Sites, 2014 (continued)

Stream	Vulture-Polar					Kodiak-Little				
Date	2-Sep-14					5-Sep-14				
Replicate No.	1	2	3	4	5	1	2	3	4	5
Sample ID	6823.01-11	6823.01-12	6823.01-13	6823.01-14	6823.01-15	6823.01-26	6823.01-27	6823.01-28	6823.01-29	6823.01-30
Area Sampled (m^2)	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Percent Sampled	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Species/Group (organisms/m^2)										
Nematoda	22	56	22	100	-	33	22	11	89	33
Arachnida										
Acari	-	-	-	-	-	-	-	11	-	-
Oribatei	11	44	11	11	11	-	-	-	-	-
Trombidiformes										
Atractides sp.	-	-	-	-	78	-	-	-	-	-
Hygrobates sp.	22	33	100	33	33	11	67	156	33	44
Lebertia sp.	-	11	-	-	-	-	-	11	-	-
Limnesia sp.	-	-	-	-	-	-	-	-	-	-
Sperchon sp.	-	11	11	-	11	-	11	11	-	11
Sperchonopsis sp.	-	-	11	-	-	-	-	-	-	-
Mollusca										
Bivalvia										
Veneroida										
Pisidium sp.	-	-	-	-	-	-	-	33	56	-
Sphaeriidae	-	-	-	-	-	-	-	344	-	-
Sphaerium sp.	-	-	-	-	-	-	-	22	-	78
Gastropoda										
Gastropoda	-	-	-	-	-	-	-	-	-	-
Basommatophora										
Gyraulus sp.	-	-	-	-	-	-	-	-	-	-
Physa sp.	-	-	-	-	-	-	-	-	-	-
Planorbidae	-	-	-	-	-	-	-	-	-	-
Heterostropha										
Valvata lewisi	-	-	-	-	-	33	-	22	33	11
Valvata sp.	-	-	-	-	-	-	-	-	-	-
Coelentrata										
Hydrozoa										
Hydra sp.	-	-	-	-	-	-	-	-	-	-
Oligochaeta										
Lumbriculida										
Lumbriculidae	-	-	-	33	-	-	-	-	-	-
Tubificida										
Chaetogaster diaphanus	-	-	-	-	-	-	-	-	-	-
Nais sp.	-	-	-	-	-	-	-	-	-	-
Tubificidae w/ cap setae sp.	-	-	-	11	-	-	-	-	-	-
Cladocera	22	22	33	-	-	-	44	-	89	22
Coleoptera										
Hydroporus sp.	-	-	-	-	-	-	-	-	-	-
Collembola	-	11	-	-	-	-	-	-	-	-
Diptera										
Ablabesmyia (Karelia) sp.	-	-	-	-	-	-	-	-	22	11
Ablabesmyia sp.	-	-	-	-	-	-	-	-	-	22
Bezzia/Palpomyia sp.	144	67	67	122	311	-	-	-	-	-
Chironomini	-	-	-	-	-	-	-	-	-	-
Chironomus sp.	-	-	-	-	-	-	-	-	-	-
Cladotanytarsus sp.	-	-	-	-	22	11	-	-	-	-
Corynoneura sp.	78	167	67	100	100	44	44	144	44	44
Cricotopus sp.	256	478	367	211	1,167	300	389	944	533	244
Dicrotendipes fumidus	-	-	-	-	-	11	-	-	-	-
Dicrotendipes sp.	11	-	-	-	11	-	-	11	44	-
Diptera	22	11	11	-	22	-	-	-	-	-
Endochironomus sp.	-	-	-	-	-	11	-	-	-	-
Eukiefferiella claripennis gr.	-	-	-	-	11	-	-	-	-	-
Heterotrissocladius marcidus gr.	-	-	-	-	-	22	-	-	-	-
Limnophyes sp.	-	-	-	-	-	-	-	-	-	-
Micropsectra sp.	-	-	-	-	-	-	-	-	-	-
Microtendipes pedellus gr.	-	-	-	-	-	-	-	-	-	-
Nanocladius sp.	-	-	11	11	244	622	900	933	278	744

(continued)

Table 3.7-9. Taxonomic Density Results for Benthic Invertebrates at AEMP Stream Sites, 2014 (continued)

Stream	Vulture-Polar					Kodiak-Little				
Date	2-Sep-14					5-Sep-14				
Replicate No.	1	2	3	4	5	1	2	3	4	5
Sample ID	6823.01-11	6823.01-12	6823.01-13	6823.01-14	6823.01-15	6823.01-26	6823.01-27	6823.01-28	6823.01-29	6823.01-30
Area Sampled (m^2)	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Percent Sampled	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Species/Group (organisms/m^2)										
Diptera (continued)										
Orthocladiinae	-	-	-	-	22	144	-	56	33	-
Orthocladius annectens	144	244	233	78	689	44	11	22	100	11
Orthocladius Complex	22	44	22	-	11	33	-	22	11	-
Orthocladius sp.	-	-	-	-	-	-	-	-	11	-
Parachironomus sp.	-	-	-	-	-	-	-	-	-	-
Parakiefferiella sp.	111	167	122	122	178	56	-	-	22	22
Paratanytarsus sp.	11	11	11	11	33	11	11	-	22	11
Pentaneurini	-	-	-	-	-	11	-	-	11	11
Phaenopsectra sp.	-	-	-	-	-	-	-	-	-	-
Polypedilum sp.	-	-	11	-	-	-	-	-	-	-
Potthastia longimana gr.	-	-	-	-	-	-	-	-	-	-
Psectrocladius sp.	44	356	11	11	89	22	11	-	-	-
Rheotanytarsus sp.	-	-	-	11	100	22	22	11	-	22
Simuliidae	-	-	-	11	-	-	-	-	-	-
Simulium sp.	11	22	11	-	11	-	11	-	-	11
Synorthocladius sp.	-	-	-	-	-	-	-	-	-	-
Tanytarsus sp.	22	33	-	111	56	33	-	11	-	-
Thienemanniella sp.	-	-	11	-	11	-	-	-	-	-
Thienemannimyia gr. sp.	11	56	33	11	44	178	44	178	367	100
Tipula sp.	-	-	-	-	-	-	-	-	22	-
Tribelos sp.	-	-	-	-	-	-	-	-	-	-
Tvetenia bavarica gr.	-	-	-	-	33	11	-	-	-	-
Zalutschia sp.	-	-	-	-	-	-	-	-	-	-
Ephemeroptera										
Baetis sp.	-	-	-	-	-	-	-	-	-	-
Ephemerella aurivillii	-	-	-	-	-	33	-	-	-	-
Ephemerella sp.	-	-	-	-	-	122	111	100	44	67
Leptophlebiidae	-	-	11	-	-	-	-	11	-	-
Paraleptophlebia sp.	-	-	-	-	-	-	-	-	-	-
Rhithrogena sp.	-	-	-	-	-	-	-	-	-	11
Hemiptera										
Corixidae	-	-	-	-	-	-	-	-	-	-
Hemiptera	-	-	-	-	-	-	-	-	-	-
Plecoptera										
Diura sp.	-	-	-	-	-	-	-	-	-	-
Nemoura sp.	22	-	-	22	-	256	-	133	156	33
Nemouridae	-	-	11	-	-	-	-	-	33	-
Trichoptera										
Agraylea sp.	-	-	-	-	-	-	-	-	-	-
Agrypnia sp.	-	-	-	-	-	11	-	-	-	-
Brachycentridae	-	-	-	-	-	-	-	-	-	-
Brachycentrus americanus	11	-	11	-	56	33	22	33	11	-
Brachycentrus sp.	-	-	-	-	-	-	-	-	-	-
Hydroptilidae	-	-	-	-	-	-	-	-	-	-
Limnephilidae	-	11	11	11	-	-	-	-	-	-
Micrasema sp.	-	-	-	11	-	-	-	-	-	-
Molannidae	-	-	-	-	-	-	-	-	-	-
Oxyethira sp.	-	11	33	56	22	-	-	11	-	-
Rhyacophila mongolica	-	-	-	-	-	-	-	-	-	-
Copepoda										
Calanoida	-	-	-	-	-	-	-	-	-	-
Cyclopoida	22	44	22	89	-	22	-	-	11	-
Harpacticoida		56		11	44	100	-	144	11	11
Ostracoda	56	33	56	222	-	-	11	78	78	-
TOTAL	**1,078**	**2,000**	**1,333**	**1,422**	**3,422**	**2,244**	**1,733**	**3,467**	**2,167**	**1,578**

(continued)

Table 3.7-9. Taxonomic Density Results for Benthic Invertebrates at AEMP Stream Sites, 2014 (continued)

Stream	Moose-Nero					Nema-Martine				
Date	2-Sep-14					5-Sep-14				
Replicate No.	1	2	3	4	5	1	2	3	4	5
Sample ID	6823.01-1	6823.01-2	6823.01-3	6823.01-4	6823.01-5	6823.01-31	6823.01-32	6823.01-33	6823.01-34	6823.01-35
Area Sampled (m^2)	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Percent Sampled	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Species/Group (organisms/m^2)										
Nematoda	-	44	-	11	33	-	44	11	-	-
Arachnida										
Acari	-	-	-	-	-	-	-	-	-	-
Oribatei	-	-	-	11	-	-	11	-	-	178
Trombidiformes										
Atractides sp.	-	-	-	-	-	-	-	-	-	-
Hygrobates sp.	-	-	-	-	11	-	-	-	22	-
Lebertia sp.	-	-	-	-	-	-	-	-	-	-
Limnesia sp.	-	-	-	-	-	11	-	11	-	-
Sperchon sp.	-	-	-	-	-	22	11		11	-
Sperchonopsis sp.	-	-	22	11	-	-	-	-	-	-
Mollusca										
Bivalvia										
Veneroida										
Pisidium sp.	-	-	-	-	-	-	-	-	-	-
Sphaeriidae	-	-	-	-	-	-	-	-	-	-
Sphaerium sp.	-	-	-	-	-	-	-	-	-	-
Gastropoda										
Gastropoda	-	-	-	11	-	-	-	-	-	-
Basommatophora										
Gyraulus sp.	56	156	144	356	56	189	111	89	44	22
Physa sp.	-	-	-	-	-	-	-	-	-	-
Planorbidae	11	-	-	-	-	56	-	22	44	22
Heterostropha										
Valvata lewisi	11	167	100	211	178	111	167	22	278	56
Valvata sp.	-	22	-	-	-	-	-	89	-	-
Coelentrata										
Hydrozoa										
Hydra sp.	-	-	-	-	-	-	-	-	-	-
Oligochaeta										
Lumbriculida										
Lumbriculidae	-	-	-	-	-	-	-	-	-	-
Tubificida										
Chaetogaster diaphanus	-	-	-	-	-	-	-	-	-	-
Nais sp.	-	-	-	11	-	-	-	-	-	167
Tubificidae w/ cap setae sp.	-	-	-	-	-	-	-	-	-	-
Cladocera	-	-	-	344	-	-	167	-	-	356
Coleoptera										
Hydroporus sp.	-	-	-	-	-	-	-	-	-	-
Collembola	-	-	-	-	-	-	-	-	-	-
Diptera										
Ablabesmyia (Karelia) sp.	-	-	-	-	-	11	-	-	-	-
Ablabesmyia sp.	-	-	-	-	-	-	-	-	-	-
Bezzia/Palpomyia sp.	-	-	-	-	-	-	-	-	-	-
Chironomini	-	-	-	-	-	-	-	-	-	11
Chironomus sp.	-	-	-	-	-	-	-	-	-	-
Cladotanytarsus sp.	-	-	-	-	-	-	-	-	-	-
Corynoneura sp.	-	-	33	11	11	278	122	67	422	300
Cricotopus sp.	-	-	-	22	33	289	100	233	1,322	700
Dicrotendipes fumidus	-	-	-	-	-	-	-	-	-	-
Dicrotendipes sp.	22	-	22	22	11	44	100	56	-	211
Diptera	11	33	11	11	-	-	11	-	-	-
Endochironomus sp.	-	-	-	-	-	-	-	-	-	-
Eukiefferiella claripennis gr.	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius marcidus gr.	-	111	33	11	156	-	11	-	11	-
Limnophyes sp.	-	-	-	-	-	-	-	-	11	-
Micropsectra sp.	-	-	-	-	-	-	-	-	-	-
Microtendipes pedellus gr.	-	-	-	-	-	-	-	-	-	-
Nanocladius sp.	200	89	411	178	67	333	133	189	356	11

(continued)

Table 3.7-9. Taxonomic Density Results for Benthic Invertebrates at AEMP Stream Sites, 2014 (continued)

Stream	Moose-Nero					Nema-Martine				
Date	2-Sep-14					5-Sep-14				
Replicate No.	1	2	3	4	5	1	2	3	4	5
Sample ID	6823.01-1	6823.01-2	6823.01-3	6823.01-4	6823.01-5	6823.01-31	6823.01-32	6823.01-33	6823.01-34	6823.01-35
Area Sampled (m^2)	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Percent Sampled	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Species/Group (organisms/m^2)										
Diptera (continued)										
Orthocladiinae	-	-	-	-	56	33	289	-	-	33
Orthocladius annectens	-	-	-	-	-	22	67	11	56	33
Orthocladius Complex	44	22	11	-	-	-	-	11	-	-
Orthocladius sp.	-	-	-	-	-	-	-	-	-	-
Parachironomus sp.	-	-	-	-	-	-	-	-	-	-
Parakiefferiella sp.	-	-	-	-	-	22	33	-	11	-
Paratanytarsus sp.	-	11	-	-	11	11	11	11	44	22
Pentaneurini	11	-	11	11	-	200	233	56	67	22
Phaenopsectra sp.	-	-	-	-	-	-	-	-	-	-
Polypedilum sp.	-	-	-	-	-	-	-	-	-	11
Potthastia longimana gr.	-	-	-	-	-	-	-	-	-	-
Psectrocladius sp.	-	-	-	-	-	-	-	-	-	-
Rheotanytarsus sp.	89	-	111	333	33	78	-	100	89	100
Simuliidae	-	-	-	-	-	-	-	-	11	-
Simulium sp.	-	-	-	-	-	-	11	-	-	-
Synorthocladius sp.	-	-	-	-	-	-	-	-	-	-
Tanytarsus sp.	11	44	56	33	33	78	189	56	56	367
Thienemanniella sp.	-	-	-	-	-	-	-	-	-	-
Thienemannimyia gr. sp.	189	167	189	267	111	278	356	311	144	1,422
Tipula sp.	-	-	-	-	-	-	-	-	-	-
Tribelos sp.	-	-	-	-	-	-	-	-	-	-
Tvetenia bavarica gr.	22	-	-	-	-	78	44	56	156	11
Zalutschia sp.	-	-	-	-	-	-	-	-	-	-
Ephemeroptera										
Baetis sp.	-	-	-	-	-	-	-	-	-	-
Ephemerella aurivillii	-	-	-	-	-	-	-	-	-	-
Ephemerella sp.	-	-	-	-	-	-	-	-	-	-
Leptophlebiidae	-	-	-	-	-	-	-	-	-	-
Paraleptophlebia sp.	-	-	-	-	-	-	-	-	-	-
Rhithrogena sp.	-	-	-	-	-	-	-	-	-	-
Hemiptera										
Corixidae	-	-	-	-	-	-	-	-	-	-
Hemiptera	-	-	-	-	-	-	-	-	-	-
Plecoptera										
Diura sp.	-	-	-	-	-	-	-	-	-	-
Nemoura sp.	-	122	200	211	22	111	167	133	78	122
Nemouridae	11	-	-	33	-	-	22	-	-	-
Trichoptera										
Agraylea sp.	-	-	-	-	-	-	-	-	-	-
Agrypnia sp.	-	11	-	-	-	-	-	11	-	-
Brachycentridae	-	-	-	-	-	-	-	-	-	-
Brachycentrus americanus	-	-	-	-	-	-	-	-	-	-
Brachycentrus sp.	-	-	-	-	-	-	-	-	-	-
Hydroptilidae	-	-	-	-	-	-	-	-	-	-
Limnephilidae	-	-	-	-	-	-	-	-	-	-
Micrasema sp.	-	-	-	-	-	-	-	-	-	-
Molannidae	-	-	-	-	-	-	-	-	-	-
Oxyethira sp.	-	-	-	-	-	-	-	11	33	-
Rhyacophila mongolica	-	-	-	-	-	-	-	-	-	-
Copepoda										
Calanoida	-	-	-	-	-	-	-	-	-	-
Cyclopoida	-	-	11	33	-	-	-	-	-	-
Harpacticoida	-	4,211	556	289	1,222	522	322	289	89	233
Ostracoda	-	-	-	22	-	-	44	-	11	-
TOTAL	**689**	**5,211**	**1,922**	**2,456**	**2,044**	**2,778**	**2,778**	**1,844**	**3,367**	**4,411**

(continued)

Table 3.7-9. Taxonomic Density Results for Benthic Invertebrates at AEMP Stream Sites, 2014 (continued)

Stream	Slipper-Lac de Gras					Cujo Outflow		
Date	3-Sep-14					4-Sep-14		
Replicate No.	1	2	3	4	5	1	2	3
Sample ID	6823.04,.05,.06-1	6823.04,.05,.06-2	6823.04,.05,.06-3	6823.01-16	6823.01-17	6823.01-23	6823.01-24	6823.01-25
Area Sampled (m^2)	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Percent Sampled	100.00	100.00	100.00	100.00	93.75	100.00	100.00	93.75
Species/Group (organisms/m^2)								
Nematoda	-	-	22	22	24	78	11	12
Arachnida								
Acari	-	11	-	-	-	-	-	-
Oribatei	-	-	11	33	-	11	11	12
Trombidiformes								
Atractides sp.	-	-	-	-	-	-	-	-
Hygrobates sp.	-	33	22	67	-	-	-	12
Lebertia sp.	-	-	-	-	-	-	-	-
Limnesia sp.	-	-	-	-	-	-	-	-
Sperchon sp.	11	11	67	-	12	11	-	-
Sperchonopsis sp.	-	-	-	-	-	-	-	-
Mollusca								
Bivalvia								
Veneroida								
Pisidium sp.	-	-	-	-	-	-	-	-
Sphaeriidae	-	-	-	-	-	-	-	83
Sphaerium sp.	-	-	-	-	-	-	-	-
Gastropoda								
Gastropoda	-	-	-	44	-	11	-	-
Basommatophora								
Gyraulus sp.	-	33	-	156	166	300	789	699
Physa sp.	11	33	-	33	-	-	-	-
Planorbidae	11	33	22	33	-	1,267	267	367
Heterostropha								
Valvata lewisi	22	122	22	578	71	33	33	12
Valvata sp.	-	-	-	-	-	-	-	-
Coelentrata								
Hydrozoa								
Hydra sp.	11	-	-	-	-	-	-	-
Oligochaeta								
Lumbriculida								
Lumbriculidae	-	-	-	-	-	-	-	-
Tubificida								
Chaetogaster diaphanus	11	89	-	-	-	-	-	-
Nais sp.	-	44	433	-	-	-	-	-
Tubificidae w/ cap setae sp.	-	-	-	-	-	-	-	-
Cladocera	-	178	-	511	24	33	711	24
Coleoptera								
Hydroporus sp.	-	-	-	-	-	22	-	-
Collembola	-	-	-	-	-	-	-	-
Diptera								
Ablabesmyia (Karelia) sp.	-	-	-	-	-	-	189	-
Ablabesmyia sp.	-	-	11	56	-	-	-	-
Bezzia/Palpomyia sp.	-	-	-	-	-	11	-	-
Chironomini	-	-	-	-	-	-	-	-
Chironomus sp.	-	-	-	-	-	-	-	12
Cladotanytarsus sp.	-	-	-	22	-	-	-	-
Corynoneura sp.	44	22	89	67	47	44	11	-
Cricotopus sp.	-	-	-	311	569	111	11	-
Dicrotendipes fumidus	-	-	-	-	-	-	-	24
Dicrotendipes sp.	-	22	-	33	-	-	-	-
Diptera	-	-	-	-	-	-	-	-
Endochironomus sp.	-	11	-	-	-	-	33	12
Eukiefferiella claripennis gr.	-	-	11	-	-	-	-	-
Heterotrissocladius marcidus gr.	-	22	-	44	12	-	-	-
Limnophyes sp.	-	-	-	-	-	11	-	-
Micropsectra sp.	-	522	130	-	-	-	-	-
Microtendipes pedellus gr.	-	-	-	-	-	111	11	71
Nanocladius sp.	111	89	726	56	261	11	11	-

(continued)

Table 3.7-9. Taxonomic Density Results for Benthic Invertebrates at AEMP Stream Sites, 2014 (completed)

Stream	Slipper-Lac de Gras					Cujo Outflow		
Date	3-Sep-14					4-Sep-14		
Replicate No.	1	2	3	4	5	1	2	3
Sample ID	6823.04,.05,.06-1	6823.04,.05,.06-2	6823.04,.05,.06-3	6823.01-16	6823.01-17	6823.01-23	6823.01-24	6823.01-25
Area Sampled (m^2)	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Percent Sampled	100.00	100.00	100.00	100.00	93.75	100.00	100.00	93.75
Species/Group (organisms/m^2)								
Diptera (continued)								
Orthocladiinae	1,444	344	4,385	-	154	-	100	12
Orthocladius annectens	-	-	-	33	12	11	11	12
Orthocladius Complex	2,433	44	1,819	-	-	-	-	36
Orthocladius sp.	-	-	-	-	-	-	-	-
Parachironomus sp.	-	44	33	-	12	-	-	-
Parakiefferiella sp.	-	-	11	22	-	-	-	-
Paratanytarsus sp.	-	11	-	11	-	-	133	59
Pentaneurini	-	22	11	-	12	-	-	-
Phaenopsectra sp.	-	-	-	-	-	22	-	-
Polypedilum sp.	-	-	-	-	-	33	-	12
Potthastia longimana gr.	-	-	-	-	-	-	-	-
Psectrocladius sp.	-	-	-	-	-	-	44	-
Rheotanytarsus sp.	1,356	89	5,441	56	273	33	33	-
Simuliidae	89	-	-	11	-	-	-	-
Simulium sp.	156	-	222	11	-	-	-	-
Synorthocladius sp.	-	-	-	-	-	-	-	-
Tanytarsus sp.	-	11	-	344	36	11	-	-
Thienemanniella sp.	11	-	-	-	24	-	-	-
Thienemannimyia gr. sp.	-	67	-	178	12	189	11	142
Tipula sp.	-	-	-	-	-	-	-	-
Tribelos sp.	-	-	-	-	-	56	11	83
Tvetenia bavarica gr.	944	44	3,107	56	178	-	-	-
Zalutschia sp.	-	-	-	11	-	-	-	-
Ephemeroptera								
Baetis sp.	11	-	22	-	12	-	-	-
Ephemerella aurivillii	-	-	-	-	-	-	-	-
Ephemerella sp.	-	-	-	-	-	-	-	-
Leptophlebiidae	-	-	-	-	-	-	-	-
Paraleptophlebia sp.	-	-	-	-	-	-	-	-
Rhithrogena sp.	-	-	-	-	-	-	-	-
Hemiptera								
Corixidae	-	-	-	-	-	-	-	-
Hemiptera	-	-	-	-	-	-	-	-
Plecoptera								
Diura sp.	-	-	-	-	-	-	-	-
Nemoura sp.	878	1,011	1,756	956	1,837	100	22	12
Nemouridae	89	44	211	44	213	11	-	-
Trichoptera								
Agraylea sp.	-	11	-	-	-	-	-	-
Agrypnia sp.	-	-	-	-	-	-	11	-
Brachycentridae	-	-	-	-	-	-	-	-
Brachycentrus americanus	278	-	811	-	-	-	-	-
Brachycentrus sp.		22	-	-	-	-	-	-
Hydroptilidae	-	-	-	-	-	-	-	-
Limnephilidae	-	-	-	-	-	-	-	-
Micrasema sp.	-	-	-	-	-	-	-	-
Molannidae	-	-	-	-	-	22	-	12
Oxyethira sp.	-	-	-	-	-	-	-	12
Rhyacophila mongolica	-	11	11	-	-	-	-	-
Copepoda								
Calanoida	-	-	-	-	-			
Cyclopoida	-	-	-	-	-	11	200	24
Harpacticoida	11	200	241	56	12	89		59
Ostracoda	-	100	11	378	12	456	89	2,050
TOTAL	**7,933**	**3,356**	**19,659**	**4,233**	**3,982**	**3,111**	**2,756**	**3,864**

Taxonomic identification by EcoAnalysts Inc.

