Appendix V5-3T

Hope Bay Belt Project:
2010 Freshwater Baseline Report

MAC RESOURCES

Hope Bay Mining Limited

HOPE BAY BELT PROJECT
2010 Freshwater Baseline Report

NEWMONT™
NORTH AMERICA







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HOPE BAY BELT PROJECT
2010 FRESHWATER BASELINE REPORT

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Executive Summary

Rescan™
Engineers and Scientists

Executive Summary

Environmental baseline studies were conducted by Rescan Environmental Services Ltd. (Rescan) in 2010, on behalf of Hope Bay Mining Ltd. (HBML), for the Hope Bay Belt Project. The primary objective of the 2010 freshwater program was to collect additional aquatic baseline data to support Phase 2 Project permitting and design. The 2010 aquatic baseline program involved collecting information for the following: bathymetry, physical limnology (winter and summer), lake water quality (winter and summer), lake sediment quality, lake phytoplankton, lake zooplankton, lake benthos, stream water quality, stream sediment quality, stream periphyton, and stream benthos. The program included collecting samples from lakes and streams in areas that could potentially be influenced by the future Phase 2 Project. Two reference lakes (Reference Lakes B and D) and their associated outflows located well away from potential Project activities were also sampled, as was a reference river location on the Angimajuq River. A total of 10 lakes and 16 streams and rivers were sampled in 2010.

Lake Bathymetry

Bathymetric surveys were conducted for six lakes in the Project area: Little Roberts Lake, Imniagut Lake, Trout Lake, Stickleback Lake, and Reference lakes B and D. Bathymetric maps are presented in this report.

Physical Limnology

Dissolved oxygen concentrations in Project area lakes ranged widely from 1.3 mg/L to 13.2 mg/L during winter, with the highest concentrations occurring just beneath the ice layer. Winter dissolved oxygen concentrations were lowest at the shallow Stickleback and Trout lakes. River winter dissolved oxygen concentrations were similar at both sampling sites, averaging 9.3 mg/L. During summer, lakes were generally well-mixed or weakly stratified and dissolved oxygen levels ranged from 8.4 mg/L to 10.4 mg/L. Although water clarity in most lakes surveyed was relatively low, euphotic zone depths extended to the lake bottom in all shallow lakes and extended below 10 m in the deeper lake sampling sites (Aimaokatalok Lake Station 6 and Windy Lake).

Lake Water Quality

Lakes in the study area were near neutral (pH 6.8) to slightly basic (pH 8.1) and contained variable concentrations of metals and nutrients. In some lakes, winter concentrations of certain parameters exceeded summer levels. This was particularly evident for nitrate, hardness, total dissolved solids, ammonia, sulphate, copper and zinc. Turbidity, total suspended solids, aluminum, and lead concentrations showed the opposite trend, tending to be higher in summer than in winter.

Average total phosphorus concentrations ranged from 0.0039 mg/L to 0.027 mg/L in the surveyed lakes. Based on the Canadian Council of Ministers of the Environment (CCME) trophic categorizations for total phosphorus levels (CCME 2004), lakes in the Aimaokatalok Watershed would be considered oligotrophic to meso-eutrophic and Windy Lake would be considered ultra-oligotrophic to oligotrophic.

Some of the lakes surveyed were naturally elevated in a few select metals when compared to the CCME water quality guidelines for the protection of freshwater aquatic life (CCME 2007). CCME guidelines were occasionally exceeded in Stickleback Lake (iron and lead), Trout Lake (aluminum, chromium, copper, and iron), and Aimaokatalok Lake Station 5 (cadmium). Windy Lake was the only lake in which all measured water quality parameters were below CCME guidelines.

Lake Sediment Quality

Lake sediments were largely composed of clay and silt, with lesser amounts of sand and little gravel. The proportion of fine particles in sediments increased with depth. Many sediment parameter concentrations (e.g., available phosphate, cadmium, chromium, mercury, and zinc) were higher in the middle to deep depth zones than in the shallow depth zone, likely due to the increase in fine sediments with depth. There were few clear trends in parameter concentrations among sites.

Some of the lake sediments sampled were naturally elevated in a few select metals when compared to the CCME interim sediment quality guidelines (ISQGs) and probable effects levels (PELs; CCME 2002). Sediment metal concentrations exceeded CCME ISQGs in at least one sample collected from Stickleback Lake (chromium, copper), Trout Lake (chromium), Aimaokatalok Lake Station 13 (arsenic and chromium), Aimaokatalok Lake Station 2 (chromium), Aimaokatalok Lake Station 5 (chromium), Aimaokatalok Station 6 (chromium), Windy Lake Deep (arsenic, chromium, and copper), Wolverine Dike (arsenic, chromium, and copper) and Patch Dike (chromium). Aimaokatalok Lake Stations 11 and 12 and Windy Lake Shallow were the only lake sampling sites in which all measured sediment quality parameters were below CCME ISQGs. Although concentrations of chromium (and to a lesser extent arsenic and copper) in sediments across the study area frequently exceeded CCME ISQGs, concentrations of these metals were always below the CCME PELs.

Lake Aquatic Life

Lake phytoplankton biomass (as chlorophyll *a*) was low in all lakes, ranging from 0.45 µg chl *a*/L (Windy Lake Deep) to 1.0 µg chl *a*/L (Aimaokatalok Lake Station 5). Phytoplankton abundance ranged from 128 cells/mL (Windy Lake) to 337 cells/mL (Stickleback Lake). Diatoms and chrysophytes were generally the most abundant taxa, making up a combined 61 to 94% of the phytoplankton assemblages in study lakes. Phytoplankton richness and Simpson's diversity ranged from 13 to 23 genera/sample and from 0.71 to 0.93, respectively, and tended to be highest in Aimakatalok Watershed lakes. Phytoplankton diversity and richness generally followed similar trends.

Lake zooplankton abundance ranged between 1,200 organisms/m^3 (Stickleback Lake) and 32,000 organisms/m^3 (Aimaokatalok Lake Station 13) at most lake sites; however, the average zooplankton abundance of 270,000 organisms/m^3 at Trout Lake greatly exceeded this range. The zooplankton assemblages in study lakes consisted of rotifers, cladocerans, and calanoid and cyclopoid copepods. Zooplankton genera richness ranged from 4 to 13 genera/sample and Simpson's diversity ranged from 0.22 to 0.70 among surveyed lakes.

Lake benthos densities ranged widely from 77 organisms/m^2 in Windy Lake to 35,500 organisms/m^2 in Trout Lake. Lake benthic communities were generally dominated by dipterans, although pelecypods, ostracods, and oligochaetes were also abundant. Benthos genera richness in the study lakes ranged from 2 to 17 genera/sample, and Simpson's diversity ranged from 0.28 to 0.86.

Stream Water Quality

Streams and rivers in the study area ranged from slightly acidic (pH 6.2) to slightly basic (pH 8.1). Stickleback OF was the only stream in which the average pH of 6.2 (measured during June sampling) was outside of the CCME guideline range of pH 6.5 to 9. Parameters such as hardness, total dissolved solids, and sulphate tended to be lowest during freshet (June) compared to winter or summer levels. However, for most parameters, the seasonal patterns varied between sites with no clear trends emerging.

Total phosphorus concentrations were variable across stream sites, ranging from 0.003 mg/L at S6 (an eastern tributary to Aimaokatalok Lake) in August and September to 0.060 mg/L at AWRa in June. Aimaokatalok Northeast Inflow, Koignuk Downstream and AWRa generally contained the highest total

phosphorus concentrations during the summer months. Maximum summer total phosphorus concentrations at these sites fell within the range expected for a eutrophic waterbody based on the CCME trigger ranges for total phosphorus (CCME 2004). Most sampled streams and rivers would be considered oligotrophic to meso-eutrophic. Stream S6 (an eastern tributary to Aimaokatalok Lake) was the only site that would be categorized as ultra-oligotrophic.

The natural stream and river water quality exceeded several CCME guideline parameters for the protection of freshwater aquatic life (CCME 2007). Total aluminum and total iron most commonly exceeded CCME guidelines in surveyed streams and rivers. CCME guidelines were occasionally exceeded in AWRe (chromium and iron), Aimaokatalok Northeast Inflow (aluminum, cadmium, chromium, and iron), Stickleback Outflow (pH, aluminum, and iron), Trout Outflow (aluminum, chromium, and iron), S12 (copper and iron), S6 (aluminum and iron), AWRd (iron), AWRc (copper and iron), Aimaokatalok Outflow (aluminum), Koignuk River (aluminum and iron), Koignuk Upstream (aluminum, cadmium, chromium, copper, and iron), Koignuk Downstream (aluminum, chromium, copper, and iron), AWRb (aluminum, chromium, and iron), AWRa (aluminum, cadmium, chromium, copper, iron, and silver) and Angimajuq River Reference (aluminum and iron). Aimaokatalok River was the only stream/river site in which all measured water quality parameters were below CCME guidelines.

Stream Sediment Quality

Stream sediments consisted of a highly variable mixture of gravel, sand, silt and clay. Sand and silt were the most common grain sizes at most sites. Trout Outflow, S6, and AWRd streams were dominated by fine sediments, as clay and silt together made up at least 85% of the particle composition at these sites. At all other stream and river sites, fine sediments (clay and silt) made up less than 65% of the particle composition. Sites dominated by fine sediments tended to have higher sediment parameter concentrations (e.g., TOC, available ammonium, total nitrogen, cadmium, copper, and mercury) than sites dominated by coarse sediments.

Similar to lake sediments, some stream and river sediments were naturally elevated in arsenic, chromium, and copper, and concentrations of these metals were sometimes higher than CCME ISQGs. Sediment metal concentrations exceeded CCME ISQGs in at least one sample collected from Trout OF (chromium), S6 (copper), AWRd (arsenic), Koignuk River (copper), Koignuk Upstream (chromium) and AWRb (chromium). All measured sediment parameters were below CCME ISGs in the other streams sites surveyed. Sediment metal concentrations at all sites were below CCME PELs, except arsenic in one replicate collected at AWRd.

Stream Aquatic Life

Periphyton biomass ranged from approximately 0.01 µg chl *a*/cm^2 at Koignuk Downstream to 0.44 µg chl *a*/cm^2 at Aimaokatalok Outflow. Periphyton density ranged from 5,400 cells/cm^2 at AWRd to 176,000 cells/cm^2 at Koignuk U/S. Diatoms were the dominant periphyton taxonomic group in all streams and rivers surveyed. Genera richness ranged from 10 to 18 genera/sample, and Simpson's diversity ranged from 0.47 to 0.88 among stream and river sites.

Average benthos density in most streams and rivers ranged between 600 organisms/m^2 (Koignuk Downstream) to 9,300 organisms/m^2 (AWRb). The exception was Aimaokatalok Outflow which had a much higher average density of 24,500 organisms/m^2. At most stream and river sites, dipterans were the most numerous benthic organism, making up 33 to 81% of the benthos assemblages. Aimaokatalok Outflow was a notable exception to this, as Coelenterata (specifically, the genus *Hydra*) made up 94% and dipterans made up only 3% of the benthos in this stream. Ostracods and oligochaetes were also abundant in some study streams and rivers. Benthic genera richness ranged from 10 to 20 genera/sample, and Simpson's diversity ranged from 0.12 to 0.87 among stream and river sites.

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Glossary and Abbreviations

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Glossary and Abbreviations

AEMP	Aquatic Effects Monitoring Program
Allochthonous	External inputs of carbon and nutrients into aquatic systems, for example plant debris or soils from riparian systems.
ALS	ALS Environmental Services
Autotrophic	Organisms that can synthesize complex organic compounds from simple inorganic molecules, often using light energy (photosynthesis), e.g., plants.
BC	British Columbia
$CaCO_3$	Calcium carbonate
CCME	Canadian Council of Ministers of the Environment
DEM	Digital Elevation Model
D	Simpson's Diversity Index
DO	Dissolved Oxygen
D_s	Secchi Depth
EC	Environment Canada
ESR	Environmental and Social Responsibility Department
EZD	Euphotic Zone Depth
GPS	Global Positioning System
HBML	Hope Bay Mining Limited
Heterotrophic	Organisms that are unable to synthesize organic compounds from inorganic molecules, and must therefore consume organic compounds for growth (e.g., animals and fungi).
HSLP	Health, Safety and Loss Prevention Department
IF	Inflow
ISQG	Interim Sediment Quality Guideline
Lentic	Habitats with standing or still water
NC	Not Collected
NI	Not Included
NTU	Nephelometric Turbidity Units
OF	Outflow
PEL	Probable Effects Level
QA/QC	Quality Assurance and Quality Control
TDS	Total Dissolved Solids

Thermocline	Location in water column where the change in temperature (with depth) is greatest
TIN	Triangular Irregular Network
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TSS	Total Suspended Solids

1. Introduction

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1. Introduction

The Hope Bay Belt Property is located approximately 125 km southwest of Cambridge Bay, Nunavut, on the south shore of Melville Sound (Figure 1-1). The nearest communities are Omingmaktok (75 km to the southwest of the property), Cambridge Bay, and Kingaok (Bathurst Inlet; 160 km to the southwest of the property).

The property consists of a greenstone belt running in a north/south direction, approximately 80 km long, with three main gold deposit areas. The Doris and Madrid deposits are located in the northern portion of the belt, and the Boston deposit is located in the southern end. The northern portion of the property consists of several watershed systems that drain into Roberts Bay, and a large river (Koignuk River) that drains into Hope Bay. Watersheds in the southern portion of the belt ultimately drain into the upper Koignuk, which drains into Hope Bay.

Hope Bay Mining Limited (HBML) is proceeding with the development of the Doris North Project. Required licences and permits are in place for the development of the Doris North Gold Mine, and construction of the project commenced in 2010.

HBML plans to develop additional deposits in the belt, and planning for this Phase 2 Project development has commenced. Baseline studies to support the permitting of the Phase 2 Project were carried out in 2009, and were continued in 2010. The environmental baseline program conducted in 2010 was intended to fill in information gaps in order to support the permitting process for the Phase 2 Project. The site layout options considered for the 2010 Phase 2 environmental baseline program are shown in Figure 1-2.

Results from the 2010 Phase 2 Project environmental baseline program are being reported in a series of reports, as follows:

- 2010 Hydrology Baseline Report
- 2010 Freshwater Baseline Report
- 2010 Freshwater Fish and Fish Habitat Baseline Report
- 2010 Marine Baseline Report
- 2010 Marine Fish and Fish Habitat Baseline Report
- 2010 Terrain and Soils Baseline Report
- 2010 Ecosystems and Vegetation Baseline Report
- 2010 Marine Wildlife Baseline Report

In addition, numerous reports are being produced as part of the Doris North Project compliance requirements, and many of these reports cover the geographical areas of the proposed Phase 2 Project. Examples of Doris North Project compliance reports generated in 2010 that are relevant to the proposed Phase 2 Project include:

- 2010 Meteorology Compliance Report, Doris North Project



Figure 1-1

Hope Bay Belt Project Location

NEWMONT NORTH AMERICA

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PROJECT # **1009-002-17** GIS # **HB-15-038** *February 1, 2011*

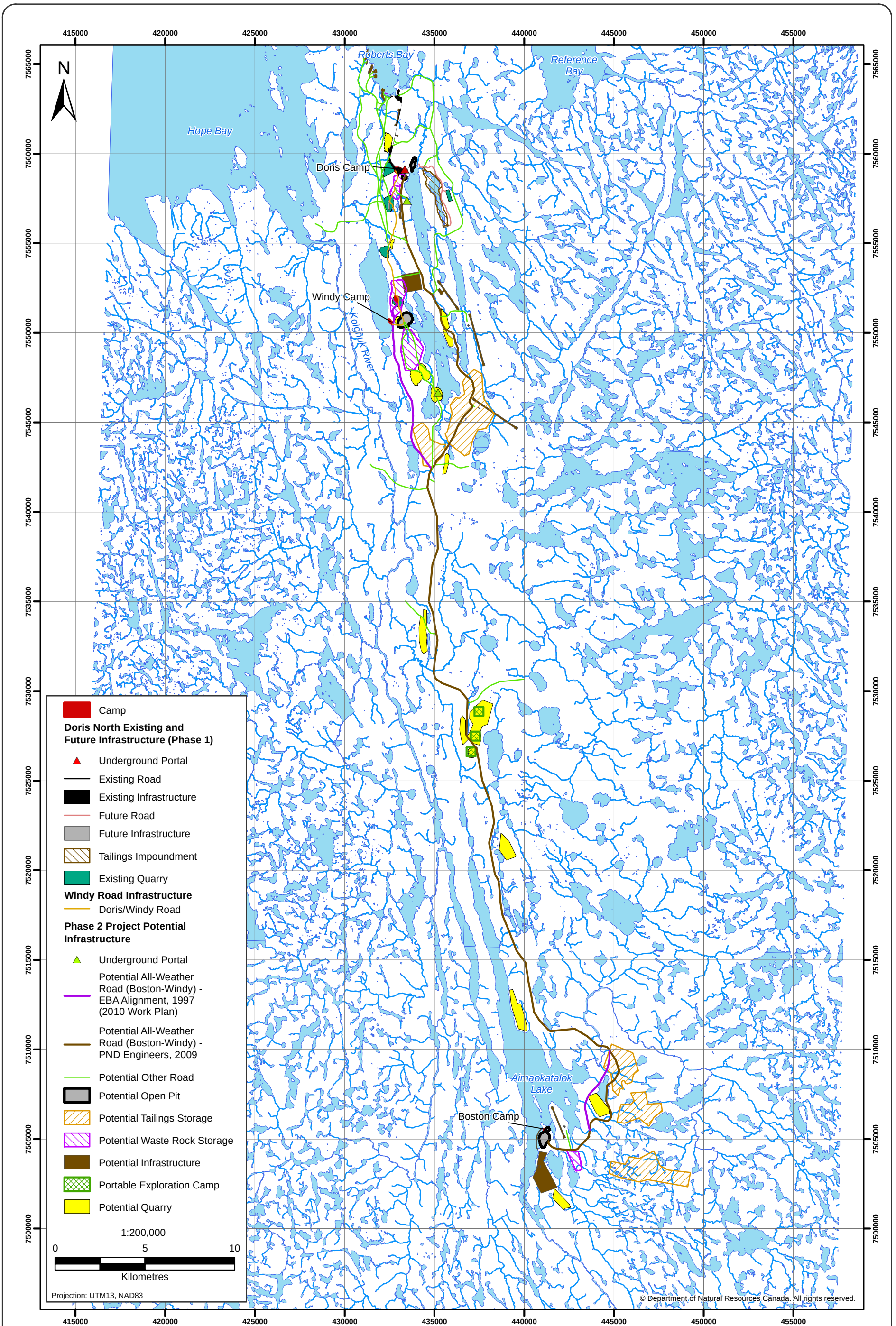


Figure 1-2

NEWMONT NORTH AMERICA

Site Layout Options Considered for Phase 2 Baseline Program, 2010

Figure 1-2

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- 2010 Hydrology Compliance Report, Doris North Project
- 2010 Aquatic Effects Monitoring Program Report, Doris North Project
- 2010 Wildlife Monitoring and Mitigation Report, Doris North Project
- 2010 Wildlife DNA Study, Doris North Project
- 2010 Air Quality Compliance Reports, Doris North Project

Archaeology work was also conducted in 2010 and is being reported separately.

This report presents the results from the freshwater baseline portion of the 2010 Phase 2 environmental baseline program.

The 2010 freshwater baseline program involved collecting information for the following: lake water quality (winter and summer), physical limnology (winter and summer), lake sediment quality, lake phytoplankton, lake zooplankton, lake benthos, stream and river water quality, stream and river sediment quality, stream and river periphyton, and stream and river benthos. The 2010 baseline sampling focused on waterbodies that could be affected by future Phase 2 Project development in the mid to southern portion of the belt, complementing 2009 baseline data collected in the northern portion of the belt. Two reference lakes (Reference Lakes B and D) and their associated outflows located well away from potential Project activities were also sampled, as was a reference river location on the Angimajuq River. Note that most of the data collected from Reference Lakes B and D and their outflows are presented in the *2010 Aquatic Effects Monitoring Program Report* (Rescan 2011), and only supplemental data from these sites that were not previously reported are presented in this baseline report. A total of 10 lakes and 16 streams/rivers were sampled in 2010.

Analytical results from all samples collected as part of the 2010 freshwater baseline program are provided as appendices to this report. A survey of the occurrence of microcystin-LR (a hepatotoxin produced by certain genera of cyanobacteria) was also undertaken in lakes in and around the Hope Bay Belt area in 2010; the results of this microcystin-LR survey are described in the memorandum *Microcystin Sampling Results in Regional Project Area, 2010* (Appendix 1-1).

Chapter 2 of this report presents the sampling locations and methods used for the 2010 freshwater baseline work. Chapter 3 presents the results of the 2010 freshwater baseline sampling program as well as a discussion of key findings. Chapter 3 also includes comparisons between data collected as part of the 2010 freshwater baseline program and historical data available for the area.

2. Methods

2. Methods

2.1 MONITORING LOCATIONS AND SAMPLING PROGRAM

The 2010 aquatic baseline program focused on the mid and southern portions of the belt that could be influenced by potential Phase 2 activity, as well as reference areas well away from future Phase 2 Project activities.

The following components were sampled as part of the 2010 freshwater baseline program (Table 2.1-1):

Lakes:

- Bathymetry;
- Physical Limnology;
- Water Quality;
- Sediment Quality;
- Phytoplankton;
- Zooplankton; and
- Benthic Invertebrates.

Streams and Rivers:

- River Physical Limnology;
- Water Quality;
- Sediment Quality;
- Periphyton; and
- Benthic Invertebrates.

The sampling location within a waterbody was selected based on one or more of the following criteria: the site was previously sampled, it was the deepest section in the lake, or it was a spatially significant location (i.e., nearby, within or outside of potential Phase 2 infrastructure or activities). The site selection rationale is presented in Table 2.1-2. In lakes with no bathymetric information or prior sampling history, winter sampling occurred near the middle of the lake, or in the middle of any obvious basins as estimated by the surrounding topography. At such sites, coarse-level bathymetry (using a depth sounder) was carried out prior to summer sampling and the sampling location was moved if more suitable areas were found.

Reference Lake B and Reference Lake D and their outflows are part of the approved Doris North Aquatic Effects Monitoring Program (AEMP). In 2010, supplemental data was collected from these lakes and their outflows that were not used in the annual AEMP. These raw data are included in appendices of this report. The following data were collected that could be used in the future: phytoplankton and zooplankton abundance and taxonomy at the deep site in Reference Lake B and in Reference Lake D, sediment quality and benthos abundance and taxonomy at the shallow site in Reference Lake B (data from the deep site are included in the 2010 AEMP), and periphyton biomass, abundance, and taxonomy from plates installed between early August and early September at Reference B Outflow and Reference D Outflow.

Table 2.1-1. Bathymetry, Water Quality, Sediment Quality, and Aquatic Biology Sampling Locations, Hope Bay Belt Project, 2010

Watershed	Site Name	Abbreviated Name	Bathymetry	Winter Water Quality and Limnology	Summer/Freshet Water Quality and Limnology	Sediment Quality	Phytoplankton/ Periphyton	Zooplankton	Benthos
Lake Sites									
Aimaokatalok	Stickleback Lake	Stickleback	X	X	X	X	X	X	X
	Trout Lake	Trout	X	X	X	X	X	X	X
	Aimaokatalok Lake: Station 13	Aim. Stn 13	-	-	X	X	X	X	X
	Aimaokatalok Lake: Station 2	Aim. Stn 2	-	-	-	X	-	-	X
	Aimaokatalok Lake: Station 12	Aim. Stn 12	-	-	-	X	-	-	X
	Aimaokatalok Lake: Station 5	Aim. Stn 5	-	X	X	X	X	X	X
	Aimaokatalok Lake: Station 11	Aim. Stn 11	-	X	X	X	X	X	X
	Aimaokatalok Lake: Station 6	Aim. Stn 6	-	X	X	X	X	X	X
Windy	Windy Lake Shallow	Windy Shallow	-	-	-	X	-	-	X
	Windy Lake Deep	Windy Deep	-	X	X	X	X	X	X
Doris	Wolverine Lake Dike	Wolverine Dike	-	-	-	X	-	-	X
	Patch Lake Dike	Patch Dike	-	-	-	X	-	-	X
	Imniagut Lake	Imniagut	X	-	-	-	-	-	-
	Little Roberts Lake†	Little Roberts	X	-	-	-	-	-	-
Reference B	Reference Lake B Shallow†	Ref. B Shallow	X	-	-	X	-	-	X
	Reference Lake B Deep†	Ref. B Deep	X	-	-	-	X	X	-
Reference D	Reference Lake D †	Ref. D	X	-	-	-	X	X	-
Stream/River Sites									
East	AWRe	AWRe	-	-	X	X	-	-	-
	Aimaokatalok Northeast Inflow	Aim. NE IF	-	-	X	X	X	-	X
Aimaokatalok River	Aimaokatalok River	Aim. R.	-	X*	X	X	X	-	X
	Stickleback Outflow	Stickleback OF	-	-	X	X	X	-	X
	Trout Outflow	Trout OF	-	-	X	X	X	-	X
	South #12	S12	-	-	X	-	-	-	-
	South #6	S6	-	-	X	X	-	-	-
	AWRd	AWRd	-	-	X	X	X	-	-
	AWRc	AWRc	-	-	X	X	X	-	X
	Aimaokatalok Lake Outflow	Aim. OF	-	X‡	X	-	X	-	X
Koignuk/Aimaokatalok	Koignuk River	Koig. R.	-	X	X	X	X	-	X
	Koignuk Upstream	Koig. U/S	-	X	X	X	X	-	X
	Koignuk Downstream	Koig. D/S	-	X*	X	X	X	-	X
	AWRb	AWRb	-	-	X	X	X	-	X
	AWRa	AWRa	-	-	X	X	X	-	X
Reference B	Reference Lake B Outflow†	Ref. B OF	-	-	-	-	X	-	-
Reference D	Reference Lake D Outflow†	Ref. D OF	-	-	-	-	X	-	-
Angimajuq	Angimajuq River Reference	Ang. R. Ref.	-	X*	X	-	-	-	-

Notes:

** No samples were collected from these locations because the river was frozen to the bottom or it was unsafe for sampling.*

† These are approved AEMP sites; data presented in this report (as appendices) are supplemental to data presented in the 2010 AEMP report (Rescan 2011).

‡ Water was flowing at the time of winter sampling; samples were collected as surface grabs.

Table 2.1-2. Rationale for Sampling Location Selection, Hope Bay Belt Project, 2010

Watershed	Site Name	Reason for Site Selection
Lake Sites		
Aimaokatalok	Stickleback	In immediate vicinity of proposed footprint; historical sampling location
	Trout	In immediate vicinity of proposed footprint; historical sampling location
	Aim. Stn 13	In immediate vicinity of proposed footprint
	Aim. Stn 2	Within proposed infrastructure footprint (pit/dike); historical sampling location
	Aim. Stn 12	In immediate vicinity of proposed footprint
	Aim. Stn 5	In immediate vicinity of proposed footprint; historical sampling location
	Aim. Stn 11	Downstream of proposed tailings areas
	Aim. Stn 6	Deep location within lake; historical sampling location
Windy	Windy Shallow	Possible drinking water source; historical sampling location
	Windy Deep	Possible drinking water source; historical sampling location
Doris	Wolverine Dike	Within proposed infrastructure footprint (pit/dike)
	Patch Dike	Within proposed infrastructure footprint (pit/dike)
	Imniagut	In immediate vicinity of proposed footprint; historical sampling location
	Little Roberts	AEMP sampling location
Reference B	Ref. B Shallow	Reference site; historical sampling location
	Ref. B Deep	AEMP sampling location; reference site
Reference D	Ref. D	AEMP sampling location; reference site
Stream/River Sites		
East	AWRe	Proposed all-weather road stream crossing
	Aim. NE IF	Major inflow to Aim. Lake; downstream of proposed tailings areas and road crossing; historical sampling location
Aimaokatalok River	Aim. R.	Major inflow to Aim. Lake; historical sampling location
	Stickleback OF	In immediate vicinity of proposed footprint; historical sampling location
	Trout OF	In immediate vicinity of proposed footprint; historical sampling location
	S12	Within proposed tailings area footprint
	S6	Within proposed tailings area footprint
	AWRd	Proposed all-weather road stream crossing
	AWRc	Proposed all-weather road stream crossing
	Aim. OF	Downstream sampling location for proposed Boston infrastructure; historical sampling location
Koignuk/Aimaokatalok	Koig. R.	Downstream sampling location for proposed Boston infrastructure; historical sampling location
	Koig. U/S	Downstream sampling location for proposed Boston infrastructure; historical sampling location
	Koig. D/S	Downstream sampling location for proposed Boston infrastructure; historical sampling location
	AWRb	Proposed all-weather road stream crossing
	AWRa	Proposed all-weather road stream crossing
Reference B	Ref. B OF	AEMP sampling location; reference site; historical sampling location
Reference D	Ref. D OF	AEMP sampling location; reference site
Angimajuq River	Ang. R. Ref.	River reference location; historical sampling location

Table 2.1-3 provides a summary of the sampling details for each aquatic component, including sampling frequency, timing, and replication. Tables 2.1-4 and 2.1-5 present the sampling dates for each lake and stream site. Figures 2.1-1 through 2.1-3 present an overview of the 2010 sampling locations along with the major watersheds in the area. Figures 2.1-4 to 2.1-13 present individual lake maps depicting lake bathymetry (where available) and the 2010 sampling locations.

2.2 LAKE BATHYMETRY

Bathymetric surveys were conducted from a small aluminum boat for six lakes in the area: Imniagut Lake, Stickleback Lake, Trout Lake, Little Roberts Lake, and Reference lakes B and D.

Continuous depth measurements were collected along lateral transects spaced 100 to 300 m apart. Data were also collected from longitudinal transects down the centre of the lake, as well as transects placed perpendicular to the centreline, and around topographical features of interest (e.g., sudden changes in depth). Surveys were conducted with the use of a Garmin GPS Map 526s depth sounder connected to a Trimble XRS Pro GPS unit with 0.5 m horizontal accuracy.

Recorded depths were imported into the ArcGIS software package. Using the 3D Analyst extension, a triangulated irregular network (TIN) was created from the depth sounder data. The TIN was used in the Spatial Analyst extension to create a grid of depth points at a density that matched that of the sounding data along a transect. These depth sounding data points and generated supplemental points were used to interpolate a digital elevation model (DEM) and contours using the TopoToRaster tool. This created smooth contours without altering any 'real' data points.

All bathymetry data were recorded, and are presented, in relation to the water level at the time of the survey. The water level at the time of data collection was also surveyed in relation to an onshore benchmark (Appendix 2.1-1).

2.3 LAKES AND RIVER PHYSICAL LIMNOLOGY

2.3.1 Winter Lake Physical Limnology

Winter dissolved oxygen and temperature profiles were collected in April 2010. To conduct the profiling, a hole was first drilled through the ice with an auger fitted with a 25-cm diameter flute. Once the hole was drilled, a weighted metred line was used to measure the bottom depth. Water column profiling and water quality sampling depths were calculated based on bottom depth.

Temperature and dissolved oxygen profiles were collected from the water column using a YSI meter. At shallower lake stations (<20 m), temperature and dissolved oxygen values were recorded at 0.5 m intervals, while at deeper lake stations (>20 m), values were recorded at 1 m intervals. The profiles ended at approximately 0.5 m above the sediment surface to minimize the disturbance of bottom sediments.

2.3.2 Summer Lake Physical Limnology

Summer dissolved oxygen and temperature profiles and Secchi depths were collected in August 2010. Summer temperature and dissolved oxygen profiles were taken at the same locations as winter profiles, unless new bathymetric data prompted the relocation of a sampling site to a deeper location.

Light attenuation was estimated in each lake using a Secchi disk. Measurements were collected at each site by lowering the disk (20-cm diameter, black and white) on a metred line through the water column on the shaded side of the boat until it disappeared from sight. The depth of disappearance was recorded as the Secchi depth (D_s), which was then used to calculate the depth of the euphotic zone (see formula in Section 2.14-2).

Table 2.1-3. Sampling Details for Physical Limnology, Water Quality, Sediment Quality, and Aquatic Biology, Hope Bay Belt Project, 2010

Monitoring Parameter	Sampling Frequency	Sampling Replication	Sampling Dates/Timing
Lakes			
Winter Limnology			
Dissolved oxygen/temperature profile	1 x	n = 1	April
Summer Limnology			
Dissolved oxygen/temperature profile; Secchi depth	1 x	n = 1	August
Winter Lake Water Quality			
Physical, nutrients, total & dissolved metals	1 x	n = 1 at 1 m below the ice and 2 m above water-sediment interface + 20% replication	April; coincident with winter DO/T profiles
Summer Lake Water Quality			
Physical, nutrients, total & dissolved metals	1 x	n = 1 at 1 m below the surface and 2 m above water-sediment interface + 20% replication	August
Lake Sediment Quality			
Physical, nutrients, metals	1 x	n = 3	August
Summer Phytoplankton			
Biomass (as chlorophyll *a*)	1 x	n = 3 at 1 m below surface	August
Abundance and taxonomy	1 x	n = 3 at 1 m below surface	August
Zooplankton			
Abundance and taxonomy	1 x	n = 3 vertical hauls from 1 m above bottom or horizontal tows of ~10 m	August
Lake Benthos			
Density and taxonomy	1 x	n = 5 composite samples	August
Streams and Rivers			
Winter Limnology			
Dissolved oxygen/temperature profile	1 x	n = 1	April
Winter River Water Quality			
Physical, nutrients, total & dissolved metals	1 x	n = 2	April
Summer Stream and River Water Quality			
Physical, nutrients, total & dissolved metals	3 x	n = 2	freshet (early June), summer (August), fall (September)
Stream and River Sediment Quality			
Physical, nutrients, metals	1 x	n = 3	August
Periphyton			
Biomass (as chlorophyll *a*)	1 x	n = 3	artificial samplers installed in early August; retrieved in early September
Density and taxonomy	1 x	n = 3	artificial samplers installed in early August; retrieved in early September
Stream and River Benthos			
Density and taxonomy	1 x	n = 5 composite samples	August

Table 2.1-4. Lake Sampling Dates, Hope Bay Belt Project, 2010

		Winter		Summer					
Watershed	Lake	DO/Temp	Water Quality	DO/Temp & Secchi Depth	Water Quality	Sediment Quality	Phytoplankton	Zooplankton	Benthos
Aimaokatalok	Stickleback	Apr. 26	Apr. 26 (1)	Aug. 19	Aug. 19 (1)	Aug. 19 (2.5)	Aug. 19	Aug. 19 (horiz.)	Aug. 19 (2.5)
	Trout	Apr. 26	Apr. 26 (1)	Aug. 16	Aug. 15 (1)	Aug. 16 (2.5)	Aug. 15	Aug. 21 (horiz.)	Aug. 16/17 (2.5)
	Aim. Stn 13	NC	NC	Aug. 13	Aug. 13 (1)	Aug. 14 (3.7)	Aug. 13	Aug. 13 (horiz.)	Aug. 14/15 (3.8)
	Aim. Stn 2	NC	NC	Aug. 18	NC	Aug. 18 (3)	NC	NC	Aug. 18 (3)
	Aim. Stn 12	NC	NC	Aug. 21	NC	Aug. 22 (0.3)	NC	NC	Aug. 21/22 (0.3)
	Aim. Stn 5	Apr. 25	Apr. 25 (1)	Aug. 12	Aug. 12 (1)	Aug. 12 (2.5)	Aug. 12	Aug. 12 (horiz.)	Aug. 12 (2.5)
	Aim. Stn 11	Apr. 25	Apr. 25 (1)	Aug. 16	Aug. 15 (1)	Aug. 17 (2.5)	Aug. 15	Aug. 22 (horiz.)	Aug. 17 (2.5)
	Aim. Stn 6	Apr. 25	Apr. 25 (1, 26)	Aug. 14	Aug. 14 (1, 26)	Aug. 14 (28)	Aug. 14	Aug. 14 (26)	Aug. 14 (28)
Windy	Windy Shallow	NC	NC	NC	NC	Aug. 23 (3)	NC	NC	Aug. 23 (3)
	Windy Deep	Apr. 19	Apr. 19 (2.8, 16)	Aug. 21	Aug. 21 (1, 16)	Aug. 22 (17)	Aug. 21	Aug. 21 (16)	Aug. 22 (17)
Doris	Wolverine Dike	NC	NC	NC	NC	Aug. 27/29 (2.5)	NC	NC	Aug. 27/29 (2.5)
	Patch Dike	NC	NC	NC	NC	Aug. 26 (3.5)	NC	NC	Aug. 26 (3.5)
Reference B	Ref. B Shallow	NC	NC	NC	NC	Aug. 23 (5.5)	NC	NC	Aug. 23 (5.5)
	Ref. B Deep	NI	NI	NI	NI	NI	Aug. 24	Aug. 25 (8.5)	NI
Reference D	Ref. D	NI	NI	NI	NI	NI	Aug. 11	Aug. 11 (horiz.)	NI

Notes:

Values in parentheses are the approximate sampling depths in metres. Horiz. = horizontal tow.

DO - dissolved oxygen

NC - not collected

NI - not included as these were part of the 2010 AEMP report (Rescan 2011)

Table 2.1-5. Stream and River Sampling Dates, Hope Bay Belt Project, 2010

		Winter		Summer						
				Water Quality			Sediment	Periphyton		
Watershed	Stream/River	DO/Temp	Water Quality	Freshet (June)	Aug	Sept	Quality	Installation	Retrieval	Benthos
East	AWRe	NC	NC	Jun. 18	Aug. 16	Sept. 16	Aug. 16	NC	NC	NC
	Aim. NE IF	NC	NC	Jun. 18	Aug. 16	Sept. 16	Aug. 16	Aug. 10	Sept. 7	Aug. 16
Aimaokatalok River	Aim. R.	NC	(Apr. 26)*	Jun. 18	Aug. 21	Sept. 16	Aug. 18	Aug. 10	Sept. 8	Aug. 18
	Stickleback OF	NC	NC	Jun. 18	Aug. 16	Sept. 16	Aug. 16	Aug. 10	Sept. 8	Aug. 16
	Trout OF	NC	NC	Jun. 18	Aug. 16	Sept. 16	Aug. 16	Aug. 10	Sept. 8	Aug. 16
	S12	NC	NC	Jun. 18	NC	Sept. 16	NC	NC	NC	NC
	S6	NC	NC	Jun. 18	Aug. 18	Sept. 16	Aug. 18	NC	NC	NC
	AWRd	NC	NC	Jun. 18	Aug. 16	Sept. 16	Aug. 16	Aug. 10	Sept. 7	NC
	AWRc	NC	NC	Jun. 18	Aug. 15	Sept. 16	Aug. 15	Aug. 10	Sept. 7	Aug. 15
	Aim. OF	NC	Apr. 25‡	Jun. 18	Aug. 16	Sept. 16	NC	Aug. 10	Sept. 8	Aug. 16
Koignuk/Aimaokatalok	Koig. R.	Apr. 25	Apr. 25	Jun. 18	Aug. 18	Sept. 16	Aug. 18	Aug. 10	Sept. 8	Aug. 18
	Koig. U/S	Apr. 18	Apr. 18	Jun. 17	Aug. 14	Sept. 15	Aug. 14	Aug. 10	Sept. 7	Aug. 14
	Koig. D/S	NC	(Apr. 19 & 23)*	Jun. 17	Aug. 14	Sept. 15	Aug. 14	Aug. 10	Sept. 7	Aug. 14
	AWRb	NC	NC	Jun. 18	Aug. 15	Sept. 15	Aug. 15	Aug. 10	Sept. 7	Aug. 15
	AWRa	NC	NC	Jun. 18	Aug. 15	Sept. 15	Aug. 15	Aug. 10	Sept. 7	Aug. 15
Reference B	Ref. B OF	NC	NC	NI	NI	NI	NI	Aug. 9	Sept. 7	NI
Reference D	Ref. D OF	NC	NC	NI	NI	NI	NI	Aug. 10	Sept. 9	NI
Angimajuq River	Ang. R. Ref.	NC	(Apr. 18)†	Jun. 19	NC	Sept. 15	NC	NC	NC	NC

Notes:

DO - dissolved oxygen

NC - not collected

NI - not included as these were part of the 2010 AEMP report (Rescan 2011)

** River was frozen to the bottom at time of sampling; no samples were collected.*

† *Surface flow at this site prohibited safe sampling; no samples were collected.*

‡ *Water was flowing at this site at the time of winter sampling; samples were collected as surface grabs.*

2.3.3 Winter River Physical Limnology

Winter river dissolved oxygen and temperature profiles were collected in April 2010. To access the water, a 15-cm diameter hole was drilled through the surface ice using an auger. Ice occasionally extended to the river bottom because some sampling sites were less than 2 m deep (the approximate ice thickness in the area). If little or no water was found on initial drilling, additional holes were drilled based on the topography of the river ice and basic river dynamics. Under-ice dissolved oxygen and temperature readings were collected at 0.5 m depth intervals using a YSI meter.

2.4 LAKE WATER QUALITY

2.4.1 Winter Lake Water Quality

Winter lake water quality samples were collected in mid to late April 2010. Under-ice samples collected in April reflect the late winter 'worst case scenario' for water quality (i.e., limited biological uptake, therefore highest annual concentrations), which makes this time period important to characterize. All water quality samples were compared to guidelines for the protection of freshwater aquatic life published by the Canadian Council of Ministers of the Environment (CCME 2007).

Lake water quality samples were collected with a modified, 2.5 L skinny Niskin bottle in winter. The Niskin bottles were acid-cleaned at ALS Environmental Services (ALS), Burnaby, BC, and contained acid-cleaned silicone to avoid metal contamination. A dual rope system was used for bottle closure and to ensure the collection of discrete samples.

Water quality samples were collected from the same locations as physical limnology measurements. Two depths were sampled: shallow depth (1 m below the ice) and deep depth (2 m from the bottom). One sample was collected at each depth, with 20% replication. The Niskin was lowered on a metred cord to the desired sampling depth and was triggered closed by a teflon-coated messenger released from the surface. Water from the Niskin was transferred into the appropriate sample containers. Preservatives were added to total metals (ultra-pure nitric acid), total organic carbon (TOC; hydrochloric acid), and total Kjeldahl nitrogen (TKN; sulphuric acid) sample containers.

All water samples were kept cold and sent to ALS in Yellowknife on the first available flight out of camp. Samples were then sent to ALS's Burnaby, BC, laboratory where the lowest metal detection limits are available. Dissolved metals samples were filtered by ALS in their Burnaby laboratory to avoid contamination issues related to field filtration. All water samples were analyzed for general physical parameters, nutrients, TOC, and total and dissolved metals. A full list of analyzed parameters including analytical detection limits is presented in Table 2.4-1.

Method detection limits were lower than, or equal to, the CCME guidelines for the protection of aquatic life. Realized detection limits were occasionally higher than the method detection limit presented in Table 2.4-1. This occurred when dilution of a sample was required to compensate for other interfering parameters. Realized detection limit ranges are indicated on all relevant figures in this report.

2.4.2 Summer Lake Water Quality

Summer water quality samples were collected in August 2010, using metal-clean techniques. An acid-cleaned and teflon-lined 5 L GO-FLO bottle was used for water collection. The GO-FLO was lowered on a metred cord to a depth 0.5 m lower than the desired sampling depth before being raised to the sampling depth and closed with the use of a weighted messenger. The water collected was used to triple-rinse the laboratory-provided sample containers, before filling and preserving them as described for winter lake water quality (Section 2.4.1).

PROJECT #1009-002-05 GIS # HB-01-029a November 29 2011

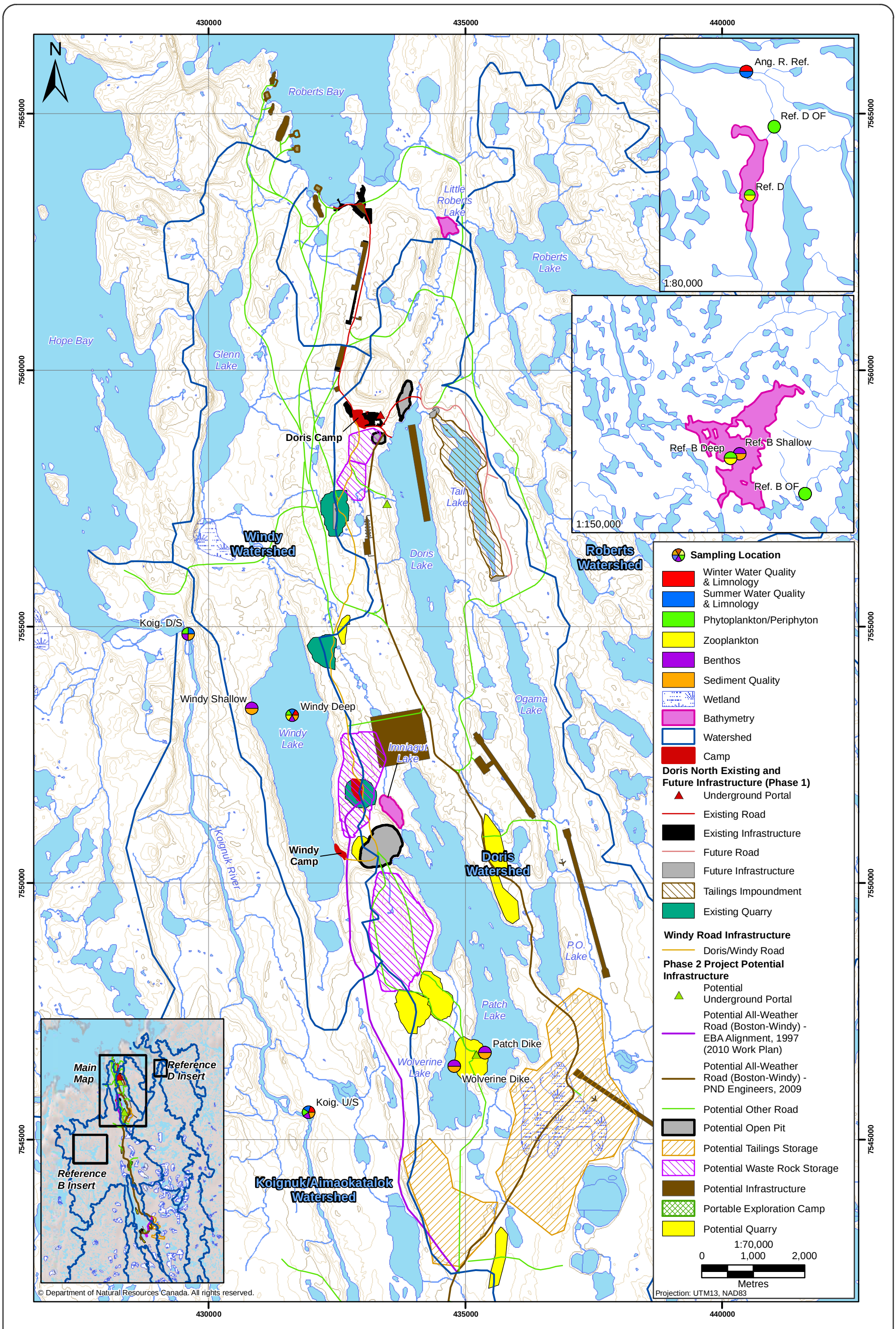


Figure 2.1-1

NEWMONT NORTH AMERICA

2010 Bathymetry, Water Quality, Sediment Quality and Aquatic Biology Sampling Locations, Hope Bay Belt Project, North End of the Belt

Figure 2.1-1

Rescan™ Engineers & Scientists

PROJECT #1009-002-05 GIS # HB-01-029b December 7, 2010

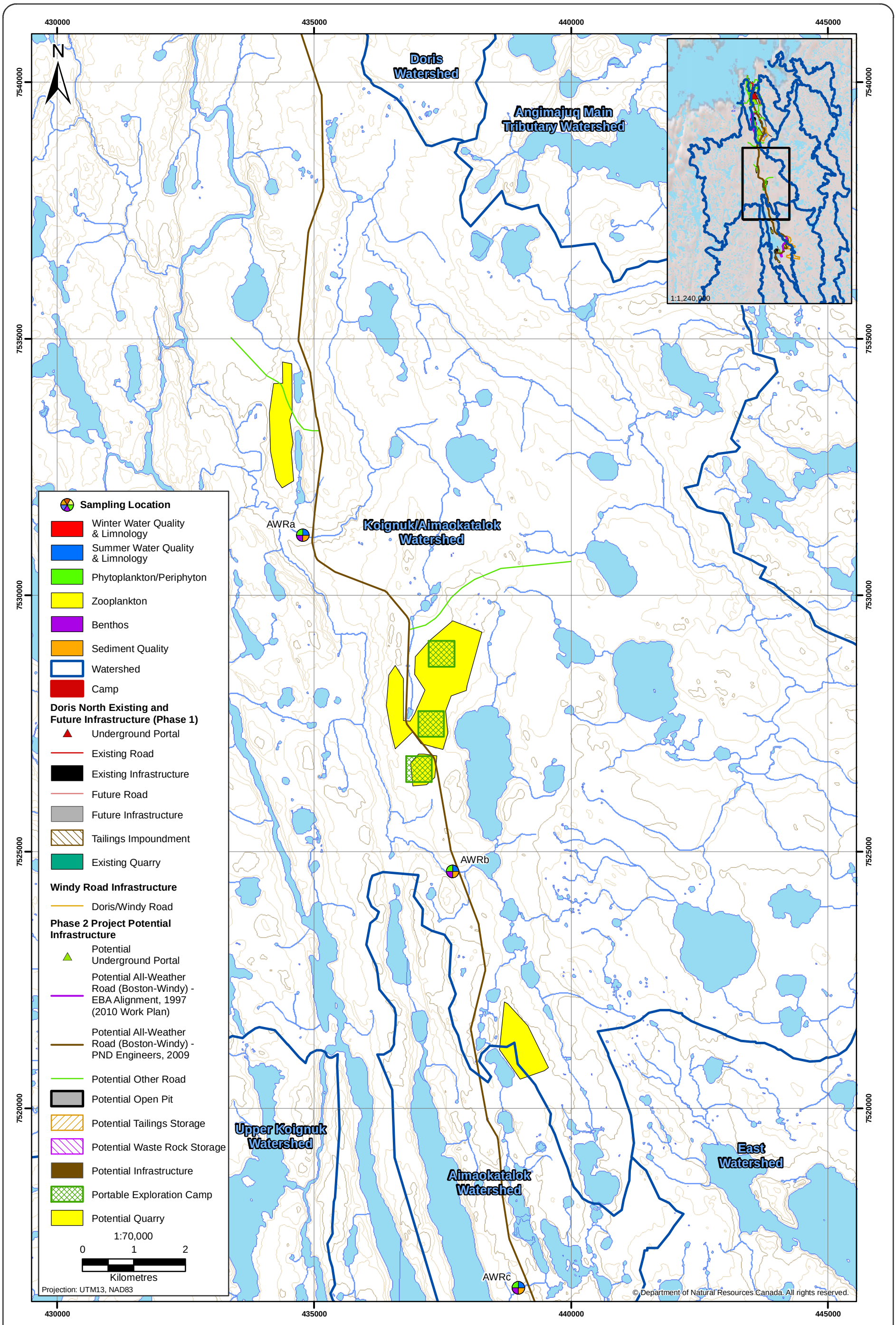


Figure 2.1-2

NEWMONT NORTH AMERICA

2010 Bathymetry, Water Quality, Sediment Quality and Aquatic Biology Sampling Locations, Hope Bay Belt Project, Central Area of the Belt

Figure 2.1-2

Rescan™ Engineers & Scientists

PROJECT #1009-002-05 GIS # HB-01-029c December 01 2011

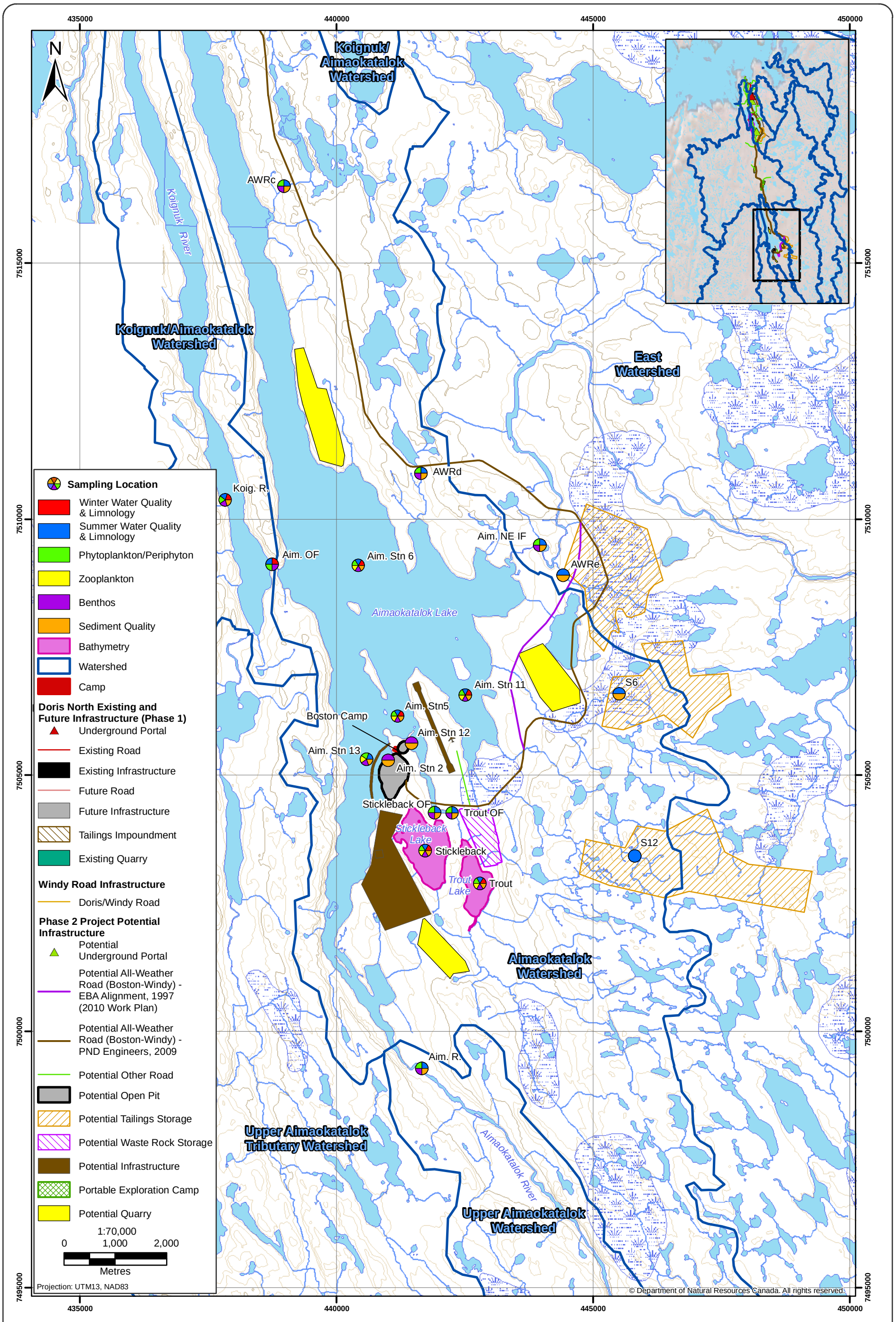


Figure 2.1-3

NEWMONT NORTH AMERICA

2010 Bathymetry, Water Quality, Sediment Quality and Aquatic Biology Sampling Locations, Hope Bay Belt Project, South End of the Belt

Figure 2.1-3

Rescan™ Engineers & Scientists

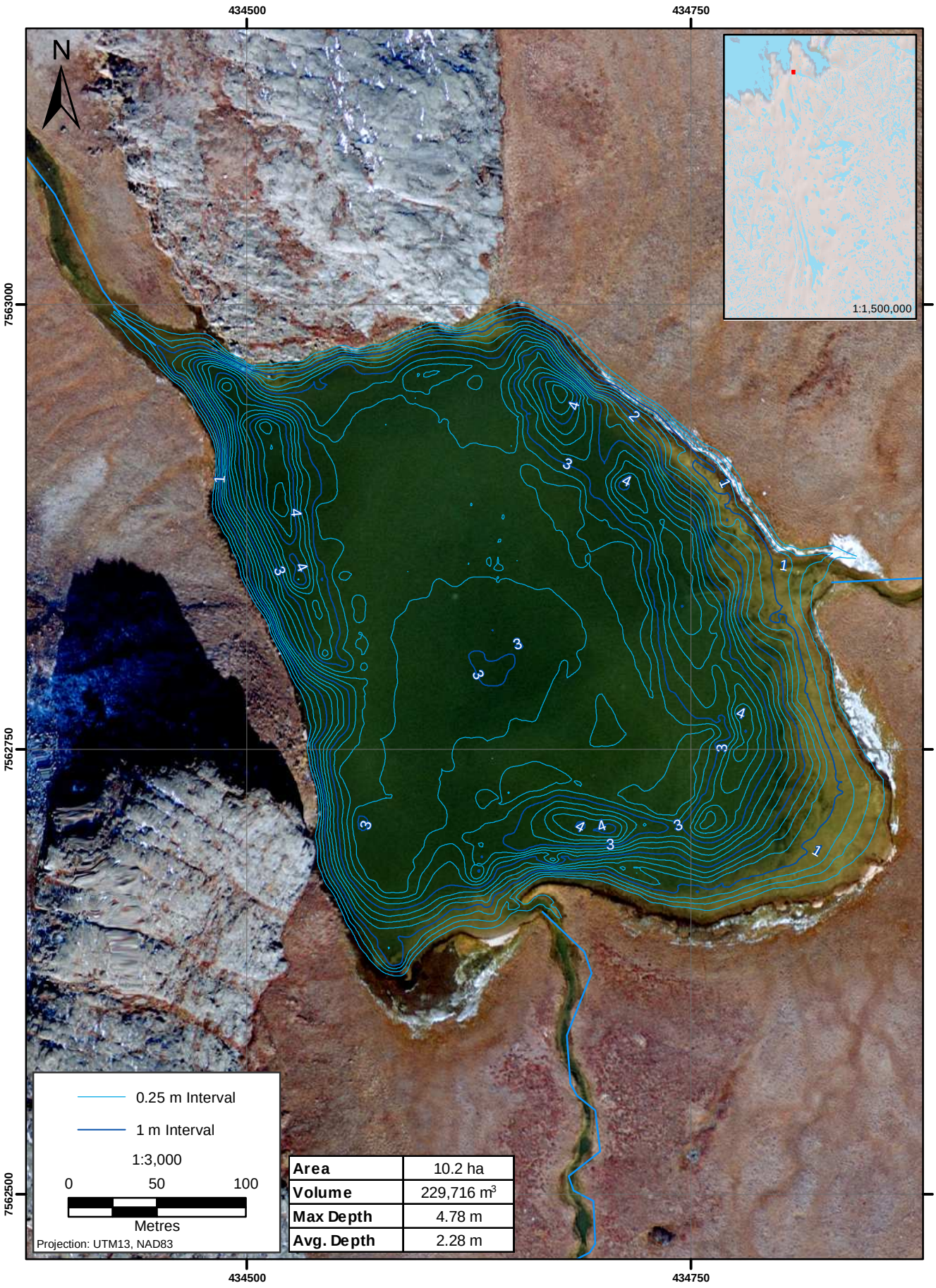
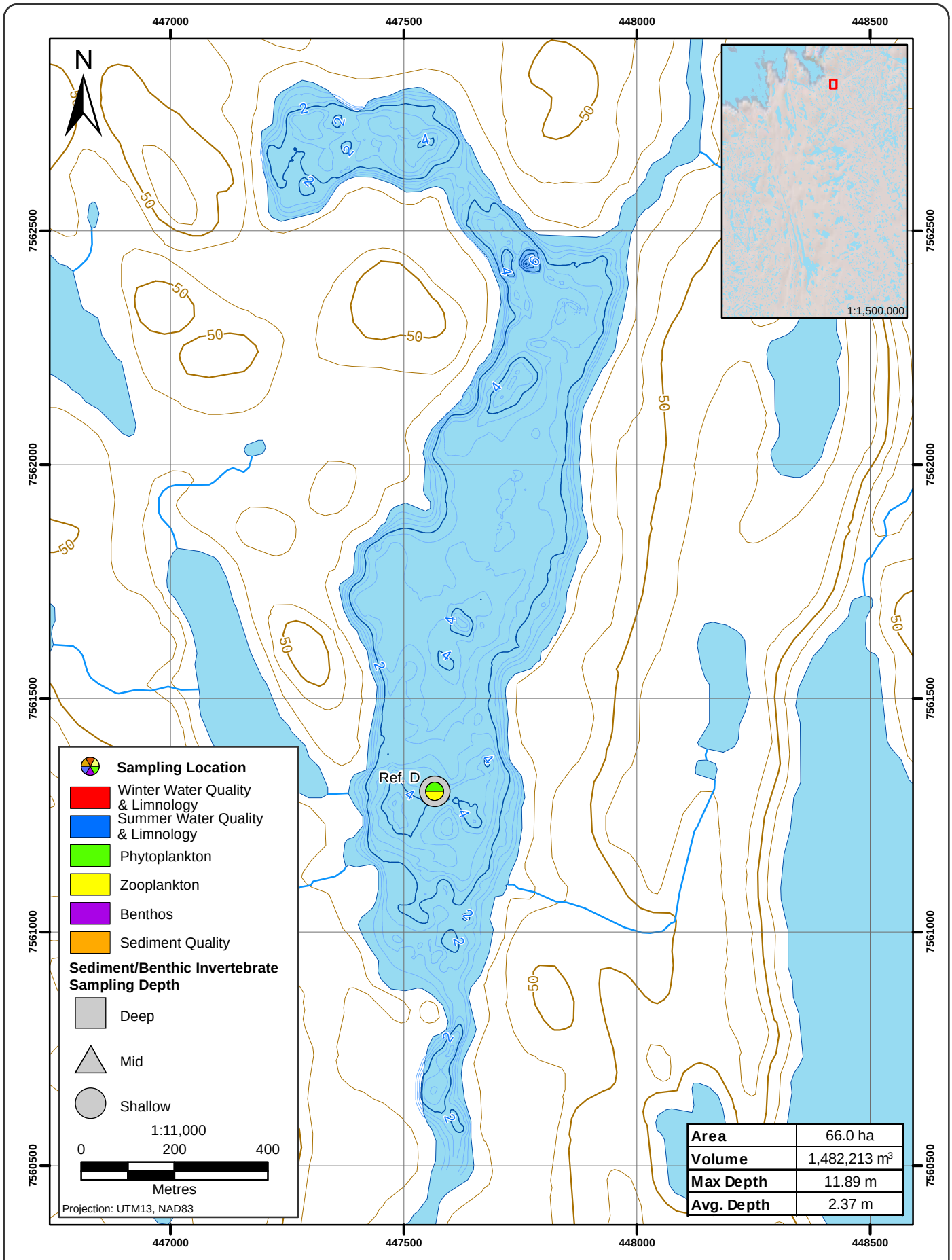


Figure 2.1-4

2010 Bathymetry for Little Roberts Lake

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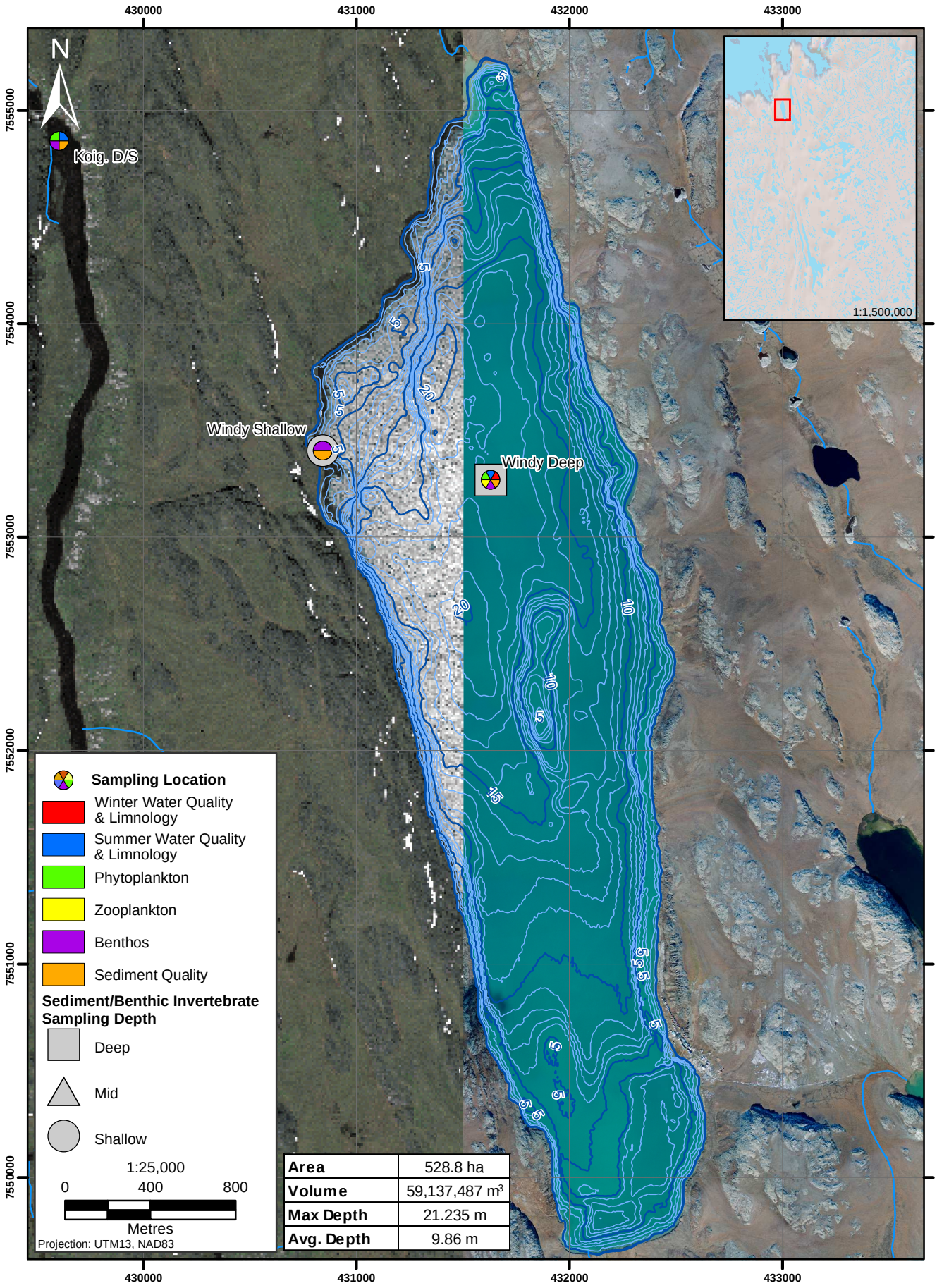


2010 Environmental Sampling Locations for Reference Lake D

Figure 2.1-5

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2010 Environmental Sampling Locations for Windy Lake

Figure 2.1-6

Rescan Engineers & Scientists

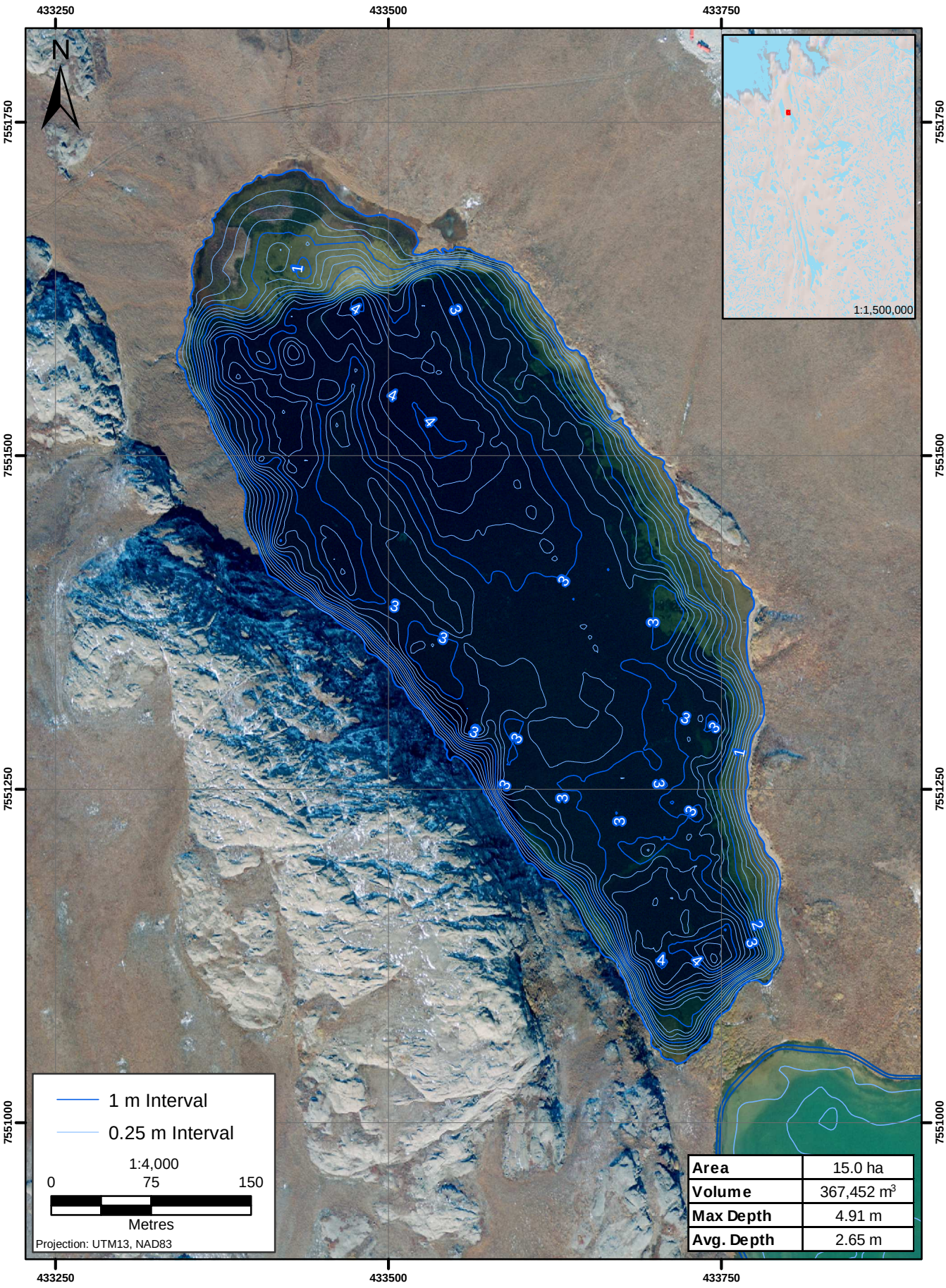
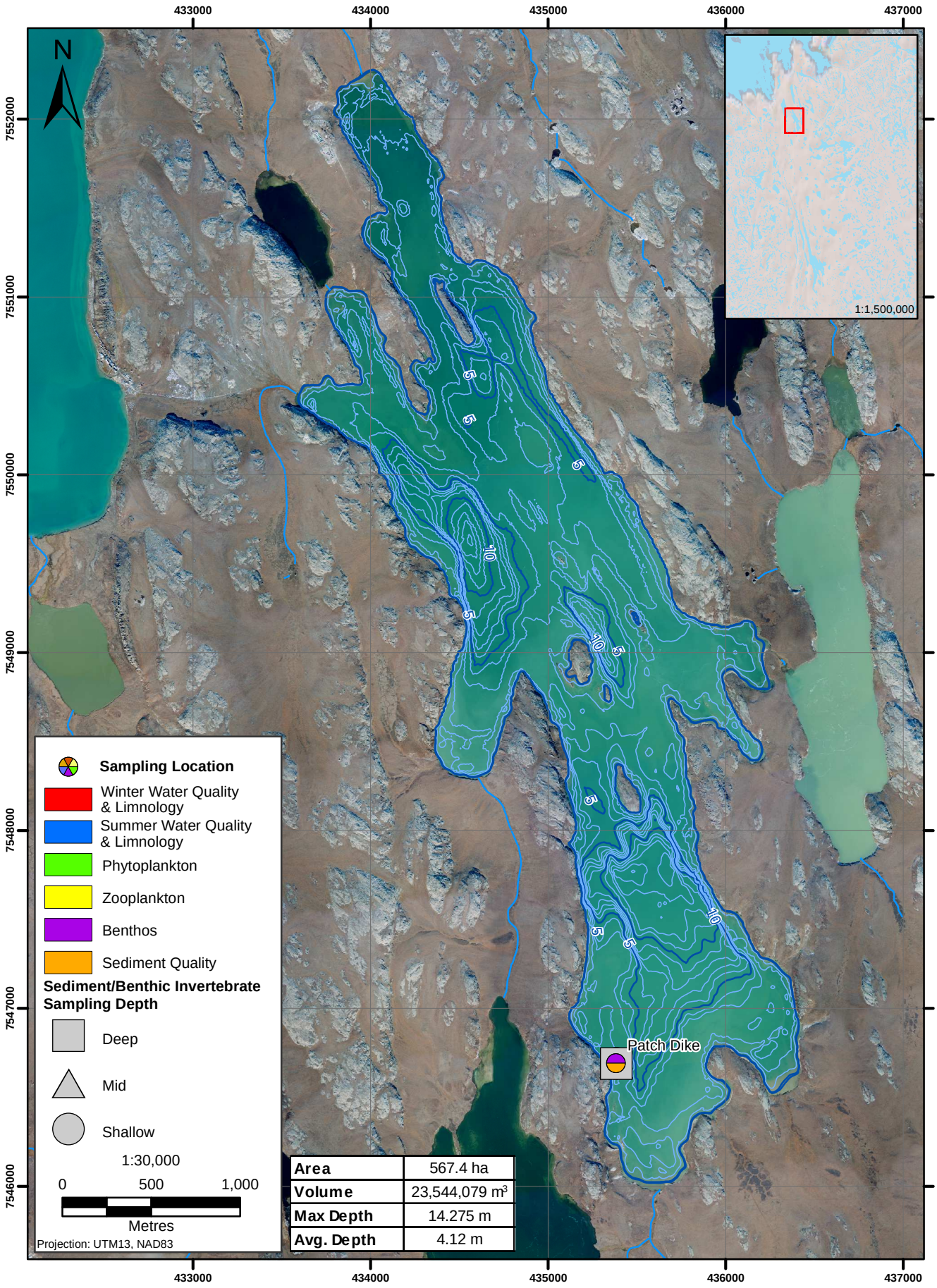


Figure 2.1-7

2010 Bathymetry for Imniagut Lake

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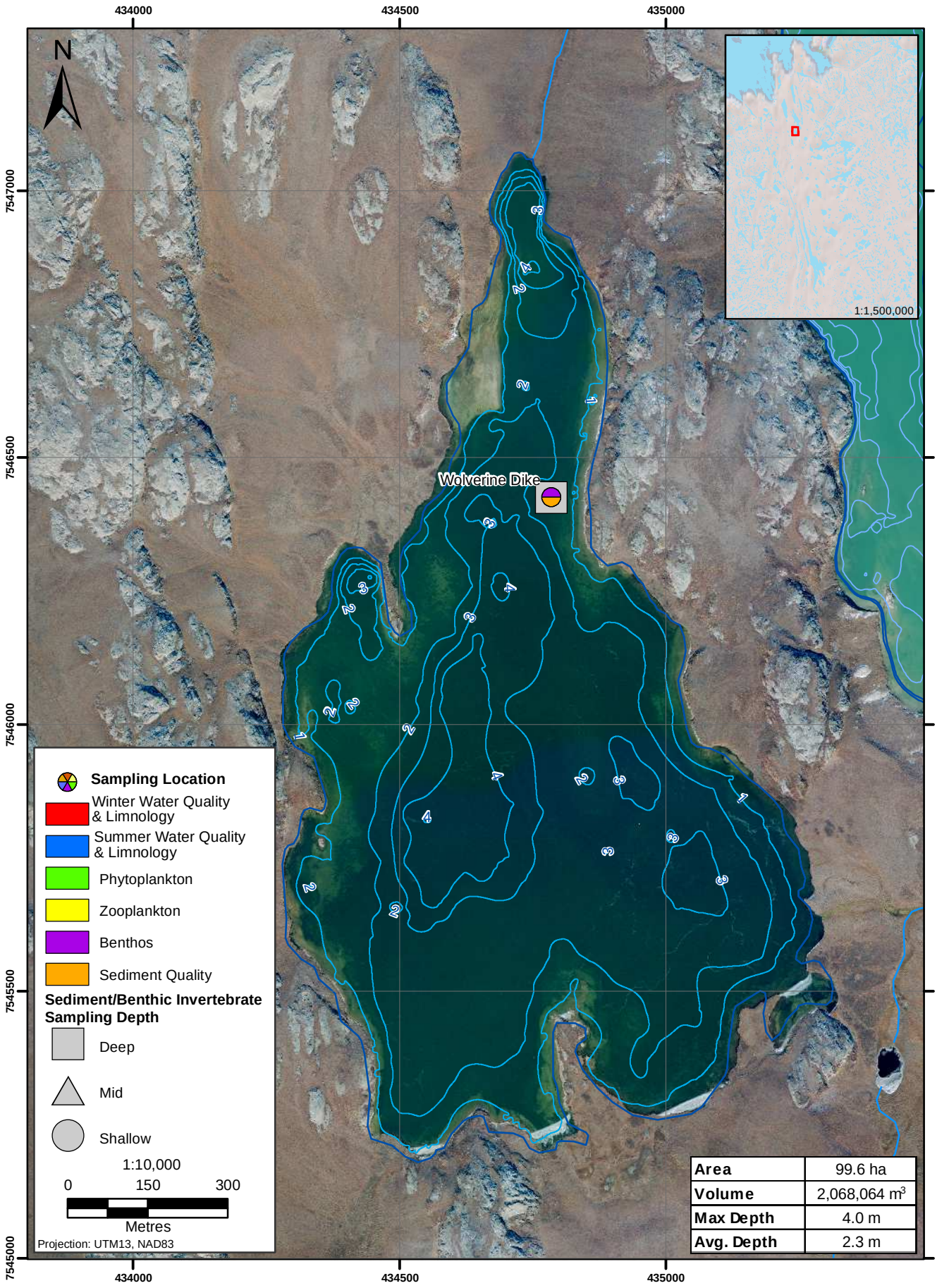


NEWMONT The Gold Company

2010 Environmental Sampling Locations for Patch Lake

Figure 2.1-8

Rescan Engineers & Scientists



2010 Environmental Sampling Locations for Wolverine Lake

Figure 2.1-9

NEWMONT The Gold Company

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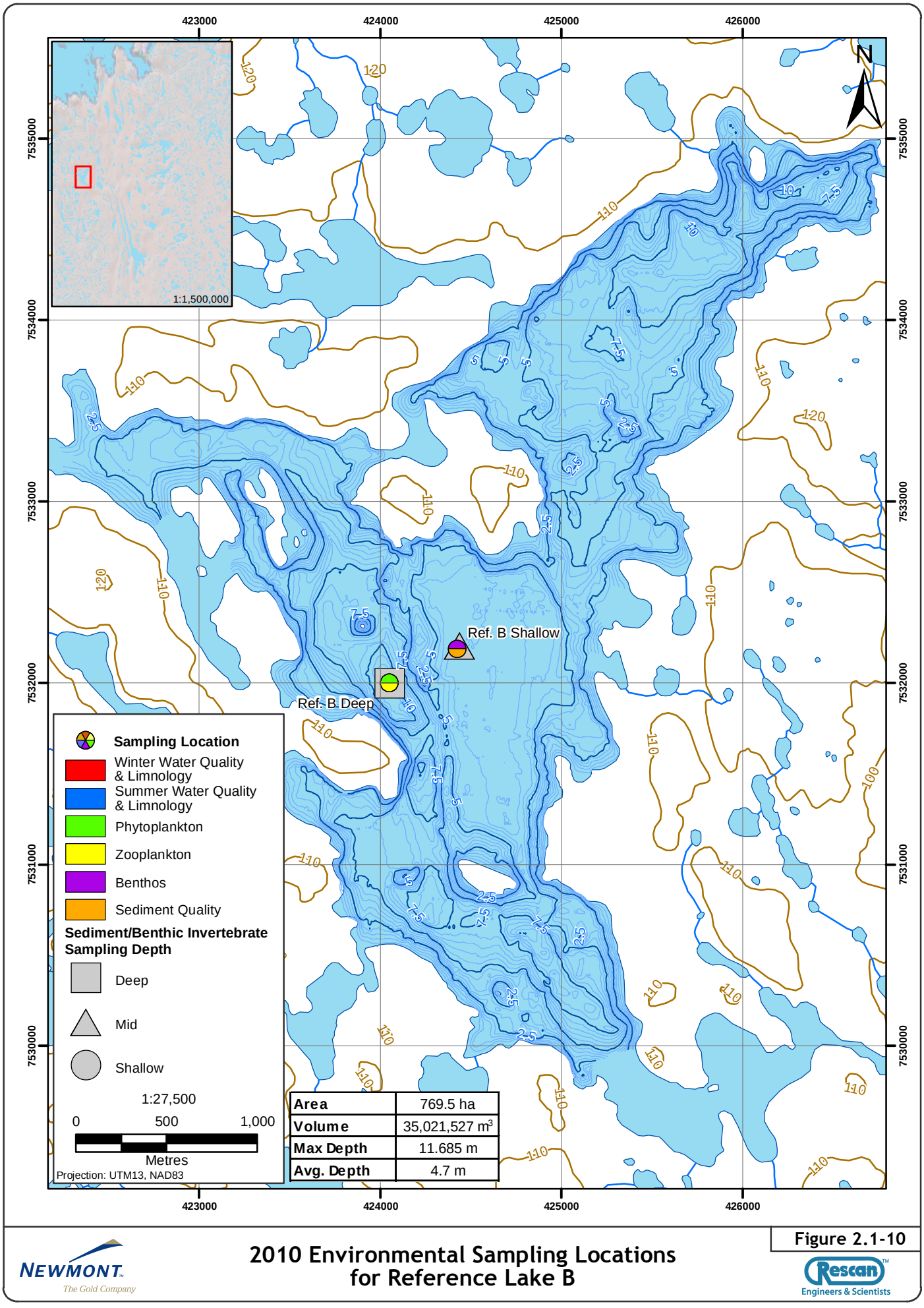
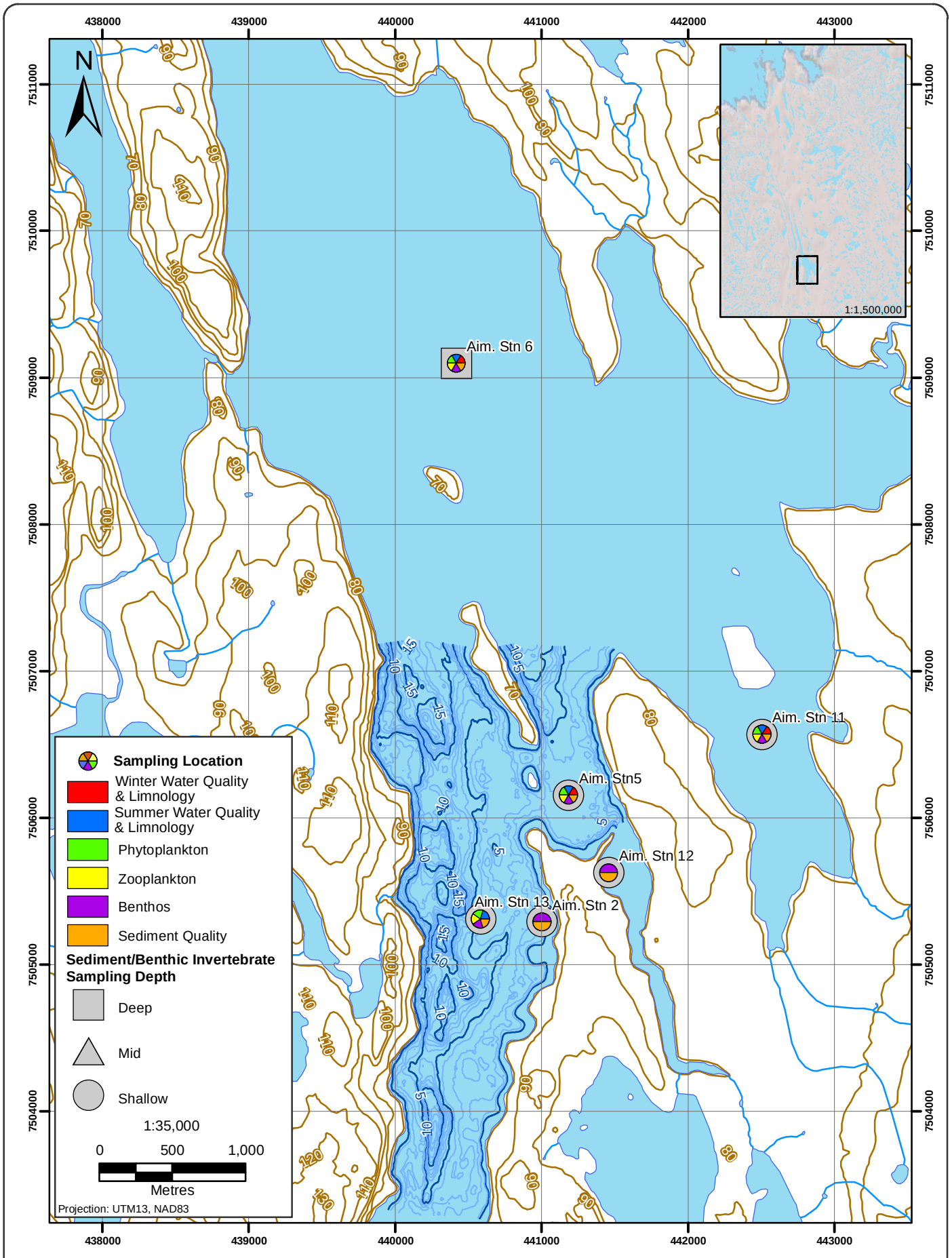


Figure 2.1-10

2010 Environmental Sampling Locations for Reference Lake B

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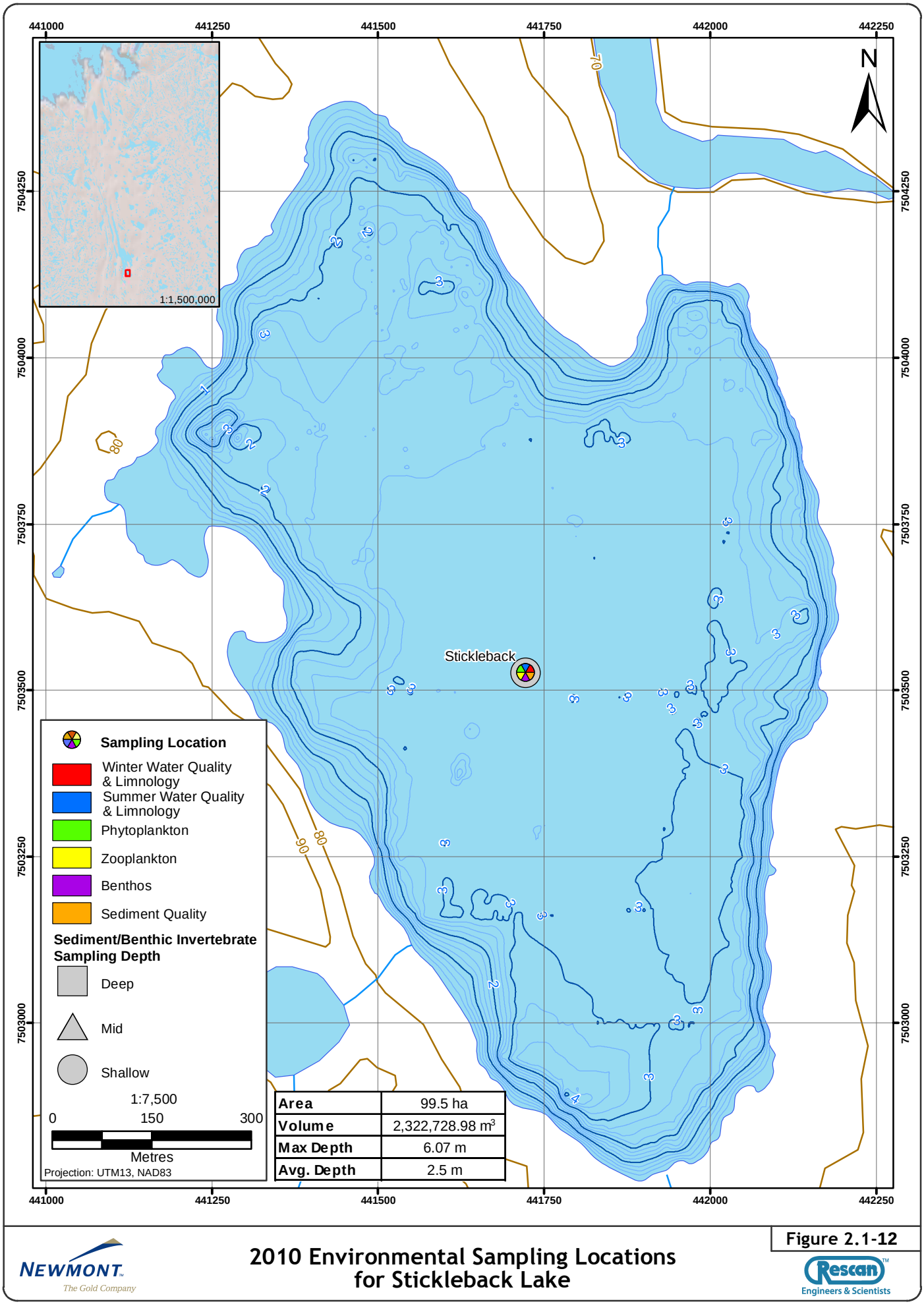


NEWMONT The Gold Company

2010 Environmental Sampling Locations for Aimaokatalok Lake

Figure 2.1-11

Rescan Engineers & Scientists

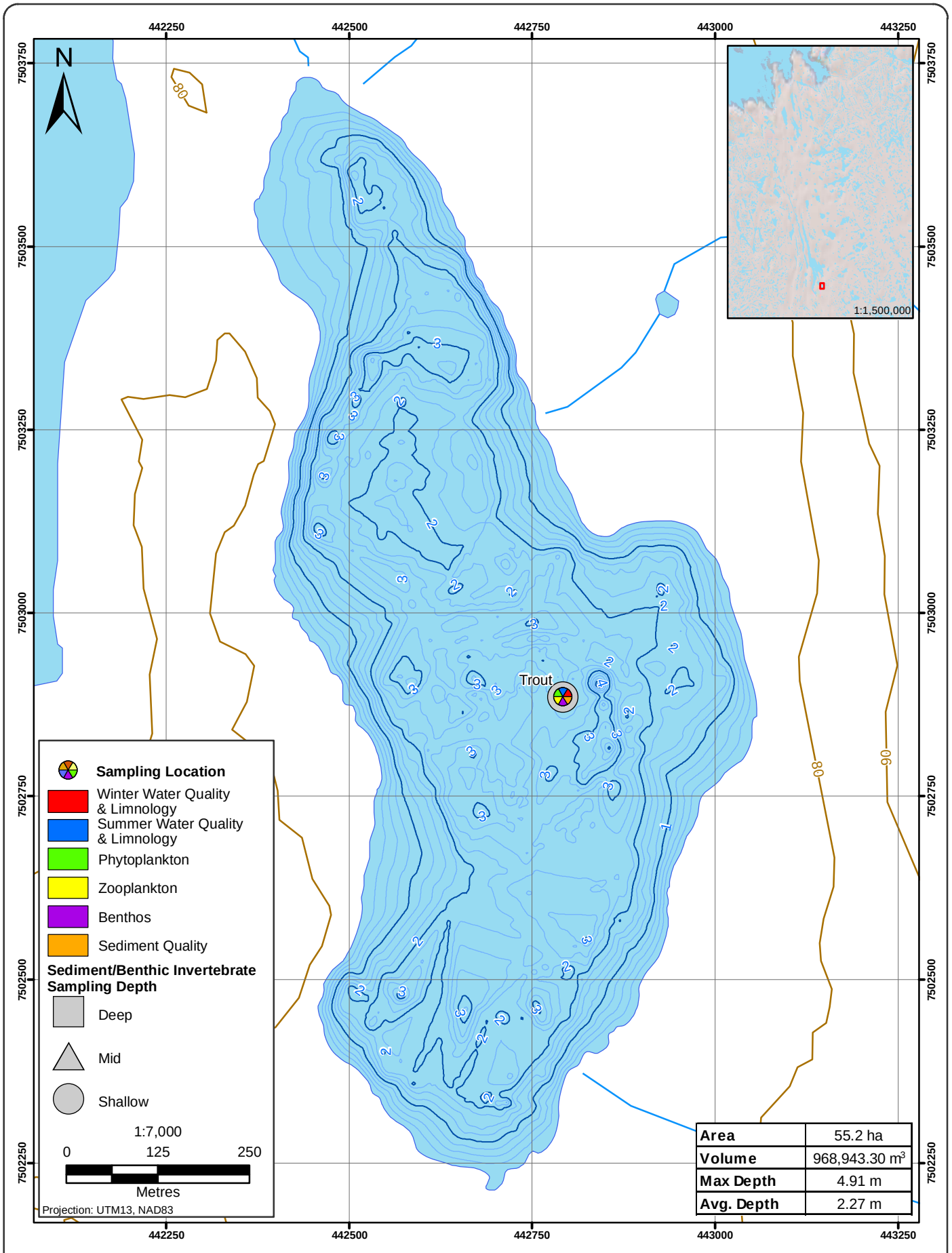


NEWMONT The Gold Company

2010 Environmental Sampling Locations for Stickleback Lake

Figure 2.1-12

Rescan Engineers & Scientists



NEWMONT The Gold Company

2010 Environmental Sampling Locations for Trout Lake

Figure 2.1-13

Rescan Engineers & Scientists

Table 2.4-1. Water Quality Parameters and Method Detection Limits, Hope Bay Belt Project, 2010

Parameter	Units	Detection Limit	Parameter	Units	Detection Limit
Physical Tests			***Total and Dissolved Metals***	***(cont'd)***	
Conductivity	µS/cm	2	Cadmium (Cd)	mg/L	0.000005
Hardness (as $CaCO_3$)	mg/L	0.5	Calcium (Ca)	mg/L	0.02
pH	pH units	0.1	Chromium (Cr)	mg/L	0.0002
Total Suspended Solids	mg/L	3	Cobalt (Co)	mg/L	0.00005
Total Dissolved Solids	mg/L	10	Copper (Cu)	mg/L	0.0001
Turbidity	NTU	0.1	Iron (Fe)	mg/L	0.01
Anions and Nutrients			Lead (Pb)	mg/L	0.00005
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	2	Lithium (Li)	mg/L	0.0002
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	2	Magnesium (Mg)	mg/L	0.005
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	2	Manganese (Mn)	mg/L	0.00005
Alkalinity, Total (as $CaCO_3$)	mg/L	2	Mercury (Hg)	mg/L	0.00001
Ammonia (as N)	mg/L	0.005	Molybdenum (Mo)	mg/L	0.00005
Bromide (Br)	mg/L	0.05	Nickel (Ni)	mg/L	0.0001
Chloride (Cl)	mg/L	0.5	Phosphorus (P)	mg/L	0.3
Fluoride (F)	mg/L	0.02	Potassium (K)	mg/L	0.05
Nitrate (as N)	mg/L	0.005	Selenium (Se)	mg/L	0.0002
Nitrite (as N)	mg/L	0.001	Silicon (Si)	mg/L	0.05
Total Kjeldahl Nitrogen	mg/L	0.05	Silver (Ag)	mg/L	0.000005
Ortho Phosphate (as P)	mg/L	0.001	Sodium (Na)	mg/L	0.01
Total Phosphorus	mg/L	0.002	Strontium (Sr)	mg/L	0.00005
Sulphate (SO_4)	mg/L	0.5	Thallium (Tl)	mg/L	0.000002
Total and Dissolved Metals			Tin (Sn)	mg/L	0.0001
Aluminum (Al)	mg/L	0.001	Titanium (Ti)	mg/L	0.0002
Antimony (Sb)	mg/L	0.00001	Uranium (U)	mg/L	0.000002
Arsenic (As)	mg/L	0.00005	Vanadium (V)	mg/L	0.00005
Barium (Ba)	mg/L	0.00005	Zinc (Zn)	mg/L	0.001
Beryllium (Be)	mg/L	0.000005	***Organic Parameters***		
Bismuth (Bi)	mg/L	0.00005	Total Organic Carbon	mg/L	0.2
Boron (B)	mg/L	0.001			

Samples were collected at shallow (1 m depth) and deep (2 m above the water-sediment interface) depths within the water column. A single sample was collected at each depth, with 20% replication. Replicate samples were collected 5 to 20 m apart from each other by leaving slack in the anchor line and allowing the boat to drift. All water samples were transported and analyzed as described for winter lake water quality (Section 2.4.1).

2.5 LAKE SEDIMENT QUALITY

Lakes were sampled for sediment quality during August 2010 (Table 2.1-5). Lakes within three different watersheds were sampled. Within each lake, samples were collected from either one or two of the following depth strata: shallow depth (0 to 5 m), mid depth (5 to 10 m), and/or deep depth (>10 m). Triplicate samples were collected from each depth strata sampled.

An Ekman grab sampler (surface area of 0.0225 m^2) was used to collect two grabs per sample, to ensure enough sediment was obtained for all of the required analyses.

Each sediment sample was carefully transferred onto a white plastic tray, photographed, and described for colour, texture, and other characteristics. The surface 2 cm of sediment was then collected. All sediment quality samples were recorded on a chain of custody form and sent to ALS in Yellowknife. Samples were then sent to ALS's Burnaby laboratory for analysis of grain size, moisture, nutrients, and solid-phase metals. Table 2.5-1 presents the sediment quality parameters that were analyzed and their method detection limits (note that realized detection limits may differ from these theoretical values; realized detection limit ranges are indicated on all relevant figures).

Table 2.5-1. Sediment Quality Parameters and Method Detection Limits, Hope Bay Belt Project, 2010

Parameter	Units	Detection Limit	Parameter	Units	Detection Limit
Physical Tests			***Metals***	***(cont'd)***	
% Moisture	%	0.1	Calcium (Ca)	mg/kg	50
pH	pH	0.1	Chromium (Cr)	mg/kg	2
Particle Size			Cobalt (Co)	mg/kg	2
% Gravel (>2 mm)	%	0.1	Copper (Cu)	mg/kg	1
% Sand (2.0 mm - 0.063 mm)	%	0.1	Iron (Fe)	mg/kg	50
% Silt (0.063 mm – 4 µm)	%	0.1	Lead (Pb)	mg/kg	2
% Clay (<4 µm)	%	0.1	Lithium (Li)	mg/kg	2
Leachable Anions & Nutrients			Magnesium (Mg)	mg/kg	50
Total Nitrogen	%	0.02	Manganese (Mn)	mg/kg	1
Organic / Inorganic Carbon			Mercury (Hg)	mg/kg	0.005
Total Organic Carbon	%	0.1	Molybdenum (Mo)	mg/kg	0.2
Plant Available Nutrients			Nickel (Ni)	mg/kg	5
Available Ammonium (as N)	mg/kg	0.8	Phosphorus (P)	mg/kg	50
Available Nitrate (as N)	mg/kg	2	Potassium (K)	mg/kg	200
Available Nitrite (as N)	mg/kg	0.4	Selenium (Se)	mg/kg	0.5
Available Phosphate (as P)	mg/kg	2	Silver (Ag)	mg/kg	0.1
Metals			Sodium (Na)	mg/kg	200
Aluminum (Al)	mg/kg	50	Strontium (Sr)	mg/kg	0.5
Antimony (Sb)	mg/kg	10	Sulphur (S)	mg/kg	100
Arsenic (As)	mg/kg	0.05	Thallium (Tl)	mg/kg	0.5
Barium (Ba)	mg/kg	1	Tin (Sn)	mg/kg	5
Beryllium (Be)	mg/kg	0.5	Titanium (Ti)	mg/kg	1
Bismuth (Bi)	mg/kg	20	Vanadium (V)	mg/kg	2
Cadmium (Cd)	mg/kg	0.1	Zinc (Zn)	mg/kg	1

2.6 PHYTOPLANKTON

Phytoplankton biomass, density, and taxonomy samples were collected from lakes during August 2010 concurrently with water quality and zooplankton samples. Samples were collected 1 m below the surface using a 5 L GO-FLO bottle. Triplicate samples were collected 5 to 20 m apart for phytoplankton biomass (as chlorophyll *a*), abundance, and taxonomy. Phytoplankton biomass samples were filtered onto 0.45 µm pore size, nitrocellulose filters back in camp. The filters were wrapped in aluminum foil and kept frozen until they were sent to ALS Burnaby for analysis. Taxonomy and density samples were

also collected in triplicate (1 L plastic bottles) at each site. These samples were preserved with Lugol's iodine solution and sent to G3 Consulting Ltd. in Surrey, BC, for enumeration and identification.

2.7 ZOOPLANKTON

Zooplankton samples were collected from lakes concurrently with phytoplankton and water quality samples during August 2010. At each sampling site, three samples were collected using vertical hauls unless the water depth was too shallow, in which case a horizontal tows were conducted. The vertical hauls were conducted by lowering a net (118 µm mesh size, 30-cm diameter) to within 1 to 2 m of the lake bottom and bringing it to the surface at a speed of approximately 0.5 m/s. An internally mounted flowmeter (General Oceanics; model 2030R) was used to record the volume of water passing through the net during all hauls. Replicate samples were collected 5 to 20 m apart. Taxonomic samples were preserved with 5% buffered formalin and sent to G3 Consulting Ltd. in Surrey, BC, for enumeration and identification.

2.8 LAKE BENTHOS

Lake benthos samples were collected concurrently with lake sediment quality samples during August 2010. Benthos samples were collected from the same depth zones and locations as the sediment samples.

Five replicate samples, each consisting of a composite of three Ekman grab samples (surface area of (0.0225 m^2), were collected at each sampling location. Replicate samples were collected approximately 20 m apart if possible. Samples were gently sieved in the field using a 500 µm sieve bucket and were preserved in 10% buffered formalin. Samples were sent to Dr. Jack Zloty in Summerland, BC, for enumeration and identification.

2.9 STREAM AND RIVER WATER QUALITY

2.9.1 Winter Stream and River Water Quality

Under-ice water quality samples were collected in April 2010 at river sites where water was present (i.e., ice did not reach the river bed). This was attempted at Aim. R., Aim. OF, Koig. R., Koig. U/S, Koig. D/S, and Ang. R. Ref. using the holes drilled for physical limnology measurements.

If sufficient under-ice water was found, a clean narrow-necked collection bottle attached to a 3 m pole was lowered into the hole to base of the ice layer and allowed to fill passively. The collected water was used to fill the required clean sample containers.

All water samples were transported and analyzed as described for winter lake water quality (Section 2.4-1).

2.9.2 Summer Stream and River Water Quality

Stream and river water quality samples were collected three times during the open-water season: the freshet period (June), the low-flow summer period (August), and the higher-flow fall period (September).

Stream water samples were collected using clean techniques. For each sample, sampling personnel stood facing upstream to minimize sample contamination by disturbed sediments. Capped bottles were plunged 30 cm into the water and opened underwater to avoid the collection of surface material. Sample bottles were triple-rinsed using stream water before filling.

All water samples were transported and analyzed as described for winter lake water quality (Section 2.4-1).

2.10 STREAM AND RIVER SEDIMENT QUALITY

Stream and river sites were sampled for sediment quality during August 2010 (Table 2.1-5).

Three replicate samples were collected per stream/river site. Replicate samples were collected approximately three times the channel width apart from each other, except in large rivers. Sediments were collected with the use of an Ekman grab or a spoon in small streams. Depositional zones (where finer sediments accumulate) were preferentially sampled. All sediment quality samples were recorded on a chain of custody form and sent to ALS in Yellowknife. Samples were then sent to ALS's Burnaby laboratory for analysis. Table 2.5-1 presents the sediment quality parameters that were analyzed and their detection limits.

2.11 PERIPHYTON

Stream periphyton samples were collected once during the open-water season using artificial substrate samplers. The samplers were installed during early August 2010 and retrieved in early September 2010.

Five 10 cm x 10 cm Plexiglas® plates were affixed to rocks with fishing line and placed in each stream such that they remained submerged until retrieval. Five plates were installed per site to increase the likelihood that three plates were available to process in September. The plates were installed a minimum distance of three times the channel width apart from each other, except in large rivers where they were spaced approximately 20 m apart.

Upon collection, three quarters of each plate were scraped using a razor blade and rinsed into a bottle for analysis of periphyton biomass (as chlorophyll *a*). These samples were filtered and processed in the same way as phytoplankton biomass samples. The remaining quarter of the plate was scraped and rinsed into a bottle for periphyton taxonomy. Periphyton taxonomy samples were preserved and processed in the same way as phytoplankton taxonomy samples.

2.12 STREAM AND RIVER BENTHOS

Stream benthos samples were collected during August 2010. Five replicate samples, each consisting of a composite of three Hess samples were collected from each stream station. Replicate samples were collected a minimum distance of three times the channel width apart from each other, except in large rivers. A 500 μm mesh size Hess sampler, with a sampling surface area of 0.096 m^2, was used to collect stream benthos samples. Samples were preserved in 10% buffered formalin and sent to Dr. Jack Zloty in Summerland, BC, for enumeration and identification.

2.13 QUALITY ASSURANCE/QUALITY CONTROL

A quality assurance and quality control (QA/QC) program, including the use of chain of custody forms, replicates, and blanks was incorporated into the design of this study to track samples, account for within site variability, and identify potential sources of contamination from sampling equipment, sample transportation, or sample processing. Below are the specific QA/QC measures undertaken for each sampling component.

2.13.1 Water Quality QA/QC

Replicate samples accounted for approximately 20% of lake water samples collected during each sampling period. These replicate samples were collected from multiple depths. Replicate samples were collected at all stream and river sites to allow identification of natural variability. Natural variability is often higher in streams compared to lakes due to heterogeneously suspended material (such as leaves, small insects, etc.), which, if accidentally collected, can alter results.

Equipment blanks, field blanks, and travel blanks made up at least 5% of the total number of water quality samples collected. Equipment blanks were designed to identify possible contamination of the sampling equipment, including the sampling bottle (GO-FLO or Niskin). Field blanks were designed to identify possible contamination from the exposure of the sample to ambient conditions at the sampling site. Travel blanks were designed to identify potential contamination from the transportation of samples from the sampling location to ALS laboratories. The blanks were analyzed for the same parameters listed in Table 2.4-1.

Equipment blanks were collected in the field by first rinsing an acid-washed or lake water-rinsed GO-FLO with double de-ionized water (provided by ALS), then filling the GO-FLO bottle with double de-ionized water. The water remained in the GO-FLO for one minute (as would occur with a real sample) until sub-samples were drawn from the sampling bottle. Equipment blanks were preserved and handled in the same manner as water quality samples.

Field blanks were processed in the field by opening the bottles provided by ALS (containing double de-ionized water) and exposing the sample to ambient air for one minute. The bottles were preserved and handled in the same manner as water quality samples.

Travel blanks were provided by ALS and were never opened, but were handled in the same manner as water quality samples. All water quality samples including equipment, field, and travel blanks were recorded on chain of custody forms and sent to ALS in Yellowknife for analysis.

2.13.2 Sediment Quality QA/QC

The lake and stream sediment quality QA/QC program included the collection of triplicate sediment samples at all sites to account for within-site variability, and the use of chain of custody forms for all samples.

2.13.3 Aquatic Biology QA/QC

Chain of custody forms were used for all aquatic biology samples as part of the QA/QC program. All samples had replication; triplicate samples were taken for phytoplankton, periphyton, and zooplankton, and five replicates of three composite samples were collected for benthos. Additional QA/QC measures were used by the benthos taxonomist to ensure consistent and accurate sorting of benthos samples. These procedures are outlined below.

2.13.3.1 Lake, Stream and River Benthos Sorting QA/QC

As part of the QC program, the re-sorting of benthic sample residues was conducted on a randomly selected 10% of the benthos samples to determine the level of sorting efficiency. The criterion for an acceptable sorting was that more than 90% of the total number of organisms found in both the initial and QA/QC sort were recovered during the initial sort, as required by Environment Canada for invertebrate community surveys (Environment Canada, 2002). This was calculated by the following equation:

$$\% \text{ Sorting Efficiency} = [1-(\#\text{ in QA/QC re-sort} / (\#\text{ sorted originally} + \#\text{ QA/QC resort}))] \times 100$$

Any sample not meeting the 90% removal criterion was re-sorted a third time. The 90% minimum efficiency was attained for all benthos samples in this study.

2.14 DATA MANAGEMENT AND ANALYSIS

Data was managed using Microsoft Office Excel (2003) software. All graphically represented data and the calculation of means and standard errors were produced using Sigma Plot v10.0 (2006) software.

Diversity indices, including genera richness and Simpson's diversity index, were calculated using PRIMER v6.1 software (2006).

2.14.1 Physical Limnology

The measured Secchi depth (D_s) for each lake was used to calculate the depth of the euphotic zone. Euphotic zone depth (EZD) is defined as the depth at which 0.1% of surface radiation occurs, and generally represents the zone within which photosynthesis can occur. EZD was calculated as follows:

$$k' = 1.7/D_s$$

$$EZD = 6.9/k'$$

where k' = light extinction coefficient and 1.7 is a constant derived from experimental data (Parsons, Maita, and Lalli 1984).

2.14.2 Water Quality

Parameters of interest, including all parameters with corresponding CCME water quality guidelines for the protection of aquatic life, were graphed for lakes and streams/rivers. Values that were below analytical detection limits were replaced with half the realized sample detection limit for graphing and analyses.

For lakes, water quality data are presented to allow comparisons of vertical (shallow vs. deep), seasonal (winter vs. summer), and annual variability. For streams, water quality data are presented to allow comparison of monthly and annual variability.

2.14.3 Sediment Quality

All sediment quality parameters for which CCME guidelines exist, as well as other parameters of interest, were graphed for lakes and streams. As was done for water quality, parameter concentrations that were below analytical detection limits were replaced with half the realized sample detection limit for graphing and analyses.

2.14.4 Aquatic Biology

The number of organisms per sample were converted to density (organisms/m^2 for benthos; organisms/m^3 for zooplankton; cells/cm^2 for periphyton; and cells/mL for phytoplankton) by dividing each sample by the area or volume sampled. The volume sampled for zooplankton was calculated using flowmeter readings, as outlined in the General Oceanics flowmeter instruction manual (General Oceanics Inc.).

Richness is defined as the number of separate genera/sample present in a sample. In assessing genera richness, multiple species of the same genus were pooled together. Organisms were occasionally not identifiable to the genus level and were identified only to higher taxonomic levels (e.g., family or order). In these instances, the family or order was assumed to comprise a single genus for the calculation of genera richness and diversity unless otherwise stated.

The Simpson's diversity index incorporates richness and abundance to calculate a measure of diversity that can be compared among samples. Simpson's diversity index (D) was calculated based on the formula:

$$D = 1 - \sum_{i=1}^{G} [\, n_i(n_i-1)] \;/\; [N(N-1)]$$

where G is the number of genera, n_i is the number of individuals in the i^{th} genus and N is the total number of individuals. Simpson's diversity index was calculated for all aquatic biology samples.

Note that this formula for the Simpson's diversity index produces values that range from 0 (lowest diversity) to 1 (maximum diversity). The use of Simpson's diversity index takes into account the number of genera and the relative distribution of each genus (evenness).

2.15 HISTORICAL DATA

Historical sampling methodologies and exact sampling locations sometimes differed from 2010 sampling. Summaries of historical collection methodologies, sample collection depths, dates of collection, and replication are presented in Tables 2.14-1 through 2.14-9. A summary of the historical data collection sites for lakes and streams in the Hope Bay Belt area are presented as maps in Figures 2.14-1 through 2.14-5. Only historical data collected from locations also sampled in 2010 are presented in this report.

Table 2.14-1. Summary of Historical Lake Water Quality Sampling Conducted for the Hope Bay Belt Project

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000
Sampling month(s)	June, Aug	Aug	Aug	May*, June*, July, Aug	Apr*, Aug	Apr*, July, Aug	Apr*	July	July, Aug
Sampling depths	Shallow depth	Shallow depth at all sites. Mid and deep depths at Aim. Stn 3	Shallow depth at all sites. Mid and deep depths at Aim. Stn 3	Surface and shoreline surface grab at all sites. Vertical profiles at Doris N and S in August.	Shallow depths at all sites. Metered depths throughout length of column where appropriate.	Shallow depth at all sites. Deep depth sampled at Doris S	Shallow depth	Shallow depth and Shoreline surface grab	Shallow depth and mid depth
Analytical results for metals	Total	Total and dissolved	Total	Total and dissolved	Total and dissolved	Total and dissolved	Total	Total	Total
Replication	n = 1 at each sampling event/depth	n = 1 at each sampling event/depth	n = 1 at each sampling event/depth	n = 1 at each sampling event/depth; n = 2 at Trout Lake and Aim. Stn 3	n = 1 at each sampling event/depth	n = 1 + 20% replication at each sampling event/depth	n = 3 at each sampling event (2 replicates, 1 split sample)	n = 2 at each sampling event/depth	n = 2 at each sampling event/depth
QA/QC	unknown	unknown	Field Blanks	Replicate samples, Travel/Field Blanks	Replicate and Split samples, Field Blanks	Replicate and Split samples, Travel Blanks	Replicate and Split samples, Travel Blanks	Replicates	Replicates, Travel/Field Blanks
Sampling method	Grab samples at surface	Grab samples at surface, unknown sampler at depth.	Grab samples at surface, unknown sampler at depth.	Grab samples at surface, 2 L GO-FLO for deep samples.	2 L GO-FLO	5 L GO-FLO	5 L GO-FLO	Grab samples at surface, 5 L GO-FLO for deep samples.	5 L GO-FLO

Year	2003	2004	2005	2006	2007	2008	2009	2010
Sampling month(s)	July, Aug, Sept	June*, July, Aug, Sept	July, Aug, Sept	May* or June*, July, Aug,	May*, July, Aug, Sept	May*, July, Aug, Sept	Apr/May*, Aug	Apr*, Aug
Sampling depths	Shallow depth	Shallow and deep depths	Shallow and deep depths	Shallow and deep depths	Shallow and deep depths	Shallow and deep depths	Shallow and deep depths	Shallow and deep depths
Analytical results for metals	Total and dissolved	Total and dissolved	Total and dissolved	Total and dissolved	Total and dissolved	Total and dissolved	Total and dissolved	Total and dissolved
Replication	n = 1 at each sampling event/depth	n = 1 at each sampling event/depth	n = 1 at each sampling event/depth	n = 1 at each sampling event/depth	n = 1 at each sampling event/depth	n = 1 at each sampling event/depth	n = 1 + 20% replication at each sampling event/depth	n = 1 + 20% replication at each sampling event/depth
QA/QC	Split samples, Travel Blank	Replicates, Field/Equipment Blanks	Replicates, Field/Equipment Blanks	Replicates, Field Blanks	Replicates, Field/Equipment Blanks	Replicates, Field/Equipment Blanks	Replicates, Travel/Field/ Equipment Blanks	Replicates, Travel/Field/ Equipment Blanks
Sampling method	VanDorn water bottle	Shallow samples collected with geopump and Tygon tubing, deep samples collected with Kemmerer sampler.	Kemmerer sampler	Kemmerer sampler	Kemmerer sampler	Kemmerer sampler	2.5 L Skinny Niskin (winter) or 5 L GO-FLO (summer)	2.5 L Skinny Niskin (winter) or 5 L GO-FLO (summer)

Notes:

Not all sites were sampled on all sampling occasions.

**Denotes under-ice sampling events.*

Table 2.14-2. Summary of Historical Stream and River Water Quality Sampling Conducted for the Hope Bay Belt Project

Year	1992	1993	1994	1995	1996	1997	1998	2000
Sampling month(s)	Aug	June, Aug	Aug	July, Aug	June, Aug	June, July, Aug	June, July, Aug	June, Sept
Analytical results for metals	Total	Total	Total and dissolved	Total and dissolved	Total and dissolved	Total and dissolved	Total	Total
Replication	unknown	unknown	n=1 at each sampling location/event	n = 1 at each sampling location/event + variable % of replicates	n = 1 at each sampling location/event + variable % of replicates	n = 1 at each sampling location/event + variable % of replicates	n = 1 at each sampling location/event + variable % of replicates	n = 2 at each sampling event/location
QA/QC	unknown	unknown	Field Blanks	Replicate samples, Travel/Field Blanks	Replicate and Split samples, Field Blanks	Replicate and Split samples,Travel Blanks	Replicate and Split samples,Travel Blanks	Replicates, Travel/Field Blanks

Year	2003	2004	2005	2006	2007	2008	2009	2010
Sampling month(s)	July, Aug, Sept	sampling multiple times per month in June, July, Aug, Sept at Doris OF, monthly at other sites	sampling multiple times per month in June, July, Aug, Sept at Doris OF, monthly at other sites	sampling multiple times per month in June, July, Aug, Sept at Doris OF, monthly at other sites	sampling multiple times per month in June, July, Aug, Sept at Doris OF, monthly at other sites	June, July, Aug, Sept	Apr/May*, June, Aug, Sept	Apr*, June, Aug, Sept
Analytical results for metals	Total	Total and dissolved	Total and dissolved	Total and dissolved	Total and dissolved	Total and dissolved	Total and dissolved	Total and dissolved
Replication	n = 1 at each sampling event/location	n = 1 at each sampling event/location	n = 1 at each sampling event/location	n = 1 at each sampling event/location	n = 1 at each sampling event/location	n = 1 at each sampling event/location	n = 2 at each sampling event/location	n = 1 at each sampling location/event + variable % of replicates
QA/QC	Travel Blank	Replicates, Field/Equipment Blanks	Replicates, Field/Equipment Blanks	Replicates, Field Blanks	Replicates, Field/Equipment Blanks	Replicates, Field/Equipment Blanks	Replicates, Travel/Field/ Equipment Blanks	Replicates, Travel/Field/ Equipment Blanks

Notes:

Not all sites were sampled on all sampling occasions.

**Denotes under-ice sampling events.*

Table 2.14-3. Summary of Historical Lake Sediment Quality Sampling Conducted for the Hope Bay Belt Project

Year	1996	1997	2007	2009	2010
Sampling month(s)	August	July	August	August	August
Data collected	Sediment Chemistry & particle size	Sediment Chemistry & particle size	Sediment Chemistry & particle size	Sediment Chemistry & particle size	Sediment Chemistry & particle size
Sampled depth zones	Deepest location	Deepest location	Shallow & Mid or Deep	Shallow & Mid or Deep	Shallow & Mid or Deep
Replicates	n = 1	n = 1	n = 5 (corer); n = 1 (Ekman)	n = 3	n = 3
Sampling method	Ekman grab	Ekman grab	Gravity Corer and Ekman	Ekman Grab	Ekman Grab

Notes:

Not all sites were sampled on all sampling occasions.

Table 2.14-4. Summary of Historical Stream Sediment Quality Sampling Conducted for the Hope Bay Belt Project

Year	1993	2009	2010
Sampling month(s)	August	July	August
Data collected	Sediment Chemistry & particle size	Sediment Chemistry & particle size	Sediment Chemistry & particle size
Replicates	n = 1	n = 3	n = 3
Sampling method	Unknown	Ekman grab; depositional	Ekman grab; depositional

Notes:

Not all sites were sampled on all sampling occasions.

Table 2.14-5. Summary of Historical Lake Phytoplankton Sampling Conducted for the Hope Bay Belt Project

Year	1993	1994	1995	1996	1997	1998	2000
Sampling month(s)	Aug	Aug	Aug	Aug	July, Aug	July	July
Data collected	Abundance and Taxonomy	Abundance and Taxonomy	Abundance and Taxonomy	Abundance and Taxonomy; Chl *a*	Abundance and Taxonomy; Chl *a*	Abundance and Taxonomy; Chl *a*	Abundance and Taxonomy
Replication	n = 1	n = 1	n = 1	n = 3	n = 3 for abundance and taxonomy; n= 1 for chl *a*	n = 3	n = 3
Sampling methods	unknown	unknown	GO-FLO sample from surface, additional sample collected at 5 m depth at Aim Stn. 6	Grab sample from 0.5 m depth	5 L GO-FLO sample from 1 m depth	5 L GO-FLO sample from 1 m depth	5 L GO-FLO sample from 1 m depth

Year	2003	2006	2007	2008	2009	2010
Sampling month(s)	July, Aug, Sept	Sept	July, Aug, Sept	July, Aug, Sept	Apr*, Aug	Aug
Data collected	Chl *a*	Chl *a*	Abundance, Biovolume, and Taxonomy; Chl *a*	Chl *a*	Abundance, Biomass, and Taxonomy; Chl *a*	Abundance, Biomass, and Taxonomy; Chl *a*
Replication	n = 1	unknown	n = 1	n = 1	April n = 1; Aug n = 3	n = 3
Sampling methods	Depth-intergrated sample from entire euphotic zone	Kemmerer water sampler from 1 m depth	Depth-intergrated sample from entire euphotic zone	Kemmerer water sampler from 1 m depth	2.5 L Skinny Niskin bottle from 1 m below ice (Apr); 5 L GO-FLO sample from 1 m depth (Aug)	5 L GO-FLO sample from 1 m depth

Notes:

Not all sites were sampled on all sampling occasions.

**Denotes under-ice sampling events.*

Table 2.14-6. Summary of Historical Stream and River Periphyton Sampling Conducted for the Hope Bay Belt Project

Year	1993	1995	1996	1997	1998	2000	2009	2010
Sampling month(s)	instantaneous; Aug	instantaneous; Aug	instantaneous; Aug	June to July; July to Aug	July to Aug	July to Aug	July to Aug	Aug to Sept
Data collected	Abundance and Taxonomy	Abundance and Taxonomy	Abundance and Taxonomy	Abundance and Taxonomy; Chl *a*	Abundance and Taxonomy; Chl *a*	Abundance and Taxonomy; Chl *a*	Abundance and Taxonomy; Chl *a*	Abundance and Taxonomy; Chl *a*
Replicates	n = 3	n = 1	n = 3	n = 1	n = 3	n = 3	n = 3	n = 3
Sampling methods	Rock scraping	Rock scraping	Rock scraping	Plexiglas plate, installed for ~ 1 month	Plexiglas plate, installed for ~ 1 month	Plexiglas plate, installed for ~ 1 month	Plexiglas plate, installed for ~ 1 month	Plexiglas plate, installed for ~ 1 month

Notes:

Not all sites were sampled on all sampling occasions.

Table 2.14-7. Summary of Historical Lake Zooplankton Sampling Conducted for the Hope Bay Belt Project

Year	1993	1995	1996	1997	1998	2009	2010
Sampling month(s)	Aug	Aug	Aug	July, Aug	July	Aug	Aug
Analytical results	Abundance and Taxonomy	Abundance and Taxonomy	Abundance and Taxonomy	Abundance and Taxonomy	Abundance and Taxonomy	Abundance and Taxonomy	Abundance and Taxonomy
Replication	n = 4	n = 3	n = 3	n = 3	n = 3	n = 3	n = 3
Sampling method	64 µm mesh net, 0.3 m diameter	118 µm mesh net, 0.3 m diameter	118 µm mesh net, 0.3 m diameter	118 µm mesh net, 0.3 m diameter	118 µm mesh net, 0.3 m diameter	118 µm mesh net, 0.3 m diameter	118 µm mesh net, 0.3 m diameter

Notes:

Not all sites were sampled on all sampling occasions.

Table 2.14-8. Summary of Historical Lake Benthos Sampling Conducted for the Hope Bay Belt Project

Year	1993	1994	1995	1996	1997	1998	2000	2007	2009	2010
Sampling month(s)	Aug	Aug	Aug	Aug	July, Aug	July	July	Aug	Aug	Aug
Replicates	n = 3	n = 3	n = 3	n = 3	n = 3	n=3	n = 3	n = 5	n = 3	n = 5 composite replicates (each replicate consisted of 3 pooled samples)
Sampling method	Core Sampler (0.00332 m^2); 250 µm sieve bucket	Ekman (0.0225 m^2); 250 µm sieve bucket	Ekman (0.0225 m^2); 250 µm sieve bucket	Ekman (0.0232 m^2); 493 µm sieve bucket	Ekman (0.0232 m^2); 493 µm sieve bucket	Ekman (0.0232 m^2); 493 µm sieve bucket	Ekman (0.0225 m^2); 500 µm sieve bucket	Ekman (0.0225 m^2); 243 µm sieve bucket	Ekman (0.0225 m^2); 500 µm sieve bucket	Ekman (0.0225 m^2); 500 µm sieve bucket

Notes:

Not all sites were sampled on all sampling occasions.

Table 2.14-9. Summary of Historical Stream and River Benthos Sampling Conducted for the Hope Bay Belt Project

Year	1993	1995	1996	1997	1998	2000	2009	2010
Sampling month(s)	Aug	Aug	July to Aug	June to July, July to August	June to July	July to Aug	July	Aug
Replicates	n = 3	n = 3	n = 2 to 4	n = 1 to 3	n = 3	n = 3	n = 3	n = 5 composite replicates (each replicate consisted of 3 pooled samples)
Sampling method	Hess Sampler (0.096 m^2); 250 µm mesh size	Hess Sampler (0.096 m^2); 250 µm mesh size	Hester Dendy; 8 plates measuring 7.5 cm × 7.5 cm	Hester Dendy; 8 plates measuring 7.5 cm × 7.5 cm	Hester Dendy; 9 plates measuring 7.5 cm × 7.6 cm	Hester Dendy; 9 plates measuring 8 cm × 8 cm; 500 µm sieve bucket	Hess Sampler (0.096 m^2); 500 µm mesh size	Hess Sampler (0.096 m^2); 500 µm mesh size

Notes:

Not all sites were sampled on all sampling occasions.