Table 3.7-10. Benthos Taxonomy QA/QC Sorting Efficiency Results for AEMP Stream Samples, 2014

Stream	Replicate No.	Sample ID	Total Organisms in Sample	Sorting Efficiency (%)
Nanuq Outflow	1	6823.01-6	92	100
	2	6823.01-7	331	100
	3	6823.01-8	73	100
	4	6823.01-9	342	100
	5	6823.01-10	225	100
Counts Outflow	1	6823.01-18	221	100
	2	6823.01-19	329	100
	3	6823.01-20	249	100
	4	6823.01-21	366	100
	5	6823.01-22	152	100
Vulture-Polar	1	6823.01-11	97	100
	2	6823.01-12	180	100
	3	6823.01-13	120	100
	4	6823.01-14	128	100
	5	6823.01-15	308	100
Kodiak-Little	1	6823.01-26	202	100
	2	6823.01-27	156	100
	3	6823.01-28	312	100
	4	6823.01-29	195	100
	5	6823.01-30	142	100
Moose-Nero	1	6823.01-1	62	100
	2	6823.01-2	469	100
	3	6823.01-3	173	100
	4	6823.01-4	221	100
	5	6823.01-5	184	100
Nema-Martine	1	6823.01-31	250	100
	2	6823.01-32	250	100
	3	6823.01-33	166	100
	4	6823.01-34	303	100
	5	6823.01-35	397	100
Slipper-Lac de Gras	1	6823.04-1	714	100
	2	6823.04-2	302	100
	3	6823.04-3	1769	100
	4	6823.01-16	381	100
	5	6823.01-17	336	100
Cujo Outflow	1	6823.01-23	280	100
	2	6823.01-24	248	100
	3	6823.01-25	326	100

Table 3.7-11. Benthos Taxonomy QA/QC Percent Similarity Results for AEMP Stream Samples, 2014

Nanuq Outflow (Rep 1) Sample 6823.1-6

Component	Species/Group	Original Count	% Total	QC Count	% Total	Absolute Difference
Chironomidae	*Ablabesmyia sp.*	1	1.3	1	1.4	0.1
	Corynoneura sp.	10	12.7	9	12.3	0.3
	Nanocladius sp.	1	1.3	1	1.4	0.1
	Orthocladius annectens	2	2.5	0	0.0	2.5
	Orthocladius Complex	13	16.5	10	13.7	2.8
	Paratanytarsus sp.	8	10.1	8	11.0	0.8
	Pentaneurini	0	0.0	1	1.4	1.4
	Phaenopsectra sp.	0	0.0	0	0.0	0.0
	Polypedilum sp.	0	0.0	0	0.0	0.0
	Psectrocladius sp.	2	2.5	2	2.7	0.2
	Tanytarsus sp.	11	13.9	11	15.1	1.1
	Thienemannimyia gr. sp.	4	5.1	3	4.1	1.0
General	Cyclopoida	18	22.8	19	26.0	3.2
	Harpacticoida	2	2.5	2	2.7	0.2
	Hemiptera	1	1.3	1	1.4	0.1
	Lebertia sp.	0	0.0	0	0.0	0.0
	Nematoda	1	1.3	0	0.0	1.3
	Ostracoda	5	6.3	5	6.8	0.5
	Oxyethira sp.	0	0.0	0	0.0	0.0
	Paraleptophlebia sp.	0	0.0	0	0.0	0.0
Total		**79**	**100.0**	**73**	**100**	**15.7**
% Similarity				**92.16**		

Counts Outflow (Rep 5) Sample 6823.1-22

Component	Species/Group	Original Count	% Total	QC Count	% Total	Absolute Difference
Chironomidae	*Corynoneura sp.*	91	61.1	88	60.7	0.4
	Cricotopus sp.	8	5.4	8	5.5	0.1
	Limnophyes sp.	1	0.7	1	0.7	0.0
	Nanocladius sp.	7	4.7	6	4.1	0.6
	Orthocladius annectens	2	1.3	2	1.4	0.0
	Orthocladius Complex	1	0.7	1	0.7	0.0
	Parakiefferiella sp.	2	1.3	2	1.4	0.0
	Psectrocladius sp.	4	2.7	4	2.8	0.1
	Rheotanytarsus sp.	0	0.0	1	0.7	0.7
	Tanytarsus sp.	9	6.0	7	4.8	1.2
	Thienemannimyia gr. sp.	5	3.4	6	4.1	0.8
General	*Bezzia/Palpomyia sp.*	7	4.7	9	6.2	1.5
	Cladocera	2	1.3	1	0.7	0.7
	Cyclopoida	1	0.7	1	0.7	0.0
	Harpacticoida	6	4.0	5	3.4	0.6
	Nemoura sp.	1	0.7	1	0.7	0.0
	Oribatei	1	0.7	1	0.7	0.0
	Sperchonopsis sp.	1	0.7	1	0.7	0.0
Total		**149**	**100**	**145**	**100**	**6.8**
% Similarity				**96.61**		

(continued)

Table 3.7-11. Benthos Taxonomy QA/QC Percent Similarity Results for AEMP Stream Samples, 2014 (completed)

Vulture-Polar (Rep 4) Sample 6823.1-14

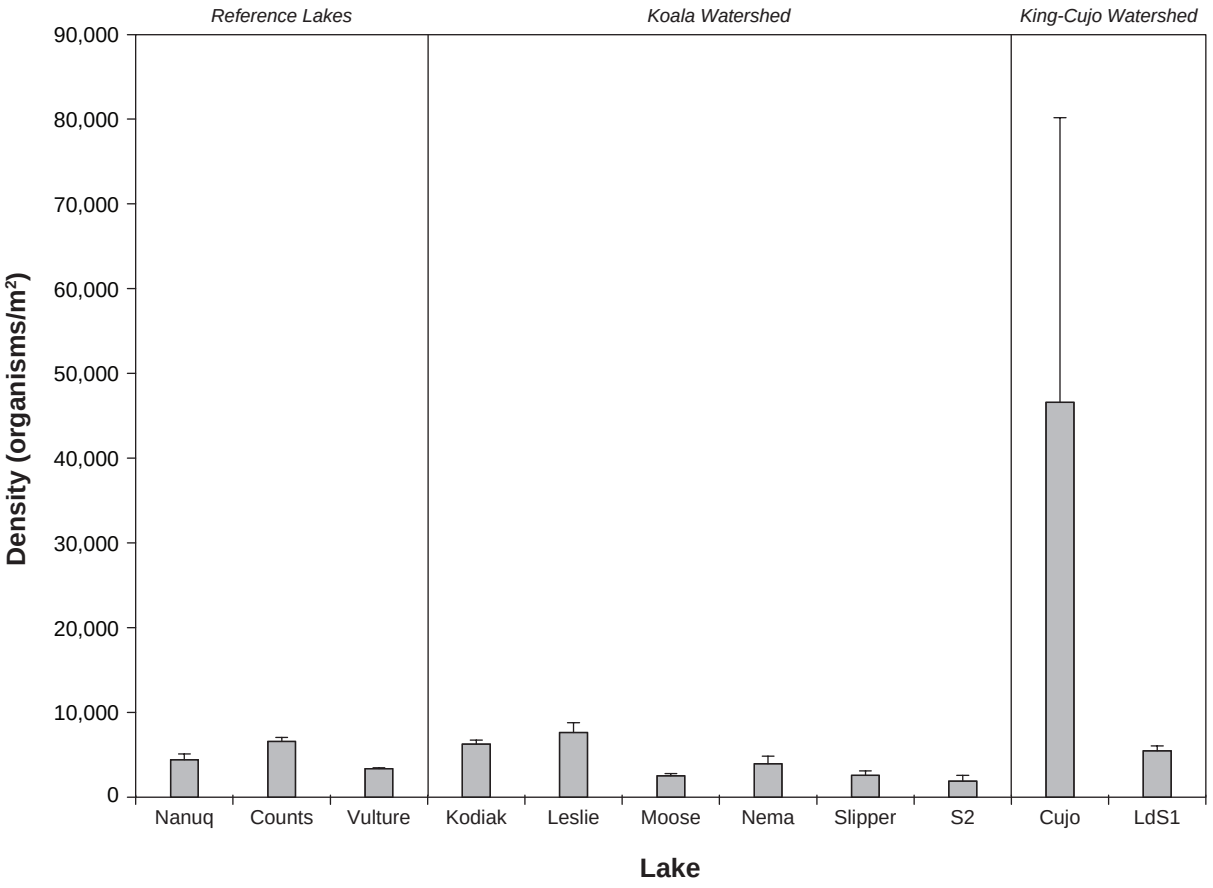
Component	Species/Group	Original Count	% Total	QC Count	% Total	Absolute Difference
Chironomidae	*Corynoneura sp.*	9	7.2	8	6.8	0.4
	Cricotopus sp.	19	15.2	17	14.4	0.8
	Nanocladius sp.	0	0.0	1	0.8	0.8
	Orthocladius annectens	7	5.6	7	5.9	0.3
	Parakiefferiella sp.	11	8.8	11	9.3	0.5
	Paratanytarsus sp.	1	0.8	1	0.8	0.0
	Psectrocladius sp.	2	1.6	1	0.8	0.8
	Rheotanytarsus sp.	1	0.8	1	0.8	0.0
	Tanytarsus sp.	10	8.0	10	8.5	0.5
	Thienemannimyia gr. sp.	1	0.8	1	0.8	0.0
General	*Bezzia/Palpomyia sp.*	11	8.8	11	9.3	0.5
	Cyclopoida	8	6.4	6	5.1	1.3
	Harpacticoida	1	0.8	1	0.8	0.0
	Hygrobates sp.	3	2.4	3	2.5	0.1
	Limnephilidae	1	0.8	1	0.8	0.0
	Micrasema sp.	0	0.0	0	0.0	0.0
	Nematoda	9	7.2	8	6.8	0.4
	Nemoura sp.	2	1.6	2	1.7	0.1
	Oribatei	1	0.8	1	0.8	0.0
	Ostracoda	20	16.0	19	16.1	0.1
	Oxyethira sp.	5	4.0	5	4.2	0.2
	Simuliidae	1	0.8	1	0.8	0.0
Oligochaete	Lumbriculidae	2	1.6	2	1.7	0.1
	Tubificidae w/ cap setae sp.	0	0.0	0	0.0	0.0
Total		**125**	**100**	**118**	**100**	**7.4**
% Similarity				**96.30**		

Nema Martine (Rep 3) Sample 6823.1-33

Component	Species/Group	Original Count	% Total	QC Count	% Total	Absolute Difference
Chironomidae	*Corynoneura sp.*	0	0.0	6	3.8	3.8
	Cricotopus sp.	21	13.1	20	12.5	0.6
	Dicrotendipes sp.	5	3.1	5	3.1	0.0
	Nanocladius sp.	17	10.6	16	10.0	0.6
	Orthocladius annectens	1	0.6	1	0.6	0.0
	Orthocladius Complex	1	0.6	1	0.6	0.0
	Paratanytarsus sp.	1	0.6	0	0.0	0.6
	Pentaneurini	5	3.1	5	3.1	0.0
	Rheotanytarsus sp.	9	5.6	9	5.6	0.0
	Tanytarsus sp.	5	3.1	5	3.1	0.0
	Thienemannimyia gr. sp.	28	17.5	27	16.9	0.6
	Tvetenia bavarica gr.	5	3.1	3	1.9	1.3
General	*Agrypnia sp.*	1	0.6	1	0.6	0.0
	Gyraulus sp.	8	5.0	8	5.0	0.0
	Harpacticoida	26	16.3	26	16.3	0.0
	Limnesia sp.	1	0.6	1	0.6	0.0
	Nematoda	1	0.6	1	0.6	0.0
	Nemoura sp.	12	7.5	12	7.5	0.0
	Oxyethira sp.	1	0.6	1	0.6	0.0
	Planorbidae	2	1.3	2	1.3	0.0
	Valvata sp.	8	5.0	8	5.0	0.0
	Valvata lewisi	2	1.3	2	1.3	0.0
Total		**160**	**100**	**160**	**100**	**7.5**
% Similarity				**96.25**		

Figure 3.7-1

Average Benthic Invertebrate Density at AEMP Lake Sites, 2014



Note: Error bars represent the standard error of the mean.

Figure 3.7-2a

Relative Densities of Benthic Invertebrate Taxa at AEMP Lake Sites, 2014

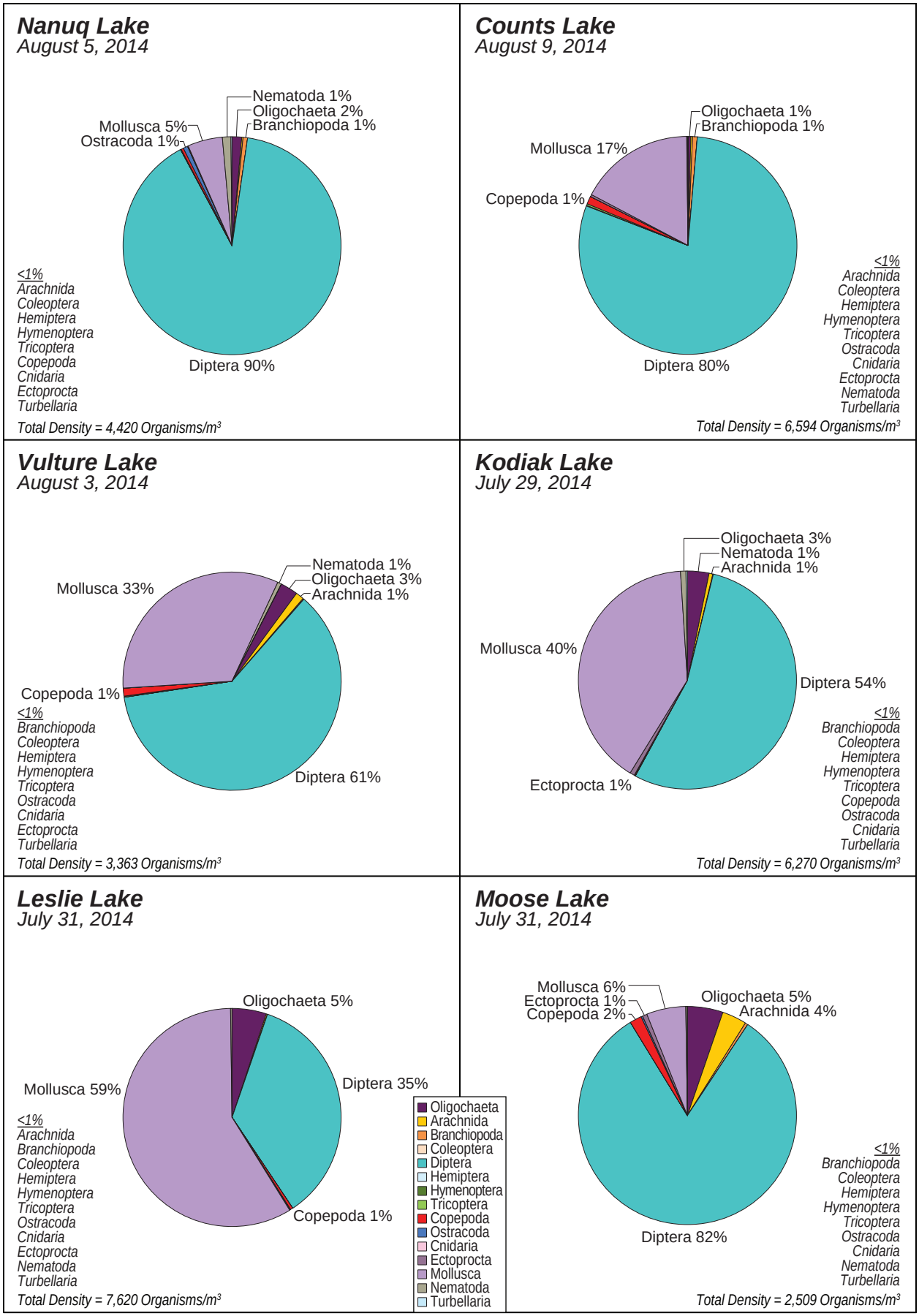


Figure 3.7-2b

Relative Densities of Benthic Invertebrate Taxa at AEMP Lake Sites, 2014

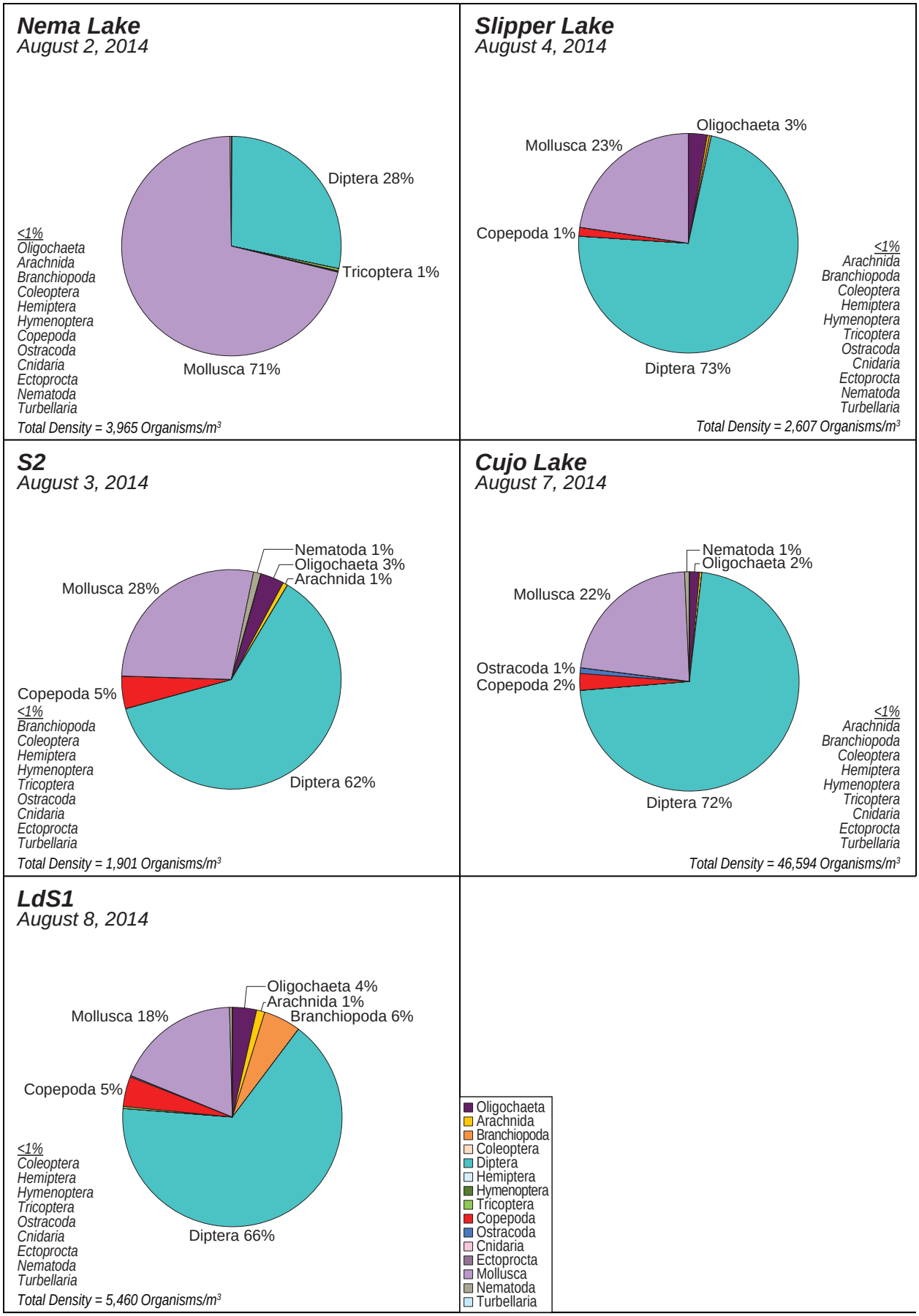
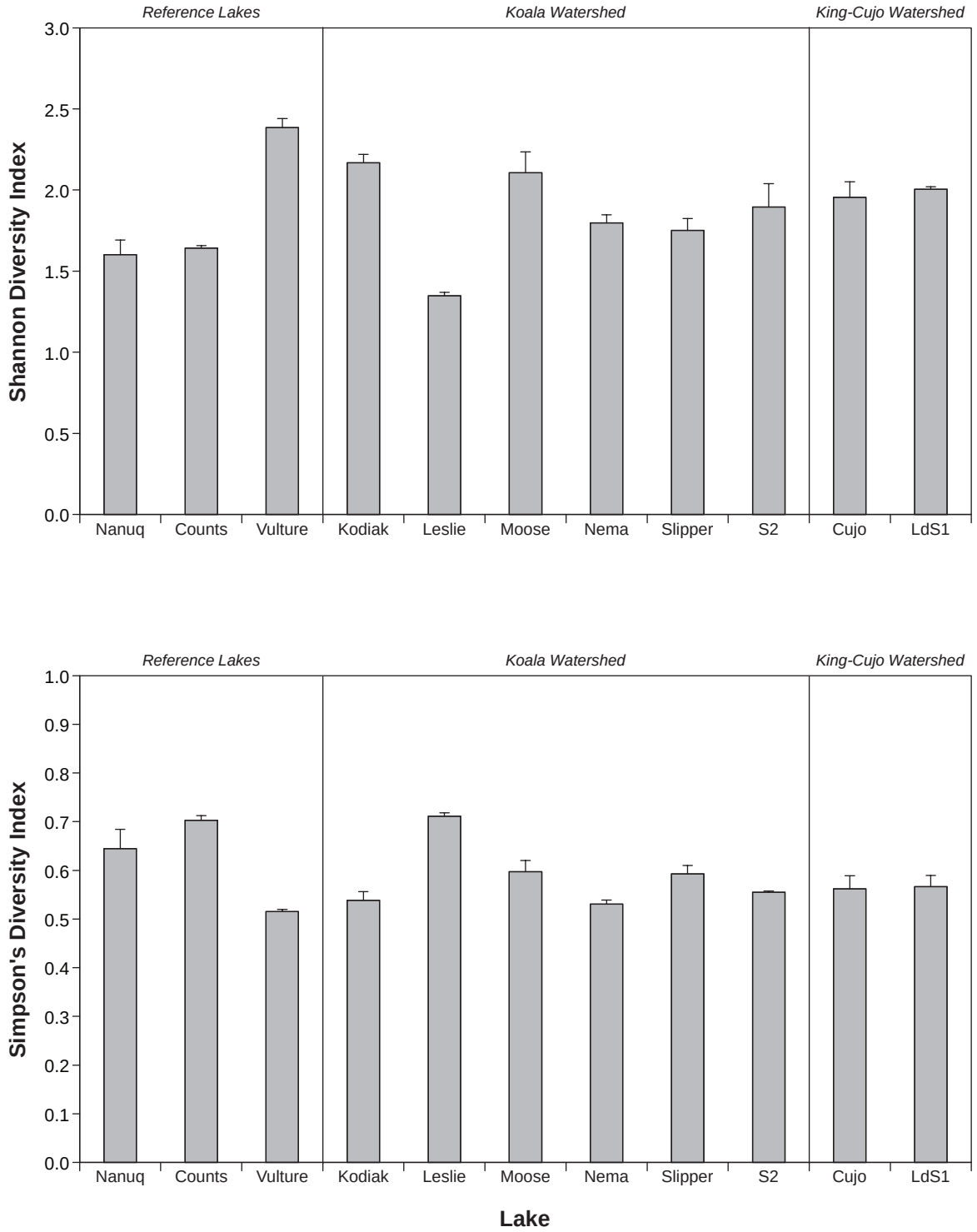


Figure 3.7-3

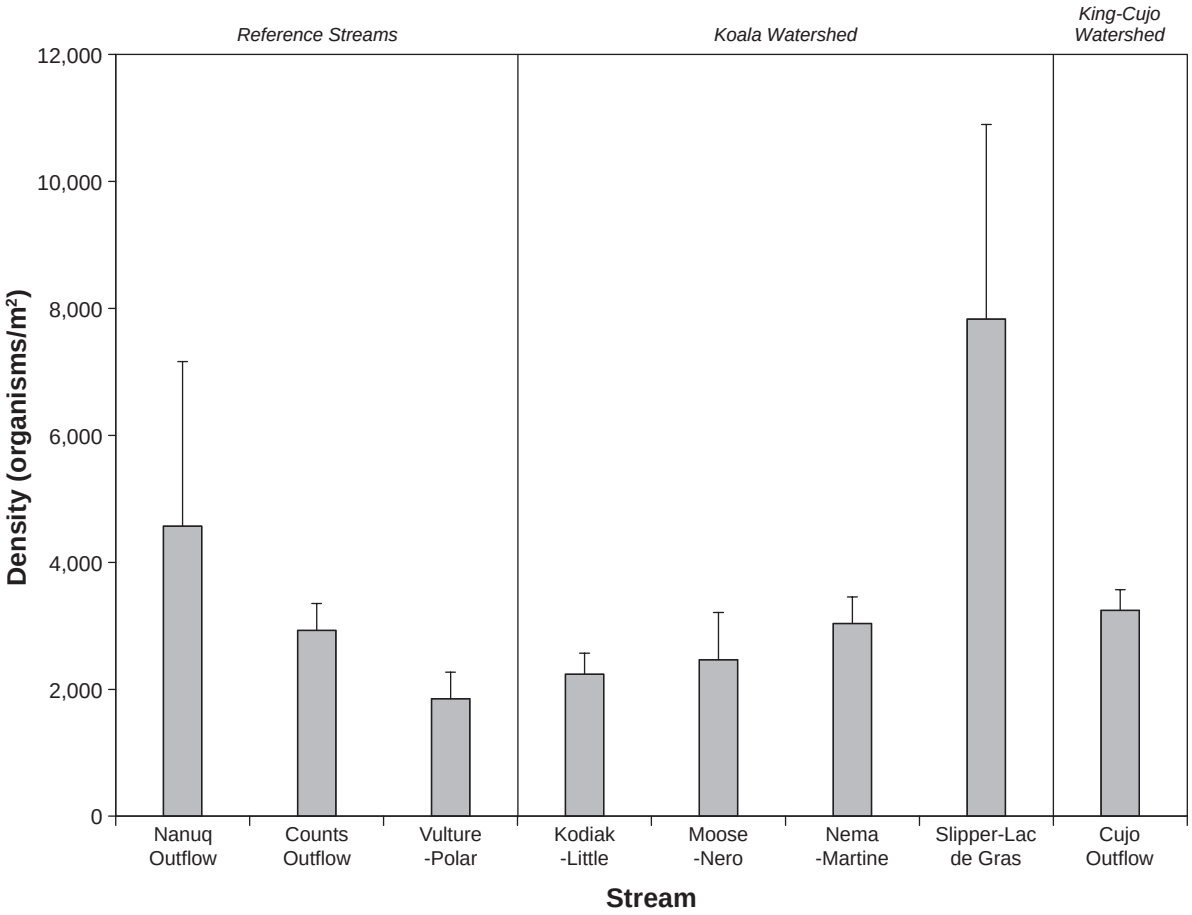
Average Diversity Indices for Dipteran Invertebrates at AEMP Lake Sites, 2014



Note: Error bars represent the standard error of the mean.

Figure 3.7-4

Average Benthic Invertebrate Density at AEMP Stream Sites, 2014



Note: Error bars represent the standard error of the mean.

Figure 3.7-5

Relative Densities of Benthic Invertebrate Taxa at AEMP Stream Sites, 2014

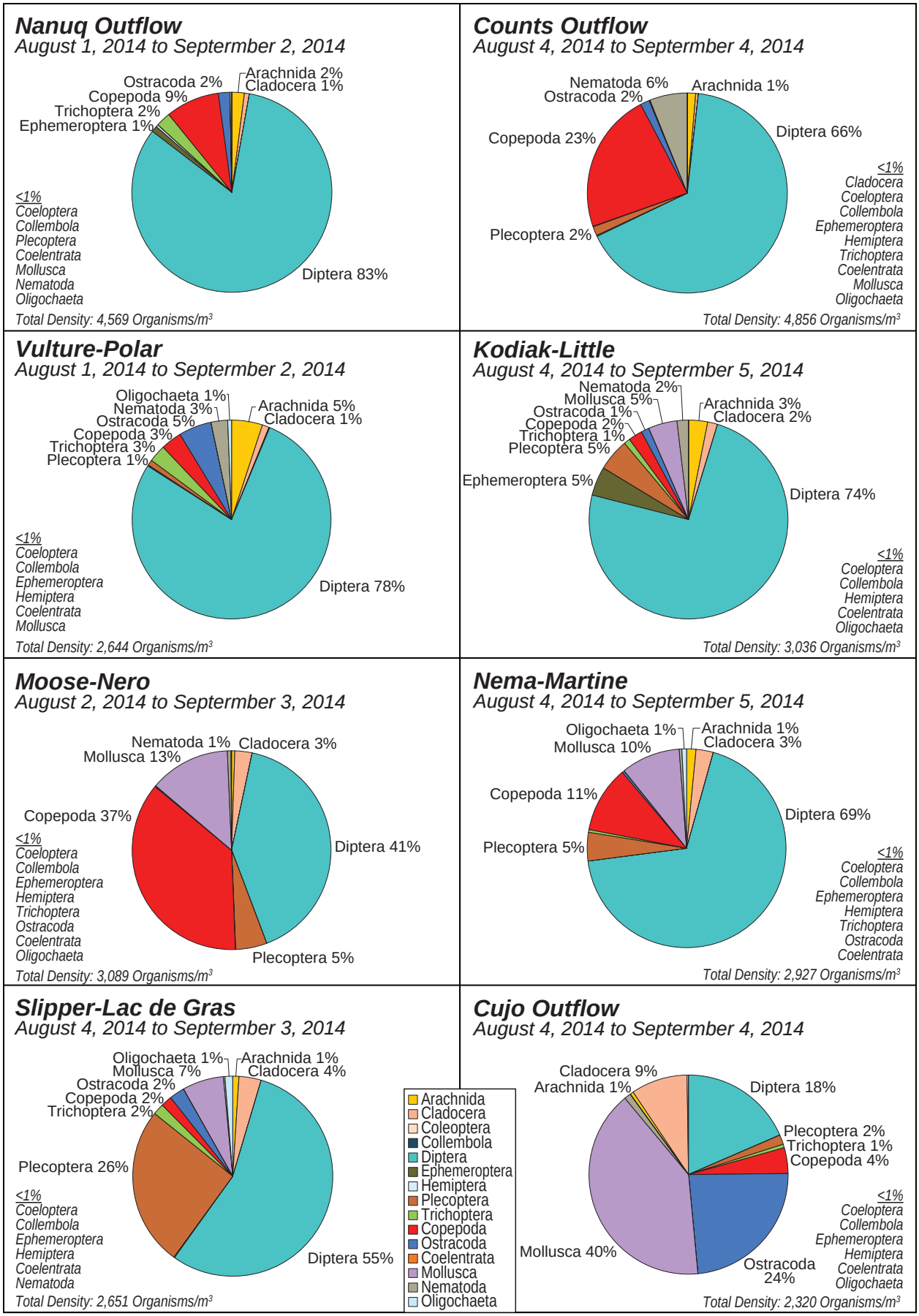
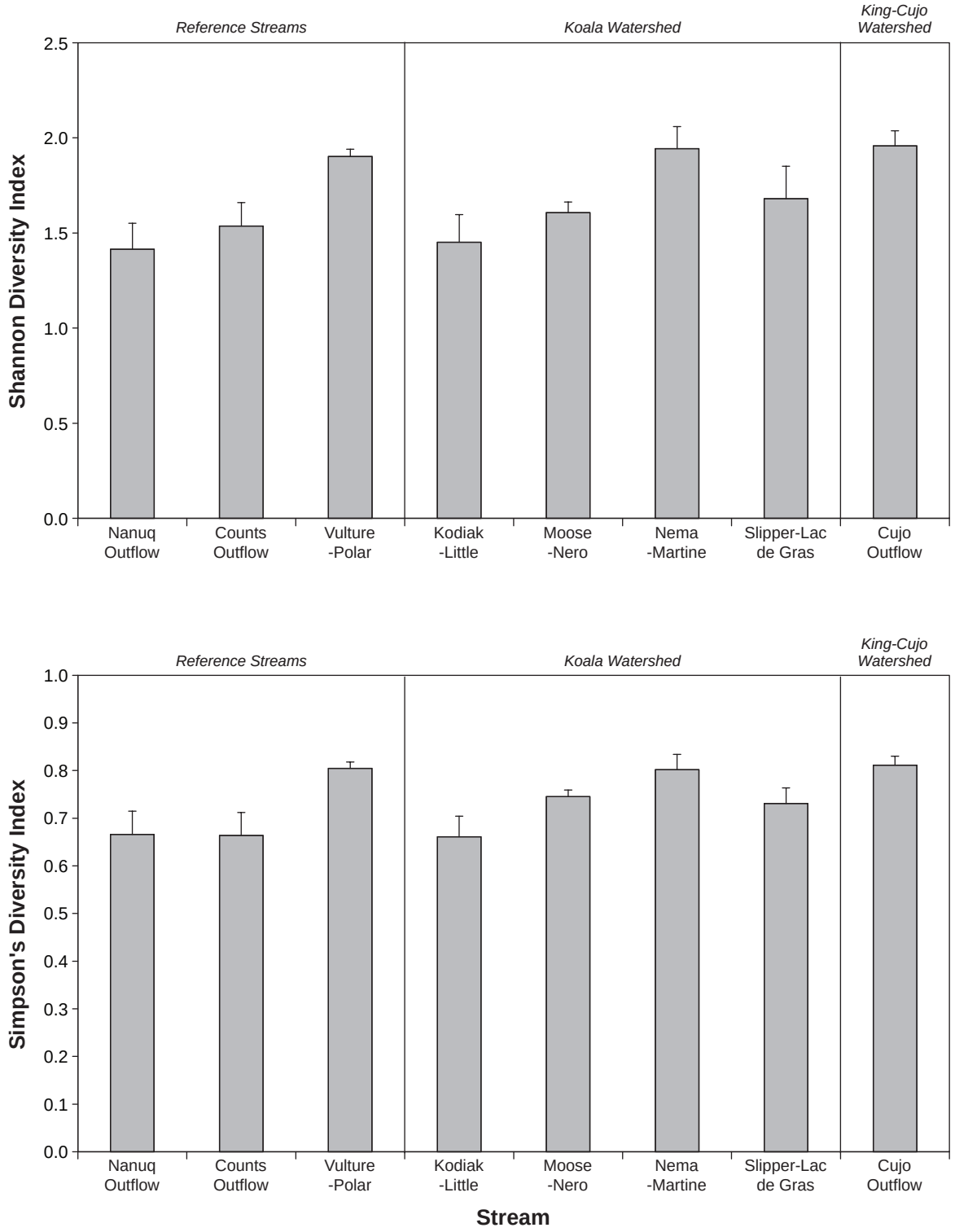


Figure 3.7-6

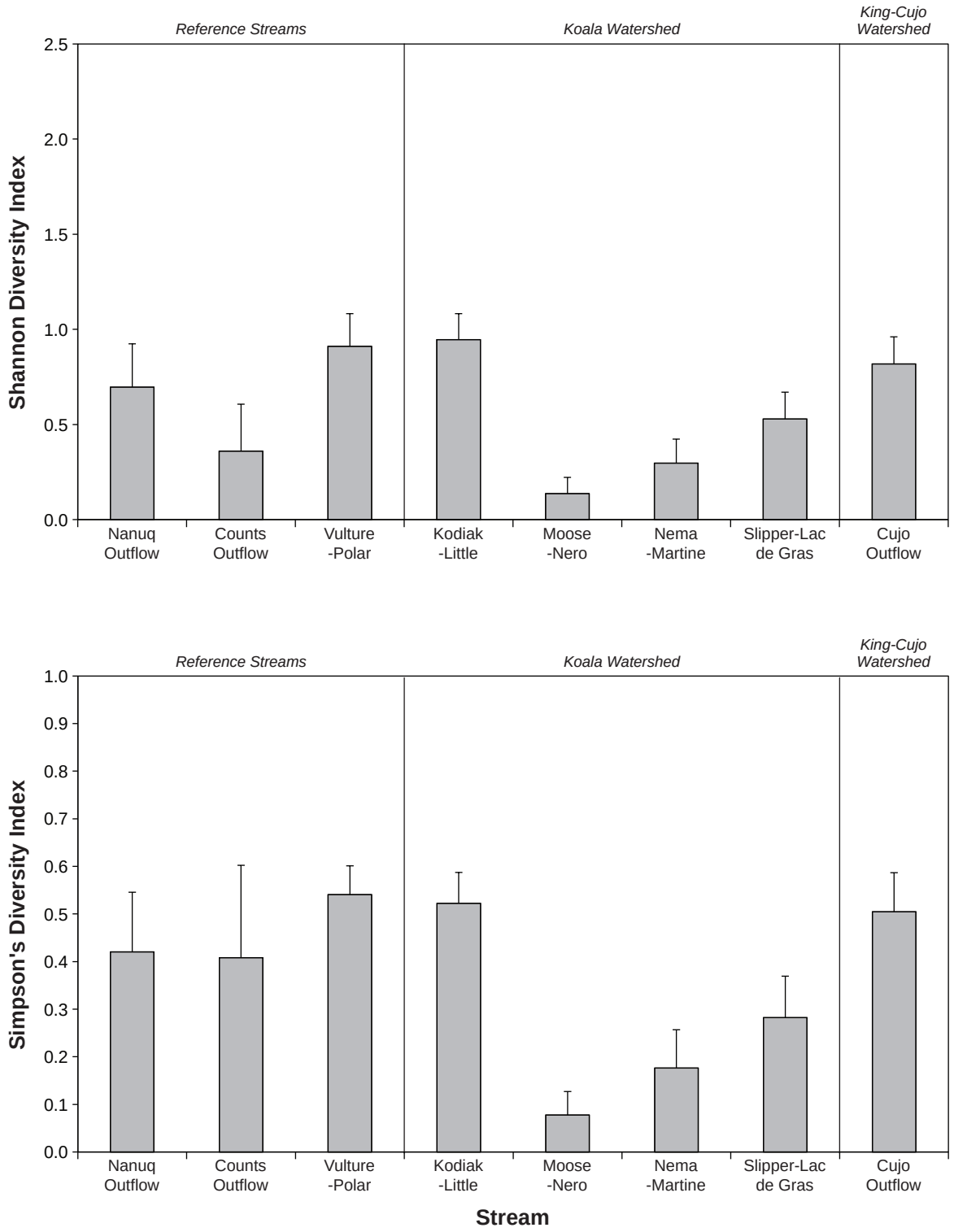
Average Diversity Indices for Dipteran Invertebrates at AEMP Stream Sites, 2014



Note: Error bars represent the standard error of the mean.

Figure 3.7-7

Average Diversity Indices for EPT Invertebrates at AEMP Stream Sites, 2014



Note: Error bars represent the standard error of the mean.

3.8 SEDIMENT QUALITY

Lake sediment quality samples were collected from six lakes within the Koala Watershed including Vulture (an internal reference lake), Kodiak, Leslie, Moose, Nema, and Slipper lakes, two sites within Lac de Gras (S2 and S3), one lake within the King-Cujo Watershed (Cujo), one site within Lac du Sauvage (LdS1), and two external reference lakes (Nanuq and Counts). Sediment samples were collected from late-July to early August (Table 3.8-1). Triplicate Ekman and core sediment samples were collected at mid-depth at each lake.

Results of the laboratory analyses for Ekman and core sediment quality samples are presented in Tables 3.8-2 and 3.8-3, respectively. A summary of the analytical detection limits for Ekman and core sediment samples are presented in Tables 3.8-4 and 3.8-5. For the purpose of presentation and analysis, half of the analytical detection limit was used when variable concentrations were below the detection limit. Sediment quality variables are presented graphically as averages of the triplicate samples collected at each lake.

3.8.1 Sediment Physical Characteristics and Particle Size

Physical characteristics of sediments through visual descriptions and photographs are summarized in Table 3.8-6 and Plate 3.8-1. Sediment descriptions and particle sizing were recorded and processed for Ekman sediments only. Generally, most lakes had fine sediments and very little biological material and debris (Table 3.8-6).

Particle size analysis indicated the percent of gravel was below detection limits in all lake sediments (Table 3.8-2; Figure 3.8-1a to 3.8-1c). The percentages of sand, silt, and clay were variable between lake sediments, but all lakes were dominated by silt (mean range: 66.3% to 85.6%; Figure 3.8-1a to 3.8-1c). Clay and sand were present in lake sediments in much smaller proportions (clay mean range: 5.9% to 14.9%; sand mean range: 2.0% to 23.7%). Clay was more abundant than sand in some sediments (Kodiak, Leslie, Moose, Nema, Slipper, and Cujo lakes, site LdS1 in Lac du Sauvage, Fay Bay, and Upper Exeter Lake) and sand was more abundant than clay at Counts, Nanuq, and Vulture lakes, and site S2 in Lac de Gras (Figure 3.8-1a to 3.8-1c).

3.8.2 Sediment Nutrients

Available phosphorus concentrations in sediments varied within and between watersheds, but showed no clear pattern (Figure 3.8-2). In general, available phosphorus concentrations were greater in Ekman samples than in core samples at all lakes (Figure 3.8-2). Results from Ekman samples show that available phosphorus concentrations were greatest in Counts Lake (206 mg/kg), Fay Bay (125 mg/kg), and Nema Lake (108 mg/kg) sediments (Figure 3.8-2). In core samples, concentrations were greatest in Fay Bay (96 mg/kg), Moose Lake (53 mg/kg), and Nema Lake (47 mg/kg) sediments (Figure 3.8-2).

In general, total nitrogen and TOC concentrations were greater in core samples than in Ekman samples (Figures 3.8-2 and 3.8-3). Results from core samples show that total nitrogen and TOC were greatest in Nanuq (0.99% and 12.2%), Moose (0.96% and 10.2%), and Counts (0.83% and 9.04%) lakes sediments and lowest in LdS1 sediments (0.25% and 2.6%) sediments (Figures 3.8-2 and 3.8-3).

Results from Ekman samples show that total nitrogen and TOC were greatest in Moose (0.73% and 9.5%), Cujo (0.71% and 7.2%), and Nanuq (0.62% and 8.4%) lake sediments and lowest in LdS1 sediments (Ekman: 0.2% and 2.0%) sediments (Figures 3.8-2 and 3.8-3). Both total nitrogen and TOC showed similar spatial patterns over watersheds, with concentrations decreasing from Moose Lake to Lac de Gras (S2), from Cujo Lake to LdS1, and from Fay Bay to Upper Exeter although concentrations at the reference lakes were often greater (Figures 3.8-2 and 3.8-3).

3.8.3 Sediment Metals

Concentrations of total metals in lake sediments (i.e., antimony, arsenic, cadmium, copper, molybdenum, nickel, phosphorus, selenium, and strontium) are presented in Figures 3.8-2 to 3.8-7. In general, concentrations of antimony, cadmium, copper, molybdenum, nickel, selenium, and strontium in lake sediments from Ekman and core samples were similar among reference lakes. However, compared to other reference concentrations, arsenic concentrations were elevated in Ekman samples from Vulture Lake and core samples from Counts and Vulture lakes. Phosphorus was also elevated compared to other reference concentrations in both Ekman and core samples from Counts Lake (Figures 3.8-2 to 3.8-7).

Results from core samples show that the highest concentrations of the individual total metals were observed in various lakes, including Leslie (antimony, molybdenum, and selenium), Moose (selenium and strontium), and Slipper (copper), and at sites S2 (cadmium and nickel) and LdS1 (arsenic and phosphorus). Results from Ekman samples showed that the highest concentrations of the individual total metals were observed in Leslie (antimony), Moose (molybdenum, selenium, and strontium), Slipper (cadmium and copper), LdS1 (arsenic and phosphorus), and Upper Exeter (nickel; Figures 3.8-2 to 3.8-7).

Metal concentrations were variable across watersheds, showing clear spatial patterns for antimony, molybdenum, and strontium, where concentrations generally decreased with downstream distance from the LLCF to site S2 and from KPSF to site LdS1 (Figures 3.8-4 to 3.8-7). A spatial pattern was of decreasing concentration from the KPSF to site LdS1 was also noticeable for copper and selenium (Figures 3.8-5 and 3.8-7). Total metal concentrations in the Pigeon-Fay and Upper Exeter Watershed were generally low to moderate in comparison to the other watersheds.

Most often, metal concentrations were greater in the core samples than in the Ekman samples (Figures 3.8-3 to 3.8-7). Exceptions included cadmium and copper concentrations where concentrations in Ekman samples were sometime greater than in core samples (Figures 3.8-4 and 3.8-5).

3.8.4 Sediment Quality Guidelines

The number (percentage of the total) and the factor by which the sediment quality samples were greater than CCME Interim Sediment Quality Guidelines (ISQG) and Probable Effects Levels (PEL) for total arsenic (ISQG: 59 mg/kg; PEL: 17 mg/kg), cadmium (ISQG: 0.6 mg/kg; PEL: 3.5 mg/kg), and copper (ISQG: 35.7 mg/kg; PEL: 197 mg/kg) concentrations for Ekman and core sediments in AEMP lakes are presented in Table 3.8-7.

Arsenic concentrations in sediment were greater than the CCME ISQG guideline in one or more replicates from all lakes in both cores and Ekmans, with the exception of Fay Bay. Arsenic concentrations were also greater than the PEL guideline in one or more replicates from Nanuq (core), Counts (Ekman and core), Vulture (Ekman and core), Kodiak (core), Leslie (core), and Slipper (Ekman and core) lakes, Lac de Gras (S2; Ekman and core), Cujo Lake (Ekman and core), Lac du Sauvage (LdS1; Ekman and core), and Upper Exeter Lake (Ekman and core; Table 3.8-7). Arsenic concentrations were greater than the CCME ISQG and PEL guidelines in reference lake sediments, suggesting that elevated arsenic concentrations were likely widespread and naturally occurring.

Cadmium concentrations were greater than the CCME ISQG guideline in one or more replicates from Lac du Sauvage (S2; core only). Sediment cadmium concentrations were below the CCME PEL guideline in all lakes (Table 3.8-7).

Copper concentrations in all lake sediments were above the ISQG guideline in one or more replicates in both cores and Ekmans from all lakes except LdS1 and Fay Bay. Sediment copper concentrations were below the CCME PEL guideline in all lakes (Table 3.8-7).

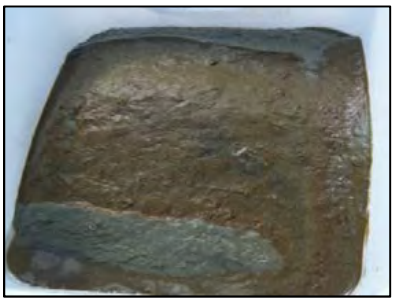
Nanuq

Rep 1

Rep 2

Rep 3

Counts



Rep 1

Rep 2

Rep 3

(continued)

Plate 3.8-1. Photographic Record of Sediment Samples Collected at AEMP Lake Sites, Ekman Sampling 2014

Vulture

Rep 1

Rep 2

Rep 3

Kodiak

Rep 1

Rep 2

Rep 3

Leslie

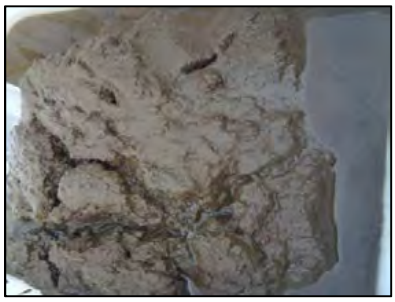
Rep 1

Rep 2

Rep 3

Moose

Rep 1



Rep 2

Rep 3

(continued)

Plate 3.8-1. Photographic Record of Sediment Samples Collected at AEMP Lake Sites, Ekman Sampling 2014 (continued)

Nema

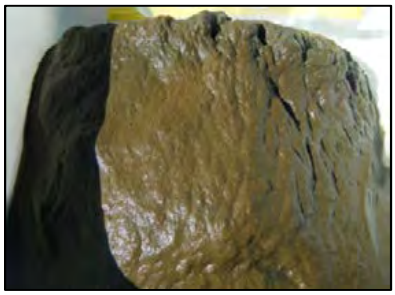
Rep 1

Rep 2

Rep 3

Slipper

Rep 1



Rep 2

Rep 3

S2

Rep 1

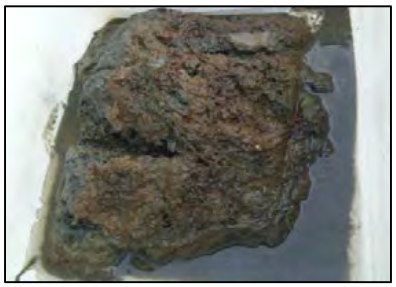
Rep 2

Rep 3

Cujo

Rep 1

Rep 2



Rep 3

(continued)

Plate 3.8-1. Photographic Record of Sediment Samples Collected at AEMP Lake Sites, Ekman Sampling 2014 (continued)

LdS1

Rep 1

Rep 2

Rep 3

Fay Bay

Rep 1

Rep 2

Rep 3

Upper Exeter

Rep 1

Rep 2

Rep 3

Plate 3.8-1. Photographic Record of Sediment Samples Collected at AEMP Lake Sites, Ekman Sampling 2014 (completed)

Supporting Tables and Figures

Table 3.8-1. Locations, Depths, and Dates for Sediment Sampling at AEMP Lake Sites, 2014

		Average Sample Depth (m)		Replicates	
Lake	Date	Ekman	Core	Ekman	Core[2]
Nanuq	August 3	7.1	7.1	3	3
Counts[1]	August 9	5.5	5.6	3	3
Vulture	August 3	9.5	6.5	3	3
Kodiak	July 29	6.2	5.9	3	3
Leslie	July 31	7.0	6.8	3	3
Moose	July 31	9.5	9.5	3	3
Nema	August 2	9.5	9.5	3	3
Slipper	August 4	5.6	5.6	3	3
S2	July 30 (Core); August 3 (Ekman)	5.9	5.2	3	3
Cujo[1]	August 7	5.5	6.5	3	3
LdS1	August 8	7.2	7.4	3	3
Fay Bay	August 1	6.7	6.6	3	3
Upper Exeter[1]	August 10	8.5	8.4	3	3

[1] *One or two replicate sample depths not recorded.*
[2] *Each core sample was a composite of five individual cores.*

Table 3.8-2. Analytical Results for AEMP Lake Sediment Quality Variables, Ekman Sampling 2014

Lake		Nanuq			Counts			Vulture			Kodiak			Leslie		
Date Sampled		5-Aug-14			9-Aug-14			3-Aug-14			29-Jul-14			31-Jul-14		
Replicate No.		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Sample ID		L1501039-1	L1501039-2	L1501039-3	L1501739-4	L1501739-5	L1501739-6	L1498600-1	L1498600-2	L1498600-3	L1497697-1	L1497697-2	L1497697-3	L1497645-1	L1497645-2	L1497645-3
Physical Tests	**Units**															
% Moisture	%	89.2	76.8	87.9	87.1	85.5	84.7	82.9	92.8	86.7	80.4	79.2	73.5	83.9	81.6	82.9
Particle Size																
% Gravel (>2mm)	%	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
% Sand (2.0mm - 0.063mm)	%	16.8	15.0	12.4	13.2	23.8	8.72	17.4	21.0	16.2	7.16	6.64	6.58	3.16	2.75	2.54
% Silt (0.063mm - 4µm)	%	76.9	75.7	80.0	74.1	66.2	73.1	77.8	73.4	76.5	82.8	81.3	80.7	87.8	87.0	85.0
% Clay (<4µm)	%	6.33	9.31	7.59	12.6	10.1	18.2	4.78	5.57	7.25	10.0	12.0	12.6	9.01	10.3	12.5
Plant Available Nutrients																
Available Phosphorus (P)	mg/kg	29.8	37.6	32.8	121	161	335	13.4	23.9	73.7	27.9	37.9	42.3	33.2	70.7	65.5
Leechable Nutrients																
Total Nitrogen (N)	%	0.623	0.636	0.599	0.633	0.482	0.525	0.368	0.323	0.367	0.495	0.448	0.387	0.551	0.553	0.572
Organic Carbon																
Total Organic Carbon	%	8.39	8.51	8.24	7.20	5.65	6.17	4.72	4.52	4.85	5.86	5.46	4.67	7.23	7.23	7.25
Total Metals																
Aluminum (Al)	mg/kg	13,300	13,700	14,600	17,800	18,800	24,400	14,500	13,600	14,700	20,200	19,700	20,600	17,600	18,100	17,200
Antimony (Sb)	mg/kg	0.15	0.15	0.16	<0.10	<0.10	<0.10	0.13	0.13	<0.10	0.16	0.13	0.11	1.63	0.68	0.99
Arsenic (As)	mg/kg	10.2	10.4	11.2	19.2	14.2	8.68	105	99.7	10.8	14.7	11.8	9.00	9.71	4.71	7.45
Barium (Ba)	mg/kg	95.6	101	103	106	111	140	102	99.3	90.3	194	168	180	146	128	141
Beryllium (Be)	mg/kg	0.62	0.69	0.71	0.73	0.73	0.96	0.79	0.77	0.76	0.78	0.80	0.76	0.65	0.60	0.68
Bismuth (Bi)	mg/kg	0.29	0.31	0.33	0.45	0.44	0.60	0.50	0.50	0.50	0.61	0.60	0.63	0.44	0.41	0.42
Boron (B)	mg/kg	15	17	16	<10	<10	<10	<10	<10	<10	<10	<10	<10	16	13	15
Cadmium (Cd)	mg/kg	0.380	0.419	0.421	0.224	0.254	0.452	0.331	0.342	0.194	0.189	0.190	0.151	0.211	0.220	0.219
Calcium (Ca)	mg/kg	2,070	2,170	1,980	1,760	1,710	1,800	1,210	1,140	1,190	4,560	3,090	3,330	3,190	2,470	3,950
Chromium (Cr)	mg/kg	36.4	36.6	39.2	51.2	54.9	69.4	40.6	38.6	41.7	72.6	66.3	73.3	63.0	59.5	62.8
Cobalt (Co)	mg/kg	9.26	9.65	10.6	12.8	12.5	13.4	42.6	40.9	13.4	17.0	15.5	17.1	12.6	11.3	12.0
Copper (Cu)	mg/kg	57.6	60.3	64.6	47.7	46.1	63.7	54.5	52.8	51.1	55.5	55.1	56.4	47.9	50.3	48.1
Iron (Fe)	mg/kg	21,700	22,700	23,300	35,800	32,000	29,200	51,900	49,900	22,400	41,000	35,000	34,700	32,100	24,000	26,600
Lead (Pb)	mg/kg	6.15	6.48	6.27	6.54	6.25	7.17	5.84	5.63	6.07	6.85	6.83	7.34	6.09	5.25	5.85
Lithium (Li)	mg/kg	26.2	27.9	28.1	36.8	39.4	48.4	33.1	31.5	35.5	50.2	50.0	52.0	48.7	44.2	47.2
Magnesium (Mg)	mg/kg	4,270	4,370	4,560	6,360	7,040	8,540	5,060	4,820	5,440	13,200	10,600	12,900	8,650	8,050	8,790
Manganese (Mn)	mg/kg	211	263	261	583	435	286	2150	2090	484	362	316	377	403	219	348
Mercury (Hg)	mg/kg	0.0265	0.0276	0.0252	0.0259	0.0207	0.0167	0.0142	0.0134	0.0153	0.0481	0.0507	0.0449	0.0381	0.0388	0.0373
Molybdenum (Mo)	mg/kg	1.36	1.31	1.46	1.67	1.55	1.65	3.31	3.22	1.59	4.83	3.50	3.23	41.7	10.9	25.2
Nickel (Ni)	mg/kg	33.8	35.6	37.8	42.1	48.8	62.3	51.1	49.7	40.7	69.9	55.3	62.7	53.4	45.5	53.3
Phosphorus (P)	mg/kg	467	526	533	1,430	1,270	1,750	1,220	1,190	791	985	889	971	740	770	738
Potassium (K)	mg/kg	2,350	2,500	2,500	3,800	4,120	5,040	3,170	2,990	3,330	5,660	5,350	5,930	4,780	4,640	4,620
Selenium (Se)	mg/kg	0.49	0.49	0.57	0.40	0.41	0.51	0.54	0.55	0.40	0.37	0.37	0.32	0.66	0.48	0.57
Silver (Ag)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.13	<0.10	<0.10	<0.10	0.11	0.12	0.12	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg	130	130	140	170	210	210	160	170	150	290	260	270	1070	880	1170
Strontium (Sr)	mg/kg	15.8	17.4	16.5	14.8	14.0	15.7	11.3	10.5	10.7	28.1	20.8	21.7	56.0	41.7	59.4
Thallium (Tl)	mg/kg	0.181	0.198	0.209	0.224	0.231	0.321	0.496	0.463	0.235	0.362	0.345	0.354	0.316	0.291	0.304
Tin (Sn)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	mg/kg	416	472	474	646	732	886	573	533	522	1,060	970	1,090	893	863	820
Uranium (U)	mg/kg	5.32	5.52	5.73	4.70	4.74	6.49	5.48	5.27	5.32	5.73	5.51	5.20	6.10	5.26	5.75
Vanadium (V)	mg/kg	33.2	34.3	36.5	44.5	47.1	58.6	37.2	35.9	39.7	55.1	52.9	56.7	48.0	46.2	44.9
Zinc (Zn)	mg/kg	103	111	118	92.3	99.1	116	89.6	85.2	73.1	125	107	108	84.8	81.2	80.4

(continued)

Table 3.8-2. Analytical Results for AEMP Lake Sediment Quality Variables, Ekman Sampling 2014 (continued)