PROJECT #1009-002-05 GIS # HB-01-032a July 15 2011

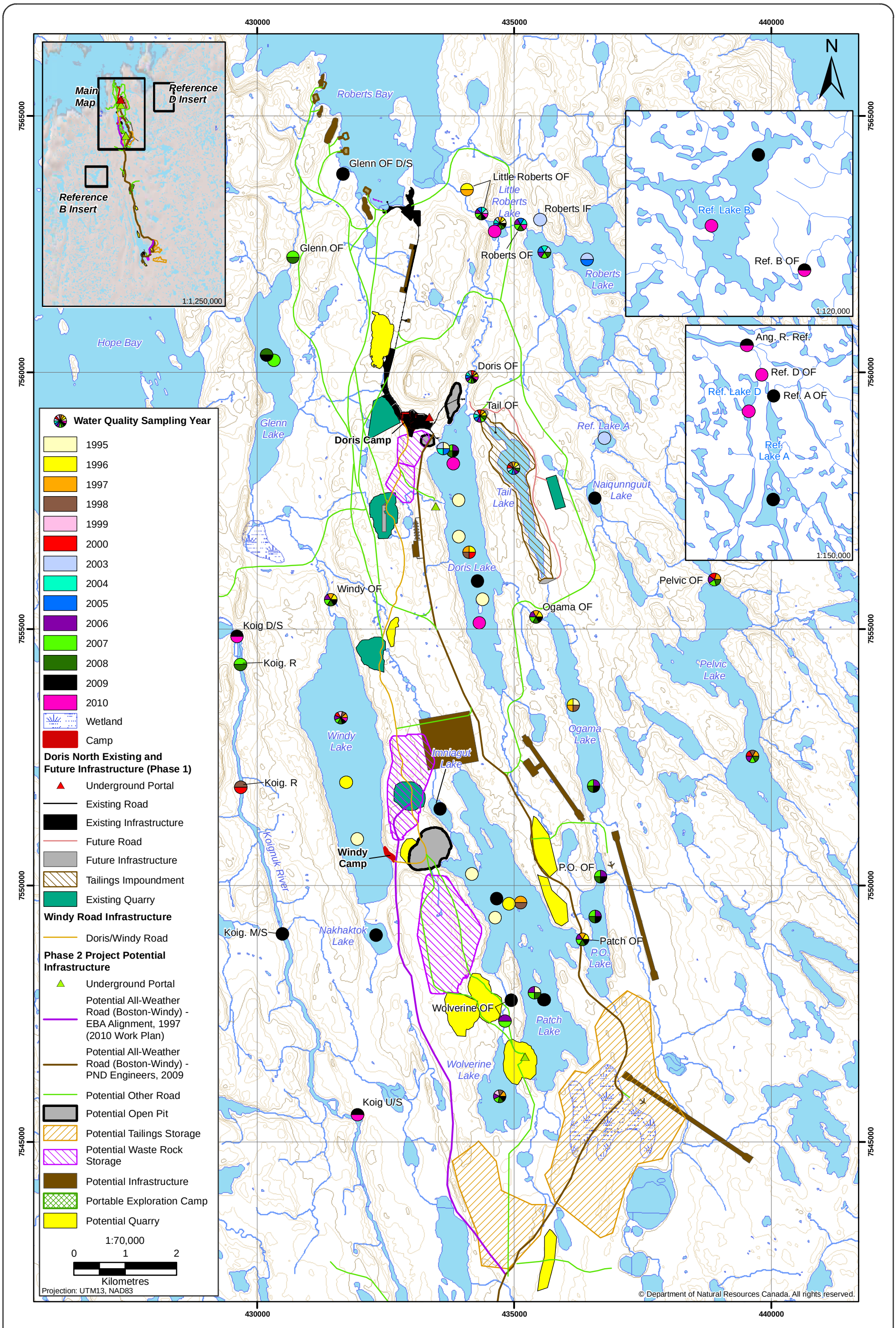


Figure 2.14-1a

NEWMONT NORTH AMERICA

Historical Water Quality Sampling Locations, Hope Bay Belt Project, North End of the Belt

Figure 2.14-1a

Rescan Engineers & Scientists

*PROJECT #***1009-002-05** *GIS #* **HB-01-032b** *July 15 2011*

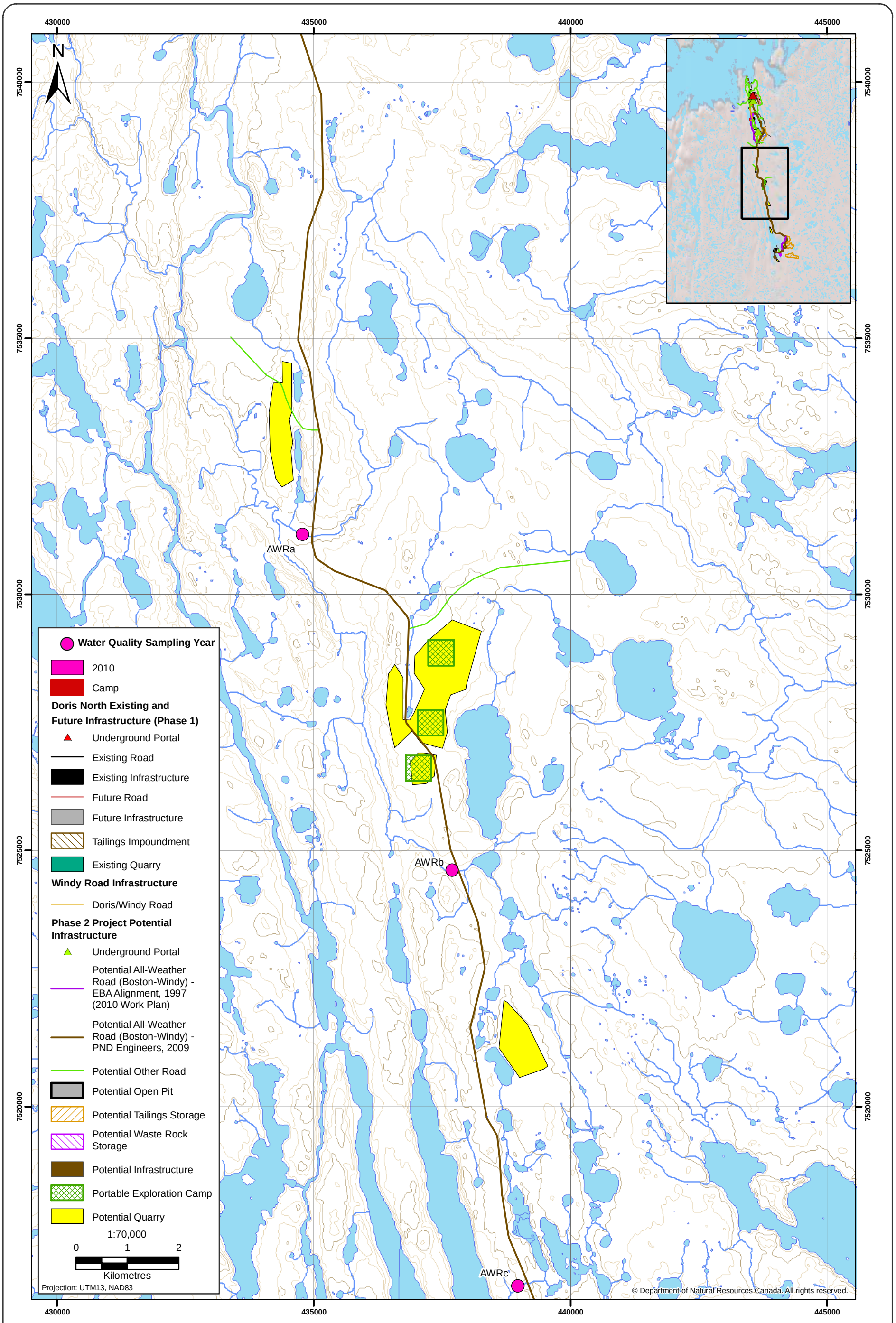


Figure 2.14-1b

NEWMONT NORTH AMERICA

Historical Water Quality Sampling Locations, Hope Bay Belt Project, Central Area of the Belt

Figure 2.14-1b

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PROJECT #**1009-002-05** GIS # **HB-01-032c** *July 15 2011*

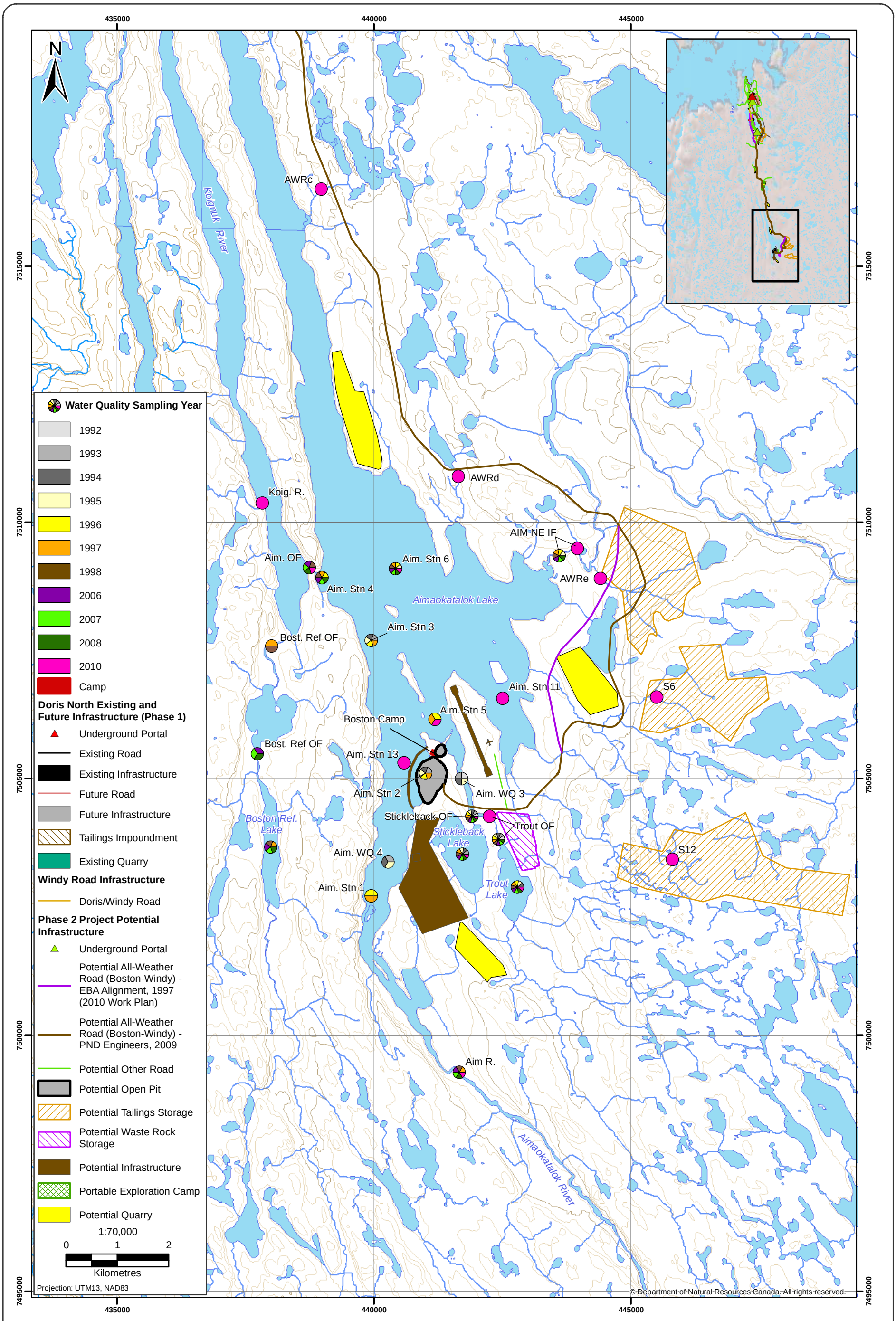


Figure 2.14-1c

NEWMONT NORTH AMERICA

Historical Water Quality Sampling Locations, Hope Bay Belt Project, South End of the Belt

Figure 2.14-1c

Rescan Engineers & Scientists

PROJECT #1009-002-05 GIS # HB-01-033a December 7, 2010

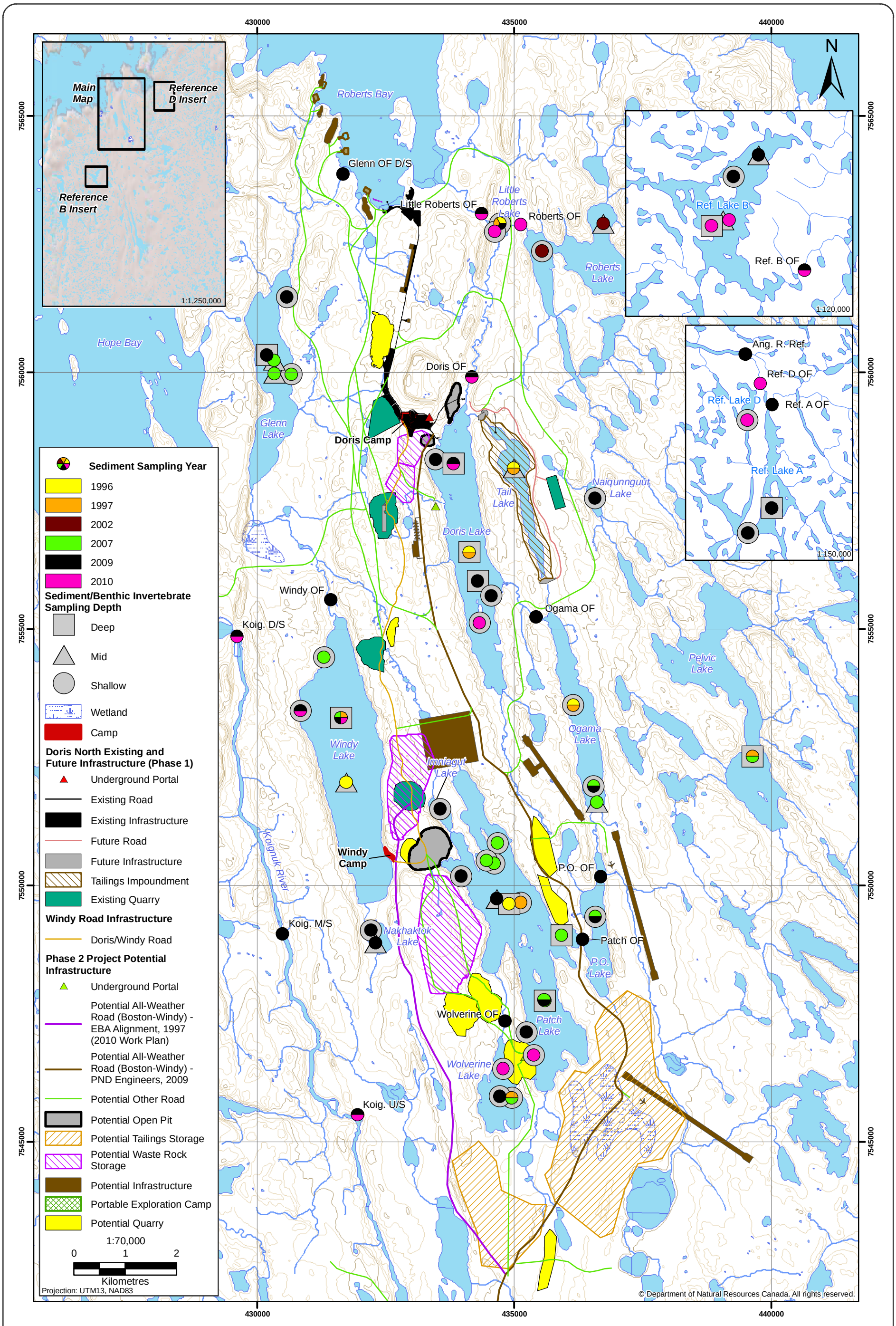


Figure 2.14-2a

NEWMONT NORTH AMERICA

Historical Sediment Quality Sampling Locations, Hope Bay Belt Project, North End of the Belt

Figure 2.14-2a

Rescan™ Engineers & Scientists

PROJECT #**1009-002-05** GIS # **HB-01-033b** *December 7, 2010*

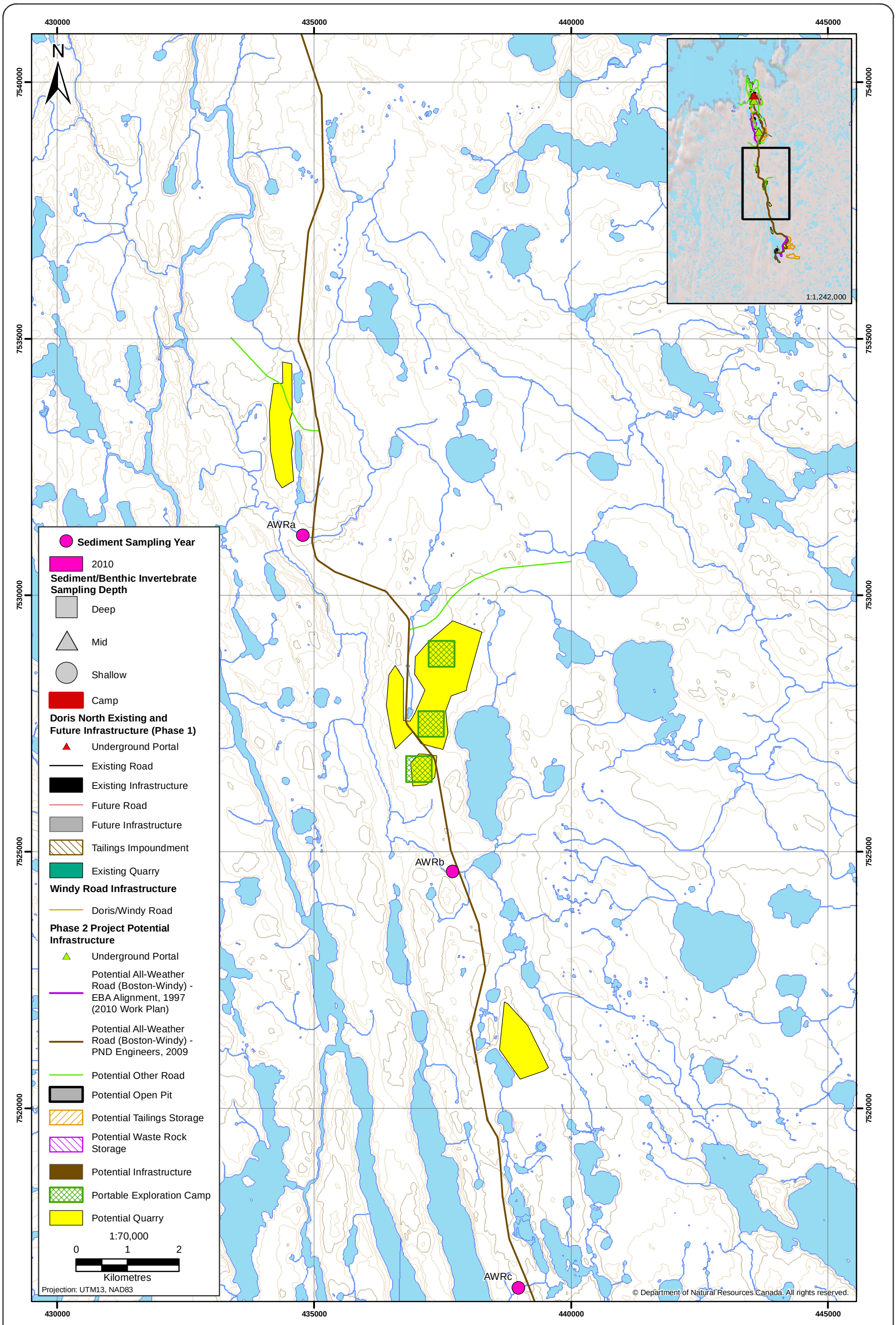


Figure 2.14-2b

NEWMONT NORTH AMERICA

Historical Sediment Quality Sampling Locations, Hope Bay Belt Project, Central Area of the Belt

Figure 2.14-2b

Rescan™ Engineers & Scientists

PROJECT #**1009-002-05** GIS # **HB-01-033c** *December 7, 2010*

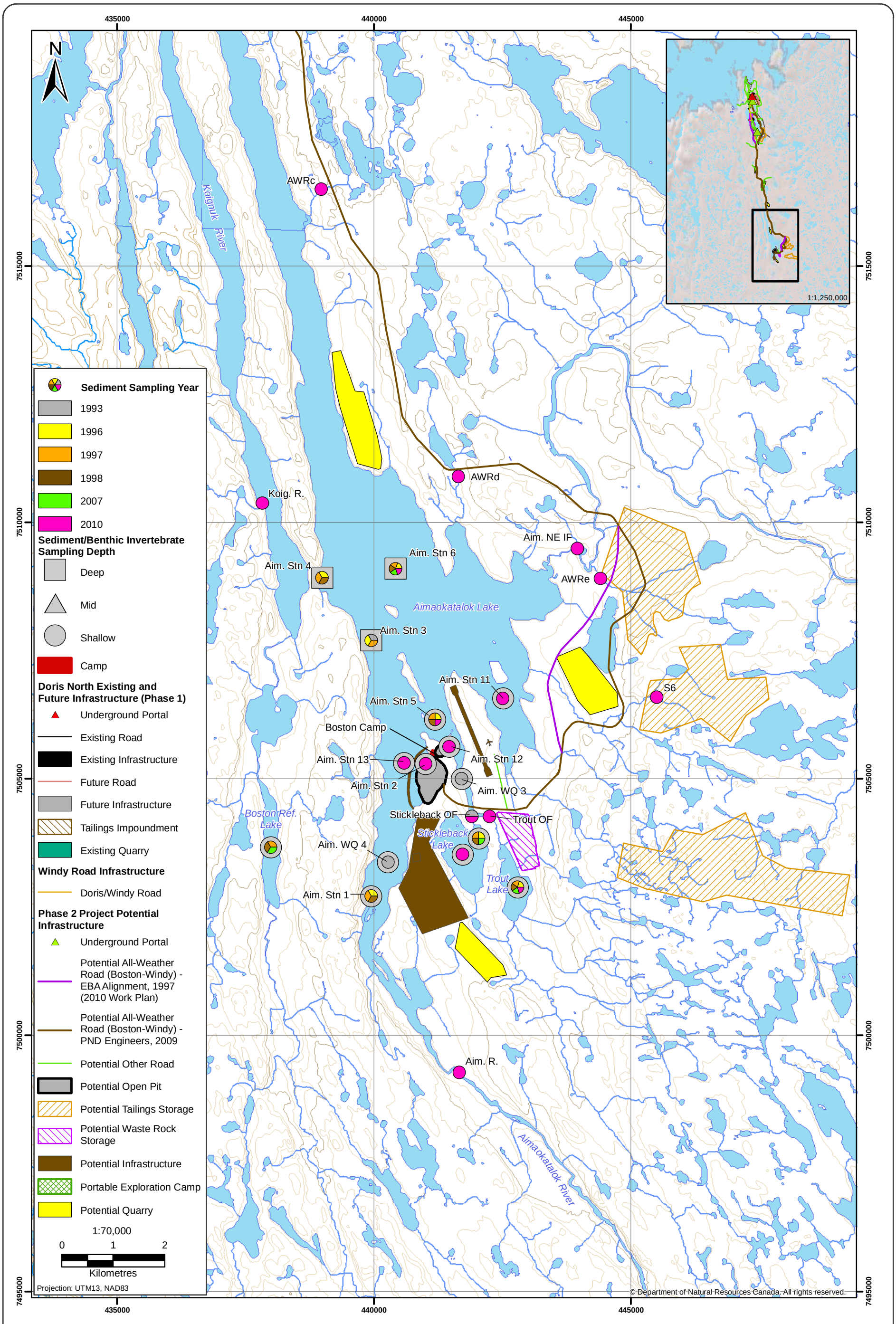


Figure 2.14-2c

NEWMONT NORTH AMERICA

Historical Sediment Quality Sampling Locations, Hope Bay Belt Project, South End of the Belt

Figure 2.14-2c

Rescan™ Engineers & Scientists

PROJECT #1009-002-05 GIS # HB-01-034a December 7, 2010

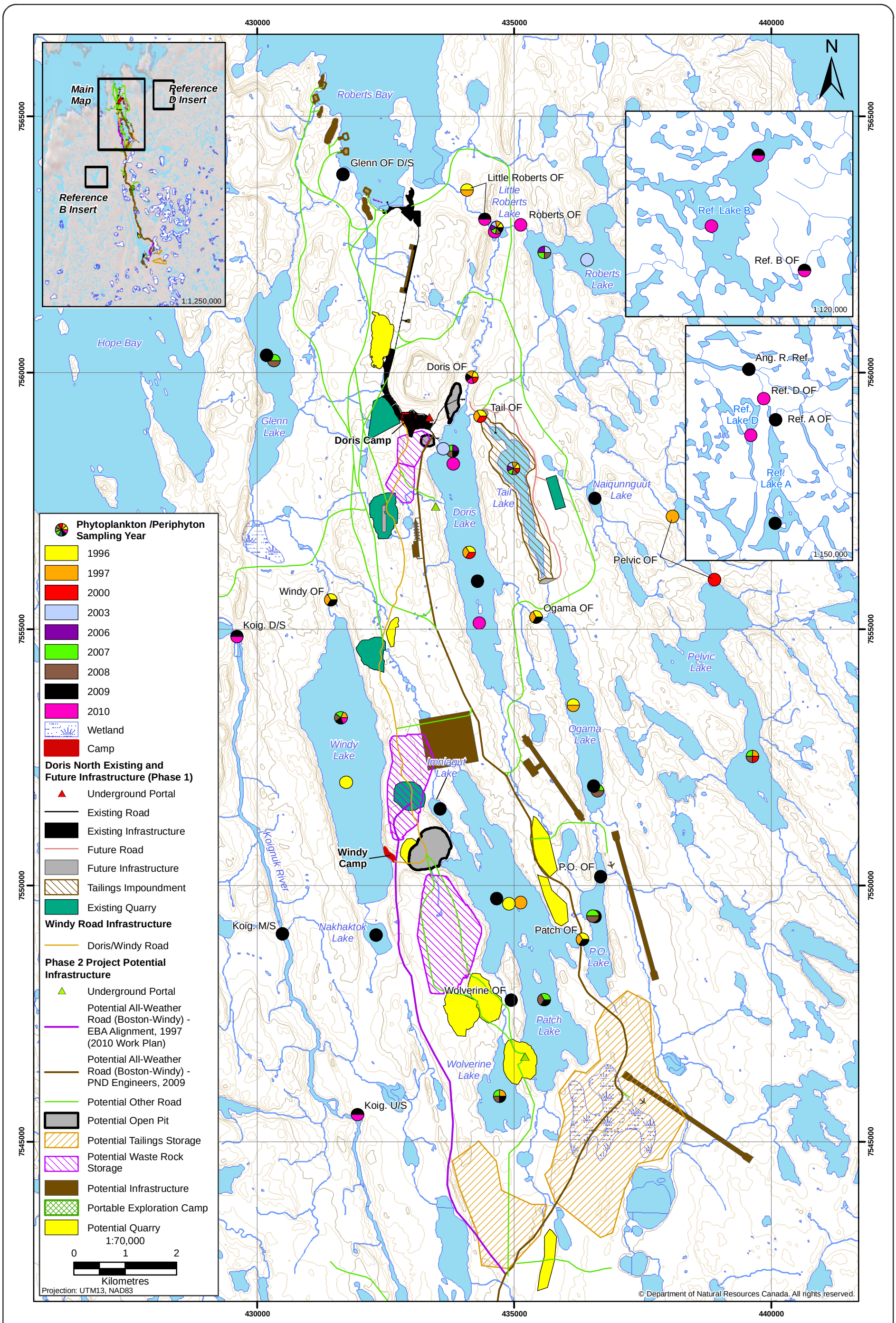


Figure 2.14-3a

NEWMONT NORTH AMERICA

Historical Phytoplankton and Periphyton Sampling Locations, Hope Bay Belt Project, North End of the Belt

Figure 2.14-3a

Rescan Engineers & Scientists

*PROJECT #***1009-002-05** *GIS #* **HB-01-034b** *December 7, 2010*

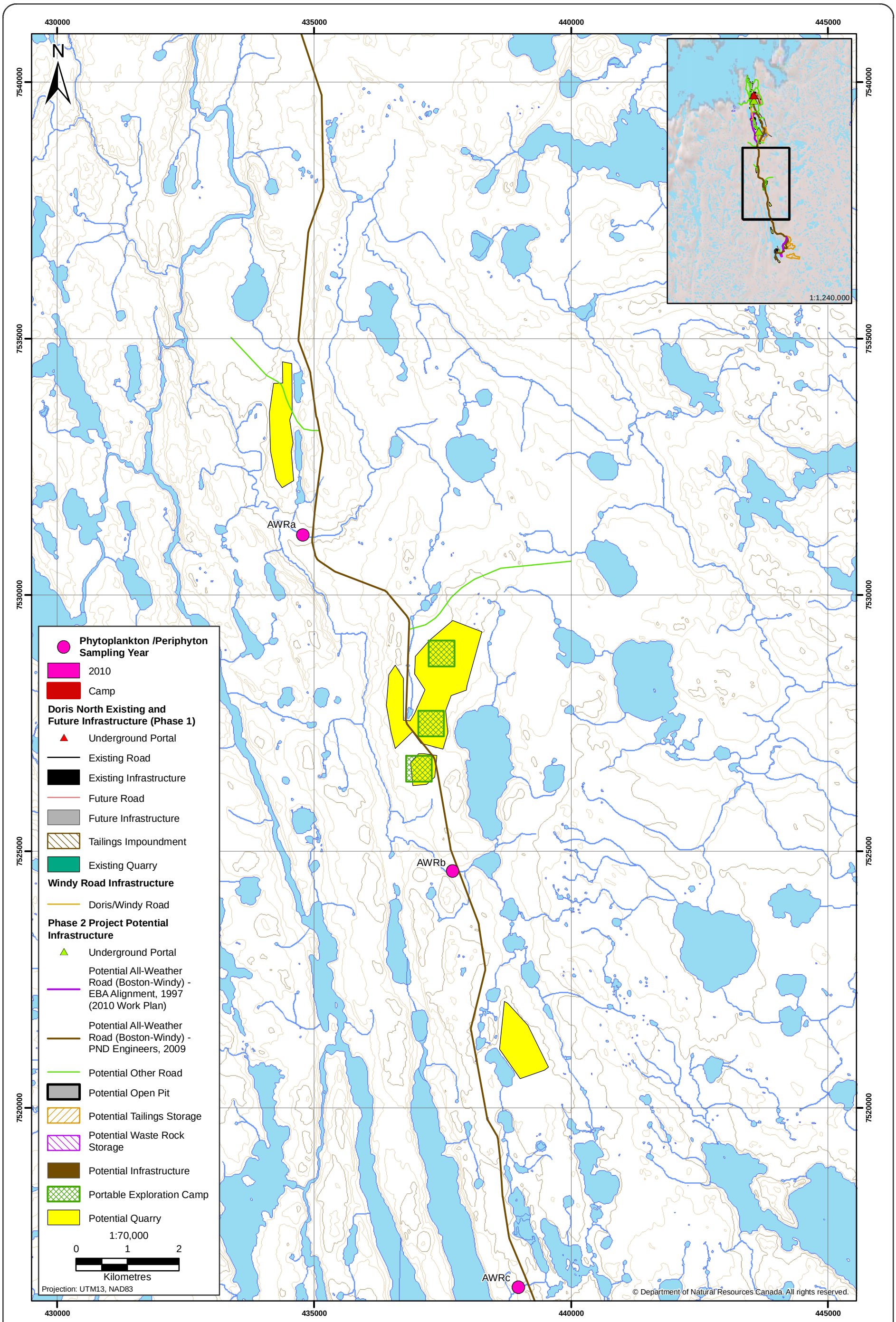


Figure 2.14-3b

NEWMONT NORTH AMERICA

Historical Phytoplankton and Periphyton Sampling Locations, Hope Bay Belt Project, Central Area of the Belt

Figure 2.14-3b

Rescan™ Engineers & Scientists

*PROJECT #***1009-002-05** *GIS #* **HB-01-034c** *December 7, 2010*

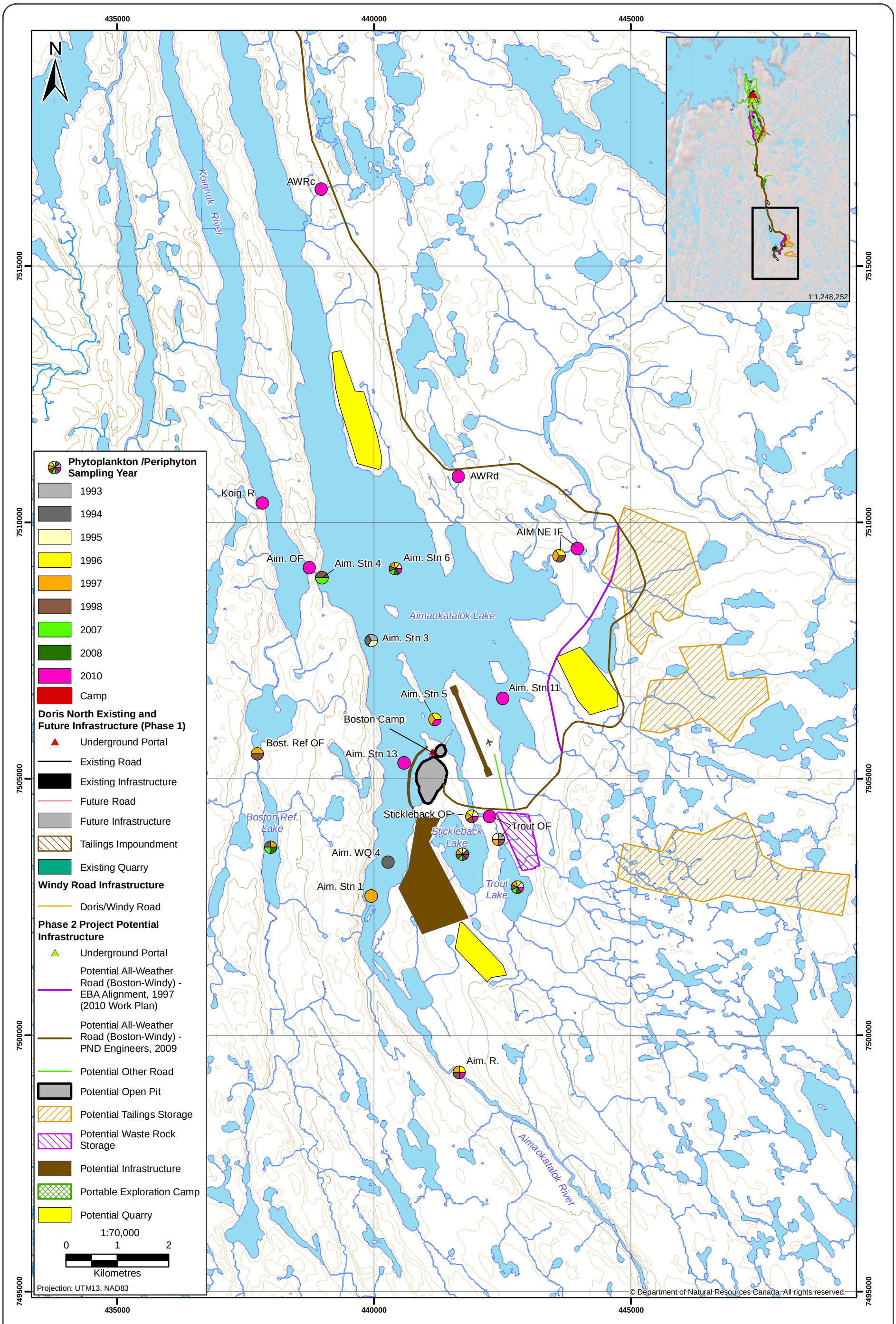


Figure 2.14-3c

NEWMONT NORTH AMERICA

Historical Phytoplankton and Periphyton Sampling Locations, Hope Bay Belt Project, South End of the Belt

Figure 2.14-3c

Rescan™ Engineers & Scientists

PROJECT #1009-002-05 GIS # HB-01-035a December 7, 2010

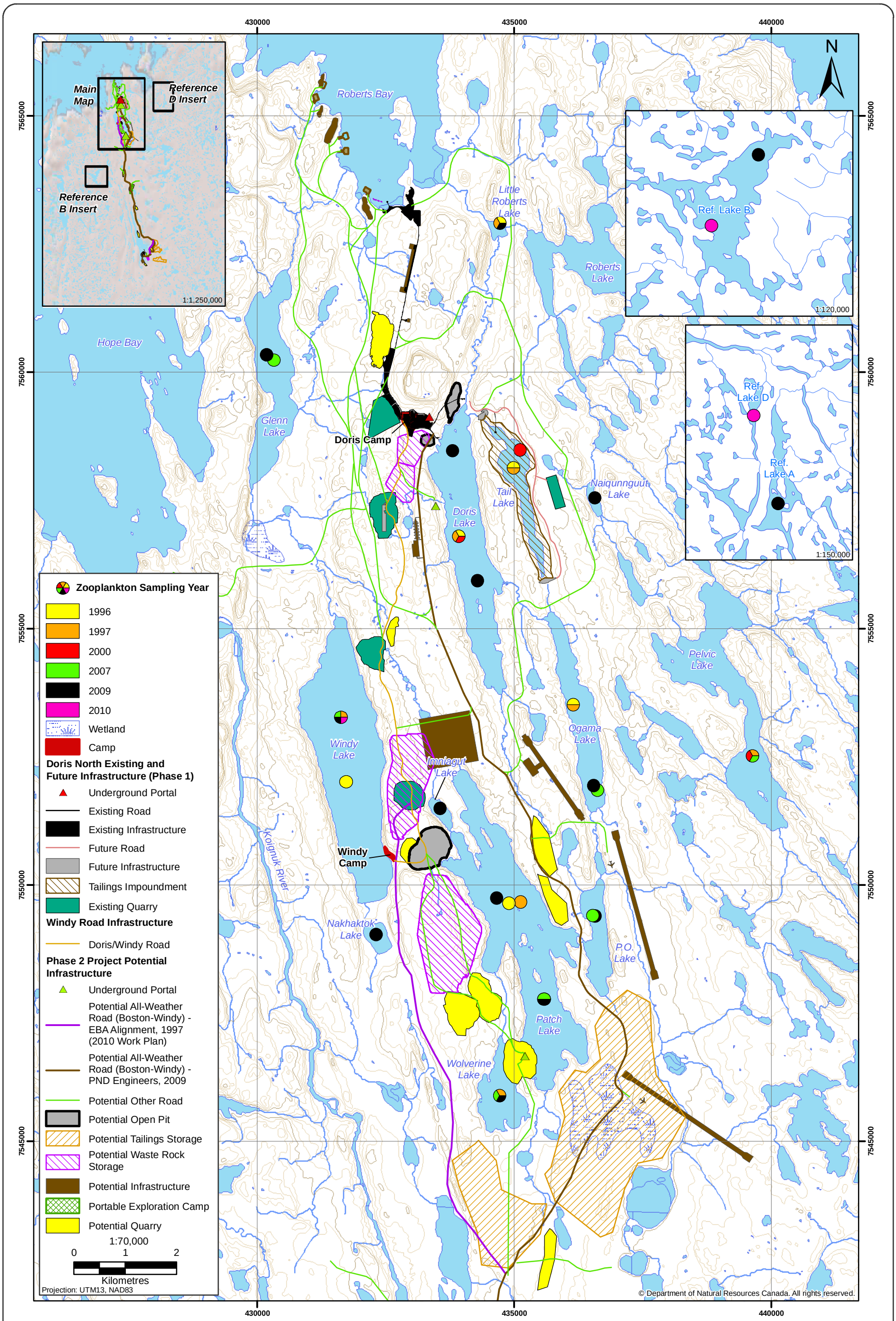


Figure 2.14-4a

NEWMONT NORTH AMERICA

Historical Zooplankton Sampling Locations, Hope Bay Belt Project, North End of the Belt

Figure 2.14-4a

Rescan™ Engineers & Scientists

*PROJECT #***1009-002-05** *GIS #* **HB-01-035b** *December 7, 2010*

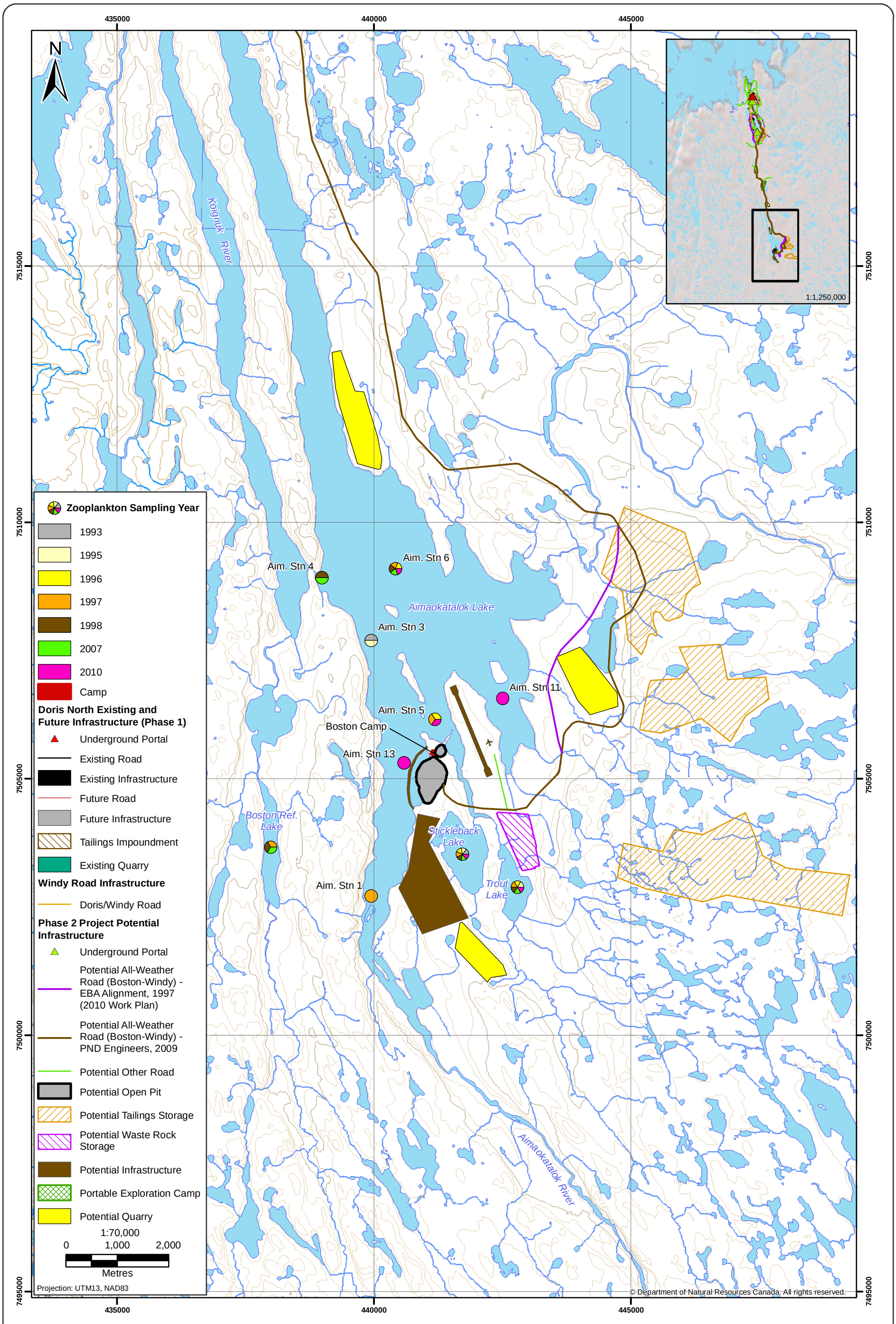


Figure 2.14-4b

NEWMONT NORTH AMERICA

Historical Zooplankton Sampling Locations, Hope Bay Belt Project, South End of the Belt

Figure 2.14-4b

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PROJECT #1009-002-05 GIS # HB-01-036a December 7, 2010

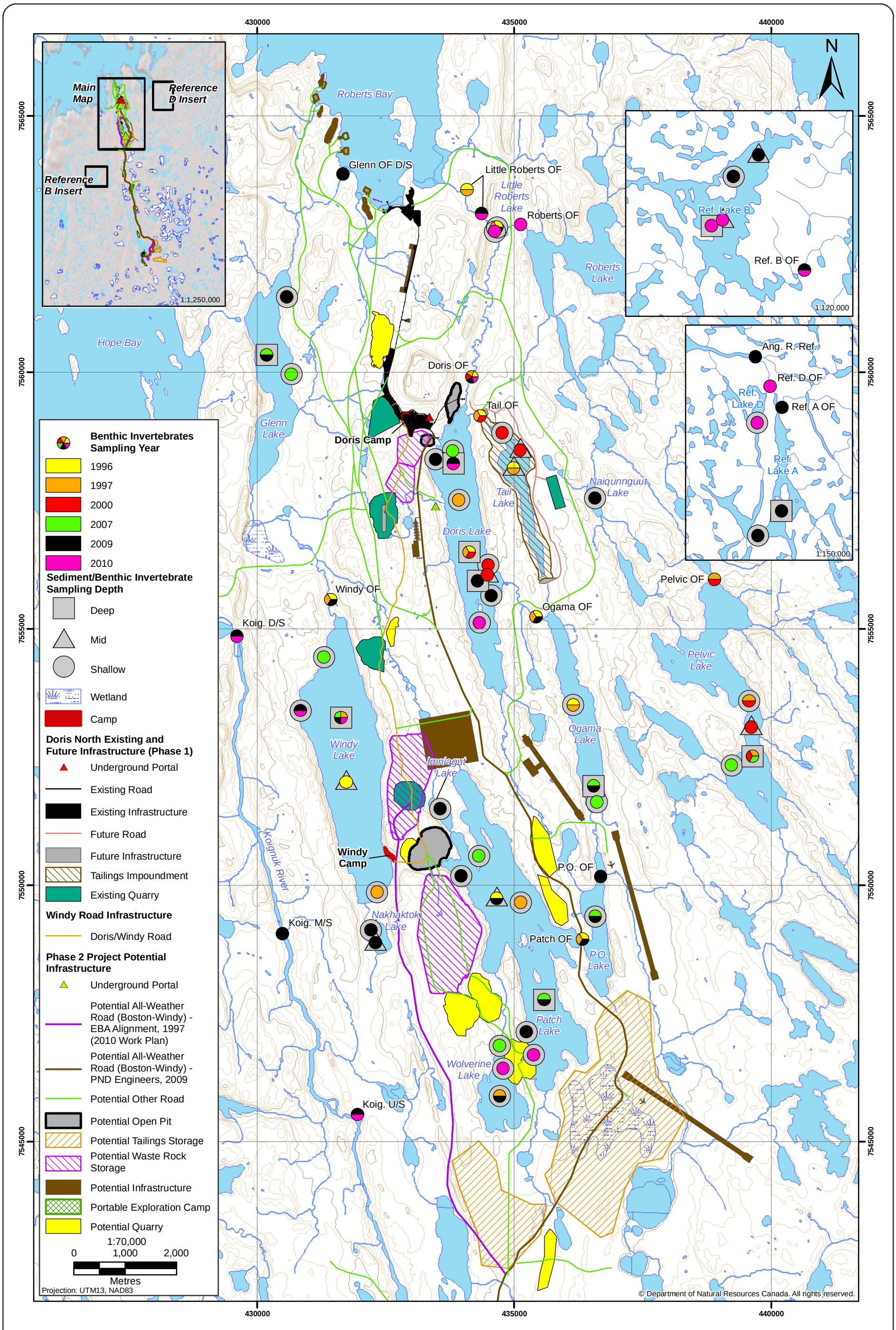


Figure 2.14-5a

NEWMONT NORTH AMERICA

Historical Benthic Invertebrate Sampling Locations, Hope Bay Belt Project, North End of the Belt

Figure 2.14-5a

Rescan™ Engineers & Scientists

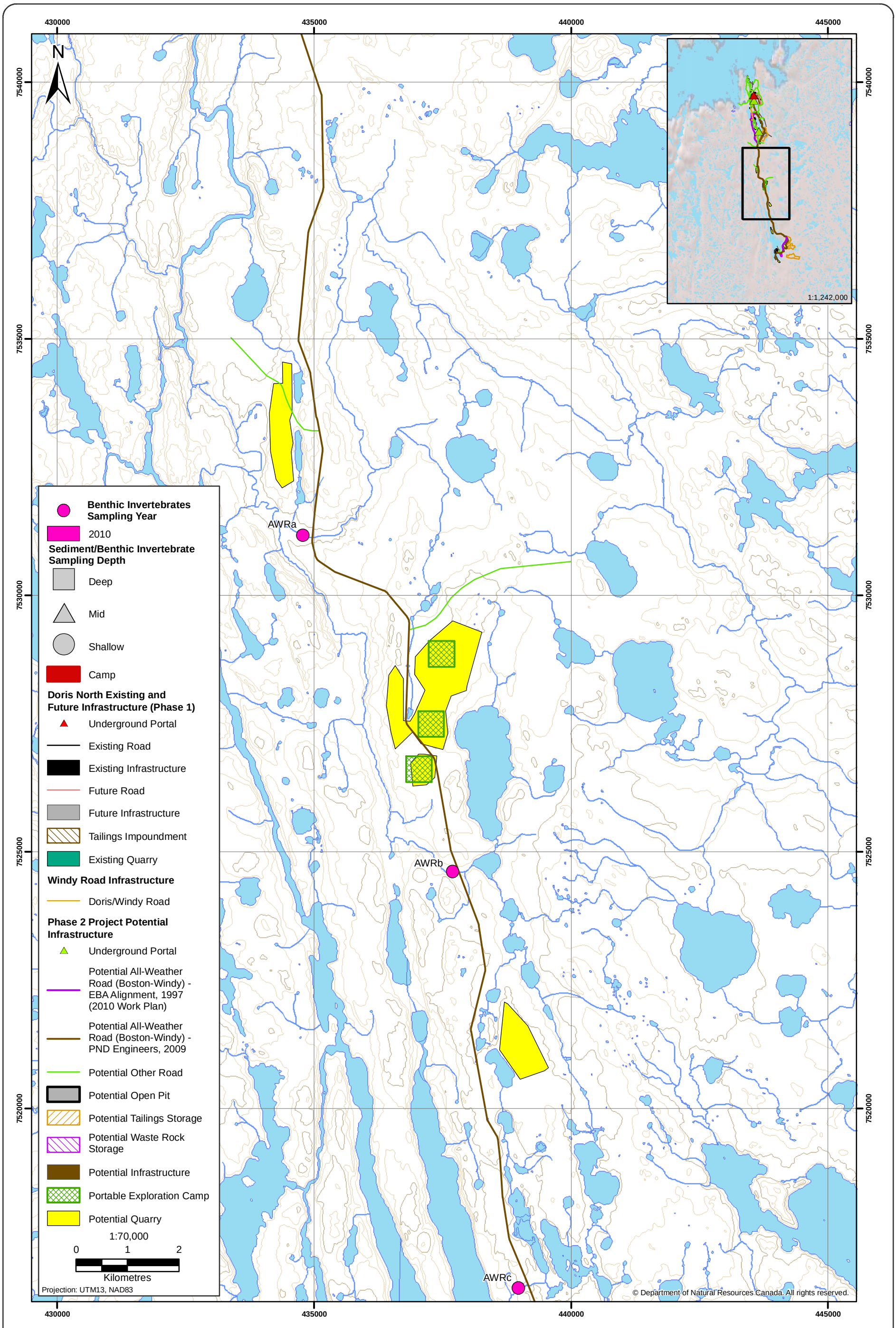


Figure 2.14-5b

NEWMONT NORTH AMERICA

Historical Benthic Invertebrate Sampling Locations, Hope Bay Belt Project, Central Area of the Belt

Figure 2.14-5b

Rescan™ Engineers & Scientists

PROJECT #**1009-002-05** GIS # **HB-01-036c** *December 7, 2010*

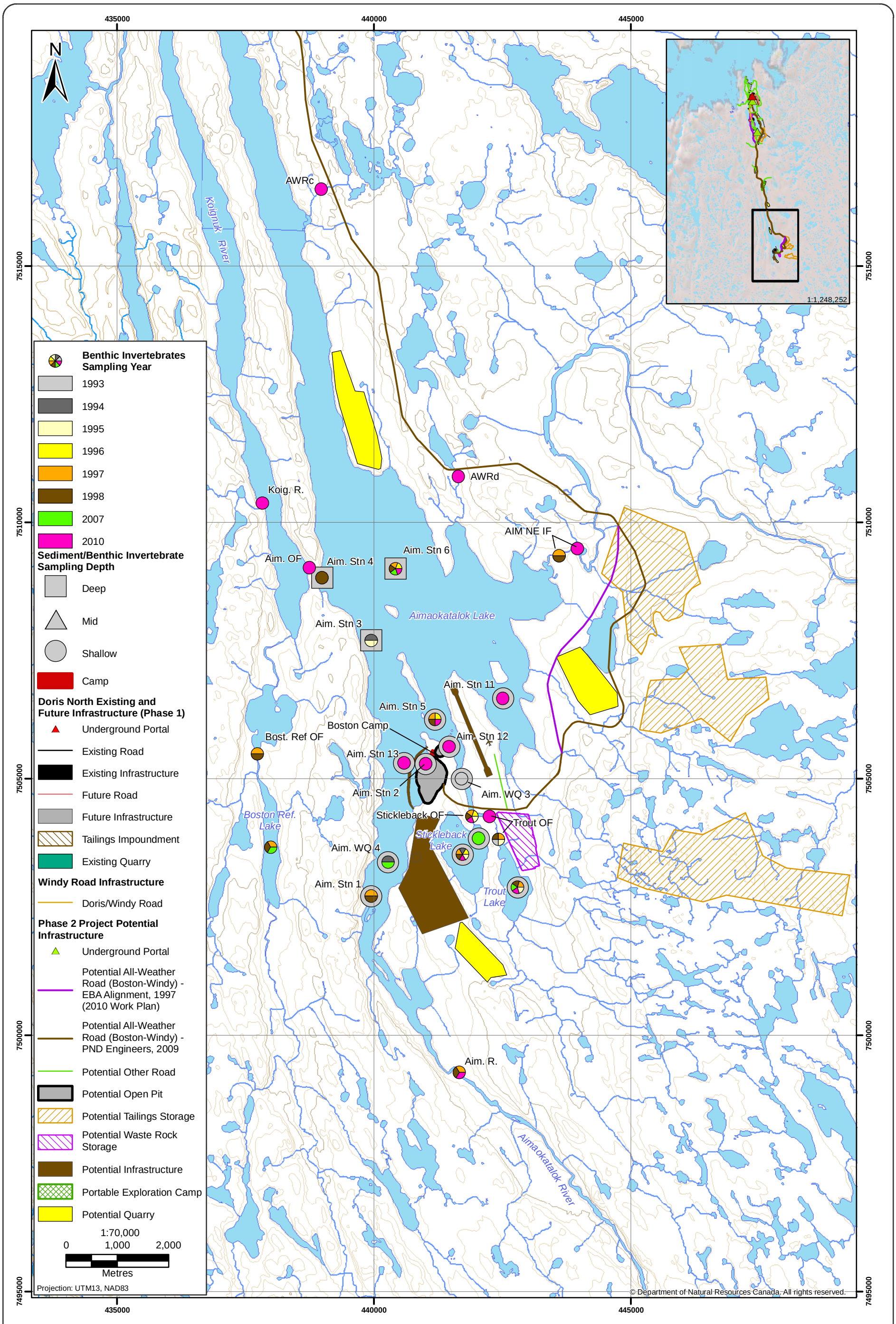


Figure 2.14-5c

NEWMONT NORTH AMERICA

Historical Benthic Invertebrate Sampling Locations, Hope Bay Belt Project, South End of the Belt

Figure 2.14-5c

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3. Results and Discussion

3. Results and Discussion

3.1 BATHYMETRY AND PHYSICAL LIMNOLOGY

3.1.1 Bathymetry

Bathymetric surveys of Stickleback Lake, Trout Lake, Imniagut Lake, Reference Lake B, and Reference Lake D were conducted in August 2010. Bathymetric maps produced for each of these lakes, including details on lake surface area, volume, and maximum and mean depths are presented in Figures 2.1-4 to 2.1-13. Benchmark locations (to which water levels at the time of each survey were measured) and photographs are presented in Appendix 2.1-1.

3.1.2 Physical Limnology

3.1.2.1 Winter Lake Physical Limnology

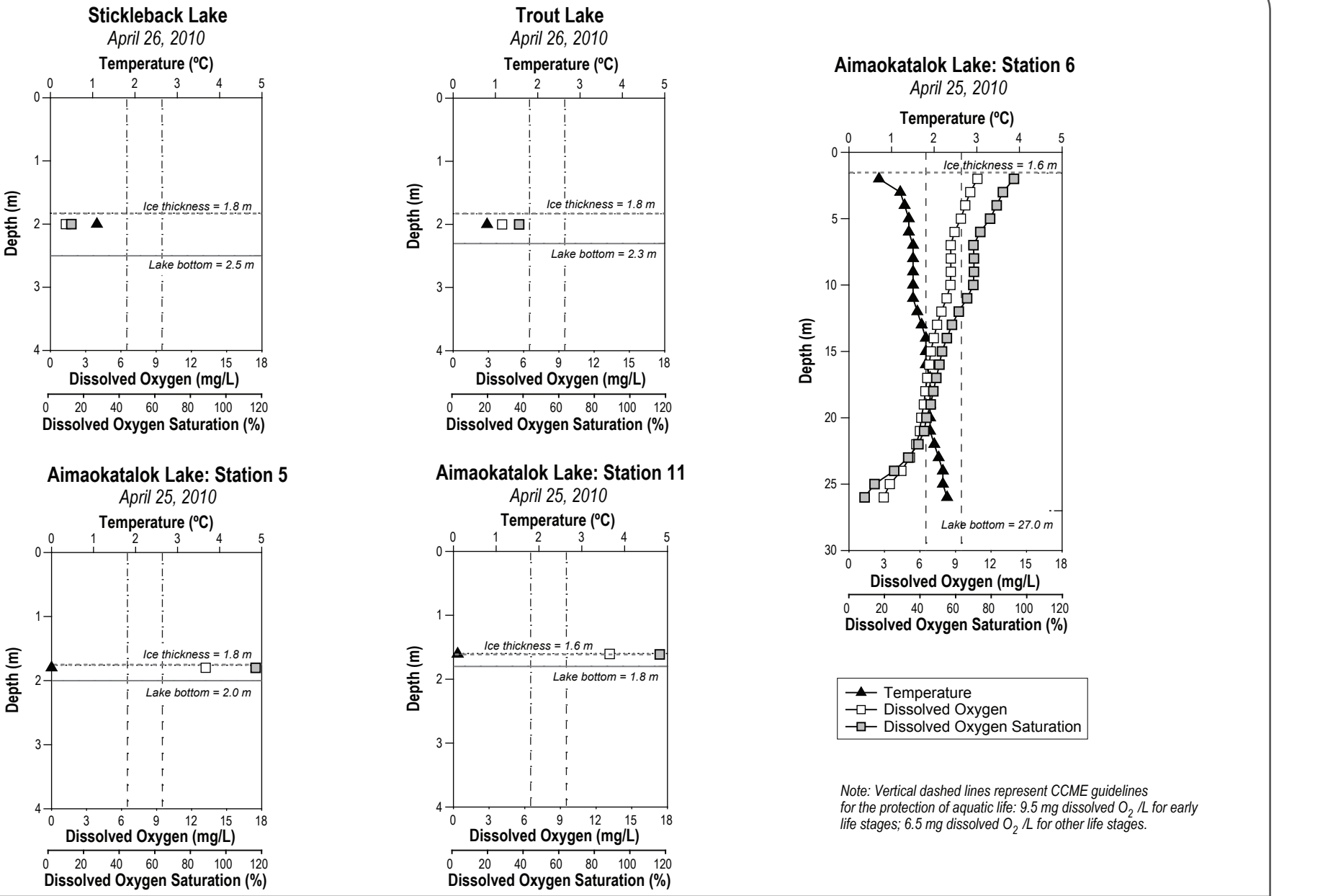
The ice cover was approximately 2 m thick on all lakes in April. Overall, the winter water column structure was typical of ice-covered lakes as water temperatures were coldest just below the ice, ranging from 0.0 to 1.1°C, and warmed slightly with depth in deeper lakes, reaching 2.2. to 2.3°C at the sediment-water interface (Figures 3.1-1a to 3.1-1b; raw data in Appendix 3.1-1). Although there were slight temperature gradients in the water columns of the deepest lakes, Aim. Stn 6 and Windy, the thermocline was not well-defined and temperatures generally changed gradually with depth.

Winter dissolved oxygen concentrations were highest near the water-ice interface, generally ranging between 10.8 and 13.2 mg/L. These levels were nearly saturated (97%) or supersaturated (117%), indicating that algae were actively photosynthesizing during this time. In two of the shallowest lakes, Stickleback and Trout, the ice cover extended nearly to the lake bottom and dissolved oxygen levels in the thin layer of water overlying the sediment were relatively low (Stickleback Lake: 1.3 mg/L, 11.9% saturation; Trout Lake: 4.2 mg/L, 37.4% saturation). In deeper lakes, dissolved oxygen concentrations and saturation levels gradually declined with depth to 2.9 to 3.8 mg/L and 27 to 35% at the water-sediment interface (Figure 3.1-1a to 3.1-1b and Table 3.1-1).

The CCME guideline for the lowest acceptable dissolved oxygen concentration for the protection of (cold-water) aquatic life is 9.5 mg/L for early life stages and 6.5 mg/L for other life stages (CCME 2007). During winter, dissolved oxygen concentrations in most lakes were above these guidelines in the upper portions of the water column (Figure 3.1-1a to 3.1-1b). However, bottom water dissolved oxygen concentrations were below guideline levels in the deeper lakes (Aim.Lake Stn 6 and Windy Lake). In the shallow Stickleback and Trout lakes, oxygen levels were also below 6.5 mg/L near the water-sediment interface. The low winter levels of dissolved oxygen in the deep waters of the sampled lakes are a common phenomenon in Arctic lakes, and are a result of oxygen depletion from respiration and a lack of exchange with atmospheric oxygen. This trend was also seen in Hope Bay area lakes during the winter of 2009 (Rescan 2010a).

3.1.2.2 Summer Lake Physical Limnology

Open-water limnological characteristics were measured in August 2010 (Figures 3.1-2a to 3.1-2c; Appendix 3.1-1). Most sites were well mixed during the summer. The exception was the deepest site, Aim. Stn 6, which had a pronounced thermal gradient at approximately 19 m depth. Overall, lake water temperatures ranged from 11.2°C to 14.8°C in August.



Note: Vertical dashed lines represent CCME guidelines for the protection of aquatic life: 9.5 mg dissolved O_2 /L for early life stages; 6.5 mg dissolved O_2 /L for other life stages.

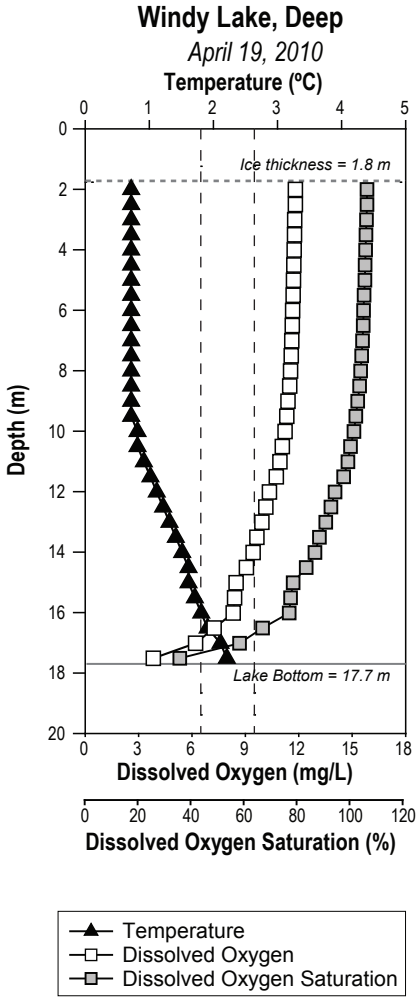
Figure 3.1-1a

NEWMONT NORTH AMERICA

Winter Dissolved Oxygen and Temperature Profiles in Lakes, Hope Bay Belt Project, April 2010

Figure 3.1-1a

Rescan™ Engineers & Scientists



Note: Vertical dashed lines represent CCME guidelines for the protection of aquatic life: 9.5 mg dissolved O_2 /L for early life stages; 6.5 mg dissolved O_2 /L for other life stages.

Figure 3.1-1b

NEWMONT NORTH AMERICA

Winter Dissolved Oxygen and Temperature Profiles in Lakes, Hope Bay Belt Project, April 2010

Figure 3.1-1b

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Table 3.1-1. Lake Dissolved Oxygen Concentrations and Percent Saturation, Winter and Summer 2010

	Winter					Summer				
	Bottom Depth	Dissolved Oxygen Concentration (mg/L)		Dissolved Oxygen Saturation (%)		Bottom Depth	Dissolved Oxygen Concentration (mg/L)		Dissolved Oxygen Saturation (%)	
Lake	(m)	min.	max.	min.	max.	(m)	min.	max.	min.	max.
Stickleback	2.5	**1.3**	**1.3**	11.9	11.9	2.6	**9.4**	**9.4**	100.0	100.7
Trout	2.3	**4.2**	**4.2**	37.4	37.4	2.4	**8.8**	**8.8**	96.7	97.0
Aim.Stn 13			NC			3.7	10.1	10.2	97.9	98.4
Aim. Stn 2			NC			2.5	**8.4**	**8.5**	91.3	91.7
Aim. Stn 12			NC			0.3	10.4	10.4	117.2	117.2
Aim. Stn 5	2.0	13.2	13.3	116.6	116.6	2.5	10.0	10.0	98.3	98.7
Aim. Stn 11	1.8	13.2	13.2	116.0	116.0	2.6	**9.2**	**9.2**	100.2	100.5
Aim. Stn 6	27.0	**2.9**	10.8	27.2	97.4	28.5	**8.8**	10.1	81.5	97.7
Windy Deep	17.7	**3.8**	11.8	35.1	105.6	17.7	10.2	10.3	93.1	95.5

CCME guideline for dissolved oxygen is 9.5 mg/L for early life stages, 6.5 mg/L for other life stages.
Bold values indicate concentrations that are below at least one CCME guideline level.
NC - not collected

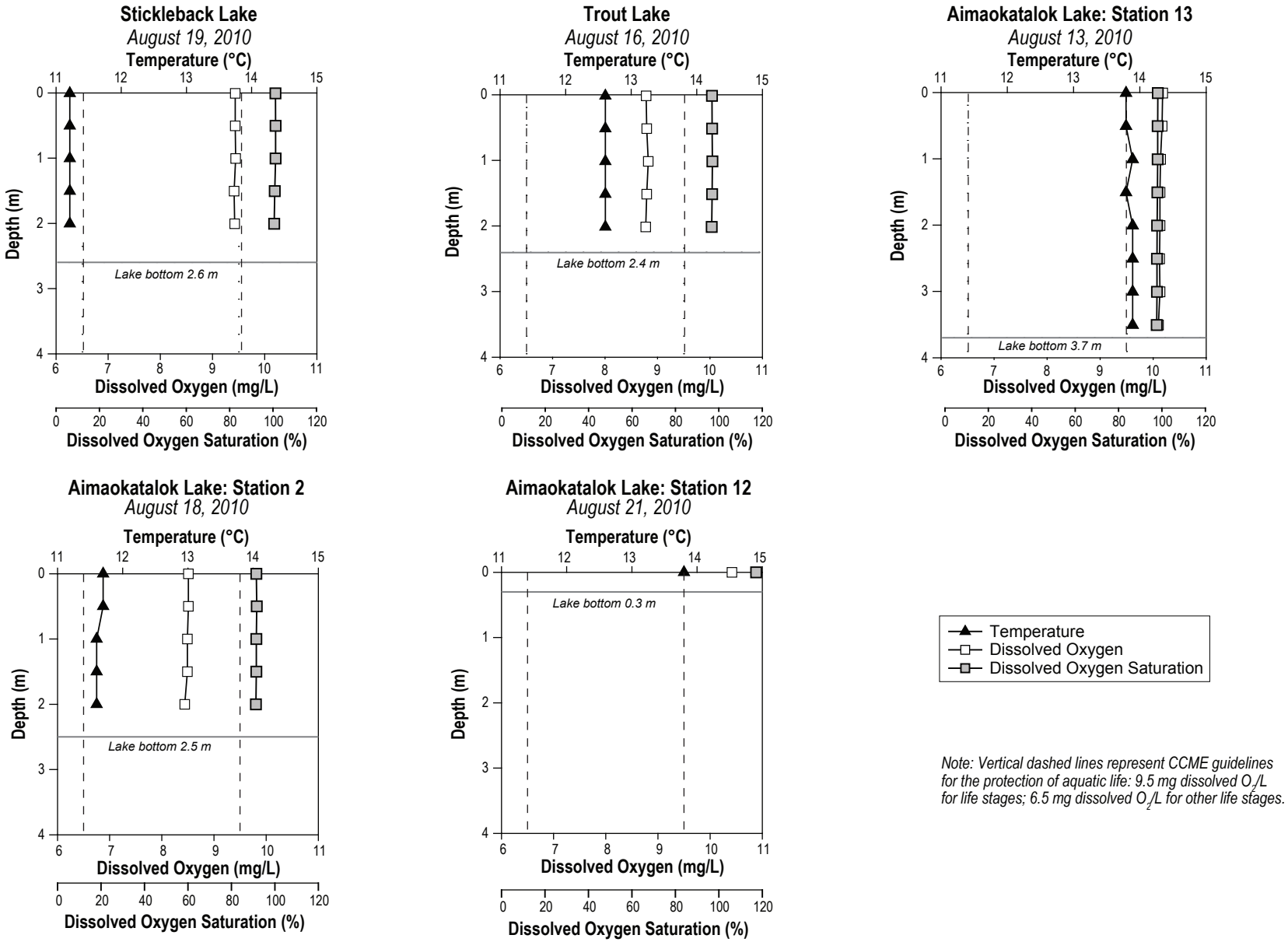
Summer dissolved oxygen concentrations changed little throughout the water columns of all lakes, mirroring patterns observed in water temperature. Slight declines in oxygen concentrations occurred near the lake bottom at Aim. Stn 6, likely due to respiratory oxygen consumption. Overall, lakes were well-oxygenated, with water column oxygen concentrations ranging from 8.4 mg/L (Aim. Stn 2 at 2.0 m depth) to 10.4 mg/L (Aim. Stn 12 at the surface). Dissolved oxygen saturation levels ranged from 81.5% in the bottom waters of Aim. Stn 6 to 117% at the surface of the shallow site Aim. Stn 12 (Figures 3.1-2a to 3.1-2c; Table 3.1-1).

Secchi depths and calculated euphotic zone depths for all lakes sampled during the open-water season are presented in Table 3.1-2. Secchi depth, a measure of water clarity, was shallow and ranged from 1.4 m (Trout) to 3.5 m (Windy). Water clarity was generally greatest in deepest lake sites, Windy (17.7 m) than in the other shallow lake sites.

The euphotic zone depth, which defines the area of the water column where there is enough light to support photosynthesis, ranged from 5.7 to 14.2 m (calculated from Secchi depth). The euphotic zone extended throughout the entire water column in all shallow lake sampling sites, allowing benthic primary production in these lakes (Table 3.1-2).

Table 3.1-2. Lake Secchi and Euphotic Zone Depths, August 2010

Watershed	Lake/Station	Lake Depth (m)	Secchi Depth D_s (m)	Euphotic Zone Depth EZD (m)
Aimaokatalok	Stickleback	2.6	bottom	10.6
	Trout	2.4	1.4	5.7
	Aim. Stn 13	3.7	2.7	11.0
	Aim. Stn 2	2.5	2.4	9.7
	Aim. Stn 5	2.5	2.0	8.1
	Aim. Stn 11	2.6	2.2	8.9
	Aim. Stn 6	28.5	2.7	11.0
Windy	Windy	17.7	3.5	14.2



Note: Vertical dashed lines represent CCME guidelines for the protection of aquatic life: 9.5 mg dissolved O_2/L for life stages; 6.5 mg dissolved O_2/L for other life stages.

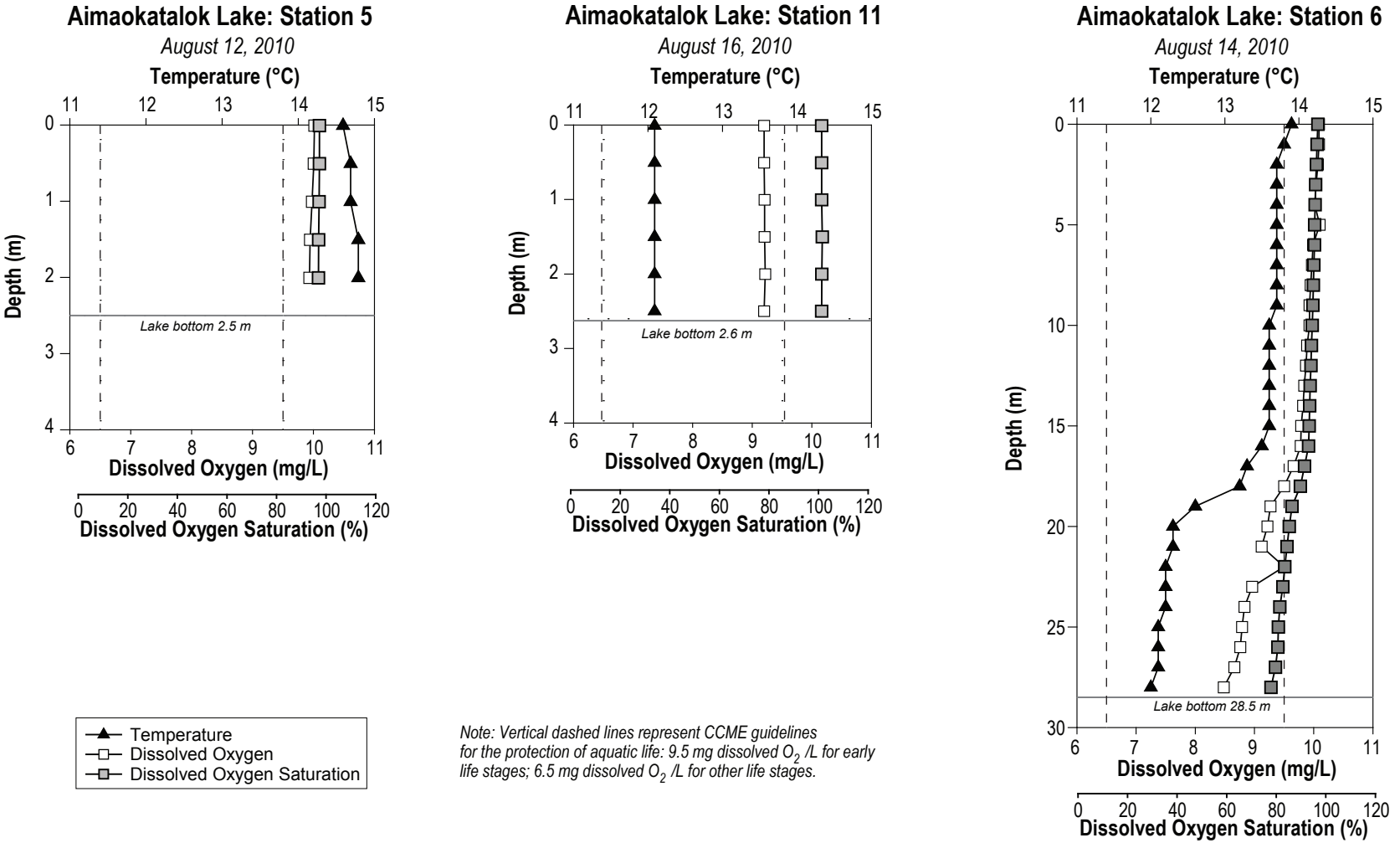
Figure 3.1-2a

NEWMONT NORTH AMERICA

Summer Dissolved Oxygen and Temperature Profiles in Lakes, Hope Bay Belt Project, August 2010

Figure 3.1-2a

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Note: Vertical dashed lines represent CCME guidelines for the protection of aquatic life: 9.5 mg dissolved O_2 /L for early life stages; 6.5 mg dissolved O_2 /L for other life stages.

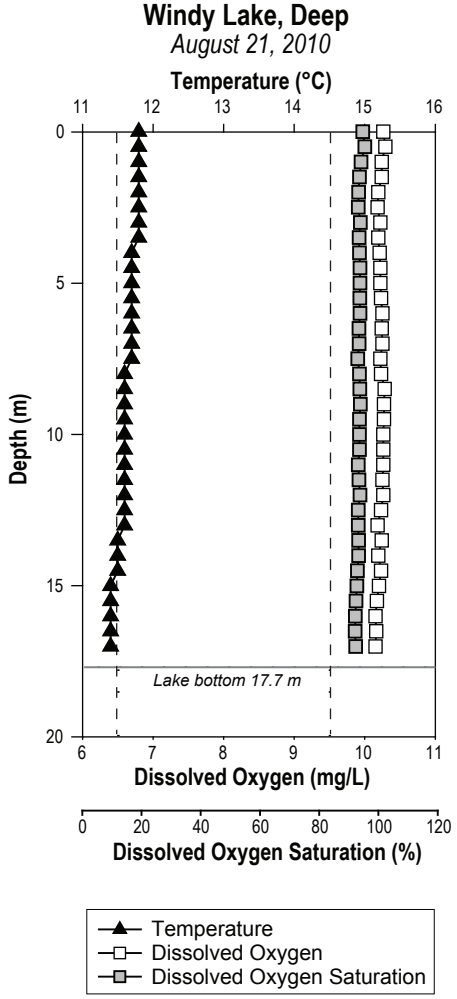
Figure 3.1-2b

NEWMONT NORTH AMERICA

Summer Dissolved Oxygen and Temperature Profiles in Lakes, Hope Bay Belt Project, August 2010

Figure 3.1-2b

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Note: Vertical dashed lines represent CCME guidelines for the protection of aquatic life: 9.5 mg dissolved O_2 /L for early life stages; 6.5 mg dissolved O_2 /L for other life stages.

Figure 3.1-2c

NEWMONT NORTH AMERICA

Summer Dissolved Oxygen and Temperature Profiles in Lakes, Hope Bay Belt Project, August 2010

Figure 3.1-2c

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3.1.2.3 Winter Stream and River Physical Limnology

Winter temperature and dissolved oxygen profiles were collected at Koig. R. and Koig. U/S on the Koignuk River in April 2010 (Table 3.1-3 and Appendix 3.1-2). Ice thickness on the Koignuk River ranged from 1.5 to 1.8 m. Because of the ice thickness, under-ice river water was assumed to be limited to isolated pools separated by frozen sections of river. The following observations supported this assumption:

- four attempts to reach under-ice river water in the downstream Koignuk were unsuccessful as ice extended to the river bottom. This site was successfully sampled in 2009 (Rescan 2010a);
- stream flow measurements from 2009 found that the Koignuk River does not flow year-round, and flow ceases during some winter months (Rescan 2009);
- there was no evidence of freshwater input at the confluence with Hope Bay (no decrease in ocean salinity; Rescan 2010b); and
- no section of the Koignuk River was observed to be free of ice.

Table 3.1-3. River Dissolved Oxygen and Temperature Profiles, Winter 2010

Site	Date Sampled	Ice Thickness (m)	Bottom Depth (m)	Sampling Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
Koig. R.	25-April-10	1.81	4.3	2.0	0.5	10.72	95.6
				2.5	0.8	9.74	87.4
				3.0	1.0	**9.29**	83.5
				3.5	1.0	**8.25**	74.5
				4.0	1.1	**8.03**	72.6
Koig. U/S	18-April-10	1.46	2.0	1.5	0.0	**9.46**	83.2
				2.0	0.0	9.51	83.8

CCME guideline for dissolved oxygen is 9.5 mg/L for early life stages, 6.5 mg/L for other life stages.
Bold values indicate concentrations that are below at least one CCME guideline level.

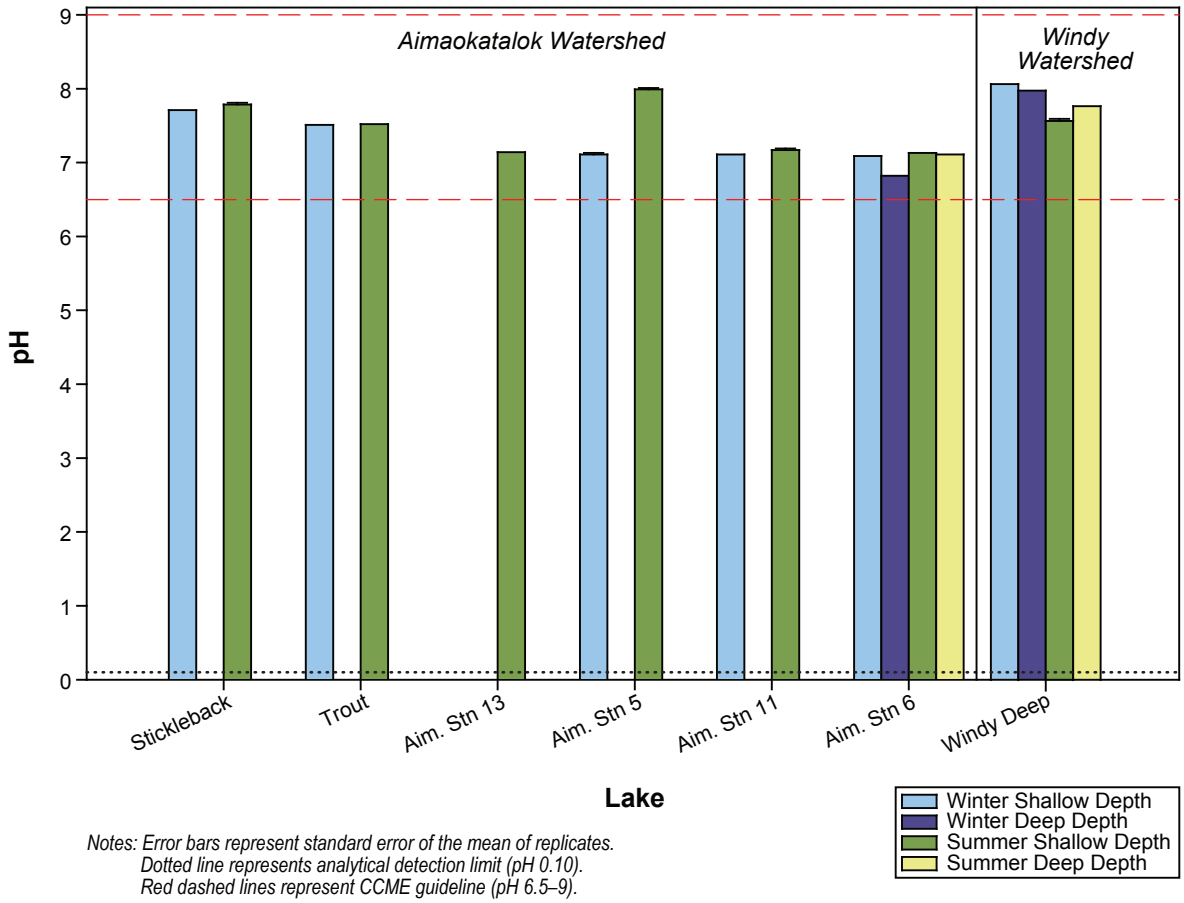
As expected, the water temperatures in the Koignuk River were near freezing, ranging from 0.0 to 1.1°C. Oxygen concentrations were similar at both Koignuk River sampling sites, averaging 9.3 mg/L and 83% saturation. Temperatures increased and dissolved oxygen decreased with depth at the deeper Koig. R. sampling site.

3.2 LAKE WATER QUALITY

Lake water quality samples were collected in both the under-ice (April) and open-water season (August) in 2010. Historical data are also available for some lakes in the study area (Figures 2.14-1a to 2.14-1c; Table 2.14-1). Raw 2010 water quality data for lakes are presented in Appendix 3.2-1, and QA/QC data are presented in Appendix 3.2-2. All water quality data were compared to CCME guidelines for the protection of freshwater aquatic life (CCME 2007).

3.2.1 Depth Variation

Lake water quality data collected in 2010 are presented graphically in Figures 3.2-1a to 3.2-1y. Within the two deep lake sampling stations, Aim. Stn 6 and Windy, there were few differences in water quality between surface samples and samples collected from 2 m above the sediment. This is not surprising, as lakes tended to be well-mixed to weakly stratified in both April and August 2010.



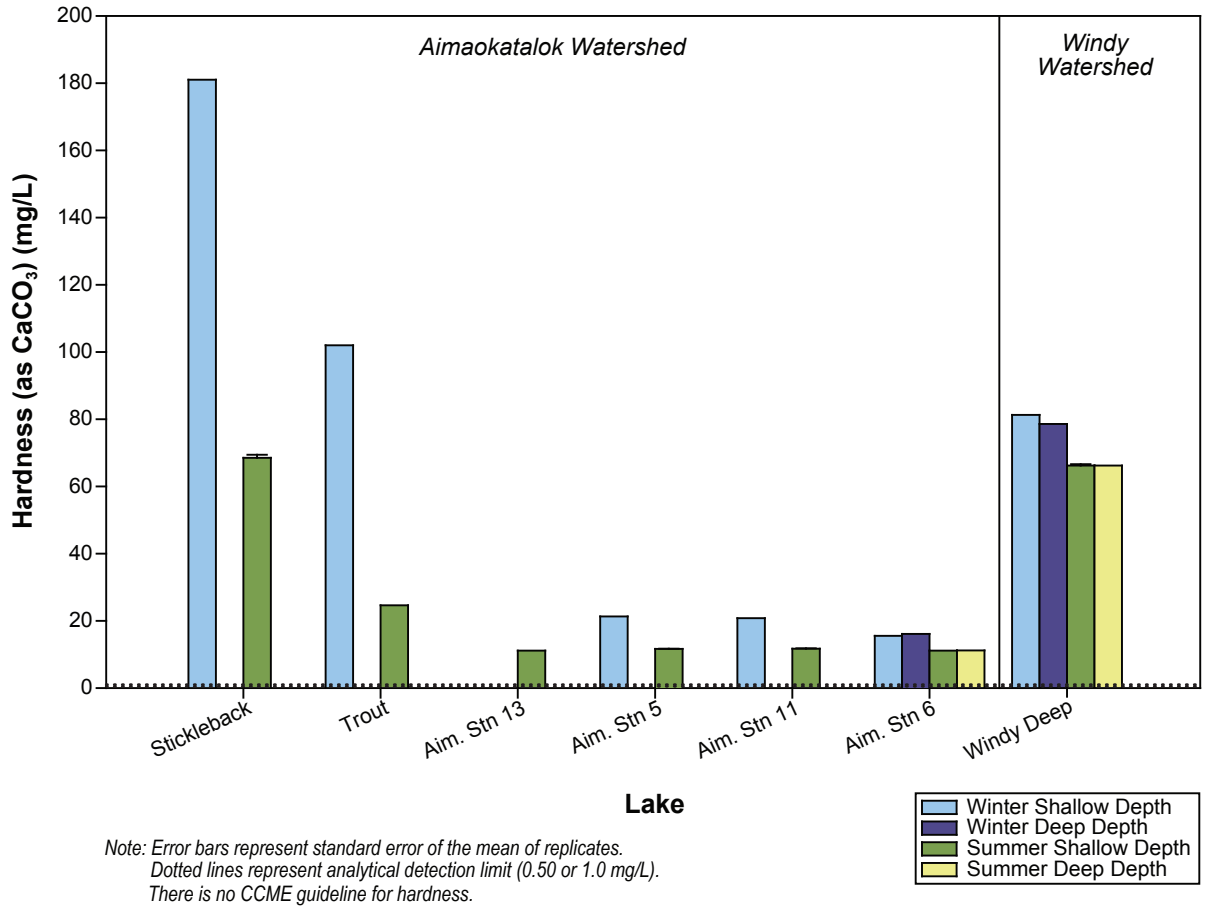
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (pH 0.10).
Red dashed lines represent CCME guideline (pH 6.5–9).

NEWMONT NORTH AMERICA

pH in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1a

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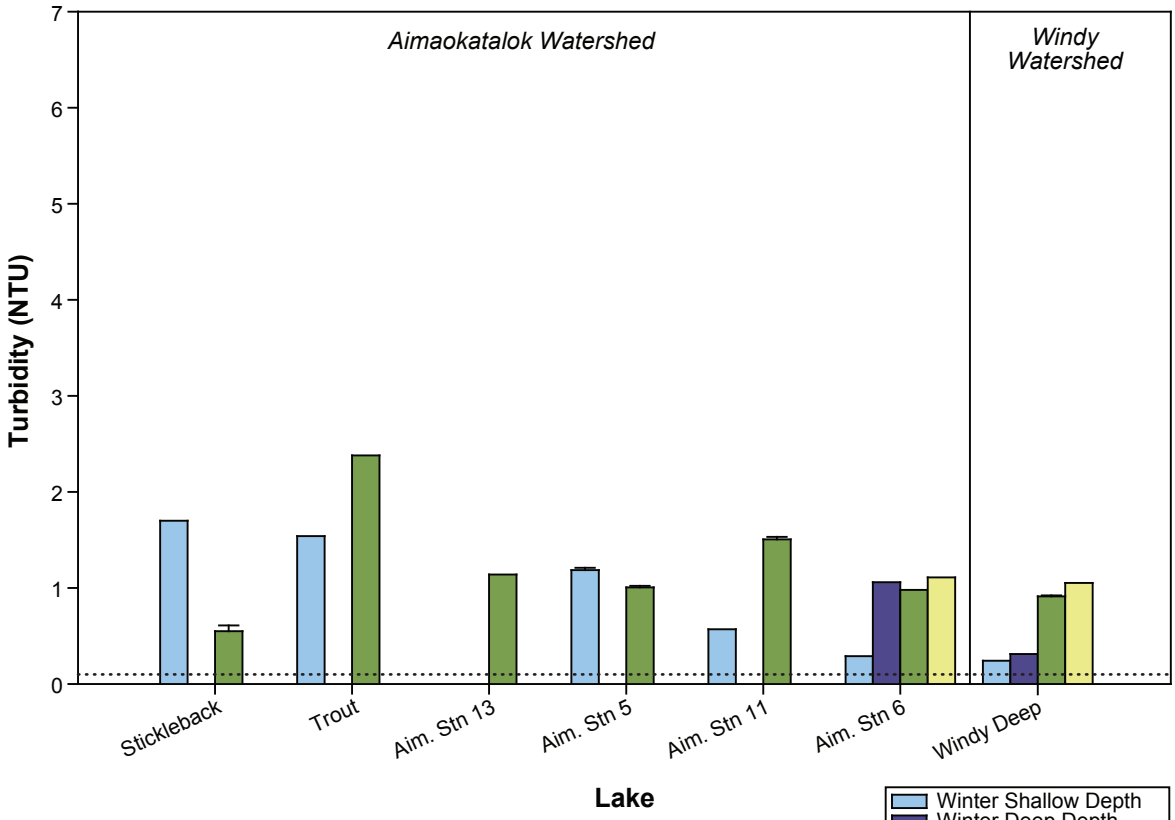
Note: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.50 or 1.0 mg/L).
There is no CCME guideline for hardness.

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Hardness in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1b

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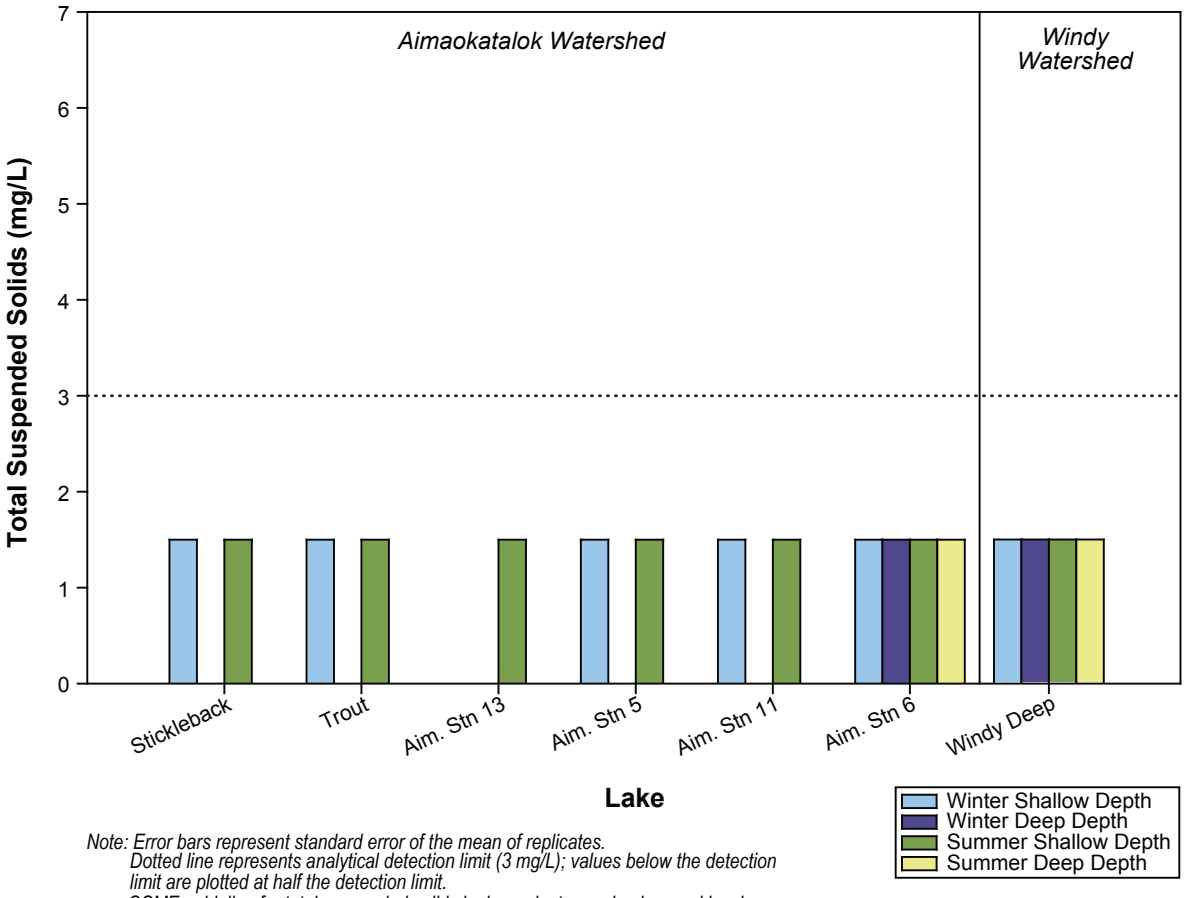
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.1 NTU).
CCME guideline for turbidity is dependent upon background levels.

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Turbidity in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1c

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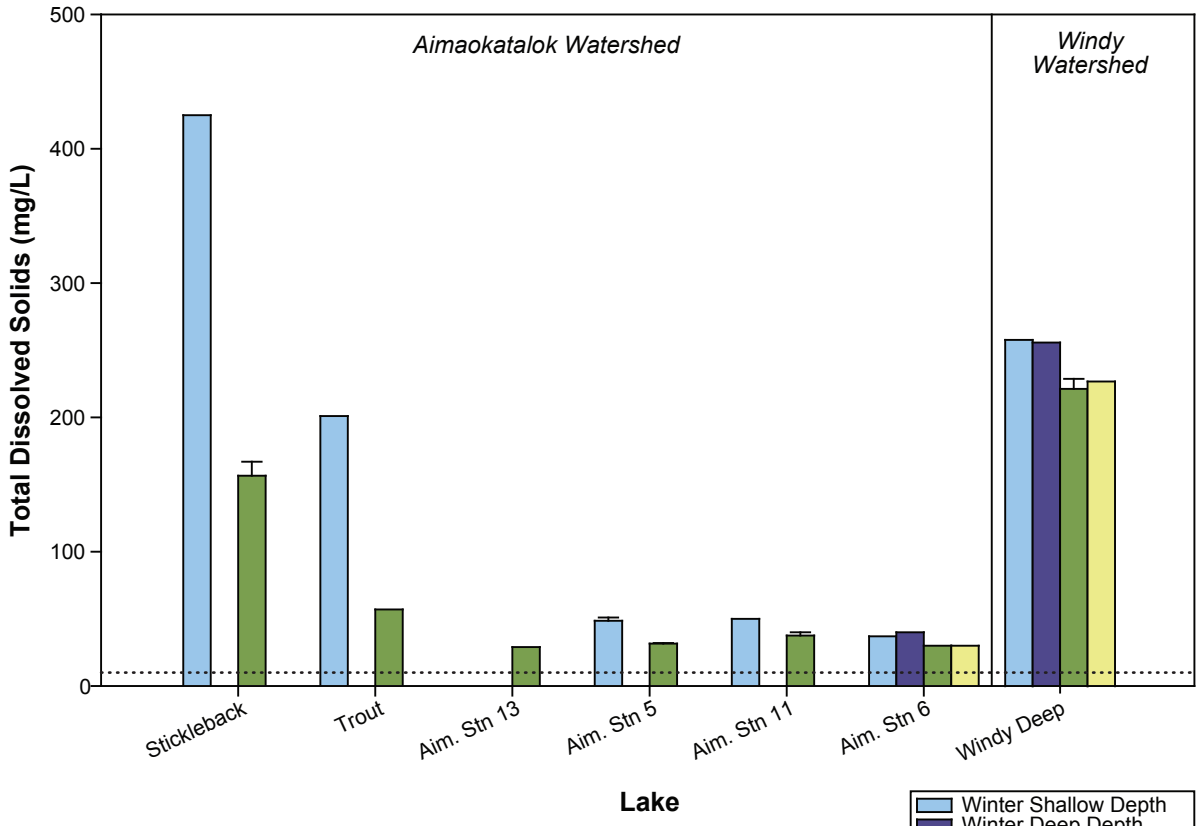
Note: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (3 mg/L); values below the detection limit are plotted at half the detection limit.
CCME guideline for total suspended solids is dependent upon background levels.

NEWMONT NORTH AMERICA

Total Suspended Solids Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1d

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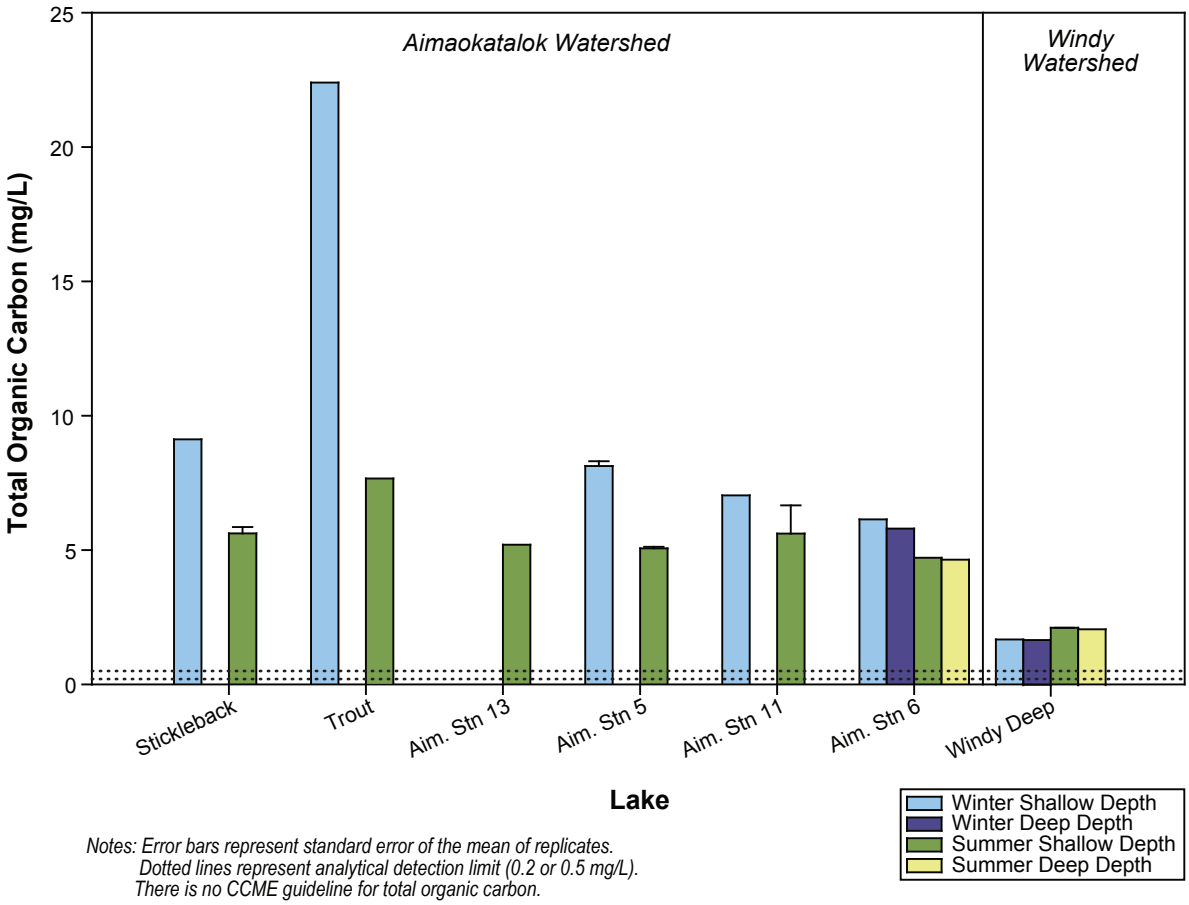
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (10 mg/L).
Total dissolved solids were not measured in Doris South, Doris North, and Little Roberts lakes.
There is no CCME guideline for total dissolved solids.

NEWMONT NORTH AMERICA

Total Dissolved Solids Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1e

Rescan™ Engineers & Scientists



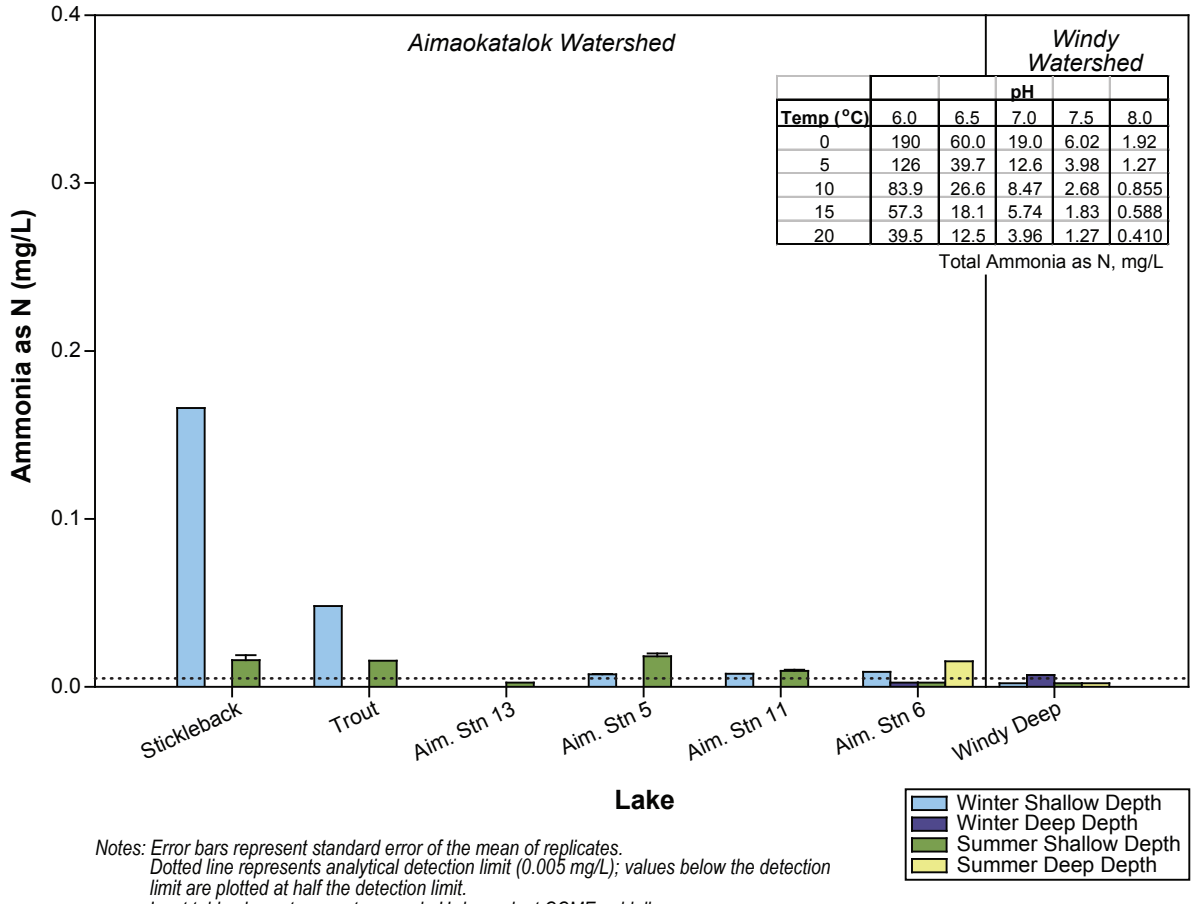
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.2 or 0.5 mg/L).
There is no CCME guideline for total organic carbon.

NEWMONT NORTH AMERICA

Total Organic Carbon in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1f

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	pH				
Temp (°C)	6.0	6.5	7.0	7.5	8.0
0	190	60.0	19.0	6.02	1.92
5	126	39.7	12.6	3.98	1.27
10	83.9	26.6	8.47	2.68	0.855
15	57.3	18.1	5.74	1.83	0.588
20	39.5	12.5	3.96	1.27	0.410

Total Ammonia as N, mg/L

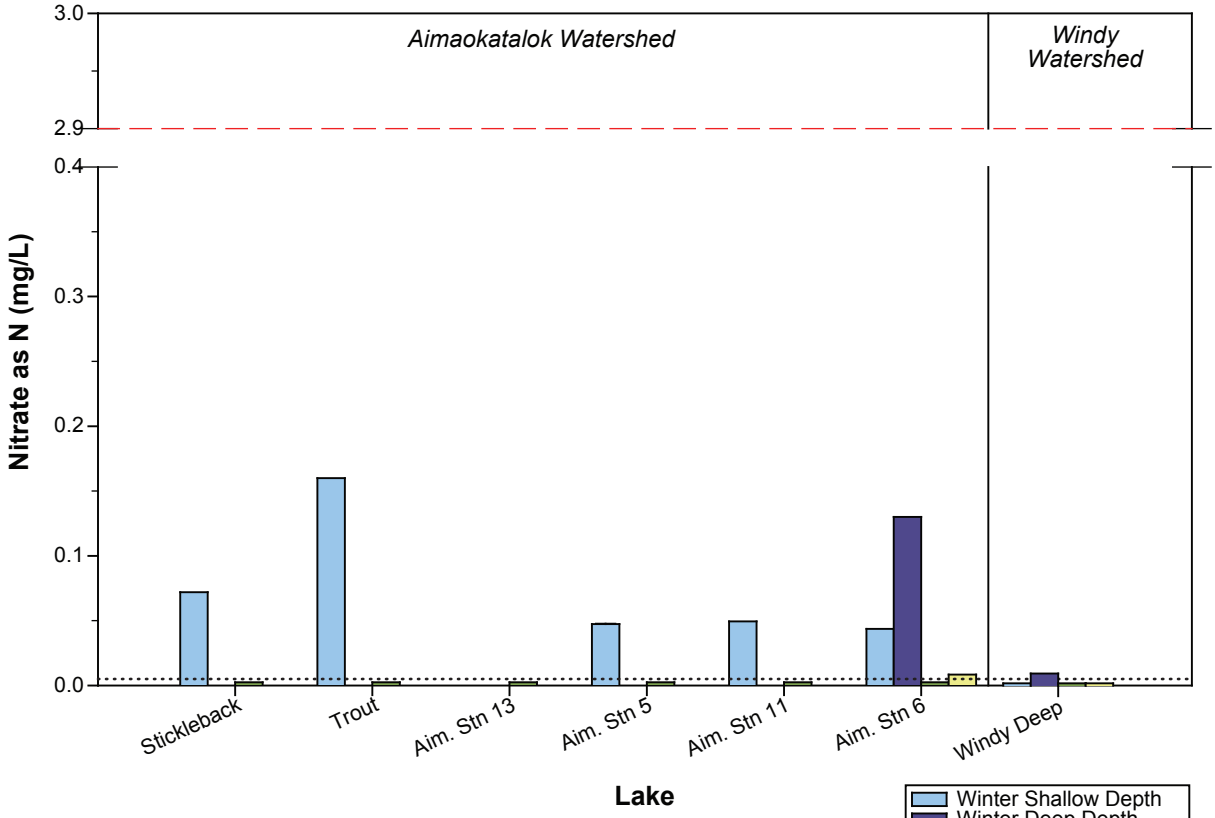
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.005 mg/L); values below the detection limit are plotted at half the detection limit.
Inset table shows temperature- and pH-dependent CCME guideline.

NEWMONT NORTH AMERICA

Ammonia Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1g

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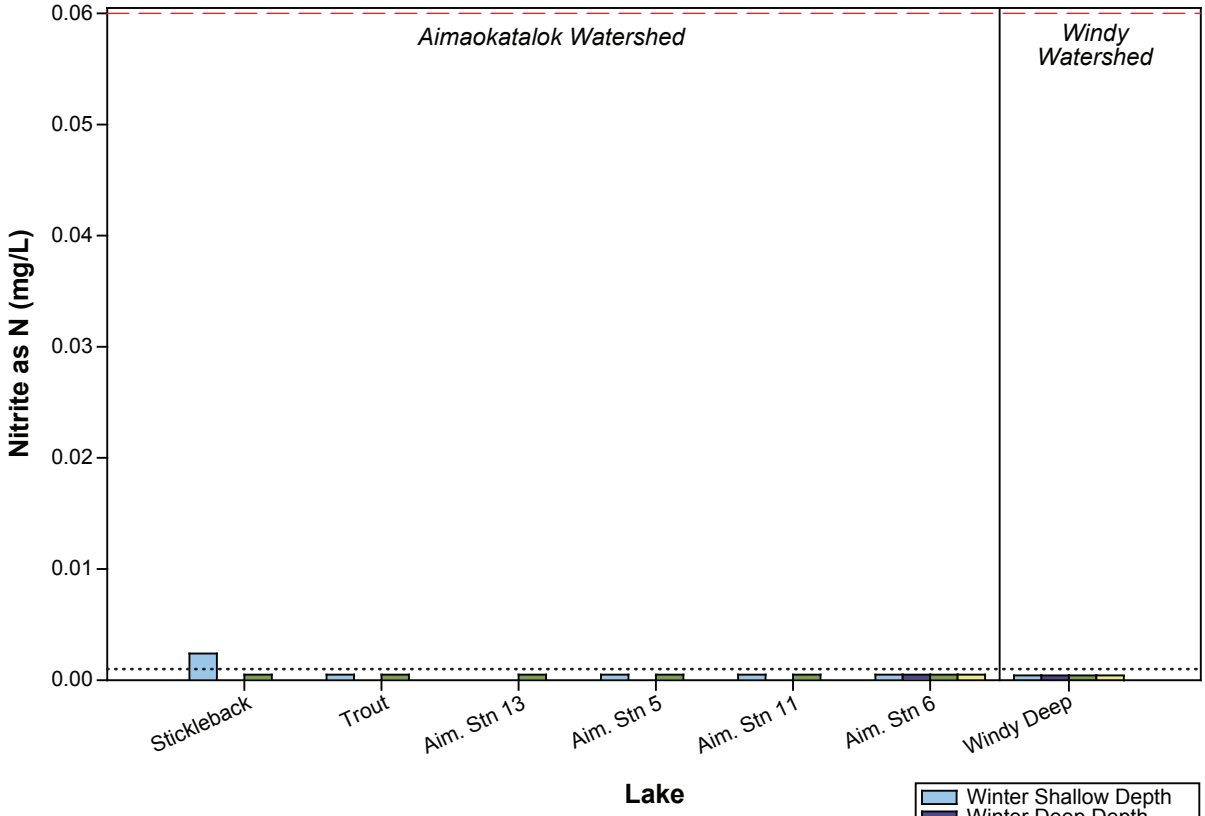
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.005 mg/L);
values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (2.9 mg/L).

NEWMONT NORTH AMERICA

Nitrate Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1h

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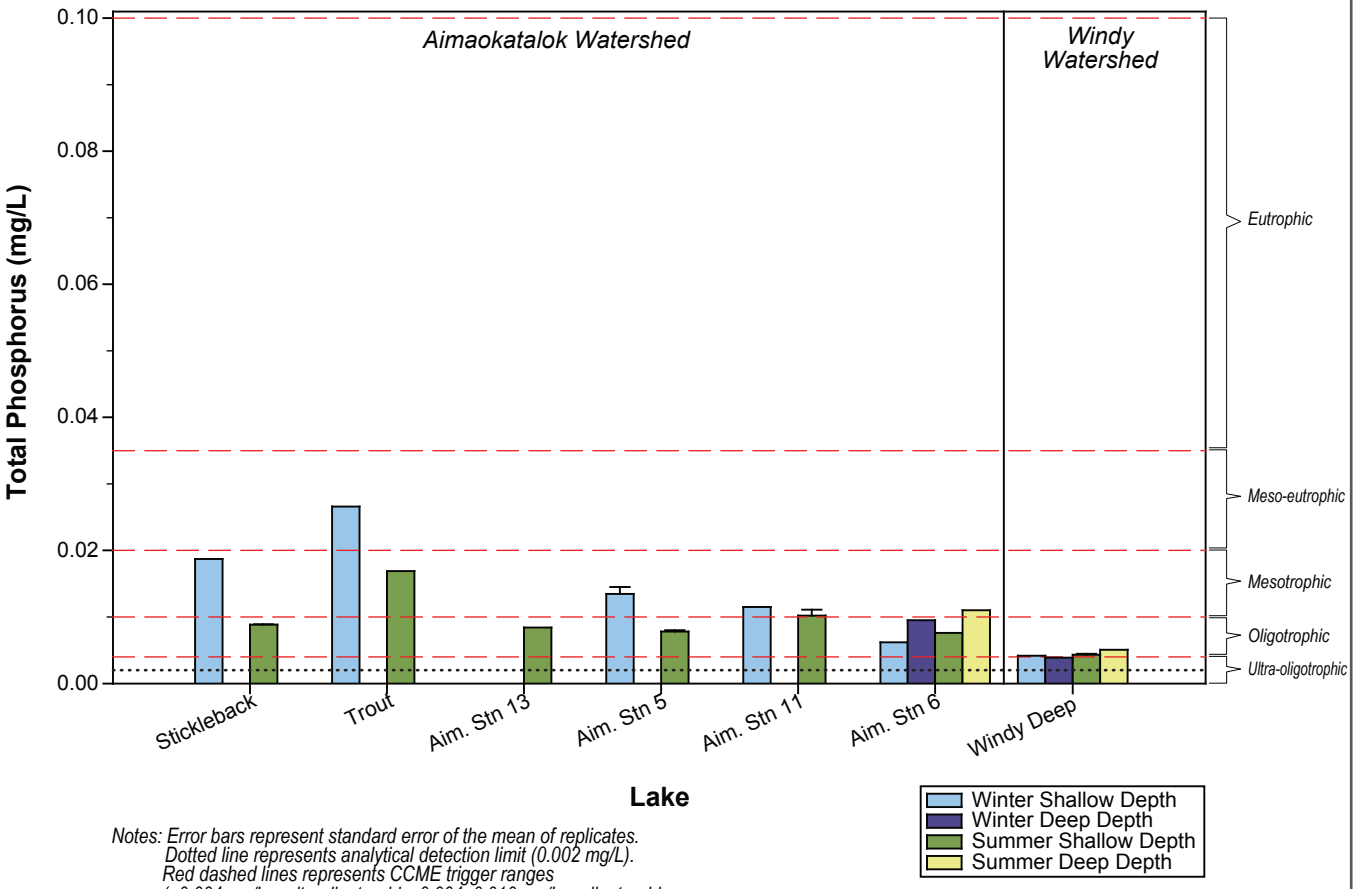
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.001 mg/L);
values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.06 mg/L).

NEWMONT NORTH AMERICA

Nitrite Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1i

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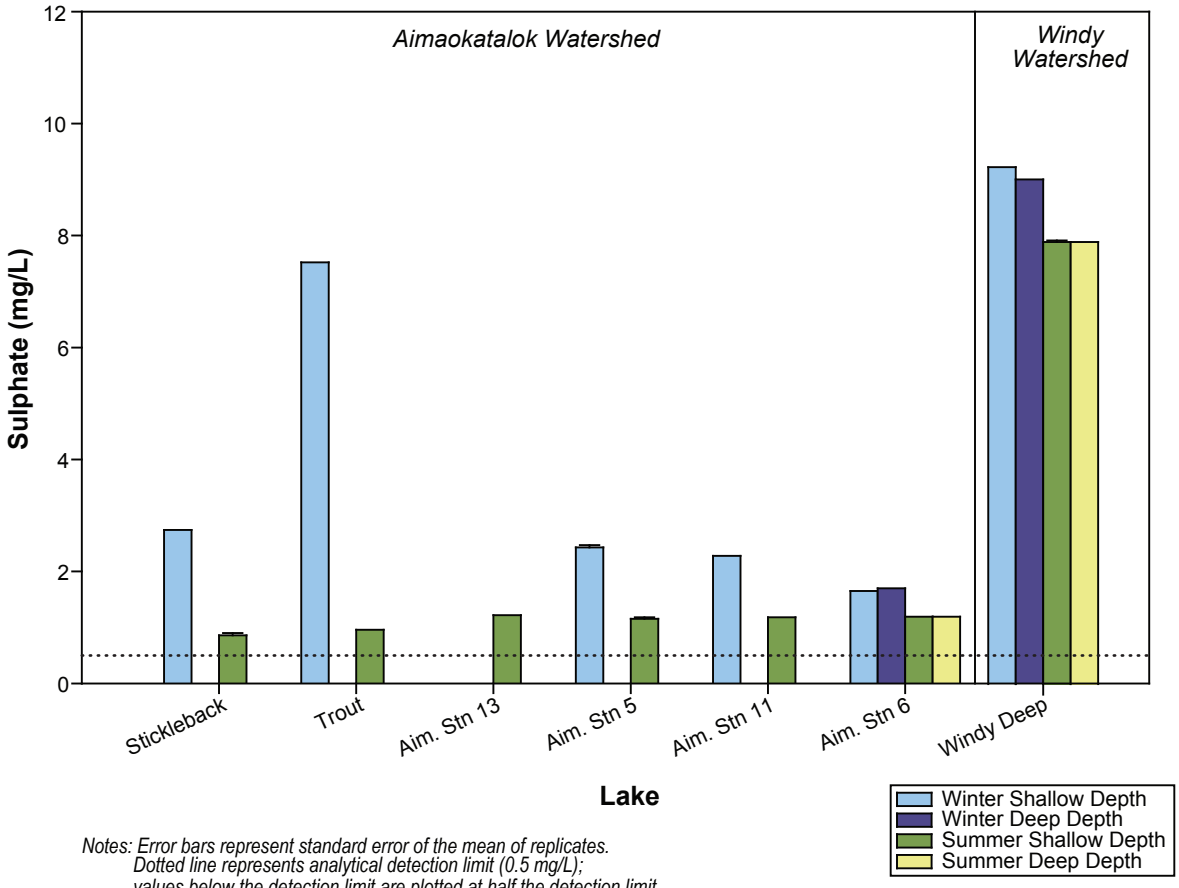
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.002 mg/L).
Red dashed lines represents CCME trigger ranges
(<0.004 mg/L = ultraoligotrophic; 0.004–0.010 mg/L = oligotrophic;
0.01–0.02 mg/L = mesotrophic; 0.02–0.035 mg/L = meso-eutrophic;
0.035–0.1 mg/L = eutrophic; >0.1 mg/L = hyper-eutrophic).

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Total Phosphorus Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1j

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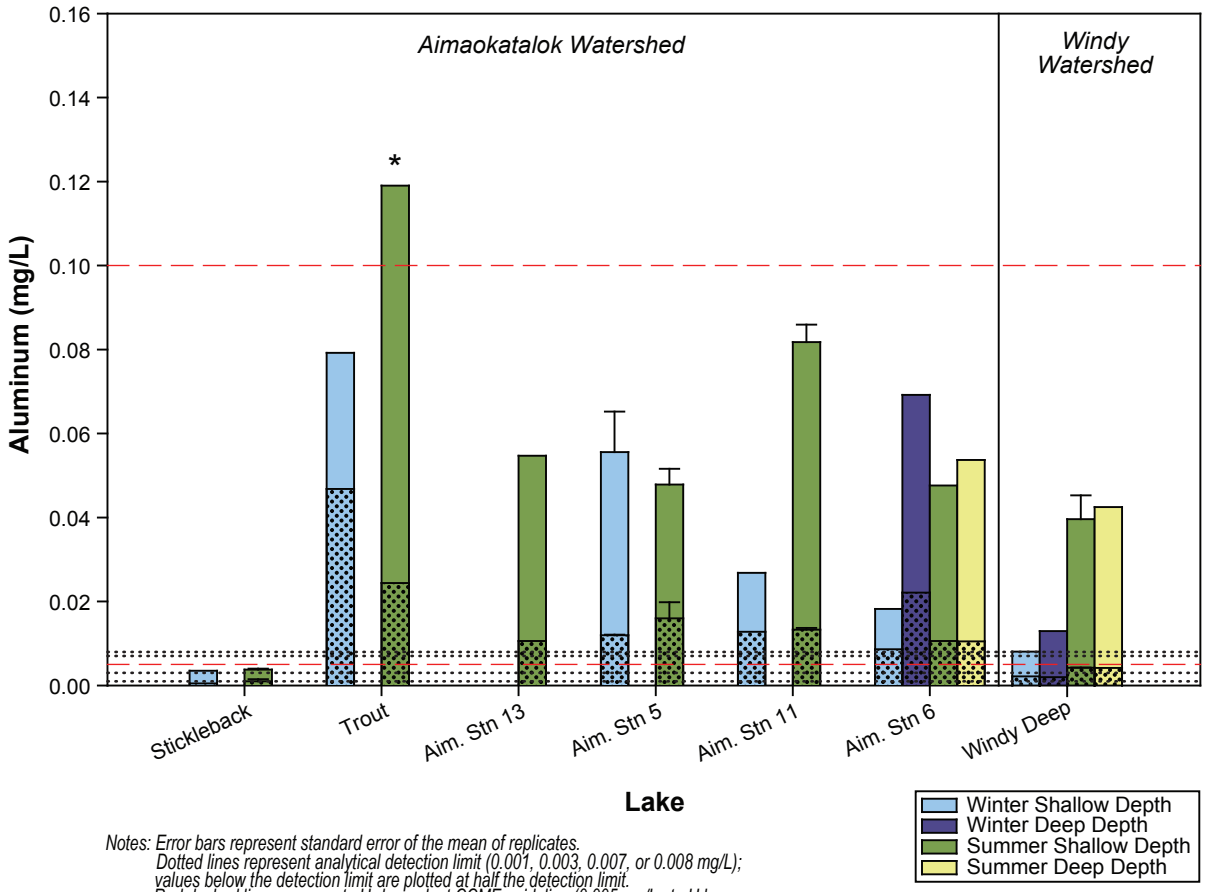
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.5 mg/L);
values below the detection limit are plotted at half the detection limit.
There is no CCME guideline for sulphate.

NEWMONT NORTH AMERICA

Sulphate Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1k

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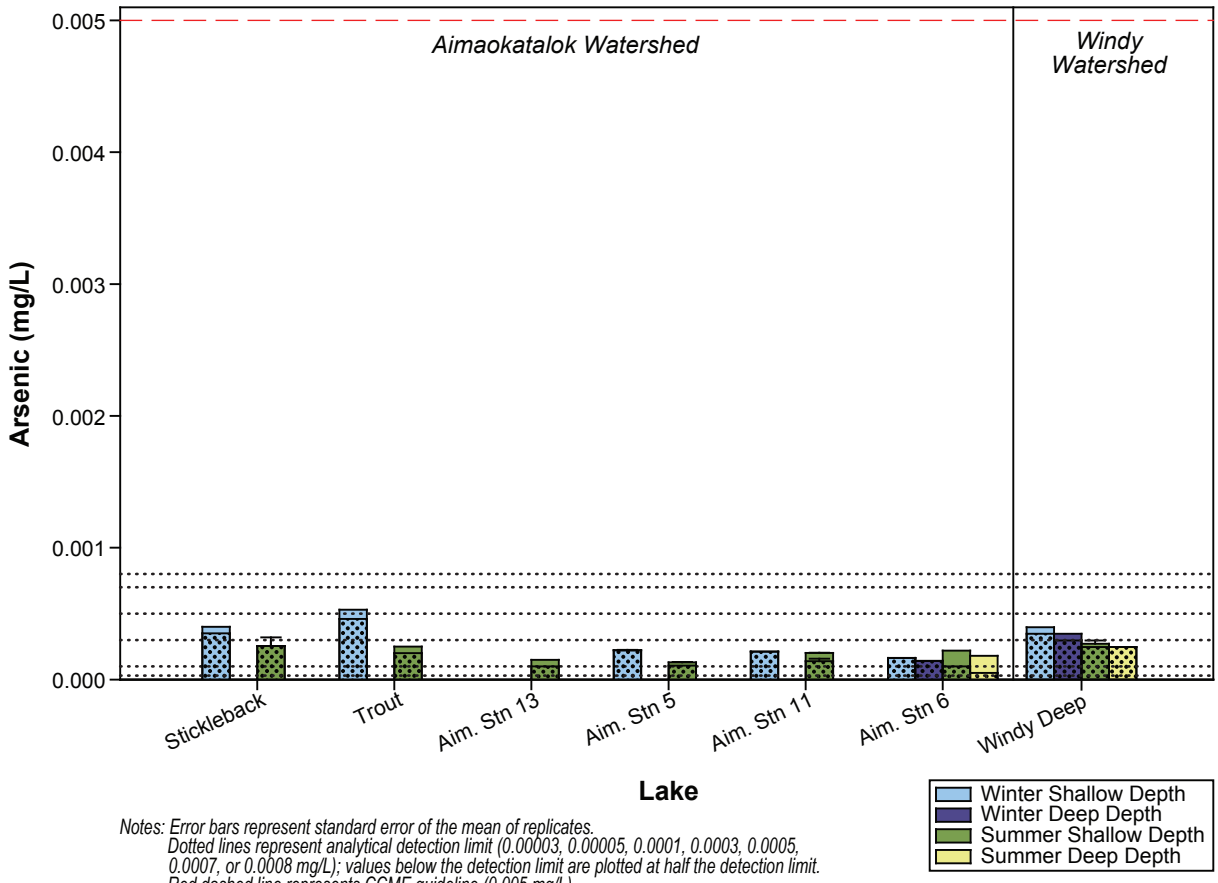
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.001, 0.003, 0.007, or 0.008 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed lines represent pH-dependent CCME guideline (0.005 mg/L at pH less than 6.5; 0.1 mg/L at pH greater than or equal to 6.5).
pH was greater than 6.5 in all samples.
Solid columns represent total aluminum and superimposed dotted columns represent dissolved aluminum.
** Indicates average total aluminum values that are higher than CCME guideline.*

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Aluminum Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1l

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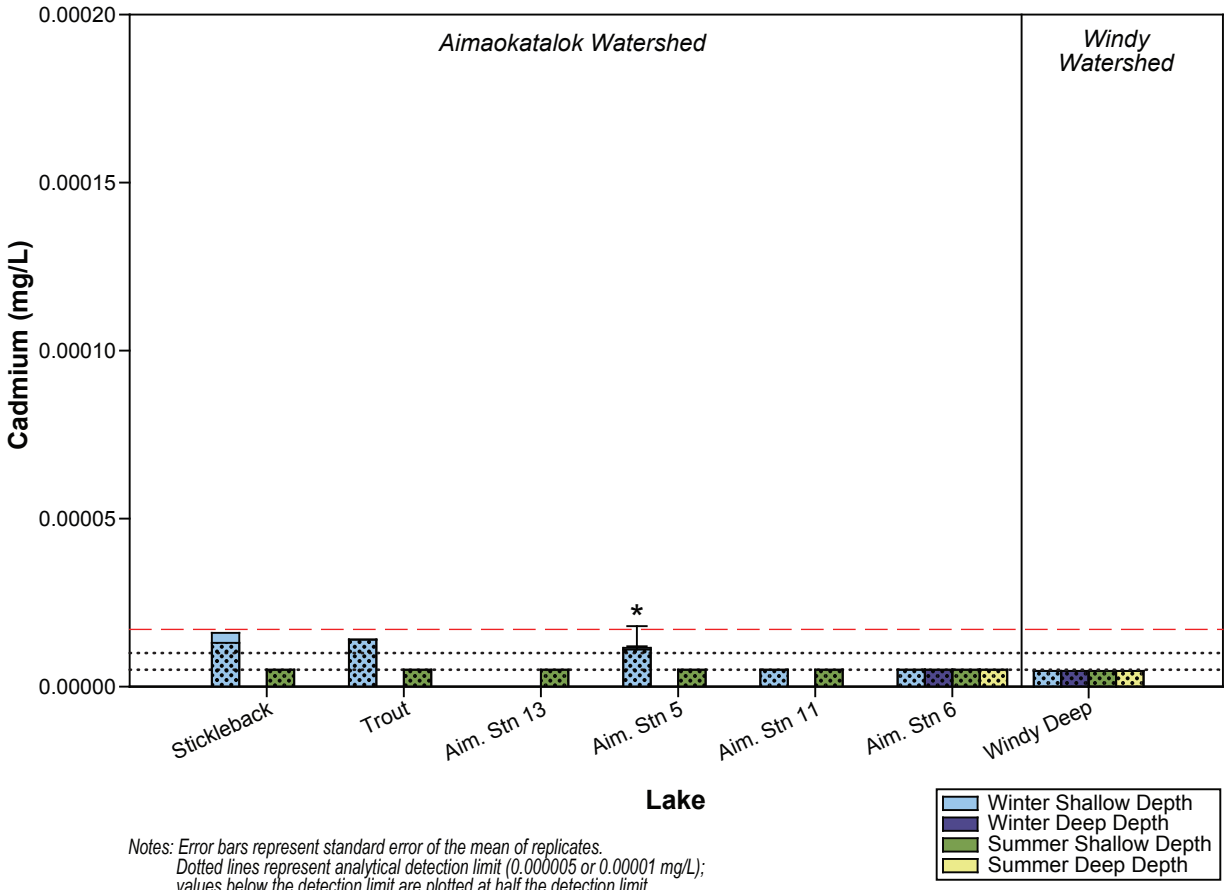
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.00003, 0.00005, 0.0001, 0.0003, 0.0005, 0.0007, or 0.0008 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.005 mg/L).
Solid columns represent total arsenic and superimposed dotted columns represent dissolved arsenic.

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Arsenic Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1m

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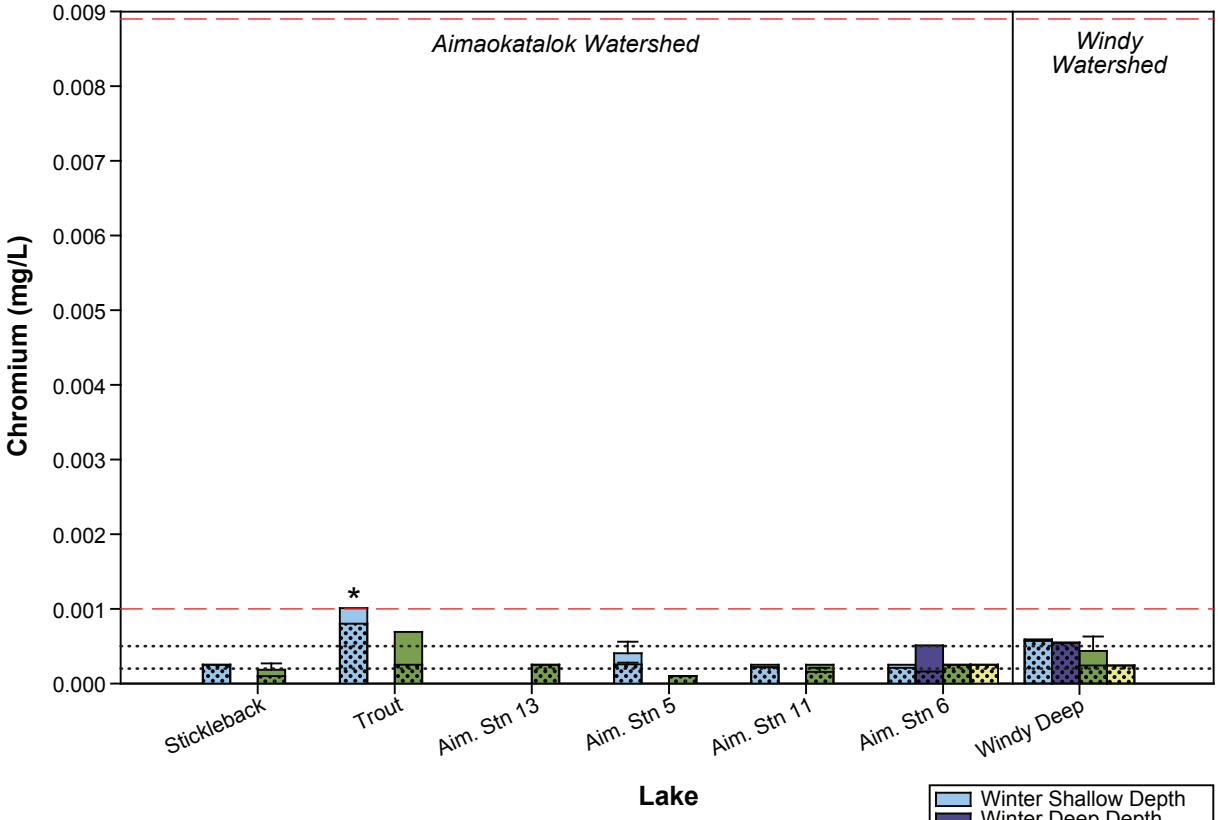
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.000005 or 0.00001 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.000017 mg/L).
The equation for correcting this guideline for hardness is: $10^{[0.86[\log(\text{hardness})]-3.2]}/1000$.
Solid columns represent total cadmium and superimposed dotted columns represent dissolved cadmium.
** Indicates average total cadmium values that are higher than hardness-corrected CCME guideline.*

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Cadmium Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1n

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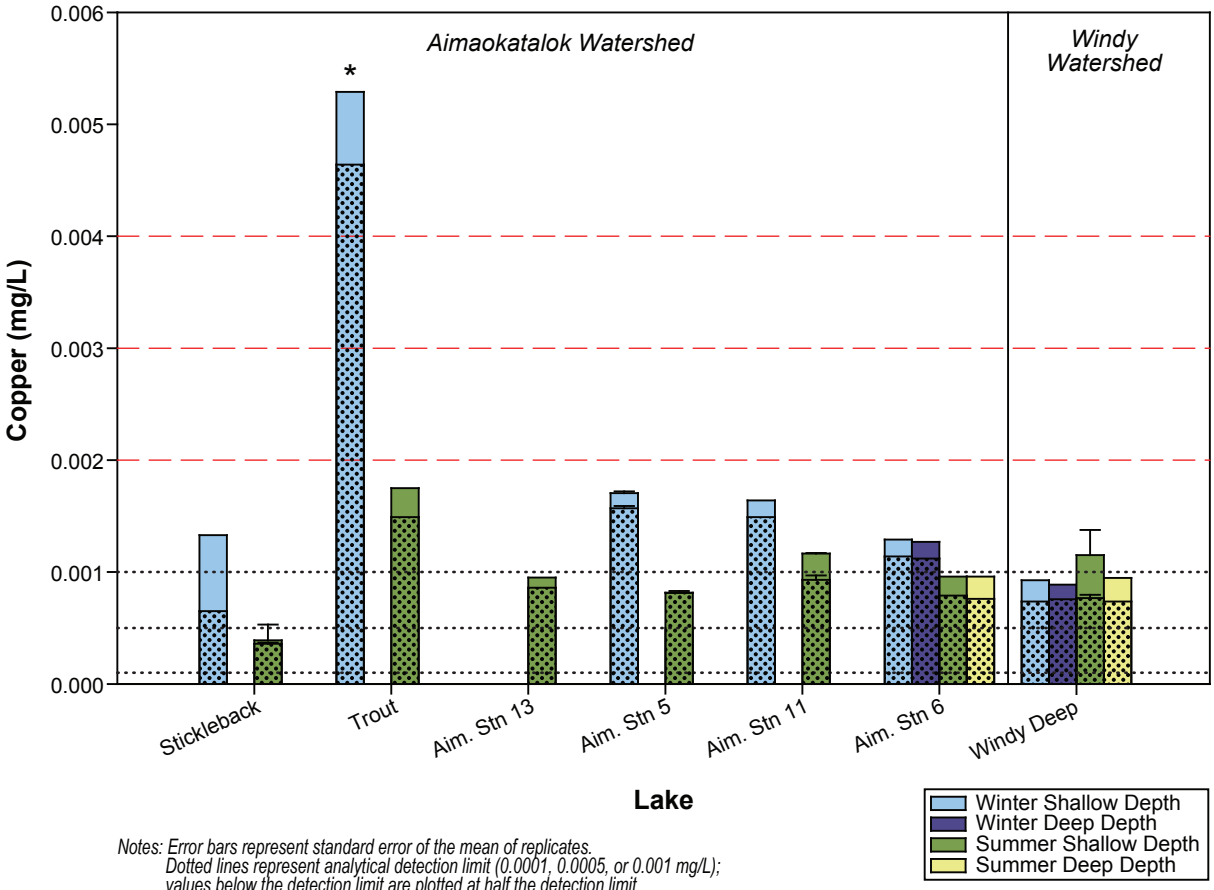
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.0002 or 0.0005 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline for hexavalent chromium (0.001 mg/L) and interim guideline for trivalent chromium (0.0089 mg/L).
Solid columns represent total chromium and superimposed dotted columns represent dissolved chromium.
** Indicates average total chromium values that are higher than CCME guideline for hexavalent chromium.*

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Chromium Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1o

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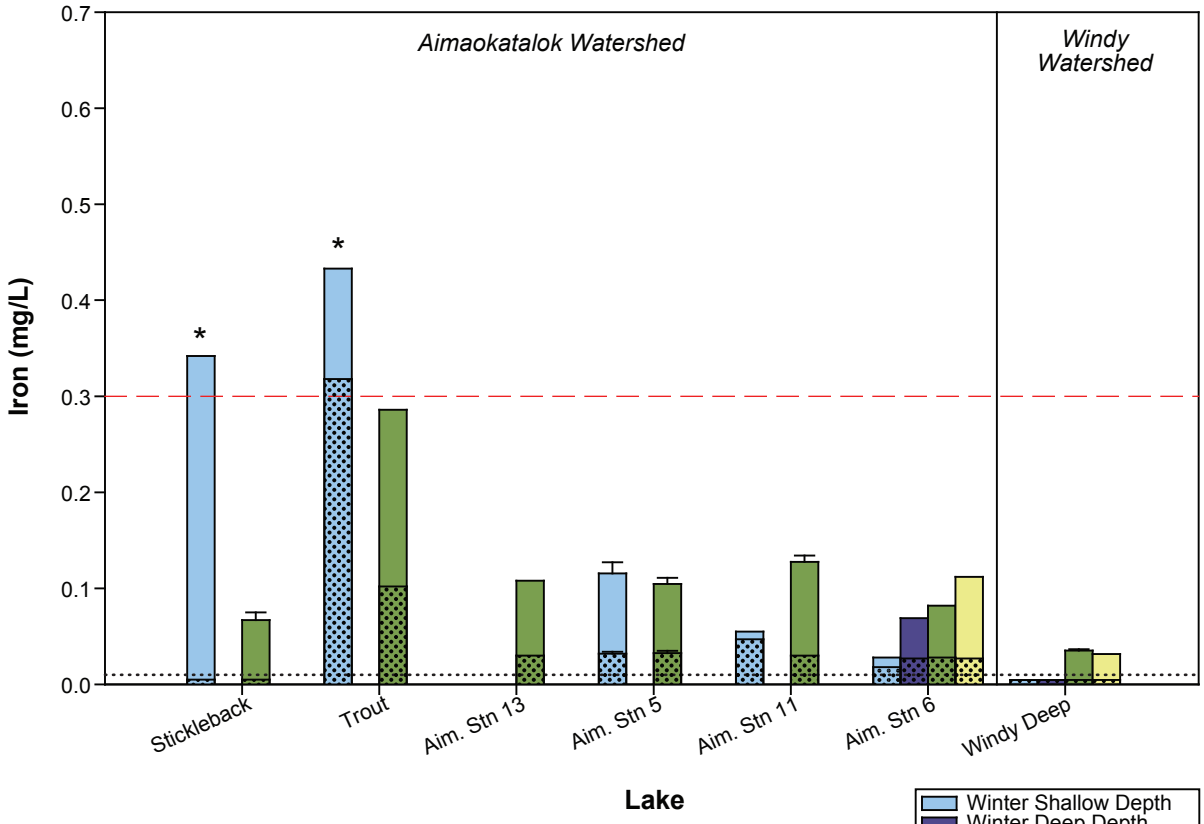
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.0001, 0.0005, or 0.001 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed lines represent hardness-dependent CCME guideline (0.002 mg/L at [$CaCO_3$] = 0–120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120–180 mg/L; 0.004 mg/L at [$CaCO_3$] = >180 mg/L). Hardness [as $CaCO_3$] in lakes ranged from 11 to 181 mg/L.
Solid columns represent total copper and superimposed dotted columns represent dissolved copper.
** Indicates average total copper values that are higher than CCME guideline.*

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Copper Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1p

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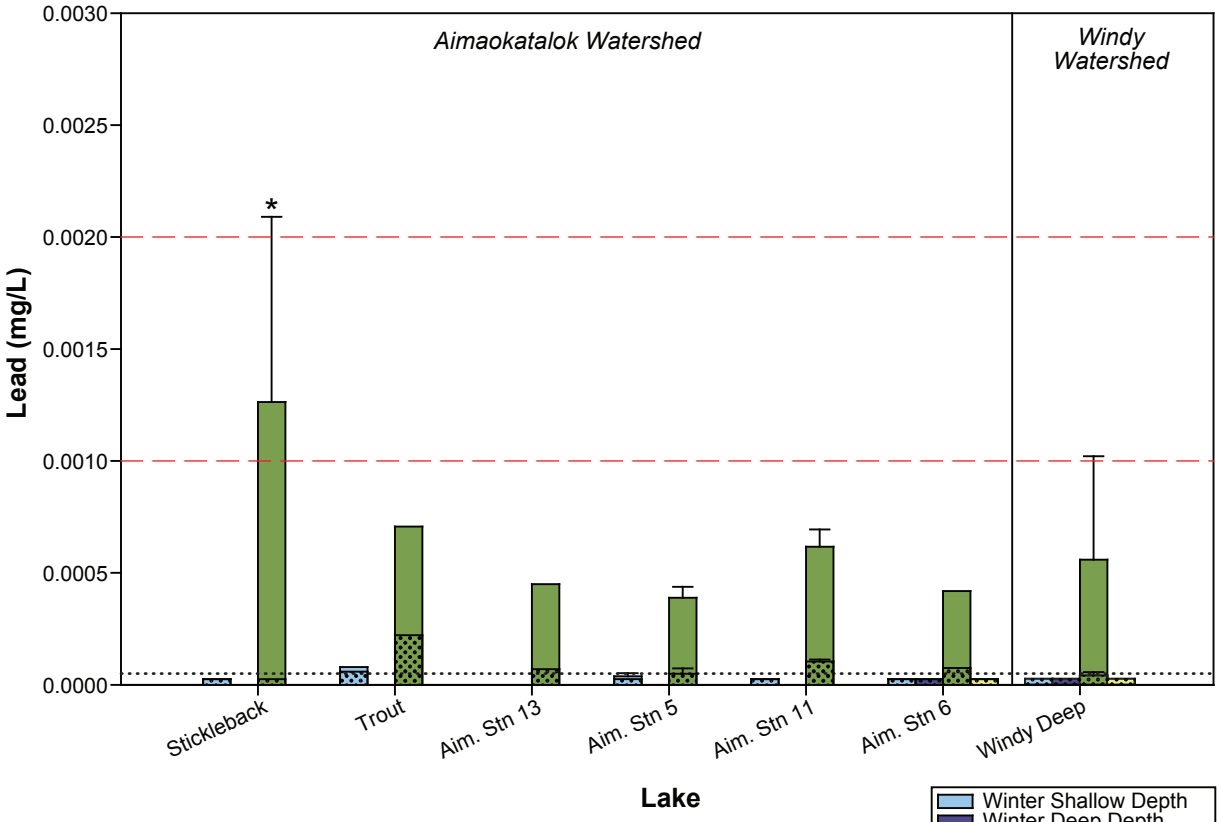
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.01 or 0.03 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.3 mg/L).
Solid columns represent total iron and superimposed dotted columns represent dissolved iron.
** Indicates average total iron values that are higher than CCME guideline.*

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Iron Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1q

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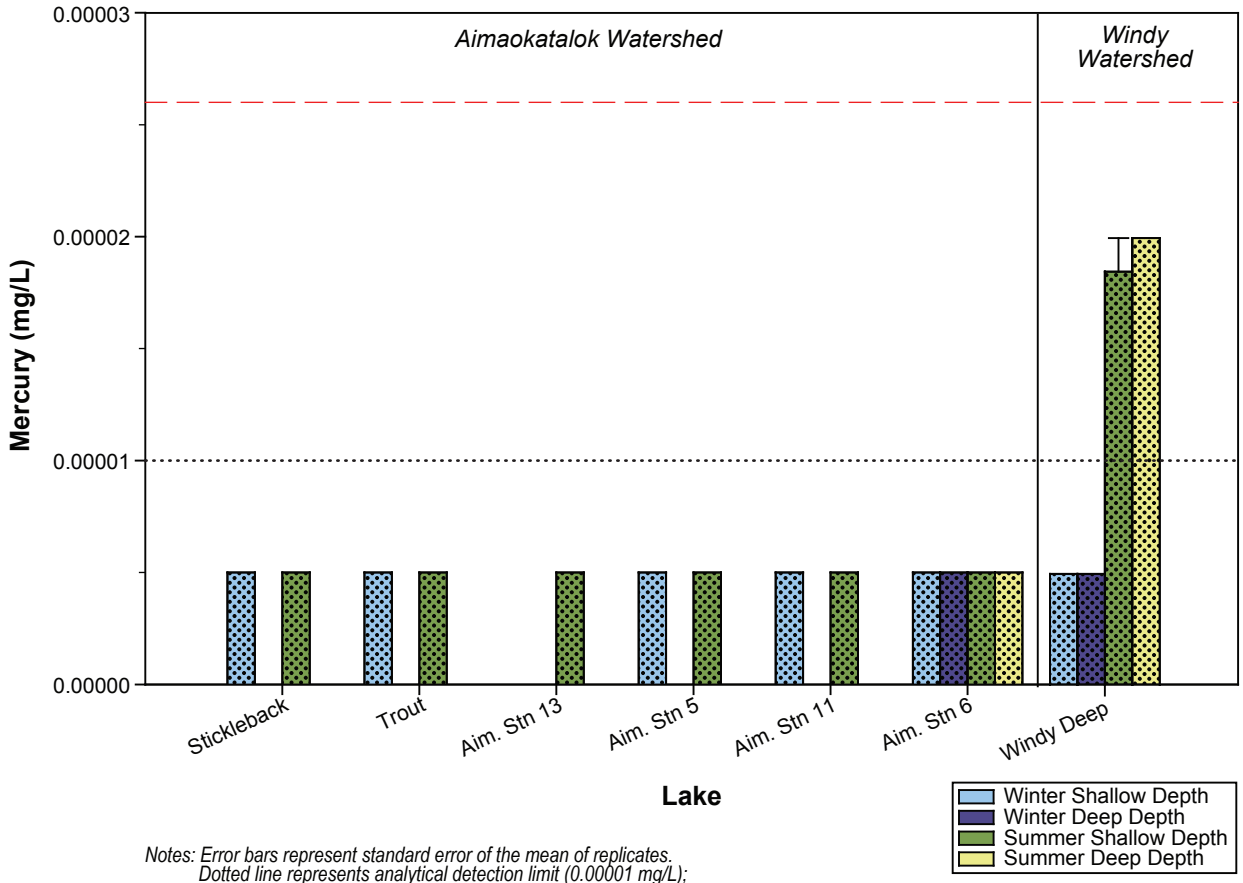
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.00005 mg/L); values below detection limit are plotted at half the detection limit.
Red dashed lines represent CCME guideline (0.001 mg/L at [$CaCO_3$] = 0–60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60–120 mg/L; 0.004 mg/L at [$CaCO_3$] = 120–180 mg/L [not shown]; 0.007 mg/L at [$CaCO_3$] = >180 mg/L [not shown]).
Hardness [as $CaCO_3$] in lakes ranged from 11 to 181 mg/L.
Solid columns represent total lead and superimposed dotted columns represent dissolved lead.
** Indicates average total lead values that are higher than CCME guideline.*

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Lead Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1r

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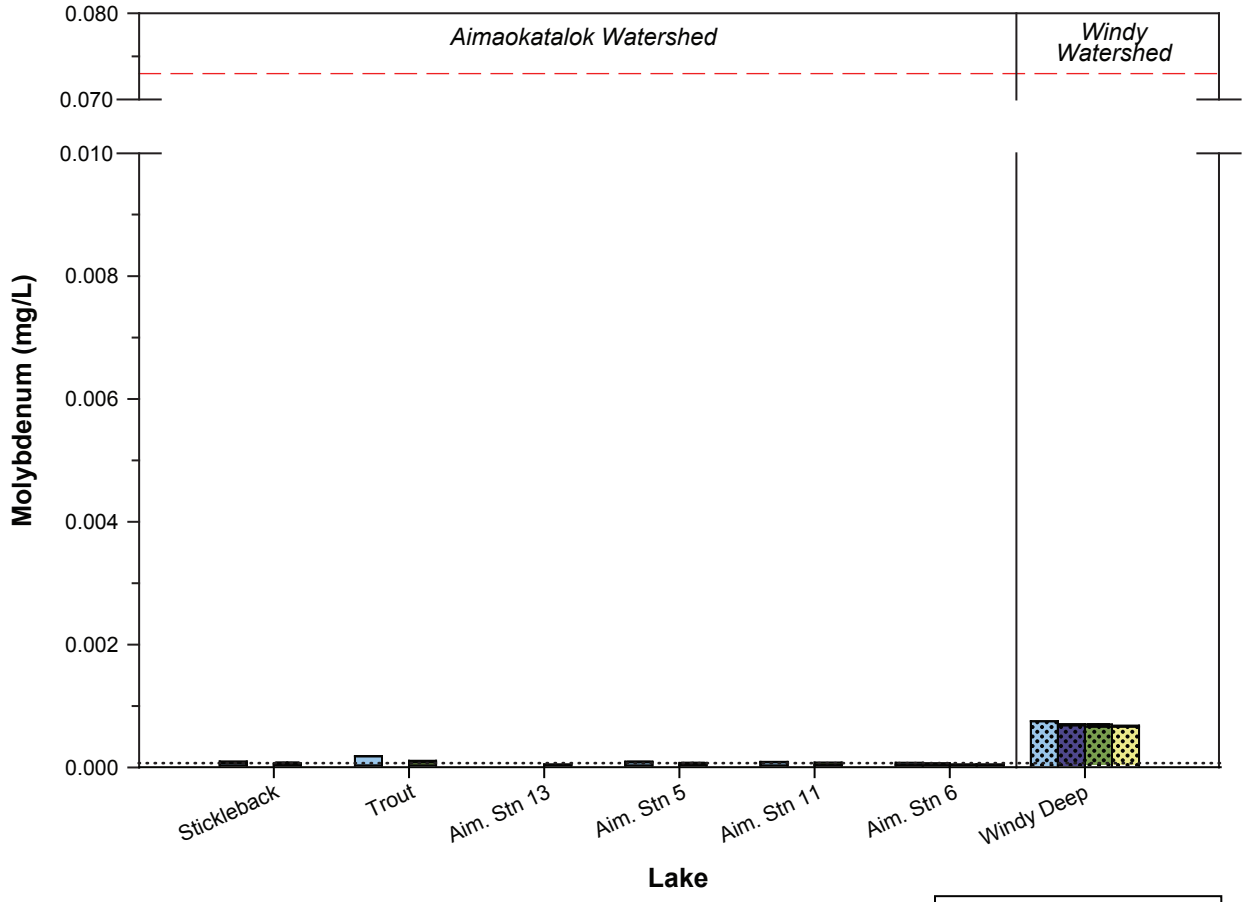
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.00001 mg/L); values below detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline for inorganic mercury (0.000026 mg/L); the interim CCME guideline for methylmercury (0.000004 mg/L) is not shown.
Solid columns represent total mercury and superimposed dotted columns represent dissolved mercury.