Lake		Moose			Nema			Slipper			S2		
Date Sampled		31-Jul-14			2-Aug-14			4-Aug-14			3-Aug-14		
Replicate No.		1	2	3	1	2	3	1	2	3	1	2	3
Sample ID		L1497645-7	L1497645-8	L1497645-9	L1497645-19	L1497645-20	L1497645-21	L1498600-7	L1498600-8	L1498600-9	L1497645-16	L1497645-17	L1497645-18
Physical Tests	**Units**												
% Moisture	%	82.9	82.8	85.3	82.6	82.0	83.8	84.3	85.4	83.6	86.6	81.5	81.4
Particle Size													
% Gravel (>2mm)	%	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
% Sand (2.0mm - 0.063mm)	%	1.71	2.60	1.77	2.54	3.09	2.48	1.73	2.68	2.38	16.0	30.0	25.1
% Silt (0.063mm - 4µm)	%	84.4	84.4	86.4	85.3	85.5	85.9	81.9	84.8	82.0	73.4	60.1	65.4
% Clay (<4µm)	%	13.9	13.0	11.9	12.2	11.4	11.7	16.4	12.6	15.6	10.6	9.91	9.54
Plant Available Nutrients													
Available Phosphorus (P)	mg/kg	17.3	45.7	42.9	164	78.2	82.8	18.9	21.3	13.7	7.5	18.0	<4.0
Leechable Nutrients													
Total Nitrogen (N)	%	0.739	0.625	0.823	0.626	0.560	0.654	0.532	0.560	0.516	0.490	0.415	0.447
Organic Carbon													
Total Organic Carbon	%	9.17	9.60	9.75	6.85	6.37	6.77	5.81	6.13	5.70	5.42	4.51	4.97
Total Metals													
Aluminum (Al)	mg/kg	17,800	16,400	17,100	17,500	18,000	17,200	27,600	26,200	26,900	18,500	17,200	18,500
Antimony (Sb)	mg/kg	1.41	0.35	1.10	0.71	0.77	1.32	0.38	0.59	0.43	0.16	0.13	0.13
Arsenic (As)	mg/kg	10.3	5.04	5.99	5.21	6.71	6.69	43.2	62.5	48.5	85.0	31.8	56.2
Barium (Ba)	mg/kg	125	115	134	120	113	119	174	168	166	151	111	129
Beryllium (Be)	mg/kg	0.64	0.60	0.59	0.69	0.67	0.68	1.37	1.26	1.29	0.88	0.73	0.81
Bismuth (Bi)	mg/kg	0.54	0.46	0.49	0.52	0.51	0.54	1.01	0.97	0.96	0.57	0.49	0.52
Boron (B)	mg/kg	<10	<10	<10	<10	<10	<10	11	11	11	<10	<10	<10
Cadmium (Cd)	mg/kg	0.200	0.184	0.213	0.218	0.196	0.196	0.429	0.402	0.485	0.485	0.370	0.268
Calcium (Ca)	mg/kg	3,870	3,500	3,600	2,720	3,010	3,220	2,210	2,390	2,190	1,760	1,470	1,330
Chromium (Cr)	mg/kg	53.5	48.0	52.9	52.7	55.6	54.3	77.1	73.7	75.6	52.1	49.0	53.2
Cobalt (Co)	mg/kg	12.9	9.61	12.1	12.2	13.7	14.1	30.6	42.0	39.8	67.0	51.3	71.1
Copper (Cu)	mg/kg	50.6	44.7	47.1	51.7	50.0	51.1	91.0	89.7	89.1	60.1	52.5	56.5
Iron (Fe)	mg/kg	35,000	19,900	22,900	21,100	26,000	25,800	70,400	85,400	71,600	66,600	37,300	51,200
Lead (Pb)	mg/kg	6.29	4.98	6.23	5.75	5.72	5.89	8.45	8.54	8.43	7.13	6.29	6.21
Lithium (Li)	mg/kg	43.0	39.2	42.1	39.6	40.1	40.1	54.6	50.8	53.1	37.9	34.2	36.5
Magnesium (Mg)	mg/kg	7,030	6,060	7,040	6,790	7,480	7,670	8,790	8,400	8,660	6,140	5,740	6,150
Manganese (Mn)	mg/kg	375	191	360	213	214	224	888	1390	977	4980	2140	3490
Mercury (Hg)	mg/kg	0.0747	0.0523	0.0694	0.0728	0.0714	0.0795	0.0696	0.0771	0.0744	0.0536	0.0471	0.0438
Molybdenum (Mo)	mg/kg	51.7	13.5	31.3	17.8	21.0	33.8	19.0	36.7	20.2	10.8	5.36	7.31
Nickel (Ni)	mg/kg	40.5	29.9	38.6	36.9	39.5	42.5	75.1	79.4	83.2	88.7	72.3	72.8
Phosphorus (P)	mg/kg	1,040	775	931	942	933	933	1,160	1,300	1,260	950	755	809
Potassium (K)	mg/kg	4,140	3,640	4,330	3,960	4,200	4,230	5,230	4,890	5,050	3,380	3,230	3,620
Selenium (Se)	mg/kg	0.77	0.52	0.80	0.47	0.44	0.57	0.75	0.70	0.63	0.63	0.54	0.62
Silver (Ag)	mg/kg	0.13	0.11	0.11	0.15	0.16	0.16	0.20	0.18	0.17	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg	1300	1100	1420	670	670	750	520	510	510	210	190	200
Strontium (Sr)	mg/kg	67.5	57.0	62.6	41.8	41.3	49.0	36.4	43.0	38.3	26.9	18.8	18.2
Thallium (Tl)	mg/kg	0.269	0.232	0.273	0.286	0.292	0.275	0.543	0.510	0.549	0.418	0.379	0.404
Tin (Sn)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	mg/kg	767	736	745	679	707	636	842	816	856	588	545	625
Uranium (U)	mg/kg	7.72	6.24	6.61	6.15	6.14	6.44	9.83	9.77	9.64	5.22	4.50	4.92
Vanadium (V)	mg/kg	42.4	36.8	40.0	43.7	45.8	44.3	65.6	63.1	63.6	45.6	41.5	46.4
Zinc (Zn)	mg/kg	72.4	61.8	66.4	77.0	89.8	85.9	134	134	132	108	92.5	94.0

(continued)

Table 3.8-2. Analytical Results for AEMP Lake Sediment Quality Variables, Ekman Sampling 2014 (completed)

Lake		Cujo			LdS1			Fay Bay			Upper Exeter		
Date Sampled		7-Aug-14			8-Aug-14			3-Aug-14			10-Aug-14		
Replicate No.		1	2	3	1	2	3	1	2	3	1	2	3
Sample ID		L1501739-16	L1501739-17	L1501739-18	L1501739-10	L1501739-11	L1501739-12	L1497645-10	L1497645-11	L1497645-12	L1501739-22	L1501739-23	L1501739-24
Physical Tests	**Units**												
% Moisture	%	80.6	82.9	83.2	71.1	68.6	70.9	78.0	79.4	79.9	81.8	83.6	78.3
Particle Size													
% Gravel (>2mm)	%	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
% Sand (2.0mm - 0.063mm)	%	4.13	4.90	6.06	8.12	8.00	7.81	5.92	5.85	8.25	4.61	2.25	2.04
% Silt (0.063mm - 4µm)	%	86.2	83.6	83.4	78.2	77.6	77.6	82.9	85.6	82.6	83.1	82.4	82.0
% Clay (<4µm)	%	9.70	11.6	10.5	13.7	14.4	14.6	11.2	8.52	9.17	12.3	15.4	16.0
Plant Available Nutrients													
Available Phosphorus (P)	mg/kg	38.6	24.9	10.9	59.4	51.4	44.5	126	158	91.3	41.8	14.1	38.5
Leechable Nutrients													
Total Nitrogen (N)	%	0.684	0.683	0.770	0.204	0.199	0.218	0.523	0.547	0.642	0.395	0.450	0.377
Organic Carbon													
Total Organic Carbon	%	7.08	6.98	7.49	1.98	1.97	2.07	6.16	6.43	6.95	4.61	4.97	4.46
Total Metals													
Aluminum (Al)	mg/kg	16,200	15,500	13,800	16,000	16,700	16,400	15,900	15,900	14,800	17,800	17,300	17,300
Antimony (Sb)	mg/kg	0.18	0.19	0.22	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.14	0.14	0.15
Arsenic (As)	mg/kg	27.4	25.0	37.3	88.4	66.9	86.6	5.44	5.36	5.20	22.6	37.7	21.0
Barium (Ba)	mg/kg	135	126	123	148	170	187	121	123	120	134	129	129
Beryllium (Be)	mg/kg	0.54	0.47	0.50	0.46	0.47	0.43	0.54	0.57	0.50	0.70	0.64	0.64
Bismuth (Bi)	mg/kg	0.37	0.35	0.34	0.30	0.29	0.28	0.37	0.39	0.34	0.45	0.42	0.41
Boron (B)	mg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cadmium (Cd)	mg/kg	0.203	0.186	0.158	0.114	0.164	0.180	0.179	0.192	0.142	0.277	0.262	0.274
Calcium (Ca)	mg/kg	4,070	3,450	3,750	1,420	1,590	1,550	2,300	2,390	2,480	2,150	2,150	2,070
Chromium (Cr)	mg/kg	58.0	54.7	49.6	59.6	62.7	61.8	49.3	49.5	48.3	57.7	56.2	56.3
Cobalt (Co)	mg/kg	19.3	17.2	16.6	23.0	24.3	25.4	15.6	16.4	15.2	44.0	49.4	39.8
Copper (Cu)	mg/kg	46.7	45.6	40.1	25.2	26.3	26.3	30.9	33.2	29.1	50.2	47.3	48.0
Iron (Fe)	mg/kg	34,600	32,600	38,800	51,900	44,500	48,200	18,700	20,400	21,400	39,600	54,300	38,500
Lead (Pb)	mg/kg	5.95	5.59	5.33	4.97	5.14	4.97	5.07	5.58	4.89	7.65	7.35	7.39
Lithium (Li)	mg/kg	35.8	34.0	32.3	39.6	41.1	38.8	37.8	38.3	36.9	44.5	42.4	43.2
Magnesium (Mg)	mg/kg	6,840	6,680	6,190	8,410	8,730	8,520	7,420	7,190	8,320	7,760	7,770	7,580
Manganese (Mn)	mg/kg	848	593	713	3650	4440	6690	209	268	274	523	1220	606
Mercury (Hg)	mg/kg	0.0631	0.0627	0.0679	0.0142	0.0145	0.0139	0.0602	0.0656	0.0595	0.0466	0.0457	0.0434
Molybdenum (Mo)	mg/kg	12.0	11.7	16.6	2.56	2.01	2.24	1.44	1.37	1.46	2.24	2.44	2.14
Nickel (Ni)	mg/kg	42.4	40.8	37.5	40.5	45.9	48.1	44.4	42.8	48.4	83.4	85.7	81.0
Phosphorus (P)	mg/kg	1,150	1,150	1,100	1,900	1,450	1,380	866	909	953	1,000	875	864
Potassium (K)	mg/kg	3,950	3,760	3,570	4,450	4,730	4,720	3,490	3,510	3,430	4,410	4,340	4,310
Selenium (Se)	mg/kg	0.62	0.63	0.65	0.18	0.17	0.16	0.38	0.33	0.32	0.38	0.36	0.38
Silver (Ag)	mg/kg	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg	240	240	220	240	230	270	180	170	170	240	210	200
Strontium (Sr)	mg/kg	33.2	29.2	30.3	11.9	12.8	12.8	18.1	19.2	19.9	16.8	16.3	15.7
Thallium (Tl)	mg/kg	0.230	0.206	0.201	0.243	0.269	0.266	0.292	0.297	0.253	0.348	0.340	0.350
Tin (Sn)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	mg/kg	725	679	642	850	960	921	722	719	671	874	863	848
Uranium (U)	mg/kg	6.03	6.45	7.48	2.57	2.58	2.47	3.06	3.28	3.00	3.94	3.67	3.78
Vanadium (V)	mg/kg	49.6	47.3	43.8	49.1	51.7	50.8	40.1	40.4	38.3	49.8	48.1	48.3
Zinc (Zn)	mg/kg	74.8	68.4	64.1	67.8	71.4	72.9	71.9	71.4	65.0	109	106	106

Notes: All variables analyzed by ALS Environmental (Burnaby, BC).

< = less than the analytical detection limit indicated

Table 3.8-3. Analytical Results for AEMP Lake Sediment Quality Variables, Core Sampling 2014

Lake		Nanuq			Counts			Vulture			Kodiak			Leslie		
Date Sampled		5-Aug-14			9-Aug-14			3-Aug-14			29-Jul-14			31-Jul-14		
Replicate No.		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Sample ID		L1501039-4	L1501039-5	L1501039-6	L1501739-1	L1501739-2	L1501739-3	L1498600-4	L1498600-5	L1498600-6	L1497697-4	L1497697-5	L1497697-6	L1497645-4	L1497645-5	L1497645-6
Physical Tests	**Units**															
% Moisture	%	89.5	92.8	92.9	92.5	92.2	93.5	93.2	90.6	93.4	84.3	83.5	84.9	90.9	94.2	89.6
Plant Available Nutrients																
Available Phosphorus (P)	mg/kg	21.7	32.5	9.1	15.1	38.3	15.6	14.6	44.2	7.5	7.0	<4.0	4.3	18.4	29.1	51.1
Leechable Nutrients																
Total Nitrogen (N)	%	1.05	0.827	1.08	0.850	0.764	0.867	0.672	0.695	0.791	0.448	0.414	0.485	0.698	0.707	0.616
Organic Carbon																
Total Organic Carbon	%	12.8	10.6	13.1	9.33	8.52	9.28	7.98	8.15	8.93	5.02	4.68	5.27	7.86	7.90	7.29
Total Metals																
Aluminum (Al)	mg/kg	11,400	12,500	10,800	16,400	16,000	16,200	9,910	11,200	11,400	20,900	22,200	21,100	15,900	17,300	17,700
Antimony (Sb)	mg/kg	0.18	0.12	0.15	0.12	0.16	<0.10	0.12	0.14	0.21	0.13	0.14	0.16	3.44	2.80	1.70
Arsenic (As)	mg/kg	30.5	15.3	28.2	80.1	32.0	50.0	78.7	60.4	110	15.0	14.5	19.0	20.3	17.3	10.4
Barium (Ba)	mg/kg	88.6	89.0	85.4	116	95.8	101	132	135	195	201	225	224	175	185	148
Beryllium (Be)	mg/kg	0.57	0.57	0.52	0.69	0.64	0.66	0.57	0.62	0.65	0.69	0.67	0.66	0.58	0.66	0.68
Bismuth (Bi)	mg/kg	0.28	0.29	0.27	0.44	0.41	0.44	0.35	0.41	0.45	0.63	0.66	0.60	0.39	0.46	0.44
Boron (B)	mg/kg	20	15	16	<10	<10	<10	<10	<10	<10	<10	<10	<10	15	17	17
Cadmium (Cd)	mg/kg	0.271	0.327	0.243	0.199	0.176	0.173	0.280	0.348	0.482	0.155	0.138	0.135	0.210	0.249	0.217
Calcium (Ca)	mg/kg	2,250	1,890	2,440	2,020	1,740	2,150	1,280	1,450	1,550	3,660	4,580	4,260	3,360	4,640	3,700
Chromium (Cr)	mg/kg	32.6	35.0	31.1	47.5	46.4	47.4	29.3	33.0	32.0	79.4	93.6	89.0	66.9	70.2	63.3
Cobalt (Co)	mg/kg	20.6	11.6	20.6	24.0	15.7	19.7	65.9	72.6	153	20.0	24.5	23.0	16.3	16.7	13.0
Copper (Cu)	mg/kg	51.3	54.6	47.4	50.9	43.1	41.9	34.1	40.5	48.5	51.3	55.9	51.9	44.7	46.5	47.6
Iron (Fe)	mg/kg	47,600	28,400	47,600	82,500	45,200	59,400	60,100	59,300	121,000	49,300	55,200	59,700	47,900	43,900	32,000
Lead (Pb)	mg/kg	6.49	5.43	5.70	7.12	6.76	6.70	5.26	6.15	7.33	7.12	7.42	7.39	6.38	6.67	6.20
Lithium (Li)	mg/kg	23.0	24.9	22.5	31.3	32.5	33.8	24.7	26.9	24.4	51.7	52.5	50.9	43.1	48.6	48.5
Magnesium (Mg)	mg/kg	3,830	4,080	3,710	5,820	5,840	6,050	4,070	4,500	4,300	16,100	21,400	20,400	9,370	9,840	8,770
Manganese (Mn)	mg/kg	1,410	498	1,420	2,070	1,240	1,850	7,550	7,000	12,300	502	614	586	719	815	433
Mercury (Hg)	mg/kg	0.0320	0.0237	0.0280	0.0366	0.0285	0.0391	0.0167	0.0198	0.0271	0.0442	0.0457	0.0444	0.0412	0.0406	0.0402
Molybdenum (Mo)	mg/kg	1.54	1.31	1.33	3.32	2.04	2.44	4.51	3.53	4.50	4.47	4.83	5.35	110	95.0	46.3
Nickel (Ni)	mg/kg	35.9	33.6	33.6	44.8	40.0	43.1	60.6	69.1	107	79.7	105	100	65.5	68.8	55.0
Phosphorus (P)	mg/kg	762	571	596	2180	1500	1660	587	708	965	1020	1050	1040	806	894	805
Potassium (K)	mg/kg	2,250	2,290	2,160	3,370	3,470	3,590	2,630	2,800	2,470	6,320	7,090	6,780	4,810	5,250	4,940
Selenium (Se)	mg/kg	0.55	0.53	0.52	0.49	0.38	0.39	0.35	0.42	0.62	0.33	0.39	0.37	1.00	0.98	0.66
Silver (Ag)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.11	0.12	0.11	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg	130	120	110	170	170	180	110	140	160	330	390	350	1480	1870	1490
Strontium (Sr)	mg/kg	19.6	15.8	18.5	15.5	14.2	15.8	13.4	15.1	16.8	25.5	30.6	28.6	66.5	78.9	61.4
Thallium (Tl)	mg/kg	0.174	0.166	0.160	0.231	0.220	0.228	0.342	0.418	0.637	0.387	0.395	0.390	0.283	0.330	0.327
Tin (Sn)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	mg/kg	398	419	346	482	552	566	420	435	381	1140	1310	1210	826	904	879
Uranium (U)	mg/kg	5.29	5.07	4.91	4.67	4.27	4.29	3.54	4.13	4.70	5.14	5.12	5.04	6.31	6.69	6.26
Vanadium (V)	mg/kg	29.7	31.8	28.2	42.6	41.1	41.5	26.8	31.0	31.1	58.2	63.8	61.5	46.4	49.0	47.3
Zinc (Zn)	mg/kg	105	98.6	96.9	103	93.6	97.1	72.4	82.8	104	118	128	126	83.8	87.4	84.2

(continued)

Table 3.8-3. Analytical Results for AEMP Lake Sediment Quality Variables, Core Sampling 2014 (continued)

Lake		Moose			Nema			Slipper			S2		
Date Sampled		31-Jul-14			2-Aug-14			4-Aug-14			30-Jul-14		
Replicate No.		1	2	3	1	2	3	1	2	3	1	2	3
Sample ID		L1498600-13	L1498600-14	L1498600-15	L1497645-22	L1497645-23	L1497645-24	L1498600-10	L1498600-11	L1498600-12	L1497645-25	L1497645-26	L1497645-27
Physical Tests	**Units**												
% Moisture	%	90.0	93.0	92.9	90.9	91.0	90.4	89.1	89.3	83.7	91.3	88.4	82.2
Plant Available Nutrients													
Available Phosphorus (P)	mg/kg	42.2	83.1	32.6	38.4	43.3	59.6	5.0	9.9	18.4	<2.0	<2.0	3.8
Leechable Nutrients													
Total Nitrogen (N)	%	0.728	1.22	0.923	0.780	0.752	0.688	0.607	0.656	0.515	0.781	0.629	0.377
Organic Carbon													
Total Organic Carbon	%	9.05	11.7	9.98	7.68	7.43	7.27	6.66	7.00	5.69	7.61	6.32	3.85
Total Metals													
Aluminum (Al)	mg/kg	17,600	16,400	15,600	17,000	17,400	18,100	24,400	24,600	24,300	14,600	15,100	12,900
Antimony (Sb)	mg/kg	1.27	1.74	1.09	2.10	1.89	1.91	0.73	0.83	0.89	0.45	0.37	0.19
Arsenic (As)	mg/kg	8.50	10.8	7.01	10.3	9.56	7.99	71.2	71.2	82.0	77.1	58.0	28.2
Barium (Ba)	mg/kg	124	142	141	145	139	122	160	166	167	266	188	133
Beryllium (Be)	mg/kg	0.63	0.61	0.51	0.62	0.65	0.71	1.24	1.19	1.13	0.70	0.71	0.54
Bismuth (Bi)	mg/kg	0.53	0.52	0.46	0.47	0.49	0.52	0.92	0.98	0.89	0.53	0.55	0.37
Boron (B)	mg/kg	<10	<10	<10	<10	<10	10	<10	11	10	<10	<10	<10
Cadmium (Cd)	mg/kg	0.224	0.215	0.238	0.225	0.204	0.194	0.427	0.401	0.405	0.725	0.670	0.369
Calcium (Ca)	mg/kg	3,910	4,360	3,720	4,620	4,630	3,670	2,550	2,750	2,870	2,530	2,220	1,440
Chromium (Cr)	mg/kg	54.7	53.7	50.9	55.3	56.7	56.6	70.7	70.5	70.1	40.2	41.1	37.1
Cobalt (Co)	mg/kg	12.8	14.1	13.5	16.2	15.1	15.0	42.3	41.1	42.9	121	100	58.9
Copper (Cu)	mg/kg	50.5	49.3	45.8	49.9	50.3	51.8	86.3	86.3	84.6	53.8	52.1	39.4
Iron (Fe)	mg/kg	30,700	31,300	22,200	39,200	36,700	32,700	97,100	101,000	108,000	70,900	55,400	31,200
Lead (Pb)	mg/kg	6.58	6.89	6.65	5.65	8.03	5.76	8.66	8.67	8.59	7.51	7.47	5.36
Lithium (Li)	mg/kg	43.5	43.5	39.7	38.2	39.3	40.3	47.7	48.5	46.2	27.7	30.1	27.6
Magnesium (Mg)	mg/kg	7,310	7,780	7,070	8,900	8,900	8,270	8,020	8,080	8,110	5,200	5,290	4,710
Manganese (Mn)	mg/kg	390	628	664	519	549	317	1,750	1,980	2,240	21,200	13,500	8,520
Mercury (Hg)	mg/kg	0.0746	0.0798	0.0622	0.0813	0.0798	0.0811	0.0830	0.0872	0.0951	0.0682	0.0626	0.0373
Molybdenum (Mo)	mg/kg	41.3	67.7	41.9	89.5	72.9	52.4	45.6	54.1	60.2	41.6	27.3	14.5
Nickel (Ni)	mg/kg	42.4	51.8	43.6	52.7	50.3	47.1	74.7	74.7	74.9	170	135	85.4
Phosphorus (P)	mg/kg	1010	1120	1000	1070	1070	1030	1180	1180	1160	1020	907	649
Potassium (K)	mg/kg	4,540	4,940	4,520	4,520	4,540	4,410	4,580	4,660	4,610	2,710	2,740	2,380
Selenium (Se)	mg/kg	0.75	1.10	0.78	0.76	0.76	0.64	0.68	0.75	0.72	0.67	0.60	0.38
Silver (Ag)	mg/kg	0.13	0.14	0.12	0.14	0.14	0.15	0.18	0.19	0.17	<0.10	0.10	<0.10
Sodium (Na)	mg/kg	1630	2470	2130	910	960	840	470	490	530	200	180	140
Strontium (Sr)	mg/kg	72.3	83.7	67.3	64.7	63.4	55.0	47.7	52.9	55.9	55.0	42.6	27.9
Thallium (Tl)	mg/kg	0.295	0.309	0.296	0.255	0.252	0.274	0.457	0.455	0.449	0.613	0.569	0.374
Tin (Sn)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	mg/kg	814	747	730	672	689	702	764	801	795	369	402	345
Uranium (U)	mg/kg	7.11	8.01	6.94	7.14	6.95	6.76	9.53	9.75	9.45	5.00	4.76	3.52
Vanadium (V)	mg/kg	42.3	42.5	38.3	44.5	45.4	46.8	60.9	60.8	60.4	35.6	36.6	30.9
Zinc (Zn)	mg/kg	71.1	71.2	64.2	88.2	94.4	90.6	130	130	130	121	112	78.0

(continued)

Table 3.8-3. Analytical Results for AEMP Lake Sediment Quality Variables, Core Sampling 2014 (completed)

Lake		Cujo			LdS1			Fay Bay			Upper Exeter		
Date Sampled		7-Aug-14			8-Aug-14			3-Aug-14			10-Aug-14		
Replicate No.		1	2	3	1	2	3	1	2	3	1	2	3
Sample ID		L1501739-13	L1501739-14	L1501739-15	L1501739-7	L1501739-8	L1501739-9	L1497645-13	L1497645-14	L1497645-15	L1501739-19	L1501739-20	L1501739-21
Physical Tests	**Units**												
% Moisture	%	87.0	88.4	88.1	80.1	80.8	81.9	86.8	83.9	85.7	85.1	86.1	85.9
Plant Available Nutrients													
Available Phosphorus (P)	mg/kg	9.0	12.8	8.4	18.6	23.6	21.7	91.7	110	87.1	16.0	17.5	20.2
Leechable Nutrients													
Total Nitrogen (N)	%	0.704	0.771	0.818	0.230	0.255	0.276	0.731	0.618	0.667	0.458	0.459	0.438
Organic Carbon													
Total Organic Carbon	%	7.06	7.41	7.91	2.36	2.74	2.59	7.75	6.60	7.02	5.07	5.08	4.91
Total Metals													
Aluminum (Al)	mg/kg	15,000	14,100	14,400	15,800	16,800	15,300	15,300	14,700	15,400	16,600	17,100	17,000
Antimony (Sb)	mg/kg	0.26	0.25	0.24	<0.10	0.12	<0.10	<0.10	<0.10	<0.10	0.11	0.12	0.13
Arsenic (As)	mg/kg	55.3	57.0	50.5	170	174	133	5.42	4.87	5.46	32.0	27.7	32.8
Barium (Ba)	mg/kg	133	128	129	196	197	206	124	124	123	128	130	132
Beryllium (Be)	mg/kg	0.49	0.52	0.47	0.46	0.51	0.48	0.54	0.53	0.51	0.64	0.65	0.64
Bismuth (Bi)	mg/kg	0.38	0.37	0.36	0.29	1.10	0.28	0.36	0.32	0.33	0.39	0.40	0.42
Boron (B)	mg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cadmium (Cd)	mg/kg	0.199	0.168	0.173	0.157	0.165	0.175	0.150	0.131	0.168	0.241	0.260	0.265
Calcium (Ca)	mg/kg	4,120	4,340	3,610	1,750	2,540	1,990	2,870	2,640	2,620	2,150	2,200	2,170
Chromium (Cr)	mg/kg	53.8	50.1	51.4	57.6	64.8	56.8	50.3	49.3	49.6	54.5	56.2	55.6
Cobalt (Co)	mg/kg	21.2	20.6	21.0	31.2	31.5	40.5	16.0	13.9	15.7	34.0	39.1	47.7
Copper (Cu)	mg/kg	44.1	39.8	41.3	24.6	28.8	25.4	31.3	26.8	29.4	44.9	45.5	46.0
Iron (Fe)	mg/kg	56,400	56,800	54,900	70,900	77,500	70,900	24,200	21,500	23,600	52,500	48,100	51,600
Lead (Pb)	mg/kg	5.83	5.37	5.48	4.91	5.64	4.83	6.65	4.61	5.02	6.94	7.21	7.36
Lithium (Li)	mg/kg	31.6	30.4	29.0	37.9	42.1	37.5	35.9	37.1	37.2	42.5	42.9	42.3
Magnesium (Mg)	mg/kg	6,550	6,170	6,140	8,110	9,470	8,080	8,520	8,620	8,350	7,680	7,830	7,650
Manganese (Mn)	mg/kg	1,020	1,150	1,150	9,460	7,320	11,400	330	280	311	1,200	907	1,120
Mercury (Hg)	mg/kg	0.0724	0.0647	0.0721	0.0155	0.0196	0.0161	0.0666	0.0496	0.0586	0.0478	0.0475	0.0461
Molybdenum (Mo)	mg/kg	23.8	24.5	20.3	4.22	4.09	3.84	1.58	1.26	1.49	2.25	2.12	2.31
Nickel (Ni)	mg/kg	41.1	38.4	39.0	46.3	49.7	51.7	50.6	49.1	48.4	70.5	75.9	84.4
Phosphorus (P)	mg/kg	1380	1350	1430	1830	2450	2350	1040	939	968	1030	960	983
Potassium (K)	mg/kg	3,700	3,500	3,570	4,420	5,040	4,370	3,490	3,610	3,580	4,170	4,360	4,330
Selenium (Se)	mg/kg	0.78	0.79	0.76	0.21	0.26	0.21	0.38	0.32	0.35	0.37	0.37	0.41
Silver (Ag)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg	230	230	230	230	290	260	190	190	190	220	200	200
Strontium (Sr)	mg/kg	34.9	35.1	32.1	15.5	18.8	15.7	22.4	21.0	21.2	17.2	17.5	16.8
Thallium (Tl)	mg/kg	0.205	0.188	0.186	0.257	0.278	0.287	0.267	0.259	0.264	0.326	0.339	0.353
Tin (Sn)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	mg/kg	639	615	624	885	1240	821	660	693	693	821	842	842
Uranium (U)	mg/kg	8.80	8.92	8.63	2.53	2.67	2.59	3.02	2.88	3.03	3.55	3.55	3.58
Vanadium (V)	mg/kg	47.3	44.4	45.7	47.9	54.6	47.7	38.6	37.4	39.2	46.7	47.3	47.4
Zinc (Zn)	mg/kg	72.1	66.0	67.8	68.3	76.0	70.1	72.2	63.1	67.6	101	104	106

Notes:

All variables analyzed by ALS Environmental (Burnaby, BC).

< = less than the analytical detection limit indicated

Table 3.8-4. Analytical Detection Limits for Evaluated Lake Sediment Quality Variables, Ekman Sampling 2014

	Available Phosphorus	Total Nitrogen	Total Organic Carbon	Total Antimony	Total Arsenic	Total Cadmium	Total Copper	Total Molybdenum	Total Nickel	Total Phosphorus	Total Selenium	Total Strontium
Target Detection Limits	2.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Lake												
Nanuq	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Counts	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Vulture	2.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Kodiak	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Leslie	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Moose	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Nema	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Slipper	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
S2	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Cujo	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
LdS1	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Fay Bay	4.0, 6.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Upper Exeter	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50

Table 3.8-5. Analytical Detection Limits for Evaluated Lake Sediment Quality Variables, Core Sampling 2014

	Available Phosphorus	Total Nitrogen	Total Organic Carbon	Total Antimony	Total Arsenic	Total Cadmium	Total Copper	Total Molybdenum	Total Nickel	Total Phosphorus	Total Selenium	Total Strontium
Target Detection Limits	2.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Lake												
Nanuq	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Counts	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Vulture	4.0	0.020	0.10	0.10	0.050, 0.060	0.050	0.50	0.50	0.50	50	0.10	0.50
Kodiak	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Leslie	6.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Moose	4.0	0.020	0.10	0.10	0.050, 0.060	0.050	0.50	0.50	0.50	50	0.10	0.50
Nema	6.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Slipper	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
S2	2.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Cujo	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
LdS1	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Fay Bay	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50
Upper Exeter	4.0	0.020	0.10	0.10	0.050	0.050	0.50	0.50	0.50	50	0.10	0.50

Table 3.8-6. Sediment Sample Descriptions for AEMP Lake Sites, Ekman Sampling 2014

Lake	Nanuq		
Date	5-Aug-14		
Replicate No.	1	2	3
Grab Depth (m)	7.4	7	6.8
Grab Thickness (mm)	130	130	130
Physical Description	silt	silt	silt
Munsell Colour Classification	top 2 mm - 5YR 4/4 (2 mm), remaining - 2.5Y 3/2	top 2 mm - 5YR 4/4 (2 mm), remaining - 2.5Y 3/2	top 2 mm - 5YR 4/4 (2 mm), remaining - 2.5Y 3/2
Biological Material	none	none	none
Debris	none	none	none
Photograph (Y/N)	Y	Y	Y
Notes	very watery	very watery	very watery

Lake	Counts		
Date	9-Aug-14		
Replicate No.	1	2	3
Grab Depth (m)	5.8	5.4	5.4
Grab Thickness (mm)	60	70	60
Physical Description	silt	silt	silt
Munsell Colour Classification	top 2 mm - 7.5YR 3/4, remaining - 10YR 4/1	top 2 mm - 7.5YR 3/4, remaining - 10YR 4/1	top 2 mm - 7.5YR 3/4, remaining - 10YR 4/1
Biological Material	none	none	none
Debris	none	none	none
Photograph (Y/N)	Y	Y	Y
Notes	very thick	watery	watery

Lake	Vulture		
Date	3-Aug-14		
Replicate No.	1	2	3
Grab Depth (m)	9.5	9.9	9.1
Grab Thickness (mm)	70	60	60
Physical Description	~1-2 mm rusty silt/sand on top of clay/sand	~1-2 mm rusty silt/sand on top of clay/sand	~1-2 mm rusty silt/sand on top of clay/sand
Munsell Colour Classification	top - 2.5YR 3/4, remaining - 2.5Y 5/4	top - 2.5YR 3/4, remaining - 2.5Y 5/4	top - 2.5YR 3/4, remaining - 2.5Y 5/4
Biological Material	none	none	none
Debris	none	none	none
Photograph (Y/N)	Y	Y	Y
Notes	high moisture content	high moisture content	high moisture content; ~0.5 cm thick black material present

Lake	Kodiak		
Date	29-Jul-14		
Replicate No.	1	2	3
Grab Depth (m)	5.9	6	6.7
Grab Thickness (mm)	45	50	55
Physical Description	organic/silt on top of a mixed clay/sand mix layer	organic/silt on top of a mixed clay/sand mix layer	organic/silt on top of a mixed clay/sand mix layer
Munsell Colour Classification	top - 5YR 3/4, middle - 10YR 4/3, remaining - 10YR 4/1	top - 5YR 3/4, middle - 10YR 4/3, remaining - 10YR 4/1	top - 5YR 3/2, middle - 10YR 4/4, remaining - 10YR 4/1
Biological Material	plant material	none	none
Debris	none	none	none
Photograph (Y/N)	Y	Y	Y
Notes	high moisture content, slight "sewage" odor	high moisture content, slight "sewage" odor	high moisture content, slight "sewage" odor

(continued)

Table 3.8-6. Sediment Sample Descriptions for AEMP Lake Sites, Ekman Sampling 2014 (continued)

Lake	Leslie		
Date	31-Jul-14		
Replicate No.	1	2	3
Grab Depth (m)	6.9	7	7.2
Grab Thickness (mm)	75	55	70
Physical Description	thin silt on top of clay	thin silt on top of clay	thin silt on top of clay
Munsell Colour Classification	top - 10YR 3/6, remaining - 5Y 4/1	top - 10YR 4/2, remaining - 5Y 4/1	top - 10YR 3/6, remaining - 5Y 4/1
Biological Material	none	none	none
Debris	none	none	none
Photograph (Y/N)	Y	Y	Y
Notes	possibly chironomid casings on sediment surface	possibly chironomid casings on sediment surface	possibly chironomid casings on sediment surface

Lake	Moose		
Date	31-Jul-14		
Replicate No.	1	2	3
Grab Depth (m)	9.7	9.5	9.4
Grab Thickness (mm)	60	60	55
Physical Description	silty	silty	silty
Munsell Colour Classification	7.5YR 3/3	10YR 3/3	7.5YR 3/3
Biological Material	none	plant material	none
Debris	none	none	none
Photograph (Y/N)	Y	Y	Y
Notes	-	-	-

Lake	Nema		
Date	2-Aug-14		
Replicate No.	1	2	3
Grab Depth (m)	9.6	9.6	9.4
Grab Thickness (mm)	45	60	60
Physical Description	silt	silt	silt
Munsell Colour Classification	10YR 3/3	top 1 mm - 2.5YR 4/6, remaining - 10YR 3/3 with black interspersed	top 1 mm - 2.5YR 4/6, remaining - 10YR 3/3 with black interspersed
Biological Material	none	none	none
Debris	none	none	none
Photograph (Y/N)	Y	Y	Y
Notes	watery	-	-

Lake	Slipper		
Date	4-Aug-14		
Replicate No.	1	2	3
Grab Depth (m)	6.2	5.3	5.4
Grab Thickness (mm)	70	60	70
Physical Description	silt	silt	silt
Munsell Colour Classification	top 1 mm - 10YR 3/3, remaining - 2.5Y 3/2	top 1 mm - 10YR 3/3, remaining - 2.5Y 3/2	top 1 mm - 10YR 3/3, remaining - 2.5Y 3/2
Biological Material	none	none	none
Debris	none	none	none
Photograph (Y/N)	Y	Y	Y
Notes	-	-	-

Lake	S2		
Date	3-Aug-14		
Replicate No.	1	2	3
Grab Depth (m)	5.6	6	6.2
Grab Thickness (mm)	50	40	50
Physical Description	silt on top of clay/sand	silt on top of clay/sand	silt on top of clay/sand
Munsell Colour Classification	top 2 mm - 2.5R 2.5/1, middle 1 mm - 5YR 4/6, remaining - 10YR 3/2	top 2 mm - 2.5R 2.5/1, middle 1 mm - 5YR 4/6, remaining - 10YR 3/2	top 2 mm - 2.5R 2.5/1, middle 1 mm - 5YR 4/6, remaining - 10YR 3/2
Biological Material	none	none	none
Debris	none	none	none
Photograph (Y/N)	Y	Y	Y
Notes	-	-	-

(continued)

Table 3.8-6. Sediment Sample Descriptions for AEMP Lake Sites, Ekman Sampling 2014 (completed)

Lake	Cujo		
Date	7-Aug-14		
Replicate No.	1	2	3
Grab Depth (m)	5.5	5.3	5.6
Grab Thickness (mm)	60	70	75
Physical Description	silt	silt	silt
Munsell Colour Classification	top 3-4 mm -7.5YR 3/3, remaining - 2.5Y 4/3 with 3 cm black organics	top 3-4 mm -7.5YR 3/3, remaining - 2.5Y 4/3 with 3 cm black organics	top 3-4 mm -7.5YR 3/3, remaining - 2.5Y 4/3 with 3 cm black organics
Biological Material	plant material	plant material	plant material, clam
Debris	none	none	none
Photograph (Y/N)	Y	Y	Y
Notes	-	-	-

Lake	LdS1		
Date	8-Aug-14		
Replicate No.	1	2	3
Grab Depth (m)	7.4	7.3	7
Grab Thickness (mm)	50	80	50
Physical Description	silt/clay	silt/clay	silt/clay
Munsell Colour Classification	top 0.5 cm- 2.5YR 3/4, remaining -10YR 4/1	top 0.5 cm- 2.5YR 3/4, remaining -10YR 4/1	top 0.5 cm- 2.5YR 3/4, remaining -10YR 4/1
Biological Material	none	none	none
Debris	none	none	none
Photograph (Y/N)	Y	Y	Y
Notes	-	-	-

Lake	Fay Bay		
Date	3-Aug-14		
Replicate No.	1	2	3
Grab Depth (m)	6.8	6.8	6.4
Grab Thickness (mm)	60	70	70
Physical Description	silt	silt	silt
Munsell Colour Classification	top 4 mm- 10YR 3/3, remaining - 10YR 3/2 (2 mm light gray layer 3 cm down)	top 4 mm- 10YR 3/3, remaining - 10YR 3/2 (2 mm light gray layer 3 cm down)	top 4 mm- 10YR 3/3, remaining - 10YR 3/2 (2 mm light gray layer 3 cm down)
Biological Material	plant material	plant material	plant material
Debris	none	none	none
Photograph (Y/N)	Y	Y	Y
Notes	-	-	-

Lake	Upper Exeter		
Date	10-Aug-14		
Replicate No.	1	2	3
Grab Depth (m)	8.7	8.4	8.4
Grab Thickness (mm)	40	30	130
Physical Description	silt	silt	silt
Munsell Colour Classification	top 1 mm - 2.5YR 3/3, remaining - 10YR 3/4	top 1 mm - 2.5YR 3/3, remaining - 10YR 3/4	top 1 mm - 2.5YR 3/3, remaining - 10YR 3/4
Biological Material	none	none	none
Debris	none	none	none
Photograph (Y/N)	Y	Y	Y
Notes	watery	watery	watery

Table 3.8-7. Percent of Sediment Samples and Factor by which Average Concentrations are Greater than CCME Guidelines, AEMP Lakes, 2014

Lake		Total Number of Samples Collected	CCME Guideline Value[1]:	Total Arsenic		Total Cadmium		Total Copper	
				PEL (17 mg/kg)	ISQG (5.9 mg/kg)	PEL (3.5 mg/kg)	ISQG (0.6 mg/kg)	PEL (197 mg/kg)	ISQG (35.7 mg/kg)
Nanuq	Ekman	3		-	100% (1.80)	-	-	-	100% (1.70)
	Core	3		67% (1.45)	100% (4.18)	-	-	-	100% (1.43)
Counts	Ekman	3		33% (0.83)	100% (2.38)	-	-	-	100% (1.47)
	Core	3		100% (3.18)	100% (9.16)	-	-	-	100% (1.27)
Vulture	Ekman	3		67% (4.23)	100% (12.18)	-	-	-	100% (1.48)
	Core	3		100% (4.88)	100% (14.07	-	-	-	67% (1.15)
Kodiak	Ekman	3		-	100% (2.01)	-	-	-	100% (1.56)
	Core	3		33% (0.95)	100% (2.74)	-	-	-	100% (1.49)
Leslie	Ekman	3		-	67% (1.24)	-	-	-	100% (1.37)
	Core	3		67% (0.94)	100% (2.71)	-	-	-	100% (1.30)
Moose	Ekman	3		-	67% (1.21)	-	-	-	100% (1.33)
	Core	3		-	100% (1.49)	-	-	-	100% (1.36)
Nema	Ekman	3		-	67% (1.05)	-	-	-	100% (1.43)
	Core	3		-	100% (1.57)	-	-	-	100% (1.42)
Slipper	Ekman	3		100% (3.02)	100% (8.71)	-	-	-	100% (2.52)
	Core	3		100% (4.40)	100% (12.68)	-	-	-	100% (2.40)
S2	Ekman	3		100% (3.39)	100% (9.77)	-	-	-	100% (1.58)
	Core	3		100% (3.20)	100% (9.23)	-	67% (0.10)	-	100% (1.36)
Cujo	Ekman	3		100% (1.76)	100% (5.07)	-	-	-	100% (1.24)
	Core	3		100% (3.19)	100% (9.20)	-	-	-	100% (1.17)
LdS1	Ekman	3		100% (4.74)	100% (13.67)	-	-	-	-
	Core	3		100% (9.35)	100% (26.95)	-	-	-	-
Fay Bay	Ekman	3		-	-	-	-	-	-
	Core	3		-	-	-	-	-	-
Upper Exeter	Ekman	3		100% (1.59)	100% (4.59)	-	-	-	100% (1.36)
	Core	3		100% (1.81)	100% (5.23)	-	-	-	100% (1.27)
Number of sites where Average Concentrations > CCME Guidelines				**10**	**12**	**0**	**1**	**0**	**11**

Notes:

Values represent the percentage of samples collected at each site that were higher than CCME guidelines.

[1] Canadian sediment quality guidelines for the protection of aquatic life (CCME 2014).

ISQG = Interim Sediment Quality Guideline

PEL = Probable Effects Level

Figure 3.8-1a

Particle Sizes of Surface Sediments at AEMP Lakes, Ekman Sampling 2014

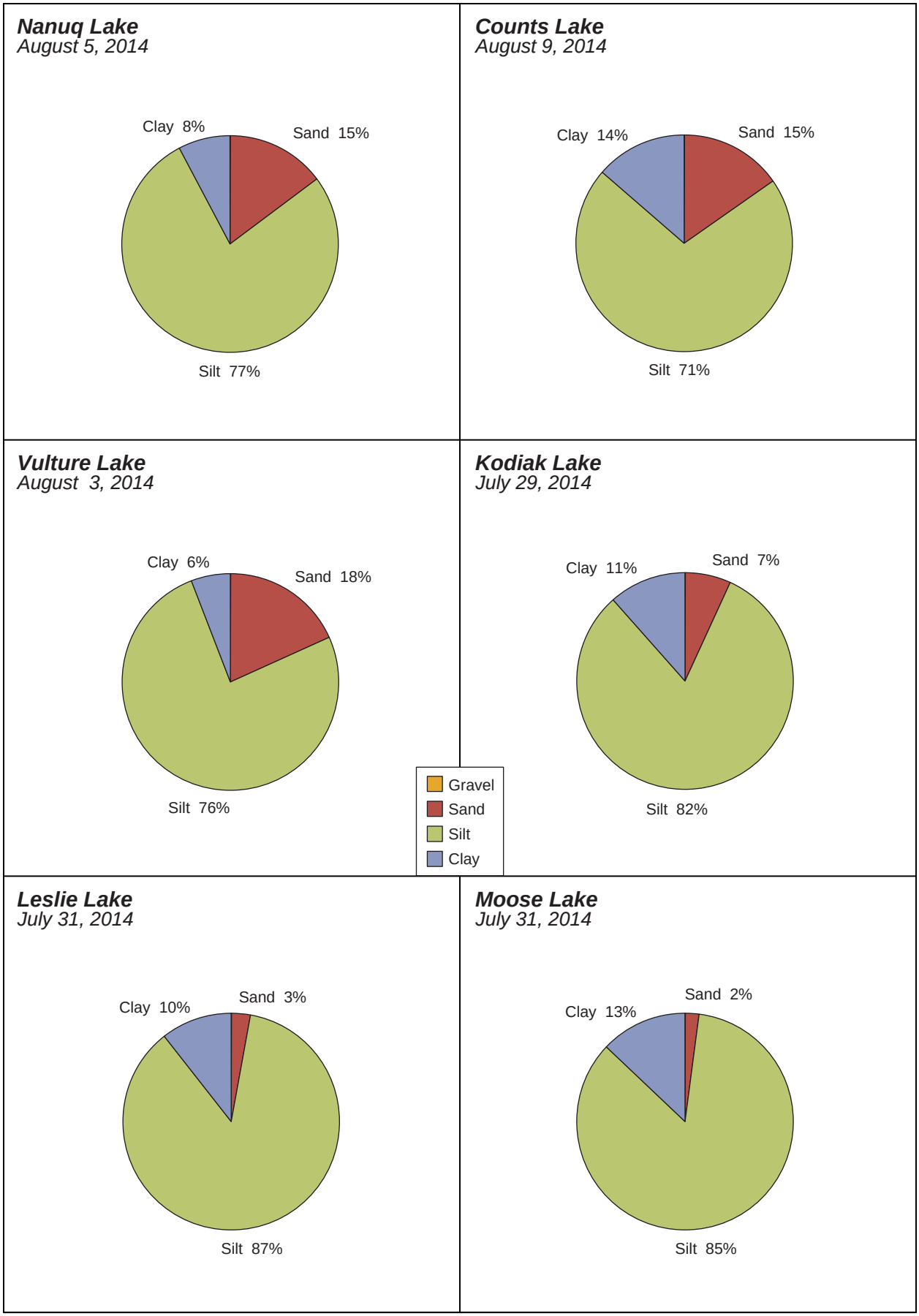


Figure 3.8-1b

Particle Sizes of Surface Sediments at AEMP Lakes, Ekman Sampling 2014

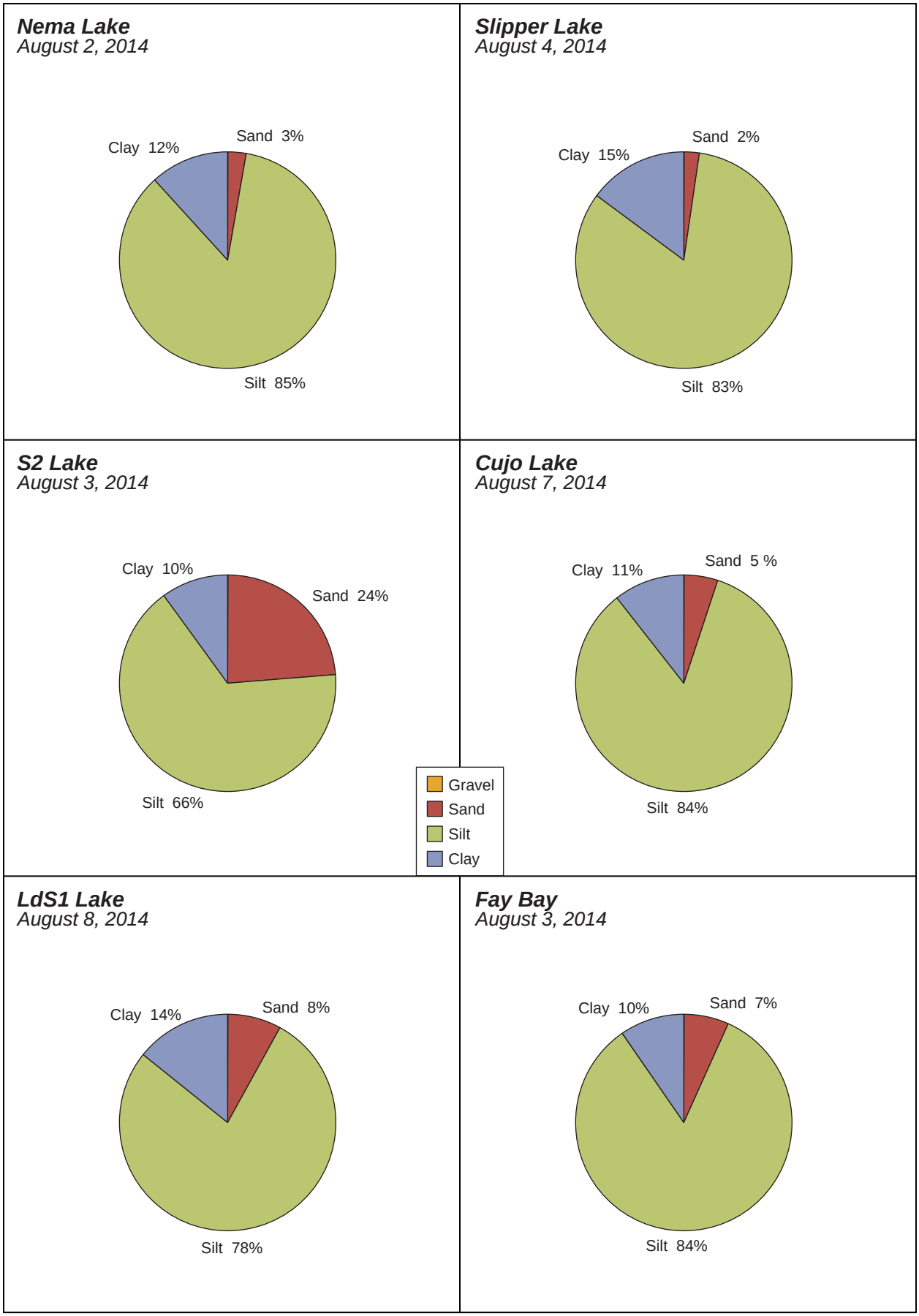


Figure 3.8-1c

Particle Sizes of Surface Sediments at AEMP Lakes, Ekman Sampling 2014

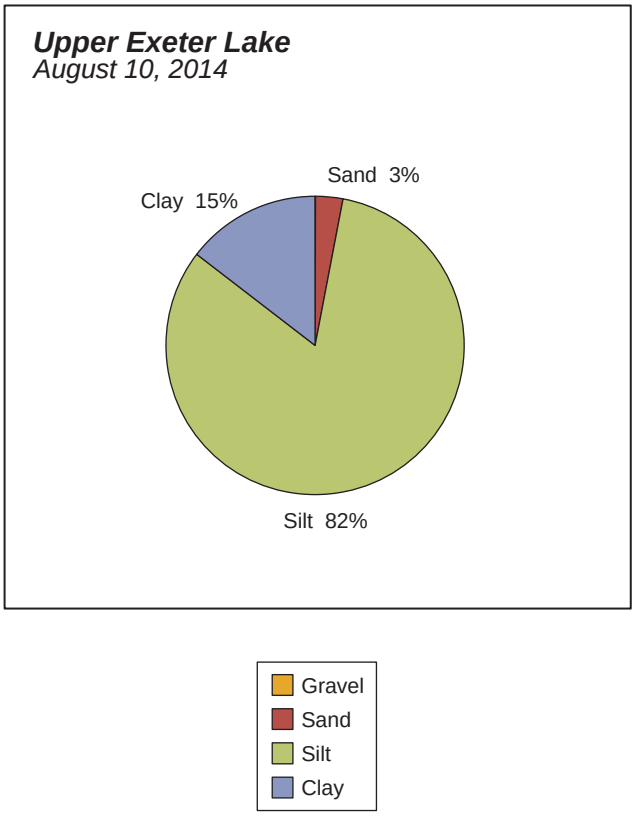
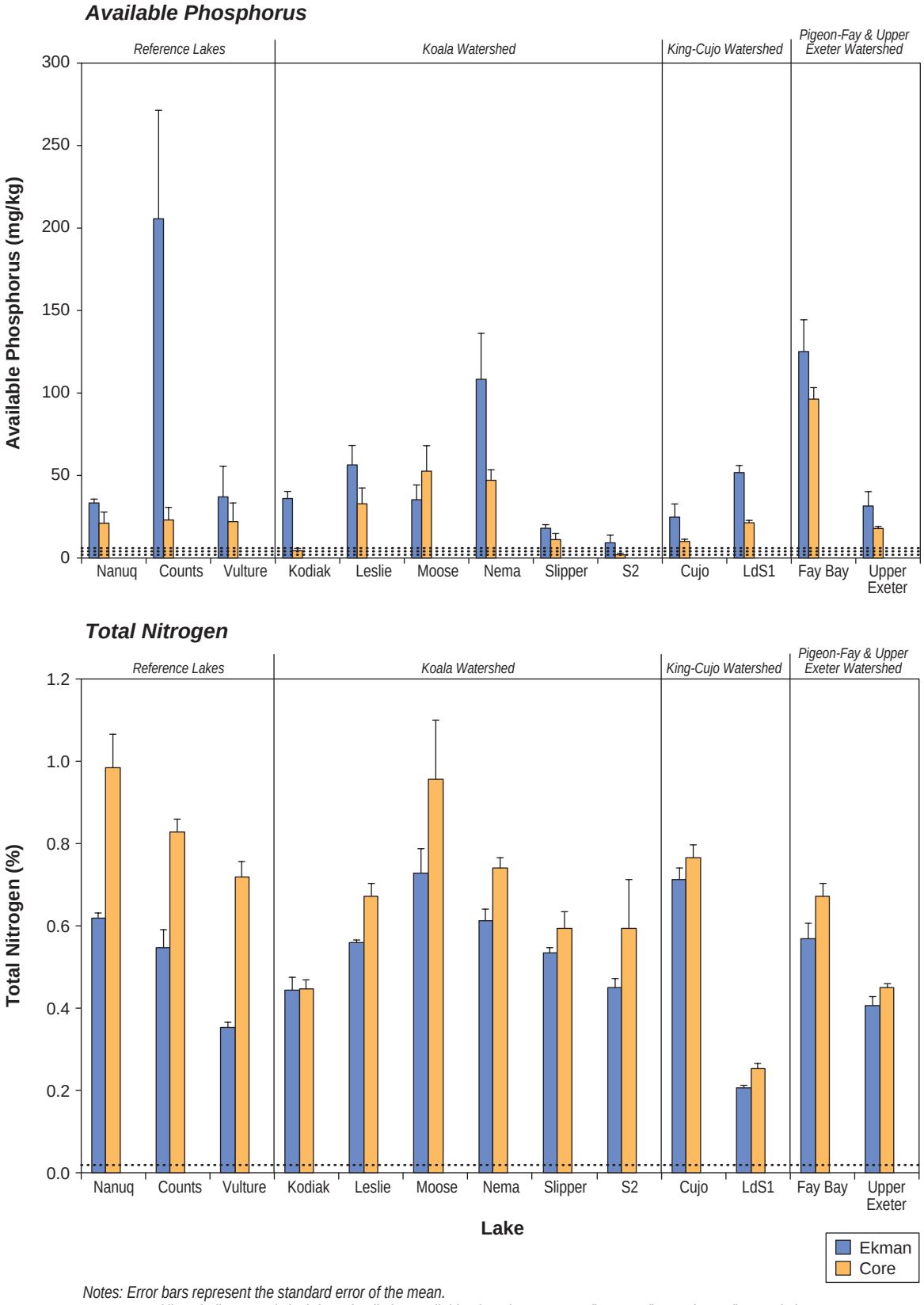


Figure 3.8-2

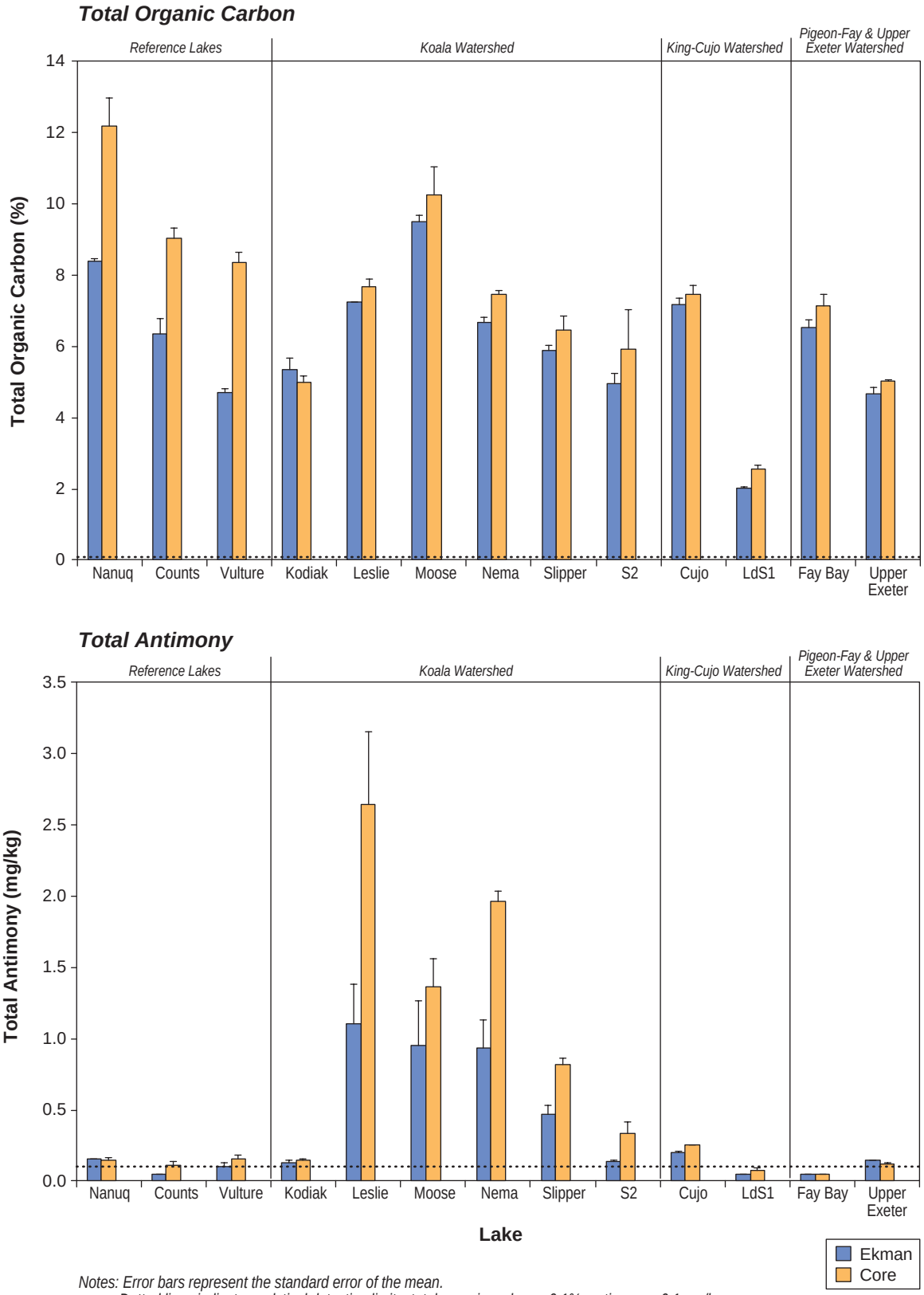
Available Phosphorus and Total Nitrogen Concentrations in Surface Sediments at AEMP Lakes, Ekman and Core Sampling 2014



Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits: available phosphorus = 2 mg/kg, 4 mg/kg, and 6 mg/kg; total nitrogen = 0.02 %.