NEWMONT NORTH AMERICA

Mercury Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1s

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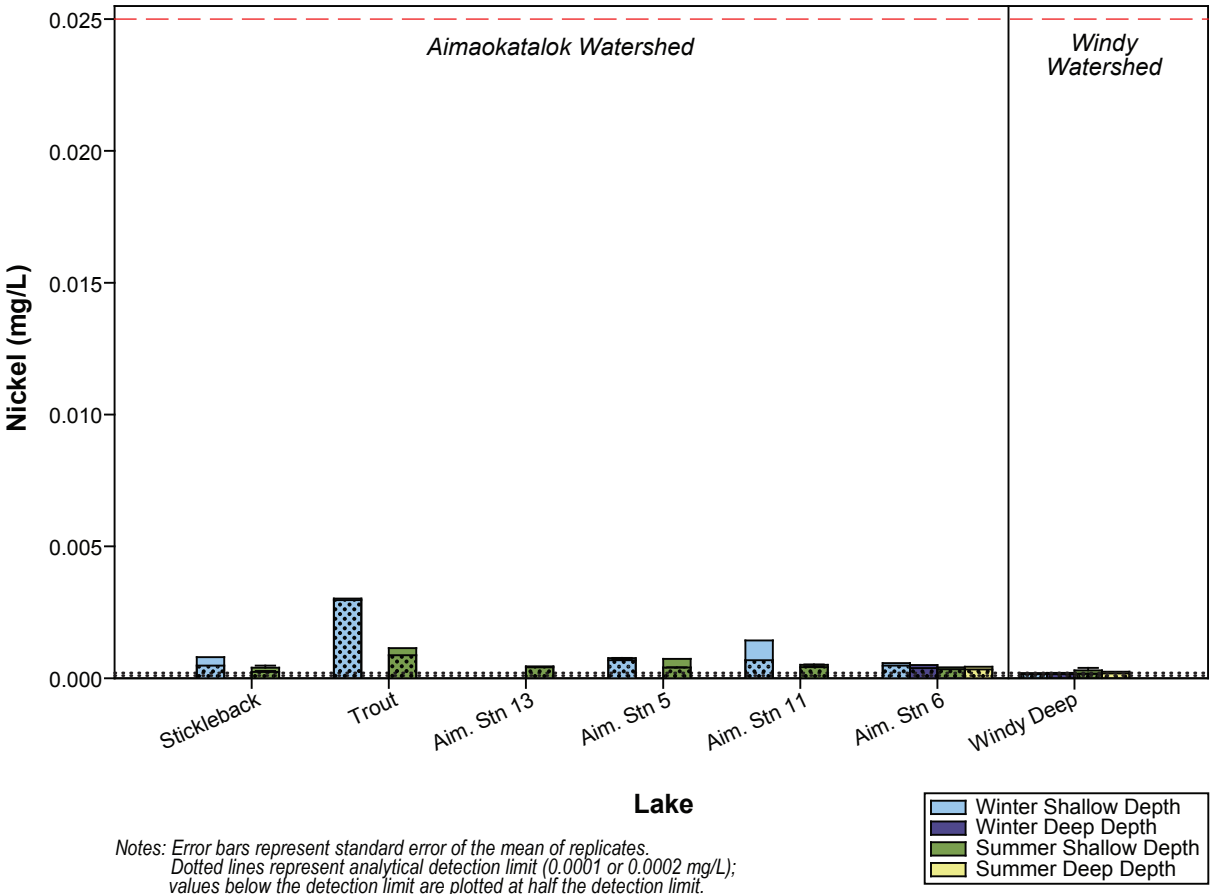
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.00005 mg/L);
values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.073 mg/L).
Solid columns represent total molybdenum and superimposed dotted columns represent dissolved molybdenum.

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Molybdenum Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1t

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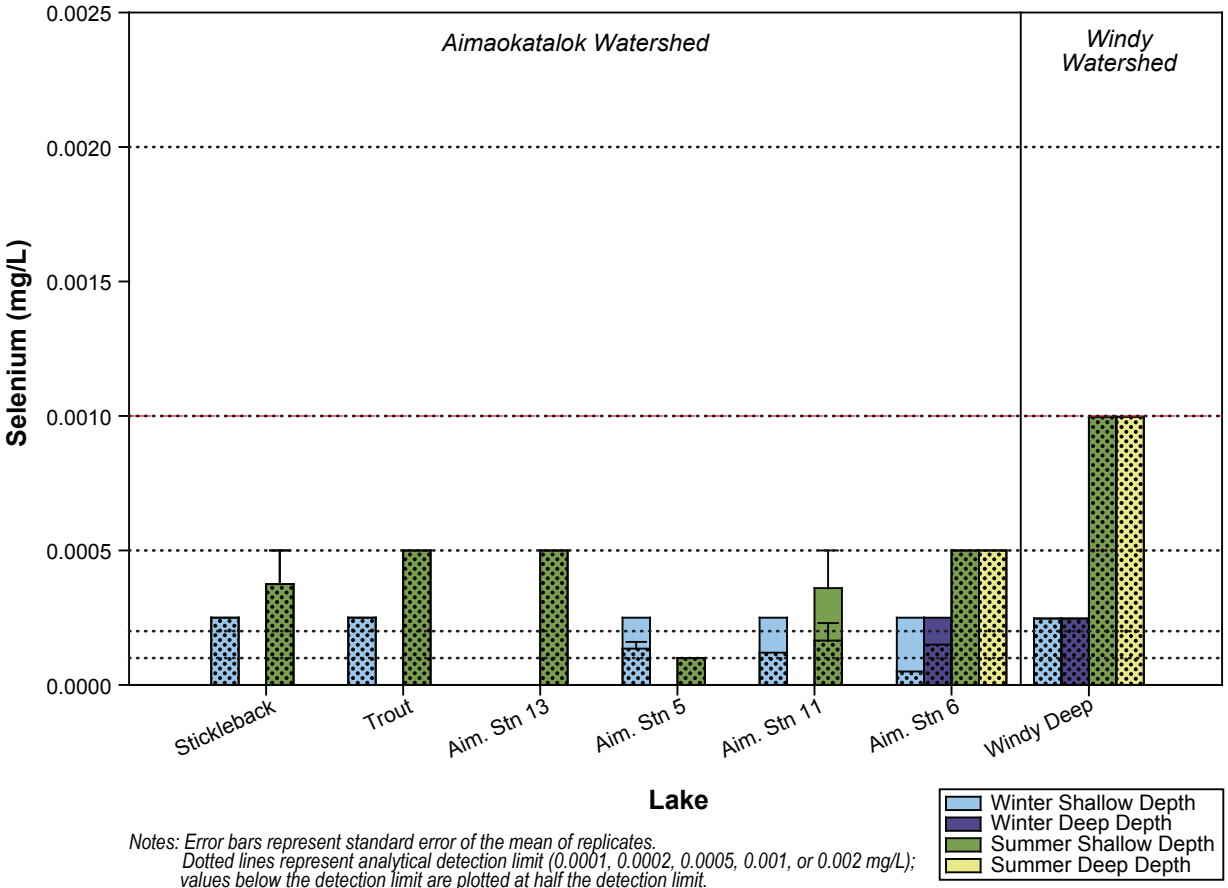
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.0001 or 0.0002 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed lines represent hardness-dependent CCME guideline (0.025 mg/L at [$CaCO_3$] = 0–60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60–120 mg/L [not shown]; 0.110 mg/L at [$CaCO_3$] = 120–180 mg/L [not shown]; 0.150 mg/L at [$CaCO_3$] = >180 mg/L [not shown]).
Hardness [as $CaCO_3$] in lakes ranged from 11 to 181 mg/L.
Solid columns represent total nickel and superimposed dotted columns represent dissolved nickel.

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Nickel Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1u

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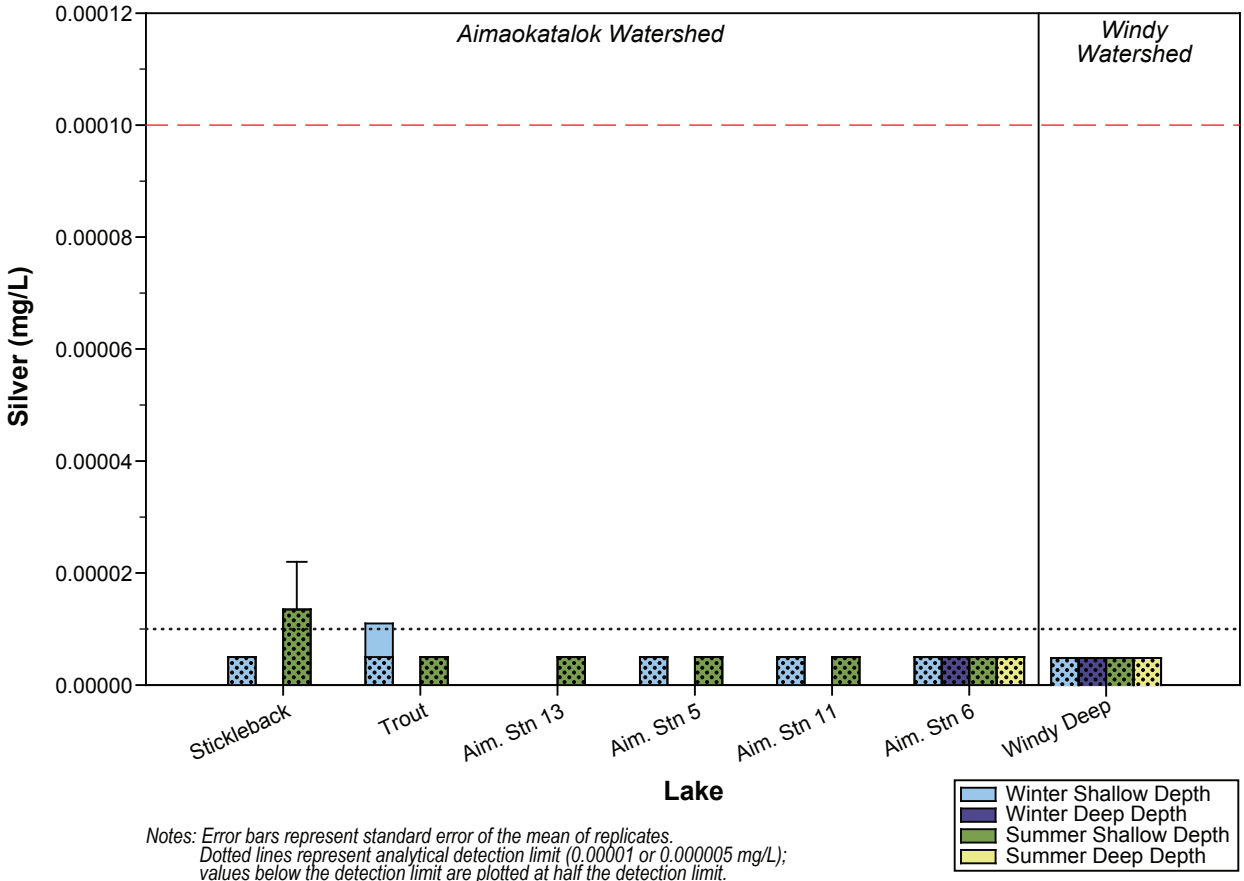
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.0001, 0.0002, 0.0005, 0.001, or 0.002 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.001 mg/L).
Solid columns represent total selenium and superimposed dotted columns represent dissolved selenium.

NEWMONT NORTH AMERICA

Selenium Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1v

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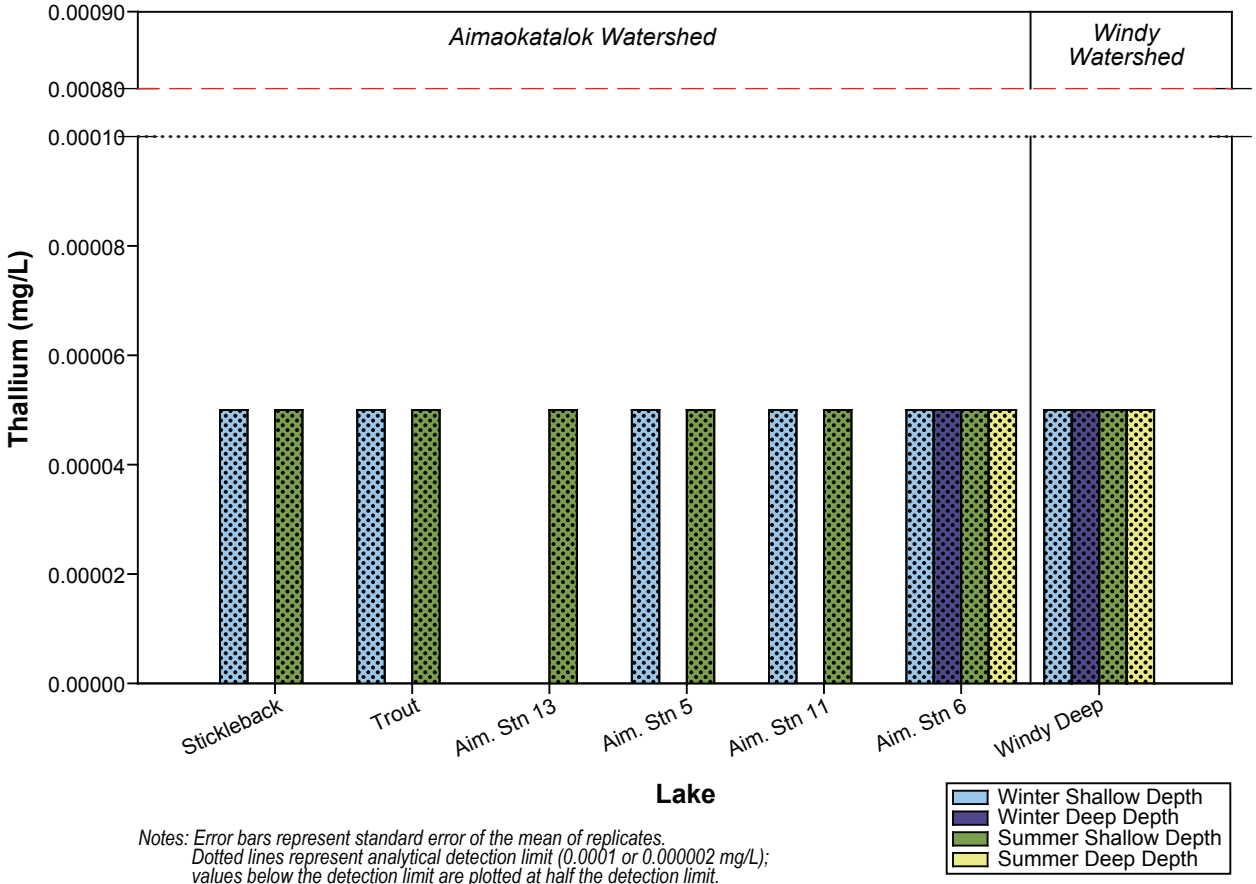
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.00001 or 0.000005 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.0001 mg/L).
Solid columns represent total silver and superimposed dotted columns represent dissolved silver.

NEWMONT NORTH AMERICA

Silver Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1w

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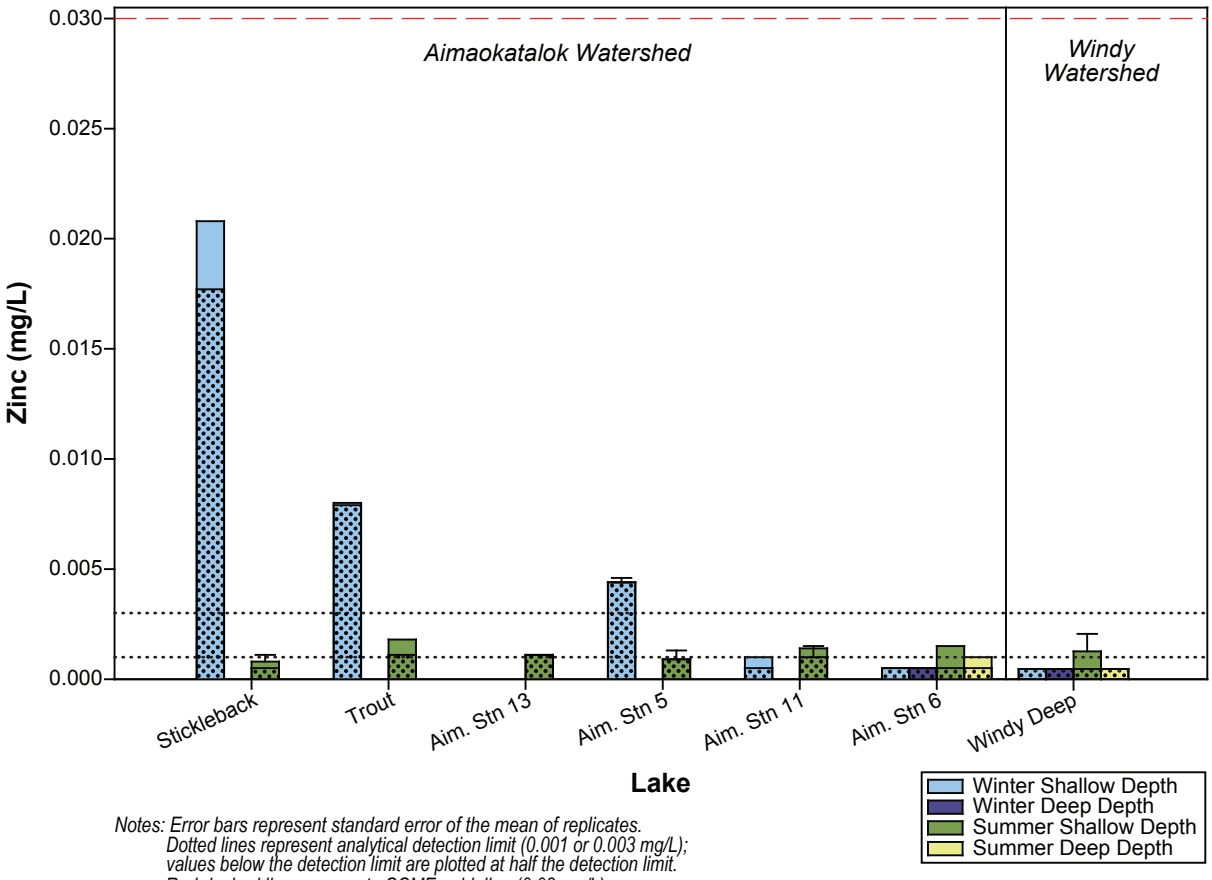
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.0001 or 0.000002 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.0008 mg/L).
Solid columns represent total thallium and superimposed dotted columns represent dissolved thallium.

NEWMONT NORTH AMERICA

Thallium Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1x

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Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.001 or 0.003 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.03 mg/L).
Solid columns represent total zinc and superimposed dotted columns represent dissolved zinc.

NEWMONT NORTH AMERICA

Zinc Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1y

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Nitrate concentrations were mainly higher in bottom than in surface waters, which is consistent with algal update of this nutrient in well-lit surface waters (Figure 3.2-1h). Aluminum concentrations also tended to be highest in deep waters (Figure 3.2-1l). Lead showed the opposite trend, as surface waters in August consistently contained higher lead concentrations than deep waters (Figure 3.2-1r).

3.2.2 Seasonal Variation

Water column concentrations of nutrients, metals, and other parameters can be higher during the winter due to natural processes, including solute exclusion during ice formation, changes in redox chemistry, and decreased biological uptake, particularly in the surface layer where phytoplankton are light-limited during the winter months due to shorter photoperiods. Samples collected in April reflect the late winter 'worst case scenario' for under-ice water quality, when oxygen concentrations are at their lowest and metal and nutrient concentrations are potentially at their highest.

In the lakes sampled, winter levels of some general parameters, nutrients, and metals were higher than summer levels. This trend was particularly apparent for nitrate (Figure 3.2-1h), as summer nitrate concentrations were below detection limits (<0.005 mg/L) in all lakes except Aim. Stn 6, where concentrations were 0.0084 mg/L (Figure 3.2-1h). In comparison, winter nitrate levels were often several times higher than summer, with detectable concentrations ranging from 0.01 to 0.16 mg/L. This trend was also evident for hardness (Figure 3.2-1b), total dissolved solids (TDS; Figure 3.2-1e), ammonia (Figure 3.2-1g), sulphate (Figure 3.2-1k), copper (Figure 3.2-19p), and zinc (Figure 3.2-1y).

Turbidity and total suspended solids (TSS) showed the opposite trend, as these parameters were often higher in summer than in winter. This is likely due to summer increases in wind-driven mixing and re-suspension of sediments, direct inputs from riverine sources, and elevated phytoplankton biomass. Aluminum (Figure 3.2-1l) and lead (Figure 3.2-1r) concentrations were also higher in the summer than in the winter. These may have been associated with the higher TSS levels seen during summer.

3.2.3 Spatial Variation

Stickleback, Trout, and Aimaokatalok lakes are in the Aimaokatalok Watershed, and Windy Lake is in the Windy Watershed (Figure 2.1-1, 2.1-2, 2.1-3).

Lake pH levels ranged from near neutral, 6.8 (Aim. Stn 6 in winter, deep depth), to slightly basic, 8.1 (Windy in winter, shallow depth; Figure 3.2-1a). Hardness levels varied between lakes, as Aimaokatalok Lake generally contained softer water (i.e., lower hardness) than other lakes (Figure 3.2-1b). Turbidity ranged from 0.29 to 2.38 NTU, and TSS concentrations were consistently below the detection limit in all lakes (<3.0 mg/L; Figures 3.2-1c and 3.2-1d). Average TDS concentrations ranged from 29 mg/L in Aim. Stn 13 during summer to 425 mg/L in Stickleback Lake during winter (Figure 3.2-1e). Aimaokatalok Lake had the lowest TDS levels, with all sites at or below–50 mg/L. Patterns in TDS closely reflected patterns in hardness (Figure 3.2-1b). Average total organic carbon (TOC) concentrations generally ranged from 1.71 mg/L (Windy in winter, deep depth) to 9.12 mg/L (Stickleback in winter, shallow depth); however a particularly high TOC concentration of 22.4 mg/L was measured in Trout Lake in winter (Figure 3.2-1f).

Nitrate and ammonia were the major forms of inorganic nitrogen in the lakes, while nitrite concentrations were generally below detection limits (<0.001 mg/L; Figure 3.2-1i). Average ammonia concentrations ranged from below detection (<0.005 mg/L) in several lakes to 0.166 mg/L in Stickleback Lake during winter (Figure 3.2-1g). Average nitrate concentrations ranged from below detection (<0.005 mg/L) in nearly all samples collected during summer to 0.16 mg/L in Trout Lake during winter (Figure 3.2-1h).

Average total phosphorus concentrations ranged from 0.0039 mg/L (Windy Lake in winter, deep depth) to 0.027 mg/L (Trout Lake in winter, Figure 3.2-1j). Based on the CCME's trophic categorizations for total phosphorus levels (CCME 2004), Stickleback Lake, Trout Lake, and Aimaokatalok Lake would be considered oligotrophic to meso-eutrophic; and Windy Lake would be considered ultra-oligotrophic to oligotrophic based on their average (April and August) total phosphorus concentrations.

Sulphate concentrations ranged from 0.86 mg/L (Stickleback in summer, shallow depth) to 9.25 mg/L (Windy in winter, shallow depth). Windy Lake sulphate concentrations were consistently higher than other lakes, particularly during the summer (Figure 3.2-1k).

Average metal concentrations varied among sites (Figures 3.2-1l to 3.2-1y). Concentrations of metals typically associated with suspended sediments (e.g., aluminum, copper, iron, and zinc; Milburn and Prowse 1996), were often highest in the shallower lakes: Stickleback and Trout. Total and dissolved molybdenum concentrations were consistently at least four times higher in Windy Lake than in any other lake, but were orders of magnitude lower than the CCME guideline for molybdenum (Figure 3.2-1t). Windy Lake was also the only site that had detectable concentrations of dissolved mercury (ranging from 0.000017 to 0.000020 mg/L; Figure 3.2-1s). However, these concentrations were very close to the detection limit of 0.000010 mg/L, and total mercury concentrations in the same Windy Lake samples were below the detection limit (<0.000010), suggesting that there may have been an analytical error in the analysis of dissolved mercury (dissolved concentrations should always be lower than or equal to total concentrations). Although there were some exceptions, total and dissolved cadmium (Figure 3.2 1n), chromium (Figure 3.2-1o), mercury (Figure 3.2-1s), selenium (Figure 3.2-1v), silver (Figure 3.2-1w), and thallium (Figure 3.2-1x) concentrations were frequently below analytical detection limits in the lakes sampled.

3.2.4 Comparison with CCME Guidelines

The majority of water quality parameters measured in the lakes were below CCME guidelines for the protection of freshwater aquatic life (2007), with the following exceptions: total aluminum, total cadmium, total chromium, total copper, total iron, and total lead. Each of these metals exceeded applicable CCME guidelines in at least one sample collected at Stickleback, Trout, or Aim. Stn 5 in 2010. Table 3.2-1 presents the percentage of lake water quality samples in which parameter concentrations were higher than CCME guidelines, and Table 3.2-2 provides the factor by which average 2010 concentrations were higher than CCME guidelines.

In Stickleback Lake, the total iron concentration in a single sample collected during winter (0.342 mg/L) slightly exceeded the CCME guideline of 0.3 mg/L. Similarly, the total lead concentration in a single sample collected during summer (0.00209 mg/L) was slightly higher than the hardness-dependent lead guideline of 0.002 mg/L. For both total iron and total lead, the average concentrations of these metals including all summer and winter samples collected at Stickleback Lake in 2010 were below applicable CCME guidelines.

In Trout Lake, a single water quality sample was collected in April, and a second sample was collected in August. Concentrations of total copper (0.00529 mg/L), and total iron (0.433 mg/L) in the April sample exceeded applicable CCME guidelines. The April sample had a total chromium concentration of 0.00101 mg/L, and the CCME guideline for hexavalent chromium (Cr(VI)) is 0.001 mg/L and the interim guideline for trivalent chromium (Cr(III)) is 0.0089 mg/L). In the August sample, the total aluminum concentration (0.119 mg/L) slightly exceeded the CCME guideline of 0.1 mg/L.

Table 3.2-1. Lake Water Quality, Percent of Samples in which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2010

Lake	Total Number of Samples Collected	CCME Guideline Value[a]:	pH	Ammonia (as N) temperature- and pH-dependent	Nitrate (as N)	Nitrite (as N)	Total Phosphorus	Aluminum (Al)-Total	Arsenic (As)-Total	Cadmium (Cd)-Total	Chromium (Cr)-Total
			6.5-9.0		2.9 mg/L	0.06 mg/L	Trophic Status[b]	0.005-0.1[c] mg/L	0.005 mg/L	0.000017[d] mg/L	0.001[e] mg/L
Aimaokatalok											
Stickleback	3		0	0	0	0	Oligotrophic to Mesotrophic	0	0	0	0
Trout	2		0	0	0	0	Mesotrophic to Meso-eutrophic	50	0	0	50
Aim. Stn 13	1		0	0	0	0	Oligotrophic	0	0	0	0
Aim. Stn 5	4		0	0	0	0	Oligotrophic to Mesotrophic	0	0	25	0
Aim. Stn 11	3		0	0	0	0	Mesotrophic	0	0	0	0
Aim. Stn 6	4		0	0	0	0	Oligotrophic to Mesotrophic	0	0	0	0
Windy											
Windy Deep	5		0	0	0	0	Oligotrophic	0	0	0	0

Lake	Total Number of Samples Collected	Copper (Cu)-Total	Iron (Fe)-Total	Lead (Pb)-Total	Mercury (Hg)-Total	Molybdenum (Mo)-Total	Nickel (Ni)-Total	Selenium (Se)-Total	Silver (Ag)-Total	Thallium (Tl)-Total	Zinc (Zn)-Total
		0.002-0.004[f] mg/L	0.3 mg/L	0.001-0.007[g] mg/L	0.000026[h] mg/L	0.073 mg/L	0.025-0.150[i] mg/L	0.001 mg/L	0.0001 mg/L	0.0008 mg/L	0.03 mg/L
Aimaokatalok											
Stickleback	3	0	33	33	0	0	0	0	0	0	0
Trout	2	50	50	0	0	0	0	0	0	0	0
Aim. Stn 13	1	0	0	0	0	0	0	0	0	0	0
Aim. Stn 5	4	0	0	0	0	0	0	0	0	0	0
Aim. Stn 11	3	0	0	0	0	0	0	0	0	0	0
Aim. Stn 6	4	0	0	0	0	0	0	0	0	0	0
Windy											
Windy Deep	5	0	0	0	0	0	0	0	0	0	0

All values represent percentages of 2010 samples that are both higher than the CCME guidelines and above analytical detection limits.

a) Canadian water quality guidelines for the protection of aquatic life (CCME 2007)

b) <0.004 mg/L = ultra-oligotrophic; 0.004 - 0.010 mg/L = oligotrophic; 0.01 - 0.02 mg/L = mesotrophic; 0.02 - 0.035 mg/L = meso-eutrophic; 0.035 - 0.1 mg/L = eutrophic; >0.1 mg/L = hyper-eutrophic

c) 0.005 mg/L at pH <6.5; 0.1 mg/L a pH ≥6.5

d) The equation for correcting this guideline for hardness is: $10^{\{0.86[\log(\text{hardness})]-3.2\}} / 1000$

e) Guideline concentration for hexavalent chromium. No concentrations were higher than the CCME guideline for trivalent chromium (0.0089 mg/L)

f) 0.002 mg/L at water hardness of 0-120 mg/L (as $CaCO_3$); 0.003 mg/L at water hardness of 120-180 mg/L (as $CaCO_3$); 0.004 mg/L at water hardness of > 180 mg/L (as $CaCO_3$)

g) 0.001 mg/L at water hardness of 0-60 mg/L (as $CaCO_3$); 0.002 mg/L at water hardness of 60-120 mg/L (as $CaCO_3$); 0.004 mg/L at water hardness of 120-180 mg/L (as $CaCO_3$); 0.007 mg/L at water hardness of > 180 mg/L (as $CaCO_3$)

h) Guideline concentration for inorganic mercury

i) 0.025 mg/L at water hardness of 0-60 mg/L (as $CaCO_3$); 0.065 mg/L at water hardness of 60-120 mg/L (as $CaCO_3$); 0.110 mg/L at water hardness of 120-180 mg/L (as $CaCO_3$); 0.150 mg/L at water hardness of > 180 mg/L (as $CaCO_3$)

Table 3.2-2. Lake Water Quality, Factor by which Average Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2010

Lake	Total Number of Samples Collected	CCME Guideline Value[a]:	pH 6.5-9.0	Ammonia (as N) temperature- and pH-dependent	Nitrate (as N) 2.9 mg/L	Nitrite (as N) 0.06 mg/L	Total Phosphorus Trophic Status[b]	Aluminum (Al)-Total 0.005-0.1[c] mg/L	Arsenic (As)-Total 0.005 mg/L	Cadmium (Cd)-Total 0.000017[d] mg/L	Chromium (Cr)-Total 0.001[e] mg/L
Aimaokatalok											
Stickleback	3		-	-	-	-	Oligotrophic to Mesotrophic	-	-	-	-
Trout	2		-	-	-	-	Mesotrophic to Meso-eutrophic	-	-	-	-
Aim. Stn 13	1		-	-	-	-	Oligotrophic	-	-	-	-
Aim. Stn 5	4		-	-	-	-	Oligotrophic to Mesotrophic	-	-	1.18	-
Aim. Stn 11	3		-	-	-	-	Mesotrophic	-	-	-	-
Aim. Stn 6	4		-	-	-	-	Oligotrophic to Mesotrophic	-	-	-	-
Windy											
Windy Deep	5		-	-	-	-	Oligotrophic	-	-	-	-

Lake	Total Number of Samples Collected	Copper (Cu)-Total 0.002-0.004[f] mg/L	Iron (Fe)-Total 0.3 mg/L	Lead (Pb)-Total 0.001-0.007[g] mg/L	Mercury (Hg)-Total 0.000026[h] mg/L	Molybdenum (Mo)-Total 0.073 mg/L	Nickel (Ni)-Total 0.025-0.150[i] mg/L	Selenium (Se)-Total 0.001 mg/L	Silver (Ag)-Total 0.0001 mg/L	Thallium (Tl)-Total 0.0008 mg/L	Zinc (Zn)-Total 0.03 mg/L
Aimaokatalok											
Stickleback	3	-	-	-	-	-	-	-	-	-	-
Trout	2	1.76	1.20	-	-	-	-	-	-	-	-
Aim. Stn 13	1	-	-	-	-	-	-	-	-	-	-
Aim. Stn 5	4	-	-	-	-	-	-	-	-	-	-
Aim. Stn 11	3	-	-	-	-	-	-	-	-	-	-
Aim. Stn 6	4	-	-	-	-	-	-	-	-	-	-
Windy											
Windy Deep	5	-	-	-	-	-	-	-	-	-	-

All values represent the factor by which 2010 lake averages are higher than CCME guidelines (using the average concentration of each parameter within a lake site across various depths and seasons).

Even though a percentage of samples may be higher than a guideline amount, the calculated lake average may not be higher than CCME guidelines.

Dashes represent averages that are not higher than guidelines

a) Canadian water quality guidelines for the protection of aquatic life (CCME 2007)

b) <0.004 mg/L = ultra-oligotrophic; 0.004 - 0.010 mg/L = oligotrophic; 0.01 - 0.02 mg/L = mesotrophic; 0.02 - 0.035 mg/L = meso-eutrophic; 0.035 - 0.1 mg/L = eutrophic; >0.1 mg/L = hyper-eutrophic

c) 0.005 mg/L at pH <6.5; 0.1 mg/L a pH ≥6.5

d) The equation for correcting this guideline for hardness is: $10^{\{0.86[\log(\text{hardness})]-3.2\}} / 1000$

e) Guideline concentration for hexavalent chromium. No concentrations were higher than the CCME guideline for trivalent chromium (0.0089 mg/L).

f) 0.002 mg/L at water hardness of 0-120 mg/L (as [$CaCO_3$]); 0.003 mg/L at water hardness of 120-180 mg/L (as [$CaCO_3$]); 0.004 mg/L at water hardness of > 180 mg/L (as [$CaCO_3$])

g) 0.001 mg/L at water hardness of 0-60 mg/L (as [$CaCO_3$]); 0.002 mg/L at water hardness of 60-120 mg/L (as [$CaCO_3$]); 0.004 mg/L at water hardness of 120-180 mg/L (as [$CaCO_3$]); 0.007 mg/L at water hardness of > 180 mg/L (as [$CaCO_3$])

h) Guideline concentration for inorganic mercury

i) 0.025 mg/L at water hardness of 0-60 mg/L (as [$CaCO_3$]); 0.065 mg/L at water hardness of 60-120 mg/L (as [$CaCO_3$]); 0.110 mg/L at water hardness of 120-180 mg/L (as [$CaCO_3$]); 0.150 mg/L at water hardness of > 180 mg/L (as [$CaCO_3$])

Among all the samples collected at various stations within Aimaokatalok Lake during 2010, a single sample collected at Aim. Stn 5 in April contained a slightly elevated total cadmium concentration (0.000018 mg/L) that exceeded the hardness-dependent CCME guideline for cadmium. All other total cadmium concentrations measured in Aimaokatalok Lake sites were below the detection limit (<0.00001 mg/L). All other water quality parameters in Aimaokatalok samples were below CCME guidelines.

3.2.5 Drinking Water Quality

Doris, Aimaokatalok and Windy lakes are potential drinking water sources in the area. Untreated water quality samples collected from these lakes were therefore screened against Health Canada's Guidelines for Canadian Drinking Water Quality (Health Canada 2010). In all lakes, turbidity values exceeded the drinking water quality guidelines (Table 3.2-3). However, the turbidity guideline apply to filtered water, and the samples collected were raw, untreated lake water. For camp use, water is particulate filtered and undergoes ozonation and ultraviolet treatment. Drinking water also undergoes reverse osmosis at the tap. No other parameters analyzed exceeded drinking water guidelines (Table 3.2-3).

3.2.6 Quality Assurance/Quality Control

In total, 8 travel blanks, 12 field blanks, and 4 equipment blanks (accounting for 20% of lake and stream samples collected) were processed as part of the 2010 lake and stream water quality program. Slight ammonia contamination was apparent in some field blanks; however, ammonia concentrations in lakes and streams were generally near or below the detection limit, and all concentrations were well below the pH- and temperature-dependent CCME guideline for the protection of aquatic life. Aside from ammonia, there were no obvious signs of contamination in travel, field, and equipment blanks (Appendix 3.2-2).

3.2.7 Annual Variation

Only historical sampling locations that were also sampled in 2010 were included in the comparison of annual water quality data shown in Figures 3.2-2a to 3.2-2y. Note that historical sampling locations may not correspond exactly with those sampled in 2010, and this, in addition to methodological differences, may contribute to variability observed among years (see Table 2.14-1 and Figures 2.14-1a to 2.14-1c for historical sampling methodologies and locations). Differences in the timing of sample collection can also affect annual averages for many parameters. For example, under-ice water samples can contain higher metal and nutrient concentrations than those collected in the summer. Comparisons between years are further complicated by differences in analytical detection limits.

Some general trends were apparent in the historical dataset (Figures 3.2-2a to 3.2-2y). Lake hardness and TDS concentrations were generally lowest in Aimaokatalok Lake compared to other lakes (Figures 3.2-2b and 3.2-2e). Total phosphorus concentrations tended to be highest in Trout Lake (Figure 3.2-2j). Sulphate concentrations tended to be highest in Windy Lake (Figure 3.2-2k). Trout Lake tended to have the highest concentrations of several metals, including total aluminum (Figure 3.2-2l), total copper (Figure 3.2-2p), and total iron (Figure 3.2-2q). Molybdenum and selenium concentrations have historically been higher in Windy Lake than in other lakes (Figure 3.2-2t and 3.2-2v). Several parameters have historically had concentrations that were close to or exceeded CCME guidelines, including total aluminum, total cadmium, total chromium (when compared to the most conservative speciation guideline), total copper, total iron, total lead, and total selenium.

Table 3.2-3. Comparison of Raw Lake Water to Drinking Water Quality Guidelines, Hope Bay Belt Project, 2010

Site		Health Canada	Windy Lake		Doris Lake (North and South)		Aimaokatalok Lake (Stations 5, 6, 11, 13)	
Date Range		Guideline for Canadian	April to August 2010		April to September 2010		April to August 2010	
	Units	Drinking Water Quality[a]	Min	Max	Min	Max	Min	Max
Physical Tests								
pH	pH	6.5-8.5*	7.55	8.08	7.55	7.91	6.82	8.01
Total Dissolved Solids	mg/L	500*	214	258	NC	NC	29	51
Turbidity	NTU	0.3/1.0/0.1[b]	0.25	1.06	1.87	8.03	0.29	1.53
Anions and Nutrients								
Chloride (Cl)	mg/L	250*	94.8	113	61.9	80.6	7.35	16.2
Fluoride (F)	mg/L	1.5	0.074	0.080	0.047	0.057	<0.020	0.033
Nitrate (as N)	mg/L	10.2	<0.0050	0.0100	<0.0050	0.107	<0.0050	0.130
Nitrite (as N)	mg/L	0.973	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulphate (SO_4)	mg/L	500*	7.88	9.25	2.62	3.36	1.13	2.47
Cyanides								
Cyanide, Total	mg/L	0.2	N/A	N/A	0.0038	0.0055	N/A	N/A
Total Metals								
Aluminum (Al)	mg/L	0.1/0.2*[c]	0.0083	0.0455	0.0055	0.0898	0.0182	0.0859
Antimony (Sb)	mg/L	0.006	<0.00010	<0.00010	0.000014	0.000043	<0.00010	0.00033
Arsenic (As)	mg/L	0.010	<0.00050	<0.00080	0.000233	0.000329	0.000129	0.00022
Barium (Ba)	mg/L	1	0.00236	0.00261	0.00296	0.00361	0.00199	0.00378
Cadmium (Cd)	mg/L	0.005	<0.000010	<0.000010	<0.0000050	0.000193	<0.000010	0.000018
Chromium (Cr)	mg/L	0.05	<0.00050	0.00064	<0.00050	0.00079	<0.00050	0.00056
Copper (Cu)	mg/L	1*	0.00089	0.00138	0.00146	0.00285	<0.0010	0.00172
Iron (Fe)	mg/L	0.3*	<0.010	0.037	<0.030	0.179	0.028	0.134
Lead (Pb)	mg/L	0.01	<0.000050	0.00102	<0.000050	0.000253	<0.000050	0.000694
Manganese (Mn)	mg/L	0.05*	0.000929	0.00203	0.00318	0.0384	0.000855	0.0101
Mercury (Hg)	mg/L	0.001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Selenium (Se)	mg/L	0.01	<0.00050	<0.0020	<0.00020	<0.00020	<0.00050	0.00022
Sodium (Na)	mg/L	200*	51.4	65.6	31.0	40.0	3.90	8.12
Uranium (U)	mg/L	0.02	0.000171	0.000203	0.000032	0.000041	0.000022	0.000043
Zinc (Zn)	mg/L	5*	<0.0010	0.0021	<0.0030	<0.0030	<0.0010	0.0041
Organic Parameters								
Microcystin	µg/L	1.5[d]	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Shaded cells indicate values that are both above analytical detection limits and exceed Health Canada drinking water quality guidelines.

Doris Lake samples were collected as part of the 2010 AEMP program.

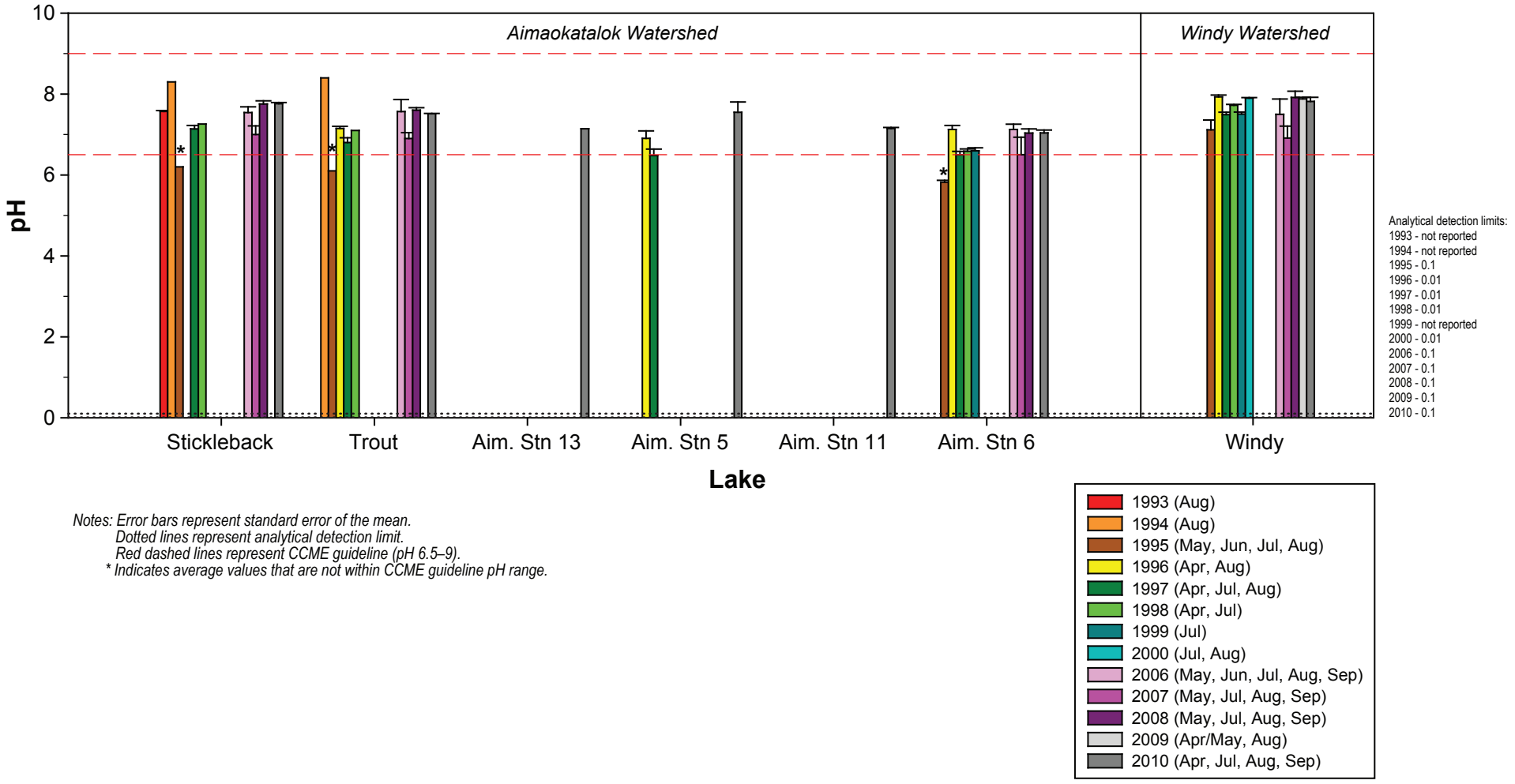
NC - not collected

a) Guidelines for Canadian drinking water quality, Health Canada (2010). All guidelines are health-based maximum acceptable concentrations, except for guidelines marked with an asterisk (*) which are based on either aesthetic or operational considerations.

b) 0.3 NTU for chemically assisted filtration, 1.0 NTU for slow sand or diatomaceous earth filtration, and 0.1 NTU for membrane filtration. Turbidity guideline is based on both health and aesthetic considerations.

c) Operational guideline that applies only to drinking water treatment plants using aluminum-based coagulants. The guideline level of 0.1 mg/L applies to conventional treatment plants, and 0.2 mg/L applies to other types of treatment systems.

d) The maximum acceptable concentration of microcystin-LR in drinking water.



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit.
Red dashed lines represent CCME guideline (pH 6.5–9).
** Indicates average values that are not within CCME guideline pH range.*

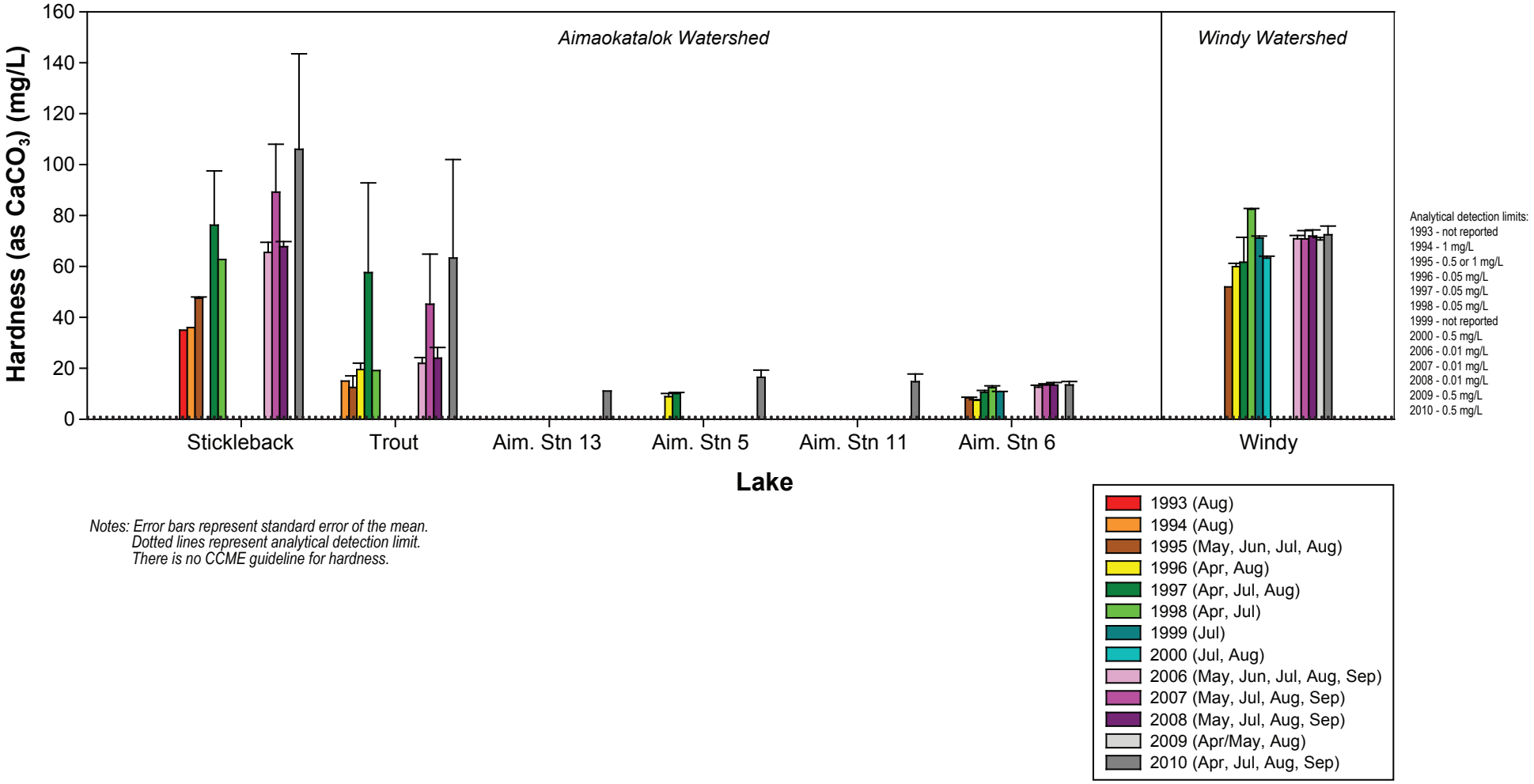
Figure 3.2-2a

NEWMONT NORTH AMERICA

Average Annual pH in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2a

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit.
There is no CCME guideline for hardness.

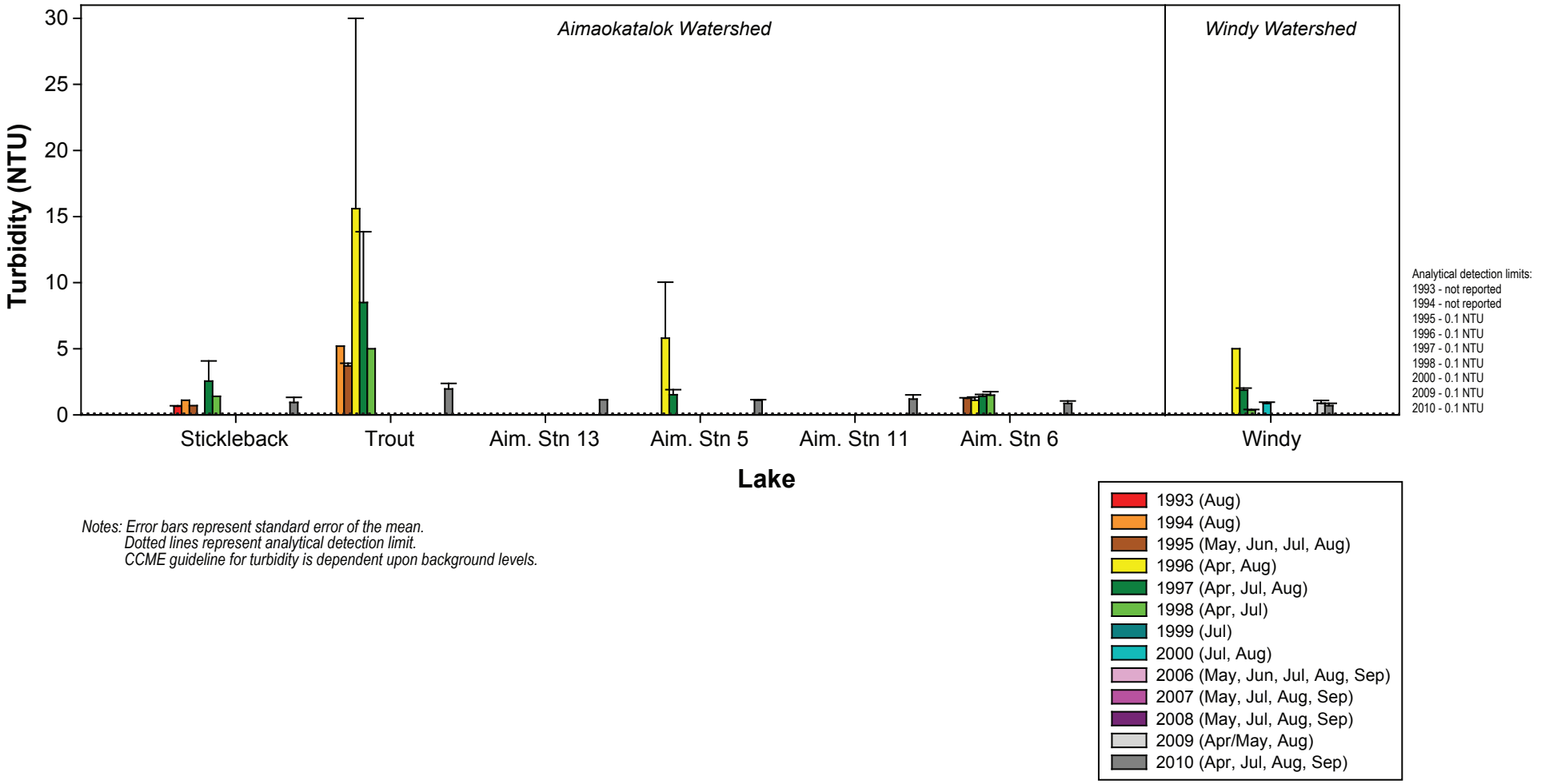
Figure 3.2-2b

NEWMONT NORTH AMERICA

Average Annual Hardness in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2b

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit.
CCME guideline for turbidity is dependent upon background levels.

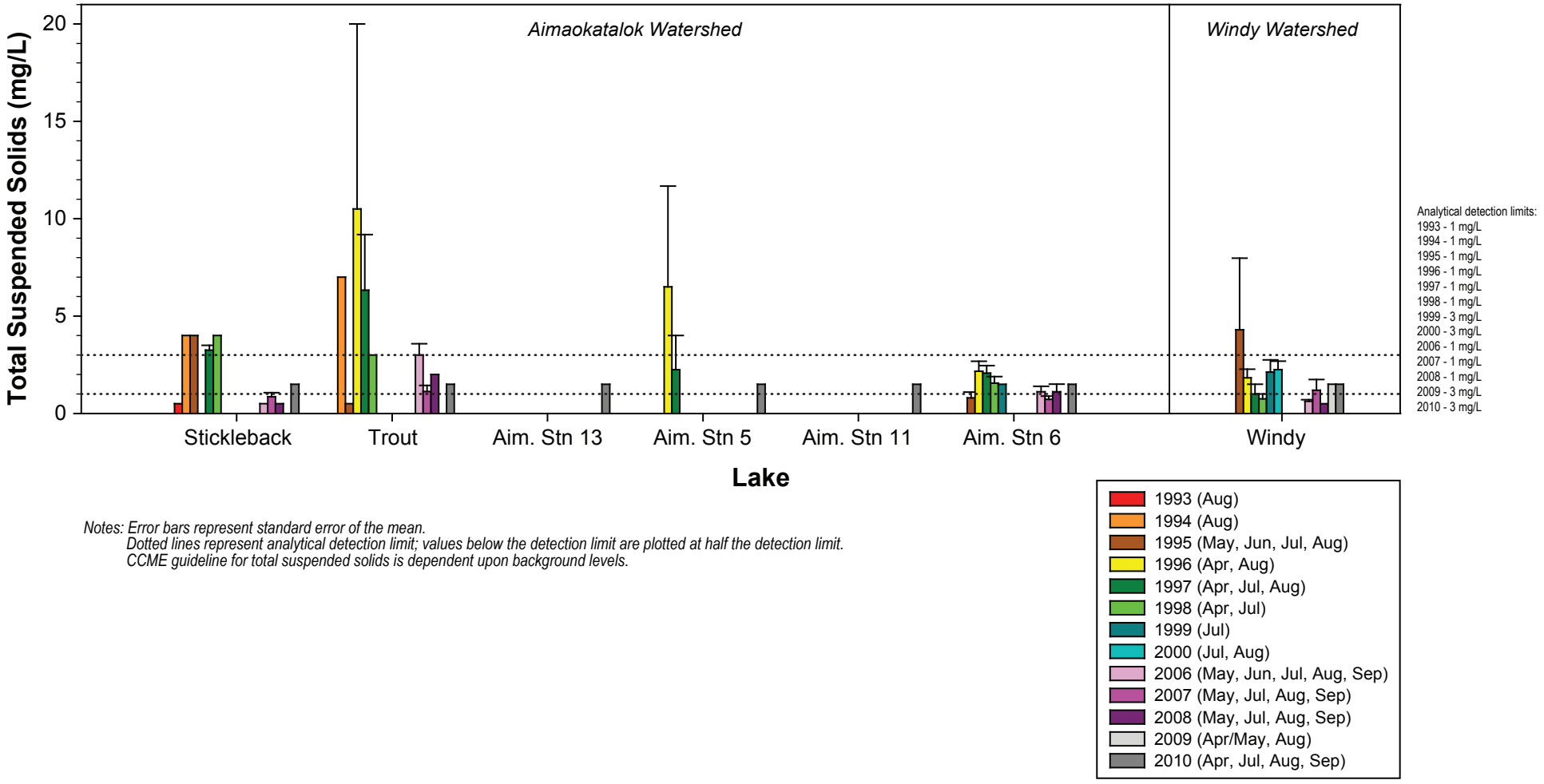
Figure 3.2-2c

NEWMONT NORTH AMERICA

Average Annual Turbidity in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2c

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
CCME guideline for total suspended solids is dependent upon background levels.

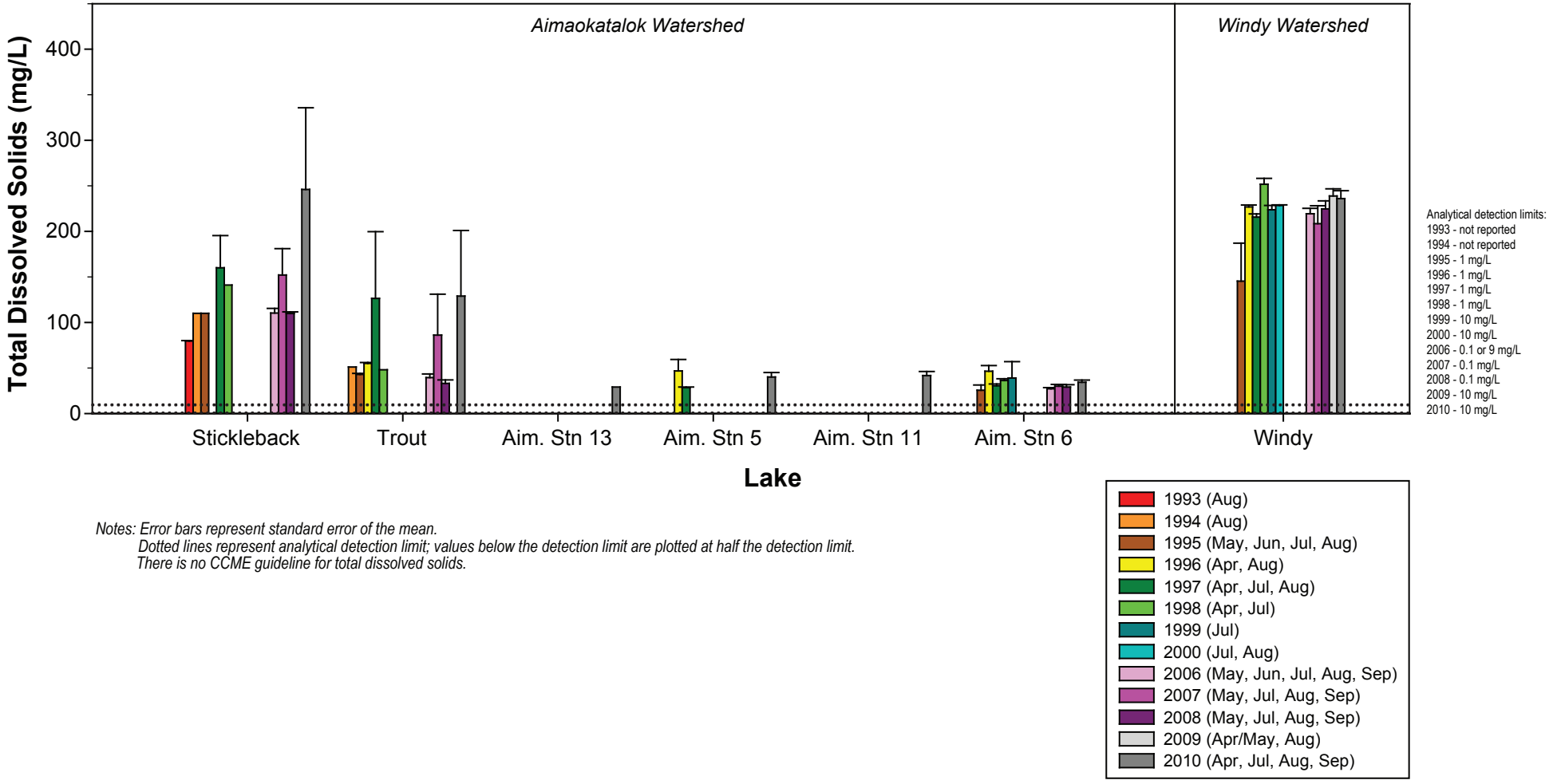
Figure 3.2-2d

NEWMONT NORTH AMERICA

Average Annual Total Suspended Solids Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2d

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
There is no CCME guideline for total dissolved solids.

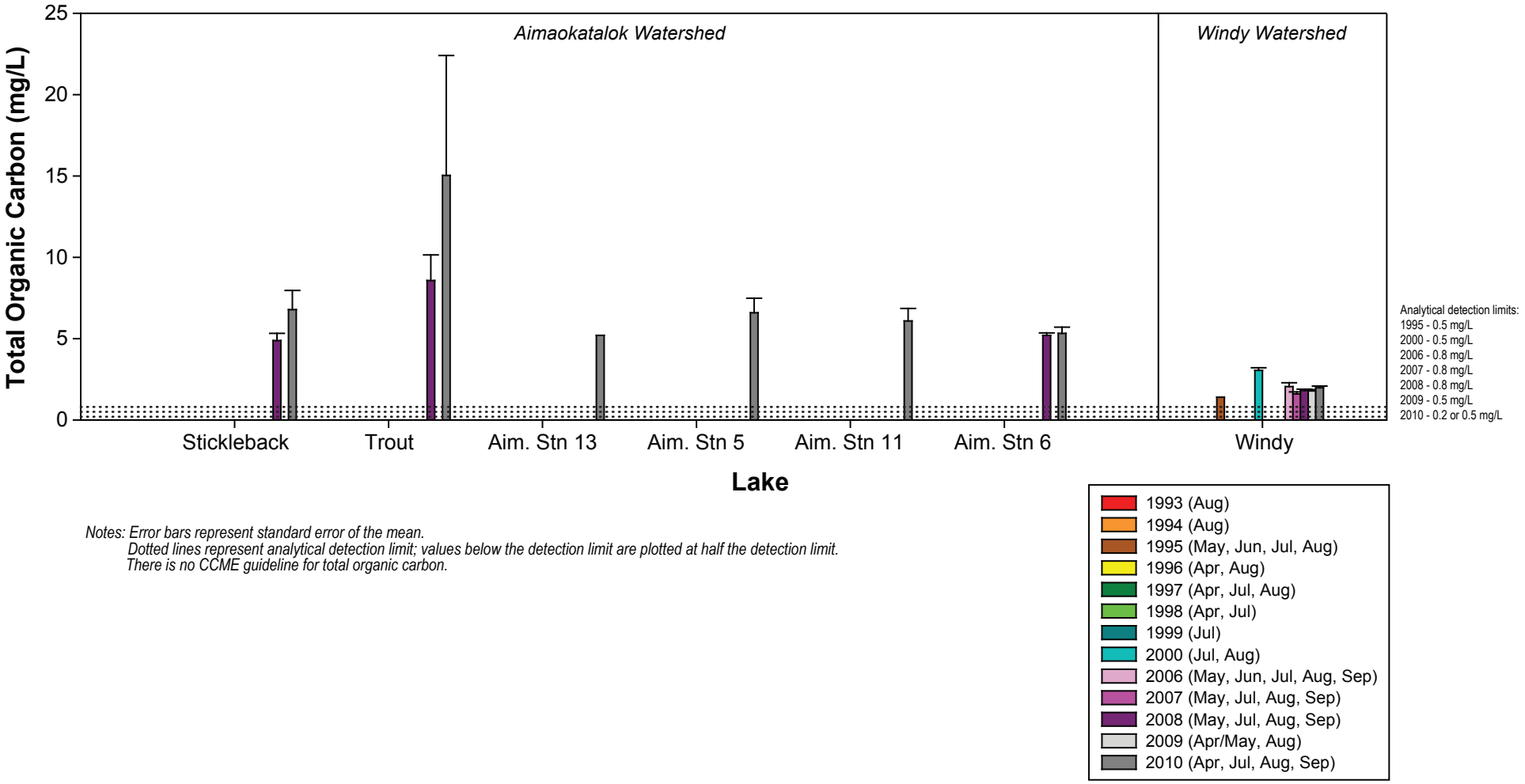
Figure 3.2-2e

NEWMONT NORTH AMERICA

Average Annual Total Dissolved Solids Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2e

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
There is no CCME guideline for total organic carbon.

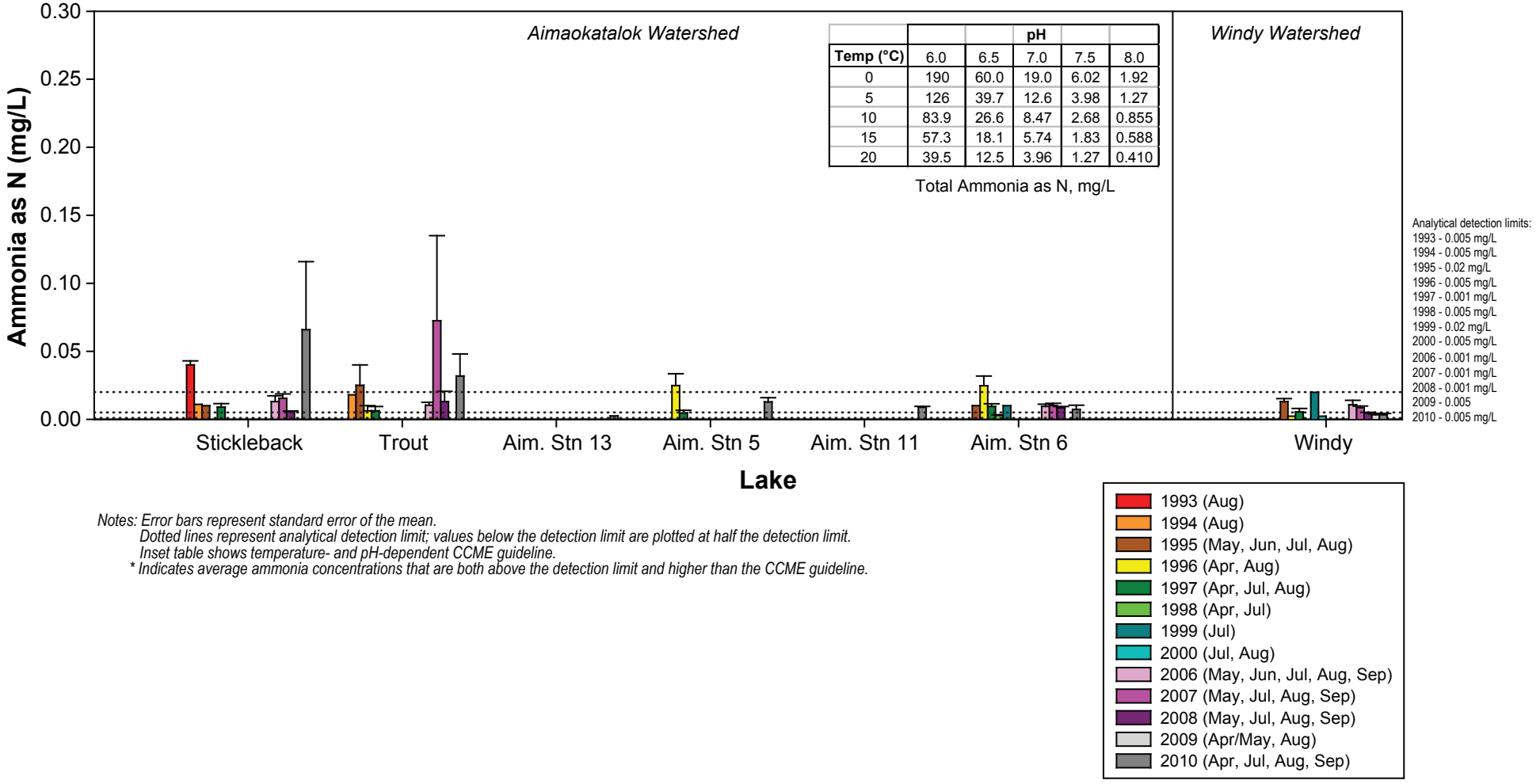
Figure 3.2-2f

NEWMONT NORTH AMERICA

Average Annual Total Organic Carbon Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2f

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	pH				
Temp (°C)	6.0	6.5	7.0	7.5	8.0
0	190	60.0	19.0	6.02	1.92
5	126	39.7	12.6	3.98	1.27
10	83.9	26.6	8.47	2.68	0.855
15	57.3	18.1	5.74	1.83	0.588
20	39.5	12.5	3.96	1.27	0.410

Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Inset table shows temperature- and pH-dependent CCME guideline.
** Indicates average ammonia concentrations that are both above the detection limit and higher than the CCME guideline.*

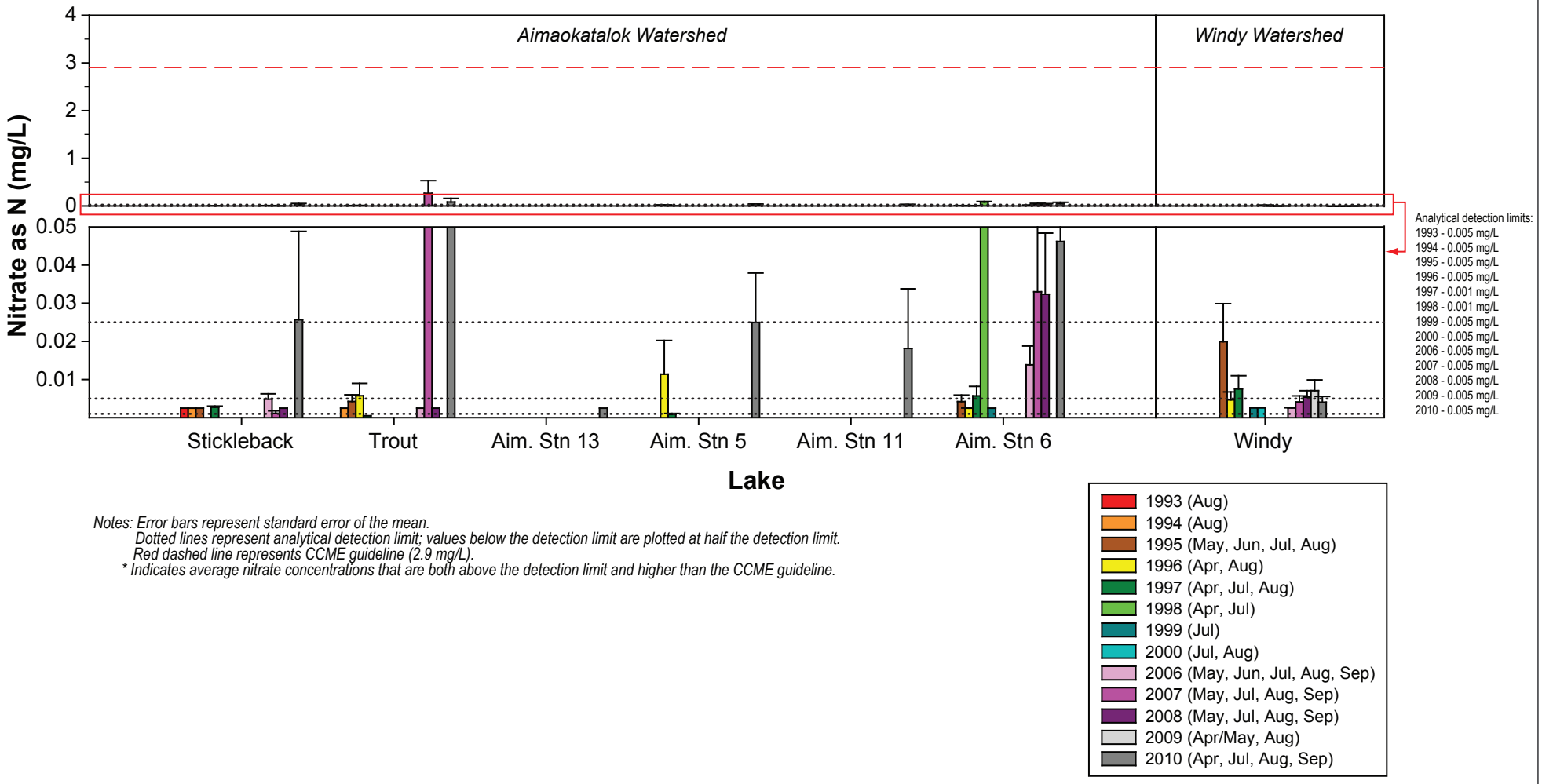
Figure 3.2-2g

NEWMONT NORTH AMERICA

Average Annual Ammonia Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2g

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (2.9 mg/L).
** Indicates average nitrate concentrations that are both above the detection limit and higher than the CCME guideline.*

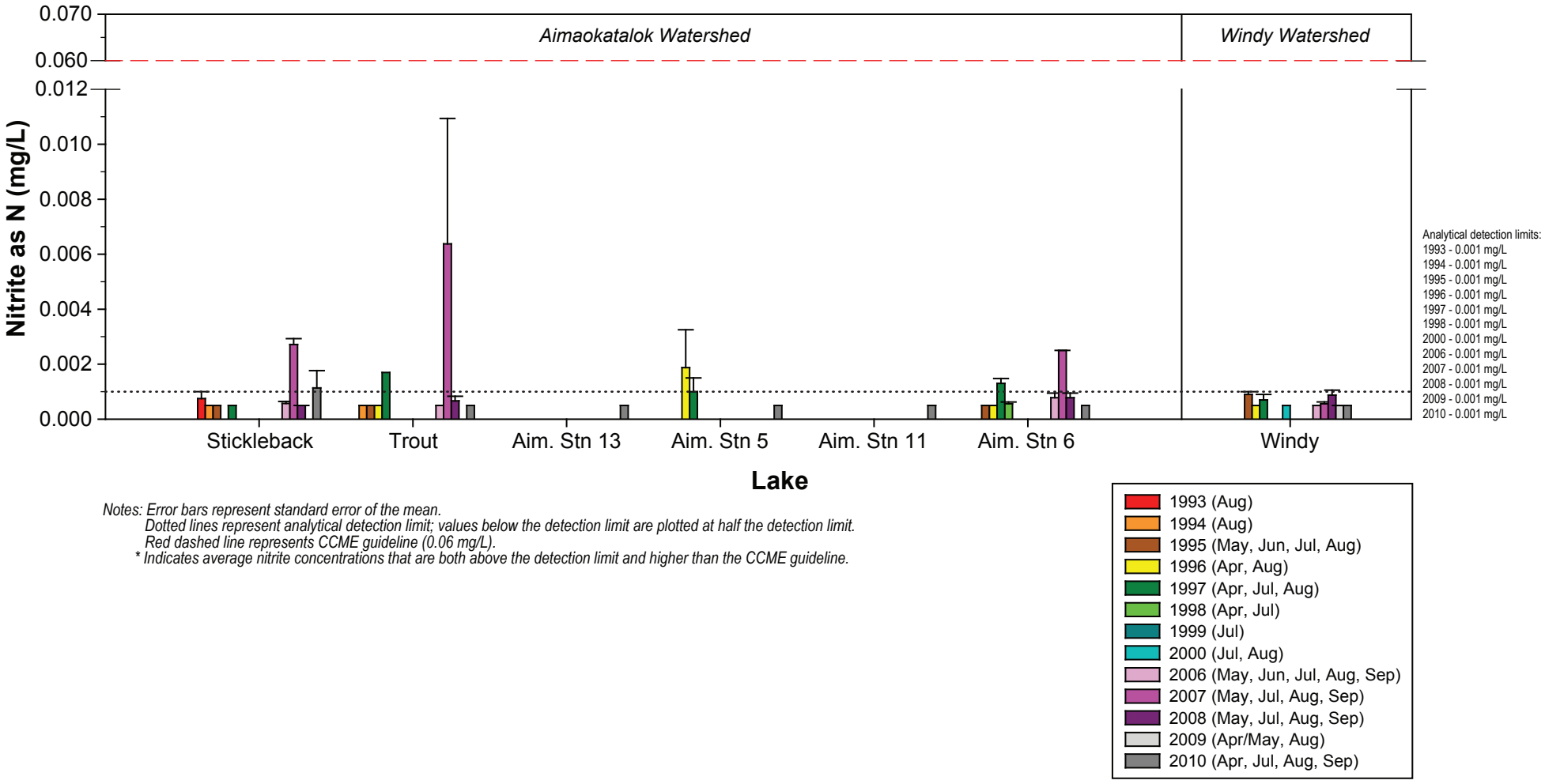
Figure 3.2-2h

NEWMONT NORTH AMERICA

Average Annual Nitrate Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2h

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.06 mg/L).
** Indicates average nitrite concentrations that are both above the detection limit and higher than the CCME guideline.*

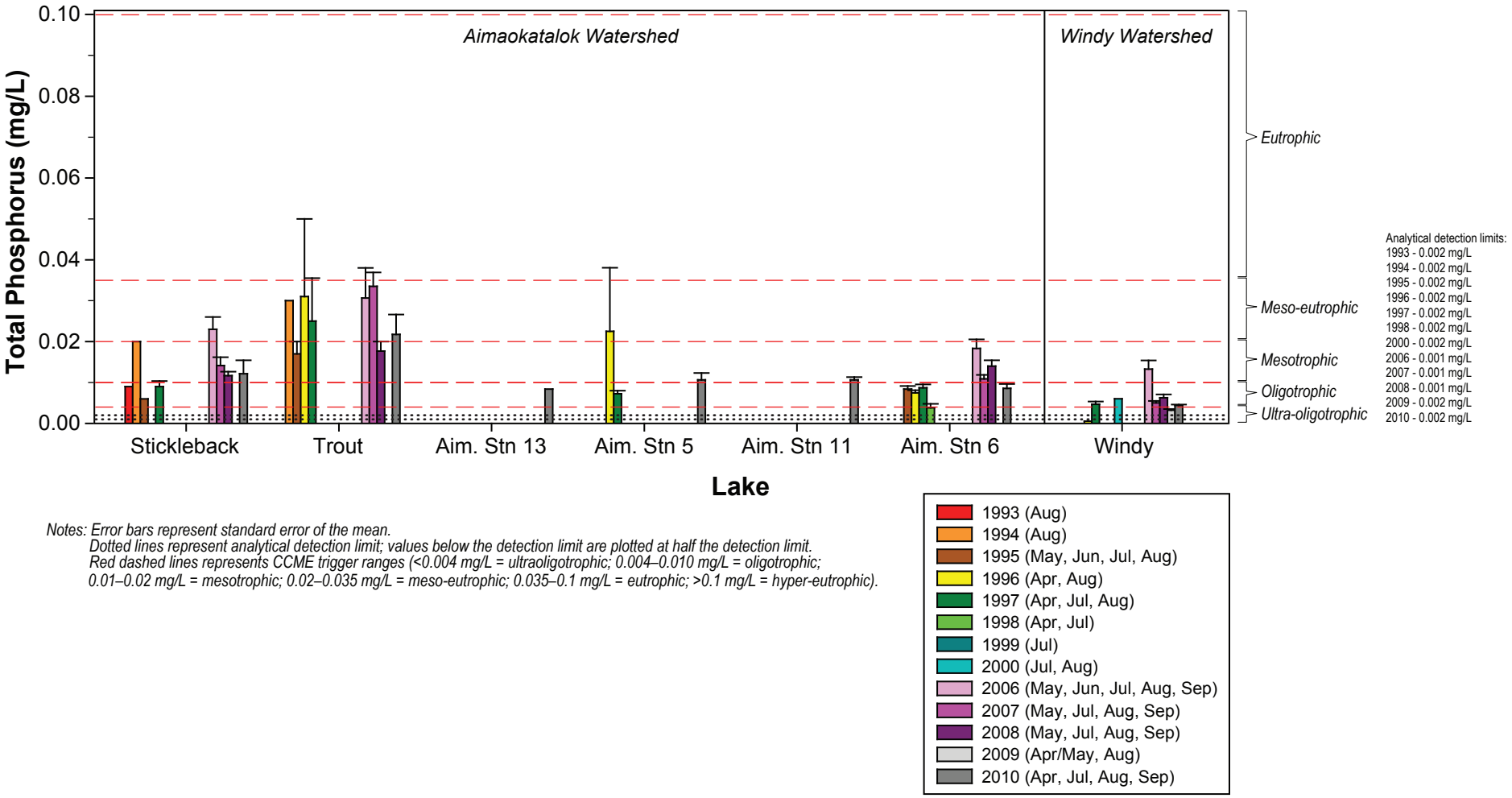
Figure 3.2-2i

NEWMONT NORTH AMERICA

Average Annual Nitrite Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2i

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed lines represents CCME trigger ranges (<0.004 mg/L = ultraoligotrophic; 0.004–0.010 mg/L = oligotrophic; 0.01–0.02 mg/L = mesotrophic; 0.02–0.035 mg/L = meso-eutrophic; 0.035–0.1 mg/L = eutrophic; >0.1 mg/L = hyper-eutrophic).

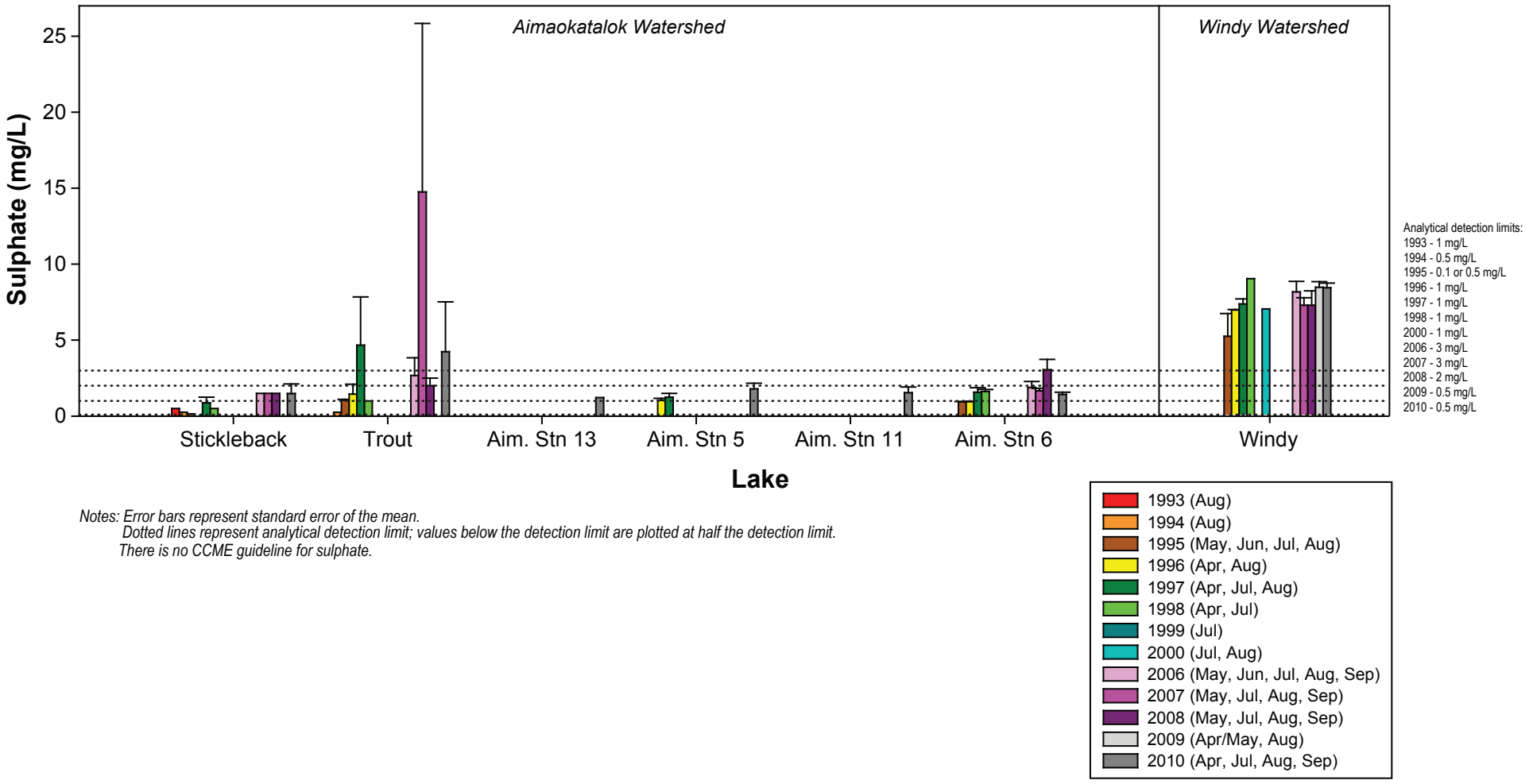
Figure 3.2-2j

NEWMONT NORTH AMERICA

Average Annual Total Phosphorus Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2j

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
There is no CCME guideline for sulphate.

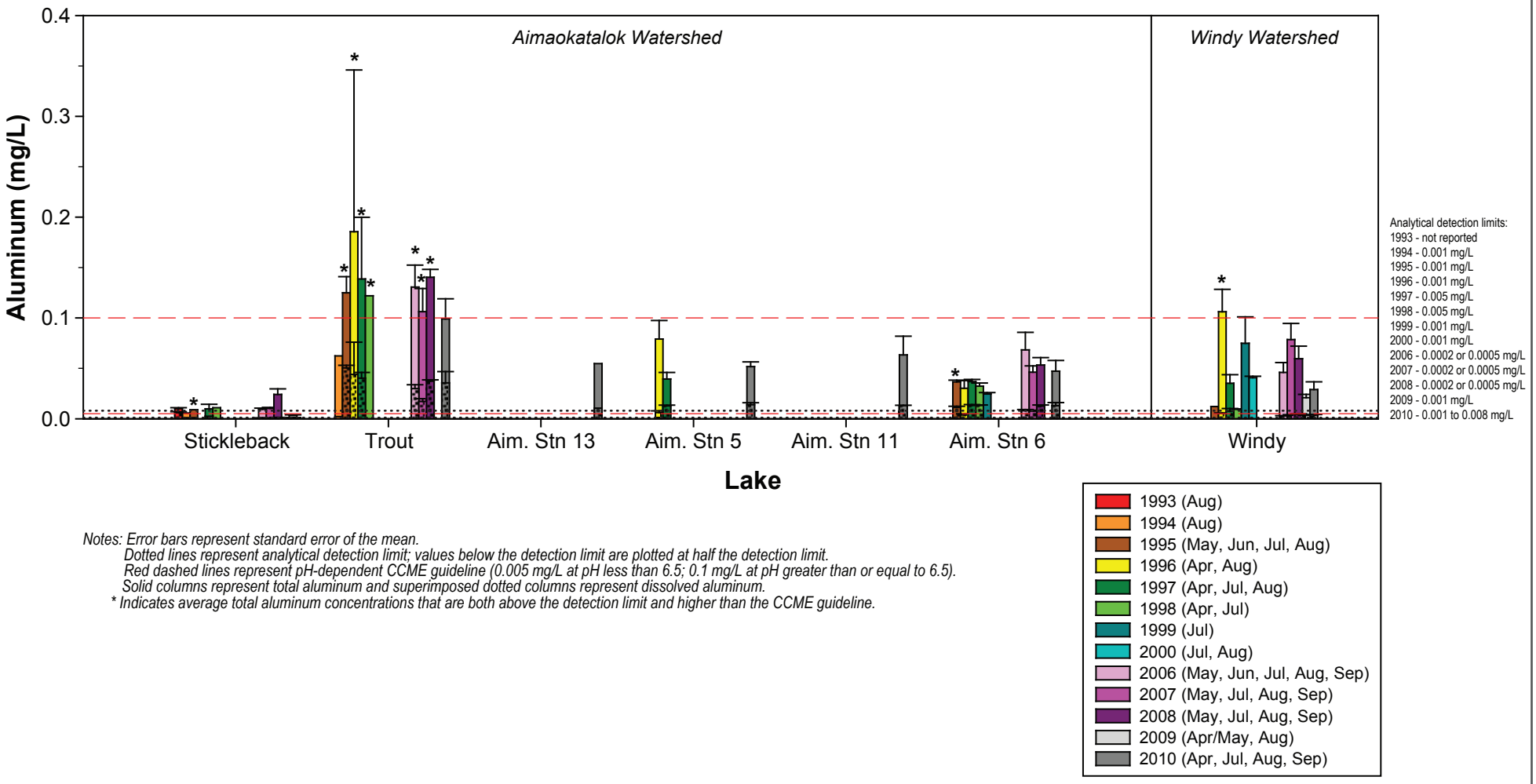
Figure 3.2-2k

NEWMONT NORTH AMERICA

Average Annual Sulphate Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2k

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed lines represent pH-dependent CCME guideline (0.005 mg/L at pH less than 6.5; 0.1 mg/L at pH greater than or equal to 6.5).
Solid columns represent total aluminum and superimposed dotted columns represent dissolved aluminum.
** Indicates average total aluminum concentrations that are both above the detection limit and higher than the CCME guideline.*

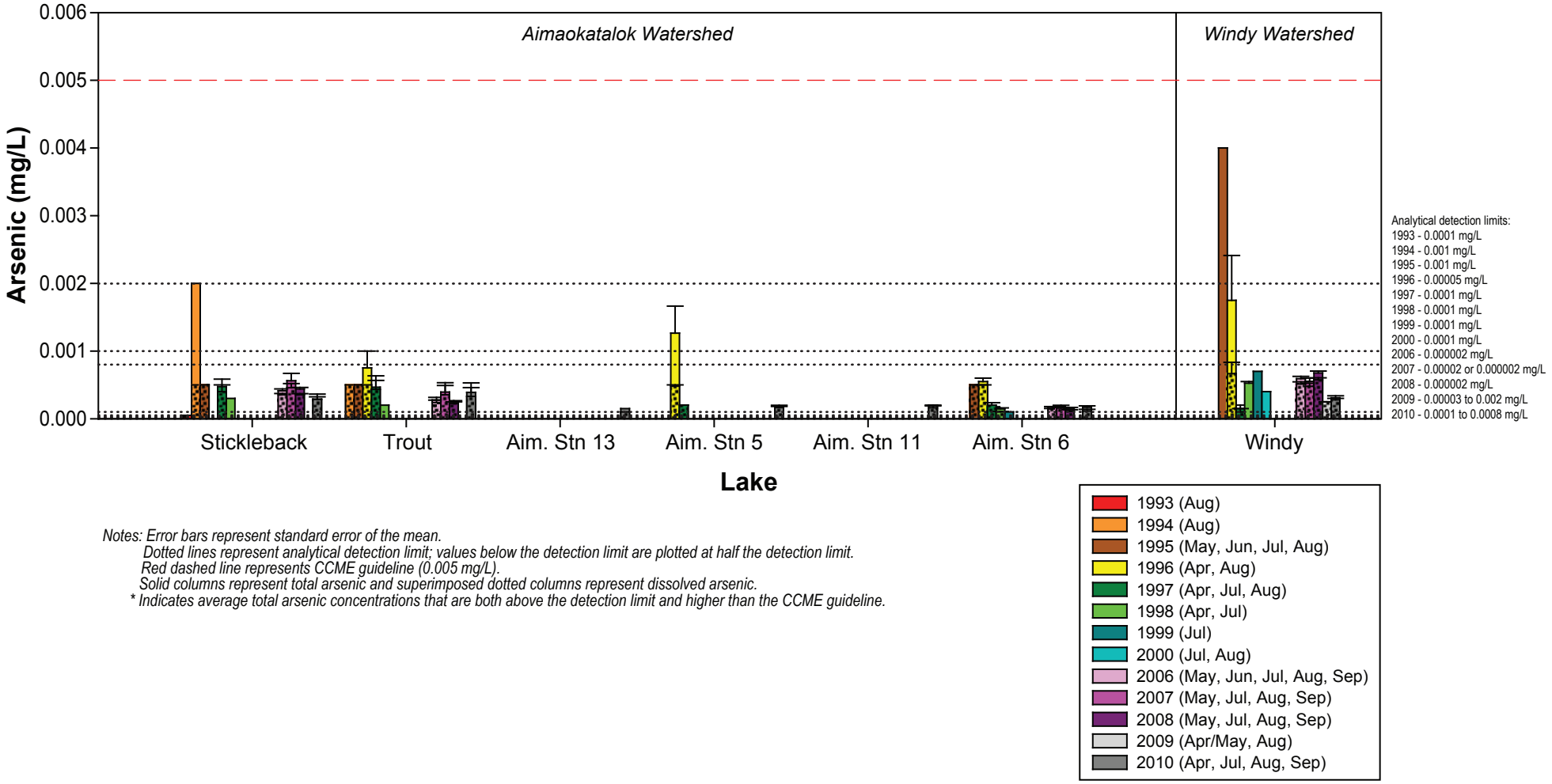
Figure 3.2-2l

NEWMONT NORTH AMERICA

Average Annual Aluminum Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2l

Rescan™ Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.005 mg/L).
Solid columns represent total arsenic and superimposed dotted columns represent dissolved arsenic.
** Indicates average total arsenic concentrations that are both above the detection limit and higher than the CCME guideline.*

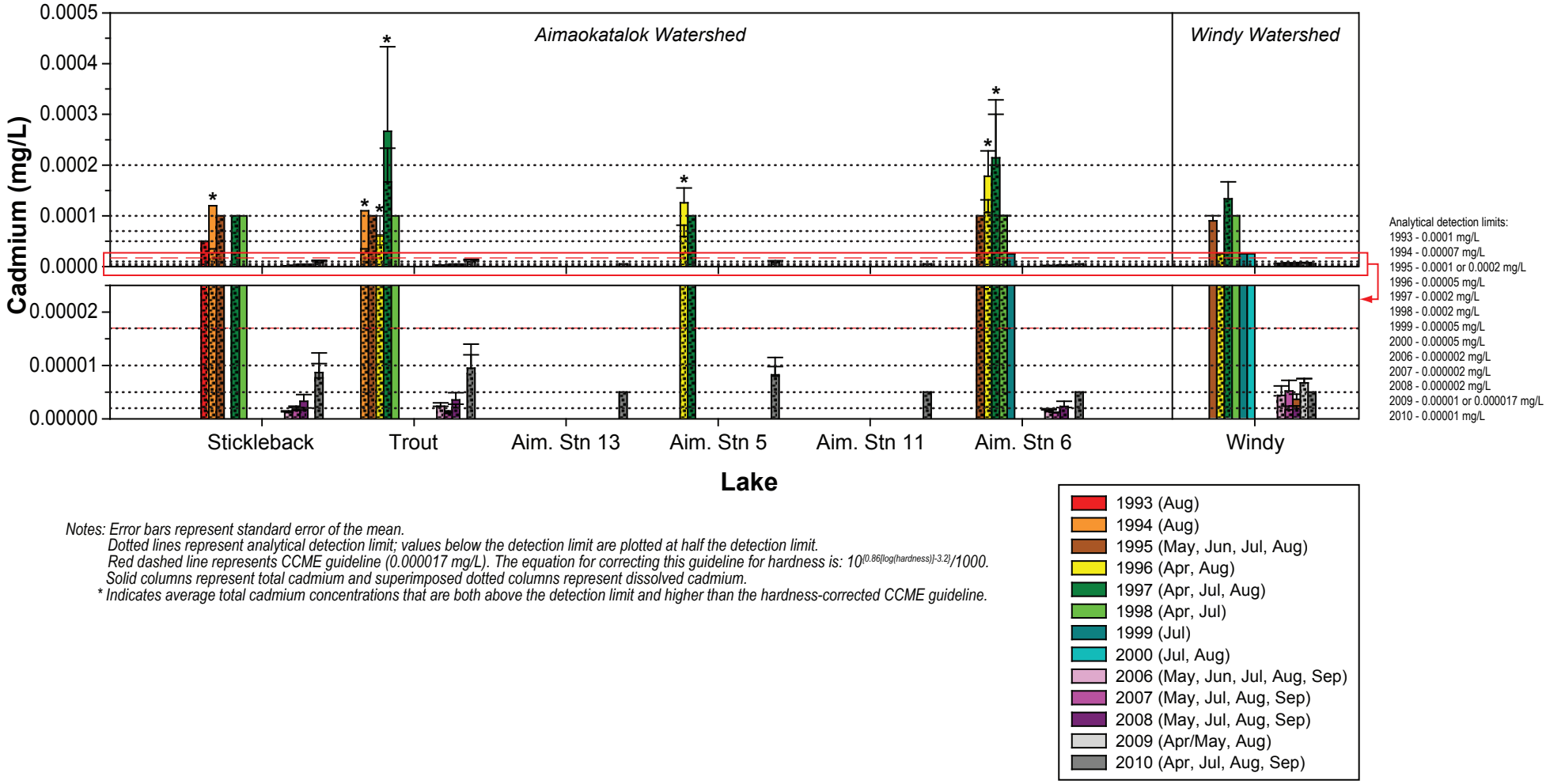
Figure 3.2-2m

NEWMONT NORTH AMERICA

Average Annual Arsenic Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2m

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.000017 mg/L). The equation for correcting this guideline for hardness is: $10^{[0.86[\log(\text{hardness})]-3.2]}/1000$.
Solid columns represent total cadmium and superimposed dotted columns represent dissolved cadmium.
** Indicates average total cadmium concentrations that are both above the detection limit and higher than the hardness-corrected CCME guideline.*

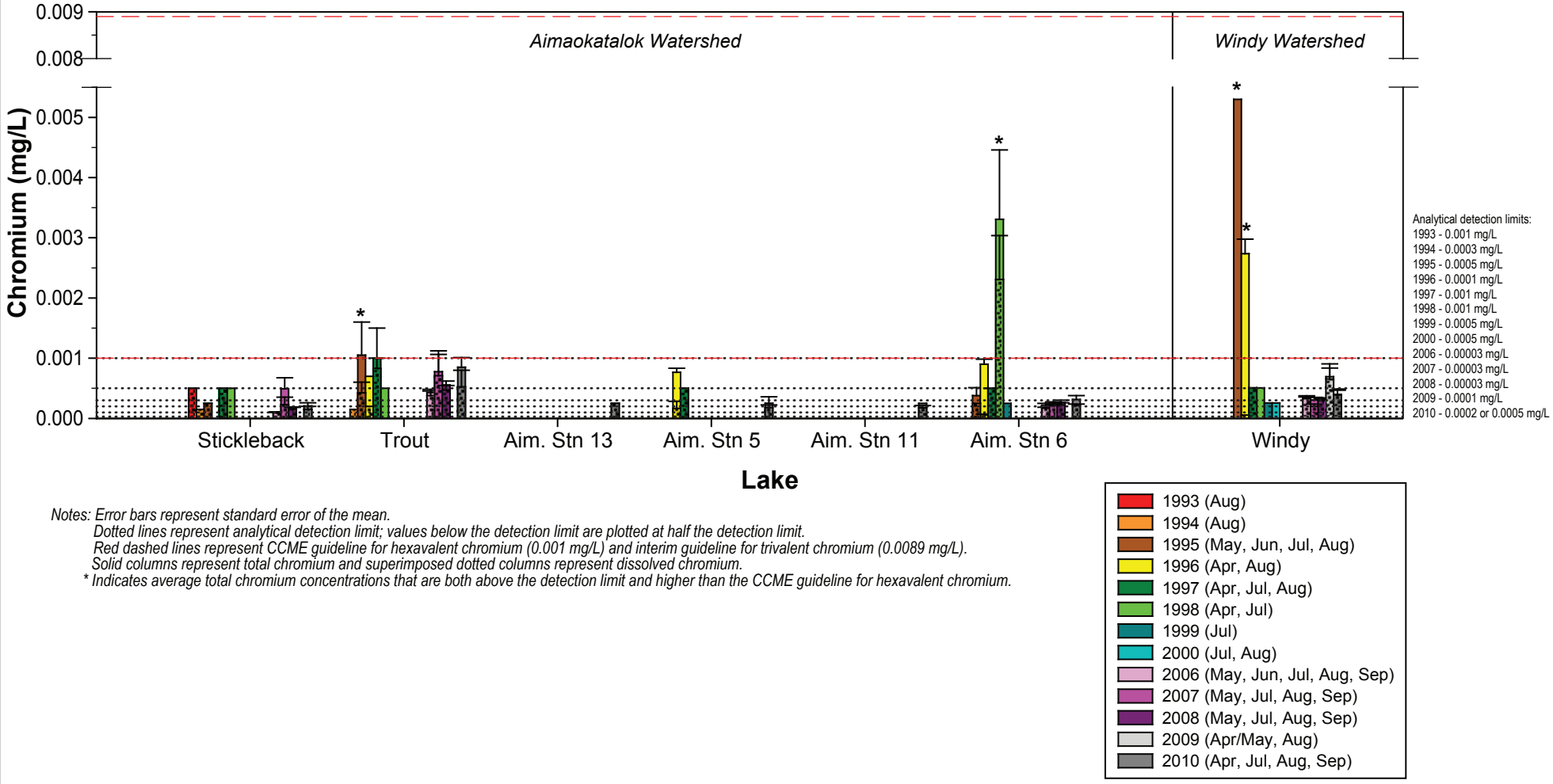
Figure 3.2-2n

NEWMONT NORTH AMERICA

Average Annual Cadmium Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2n

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed lines represent CCME guideline for hexavalent chromium (0.001 mg/L) and interim guideline for trivalent chromium (0.0089 mg/L).
Solid columns represent total chromium and superimposed dotted columns represent dissolved chromium.
** Indicates average total chromium concentrations that are both above the detection limit and higher than the CCME guideline for hexavalent chromium.*

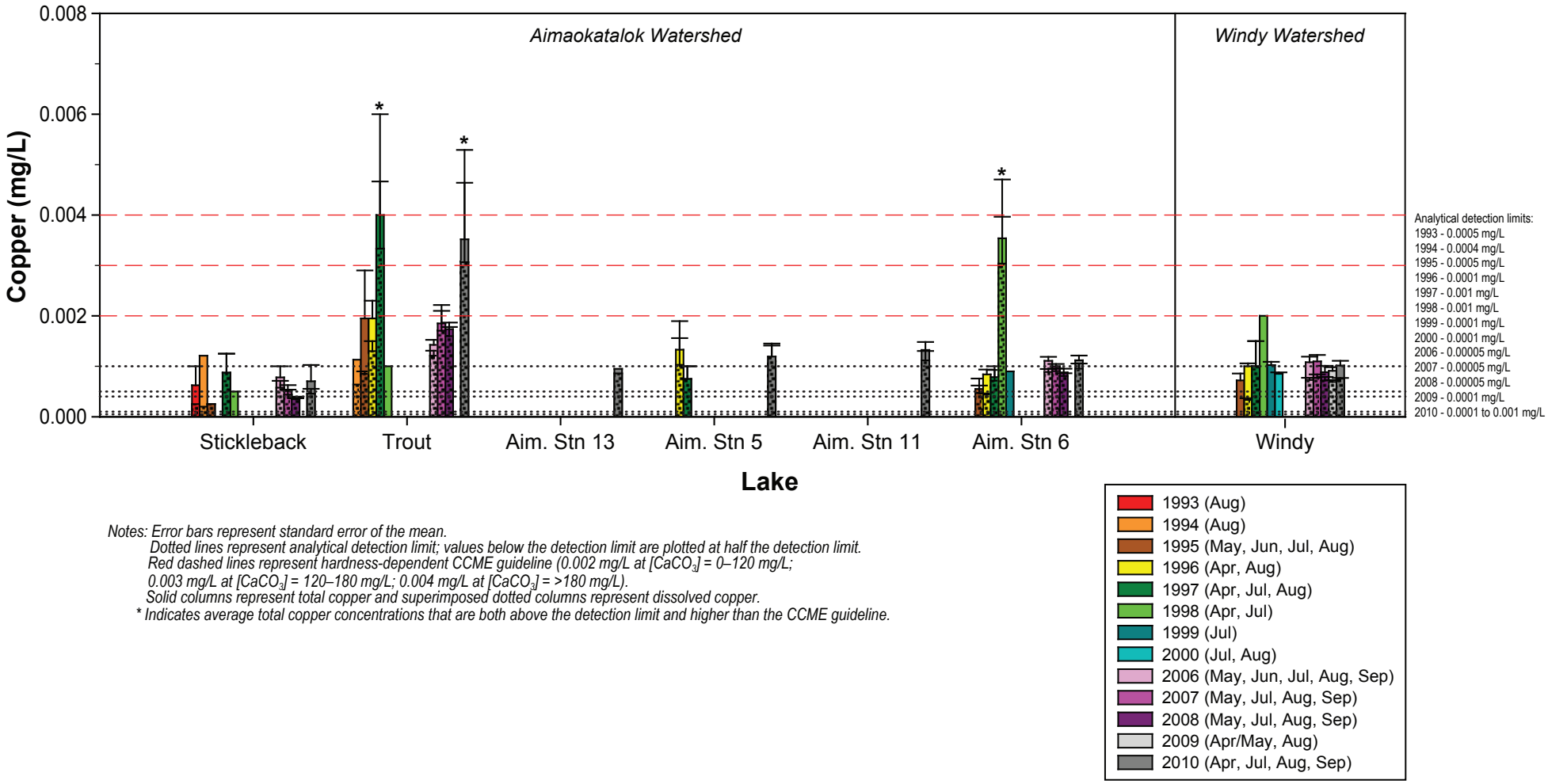
Figure 3.2-2o

NEWMONT NORTH AMERICA

Average Annual Chromium Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2o

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed lines represent hardness-dependent CCME guideline (0.002 mg/L at [$CaCO_3$] = 0–120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120–180 mg/L; 0.004 mg/L at [$CaCO_3$] = >180 mg/L).
Solid columns represent total copper and superimposed dotted columns represent dissolved copper.
** Indicates average total copper concentrations that are both above the detection limit and higher than the CCME guideline.*

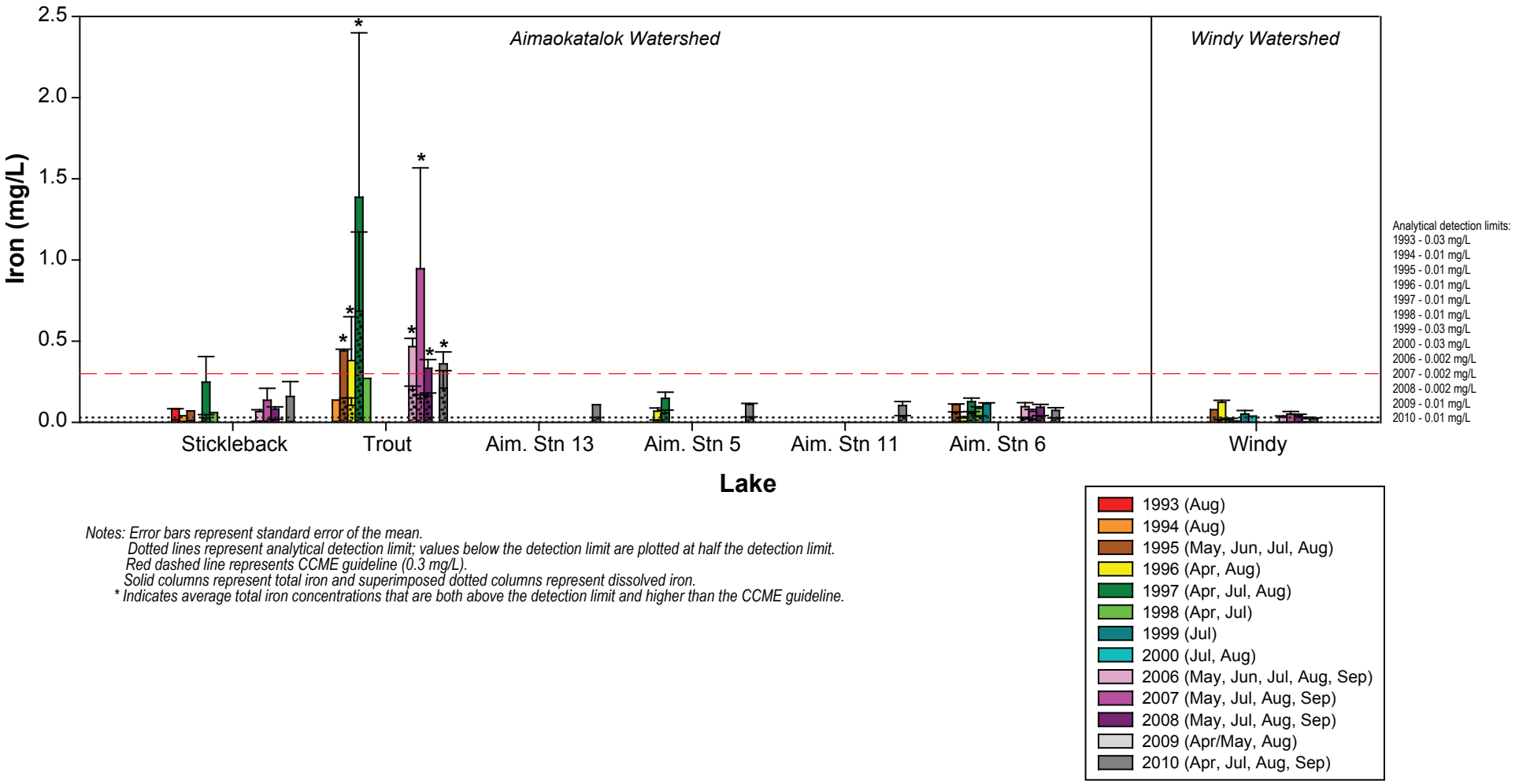
Figure 3.2-2p

NEWMONT NORTH AMERICA

Average Annual Copper Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2p

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.3 mg/L).
Solid columns represent total iron and superimposed dotted columns represent dissolved iron.
** Indicates average total iron concentrations that are both above the detection limit and higher than the CCME guideline.*

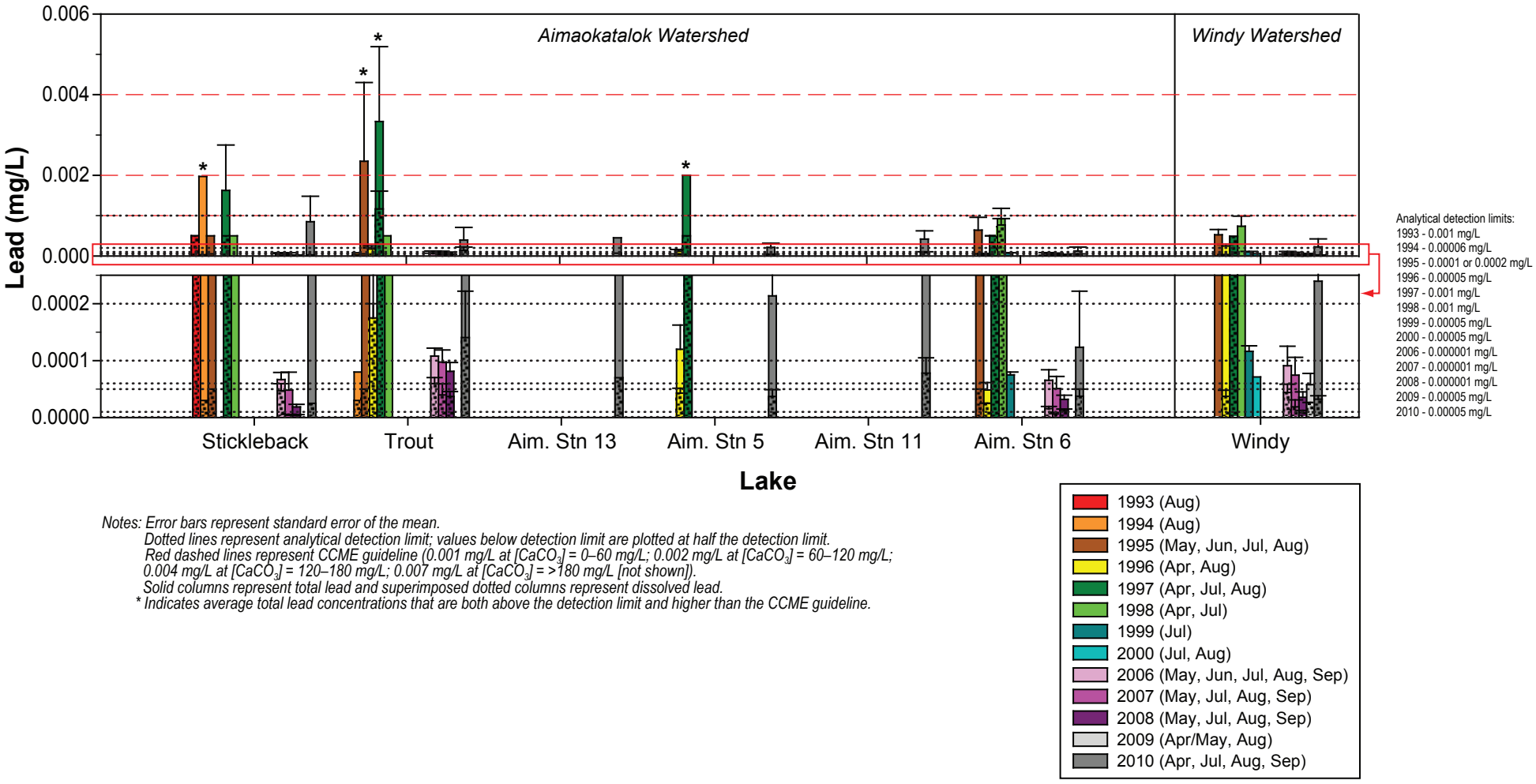
Figure 3.2-2q

NEWMONT NORTH AMERICA

Average Annual Iron Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2q

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below detection limit are plotted at half the detection limit.
Red dashed lines represent CCME guideline (0.001 mg/L at [$CaCO_3$] = 0–60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60–120 mg/L; 0.004 mg/L at [$CaCO_3$] = 120–180 mg/L; 0.007 mg/L at [$CaCO_3$] = >180 mg/L [not shown]).
Solid columns represent total lead and superimposed dotted columns represent dissolved lead.
** Indicates average total lead concentrations that are both above the detection limit and higher than the CCME guideline.*

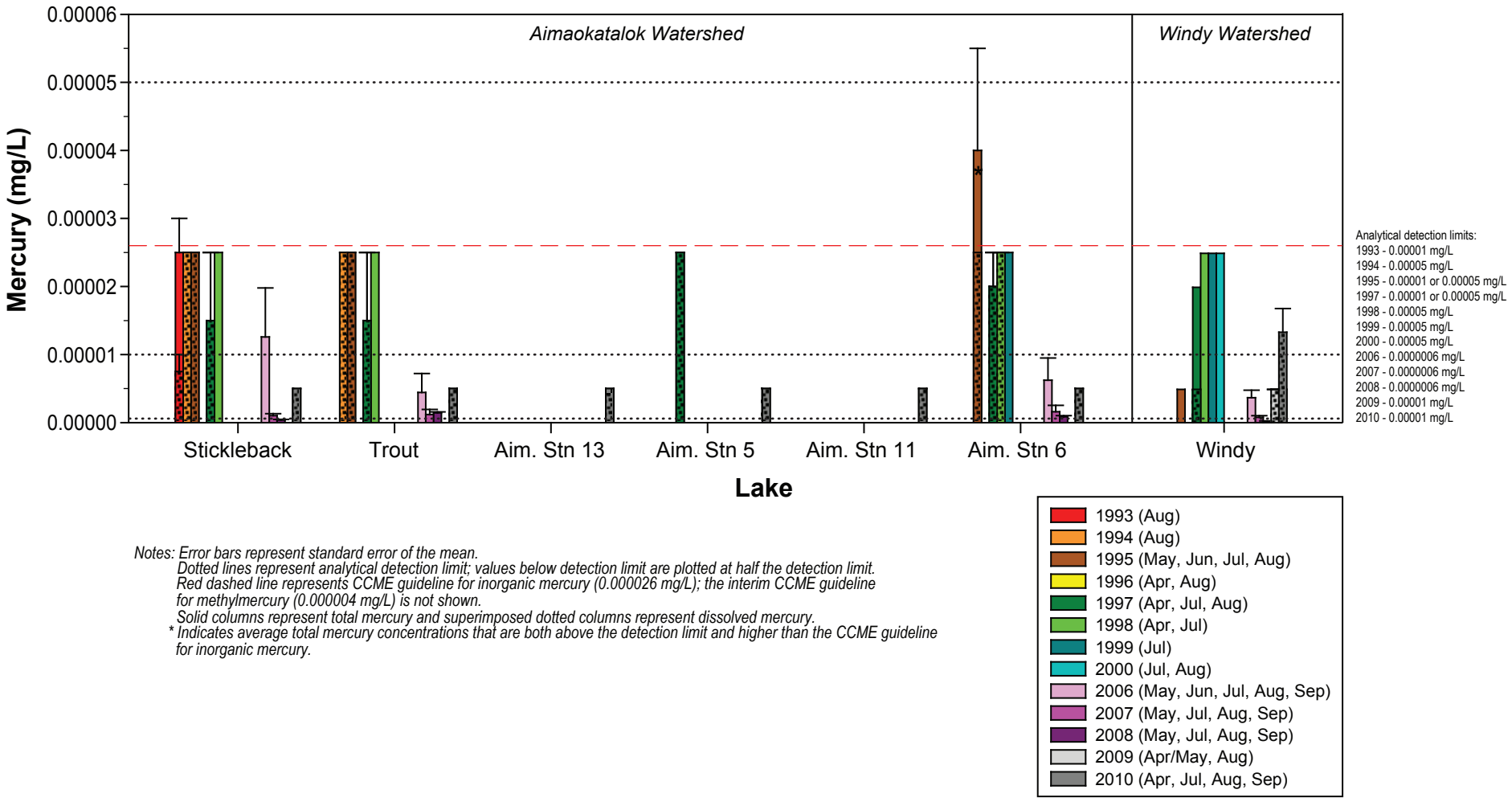
Figure 3.2-2r

NEWMONT NORTH AMERICA

Average Annual Lead Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2r

Rescan™ Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline for inorganic mercury (0.000026 mg/L); the interim CCME guideline for methylmercury (0.000004 mg/L) is not shown.
Solid columns represent total mercury and superimposed dotted columns represent dissolved mercury.
** Indicates average total mercury concentrations that are both above the detection limit and higher than the CCME guideline for inorganic mercury.*

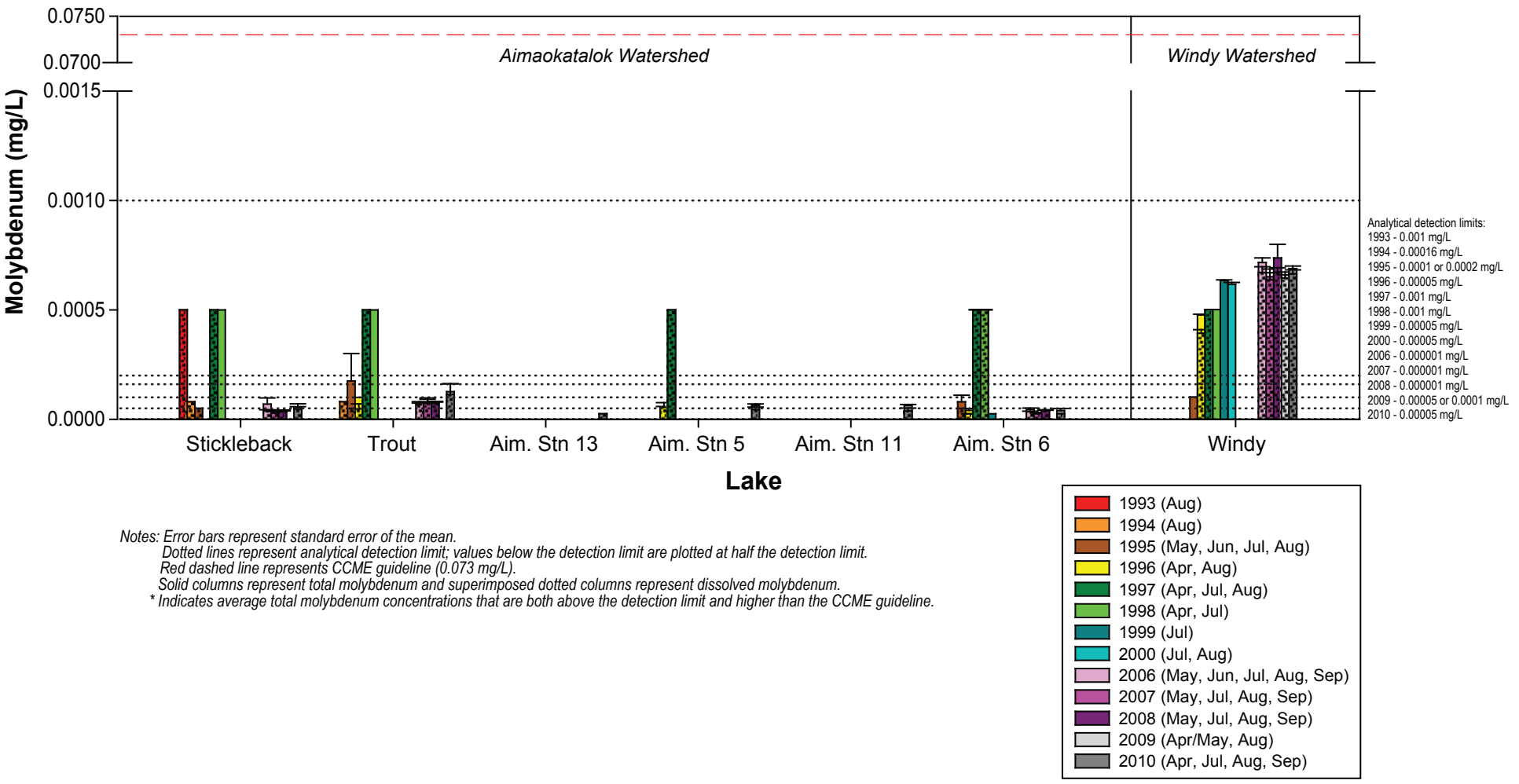
Figure 3.2-2s

NEWMONT NORTH AMERICA

Average Annual Mercury Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2s

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.073 mg/L).
Solid columns represent total molybdenum and superimposed dotted columns represent dissolved molybdenum.
** Indicates average total molybdenum concentrations that are both above the detection limit and higher than the CCME guideline.*

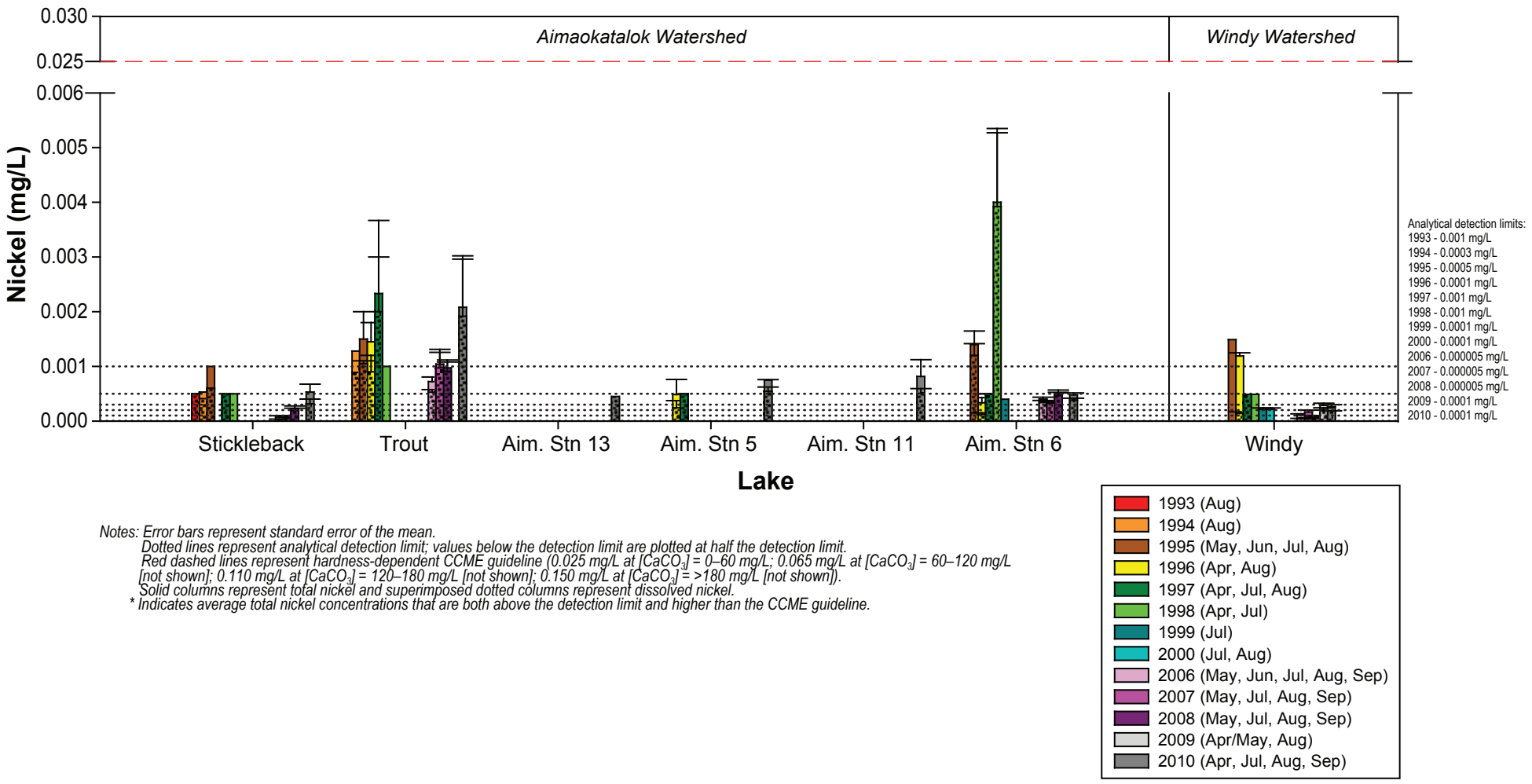
Figure 3.2-2t

NEWMONT NORTH AMERICA

Average Annual Molybdenum Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2t

Rescan™ Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed lines represent hardness-dependent CCME guideline (0.025 mg/L at [$CaCO_3$] = 0–60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60–120 mg/L [not shown]; 0.110 mg/L at [$CaCO_3$] = 120–180 mg/L [not shown]; 0.150 mg/L at [$CaCO_3$] = >180 mg/L [not shown]).
Solid columns represent total nickel and superimposed dotted columns represent dissolved nickel.
** Indicates average total nickel concentrations that are both above the detection limit and higher than the CCME guideline.*

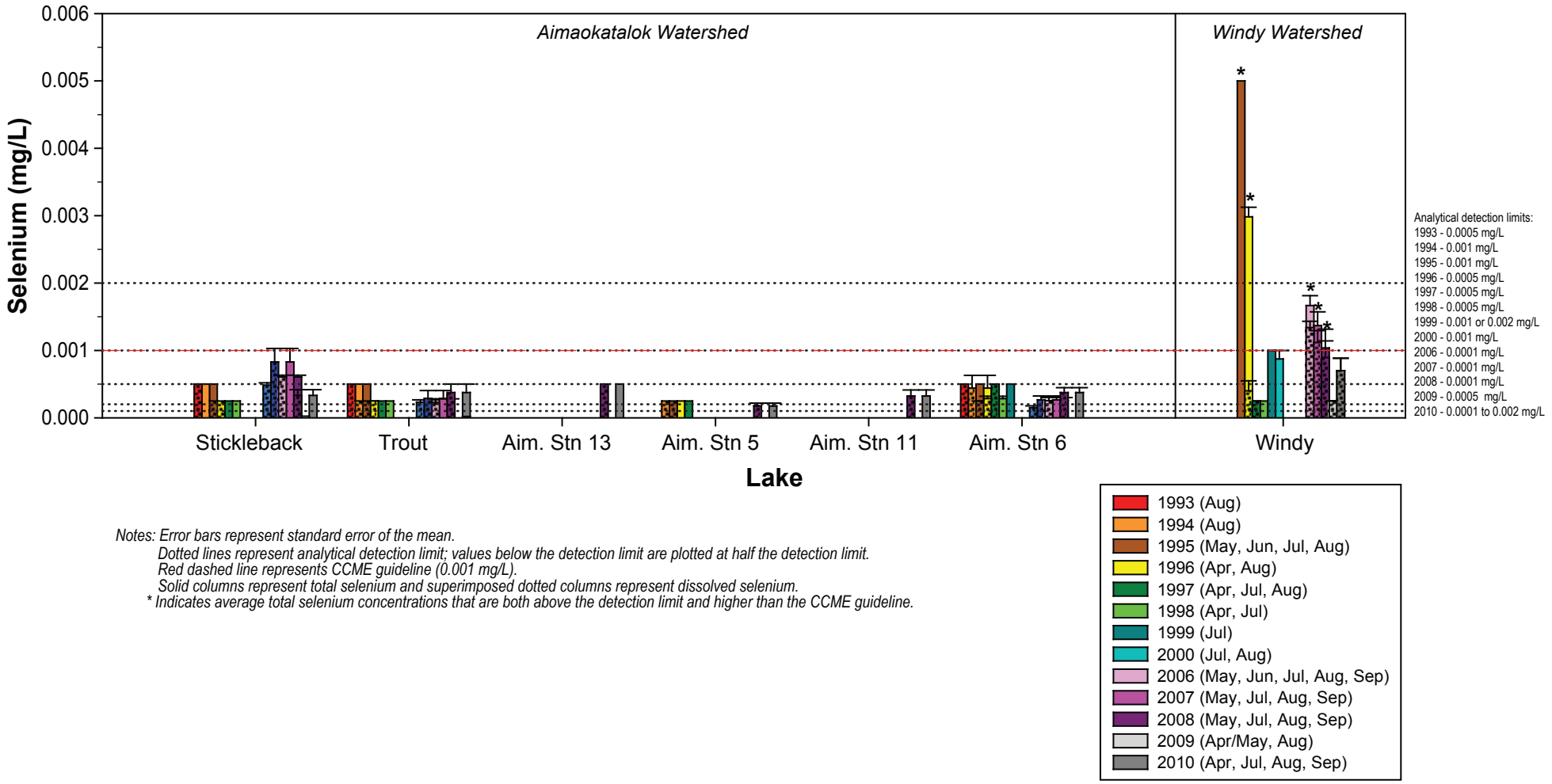
Figure 3.2-2u

NEWMONT NORTH AMERICA

Average Annual Nickel Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2u

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.001 mg/L).
Solid columns represent total selenium and superimposed dotted columns represent dissolved selenium.
** Indicates average total selenium concentrations that are both above the detection limit and higher than the CCME guideline.*

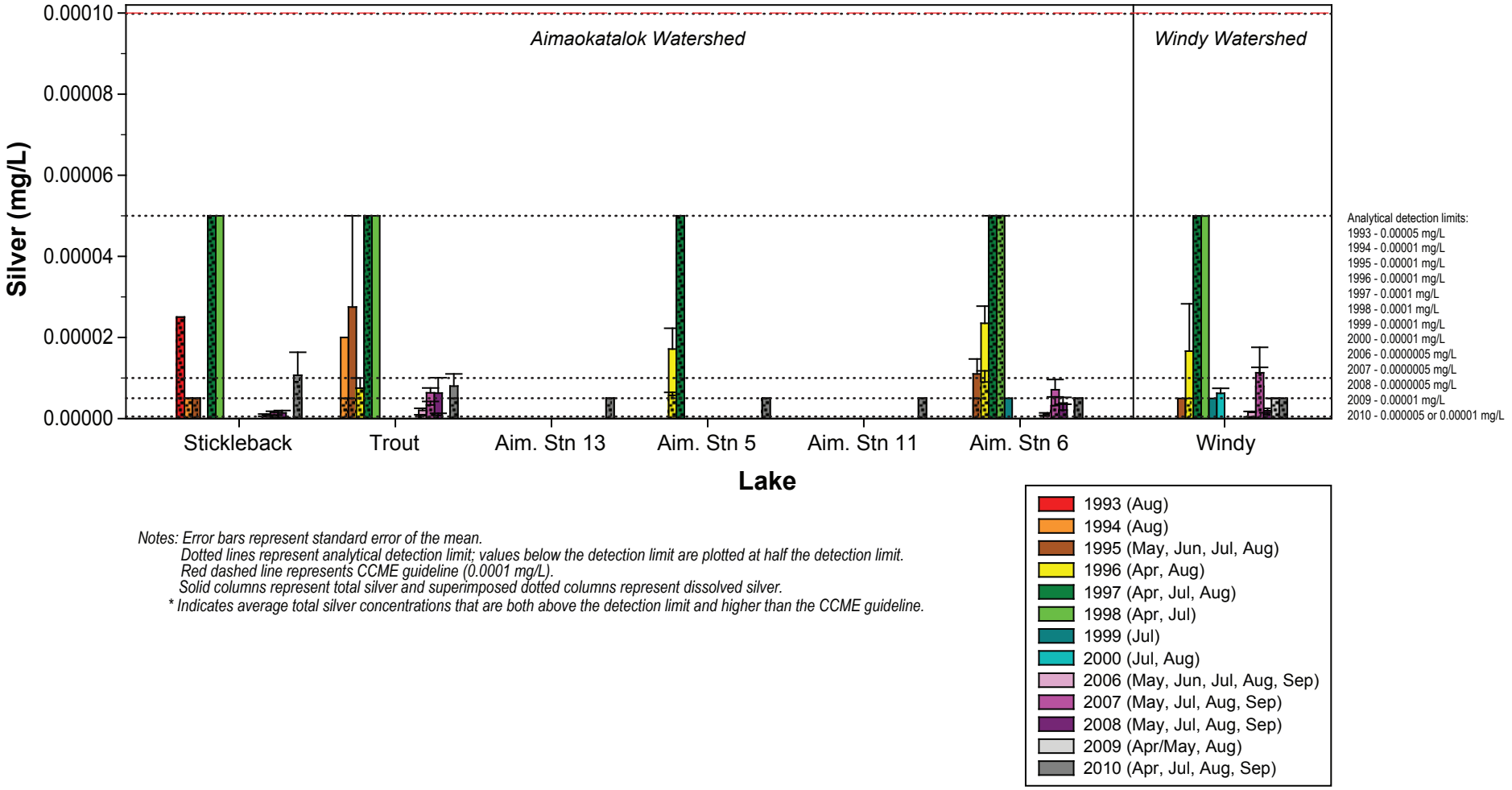
Figure 3.2-2v

NEWMONT NORTH AMERICA

Average Annual Selenium Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2v

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.0001 mg/L).
Solid columns represent total silver and superimposed dotted columns represent dissolved silver.
** Indicates average total silver concentrations that are both above the detection limit and higher than the CCME guideline.*

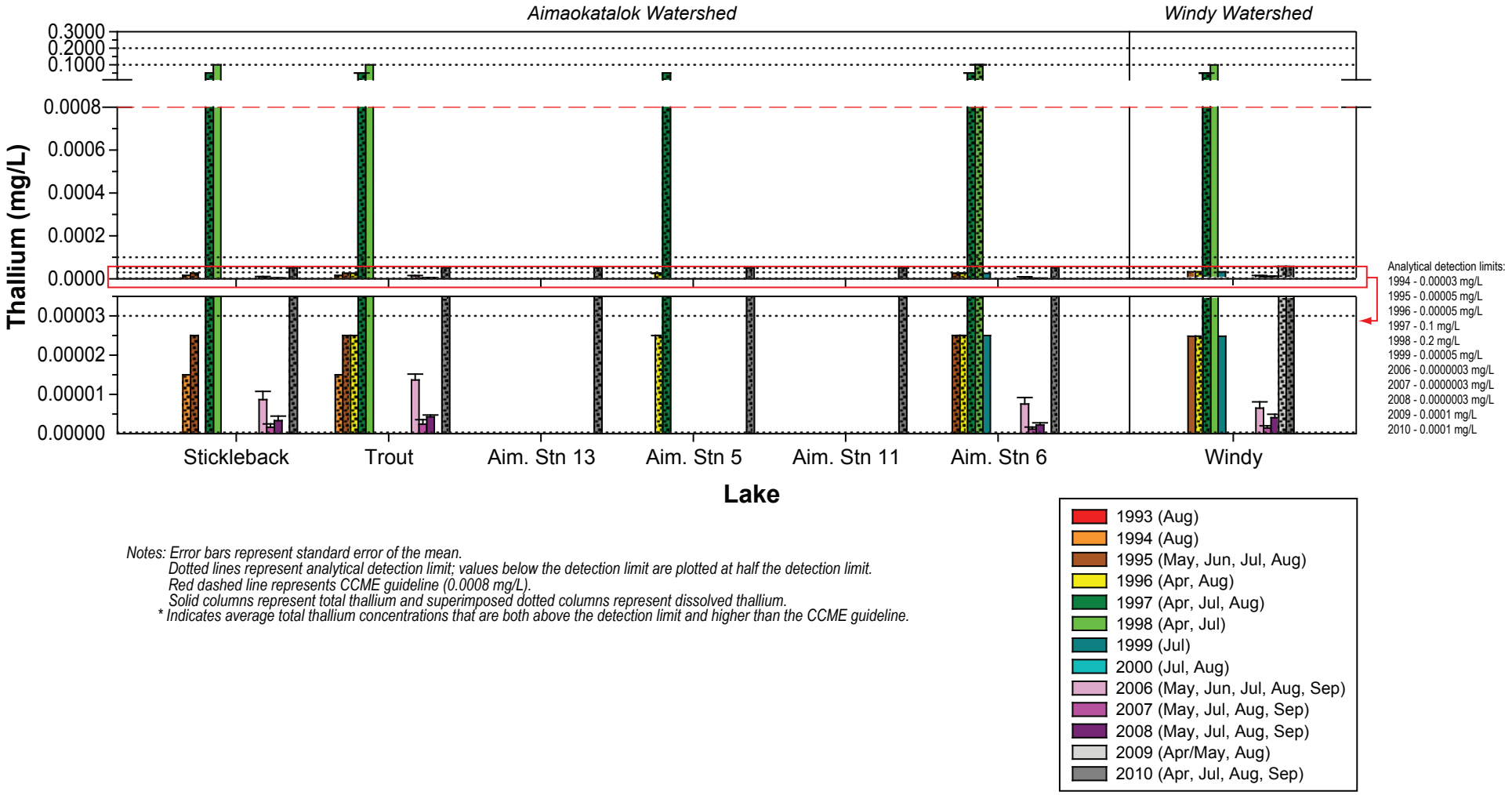
Figure 3.2-2w

NEWMONT NORTH AMERICA

Average Annual Silver Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2w

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.0008 mg/L).
Solid columns represent total thallium and superimposed dotted columns represent dissolved thallium.
** Indicates average total thallium concentrations that are both above the detection limit and higher than the CCME guideline.*

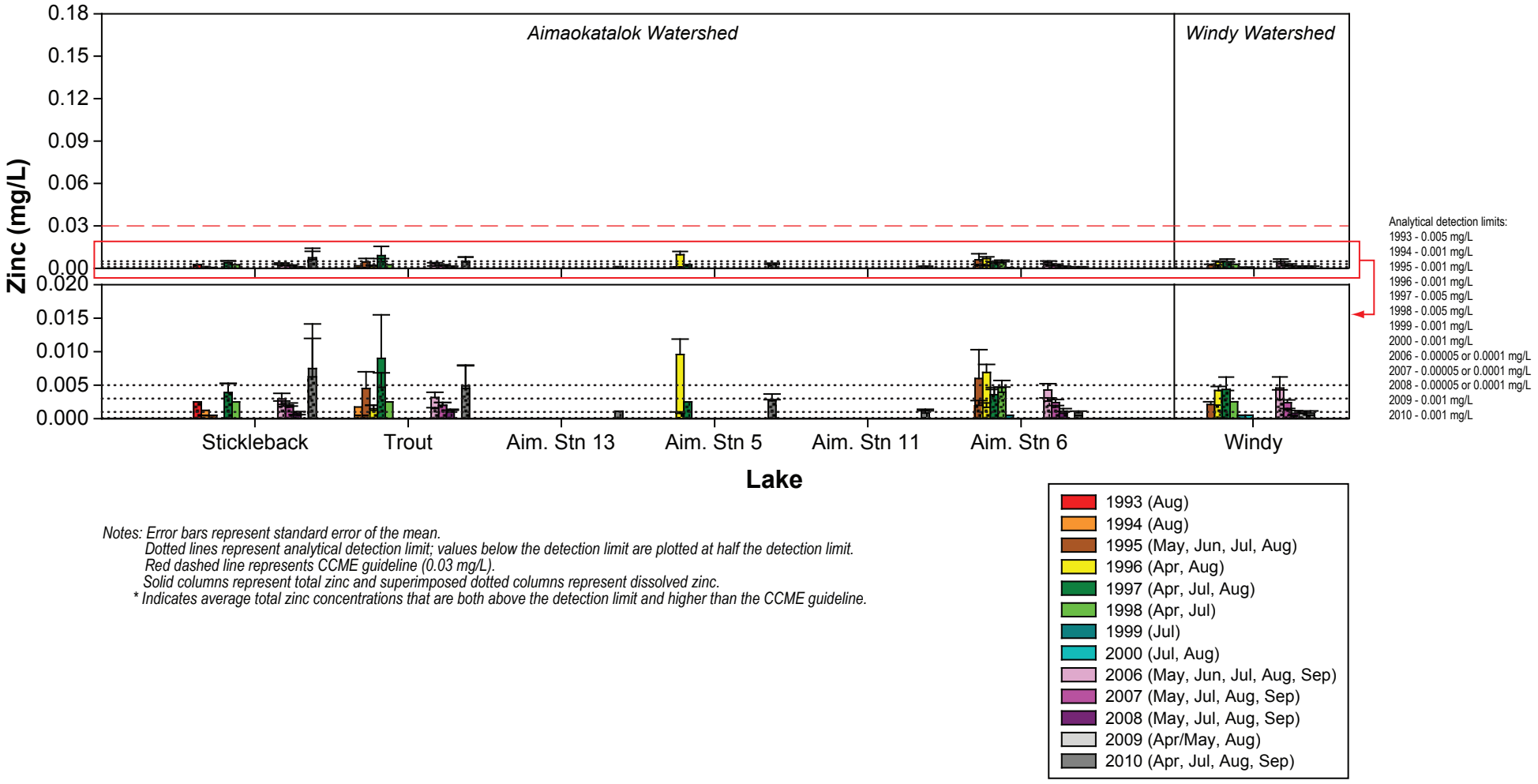
Figure 3.2-2x

NEWMONT NORTH AMERICA

Average Annual Thallium Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2x

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.03 mg/L).
Solid columns represent total zinc and superimposed dotted columns represent dissolved zinc.
** Indicates average total zinc concentrations that are both above the detection limit and higher than the CCME guideline.*

Figure 3.2-2y

NEWMONT NORTH AMERICA

Average Annual Zinc Concentration in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2y

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3.3 STREAM AND RIVER WATER QUALITY

Stream and river water quality samples were collected in April, June (freshet), August, and September of 2010 (Table 2.1-5). Historical data are also available for some streams and rivers in the study area (Figures 2.14-1a to 2.14-1c; Table 2.14-2). The 2010 raw water quality data for streams and rivers are provided in Appendix 3.3-1. All water quality data collected were compared to CCME guidelines for the protection of freshwater aquatic life (CCME 2007).