Figure 3.8-3

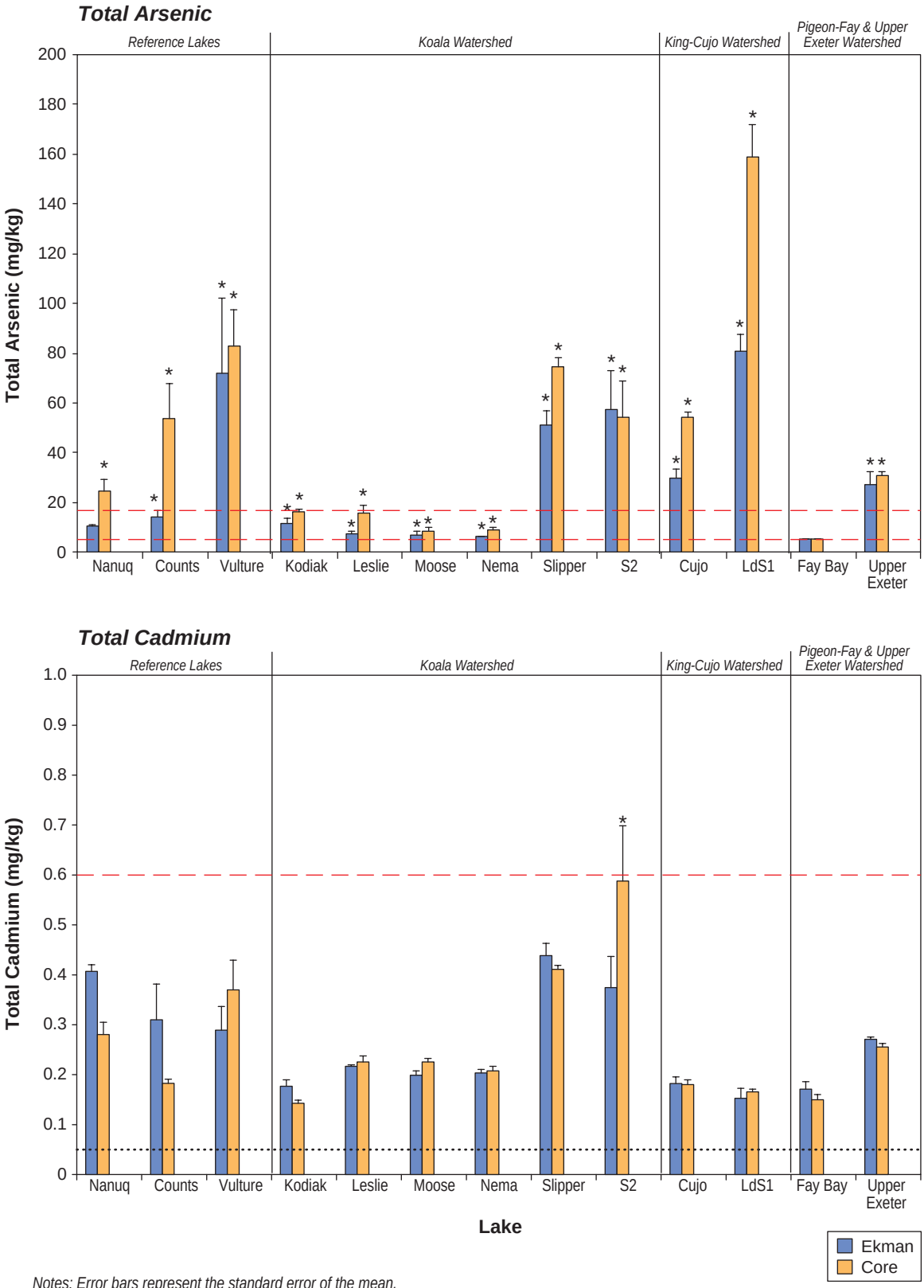
Total Organic Carbon and Total Antimony Concentrations in Surface Sediments at AEMP Lakes, Ekman and Core Sampling 2014



Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits: total organic carbon = 0.1%; antimony = 0.1 mg/kg.

Figure 3.8-4

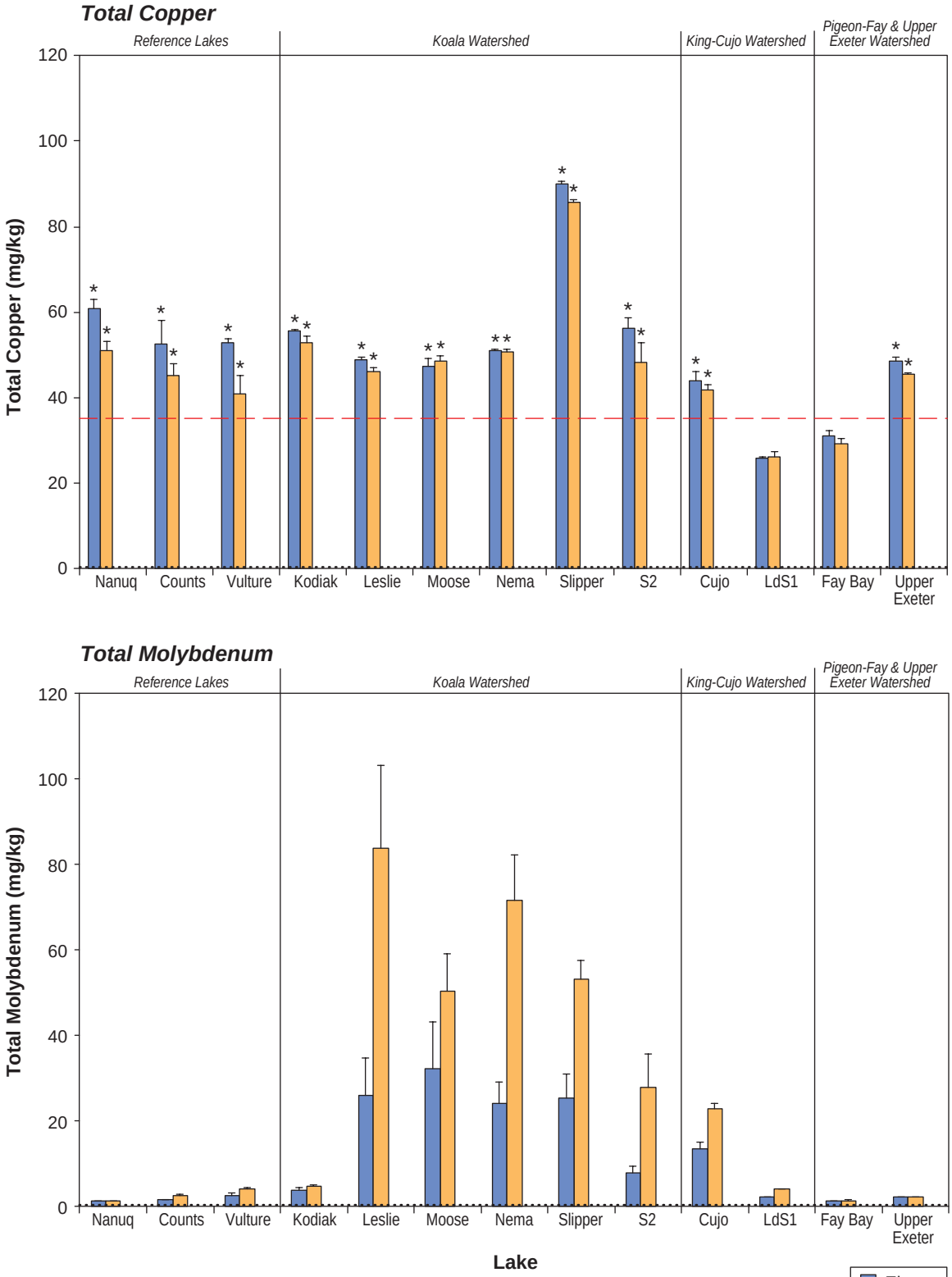
Total Arsenic and Total Cadmium Concentrations in Surface Sediments at AEMP Lakes, Ekman and Core Sampling 2014



Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits: arsenic = 0.05 mg/kg and 0.06 mg/kg (not shown); cadmium = 0.05 mg/kg.
Red dashed lines indicate CCME guidelines: arsenic ISQG = 5.9; arsenic PEL = 17 mg/L; cadmium ISQG = 0.6 mg/kg; PEL = 3.5 mg/kg (not shown).
** Indicates one or more samples exceeded their corresponding CCME guideline (see Table 3.8-7).*

Figure 3.8-5

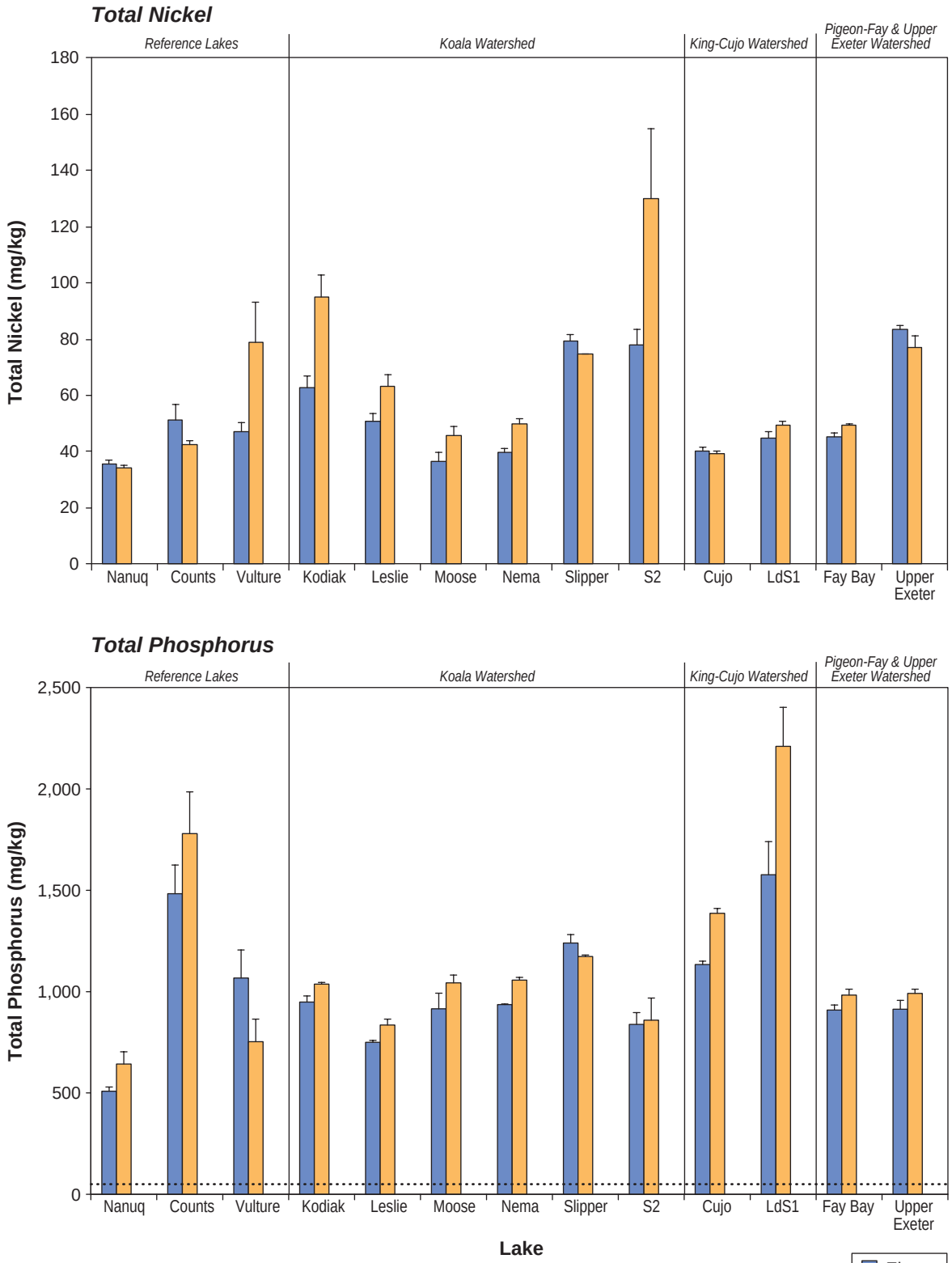
Total Copper and Total Molybdenum Concentrations in Surface Sediments at AEMP Lakes, Ekman and Core Sampling 2014



Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits: copper = 0.5 mg/kg; molybdenum = 0.5 mg/kg.
Red dashed lines indicate CCME guidelines for copper: ISQG = 35.7 mg/kg; PEL = 197 mg/L (not shown).

Figure 3.8-6

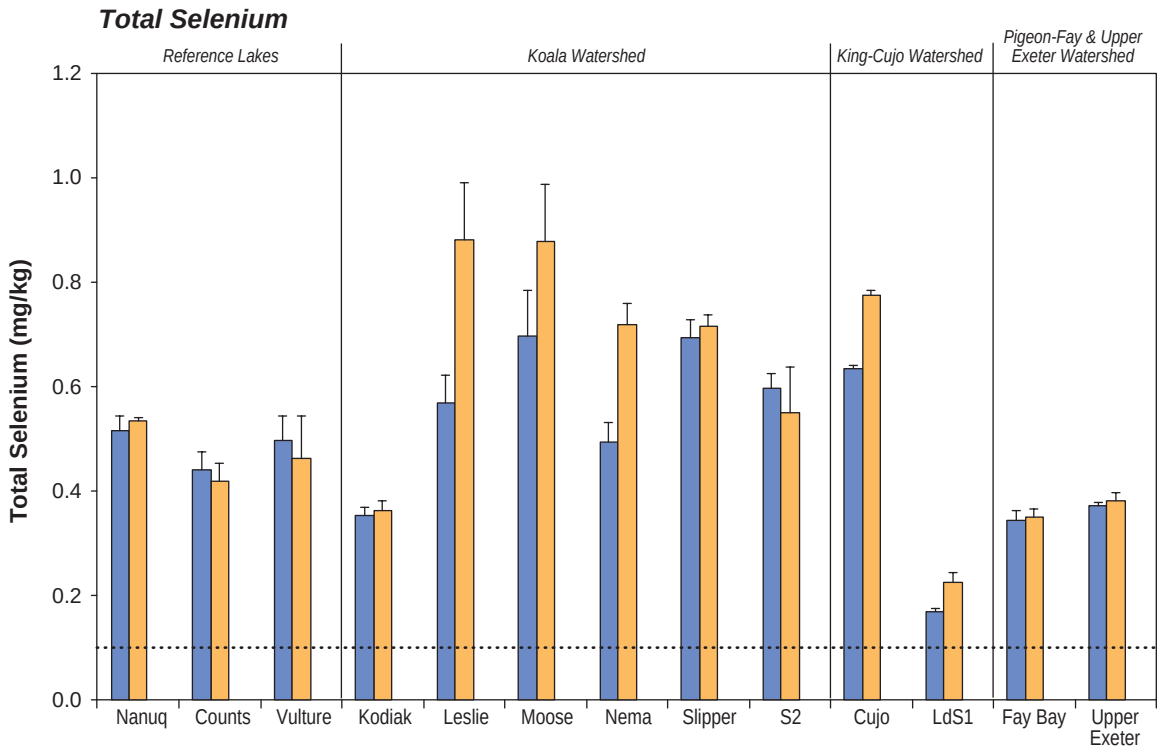
Total Nickel and Total Phosphorus Concentrations in Surface Sediments at AEMP Lakes, Ekman and Core Sampling 2014

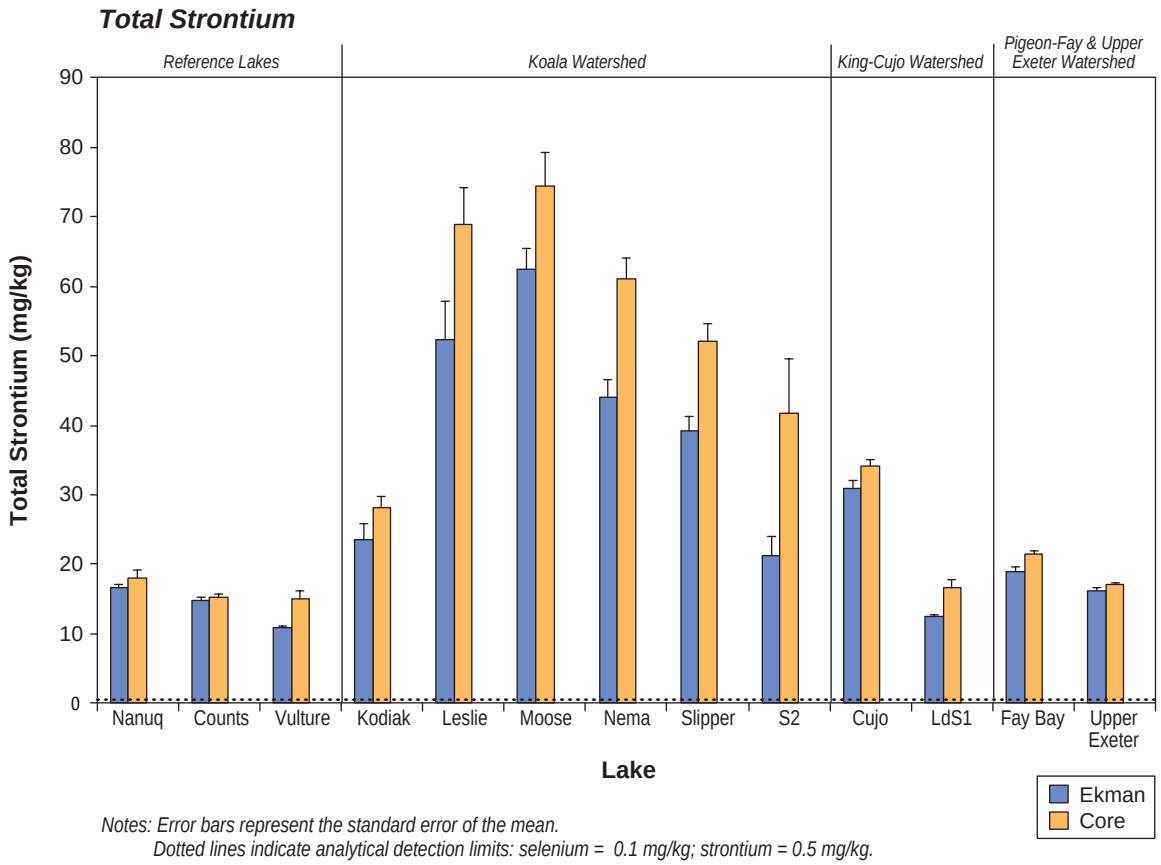


Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits: nickel = 0.5 mg/kg; phosphorus = 50 mg/kg.

Figure 3.8-7

Total Selenium and Total Strontium Concentrations in Surface Sediments at AEMP Lakes, Ekman and Core Sampling 2014





Notes: Error bars represent the standard error of the mean.
Dotted lines indicate analytical detection limits: selenium = 0.1 mg/kg; strontium = 0.5 mg/kg.

3.9 DATA OUTLIERS

A single water quality sample was identified as a data outlier due to contamination. One August water quality sample from Nema Lake (surface depth) contained elevated concentrations of total aluminum, chromium, iron, and nickel (compared to other Nema Lake replicate samples collected on the same date, other lakes in the same sampling period, and the same and other lakes historically) which suggested that sample L1497511-3 was contaminated (Table 3.4-3). The contaminated Nema Lake sample was removed entirely from the dataset for figures and analyses in both the data report and the effects analyses report (Part 1 – Evaluation of Effects). The sample results are retained in Table 3.4-6 of this report.

3.10 SPECIAL STUDIES

3.10.1 Lac de Gras Water Quality Monitoring Station

3.10.1.1 Physical Limnology

Physical limnology data for sites S5 and S6 are presented in Tables 3.10-1 and 3.10-2 for the under-ice and open water seasons respectively. Physical limnology data obtained in 2014 will feed into the 2015 AEMP Re-evaluation which will include an investigation into the necessity of adding one or both of these stations to the annual AEMP program beginning in 2016.

3.10.1.2 Water Quality

Water quality data collected at sites S5 and S6 are presented in Tables 3.10-3 and 3.10-4 for the under-ice and open water seasons respectively. Water quality data obtained in 2014 will be incorporated into the 2015 AEMP Re-evaluation which will include an investigation into the necessity of adding one or both of these stations to the annual AEMP program beginning in 2016.

3.10.2 Grizzly Lake Special Study

Grizzly Lake phytoplankton and zooplankton communities were assessed in 2014 to determine whether they had been affected by changes observed in the 2011 and 2012 thermal profiles of Grizzly Lake (Rescan 2013). The variables assessed were identical to those assessed in the AEMP for lakes that are monitored on a routine basis (see Sections 2.6 Phytoplankton and 2.7 Zooplankton). Data collected in 2014 were also compared to historical and reference data, as described in Section 2.10.2.2.

3.10.2.1 Phytoplankton

<u>2014 Results</u>

Results of the phytoplankton taxonomic analysis for each replicate sample in Grizzly Lake are presented in Table 3.10-5. Chlorophyll *a* concentrations, taxonomic richness, and diversity indices are presented in Table 3.10-6. Chlorophyll *a* concentrations were typical of an oligotrophic (low productivity) sub-Arctic, tundra lake (Pienitz et al. 1997). The mean chlorophyll *a* concentration at Grizzly Lake was 1.0 µg/L, and mean phytoplankton density was 2,963 cells/mL (Table 3.10-6).

The phytoplankton assemblage at Grizzly Lake consisted mainly of cells from the classes Myxophyceae (blue-green algae = 80%) and Chrysophyceae (golden algae = 14%; Table 3.10-7). The Grizzly Lake phytoplankton assemblage was dominated by *Aphanocapsa sp*., which composed 34% of the phytoplankton community (Table 3.10-8). The genera *Merismopedia* and *Leptyolyngbya* were also dominant, and contributed 29% and 11% of the community density, respectively (Table 3.10-8).

The mean phytoplankton genus richness at Grizzly Lake was 23 and the mean number of genera (G) that contributed 90% of the phytoplankton density was 7 (Table 3.10-6). The mean Shannon and Simpson diversity indices were 1.87 and 0.77, respectively (Table 3.10-6).

Historical and Reference Lake Comparisons

Phytoplankton in Grizzly Lake were collected between late July and early August in 1998, 1999, 2003, 2013, and 2014 (see Table 2.10-2). Baseline data was also collected in 1994, 1996, and 1997. Prior to 1996, single chlorophyll *a* samples were collected for analysis. Triplicate sampling for chlorophyll *a* and taxonomic composition began in 1996 and has continued to present day.

Chlorophyll *a*

The mean chlorophyll *a* concentration in Grizzly Lake in 2014 was within the range of the mean baseline concentration ± 2 SD and was greater than the 2013 mean concentration (Table 3.10-9). Mean chlorophyll *a* concentrations at the reference lakes were similar in 2014 to 2013, and within baseline ranges with the exception of Vulture Lake at which the 2014 mean exceeded the mean baseline range ± 2 SD. Compared to 2003 mean chlorophyll *a* concentrations ± 2 SD, 2014 mean concentrations in Grizzly Lake and one reference lake (Counts Lake) were higher. Thus, despite chlorophyll *a* concentrations in Grizzly Lake being higher in 2014 compared to 2013 and 2003, concentrations were within the baseline range in 2014, and a similar pattern occurred in one reference lake in 2003 (Counts Lake). No mine effects were detected with respect to chlorophyll *a* concentrations in Grizzly Lake.

Density

Mean phytoplankton density in Grizzly Lake in 2014 was greater than the ranges of the mean baseline concentration ± 2 SD and the mean 2003 concentration ± 2 SD (Table 3.10-10; Figure 3.10-1). A similar pattern was observed in all three reference lakes (Table 3.10-10) indicating that phytoplankton density may have been naturally elevated in 2014 and that high phytoplankton densities in Grizzly Lake were not likely related to activities at the Ekati Diamond Mine.

Diversity and Community Composition

Graphical analyses of temporal trends in phytoplankton diversity indices indicate that both Shannon and Simpson's diversity indices have varied considerably through time in Grizzly Lake and all three reference lakes (Figure 3.10-1). While the variability and limited data for Grizzly Lake make it somewhat difficult to discern temporal trends, diversity in Grizzly Lake increased between 1997 and 1998, but was comparable across all other sampling years.

Mean Shannon and Simpson's diversity in Grizzly Lake in 2014 were greater than the range of mean baseline values ± 2 SD, but within the range of the mean 2003 values ± 2 SD and within the range of the mean 2013 values ± 1 SD (Table 3.10-11). A similar pattern was observed for Shannon diversity in one reference lake (Counts Lake; Table 3.10-11). Together, the evidence suggests there has been no effect of the changing thermal profile in Grizzly Lake on phytoplankton diversity.

Graphical analyses of the taxonomic composition suggest that the relative density of phytoplankton groups has been variable through time in Grizzly Lake, and suggests that the recent changes in thermal structure in Grizzly Lake have had no effect on the phytoplankton community composition (Figure 3.10-2).

3.10.2.2 Zooplankton

2014 Results

At Grizzly Lake, mean zooplankton biomass and density were 84.4 mg dry weight/m^3 and 25,737 organisms/m^3, respectively (Table 3.10-13). Data from one replicate for zooplankton biomass was discarded due to an error in sample processing. Mean zooplankton genus richness at Grizzly Lake was nine and the number of genera (G) that contributed 90% of the zooplankton density was four (Table 3.10-13). The mean Shannon and Simpson diversity indices were 1.34 and 0.67, respectively (Table 3.10-13).

Grizzly Lake zooplankton communities were dominated by rotifers (relative density = 48%) and Calanoida copepods (relative density = 36%; Table 3.10-14). More specifically, the rotifers *Conochilius unicornis* (36%) and *Kellicottia longispina* (14%) and Calanoida – copepodites (25%) were the taxa that dominated Grizzly Lake (Table 3.10-14).

Historical and Reference Lake Comparisons

Zooplankton data in Grizzly Lake have been collected between late July and early August in 1998, 1999, and 2003 (Table 2.10-2). Baseline data were also collected in 1994 and 1997. Zooplankton biomass and taxonomic composition have been monitored using triplicate sampling from 1998 to present. Prior to 1998, zooplankton were monitored for taxonomic composition only.

Biomass

Mean zooplankton biomass in Grizzly Lake in 2014 cannot be compared to the range of baseline mean biomass because zooplankton biomass was not assessed prior to 1998. Mean zooplankton biomass in Grizzly Lake in 2014 was lower than 2013 but greater than the range of mean 2003 biomass ± 2 SD. A similar pattern was observed in one reference Lake (Nanuq Lake), thus no effects were detected with respect to zooplankton biomass (Table 3.10-16).

Density

Mean zooplankton density in Grizzly Lake in 2014 was lower than 2013 but greater than the range of the mean 2003 density ± 2 SD and within the range of the mean baseline density ± 2 SD (Table 3.10-17; Figure 3.10-3). Mean zooplankton density at the reference lakes was greater in 2014 than 2013, 2003, and baseline density. Thus, no effects were detected with respect to zooplankton density.

Diversity and Community Composition

Graphical analyses of temporal trends in diversity indices indicate that both Shannon and Simpson's diversity indices have varied considerably through time in both Grizzly Lake and all three reference lakes (Figure 3.10-3). While the variability and limited data for Grizzly Lake make it somewhat difficult to discern temporal trends, mean diversity in Grizzly Lake in 2014 was greater than observed historically (1996 to 1999 and 2003), but similar to those observed in 2013 (Table 3.10-18; Figure 3.10-3). Mean diversity values reference lakes were also generally greater in 2013 and 2014. The evidence suggests there has been no effect of the changing thermal profile in Grizzly Lake on zooplankton diversity.

Graphical analyses of zooplankton taxonomic composition suggests that the relative density of zooplankton groups may have shifted through time in Grizzly Lake (Figure 3.10-4). Densities of rotifers appear to have increased through time (similar to 2013), coinciding with a decrease in the relative density of copepods (Figure 3.10-4). A closer examination at the genera level suggests that elevated rotifer densities are driven by greater abundances of *Conochilus unicornis,* as well as *Kellicotia longispina*. Shifts in zooplankton community composition have also been observed in other monitored lakes of the Koala Watershed. However, the general pattern observed in other monitored lakes has been a decline in the density of cladocerans and rotifers, with an increase in the density of copepods and the underlying cause of these shifts was attributed to changes in the availability of macronutrients, including nitrogen and phosphorus in lakes downstream of the LLCF (see Section 3.3.2 of Part 1 – Evaluation of Effects).

Analyses of water quality variables in Grizzly Lake found no changes in nutrient availability, or in any of the evaluated water quality variables through time (see Section 3.2.4 of Part 1 – Evaluation of Effects), suggesting that shifts in zooplankton community composition in Grizzly Lake are unlikely related to changes in the relative availability of macronutrients or in water quality and may instead reflect a response to recent changes in the thermal profile. Although surface waters in Grizzly Lake in 2014 were warmer than those observed from 2010 to 2013, the pattern of increasing temperature with increasing depth remained present (see Section 3.1.3.1 in Part 1 – Evaluation of Effects). The lack of data from 2004 to 2012 makes it difficult to determine whether these changes in rotifer density represent a mine effect, rather than natural variability through time. Abundances of rotifers have been variable through time in at least one reference lake with high relative abundances observed in 2008 and 2010 (Vulture Lake; see Section 3.3.2 in Part 1 – Evaluation of Effects). All ectothermic organisms (i.e., organisms that do not generate their own body heat) are sensitive to changes in temperature, with increases in temperature resulting in higher basal metabolic rates, higher activity levels, shorter lifespans, and smaller body sizes (Angilletta 2010). Increases in temperature have also been linked to changes in zooplankton community composition, favoring small-bodied over large-bodied species (Moore and Folt 1993). As rotifers are typically comprised of the smallest zooplankton species in freshwater systems, an increase in rotifer density is consistent with what might be expected as a consequence of increasing water temperatures in Grizzly Lake.

3.10.2.3 Grizzly Lake Biology Summary

One potential change in biological variables was observed in Grizzly Lake in 2014:

- altered taxonomic composition of the zooplankton assemblage through time.

Recent changes in the thermal profile of Grizzly Lake were found to have no effect on variables assessed for phytoplankton.

Zooplankton biomass, density, and diversity in Grizzly Lake have appeared to remain relatively stable through time. However, the relative density of zooplankton groups in Grizzly Lake may have shifted through time as densities of rotifers appear to have increased. Increases in rotifer density contrasts patterns observed in other monitored lakes within the Koala Watershed and is consistent with what might be expected as a result of increasing water temperatures. However, the lack of data from 2004 to 2012 makes it difficult to determine whether these changes in rotifer density represent a

trend though time and a mine effect, rather than representing natural variability through time. It is thus recommended that an additional year of phytoplankton and zooplankton monitoring be conducted in Grizzly Lake in order to better detect potential effects.

Supporting Tables and Figures

Table 3.10-1. Under-ice Temperature and Dissolved Oxygen Profiles at Additional Lac de Gras Sites, 2014

S5, April 9, 2014

Ice Thickness (m): 1.70

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.6	0.08	100.1	14.60	7.5	0.64	97.6	14.01
1.9	0.11	100.5	14.65	7.8	0.65	97.3	13.97
2.2	0.13	100.9	14.70	8.0	0.67	97.1	13.94
2.4	0.19	101.1	14.70	8.4	0.68	96.9	13.90
2.7	0.24	101.2	14.69	8.6	0.69	96.7	13.87
3.1	0.28	101.2	14.68	8.6	0.69	96.5	13.84
3.3	0.31	101.1	14.66	8.7	0.69	96.4	13.82
3.6	0.34	101.0	14.62	9.1	0.70	96.3	13.81
4.1	0.38	100.8	14.59	9.3	0.71	96.2	13.79
4.4	0.42	100.6	14.54	9.5	0.72	96.0	13.76
4.8	0.46	100.3	14.48	9.8	0.73	96.1	13.76
5.1	0.49	100.0	14.42	10.1	0.74	96.0	13.75
5.5	0.52	99.7	14.36	10.4	0.75	96.1	13.75
5.8	0.54	99.3	14.31	10.7	0.77	96.1	13.75
6.0	0.55	99.1	14.26	11.0	0.78	96.1	13.75
6.4	0.58	98.8	14.21	11.3	0.80	96.2	13.75
6.6	0.59	98.6	14.17	11.7	0.82	96.1	13.73
6.8	0.60	98.3	14.13	12.0	0.84	96.0	13.71
7.1	0.61	98.0	14.08	12.4	0.87	96.0	13.70
7.3	0.63	97.8	14.04	12.5	0.90	96.0	13.68

S6, April 9, 2014

Ice Thickness (m): 1.48

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
1.5	0.14	80.0	11.66	2.4	0.28	82.3	11.94
1.7	0.14	80.8	11.76	2.7	0.31	82.8	11.99
2.1	0.21	81.6	11.86	3.1	0.33	83.1	12.04
3.4	0.34	83.4	12.08	13.2	0.81	86.7	12.39
3.8	0.35	83.7	12.12	13.5	0.84	86.8	12.39

(continued)

Table 3.10-1. Under-ice Temperature and Dissolved Oxygen Profiles at Additional Lac de Gras Sites, 2014 (completed)

S6, April 9, 2014 (completed)

Ice Thickness (m): 1.48

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
4.0	0.36	84.0	12.15	13.9	0.86	86.8	12.38
4.2	0.37	84.1	12.17	14.2	0.87	86.7	12.37
4.5	0.38	84.3	12.20	14.6	0.89	86.8	12.38
4.7	0.39	84.4	12.21	14.9	0.90	86.8	12.37
5.0	0.41	84.5	12.22	15.2	0.92	86.7	12.35
5.2	0.42	84.6	12.23	15.5	0.94	86.7	12.34
5.4	0.43	84.7	12.24	15.9	0.96	86.7	12.33
5.6	0.44	84.9	12.27	16.2	0.97	86.6	12.32
5.9	0.45	84.9	12.25	16.5	0.98	86.6	12.31
6.2	0.47	85.0	12.26	16.7	0.99	86.5	12.30
6.5	0.48	85.1	12.28	16.9	1.00	86.5	12.30
6.8	0.50	85.3	12.29	17.1	1.01	86.4	12.28
7.0	0.51	85.4	12.30	17.3	1.03	86.4	12.27
7.3	0.52	85.5	12.32	17.6	1.05	86.4	12.27
7.6	0.53	85.6	12.33	18.0	1.08	86.4	12.25
8.0	0.56	85.7	12.34	18.6	1.10	86.3	12.24
8.5	0.59	85.9	12.35	19.7	1.13	86.2	12.22
8.9	0.62	86.0	12.35	20.1	1.17	86.1	12.19
9.2	0.64	86.1	12.37	20.6	1.19	86.0	12.17
9.4	0.65	86.2	12.37	21.0	1.20	85.9	12.15
9.6	0.66	86.3	12.38	21.5	1.21	85.8	12.13
10.0	0.68	86.3	12.38	21.9	1.23	85.7	12.10
10.4	0.69	86.4	12.39	22.1	1.24	85.6	12.09
10.7	0.71	86.5	12.39	22.2	1.24	85.5	12.07
11.0	0.73	86.5	12.39	22.2	1.24	85.4	12.05
11.5	0.75	86.5	12.39	22.2	1.24	85.0	12.01
12.1	0.78	86.6	12.39				

Table 3.10-2. Open Water Season Temperature and Dissolved Oxygen Profiles at Additional Lac de Gras Sites, 2014

S5, August 3, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	10.41	102.2	11.40	9.0	8.59	103.8	12.10
1.0	10.40	102.9	11.49	10.0	8.49	103.7	12.13
2.0	10.37	102.9	11.51	11.0	7.87	103.2	12.25
3.0	10.05	103.0	11.59	12.0	7.78	103.1	12.27
4.0	9.42	103.6	11.84	13.0	7.68	102.9	12.28
5.0	9.14	103.9	11.95	14.0	7.62	102.8	12.29
6.0	8.97	103.6	11.98	15.0	7.55	102.6	12.28
7.0	8.77	103.6	12.04	16.0	7.53	102.5	12.27
8.0	8.68	103.7	12.07	17.0	7.46	102.2	12.27

S6, August 3, 2014

Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)	Depth (m)	Temperature (°C)	Dissolved Oxygen (% Saturation)	Dissolved Oxygen (mg/L)
0.0	8.98	101.9	11.76	12.0	7.53	103.0	12.33
1.0	8.93	103.2	11.95	13.0	7.48	102.9	12.34
2.0	8.87	103.4	11.99	14.0	7.41	102.7	12.33
3.0	8.75	103.4	12.02	15.0	7.40	102.5	12.32
4.0	8.68	103.5	12.06	16.0	7.38	102.4	12.31
5.0	8.23	103.5	12.18	17.0	7.37	102.3	12.30
6.0	8.00	103.5	12.26	18.0	7.36	102.2	12.29
7.0	7.99	103.6	12.27	19.0	7.35	102.1	12.29
8.0	7.96	103.6	12.29	20.0	7.34	101.9	12.26
9.0	7.74	103.3	12.31	21.0	7.34	101.8	12.25
10.0	7.69	103.3	12.32	22.0	7.33	101.7	12.25
11.0	7.63	103.2	12.32	23.0	7.33	101.7	12.24

Table 3.10-3. Under-ice Analytical Results for Additional Lac de Gras Sites, Water Quality Variables 2014

Lake		S5				S6			
Date		9-Apr-14				9-Apr-14			
Depth Strata		Mid		Deep		Mid		Deep	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1443109-2	L1443111-15	L1443111-12	L1443111-16	L1443111-14	L1443111-18	L1443111-13	L1443111-17
Physical Tests	**Units**								
Conductivity	uS/cm	25.9	26.0	39.2	38.6	24.3	24.2	26.1	25.9
Hardness (as $CaCO_3$)	mg/L	6.87	6.92	8.97	8.92	6.52	6.43	6.90	6.92
pH	pH	7.03	7.04	6.96	7.09	7.03	7.02	6.99	7.01
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	15.0	15.3	22.3	22.1	14.4	14.4	15.5	15.3
Turbidity	NTU	0.13	0.13	0.14	0.13	0.14	0.12	0.13	0.12
Anions									
Anion Sum	meq/L	0.22	0.23	0.34	0.33	0.21	0.22	0.23	0.23
Cation Sum	meq/L	0.22	0.22	0.33	0.33	0.21	0.20	0.22	0.23
Cation - Anion Balance	%	-0.5	-2.0	-1.0	-0.9	-1.2	-2.6	-0.7	-0.1
Alkalinity, Total (as $CaCO_3$)	mg/L	4.9	5.1	6.0	5.9	4.7	5.0	4.9	4.8
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	4.9	5.1	6.0	5.9	4.7	5.0	4.9	4.8
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride (Cl)	mg/L	1.81	1.87	3.73	3.69	1.72	1.71	1.93	1.92
Sulphate (SO_4)	mg/L	3.42	3.54	5.36	5.34	3.31	3.29	3.55	3.54
Nutrients									
Total Ammonia-N	mg/L	0.0106	0.0123	0.0127	0.0126	0.0141	0.0131	0.0159	0.0131
Nitrate-N	mg/L	<0.0050	<0.0050	0.0260	0.0255	<0.0050	<0.0050	0.0172	0.0180
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.133	0.136	0.138	0.139	0.129	0.131	0.129	0.129
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate-P	mg/L	0.0022	<0.0020	<0.0020	0.0021	<0.0020	<0.0020	0.0022	<0.0020
Organic Carbon									
Total Organic Carbon	mg/L	2.46	2.40	2.56	2.67	2.38	2.29	2.48	2.31

(continued)

Table 3.10-3. Under-ice Analytical Results for Additional Lac de Gras Sites, Water Quality Variables 2014 (completed)

Lake		S5				S6			
Date		9-Apr-14				9-Apr-14			
Depth Strata		Mid		Deep		Mid		Deep	
Replicate No.		1	2	1	2	1	2	1	2
Sample ID		L1443109-2	L1443111-15	L1443111-12	L1443111-16	L1443111-14	L1443111-18	L1443111-13	L1443111-17
Total Metals	**Units**								
Aluminum (Al)-Total	mg/L	0.0024	0.0020	0.0027	0.0027	0.0030	0.0021	0.0020	0.0022
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.000180	0.000182	0.000202	0.000189	0.000190	0.000203	0.000169	0.000183
Barium (Ba)-Total	mg/L	0.00211	0.00219	0.00279	0.00275	0.00204	0.00205	0.00226	0.00219
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000011	<0.000010	<0.000010
Boron (B)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	1.32	1.36	1.79	1.78	1.24	1.22	1.34	1.35
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00059	0.00051	0.00053	0.00053	0.00051	0.00049	0.00052	0.00052
Iron (Fe)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Magnesium (Mg)-Total	mg/L	0.868	0.856	1.10	1.09	0.828	0.821	0.862	0.863
Manganese (Mn)-Total	mg/L	0.000869	0.000855	0.00109	0.00110	0.000835	0.000870	0.00110	0.00115
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.000246	0.000257	0.000712	0.000693	0.000252	0.000264	0.000276	0.000274
Nickel (Ni)-Total	mg/L	0.000940	0.000941	0.000873	0.000866	0.000843	0.000927	0.000916	0.000948
Potassium (K)-Total	mg/L	0.781	0.785	1.18	1.17	0.748	0.745	0.801	0.792
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	<0.050	<0.050	0.078	0.072	<0.050	<0.050	<0.050	<0.050
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	1.40	1.38	2.81	2.74	1.30	1.29	1.48	1.51
Strontium (Sr)-Total	mg/L	0.0122	0.0124	0.0196	0.0193	0.0115	0.0113	0.0127	0.0124
Uranium (U)-Total	mg/L	0.000022	0.000023	0.000023	0.000024	0.000026	0.000021	0.000024	0.000022
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0032	<0.0010	<0.0010

Notes:

All variables analyzed by ALS Environmental (Burnaby, BC).

< = less than the analytical detection limit indicated

Table 3.10-4. Open Water Season Analytical Results for Additional Lac de Gras Sites, Water Quality Variables 2014

Lake		S5						S6					
Date		3-Aug-14						3-Aug-14					
Depth Strata		Shallow (1 m)			Mid (9 m)			Shallow (1 m)			Mid (13 m)		
Replicate No.		1	2	3	1	2	3	1	2	3	1	2	3
Sample ID		L1497511-9	L1497511-10	L1497511-11	L1497495-1	L1497495-2	L1497495-3	L1497511-12	L1497511-13	L1497511-14	L1497495-4	L1497495-5	L1497495-6
Physical Tests	**Units**												
Conductivity	uS/cm	26.8	26.6	26.5	23.3	23.2	23.2	25.7	23.2	23.2	22.8	22.8	22.9
Hardness (as $CaCO_3$)	mg/L	6.89	6.89	7.18	6.32	6.22	6.78	6.65	6.42	6.72	6.2	6.26	6.79
pH	pH	6.95	6.9	6.87	6.87	6.86	6.85	6.81	6.85	6.83	6.85	6.86	6.84
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
Total Dissolved Solids	mg/L	16	16.1	16.3	14.5	14.3	14.5	15.7	14.3	14.6	14.1	13.7	14.3
Turbidity	NTU	0.38	0.36	0.31	0.45	0.28	0.35	0.39	0.28	0.32	0.27	0.33	0.31
Anions													
Anion Sum	meq/L	0.24	0.24	0.24	0.21	0.21	0.21	0.22	0.21	0.22	0.2	0.2	0.21
Cation Sum	meq/L	0.23	0.23	0.24	0.2	0.2	0.21	0.22	0.21	0.21	0.2	0.2	0.21
Cation - Anion Balance	%	-0.8	-1.6	0.9	-3.3	-4.4	1.3	0.2	-2.1	-0.4	-1.6	-1	1.7
Alkalinity, Total (as $CaCO_3$)	mg/L	4.9	5	4.9	4.9	5	4.7	4.1	4.9	5	4.6	4.6	4.6
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	4.9	5	4.9	4.9	5	4.7	4.1	4.9	5	4.6	4.6	4.6
Alkalinity, Carbonate (as $CaCO_3$)	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
Alkalinity, Hydroxide (as $CaCO_3$)	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
Chloride (Cl)	mg/L	2.2	2.18	2.18	1.72	1.68	1.67	2.46	1.74	1.75	1.66	1.63	1.68
Sulphate (SO_4)	mg/L	3.74	3.74	3.74	3.28	3.24	3.22	3.44	3.27	3.26	3.17	3.17	3.16
Nutrients													
Total Ammonia-N	mg/L	<0.0050	<0.0050	0.0108	0.0055	<0.0050	<0.0050	0.0072	0.0059	0.0067	0.0121	<0.0050	<0.0050
Nitrate-N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite-N	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.137	0.136	0.139	0.127	0.13	0.129	0.135	0.124	0.133	0.143	0.126	0.133
Dissolved Orthophosphate-P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0013
Total Phosphate-P	mg/L	0.002	<0.0020	0.002	0.002	<0.0020	<0.0020	<0.0020	0.002	<0.0020	<0.0020	<0.0020	0.0024
Organic Carbon													
Total Organic Carbon	mg/L	2.37	2.45	2.51	2.51	2.41	2.49	2.89	2.26	2.32	2.57	2.13	2.45

(continued)

Table 3.10-4. Open Water Season Analytical Results for Additional Lac de Gras Sites, Water Quality Variables 2014 (completed)

Lake		S5						S6					
Date		3-Aug-14						3-Aug-14					
Depth Strata		Shallow (1 m)			Mid (9 m)			Shallow (1 m)			Mid (13 m)		
Replicate No.		1	2	3	1	2	3	1	2	3	1	2	3
Sample ID		L1497511-9	L1497511-10	L1497511-11	L1497495-1	L1497495-2	L1497495-3	L1497511-12	L1497511-13	L1497511-14	L1497495-4	L1497495-5	L1497495-6
Total Metals	**Units**												
Aluminum (Al)-Total	mg/L	0.0114	0.0062	-	0.0047	0.0041	-	0.0531	0.004	-	0.0093	0.0062	-
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	-	<0.00010	<0.00010	-	<0.00010	<0.00010	-	<0.00010	<0.00010	-
Arsenic (As)-Total	mg/L	0.000173	0.000179	-	0.000169	0.00018	-	0.000182	0.000172	-	0.000172	0.000172	-
Barium (Ba)-Total	mg/L	0.00231	0.00222	-	0.00196	0.00201	-	0.00221	0.00206	-	0.00191	0.00191	-
Beryllium (Be)-Total	mg/L	<0.000010	<0.000010	-	<0.000010	<0.000010	-	<0.000010	<0.000010	-	<0.000010	<0.000010	-
Boron (B)-Total	mg/L	<0.0050	<0.0050	-	<0.0050	<0.0050	-	<0.0050	<0.0050	-	<0.0050	<0.0050	-
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	-	<0.000010	<0.000010	-	<0.000010	<0.000010	-	<0.000010	<0.000010	-
Calcium (Ca)-Total	mg/L	1.37	1.37	-	1.25	1.22	-	1.33	1.27	-	1.2	1.22	-
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	-	<0.00010	<0.00010	-	0.00074	<0.00010	-	<0.00010	<0.00010	-
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	-	<0.00010	<0.00010	-	0.00011	<0.00010	-	<0.00010	<0.00010	-
Copper (Cu)-Total	mg/L	0.00064	0.00067	-	0.00051	0.00054	-	0.00238	0.00073	-	0.00054	0.00055	-
Iron (Fe)-Total	mg/L	0.01	<0.010	-	<0.010	<0.010	-	0.04	<0.010	-	<0.010	0.05	-
Lead (Pb)-Total	mg/L	0.000018	0.000032	-	0.000021	<0.000010	-	0.000091	0.000038	-	<0.000010	<0.000010	-
Magnesium (Mg)-Total	mg/L	0.843	0.839	-	0.78	0.772	-	0.807	0.788	-	0.777	0.78	-
Manganese (Mn)-Total	mg/L	0.00237	0.00237	-	0.00234	0.00225	-	0.00268	0.00218	-	0.00228	0.00232	-
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	-	<0.000010	<0.000010	-	<0.000010	<0.000010	-	<0.000010	<0.000010	-
Molybdenum (Mo)-Total	mg/L	0.000431	0.000405	-	0.000256	0.000243	-	0.000343	0.000276	-	0.000212	0.000234	-
Nickel (Ni)-Total	mg/L	0.000911	0.000932	-	0.000877	0.000878	-	0.00313	0.000918	-	0.000853	0.00091	-
Potassium (K)-Total	mg/L	0.824	0.823	-	0.708	0.692	-	0.765	0.722	-	0.699	0.7	-
Selenium (Se)-Total	mg/L	<0.000040	<0.000040	-	<0.000040	<0.000040	-	<0.000040	<0.000040	-	<0.000040	<0.000040	-
Silicon (Si)-Total	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	-	<0.000010	<0.000010	-	<0.000010	<0.000010	-	<0.000010	<0.000010	-
Sodium (Na)-Total	mg/L	1.69	1.65	-	1.28	1.24	-	1.45	1.32	-	1.23	1.22	-
Strontium (Sr)-Total	mg/L	0.0138	0.0136	-	0.0114	0.0112	-	0.0123	0.0118	-	0.0109	0.011	-
Uranium (U)-Total	mg/L	0.000026	0.000024	-	0.000021	0.00002	-	0.000023	0.000021	-	0.000023	0.000021	-
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	-	<0.000050	<0.000050	-	<0.000050	<0.000050	-	<0.000050	<0.000050	-
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	-	<0.0010	<0.0010	-	0.0021	<0.0010	-	<0.0010	<0.0010	-

Notes:

All variables analyzed by ALS Environmental (Burnaby, BC).

< = less than the analytical detection limit indicated

Table 3.10-5. Taxonomic Density Results for Phytoplankton at Grizzly Lake, 2014

Lake	Grizzly		
Date	10-Aug-14		
Replicate No.	1	2	3
Sample ID	6820.01-04	6820.01-05	6820.01-06
Species/Group (cells/mL)			
Bacillariophyceae			
Centrales			
Cyclotella sp.	86	87	23
Rhizosolenia sp.	-	-	2
Pennales			
Achnanthidium sp.	5	4	6
Navicula sp.	-	2	-
Synedra sp.	3	4	2
Tabellaria spp.	3	-	12
Chlorophyceae			
Chlorococcales			
Ankistrodesmus falcatus	-	21	-
Chlorella vulgaris	-	15	-
Kirchneriella sp.	-	-	4
Monoraphidium arcuatum	2	-	-
Monoraphidium contortum	-	-	2
Monoraphidium komarkovae	-	-	29
Oocystis borgei	13	-	-
Oocystis elliptica	-	8	-
Quadrigula sp.	10	-	-
Tetrasporales			
Elakatothrix gelatinosa	16	30	20
Zygnematales			
Xanthidium johnsonii	2	-	-
Chrysophyceae			
Chromulinales			
Chrysocapsella planctonica	131	59	180
Chrysococcales			
Chrysococcus rufescens	-	4	20
Chrysomonadales			
Dinobryon spp.	28	34	14
Mallomonas insignis	-	-	-
Mallomonas sp.	-	2	2
Pseudokephyrion sp.	3	8	-

(continued)

Table 3.10-5. Taxonomic Density Results for Phytoplankton at Grizzly Lake, 2014 (completed)

Lake	Grizzly		
Date	10-Aug-14		
Replicate No.	1	2	3
Sample ID	6820.01-04	6820.01-05	6820.01-06
Species/Group (cells/mL)			
Chrysophyceae ***(cont'd)***			
Hibberdiales			
Bitrichia chodatii	21	51	43
Ochromonadales			
Ochromonas sp.	165	260	-
Ochromonas spp.	2	4	242
Cryptophyceae			
Cryptomonadales			
Cryptomonas spp.	11	6	8
Komma caudata	23	17	20
Dinophyceae			
Gymnodiniales			
Gymnodinium sp.	2	4	-
Peridiniales			
Peridinium sp.	5	-	4
Euglenophyceae			
Euglenales			
Trachelomonas sp.	3	2	-
Myxophyceae			
Chroococcales			
Aphanocapsa holsatica	97	-	-
Aphanocapsa sp.	624	729	1692
Aphanothece sp.	-	-	35
Merismopedia punctata	-	896	-
Merismopedia sp.	653	-	992
Rhabdoderma lineare	23	-	86
Synechococcus sp.	91	53	-
Woronichinia naegeliana	143	-	-
Oscillatoriales			
Leptolyngbya spp.	350	222	414
Total	**2,513**	**2,523**	**3,854**

Note:
Taxonomic identification by EcoAnalysts Inc.