3.3.1 Seasonal Variation

During the winter, concentrations of many nutrients and metals are expected to be higher than in summer due to natural processes, including solute exclusion resulting from ice formation, and changes in redox chemistry and biological uptake. During the freshet in June, snow and ice melt flows into streams and rivers, allochthonous materials into downstream waterbodies, particularly if the elevated discharge flows through a highly erodible watershed (i.e., the presence of esker habitat). This could result in increased concentrations of suspended solids, metals, nutrients, and other materials. On the other hand, the increased volume can also result in the dilution of water quality parameters, thus reducing their concentrations.

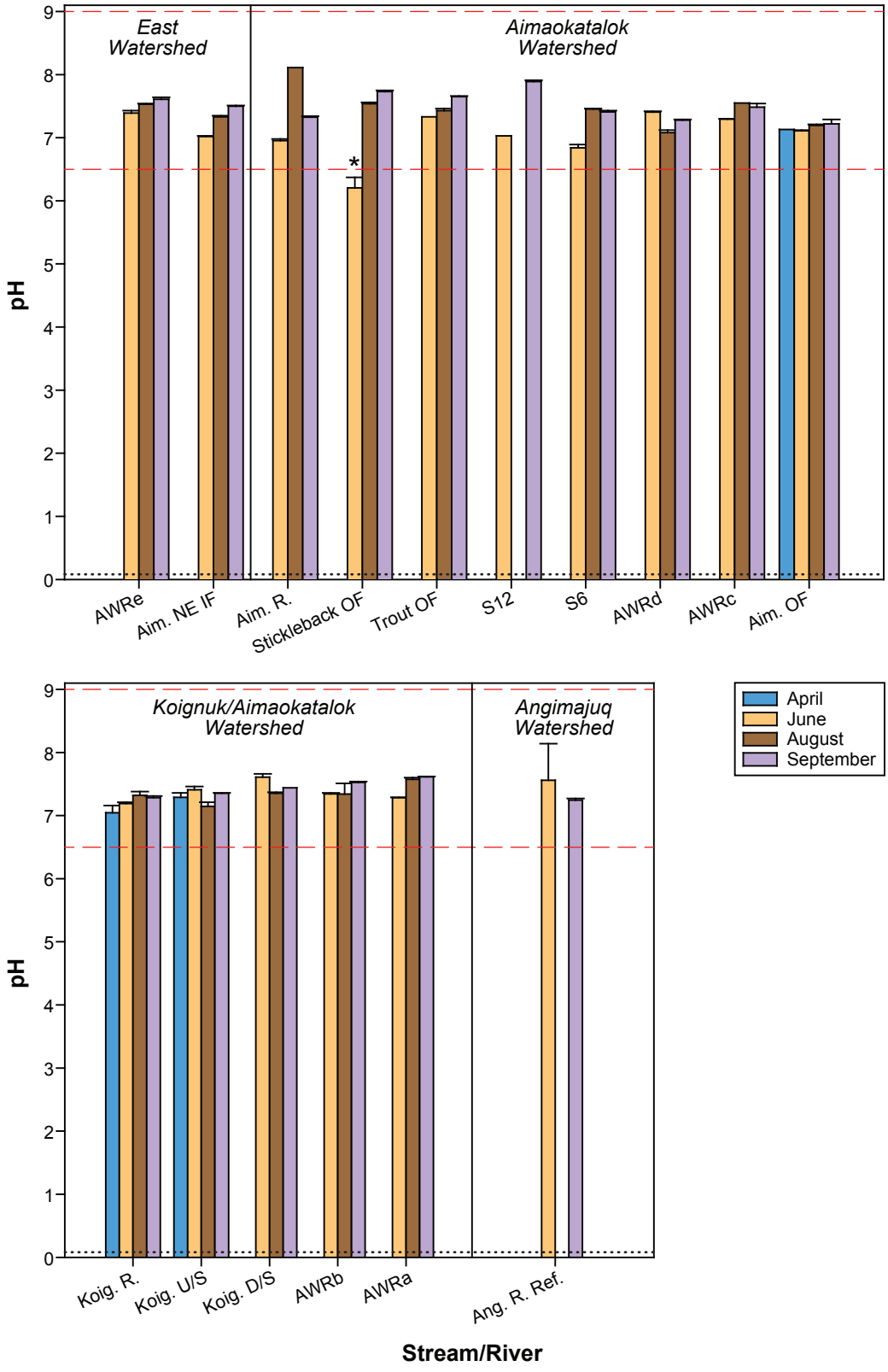
Stream and river water quality data collected in 2010 are presented in Figures 3.3-1a to 3.3-1y. The only sites sampled successfully in winter (April) were two sites in the Koignuk River (Koig. R., Koig. U/S) and one site in Aimaokatalok Outflow (Aim. OF). The other stream sites were not sampled due to safety constraints (e.g., Ang. R. Ref.) or because they were frozen to the bottom (e.g., Aim. R. and Koig. D/S). There were few apparent differences between winter and summer samples. The Koignuk River under-ice samples and Aim. OF surface grab samples had higher hardness levels in winter than in summer (Figure 3.3-1b). TOC and nitrate concentrations were also relatively high during winter compared to summer levels (Figures 3.3-1f and 3.3-1g).

During the freshet in June, hardness, TDS, and sulphate levels were generally lower than in April, August, or September (Figures 3.3-1b, 3.3-1e, 3.3-1k). However, for most parameters, the seasonal patterns varied between sites with no clear trends.

3.3.2 Spatial Variation

All streams surveyed were similar in pH, with slightly acidic to slightly basic pH levels ranging from 6.2 at Stickleback OF in June to 8.1 at Aim. R. in August (Figure 3.3-1a). Turbidity was variable across sites, ranging from 0.25 NTU (AWRe in June) to 41 NTU (AWRa in June; Figure 3.3-1c). Turbidity tended to be higher in the Koignuk/Aimaokatalok Watershed than in the other watersheds (East, Aimaokatalok).

Total phosphorus concentrations were variable across stream sites, ranging from 0.003 mg/L at S6 in August and September to 0.060 mg/L at AWRa in June. Aim. NE IF, Koig D/S, and AWRa generally contained the highest total phosphorus concentrations, although concentrations were seasonally variable(Figure 3.3-1j). Maximum total phosphorus concentrations at these sites fell within the range expected for a eutrophic waterbody based on the CCME trigger ranges for total phosphorus (CCME 2004). Most sampled streams and rivers would be considered oligotrophic to meso-eutrophic. Stream S6 was the only site that would be categorized as ultra-oligotrophic. Total phosphorus tended to be higher in the East and Koignuk/Aimaokatalok watersheds than in Aimaokatalok Watershed.



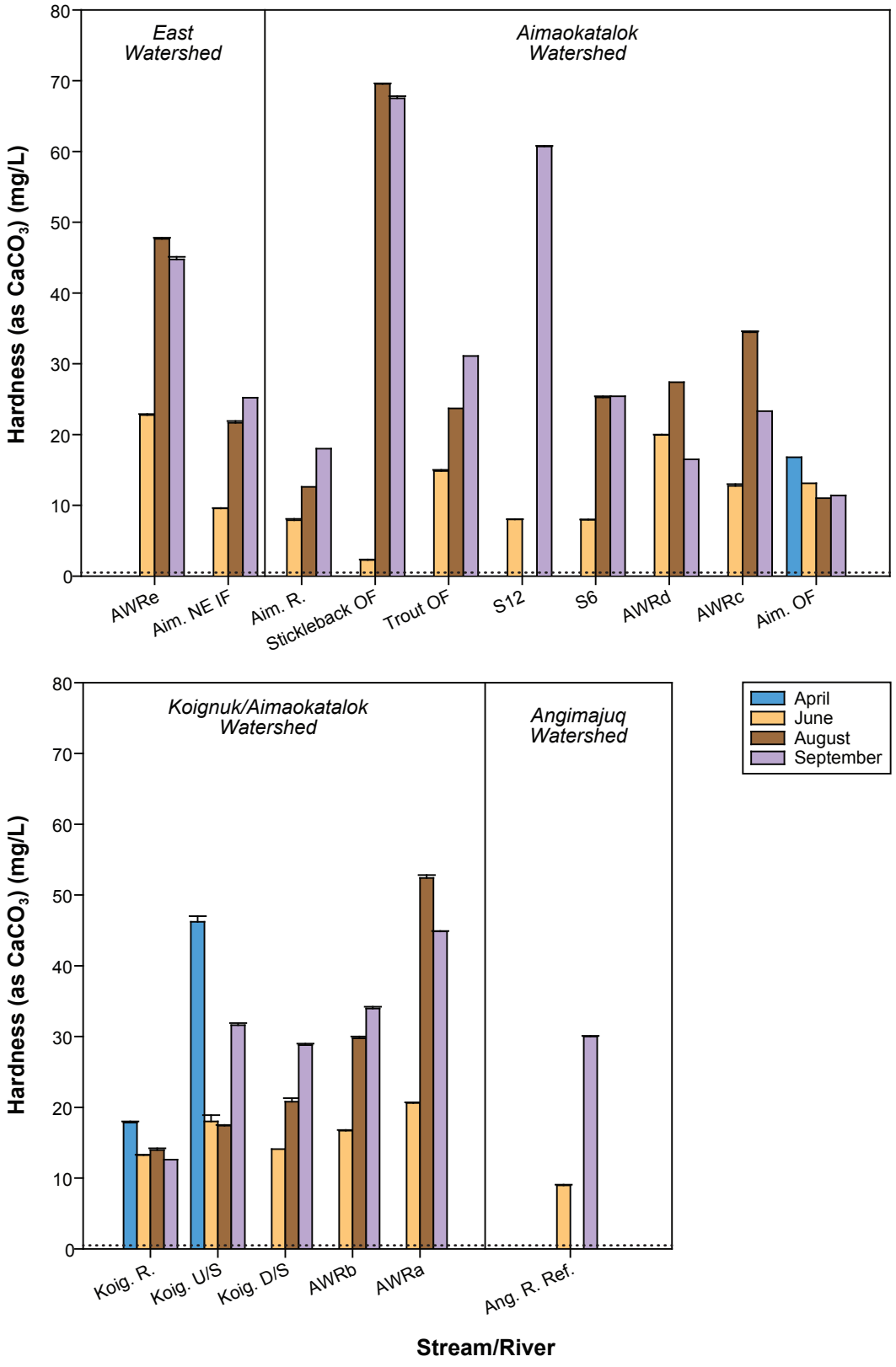
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (pH 0.10).
Red dashed lines represent CCME guideline (pH 6.5–9).
** Indicates average values that are not within CCME guideline pH range.*

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pH in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1a

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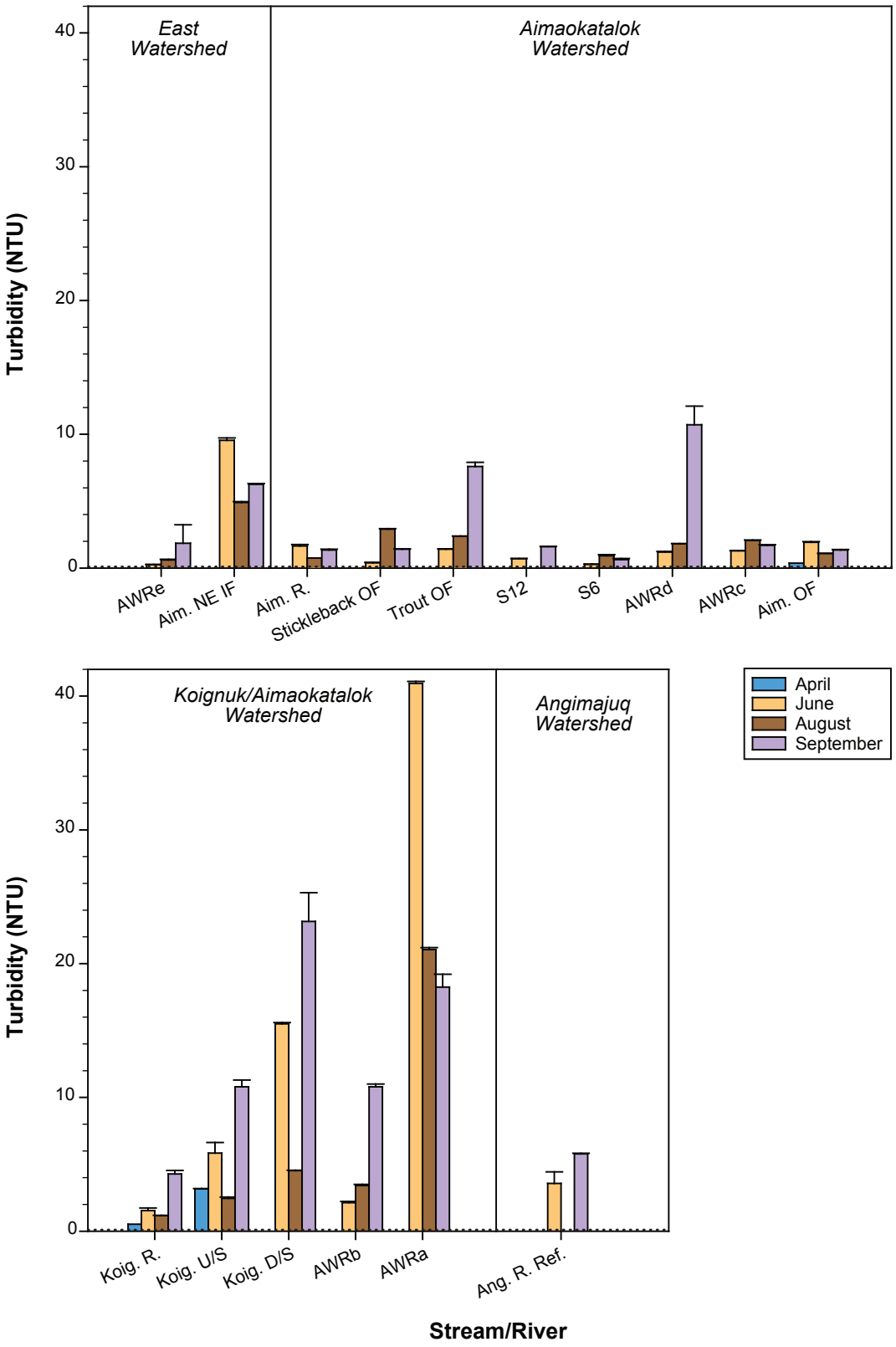
Note: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.50 mg/L).
There is no CCME guideline for hardness.

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Hardness in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1b

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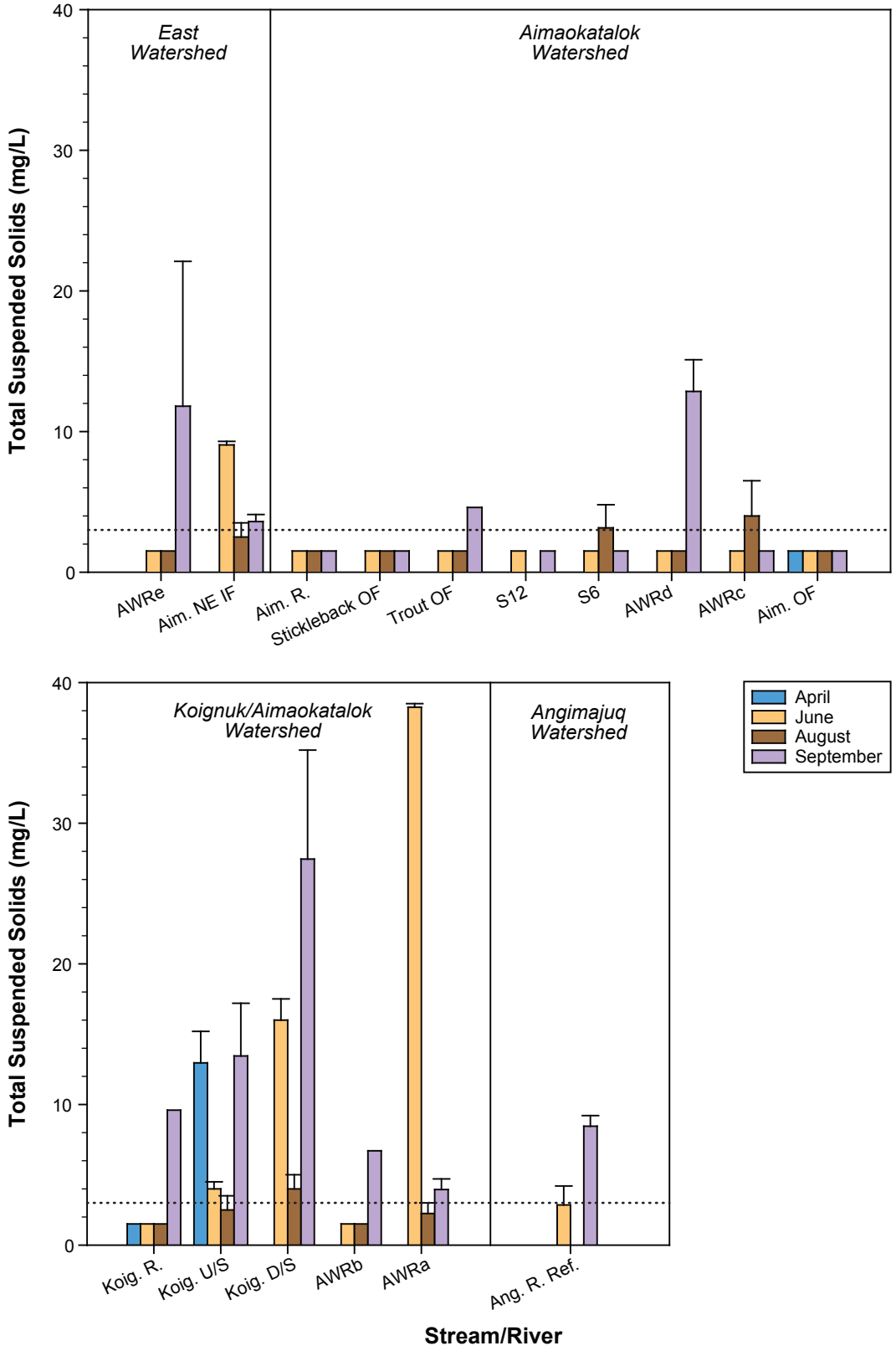
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.1 NTU).
CCME guideline for turbidity is dependent upon background levels.

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Turbidity in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1c

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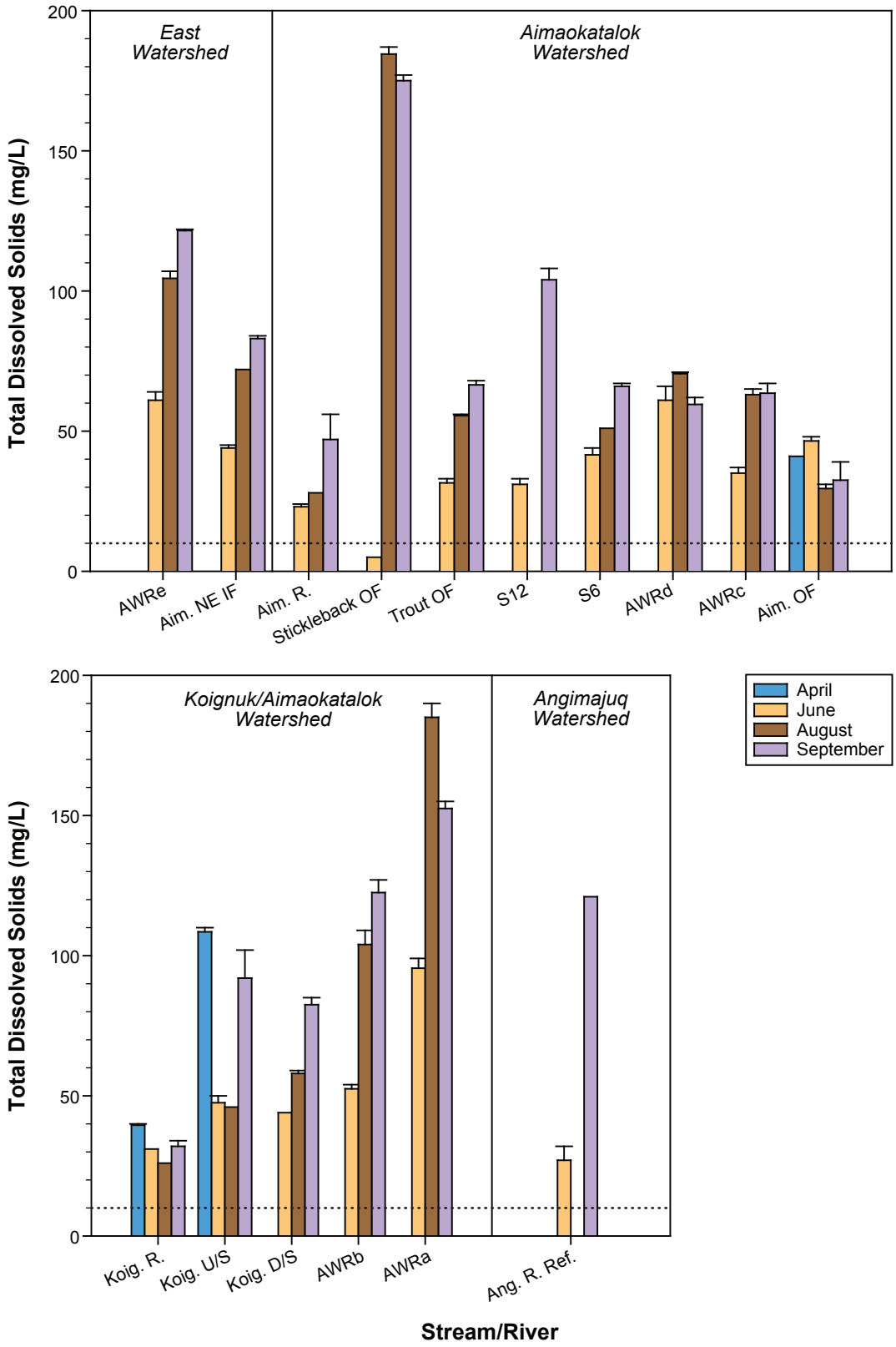
Note: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (3 mg/L); values below the detection limit are plotted at half the detection limit.
CCME guideline for total suspended solids is dependent upon background levels.

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Total Suspended Solids Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1d

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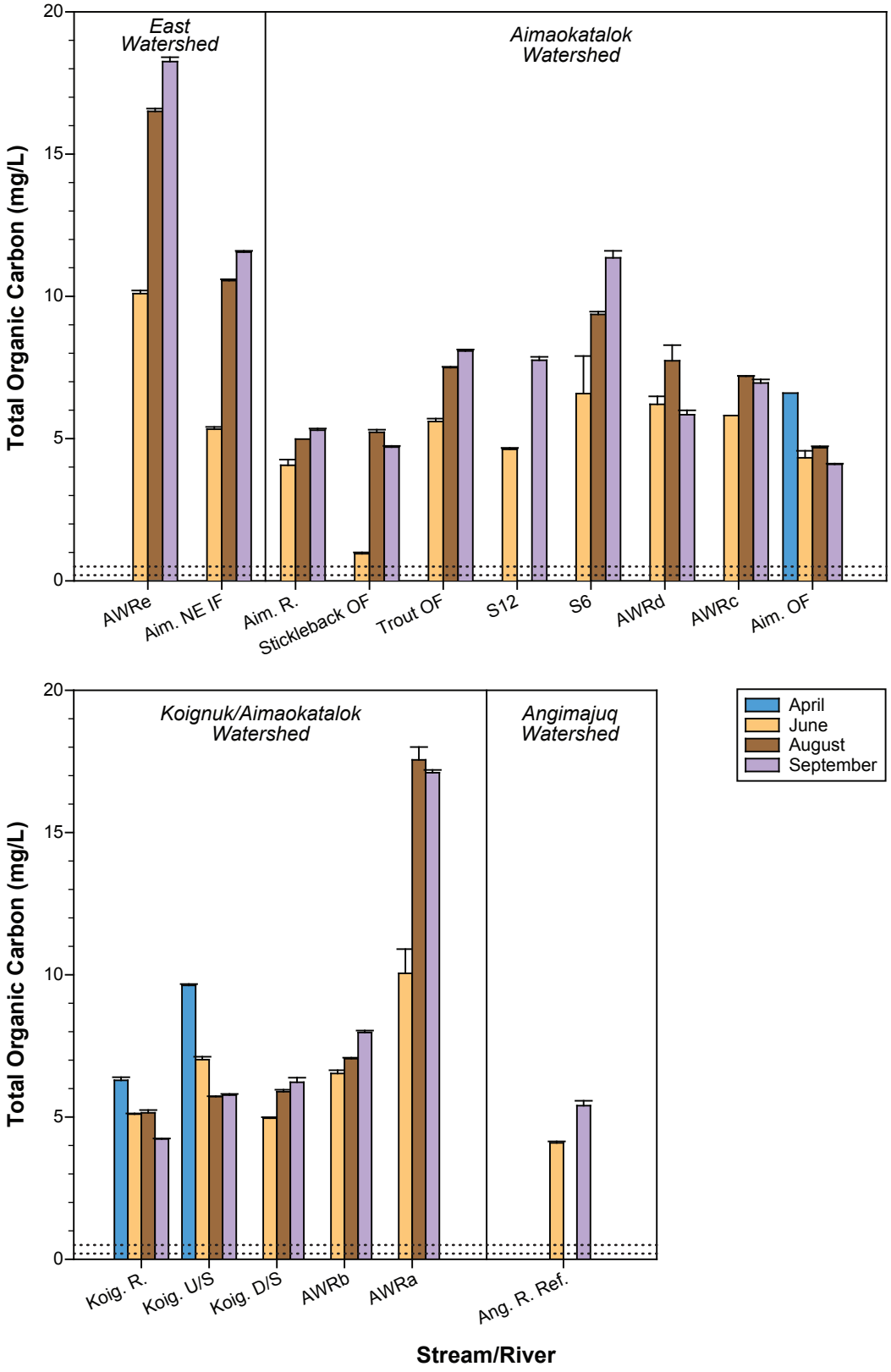
Note: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (10 mg/L); values below the detection limit are plotted at half the detection limit.
There is no CCME guideline for total dissolved solids.

NEWMONT NORTH AMERICA

Total Dissolved Solids Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1e

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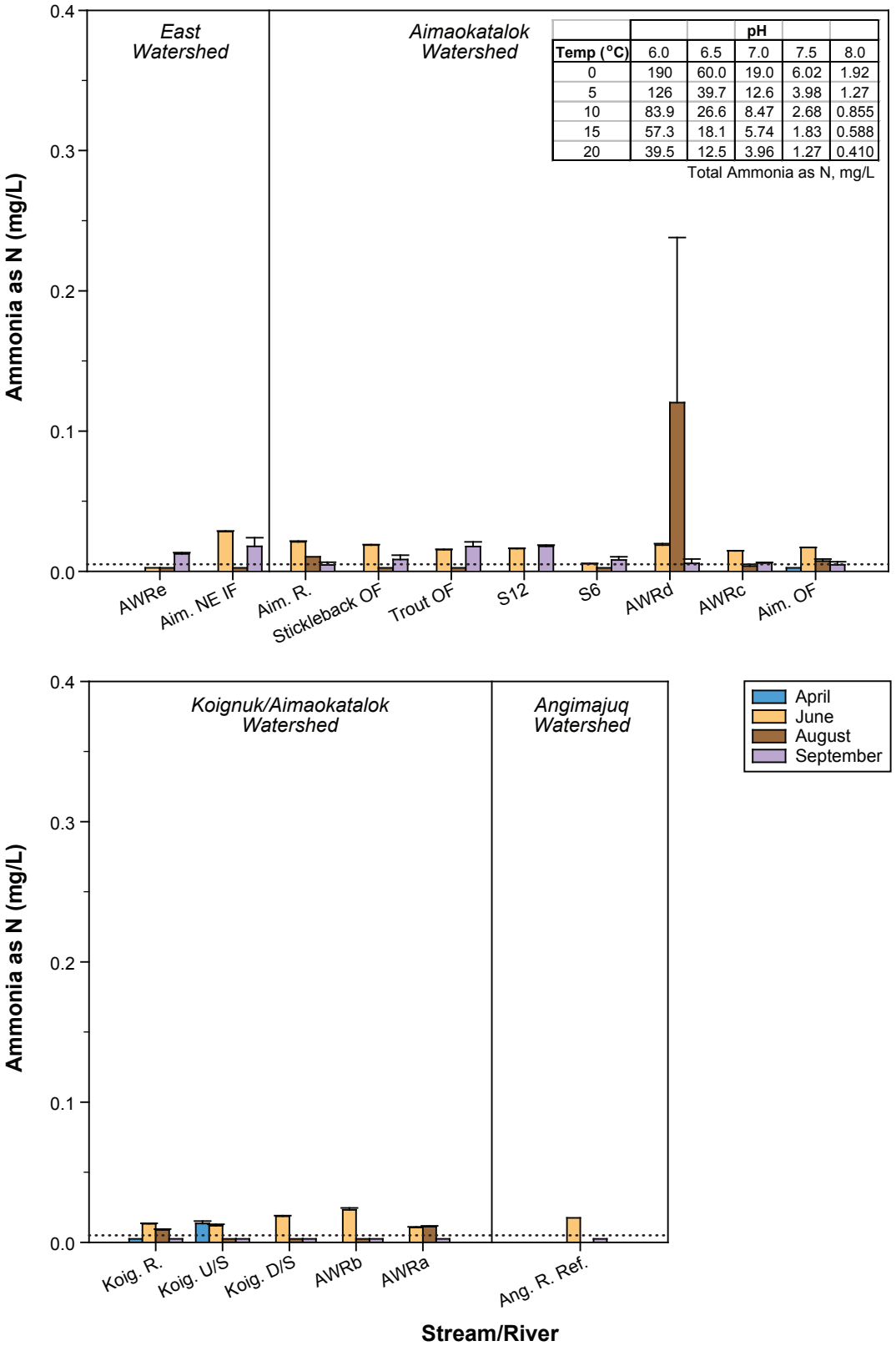
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.2 or 0.5 mg/L).
There is no CCME guideline for total organic carbon.

NEWMONT NORTH AMERICA

Total Organic Carbon Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1f

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Temp (°C)	pH 6.0	6.5	7.0	7.5	8.0
0	190	60.0	19.0	6.02	1.92
5	126	39.7	12.6	3.98	1.27
10	83.9	26.6	8.47	2.68	0.855
15	57.3	18.1	5.74	1.83	0.588
20	39.5	12.5	3.96	1.27	0.410

Total Ammonia as N, mg/L

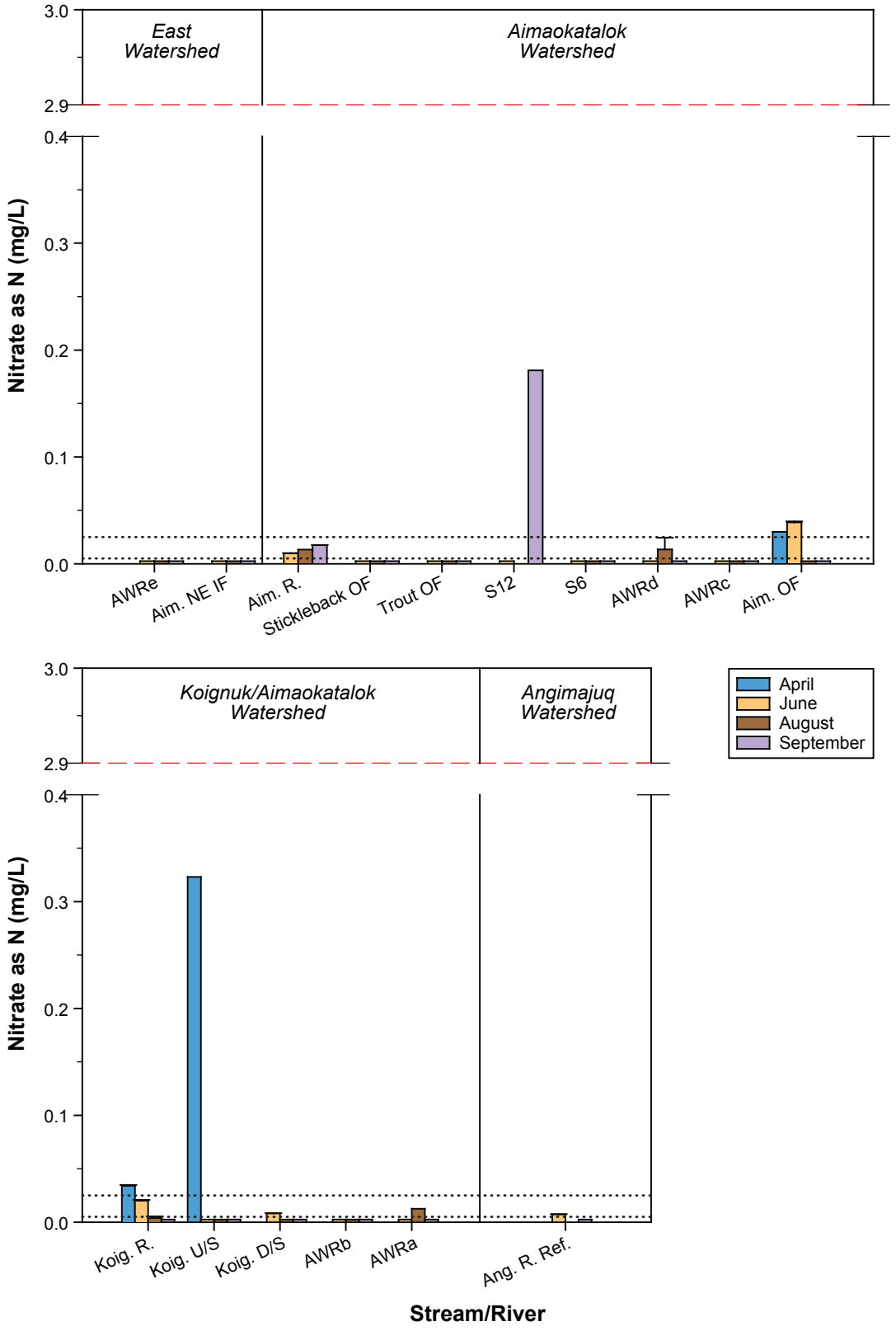
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.005 mg/L); values below the detection limit are plotted at half the detection limit.
Inset table shows temperature- and pH-dependent CCME guideline.

NEWMONT NORTH AMERICA

Ammonia Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1g

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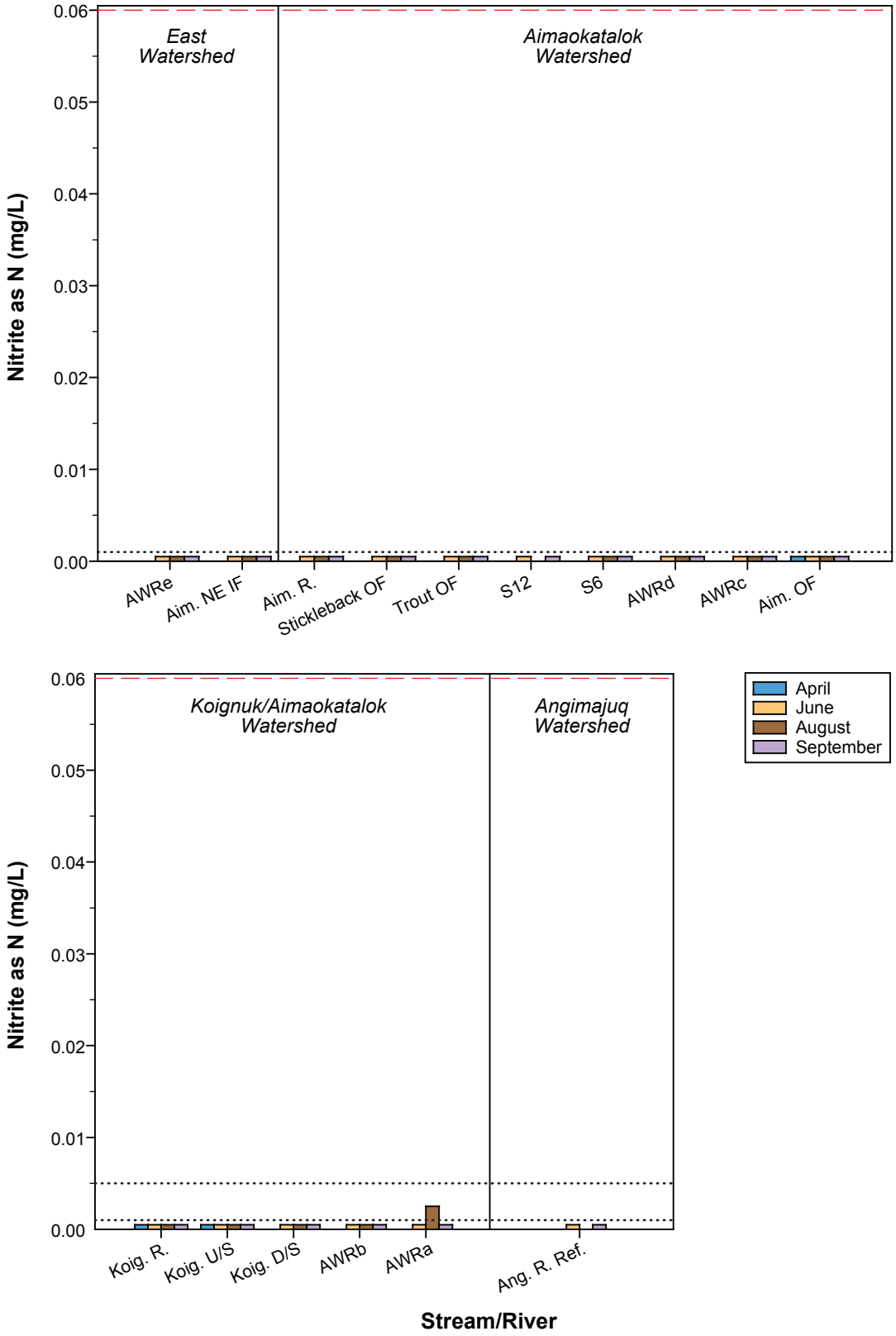
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.005 or 0.025 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (2.9 mg/L).

NEWMONT NORTH AMERICA

Nitrate Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1h

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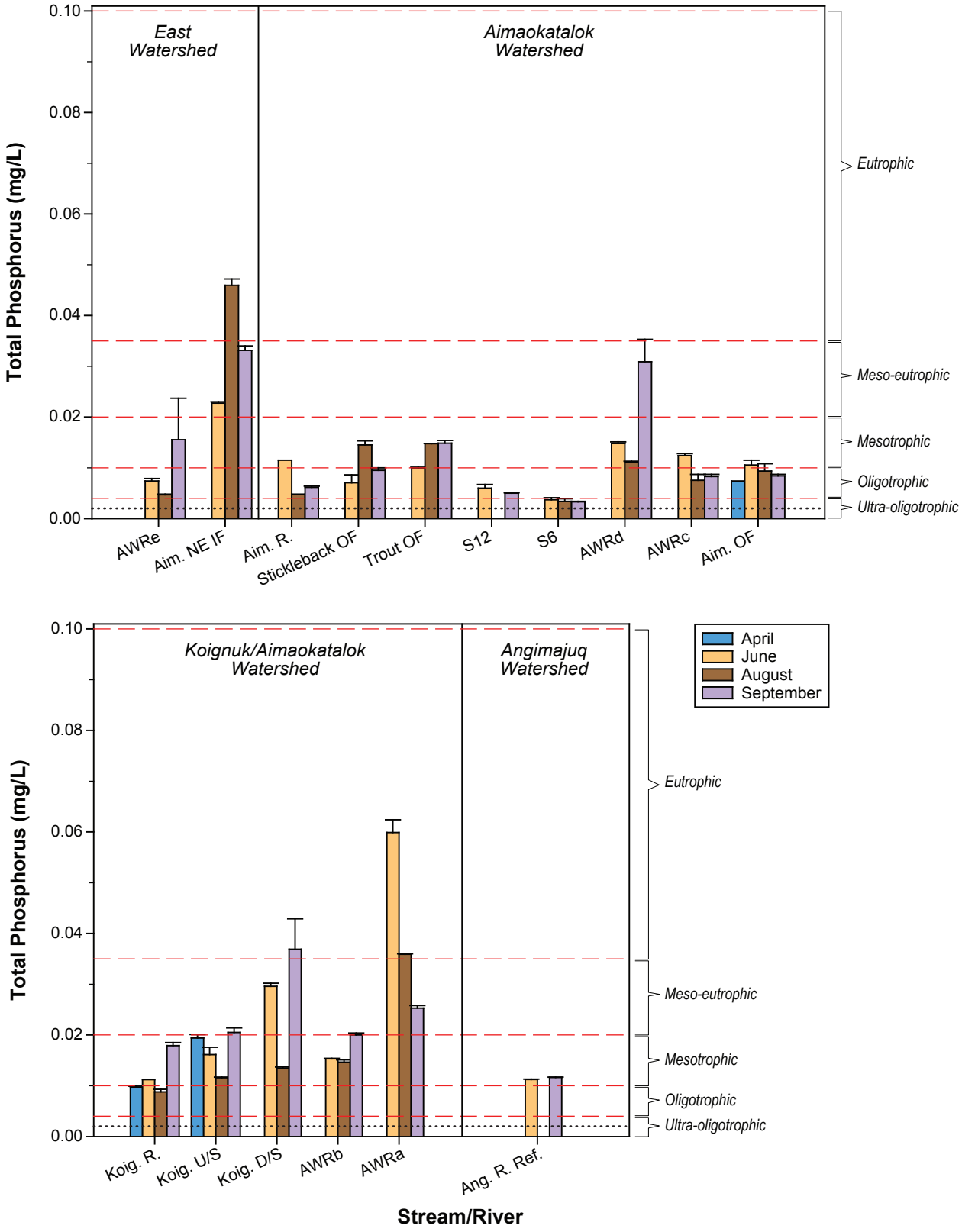
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.001 or 0.005 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.06 mg/L).

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Nitrite Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1i

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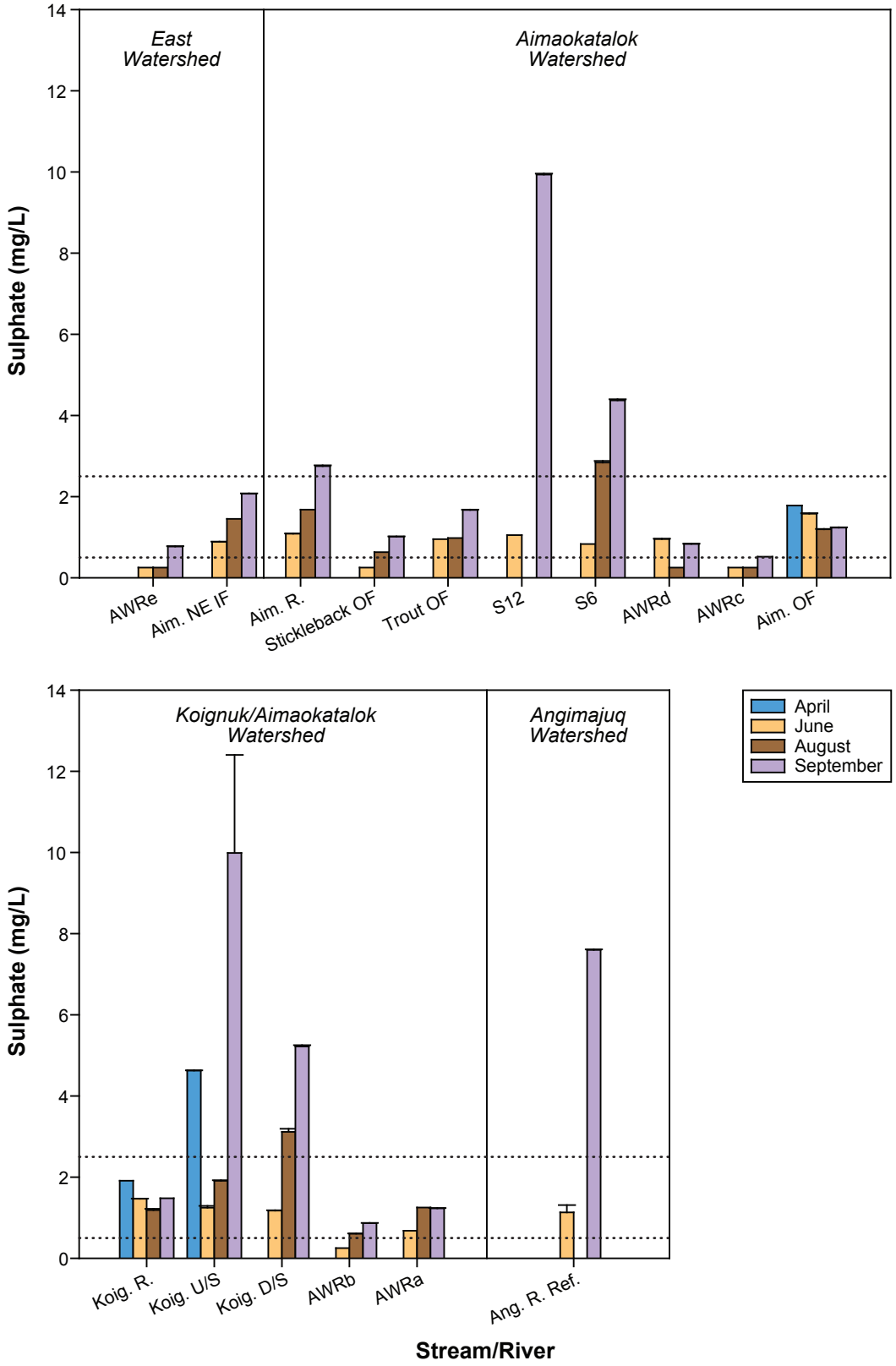
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.002 mg/L).
Red dashed lines represents CCME trigger ranges (<0.004 mg/L = ultraoligotrophic; 0.004–0.010 mg/L = oligotrophic; 0.01–0.02 mg/L = mesotrophic; 0.02–0.035 mg/L = meso-eutrophic; 0.035–0.1 mg/L = eutrophic; >0.1 mg/L = hyper-eutrophic).

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Total Phosphorus Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1j

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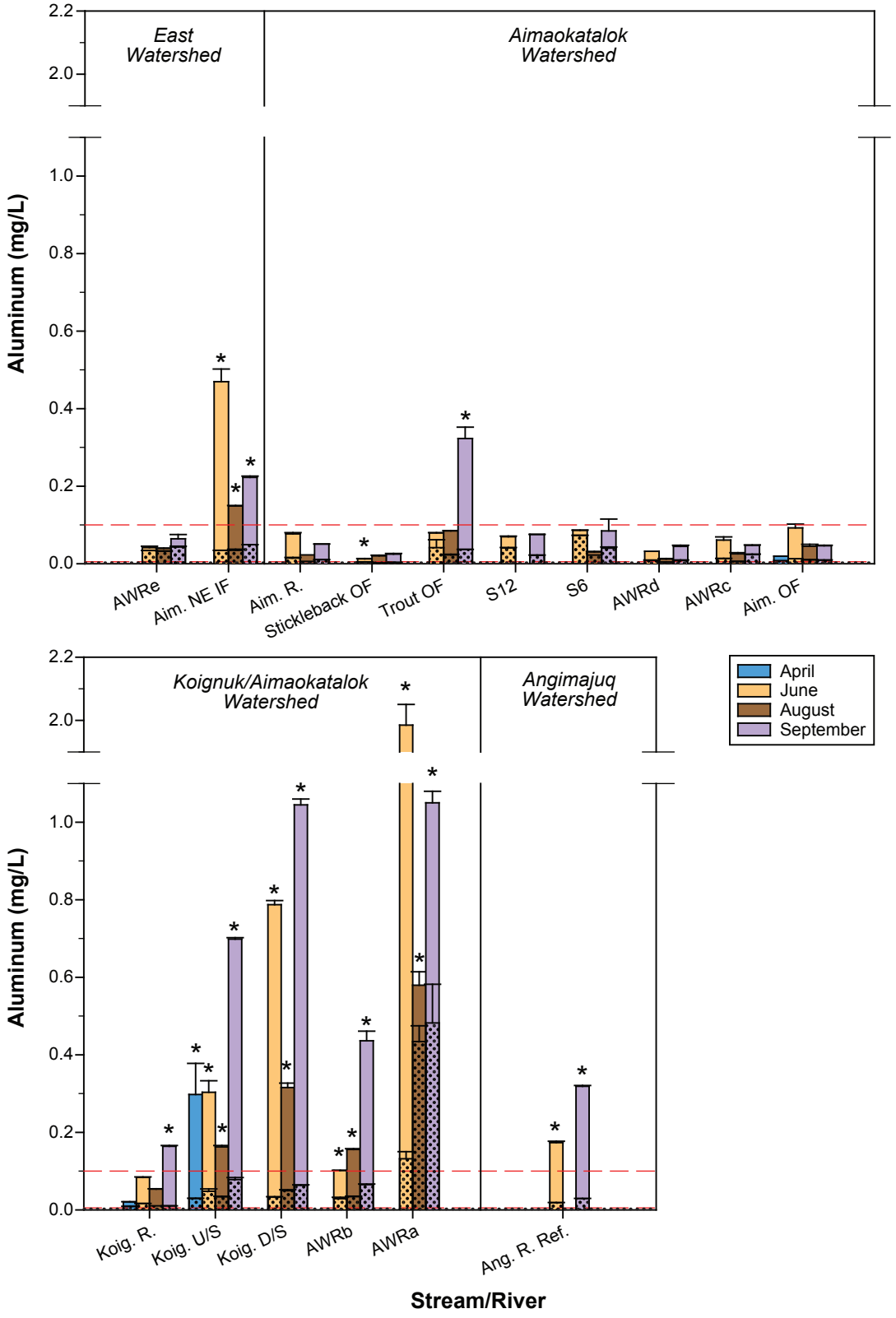
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.5 or 2.5 mg/L); values below the detection limit are plotted at half the detection limit.
There is no CCME guideline for sulphate.

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Sulphate Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1k

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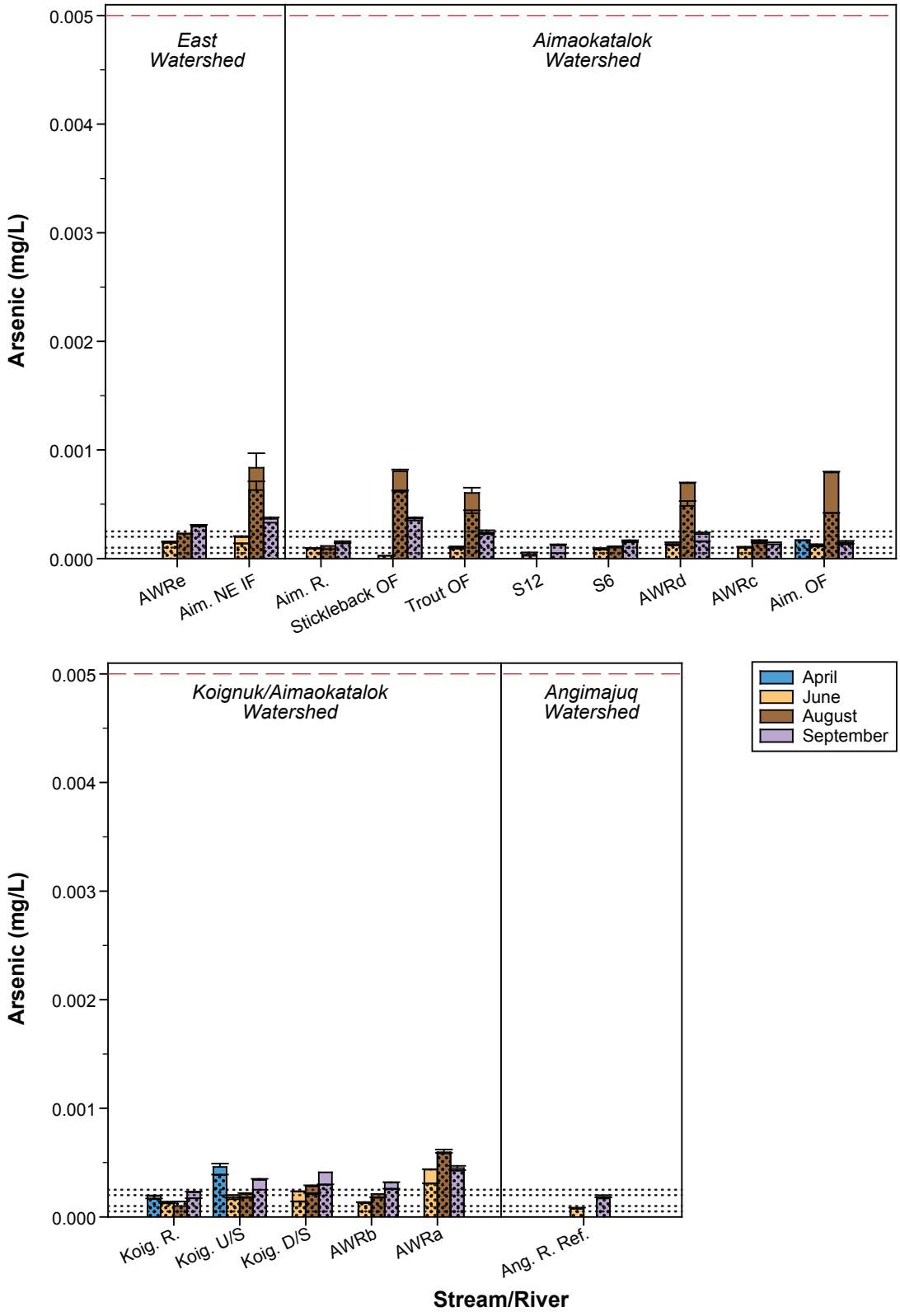
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.001 mg/L).
Red dashed lines represent pH-dependent CCME guideline (0.005 mg/L at pH less than 6.5; 0.1 mg/L at pH greater than or equal to 6.5).
pH was greater than 6.5 in all samples except Stickleback OF in June.
Solid columns represent total aluminum and superimposed dotted columns represent dissolved aluminum.
** Indicates average total aluminum values that are higher than CCME guideline.*

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Aluminum Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1l

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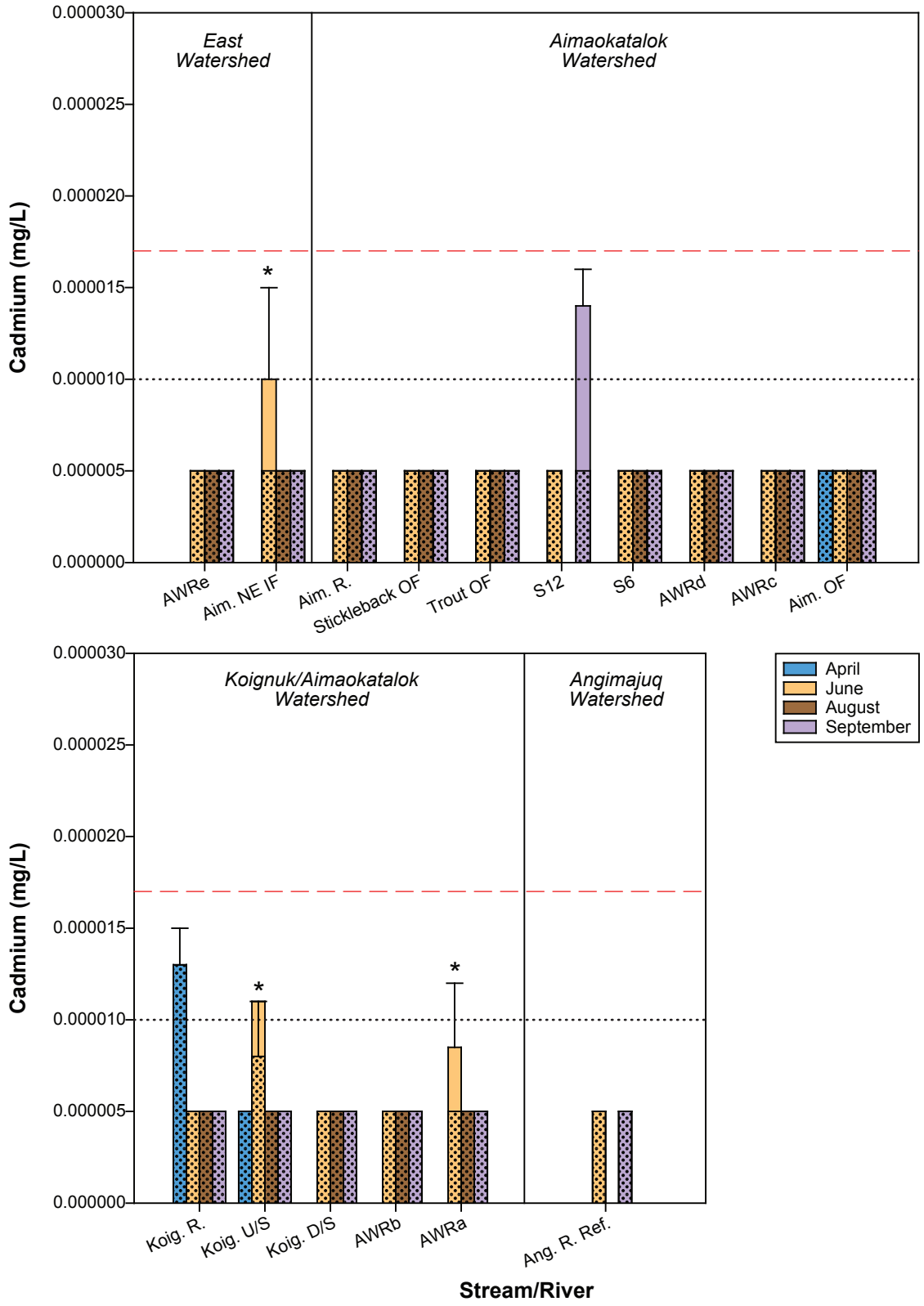
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.00005, 0.0001, 0.0002, or 0.00025 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.005 mg/L).
Solid columns represent total arsenic and superimposed dotted columns represent dissolved arsenic.

NEWMONT NORTH AMERICA

Arsenic Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1m

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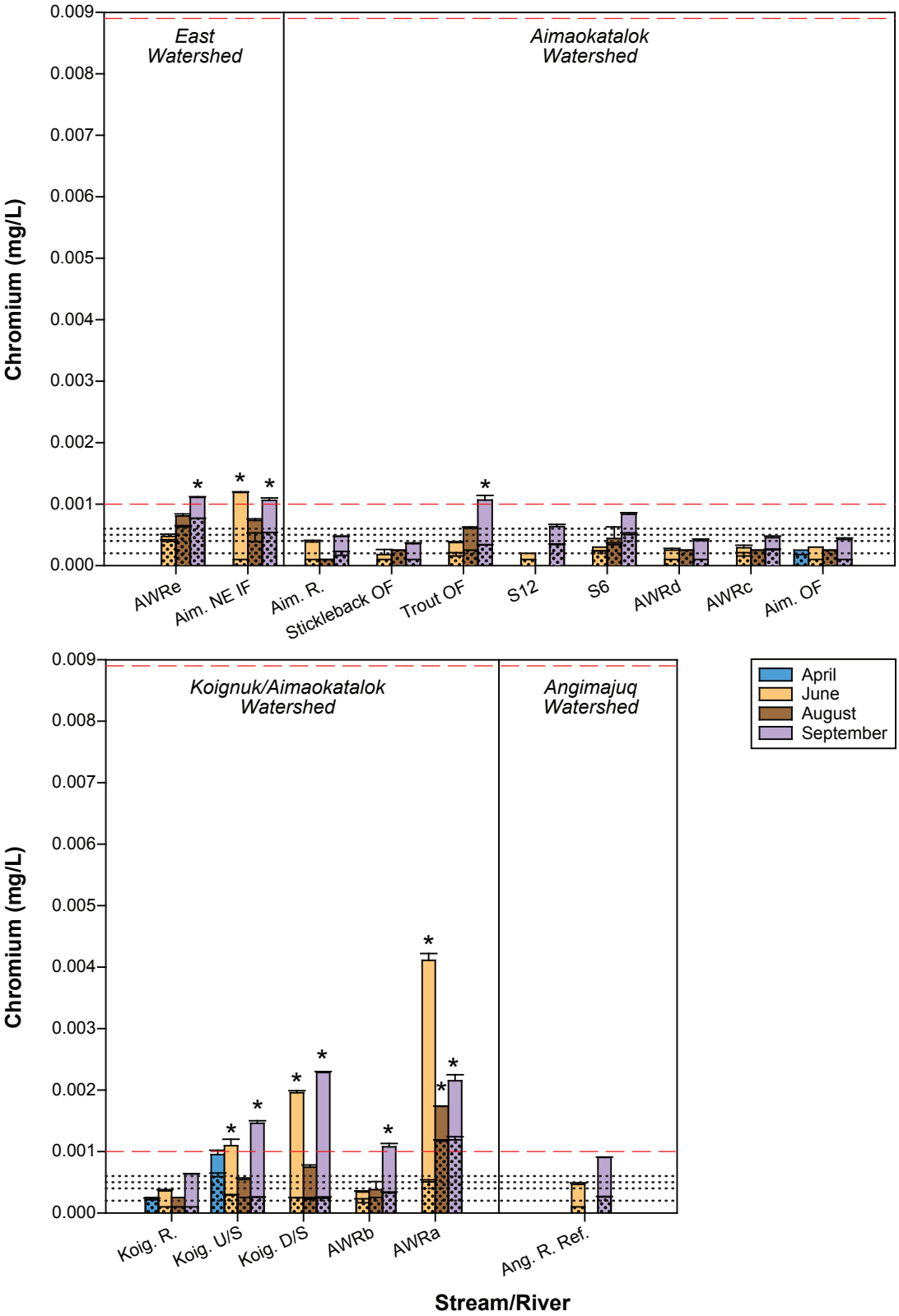
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.00001 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.000017 mg/L). The equation for correcting this guideline for hardness is: $10^{[0.86[\log(\text{hardness})]-3.2]}/1000$
Solid columns represent total cadmium and superimposed dotted columns represent dissolved cadmium.
** Indicates average total cadmium values that are higher than hardness-corrected CCME guideline.*

NEWMONT NORTH AMERICA

Cadmium Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1n

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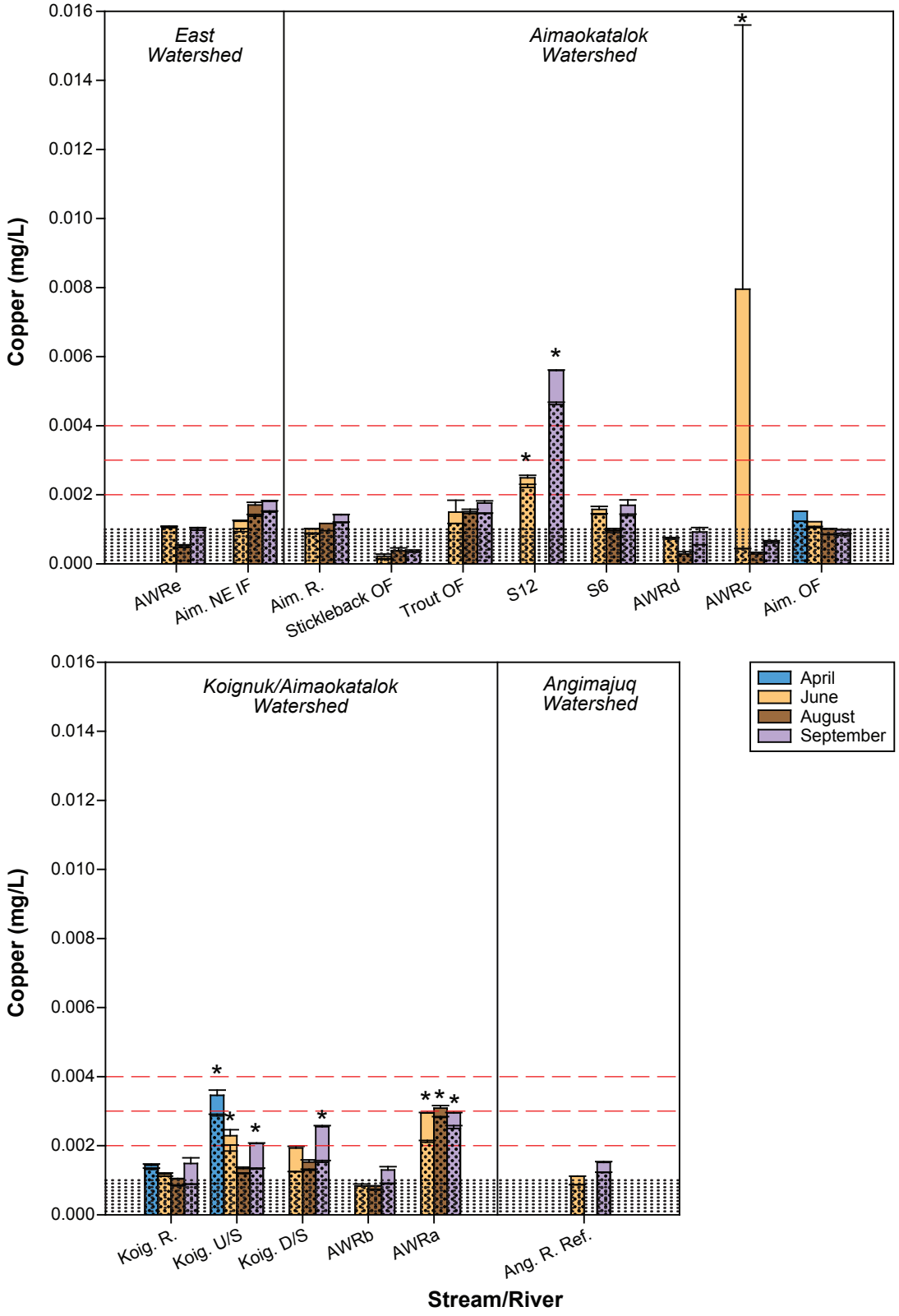
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.0002, 0.0004, 0.0005, or 0.0006 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline for hexavalent chromium (0.001 mg/L) and interim guideline for trivalent chromium (0.0089 mg/L).
Solid columns represent total chromium and superimposed dotted columns represent dissolved chromium.
** Indicates average total chromium values that are higher than CCME guideline for hexavalent chromium.*

NEWMONT NORTH AMERICA

Chromium Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1o

Rescan Engineers & Scientists



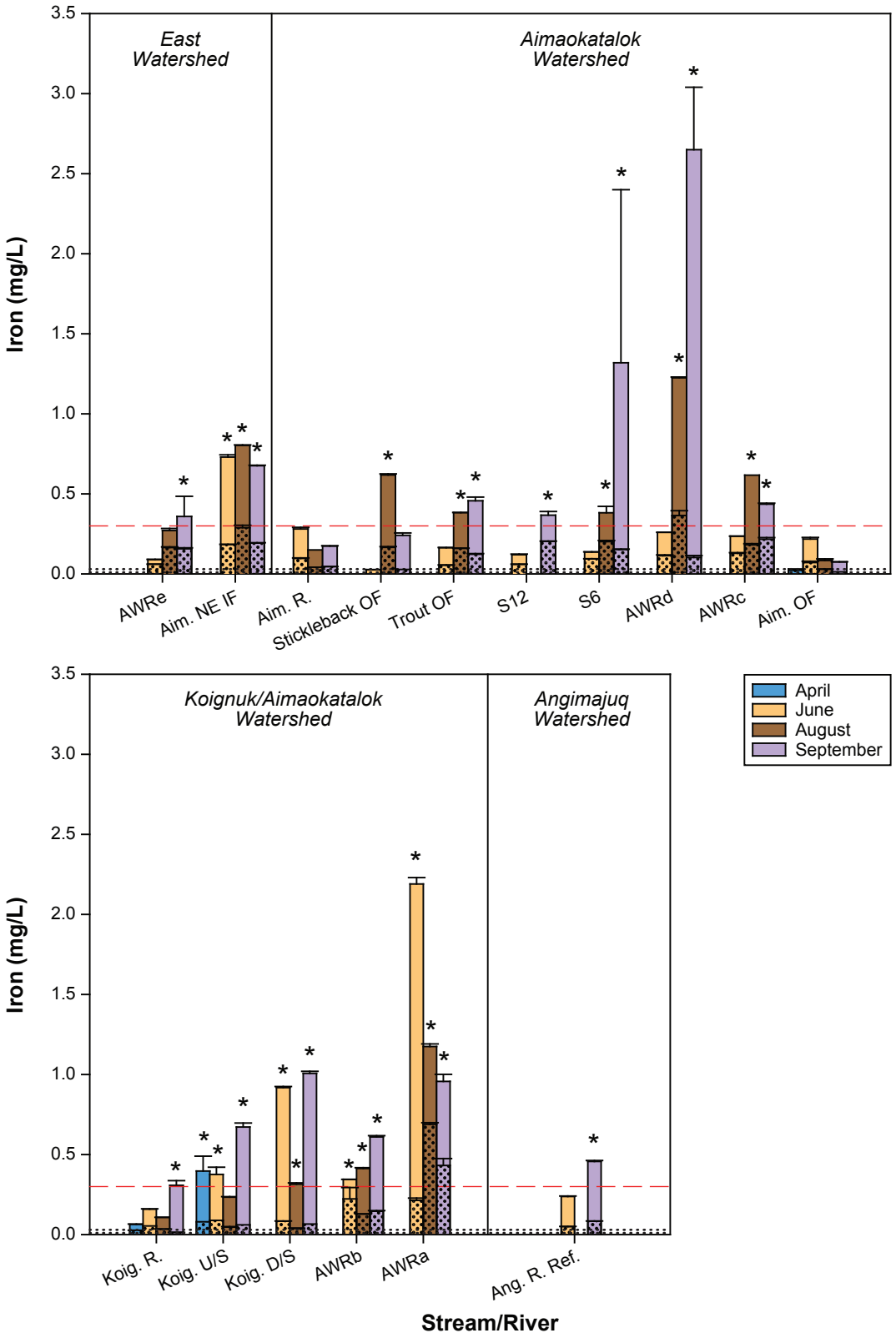
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.0001, 0.0002, 0.0003, 0.0004, 0.0005, 0.0006, 0.0007, 0.0008, 0.0009, or 0.001 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed lines represent hardness-dependent CCME guideline (0.002 mg/L at [$CaCO_3$] = 0–120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120–180 mg/L; 0.004 mg/L at [$CaCO_3$] = >180 mg/L). All measurements of hardness [as $CaCO_3$] in streams were <120 mg/L.
Solid columns represent total copper and superimposed dotted columns represent dissolved copper.
** Indicates average total copper values that are higher than CCME guideline.*

NEWMONT NORTH AMERICA

Copper Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1p

Rescan Engineers & Scientists



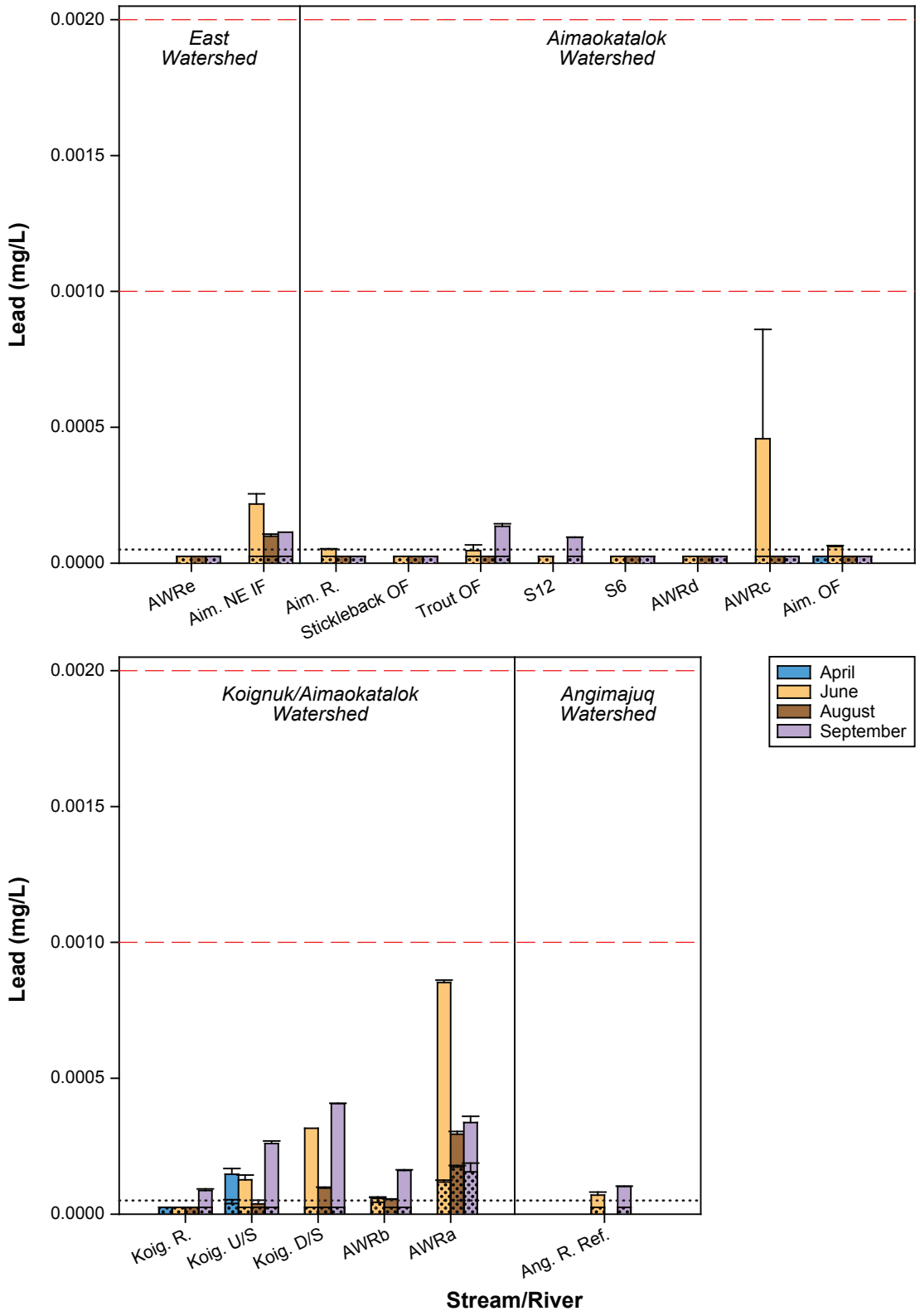
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.01 or 0.03 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.3 mg/L).
Solid columns represent total iron and superimposed dotted columns represent dissolved iron.
** Indicates average total iron values that are higher than CCME guideline.*

NEWMONT NORTH AMERICA

Iron Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1q

Rescan Engineers & Scientists



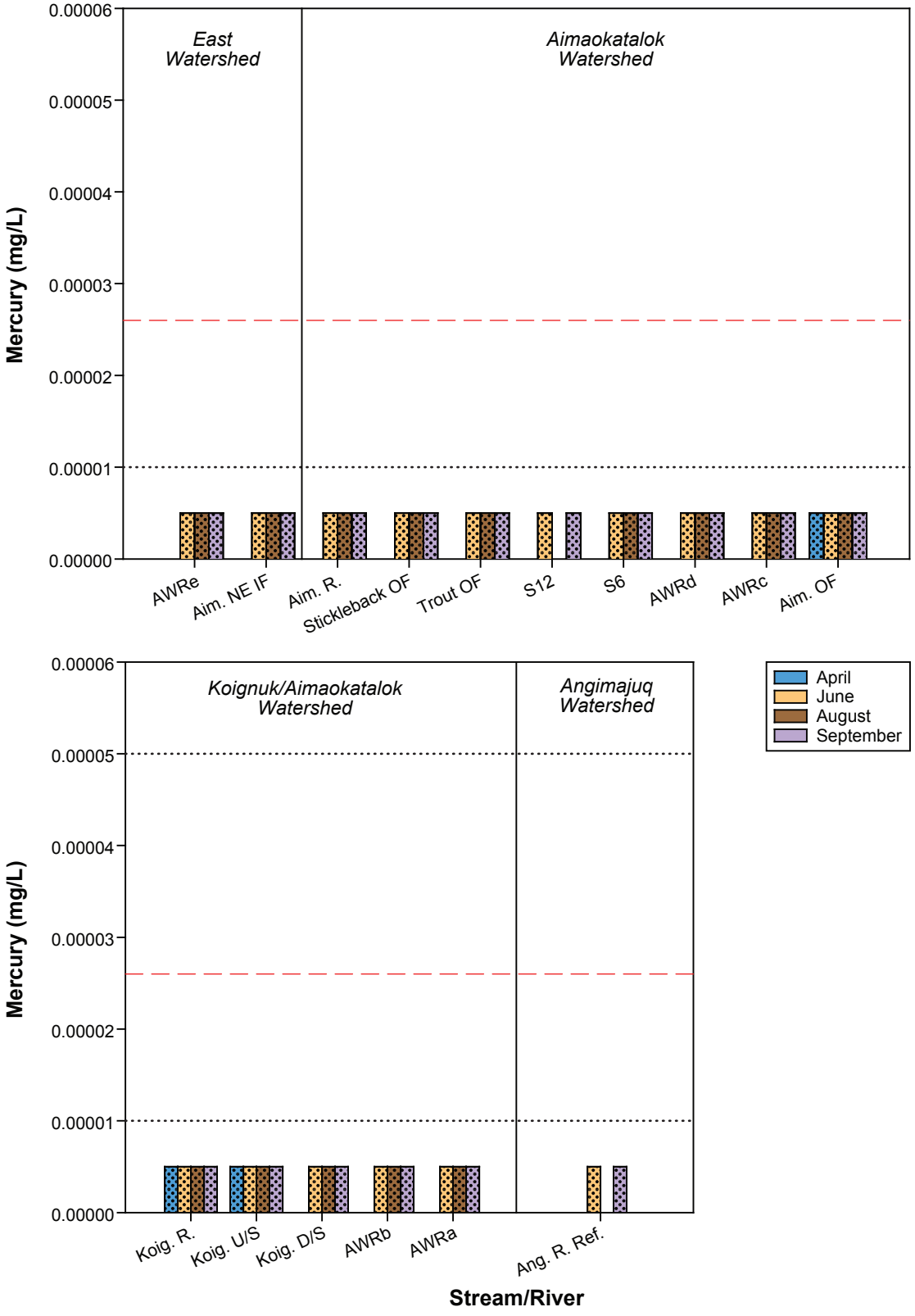
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.00005 mg/L); values below detection limit are plotted at half the detection limit.
Red dashed lines represent CCME guideline (0.001 mg/L at [$CaCO_3$] = 0–60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60–120 mg/L; 0.004 mg/L at [$CaCO_3$] = 120–180 mg/L [not shown]; 0.007 mg/L at [$CaCO_3$] = >180 mg/L [not shown]).
All measurements of hardness [as $CaCO_3$] in streams were <120 mg/L.
Solid columns represent total lead and superimposed dotted columns represent dissolved lead.

NEWMONT NORTH AMERICA

Lead Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1r

Rescan Engineers & Scientists



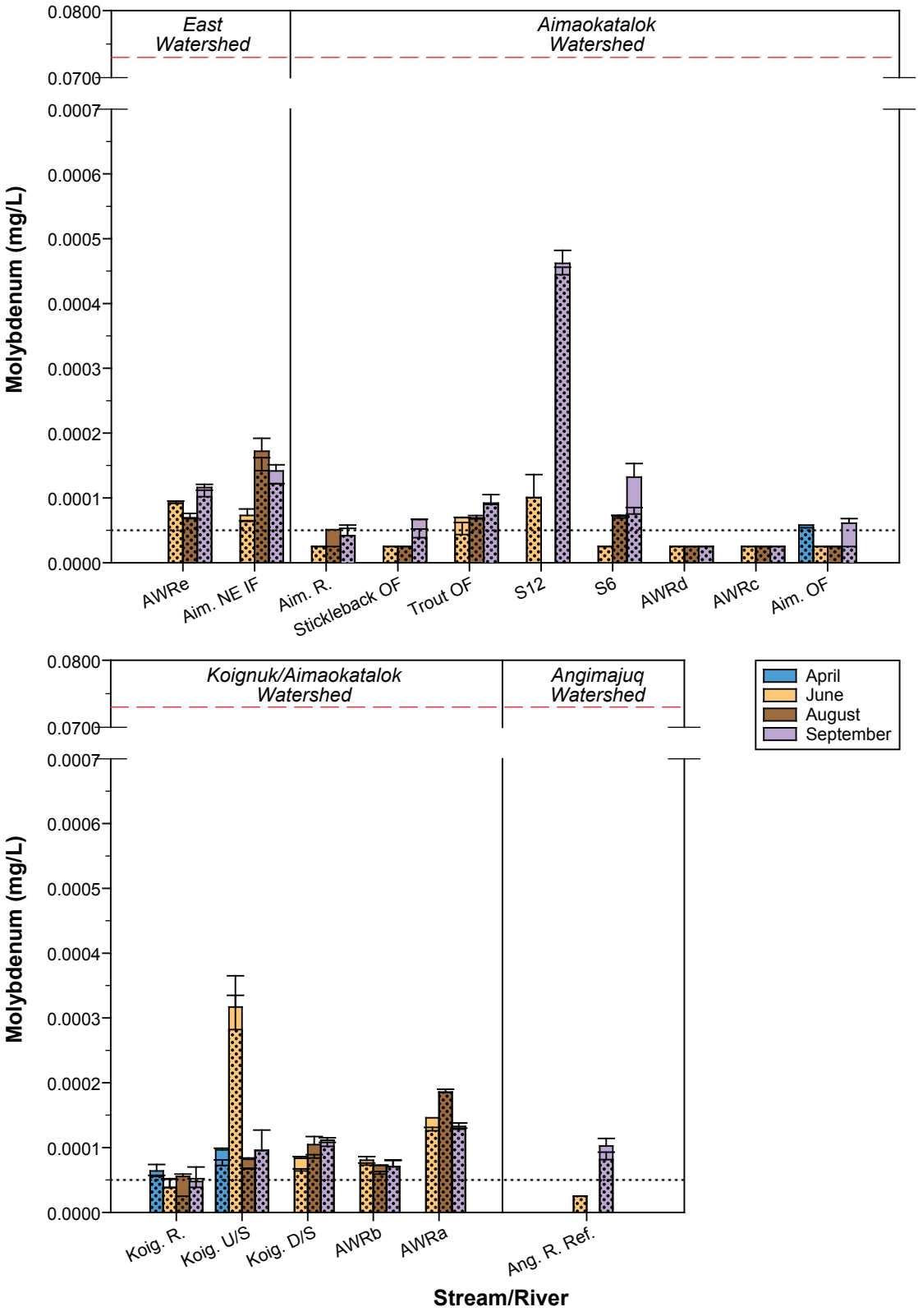
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.00001 or 0.00005 mg/L); values below detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline for inorganic mercury (0.000026 mg/L); the interim CCME guideline for methylmercury (0.000004 mg/L) is not shown.
Solid columns represent total mercury and superimposed dotted columns represent dissolved mercury.

NEWMONT NORTH AMERICA

Mercury Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1s

Rescan Engineers & Scientists



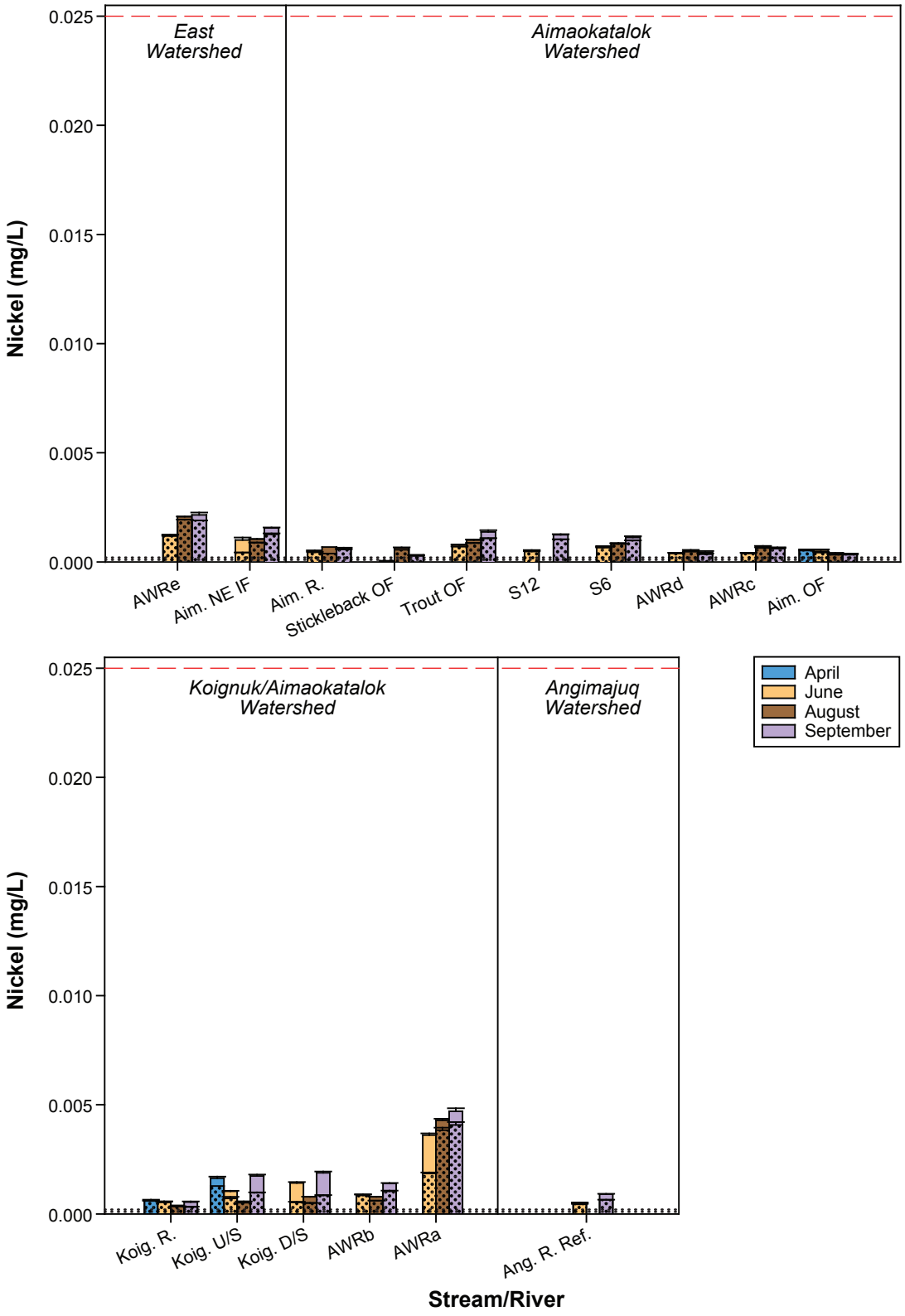
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.00005 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.073 mg/L).
Solid columns represent total molybdenum and superimposed dotted columns represent dissolved molybdenum.

NEWMONT NORTH AMERICA

Molybdenum Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1t

Rescan Engineers & Scientists



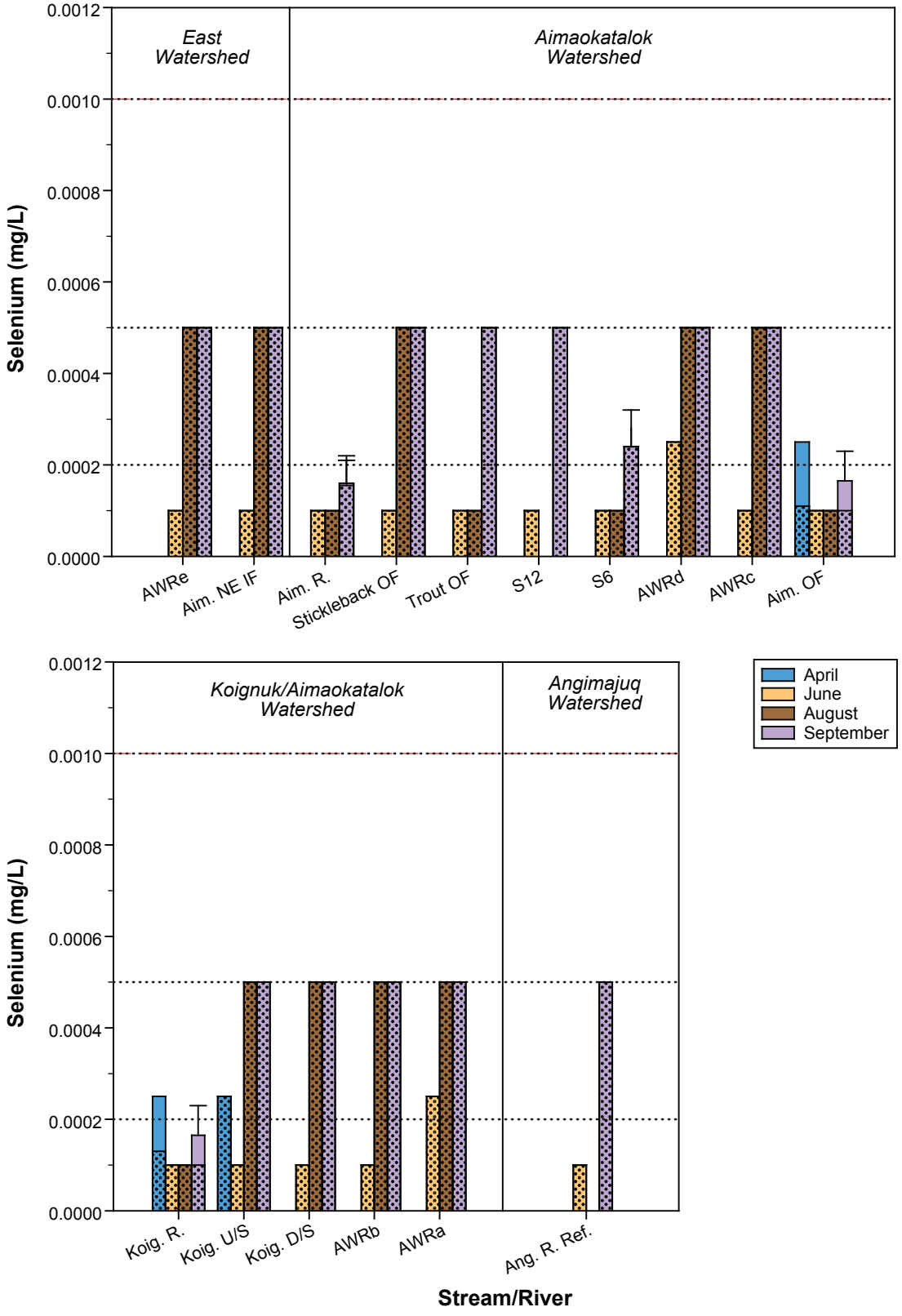
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.0001 or 0.0002 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed lines represent hardness-dependent CCME guideline (0.025 mg/L at [$CaCO_3$] = 0–60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60–120 mg/L [not shown]; 0.110 mg/L at [$CaCO_3$] = 120–180 mg/L [not shown]; 0.150 mg/L at [$CaCO_3$] = >180 mg/L [not shown]).
All measurements of hardness [as $CaCO_3$] in streams were <120 mg/L.
Solid columns represent total nickel and superimposed dotted columns represent dissolved nickel.

NEWMONT NORTH AMERICA

Nickel Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1u

Rescan™ Engineers & Scientists



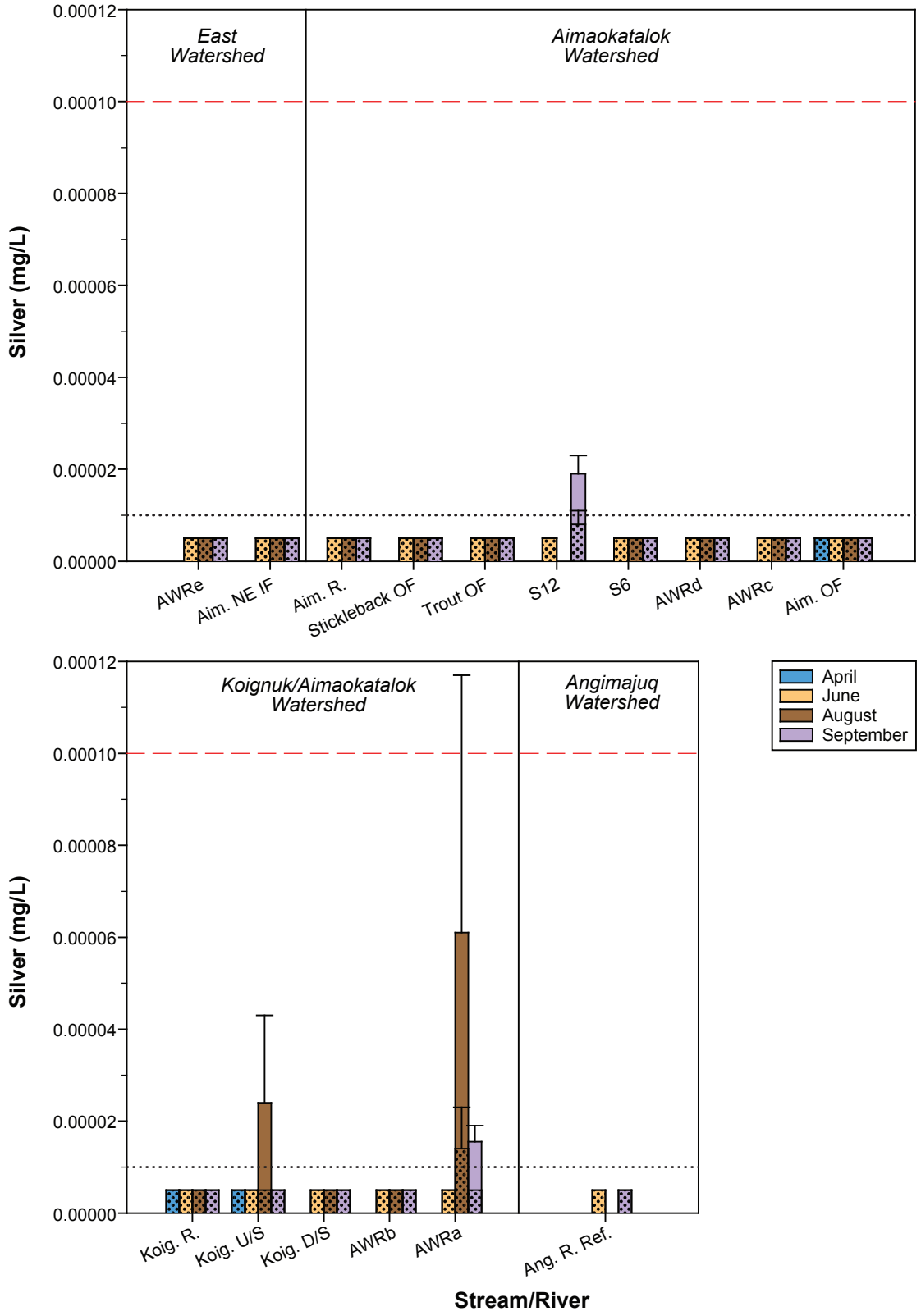
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.0002, 0.0005, or 0.001 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.001 mg/L).
Solid columns represent total selenium and superimposed dotted columns represent dissolved selenium.

NEWMONT NORTH AMERICA

Selenium Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1v

Rescan Engineers & Scientists



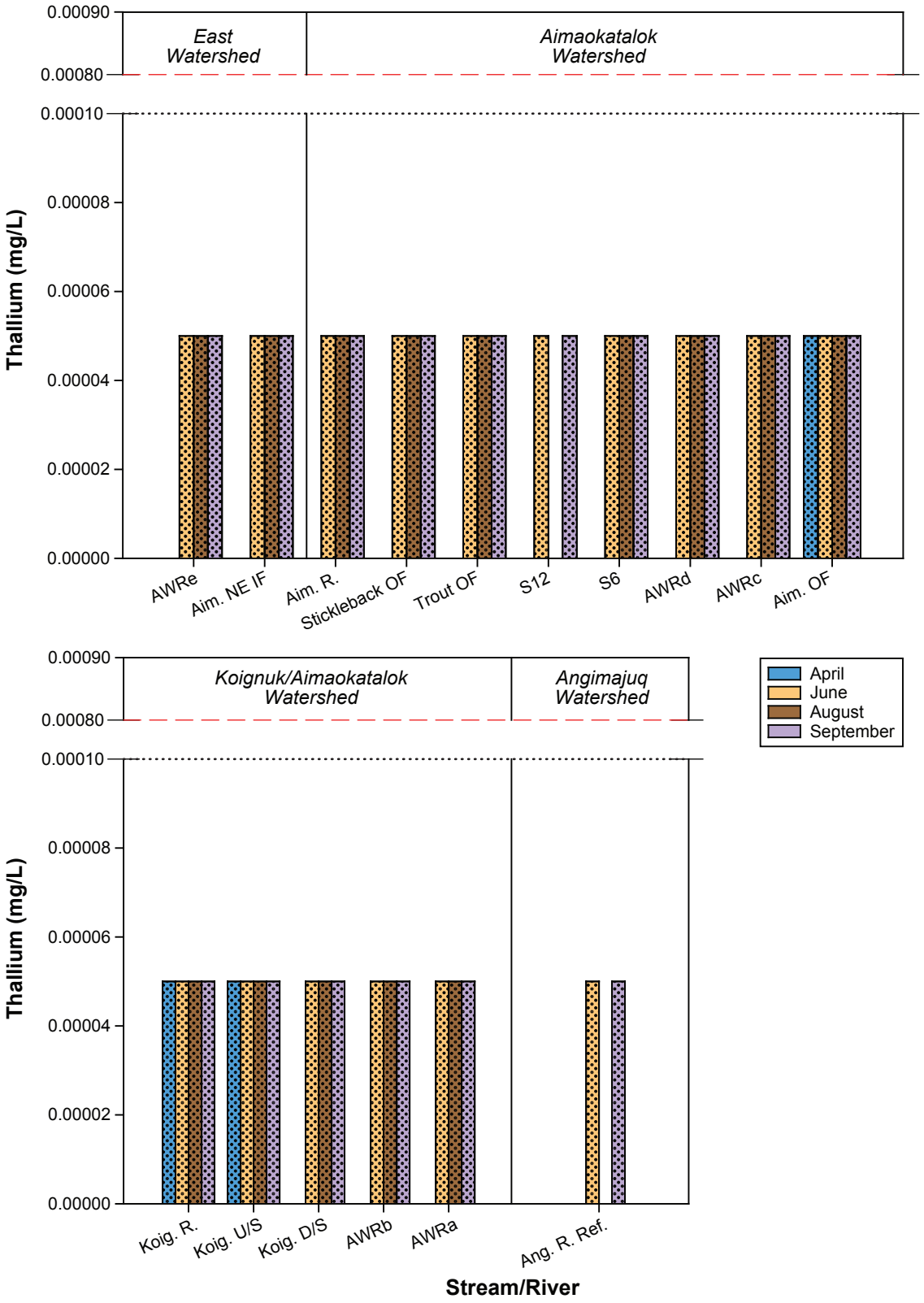
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.00001 mg/L);
values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.0001 mg/L).
Solid columns represent total silver and superimposed dotted columns represent dissolved silver.

NEWMONT NORTH AMERICA

Silver Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1w

Rescan Engineers & Scientists



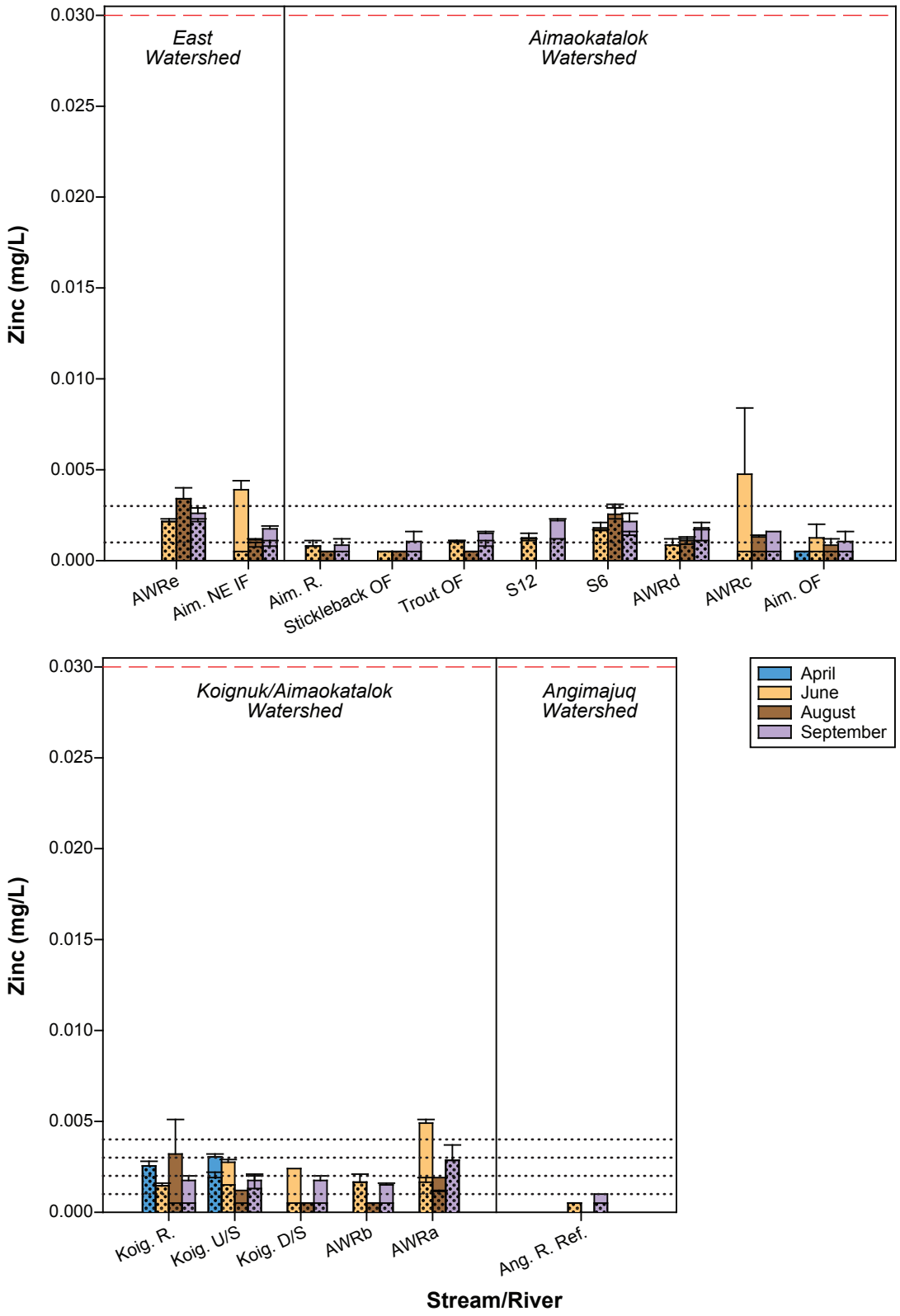
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.0001 mg/L);
values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.0008 mg/L).
Solid columns represent total thallium and superimposed dotted columns represent dissolved thallium.

NEWMONT NORTH AMERICA

Thallium Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1x

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.001, 0.002, 0.003, or 0.004 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.03 mg/L).
Solid columns represent total zinc and superimposed dotted columns represent dissolved zinc.

NEWMONT NORTH AMERICA

Zinc Concentration in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.3-1y

Rescan™ Engineers & Scientists

Overall, metal concentrations tended to be slightly higher in the Koignuk/Aimaokatalok Watershed than the other watersheds (Figures 3.3-1l to 3.3-1y). One Koignuk/Aimaokatalok site in particular, AWRa, tended to have high metal concentrations compared to other sites (e.g., aluminum, chromium, copper, iron, lead, nickel, and silver). This site generally had higher levels of TSS and turbidity than the other streams, which may account for the higher metal concentrations. Some sites in the Aimaokatalok Watershed also had relatively high concentrations of certain metals: AWRc and S12 had high copper concentrations, AWRd and S6 had high iron concentrations, AWRc had high lead concentrations, and S12 had high molybdenum concentrations.

Within the Koignuk River, several water quality parameters tended to increase downstream, particularly turbidity, TSS, total phosphorus, aluminum, chromium, iron, and lead.

3.3.3 Comparison with CCME Guidelines

Stream and river water quality naturally exceeded several CCME guidelines. Total aluminum and total iron most commonly exceeded CCME guidelines in the surveyed streams and rivers. Table 3.3-1 presents the percentage of stream and river water quality samples in which parameter concentrations were higher than CCME guidelines, and Table 3.3-2 provides the factor by which average 2010 concentrations were higher than CCME guidelines.

Within the East Watershed, the CCME guidelines for total aluminum and total iron were exceeded in all samples collected from Aim. NE IF, and average total aluminum and total iron concentrations at this site were more than 2-fold higher than CCME guidelines for these metals. The hardness-dependent total cadmium guideline was exceeded in a single sample from Aim. NE IF, and the total iron guideline was exceeded in a single sample collected from AWRe. Total chromium concentrations in several samples from both streams exceeded the CCME guideline for hexavalent chromium.

Within the Aimaokatalok Watershed, duplicate samples collected at Stickleback OF during the June freshet were slightly acidic (pH 6.04 and 6.37) and fell below the lower range of the CCME pH guideline of 6.5 to 9.0. Total aluminum and total iron concentrations commonly exceeded CCME guidelines in the streams and rivers within the Aimaokatalok Watershed. At one stream site, S12, all samples collected in 2010 exceeded the total copper guideline. In addition to these common exceedances, there were also some metals that occasionally exceeded guidelines, such as total chromium in a single sample collected from Trout OF, and total copper in a single sample collected from AWRc.

Within the Koignuk/Aimaokatalok Watershed, total aluminum, total chromium, total copper, and total iron commonly exceeded CCME guidelines. Concentrations of these four metals were higher than CCME guidelines in every sample collected from site AWRa. The hardness-dependent cadmium guideline was also exceeded in a low percentage of samples collected from Koig. U/S and AWRa, and the silver guideline was exceeded in a single sample from AWRa. Site AWRa was not only associated with the highest percentage of exceedances, but the factor by which the CCME guideline was exceeded was also highest in this stream (e.g., average total aluminum concentrations at this site exceeded the CCME guideline by 12-fold, compared to a maximum of 7-fold at the other sites).

As seen in nearly all streams and lakes, total aluminum and total iron concentrations were higher than CCME guidelines at the reference river station Ang. R. Ref. The total aluminum guideline was exceeded in all samples, and the total iron guideline was exceeded in several samples from Ang. R. Ref.

Table 3.3-1. Stream and River Water Quality, Percent of Samples in which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2010

Stream/River	Total Number of Samples Collected	CCME Guideline Value[a]:	pH 6.5-9.0	Ammonia (as N) temperature- and pH-dependent	Nitrate (as N) 2.9 mg/L	Nitrite (as N) 0.06 mg/L	Total Phosphorus Trophic Status[b]	Aluminum (Al)-Total 0.005-0.1[c] mg/L	Arsenic (As)-Total 0.005 mg/L	Cadmium (Cd)-Total 0.000017[d] mg/L	Chromium (Cr)-Total 0.001[e] mg/L	Copper (Cu)-Total 0.002-0.004[f] mg/L
East												
AWRe	6		-	-	-	-	Oligotrophic to Mesotrophic	-	-	-	33.3	-
Aim. NE IF	6		-	-	-	-	Meso-eutrophic to Eutrophic	100	-	16.7	66.7	-
Aimaokatalok												
Aim. R.	5		-	-	-	-	Oligotrophic to Mesotrophic	-	-	-	-	-
Stickleback OF	6		33.3	-	-	-	Oligotrophic to Mesotrophic	33.3	-	-	-	-
Trout OF	6		-	-	-	-	Mesotrophic	33.3	-	-	16.7	-
S12	4		-	-	-	-	Oligotrophic	-	-	-	-	100
S6	6		-	-	-	-	Ultra-oligotrophic	16.7	-	-	-	-
AWRd	6		-	-	-	-	Mesotrophic to Meso-eutrophic	-	-	-	-	-
AWRc	6		-	-	-	-	Oligotrophic to Mesotrophic	-	-	-	-	16.7
Aim. OF	7		-	-	-	-	Oligotrophic to Mesotrophic	14.3	-	-	-	-
Koignuk/Aimaokatalok												
Koig. R.	8		-	-	-	-	Oligotrophic to Mesotrophic	25	-	-	-	-
Koig. U/S	8		-	-	-	-	Mesotrophic to Meso-eutrophic	100	-	25	50	75
Koig. D/S	6		-	-	-	-	Mesotrophic to Eutrophic	100	-	-	66.7	33.3
AWRb	6		-	-	-	-	Mesotrophic	100	-	-	33.3	-
AWRa	6		-	-	-	-	Meso-eutrophic to Eutrophic	100	-	16.7	100	100
Angimajuq												
Ang. R. Ref	4		-	-	-	-	Mesotrophic	100	-	-	-	-

All values represent percentages of 2010 samples that are both higher than the CCME guidelines and above analytical detection limits. *(continued)*

a) Canadian water quality guidelines for the protection of aquatic life (CCME 2007)

b) <0.004 mg/L = ultra-oligotrophic; 0.004 - 0.010 mg/L = oligotrophic; 0.01 - 0.02 mg/L = mesotrophic; 0.02 - 0.035 mg/L = meso-eutrophic; 0.035 - 0.1 mg/L = eutrophic; >0.1 mg/L = hyper-eutrophic

c) 0.005 mg/L at pH <6.5; 0.1 mg/L a pH ≥6.5

d) The equation for correcting this guideline for hardness is: $10^{[0.86[\log(\text{hardness})]-3.2]} / 1000$

e) Guideline concentration for hexavalent chromium. No concentrations were higher than the CCME guideline for trivalent chromium (0.0089 mg/L).

f) 0.002 mg/L at water hardness of 0-120 mg/L (as $CaCO_3$); 0.003 mg/L at water hardness of 120-180 mg/L (as $CaCO_3$); 0.004 mg/L at water hardness of > 180 mg/L (as $CaCO_3$)

g) 0.001 mg/L at water hardness of 0-60 mg/L (as $CaCO_3$); 0.002 mg/L at water hardness of 60-120 mg/L (as $CaCO_3$); 0.004 mg/L at water hardness of 120-180 mg/L (as $CaCO_3$); 0.007 mg/L at water hardness of > 180 mg/L (as $CaCO_3$)

h Guideline concentration for inorganic mercury

i) 0.025 mg/L at water hardness of 0-60 mg/L (as $CaCO_3$); 0.065 mg/L at water hardness of 60-120 mg/L (as $CaCO_3$); 0.110 mg/L at water hardness of 120-180 mg/L (as $CaCO_3$); 0.150 mg/L at water hardness of > 180 mg/L (as $CaCO_3$)

Table 3.3-1. Stream and River Water Quality, Percent of Samples in which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2010 (completed)

Stream/River	Total Number of Samples Collected	CCME Guideline Value[a]:	Iron (Fe)-Total 0.3 mg/L	Lead (Pb)-Total 0.001-0.007[g] mg/L	Mercury (Hg)-Total 0.000026[h] mg/L	Molybdenum (Mo)-Total 0.073 mg/L	Nickel (Ni)-Total 0.025-0.150[i] mg/L	Selenium (Se)-Total 0.001 mg/L	Silver (Ag)-Total 0.0001 mg/L	Thallium (Tl)-Total 0.0008 mg/L	Zinc (Zn)-Total 0.03 mg/L
East											
AWRe	6		16.7	-	-	-	-	-	-	-	-
Aim. NE IF	6		100	-	-	-	-	-	-	-	-
Aimaokatalok											
Aim. R.	5		-	-	-	-	-	-	-	-	-
Stickleback OF	6		33.3	-	-	-	-	-	-	-	-
Trout OF	6		66.7	-	-	-	-	-	-	-	-
S12	4		50	-	-	-	-	-	-	-	-
S6	6		50	-	-	-	-	-	-	-	-
AWRd	6		66.7	-	-	-	-	-	-	-	-
AWRc	6		66.7	-	-	-	-	-	-	-	-
Aim. OF	7		-	-	-	-	-	-	-	-	-
Koignuk/Aimaokatalok											
Koig. R.	8		12.5	-	-	-	-	-	-	-	-
Koig. U/S	8		75	-	-	-	-	-	-	-	-
Koig. D/S	6		100	-	-	-	-	-	-	-	-
AWRb	6		100	-	-	-	-	-	-	-	-
AWRa	6		100	-	-	-	-	-	16.7	-	-
Angimajuq											
Ang. R. Ref	4		50	-	-	-	-	-	-	-	-

All values represent percentages of 2010 samples that are both higher than the CCME guidelines and above analytical detection limits.

a) Canadian water quality guidelines for the protection of aquatic life (CCME 2007)

b) <0.004 mg/L = ultra-oligotrophic; 0.004 - 0.010 mg/L = oligotrophic; 0.01 - 0.02 mg/L = mesotrophic; 0.02 - 0.035 mg/L = meso-eutrophic; 0.035 - 0.1 mg/L = eutrophic; >0.1 mg/L = hyper-eutrophic

c) 0.005 mg/L at pH <6.5; 0.1 mg/L a pH ≥6.5

d) The equation for correcting this guideline for hardness is: $10^{[0.86[\log(\text{hardness})]-3.2]} / 1000$

e) Guideline concentration for hexavalent chromium. No concentrations were higher than the CCME guideline for trivalent chromium (0.0089 mg/L).

f) 0.002 mg/L at water hardness of 0-120 mg/L (as $CaCO_3$); 0.003 mg/L at water hardness of 120-180 mg/L (as $CaCO_3$); 0.004 mg/L at water hardness of > 180 mg/L (as $CaCO_3$)

g) 0.001 mg/L at water hardness of 0-60 mg/L (as $CaCO_3$); 0.002 mg/L at water hardness of 60-120 mg/L (as CaCO3); 0.004 mg/L at water hardness of 120-180 mg/L (as $CaCO_3$); 0.007 mg/L at water hardness of > 180 mg/L (as $CaCO_3$)

h Guideline concentration for inorganic mercury

i) 0.025 mg/L at water hardness of 0-60 mg/L (as $CaCO_3$); 0.065 mg/L at water hardness of 60-120 mg/L (as $CaCO_3$); 0.110 mg/L at water hardness of 120-180 mg/L (as $CaCO_3$); 0.150 mg/L at water hardness of > 180 mg/L (as $CaCO_3$)

Table 3.3-2. Stream and River Water Quality, Factor by which Average Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2010

Stream/River	Total Number of Samples Collected	CCME Guideline Value[a]:	pH 6.5-9.0	Ammonia (as N) temperature- and pH-dependent	Nitrate (as N) 2.9 mg/L	Nitrite (as N) 0.06 mg/L	Total Phosphorus Trophic Status[b]	Aluminum (Al)-Total 0.005-0.1[c] mg/L	Arsenic (As)-Total 0.005 mg/L	Cadmium (Cd)-Total 0.000017[d] mg/L	Chromium (Cr)-Total 0.001[e] mg/L	Copper (Cu)-Total 0.002-0.004[f] mg/L
East												
AWRe	6		-	-	-	-	Oligotrophic to Mesotrophic	-	-	-	-	-
Aim. NE IF	6		-	-	-	-	Meso-eutrophic to Eutrophic	2.80	-	-	-	-
Aimaokatalok												
Aim. R.	5		-	-	-	-	Oligotrophic to Mesotrophic	-	-	-	-	-
Stickleback OF	6		-	-	-	-	Oligotrophic to Mesotrophic	-	-	-	-	-
Trout OF	6		-	-	-	-	Mesotrophic	1.62	-	-	-	-
S12	4		-	-	-	-	Oligotrophic	-	-	-	-	2.00
S6	6		-	-	-	-	Ultra-oligotrophic	-	-	-	-	-
AWRd	6		-	-	-	-	Mesotrophic to Meso-eutrophic	-	-	-	-	-
AWRc	6		-	-	-	-	Oligotrophic to Mesotrophic	-	-	-	-	1.49
Aim. OF	7		-	-	-	-	Oligotrophic to Mesotrophic	-	-	-	-	-
Koignuk/Aimaokatalok												
Koig. R.	8		-	-	-	-	Oligotrophic to Mesotrophic	-	-	-	-	-
Koig. U/S	8		-	-	-	-	Mesotrophic to Meso-eutrophic	3.65	-	-	1.01	1.15
Koig. D/S	6		-	-	-	-	Mesotrophic to Eutrophic	7.16	-	-	1.70	1.00
AWRb	6		-	-	-	-	Mesotrophic	2.31	-	-	-	-
AWRa	6		-	-	-	-	Meso-eutrophic to Eutrophic	12.05	-	-	2.70	1.50
Angimajuq												
Ang. R. Ref	4		-	-	-	-	Mesotrophic	2.46	-	-	-	-

All values represent the factor by which stream/river averages are higher than CCME guidelines (using the average concentration of each parameter within a stream/river site across various seasons). *(continued)*

Even though a percentage of samples may be higher than a guideline amount, the calculated lake average may not be higher than CCME guidelines

Dashes represent averages that are not higher than guidelines

a) Canadian water quality guidelines for the protection of aquatic life (CCME 2007)

b) <0.004 mg/L = ultra-oligotrophic; 0.004 - 0.010 mg/L = oligotrophic; 0.01 - 0.02 mg/L = mesotrophic; 0.02 - 0.035 mg/L = meso-eutrophic; 0.035 - 0.1 mg/L = eutrophic; >0.1 mg/L = hyper-eutrophic

c) 0.005 mg/L at pH <6.5; 0.1 mg/L a pH ≥6.5

d) The equation for correcting this guideline for hardness is: $10^{[0.86[\log(\text{hardness})]-3.2]} / 1000$

e) Guideline concentration for hexavalent chromium. No concentrations were higher than the CCME guideline for trivalent chromium (0.0089 mg/L).

f) 0.002 mg/L at water hardness of 0-120 mg/L (as $CaCO_3$*); 0.003 mg/L at water hardness of 120-180 mg/L (as* $CaCO_3$*); 0.004 mg/L at water hardness of > 180 mg/L (as* $CaCO_3$*)*

g) 0.001 mg/L at water hardness of 0-60 mg/L (as $CaCO_3$*); 0.002 mg/L at water hardness of 60-120 mg/L (as* $CaCO_3$*); 0.004 mg/L at water hardness of 120-180 mg/L (as* $CaCO_3$*); 0.007 mg/L at water hardness of > 180 mg/L (as* $CaCO_3$*)*

h) Guideline concentration for inorganic mercury

i) 0.025 mg/L at water hardness of 0-60 mg/L (as $CaCO_3$*); 0.065 mg/L at water hardness of 60-120 mg/L (as* $CaCO_3$*); 0.110 mg/L at water hardness of 120-180 mg/L (as* $CaCO_3$*); 0.150 mg/L at water hardness of > 180 mg/L (as* $CaCO_3$*)*

Table 3.3-2. Stream and River Water Quality, Factor by which Average Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2010 (completed)

Stream/River	Total Number of Samples Collected	CCME Guideline Value[a]:	Iron (Fe)-Total 0.3 mg/L	Lead (Pb)-Total 0.001-0.007[g] mg/L	Mercury (Hg)-Total 0.000026[h] mg/L	Molybdenum (Mo)-Total 0.073 mg/L	Nickel (Ni)-Total 0.025-0.150[i] mg/L	Selenium (Se)-Total 0.001 mg/L	Silver (Ag)-Total 0.0001 mg/L	Thallium (Tl)-Total 0.0008 mg/L	Zinc (Zn)-Total 0.03 mg/L
East											
AWRe	6		-	-	-	-	-	-	-	-	-
Aim. NE IF	6		2.45	-	-	-	-	-	-	-	-
Aimaokatalok											
Aim. R.	5		-	-	-	-	-	-	-	-	-
Stickleback OF	6		-	-	-	-	-	-	-	-	-
Trout OF	6		1.11	-	-	-	-	-	-	-	-
S12	4		-	-	-	-	-	-	-	-	-
S6	6		2.04	-	-	-	-	-	-	-	-
AWRd	6		4.59	-	-	-	-	-	-	-	-
AWRc	6		1.43	-	-	-	-	-	-	-	-
Aim. OF	7		-	-	-	-	-	-	-	-	-
Koignuk/Aimaokatalok											
Koig. R.	8		-	-	-	-	-	-	-	-	-
Koig. U/S	8		1.40	-	-	-	-	-	-	-	-
Koig. D/S	6		2.49	-	-	-	-	-	-	-	-
AWRb	6		1.52	-	-	-	-	-	-	-	-
AWRa	6		4.80	-	-	-	-	-	-	-	-
Angimajuq											
Ang. R. Ref	4		1.16	-	-	-	-	-	-	-	-

All values represent the factor by which stream/river averages are higher than CCME guidelines (using the average concentration of each parameter within a stream/river site across various seasons).

Even though a percentage of samples may be higher than a guideline amount, the calculated lake average may not be higher than CCME guidelines

Dashes represent averages that are not higher than guidelines

a) Canadian water quality guidelines for the protection of aquatic life (CCME 2007)

b) <0.004 mg/L = ultra-oligotrophic; 0.004 - 0.010 mg/L = oligotrophic; 0.01 - 0.02 mg/L = mesotrophic; 0.02 - 0.035 mg/L = meso-eutrophic; 0.035 - 0.1 mg/L = eutrophic; >0.1 mg/L = hyper-eutrophic

c) 0.005 mg/L at pH <6.5; 0.1 mg/L a pH ≥6.5

d) The equation for correcting this guideline for hardness is: $10^{[0.86[\log(\text{hardness})]-3.2]} / 1000$

e) Guideline concentration for hexavalent chromium. No concentrations were higher than the CCME guideline for trivalent chromium (0.0089 mg/L).

f) 0.002 mg/L at water hardness of 0-120 mg/L (as $CaCO_3$); 0.003 mg/L at water hardness of 120-180 mg/L (as $CaCO_3$); 0.004 mg/L at water hardness of > 180 mg/L (as $CaCO_3$)

g) 0.001 mg/L at water hardness of 0-60 mg/L (as $CaCO_3$); 0.002 mg/L at water hardness of 60-120 mg/L (as $CaCO_3$); 0.004 mg/L at water hardness of 120-180 mg/L (as $CaCO_3$); 0.007 mg/L at water hardness of > 180 mg/L (as $CaCO_3$)

h) Guideline concentration for inorganic mercury

i) 0.025 mg/L at water hardness of 0-60 mg/L (as $CaCO_3$); 0.065 mg/L at water hardness of 60-120 mg/L (as $CaCO_3$); 0.110 mg/L at water hardness of 120-180 mg/L (as $CaCO_3$); 0.150 mg/L at water hardness of > 180 mg/L (as $CaCO_3$)

3.3.4 Quality Assurance/Quality Control

Field and travel blanks from streams were pooled with lake blanks, and are discussed in the lake water quality section. Raw data are provided in Appendix 3.2-2.

3.3.5 Annual Variation

Only historical sampling locations that were also sampled in 2010 were included in the comparison of annual water quality data shown in Figures 3.3-2a to 3.3-2y. Note that historical sampling locations may not correspond exactly with those sampled in 2010, and this, in addition to methodological differences, may contribute to variability observed among years (see Table 2.14-2 and Figures 2.14-1a to 2.14-1c for historical sampling methodologies and locations). Differences in the timing of sample collection can also affect annual averages for many parameters. Under-ice or freshet water samples can sometimes contain higher metal and nutrient concentrations than those collected in the summer. Comparisons between years are further complicated by differences in analytical detection limits.

Some general trends were apparent in the historical dataset (Figures 3.3-2a to 3.3-2y). Hardness levels and TDS concentrations tended to be highest in Stickleback OF (Figures 3.3-2b and 3.3-2e). As observed in the 2010 data, historical concentrations of total aluminum and total iron frequently exceeded CCME guidelines in streams and rivers (Figures 3.3-2l and 3.3-2q).

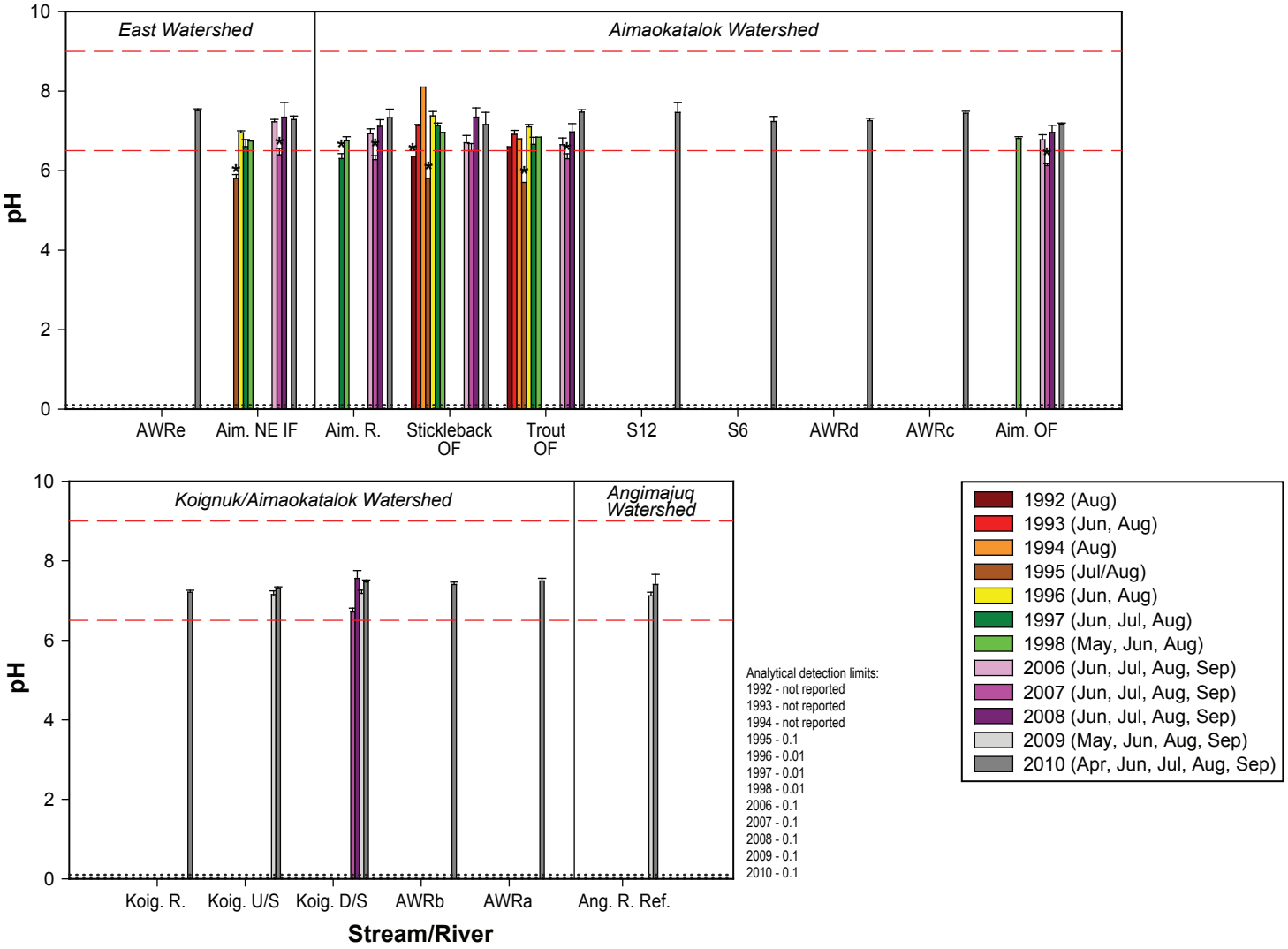
3.4 LAKE SEDIMENT QUALITY

Lake sediment samples were collected from a total of 12 sites in 6 lakes during August 2010 (see Table 2.1-4 for locations and dates of sample collection). All sediment samples collected were compared to CCME sediment quality guidelines for the protection of aquatic life: the interim sediment quality guidelines (ISQGs) and the probable effects levels (PELs; CCME 2002). The more conservative ISQGs are levels below which adverse biological effects are rarely observed, whereas the higher PELs correspond to concentrations above which negative effects frequently occur. Lake sediment descriptions and photographs can be found in Appendices 3.4-1 and 3.4-2. All lake sediment quality analytical data for 2010 are provided in Appendix 3.4-3. Historical sediment quality data are also available for some lakes in the area (Figures 2.14-2a to 2.14-2c; Table 2.14-3).

3.4.1 Depth Variation

Figure 3.4-1 presents lake sediment particle size composition. Lake sediments were largely composed of clay and silt, with lesser amounts of sand and very little gravel. In the shallow depth zone, sand made up 75% of the average sediment composition at Windy Lake, and 38 to 56% of the average sediment composition at Aimaokalatok stations 2, 12, 5, 11. In the remaining shallow sites, fine particles (clay and silt) made up at least 85% of the sediments. At depths greater than 5 m, fine sediments accounted for at least 90% of the particle size composition (Figure 3.4-1).

Figures 3.4-2a to 3.4-2k present 2010 lake sediment quality results. Windy and Aimaokatalok lakes were the only lakes at which samples were collected from both the shallow depth zone (<5 m depth) and the mid- to deep depth zones (> 5 m). In these lakes, many sediment parameter concentrations were higher in the mid- to deep depth zones than in the shallow depth zone, likely due to the increase in fine sediments with depth. Parameters that increased in concentration with depth included: available phosphate (Figure 3.4-2b), cadmium (Figure 3.4-2f), chromium (Figure 3.4-2g), mercury (Figure 3.4-2j), and zinc (Figure 3.4-2k). This trend was most apparent for Windy Lake, as concentrations of all analyzed parameters were higher in the deep samples than in the shallow samples.



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit.
Red dashed lines represent CCME guideline (pH 6.5–9).
** Indicates average values that are not within CCME guideline pH range.*

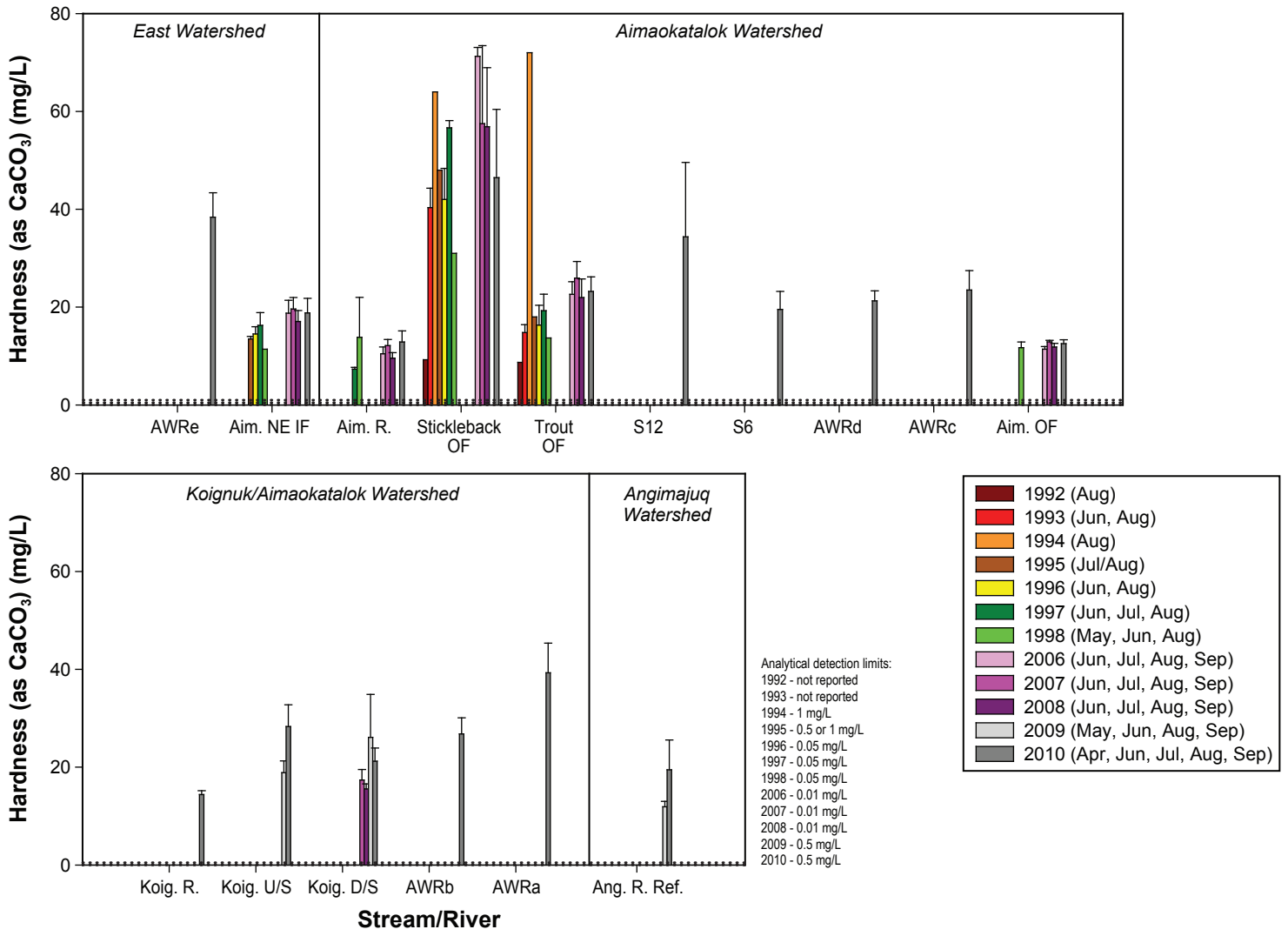
Figure 3.3-2a

NEWMONT NORTH AMERICA

Average Annual pH in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2a

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit.
There is no CCME guideline for hardness.

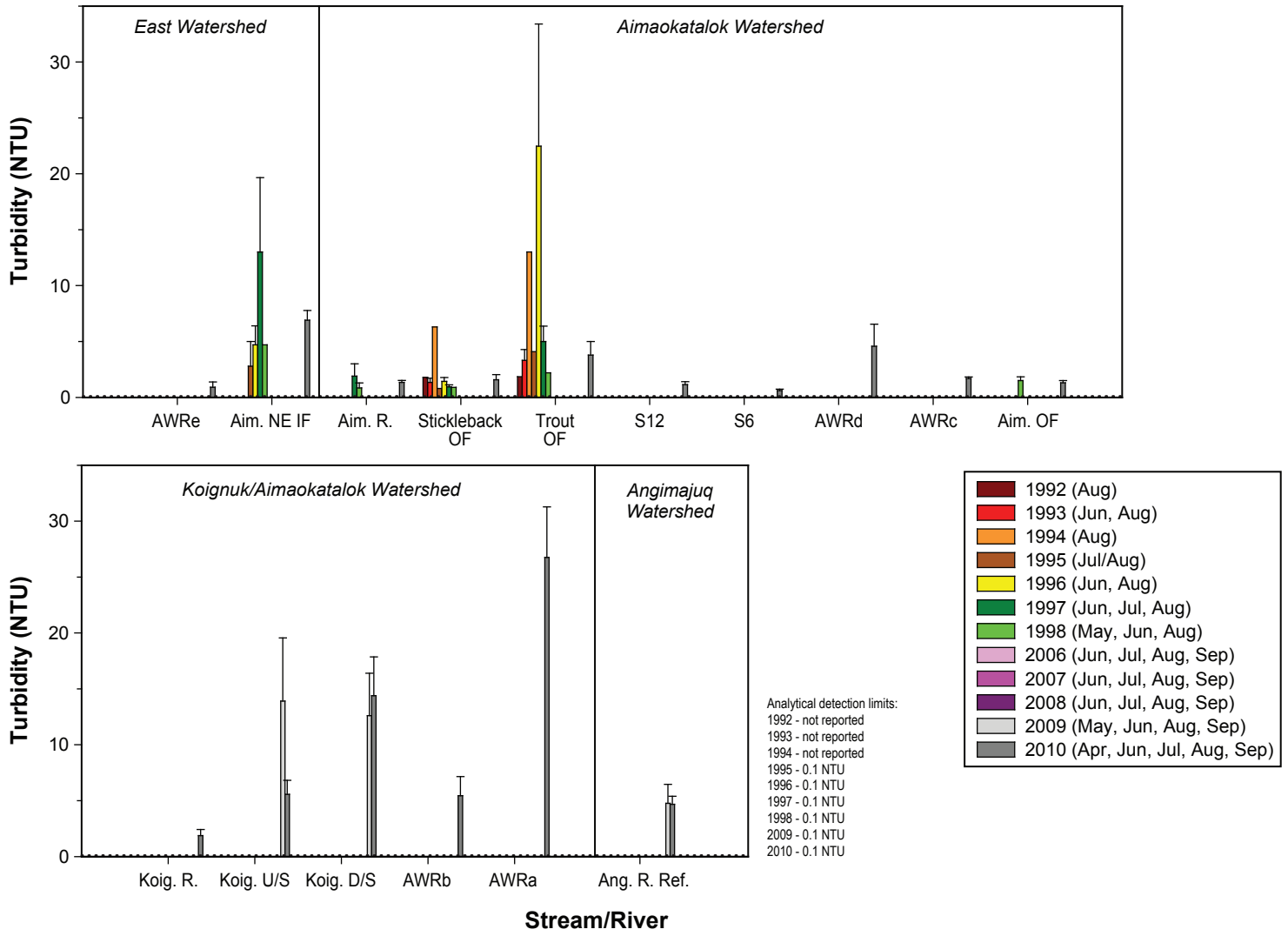
Figure 3.3-2b

NEWMONT NORTH AMERICA

Average Annual Hardness in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2b

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit.
CCME guideline for turbidity is dependent upon background levels.

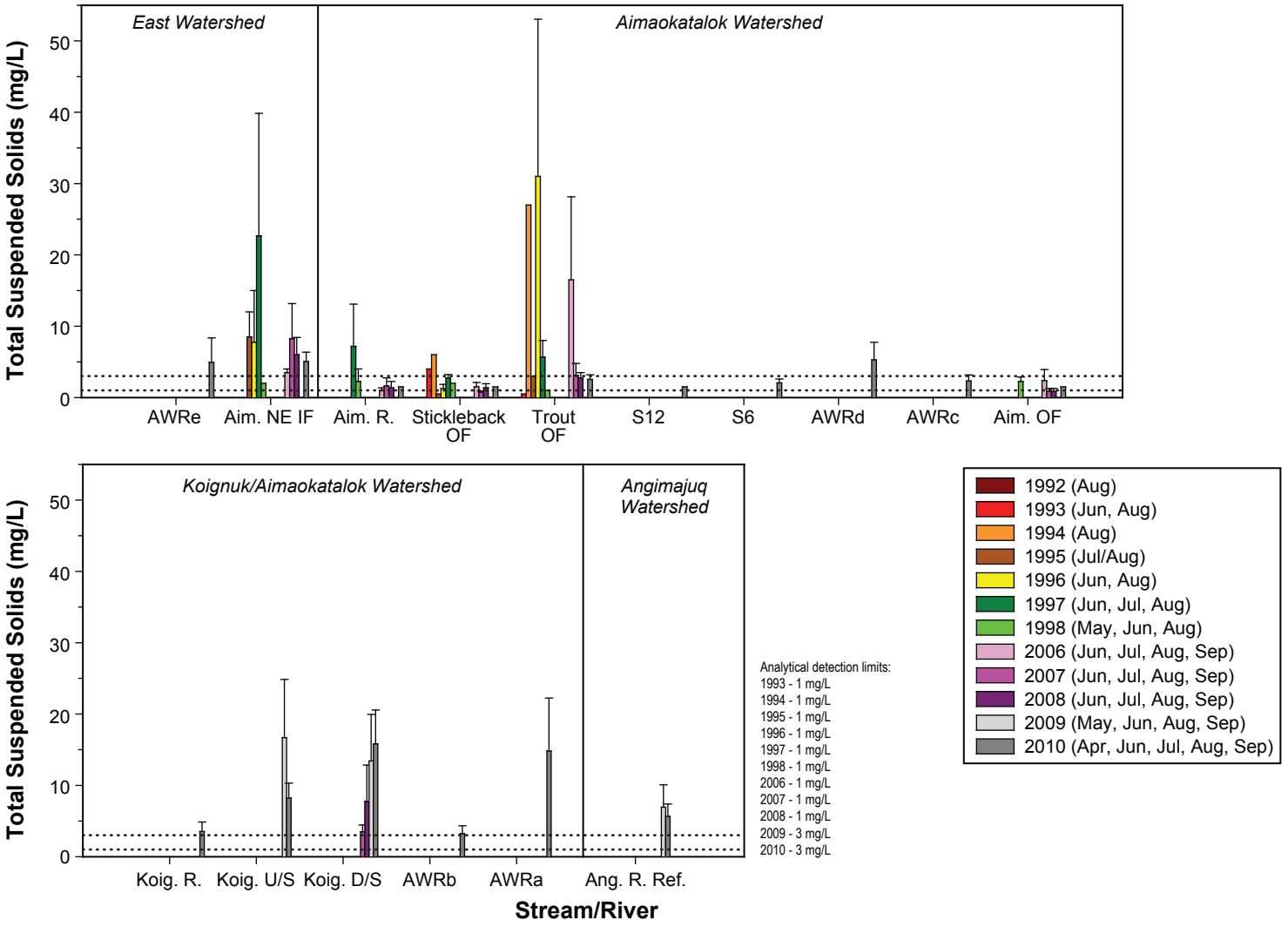
Figure 3.3-2c

NEWMONT NORTH AMERICA

Average Annual Turbidity in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2c

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
CCME guideline for total suspended solids is dependent upon background levels.

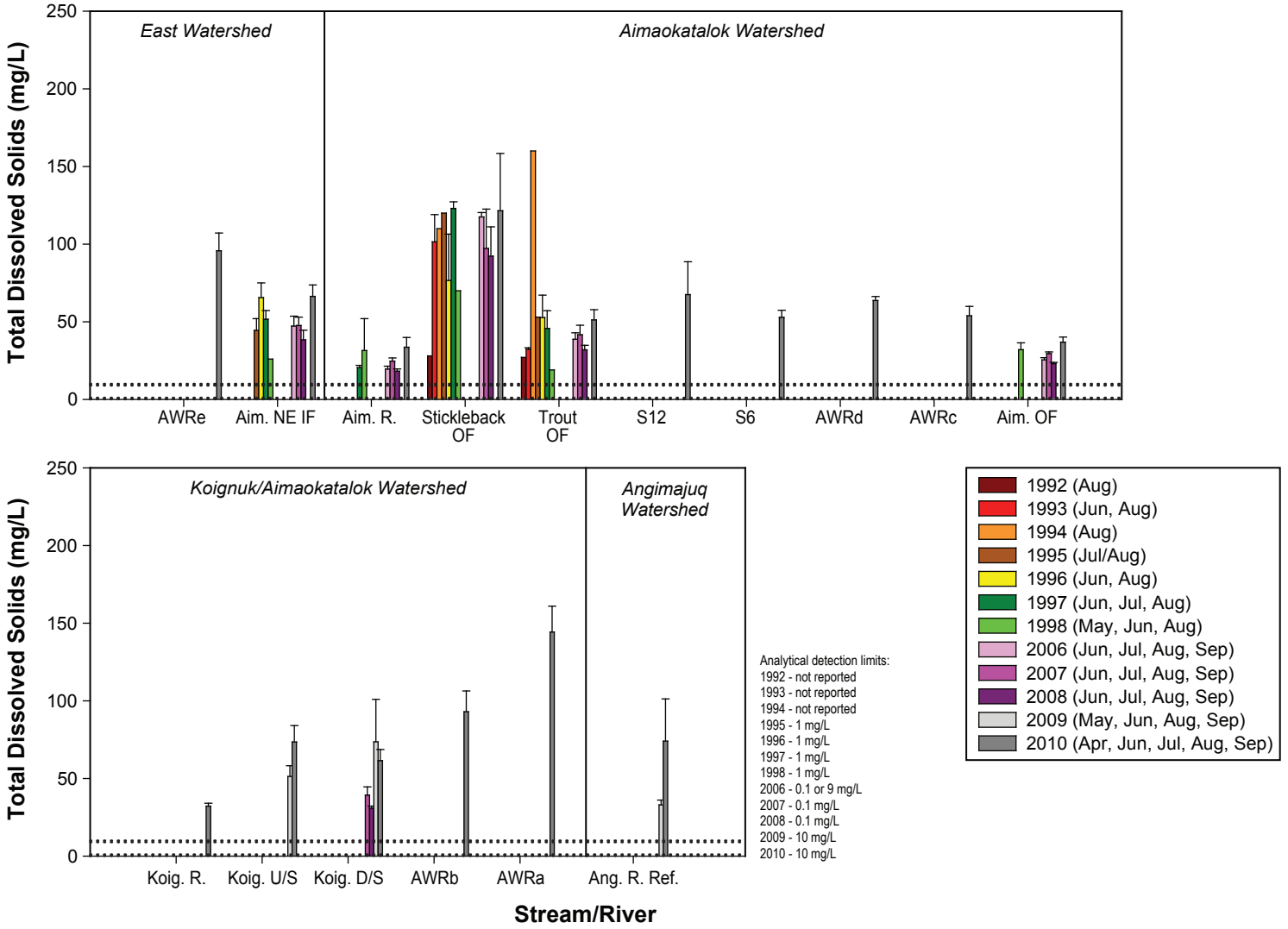
Figure 3.3-2d

NEWMONT NORTH AMERICA

Average Annual Total Suspended Solids Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2d

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
There is no CCME guideline for total dissolved solids.

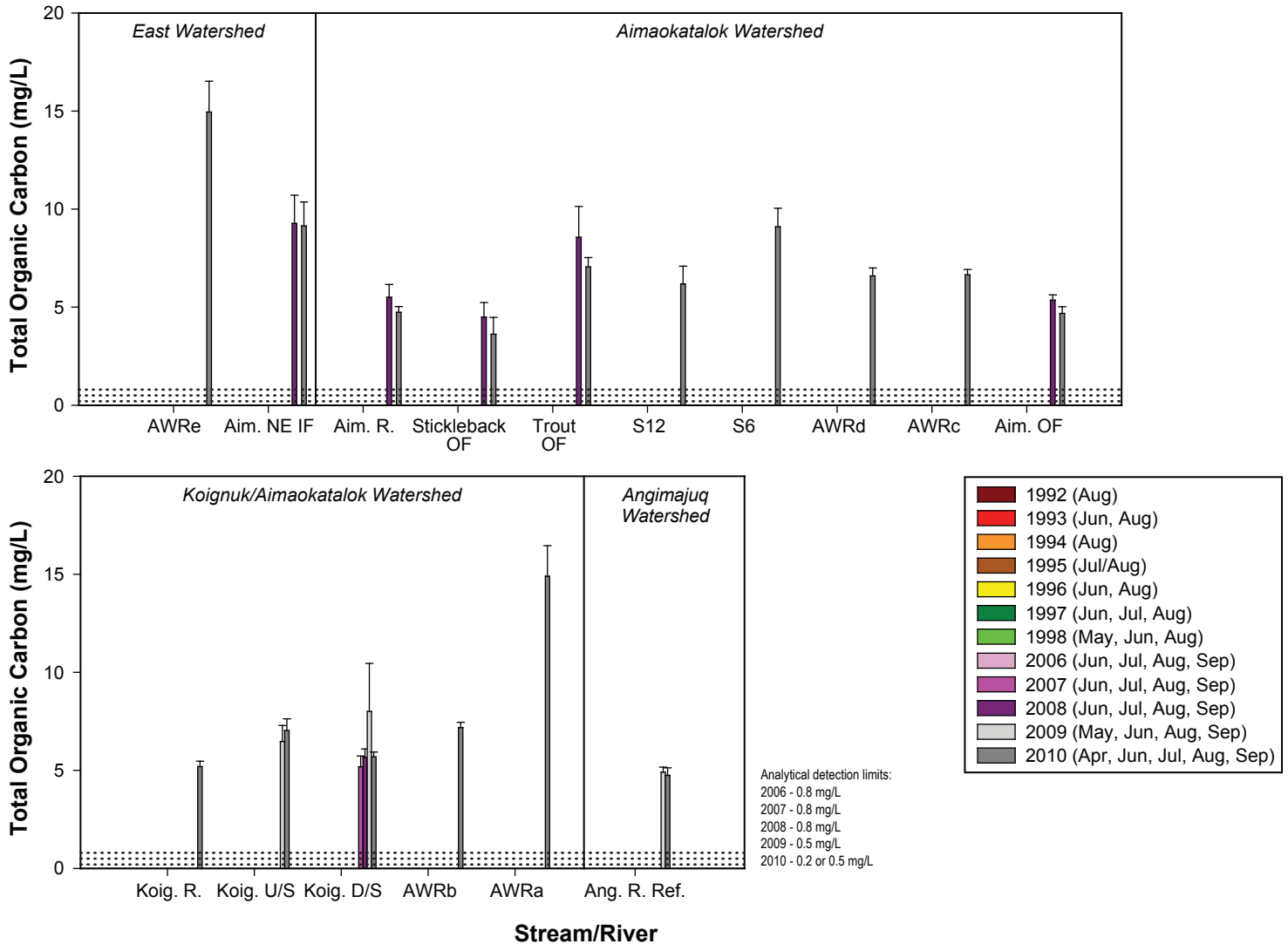
Figure 3.3-2e

NEWMONT NORTH AMERICA

Average Annual Total Dissolved Solids Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2e

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
There is no CCME guideline for total organic carbon.

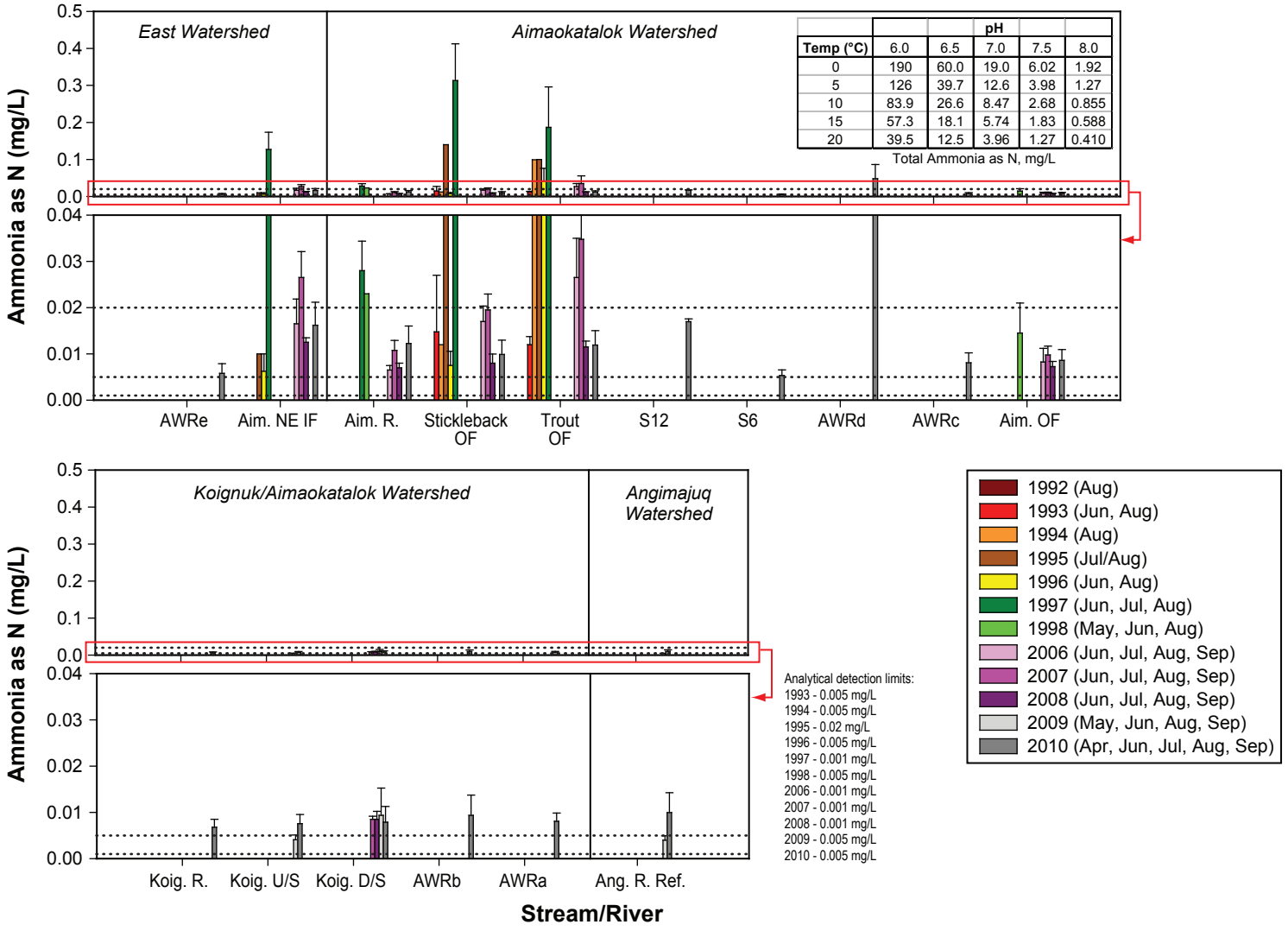
Figure 3.3-2f

NEWMONT NORTH AMERICA

Average Annual Total Organic Carbon Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2f

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Inset table shows temperature- and pH-dependent CCME guideline.
** Indicates average ammonia concentrations that are both above the detection limit and higher than the CCME guideline.*

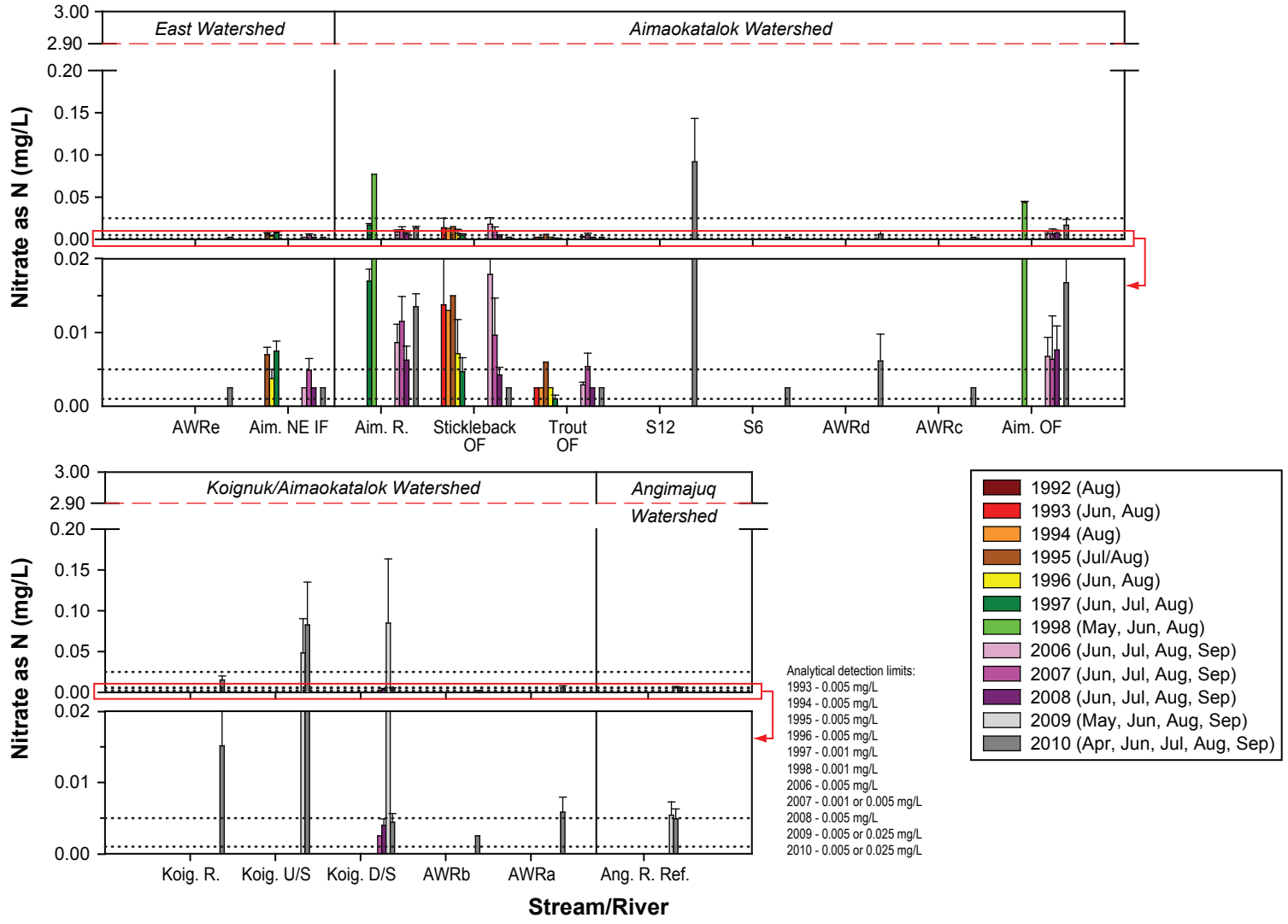
Figure 3.3-2g

NEWMONT NORTH AMERICA

Average Annual Ammonia Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2g

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (2.9 mg/L).
** Indicates average nitrate concentrations that are both above the detection limit and higher than the CCME guideline.*

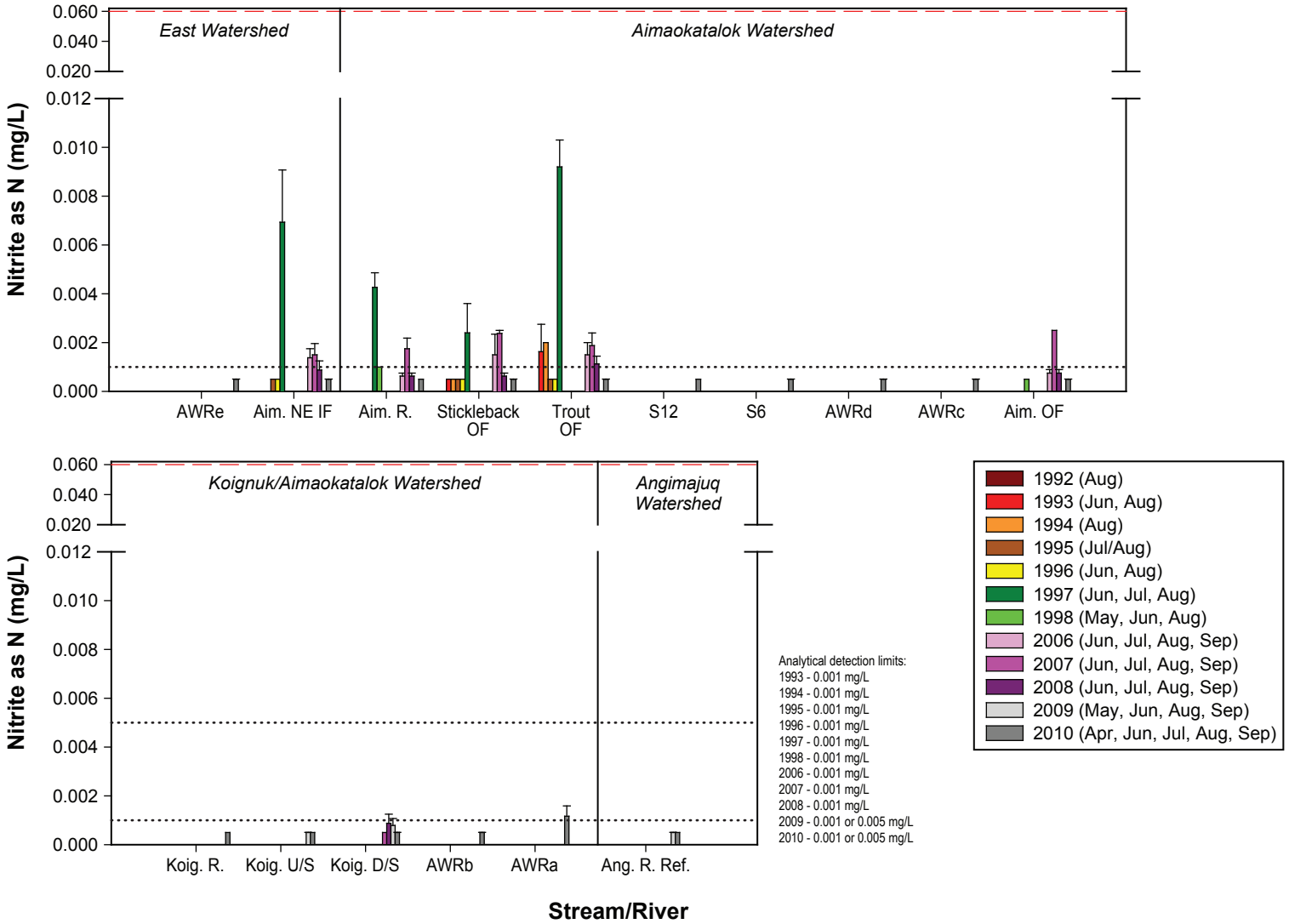
Figure 3.3-2h

NEWMONT NORTH AMERICA

Average Annual Nitrate Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2h

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.06 mg/L).
** Indicates average nitrite concentrations that are both above the detection limit and higher than the CCME guideline.*

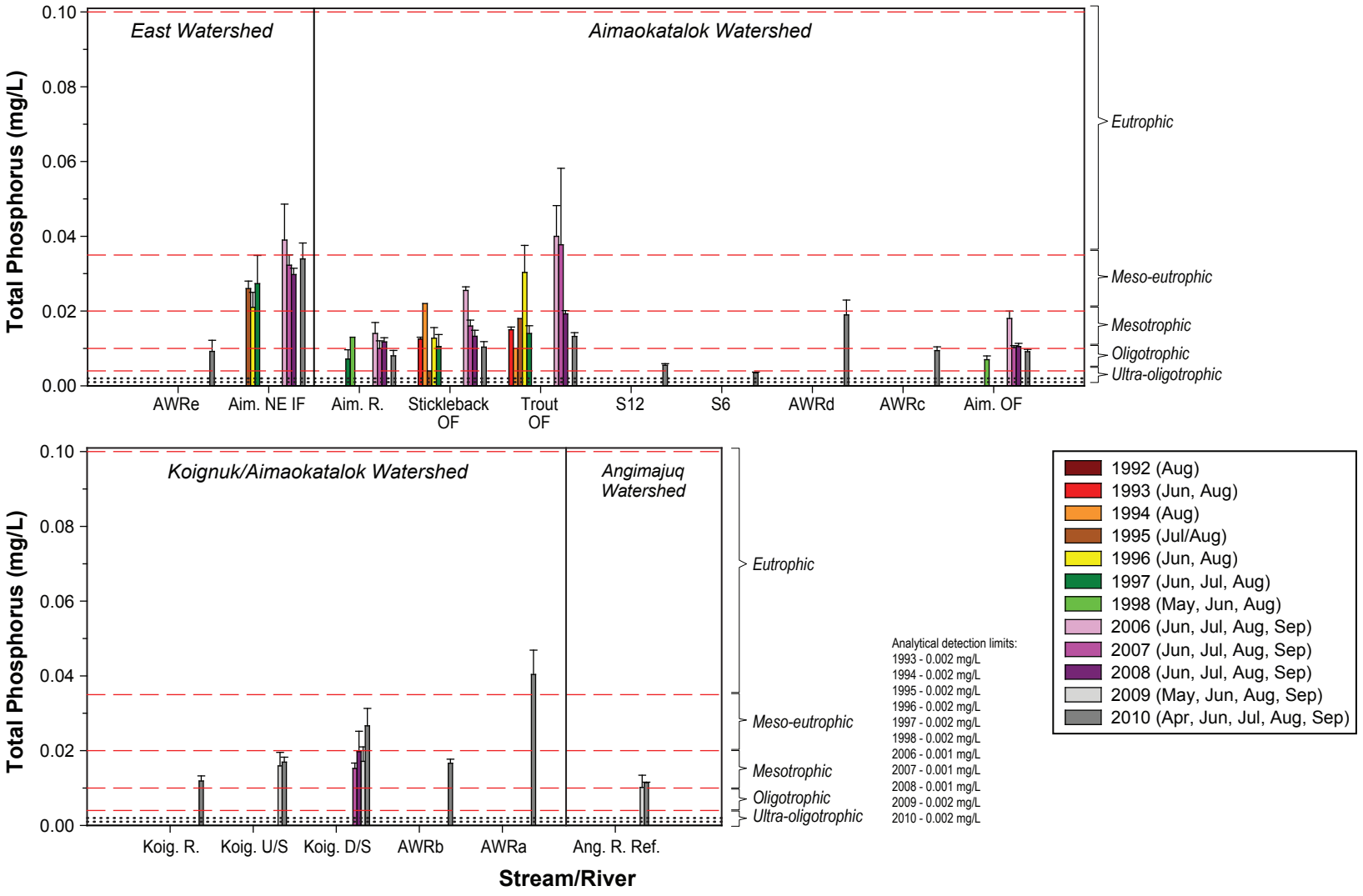
Figure 3.3-2i

NEWMONT NORTH AMERICA

Average Annual Nitrite Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2i

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed lines represents CCME trigger ranges (<0.004 mg/L = ultraoligotrophic; 0.004–0.010 mg/L = oligotrophic; 0.01–0.02 mg/L = mesotrophic; 0.02–0.035 mg/L = meso-eutrophic; 0.035–0.1 mg/L = eutrophic; >0.1 mg/L = hyper-eutrophic).

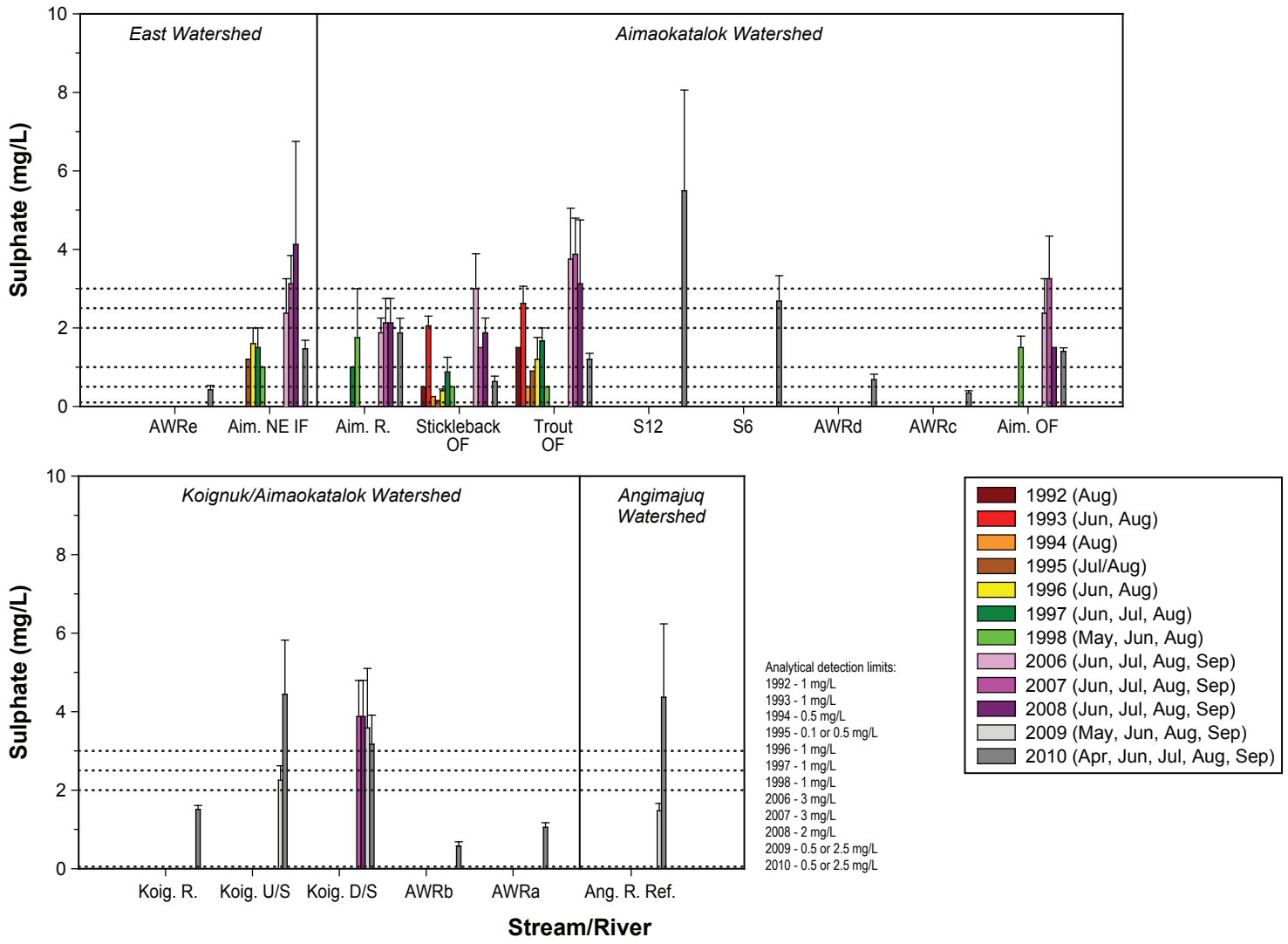
Figure 3.3-2j

NEWMONT NORTH AMERICA

Average Annual Total Phosphorus Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2j

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
There is no CCME guideline for sulphate.

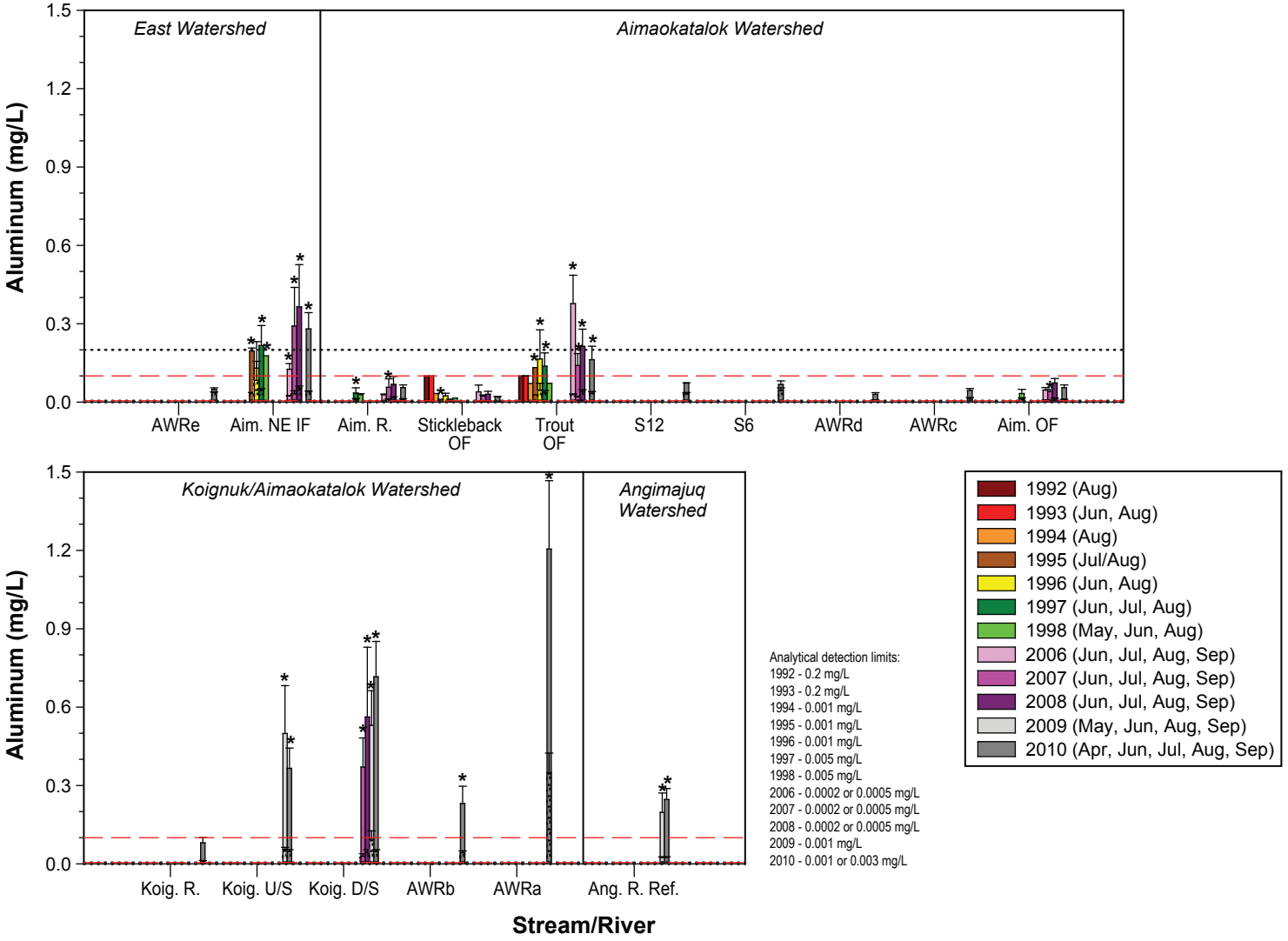
Figure 3.3-2k

NEWMONT NORTH AMERICA

Average Annual Sulphate Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2k

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed lines represent pH-dependent CCME guideline (0.005 mg/L at pH less than 6.5; 0.1 mg/L at pH greater than or equal to 6.5).
Solid columns represent total aluminum and superimposed dotted columns represent dissolved aluminum.
** Indicates average total aluminum concentrations that are both above the detection limit and higher than the CCME guideline.*

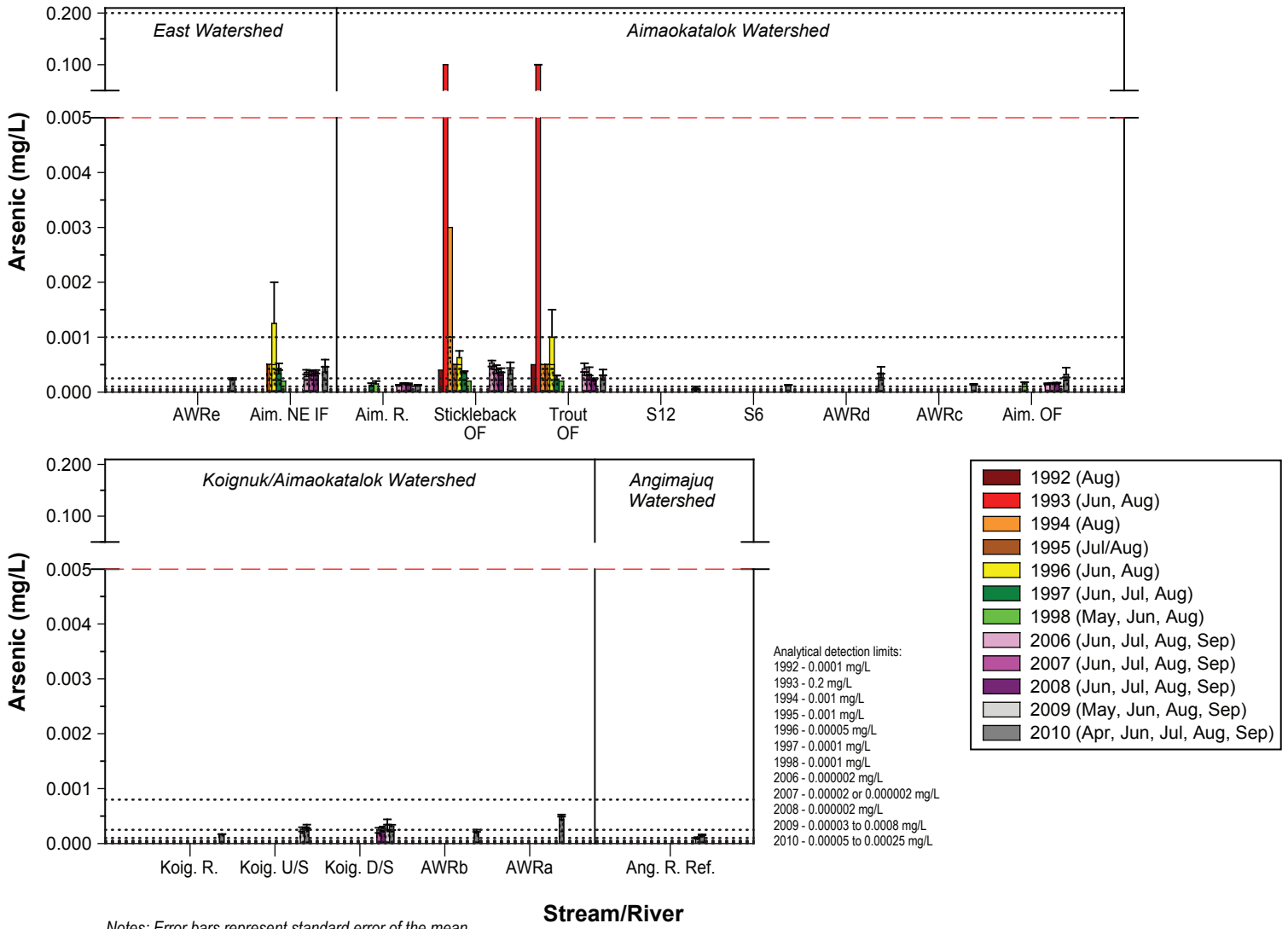
Figure 3.3-2l

NEWMONT NORTH AMERICA

Average Annual Aluminum Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2l

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.005 mg/L).
Solid columns represent total arsenic and superimposed dotted columns represent dissolved arsenic.
** Indicates average total arsenic concentrations that are both above the detection limit and higher than the CCME guideline.*

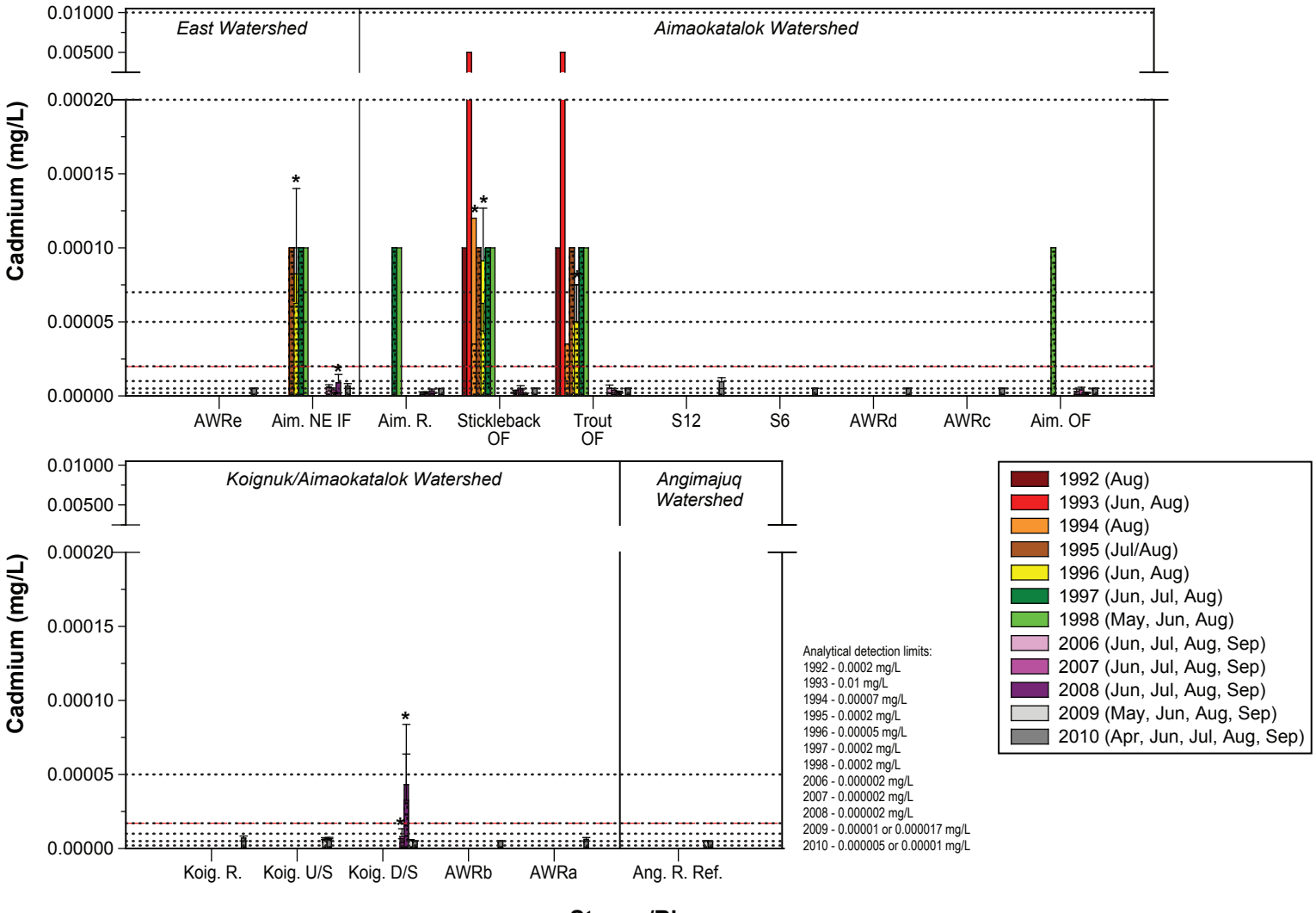
Figure 3.3-2m

NEWMONT NORTH AMERICA

Average Annual Arsenic Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2m

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.000017 mg/L). The equation for correcting this guideline for hardness is: $10^{[0.86[\log(\text{hardness})]-3.2]}/1000$.
Solid columns represent total cadmium and superimposed dotted columns represent dissolved cadmium.
** Indicates average total cadmium concentrations that are both above the detection limit and higher than the hardness-corrected CCME guideline.*

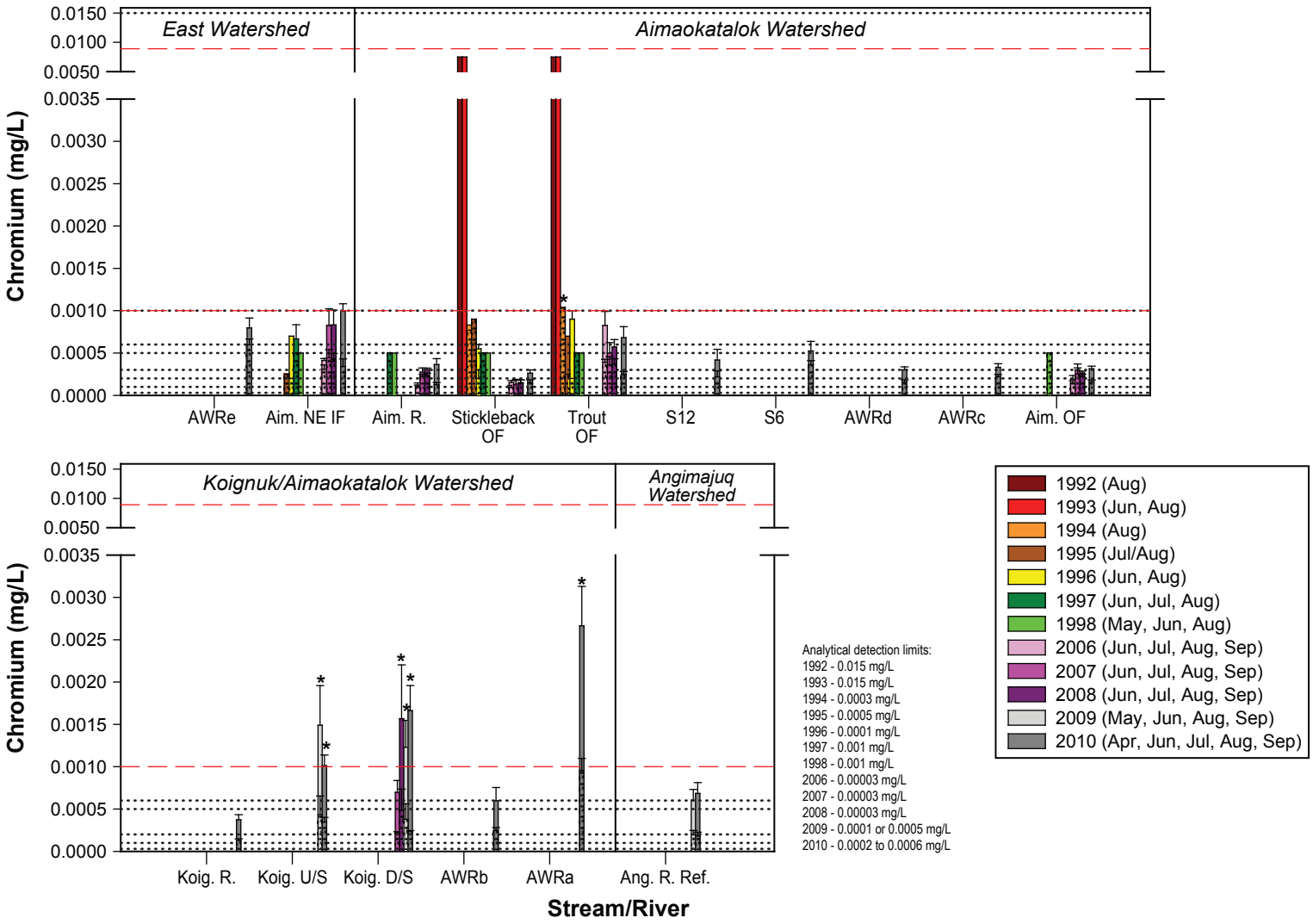
Figure 3.3-2n

NEWMONT NORTH AMERICA

Average Annual Cadmium Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2n

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed lines represent CCME guideline for hexavalent chromium (0.001 mg/L) and interim guideline for trivalent chromium (0.0089 mg/L).
Solid columns represent total chromium and superimposed dotted columns represent dissolved chromium.
** Indicates average total chromium concentrations that are both above the detection limit and higher than the CCME guideline for hexavalent chromium.*

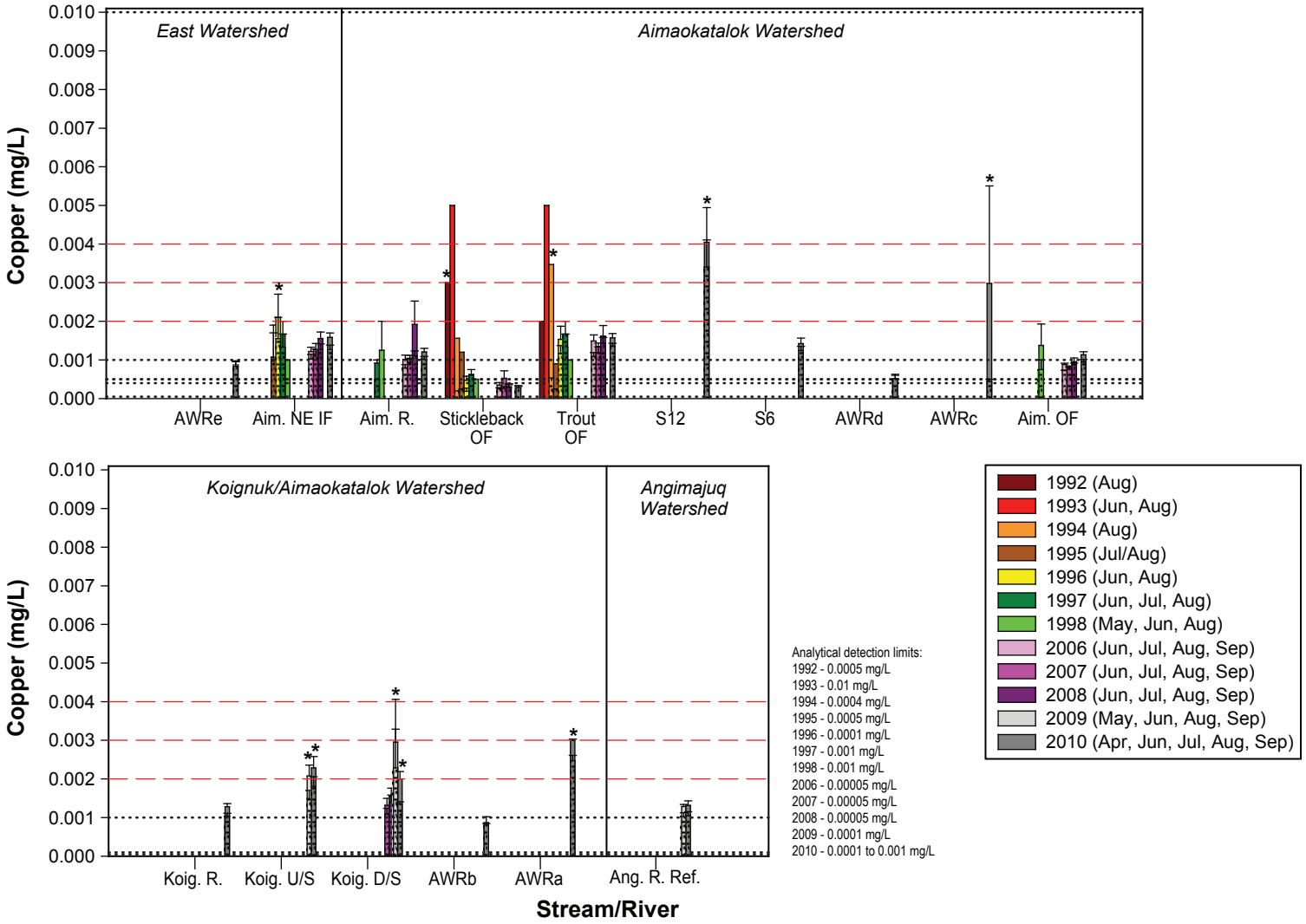
Figure 3.3-2o

NEWMONT NORTH AMERICA

Average Annual Chromium Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2o

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed lines represent hardness-dependent CCME guideline (0.002 mg/L at [$CaCO_3$] = 0–120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120–180 mg/L; 0.004 mg/L at [$CaCO_3$] = >180 mg/L).
Solid columns represent total copper and superimposed dotted columns represent dissolved copper.
** Indicates average total copper concentrations that are both above the detection limit and higher than the CCME guideline.*

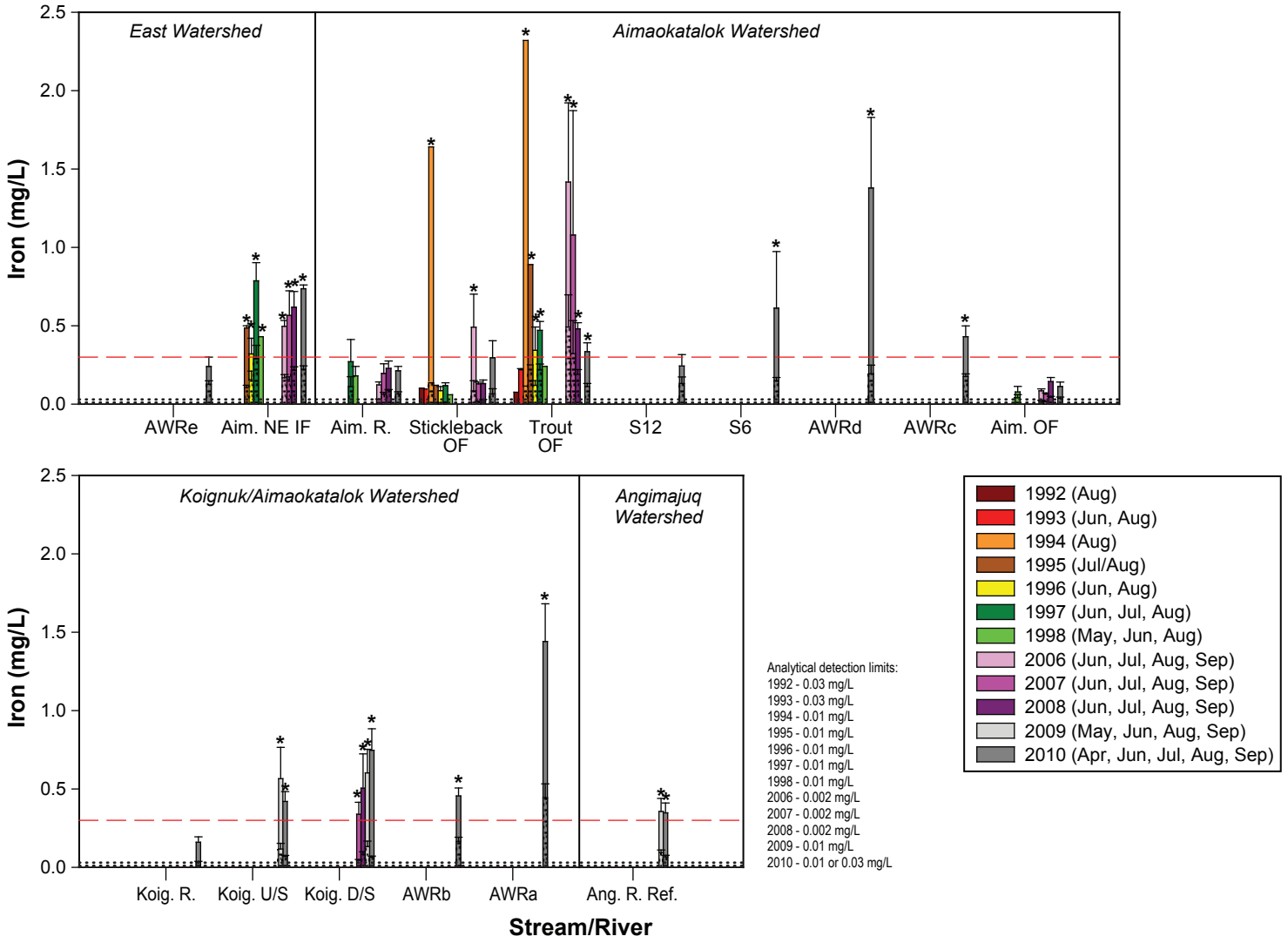
Figure 3.3-2p

NEWMONT NORTH AMERICA

Average Annual Copper Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2p

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.3 mg/L).
Solid columns represent total iron and superimposed dotted columns represent dissolved iron.
** Indicates average total iron concentrations that are both above the detection limit and higher than the CCME guideline.*

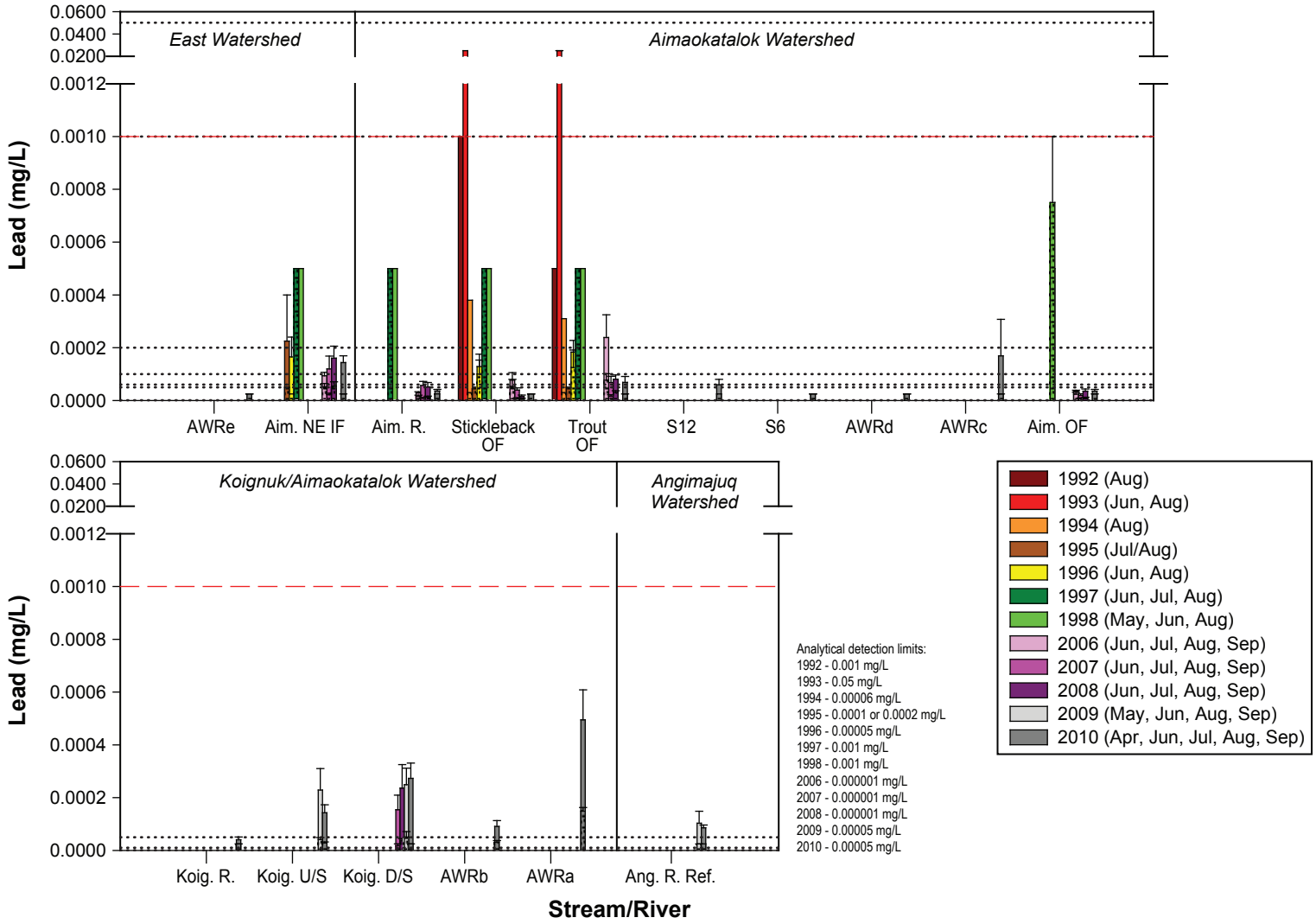
Figure 3.3-2q

NEWMONT NORTH AMERICA

Average Annual Iron Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2q

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below detection limit are plotted at half the detection limit.
Red dashed lines represent CCME guideline (0.001 mg/L at [$CaCO_3$] = 0–60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60–120 mg/L [not shown]; 0.004 mg/L at [$CaCO_3$] = 120–180 mg/L [not shown]; 0.007 mg/L at [$CaCO_3$] = >180 mg/L [not shown]).
Solid columns represent total lead and superimposed dotted columns represent dissolved lead.
** Indicates average total lead concentrations that are both above the detection limit and higher than the CCME guideline.*

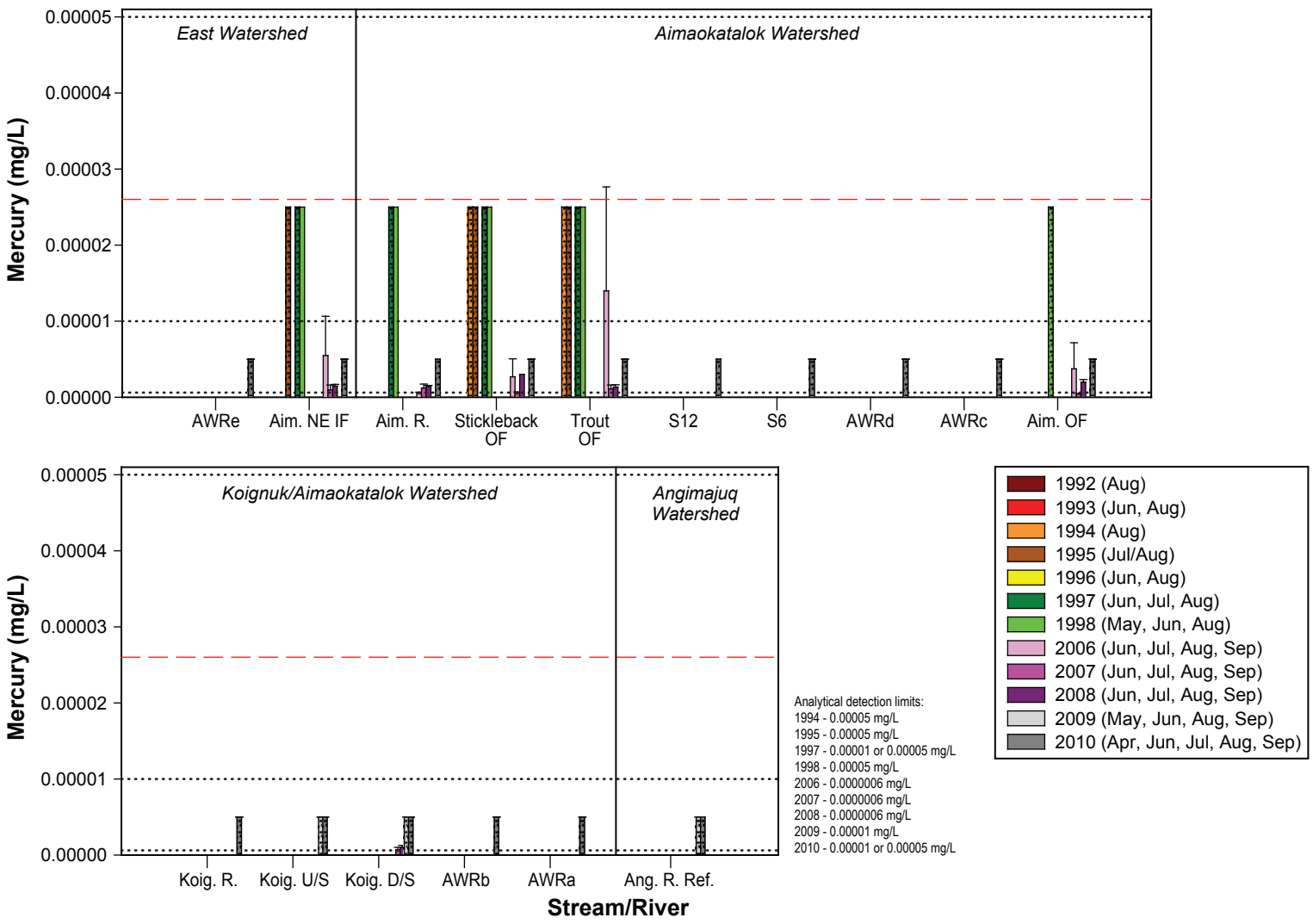
Figure 3.3-2r

NEWMONT NORTH AMERICA

Average Annual Lead Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2r

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline for inorganic mercury (0.000026 mg/L); the interim CCME guideline for methylmercury (0.000004 mg/L) is not shown.
Solid columns represent total mercury and superimposed dotted columns represent dissolved mercury.
** Indicates average total mercury concentrations that are both above the detection limit and higher than the CCME guideline for inorganic mercury.*

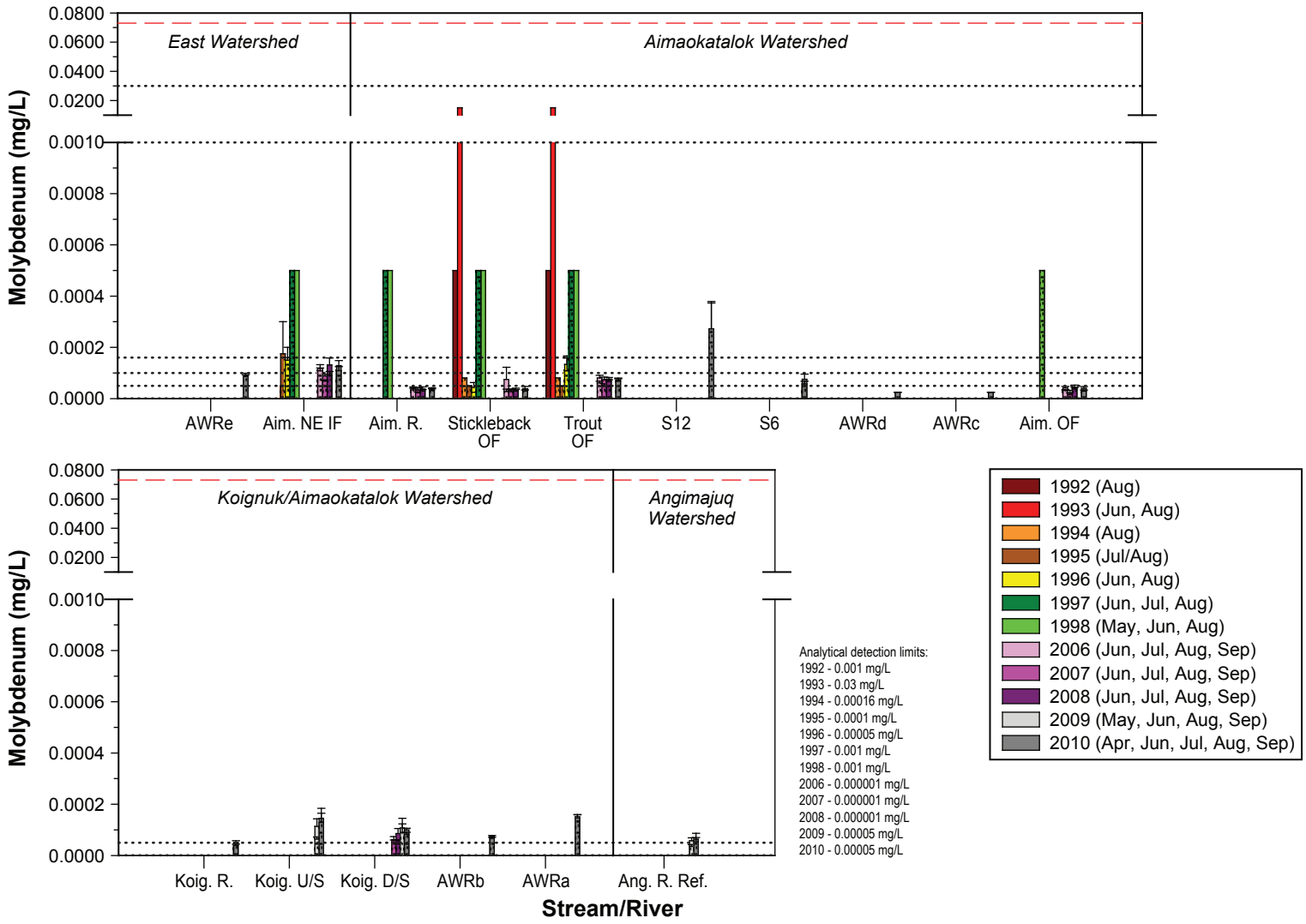
Figure 3.3-2s

NEWMONT NORTH AMERICA

Average Annual Mercury Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2s

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.073 mg/L).
Solid columns represent total molybdenum and superimposed dotted columns represent dissolved molybdenum.
** Indicates average total molybdenum concentrations that are both above the detection limit and higher than the CCME guideline.*

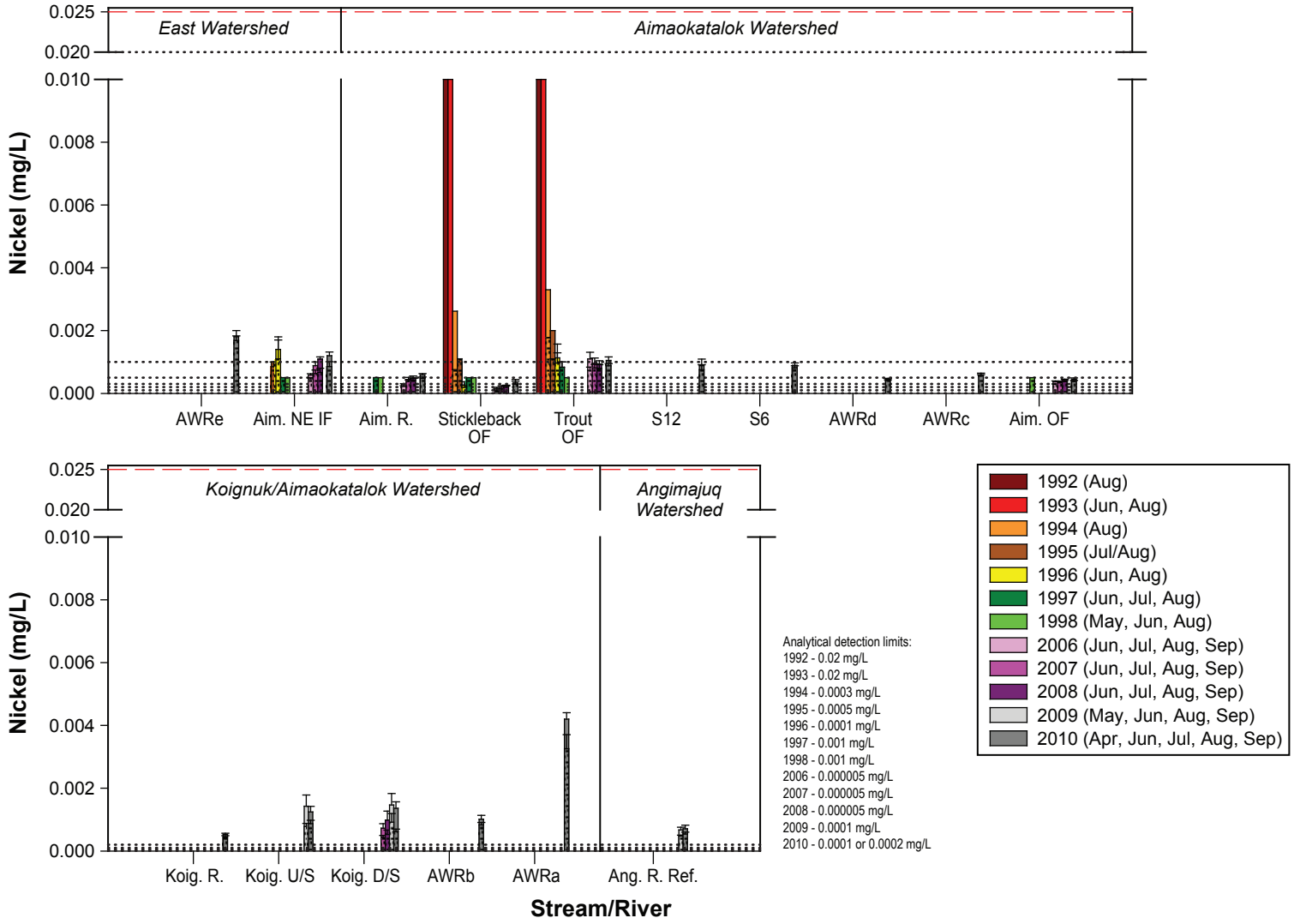
Figure 3.3-2t

NEWMONT NORTH AMERICA

Average Annual Molybdenum Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2t

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed lines represent hardness-dependent CCME guideline (0.025 mg/L at [$CaCO_3$] = 0–60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60–120 mg/L [not shown]; 0.110 mg/L at [$CaCO_3$] = 120–180 mg/L [not shown]; 0.150 mg/L at [$CaCO_3$] = >180 mg/L [not shown]).
** Indicates average total nickel concentrations that are both above the detection limit and higher than the CCME guideline.*

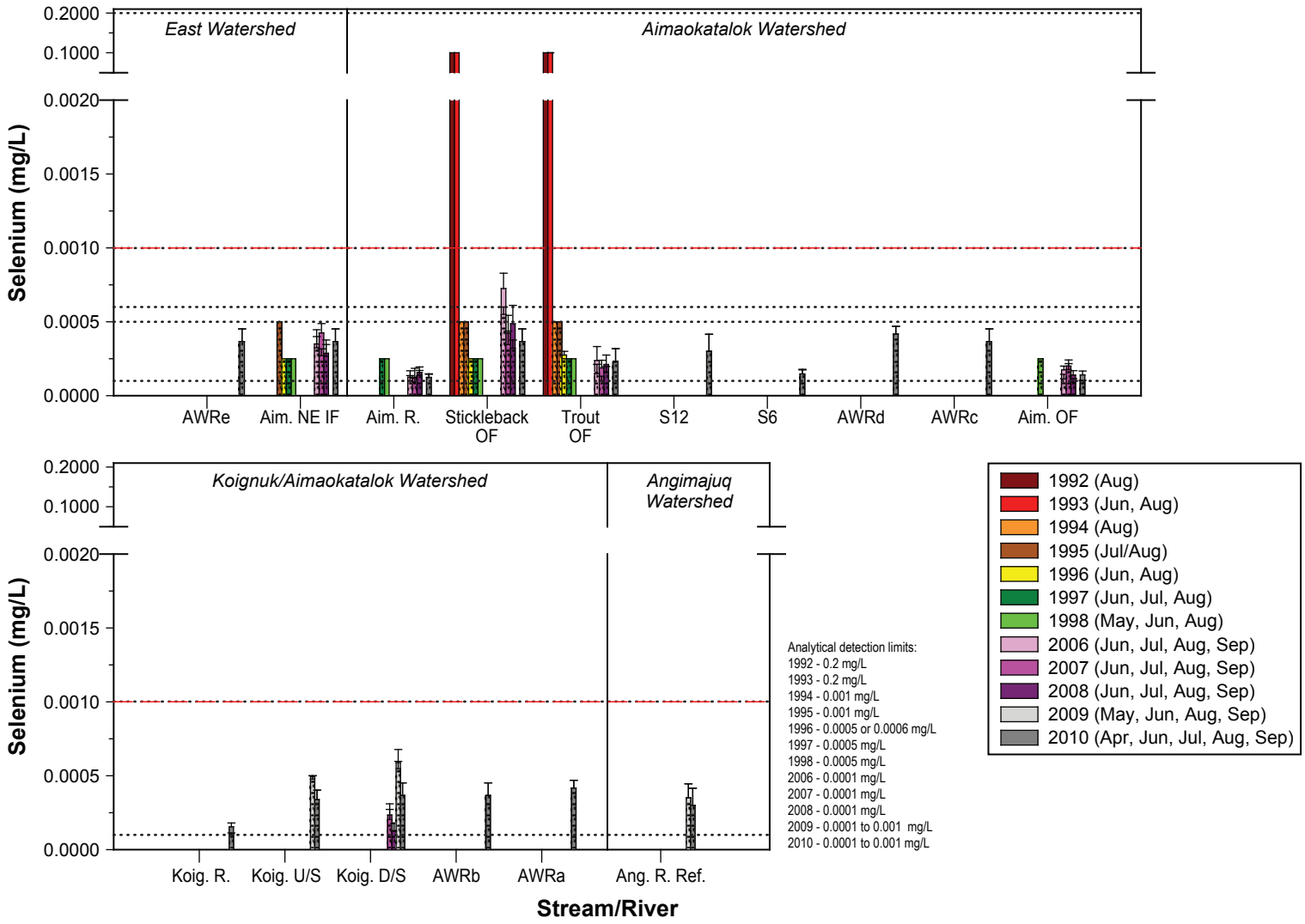
Figure 3.3-2u

NEWMONT NORTH AMERICA

Average Annual Nickel Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2u

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.001 mg/L).
Solid columns represent total selenium and superimposed dotted columns represent dissolved selenium.
** Indicates average total selenium concentrations that are both above the detection limit and higher than the CCME guideline.*

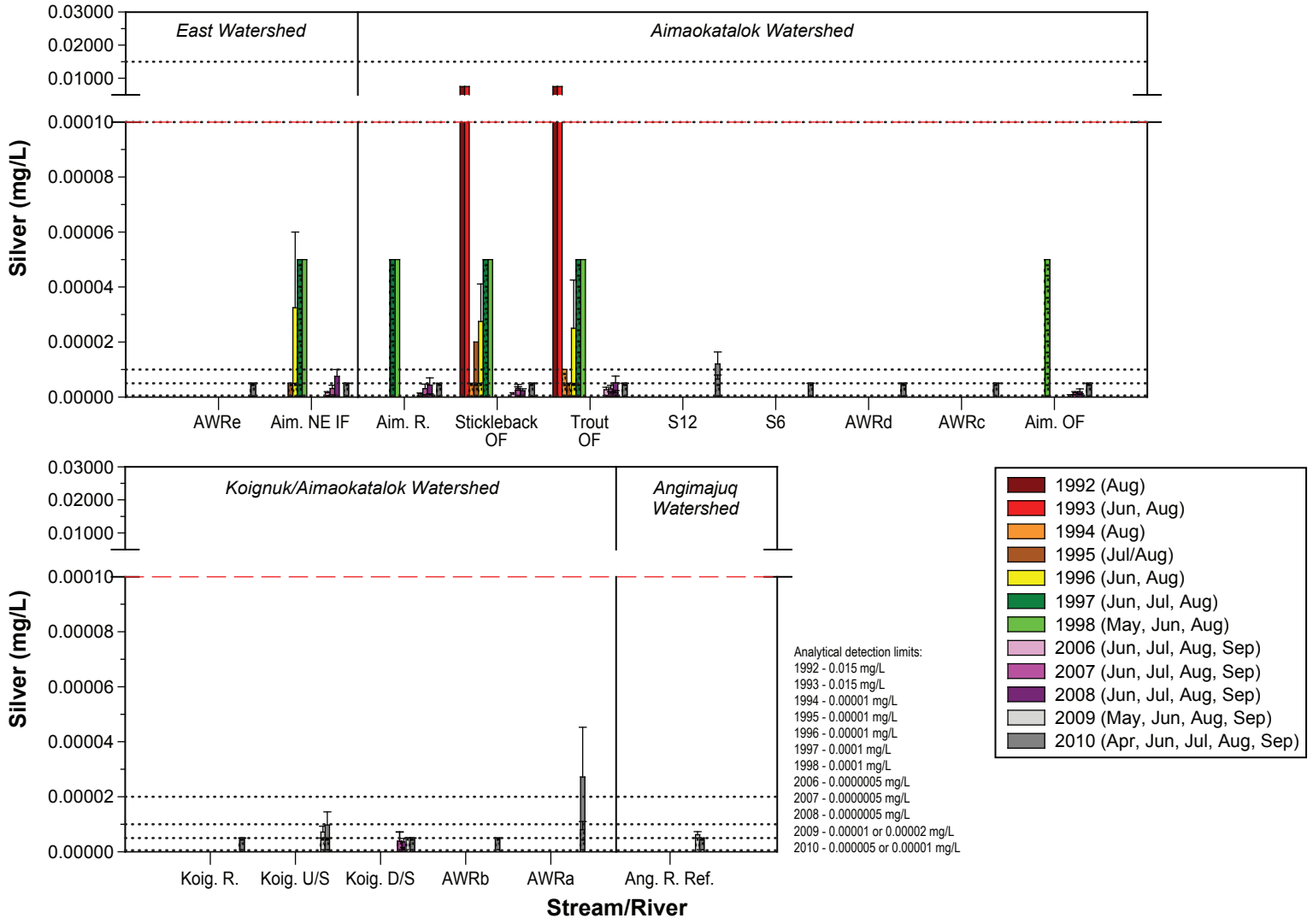
Figure 3.3-2v

NEWMONT NORTH AMERICA

Average Annual Selenium Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2v

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.0001 mg/L).
Solid columns represent total silver and superimposed dotted columns represent dissolved silver.
** Indicates average total silver concentrations that are both above the detection limit and higher than the CCME guideline.*

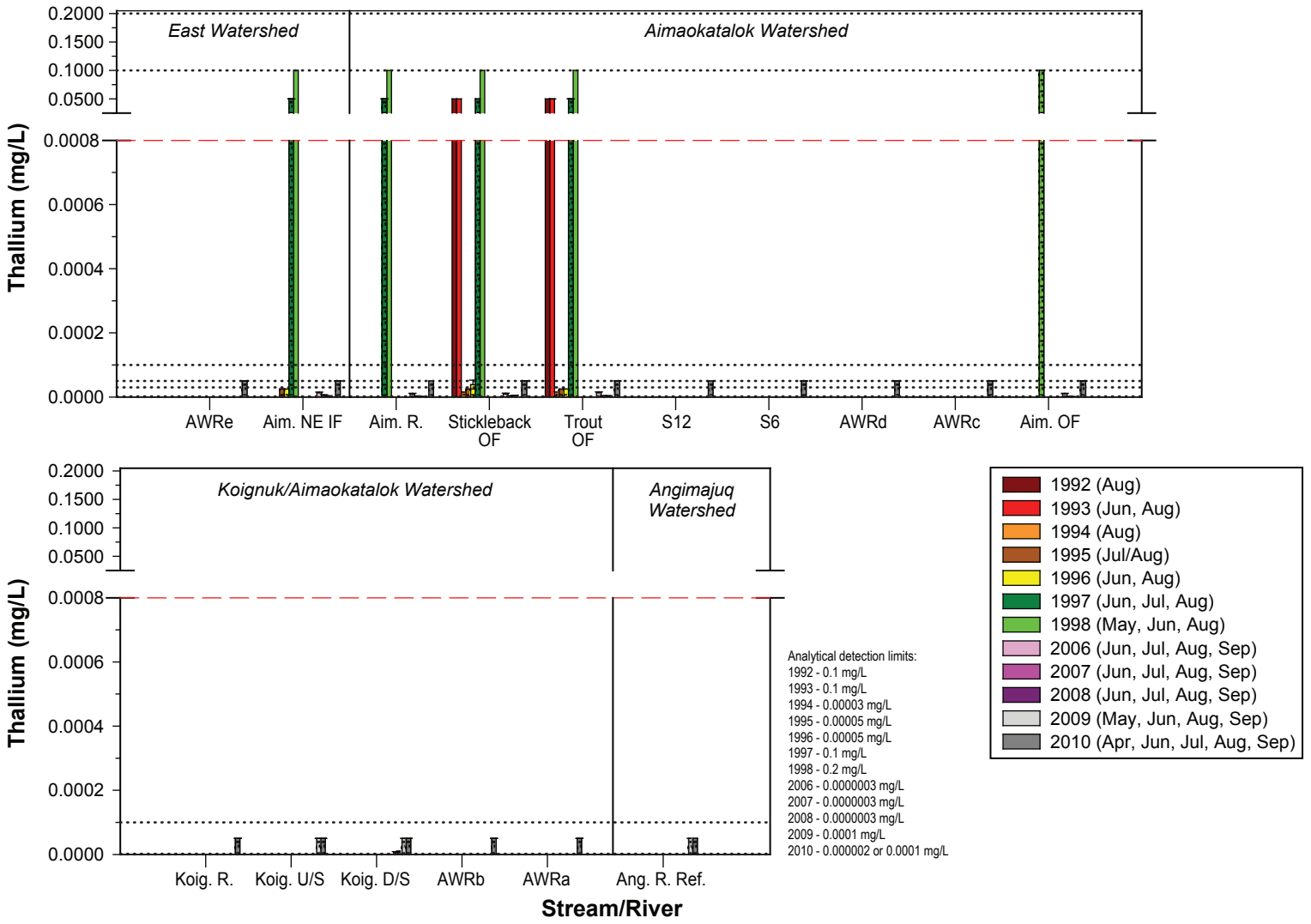
Figure 3.3-2w

NEWMONT NORTH AMERICA

Average Annual Silver Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2w

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.0008 mg/L).
Solid columns represent total thallium and superimposed dotted columns represent dissolved thallium.
** Indicates average total thallium concentrations that are both above the detection limit and higher than the CCME guideline.*

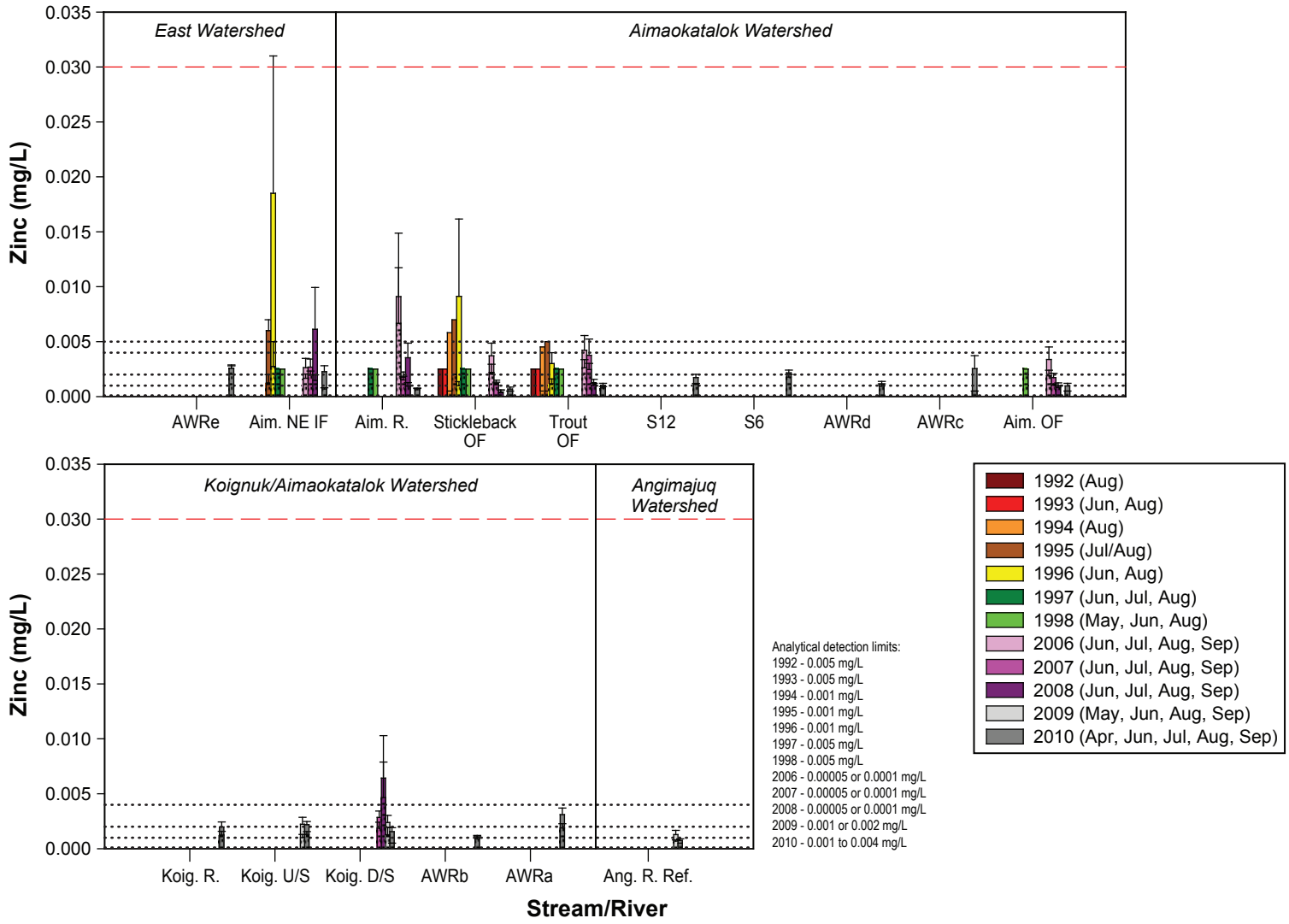
Figure 3.3-2x

NEWMONT NORTH AMERICA

Average Annual Thallium Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2x

Rescan™ Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit; values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.03 mg/L).
Solid columns represent total zinc and superimposed dotted columns represent dissolved zinc.
** Indicates average total zinc concentrations that are both above the detection limit and higher than the CCME guideline.*

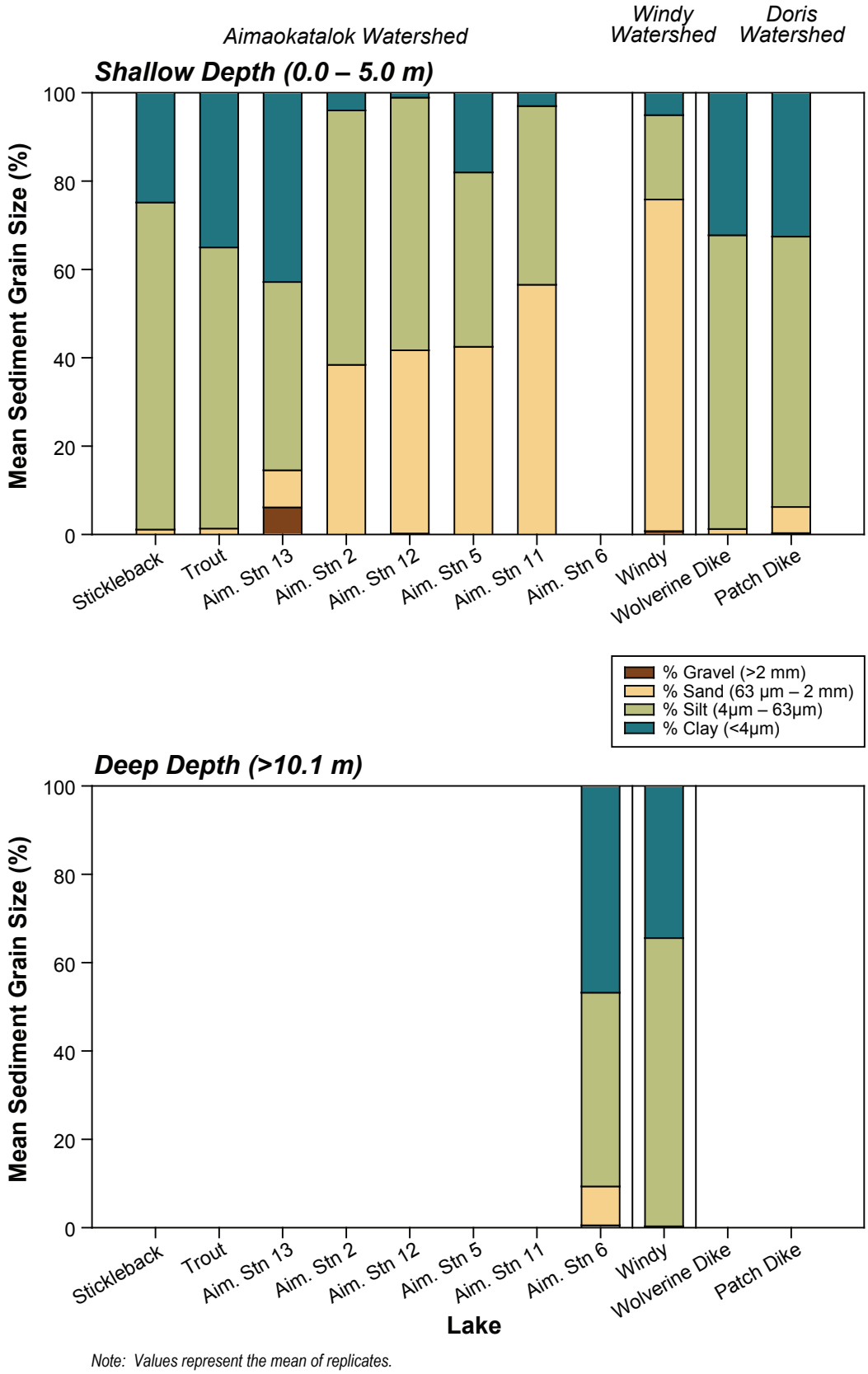
Figure 3.3-2y

NEWMONT NORTH AMERICA

Average Annual Zinc Concentration in Streams and Rivers, Hope Bay Belt Project, 1992-2010

Figure 3.3-2y

Rescan Engineers & Scientists



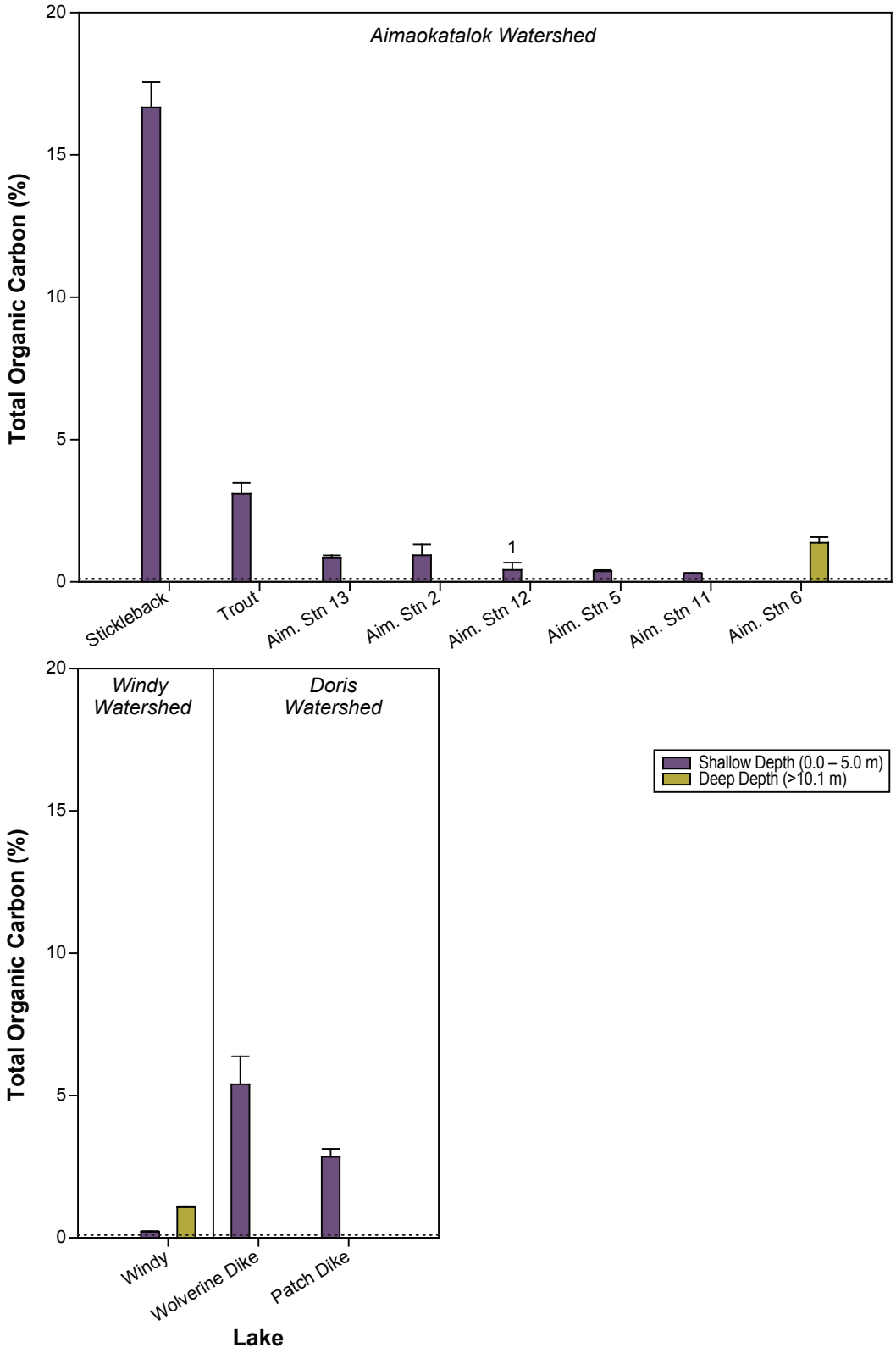
Note: Values represent the mean of replicates.

NEWMONT NORTH AMERICA

Sediment Grain Size Composition in Lakes, Hope Bay Belt Project, 2010

Figure 3.4-1

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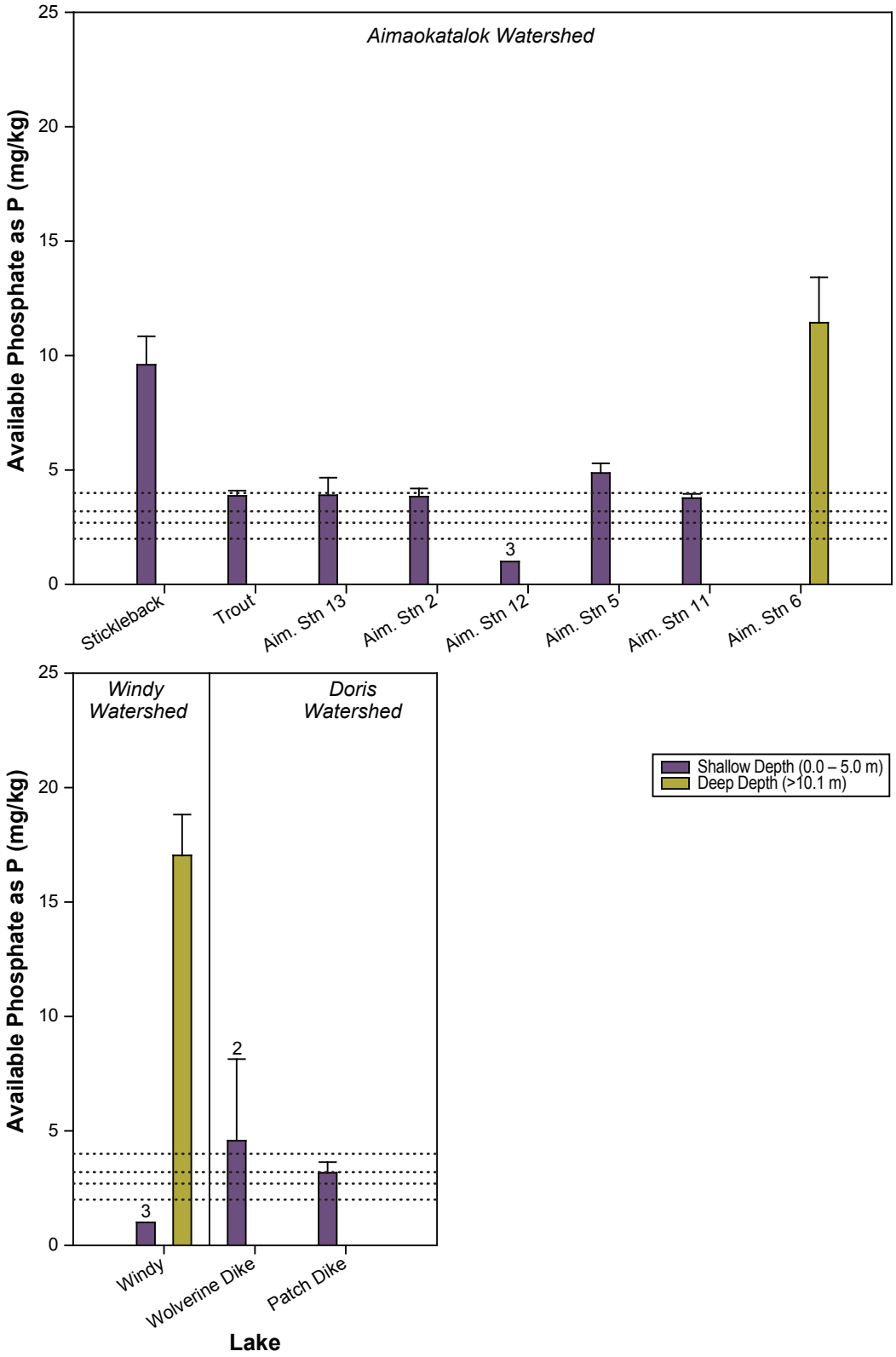
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.10 %); values below the detection limit are plotted at half the detection limit.
Numbers above the bars indicate number of replicates with concentrations below the analytical detection limit; absence of a number indicates all replicates were above the detection limit.
There is no CCME guideline for total organic carbon.

NEWMONT NORTH AMERICA

Total Organic Carbon Concentration in Lake Sediments, Hope Bay Belt Project, 2010

Figure 3.4-2a

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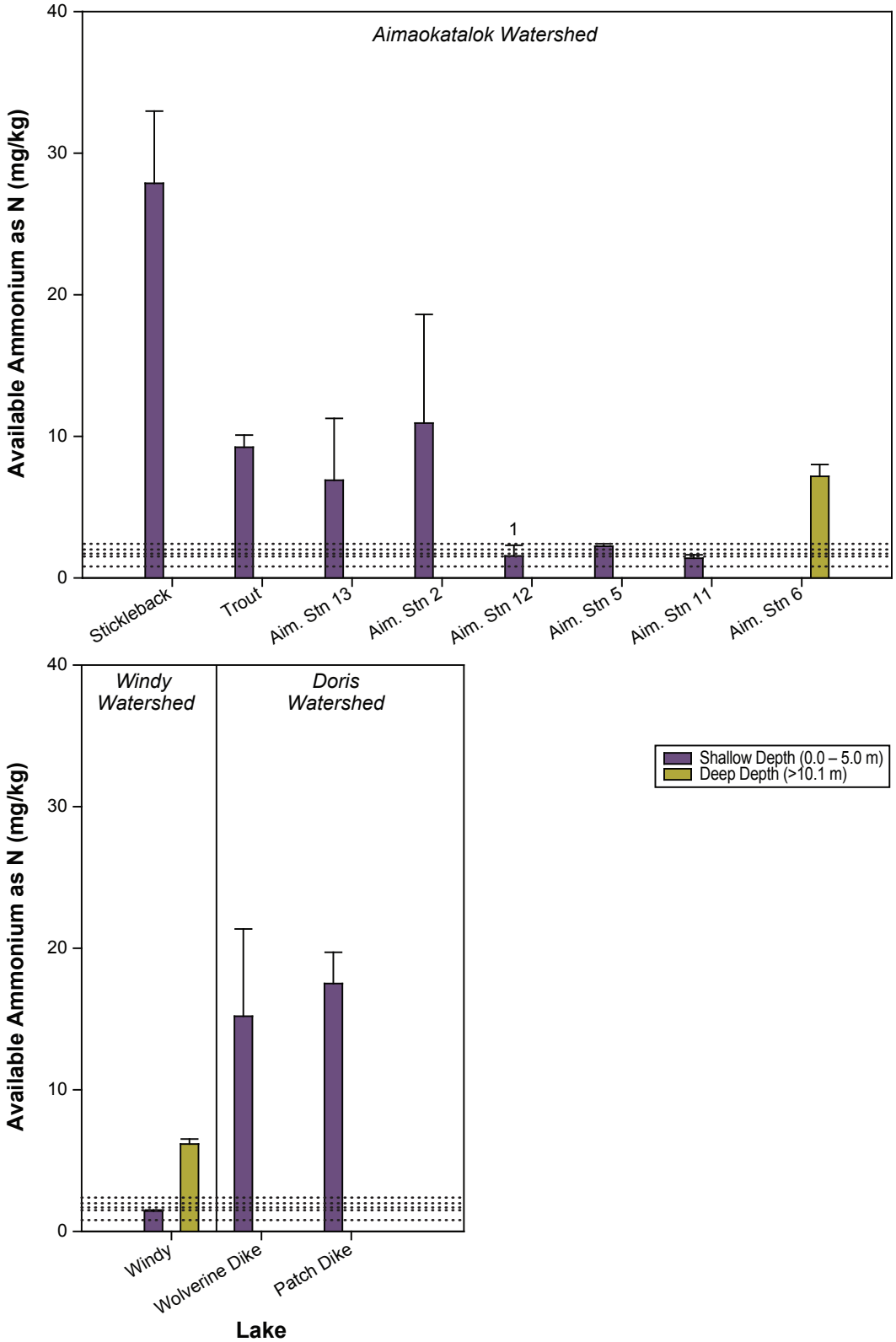
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limits (2.0, 2.7, 3.2, or 4.0 mg/kg); values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit; absence of a number indicates all replicates were above the detection limit.
There is no CCME guideline for available phosphate.

NEWMONT NORTH AMERICA

Available Phosphate Concentration in Lake Sediments, Hope Bay Belt Project, 2010

Figure 3.4-2b

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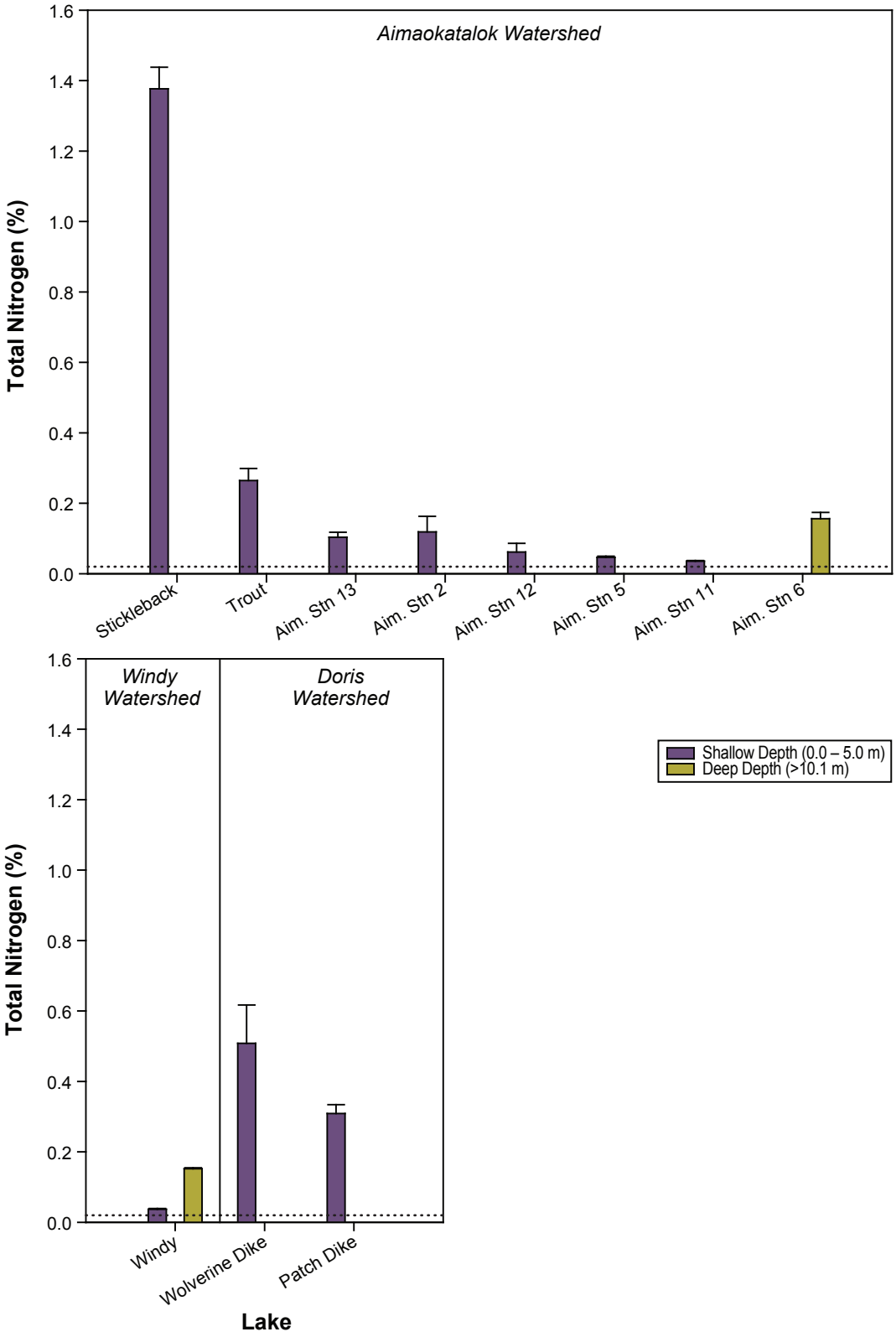
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.8, 1.5, 1.7, 2.0, or 2.4 mg/kg); values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detecion limit; absence of a number indicates all replicates were above the detection limit.
There is no CCME guideline for available ammonium.

NEWMONT NORTH AMERICA

Available Ammonium Concentration in Lake Sediments, Hope Bay Belt Project, 2010

Figure 3.4-2c

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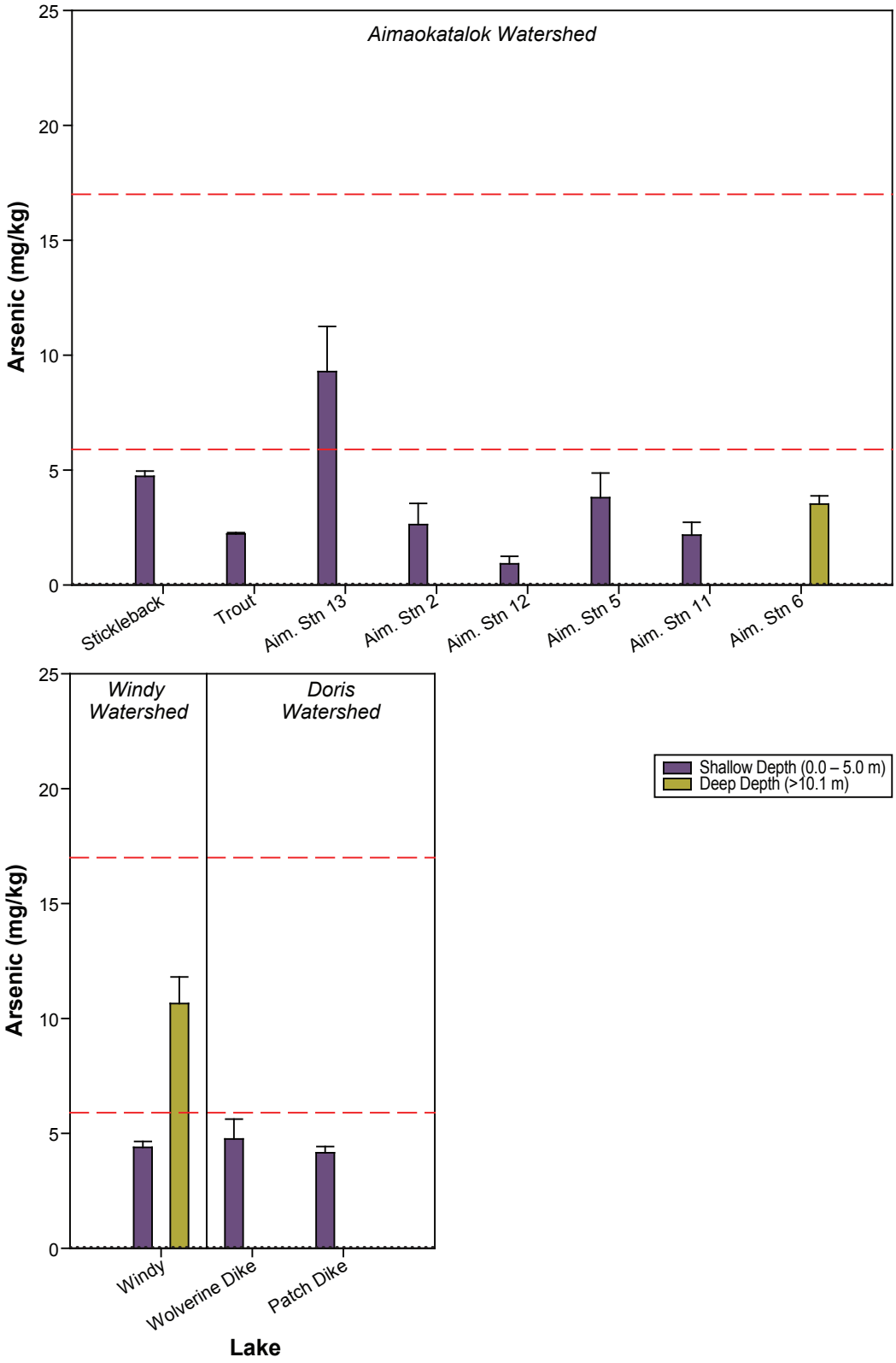
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.02 %); values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit; absence of a number indicates all replicates were above the detection limit.
There is no CCME guideline for total nitrogen.

NEWMONT NORTH AMERICA

Total Nitrogen Concentration in Lake Sediments, Hope Bay Belt Project, 2010

Figure 3.4-2d

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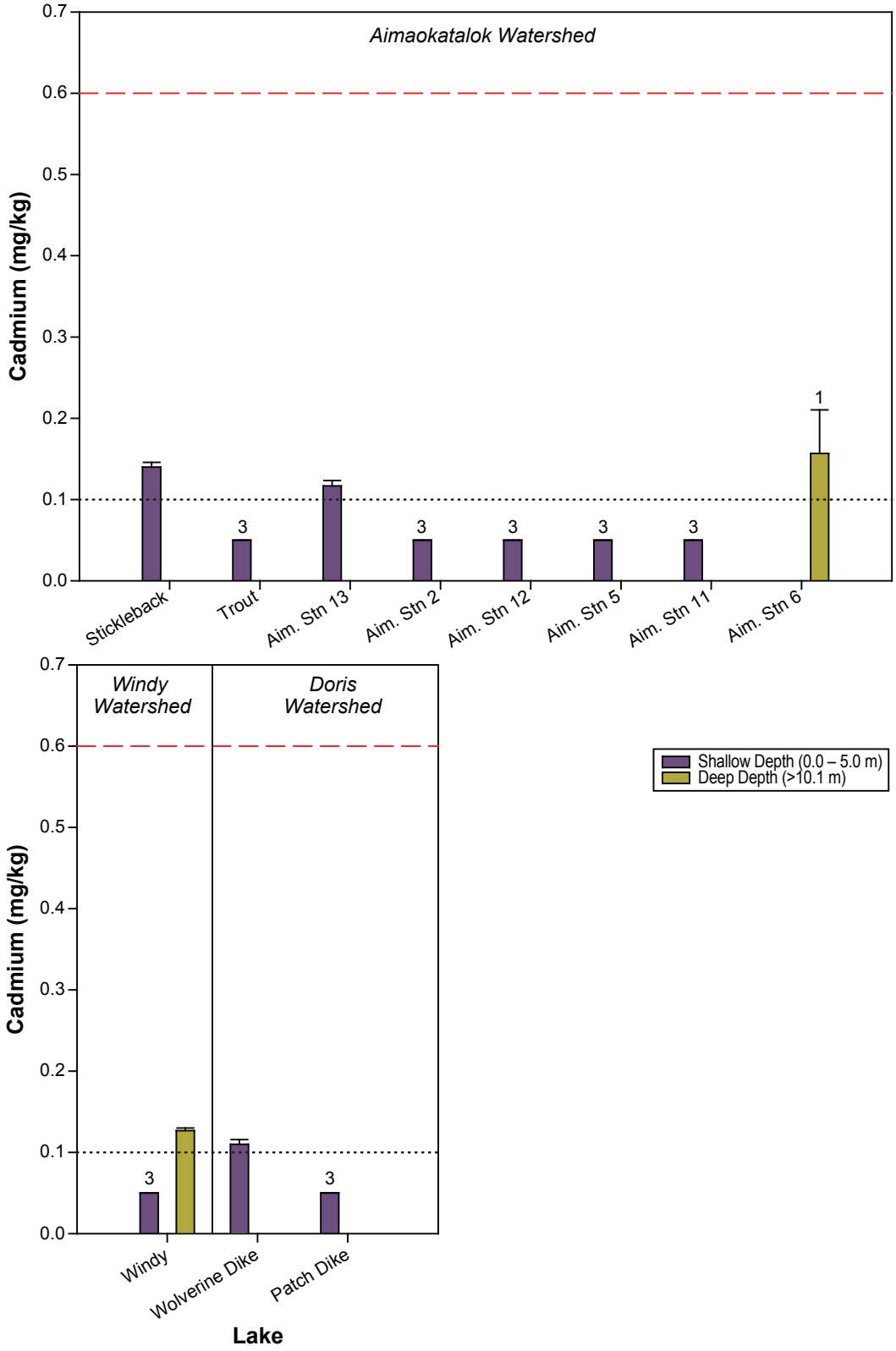
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.05 mg/kg); values below the detection limit are plotted at half the detection limit.
Dashed lines represent the CCME interim sediment quality guideline (5.9 mg/kg) and probable effects level (17 mg/kg).

NEWMONT NORTH AMERICA

Arsenic Concentration in Lake Sediments, Hope Bay Belt Project, 2010

Figure 3.4-2e

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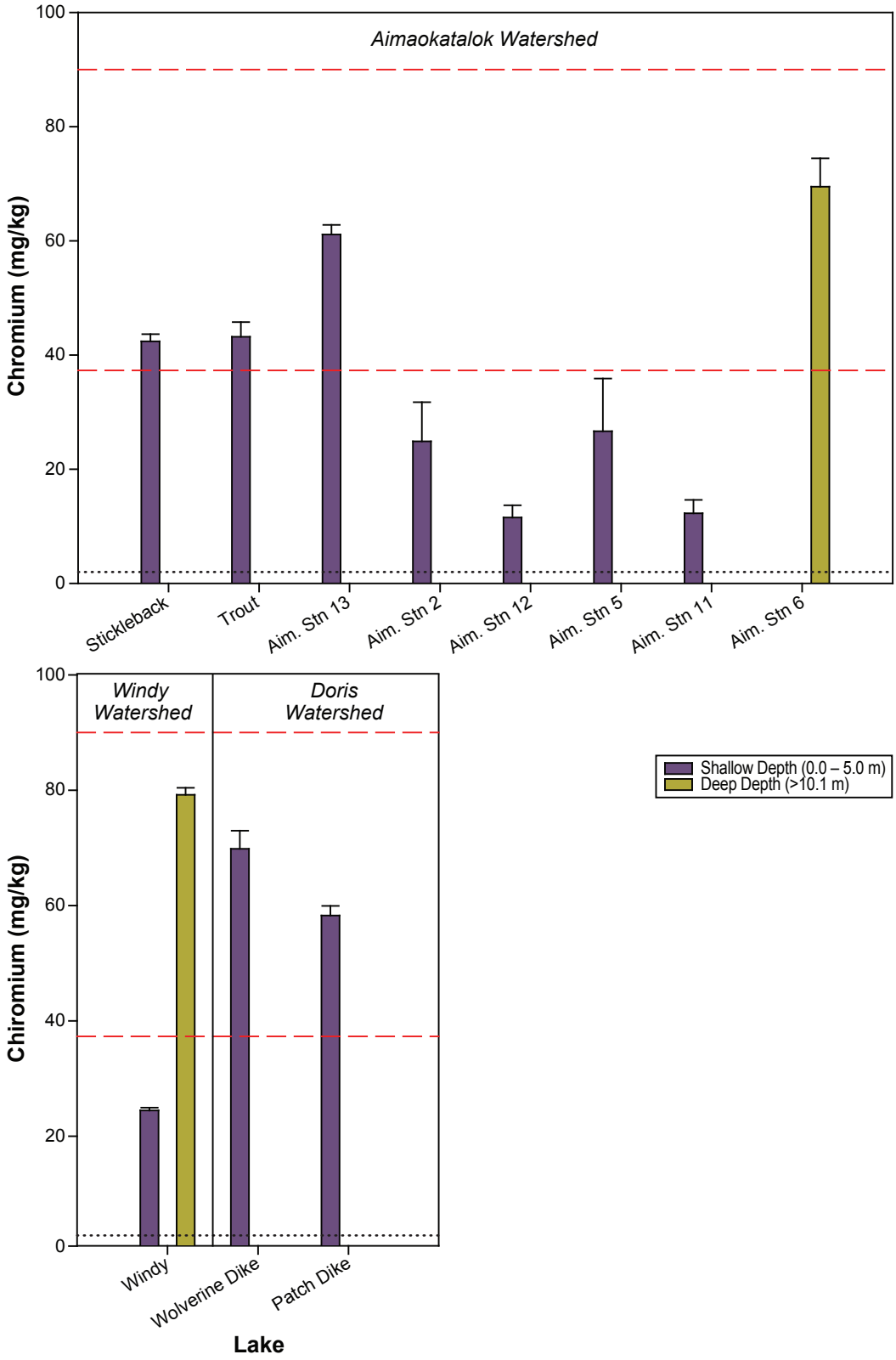
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.1 mg/kg); values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Red dashed line represents the CCME interim sediment quality guideline (0.6 mg/kg); the CCME probable effects level (3.5 mg/kg) is not shown.

NEWMONT NORTH AMERICA

Cadmium Concentration in Lake Sediments, Hope Bay Belt Project, 2010

Figure 3.4-2f

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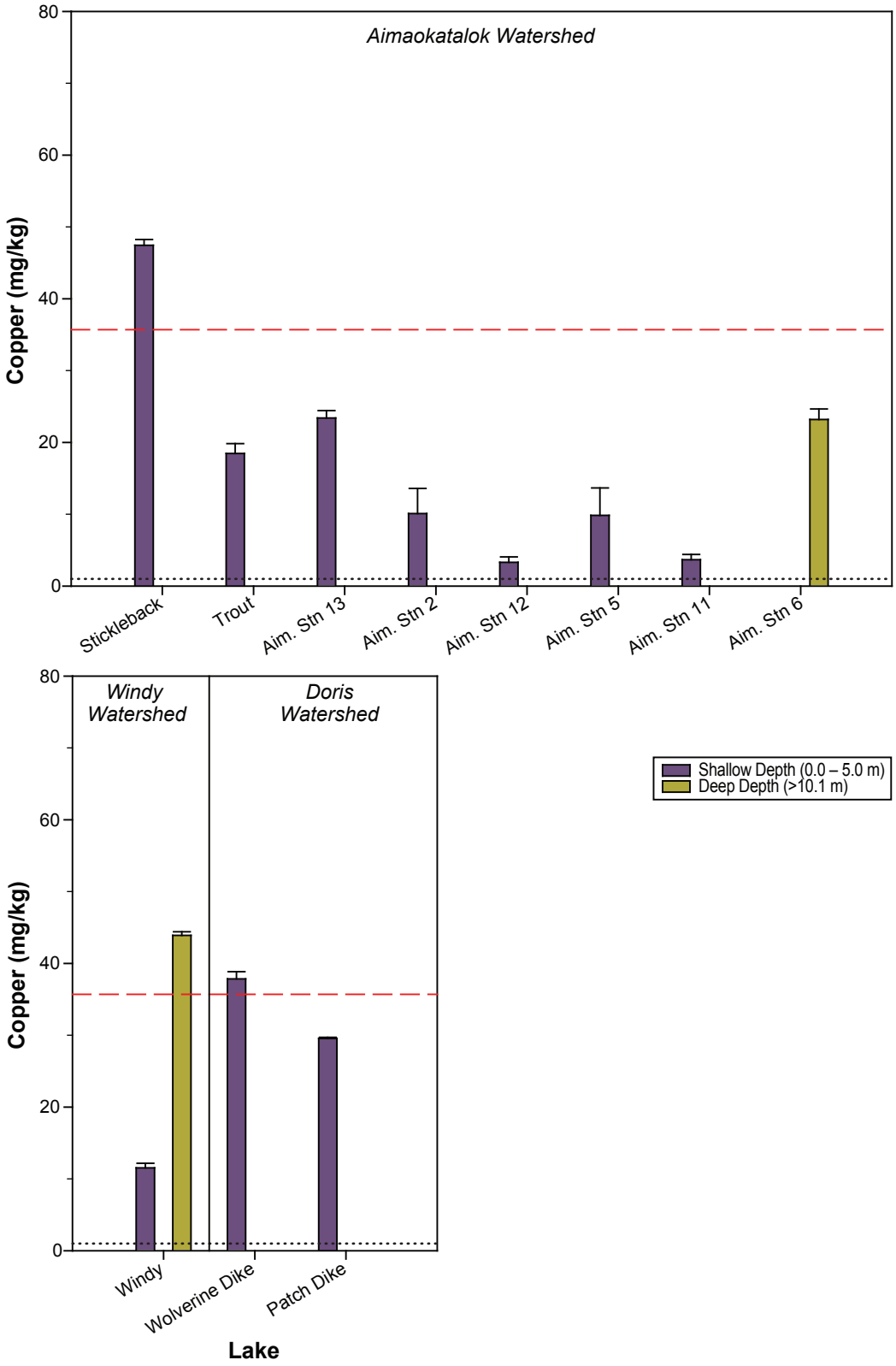
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (2.0 mg/kg); values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Red dashed lines represent the CCME interim sediment quality guideline (37.3 mg/kg) and probable effects level (90 mg/kg).

NEWMONT NORTH AMERICA

Chromium Concentration in Lake Sediments, Hope Bay Belt Project, 2010

Figure 3.4-2g

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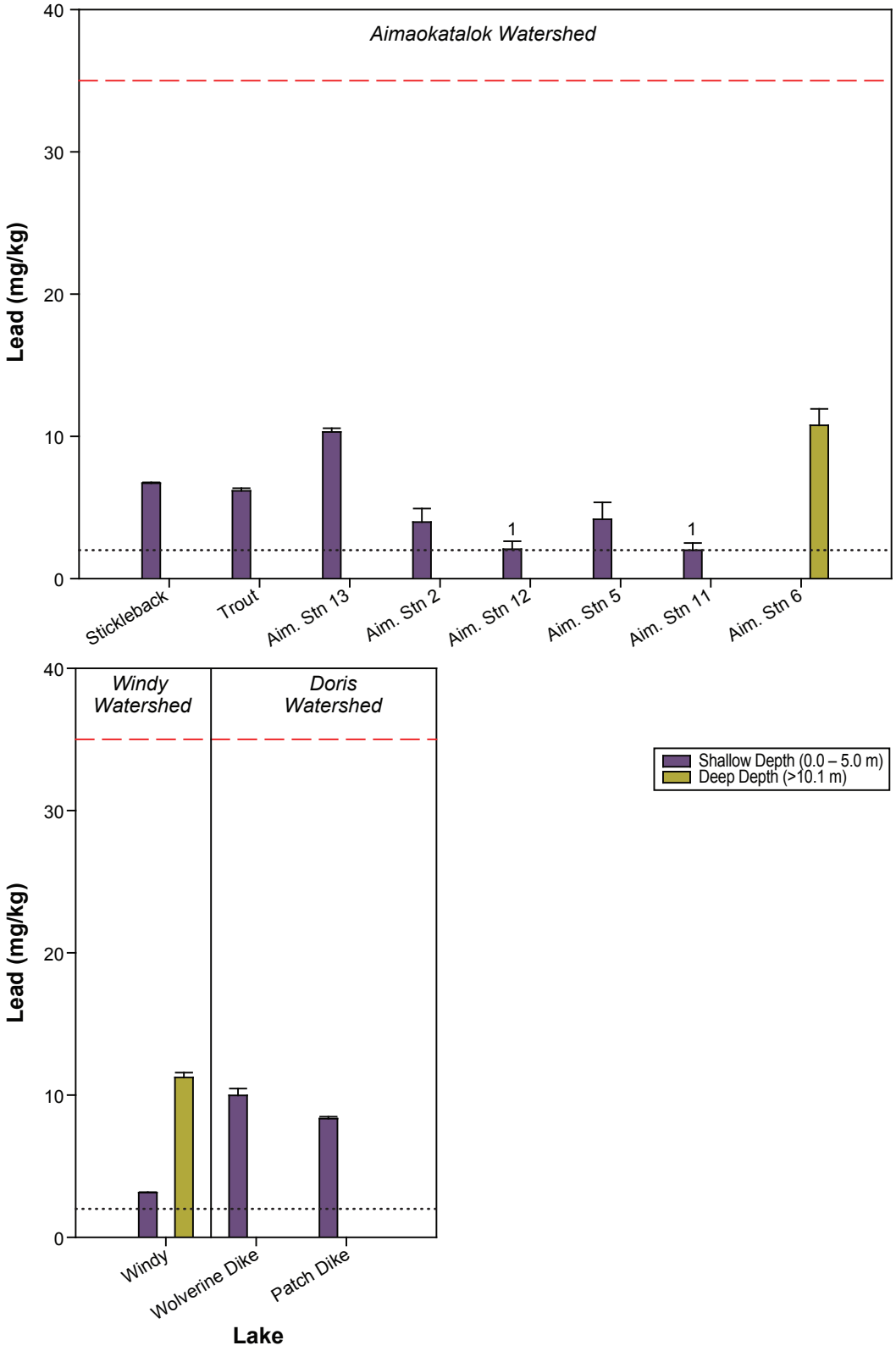
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (1.0 mg/kg); values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates wiwth concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Red dashed line represents the CCME interim sediment quality guideline (35.7 mg/kg); the CCME probable effects level (197 mg/kg) is not shown.

NEWMONT NORTH AMERICA

Copper Concentration in Lake Sediments, Hope Bay Belt Project, 2010

Figure 3.4-2h

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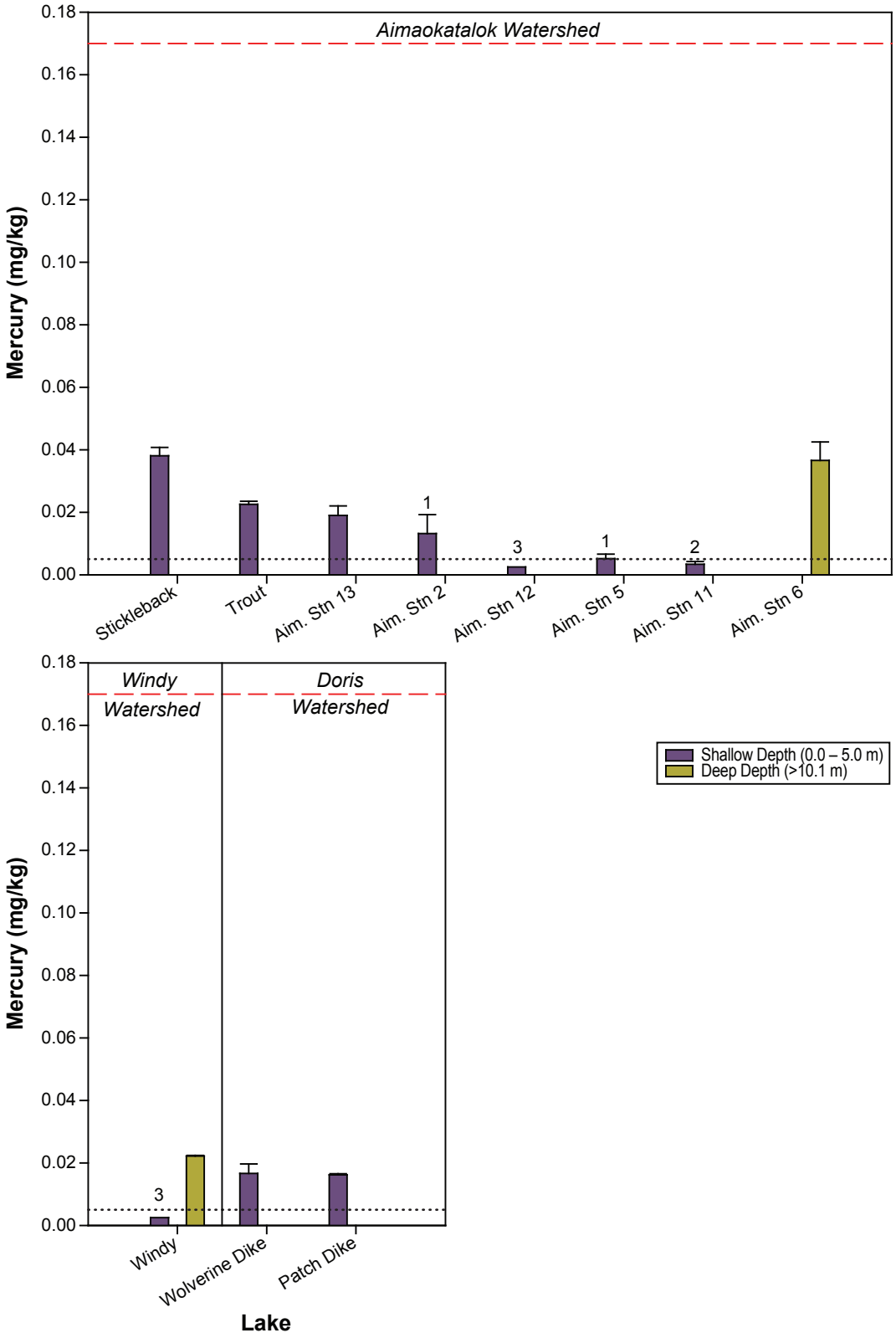
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (2.0 mg/kg); values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Red dashed line represents the CCME interim sediment quality guideline (35 mg/kg); the CCME probable effects level (91.3 mg/kg) is not shown.

NEWMONT NORTH AMERICA

Lead Concentration in Lake Sediments, Hope Bay Belt Project, 2010

Figure 3.4-2i

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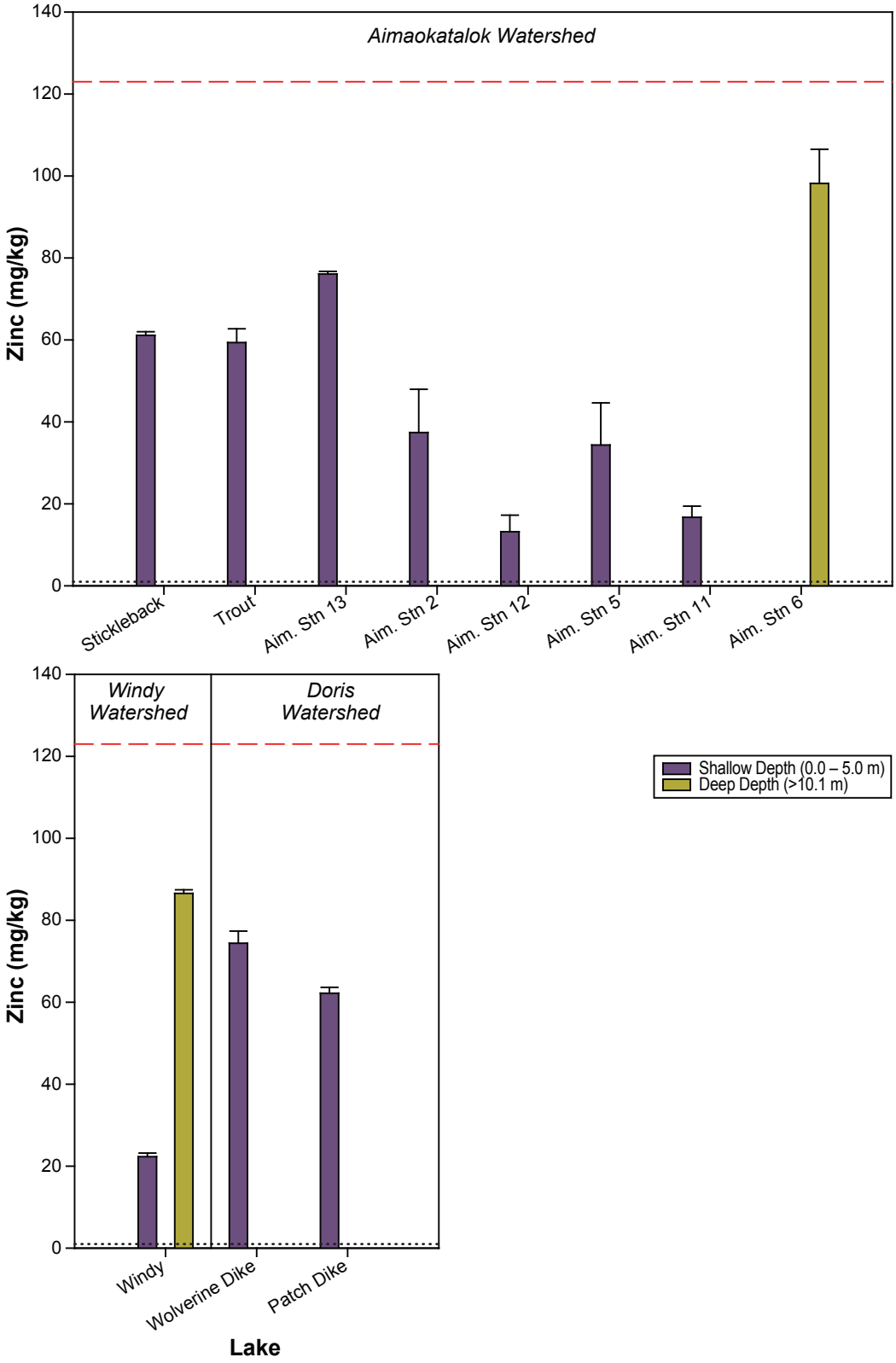
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.005 mg/kg); values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit; absence of a number indicates all replicates were above the detection limit.
Red dashed line represents the CCME interim sediment quality guideline (0.17 mg/kg); the CCME probable effects level (0.486 mg/kg) is not shown.

NEWMONT NORTH AMERICA

Mercury Concentration in Lake Sediments, Hope Bay Belt Project, 2010

Figure 3.4-2j

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Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (1.0 mg/kg); values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Red dashed line represents the CCME interim sediment quality guideline (123 mg/kg); the CCME probable effects level (315 mg/kg) is not shown.