Table 3.10-6. Phytoplankton Density, Chlorophyll *a* Concentrations, Taxonomic Richness, and Diversity Indices at Grizzly Lake, 2014

Lake	Replicate No.	Density (cells/mL)	Chlorophyll *a* (µg/L)	Genus Richness	G (90%)	Max. Dominance (%)	Shannon Diversity Index	Simpson Diversity Index
Grizzly	1	2,513	1.287	25	8	28.69	2.07	0.82
	2	2,523	1.330	23	7	35.51	1.87	0.77
	3	3,854	0.380	22	5	43.91	1.69	0.72
	Mean	**2,963**	**1.0**	**23.3**	**6.7**	**36.0**	**1.87**	**0.77**
	SE	**445**	**0.3**	**0.9**	**0.9**	**4.4**	**0.11**	**0.03**

Notes:
G (90%) is the number of genera comprising 90% of the density.
Maximum Dominance (%) is the maximum dominance accounted for by a single genus.
SE = standard error of the mean

Table 3.10-7. Relative Densities of Phytoplankton Taxa at Grizzly Lake, 2014

Group	Relative Density (%)
Bacillariophyceae	3
Chlorophyceae	2
Chrysophyceae	14
Cryptophyceae	1
Dinophyceae	0
Euglenophyceae	0
Myxophyceae	80
Xanthophyceae	0
Total	**100**

Table 3.10-8. Dominant Phytoplankton Taxa at Grizzly Lake, 2014

Species/Group	Grizzly 10-Aug-14	Edible to Zooplankton[1]
Myxophyceae		
Chroococcales		
Aphanocapsa sp.	34.3%	no
Merismopedia punctata	10.1%	no
Merismopedia sp.	18.5%	no
Leptolyngbya spp.	11.1%	possibly
Total	**73.9%**	

Note: Values represent relative density of taxa when taxa contributed at least 5% of the phytoplankton community.
[1] Phytoplankton were considered to be edible if size was < 20 µm and inedible if > 20 µm. Inedible or possibly inedible phytoplankton were also classified based on phytoplankton ecology (colonial forms, mucilage, spines).
Size data are from Prescott (1982).

Table 3.10-9. Mean and Standard Deviations (SD) of Baseline, Historical, and 2014 Concentrations of Chlorophyll *a* in each of the Koala Watershed Reference Lakes and Grizzly Lake

Lake	Baseline Mean (N)	Mean Baseline Range, ± 2 SD	2003 Mean	Mean 2003 Range, ± 2 SD	2013 Mean ± 1 SD	2014 Mean ± 1 SD
Nanuq	0.23 (1)	0 - 0.51	0.45	0.20 – 0.70	0.37 ± 0.48	0.38 ± 0.37
Counts	0.65 (1)	0 – 1.45	0.85	0.80 – 0.90	1.03 ± 0.82	0.93 ± 0.35
Vulture	0.15 (2)	0.08 - 0.23	0.69	0.59 – 0.78	0.59 ± 0.09	0.46 ± 0.24
Grizzly	0.60 (2)	0 - 1.68	0.25	0.20 – 0.31	0.49 ± 0.27	1.00 ± 0.31

Notes: Units are µg/L.
N = number of years data were collected.
Negative values were replaced with zeroes.

Table 3.10-10. Mean and Standard Deviations (SD) of Baseline, Historical, and 2014 Phytoplankton Density in each of the Koala Watershed Reference Lakes and Grizzly Lake

Lake	Baseline Mean (N)	Mean Baseline Range, ± 2 SD	2003 Mean	Mean 2003 Range, ± 2 SD	2013 Mean ± 1 SD	2014 Mean ± 1 SD
Nanuq	385 (1)	56 - 714	511	368 – 654	450 ± 118	1055 ± 346
Counts	1,561 (1)	103 - 3,020	1,111	799 – 1,422	1,868 ± 724	1,924 ± 755
Vulture	284 (2)	76 - 492	638	524 – 752	496 ± 26	1324 ± 398
Grizzly	1,592 (1)	1,058 – 2,126	1,256	720 – 1,792	2,531 ± 554	2,963 ± 771

Notes: Units are cells/L.
N = number of years data were collected.

Table 3.10-11. Mean and Standard Deviations (SD) Baseline, Historical, and 2014 Phytoplankton Diversity in each of the Koala Watershed Reference Lakes and Grizzly Lake

Shannon Diversity						
Lake	Baseline Mean (N)	Mean Baseline Range, ± 2 SD	2003 Mean	Mean 2003 Range, ± 2 SD	2013 Mean ± 1 SD	2014 Mean ± 1 SD
Nanuq	1.88 (1)	1.22 – 2.54	1.92	1.78 - 2.06	2.16 ± 0.22	2.07 ± 0.19
Counts	1.77 (1)	1.54 - 2.01	1.89	1.41 - 2.38	1.93 ± 0.22	2.25 ± 0.20
Vulture	1.76 (2)	1.43 – 2.08	1.31	0.67 - 1.95	1.68 ± 0.24	2.09 ± 0.10
Grizzly	0.44 (1)	0.28 – 0.59	1.35	0.75 - 1.95	1.62 ± 0.26	1.87 ± 0.19
Simpson's Diversity						
Lake	Baseline Mean (N)	Mean Baseline Range, ± 2 SD	2003 Mean	Mean 2003 Range, ± 2 SD	2013 Mean ± 1 SD	2014 Mean ± 1 SD
Nanuq	0.80 (1)	0.67 – 0.92	0.81	0.77 - 0.85	0.84 ± 0.03	0.81 ± 0.04
Counts	0.74 (1)	0.65 – 0.82	0.76	0.61 – 0.90	0.79 ± 0.05	0.83 ± 0.06
Vulture	0.76 (3)	0.65 – 0.88	0.64	0.43 - 0.84	0.73 ± 0.07	0.81 ± 0.02
Grizzly	0.18 (1)	0.13 – 0.22	0.58	0.34 – 0.83	0.71 ± 0.09	0.77 ± 0.05

Note: N = number of years data were collected.

Table 3.10-12. Taxonomic Density Results for Zooplankton at Grizzly Lake, 2014

Lake	Grizzly		
Date	10-Aug-14		
Replicate No.	1	2	3
Sample ID	6823.03-25	6823.03-26	6823.03-27
Species/Group (organisms/m³)			
Cladocera			
Diplostraca			
Daphnia middendorffiana	38	-	38
Holopedium gibberum	266	277	613
Rotifera			
Floscularaceae			
Conochilus unicornis	7,918	8,728	7,202
Ploima			
Kellicottia longispina	3,731	3,741	3,141
Keratella hiemalis	343	92	153
Keratella sp.	723	600	345
Copepoda			
Copepoda - nauplii	1,104	924	1,532
Calanoida			
Heterocope septentrionalis	38	554	38
Leptodiaptomus pribilofensis	1,066	785	613
Leptodiaptomus sicilis	2,018	1,755	1,915
Calanoida - copepodites	6,510	6,881	5,708
Cyclopoida	114	369	383
Cyclops sp.	114	369	383
Cyclopoida - copepodites	2,170	2,447	2,337
Total	**26,039**	**27,153**	**24,018**

Note:
Taxonomic identification by EcoAnalysts Inc.

Table 3.10-13. Zooplankton Density, Biomass, Taxonomic Richness, and Diversity Indices at Grizzly Lake, 2014

Lake	Replicate No.	Biomass (mg dry weight/m³)	Density (organisms/ m³)	Genus Richness	G (90%)	Maximum Dominance (%)	Shannon Diversity Index	Simpson Diversity Index
Grizzly	1	-	26039.3	9	3	49	1.31	0.67
	2	89.8	27153.4	9	4	52	1.35	0.66
	3	79.0	24018.3	9	4	50	1.36	0.67
	Mean	**84.4**	**25737.0**	**9.0**	**3.7**	**50.1**	**1.34**	**0.67**
	SE	**4.4**	**917.6**	**0.0**	**0.3**	**0.9**	**0.02**	**0.00**

Notes:
G (90%) is the number of genera comprising of 90% of the density.
Max. Dominance (%) is the maximum dominance accounted for by a single genera.
Dash indicates data was excluded due to an error.
SE = standard error of the mean

Table 3.10-14. Relative Densities of Zooplankton Taxa at Grizzly Lake, 2014

Group	Relative Density (%)
Rotifera	48
Cladocera	2
Copepoda - Calanoida	36
Copepoda - Cyclopoida	10
Copepoda - Nauplii	5
Total	**100**

Table 3.10-15. Dominance Zooplankton Taxa at Grizzly Lake, 2014

Species/Group	Grizzly 10-Aug-14
Rotifera	
Conochilus unicornis	30.9%
Kellicottia longispina	13.7%
Copepoda	
Calanoida - copepodites	24.7%
Leptodiaptomus sicilis	7.4%
Cyclopoida - copepodites	9.0%
Total %	**85.7%**

Note:
Values represent relative density of taxa when taxa contributed at least 5% of the zooplankton community.

Table 3.10-16. Mean and Standard Deviations (SD) of Historical and 2014 Zooplankton Biomass in each of the Koala Watershed Reference Lakes and Grizzly Lake

Lake	2003 Mean	Mean 2003 Range, ± 2 SD	2013 Mean ± 1 SD	2014 Mean ± 1 SD
Nanuq	26.8	26.3 – 27.4	79.7 ± 6.1	65.5 ± 2.7
Counts	219.3	208.4 – 230.1	224.3 ± 100.0	258.1 ± 16.8
Vulture	67.8	3.1 – 132.4	70.8 ± 5.4	50.9 ± 3.0
Grizzly	32.7	28.1 – 37.3	127.9 ± 42.0	84.4 ± 7.6

Note:
Units are mg dry weight/m³.

Table 3.10-17. Mean ± 2 Standard Deviations (SD) Baseline and 2003 Zooplankton Density in Each of the Koala Watershed Reference Lakes and Grizzly Lake

Lake	Baseline Mean (N)	Mean Baseline Range, ± 2 SD	2003 Mean	Mean 2003 Range, ± 2 SD	2013 Mean ± 1 SD	2014 Mean ± 1 SD
Nanuq	16,209 (1)	13,053 - 19,365	22,553	14,762 – 30,344	28,547 ± 1,924	61,696 ± 5,172
Counts	43,710 (1)	33,027 - 54,392	87,868	80,277 – 95, 459	42,894 ± 4,916	95,872 ± 1,539
Vulture	20,384 (3)	9,704 - 31,064	16,952	3,533 – 30,372	27,987 ± 1,506	47,709 ± 4,742
Grizzly	19,615 (2)	0 – 44,537	10,104	4,756 – 15,451	39,321 ± 6,180	25,737 ± 1,589

Notes:
Units are organisms/m³.
N = number of years data were collected.
Negative values were replaced with zeroes.

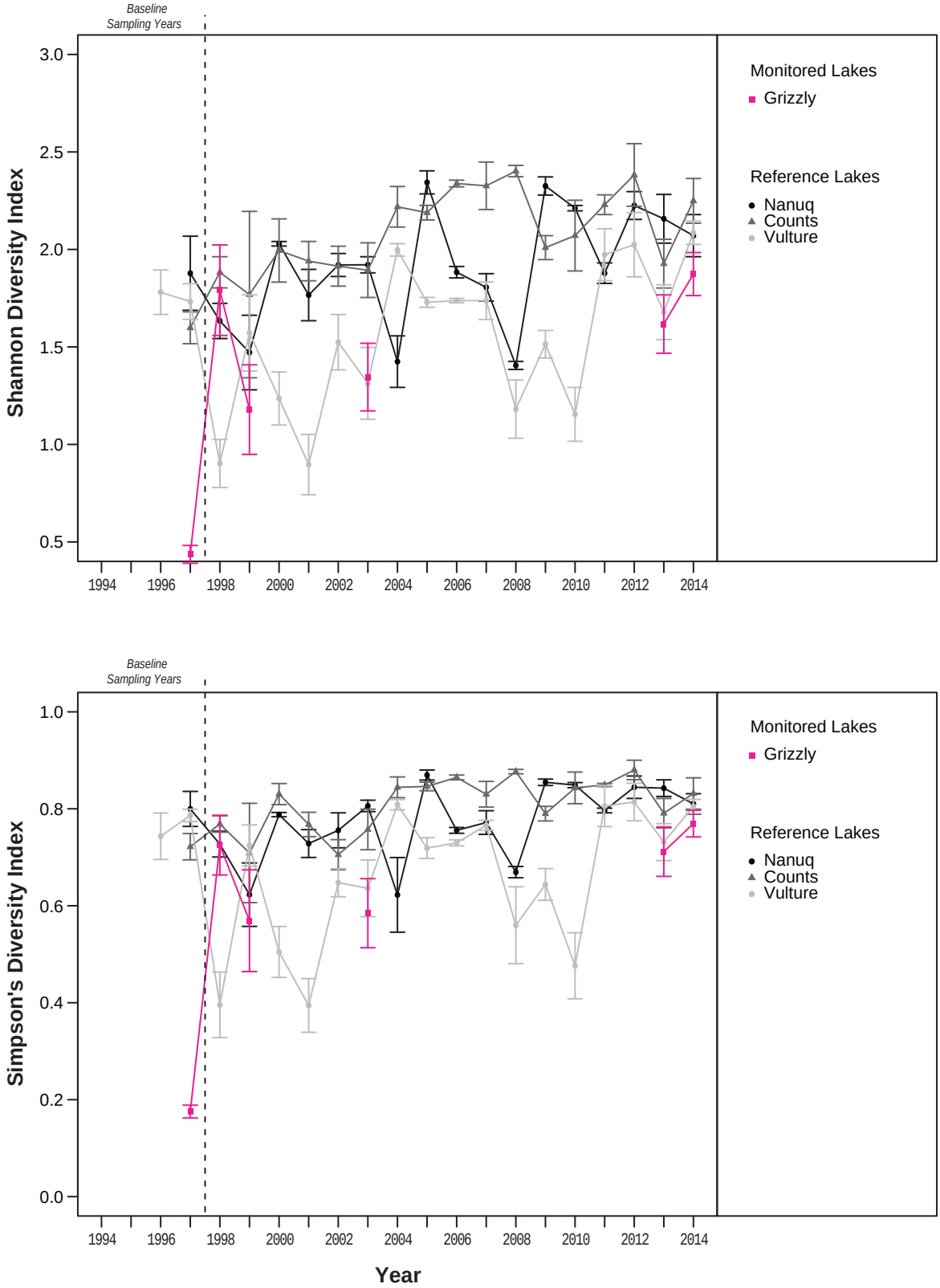
Table 3.10-18. Mean and Standard Deviations (SD) of Historical and 2014 Zooplankton Diversity in each of the Koala Watershed Reference Lakes and Grizzly Lake

Shannon Diversity						
Lake	Baseline Mean (N)	Mean Baseline Range, ± 2 SD	2003 Mean	Mean 2003 Range, ± 2 SD	2013 Mean ± 1 SD	2014 Mean ± 1 SD
Nanuq	0.76 (1)	0.61 – 0.91	1.17	1.16 – 1.18	1.54 ± 0.05	0.88 ± 0.06
Counts	1.06 (1)	0.83 – 1.29	1.01	0.98 – 1.04	1.52 ± 0.11	1.11 ± 0.04
Vulture	1.19 (3)	1.03 – 1.36	0.87	0.84 – 0.90	1.56 ± 0.12	1.11 ± 0.05
Grizzly	0.92 (2)	0.76 – 1.08	0.97	0.75 – 1.19	1.29 ± 0.09	0.87 ± 0.07
Simpson's Diversity						
Lake	Baseline Mean (N)	Mean Baseline Range, ± 2 SD	2003 Mean	Mean 2003 Range, ± 2 SD	2013 Mean ± 1 SD	2014 Mean ± 1 SD
Nanuq	0.39 (1)	0.28 – 0.51	0.67	0.66 – 0.68	0.73 ± 0.01	0.53 ± 0.01
Counts	0.56 (1)	0.38 – 0.73	0.54	0.53 – 0.55	0.73 ± 0.03	0.59 ± 0.04
Vulture	0.64 (3)	0.57 – 0.70	0.47	0.45 – 0.49	0.71 ± 0.05	0.58 ± 0.02
Grizzly	0.53 (2)	0.37 – 0.68	0.55	0.44 – 0.66	0.64 ± 0.05	0.51 ± 0.01

Note:
N = number of years data were collected.

Figure 3.10-1

Average Diversity Indices for Phytoplankton in Koala Watershed Reference Lakes and Grizzly Lake, 1996 to 2014



Note: Error bars represent standard error of the mean.

Figure 3.10-2

Average Phytoplankton Density by Taxonomic Group and Relative Densities of Phytoplankton Taxa in Grizzly Lake, 1997 to 2014

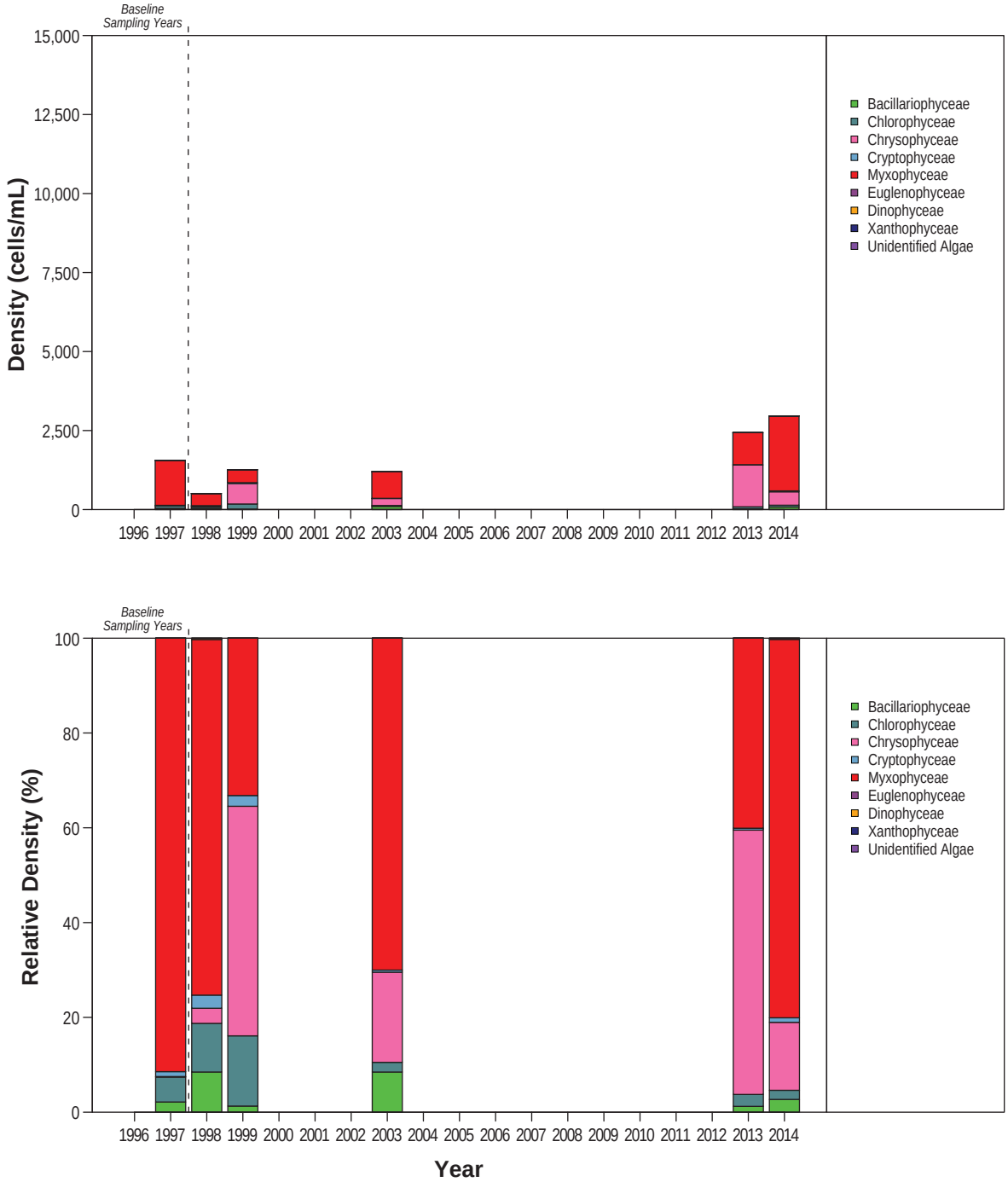
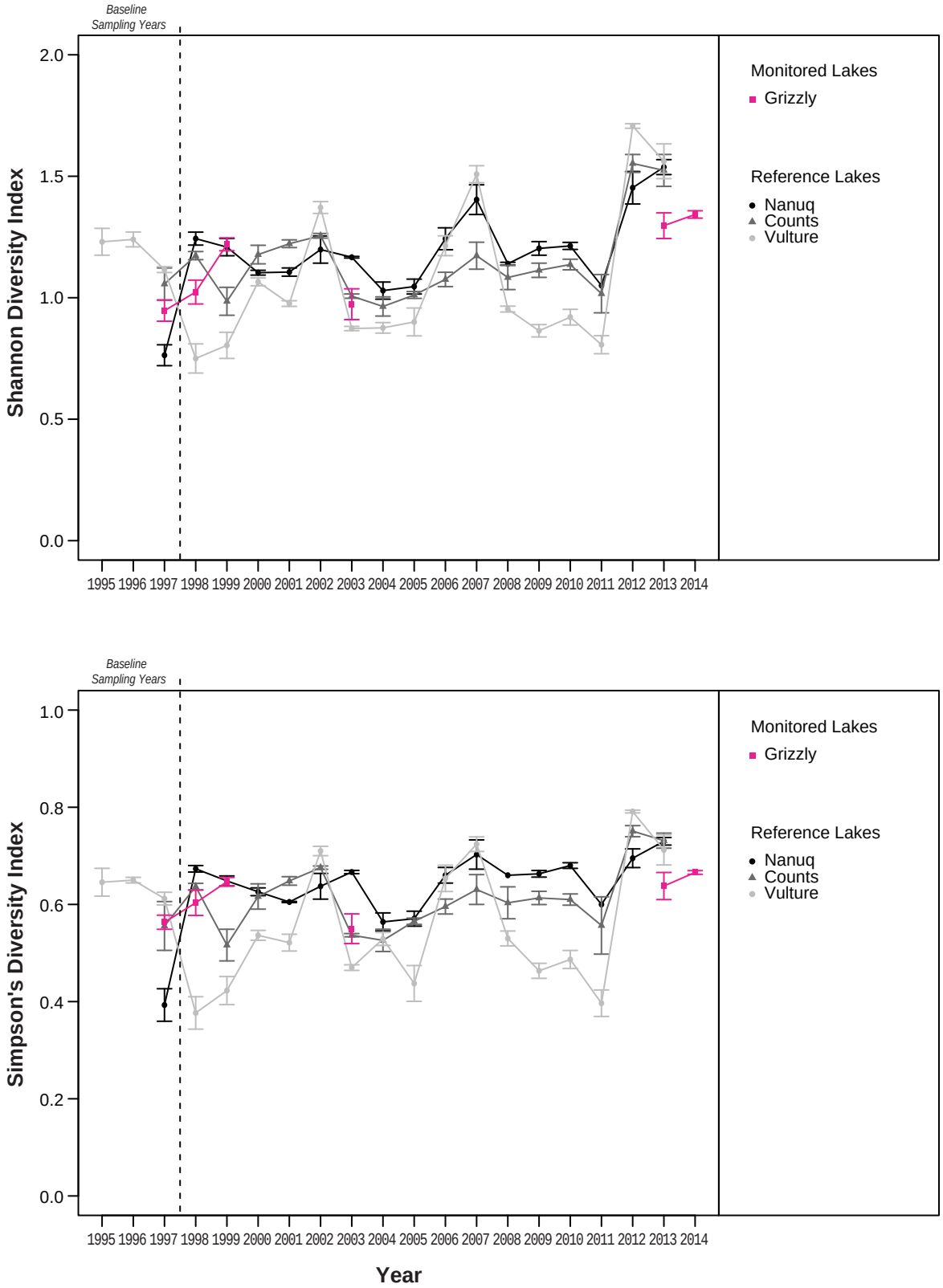


Figure 3.10-3

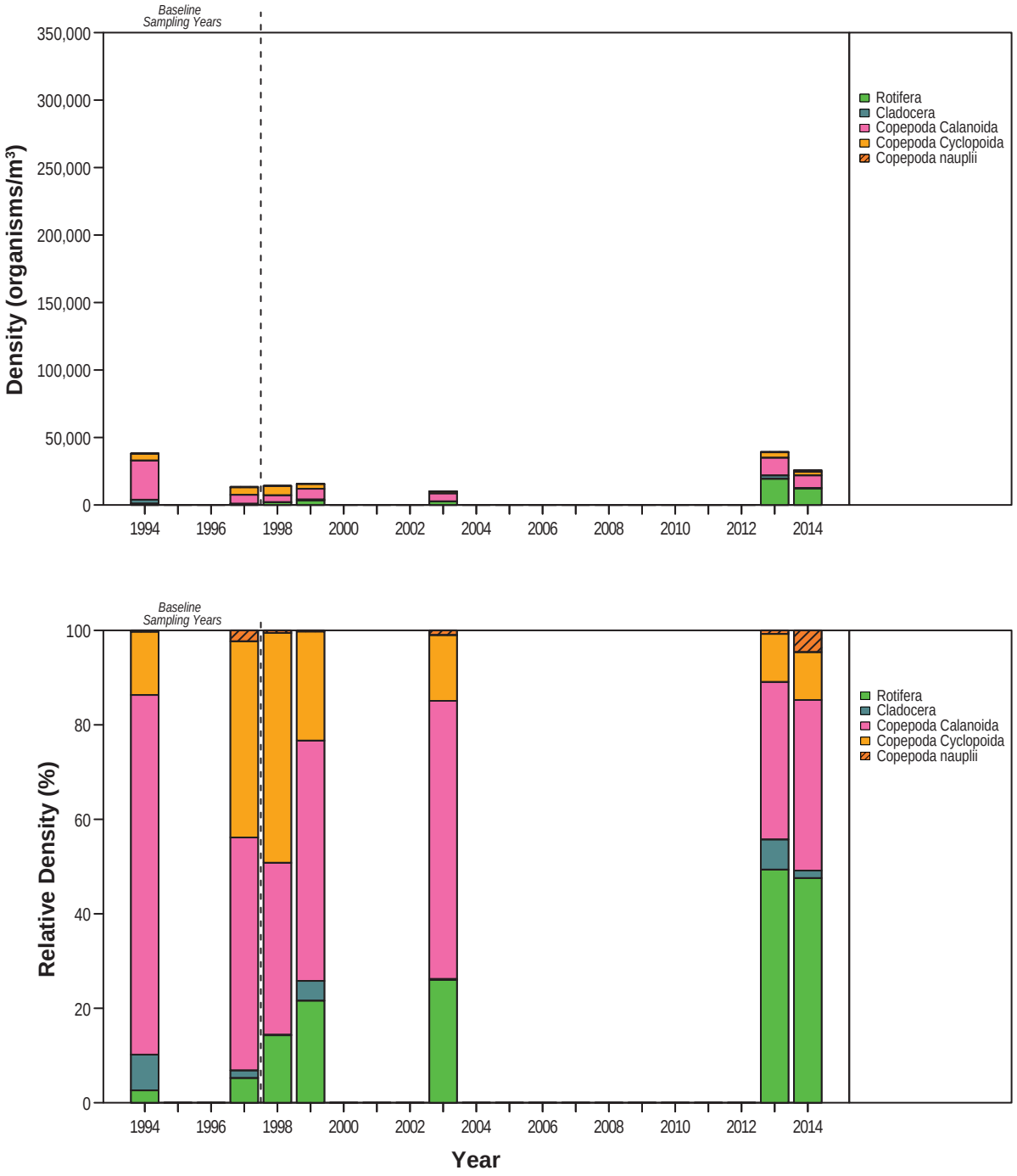
Average Diversity Indices for Zooplankton in Koala Watershed Lakes and Grizzly Lake, 1995 to 2014



Note: Error bars represent standard error of the mean.

Figure 3.10-4

Average Zooplankton Density by Taxonomic Group and Relative Densities of Zooplankton Taxa in Grizzly Lake, 1994 to 2014



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