NEWMONT NORTH AMERICA

Zinc Concentration in Lake Sediments, Hope Bay Belt Project, 2010

Figure 3.4-2k

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3.4.2 Spatial Variation

There were few clear trends in parameter concentrations among sites. Within the shallow depth zone category, Stickleback Lake sediments contained the highest concentrations of TOC (Figure 3.4-2a), available ammonium (Figure 3.4-2c), and total nitrogen (Figure 3.2-2d) compared to other lake sites. No obvious watershed-wide patterns were observed.

3.4.3 Comparison with CCME Guidelines

All sediment samples collected were compared to both ISQG and PEL CCME sediment quality guidelines for the protection of aquatic life. Table 3.4-1 presents the percentage of lake sediment samples in which metal concentrations were higher than CCME guidelines, and Table 3.4-2 provides the factor by which average 2010 sediment metal concentrations were higher than CCME guidelines.

Lake sediments were naturally elevated in arsenic, chromium, and copper, and concentrations of these metals were often higher than CCME ISQGs. Chromium concentrations in sediments were higher than the ISQG for chromium (37.3 mg/kg) in at least one replicate at nearly all lake sites sampled, with the exception of Aim. Stn 12, Aim. Stn 11, and Windy Shallow. Average copper concentrations were higher than the ISQG for copper (35.7 mg/kg) in all sediment samples collected from Stickleback and Wolverine lakes. Average arsenic concentrations were higher than the ISQG for arsenic (5.9 mg/kg) in sediments collected from Aim. Stn 13 and Windy Deep, and in one third of Wolverine Lake replicates. Although concentrations of arsenic, chromium, and copper in lake sediments frequently exceeded CCME ISQGs, concentrations of these metals were always below the CCME PELs.

3.4.4 Annual Variation

Only historical sampling locations that were also sampled in 2010 were included in the comparison of annual sediment quality data shown in Figures 3.4-3a to 3.4-3k. Note that historical sampling locations may not correspond exactly with those sampled in 2010, and this, in addition to methodological differences, may contribute to variability observed among years (see Table 2.14-3 and Figures 2.14-2a to 2.14-2c for historical sampling methodologies and locations).

Historical lake sediment quality data are available from 1996, 1997, 2007 and 2009, although not all parameters analyzed in 2010 were analyzed historically. Available phosphate, available ammonium, and total nitrogen were not sampled prior to 2009. For some sediment quality parameters, there was high variability between years, making within-site annual variability comparable in magnitude to between-site variability (e.g., TOC, arsenic, cadmium). Historical data show that lake sediment arsenic, chromium, and copper concentrations have frequently exceeded CCME guidelines (Figures 3.4-3a to 3.4-3k).

3.5 STREAM AND RIVER SEDIMENT QUALITY

Stream and river sediment samples were collected in August 2010 (see Table 2.1-5 for locations and dates of sample collection). All sediment samples collected were compared to CCME sediment quality guidelines for the protection of aquatic life: the interim sediment quality guidelines (ISQGs) and the probable effects levels (PELs; CCME 2002). The more conservative ISQGs are levels below which adverse biological effects are rarely observed, whereas the higher PELs correspond to concentrations above which negative effects frequently occur. All raw 2010 sediment quality data are presented in Appendix 3.5-1. Some historical sediment quality data are available for some streams and rivers in the study area (Figures 2.14-2a to 2.14-2c; Table 2.14-4).

Table 3.4-1. Lake Sediment Quality, Percent of Samples in which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2010

Lake	Total Number of Samples Collected	CCME Guideline value[a] (mg/kg):	Percent of Samples Higher than ISQG[b] Guidelines							Percent of Samples Higher than PEL[c] Guidelines						
			Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Zinc (Zn)	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Zinc (Zn)
			5.9	0.6	37.3	35.7	35	0.17	123	17	3.5	90	197	91.3	0.486	315
Aimaokatalok																
Stickleback	3		-	-	100	100	-	-	-	-	-	-	-	-	-	-
Trout	3		-	-	100	-	-	-	-	-	-	-	-	-	-	-
Aim. Stn 13	3		100	-	100	-	-	-	-	-	-	-	-	-	-	-
Aim. Stn 2	3		-	-	33.3	-	-	-	-	-	-	-	-	-	-	-
Aim. Stn12	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aim. Stn 5	3		-	-	33.3	-	-	-	-	-	-	-	-	-	-	-
Aim. Stn 11	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aim. Stn 6	3		-	-	100	-	-	-	-	-	-	-	-	-	-	-
Windy																
Windy Shallow	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Windy Deep	3		100	-	100	100	-	-	-	-	-	-	-	-	-	-
Doris																
Wolverine Dike	3		33.3	-	100	100	-	-	-	-	-	-	-	-	-	-
Patch Dike	3		-	-	100	-	-	-	-	-	-	-	-	-	-	-

All values represent percentages of 2010 samples that are both higher than the CCME guidelines and above analytical detection limits.

a) Canadian sediment quality guidelines for the protection of aquatic life (CCME 2002)

b) ISQG = Interim sediment quality guideline

c) PEL = Probable effects level

Table 3.4-2. Lake Sediment Quality, Factor by which Average Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2010

Lake	Total Number of Samples Collected	CCME Guideline Value[a]: (mg/kg):	Factor by which Samples are Higher than ISQG[b] Guidelines							Factor by which Samples are Higher than PEL[c] Guidelines						
			Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Zinc (Zn)	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Zinc (Zn)
			5.9	**0.6**	**37.3**	**35.7**	**35**	**0.17**	**123**	**17**	**3.5**	**90**	**197**	**91.3**	**0.486**	**315**
Aimaokatalok																
Stickleback	3		-	-	1.13	1.33	-	-	-	-	-	-	-	-	-	-
Trout	3		-	-	1.16	-	-	-	-	-	-	-	-	-	-	-
Aim. Stn 13	3		1.57	-	1.64	-	-	-	-	-	-	-	-	-	-	-
Aim. Stn 2	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aim. Stn12	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aim. Stn 5	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aim. Stn 11	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aim. Stn 6	3		-	-	1.86	-	-	-	-	-	-	-	-	-	-	-
Windy																
Windy Shallow	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Windy Deep	3		1.81	-	2.12	1.23	-	-	-	-	-	-	-	-	-	-
Doris																
Wolverine Dike	3		-	-	1.87	1.06	-	-	-	-	-	-	-	-	-	-
Patch Dike	3		-	-	1.56	-	-	-	-	-	-	-	-	-	-	-

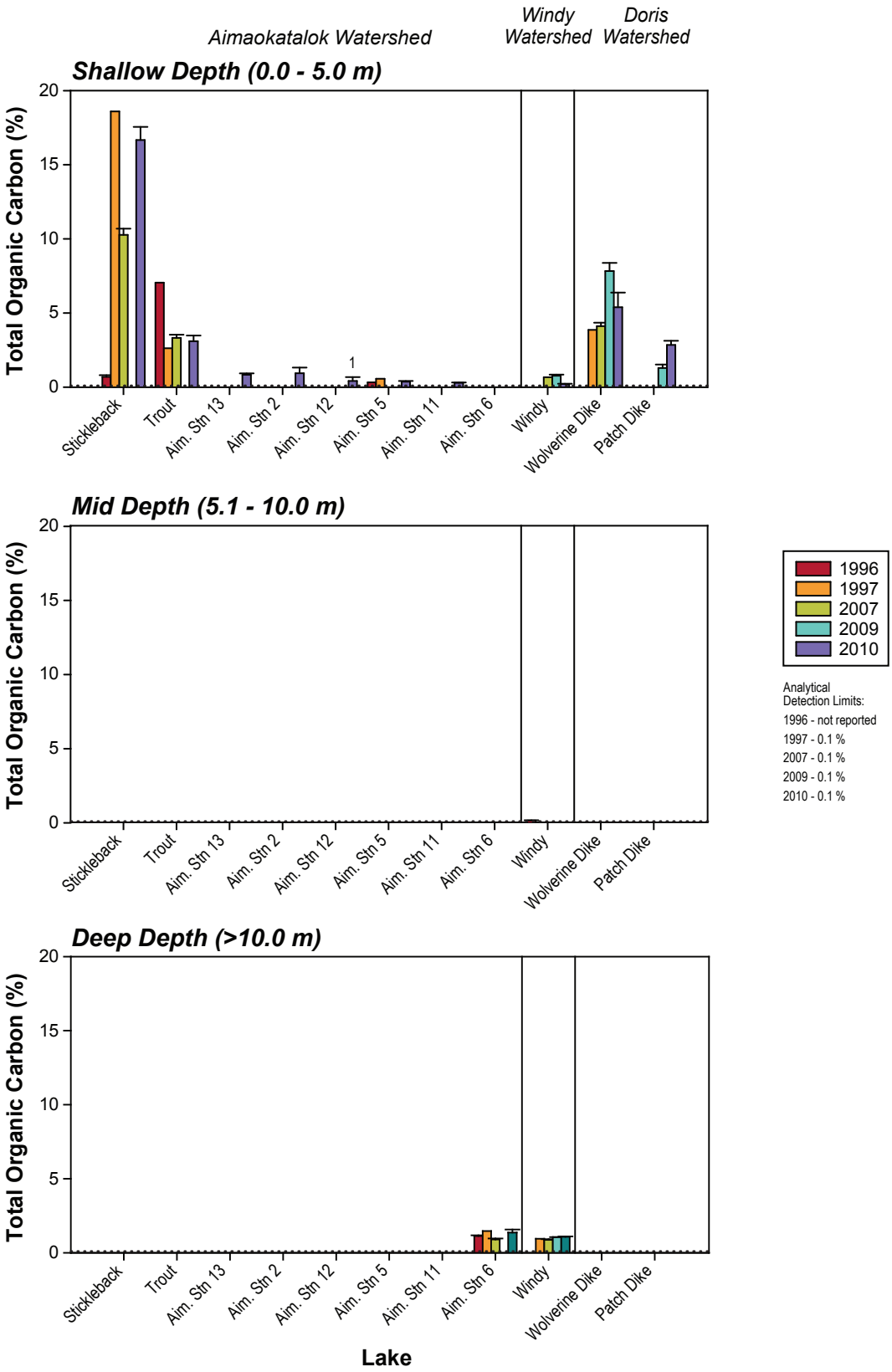
All values represent the factor by which 2010 lake averages are higher than CCME guidelines.

Even though a percentage of samples may be higher than a guideline amount, the calculated lake average may not be higher than a guideline amount.

a) Canadian sediment quality guidelines for the protection of aquatic life (CCME 2002)

b) ISQG = Interim sediment quality guideline

c) PEL = Probable effects level



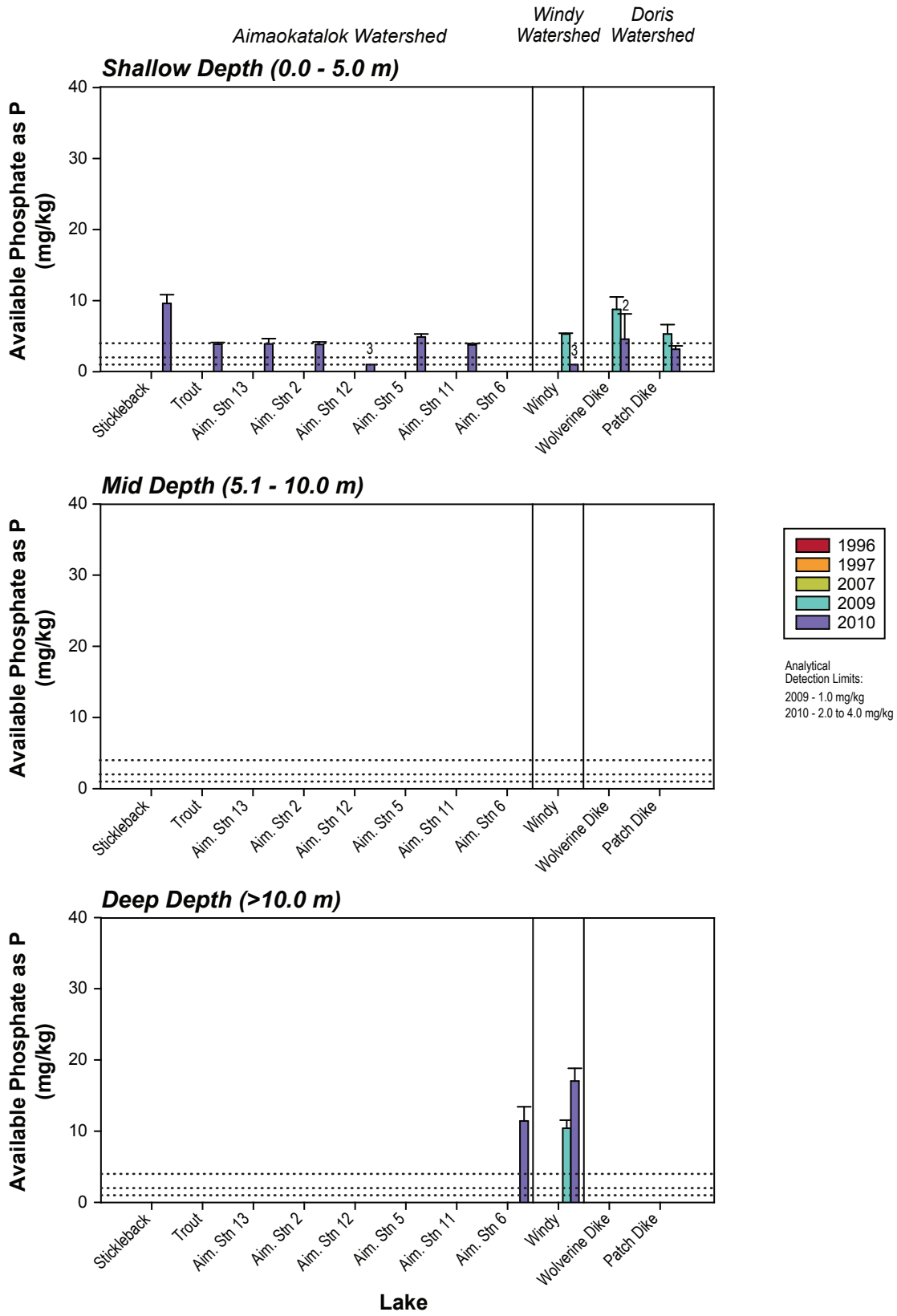
Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit; absence of a number indicates all replicates were above the detection limit.
There is no CCME guideline for total organic carbon.

NEWMONT NORTH AMERICA

Average Annual Total Organic Carbon Concentration in Lake Sediments, Hope Bay Belt Project, 1996 - 2010

Figure 3.4-3a

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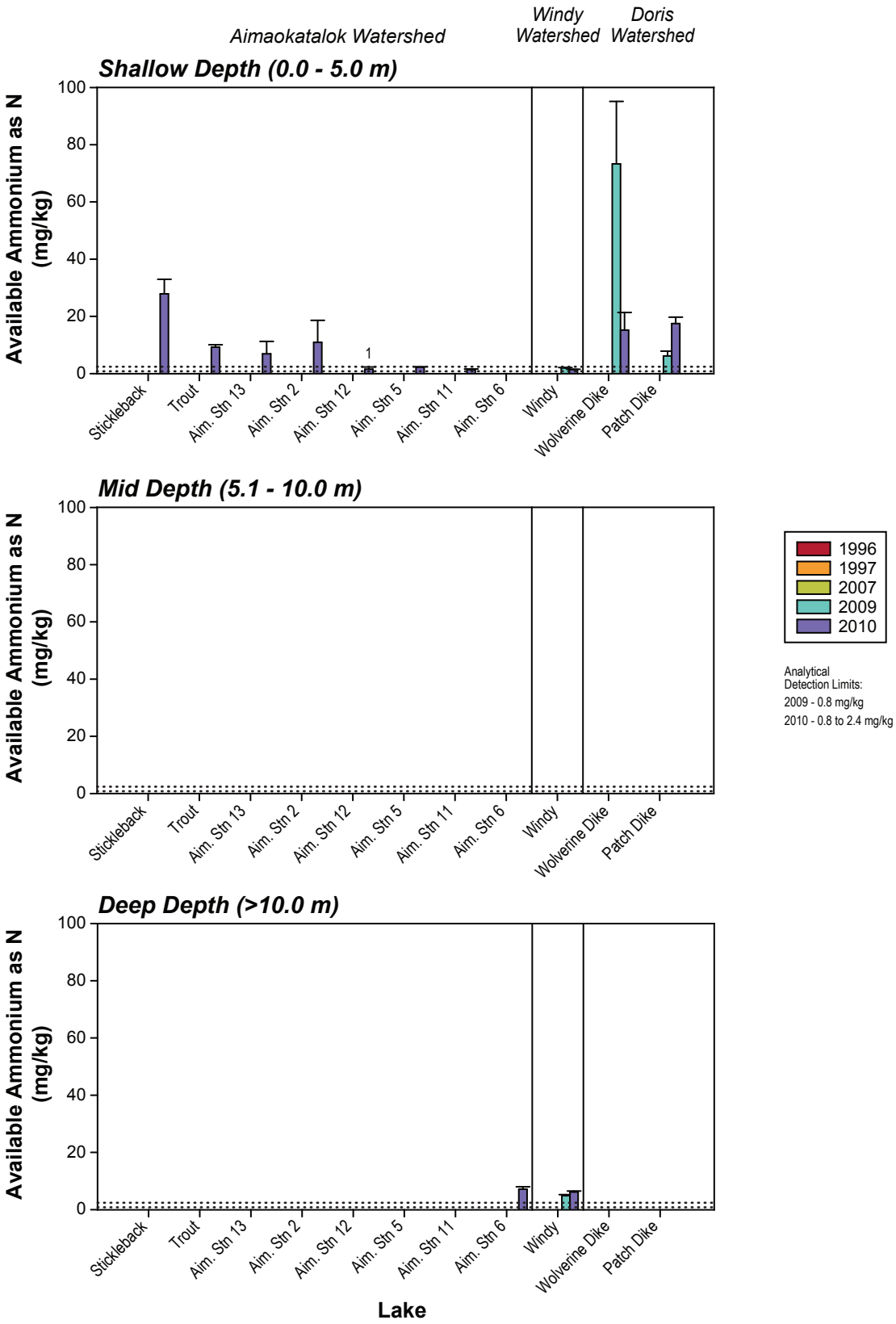
Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit; absence of a number indicates all replicates were above the detection limit.
There is no CCME guideline for available phosphate.

NEWMONT NORTH AMERICA

Average Annual Available Phosphate Concentration in Lake Sediments, Hope Bay Belt Project, 1996 - 2010

Figure 3.4-3b

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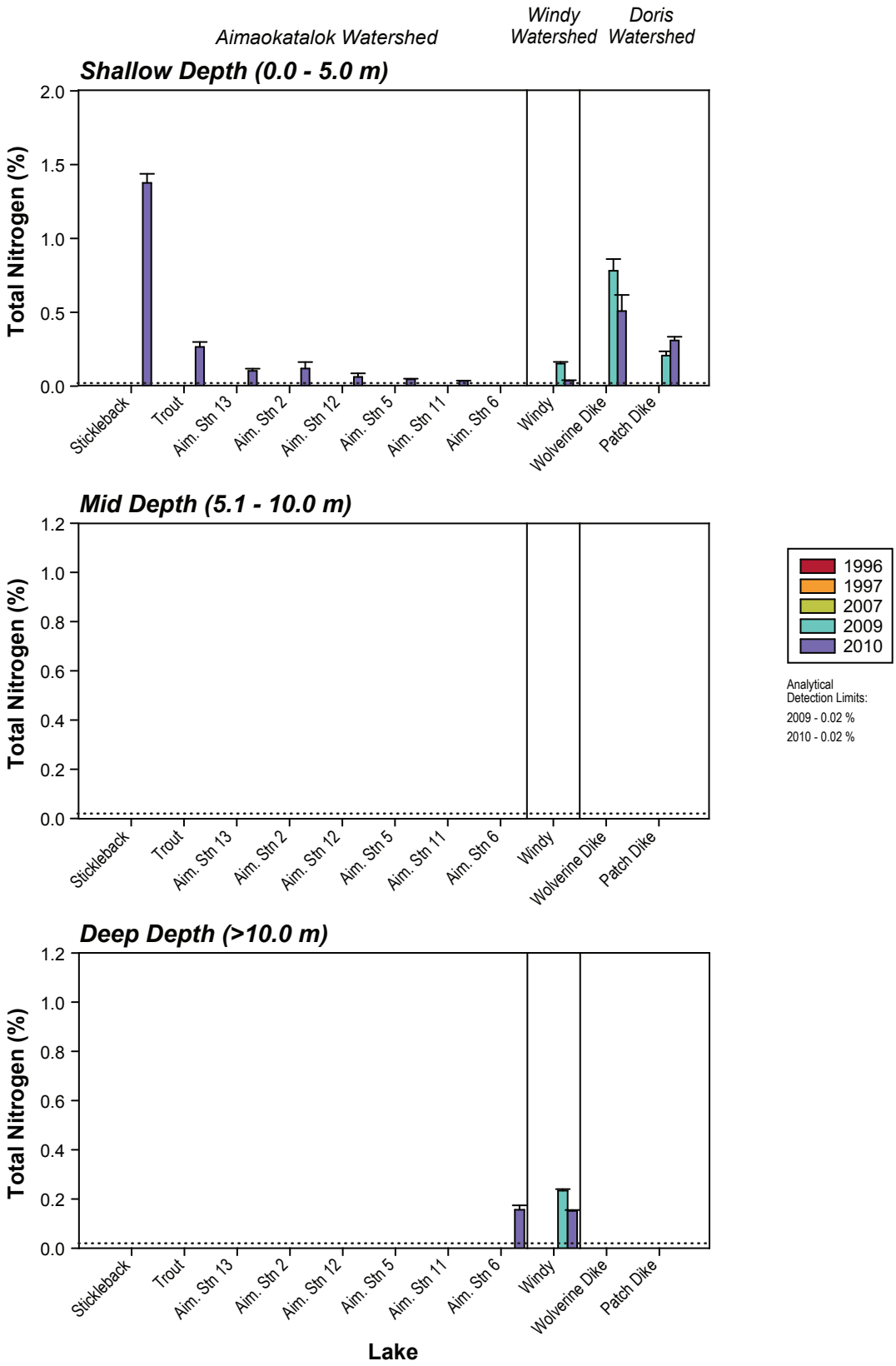
Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
There is no CCME guideline for available ammonium.

NEWMONT NORTH AMERICA

Average Annual Available Ammonium Concentration in Lake Sediments, Hope Bay Belt Project, 1996 - 2010

Figure 3.4-3c

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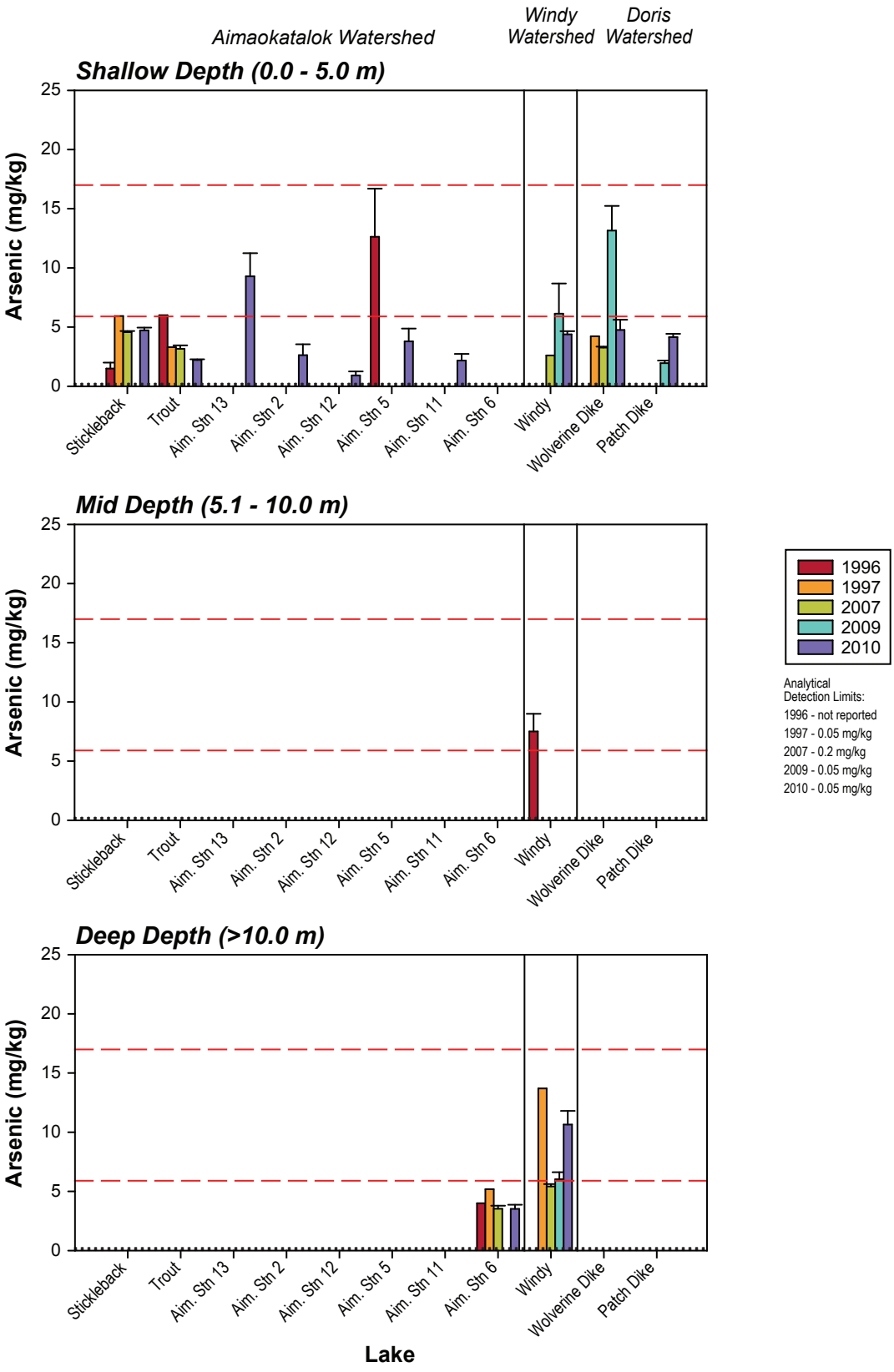
Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
There is no CCME guideline for total nitrogen.

NEWMONT NORTH AMERICA

Average Annual Total Nitrogen Concentration in Lake Sediments, Hope Bay Belt Project, 1996 - 2010

Figure 3.4-3d

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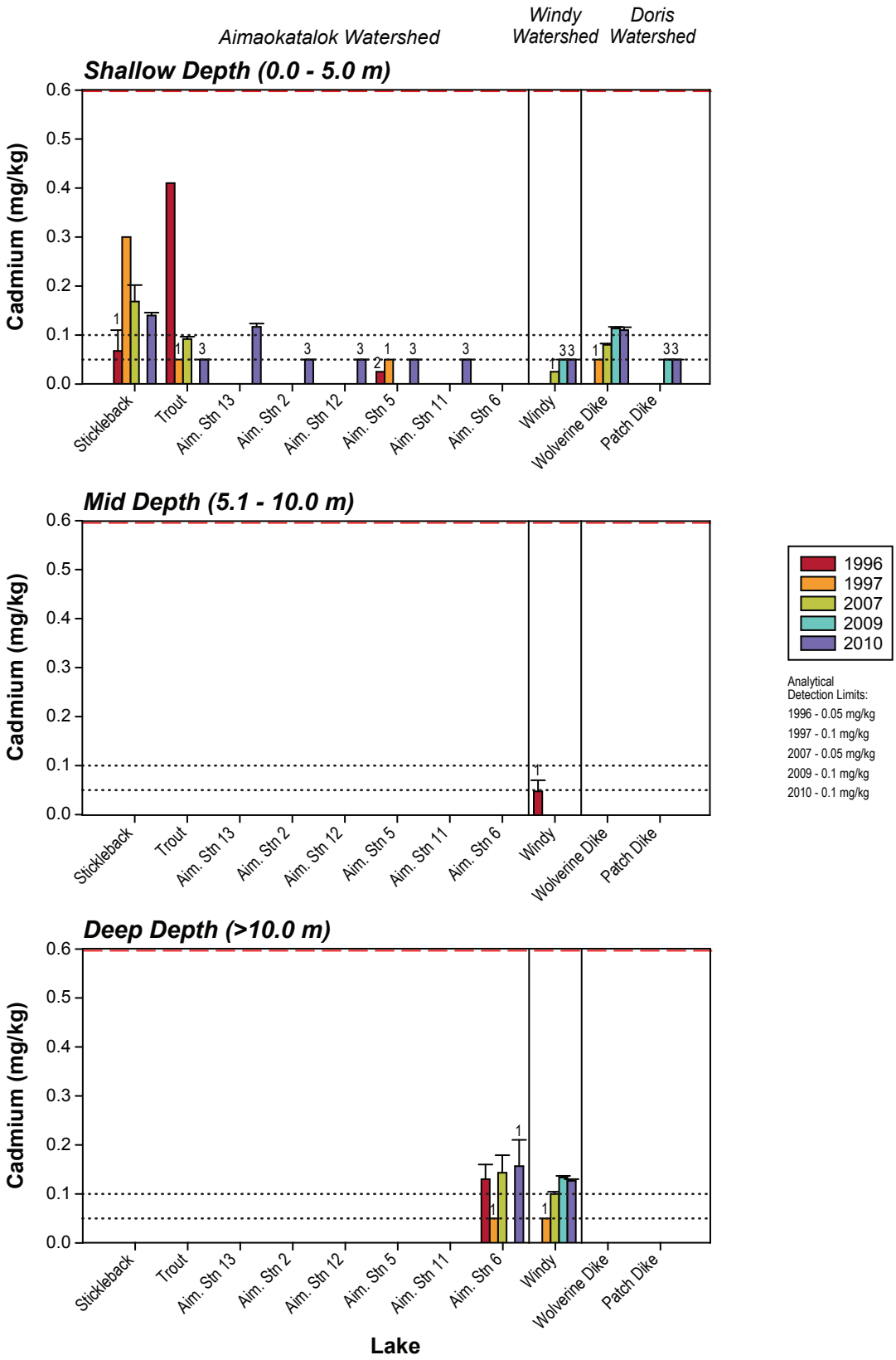
Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit; absence of a number indicates all replicates were above the detection limit.
Red dashed lines represent CCME interim sediment quality guideline (5.9 mg/kg) and probable effects level (17 mg/kg).

NEWMONT NORTH AMERICA

Average Annual Arsenic Concentration in Lake Sediments, Hope Bay Belt Project, 1996 - 2010

Figure 3.4-3e

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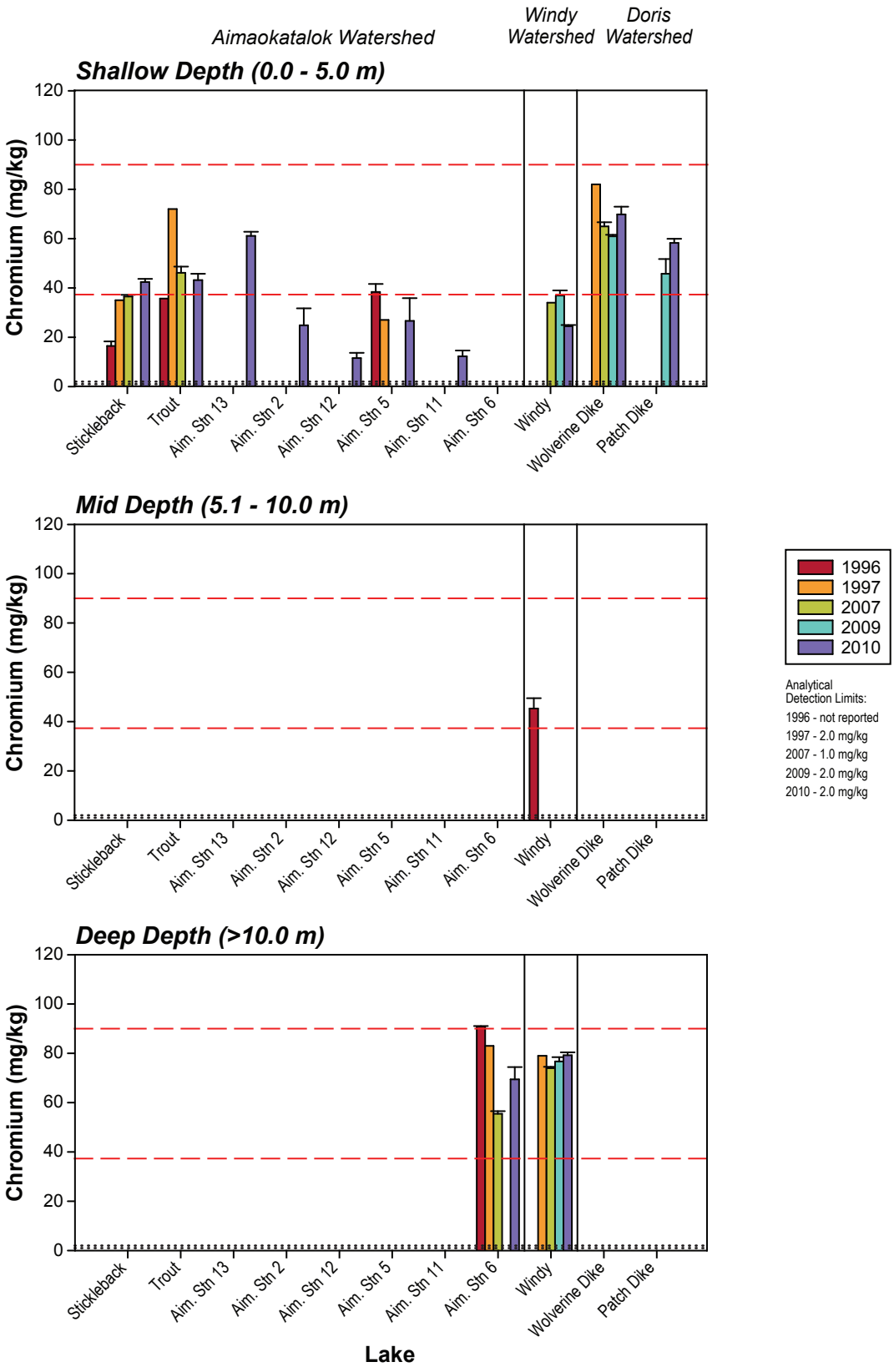
Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit; absence of a number indicates all replicates were above the detection limit.
Red dashed line represents the CCME interm sediment quality guideline (0.6 mg/kg); the CCME probable effects level (3.5 mg/kg) is not shown.

NEWMONT NORTH AMERICA

Average Annual Cadmium Concentration in Lake Sediments, Hope Bay Belt Project, 1996 - 2010

Figure 3.4-3f

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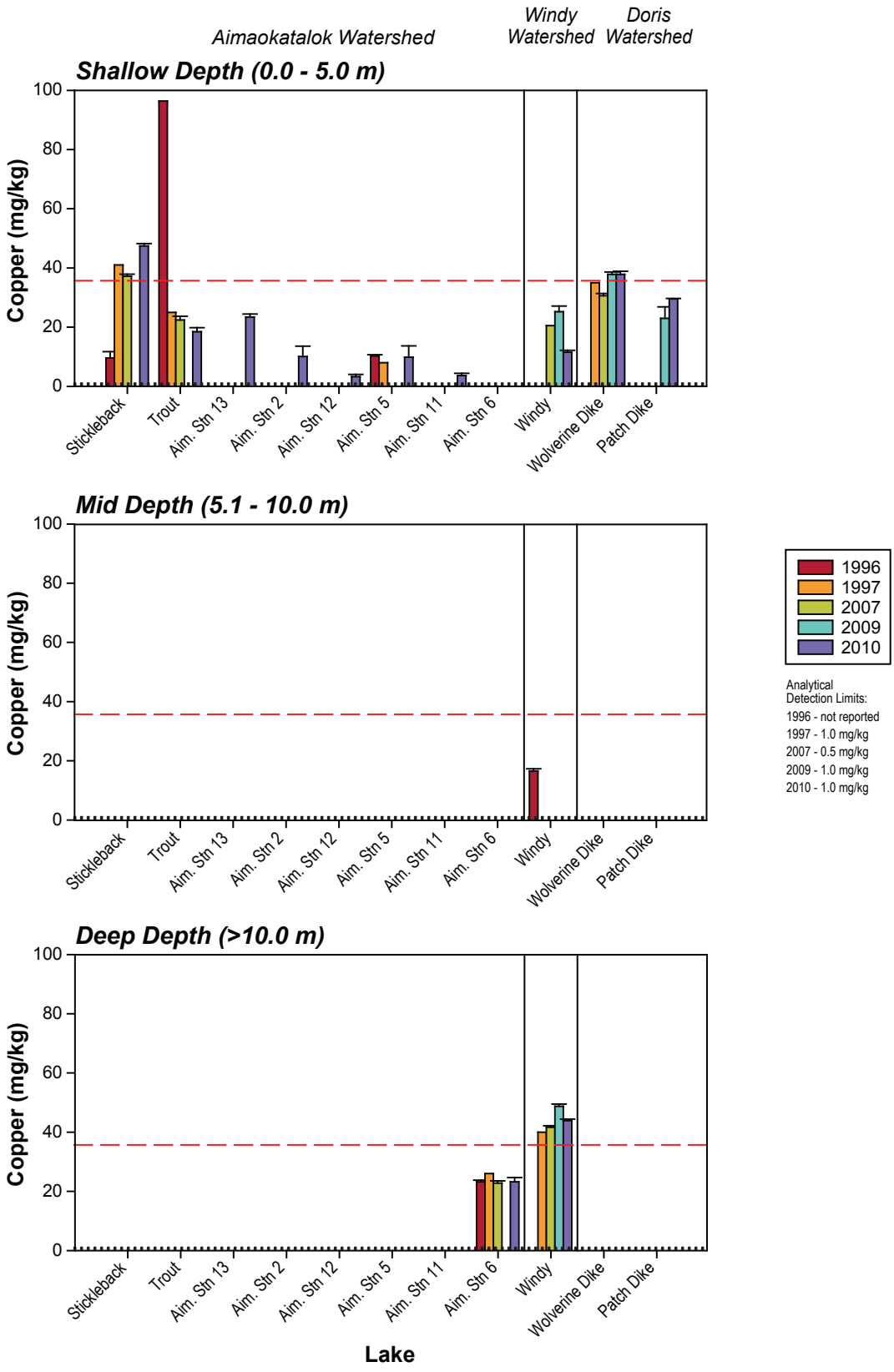
Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit; absence of a number indicates all replicates were above the detection limit.
Red dashed lines represent the CCME interim sediment quality guideline (37.3 mg/kg) and probable effects level (90 mg/kg).

NEWMONT NORTH AMERICA

Average Annual Chromium Concentration in Lake Sediments, Hope Bay Belt Project, 1996 - 2010

Figure 3.4-3g

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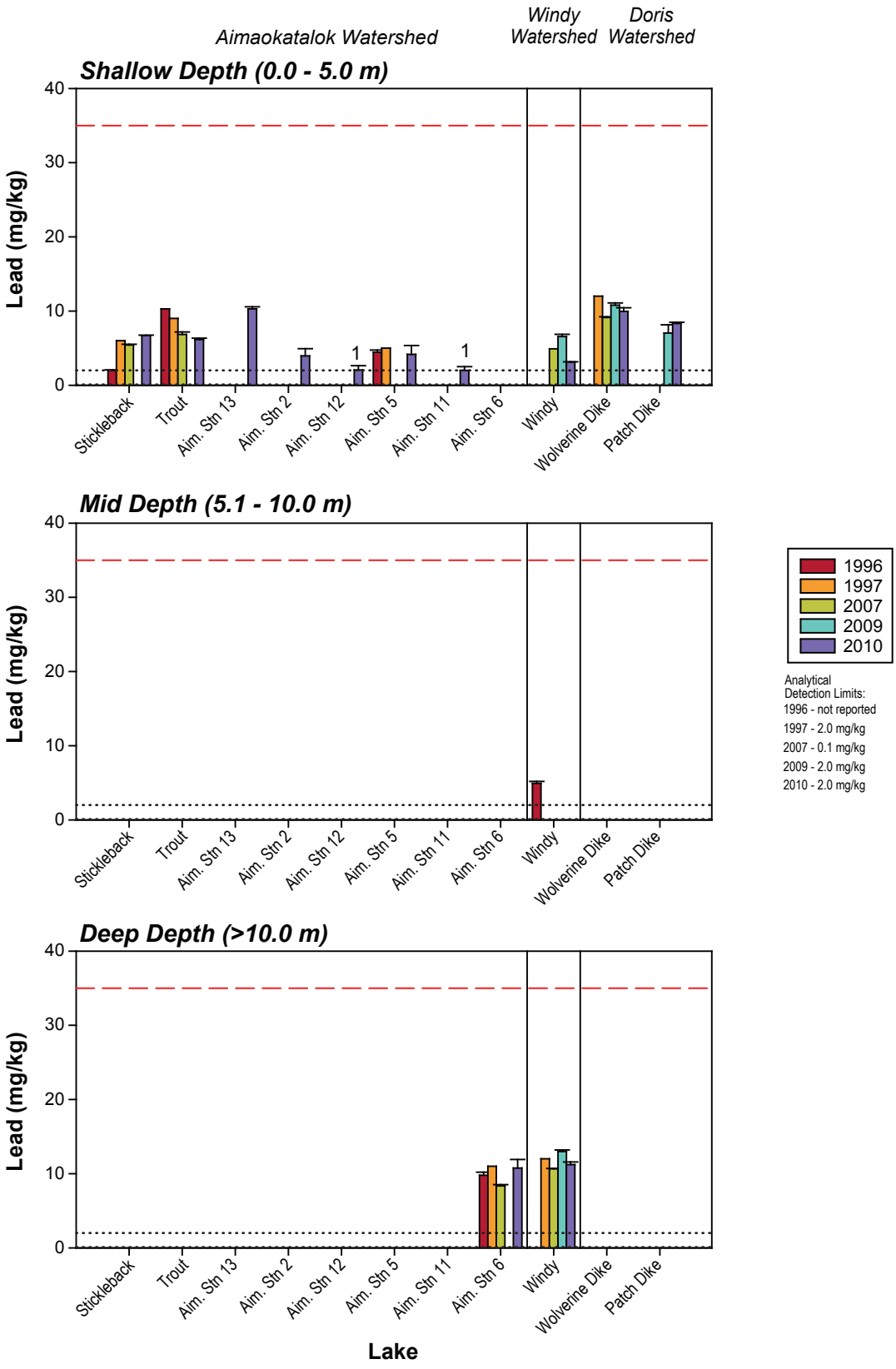
Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit; absence of a number indicates all replicates were above the detection limit.
Red dashed line represents the CCME interm sediment quality guideline (35.7 mg/kg); the CCME probable effects level (197 mg/kg) is not shown.

NEWMONT NORTH AMERICA

Average Annual Copper Concentration in Lake Sediments, Hope Bay Belt Project, 1996 - 2010

Figure 3.4-3h

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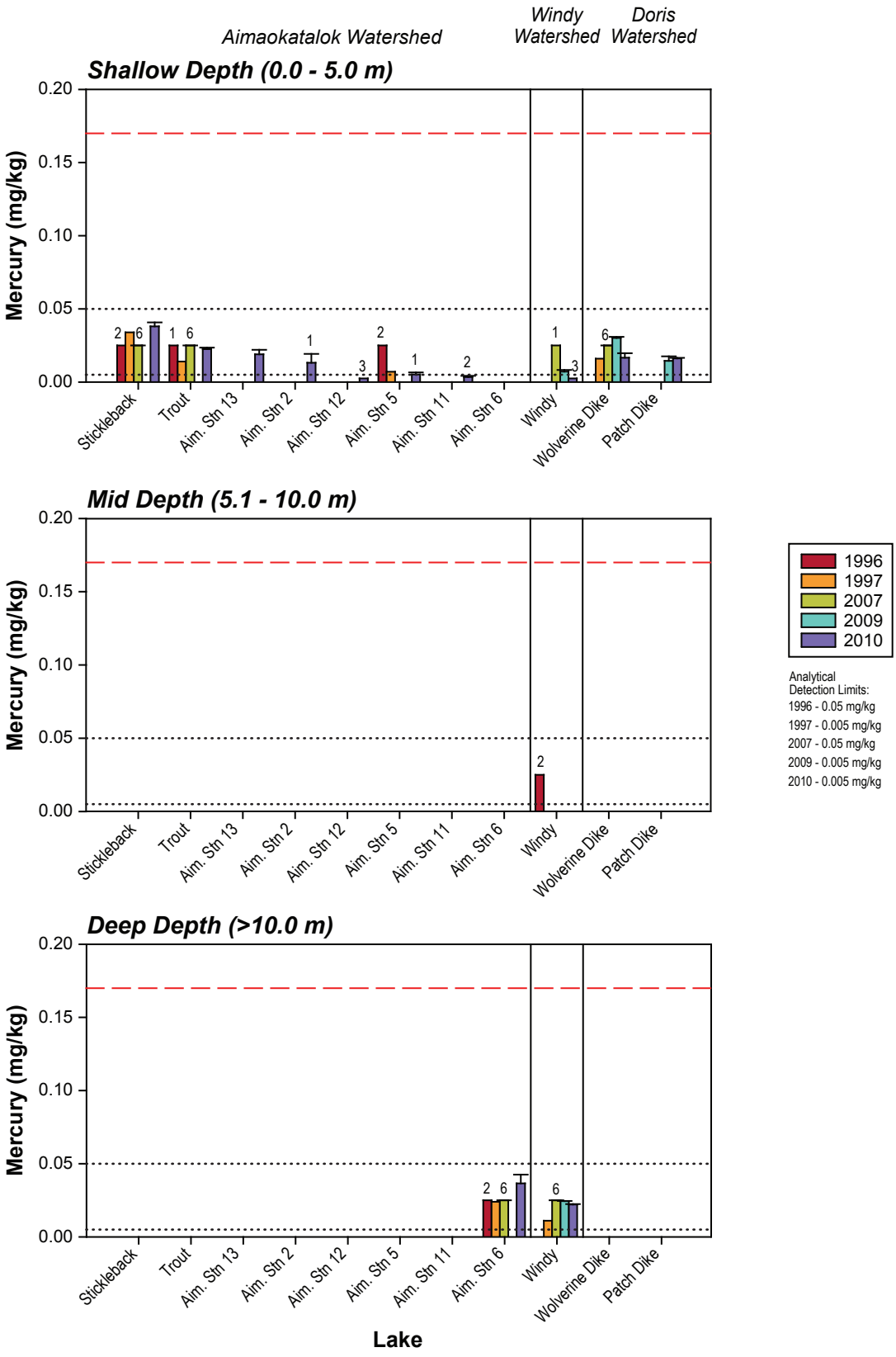
Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit; absence of a number indicates all replicates were above the detection limit.
Red dashed line represents the CCME interm sediment quality guideline (35 mg/kg); the CCME probable effects level (91.3) is not shown.

NEWMONT NORTH AMERICA

Average Annual Lead Concentration in Lake Sediments, Hope Bay Belt Project, 1996 - 2010

Figure 3.4-3i

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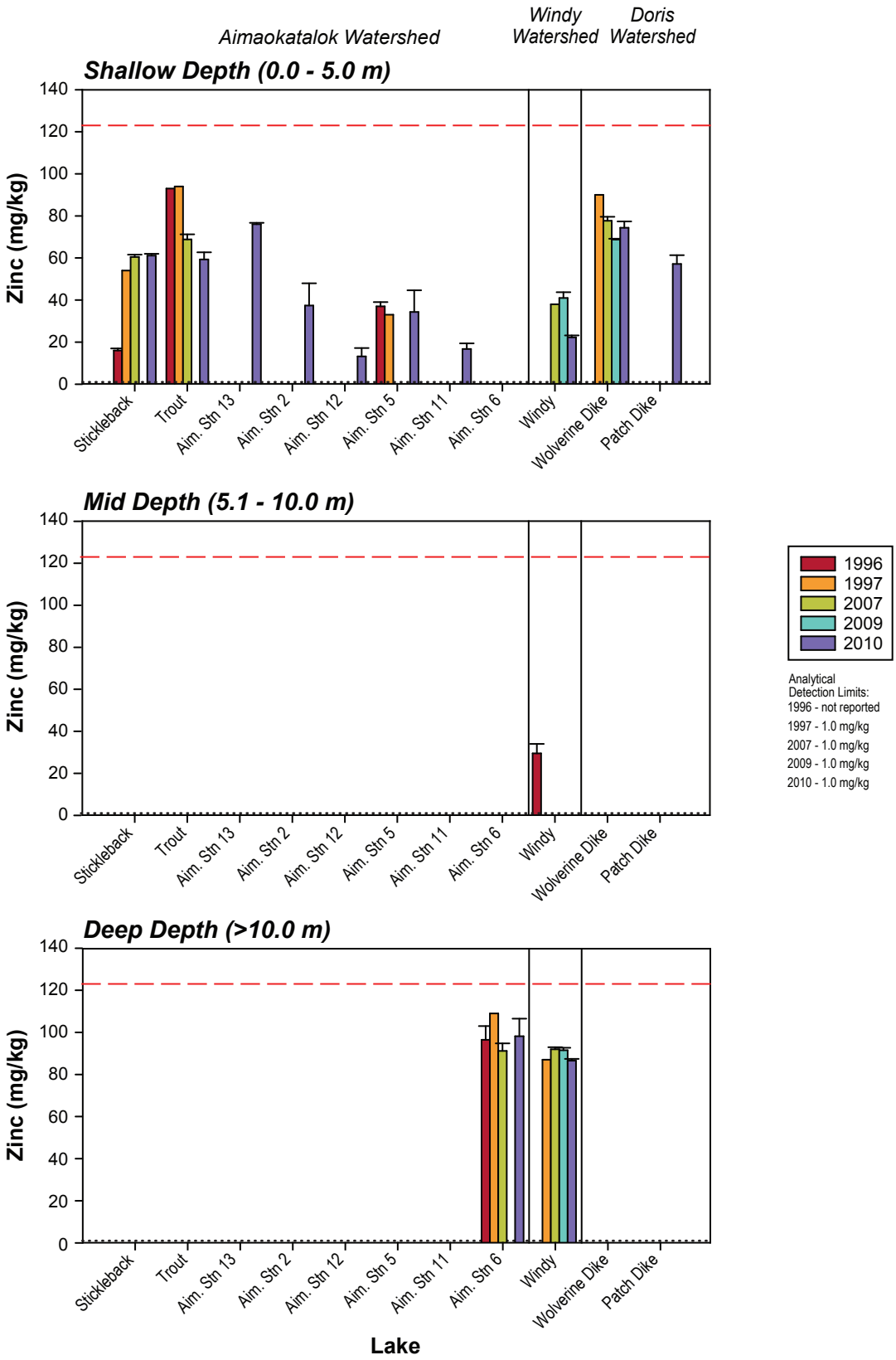
Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Red dashed line represents the CCME interm sediment quality guideline (0.17 mg/kg);
the CCME probable effects level (0.486 mg/kg) is not shown.

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Average Annual Mercury Concentration in Lake Sediments, Hope Bay Belt Project, 1996 - 2010

Figure 3.4-3j

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Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Red dashed line represents the CCME interm sediment quality guideline (123 mg/kg);
the CCME probable effects level (315 mg/kg) is not shown.

NEWMONT NORTH AMERICA

Average Annual Zinc Concentration in Lake Sediments, Hope Bay Belt Project, 1996 - 2010

Figure 3.4-3k

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3.5.1 Spatial Variation

Figure 3.5-1 presents stream and river sediment particle size composition. Stream sediments sampled in 2010 consisted of a highly variable mixture of gravel, sand, silt and clay. Sand and silt were the most common grain sizes at most sites. Clay made up a substantial proportion (31 to 44%) of sediments at Trout OF, S6, and AWRd. These three stream sites were dominated by fine sediments, as clay and silt together made up at least 85% of the particle composition at these sites. At all other stream and river sites, fine sediments (clay and silt) made up less than 65% of the particle composition. At most sites, gravel was a minor component of sediments (<10%); however, gravel made up 12% of the sediment at Koig. D/S.

Figures 3.5-2a to 3.5-2k present 2010 stream and river sediment quality results. Sites dominated by fine sediments (e.g., Trout OF, S6, and AWRd) tended to have higher sediment parameter concentrations than sites dominated by coarser sediments (e.g., Stickleback OF and Koig. D/S). This relationship between particle size composition and parameter concentration was evident for TOC (Figure 3.5-2a), available ammonium (Figure 3.5-2c), total nitrogen (Figure 3.5-2d), cadmium (Figure 3.5-2f), copper (Figure 3.5-2h), and mercury (Figure 3.5-2j).

3.5.2 Comparison with CCME Guidelines

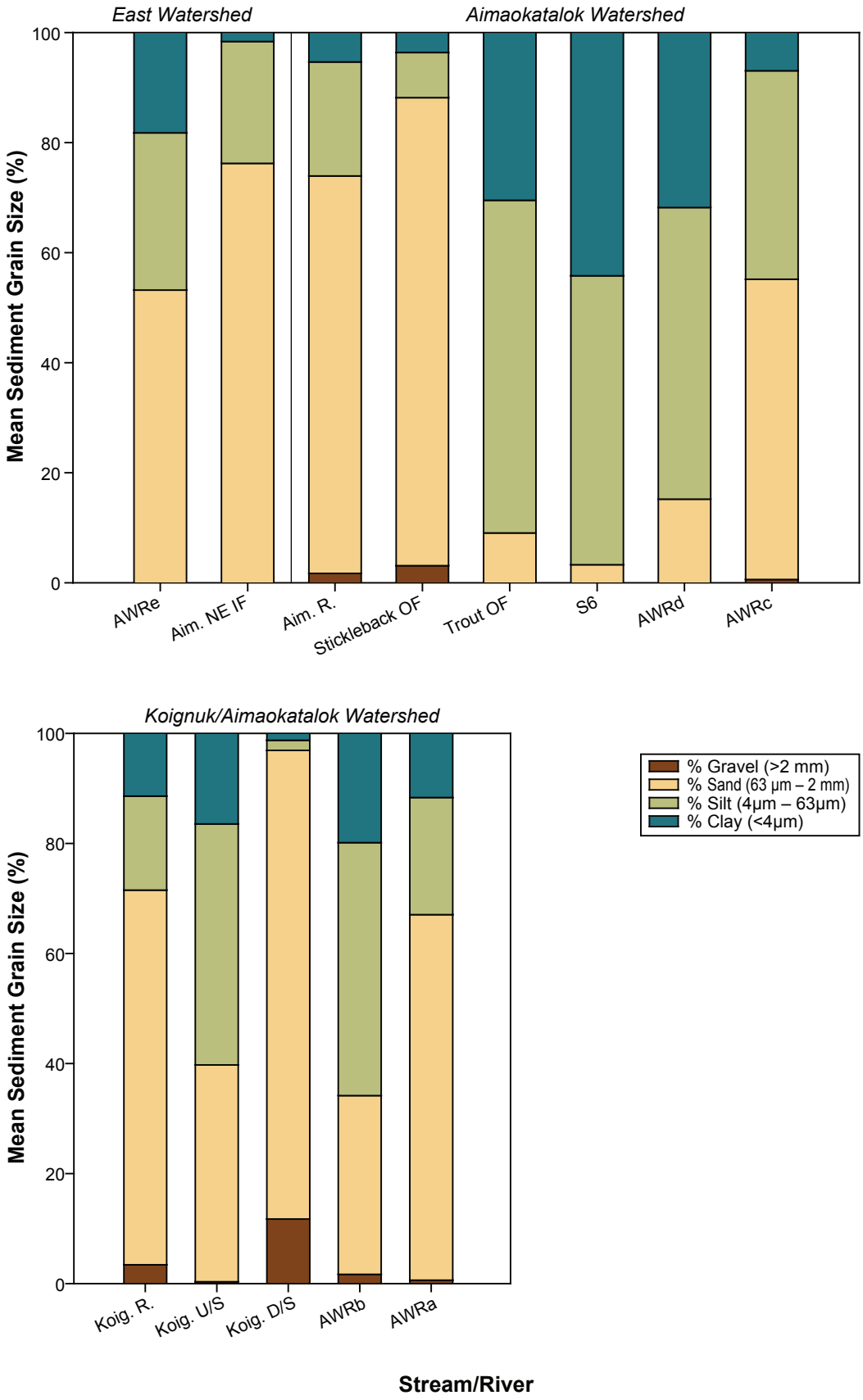
All sediment samples collected were compared to both ISQG and PEL CCME sediment quality guidelines for the protection of aquatic life. Table 3.5-1 presents the percentage of stream and river sediment samples in which metal concentrations were higher than CCME guidelines, and Table 3.5-2 provides the factor by which average 2010 sediment metal concentrations were higher than CCME guidelines.

Similar to lake sediments, stream and river sediments were naturally elevated in arsenic, chromium, and copper, and concentrations of these metals were sometimes higher than CCME ISQGs. Arsenic concentrations in two out of three replicate samples collected at AWRd exceeded the ISQG for arsenic of 5.9 mg/kg, and one of these replicates exceeded the PEL of 17 mg/kg. This was the only sample to exceed a CCME PEL for any metal. Out of all the metals for which there are CCME sediment quality guidelines, chromium most commonly exceeded its ISQG in streams and rivers. Chromium concentrations in at least one sediment sample collected from Trout OF, Koig. U/S and AWRb exceeded the ISQG of 37.3 mg/kg. At both S6 and Koig. R., the copper concentration in a single replicate was slightly higher than the ISQG of 35.7 mg/kg.

3.5.3 Annual Variation

Only historical sampling locations that were also sampled in 2010 were included in the comparison of annual sediment quality data shown in Figures 3.5-3a to 3.5-3k. Note that historical sampling locations may not correspond exactly with those sampled in 2010, and this, in addition to methodological differences, may contribute to variability observed among years (see Table 2.14-4 and Figures 2.14-2a to 2.14-2c for historical sampling methodologies and locations).

Historical stream and river sediment quality data are available from 1993 for Stickleback OF and 2009 for Koig. U/S and Koig. D/S. Although there was limited historical stream and river sediment quality data available, most sediment parameters were similar over time, and spatial variability was generally greater than annual variability.



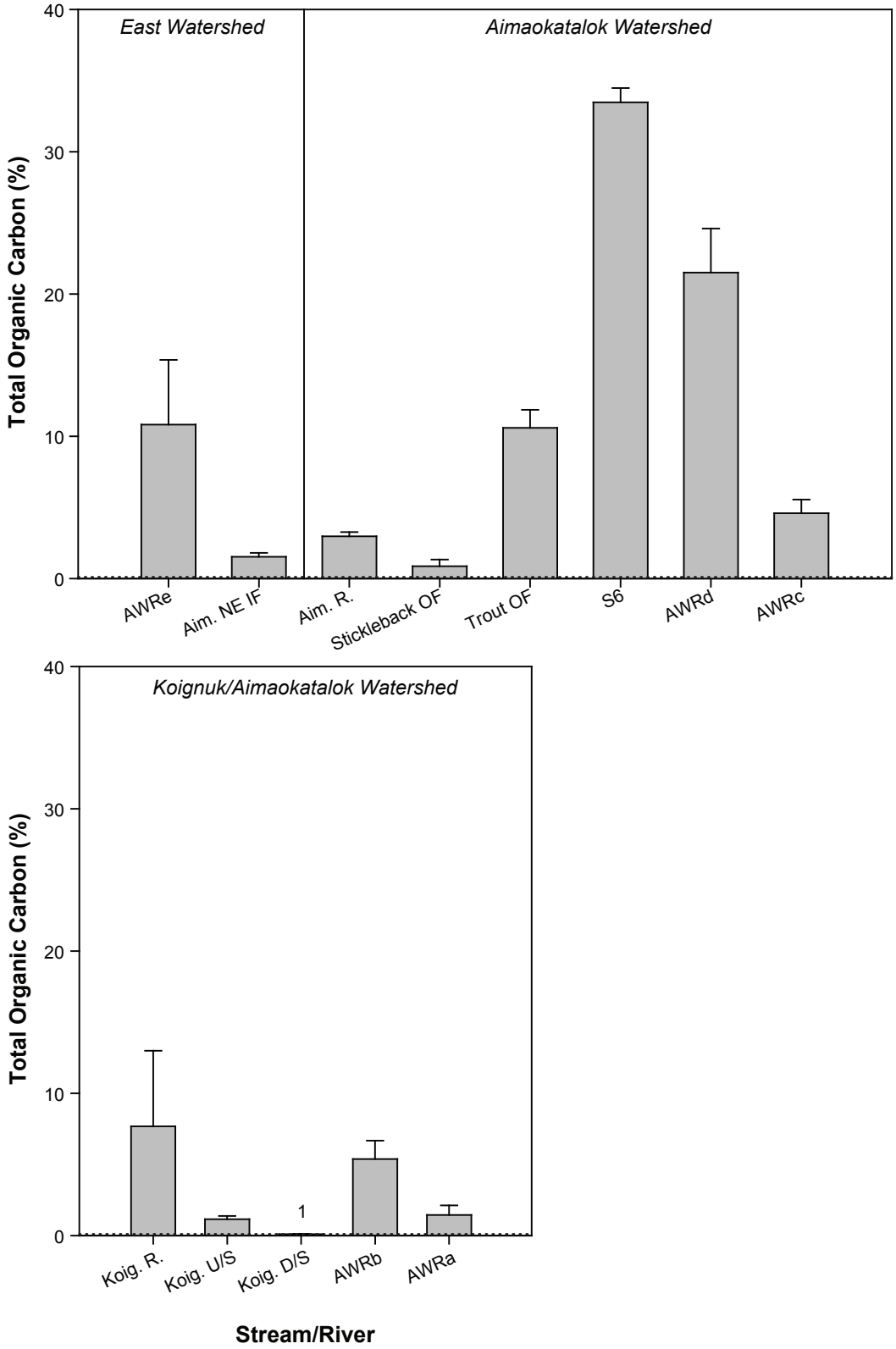
Notes: Values represent the mean of replicates.

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Sediment Grain Size Composition in Streams and Rivers, Hope Bay Belt Project, 2010

Figure 3.5-1

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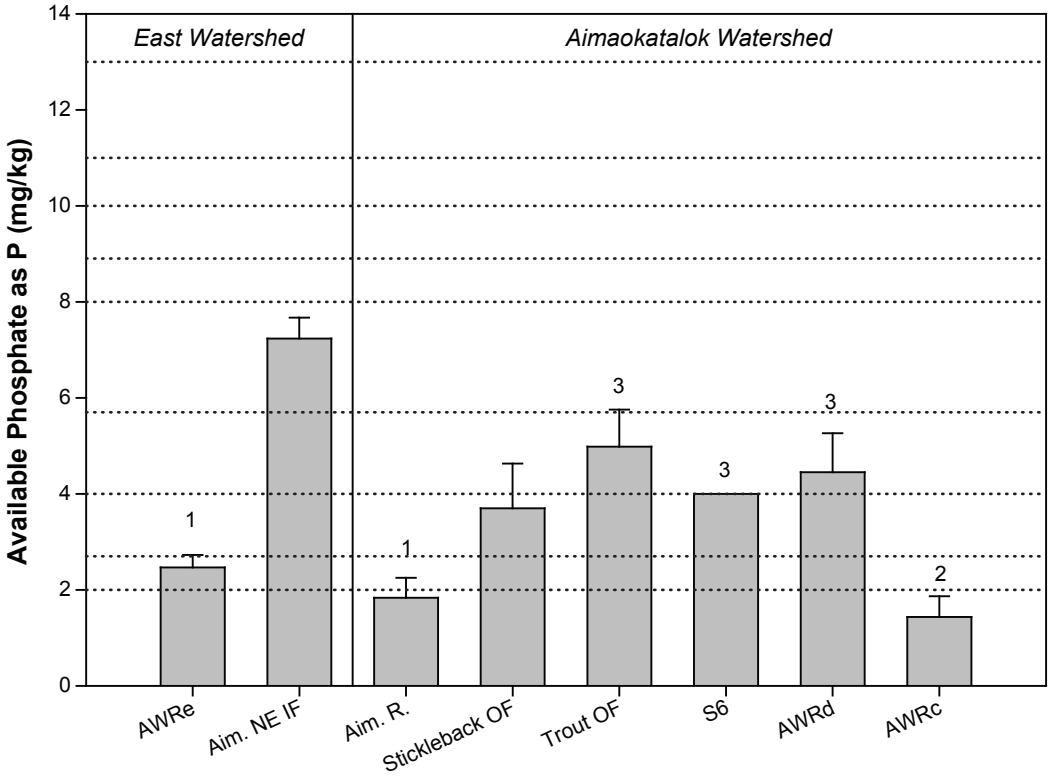
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.10 %); values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate the number of replicates with concentrations below the analytical detection limit; absence of a number indicates all replicates were above the detection limit.
There is no CCME guideline for total organic carbon.

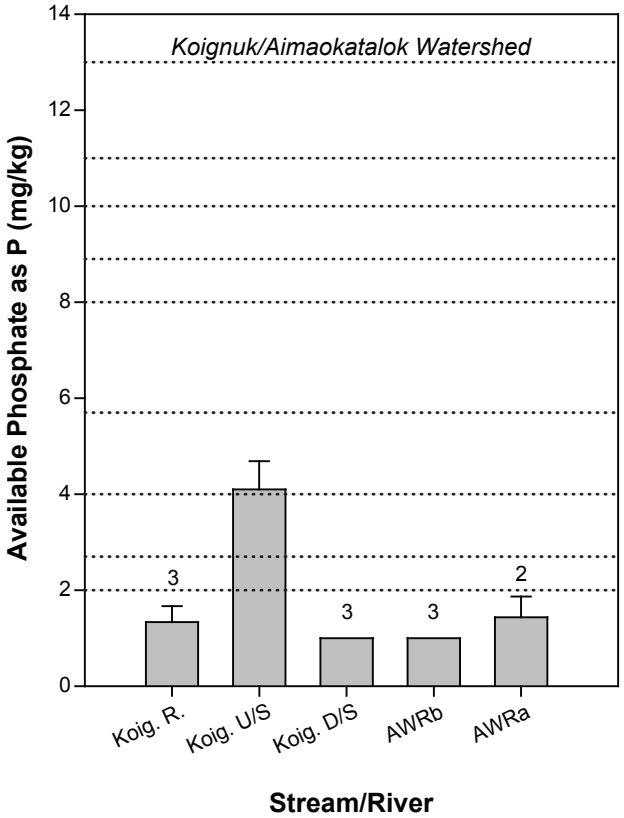
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Total Organic Carbon Concentration in Stream and River Sediments, Hope Bay Belt Project, 2010

Figure 3.5-2a

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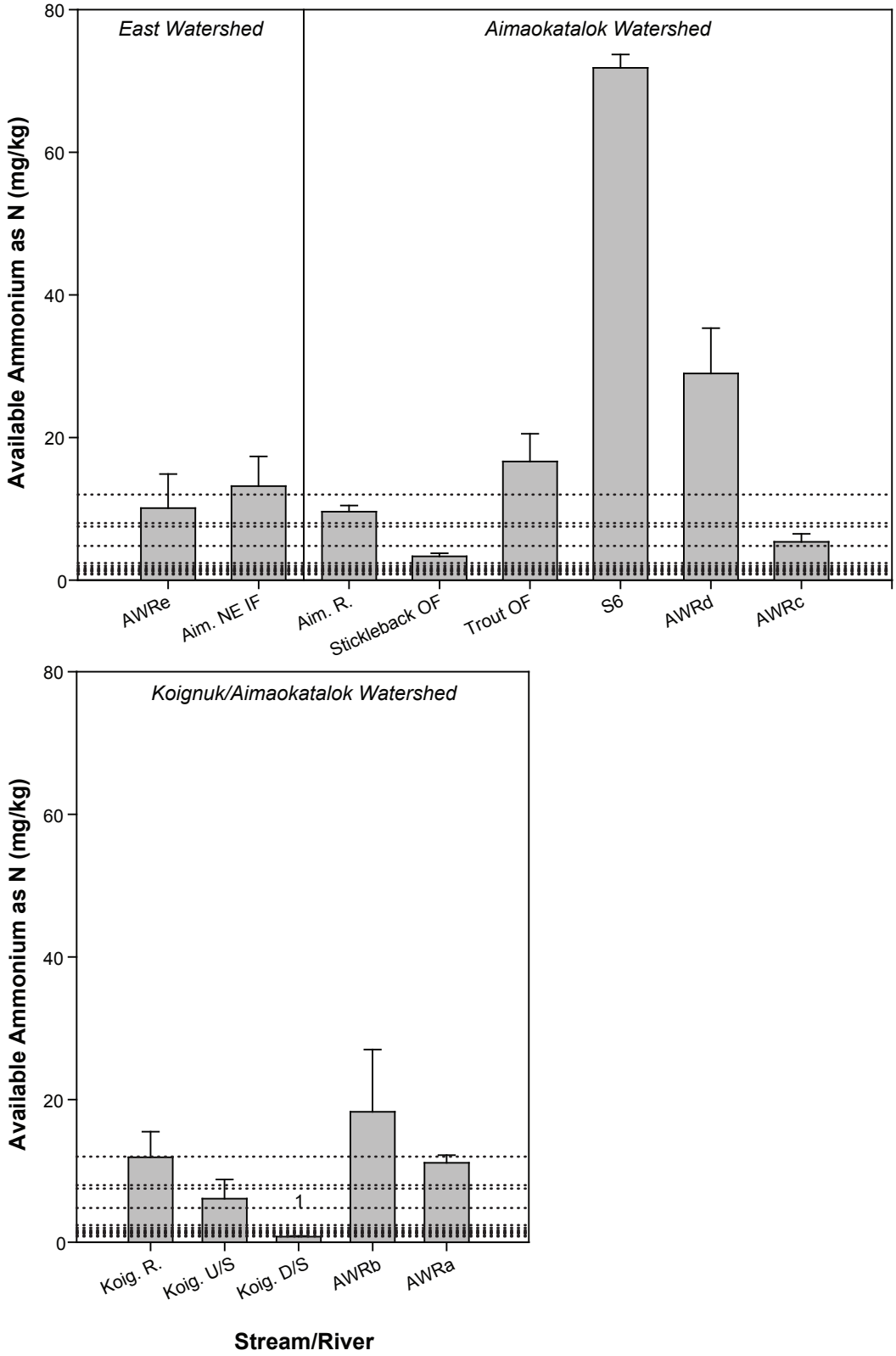
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limits (2.0, 2.7, 4.0, 5.7, 8.0, 8.9, 10, 11, or 13 mg/kg); values below the detection limit are plotted at half the detection limit.
Numbers indicate the number of replicates with concentrations below the analytical detection limit; absence of a number indicates all replicates were above the detection limit.
There is no CCME guideline for available phosphate.

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Available Phosphate Concentration in Stream and River Sediments, Hope Bay Belt Project, 2010

Figure 3.5-2b

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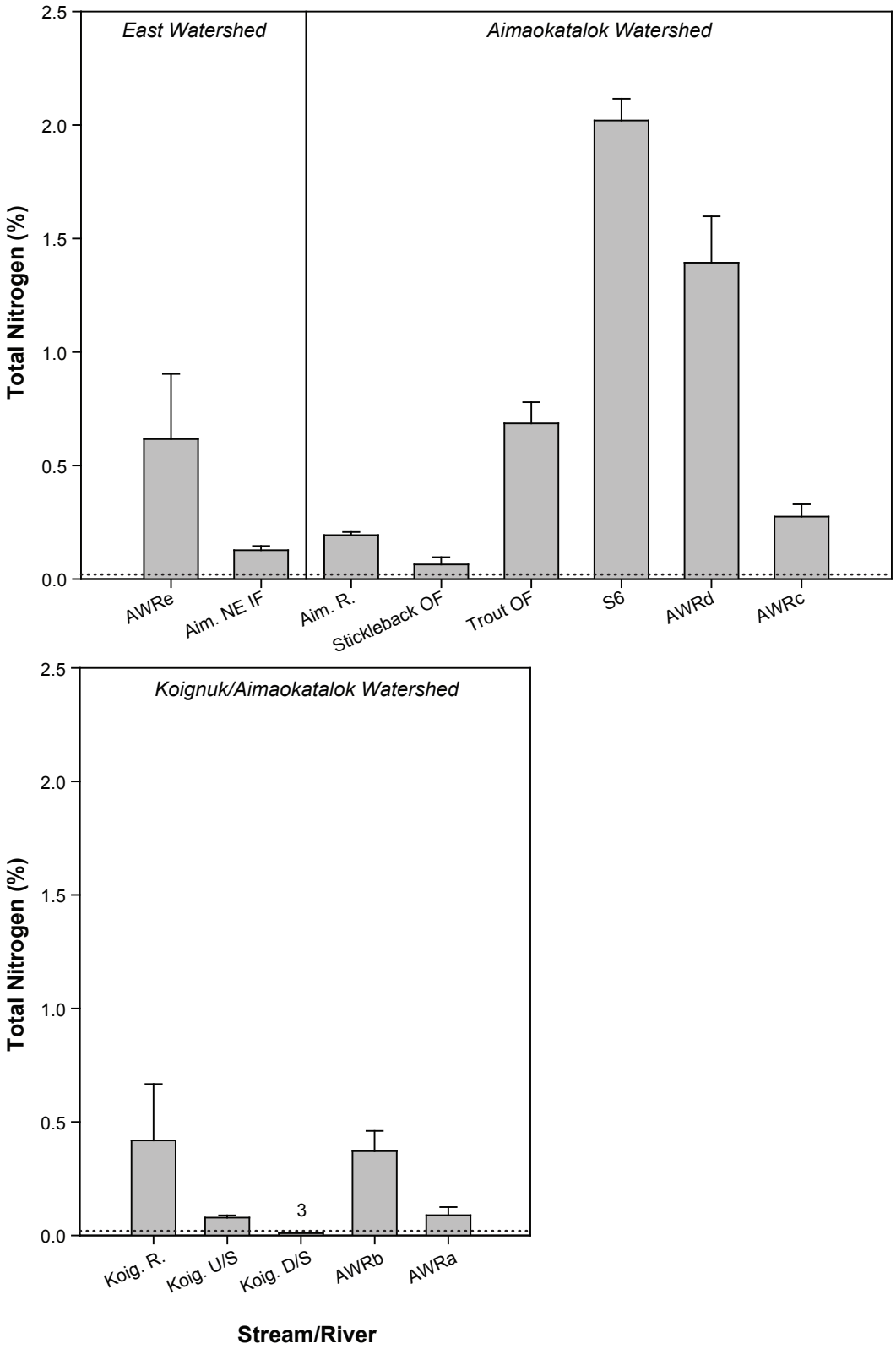
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.8, 0.92, 1.2, 1.3, 1.4, 1.5, 1.7, 2.0, 2.4, 4.8, 7.5, 8.0, or 12 mg/kg); values below the detection limit are plotted at half the detection limit.
Numbers indicate the number of replicates with concentrations below the analytical detection limit; absence of a number indicates all replicates were above the detection limit.
There is no CCME guideline for available ammonium.

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Available Ammonium Concentration in Stream and River Sediments, Hope Bay Belt Project, 2010

Figure 3.5-2c

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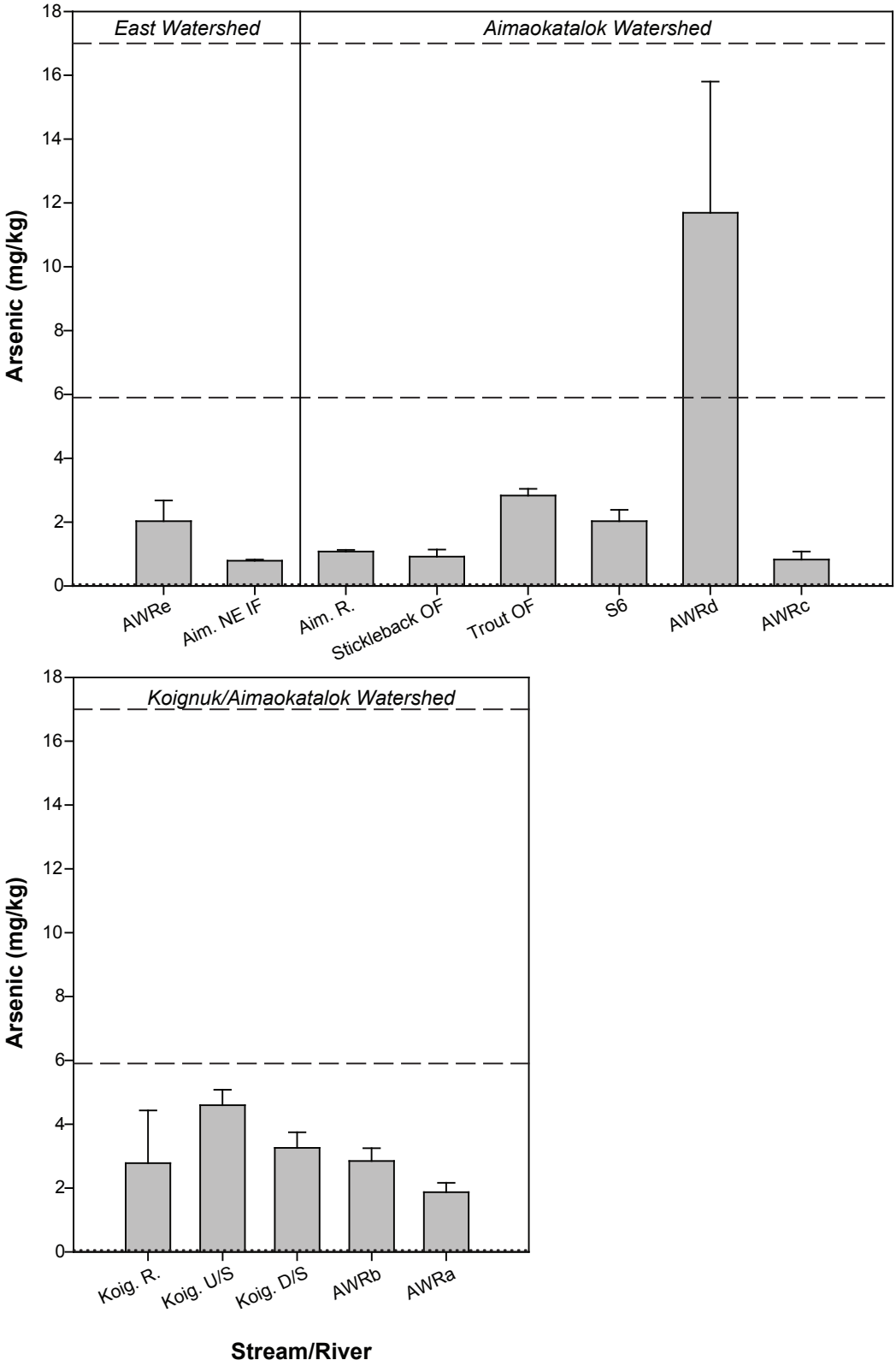
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.02 %); values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
There is no CCME guideline for total nitrogen.

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Total Nitrogen Concentration in Stream and River Sediments, Hope Bay Belt Project, 2010

Figure 3.5-2d

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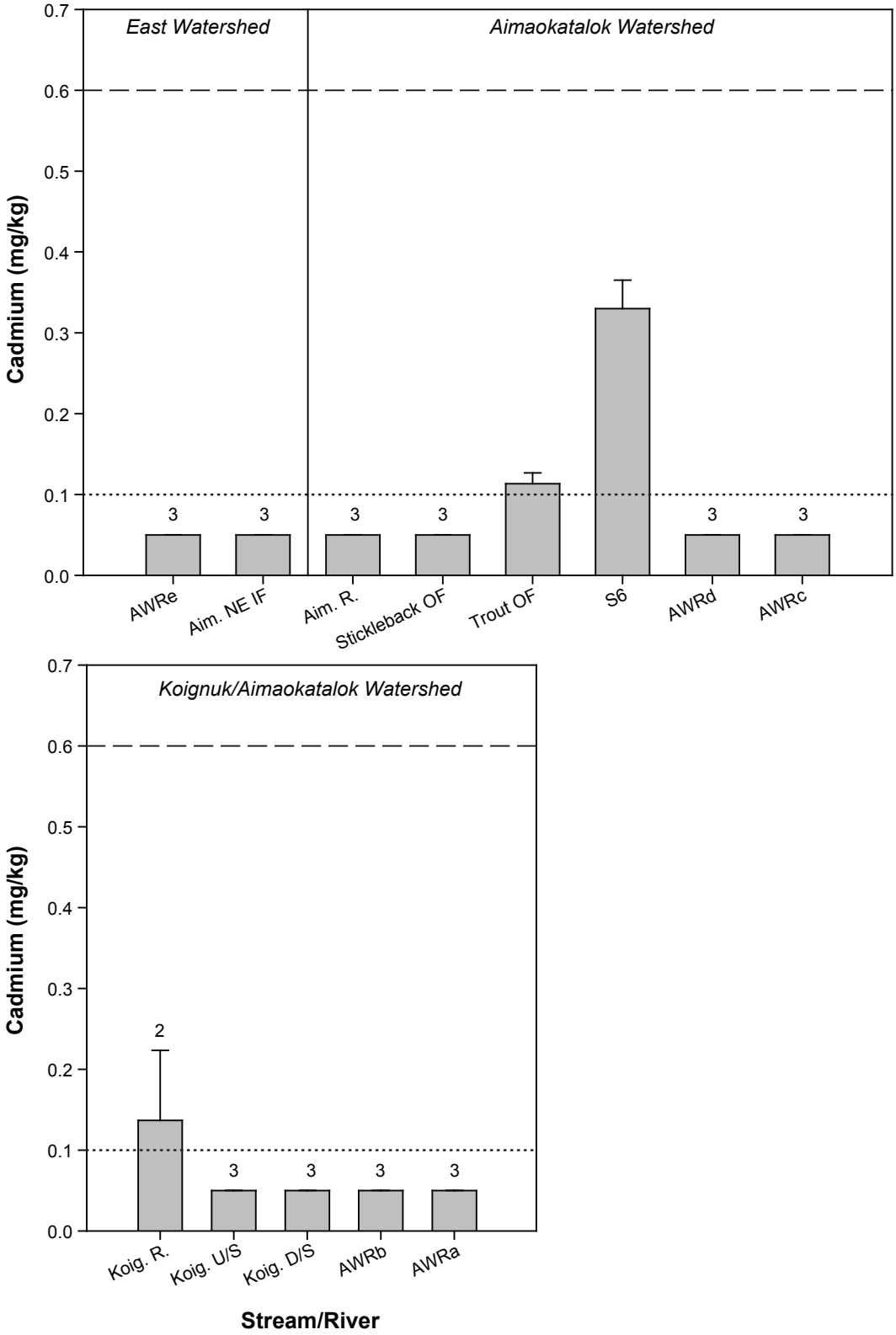
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.05 mg/kg); values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Dashed lines represent CCME interim sediment quality guideline (5.9 mg/kg) and probable effects level (17 mg/kg).

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Arsenic Concentration in Stream and River Sediments, Hope Bay Belt Project, 2010

Figure 3.5-2e

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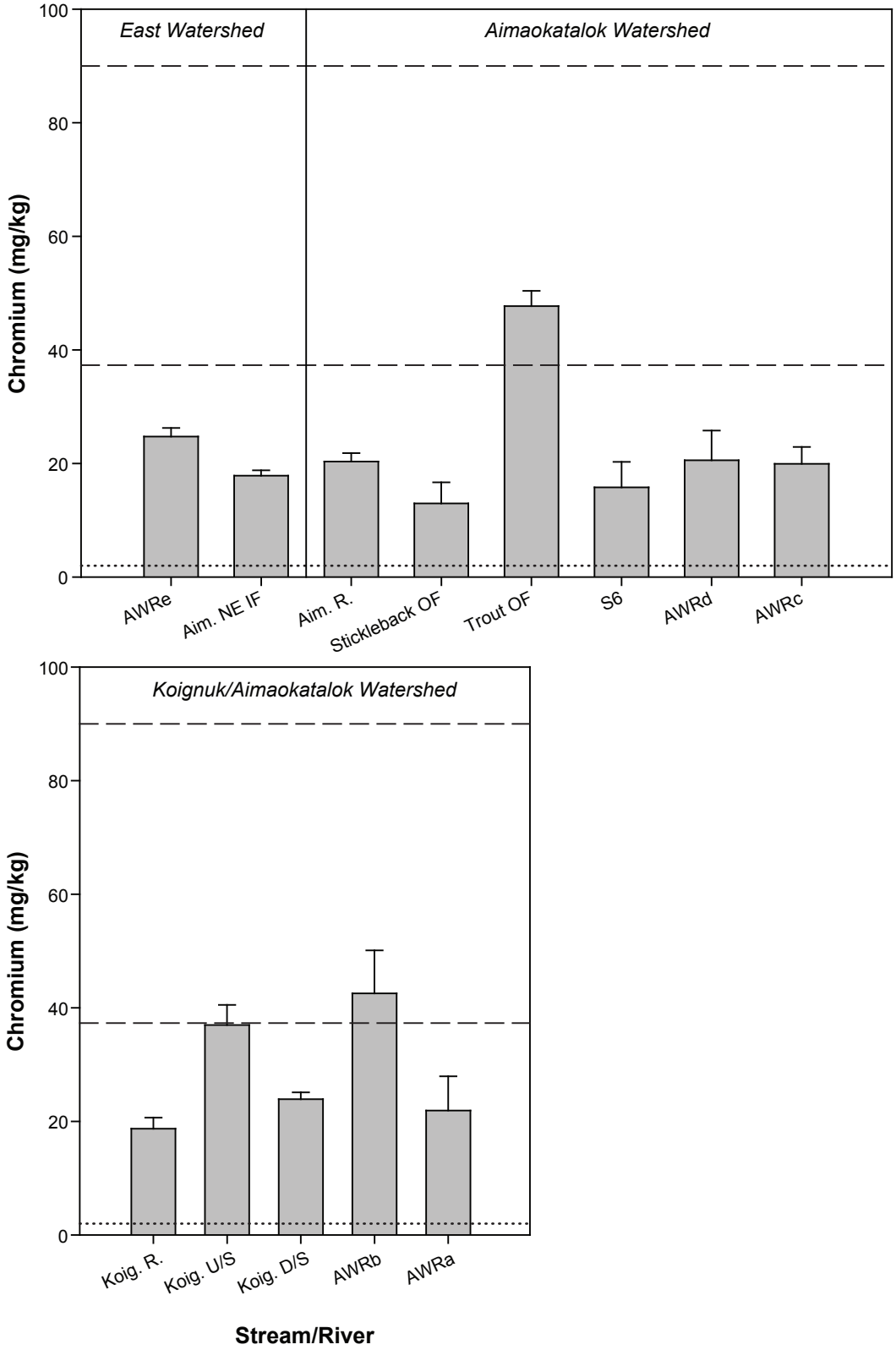
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.1 mg/kg);
values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Dashed line represents the CCME interm sediment quality guideline (0.6 mg/kg);
the CCME probable effects level (3.5 mg/kg) is not shown.

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Cadmium Concentration in Stream and River Sediments, Hope Bay Belt Project, 2010

Figure 3.5-2f

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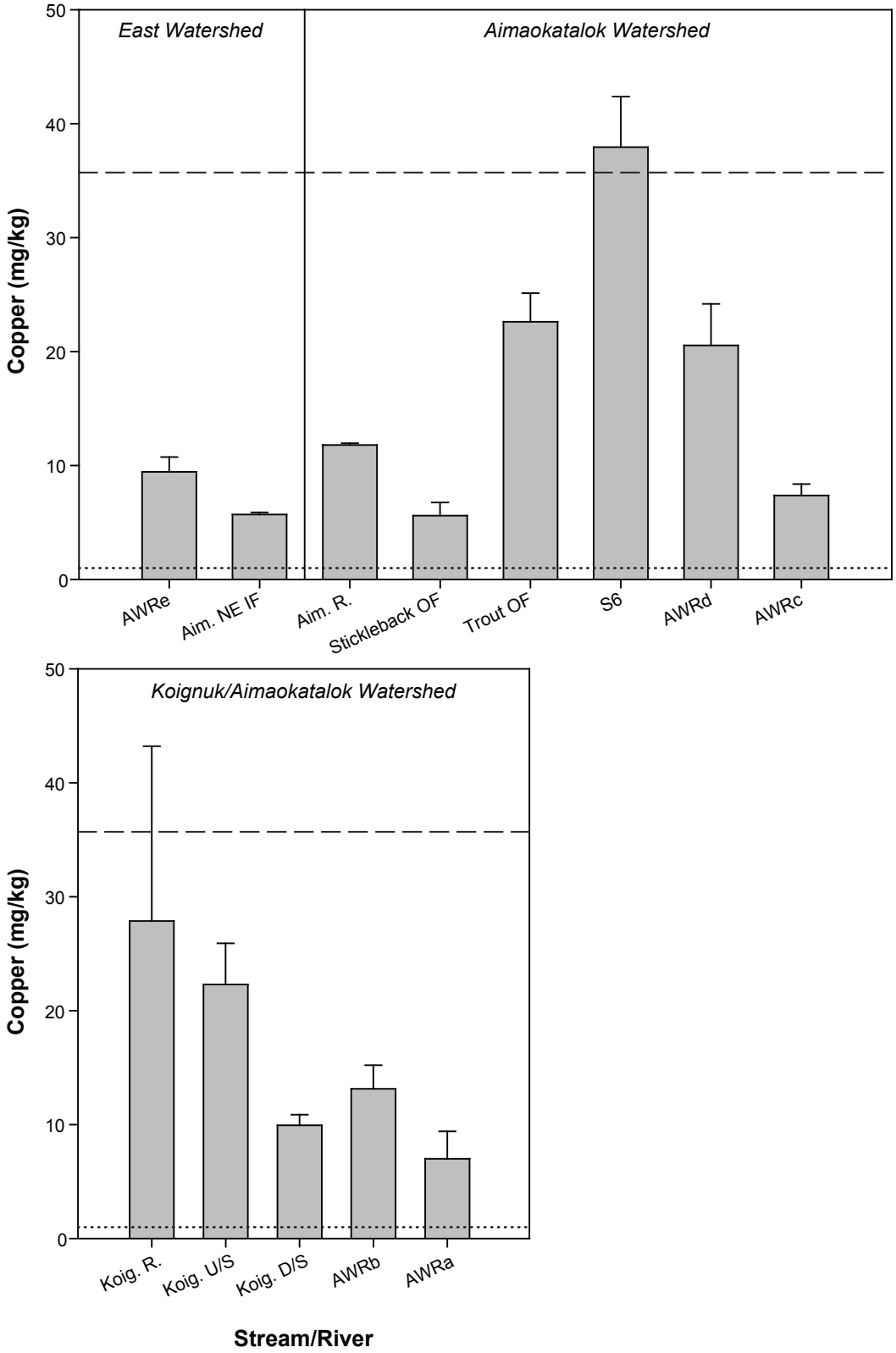
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (2.0 mg/kg); values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all relicates were above the detection limit.
Dashed lines represent CCME interim sediment quality guideline (37.3 mg/kg) and probable effects level (90 mg/kg).

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Chromium Concentration in Stream and River Sediments, Hope Bay Belt Project, 2010

Figure 3.5-2g

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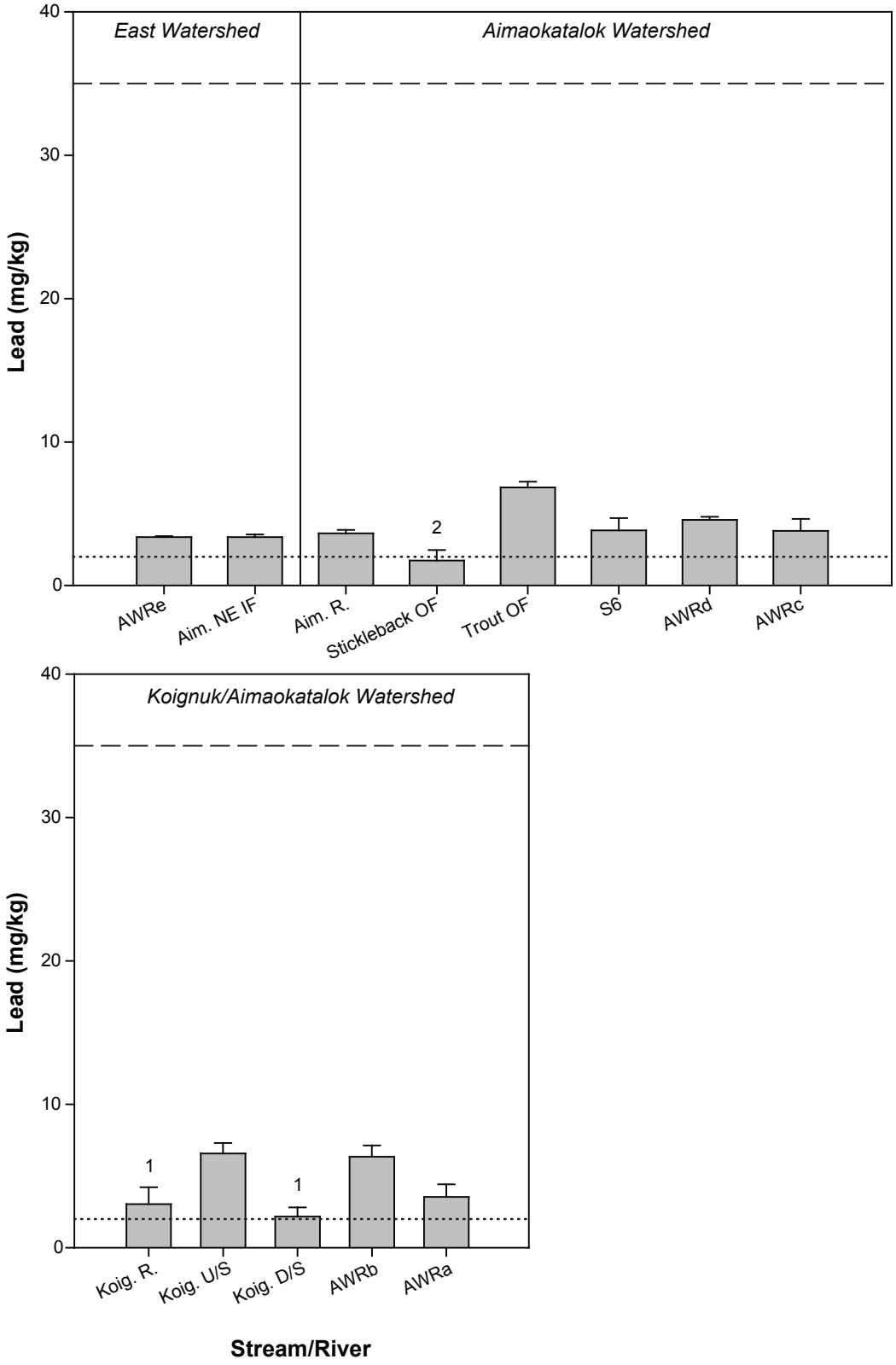
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (1.0 mg/kg); values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Dashed line represents the CCME interm sediment quality guideline (35.7 mg/kg); the CCME probable effects level (197 mg/kg) is not shown.

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Copper Concentration in Stream and River Sediments, Hope Bay Belt Project, 2010

Figure 3.5-2h

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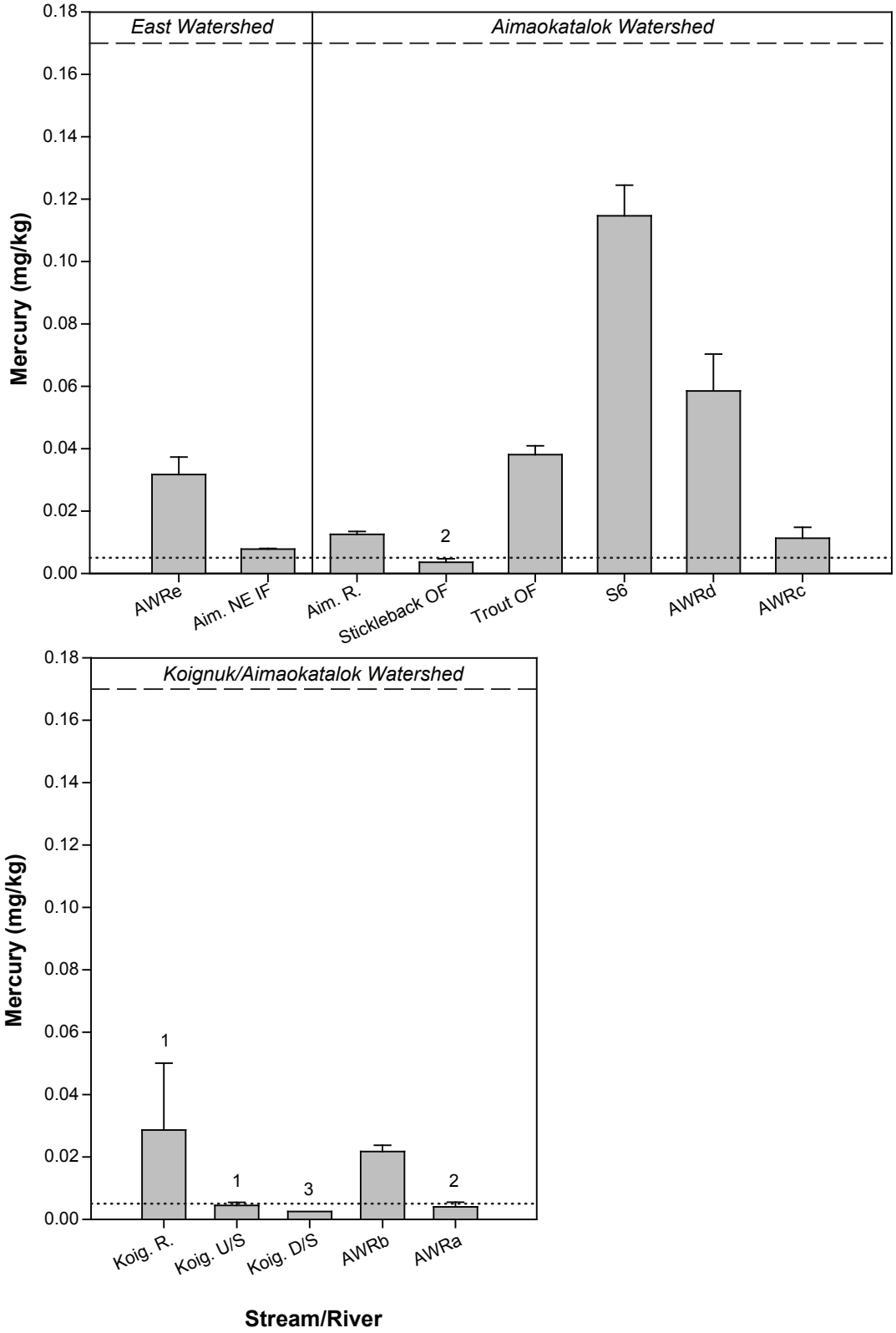
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (2.0 mg/kg); values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Dashed line represents the CCME interm sediment quality guideline (35 mg/kg); the CCME probable effects level (91.3) is not shown.

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Lead Concentration in Stream and River Sediments, Hope Bay Belt Project, 2010

Figure 3.5-2i

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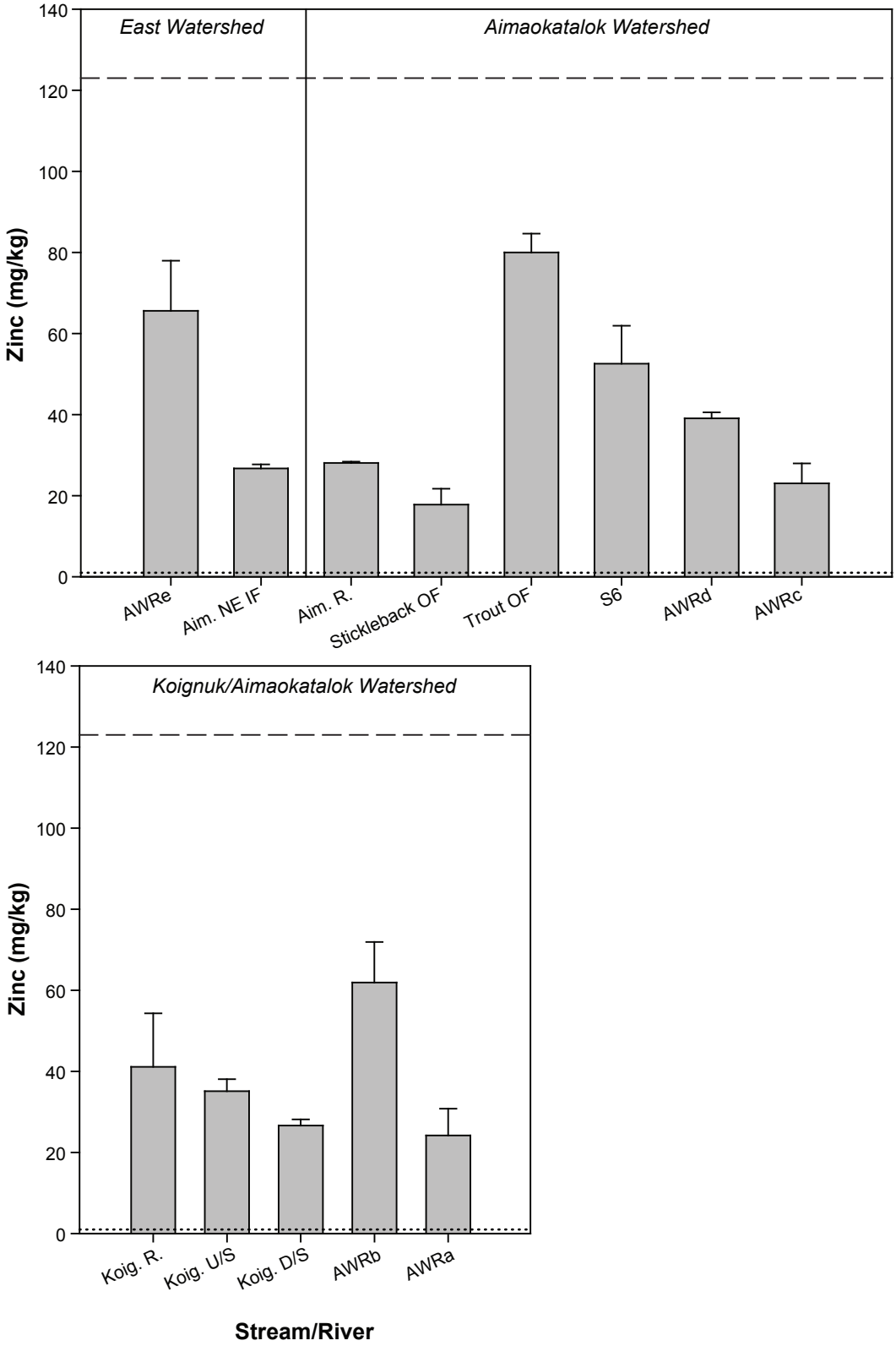
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.005 mg/kg); values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Dashed line represents the CCME interm sediment quality guideline (0.17 mg/kg); the CCME probable effects level (0.486 mg/kg) is not shown.

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Mercury Concentration in Stream and River Sediments, Hope Bay Belt Project, 2010

Figure 3.5-2j

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Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (1.0 mg/kg); values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Dashed line represents the CCME interm sediment quality guideline (123 mg/kg); the CCME probable effects level (315 mg/kg) is not shown.

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Zinc Concentration in Stream and River Sediments, Hope Bay Belt Project, 2010

Figure 3.5-2k

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Table 3.5-1. Stream and River Sediment Quality, Percent of Samples in which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2010

Stream/River	Total Number of Samples Collected	CCME Guideline value[a] (mg/kg):	Percent of samples higher than ISQG[b] guidelines							Percent of samples higher than PEL[c] guidelines						
			Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Zinc (Zn)	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Zinc (Zn)
			5.9	**0.6**	**37.3**	**35.7**	**35**	**0.17**	**123**	**17**	**3.5**	**90**	**197**	**91.3**	**0.486**	**315**
East																
AWRe	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aim. NE IF	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aimaokatalok																
Aim. R.	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stickleback OF	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trout OF	3		-	-	100	-	-	-	-	-	-	-	-	-	-	-
S6	3		-	-	-	33.3	-	-	-	-	-	-	-	-	-	-
AWRd	3		66.7	-	-	-	-	-	-	33.3	-	-	-	-	-	-
AWRc	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Koignuk/Aimaokatalok																
Koig. R.	3		-	-	-	33.3	-	-	-	-	-	-	-	-	-	-
Koig. U/S	3		-	-	66.7	-	-	-	-	-	-	-	-	-	-	-
Koig. D/S	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
AWRb	3		-	-	66.7	-	-	-	-	-	-	-	-	-	-	-
AWRa	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-

All values represent percentages of 2010 samples that are both higher than the CCME guidelines and above analytical detection limits.

a) Canadian sediment quality guidelines for the protection of aquatic life (CCME 2002)

b) ISQG = Interim sediment quality guideline

c) PEL = Probable effects level

Table 3.5-2. Stream and River Sediment Quality, Factor by which Average Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2010

Stream/River	Total Number of Samples Collected	CCME Guideline value[a] (mg/kg):	Factor by which samples are higher than ISQG[b] guidelines							Factor by which samples are higher than PEL[c] guidelines						
			Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Zinc (Zn)	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Zinc (Zn)
			5.9	**0.6**	**37.3**	**35.7**	**35**	**0.17**	**123**	**17**	**3.5**	**90**	**197**	**91.3**	**0.486**	**315**
East																
AWRe	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aim. NE IF	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aimaokatalok																
Aim. R.	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stickleback OF	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trout OF	3		-	-	1.28	-	-	-	-	-	-	-	-	-	-	-
S6	3		-	-	-	1.06	-	-	-	-	-	-	-	-	-	-
AWRd	3		1.98	-	-	-	-	-	-	-	-	-	-	-	-	-
AWRc	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Koignuk/Aimaokatalok																
Koig. R.	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Koig. U/S	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Koig. D/S	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-
AWRb	3		-	-	1.14	-	-	-	-	-	-	-	-	-	-	-
AWRa	3		-	-	-	-	-	-	-	-	-	-	-	-	-	-

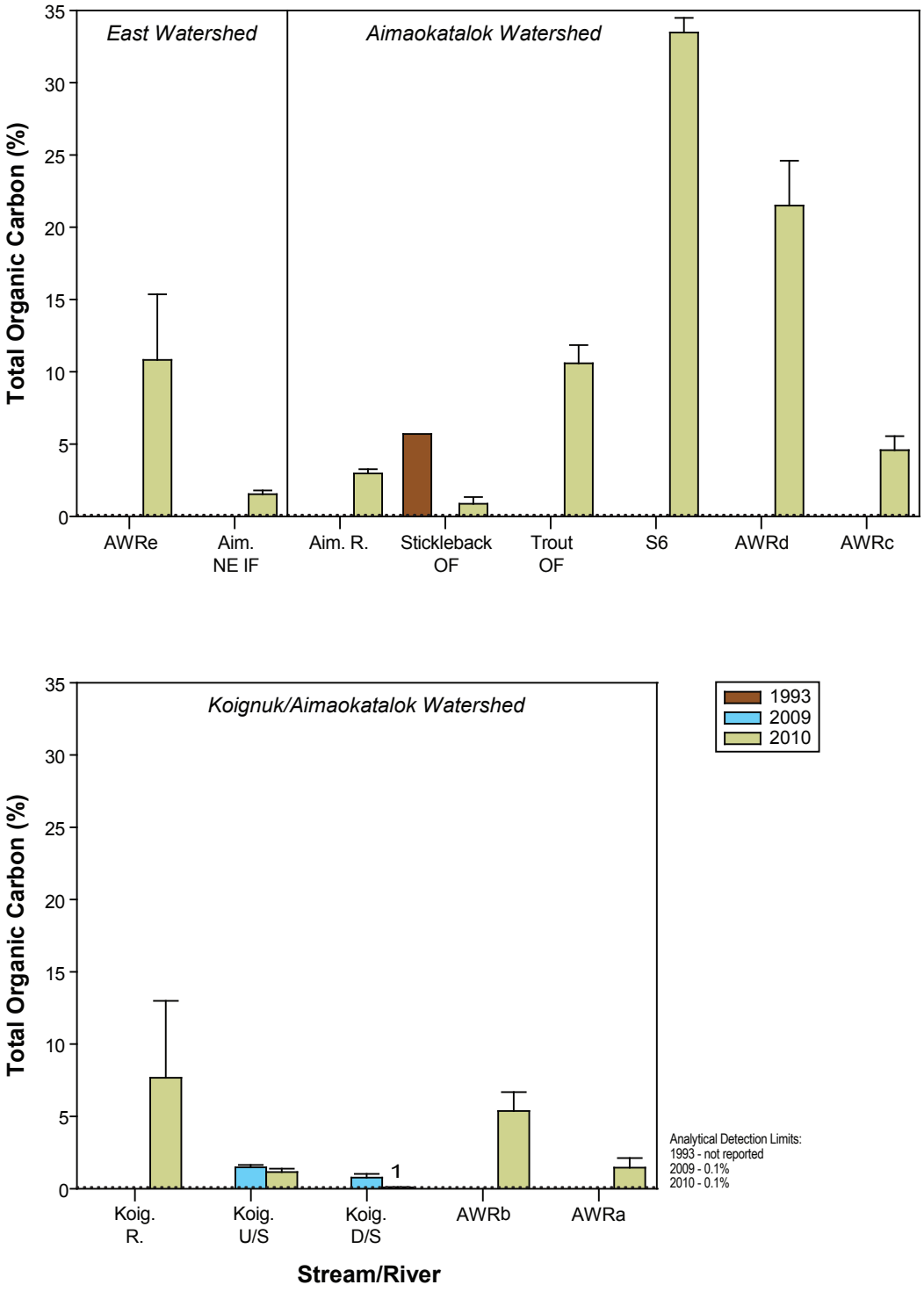
All values represent the factor by which 2010 stream/river averages are higher than CCME guidelines.

Even though a percentage of samples may be higher than a guideline amount, the calculated stream average may not be higher than a guideline amount.

a) Canadian sediment quality guidelines for the protection of aquatic life (CCME 2002)

b) ISQG = Interim sediment quality guideline

c) PEL = Probable Effects Level



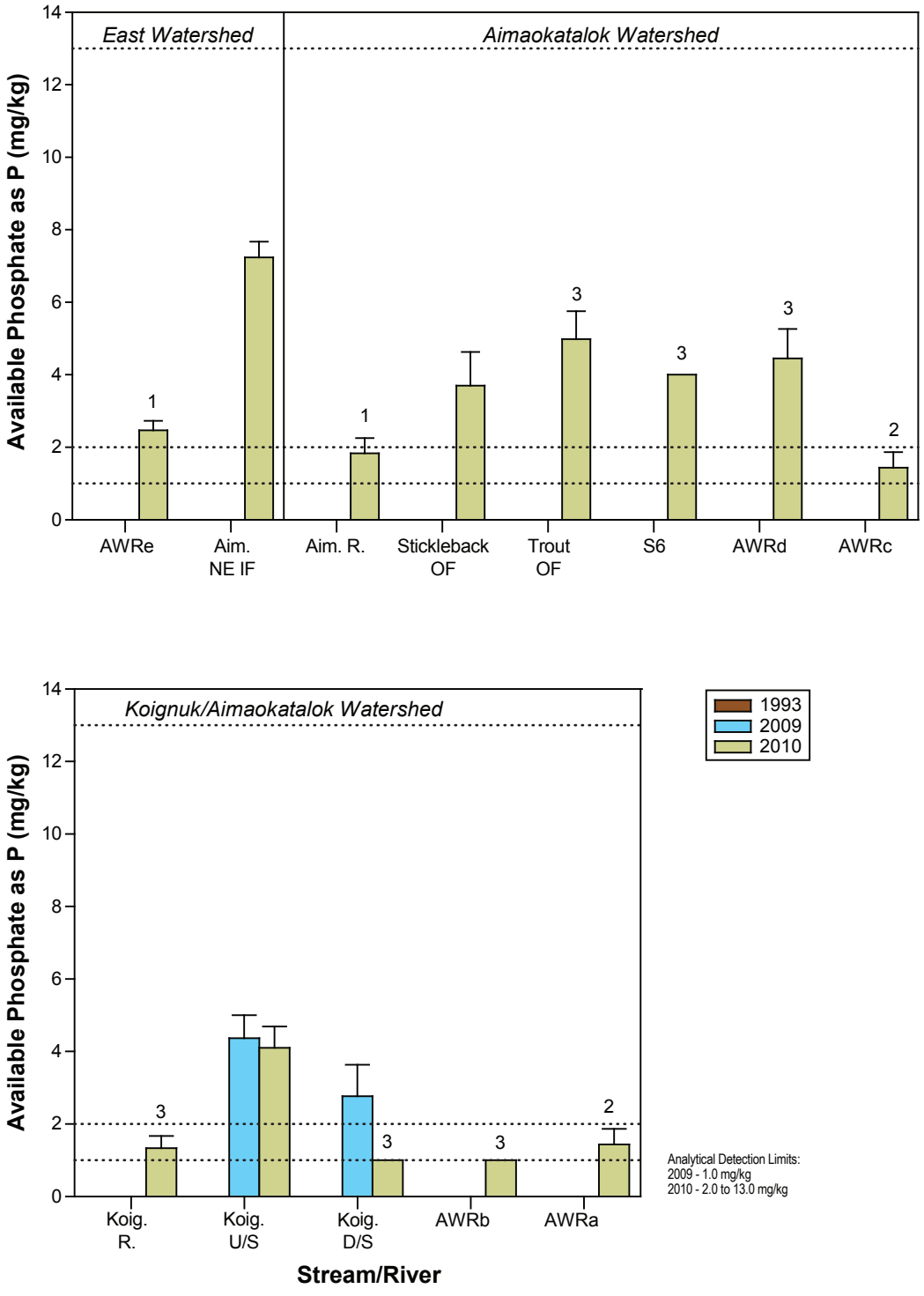
Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limits; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate the number of replicates with concentrations below the analytical detection limit;
absence of a nuimber indicates all replicates were above the detection limit.
There is no CCME guideline for total organic carbon.

NEWMONT NORTH AMERICA

Average Annual Total Organic Carbon Concentration in Stream and River Sediments, Hope Bay Belt Project, 1993 - 2010

Figure 3.5-3a

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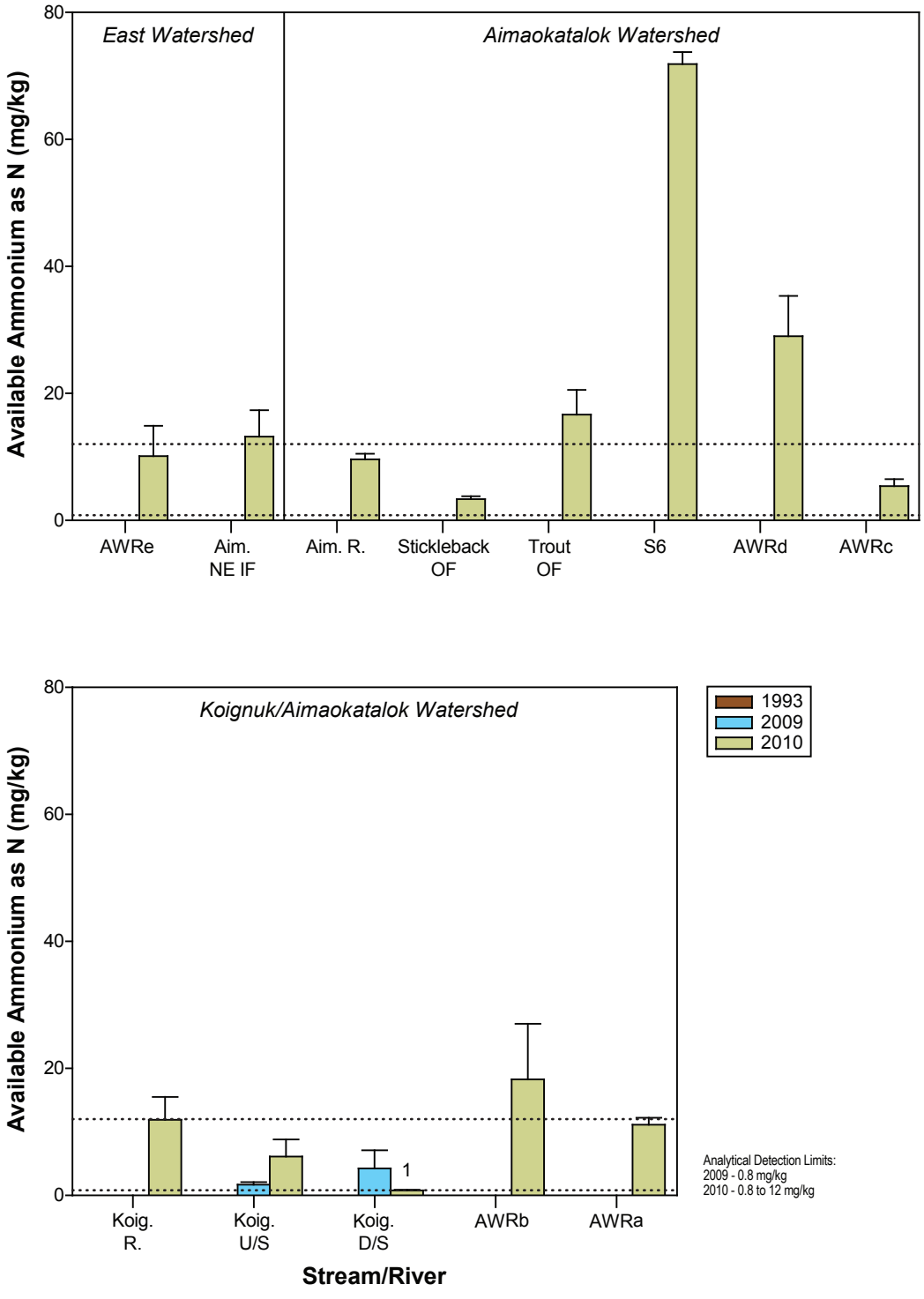
Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limits; values below the analytical detection limit are plotted at half the detection limit.
Numbers above bars indicate the number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
There is no CCME guideline for available phosphate.

NEWMONT NORTH AMERICA

Average Annual Available Phosphate Concentration in Stream and River Sediments, Hope Bay Belt Project, 1993 - 2010

Figure 3.5-3b

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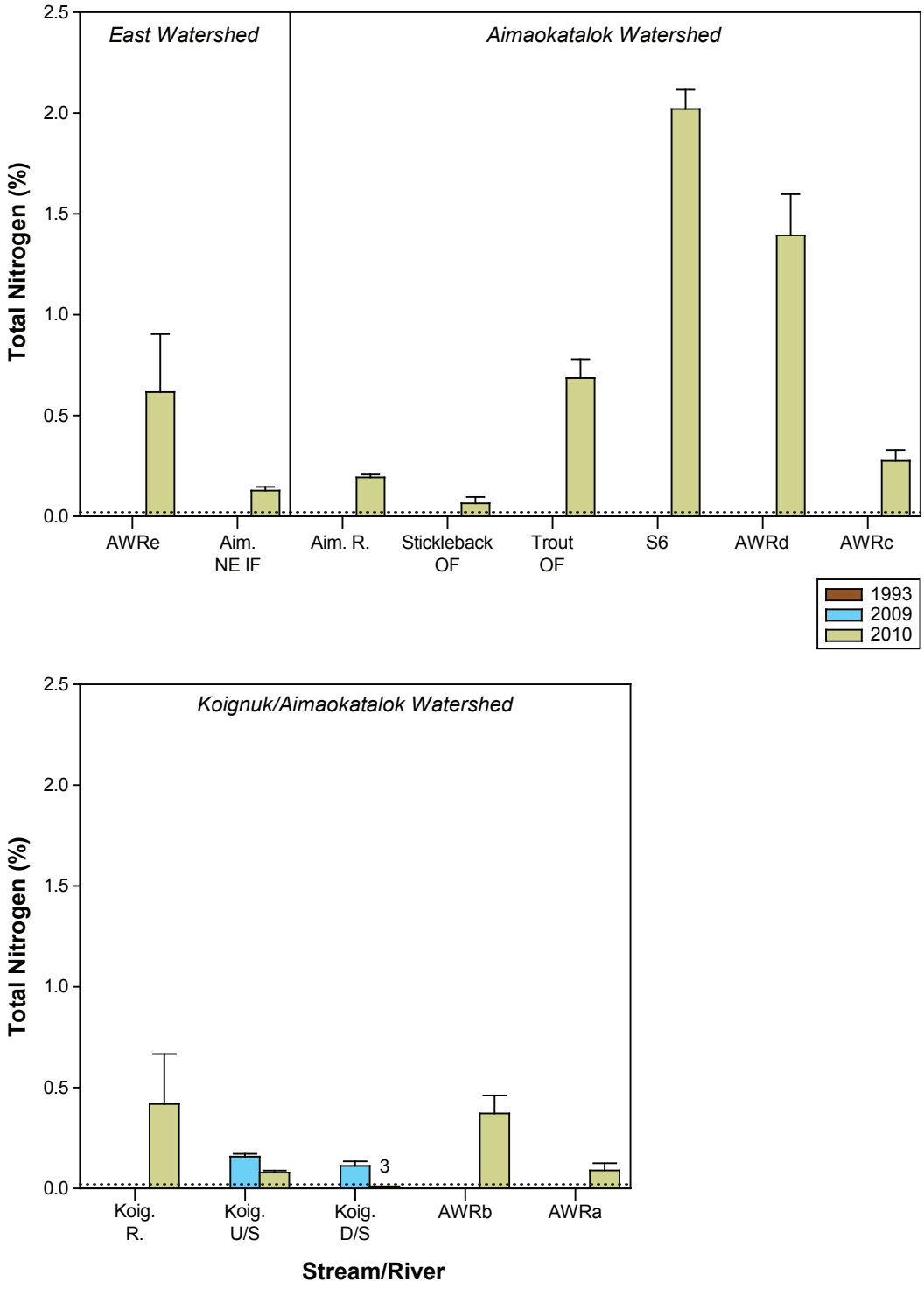
Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limits; values below the analytical detection limit are plotted at half the detection limit.
Numbers above bars indicate the number of replicates with concentrations below the analytical detection limit;
absence of a nuimber indicates all replicates were above the detection limit.
There is no CCME guideline for availble ammonium.

NEWMONT NORTH AMERICA

Average Annual Available Ammonium Concentration in Stream and River Sediments, Hope Bay Belt Project, 1993 - 2010

Figure 3.5-3c

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Analytical Detection Limits:
2009 - 0.02%
2010 - 0.02%

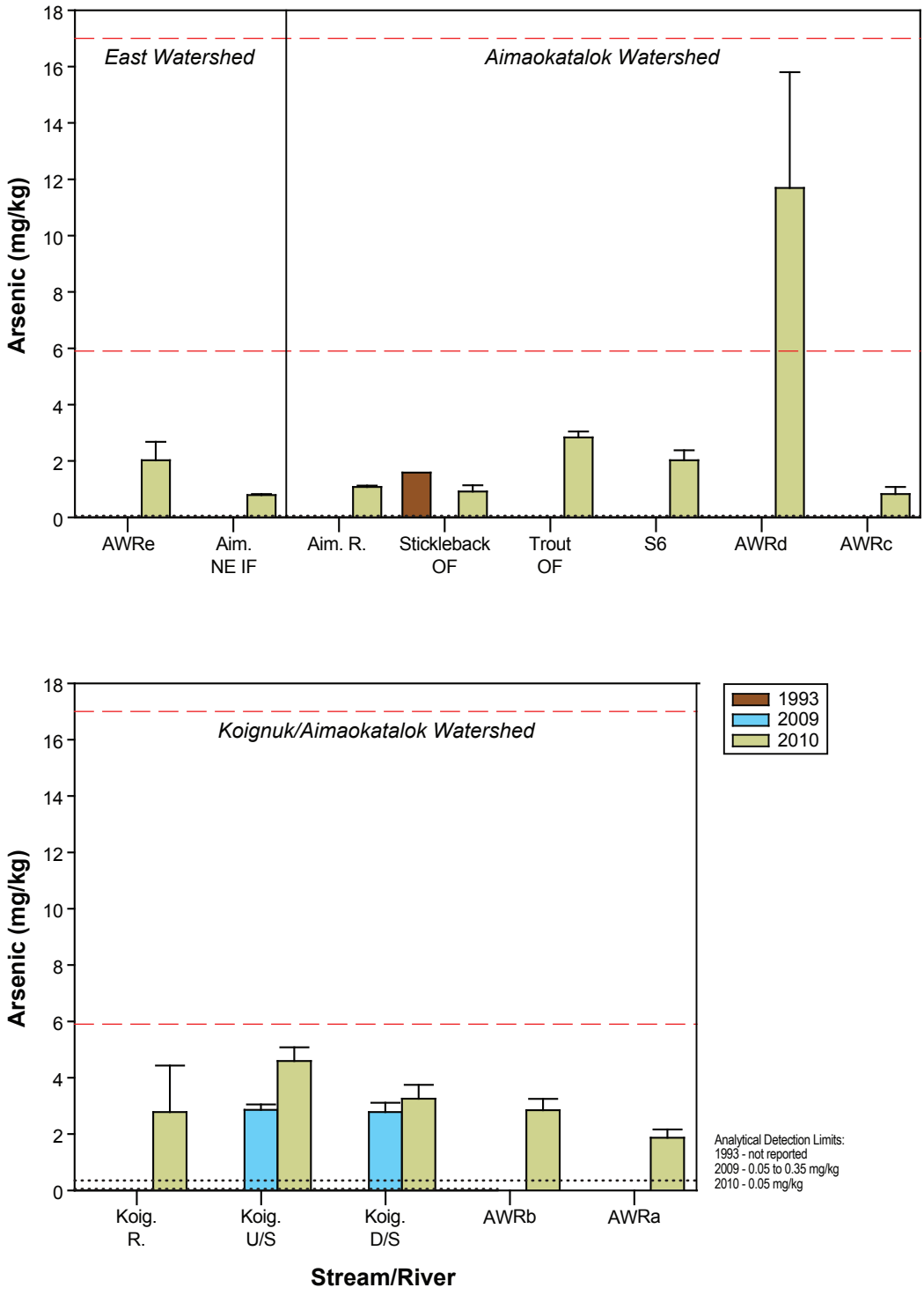
Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limits; values below the analytical detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates weer above the detection limit.
There is no CCME guideline for total nitrogen.

NEWMONT NORTH AMERICA

Average Annual Total Nitrogen Concentration in Stream and River Sediments, Hope Bay Belt Project, 1993 - 2010

Figure 3.5-3d

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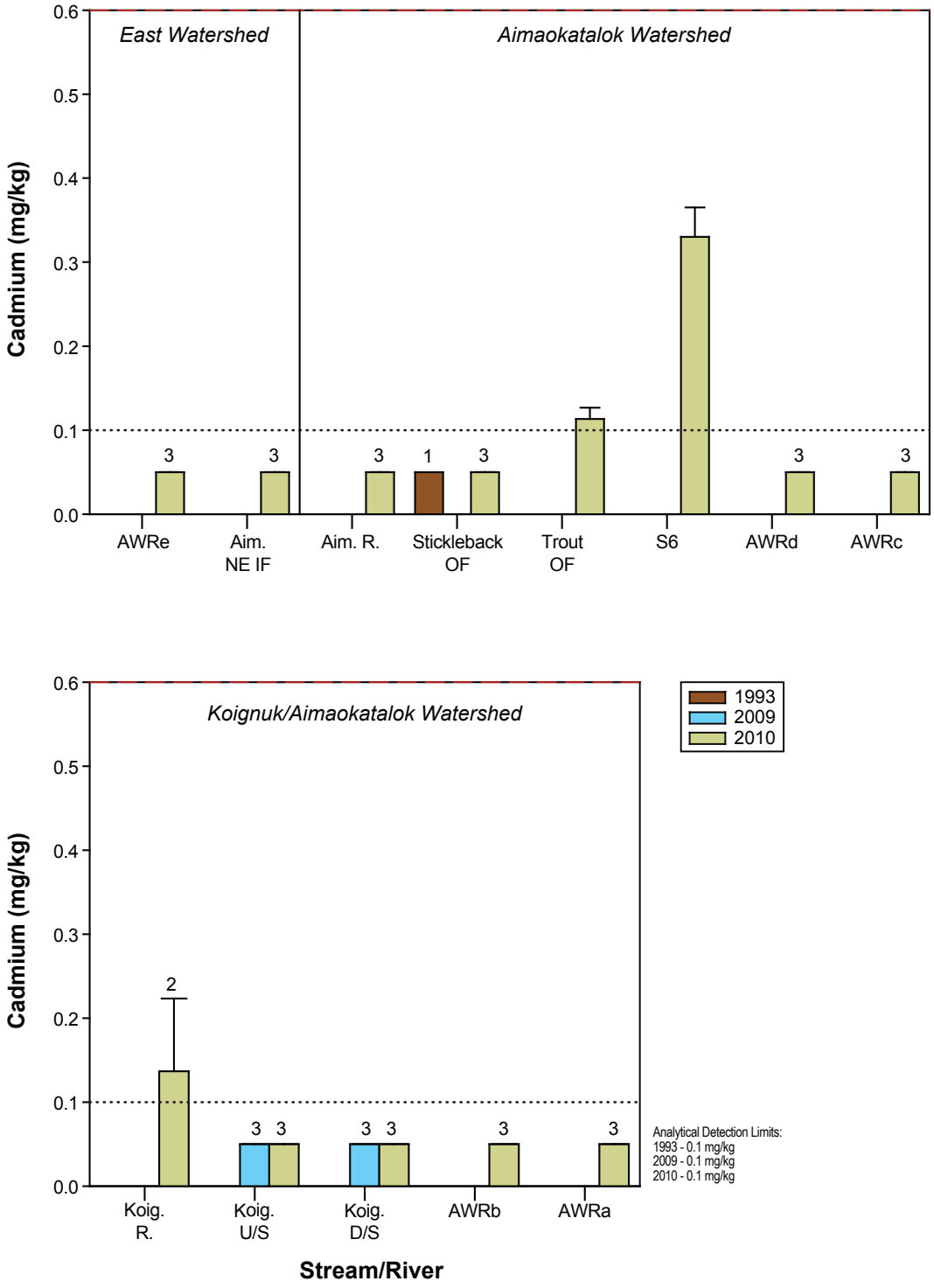
Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limits; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Red dashed lines represent the CCME interm sediment quality guideline (5.9 mg/kg) and probable effects level (17mg/kg).

NEWMONT NORTH AMERICA

Average Annual Arsenic Concentration in Stream and River Sediments, Hope Bay Belt Project, 1993 - 2010

Figure 3.5-3e

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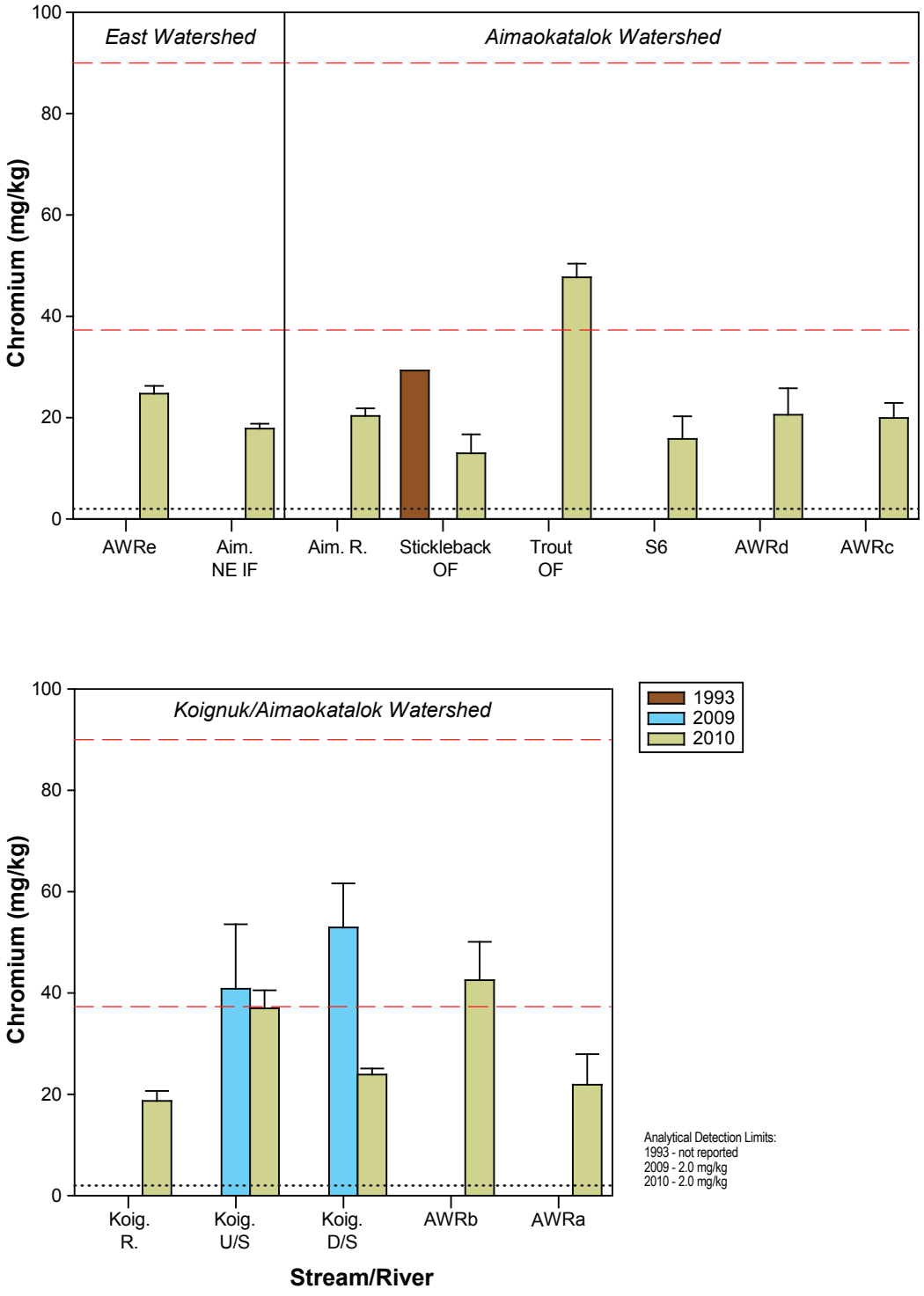
Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limits; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate the number of multiple samples below the detection limit; bolded number indicates there was only one value reported
Red dashed line represents the CCME interm sediment quality guideline (0.6 mg/kg); the CCME probable effects level (3.5 mg/kg) is not shown.

NEWMONT NORTH AMERICA

Average Annual Cadmium Concentration in Stream and River Sediments, Hope Bay Belt Project, 1993 - 2010

Figure 3.5-3f

Rescan™ Engineers & Scientists



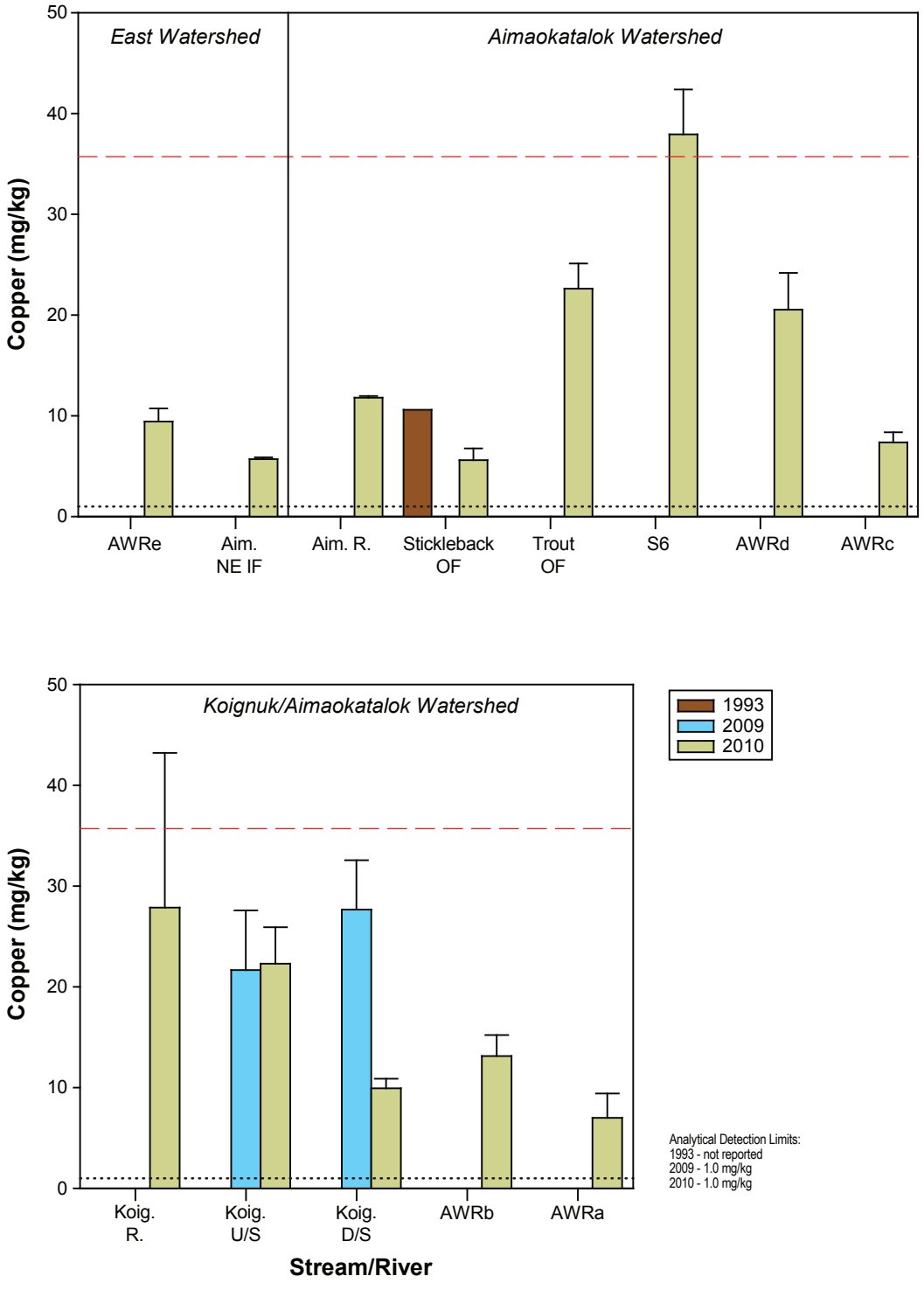
Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limits; values below the detection limit are plotted at half the detection limit.
Numbers avove bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Red dashed lines represent the CCME interim sediment quality guideline (37.3 mg/kg) and probable effects level (90 mg/kg).

NEWMONT NORTH AMERICA

Average Annual Chromium Concentration in Stream and River Sediments, Hope Bay Belt Project, 1993 - 2010

Figure 3.5-3g

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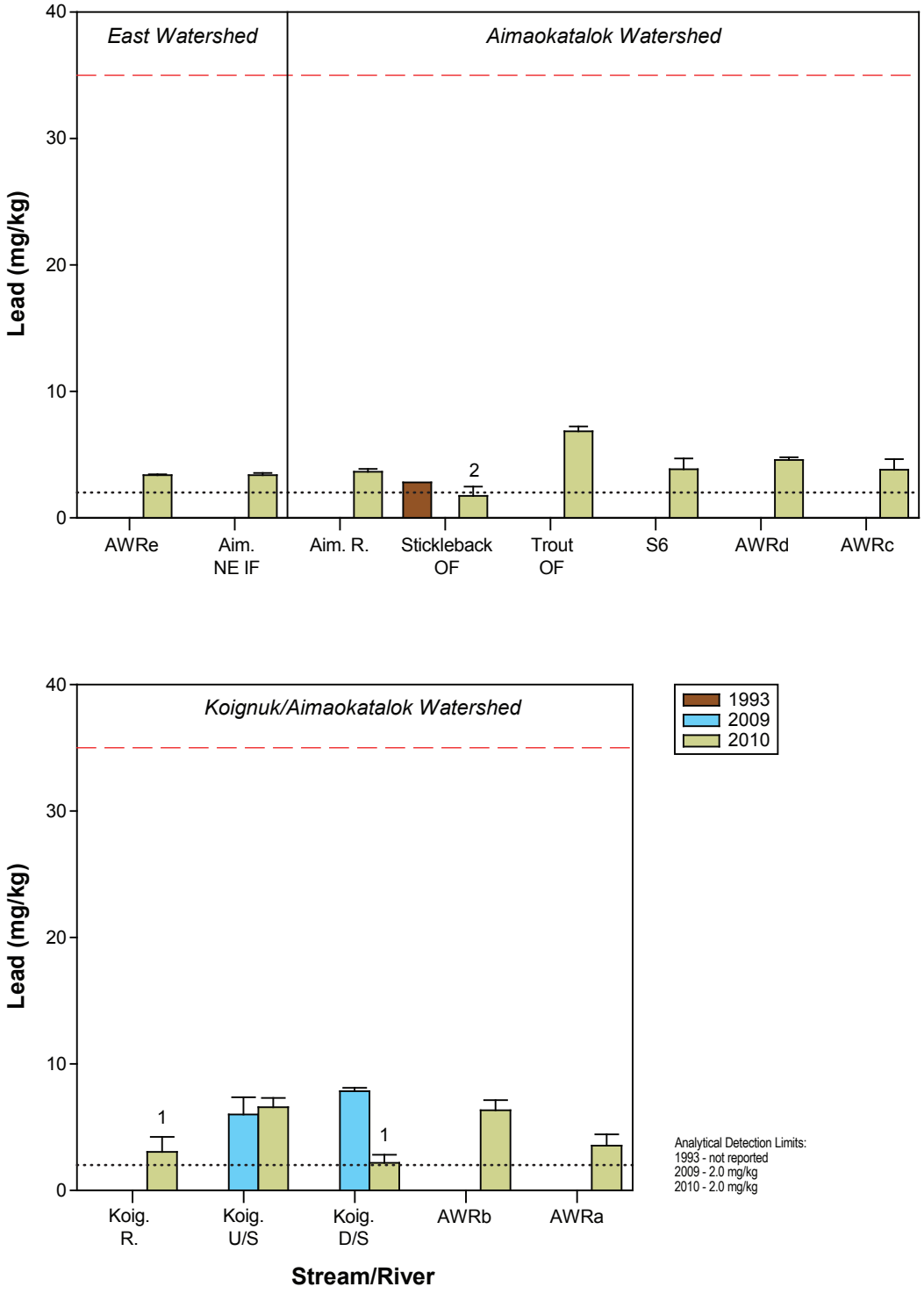
Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limits; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Red dashed line represents the CCME interm sediment quality guideline (35.7 mg/kg); the CCME probable effects level (197 mg/kg) is not shown.

NEWMONT NORTH AMERICA

Average Annual Copper Concentration in Stream and River Sediments, Hope Bay Belt Project, 1993 - 2010

Figure 3.5-3h

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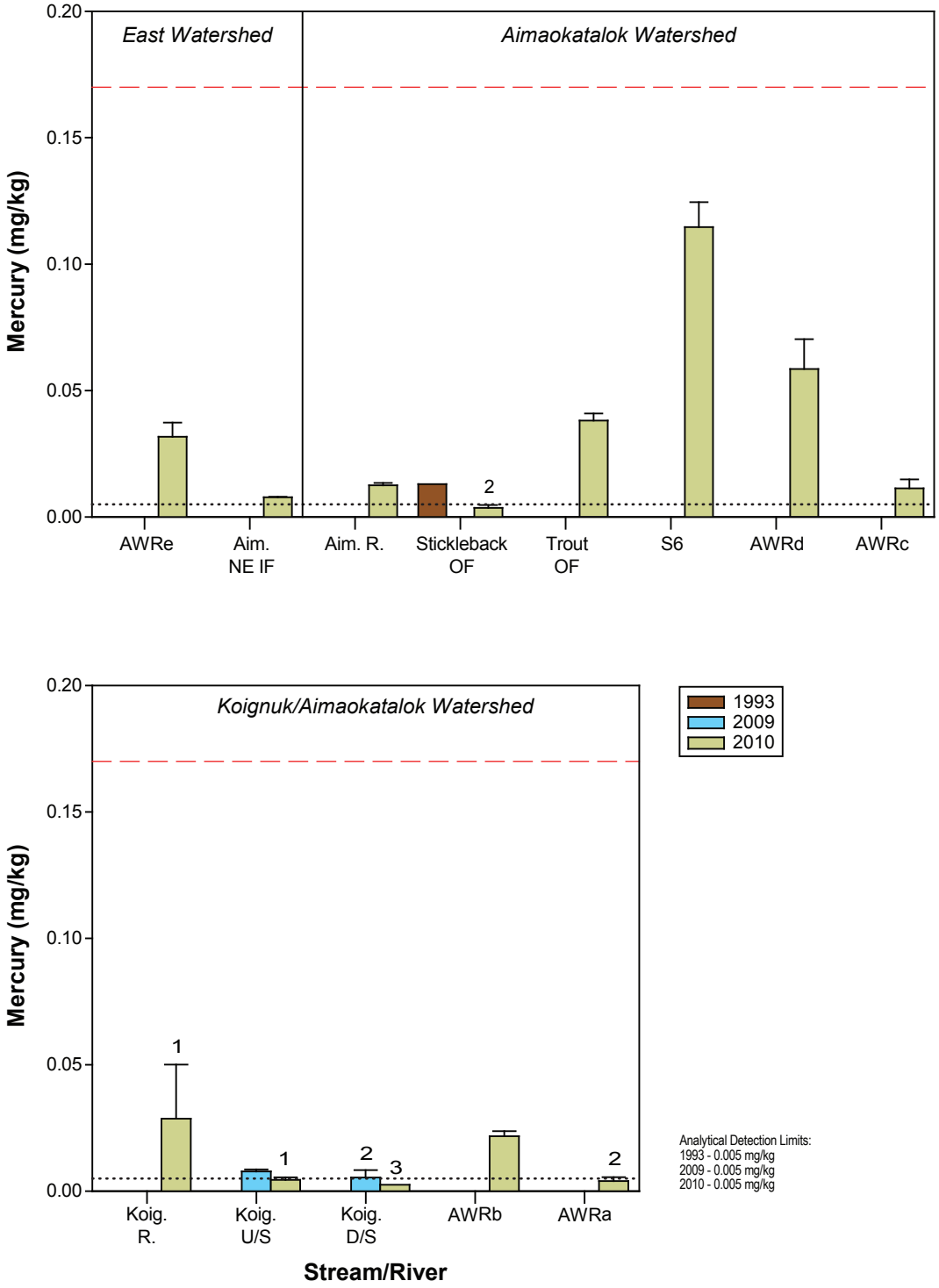
Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limits; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Red dashed line represents the CCME interm sediment quality guideline (35 mg/kg); the CCME probable effects level (91.3) is not shown.

NEWMONT NORTH AMERICA

Avearge Annual Lead Concentration in Stream and River Sediments, Hope Bay Belt Project, 1993 - 2010

Figure 3.5-3i

Rescan™ Engineers & Scientists



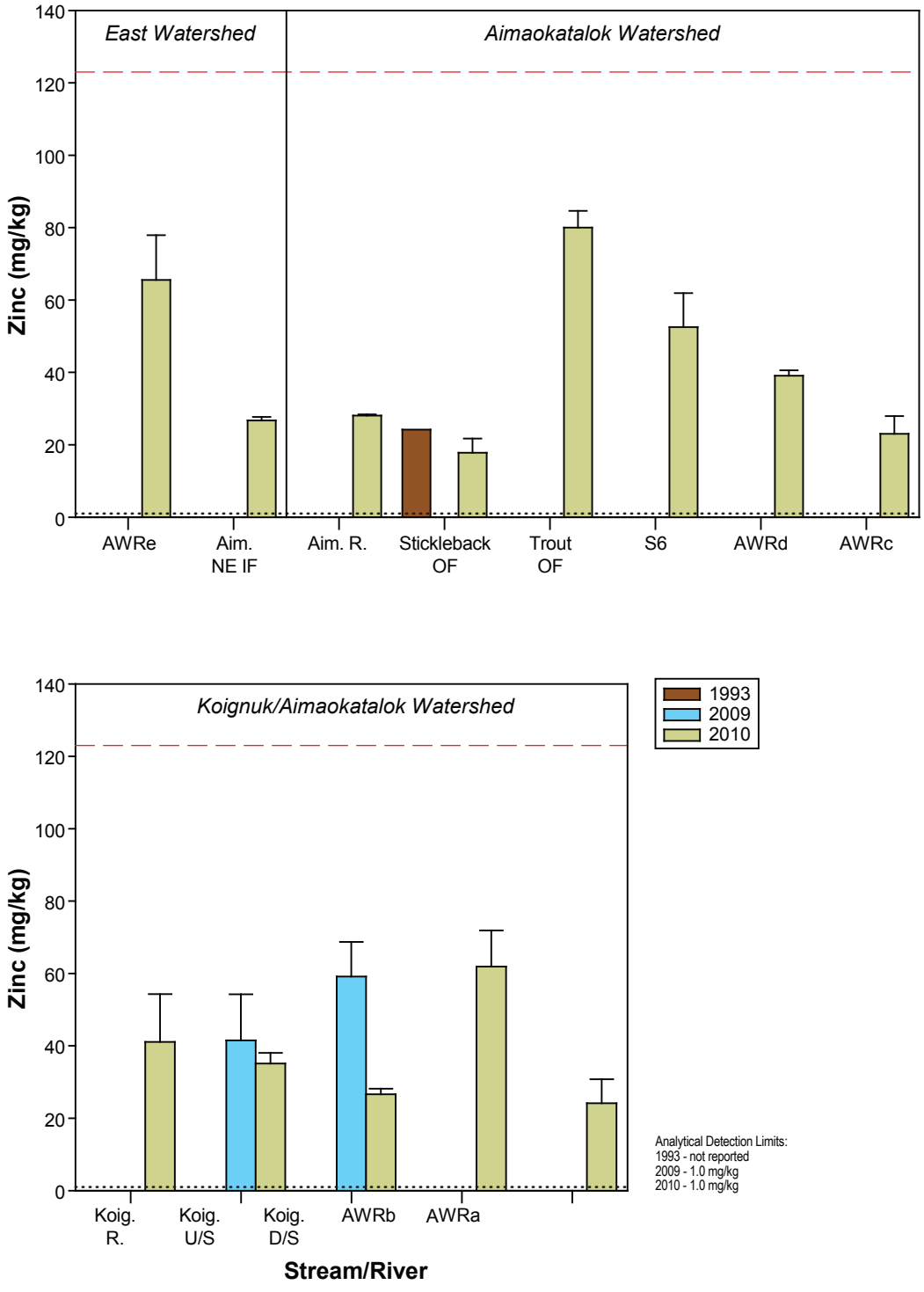
Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limits; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were abaove the detection limit.
Red dashed line represents the CCME interm sediment quality guideline (0.17 mg/kg); the CCME probable effects level (0.486 mg/kg) is not shown.

NEWMONT NORTH AMERICA

Average Annual Mercury Concentration in Stream and River Sediments, Hope Bay Belt Project, 1993 - 2010

Figure 3.5-3j

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Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limits; values below the detection limit are plotted at half the detection limit.
Numbers above bars indicate number of replicates with concentrations below the analytical detection limit;
absence of a number indicates all replicates were above the detection limit.
Red dashed line represents the CCME interm sediment quality guideline (123 mg/kg); the CCME probable effects level (315 mg/kg) is not shown.

NEWMONT NORTH AMERICA

Average Annual Zinc Concentration in Stream and River Sediments, Hope Bay Belt Project, 1993 - 2010

Figure 3.5-3k

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3.6 PHYTOPLANKTON

Phytoplankton biomass, abundance, and taxonomy samples were collected from lakes in August 2010. Raw phytoplankton biomass data are provided in Appendix 3.6-1 and phytoplankton abundance and taxonomy data are provided in Appendix 3.6-2.

3.6.1 Biomass

August phytoplankton biomass (as chlorophyll *a*) was low at all lake sites, and ranged from 0.45 µg chl *a*/L in Windy Deep to 1.0 µg chl *a*/L in Aim. Stn 5 (Figure 3.6-1). Windy Lake had the lowest average concentrations, and Stickleback, Trout, and Aimaokatalok lakes all had similar, low concentrations. All phytoplankton biomass levels measured in August 2010 were indicative of ultra-oligotrophic lakes (Vollenweider and Kerekes 1982).

Trophic status of a lake can be categorized by phytoplankton biomass or total phosphorus concentration (as well as other parameters, such as Secchi depth). The trophic status of some of the lakes differed based on total phosphorus concentrations compared to phytoplankton biomass concentrations. Overall, Windy Lake could be considered the lake with the lowest trophic classification (ultra-oligotrophic to oligotrophic), followed by Aimaokatalok Lake, Stickleback Lake, and Trout Lake.

3.6.2 Abundance

Phytoplankton abundance in August averaged 237 cells/mL, and ranged from 129 cells/mL at Windy Lake to 337 cells/mL at Stickleback Lake. There were no clear spatial trends in phytoplankton abundance (Figure 3.6-1).

3.6.3 Taxonomic Composition

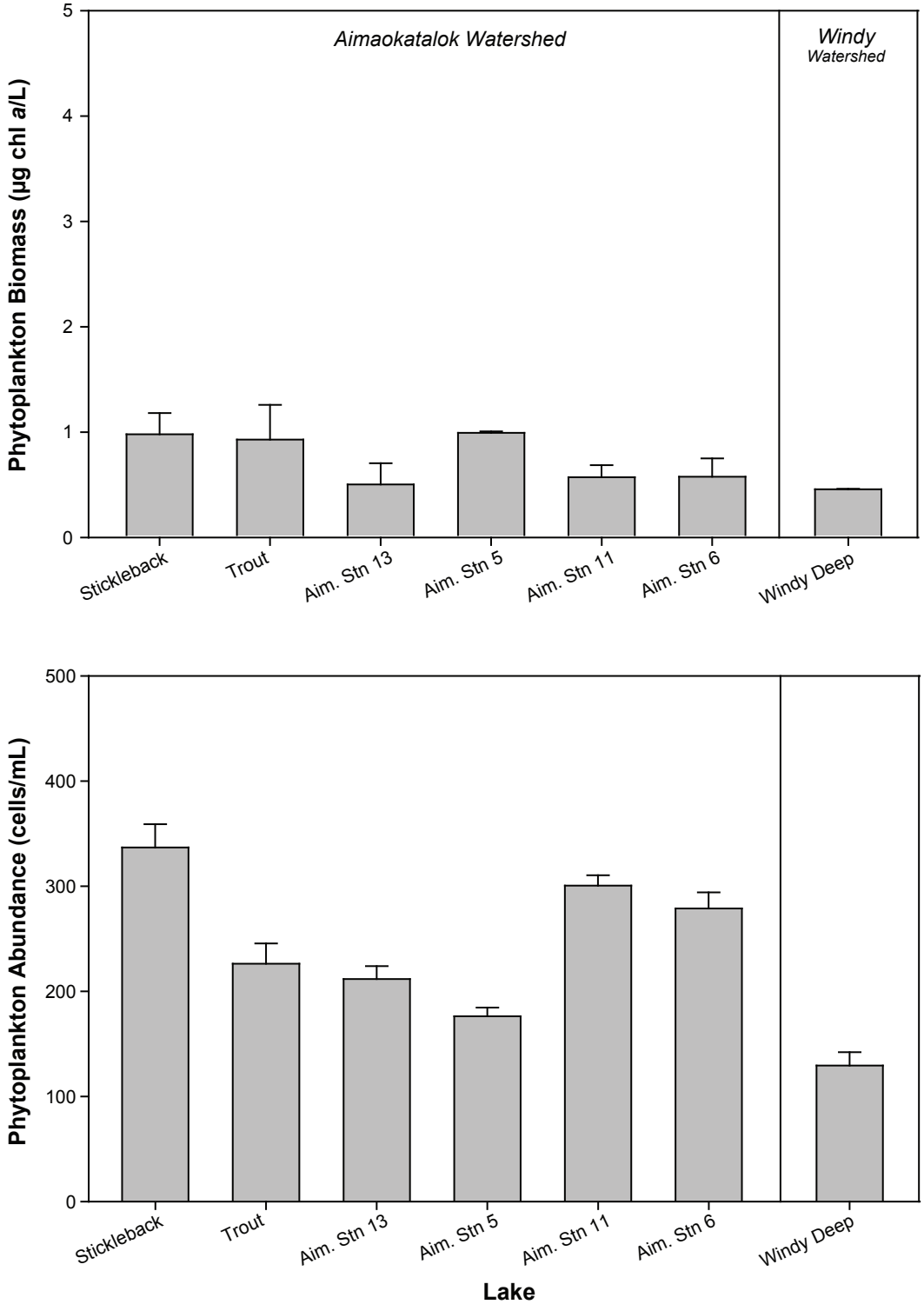
Lakes in the study area contained a diverse assemblage of phytoplankton taxa during August (Figure 3.6-2). Diatoms and chrysophytes were generally the most abundant taxa, making up a combined 61% to 90% of the phytoplankton assemblages in study lakes. The exception to this was Windy deep, where the phytoplankton was composed of 61% diatoms but less than 1% chrysophytes. The abundance of other taxonomic groups, including chlorophytes, cyanophytes and dinoflagellates, varied between lakes (Figure 3.6-2).

Cyanophytes (also known as blue-green algae or cyanobacteria) accounted for 29% and 38% of the phytoplankton assemblages in Trout Lake and Windy Lake, respectively, compared to a maximum of 4% at the other lake sampling sites. *Anabaena flos-aquae and Anabaena planctonica* were the most abundant species of blue-green algae in Trout Lake. *Aphanizomenon flos-aquae* was the dominant species in Windy Lake. The phytoplankton community in Windy Lake was distinctive both because of the relatively high contribution of cyanobacteria and the very low abundance of chrysophytes compared to other lakes (Figure 3.6-2).

The phytoplankton assemblages in Stickleback and Trout lakes contained larger proportions of dinoflagellates compared to other lake sites, averaging 8.8% and 4.5%, respectively, compared to less than 1.4% at the other sites (Figure 3.6-2).

3.6.4 Richness and Diversity

Phytoplankton genera richness averaged 21 genera/sample in the lakes during August 2010 (Figure 3.6-3). Lakes within the Aimaokatalok Watershed had slightly greater richness (averaging 20 to 23 genera/sample) than Windy Lake (averaging 13 genera/sample).



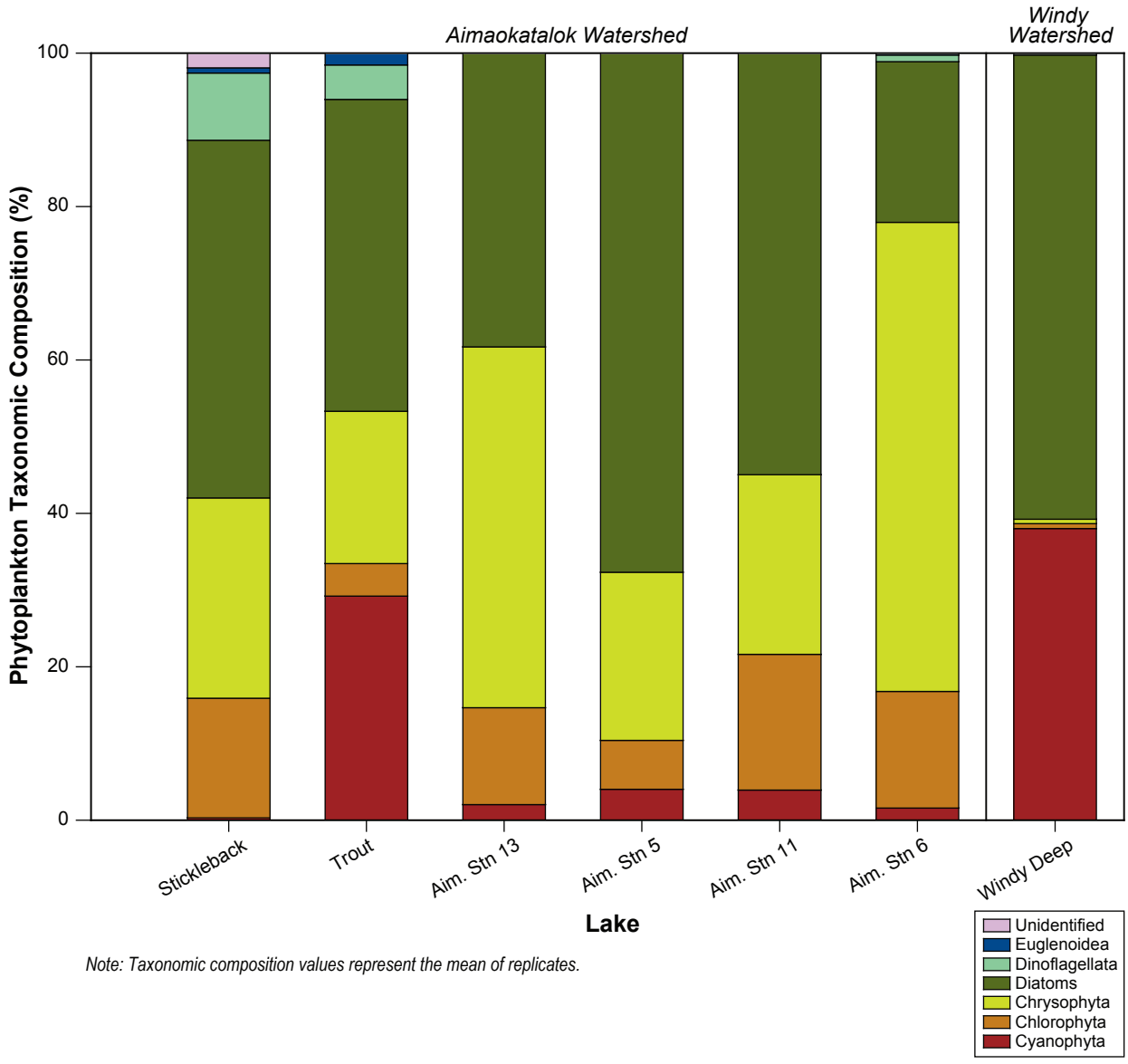
Note: Error bars represent standard error of the mean.

NEWMONT NORTH AMERICA

Phytoplankton Biomass and Abundance in Lakes, Hope Bay Belt Project, August 2010

Figure 3.6-1

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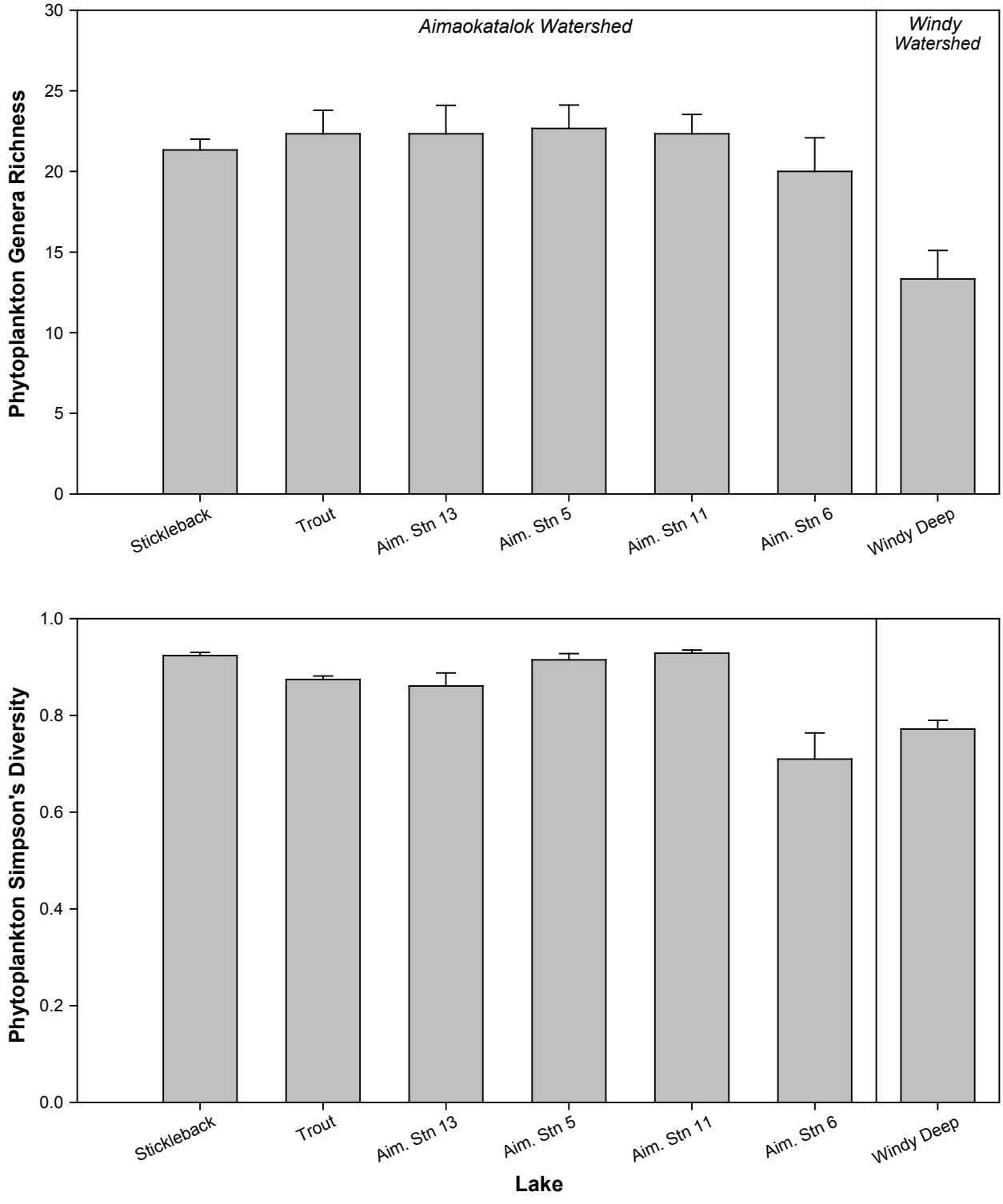
Note: Taxonomic composition values represent the mean of replicates.

NEWMONT NORTH AMERICA

Phytoplankton Taxonomic Composition in Lakes, Hope Bay Belt Project, August 2010

Figure 3.6-2

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Note: Error bars represent standard error of the mean.

NEWMONT NORTH AMERICA

Phytoplankton Richness and Diversity in Lakes, Hope Bay Belt Project, August 2010

Figure 3.6-3

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During August, the diversity was lowest at Aim. Stn 6 (0.71) and highest at Aim. Stn 11 (0.93; Figure 3.6-3). Aimaokatalok Watershed tended to have greater diversity than Windy Lake.

3.6.5 Annual Variation

Only historical sampling locations that were also sampled in 2010 were included in the comparisons of annual phytoplankton biomass and abundance data shown in Figures 3.6-4 and 3.6-5. Note that historical sampling locations and methodology may not correspond exactly with 2010 locations and methodology, and this may contribute to variability observed between years (see Table 2.14-5 and Figures 2.14-3a to 2.14-3c for historical sampling locations and methodologies). Winter phytoplankton data were not included in the annual averages as winter samples were collected only in 2009 and 2010.

Phytoplankton biomass data have been collected since 1996 at some of the lakes that were sampled in 2010. Considering the annual differences in sample collection location, sampling date, and sampling methodology (e.g., discrete samples vs. depth-integrated samples), historical data generally showed similar biomasses. The exception being the spike in biomass at Trout Lake in 2006, which was five times higher than biomasses recorded in the six other years (Figure 3.6-4).

Phytoplankton abundance data have been collected since 1994 at some of the lakes that were sampled in 2010. Annual data were highly variable (Figure 3.6-5).

3.7 PERIPHYTON

Periphyton plates were installed in streams and rivers in early August and retrieved in early September 2010. Appendix 3.7-1 provides periphyton biomass data, and Appendix 3.7-2 provides periphyton density and taxonomy data.

3.7.1 Biomass

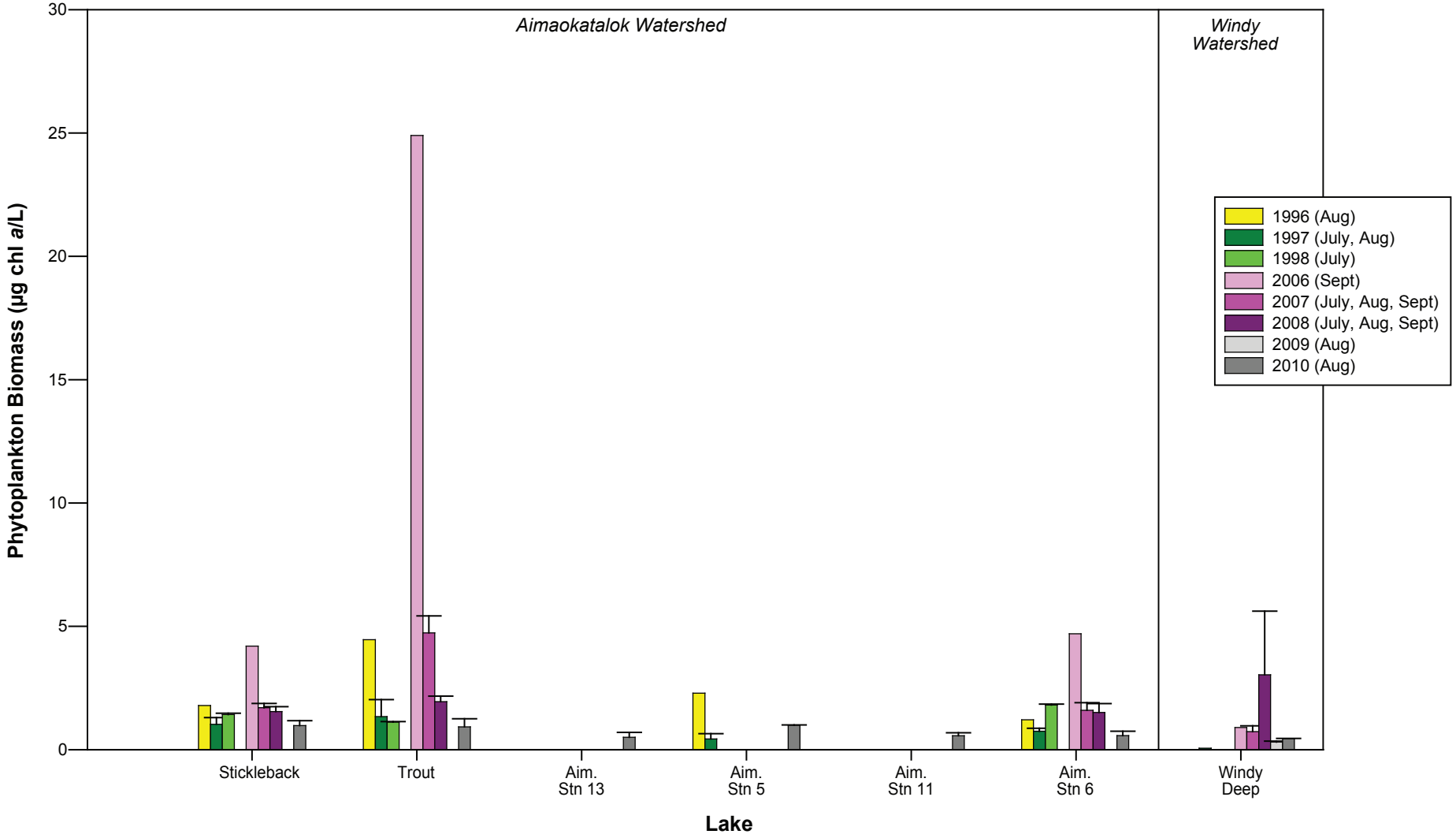
Average periphyton biomass (as chlorophyll *a*) ranged from 0.01 µg chl *a*/cm^2 at Koig. D/S to 0.44 µg chl *a*/cm^2 at Aim. OF (Figure 3.7-1). The average periphyton biomass for all of the sampled streams and rivers was 0.18 µg chl *a*/cm^2. There were no clear spatial patterns in periphyton biomass between watersheds (Figure 3.7-1).

3.7.2 Density

Average periphyton density ranged from approximately 5,400 cells/cm^2 at AWRd to 176,000 cells/cm^2 at Koig. U/S (Figure 3.7-1). Periphyton density and biomass generally showed similar patterns (e.g., with low biomass sites having low periphyton density, and sites with high biomass having high density). Overall, periphyton density averaged 65,100 cells/cm^2 across all sites, and there were no apparent differences between watersheds (Figure 3.7-1).

3.7.3 Taxonomic Composition

Periphyton assemblages were almost exclusively composed of diatoms, which made up at least 81% of the periphyton community in all sampled streams and rivers (Figure 3.7-2). The periphyton community at Koig. U/S was entirely composed of diatoms (100%). The diatoms *Achnanthes minutissima* and *Diatoma tenue* were among the most common species of diatoms found in stream and river periphyton communities. *Achnanthes minutissima* is a small, adnate diatom that is common in riffle habitats and often dominates high flow regimes.



Note: Error bars represent standard error of the mean

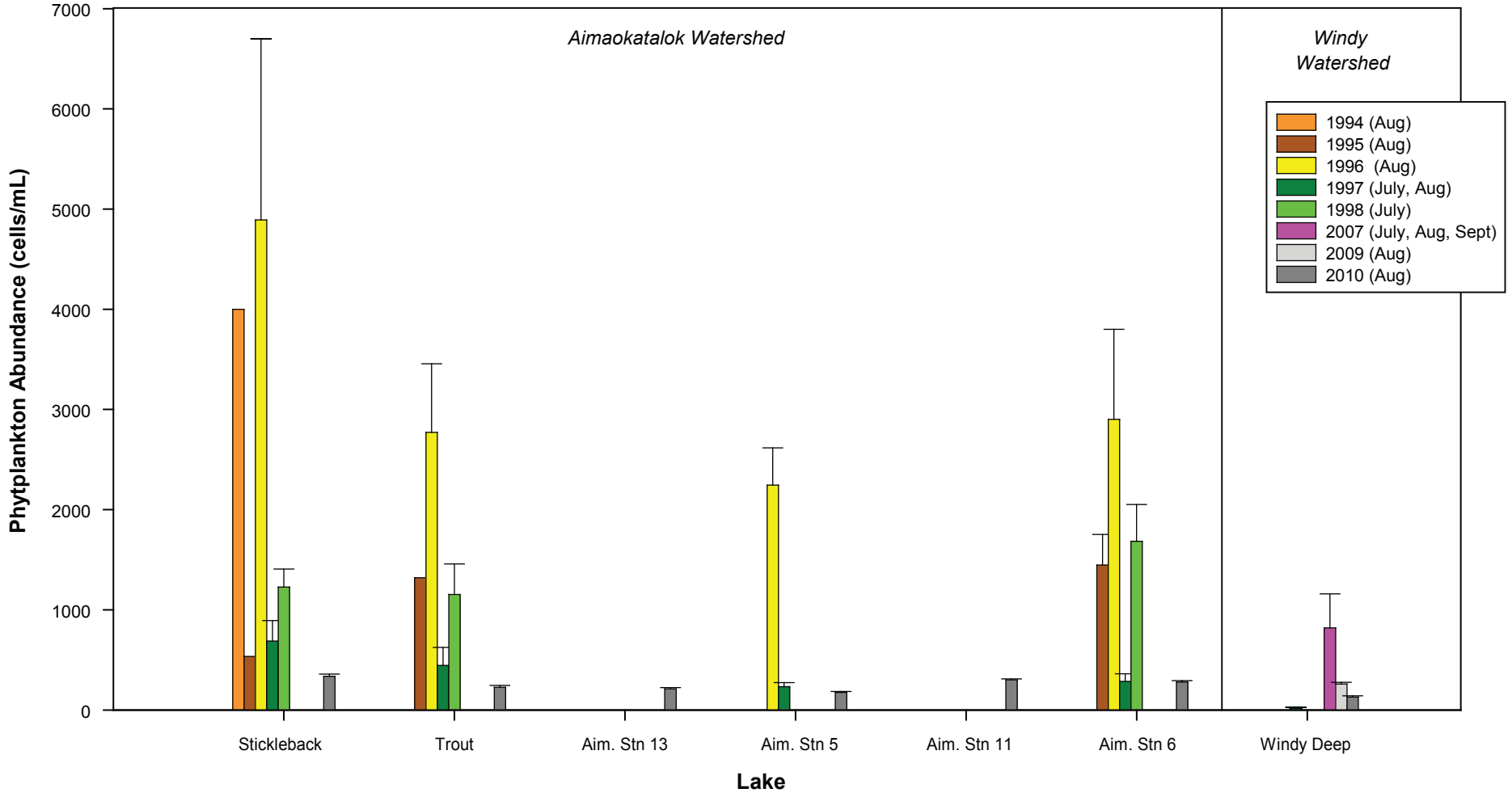
Figure 3.6-4

NEWMONT NORTH AMERICA

Average Annual Phytoplankton Biomass in Lakes, Hope Bay Belt Project, 1996 - 2010

Figure 3.6-4

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Note: Error bars represent standard error of the mean

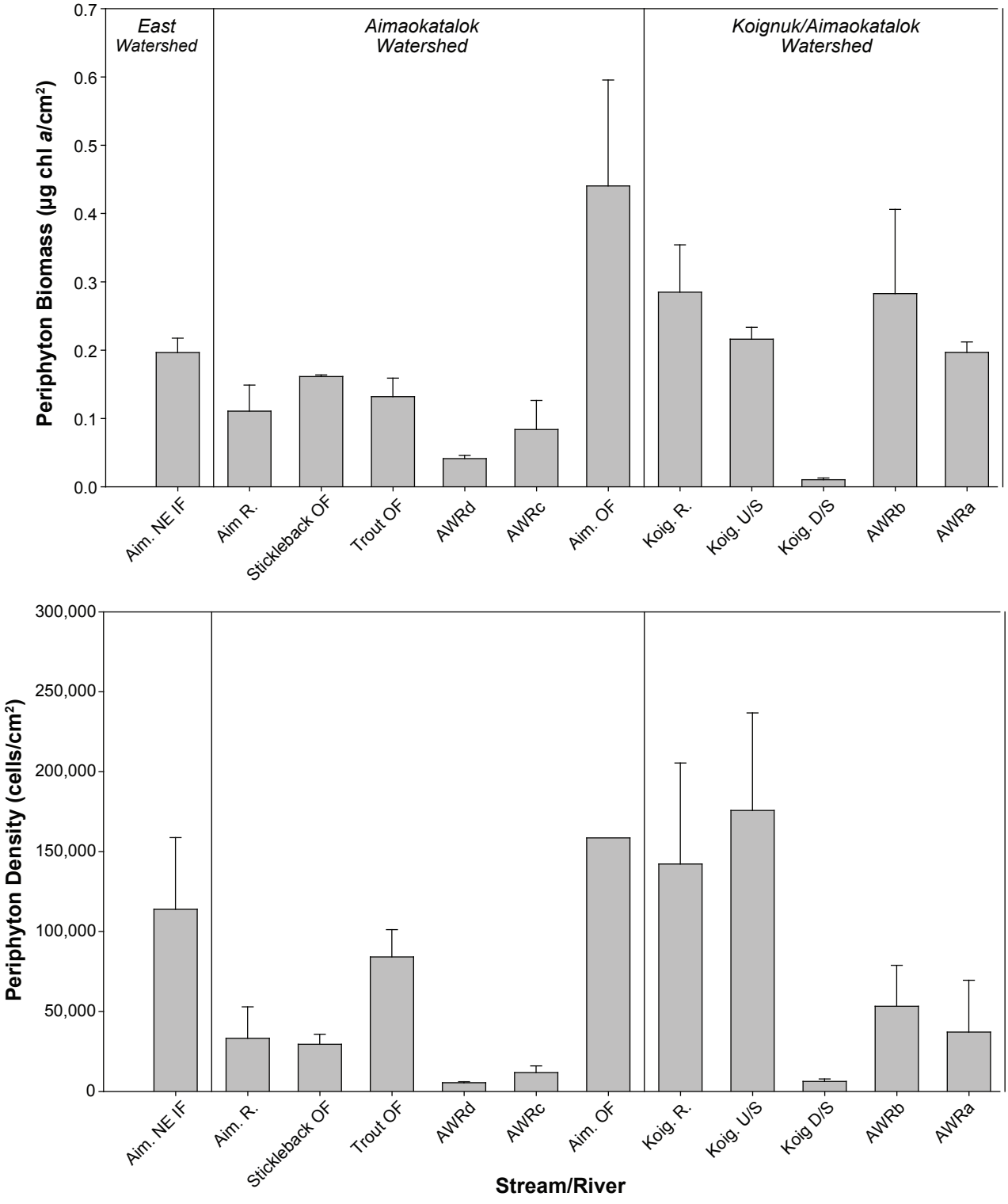
Figure 3.6-5

NEWMONT NORTH AMERICA

Average Annual Phytoplankton Abundance in Lakes, Hope Bay Belt Project, 1994 - 2010

Figure 3.6-5

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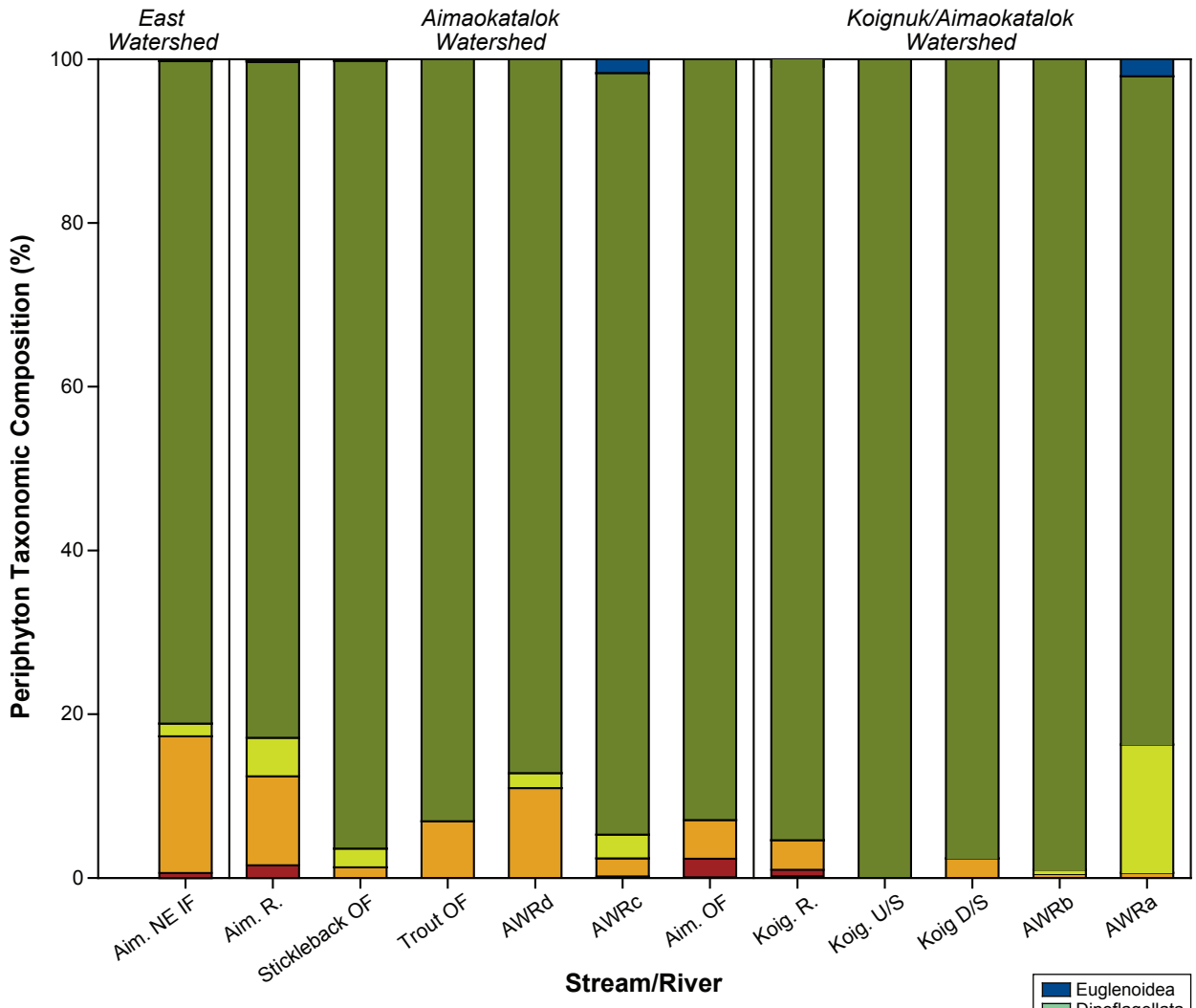
Note: Error bars represent standard error of the mean
Samplers were immersed for 28 - 30 days between early August and early September

NEWMONT NORTH AMERICA

Periphyton Biomass and Density in Streams and Rivers, Hope Bay Belt Project, August/September 2010

Figure 3.7-1

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Note: Taxonomic composition values represent the mean of replicates
Samplers were immersed for 28 - 30 days between early August and early September

NEWMONT NORTH AMERICA

Periphyton Taxonomic Composition in Streams and Rivers, Hope Bay Belt Project, August/September 2010

Figure 3.7-2

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Chlorophytes were the second most common periphyton group in most streams and rivers, making up between 0% (Koig. U/S) and 16.7% (Aim. NE IF) of the composition by density. Chrysophytes, cyanophytes, and euglenoids generally made minor contributions to the periphyton assemblages.

3.7.4 Richness and Diversity

Periphyton genera richness ranged from 10 genera/sample at both Trout OF and Koig D/S to 18 genera/sample at both Aim. R and Aim. OF (Figure 3.7-3). Overall, the periphyton communities were quite diverse and relatively similar among sites, with diversity ranging from 0.63 to 0.88 at most sites, and averaging 0.77 (Simpson's diversity index). Trout OF was the exception to this, as diversity at this site (0.47) was relatively low compared to the other sites. This low diversity is likely a reflection of both the low genera richness as well as the low genera evenness at Trout OF, as the genus *Achnanthes* made up more than 60% of the periphyton community composition at this site.

3.7.5 Annual Variation

Only historical sampling locations corresponding to streams and rivers sampled in 2010 were included in the comparison of annual periphyton biomass and density shown in Figures 3.7-4 and 3.7-5. Note that historical sampling locations may not correspond exactly with those sampled in 2010 and this may contribute to variability in periphyton biomass and density between years. Prior to 1997, periphyton was collected by scraping rocks in streams and rivers, whereas from 1997 onward, Plexiglas® plates were installed in streams and rivers for approximately one month to allow for colonization by periphyton. As well, the timing of plate installation has varied between years. These differences in methodology and timing of sampling may also contribute to differences in periphyton biomass and density between years (see Table 2.14-6 and Figures 2.14-3a to 2.14-3c for historical sampling locations and methodologies).

Historical annual periphyton biomass data were highly variable within sites over time as well as between sites for any given year (Figure 3.7-4). Periphyton biomass was particularly high in 1997 and 1998 ranging from 9.5 to 371 µg chl *a*/cm^2 at Aim. NE IF, Aim. R, Stickleback OF, and Trout OF. Periphyton biomass levels in 2009 and 2010 have remained below 0.5 µg chl *a*/cm^2 at all sampling sites.

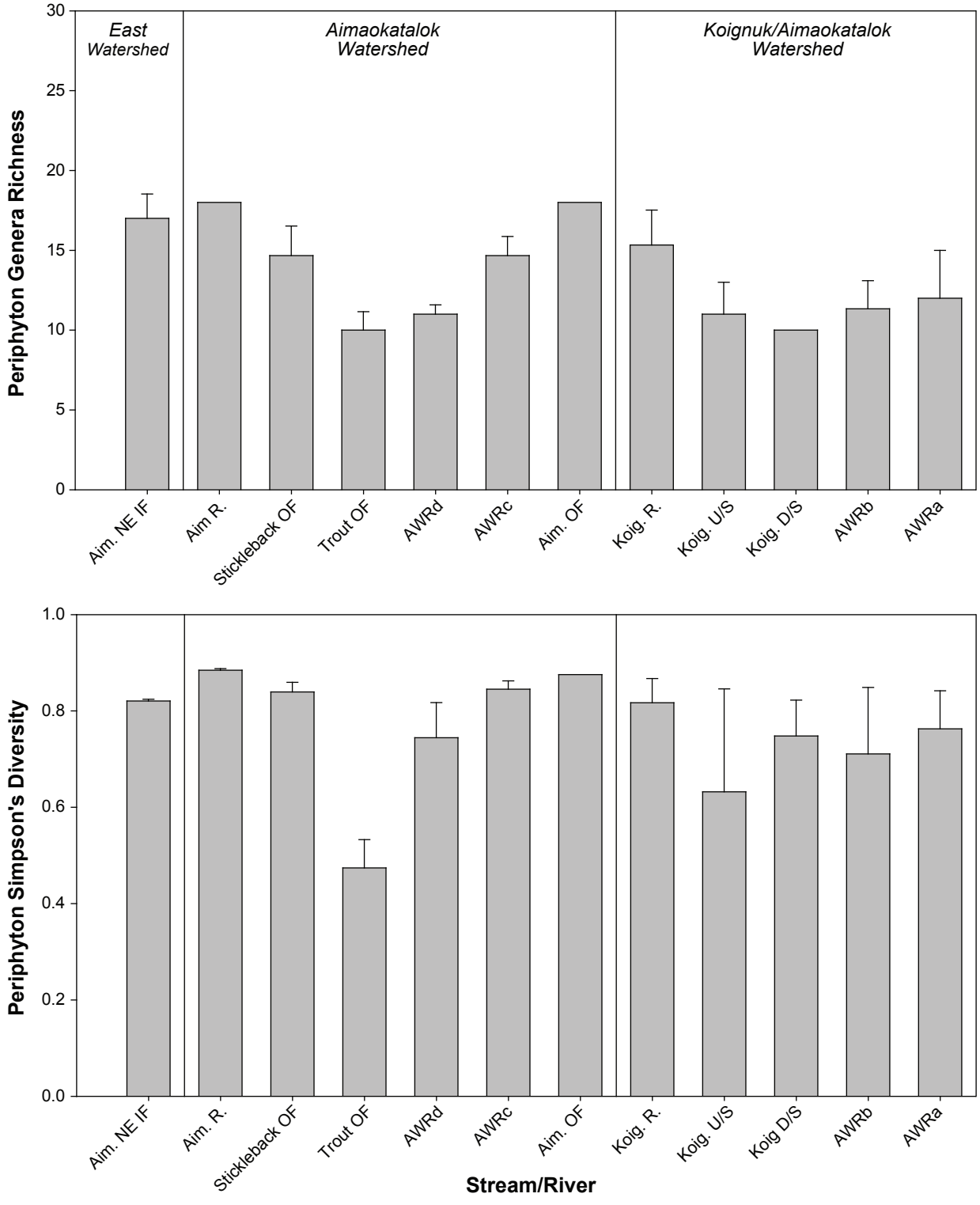
Historical annual periphyton density was also highly variable within and between sites (Figure 3.7-5). Some of the highest periphyton densities were reported in 1995 when samples were collected by scraping periphyton from the surface of rocks. There were no obvious spatial or temporal trends in periphyton density, possibly because of the high variability in the historical dataset (Figure 3.7-5).

3.8 ZOOPLANKTON

Zooplankton abundance and taxonomy samples were collected from lakes in August 2010. The raw zooplankton data are presented in Appendix 3.8-1.

3.8.1 Abundance

Zooplankton abundances were below 32,000 organisms/m^3 in all lakes, except Trout Lake where zooplankton abundance averaged 270,000 organisms/m^3 (Figure 3.8-1). The lowest abundances were found in Stickleback and Windy Lake sites, which averaged 1,250 and 8,330 organisms/m^3 respectively. Zooplankton abundances at the other sites averaged between 26,000 and 32,000 organisms/m^3. There were no clear differences in zooplankton abundances between watersheds (Figure 3.8-1).



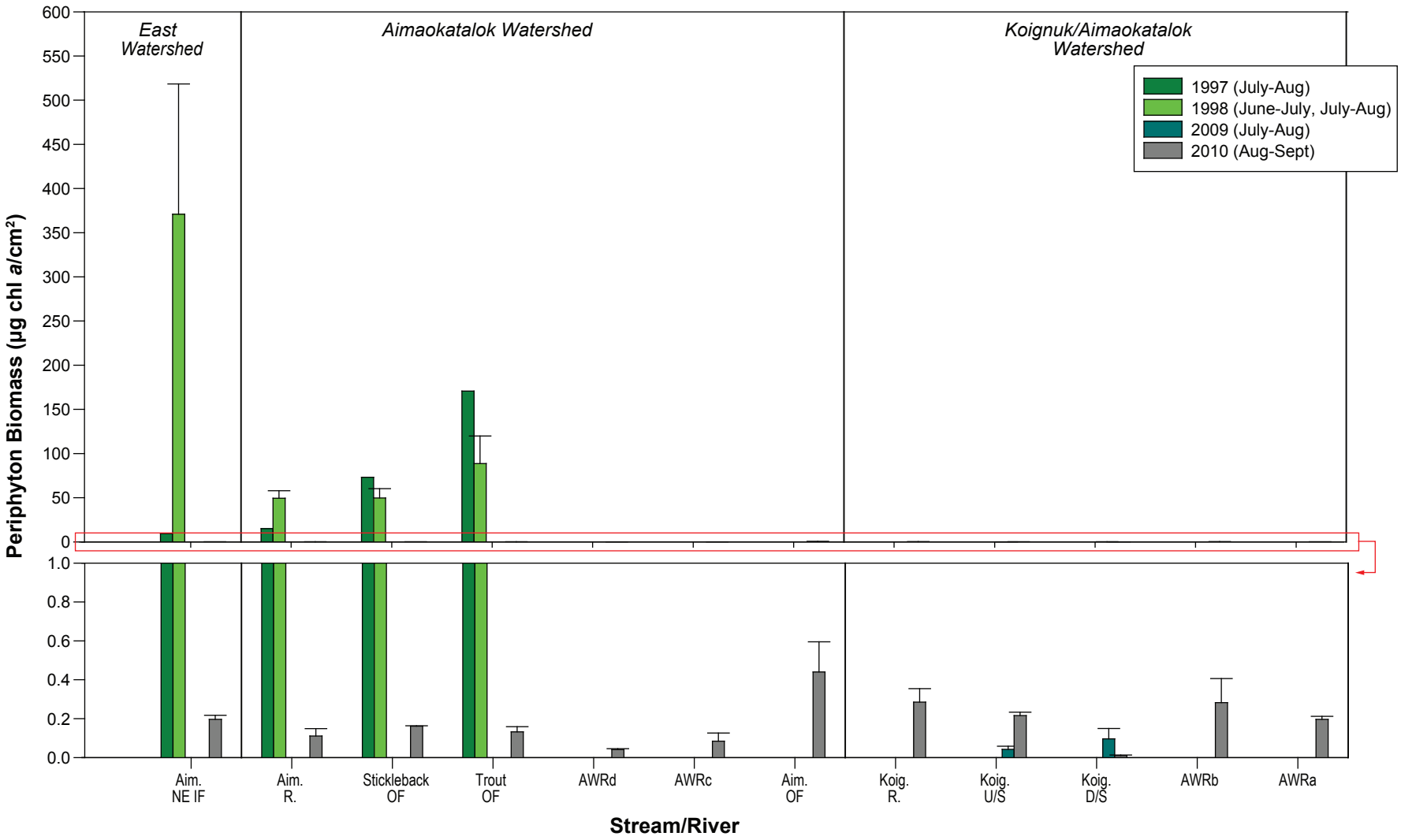
Note: Error bars represent the stand error of the mean
Samplers were immersed for 28 - 30 days between early August and early September

NEWMONT NORTH AMERICA

Periphyton Richness and Diversity in Streams and Rivers, Hope Bay Belt Project, August/September 2010

Figure 3.7-3

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Note: Error bars represent standard error of the mean

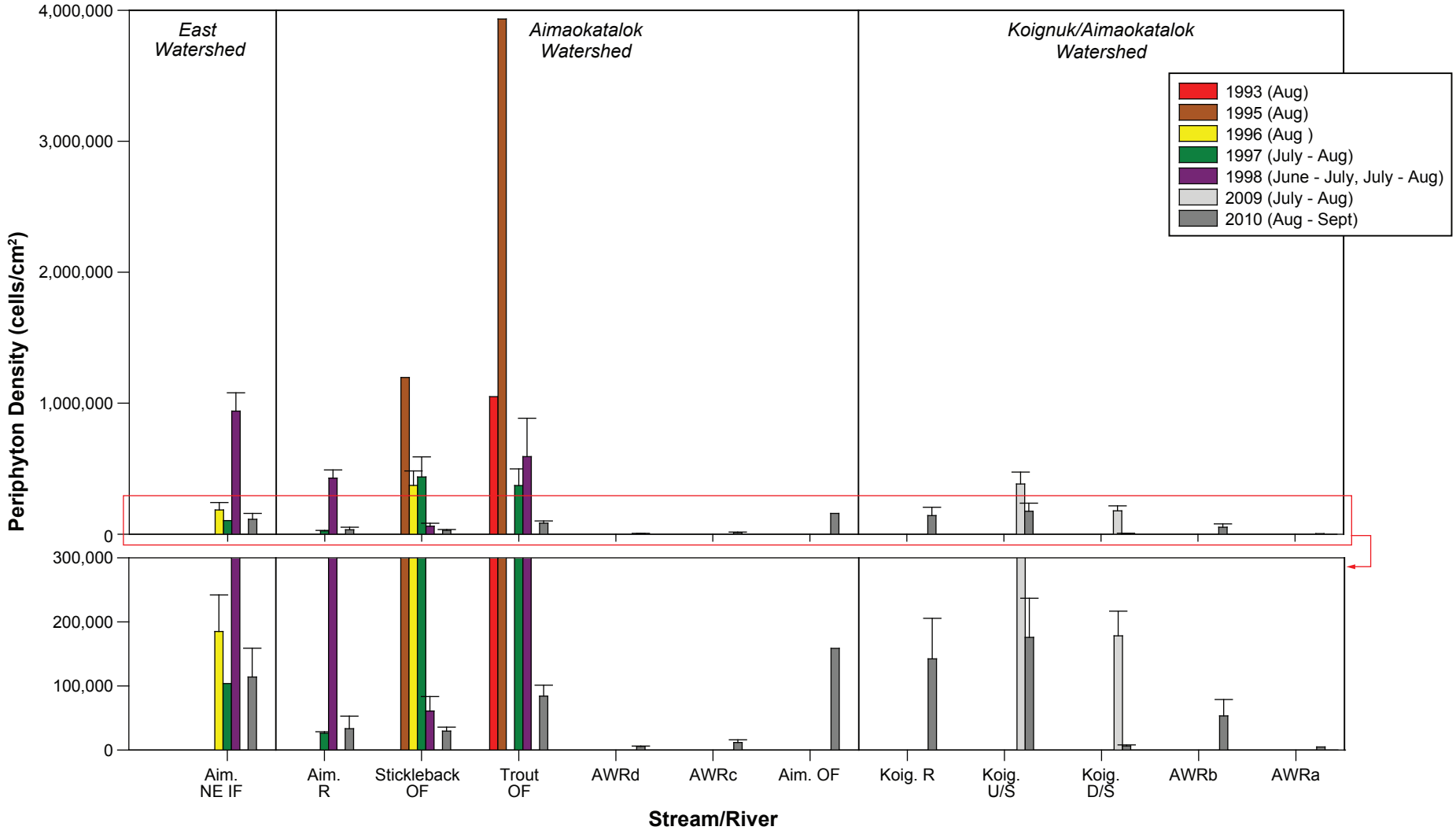
Figure 3.7-4

NEWMONT NORTH AMERICA

Average Annual Periphyton Biomass in Streams and Rivers, Hope Bay Belt Project, 1997 - 2010

Figure 3.7-4

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Note: Error bars represent standard error of the mean
1993, 1995, 1996 data were collected instantaneously by scraping rocks; 1997, 1998, 2009, and 2010 data were collected using Plexiglas plate samplers installed for approximately 1 month.

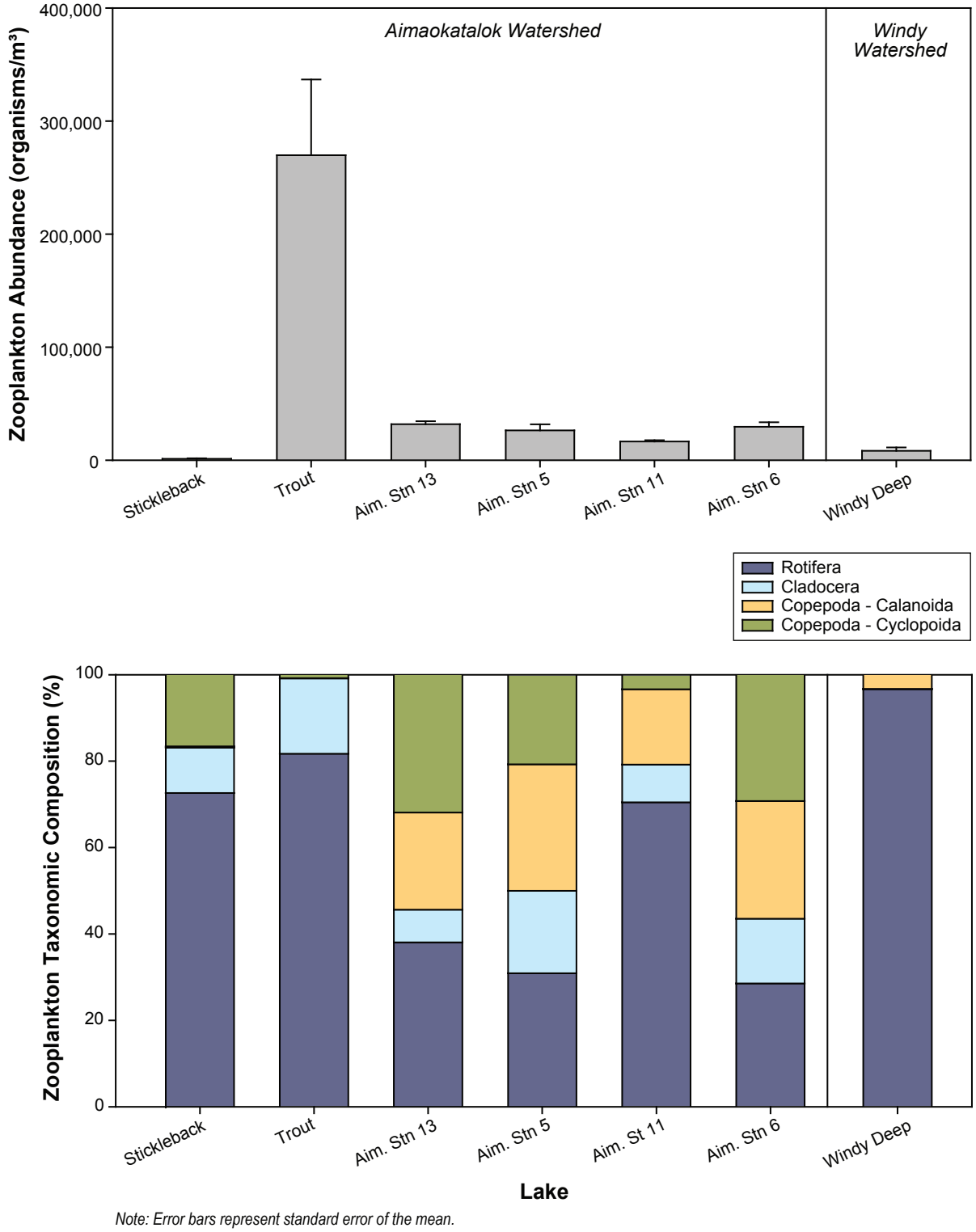
Figure 3.7-5

NEWMONT NORTH AMERICA

Average Annual Periphyton Density in Streams and Rivers, Hope Bay Belt Project, 1993 - 2010

Figure 3.7-5

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Note: Error bars represent standard error of the mean.

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Zooplankton Abundance and Taxonomic Composition in Lakes, Hope Bay Belt Project, August 2010

Figure 3.8-1

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3.8.2 Taxonomic Composition

Lake zooplankton assemblages were largely composed of rotifers, cladocerans, and calanoid and cyclopoid copepods (Figure 3.8-1). Aim. Stn 13, Aim. Stn 5, and Aim. Stn 6 were similar in composition, having approximately even proportions of rotifers, and calanoid and cyclopoid copepods, with fewer cladocerans. The zooplankton assemblages at Stickleback, Trout, Aim. Stn 11, and Windy lakes were composed mainly of rotifers, which made up between 70 and 97% of the zooplankton community. The rotifer *Kellicottia longispina* was particularly abundant in Trout Lake, which had the highest total zooplankton abundance. This rotifer accounted for 61% of all zooplankton individuals collected in the study lakes. Compared to other lakes, Trout Lake contained relatively small proportions of copepods (<1%), and Windy Deep had low proportions of cladocerans and cyclopoid copepods(<1%) (Figure 3.8-1).

3.8.3 Richness and Diversity

Average zooplankton genera richness varied between lakes, and ranged from 4 genera/sample at Windy Lake Deep, to 13 genera/sample at Trout Lake. The genera richness of the remaining sites ranged between 8.3 and 9.3 genera/sample (Figure 3.8-2).

The Simpson's diversity index for zooplankton was also variable, ranging from 0.22 at Windy Deep to 0.70 at Aim. Stn 5 (Figure 3.8-2). The site with the lowest Simpson's diversity, Windy Deep, also had very low evenness, with only two genera making up more than 96% of the community. There were no clear differences in diversity between watersheds.

3.8.4 Annual Variation

Only historical sampling locations that were also sampled in 2010 were included in the comparison of annual zooplankton abundance shown in Figure 3.8-3. Note that historical sampling locations and methods may not correspond exactly with those sampled in 2010, and this may contribute to the large variability observed between years (see Table 2.14-7 and Figures 2.14-4a to 2.14-4c for historical sampling locations and methodologies).

Zooplankton abundances were highly variable among years, and no consistent annual trends were apparent. The very high zooplankton abundance at Stickleback Lake in 1993 may be partly attributable to the smaller zooplankton net mesh size used in 1993 (63 µm compared to 118 µm from 1995 to 2010). 2010 zooplankton abundances at Aim. Stn 5, and Windy Deep were generally similar to previous years. Trout Lake zooplankton abundance was high in 2010 relative to previous years (Figure 3.8-3).

3.9 LAKE BENTHOS

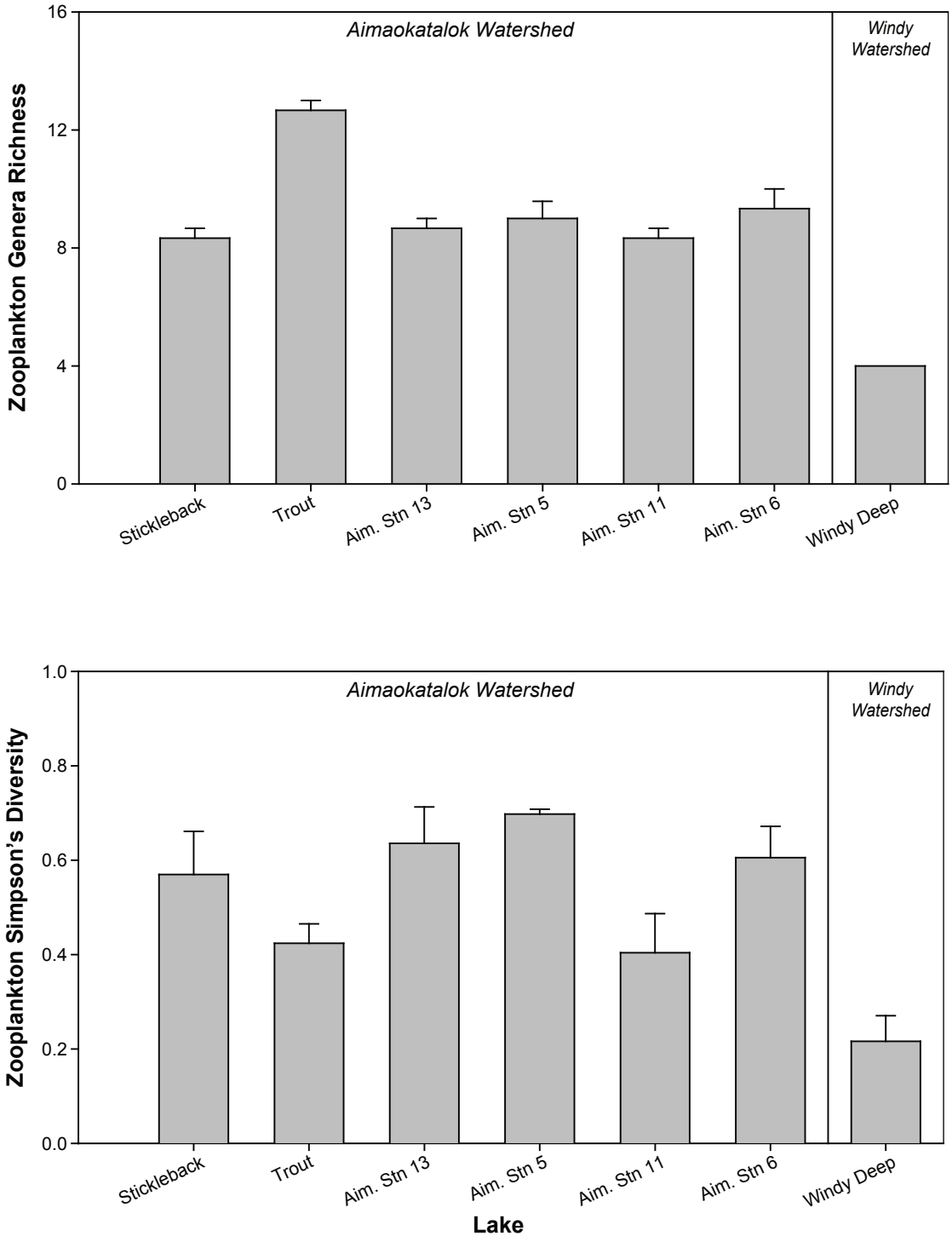
Benthos density and taxonomy samples were collected from lakes in August 2010. Raw benthos data are provided in Appendix 3.9-1.

3.9.1 Density

Average benthos density varied between lakes, ranging from 77 organisms/m^2 in Windy Lake (deep depth) to 35,500 organisms/m^2 in Trout Lake (shallow depth; Figure 3.9-1; Appendix 3.9-1). Benthos densities at Trout and Stickleback lakes were much higher than other lakes, averaging of 31,600 organisms/m^2, while all other lakes had average densities below 8,000 organisms/m^2 (Figure 3.9-1).

3.9.2 Taxonomic Composition

Figure 3.9-2 presents the taxonomic composition of the lake benthos communities surveyed. Benthic communities in the study lakes were composed largely of dipterans, or true flies as they are commonly known (between 26 and 91% of individuals found at each site). Pelecypods (bivalves), oligochaetes (segmented worms), and ostracods (seed shrimp) also made important contributions to the benthic assemblages at some sites.



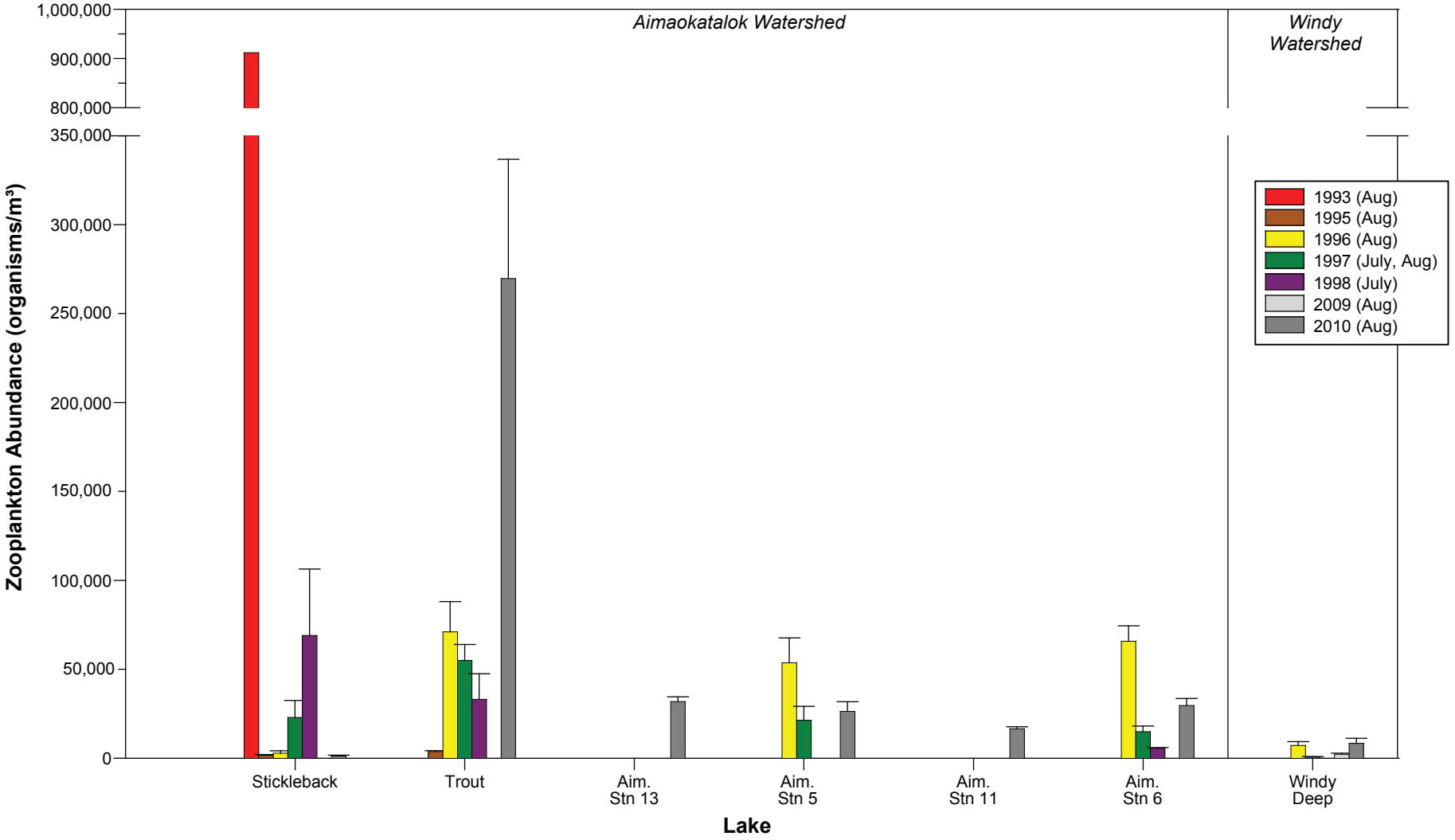
Note: Error bars represent standard error of the mean.

NEWMONT NORTH AMERICA

Zooplankton Richness and Diversity in Lakes, Hope Bay Belt Project, August 2010

Figure 3.8-2

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Note: Error bars represent standard error of the mean.

Figure 3.8-3

NEWMONT NORTH AMERICA

Average Annual Zooplankton Abundance in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.8-3

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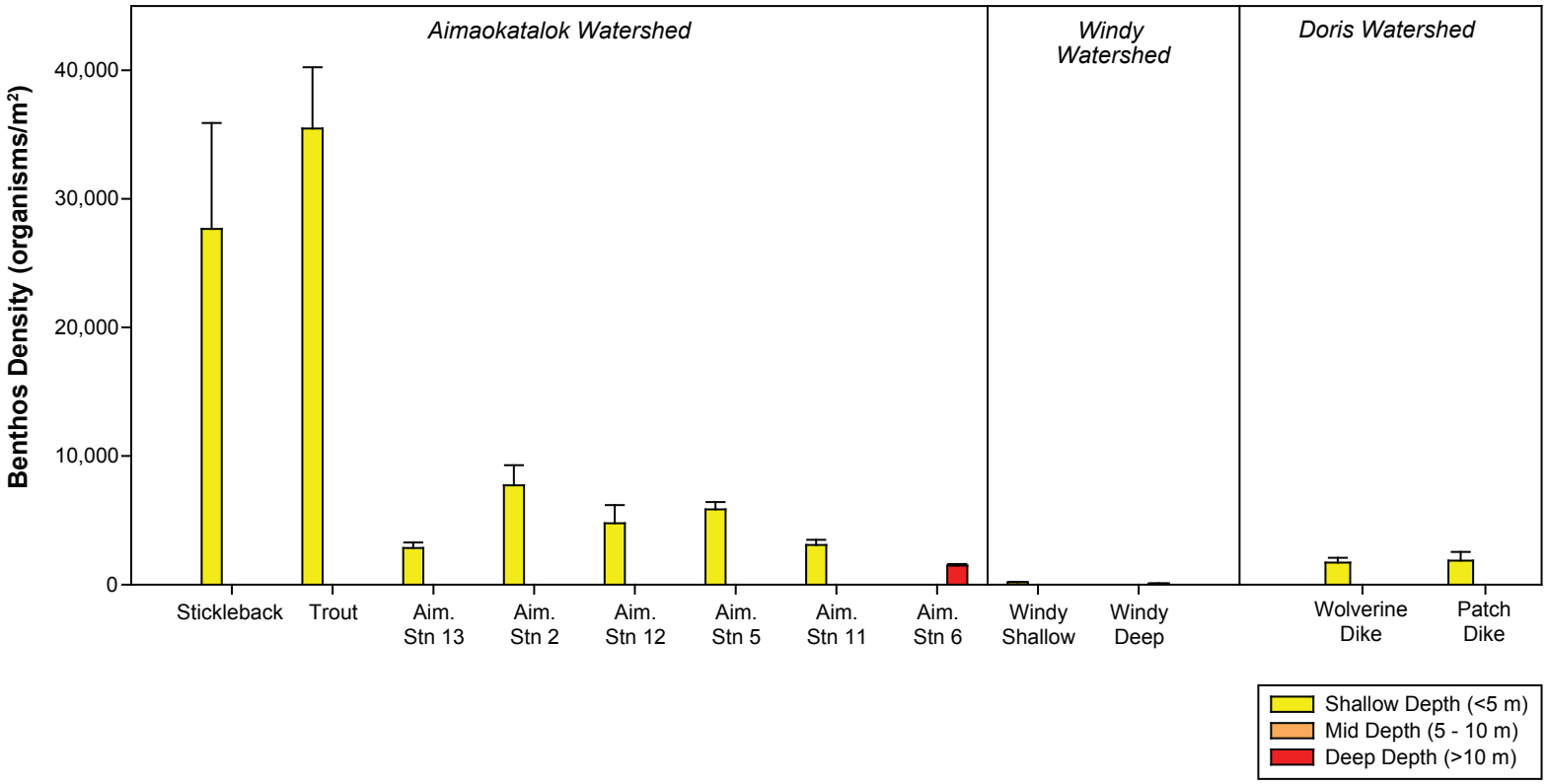


Figure 3.9-1

NEWMONT NORTH AMERICA

Average Benthos Density by Depth Strata in Lakes, Hope Bay Belt Project, August 2010

Figure 3.9-1

Rescan™ Engineers & Scientists

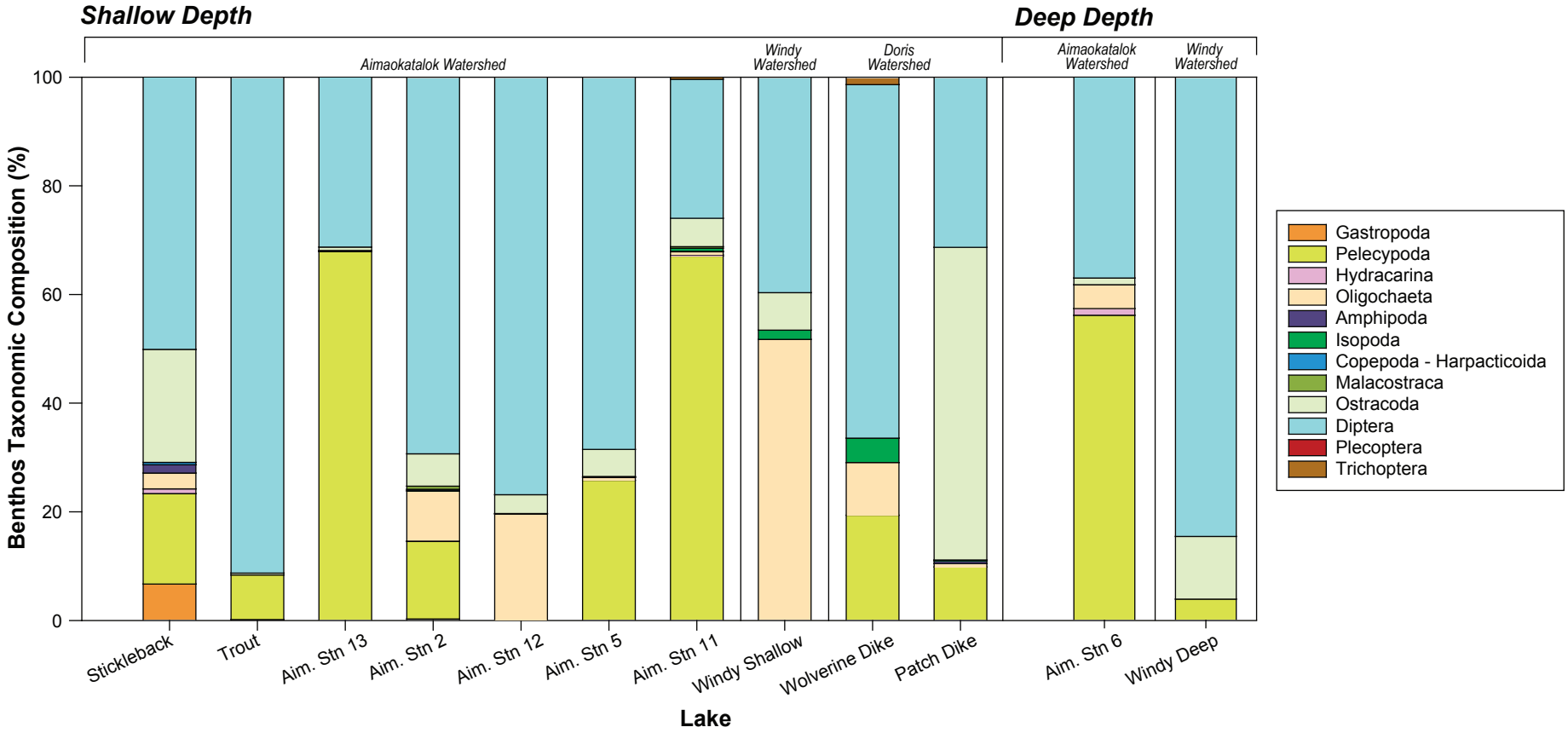


Figure 3.9-2

NEWMONT NORTH AMERICA

Benthos Taxonomic Composition by Depth Strata in Lakes, Hope Bay Belt Project, August 2010

Figure 3.9-2

Rescan™ Engineers & Scientists

Dipterans made up over 60% of the total benthos community in Trout, Aim. Stn 2, Aim. Stn 12, Aim. Stn 5, and Wolverine Dike (Figure 3.9-2). The proportions of pelecypods, oligochaetes, and ostracods varied between sites. Pelecypods made up the largest proportion of the benthos community at Aim. Stn 13 (68%), Aim. Stn 11 (67%), and Aim. Stn 6 (56%). Oligochaetes made up a substantial component of the benthos assemblage at Aim. Stn 12 (20%) and Windy Shallow (52%). Ostracods made up 21% of the benthos community at Stickleback, and 58% (Figure 3.9-2).

Overall, there were no clear patterns in benthos composition between watersheds or sampling depths. Community composition also did not seem to be related to the total density of benthos organisms (Figure 3.9-2).

3.9.3 Richness and Diversity

Dipterans were typically the dominant taxonomic group in lake benthos samples (Figure 3.9-2). For this reason, benthic diversity (at the level of genus) was analyzed for both the whole community and the dipteran subset.

3.9.3.1 Community Richness and Diversity

Benthos genera richness in lakes ranged from 2 to 17 genera/sample and averaged 9 genera/sample (Figure 3.9-3). Average genera richness was lowest at Windy Deep (2 genera/sample) and Windy Shallow (4 genera/sample), the two sites with the lowest benthos densities. The highest genera richness (17 genera/sample) occurred in Stickleback Lake, one of the two lakes with the highest benthos density (Figure 3.9-3). Genera richness tended to decline with increasing depth in the lakes that samples were collected from different depth strata (Aimaokatalok and Windy).

Benthos Simpson's diversity was variable across lakes, ranging from 0.28 at Windy Deep to 0.86 at Aim. Stn 12. There were no apparent trends in benthos diversity between watersheds or sampling depths. Diversity also seemed to be unrelated to the total density of benthos organisms (Figure 3.9-2).

3.9.3.2 Dipteran Richness and Diversity

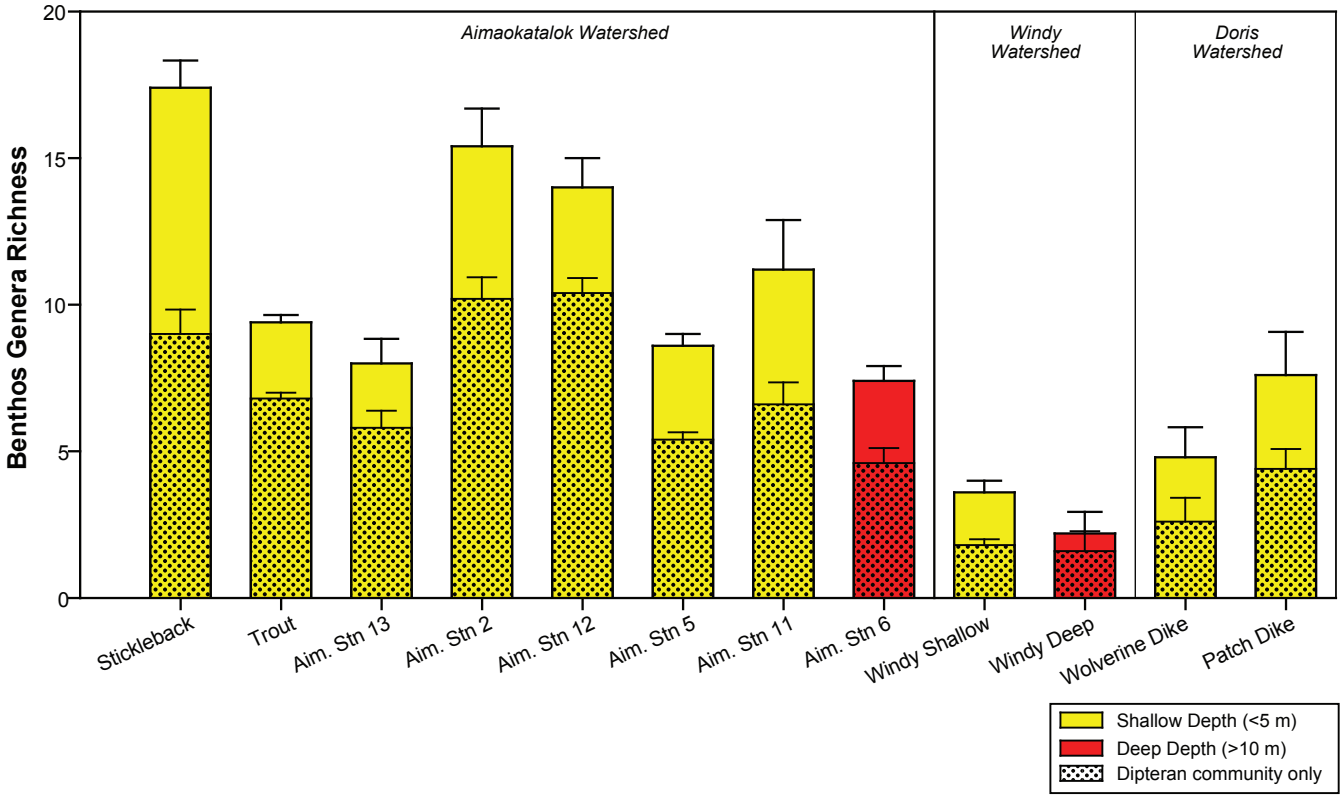
Mean dipteran genera richness averaged 6 genera/sample and ranged from 2 genera/sample at Windy Shallow and Windy Deep to 10 genera/sample at Aim. Stn 2 and Aim. Stn 12. Patterns in dipteran genera richness closely followed those observed for total community benthos genera richness.

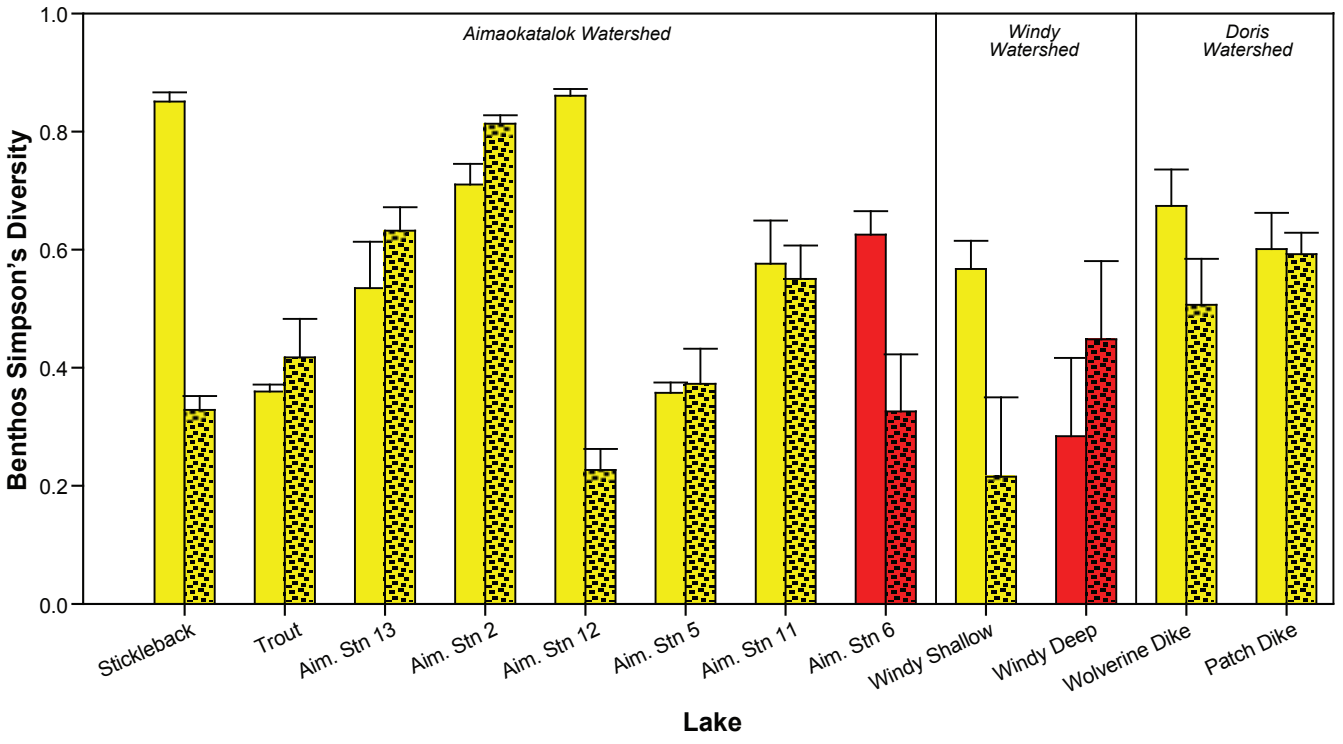
Dipteran diversity ranged widely from 0.22 at Windy Shallow to 0.81 at at Aim. Stn 2. There was no clear pattern between dipteran diversity and overall benthos diversity.

3.9.4 Annual Variation

Only historical sampling locations that were also sampled in 2010 were included in the annual comparison of benthos density shown in Figures 3.9-4a and b. Note that historical sampling locations and methods may not correspond exactly with those sampled in 2010, and this may contribute to the variability observed between years (see Table 2.14-8 and Figures 2.14-5a to 2.14-5c for historical sampling locations and methodologies).

Lake benthos samples have been collected at some of the 2010 sampling sites since 1994. Between 1994 and 2010, Stickleback Lake often had the highest benthos densities compared to other lakes, averaging 25,000 organisms/m^2 across years. Trout Lake and Wolverine Lake had sporadically elevated benthos densities during at least one year of sampling (Figures 3.9-4a and b). Aim. Stn 6, Windy Shallow, Windy Deep, and Patch lake sampling sites generally had low benthos densities over time (<2,500 organisms/m^2; Figure 3.9-4a and b).





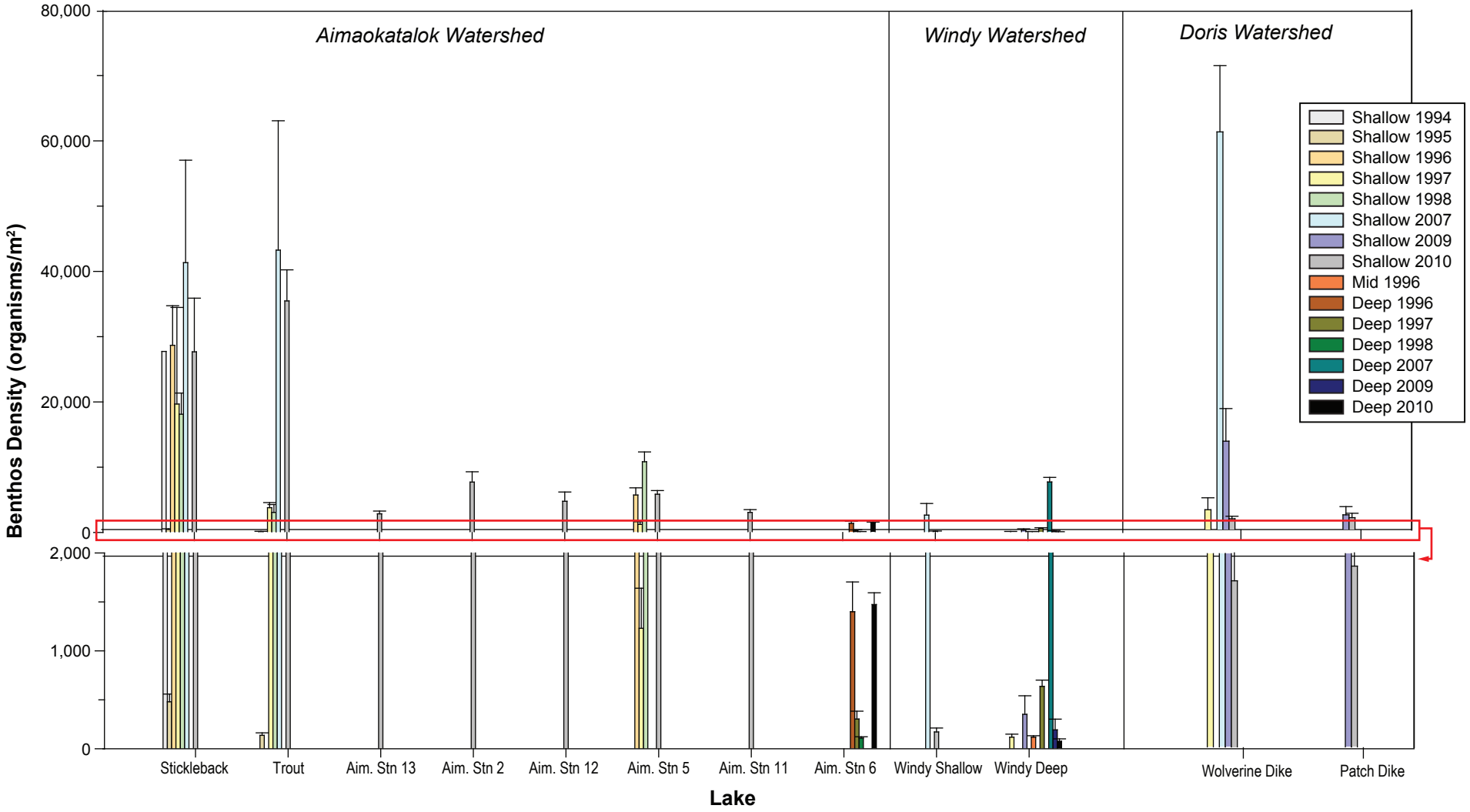
Note: Error bars represent standard error of the mean.
Superimposed bars represent the dipteran component of the benthos community.

NEWMONT NORTH AMERICA

Average Benthos Richness and Diversity by Depth Strata in Lakes, Hope Bay Belt Project, August 2010

Figure 3.9-3

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Note: Error bars represent standard error of the mean.
Shallow samples are from <5 m depth, mid samples are from 5 m to 10 m, and deep samples are from >10 m.

Figure 3.9-4

NEWMONT NORTH AMERICA

Average Annual Benthos Density by Depth Strata in Lakes, Hope Bay Belt Project, 1995-2010

Figure 3.9-4

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3.10 STREAM AND RIVER BENTHOS

Benthos samples were collected from streams and rivers in August 2010. All raw stream benthos density and taxonomic data are presented in Appendix 3.10-1.

3.10.1 Density

Average benthos density in most streams and rivers ranged from 600 organisms/m^2 (Koig. D/S) to 9,300 organisms/m^2 (AWRb; Figure 3.10-1). The exception was Aim. OF which had a much higher average density of 24,500 organisms/m^2. There were no apparent trends in benthos density among different watersheds (Figure 3.10-1).

3.10.2 Taxonomic Composition

Like the lakes, dipterans were the most numerous benthic organism at most stream and river sites, making up 33% to 81% of the benthos assemblages (Figure 3.10-2). Aim. OF was a notable exception to this, as Coelenterata (specifically, the genus *Hydra*) made up 94% and dipterans made up only 3% of the benthos in this stream. Aim. OF also contained the highest overall density of benthic organisms. Ostracods and oligochaetes were abundant in some study streams and rivers, making up 1 to 33% and 2 to 37% of benthos assemblages, respectively. Gastropoda, Hydracarina, and other benthos groups generally made minor contributions to the benthos taxonomic composition (Figure 3.10-2).

3.10.3 Richness and Diversity

Because dipterans were the dominant taxa found in stream and river benthic samples, benthic diversity was calculated for the whole community as well as the dipteran subset.

3.10.3.1 Community Richness and Diversity

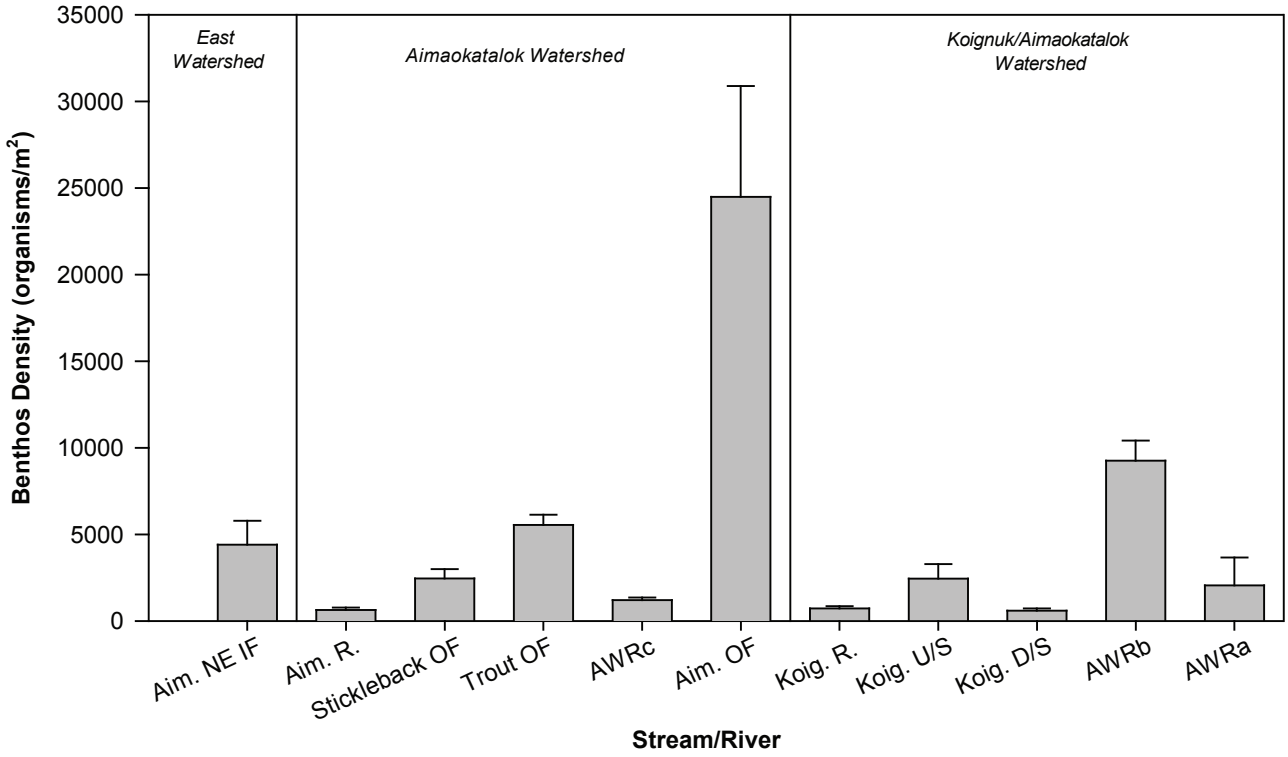
Stream and river benthos richness ranged from 10 to 20 genera/sample and averaged 15 genera/sample (Figure 3.10-3). The sites that had the lowest richness were AWRa (9 genera/sample), Aim. OF (10 genera/sample) and Stickleback OF (11 genera/sample). All other streams contained an average of at least 14 genera/sample.

Simpson's diversity did not always correspond with richness, indicating that some genus-rich sites were dominated by few genera (or a single genus) or, alternatively, that some genus-poor sites contained a relatively even distribution of genera. The average Simpson's diversity index ranged between 0.66 and 0.87 for streams in the study area. The exception to this was Aim. OF which had a diversity index of only 0.12. This is attributable to the dominance of one genus (*Hydra*), which made up 94% of the benthos assemblage at this site (Figure 3.10-3).

3.10.3.2 Dipteran Richness Diversity

Dipteran genera richness generally followed a similar trend as overall benthic richness (Figure 3.10-3). Dipteran richness ranged from 4 genera/sample at Aim. OF to 12 genera/sample at Aim. NE IF and Koig. U/S, and averaged 9 genera/sample.

Dipteran diversity was similar to community diversity at most sites, and averaged 0.67. Exceptions to this included Trout OF and Aim. OF. At Trout OF, dipteran diversity (0.26) was much lower than overall community diversity (0.66). Conversely, dipteran diversity (0.41) was much higher than community diversity (0.12) at Aim. OF. However, dipterans made up only 3% of the benthos assemblage at Aim. OF.



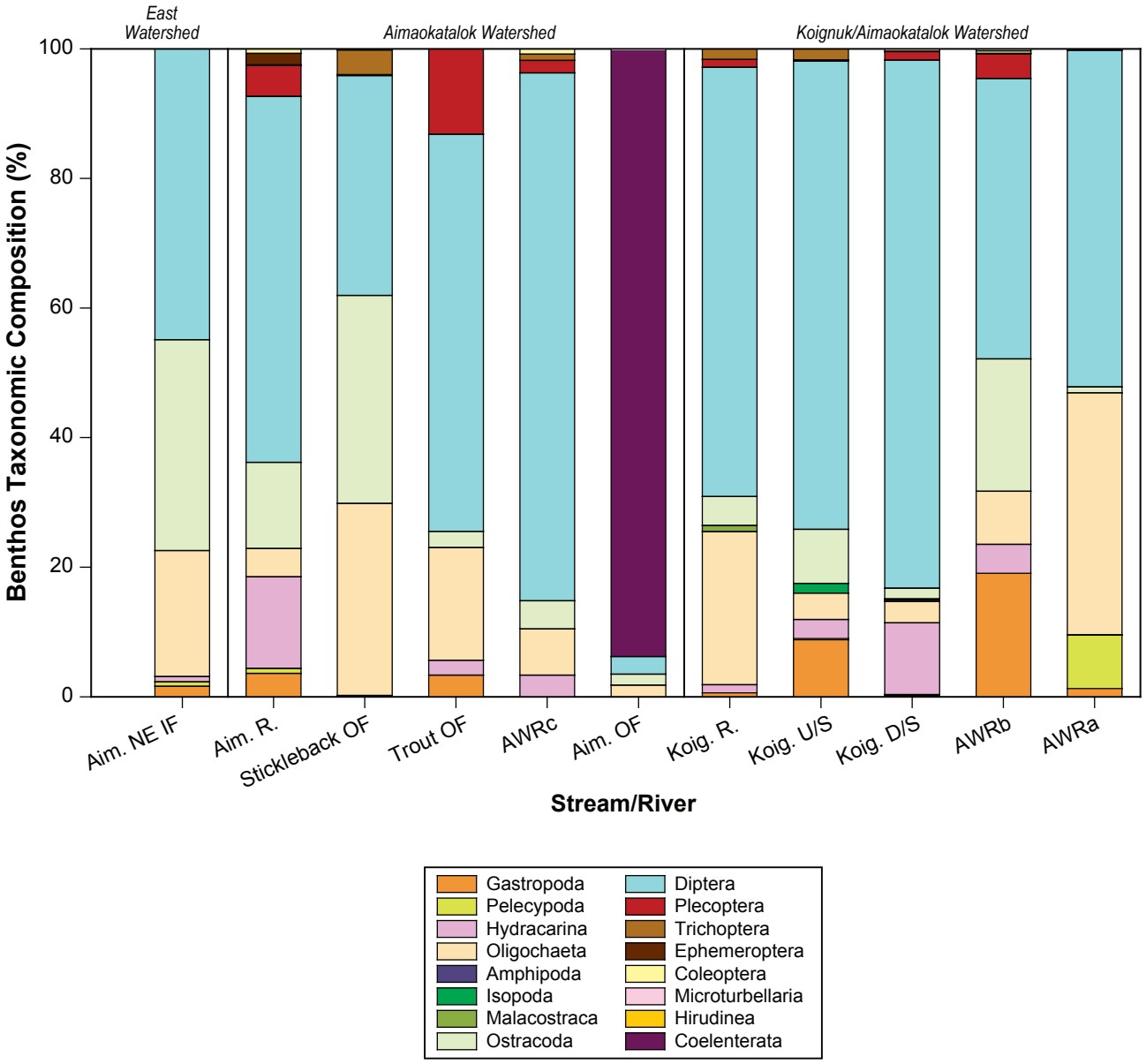
Note: Error bars represent standard error of the mean.

NEWMONT NORTH AMERICA

Average Benthos Density in Streams and Rivers, Hope Bay Belt Project, August 2010

Figure 3.10-1

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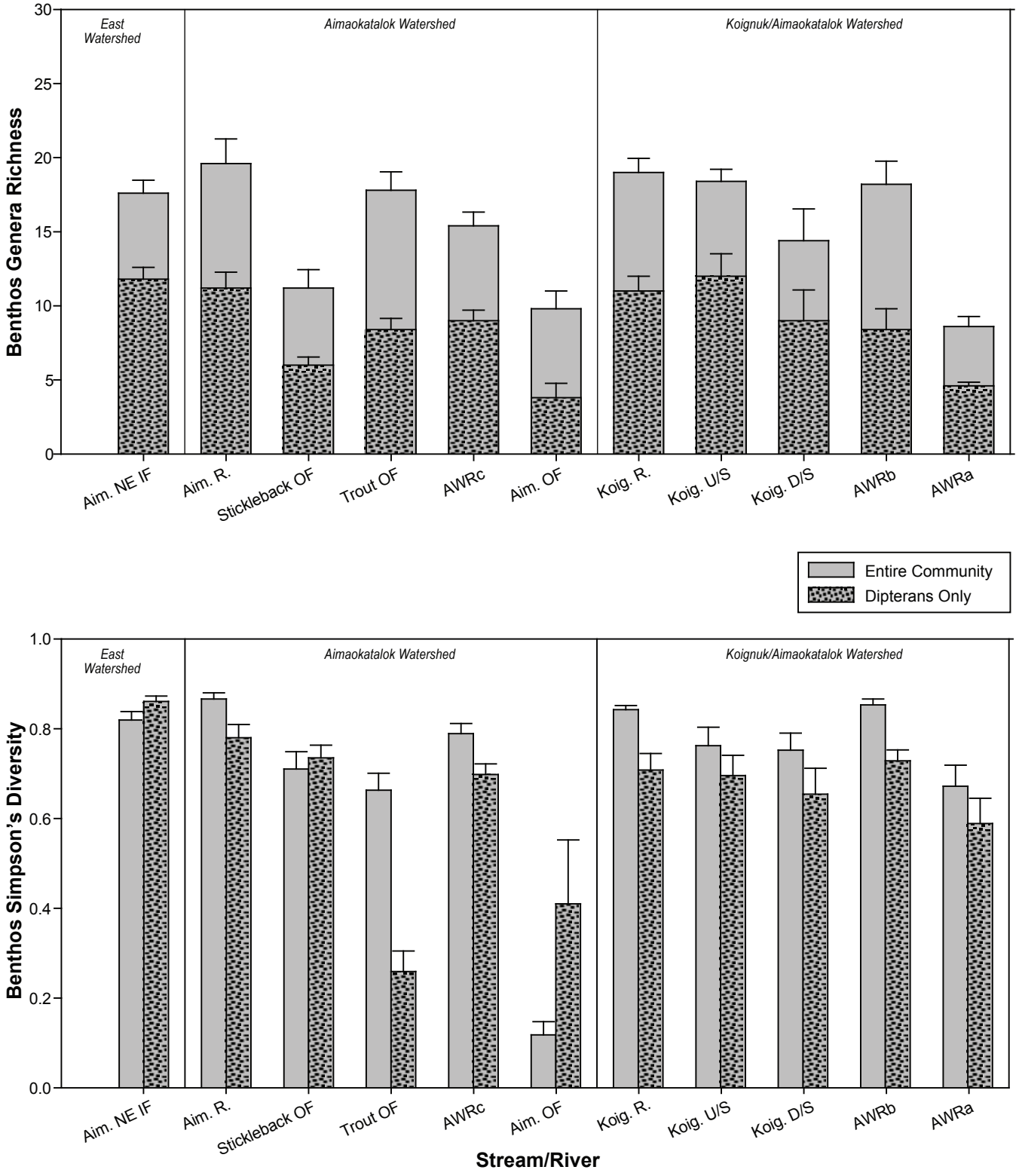


NEWMONT NORTH AMERICA

Benthos Taxonomic Composition in Streams and Rivers, Hope Bay Belt Project, August 2010

Figure 3.10-2

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Note: Error bars represent standard error of the mean.
Superimposed bars represent the dipteran component of the benthos community.

NEWMONT NORTH AMERICA

Average Benthos Richness and Diversity in Streams and Rivers, Hope Bay Belt Project, August 2010

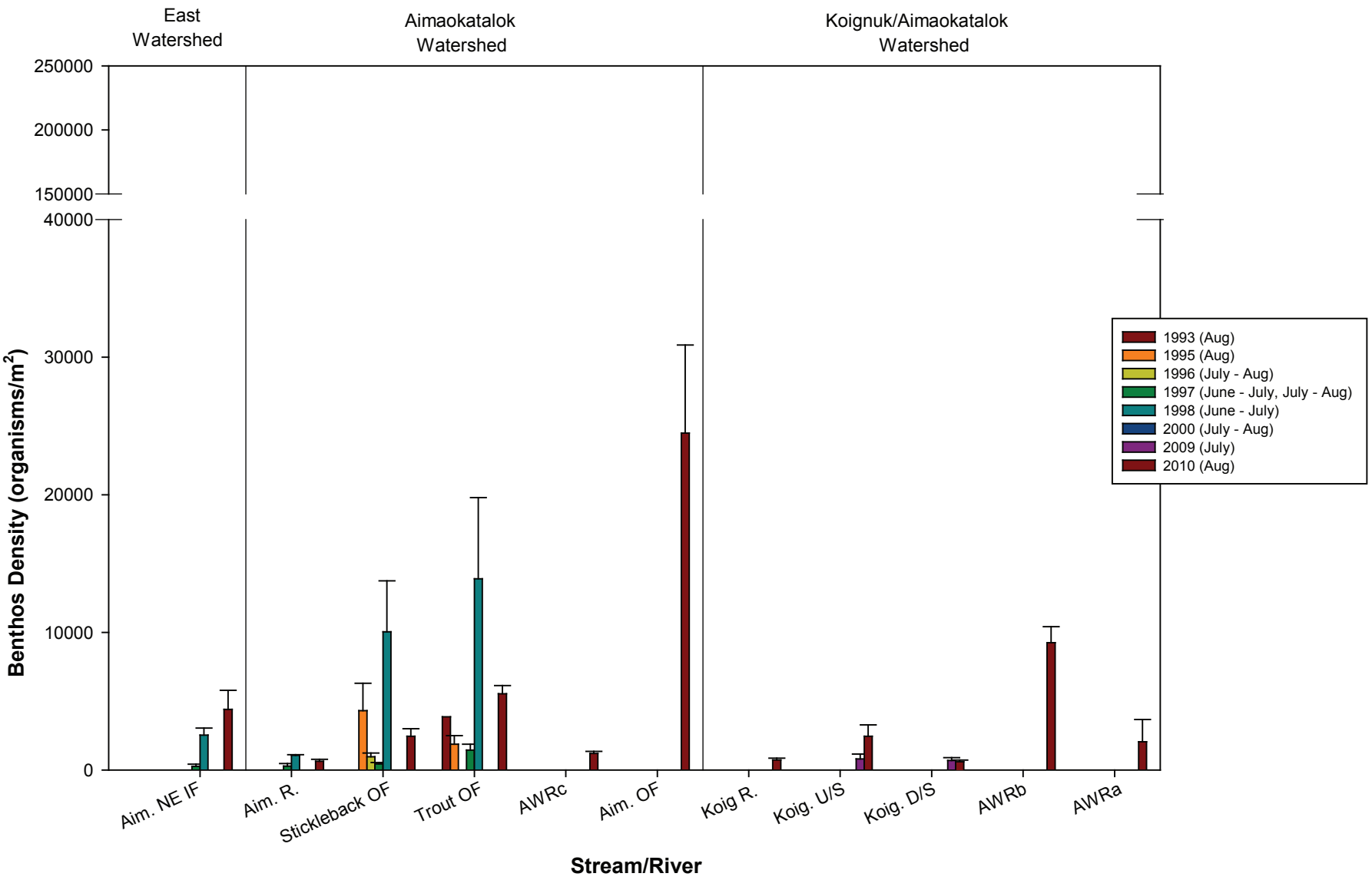
Figure 3.10-3

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3.10.4 Annual Variation

Only historical sampling locations that were also sampled in 2010 were included in the annual comparison of benthos density shown in Figure 3.10-4. Note that historical sampling locations and methods may not correspond exactly with those sampled in 2010, and this may contribute to the variability observed between years (see Table 2.14-9 and Figures 2.14-5a to 2.14-5c for historical sampling locations and methodologies).

Stream and river benthos densities were highly variable between years (Figure 3.10-4). This high variability may be partly due to differences in methodology (the use of Hester-Dendy artificial substrate samplers installed for approximately one month vs. instantaneous samples collected using a Hess sampler) and timing of sampling. There were no clear spatial or temporal trends in stream and river benthos density at the streams and rivers sampled.



Note: Error bars represent standard error of the mean.
1993, 1995, 2009, and 2010 data were collected instantaneously using a Hess sampler; 1996, 1997, 1998, and 2000 data were collected using Hester Dendy plate samplers installed for approximately 1 month.

Figure 3.10-4

NEWMONT NORTH AMERICA

Average Annual Benthos Density in Streams and Rivers, Hope Bay Belt Project, 1993 - 2010

Figure 3.10-4

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References

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References

CCME. 2002. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life: Summary table. Updated 2002. In *Canadian Environmental Quality Guidelines, 1999*.Winnipeg, MB: Canadian Council of Ministers of the Environment.

CCME. 2004. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems. In *Canadian Environmental Quality Guidelines, 1999*.Winnipeg, MB: Canadian Council of Ministers of the Environment.

CCME. 2007. Canadian Water quality Guidelines for the Protection of Aquatic Life: Summary table. Updated December, 2007. In *Canadian Environmental Quality Guidelines, 1999*.Winnipeg, MB: Canadian Council of Ministers of the Environment.

Environment Canada. 2002. *Additional Technical Guidance: Sample Sorting and Subsampling Protocols for Environmental Effects Monitoring Benthic Invertebrate Community Surveys*. http://www.ec.gc.ca/esee-eem/default.asp?lang=En&n=B9DBF4CC-1 (accessed November 2011).

General Oceanics Inc. *Digital Flowmeter Mechanical and Electronic Operators Manual*. www.sluse.mju.ac.th/database/silo/otherpub/2030flowmetermanual.pdf (accessed March 2011).

Health Canada. 2010. *Guidelines for Canadian Drinking Water Quality: Summary Table. Updated December 2010.* Federal-Provincial-Territorial Committee on Drinking Water.

Milburn, D. and T. D. Prowse. 1996. The effect of river-ice break-up on suspended sediment and select trace-element fluxes. *Nordic Hydrology* 27 69-84.

Parsons, T. R., Y. Maita, and C. M. Lalli. 1984. *A Manual of Chemical and Biological Methods for Seawater Analysis*. Oxford: Pergamon Press.

Rescan. 2009. *2009 Hydrology Baseline Report, Hope Bay Belt Project*. Prepared for Hope Bay Mining Ltd. by Rescan Environmental Services Ltd.

Rescan. 2010a. *2009 Freshwater Baseline Report, Hope Bay Belt Project*. Prepared for Hope Bay Mining Ltd. by Rescan Environmental Services Ltd.

Rescan. 2010b. *2009 Marine Baseline Report, Hope Bay Belt Project*. Prepared for Hope Bay Mining Ltd. by Rescan Environmental Services Ltd.

Rescan. 2011. *Doris North Gold Mine Project: 2010 Aquatic Effects Monitoring Program Report*. Prepared for Hope Bay Mining Ltd. by Rescan Environmental Services Ltd.

Vollenweider, R. A. and J. Kerekes. 1982. *Eutrophication of Waters. Monitoring Assessment and Control*. Paris: Organization for Economic Co-Operation and Development (OECD).

Appendix 1-1

Microcystin Sampling Results in Regional Project Area, 2010

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Memorandum

Refer to File No.: N:\1009 Hope Bay\1009-002 Hope Bay Belt Baseline & EIS\1009-002-05 Freshwater WQ, SQ, AB\Word Processing\Microcystin Memo\A.1_1009-008-01_Microcystin Memorandum.doc

DATE: July 14, 2011

TO: Chris Hanks, Director Environment and Social Responsibility

FROM: Carol Adly (M.Sc.), Mike Henry (Ph.D.), Deborah Muggli (M.Sc., Ph.D., R.P.Bio.)

SUBJECT: Microcystin Sampling Results in Regional Project Area, 2010

Introduction

Microcystin is a hepatotoxin (liver toxin) produced by some species of cyanobacteria that can have negative effects on humans and other organisms. The major route of human exposure to this toxin is through the consumption of drinking water (Health Canada 2002). The Health Canada maximum acceptable concentration of microcystin LR (the most common variant of microcystin; Carmichael 1992) in drinking water is 1.5 µg/L (Health Canada 2002). Microcystin was identified by the Hope Bay Mining Limited (HBML) Environment and Social Responsibility (ESR) Department as a parameter of concern in Doris Camp drinking water, which is currently drawn from Doris Lake. Extensive water quality testing, pre- and post-treatment, is undertaken by the on-site ESR staff on a regular basis. However, Rescan was asked to sample microcystin in lakes within the Doris Watershed as well as in various other lakes in the region to determine the spatial extent of the elevated microcystin concentrations.

Methods

In order to assess the natural occurrence of microcystin in lakes in and around the Hope Bay Belt area, microcystin LR samples were collected from 8 lakes that were part of the 2010 Phase 2 freshwater baseline program or the Aquatic Effects Monitoring Program (AEMP), as well as 10 additional lakes (microcystin add-on lakes; Figure 1). Several of the add-on lakes were selected because blooms of cyanobacteria have been known to occur in these waterbodies. The timing of microcystin LR sampling for the freshwater baseline and AEMP lakes coincided with planned water quality sampling in these lakes between April and September 2010, and the add-on lakes were sampled once in September 2010. Table 1 presents the locations, dates, and depths of microcystin LR sampling.

For winter (April) microcystin-LR sampling, a 10-inch diameter ice auger was used to drill a hole through the ice, and samples were collected using modified skinny Niskin bottles. Microcystin-LR samples were collected at approximately 1 m below the ice-water interface at all sites, and an additional sample was collected at 2 m above the water-sediment interface at certain sites. A dual

Table 1. Microcystin-LR Sampling Details

	Sampling Date(s)	Sampling Depth(s) (m)	Number of Samples Collected
Freshwater Baseline Lakes (WQ Program)			
Aimaokatalok Lake, Station 5	April 25, 2010	2.8	2
	August 21, 2010	1	2
Aimaokatalok Lake, Station 6	April 25, 2010	2.6, 24	2
Aimaokatalok Lake, Station 11	April 25, 2010	2.6	1
	August 15, 2010	1	2
Trout Lake	April 26, 2010	2.8	1
	August 15, 2010	1	1
Stickleback Lake	April 26, 2010	2.8	1
	August 19-21, 2010	1	2
Windy Lake	April 19, 2010	2.8, 16	2
	August 21, 2010	1	1
AEMP Lakes (WQ Program)			
Little Roberts Lake	April 22, 2010	2.8	2
	September 12, 2010	1	1
Doris Lake North	April 22, 2010	2.8, 11.5	2
	September 12, 2010	1	1
Doris Lake South	April 22, 2010	3	2
	September 12, 2010	1	1
Reference Lake B	April 18, 2010	2.7, 4.3	2
	August 24, 2010	1	1
	September 17, 2010	1, 8.5	2
Reference Lake D	April 18, 2010	2.5	2
	August 21, 2010	1	1
	September 25, 2010	1	1
Microcystin Add-on Lakes			
MC1 Lake	September 11, 2010	1	1
MC2 Lake	September 11, 2010	1	1
MC3 Lake	September 16, 2010	1	1
MC4 Lake	September 11, 2010	1	1
MC5 Lake	September 11, 2010	1	1
Pelvic Lake	September 11, 2010	1	1
Ogama Lake	September 10, 2010	1	1
Nakhaktok Lake	September 11, 2010	1	1
Roberts Lake	September 11, 2010	1	1
Historical Boston Reference Lake	September 16, 2010	1	1
Total Number of Samples Collected			**45**

Note: April surface microcystin LR samples were collected at 1 m below the ice-water interface (ice thickness ranged from 1.6 to 2 m).

PROJECT # 1009-008-01 GIS # HB-15-069 June 13, 2011

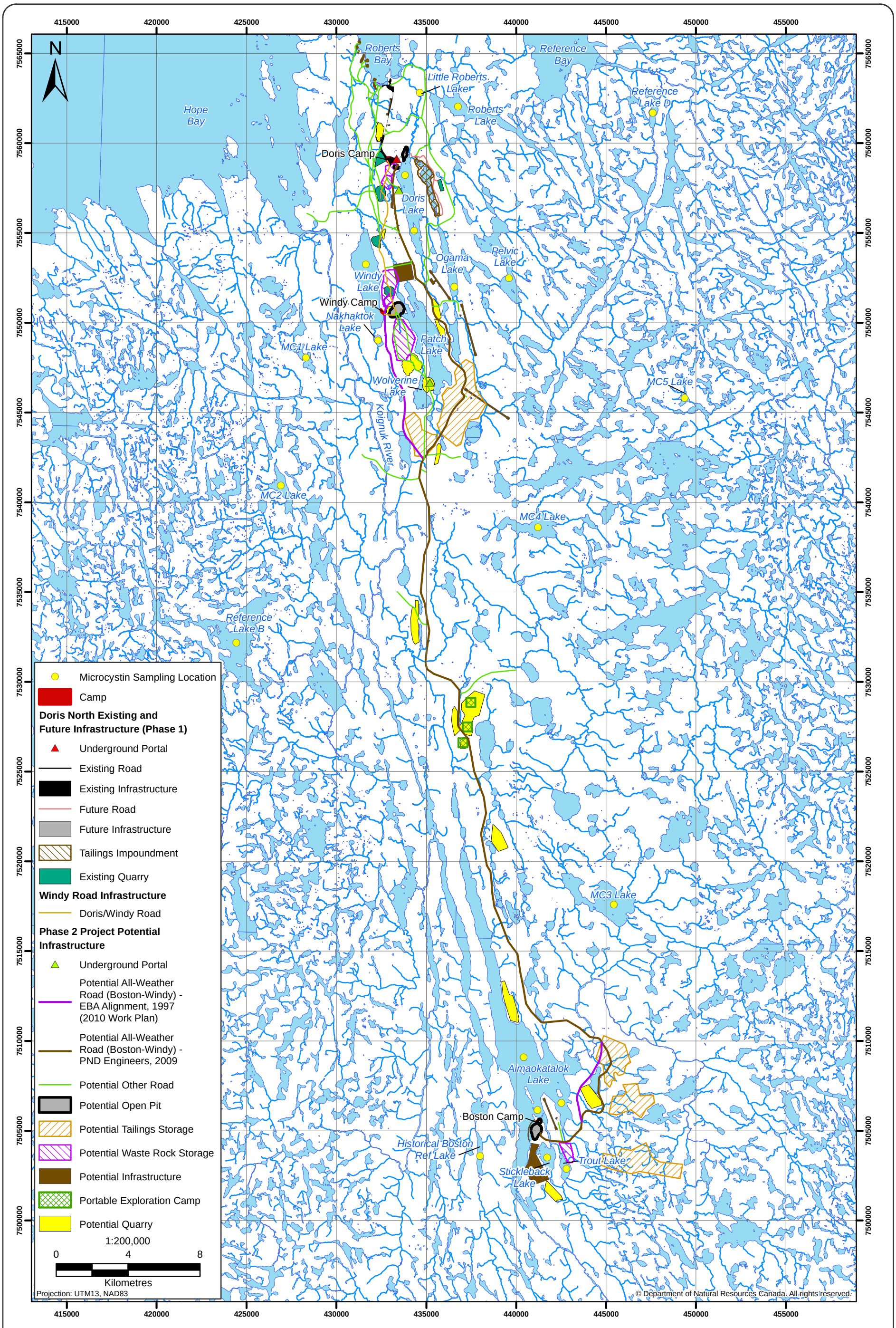


Figure 1

NEWMONT NORTH AMERICA

2010 Microcystin-LR Sampling Locations

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Figure 1

For summer (August and September) microcystin LR sampling, a Teflon-lined GO-FLO bottle was used for water collection. Microcystin LR samples were collected at approximately 1 m below the surface at all sites, and an additional sample was collected at 2 m above the water-sediment interface at certain sites. The water collected was used to triple-rinse the sample containers before filling sample bottles.

All water samples were kept cold and sent to ALS in Yellowknife on the first available flight out of camp. Samples were then sent to ALS's Burnaby laboratory for analysis of microcystin LR. The analytical detection limit for microcystin LR analysis at ALS is 0.2 µg/L.

Results

Microcystin sampling results are provided in Appendix A. Out of the 45 samples collected from lakes within the Doris Watershed and various other lakes in the region, microcystin-LR concentrations were below the detection limit of 0.2 µg/L in all but a single sample collected from MC3 Lake on September 16, 2010. The concentration of microcystin-LR in this sample from MC3 Lake was 0.26 µg/L, which is barely above the analytical detection limit and well below the Health Canada maximum acceptable concentration in drinking water of 1.5 µg/L.

Although these results suggest that microcystin-LR concentrations are low in lakes in and around the Hope Bay Belt area, samples collected from near the drinking water intake pipe in Doris Lake in February 2009 by ESR staff contained microcystin-LR concentrations that slightly exceeded the Health Canada guideline of 1.5 µg/L. Microcystin levels in lakes can be highly variable seasonally and inter-annually because concentrations of this toxin are highly dependent on environmental conditions and on the abundance of certain species of cyanobacteria that produce microcystin (Health Canada 2002).

The genera of cyanobacteria known to produce microcystins are: *Anabaena*, *Microcystis*, *Oscillatoria*, *Nostoc*, and *Anabaenopsis* (Codd et al. 1999). Blooms of cyanobacteria have been observed in certain lakes of the Hope Bay Belt region. In August of 2009, the phytoplankton composition of three lakes—Doris, Ogama, and Little Roberts lakes—were dominated by cyanobacteria (*Aphanizomenon* in Doris Lake, and both *Aphanizomenon* and *Oscillatoria* in Ogama and Little Roberts lakes; Rescan 2010). In August of 2010, cyanobacteria made up approximately one third (by abundance) of the phytoplankton assemblages in Trout and Windy lakes (*Anabaena* in Trout Lake and *Aphanizomenon* in Windy Lake; Rescan 2011); however, microcystin-LR concentrations remained below the detection limit in surface samples collected from these lakes concurrently with phytoplankton samples.

Conclusions

The purpose of this 2010 microcystin survey was to determine if microcystin-LR concentrations were naturally elevated in lakes in and around the Hope Bay Belt area. The results of this survey indicate that microcystin-LR concentrations were low throughout the Hope Bay Belt region in 2010. Microcystin-LR concentrations measured between April and September 2010 were below the analytical detection limit of 0.2 µg/L in nearly all lakes surveyed, including Doris Lake. MC3 Lake was the only lake in which the microcystin-LR concentration was above the detection limit, and the concentration of microcystin-LR in this lake in September 2010 was 0.26 µg/L, which is barely above the analytical detection limit and well below the Health Canada maximum acceptable concentration in drinking water of 1.5 µg/L. Because microcystin concentrations can be highly variable seasonally and inter-annually, the results of this survey cannot rule out the potential for elevated microcystin-LR levels in lakes in the Hope Bay Belt region, because microcystin-producing genera of cyanobacteria are known to occur in the region, and can dominate the summer assemblages in certain lakes. However, results of

this survey indicate that elevated microcystin-LR concentrations are not a widespread or common occurrence in Hope Bay Belt area lakes.

References

Carmichael, W. W. 1992. Cyanobacteria secondary metabolites — the cyanotoxins. *Journal of Applied Bacteriology* 72 445–59.

Codd, G. A., S. G. Bell, K. Kunimitsu, C. J. Ward, K. A. Beattie, and J. S. Metcalf. 1999. Cyanobacterial toxins, exposure routes and human health. *European Journal of Phycology* 34 405–15.

Health Canada. 2002. Cyanobacterial Toxins — Microcystin-LR. In: *Guidelines for Canadian Drinking Water Quality: Supporting Documentation*. Federal-Provincial-Territorial Committee on Drinking Water. October 1999, updated April 2002 (edited May 2002). http://www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/water-eau/cyanobacterial_toxins/cyanobacterial_toxins-eng.pdf (accessed June 13, 2011).

Rescan. 2010. *2009 Freshwater Baseline Report, Hope Bay Belt Project*. Prepared for Hope Bay Mining Ltd. by Rescan Environmental Services Ltd.

Rescan. 2011. *Hope Bay Belt Project: 2010 Freshwater Baseline Report*. Prepared for Hope Bay Mining Ltd. by Rescan Environmental Services Ltd.

Appendix A. Microcysin Sampling Results

Site ID			Ref. B	Ref. B	Ref. D	Ref. D	Windy	Windy	Little Roberts	Little Roberts	Doris North	Doris North
Depth Zone		Health Canada Maximum Acceptable Concentration for Drinking Water	Surface	Deep	Surface	Surface	Deep	Surface	Surface	Surface	Surface	Deep
Depth (m)			2.7	4.3	2.5	2.5	16	2.8	2.8	2.8	2.8	11.5
Date Sampled			18-APR-10	18-APR-10	18-APR-10	18-APR-10	19-APR-10	19-APR-10	22-APR-10	22-APR-10	22-APR-10	22-APR-10
ALS Sample ID	Units		L879365-1	L879365-2	L879365-3	L879365-4	L879372-3	L879372-4	L880317-1	L880317-2	L880317-3	L880317-4
Microcystin-LR	µg/L	1.5	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Site ID			Doris South	Doris South	Aim. Stn 6	Aim. Stn 6	Aim. Stn 5	Aim. Stn 5	Aim. Stn 11	Stickleback	Trout	Aim. Stn 11
Depth Zone		Health Canada Maximum Acceptable Concentration for Drinking Water	Surface	Surface	Surface	Deep	Surface	Surface	Surface	Surface	Surface	Surface
Depth (m)			3	3	2.6	24	2.8	2.8	2.6	2.8	2.8	1
Date Sampled			22-APR-10	22-APR-10	25-APR-10	25-APR-10	25-APR-10	25-APR-10	25-APR-10	26-APR-10	26-APR-10	15-AUG-10
ALS Sample ID	Units		L880317-5	L880317-6	L880485-2	L880485-4	L880485-5	L880485-6	L880485-7	L881551-1	L881551-2	L921923-1
Microcystin-LR	µg/L	1.5	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Site ID			Aim. Stn 11	Trout	Stickleback	Windy	Stickleback	Aim. Stn 5	Aim. Stn 5	Equipment Blank	Ref. D
Depth Zone		Health Canada Maximum Acceptable Concentration for Drinking Water	Surface	Surface	Surface	Surface	Surface	Surface	Surface		Surface
Depth (m)			1	1	1	1	1	1	1		1
Date Sampled			15-AUG-10	15-AUG-10	19-AUG-10	21-AUG-10	21-AUG-10	21-AUG-10	21-AUG-10	21-AUG-10	21-AUG-10
ALS Sample ID	Units		L921923-2	L921923-4	L923075-1	L923760-16	L926333-1	L926333-3	L926333-4	L926333-5	L926333-6
Microcystin-LR	µg/L	1.5	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Site ID			Ref. B	Ogama	Roberts	Pelvic	MC2	Nakhaktok	MC1	MC4	MC5	Little Roberts
Depth Zone		Health Canada Maximum Acceptable Concentration for Drinking Water	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Depth (m)			1	1	1	1	1	1	1	1	1	1
Date Sampled			24-AUG-10	10-SEP-10	11-SEP-10	11-SEP-10	11-SEP-10	11-SEP-10	11-SEP-10	11-SEP-10	11-SEP-10	12-SEP-10
ALS Sample ID	Units		L926334-1	L930662-1	L930662-2	L930662-3	L930662-4	L930662-5	L930662-6	L930662-7	L930662-8	L930857-1
Microcystin-LR	µg/L	1.5	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Site ID			Doris North	Doris South	MC3	Boston Historical Ref.	Ref. B	Ref. B	Ref. D
Depth Zone		Health Canada Maximum Acceptable Concentration for Drinking Water	Surface	Surface	Surface	Surface	Surface	Deep	Surface
Depth (m)			1	1	1	1	1	8.5	1
Date Sampled			12-SEP-10	12-SEP-10	16-SEP-10	16-SEP-10	17-SEP-10	17-SEP-10	25-SEP-10
ALS Sample ID	Units		L930857-2	L930857-5	L933176-1	L933176-2	L933534-1	L933534-2	L936328-1
Microcystin-LR	µg/L	1.5	<0.20	<0.20	0.26	<0.20	<0.20	<0.20	<0.20

Appendix 2.1-1

Bathymetric Benchmarks, Hope Bay Belt Project, 2010

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Stickleback Lake (Benchmark UTM Coordinates: 13W 0441631 7502965)
Elevation difference between benchmark and water level = 3.556 ± 0.003 m



Holding surveyors rod for elevation measurement



Close-up view of benchmark location



Close-up view of benchmark location

Trout Lake (Benchmark UTM Coordinates:
13W 0442337 7503660)
Elevation difference between benchmark and water level = 3.36 ± 0.003 m



Landscape view of benchmark



Boulder used for benchmark



Close-up view of benchmark at top of boulder

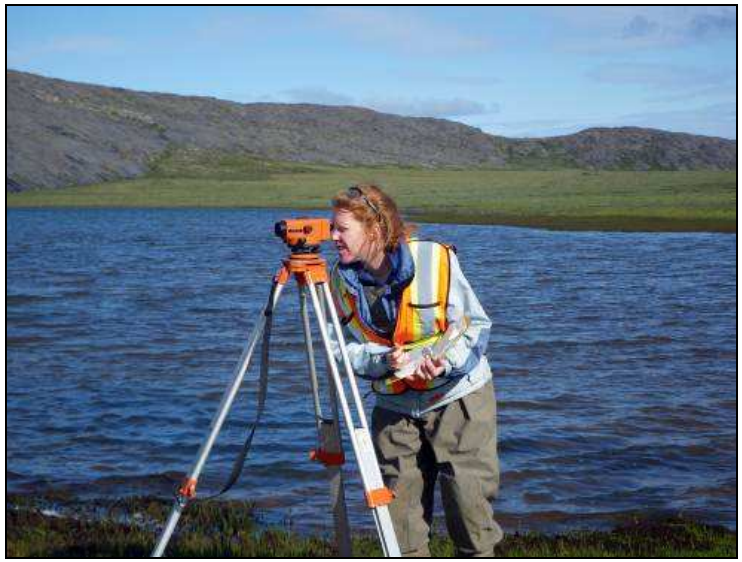
Little Roberts Lake (Benchmark UTM Coordinates: 13W 0434849 7562676
Elevation difference between benchmark and water level = 0.331 ± 0.003 m



Landscape view of benchmark



Benchmark installed along shoreline



Surveying the benchmark and the water level

Reference B Lake (Benchmark UTM Coordinates: 13W 0425325 7531641)
Elevation difference between benchmark and water level = 1.726 ± 0.003 m



Landscape view of benchmark



Benchmark on top of boulder



Close-up view of benchmark

Reference D Lake (Benchmark UTM Coordinates: 13W 0447430 7561072)
Elevation difference between benchmark and water level = 1.656 ± 0.003 m



Benchmark along shoreline



Benchmark on top of boulder



Surveying the benchmark

Imniagut Lake (Benchmark UTM Coordinates:
13W 0433704 7551038)
Elevation difference between benchmark and water level = 2.860 ± 0.004 m



Benchmark along shoreline



Close-up of benchmark at top of boulder



Surveying the shoreline

Appendix 3.1-1

Lakes Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2010

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Appendix 3.1-1. Lakes Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2010

Lake	Stickleback					
Date	26-Apr-10			19-Aug-10		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0	ice thickness = 1.8 m			11.2	9.42	100.6
0.5				11.2	9.42	100.7
1				11.2	9.43	100.7
1.5				11.2	9.40	100.3
2	1.1	1.32	11.9	11.2	9.41	100.0
	bottom depth = 2.5 m			bottom depth = 2.6 m		

Lake	Trout					
Date	26-Apr-10			16-Aug-10		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0	ice thickness = 1.83 m			12.6	8.78	96.8
0.5				12.6	8.79	96.9
1				12.6	8.82	97.0
1.5				12.6	8.79	96.9
2	0.8	4.16	37.4	12.6	8.77	96.7
	bottom depth = 2.4 m			bottom depth = 2.4 m		

Lake	Aim. Stn 13			Aim. Stn 2			Aim. Stn 12		
Date	13-Aug-10			18-Aug-10			21-Aug-10		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0	13.8	10.19	98.4	11.7	8.51	91.5	13.8	10.42	117.2
0.5	13.8	10.18	98.3	11.7	8.51	91.7			
1	13.9	10.15	98.3	11.6	8.49	91.5			
1.5	13.8	10.14	98.2	11.6	8.49	91.5			
2	13.9	10.14	98.1	11.6	8.44	91.3			
2.5	13.9	10.13	98.0						
3	13.9	10.14	98.0						
3.5	13.9	10.11	97.9						
	bottom depth = 3.7 m			bottom depth = 2.5 m			bottom depth = 0.3 m		

Lake	Aim. Stn 5					
Date	25-Apr-10			12-Aug-10		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0	ice thickness = 1.76 m			14.6	10.03	98.7
0.5				14.7	10.02	98.7
1				14.7	9.99	98.6
1.5	0.0	13.25	116.6	14.8	9.96	98.4
1.8	0.0	13.21	116.6			
2				14.8	9.95	98.3
	bottom depth = 2.0 m			bottom depth = 2.5 m		

Appendix 3.1-1. Lakes Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2010

Lake	Aim. Stn 11					
Date	25-Apr-10			16-Aug-10		
Depth	Temp	Dissolved Oxygen	Dissolved Oxygen	Temp	Dissolved Oxygen	Dissolved Oxygen
(m)	(˚C)	(mg/L)	(% Saturation)	(˚C)	(mg/L)	(% Saturation)
0	ice thickness = 1.60 m			12.1	9.21	100.2
0.5				12.1	9.21	100.2
1				12.1	9.22	100.2
1.6	0.1	13.15	116.0	12.1	9.22	100.5
2				12.1	9.23	100.3
2.5				12.1	9.21	100.2
	bottom depth = 1.8 m			bottom depth = 2.6 m		

Lake	**Aim. Stn 6**					
Date	**25-Apr-10**			**14-Aug-10**		
Depth	**Temp**	**Dissolved Oxygen**	**Dissolved Oxygen**	**Temp**	**Dissolved Oxygen**	**Dissolved Oxygen**
(m)	**(˚C)**	**(mg/L)**	**(% Saturation)**	**(˚C)**	**(mg/L)**	**(% Saturation)**
0	ice thickness = 1.57 m			13.9	10.09	97.7
1				13.8	10.09	97.4
2	0.7	10.84	97.4	13.7	10.07	97.1
3	1.2	10.24	92.2	13.7	10.04	96.8
4	1.3	9.81	89.3	13.7	10.02	96.6
5	1.4	9.45	86.2	13.7	10.10	96.4
6	1.4	8.91	81.6	13.7	9.99	96.3
7	1.5	8.58	78.4	13.7	9.97	96.1
8	1.5	8.60	78.6	13.7	9.95	95.9
9	1.5	8.60	78.6	13.7	9.93	95.7
10	1.5	8.56	78.3	13.6	9.93	95.4
11	1.5	8.24	75.4	13.6	9.89	95.1
12	1.6	7.80	71.5	13.6	9.87	94.9
13	1.7	7.43	68.3	13.6	9.84	94.6
14	1.8	7.16	65.9	13.6	9.82	94.4
15	1.8	6.90	63.6	13.6	9.79	94.2
16	1.8	6.77	62.4	13.5	9.78	93.9
17	1.9	6.60	60.9	13.3	9.66	92.3
18	1.9	6.44	59.5	13.2	9.50	90.6
19	1.9	6.31	58.3	12.6	9.27	87.2
20	1.9	6.09	56.3	12.3	9.22	86.1
21	1.9	5.98	55.2	12.3	9.12	85.2
22	2.0	5.67	52.5	12.2	9.50	84.3
23	2.1	5.14	47.7	12.2	8.96	83.5
24	2.2	4.41	41.1	12.2	8.83	82.3
25	2.2	3.43	31.9	12.1	8.79	81.7
26	2.3	2.92	27.2	12.1	8.76	81.5
	bottom depth = 27.0 m			bottom depth = 28.0 m		

Appendix 3.1-1. Lakes Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2010

Lake	Windy Deep					
Date	19-Apr-10			21-Aug-10		
Depth	Temp	Dissolved Oxygen	Dissolved Oxygen	Temp	Dissolved Oxygen	Dissolved Oxygen
(m)	(°C)	(mg/L)	(% Saturation)	(°C)	(mg/L)	(% Saturation)
0	ice thickness = 1.77m			11.8	10.27	95.5
0.5				11.8	10.30	96.2
1				11.8	10.25	94.9
1.5				11.8	10.25	94.4
2	0.7	11.79	105.6	11.8	10.20	94.1
2.5	0.7	11.79	105.6	11.8	10.19	94.0
3	0.7	11.76	105.4	11.8	10.23	94.7
3.5	0.7	11.75	105.2	11.8	10.20	94.3
4	0.7	11.73	105.1	11.7	10.22	94.4
4.5	0.7	11.71	104.9	11.7	10.23	94.6
5	0.7	11.69	104.8	11.7	10.23	94.6
5.5	0.7	11.67	104.5	11.7	10.24	94.5
6	0.7	11.64	104.3	11.7	10.26	94.6
6.5	0.7	11.62	104.2	11.7	10.25	94.2
7	0.7	11.59	103.9	11.7	10.26	94.3
7.5	0.7	11.56	103.6	11.7	10.23	93.8
8	0.7	11.52	103.2	11.6	10.24	94.4
8.5	0.7	11.47	102.8	11.6	10.29	94.5
9	0.7	11.38	102.1	11.6	10.28	94.7
9.5	0.7	11.31	101.4	11.6	10.28	94.4
10	0.8	11.21	100.7	11.6	10.27	94.4
10.5	0.8	11.06	99.4	11.6	10.27	94.4
11	0.9	10.92	98.4	11.6	10.27	94.0
11.5	1.0	10.72	96.8	11.6	10.26	94.2
12	1.1	10.33	93.6	11.6	10.27	94.6
12.5	1.2	10.13	92.0	11.6	10.24	94.0
13	1.3	9.90	90.1	11.6	10.19	94.0
13.5	1.4	9.62	87.7	11.5	10.25	94.1
14	1.5	9.41	86.0	11.5	10.20	94.1
14.5	1.6	9.03	82.7	11.5	10.24	93.7
15	1.6	8.45	77.8	11.4	10.21	93.5
15.5	1.7	8.36	76.8	11.4	10.18	93.2
16	1.8	8.28	76.3	11.4	10.16	93.0
16.5	1.9	7.20	66.3	11.4	10.17	92.9
17	2.1	6.16	57.6	11.4	10.16	93.1
17.5	2.2	3.77	35.1			
	bottom depth = 17.7 m			bottom depth = 18.0 m		

Appendix 3.1-2

Stream and River Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2010

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Appendix 3.1-2. Stream and River Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2010

River	Aim. R.						Koig. R.			Koig. U/S		
Date	26-Apr-10			21-Aug-10			25-Apr-10			18-Apr-10		
Depth (m)	Temp (˚C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (˚C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (˚C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (˚C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0	ice thickness = 0.6 m (reached bottom)			10.7	10.19	107.1	ice thickness = 1.81 m			ice thickness = 1.46 m		
0.5												
1												
1.5										0	9.46	83.2
2							0.5	10.72	95.6	0	9.51	83.8
2.5							0.8	9.74	87.4			
3							1	9.29	83.9			
3.5							1	8.25	74.5			
4							1.1	8.03	72.6			
4.5												
	bottom depth = 0.6 m			bottom depth = 0.4 m			bottom depth = 4.3 m			bottom depth = 2.0 m		

Appendix 3.2-1

Lake Water Quality Analytical Results, Hope Bay Belt Project, 2010

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Appendix 3.2-1. Lake Water Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:				Stickleback	Trout	Aim. Stn 5	Aim. Stn 5	Aim. Stn 11	Aim. Stn 6	Aim. Stn 6	Windy Deep	Windy Deep	Aim. Stn 13	Aim. Stn 6	Aim. Stn 6	Aim. Stn 11	Aim. Stn 11	Trout	Stickleback	Windy Deep	Windy Deep	Windy Deep	Stickleback	Aim. Stn 5	Aim. Stn 5
Depth Zone:				Surface	Surface	Surface	Surface	Surface	Surface	Deep	Deep	Surface	Surface	Surface	Deep	Surface	Surface	Surface	Surface	Surface	Surface	Deep	Surface	Surface	Surface
Depth (m):				1	1	1	1	1	1	24	16	1	1	1	26	1	1	1	1	1	1	16	1	1	1
Replicate:		CCME Guideline		1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1
Date Sampled:		for the Protection		26-Apr-10	26-Apr-10	25-Apr-10	25-Apr-10	25-Apr-10	25-Apr-10	25-Apr-10	19-Apr-10	19-Apr-10	13-Aug-10	14-Aug-10	14-Aug-10	15-Aug-10	15-Aug-10	15-Aug-10	19-Aug-10	21-Aug-10	21-Aug-10	21-Aug-10	21-Aug-10	21-Aug-10	21-Aug-10
ALS Sample ID:	Units	of Freshwater Aquatic Life[a]	RDL[b]	L881551-1	L881551-2	L880485-5	L880485-6	L880485-7	L880485-2	L880485-4	L879372-3	L879372-4	L921179-1	L921179-2	L921179-3	L921923-1	L921923-2	L921923-4	L923075-1	L923760-16	L923760-17	L923760-18	L926333-1	L926333-3	L926333-4
Physical Tests																									
Conductivity	µS/cm		2.0	605	276	86.0	89.0	81.9	60.3	65.3	484	493	44.8	46.3	45.2	46.9	47.0	77.4	230	418	418	418	235	47.0	46.9
Hardness (as $CaCO_3$)	mg/L		0.5-1.0	181	102	21.3	21.3	20.8	15.5	16.1	79.4	82.1	11.1	11.1	11.2	11.8	11.6	24.6	69.4	66.5	67.3	66.9	67.6	11.6	11.7
pH	pH	6.5-9.0	0.1	7.71	7.51	7.13	7.09	7.11	7.09	6.82	7.99	8.08	7.14	7.13	7.11	7.19	7.15	7.52	7.81	7.55	7.61	7.78	7.76	8.01	7.97
Total Suspended Solids	mg/L	dependent on background levels	3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L		10	425	201	46	51	50	37	40	256	258	29	30	30	40	35	57	146	214	229	227	167	31	32
Turbidity	NTU	dependent on background levels	0.10	1.70	1.54	1.16	1.21	0.57	0.29	1.06	0.32	0.25	1.14	0.98	1.11	1.48	1.53	2.38	0.61	0.91	0.93	1.06	0.49	1.02	0.99
Anions and Nutrients																									
Acidity (as $CaCO_3$)	mg/L		1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.2	3.5	3.6
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L		2.0	96.5	91.4	13.4	13.4	13.6	9.7	9.8	56.1	58.9	7.8	7.8	7.9	8.0	8.3	20.7	34.7	47.5	47.4	47.9	35.5	8.3	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	<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
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	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as $CaCO_3$)	mg/L		2.0	96.5	91.4	13.4	13.4	13.6	9.7	9.8	56.1	58.9	7.8	7.8	7.9	8.0	8.3	20.7	34.7	47.5	47.4	47.9	35.5	8.3	8.3
Ammonia as N	mg/L	pH- and temperature-dependent	0.0050	0.166	0.0481	0.0076	0.0072	0.0077	0.0089	<0.0050	0.0074	<0.0050	<0.0050	<0.0050	0.0152	0.0101	0.0087	0.0155	0.0128	<0.0050	<0.0050	<0.0050	0.0188	0.0198	0.0164
Bromide (Br)	mg/L		0.050	0.131	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.273	0.277	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.064	0.241	0.246	0.244	0.073	<0.050	<0.050
Chloride (Cl)	mg/L		0.50	131	30.2	15.4	16.2	14.2	10.2	11.3	111	113	7.35	7.43	7.45	7.81	7.79	9.82	46.3	95.4	94.8	95.1	49.3	7.43	7.44
Fluoride (F)	mg/L		0.020	0.086	0.067	0.033	0.033	0.032	0.024	0.025	0.079	0.080	0.021	0.021	0.021	0.021	0.022	0.031	0.033	0.074	0.074	0.074	0.034	<0.020	<0.020
Nitrate (as N)	mg/L	2.9	0.0050	0.0720	0.160	0.0477	0.0471	0.0494	0.0437	0.130	0.0100	<0.0050	<0.0050	<0.0050	0.0084	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	0.0010	0.0024	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<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		0.050	1.35	1.45	0.294	0.278	0.408	0.163	0.154	0.054	0.059	0.206	0.183	0.203	0.501	0.284	0.569	0.291	0.085	1.10	0.097	0.290	0.210	0.216
Ortho Phosphate as P	mg/L		0.0010	0.0014	<0.0010	<0.0010	<0.0010	<0.0010	0.0015	0.0035	<0.0010	<0.0010	<0.0010	<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 Phosphorus	mg/L		0.0020	0.0187	0.0266	0.0145	0.0124	0.0115	0.0062	0.0095	0.0039	0.0042	0.0084	0.0076	0.0110	0.0093	0.0111	0.0169	0.0089	0.0045	0.0042	0.0051	0.0088	0.0080	0.0076
Sulphate (SO_4)	mg/L		0.50	2.74	7.52	2.39	2.47	2.28	1.65	1.70	9.03	9.25	1.22	1.19	1.19	1.18	1.18	0.96	0.82	7.94	7.88	7.91	0.90	1.13	1.18
Organic / Inorganic Carbon																									
Total Organic Carbon	mg/L		0.20-0.50	9.12	22.4	7.95	8.30	7.03	6.14	5.80	1.71	1.73	5.20	4.71	4.64	6.66	4.56	7.66	5.85	2.17	2.16	2.11	5.39	5.12	5.00
Total Metals																									
Aluminum (Al)	mg/L	0.005-0.1[b]	0.0010-0.0080	<0.0070	0.0792	0.0652	0.0459	0.0268	0.0182	0.0692	0.0132	0.0083	0.0547	0.0476	0.0537	0.0776	0.0859	0.119	<0.0070	0.0342	0.0455	0.0427	<0.0080	0.0441	0.0516
Antimony (Sb)	mg/L		0.000010-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00033	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)	mg/L	0.005	0.000050-0.00080	<0.00080	0.00053	0.00020	0.00019	0.00019	0.00014	0.00014	<0.00070	<0.00080	0.00015	0.00022	0.00018	0.00020	0.000203	0.00025	<0.00030	<0.00050	<0.00060	<0.00050	0.00032	0.000129	0.000133
Barium (Ba)	mg/L		0.000050-0.00010	0.0233	0.0193	0.00336	0.00378	0.00294	0.00202	0.00285	0.00261	0.00237	0.00222	0.00199	0.00208	0.00230	0.00240	0.00535	0.00520	0.00236	0.00244	0.00236	0.00503	0.00222	0.00217
Beryllium (Be)	mg/L		0.0000050-0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)	mg/L		0.000050-0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.0010-0.0050	0.0357	0.0119	0.0085	0.0089	0.0084	0.0072	0.0069	0.0521	0.0575	0.0101	0.0117	0.0110	0.0109	0.0111	0.0122	0.0227	0.0528	0.0530	0.0552	0.0205	0.0098	0.0100
Cadmium (Cd)	mg/L	0.000017 [c,d]	0.0000050-0.000010	0.000016	0.000012	<0.000010	0.000018	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)	mg/L		0.02-0.05	49.0	31.1	4.43	4.42	4.56	3.34	3.51	13.3	13.7	2.47	2.53	2.51	2.71	2.67	7.68	19.1	12.4	12.1	12.0	17.9	2.56	2.57
Chromium (Cr)	mg/L	Cr(VI): 0.001 Cr(III): 0.0089[d]	0.00020-0.00050	<0.00050	0.00101	<0.00050	0.00056	<0.00050	<0.00050	0.00051	<0.00050	0.00058	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00069	0.00027	<0.00050	0.00064	<0.00050	<0.00020	<0.00020	<0.00020
Cobalt (Co)	mg/L		0.000050-0.00010	<0.00010	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)	mg/L	0.002-0.004[e]	0.00010-0.0010	0.00133	0.00529	0.00169	0.00172	0.00164	0.00129	0.00127	0.00089	0.00093	0.00095	0.00096	0.00096	0.00116	0.00117	0.00175	0.00053	0.00138	0.00093	0.00095	<0.00050	<0.0010	<0.0010
Iron (Fe)	mg/L	0.3	0.010-0.030	0.342	0.433	0.127	0.104	0.055	0.028	0.069	<0.010	<0.010	0.108	0.082	0.112	0.121	0.134	0.286	0.059	0.037	0.034	0.032	0.075	0.111	0.098
Lead (Pb)	mg/L	0.001-0.007[f]	0.000050	<0.000050	0.000079	<0.000050	0.000052	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000450	0.000419	<0.000050	0.000540	0.000694	0.000707	0.000436	0.00102	0.000096	<0.000050	0.00209	0.000340	0.000438
Lithium (Li)	mg/L		0.00020-0.0050	0.0118	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0052	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)	mg/L		0.0050-0.10	17.2	7.52	2.53	2.59	2.56	1.86	2.00	11.3	12.1	1.44	1.47	1.48	1.58	1.56	2.02	6.53	9.52	9.52	9.65	6.11	1.45	1.44
Manganese (Mn)	mg/L		0.000050-0.00020	0.0985	0.0104	0.00510	0.00484	0.00252	0.000855	0.0101	0.00127	0.000929	0.00723	0.00570	0.00944	0.00755	0.00756	0.00450	0.0117	0.00184	0.00203	0.00186	0.0112	0.00634	0.00636
Mercury (Hg)	mg/L	Inorganic Mercury: 0.000026 Methylmercury: 0.000004[d]	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L	0.073[d]	0.000050	0.000080	0.000162	0.000073	0.000075	0.000071	0.000059	0.000052	0.000687	0.000730	<0.000050	<0.000050	<0.000050	0.000060	0.000060	0.000090	<0.000050	0.000686	0.000669	0.000661	0.000059	0.000057	0.000052
Nickel (Ni)	mg/L	0.025-0.150[g]	0.00010-0.00020	0.00080	0.00302	0.00077	0.00076	0.00143	0.00057	0.00050	0.00023	0.00022	0.00041	0.00041	0.00043	0.00050	0.00052	0.00114	0.00031	0.00023	0.00042	0.00027	0.00048	0.00073	0.00073
Phosphorus (P)	mg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)	mg/L		0.050-2.0	4.45	1.75	1.01	1.05	1.03	0.736	0.786	4.38	4.64	0.651	0.651	0.669	0.727	0.727	0.529	1.78	3.90	3.89	3.91	1.65	0.672	0.669
Selenium (Se)	mg/L	0.001	0.00020-0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	0.00022	<0.0010	<0.0010	<0.0020	<0.0020	<0.0020	<0.00050	<0.00020	<0.00020
Silicon (Si)	mg/L		0.050	1.97	4.66	0.361	0.326	0.253	0.216	0.845	0.371	0.284	0.325	0.306	0.391	0.344	0.384	0.635	0.390	0.303	0.317	0.311	0.448	0.314	0.304
Silver (Ag)	mg/L	0.0001	0.0000050-0.000010	<0.000010	0.000011	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)	mg/L		0.010-2.0	39.2	16.0	7.38	8.12	7.26	5.36	5.99	61.4	65.6	3.90	4.04	4.12	4.36	4.36	5.49	15.9	51.8	51.4	51.7	14.6	4.13	4.12
Strontium (Sr)	mg/L		0.000050-0.00010	0.260	0.106	0.0206	0.0207	0.0208	0.0155	0.0167	0.0636	0.0648	0.0117	0.0117	0.0120	0.0130	0.0131	0.0301	0.0942	0.0572	0.0562	0.0564	0.0880	0.0120	0.0120

Winter surface water quality samples were collected from 1 m below the ice.

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian water quality guidelines for the protection of freshwater aquatic life, Canadian Council of Ministers of the Environment, Updated December 2007

b) 0.005 mg/L at pH <6.5; 0.1 mg/L at pH ≥ 6.5

c) Equation for correcting the guideline value for hardness = $10^{[0.86[\log(\text{hardness})] - 3.2]}$ / 1000

d) Interim guideline

e) 0.002 mg/L at [$CaCO_3$] = 0-120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120-180 mg/L; ¤0.004 mg/L at [$CaCO_3$] = >180 mg/L

f) 0.001 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.004 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.007 mg/L at [$CaCO_3$] = >180 mg/L

g) 0.025 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.110 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.150 mg/L at [$CaCO_3$] = >180 mg/L

h) RDL = Realized detection limit

Appendix 3.2-1. Lake Water Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:				Stickleback	Trout	Aim. Stn 5	Aim. Stn 5	Aim. Stn 11	Aim. Stn 6	Aim. Stn 6	Windy Deep	Windy Deep	Aim. Stn 13	Aim. Stn 6	Aim. Stn 6	Aim. Stn 11	Aim. Stn 11	Trout	Stickleback	Windy Deep	Windy Deep	Windy Deep	Stickleback	Aim. Stn 5	Aim. Stn 5
Depth Zone:				Surface	Surface	Surface	Surface	Surface	Surface	Deep	Deep	Surface	Surface	Surface	Deep	Surface	Surface	Surface	Surface	Surface	Surface	Deep	Surface	Surface	Surface
Depth (m):				1	1	1	1	1	1	24	16	1	1	1	26	1	1	1	1	1	1	16	1	1	1
Replicate:		CCME Guideline		1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1
Date Sampled:		for the Protection		26-Apr-10	26-Apr-10	25-Apr-10	25-Apr-10	25-Apr-10	25-Apr-10	25-Apr-10	19-Apr-10	19-Apr-10	13-Aug-10	14-Aug-10	14-Aug-10	15-Aug-10	15-Aug-10	15-Aug-10	19-Aug-10	21-Aug-10	21-Aug-10	21-Aug-10	21-Aug-10	21-Aug-10	21-Aug-10
ALS Sample ID:	Units	of Freshwater Aquatic Life[a]	RDL[b]	L881551-1	L881551-2	L880485-5	L880485-6	L880485-7	L880485-2	L880485-4	L879372-3	L879372-4	L921179-1	L921179-2	L921179-3	L921923-1	L921923-2	L921923-4	L923075-1	L923760-16	L923760-17	L923760-18	L926333-1	L926333-3	L926333-4
Total Metals (continued)																									
Tellurium (Te)	mg/L		0.000010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium (Tl)	mg/L	0.0008	0.0000020-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)	mg/L		0.00010-0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)	mg/L		0.00020-0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)	mg/L		0.0000020-0.000010	0.000033	0.000117	0.000043	0.000043	0.000037	0.000032	0.000030	0.000171	0.000203	0.000023	0.000023	0.000022	0.000028	0.000026	0.000044	0.000013	0.000176	0.000179	0.000175	0.000012	0.000025	0.000024
Vanadium (V)	mg/L		0.000050-0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050
Zinc (Zn)	mg/L	0.03	0.0010-0.0030	0.0208	0.0080	0.0027	0.0041	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	0.0015	0.0010	0.0014	0.0014	0.0018	0.0011	<0.0010	0.0021	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Metals																									
Aluminum (Al)	mg/L		0.0010-0.0030	<0.0010	0.0468	0.0118	0.0121	0.0128	0.0086	0.0221	0.0022	0.0024	0.0106	0.0106	0.0105	0.0137	0.0129	0.0244	0.0015	0.0044	0.0045	0.0044	<0.0010	0.0122	0.0198
Antimony (Sb)	mg/L		0.000010-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)	mg/L		0.000030-0.00070	<0.00070	0.00046	0.000220	0.000225	0.000212	0.000164	0.000142	<0.00060	<0.00070	0.00010	0.00010	<0.00010	0.000158	0.000120	0.00020	0.00022	<0.00050	<0.00050	<0.00050	0.00029	0.000106	0.000106
Barium (Ba)	mg/L		0.000050-0.00010	0.0219	0.0182	0.00311	0.00329	0.00267	0.00184	0.00219	0.00241	0.00222	0.00155	0.00157	0.00156	0.00156	0.00154	0.00406	0.00488	0.00206	0.00202	0.00200	0.00468	0.00164	0.00161
Beryllium (Be)	mg/L		0.0000050-0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)	mg/L		0.000050-0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.0010-0.0050	0.0338	0.0117	0.0069	0.0068	0.0065	0.0051	0.0051	0.0540	0.0567	0.0093	0.0073	0.0085	0.0084	0.0083	0.0088	0.0198	0.0526	0.0492	0.0506	0.0205	0.0088	0.0096
Cadmium (Cd)	mg/L		0.0000050-0.000020	0.000013	0.000014	0.000012	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)	mg/L		0.02-0.05	45.5	28.9	4.32	4.27	4.23	3.17	3.32	13.3	13.8	2.29	2.26	2.31	2.43	2.33	6.91	17.6	11.6	11.7	11.5	17.2	2.36	2.37
Chromium (Cr)	mg/L		0.00010-0.00050	<0.00050	0.00080	0.00023	0.00028	0.00022	0.00021	0.00016	0.00056	0.00060	<0.00050	<0.00050	<0.00050	0.00021	<0.00020	<0.00050	<0.00020	<0.00050	<0.00050	<0.00050	<0.00020	<0.00020	<0.00020
Cobalt (Co)	mg/L		0.000050-0.00010	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)	mg/L		0.00010-0.00050	0.00065	0.00464	0.00155	0.00159	0.00149	0.00114	0.00112	0.00076	0.00074	0.00086	0.00079	0.00076	0.00097	0.00089	0.00149	0.00037	0.00080	0.00074	0.00074	0.00035	0.00080	0.00083
Iron (Fe)	mg/L		0.010-0.030	<0.010	0.318	0.034	0.030	0.047	0.018	0.027	<0.010	<0.010	0.030	0.028	0.027	0.030	0.030	0.102	<0.010	<0.010	<0.010	<0.010	<0.010	0.035	0.030
Lead (Pb)	mg/L		0.000050	<0.000050	0.000059	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000070	0.000075	<0.000050	0.000096	0.000113	0.000222	<0.000050	0.000055	<0.000050	<0.000050	<0.000050	0.000073	<0.000050
Lithium (Li)	mg/L		0.00020-0.0050	0.0111	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)	mg/L		0.0050-0.10	16.3	7.36	2.56	2.57	2.48	1.85	1.91	11.2	11.5	1.30	1.32	1.32	1.40	1.39	1.79	6.17	9.12	9.26	9.27	5.97	1.39	1.40
Manganese (Mn)	mg/L		0.000050-0.00020	0.0469	0.00887	0.00179	0.00154	0.00151	0.000458	0.00767	0.000093	<0.000050	0.000578	0.000779	0.00102	0.000639	0.000608	0.000317	0.000060	0.000078	0.000058	0.000051	<0.000050	0.000602	0.000430
Mercury (Hg)	mg/L		0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000017	0.000020	0.000020	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.000050	0.000052	0.000162	0.000059	0.000068	0.000064	<0.000050	<0.000050	0.000661	0.000731	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000064	<0.000050	0.000654	0.000625	0.000641	0.000063	<0.000050	<0.000050
Nickel (Ni)	mg/L		0.00010-0.00020	0.00048	0.00296	0.00070	0.00066	0.00068	0.00048	0.00038	0.00018	0.00018	0.00045	0.00034	0.00033	0.00043	0.00041	0.00087	0.00027	0.00020	0.00019	0.00021	0.00020	0.00041	0.00040
Phosphorus (P)	mg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)	mg/L		0.050-2.0	4.11	1.68	1.02	1.04	0.978	0.713	0.742	4.44	4.65	0.602	0.612	0.622	0.637	0.635	0.448	1.63	3.69	3.73	3.75	1.61	0.647	0.652
Selenium (Se)	mg/L		0.00010-0.0020	<0.00050	<0.00050	0.00016	0.00011	0.00012	<0.00010	0.00015	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	0.00023	<0.00020	<0.0010	<0.0010	<0.0020	<0.0020	<0.0020	<0.00050	<0.00020	<0.00020
Silicon (Si)	mg/L		0.050	1.94	4.65	0.239	0.229	0.206	0.187	0.751	0.352	0.265	0.195	0.203	0.242	0.176	0.162	0.402	0.362	0.223	0.220	0.224	0.352	0.183	0.179
Silver (Ag)	mg/L		0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000022	<0.000010	<0.000010
Sodium (Na)	mg/L		0.010-2.0	36.5	15.7	7.89	8.26	7.22	5.24	5.74	62.2	63.4	3.65	3.74	3.81	3.85	3.95	4.80	15.0	49.5	50.5	50.6	14.3	3.99	4.04
Strontium (Sr)	mg/L		0.000050-0.00010	0.241	0.0996	0.0204	0.0204	0.0197	0.0148	0.0158	0.0616	0.0623	0.0108	0.0109	0.0111	0.0118	0.0117	0.0272	0.0887	0.0544	0.0548	0.0542	0.0861	0.0112	0.0113
Thallium (Tl)	mg/L		0.0000020-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)	mg/L		0.00010-0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)	mg/L		0.00020-0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)	mg/L		0.0000020-0.000010	0.000029	0.000107	0.000034	0.000034	0.000035	0.000026	0.000021	0.000167	0.000193	0.000013	0.000017	0.000014	0.000019	0.000019	0.000037	0.000012	0.000171	0.000174	0.000175	0.000010	0.000019	0.000018
Vanadium (V)	mg/L		0.000050-0.0010	<0.0010	<0.0010	0.000078	<0.000050	0.000055	<0.000050	0.000092	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050
Zinc (Zn)	mg/L		0.0010-0.0030	0.0177	0.0079	0.0046	0.0042	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	0.0015	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0013	<0.0010
Organic Parameters																									
Microcystin	µg/L		0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	-	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	-	-	<0.20	<0.20	<0.20

Winter surface water quality samples were collected from 1 m below the ice.

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian water quality guidelines for the protection of freshwater aquatic life, Canadian Council of Ministers of the Environment, Updated December 2007

b) 0.005 mg/L at pH <6.5; 0.1 mg/L at pH ≥ 6.5

c) Equation for correcting the guideline value for hardness = $10^{[0.86[\log(\text{hardness})] - 3.2]}$ / 1000

d) Interim guideline

e) 0.002 mg/L at [$CaCO_3$] = 0-120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120-180 mg/L; ¤0.004 mg/L at [$CaCO_3$] = >180 mg/L

f) 0.001 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.004 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.007 mg/L at [$CaCO_3$] = >180 mg/L

g) 0.025 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.110 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.150 mg/L at [$CaCO_3$] = >180 mg/L

h) RDL = Realized detection limit

Appendix 3.2-2

Water Quality QA/QC Results, Hope Bay Belt Project, 2010

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Appendix 3.2-2. Water Quality QA/QC Results, Hope Bay Belt Project, 2010

Site Abbreviation:			Equipment Blank	Equipment Blank	Travel Blank	Field Blank	Field Blank	Travel Blank	Travel Blank	Field Blank	Field Blank	Field Blank	Equipment Blank	Field Blank	Field Blank
Date Sampled:			18-Apr-10	18-Apr-10	18-Apr-10	22-Apr-10	25-Apr-10	17-Jun-10	17-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	08-Aug-10	10-Aug-10	13-Aug-10
ALS Sample ID:	**Units**	**RDL[a]**	L879372-5	L879380-1	L879380-2	L880317-7	L880485-10	L899505-5	L899508-5	L900028-30	L900028-32	L900033-3	L919821-1	L919821-7	L921162-7
Physical Tests															
Conductivity	µS/cm	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
Hardness (as $CaCO_3$)	mg/L	0.5-1.0	<0.50	<1.0	<1.0	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
pH	pH	0.1	5.92	5.83	5.69	5.90	5.68	5.98	5.59	5.81	5.60	5.62	5.65	5.64	5.92
Total Suspended Solids	mg/L	3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	10	<10	<10	<10	-	<10	-	<10	<10	<10	-	-	-	-
Turbidity	NTU	0.1	<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
Anions and Nutrients															
Acidity (as $CaCO_3$)	mg/L	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
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	-	-	-	-
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	<2.0	<2.0	<2.0	<2.0	<2.0
Ammonia as N	mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.005	<0.0050	0.0066	0.0060	<0.005	<0.0050	<0.0050	<0.0050
Bromide (Br)	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	<0.050	<0.050
Chloride (Cl)	mg/L	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F)	mg/L	0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Nitrate (as 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	<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	<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	-	-	-	-
Ortho Phosphate as P	mg/L	0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-	<0.0010	<0.0010	<0.0010	-	-	-	-
Total Phosphorus	mg/L	0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Sulphate (SO_4)	mg/L	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Cyanides															
Cyanide, Total	mg/L	0.0010	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon															
Total Organic Carbon	mg/L	0.20-0.50	<0.20	0.34	0.28	<0.20	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	-
Total Metals															
Aluminum (Al)	mg/L	0.0010-0.0030	<0.0010	<0.0030	<0.0030	<0.0030	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010	<0.0030	<0.0030	<0.0030	<0.0030
Antimony (Sb)	mg/L	0.000010-0.00010	<0.00010	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.00010	<0.00010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010
Arsenic (As)	mg/L	0.000030-0.00010	<0.000030	<0.000050	<0.000050	<0.000050	<0.000030	<0.000050	<0.000030	<0.000030	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Barium (Ba)	mg/L	0.000050-0.00010	<0.000050	<0.00010	<0.00010	<0.00010	<0.000050	<0.00010	<0.000050	<0.000050	<0.000050	<0.00010	0.00012	<0.00010	<0.00010
Beryllium (Be)	mg/L	0.0000050-0.00020	<0.00020	<0.0000050	<0.0000050	<0.0000050	<0.00020	<0.0000050	<0.00020	<0.00020	<0.00020	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Bismuth (Bi)	mg/L	0.000050-0.00050	<0.00050	<0.000050	<0.000050	<0.000050	<0.00050	<0.000050	<0.00050	<0.00050	<0.00050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)	mg/L	0.0010-0.0050	<0.0010	<0.0050	<0.0050	<0.0050	0.0012	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)	mg/L	0.0000050-0.000010	<0.000010	<0.0000050	<0.0000050	<0.0000050	<0.000010	<0.0000050	<0.000010	<0.000010	<0.000010	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)	mg/L	0.02-0.05	<0.020	<0.050	<0.050	<0.050	<0.020	<0.050	<0.020	<0.020	<0.020	<0.050	<0.050	<0.050	<0.050
Cesium (Cs)	mg/L	0.0000050	-	<0.0000050	<0.0000050	<0.0000050	-	<0.0000050	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Chromium (Cr)	mg/L	0.00010-0.00050	<0.00020	<0.00050	<0.00050	<0.00050	<0.00020	<0.00050	<0.00020	<0.00020	<0.00020	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)	mg/L	0.000050-0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.00010	<0.000050	<0.00010	<0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050
Copper (Cu)	mg/L	0.00010-0.00050	<0.00010	<0.00050	<0.00050	<0.00050	<0.00010	<0.00050	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050
Gallium (Ga)	mg/L	0.000050	-	<0.000050	<0.000050	<0.000050	-	<0.000050	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050
Iron (Fe)	mg/L	0.010-0.030	<0.010	<0.030	<0.030	<0.030	<0.010	<0.030	<0.010	<0.010	<0.010	<0.030	<0.030	<0.030	<0.030
Lead (Pb)	mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)	mg/L	0.00020-0.0050	<0.0050	<0.00020	<0.00020	<0.00020	<0.0050	<0.00020	<0.0050	<0.0050	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020
Magnesium (Mg)	mg/L	0.0050-0.10	<0.0050	<0.10	<0.10	<0.10	<0.0050	<0.10	<0.0050	<0.0050	<0.0050	<0.10	<0.10	<0.10	<0.10
Manganese (Mn)	mg/L	0.000050-0.00020	<0.000050	<0.00020	<0.00020	<0.00020	<0.000050	<0.00020	<0.000050	<0.000050	<0.000050	<0.00020	<0.00020	<0.00020	<0.00020
Mercury (Hg)	mg/L	0.000010-0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)	mg/L	0.00010-0.00020	<0.00010	<0.00020	<0.00020	<0.00020	<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020
Phosphorus (P)	mg/L	0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)	mg/L	0.050-2.0	<0.050	<2.0	<2.0	<2.0	<0.050	<2.0	<0.050	<0.050	<0.050	<2.0	<2.0	<2.0	<2.0
Rhenium (Re)	mg/L	0.0000050	-	<0.0000050	<0.0000050	<0.0000050	-	<0.0000050	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Rubidium (Rb)	mg/L	0.000020	-	<0.000020	<0.000020	<0.000020	-	<0.000020	-	-	-	<0.000020	<0.000020	<0.000020	<0.000020
Selenium (Se)	mg/L	0.00010-0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Silicon (Si)	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	<0.050	<0.050
Silver (Ag)	mg/L	0.0000050-0.000010	<0.000010	<0.0000050	<0.0000050	<0.0000050	<0.000010	<0.0000050	<0.000010	<0.000010	<0.000010	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na)	mg/L	0.010-2.0	<0.010	<2.0	<2.0	<2.0	<0.010	<2.0	<0.010	<0.010	<0.010	<2.0	<2.0	<2.0	<2.0
Strontium (Sr)	mg/L	0.000050-0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.00010	<0.000050	<0.00010	<0.00010	<0.00010	<0.000050	0.000273	<0.000050	<0.000050

a) RDL = Realized detection limit

Appendix 3.2-2. Water Quality QA/QC Results, Hope Bay Belt Project, 2010

Site Abbreviation:			Equipment Blank	Equipment Blank	Travel Blank	Field Blank	Field Blank	Travel Blank	Travel Blank	Field Blank	Field Blank	Field Blank	Equipment Blank	Field Blank	Field Blank
Date Sampled:			18-Apr-10	18-Apr-10	18-Apr-10	22-Apr-10	25-Apr-10	17-Jun-10	17-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	08-Aug-10	10-Aug-10	13-Aug-10
ALS Sample ID:	**Units**	**RDL[a]**	L879372-5	L879380-1	L879380-2	L880317-7	L880485-10	L899505-5	L899508-5	L900028-30	L900028-32	L900033-3	L919821-1	L919821-7	L921162-7
Total Metals (continued)															
Tellurium (Te)	mg/L	0.000010	-	<0.000010	<0.000010	<0.000010	-	<0.000010	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010
Thallium (Tl)	mg/L	0.0000020-0.00010	<0.00010	<0.0000020	<0.0000020	<0.0000020	<0.00010	<0.0000020	<0.00010	<0.00010	<0.00010	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Thorium (Th)	mg/L	0.0000050	-	<0.0000050	<0.0000050	<0.0000050	-	<0.0000050	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Tin (Sn)	mg/L	0.00010-0.00020	<0.00010	<0.00020	<0.00020	<0.00020	<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti)	mg/L	0.00020-0.010	<0.010	<0.00020	<0.00020	<0.00020	<0.010	<0.00020	<0.010	<0.010	<0.010	<0.00020	<0.00020	<0.00020	<0.00020
Tungsten (W)	mg/L	0.000010	-	<0.000010	<0.000010	<0.000010	-	<0.000010	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010
Uranium (U)	mg/L	0.0000020-0.000010	<0.000010	<0.0000020	<0.0000020	<0.0000020	<0.000010	<0.0000020	<0.000010	<0.000010	<0.000010	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Vanadium (V)	mg/L	0.000050-0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00020	<0.00020	<0.000050	<0.000050	<0.000050	<0.000050
Yttrium (Y)	mg/L	0.0000050	-	<0.0000050	<0.0000050	<0.0000050	-	<0.0000050	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Zinc (Zn)	mg/L	0.0010-0.0030	<0.0010	<0.0030	<0.0030	<0.0030	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)	mg/L	0.000050	-	<0.000050	<0.000050	<0.000050	-	<0.000050	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Metals															
Aluminum (Al)	mg/L	0.0010-0.0030	<0.0010	-	-	-	<0.0010	-	<0.0010	<0.0010	<0.0010	-	-	-	<0.0030
Antimony (Sb)	mg/L	0.000010-0.00010	<0.00010	-	-	-	<0.00010	-	<0.00010	<0.00010	<0.00010	-	-	-	<0.000010
Arsenic (As)	mg/L	0.000030-0.000050	<0.000030	-	-	-	<0.000030	-	<0.000030	<0.000050	<0.000050	-	-	-	<0.000050
Barium (Ba)	mg/L	0.000050-0.00010	<0.000050	-	-	-	<0.000050	-	<0.000050	<0.000050	<0.000050	-	-	-	<0.00010
Beryllium (Be)	mg/L	0.0000050-0.00020	<0.00020	-	-	-	<0.00020	-	<0.00020	<0.00020	<0.00020	-	-	-	<0.0000050
Bismuth (Bi)	mg/L	0.000050-0.00050	<0.00050	-	-	-	<0.00050	-	<0.00050	<0.00050	<0.00050	-	-	-	<0.000050
Boron (B)	mg/L	0.0010-0.0050	0.0015	-	-	-	<0.0010	-	<0.0050	<0.0050	<0.0050	-	-	-	<0.0050
Cadmium (Cd)	mg/L	0.0000050-0.000010	<0.000010	-	-	-	<0.000010	-	<0.000010	<0.000010	<0.000010	-	-	-	<0.0000050
Calcium (Ca)	mg/L	0.02-0.05	<0.020	-	-	-	<0.020	-	<0.020	<0.020	<0.020	-	-	-	<0.050
Cesium (Cs)	mg/L	0.0000050	-	-	-	-	-	-	-	-	-	-	-	-	<0.0000050
Chromium (Cr)	mg/L	0.00010-0.00050	<0.00020	-	-	-	<0.00020	-	<0.00020	<0.00020	<0.00020	-	-	-	<0.00050
Cobalt (Co)	mg/L	0.000050-0.00010	<0.00010	-	-	-	<0.00010	-	<0.00010	<0.00010	<0.00010	-	-	-	<0.000050
Copper (Cu)	mg/L	0.00010-0.00050	<0.00010	-	-	-	<0.00010	-	<0.00010	<0.00010	<0.00010	-	-	-	<0.00050
Gallium (Ga)	mg/L	0.000050	-	-	-	-	-	-	-	-	-	-	-	-	<0.000050
Iron (Fe)	mg/L	0.010-0.030	<0.010	-	-	-	<0.010	-	<0.010	<0.010	<0.010	-	-	-	<0.030
Lead (Pb)	mg/L	0.000050	<0.000050	-	-	-	<0.000050	-	<0.000050	<0.000050	<0.000050	-	-	-	<0.000050
Lithium (Li)	mg/L	0.00020-0.0050	<0.0050	-	-	-	<0.0050	-	<0.0050	<0.0050	<0.0050	-	-	-	<0.00020
Magnesium (Mg)	mg/L	0.0050-0.10	<0.0050	-	-	-	<0.0050	-	<0.0050	<0.0050	<0.0050	-	-	-	<0.10
Manganese (Mn)	mg/L	0.000050-0.00020	<0.000050	-	-	-	<0.000050	-	<0.000050	<0.000050	<0.000050	-	-	-	<0.00020
Mercury (Hg)	mg/L	0.000010	<0.000010	-	-	-	<0.000010	-	<0.000010	<0.000010	<0.000010	-	-	-	<0.000010
Molybdenum (Mo)	mg/L	0.000050	<0.000050	-	-	-	<0.000050	-	<0.000050	<0.000050	<0.000050	-	-	-	<0.000050
Nickel (Ni)	mg/L	0.00010-0.00020	<0.00010	-	-	-	<0.00010	-	<0.00010	<0.00010	<0.00010	-	-	-	<0.00020
Phosphorus (P)	mg/L	0.30	<0.30	-	-	-	<0.30	-	<0.30	<0.30	<0.30	-	-	-	<0.30
Potassium (K)	mg/L	0.050-2.0	<0.050	-	-	-	<0.050	-	<0.050	<0.050	<0.050	-	-	-	<2.0
Rhenium (Re)	mg/L	0.0000050	-	-	-	-	-	-	-	-	-	-	-	-	<0.0000050
Rubidium (Rb)	mg/L	0.000020	-	-	-	-	-	-	-	-	-	-	-	-	<0.000020
Selenium (Se)	mg/L	0.00010-0.00020	<0.00020	-	-	-	<0.00020	-	<0.00010	<0.00020	<0.00020	-	-	-	<0.00020
Silicon (Si)	mg/L	0.050	<0.050	-	-	-	<0.050	-	<0.050	<0.050	<0.050	-	-	-	<0.050
Silver (Ag)	mg/L	0.0000050-0.000010	<0.000010	-	-	-	<0.000010	-	<0.000010	<0.000010	<0.000010	-	-	-	<0.0000050
Sodium (Na)	mg/L	0.010-2.0	<0.010	-	-	-	<0.010	-	<0.010	<0.010	<0.010	-	-	-	<2.0
Strontium (Sr)	mg/L	0.000050-0.00010	<0.00010	-	-	-	<0.00010	-	<0.00010	<0.00010	<0.00010	-	-	-	<0.000050
Tellurium (Te)	mg/L	0.000010	-	-	-	-	-	-	-	-	-	-	-	-	<0.000010
Thallium (Tl)	mg/L	0.0000020-0.00010	<0.00010	-	-	-	<0.00010	-	<0.00010	<0.00010	<0.00010	-	-	-	<0.0000020
Thorium (Th)	mg/L	0.0000050	-	-	-	-	-	-	-	-	-	-	-	-	<0.0000050
Tin (Sn)	mg/L	0.00010-0.00020	<0.00010	-	-	-	<0.00010	-	<0.00010	<0.00010	<0.00010	-	-	-	<0.00020
Titanium (Ti)	mg/L	0.00020-0.010	<0.010	-	-	-	<0.010	-	<0.010	<0.010	<0.010	-	-	-	<0.00020
Tungsten (W)	mg/L	0.000010	-	-	-	-	-	-	-	-	-	-	-	-	<0.000010
Uranium (U)	mg/L	0.0000020-0.000010	<0.000010	-	-	-	<0.000010	-	<0.000010	<0.000010	<0.000010	-	-	-	<0.0000020
Vanadium (V)	mg/L	0.000050-0.00020	<0.000050	-	-	-	<0.000050	-	<0.000050	<0.00020	<0.00020	-	-	-	<0.000050
Yttrium (Y)	mg/L	0.0000050	-	-	-	-	-	-	-	-	-	-	-	-	<0.0000050
Zinc (Zn)	mg/L	0.0010-0.0030	<0.0010	-	-	-	<0.0010	-	<0.0010	<0.0010	<0.0010	-	-	-	<0.0030
Zirconium (Zr)	mg/L	0.000050	-	-	-	-	-	-	-	-	-	-	-	-	<0.000050
Organic Parameters															
Microcystin	µg/L	0.20	-	-	-	-	-	-	-	-	-	-	-	-	-
Radiochemistry															
Radium-226	Bq/L	0.005-0.007	-	<0.007	<0.007	0.008	-	-	-	-	-	-	<0.005	-	-

a) RDL = Realized detection limit

Appendix 3.2-2. Water Quality QA/QC Results, Hope Bay Belt Project, 2010

Site Abbreviation:			Field Blank	Field Blank	Travel Blank	Travel Blank	Equipment Blank	Field Blank	Travel Blank	Travel Blank	Field Blank	Travel Blank	Field Blank
Date Sampled:			14-Aug-10	14-Aug-10	15-Aug-10	18-Aug-10	21-Aug-10	24-Aug-10	24-Aug-10	12-Sep-10	15-Sep-10	15-Sep-10	16-Sep-10
ALS Sample ID:	**Units**	**RDL[a]**	L921173-5	L921179-4	L921923-3	L923023-7	L926333-5	L926334-3	L926334-4	L930857-6	L932990-9	L932990-10	L933177-23
Physical Tests													
Conductivity	µS/cm	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Hardness (as $CaCO_3$)	mg/L	0.5-1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
pH	pH	0.1	5.69	5.81	5.82	5.79	5.86	5.67	5.76	5.43	5.75	5.57	5.52
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	10	<10	<10	<10	<10	<10	<10	<10	-	-	-	<10
Turbidity	NTU	0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Anions and Nutrients													
Acidity (as $CaCO_3$)	mg/L	1.0	-	-	-	-	2.9	2.7	2.6	-	-	-	-
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
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	<2.0	<2.0	<2.0
Ammonia as N	mg/L	0.0050	0.0070	<0.0050	<0.0050	<0.0050	<0.0050	0.0186	<0.0050	-	<0.0050	<0.0050	0.0088
Bromide (Br)	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
Chloride (Cl)	mg/L	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F)	mg/L	0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Nitrate (as 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 (as 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	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-	-	<0.050	<0.050
Ortho Phosphate as P	mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	-	<0.0010
Total Phosphorus	mg/L	0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Sulphate (SO_4)	mg/L	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Cyanides													
Cyanide, Total	mg/L	0.0010	-	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Organic / Inorganic Carbon													
Total Organic Carbon	mg/L	0.20-0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	-	<0.50	0.257	0.74
Total Metals													
Aluminum (Al)	mg/L	0.0010-0.0030	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0010
Antimony (Sb)	mg/L	0.000010-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010
Arsenic (As)	mg/L	0.000030-0.00010	-	<0.00010	<0.000030	<0.000030	<0.000030	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000030
Barium (Ba)	mg/L	0.000050-0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000050
Beryllium (Be)	mg/L	0.0000050-0.00020	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.00020
Bismuth (Bi)	mg/L	0.000050-0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00050
Boron (B)	mg/L	0.0010-0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)	mg/L	0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000010
Calcium (Ca)	mg/L	0.02-0.05	<0.020	<0.020	<0.020	<0.020	<0.020	<0.050	<0.050	<0.050	<0.050	<0.050	<0.020
Cesium (Cs)	mg/L	0.0000050	-	-	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-
Chromium (Cr)	mg/L	0.00010-0.00050	-	<0.00050	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010
Cobalt (Co)	mg/L	0.000050-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00010
Copper (Cu)	mg/L	0.00010-0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010
Gallium (Ga)	mg/L	0.000050	-	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-
Iron (Fe)	mg/L	0.010-0.030	<0.010	<0.010	<0.010	<0.010	<0.010	<0.030	<0.030	<0.030	<0.030	<0.030	<0.010
Lead (Pb)	mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000104	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)	mg/L	0.00020-0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0050
Magnesium (Mg)	mg/L	0.0050-0.10	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.0050
Manganese (Mn)	mg/L	0.000050-0.00020	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.000050
Mercury (Hg)	mg/L	0.000010-0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)	mg/L	0.00010-0.00020	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010
Phosphorus (P)	mg/L	0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)	mg/L	0.050-2.0	<0.050	<0.050	<0.050	<0.050	<0.050	<2.0	<2.0	<2.0	<2.0	<2.0	<0.050
Rhenium (Re)	mg/L	0.0000050	-	-	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-
Rubidium (Rb)	mg/L	0.000020	-	-	-	-	-	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	-
Selenium (Se)	mg/L	0.00010-0.0010	-	<0.0010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010
Silicon (Si)	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)	mg/L	0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000010
Sodium (Na)	mg/L	0.010-2.0	-	<0.010	<0.010	<0.010	0.020	<2.0	<2.0	<2.0	<2.0	<2.0	<0.010
Strontium (Sr)	mg/L	0.000050-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00010

a) RDL = Realized detection limit

Appendix 3.2-2. Water Quality QA/QC Results, Hope Bay Belt Project, 2010

Site Abbreviation:			Field Blank	Field Blank	Travel Blank	Travel Blank	Equipment Blank	Field Blank	Travel Blank	Travel Blank	Field Blank	Travel Blank	Field Blank
Date Sampled:			14-Aug-10	14-Aug-10	15-Aug-10	18-Aug-10	21-Aug-10	24-Aug-10	24-Aug-10	12-Sep-10	15-Sep-10	15-Sep-10	16-Sep-10
ALS Sample ID:	**Units**	**RDL[a]**	L921173-5	L921179-4	L921923-3	L923023-7	L926333-5	L926334-3	L926334-4	L930857-6	L932990-9	L932990-10	L933177-23
Total Metals													
Tellurium (Te)	mg/L	0.000010	-	-	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Thallium (Tl)	mg/L	0.0000020-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.00010
Thorium (Th)	mg/L	0.0000050	-	-	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-
Tin (Sn)	mg/L	0.00010-0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010
Titanium (Ti)	mg/L	0.00020-0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.010
Tungsten (W)	mg/L	0.000010	-	-	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Uranium (U)	mg/L	0.0000020-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.000010
Vanadium (V)	mg/L	0.000050-0.0010	-	<0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Yttrium (Y)	mg/L	0.0000050	-	-	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-
Zinc (Zn)	mg/L	0.0010-0.0030	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0010
Zirconium (Zr)	mg/L	0.000050	-	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-
Dissolved Metals													
Aluminum (Al)	mg/L	0.0010-0.0030	<0.0010	-	-	<0.0010	<0.0010	<0.0030	-	-	-	-	<0.0010
Antimony (Sb)	mg/L	0.000010-0.00010	<0.00010	-	-	<0.00010	<0.00010	<0.000010	-	-	-	-	<0.00010
Arsenic (As)	mg/L	0.000030-0.000050	<0.000030	-	-	<0.000030	<0.000030	<0.000050	-	-	-	-	<0.000030
Barium (Ba)	mg/L	0.000050-0.00010	<0.000050	-	-	<0.000050	<0.000050	<0.00010	-	-	-	-	<0.000050
Beryllium (Be)	mg/L	0.0000050-0.00020	<0.00020	-	-	<0.00020	<0.00020	<0.0000050	-	-	-	-	<0.00020
Bismuth (Bi)	mg/L	0.000050-0.00050	<0.00050	-	-	<0.00050	<0.00050	<0.000050	-	-	-	-	<0.00050
Boron (B)	mg/L	0.0010-0.0050	<0.0050	-	-	<0.0050	0.0014	<0.0050	-	-	-	-	<0.0050
Cadmium (Cd)	mg/L	0.0000050-0.000010	<0.000010	-	-	<0.000010	<0.000010	<0.0000050	-	-	-	-	<0.000010
Calcium (Ca)	mg/L	0.02-0.05	<0.020	-	-	<0.020	<0.020	<0.050	-	-	-	-	<0.020
Cesium (Cs)	mg/L	0.0000050	-	-	-	-	-	<0.0000050	-	-	-	-	-
Chromium (Cr)	mg/L	0.00010-0.00050	<0.00010	-	-	<0.00010	<0.00010	<0.00050	-	-	-	-	<0.00010
Cobalt (Co)	mg/L	0.000050-0.00010	<0.00010	-	-	<0.00010	<0.00010	<0.000050	-	-	-	-	<0.00010
Copper (Cu)	mg/L	0.00010-0.00050	<0.00010	-	-	<0.00010	<0.00010	<0.00050	-	-	-	-	<0.00010
Gallium (Ga)	mg/L	0.000050	-	-	-	-	-	<0.000050	-	-	-	-	-
Iron (Fe)	mg/L	0.010-0.030	<0.010	-	-	<0.010	<0.010	<0.030	-	-	-	-	<0.010
Lead (Pb)	mg/L	0.000050	<0.000050	-	-	<0.000050	<0.000050	<0.000050	-	-	-	-	<0.000050
Lithium (Li)	mg/L	0.00020-0.0050	<0.0050	-	-	<0.0050	<0.0050	<0.00020	-	-	-	-	<0.0050
Magnesium (Mg)	mg/L	0.0050-0.10	<0.0050	-	-	<0.0050	<0.0050	<0.10	-	-	-	-	<0.0050
Manganese (Mn)	mg/L	0.000050-0.00020	<0.000050	-	-	<0.000050	<0.000050	<0.00020	-	-	-	-	<0.000050
Mercury (Hg)	mg/L	0.000010	<0.000010	-	-	<0.000010	<0.000010	<0.000010	-	-	-	-	<0.000010
Molybdenum (Mo)	mg/L	0.000050	<0.000050	-	-	<0.000050	<0.000050	<0.000050	-	-	-	-	<0.000050
Nickel (Ni)	mg/L	0.00010-0.00020	<0.00010	-	-	<0.00010	<0.00010	<0.00020	-	-	-	-	<0.00010
Phosphorus (P)	mg/L	0.30	<0.30	-	-	<0.30	<0.30	<0.30	-	-	-	-	<0.30
Potassium (K)	mg/L	0.050-2.0	<0.050	-	-	<0.050	<0.050	<2.0	-	-	-	-	<0.050
Rhenium (Re)	mg/L	0.0000050	-	-	-	-	-	<0.0000050	-	-	-	-	-
Rubidium (Rb)	mg/L	0.000020	-	-	-	-	-	<0.000020	-	-	-	-	-
Selenium (Se)	mg/L	0.00010-0.00020	<0.00010	-	-	<0.00010	<0.00010	<0.00020	-	-	-	-	<0.00010
Silicon (Si)	mg/L	0.050	<0.050	-	-	<0.050	<0.050	<0.050	-	-	-	-	<0.050
Silver (Ag)	mg/L	0.0000050-0.000010	<0.000010	-	-	<0.000010	<0.000010	<0.0000050	-	-	-	-	<0.000010
Sodium (Na)	mg/L	0.010-2.0	<0.010	-	-	<0.010	0.018	<2.0	-	-	-	-	<0.010
Strontium (Sr)	mg/L	0.000050-0.00010	<0.00010	-	-	<0.00010	<0.00010	<0.000050	-	-	-	-	<0.00010
Tellurium (Te)	mg/L	0.000010	-	-	-	-	-	<0.000010	-	-	-	-	-
Thallium (Tl)	mg/L	0.0000020-0.00010	<0.00010	-	-	<0.00010	<0.00010	<0.0000020	-	-	-	-	<0.00010
Thorium (Th)	mg/L	0.0000050	-	-	-	-	-	<0.0000050	-	-	-	-	-
Tin (Sn)	mg/L	0.00010-0.00020	<0.00010	-	-	<0.00010	<0.00010	<0.00020	-	-	-	-	<0.00010
Titanium (Ti)	mg/L	0.00020-0.010	<0.010	-	-	<0.010	<0.010	<0.00020	-	-	-	-	<0.010
Tungsten (W)	mg/L	0.000010	-	-	-	-	-	<0.000010	-	-	-	-	-
Uranium (U)	mg/L	0.0000020-0.000010	<0.000010	-	-	<0.000010	<0.000010	<0.0000020	-	-	-	-	<0.000010
Vanadium (V)	mg/L	0.000050-0.00020	<0.000050	-	-	<0.000050	<0.000050	<0.000050	-	-	-	-	<0.000050
Yttrium (Y)	mg/L	0.0000050	-	-	-	-	-	<0.0000050	-	-	-	-	-
Zinc (Zn)	mg/L	0.0010-0.0030	<0.0010	-	-	<0.0010	<0.0010	<0.0030	-	-	-	-	<0.0010
Zirconium (Zr)	mg/L	0.000050	-	-	-	-	-	<0.000050	-	-	-	-	-
Organic Parameters													
Microcystin	µg/L	0.20	-	-	-	-	<0.20	-	-	-	-	-	-
Radiochemistry													
Radium-226	Bq/L	0.005-0.007	-	-	-	-	-	-	-	-	-	-	-

a) RDL = Realized detection limit

Appendix 3.3-1

Stream and River Water Quality Analytical Results, Hope Bay Belt Project, 2010

Rescan™
Engineers and Scientists

Appendix 3.3-1. Stream and River Water Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:				Koig. U/S	Koig. U/S	Aim. OF	Koig. R.	Koig. R.	Koig. D/S	Koig. D/S	Koig. U/S	Koig. U/S	Aim. R.	Aim. R.	Trout OF	Trout OF	AWRa	AWRa	AWRb	AWRb	AWRc	AWRc	AWRd	AWRd	AWRe	AWRe
Depth Zone:				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Replicate:		CCME Guideline		1	2	1	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Date Sampled:		for the Protection		18-Apr-10	18-Apr-10	25-Apr-10	25-Apr-10	25-Apr-10	17-Jun-10	17-Jun-10	17-Jun-10	17-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10
ALS Sample ID:	Units	of Freshwater Aquatic Life[a]	RDL[h]	L879372-1	L879372-2	L880485-1	L880485-8	L880485-9	L899508-1	L899508-2	L899508-3	L899508-4	L900028-1	L900028-2	L900028-3	L900028-4	L900028-13	L900028-14	L900028-15	L900028-16	L900028-17	L900028-18	L900028-19	L900028-20	L900028-21	L900028-22
Physical Tests																										
Conductivity	µS/cm		2.0	169	170	66.3	70.9	70.3	53.9	54.1	55.8	59.7	27.8	28.0	38.9	39.0	126	124	77.5	76.7	47.8	47.7	97.6	97.4	80.8	80.5
Hardness (as $CaCO_3$)	mg/L		0.50	45.4	47.0	16.8	18.0	17.7	14.1	14.1	17.1	18.9	8.09	7.72	15.0	14.7	20.5	20.7	16.6	16.8	12.5	13.0	20.0	19.9	22.6	22.9
pH	pH	6.5-9.0	0.10	7.22	7.36	7.13	6.93	7.16	7.56	7.66	7.36	7.46	6.93	6.98	7.33	7.33	7.28	7.29	7.33	7.36	7.30	7.29	7.42	7.39	7.43	7.35
Total Suspended Solids	mg/L	dependent on background levels	3.0	15.2	10.7	<3.0	<3.0	<3.0	17.5	14.5	4.5	3.5	<3.0	<3.0	<3.0	<3.0	38.5	38.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L		10	107	110	41	40	39	44	44	45	50	24	22	33	30	99	92	51	54	33	37	56	66	64	58
Turbidity	NTU	dependent on background levels	0.10	3.13	3.19	0.37	0.52	0.52	15.4	15.6	6.63	5.04	1.76	1.54	1.37	1.44	40.8	41.1	2.04	2.23	1.30	1.29	1.24	1.15	0.25	0.27
Anions and Nutrients																										
Acidity (as $CaCO_3$)	mg/L		1.0																							
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L		1.0-2.0	33.6	33.8	10.9	11.9	11.8	16.0	17.1	13.4	16.3	5.2	5.2	13.2	13.3	12.5	12.3	13.2	13.2	10.4	10.3	15.6	16.1	17.5	17.7
Alkalinity, Carbonate (as $CaCO_3$)	mg/L		1.0-2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<1.0	<1.0	<1.0	<1.0	<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
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L		1.0-2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<1.0	<1.0	<1.0	<1.0	<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
Alkalinity, Total (as $CaCO_3$)	mg/L		1.0-2.0	33.6	33.8	10.9	11.9	11.8	16.0	17.1	13.4	16.3	5.2	5.2	13.2	13.3	12.5	12.3	13.2	13.2	10.4	10.3	15.6	16.1	17.5	17.7
Ammonia as N	mg/L	pH- and temperature-dependent	0.0050-0.010	0.0151	0.0117	<0.0050	<0.0050	<0.0050	0.0190	0.0182	0.0129	0.0108	0.0216	0.0203	0.0156	0.0154	0.0110	0.0102	0.0245	0.0217	0.0147	0.0145	0.0197	0.0177	<0.0050	<0.0050
Bromide (Br)	mg/L		0.050-0.25	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.059	0.060	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	mg/L		0.50-2.50	27.3	27.3	11.1	12.3	12.4	7.98	8.01	6.90	6.19	4.23	4.22	2.90	2.89	29.3	29.3	14.7	14.6	7.68	7.70	19.2	19.1	13.5	13.5
Fluoride (F)	mg/L		0.020-0.10	0.046	0.047	0.028	0.025	0.027	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.024	0.023	0.068	0.068	0.036	0.036	0.028	0.028	0.032	0.034	0.051	0.050
Nitrate (as N)	mg/L	2.9	0.0050-0.025	0.323	0.323	0.0298	0.0333	0.0347	0.0082	0.0083	<0.0050	<0.0050	0.0100	0.0093	<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 (as N)	mg/L	0.06	0.0010-0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<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		0.050	0.450	0.524	0.284	0.340	0.206	0.187	0.260	<0.050	0.235	0.423	0.544	0.661	0.465	0.980	0.989	0.577	0.604	0.631	0.506	0.529	0.720	0.735	0.942
Ortho Phosphate as 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	<0.0010	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0018	<0.0010	<0.0010	<0.0010
Total Phosphorus	mg/L		0.0020	0.0201	0.0187	0.0074	0.0099	0.0094	0.0290	0.0302	0.0176	0.0147	0.0115	0.0115	0.0099	0.0101	0.0574	0.0624	0.0152	0.0154	0.0128	0.0120	0.0145	0.0151	0.0069	0.0079
Sulphate (SO_4)	mg/L		0.50-2.5	4.63	4.62	1.78	1.91	1.91	1.17	1.18	1.20	1.29	1.09	1.08	0.95	0.95	0.68	0.68	<0.50	<0.50	<0.50	<0.50	0.96	0.95	<0.50	<0.50
Organic / Inorganic Carbon																										
Total Organic Carbon	mg/L		0.20-0.50	9.58	9.67	6.60	6.18	6.40	4.93	4.99	6.91	7.12	3.86	4.26	5.49	5.70	10.9	9.20	6.42	6.64	5.81	5.81	6.48	5.93	9.99	10.2
Total Metals																										
Aluminum (Al)	mg/L	0.005-0.1[b]	0.0010-0.0030	0.378	0.217	0.0192	0.0203	0.0210	0.777	0.798	0.333	0.274	0.0800	0.0737	0.0786	0.0799	2.05	1.92	0.102	0.101	0.0531	0.0690	0.0321	0.0321	0.0381	0.0450
Antimony (Sb)	mg/L		0.000010-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)	mg/L	0.005	0.000050-0.000250	0.00049	0.00043	0.00014	0.00016	0.00017	0.000229	0.000237	0.000198	0.000200	0.000096	0.000087	0.000093	0.000089	0.00044	0.00043	0.000121	0.000134	0.000109	0.000089	0.00011	0.00013	0.000138	0.000150
Barium (Ba)	mg/L		0.000050-0.00010	0.0110	0.00964	0.00224	0.00250	0.00254	0.00929	0.00972	0.00549	0.00508	0.00295	0.00291	0.00366	0.00354	0.0237	0.0232	0.00324	0.00320	0.00279	0.00279	0.00316	0.00324	0.00376	0.00371
Beryllium (Be)	mg/L		0.0000050-0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)	mg/L		0.000050-0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.0010-0.0050	0.0142	0.0134	0.0074	0.0072	0.0070	0.0121	0.0128	0.0146	0.0159	0.0086	0.0085	0.0095	0.0088	0.0138	0.0134	0.0127	0.0116	0.0111	0.0109	0.0161	0.0164	0.0122	0.0112
Cadmium (Cd)	mg/L	0.000017[c,d]	0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000011	0.000011	<0.000010	<0.000010	<0.000010	<0.000010	0.000012	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)	mg/L		0.02-0.05	10.5	10.6	3.69	3.75	3.74	3.71	3.63	4.33	4.70	1.58	1.50	4.48	4.32	3.03	3.06	3.40	3.39	2.58	2.70	4.41	4.40	5.42	5.45
Chromium (Cr)	mg/L	Cr(VI): 0.001 Cr(III): 0.0089[d]	0.00020-0.00060	0.00102	0.00088	<0.00050	<0.00050	<0.00050	0.00199	0.00192	0.00120	0.00099	0.00041	0.00036	0.00036	0.00039	0.00422	0.00400	0.00036	0.00032	0.00025	0.00033	0.00028	0.00022	0.00044	0.00051
Cobalt (Co)	mg/L		0.000050-0.00010	0.00029	0.00020	<0.00010	<0.00010	<0.00010	0.00040	0.00039	0.00017	0.00013	0.00012	0.00011	<0.00010	<0.00010	0.00092	0.00089	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)	mg/L	0.002-0.004[e]	0.00010-0.0010	0.00361	0.00331	0.00152	0.00147	0.00140	0.00198	0.00188	0.00212	0.00246	0.00102	0.00100	0.00115	0.00184	0.00293	0.00296	<0.0010	<0.00090	<0.00060	0.0156	<0.00080	<0.00070	0.00101	0.00107
Iron (Fe)	mg/L	0.3	0.010-0.030	0.490	0.304	0.031	0.062	0.066	0.911	0.924	0.421	0.331	0.290	0.271	0.164	0.163	2.23	2.15	0.344	0.345	0.236	0.235	0.259	0.260	0.089	0.090
Lead (Pb)	mg/L	0.001-0.007[f]	0.000050	0.000168	0.000126	<0.000050	<0.000050	<0.000050	0.000316	0.000316	0.000144	0.000108	0.000053	0.000050	0.000067	<0.000050	0.000861	0.000844	0.000063	0.000052	0.000055	0.000860	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)	mg/L		0.00020-0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0054	0.0052	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)	mg/L		0.0050-0.10	5.18	5.39	2.03	2.11	2.03	1.87	1.87	2.09	2.28	1.00	1.00	0.973	0.941	3.86	3.73	1.98	1.96	1.40	1.55	2.14	2.13	2.20	2.19
Manganese (Mn)	mg/L		0.000050-0.00020	0.0385	0.0321	0.000952	0.00533	0.00566	0.0214	0.0206	0.0111	0.00844	0.00701	0.00624	0.00190	0.00183	0.0263	0.0258	0.00615	0.00691	0.00136	0.00139	0.00150	0.00148	0.000327	0.000373
Mercury (Hg)	mg/L	Inorganic Mercury: 0.000026 Methylmercury: 0.000004[d]	0.000010-0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L	0.073[d]	0.000050	0.000099	0.000094	0.000058	0.000054	0.000074	0.000086	0.000081	0.000269	0.000365	<0.000050	<0.000050	0.000070	0.000069	0.000146	0.000146	0.000086	0.000075	<0.000050	<0.000050	<0.000050	<0.000050	0.000072	0.000095
Nickel (Ni)	mg/L	0.025-0.150[g]	0.00010-0.00020	0.00171	0.00156	0.00057	0.00062	0.00065	0.00146	0.00138	0.00106	0.00101	0.00053	0.00046	0.00076	0.00080	0.00369	0.00353	0.00085	0.00089	0.00038	0.00042	0.00042	0.00036	0.00120	0.00118
Phosphorus (P)	mg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)	mg/L		0.050-2.0	1.88	1.90	0.832	0.849	0.826	1.08	1.08	0.910	0.863	0.588	0.563	0.550	0.533	1.86	1.81	1.01	0.999	0.734	0.781	1.03	1.02	0.570	0.575
Selenium (Se)	mg/L	0.001	0.00020-0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00050	<0.00050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00050	<0.00050	<0.00020	<0.00020
Silicon (Si)	mg/L		0.050	1.61	1.26	0.183	0.219	0.238	1.96	2.09	1.54	1.70	0.371	0.386	0.604	0.619	6.24	5.86	0.890	0.893	0.336	0.364	0.384	0.386	0.621	0.594
Silver (Ag)	mg/L	0.0001	0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)	mg/L		0.010-2.0	14.2	14.8	5.91	6.12	6.03	4.98	4.96	4.60	4.40	2.25	2.23	1.88	1.81	13.3	13.0	7.14	7.02	4.01	4.42	10.9	10.8	7.61	7.58
Strontium (Sr)	mg/L		0.000050-0.00010	0.0444	0.0434	0.0168	0.0172	0.0173	0.0157	0.0158	0.0145	0.0142	0.00793	0.00754	0.0139	0.0135	0.0216	0.0214	0.0135	0.0132	0.0102	0.0103	0.0146	0.0146	0.0146	0.0147

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian water quality guidelines for the protection of freshwater aquatic life, Canadian Council of Ministers of the Environment, Updated December 2007

b) 0.005 mg/L at pH <6.5; 0.1 mg/L at pH ≥ 6.5

c) Equation for correcting the guideline value for hardness = $10^{[0.86[\log(\text{hardness})] - 3.2]}$ / 1000

d) Interim guideline

e) 0.002 mg/L at [$CaCO_3$] = 0-120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120-180 mg/L; ¤0.004 mg/L at [$CaCO_3$] = >180 mg/L

f) 0.001 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.004 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.007 mg/L at [$CaCO_3$] = >180 mg/L

g) 0.025 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.110 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.150 mg/L at [$CaCO_3$] = >180 mg/L

h) RDL = Realized detection limit

Appendix 3.3-1. Stream and River Water Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:				Koig. U/S	Koig. U/S	Aim. OF	Koig. R.	Koig. R.	Koig. D/S	Koig. D/S	Koig. U/S	Koig. U/S	Aim. R.	Aim. R.	Trout OF	Trout OF	AWRa	AWRa	AWRb	AWRb	AWRc	AWRc	AWRd	AWRd	AWRe	AWRe
Depth Zone:				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Replicate:		CCME Guideline		1	2	1	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Date Sampled:		for the Protection		18-Apr-10	18-Apr-10	25-Apr-10	25-Apr-10	25-Apr-10	17-Jun-10	17-Jun-10	17-Jun-10	17-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10
ALS Sample ID:	Units	of Freshwater Aquatic Life[a]	RDL[h]	L879372-1	L879372-2	L880485-1	L880485-8	L880485-9	L899508-1	L899508-2	L899508-3	L899508-4	L900028-1	L900028-2	L900028-3	L900028-4	L900028-13	L900028-14	L900028-15	L900028-16	L900028-17	L900028-18	L900028-19	L900028-20	L900028-21	L900028-22
Total Metals (continued)																										
Thallium (Tl)	mg/L	0.0008	0.0000020-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)	mg/L		0.00010-0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)	mg/L		0.00020-0.010	0.017	<0.010	<0.010	<0.010	<0.010	0.037	0.038	0.014	0.012	<0.010	<0.010	<0.010	<0.010	0.108	0.099	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)	mg/L		0.0000020-0.000010	0.000091	0.000078	0.000030	0.000034	0.000036	0.000065	0.000069	0.000044	0.000043	0.000025	0.000024	0.000022	0.000024	0.000149	0.000148	0.000018	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	0.000011	0.000012
Vanadium (V)	mg/L		0.000050-0.0010	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	0.00173	0.00178	0.00074	0.00062	0.00025	0.00021	0.00021	0.00021	0.00404	0.00394	0.00022	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Zinc (Zn)	mg/L	0.03	0.0010-0.0040	0.0029	0.0032	<0.0010	0.0016	0.0021	0.0024	0.0024	0.0026	0.0029	<0.0010	<0.0010	0.0010	0.0011	0.0047	0.0051	0.0011	0.0010	0.0011	0.0084	<0.0010	<0.0010	0.0017	0.0020
Dissolved Metals																										
Aluminum (Al)	mg/L		0.0010-0.0030	0.0289	0.0301	0.0078	0.0091	0.0086	0.0342	0.0314	0.0417	0.0538	0.0160	0.0132	0.0618	0.0212	0.150	0.114	0.0325	0.0249	0.0135	0.0133	0.0090	0.0093	0.0335	0.0342
Antimony (Sb)	mg/L		0.000010-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)	mg/L		0.000030-0.00010	0.00038	0.00039	0.000169	0.000197	0.000187	0.000144	0.000133	0.000149	0.000177	0.000097	0.000095	0.000111	0.000093	0.00031	0.00030	0.000134	0.000136	0.000105	0.000099	0.00015	0.00014	0.000156	0.000158
Barium (Ba)	mg/L		0.000050-0.00010	0.00738	0.00787	0.00204	0.00241	0.00238	0.00190	0.00189	0.00241	0.00258	0.00219	0.00207	0.00291	0.00289	0.00461	0.00421	0.00237	0.00220	0.00220	0.00221	0.00281	0.00286	0.00353	0.00351
Beryllium (Be)	mg/L		0.0000050-0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)	mg/L		0.000050-0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.0010-0.010	0.0124	0.0136	0.0055	0.0055	0.0058	0.0095	0.0091	0.0118	0.0128	0.0074	0.0083	0.0073	0.0083	0.0121	0.0127	0.0104	0.0100	0.0098	0.0095	0.0136	0.0131	0.0094	0.0111
Cadmium (Cd)	mg/L		0.0000050-0.000010	<0.000010	<0.000010	<0.000010	0.000015	0.000011	<0.000010	<0.000010	0.000011	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)	mg/L		0.02-0.05	10.2	10.4	3.45	3.66	3.64	3.27	3.22	3.83	4.20	1.61	1.50	4.44	4.36	2.80	2.84	3.38	3.41	2.63	2.70	4.45	4.43	5.42	5.52
Chromium (Cr)	mg/L		0.00010-0.00050	0.00053	0.00065	0.00018	0.00024	0.00019	0.00024	0.00025	0.00028	0.00030	<0.00020	<0.00020	0.00021	<0.00020	0.00047	0.00054	0.00023	<0.00020	<0.00020	0.00021	<0.00020	<0.00020	0.00042	0.00037
Cobalt (Co)	mg/L		0.000050-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)	mg/L		0.00010-0.00050	0.00282	0.00291	0.00123	0.00135	0.00128	0.00125	0.00124	0.00167	0.00202	0.00089	0.00083	0.00117	0.00116	0.00205	0.00215	0.00089	0.00072	0.00043	0.00044	0.00076	0.00068	0.00109	0.00103
Iron (Fe)	mg/L		0.010-0.030	0.080	0.080	0.023	0.027	0.026	0.085	0.082	0.089	0.089	0.100	0.094	0.056	0.053	0.228	0.200	0.294	0.151	0.132	0.126	0.109	0.119	0.061	0.060
Lead (Pb)	mg/L		0.000050	<0.000050	0.000053	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000125	0.000111	0.000062	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)	mg/L		0.00020-0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)	mg/L		0.0050-0.10	4.85	5.13	2.00	2.16	2.10	1.43	1.46	1.82	2.03	0.990	0.968	0.955	0.931	3.29	3.30	1.99	2.01	1.44	1.52	2.15	2.16	2.20	2.22
Manganese (Mn)	mg/L		0.000050-0.00020	0.0171	0.0195	0.000306	0.00173	0.00191	0.000941	0.000920	0.00115	0.00122	0.00306	0.000704	0.000723	0.000362	0.00113	0.00122	0.00669	0.00107	0.000260	0.000272	0.000487	0.000487	0.000202	0.000223
Mercury (Hg)	mg/L		0.000010-0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.000050	0.000081	0.000064	0.000054	0.000057	0.000054	0.000061	0.000067	0.000229	0.000335	<0.000050	<0.000050	0.000062	<0.000050	0.000121	0.000131	0.000076	0.000070	<0.000050	<0.000050	<0.000050	<0.000050	0.000084	0.000092
Nickel (Ni)	mg/L		0.00010-0.00020	0.00128	0.00128	0.00052	0.00059	0.00060	0.00056	0.00049	0.00064	0.00078	0.00046	0.00042	0.00071	0.00070	0.00181	0.00190	0.00089	0.00081	0.00037	0.00042	0.00042	0.00038	0.00125	0.00120
Phosphorus (P)	mg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)	mg/L		0.050-2.0	1.77	1.82	0.790	0.867	0.850	0.755	0.752	0.742	0.726	0.570	0.543	0.533	0.516	1.23	1.24	0.983	0.986	0.739	0.761	1.02	1.02	0.574	0.585
Selenium (Se)	mg/L		0.00010-0.0010	<0.00050	<0.00050	0.00011	0.00013	0.00013	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00050	<0.00050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00050	<0.00050	<0.00020	<0.00020
Silicon (Si)	mg/L		0.050	0.929	0.922	0.182	0.175	0.187	0.423	0.424	0.890	1.17	0.252	0.245	0.491	0.485	1.42	1.31	0.692	0.709	0.254	0.243	0.303	0.307	0.602	0.606
Silver (Ag)	mg/L		0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)	mg/L		0.010-2.0	13.7	14.2	5.72	6.48	6.24	4.56	4.53	4.24	4.16	2.20	2.15	1.84	1.79	13.3	13.6	7.09	7.16	4.04	4.23	10.7	10.8	7.47	7.61
Strontium (Sr)	mg/L		0.000050-0.00010	0.0417	0.0414	0.0160	0.0173	0.0171	0.0127	0.0127	0.0127	0.0126	0.00730	0.00721	0.0133	0.0133	0.0164	0.0165	0.0129	0.0128	0.00983	0.0100	0.0141	0.0144	0.0141	0.0142
Thallium (Tl)	mg/L		0.0000020-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)	mg/L		0.00010-0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)	mg/L		0.00020-0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)	mg/L		0.0000020-0.000010	0.000062	0.000061	0.000029	0.000032	0.000030	0.000030	0.000032	0.000031	0.000033	0.000018	0.000017	0.000018	0.000017	0.000065	0.000066	0.000016	0.000014	<0.000010	<0.000010	<0.000010	<0.000010	0.000011	0.000011
Vanadium (V)	mg/L		0.000050-0.0010	<0.0010	<0.0010	<0.000050	0.000056	<0.000050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00064	0.00065	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Zinc (Zn)	mg/L		0.0010-0.0030	0.0016	0.0022	<0.0010	0.0028	0.0023	<0.0010	<0.0010	<0.0030	<0.0030	0.0011	<0.0010	0.0011	0.0010	0.0014	0.0019	0.0012	0.0021	<0.0010	<0.0010	0.0012	<0.0010	0.0020	0.0023
Organic Parameters																										
Microcystin	µg/L	0.20		-	-	-	<0.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian water quality guidelines for the protection of freshwater aquatic life, Canadian Council of Ministers of the Environment, Updated December 2007

b) 0.005 mg/L at pH <6.5; 0.1 mg/L at pH ≥ 6.5

c) Equation for correcting the guideline value for hardness = $10^{[0.86[\log(\text{hardness})] - 3.2]}$ / 1000

d) Interim guideline

e) 0.002 mg/L at [$CaCO_3$] = 0-120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120-180 mg/L; ¤0.004 mg/L at [$CaCO_3$] = >180 mg/L

f) 0.001 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.004 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.007 mg/L at [$CaCO_3$] = >180 mg/L

g) 0.025 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.110 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.150 mg/L at [$CaCO_3$] = >180 mg/L

h) RDL = Realized detection limit

Appendix 3.3-1. Stream and River Water Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:				Koig. R.	Koig. R.	Ang. R. Ref.	Ang. R. Ref.	Stickleback OF	Stickleback OF	Aim. OF	Aim. OF	Aim. NE IF	Aim. NE IF	S12	S12	S6	S6	Koig. U/S	Koig. U/S	Koig. D/S	Koig. D/S	AWRa	AWRa	AWRb	AWRb	AWRc	AWRc
Depth Zone:				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Replicate:		CCME Guideline		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Date Sampled:		for the Protection		18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	14-Aug-10	14-Aug-10	14-Aug-10	14-Aug-10	15-Aug-10	15-Aug-10	15-Aug-10	15-Aug-10	15-Aug-10	15-Aug-10
ALS Sample ID:	**Units**	**of Freshwater Aquatic Life[a]**	**RDL[b]**	L900028-23	L900028-24	L900028-29	L900028-35	L900028-33	L900028-34	L901007-1	L901007-2	L901007-3	L901007-4	L901007-5	L901007-6	L901007-7	L901007-8	L921173-1	L921173-2	L921173-3	L921173-4	L921173-6	L921173-7	L921173-8	L921173-9	L921173-10	L921173-11
Physical Tests																											
Conductivity	µS/cm		2.0	47.4	47.6	33.0	35.1	6.2	6.7	52.2	52.3	43.1	42.9	22.8	22.8	23.5	23.6	70.7	69.6	94.2	90.5	260	261	180	179	103	103
Hardness (as $CaCO_3$)	mg/L		0.50	13.3	13.2	8.86	9.07	2.22	2.34	13.1	13.1	9.60	9.55	7.98	8.04	7.94	7.99	17.3	17.5	21.3	20.3	52.8	52.0	30.0	29.5	34.3	34.6
pH	pH	6.5-9.0	0.10	7.21	7.17	6.98	8.14	6.37	6.04	7.10	7.12	7.03	7.01	7.03	7.03	6.89	6.79	7.08	7.21	7.34	7.37	7.55	7.60	7.51	7.17	7.55	7.55
Total Suspended Solids	mg/L	dependent on background levels	3.0	<3.0	<3.0	<3.0	4.2	<3.0	<3.0	<3.0	<3.0	8.8	9.3	<3.0	<3.0	<3.0	<3.0	<3.0	3.5	5.0	3.0	3.0	<3.0	<3.0	<3.0	<3.0	6.5
Total Dissolved Solids	mg/L		10	31	31	32	22	<10	<10	48	45	45	43	29	33	39	44	46	46	57	59	180	190	99	109	65	61
Turbidity	NTU	dependent on background levels	0.10	1.35	1.73	2.70	4.44	0.43	0.36	1.98	1.88	9.36	9.73	0.69	0.71	0.28	0.29	2.37	2.55	4.52	4.55	20.9	21.2	3.32	3.50	2.05	2.09
Anions and Nutrients																											
Acidity (as $CaCO_3$)	mg/L		1.0																								
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L		1.0-2.0	9.3	9.3	5.9	5.8	<2.0	<2.0	8.9	8.7	6.6	6.9	6.8	6.6	5.7	5.7	11.8	11.9	13.0	13.0	36.0	35.6	19.7	19.8	34.0	34.1
Alkalinity, Carbonate (as $CaCO_3$)	mg/L		1.0-2.0	<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	<2.0	<2.0	<2.0	<2.0	<2.0	<1.0	<1.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L		1.0-2.0	<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	<2.0	<2.0	<2.0	<2.0	<2.0	<1.0	<1.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as $CaCO_3$)	mg/L		1.0-2.0	9.3	9.3	5.9	5.8	<2.0	<2.0	8.9	8.7	6.6	6.9	6.8	6.6	5.7	5.7	11.8	11.9	13.0	13.0	36.0	35.6	19.7	19.8	34.0	34.1
Ammonia as N	mg/L	pH- and temperature-dependent	0.0050-0.010	0.0136	0.0129	0.0174	0.0174	0.0190	0.0183	0.0170	0.0169	0.0287	0.0278	0.0159	0.0164	0.0055	0.0054	<0.0050	<0.0050	<0.0050	<0.0050	0.0105	0.0117	<0.0050	<0.0050	0.0050	<0.0050
Bromide (Br)	mg/L		0.050-0.25	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.25	2.23	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	mg/L		0.50-2.50	7.38	7.41	5.16	4.57	1.39	1.46	8.46	8.48	7.60	7.60	1.58	1.57	2.06	2.06	11.5	11.5	17.0	15.9	56.2	58.2	40.5	40.5	10.2	10.2
Fluoride (F)	mg/L		0.020-0.10	0.022	0.023	<0.020	<0.020	<0.020	<0.020	0.024	0.024	0.023	0.023	0.023	0.024	0.037	0.037	0.025	0.025	0.026	0.025	<0.10	<0.10	0.040	0.039	0.033	0.035
Nitrate (as N)	mg/L	2.9	0.0050-0.025	0.0194	0.0208	0.0071	0.0075	<0.0050	<0.0050	0.0379	0.0396	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.025	<0.025	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	0.0010-0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.050	0.504	0.429	0.364	0.351	<0.050	0.054	0.504	0.539	0.731	0.574	0.489	0.463	0.581	0.641	0.289	0.261	0.268	0.267	0.990	0.948	0.338	0.413	0.350	0.325
Ortho Phosphate as P	mg/L		0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	0.0013	<0.0010	<0.0010	0.0010	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0027	0.0025	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphorus	mg/L		0.0020	0.0112	0.0112	0.0112	0.0113	0.0086	0.0055	0.0115	0.0096	0.0230	0.0225	0.0053	0.0067	0.0041	0.0033	0.0117	0.0115	0.0132	0.0137	0.0358	0.0360	0.0151	0.0142	0.0064	0.0087
Sulphate (SO_4)	mg/L		0.50-2.5	1.47	1.46	1.31	0.95	<0.50	<0.50	1.57	1.59	0.88	0.89	1.05	1.05	0.83	0.83	1.92	1.90	3.19	3.04	<2.5	<2.5	0.60	0.61	<0.50	<0.50
Organic / Inorganic Carbon																											
Total Organic Carbon	mg/L		0.20-0.50	5.12	5.08	4.04	4.14	0.90	1.00	4.08	4.57	5.25	5.41	4.67	4.57	5.26	7.90	5.73	5.70	5.82	5.96	18.0	17.1	7.08	7.02	7.20	7.18
Total Metals																											
Aluminum (Al)	mg/L	0.005-0.1[b]	0.0010-0.0030	0.0827	0.0851	0.170	0.177	0.0118	0.0132	0.0824	0.102	0.437	0.502	0.0679	0.0712	0.0867	0.0855	0.159	0.166	0.327	0.304	0.614	0.545	0.158	0.154	0.0225	0.0285
Antimony (Sb)	mg/L		0.000010-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)	mg/L	0.005	0.000050-0.000250	0.000122	0.000128	0.000085	0.000078	<0.000050	<0.000050	0.000117	0.000132	0.000189	0.000206	<0.000050	<0.000050	0.000097	0.000075	0.00020	0.00022	0.00029	0.00027	0.00062	0.00057	0.00021	0.00021	0.00015	0.00017
Barium (Ba)	mg/L		0.000050-0.00010	0.00262	0.00258	0.00390	0.00368	0.000506	0.000497	0.00294	0.00297	0.00595	0.00631	0.00317	0.00320	0.00311	0.00301	0.00331	0.00337	0.00520	0.00489	0.0130	0.0121	0.00439	0.00436	0.00506	0.00510
Beryllium (Be)	mg/L		0.0000050-0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)	mg/L		0.000050-0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.0010-0.0050	0.0102	0.0113	0.0096	0.0143	0.0067	0.0077	0.0114	0.0129	0.0124	0.0132	0.0140	0.0104	0.0122	0.0113	0.0142	0.0142	0.0155	0.0154	0.0221	0.0214	0.0174	0.0176	0.0107	0.0109
Cadmium (Cd)	mg/L	0.000017 [c,d]	0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000015	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)	mg/L		0.02-0.05	3.10	3.12	1.73	1.79	0.586	0.612	2.86	2.82	2.05	2.49	2.61	2.53	2.01	1.97	3.94	4.02	4.59	4.46	8.07	7.84	5.91	5.86	8.63	8.82
Chromium (Cr)	mg/L	Cr(VI): 0.001 Cr(III): 0.0089[d]	0.00020-0.00060	0.00034	0.00038	0.00049	0.00044	0.00026	<0.00020	<0.00060	<0.00060	0.00118	0.00120	<0.00040	<0.00040	<0.00060	<0.00060	0.00052	0.00057	0.00078	0.00071	0.00174	0.00173	<0.00050	0.00051	<0.00050	<0.00050
Cobalt (Co)	mg/L		0.000050-0.00010	<0.00010	<0.00010	0.00010	0.00011	<0.00010	<0.00010	0.00014	0.00015	0.00029	0.00030	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	0.00012	0.00024	0.00023	<0.00010	<0.00010	0.00011	0.00012
Copper (Cu)	mg/L	0.002-0.004[e]	0.00010-0.0010	0.00114	0.00121	0.00112	0.00111	<0.00030	0.00028	0.00122	0.00122	0.00120	0.00126	0.00242	0.00256	0.00166	0.00149	0.00129	0.00138	0.00146	0.00159	0.00316	0.00302	0.00084	0.00082	0.00033	0.00031
Iron (Fe)	mg/L	0.3	0.010-0.030	0.161	0.157	0.240	0.236	0.027	0.026	0.209	0.227	0.715	0.744	0.115	0.124	0.136	0.137	0.230	0.237	0.323	0.307	1.19	1.16	0.409	0.417	0.617	0.617
Lead (Pb)	mg/L	0.001-0.007[f]	0.000050	<0.000050	<0.000050	0.000059	0.000081	<0.000050	<0.000050	0.000065	0.000058	0.000180	0.000255	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000051	0.000093	0.000099	0.000304	0.000285	0.000056	0.000052	<0.000050	<0.000050
Lithium (Li)	mg/L		0.00020-0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0067	0.0066	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)	mg/L		0.0050-0.10	1.37	1.35	1.11	1.21	0.197	0.211	1.62	1.65	1.39	1.39	0.537	0.533	0.862	0.840	2.26	2.28	2.97	2.84	9.44	9.12	4.46	4.38	3.85	3.97
Manganese (Mn)	mg/L		0.000050-0.00020	0.0119	0.0114	0.00552	0.00560	0.00768	0.00761	0.0204	0.0216	0.0201	0.0204	0.00174	0.00202	0.000630	0.000604	0.0130	0.0131	0.0158	0.0153	0.0157	0.0153	0.0147	0.0147	0.0107	0.0106
Mercury (Hg)	mg/L	Inorganic Mercury: 0.000026 Methylmercury: 0.000004[d]	0.000010-0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L	0.073[d]	0.000050	<0.000050	0.000052	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000063	0.000083	0.000066	0.000068	<0.000050	<0.000050	0.000080	0.000084	0.000092	0.000117	0.000184	0.000165	0.000073	0.000072	<0.000050	<0.000050
Nickel (Ni)	mg/L	0.025-0.150[g]	0.00010-0.00020	0.00054	0.00057	0.00050	0.00052	<0.00010	<0.00010	0.00052	0.00057	0.00089	0.00112	0.00051	0.00054	0.00072	0.00071	0.00057	0.00057	0.00079	0.00078	0.00436	0.00421	0.00079	0.00078	0.00068	0.00073
Phosphorus (P)	mg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)	mg/L		0.050-2.0	0.680	0.673	0.636	0.677	0.092	0.096	0.771	0.762	0.792	0.814	0.434	0.434	0.324	0.320	0.734	0.739	0.935	0.894	1.36	1.30	1.22	1.22	0.319	0.323
Selenium (Se)	mg/L	0.001	0.00020-0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon (Si)	mg/L		0.050	0.546	0.558	0.548	0.549	0.057	<0.050	0.494	0.481	1.14	1.23	0.264	0.277	0.492	0.495	0.639	0.656	1.07	1.01	3.94	3.61	0.928	0.966	1.43	1.43
Silver (Ag)	mg/L	0.0001	0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000043	<0.000010	<0.000010	<0.000010	<0.000010	0.000117	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)	mg/L		0.010-2.0	3.79	3.70	2.55	2.87	0.559	0.598	4.54	4.48	4.35	4.41	1.16	1.13	1.62	1.57	6.63	6.66	10.1	9.43	31.1	30.3	21.2	20.9	6.36	6.44
Strontium (Sr)	mg/L		0.000050-0.00010	0.0115	0.0114	0.00923	0.00929	0.00292	0.00309	0.0135	0.0132	0.0119	0.0123	0.0121	0.0123	0.00922	0.00875	0.0177	0.0179	0.0220	0.0212	0.0470	0.0462	0.0270	0.0272	0.0297	0.0301

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian water quality guidelines for the protection of freshwater aquatic life, Canadian Council of Ministers of the Environment, Updated December 2007

b) 0.005 mg/L at pH <6.5; 0.1 mg/L at pH ≥ 6.5

c) Equation for correcting the guideline value for hardness = $10^{[0.86[\log(\text{hardness})] - 3.2]}$ / 1000

d) Interim guideline

e) 0.002 mg/L at [$CaCO_3$] = 0-120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120-180 mg/L; ¤0.004 mg/L at [$CaCO_3$] = >180 mg/L

f) 0.001 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.004 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.007 mg/L at [$CaCO_3$] = >180 mg/L

g) 0.025 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.110 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.150 mg/L at [$CaCO_3$] = >180 mg/L

h) RDL = Realized detection limit

Appendix 3.3-1. Stream and River Water Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:				Koig. R.	Koig. R.	Ang. R. Ref.	Ang. R. Ref.	Stickleback OF	Stickleback OF	Aim. OF	Aim. OF	Aim. NE IF	Aim. NE IF	S12	S12	S6	S6	Koig. U/S	Koig. U/S	Koig. D/S	Koig. D/S	AWRa	AWRa	AWRb	AWRb	AWRc	AWRc
Depth Zone:				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Replicate:		CCME Guideline		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Date Sampled:		for the Protection		18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	18-Jun-10	14-Aug-10	14-Aug-10	14-Aug-10	14-Aug-10	15-Aug-10	15-Aug-10	15-Aug-10	15-Aug-10	15-Aug-10	15-Aug-10
ALS Sample ID:	Units	of Freshwater Aquatic Life[a]	RDL[h]	L900028-23	L900028-24	L900028-29	L900028-35	L900028-33	L900028-34	L901007-1	L901007-2	L901007-3	L901007-4	L901007-5	L901007-6	L901007-7	L901007-8	L921173-1	L921173-2	L921173-3	L921173-4	L921173-6	L921173-7	L921173-8	L921173-9	L921173-10	L921173-11
Total Metals (continued)																											
Thallium (Tl)	mg/L	0.0008	0.0000020-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)	mg/L		0.00010-0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)	mg/L		0.00020-0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.018	0.020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.011	<0.010	<0.010	<0.010	<0.010
Uranium (U)	mg/L		0.0000020-0.000010	0.000024	0.000025	0.000036	0.000035	<0.000010	<0.000010	0.000027	0.000028	0.000047	0.000050	0.000241	0.000258	0.000060	0.000059	0.000032	0.000032	0.000047	0.000050	0.000131	0.000120	0.000027	0.000022	<0.000010	<0.000010
Vanadium (V)	mg/L		0.000050-0.0010	0.00021	0.00021	0.00037	0.00038	<0.00020	<0.00020	0.00021	0.00029	0.00119	0.00127	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	0.0017	0.0015	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)	mg/L	0.03	0.0010-0.0040	0.0011	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0020	0.0034	0.0044	0.0015	0.0010	0.0021	0.0015	0.0012	0.0012	<0.0010	<0.0010	0.0019	0.0019	<0.0010	<0.0010	0.0012	0.0014
Dissolved Metals																											
Aluminum (Al)	mg/L		0.0010-0.0030	0.0161	0.0165	0.0188	0.0186	0.0047	0.0042	0.0127	0.0127	0.0346	0.0345	0.0390	0.0419	0.0727	0.0733	0.0325	0.0348	0.0520	0.0472	0.393	0.475	0.0353	0.0330	0.0058	0.0057
Antimony (Sb)	mg/L		0.000010-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)	mg/L		0.000030-0.00010	0.000140	0.000127	0.000074	0.000074	<0.000050	<0.000050	0.000115	0.000104	0.000140	0.000132	0.000056	<0.000050	0.000074	0.000088	0.00017	0.00018	0.00020	0.00022	0.00059	0.00058	0.00018	0.00017	0.00013	0.00015
Barium (Ba)	mg/L		0.000050-0.00010	0.00187	0.00189	0.00224	0.00216	0.000412	0.000422	0.00213	0.00214	0.00254	0.00252	0.00282	0.00300	0.00301	0.00305	0.00190	0.00181	0.00232	0.00217	0.0105	0.0120	0.00278	0.00272	0.00439	0.00444
Beryllium (Be)	mg/L		0.0000050-0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020
Bismuth (Bi)	mg/L		0.000050-0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.0010-0.010	0.0083	0.0103	0.0080	0.0082	<0.0050	<0.0050	0.0092	0.0083	0.0087	0.0096	0.0113	0.0064	0.0063	0.0064	0.0106	0.0110	0.0123	0.0119	0.0189	0.0179	0.0146	0.0153	0.0076	0.0075
Cadmium (Cd)	mg/L		0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)	mg/L		0.02-0.05	3.09	3.08	1.76	1.74	0.575	0.600	2.72	2.73	1.87	1.87	2.37	2.41	1.89	1.89	3.59	3.61	4.20	4.02	7.25	7.09	5.44	5.32	7.91	7.99
Chromium (Cr)	mg/L		0.00010-0.00050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00024	0.00023	<0.00050	<0.00050	0.00020	<0.00050	0.00115	0.00119	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)	mg/L		0.000050-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)	mg/L		0.00010-0.00050	0.00111	0.00112	0.00087	0.00086	0.00012	0.00015	0.00101	0.00108	0.00084	0.00102	0.00212	0.00230	0.00141	0.00145	0.00121	0.00117	0.00132	0.00125	0.00284	0.00280	0.00074	0.00068	0.00027	0.00030
Iron (Fe)	mg/L		0.010-0.030	0.054	0.054	0.051	0.049	<0.010	<0.010	0.079	0.062	0.182	0.185	0.061	0.058	0.092	0.095	0.050	0.044	0.039	0.040	0.679	0.699	0.129	0.128	0.189	0.175
Lead (Pb)	mg/L		0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000168	0.000179	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)	mg/L		0.00020-0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0057	0.0057	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)	mg/L		0.0050-0.10	1.36	1.34	1.08	1.15	0.191	0.205	1.53	1.52	1.19	1.18	0.503	0.489	0.782	0.793	2.02	2.05	2.64	2.50	8.43	8.32	3.99	3.94	3.52	3.56
Manganese (Mn)	mg/L		0.000050-0.00020	0.00243	0.00230	0.000616	0.000654	0.00254	0.00252	0.00201	0.00176	0.000807	0.000856	0.000532	0.000475	0.000251	0.000253	0.000371	0.000423	0.000391	0.000339	0.00246	0.00286	0.000468	0.000623	0.00231	0.00285
Mercury (Hg)	mg/L		0.000010-0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.000050	<0.000050	0.000051	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000065	0.000063	0.000136	0.000065	<0.000050	<0.000050	0.000068	0.000066	0.000089	0.000079	0.000181	0.000190	0.000055	0.000063	<0.000050	<0.000050
Nickel (Ni)	mg/L		0.00010-0.00020	0.00057	0.00048	0.00046	0.00042	<0.00010	<0.00010	0.00046	0.00039	0.00042	0.00043	0.00046	0.00049	0.00067	0.00065	0.00046	0.00057	0.00051	0.00049	0.00372	0.00395	0.00061	0.00060	0.00061	0.00067
Phosphorus (P)	mg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)	mg/L		0.050-2.0	0.663	0.657	0.604	0.621	0.091	0.100	0.708	0.710	0.655	0.640	0.410	0.400	0.301	0.318	0.664	0.665	0.797	0.771	1.26	1.28	1.13	1.12	0.305	0.301
Selenium (Se)	mg/L		0.00010-0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon (Si)	mg/L		0.050	0.386	0.410	0.219	0.224	<0.050	<0.050	0.319	0.315	0.331	0.341	0.216	0.234	0.503	0.501	0.365	0.352	0.485	0.498	3.98	4.25	0.644	0.662	1.39	1.38
Silver (Ag)	mg/L		0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000023	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)	mg/L		0.010-2.0	3.70	3.66	2.61	2.75	0.539	0.591	4.23	4.21	4.20	4.13	1.09	1.04	1.42	1.47	6.30	6.21	9.60	8.72	29.0	28.5	19.8	19.6	5.93	5.96
Strontium (Sr)	mg/L		0.000050-0.00010	0.0112	0.0110	0.00881	0.00873	0.00278	0.00303	0.0130	0.0129	0.0107	0.0107	0.0118	0.0118	0.00861	0.00877	0.0165	0.0166	0.0204	0.0192	0.0443	0.0446	0.0250	0.0250	0.0278	0.0280
Thallium (Tl)	mg/L		0.0000020-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)	mg/L		0.00010-0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)	mg/L		0.00020-0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)	mg/L		0.0000020-0.000010	0.000019	0.000019	0.000026	0.000023	<0.000010	<0.000010	0.000019	0.000019	0.000025	0.000027	0.000237	0.000228	0.000055	0.000057	0.000021	0.000025	0.000029	0.000026	0.000100	0.000095	0.000016	0.000016	<0.000010	<0.000010
Vanadium (V)	mg/L		0.000050-0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00031	0.00029	<0.000050	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)	mg/L		0.0010-0.0030	0.0013	0.0016	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	0.0010	0.0016	0.0017	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	0.0011	<0.0010	<0.0010	<0.0010	<0.0010
Organic Parameters																											
Microcystin	µg/L		0.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian water quality guidelines for the protection of freshwater aquatic life, Canadian Council of Ministers of the Environment, Updated December 2007

b) 0.005 mg/L at pH <6.5; 0.1 mg/L at pH ≥ 6.5

c) Equation for correcting the guideline value for hardness = $10^{[0.86[\log(\text{hardness})] - 3.2]}$ / 1000

d) Interim guideline

e) 0.002 mg/L at [$CaCO_3$] = 0-120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120-180 mg/L; ¤0.004 mg/L at [$CaCO_3$] = >180 mg/L

f) 0.001 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.004 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.007 mg/L at [$CaCO_3$] = >180 mg/L

g) 0.025 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.110 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.150 mg/L at [$CaCO_3$] = >180 mg/L

h) RDL = Realized detection limit

Appendix 3.3-1. Stream and River Water Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:				Aim. NE IF	Aim. NE IF	Aim. OF	Aim. OF	Trout OF	Trout OF	Stickleback OF	Stickleback OF	AWRd	AWRd	S6	S6	AWRe	AWRe	Koig. R.	Koig. R.	Aim. R.	Ang. R. Ref.	Ang. R. Ref.	Koig. U/S	Koig. U/S	Koig. D/S	Koig. D/S
Depth Zone:				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Replicate:		**CCME Guideline**		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	1	2	1	2	1	2
Date Sampled:		**for the Protection**		16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	18-Aug-10	18-Aug-10	18-Aug-10	18-Aug-10	18-Aug-10	18-Aug-10	21-Aug-10	15-Sep-10	15-Sep-10	15-Sep-10	15-Sep-10	15-Sep-10	15-Sep-10
ALS Sample ID:	**Units**	**of Freshwater Aquatic Life[a]**	**RDL[b]**	L921266-1	L921266-2	L921266-3	L921266-4	L921266-5	L921266-6	L921266-7	L921266-8	L921266-9	L921266-10	L923023-1	L923023-2	L923023-3	L923023-4	L923023-5	L923023-6	L926333-2	L932992-1	L932992-2	L932992-3	L932992-4	L932992-5	L932992-6
Physical Tests																										
Conductivity	µS/cm		2.0	99.8	99.5	46.2	46.6	78.5	78.9	249	249	116	116	65.4	63.7	138	139	48.8	53.3	45.2	206	209	131	175	134	139
Hardness (as $CaCO_3$)	mg/L		0.50	21.9	21.4	11.0	11.0	23.7	23.7	69.5	69.6	27.4	27.4	25.4	25.1	47.8	47.5	13.7	14.2	12.6	30.1	29.9	31.9	31.3	28.6	29.0
pH	pH	6.5-9.0	0.10	7.31	7.35	7.21	7.18	7.40	7.46	7.52	7.56	7.04	7.12	7.45	7.46	7.54	7.52	7.26	7.38	8.11	7.22	7.27	7.35	7.36	7.44	7.44
Total Suspended Solids	mg/L	dependent on background levels	3.0	3.5	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	4.8	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	9.2	7.7	9.7	17.2	19.7	35.2
Total Dissolved Solids	mg/L		10	72	72	28	31	56	55	182	187	70	71	51	51	102	107	26	26	28	121	121	82	102	85	80
Turbidity	NTU	dependent on background levels	0.10	4.85	4.96	1.10	1.09	2.34	2.39	2.95	2.88	1.83	1.81	1.0	0.84	0.65	0.57	1.18	1.16	0.75	5.72	5.83	10.3	11.3	21.0	25.3
Anions and Nutrients																										
Acidity (as $CaCO_3$)	mg/L		1.0																	3.3						
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L		1.0-2.0	14.8	14.8	7.7	7.8	19.9	20.0	39.7	39.4	26.4	27.0	21.5	20.9	39.9	39.9	10.1	12.3	9.0	11.8	11.7	14.5	14.6	16.0	16.2
Alkalinity, Carbonate (as $CaCO_3$)	mg/L		1.0-2.0	<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	<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		1.0-2.0	<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	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as $CaCO_3$)	mg/L		1.0-2.0	14.8	14.8	7.7	7.8	19.9	20.0	39.7	39.4	26.4	27.0	21.5	20.9	39.9	39.9	10.1	12.3	9.0	11.8	11.7	14.5	14.6	16.0	16.2
Ammonia as N	mg/L	pH- and temperature-dependent	0.0050-0.010	<0.0050	<0.0050	0.0057	0.0088	<0.0050	<0.0050	<0.0050	<0.0050	0.238	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0094	0.0084	0.0103	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromide (Br)	mg/L		0.050-0.25	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.216	0.250	<0.050	<0.050	0.053	<0.050
Chloride (Cl)	mg/L		0.50-2.50	18.7	18.7	7.48	7.44	10.2	10.3	50.0	50.0	18.0	17.9	4.70	4.67	18.4	18.9	7.22	6.76	6.26	51.5	51.4	26.7	36.6	27.6	28.7
Fluoride (F)	mg/L		0.020-0.10	0.040	0.039	0.020	0.021	0.030	0.031	0.038	0.038	0.035	0.034	0.057	0.056	0.053	0.054	<0.020	<0.020	0.022	0.027	0.026	0.028	0.027	0.030	0.029
Nitrate (as N)	mg/L	2.9	0.0050-0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0243	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0054	0.0133	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	0.0010-0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<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		0.050	0.691	0.744	0.228	0.201	0.372	0.405	0.295	0.353	0.304	0.454	0.378	0.378	0.810	0.718	0.277	0.271	0.214	0.343	0.374	0.390	0.371	0.428	0.377
Ortho Phosphate as 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	<0.0010	<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 Phosphorus	mg/L		0.0020	0.0472	0.0447	0.0079	0.0108	0.0147	0.0148	0.0137	0.0153	0.0110	0.0113	0.0039	0.0029	0.0048	0.0046	0.0083	0.0093	0.0048	0.0117	0.0116	0.0196	0.0214	0.0309	0.0429
Sulphate (SO_4)	mg/L		0.50-2.5	1.45	1.45	1.20	1.19	0.98	0.98	0.63	0.63	<0.50	<0.50	2.80	2.88	<0.50	<0.50	1.22	1.15	1.68	7.61	7.59	7.57	12.4	5.19	5.25
Organic / Inorganic Carbon																										
Total Organic Carbon	mg/L		0.20-0.50	10.5	10.6	4.62	4.73	7.47	7.52	5.31	5.13	8.28	7.19	9.27	9.46	16.6	16.4	5.24	5.05	4.98	5.23	5.57	5.73	5.81	6.06	6.38
Total Metals																										
Aluminum (Al)	mg/L	0.005-0.1[b]	0.0010-0.0030	0.150	0.148	0.0501	0.0397	0.0854	0.0840	0.0217	0.0184	0.0111	0.0131	0.0317	0.0286	0.0400	0.0393	0.0532	0.0542	0.0227	0.317	0.321	0.695	0.702	1.06	1.03
Antimony (Sb)	mg/L		0.000010-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00016	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00016	<0.00010	<0.00010
Arsenic (As)	mg/L	0.005	0.000050-0.000250	0.00070	0.00097	0.000801	0.000783	0.000557	0.000652	0.000787	0.00082	0.00069	0.00070	<0.00020	<0.00020	<0.00025	<0.00025	<0.00020	<0.00020	0.000116	0.00017	0.00020	0.00033	0.00035	0.00041	0.00041
Barium (Ba)	mg/L		0.000050-0.00010	0.00435	0.00431	0.00176	0.00175	0.00448	0.00456	0.00649	0.00660	0.00470	0.00460	0.00612	0.00581	0.00647	0.00639	0.00204	0.00205	0.00244	0.00613	0.00635	0.00937	0.00955	0.0122	0.0119
Beryllium (Be)	mg/L		0.0000050-0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)	mg/L		0.000050-0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.0010-0.0050	0.0138	0.0148	0.0109	0.0114	0.0109	0.0101	0.0194	0.0213	0.0132	0.0121	0.0085	0.0076	0.0080	0.0088	0.0123	0.0107	0.0073	0.0209	0.0209	0.0177	0.0193	0.0152	0.0143
Cadmium (Cd)	mg/L	0.000017 [c,d]	0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)	mg/L		0.02-0.05	4.56	4.48	2.48	2.42	7.14	6.95	18.9	19.0	6.88	6.83	6.72	6.56	12.5	12.8	3.52	3.75	2.86	4.47	4.34	5.81	6.23	5.76	5.84
Chromium (Cr)	mg/L	Cr(VI): 0.001 Cr(III): 0.0089[d]	0.00020-0.00060	0.00076	0.00071	<0.00050	<0.00050	0.00058	0.00063	<0.00050	<0.00050	<0.00050	<0.00050	0.00063	<0.00050	0.00077	0.00084	<0.00050	<0.00050	<0.00020	0.00090	0.00091	0.00142	0.00150	0.00230	0.00227
Cobalt (Co)	mg/L		0.000050-0.00010	0.00017	0.00017	<0.00010	<0.00010	0.00012	0.00010	0.00019	0.00020	0.00027	0.00026	<0.00010	<0.00010	0.00016	0.00013	<0.00010	<0.00010	<0.00010	0.00013	0.00013	0.00036	0.00043	0.00045	0.00045
Copper (Cu)	mg/L	0.002-0.004[e]	0.00010-0.0010	0.00178	0.00163	0.00098	0.00102	0.00141	0.00151	<0.00040	<0.00040	<0.00030	<0.00020	0.00102	0.00097	0.00051	0.00055	0.00105	0.00102	0.00117	0.00154	0.00149	0.00205	0.00208	0.00252	0.00258
Iron (Fe)	mg/L	0.3	0.010-0.030	0.805	0.800	0.094	0.073	0.383	0.382	0.624	0.611	1.22	1.23	0.422	0.341	0.284	0.258	0.107	0.108	0.150	0.450	0.463	0.647	0.696	1.02	0.994
Lead (Pb)	mg/L	0.001-0.007[f]	0.000050	0.000107	0.000091	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000101	0.000103	0.000250	0.000269	0.000408	0.000405
Lithium (Li)	mg/L		0.00020-0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0051	0.0051	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)	mg/L		0.0050-0.10	2.96	2.94	1.41	1.39	1.94	1.95	6.61	6.74	3.03	2.95	2.50	2.37	4.58	4.62	1.42	1.45	1.49	5.56	5.38	5.17	6.07	4.51	4.43
Manganese (Mn)	mg/L		0.000050-0.00020	0.0185	0.0180	0.00753	0.00574	0.00690	0.00683	0.0404	0.0403	0.0517	0.0513	0.00294	0.00243	0.00545	0.00496	0.00817	0.00813	0.00410	0.00627	0.00613	0.0167	0.0189	0.0173	0.0170
Mercury (Hg)	mg/L	Inorganic Mercury: 0.000026 Methylmercury: 0.000004[d]	0.000010-0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L	0.073[d]	0.000050	0.000192	0.000152	<0.000050	<0.000050	0.000056	0.000064	<0.000050	<0.000050	<0.000050	<0.000050	0.000065	0.000073	0.000062	0.000076	0.000052	0.000059	0.000051	0.000114	0.000091	0.000095	0.000077	0.000108	0.000115
Nickel (Ni)	mg/L	0.025-0.150[g]	0.00010-0.00020	0.00105	0.00104	0.00041	0.00040	0.00102	0.00099	0.00062	0.00067	0.00055	0.00049	0.00084	0.00086	0.00207	0.00208	0.00039	0.00039	0.00068	0.00090	0.00092	0.00168	0.00180	0.00194	0.00183
Phosphorus (P)	mg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)	mg/L		0.050-2.0	0.911	0.897	0.678	0.671	0.483	0.481	1.58	1.61	0.517	0.509	0.421	0.406	0.075	0.071	0.670	0.675	0.563	1.73	1.68	1.31	1.43	1.39	1.39
Selenium (Se)	mg/L	0.001	0.00020-0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon (Si)	mg/L		0.050	0.914	0.877	0.302	0.279	0.618	0.620	0.757	0.753	1.22	1.20	1.27	1.24	2.18	2.13	0.321	0.320	0.373	1.36	1.39	2.10	2.13	2.72	2.66
Silver (Ag)	mg/L	0.0001	0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)	mg/L		0.010-2.0	10.6	10.4	4.14	4.13	5.61	5.58	15.4	15.9	11.2	10.9	3.45	3.32	10.4	10.8	4.01	4.09	3.28	29.4	28.3	17.0	20.3	14.9	14.9
Strontium (Sr)	mg/L		0.000050-0.00010	0.0251	0.0246	0.0117	0.0117	0.0286	0.0287	0.0980	0.0994	0.0251	0.0247	0.0278	0.0270	0.0329	0.0340	0.0126	0.0127	0.0117	0.0351	0.0340	0.0308	0.0348	0.0300	0.0298

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian water quality guidelines for the protection of freshwater aquatic life, Canadian Council of Ministers of the Environment, Updated December 2007

b) 0.005 mg/L at pH <6.5; 0.1 mg/L at pH ≥ 6.5

c) Equation for correcting the guideline value for hardness = $10^{[0.86[\log(\text{hardness})] - 3.2]}$ / 1000

d) Interim guideline

e) 0.002 mg/L at [$CaCO_3$] = 0-120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120-180 mg/L; ¤0.004 mg/L at [$CaCO_3$] = >180 mg/L

f) 0.001 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.004 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.007 mg/L at [$CaCO_3$] = >180 mg/L

g) 0.025 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.110 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.150 mg/L at [$CaCO_3$] = >180 mg/L

h) RDL = Realized detection limit

Appendix 3.3-1. Stream and River Water Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:				Aim. NE IF	Aim. NE IF	Aim. OF	Aim. OF	Trout OF	Trout OF	Stickleback OF	Stickleback OF	AWRd	AWRd	S6	S6	AWRe	AWRe	Koig. R.	Koig. R.	Aim. R.	Ang. R. Ref.	Ang. R. Ref.	Koig. U/S	Koig. U/S	Koig. D/S	Koig. D/S
Depth Zone:				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Replicate:		**CCME Guideline**		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	1	2	1	2	1	2
Date Sampled:		**for the Protection**		16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	18-Aug-10	18-Aug-10	18-Aug-10	18-Aug-10	18-Aug-10	18-Aug-10	21-Aug-10	15-Sep-10	15-Sep-10	15-Sep-10	15-Sep-10	15-Sep-10	15-Sep-10
ALS Sample ID:	**Units**	**of Freshwater Aquatic Life[a]**	**RDL[h]**	L921266-1	L921266-2	L921266-3	L921266-4	L921266-5	L921266-6	L921266-7	L921266-8	L921266-9	L921266-10	L923023-1	L923023-2	L923023-3	L923023-4	L923023-5	L923023-6	L926333-2	L932992-1	L932992-2	L932992-3	L932992-4	L932992-5	L932992-6
Total Metals (continued)																										
Thallium (Tl)	mg/L	0.0008	0.0000020-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)	mg/L		0.00010-0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)	mg/L		0.00020-0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.012	0.025	0.026	0.046	0.044
Uranium (U)	mg/L		0.0000020-0.000010	0.000051	0.000049	0.000016	0.000014	0.000030	0.000032	<0.000010	<0.000010	<0.000010	<0.000010	0.000054	0.000053	0.000012	0.000011	0.000023	0.000022	0.000020	0.000120	0.000113	0.000057	0.000061	0.000097	0.000100
Vanadium (V)	mg/L		0.000050-0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.0010	<0.0010	0.0014	0.0015	0.0022	0.0022
Zinc (Zn)	mg/L	0.03	0.0010-0.0040	0.0012	0.0011	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	0.0010	0.0020	0.0031	0.0034	0.0029	0.0051	0.0013	<0.0010	<0.0020	<0.0020	<0.0030	<0.0040	<0.0030	<0.0040
Dissolved Metals																										
Aluminum (Al)	mg/L		0.0010-0.0030	0.0374	0.0315	0.0103	0.0100	0.0241	0.0213	0.0022	0.0022	0.0041	0.0035	0.0221	0.0221	0.0330	0.0314	0.0105	0.0105	0.0060	0.0294	0.0291	0.0835	0.0727	0.0644	0.0622
Antimony (Sb)	mg/L		0.000010-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)	mg/L		0.000030-0.00010	0.00055	0.00071	0.000421	0.000418	0.000390	0.000444	0.000627	0.00060	0.00053	0.00044	0.000113	0.000110	0.00023	0.00023	0.000139	0.000142	0.000087	0.00016	0.00018	0.00025	0.00025	0.00029	0.00030
Barium (Ba)	mg/L		0.000050-0.00010	0.00271	0.00259	0.00140	0.00136	0.00345	0.00343	0.00593	0.00594	0.00412	0.00417	0.00576	0.00568	0.00606	0.00603	0.00150	0.00154	0.00201	0.00302	0.00307	0.00327	0.00306	0.00274	0.00270
Beryllium (Be)	mg/L		0.0000050-0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)	mg/L		0.000050-0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.0010-0.010	0.0122	0.0158	0.0092	0.0084	0.0094	0.0097	0.0188	0.0198	0.0138	0.0146	<0.0050	<0.0050	0.0068	0.0058	0.0081	0.0081	0.0072	0.0165	0.0167	0.0128	0.0120	0.0107	0.0095
Cadmium (Cd)	mg/L		0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)	mg/L		0.02-0.05	4.20	4.15	2.28	2.25	6.56	6.59	17.5	17.5	6.37	6.39	6.26	6.21	11.9	11.8	3.27	3.48	2.67	3.94	3.91	5.20	5.16	5.18	5.18
Chromium (Cr)	mg/L		0.00010-0.00050	<0.00050	0.00053	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00031	0.00037	0.00061	0.00065	<0.00020	<0.00020	<0.00020	0.00027	0.00025	0.00025	0.00026	0.00026	0.00022
Cobalt (Co)	mg/L		0.000050-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00013	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)	mg/L		0.00010-0.00050	0.00143	0.00133	0.00086	0.00083	0.00158	0.00134	0.00046	0.00029	0.00035	0.00021	0.00096	0.00086	0.00046	0.00049	0.00081	0.00086	0.00096	0.00122	0.00123	0.00135	0.00130	0.00147	0.00157
Iron (Fe)	mg/L		0.010-0.030	0.304	0.274	0.029	0.030	0.159	0.160	0.171	0.161	0.395	0.334	0.209	0.195	0.169	0.160	0.034	0.035	0.042	0.083	0.085	0.061	0.061	0.066	0.066
Lead (Pb)	mg/L		0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)	mg/L		0.00020-0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)	mg/L		0.0050-0.10	2.76	2.69	1.30	1.31	1.77	1.75	6.25	6.28	2.78	2.77	2.37	2.32	4.38	4.39	1.35	1.35	1.45	4.92	4.89	4.60	4.46	3.81	3.91
Manganese (Mn)	mg/L		0.000050-0.00020	0.00172	0.00133	0.00100	0.00111	0.000420	0.000440	0.00593	0.00544	0.0198	0.0204	0.00210	0.00197	0.00416	0.00382	0.000749	0.000723	0.00100	0.000434	0.000411	0.00106	0.000958	0.000403	0.000632
Mercury (Hg)	mg/L		0.000010-0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.000050	0.000162	0.000122	<0.000050	<0.000050	0.000066	0.000069	<0.000050	<0.000050	<0.000050	<0.000050	0.000073	0.000070	0.000067	0.000069	<0.000050	<0.000050	<0.000050	0.000070	0.000093	0.000064	0.000127	0.000108	0.000096
Nickel (Ni)	mg/L		0.00010-0.00020	0.00089	0.00086	0.00032	0.00034	0.00087	0.00085	0.00056	0.00056	0.00047	0.00048	0.00084	0.00080	0.00193	0.00194	0.00033	0.00035	0.00038	0.00065	0.00064	0.00099	0.00096	0.00084	0.00086
Phosphorus (P)	mg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)	mg/L		0.050-2.0	0.804	0.790	0.631	0.621	0.429	0.432	1.50	1.51	0.487	0.494	0.394	0.394	0.070	0.067	0.611	0.612	0.539	1.45	1.45	1.02	0.977	0.974	0.990
Selenium (Se)	mg/L		0.00010-0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon (Si)	mg/L		0.050	0.652	0.631	0.195	0.185	0.467	0.431	0.732	0.715	1.17	1.15	1.25	1.27	2.13	2.10	0.195	0.195	0.268	0.716	0.731	0.982	0.939	0.950	0.941
Silver (Ag)	mg/L		0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)	mg/L		0.010-2.0	9.70	9.72	3.88	3.90	5.06	5.12	14.4	14.7	9.99	10.2	3.26	3.24	10.0	9.99	3.86	3.88	3.13	26.4	26.2	16.0	15.0	13.8	14.2
Strontium (Sr)	mg/L		0.000050-0.00010	0.0227	0.0226	0.0109	0.0110	0.0262	0.0262	0.0928	0.0932	0.0228	0.0230	0.0263	0.0259	0.0316	0.0313	0.0115	0.0117	0.0109	0.0306	0.0308	0.0273	0.0268	0.0262	0.0266
Thallium (Tl)	mg/L		0.0000020-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)	mg/L		0.00010-0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)	mg/L		0.00020-0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)	mg/L		0.0000020-0.000010	0.000031	0.000032	<0.000010	0.000011	0.000028	0.000024	<0.000010	<0.000010	<0.000010	<0.000010	0.000045	0.000048	0.000011	0.000011	0.000017	0.000017	0.000014	0.000084	0.000079	0.000034	0.000029	0.000044	0.000044
Vanadium (V)	mg/L		0.000050-0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)	mg/L		0.0010-0.0030	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0013	0.0017	0.0029	0.0028	0.0040	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0021	<0.0010	<0.0010
Organic Parameters																										
Microcystin	µg/L	0.20		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian water quality guidelines for the protection of freshwater aquatic life, Canadian Council of Ministers of the Environment, Updated December 2007

b) 0.005 mg/L at pH <6.5; 0.1 mg/L at pH ≥ 6.5

c) Equation for correcting the guideline value for hardness = $10^{[0.86[\log(\text{hardness})] - 3.2]}$ / 1000

d) Interim guideline

e) 0.002 mg/L at [$CaCO_3$] = 0-120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120-180 mg/L; ¤0.004 mg/L at [$CaCO_3$] = >180 mg/L

f) 0.001 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.004 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.007 mg/L at [$CaCO_3$] = >180 mg/L

g) 0.025 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.110 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.150 mg/L at [$CaCO_3$] = >180 mg/L

h) RDL = Realized detection limit

Appendix 3.3-1. Stream and River Water Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:				AWRa	AWRa	AWRb	AWRb	AWRc	AWRc	AWRd	AWRd	AWRe	AWRe	Aim. NE IF	Aim. NE IF	S6	S6	S12	S12	Trout OF	Trout OF	Stickleback OF	Stickleback OF
Depth Zone:				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Replicate:		CCME Guideline		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Date Sampled:		for the Protection		15-Sep-10	15-Sep-10	15-Sep-10	15-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10
ALS Sample ID:	Units	of Freshwater Aquatic Life[a]	RDL[h]	L932992-7	L932992-8	L932992-9	L932992-10	L933177-1	L933177-2	L933177-3	L933177-4	L933177-5	L933177-6	L933177-7	L933177-8	L933177-9	L933177-10	L933177-11	L933177-12	L933177-13	L933177-14	L933177-15	L933177-16
Physical Tests																							
Conductivity	µS/cm		2.0	186	186	173	173	79.5	79.6	90.1	90.0	151	152	107	107	75.6	73.2	166	167	89.6	89.8	238	237
Hardness (as $CaCO_3$)	mg/L		0.50	44.8	44.9	33.7	34.2	23.3	23.3	16.5	16.5	44.4	45.1	25.2	25.2	25.4	25.4	60.6	60.8	31.1	31.1	67.2	67.8
pH	pH	6.5-9.0	0.10	7.62	7.61	7.54	7.51	7.43	7.54	7.29	7.27	7.64	7.58	7.51	7.49	7.43	7.39	7.87	7.91	7.66	7.64	7.71	7.75
Total Suspended Solids	mg/L	dependent on background levels	3.0	4.7	3.2	6.7	6.7	<3.0	<3.0	15.1	10.6	22.1	<3.0	4.1	3.1	<3.0	<3.0	<3.0	<3.0	4.6	4.6	<3.0	<3.0
Total Dissolved Solids	mg/L		10	150	155	118	127	60	67	57	62	121	122	82	84	65	67	100	108	68	65	173	177
Turbidity	NTU	dependent on background levels	0.10	17.3	19.2	11.0	10.6	1.74	1.65	12.1	9.32	3.24	0.46	6.32	6.19	0.71	0.55	1.58	1.62	7.27	7.90	1.40	1.43
Anions and Nutrients																							
Acidity (as $CaCO_3$)	mg/L		1.0																				
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L		1.0-2.0	29.6	29.6	22.2	22.1	20.4	20.2	13.8	14.0	30.8	30.9	17.7	17.6	18.5	18.7	53.6	54.0	26.5	26.5	34.0	34.0
Alkalinity, Carbonate (as $CaCO_3$)	mg/L		1.0-2.0	<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	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L		1.0-2.0	<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	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as $CaCO_3$)	mg/L		1.0-2.0	29.6	29.6	22.2	22.1	20.4	20.2	13.8	14.0	30.8	30.9	17.7	17.6	18.5	18.7	53.6	54.0	26.5	26.5	34.0	34.0
Ammonia as N	mg/L	pH- and temperature-dependent	0.0050-0.010	<0.0050	<0.0050	<0.0050	<0.0050	0.0054	0.0064	0.0088	<0.0050	0.0133	0.0114	0.0239	0.0117	0.0104	0.0057	0.0187	0.0168	0.0144	0.0210	0.0054	0.0115
Bromide (Br)	mg/L		0.050-0.25	0.085	0.083	0.112	0.101	<0.050	<0.050	<0.050	<0.050	0.061	0.060	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.078	0.081
Chloride (Cl)	mg/L		0.50-2.50	38.9	38.8	39.8	39.6	10.7	10.7	17.1	17.1	25.8	25.7	18.8	18.8	7.33	7.30	12.5	12.5	10.4	10.5	52.1	51.9
Fluoride (F)	mg/L		0.020-0.10	0.080	0.082	0.040	0.039	0.026	0.025	0.031	0.033	0.051	0.049	0.041	0.041	0.048	0.048	0.037	0.037	0.030	0.032	0.034	0.035
Nitrate (as N)	mg/L	2.9	0.0050-0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.181	0.181	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	0.0010-0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<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		0.050	0.889	0.878	0.420	<0.050	0.413	0.433	0.511	0.457	0.942	0.798	0.732	0.821	0.677	0.510	0.529	0.514	0.495	0.523	0.413	0.372
Ortho Phosphate as 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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphorus	mg/L		0.0020	0.0248	0.0258	0.0204	0.0196	0.0079	0.0087	0.0353	0.0265	0.0237	0.0074	0.0323	0.0340	0.0034	0.0032	0.0049	0.0051	0.0143	0.0154	0.0090	0.0100
Sulphate (SO_4)	mg/L		0.50-2.5	1.22	1.24	0.87	0.86	0.52	0.52	0.84	0.83	0.78	0.76	2.06	2.08	4.34	4.40	9.96	9.91	1.66	1.68	1.02	1.01
Organic / Inorganic Carbon																							
Total Organic Carbon	mg/L		0.20-0.50	17.2	17.0	7.90	8.04	6.82	7.08	5.99	5.69	18.1	18.4	11.5	11.6	11.6	11.1	7.87	7.63	8.03	8.13	4.66	4.74
Total Metals																							
Aluminum (Al)	mg/L	0.005-0.1[b]	0.0010-0.0030	1.08	1.02	0.461	0.411	0.0481	0.0470	0.0474	0.0416	0.0751	0.0531	0.219	0.226	0.115	0.0542	0.0753	0.0756	0.294	0.352	0.0235	0.0261
Antimony (Sb)	mg/L		0.000010-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)	mg/L	0.005	0.000050-0.000250	0.00047	0.00043	0.00032	0.00031	0.00015	0.00015	0.00024	0.00021	0.00029	0.00031	0.00038	0.00035	0.000169	0.000150	0.00013	0.00011	0.00022	0.00026	0.00038	0.00036
Barium (Ba)	mg/L		0.000050-0.00010	0.0181	0.0166	0.00805	0.00717	0.00340	0.00350	0.00372	0.00337	0.00624	0.00600	0.00573	0.00573	0.00700	0.00603	0.0131	0.0137	0.00781	0.00800	0.00632	0.00577
Beryllium (Be)	mg/L		0.0000050-0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)	mg/L		0.000050-0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.0010-0.0050	0.0146	0.0127	0.0141	0.0143	0.0126	0.0107	0.0201	0.0153	0.0106	0.0121	0.0146	0.0141	0.0092	0.0110	0.0132	0.0138	0.0118	0.0133	0.0248	0.0265
Cadmium (Cd)	mg/L	0.000017 [c,d]	0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000012	0.000016	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)	mg/L		0.02-0.05	6.73	6.91	7.08	7.05	5.82	5.85	4.04	3.85	12.1	12.4	5.72	5.57	6.64	6.83	18.3	19.7	9.84	9.64	18.7	18.9
Chromium (Cr)	mg/L	Cr(VI): 0.001 Cr(III): 0.0089[d]	0.00020-0.00060	0.00225	0.00205	0.00113	0.00102	0.00048	0.00043	0.00043	0.00038	0.00110	0.00112	0.00102	0.00110	0.00086	0.00081	0.00060	0.00067	0.00099	0.00114	0.00034	0.00037
Cobalt (Co)	mg/L		0.000050-0.00010	0.00033	0.00032	0.00018	0.00019	<0.00010	<0.00010	0.00027	0.00022	0.00016	0.00011	0.00020	0.00020	0.00030	<0.00010	<0.00010	<0.00010	0.00016	0.00018	<0.00010	0.00011
Copper (Cu)	mg/L	0.002-0.004[e]	0.00010-0.0010	0.00296	0.00294	0.00120	0.00139	0.00066	0.00067	0.00105	0.00079	0.00103	0.00103	0.00183	0.00179	0.00185	0.00154	0.00559	0.00561	0.00170	0.00182	0.00040	0.00040
Iron (Fe)	mg/L	0.3	0.010-0.030	1.00	0.913	0.617	0.602	0.429	0.442	3.04	2.26	0.485	0.232	0.678	0.674	2.40	0.237	0.390	0.344	0.435	0.479	0.226	0.256
Lead (Pb)	mg/L	0.001-0.007[f]	0.000050	0.000360	0.000314	0.000159	0.000163	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000114	0.000114	<0.000050	<0.000050	0.000093	0.000096	0.000126	0.000145	<0.000050	<0.000050
Lithium (Li)	mg/L		0.00020-0.0050	0.0069	0.0077	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0056	0.0055
Magnesium (Mg)	mg/L		0.0050-0.10	7.64	7.98	4.86	4.81	2.49	2.47	1.76	1.73	4.32	4.41	3.24	3.16	2.40	2.51	3.93	4.14	2.30	2.25	6.01	6.08
Manganese (Mn)	mg/L		0.000050-0.00020	0.0128	0.0128	0.0123	0.0122	0.00587	0.00594	0.0329	0.0247	0.00586	0.00165	0.0217	0.0220	0.0114	0.00127	0.00597	0.00600	0.00515	0.00544	0.0199	0.0209
Mercury (Hg)	mg/L	Inorganic Mercury: 0.000026 Methylmercury: 0.000004[d]	0.000010-0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L	0.073[d]	0.000050	0.000127	0.000138	0.000081	0.000060	<0.000050	<0.000050	<0.000050	<0.000050	0.000111	0.000121	0.000151	0.000132	0.000153	0.000111	0.000482	0.000442	0.000075	0.000105	0.000066	0.000067
Nickel (Ni)	mg/L	0.025-0.150[g]	0.00010-0.00020	0.00457	0.00484	0.00142	0.00137	0.00064	0.00067	0.00050	0.00038	0.00204	0.00226	0.00158	0.00153	0.00118	0.00105	0.00127	0.00122	0.00129	0.00145	0.00031	0.00032
Phosphorus (P)	mg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)	mg/L		0.050-2.0	1.66	1.68	1.47	1.40	0.905	0.909	0.907	0.897	0.834	0.859	0.918	0.906	0.790	0.826	1.86	1.97	0.665	0.689	1.73	1.76
Selenium (Se)	mg/L	0.001	0.00020-0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00032	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon (Si)	mg/L		0.050	6.14	6.28	2.21	2.00	1.87	1.93	0.843	0.797	3.07	3.09	2.16	2.08	2.84	2.80	2.48	2.65	1.65	1.80	0.683	0.696
Silver (Ag)	mg/L	0.0001	0.0000050-0.000010	0.000012	0.000019	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000015	0.000023	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)	mg/L		0.010-2.0	20.2	21.5	21.7	21.3	5.81	5.70	9.73	9.61	11.9	12.2	10.4	10.2	4.09	4.24	7.79	8.14	5.70	5.60	15.6	15.8
Strontium (Sr)	mg/L		0.000050-0.00010	0.0387	0.0395	0.0301	0.0291	0.0193	0.0193	0.0135	0.0129	0.0309	0.0321	0.0276	0.0274	0.0274	0.0274	0.0776	0.0830	0.0336	0.0343	0.0933	0.0948

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian water quality guidelines for the protection of freshwater aquatic life, Canadian Council of Ministers of the Environment, Updated December 2007

b) 0.005 mg/L at pH <6.5; 0.1 mg/L at pH ≥ 6.5

c) Equation for correcting the guideline value for hardness = $10^{[0.86[\log(\text{hardness})] - 3.2]}$ / 1000

d) Interim guideline

e) 0.002 mg/L at [$CaCO_3$] = 0-120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120-180 mg/L; ¤0.004 mg/L at [$CaCO_3$] = >180 mg/L

f) 0.001 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.004 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.007 mg/L at [$CaCO_3$] = >180 mg/L

g) 0.025 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.110 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.150 mg/L at [$CaCO_3$] = >180 mg/L

h) RDL = Realized detection limit

Appendix 3.3-1. Stream and River Water Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:			AWRa	AWRa	AWRb	AWRb	AWRc	AWRc	AWRd	AWRd	AWRe	AWRe	Aim. NE IF	Aim. NE IF	S6	S6	S12	S12	Trout OF	Trout OF	Stickleback OF	Stickleback OF
Depth Zone:			Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Replicate:		CCME Guideline	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Date Sampled:		for the Protection	15-Sep-10	15-Sep-10	15-Sep-10	15-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10
ALS Sample ID:	Units	of Freshwater Aquatic Life[a]	L932992-7	L932992-8	L932992-9	L932992-10	L933177-1	L933177-2	L933177-3	L933177-4	L933177-5	L933177-6	L933177-7	L933177-8	L933177-9	L933177-10	L933177-11	L933177-12	L933177-13	L933177-14	L933177-15	L933177-16
Total Metals (continued)																						
Thallium (Tl)	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)	mg/L		0.021	0.019	0.015	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	0.015	<0.010	<0.010
Uranium (U)	mg/L		0.000087	0.000088	0.000036	0.000040	<0.000010	0.000010	<0.000010	<0.000010	0.000019	0.000023	0.000094	0.000087	0.000113	0.000098	0.00108	0.00112	0.000053	0.000058	<0.000010	0.000011
Vanadium (V)	mg/L		0.0016	0.0014	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)	mg/L	0.03	<0.0040	0.0030	0.0014	0.0016	0.0016	0.0016	0.0015	0.0021	0.0029	0.0023	0.0016	0.0019	0.0026	0.0017	0.0023	0.0021	0.0014	0.0016	0.0016	<0.0010
Dissolved Metals																						
Aluminum (Al)	mg/L		0.582	0.382	0.0634	0.0665	0.0226	0.0245	0.0073	0.0094	0.0405	0.0451	0.0492	0.0486	0.0373	0.0430	0.0214	0.0222	0.0364	0.0370	0.0034	0.0028
Antimony (Sb)	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)	mg/L		0.00043	0.00042	0.00025	0.00026	0.00013	0.00013	0.00015	0.00016	0.00031	0.00028	0.00033	0.00033	0.000145	0.000153	<0.00010	<0.00010	0.00023	0.00022	0.00037	0.00033
Barium (Ba)	mg/L		0.0123	0.00928	0.00354	0.00355	0.00302	0.00308	0.00250	0.00257	0.00565	0.00552	0.00345	0.00341	0.00543	0.00550	0.0121	0.0122	0.00464	0.00467	0.00502	0.00513
Beryllium (Be)	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.0102	0.0095	0.0115	0.0110	0.0077	0.0079	0.0135	0.0126	0.0057	0.0068	0.0106	0.0093	0.0056	0.0066	0.0096	0.0099	0.0081	0.0078	0.0184	0.0216
Cadmium (Cd)	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)	mg/L		6.17	6.12	6.38	6.41	5.37	5.44	3.79	3.76	11.1	11.3	5.21	5.17	6.24	6.33	17.8	17.8	9.02	9.04	17.4	17.6
Chromium (Cr)	mg/L		0.00124	0.00114	0.00031	0.00034	0.00024	0.00027	<0.00020	<0.00020	0.00077	0.00076	0.00053	0.00054	0.00048	0.00053	0.00035	0.00033	0.00033	0.00034	<0.00020	<0.00020
Cobalt (Co)	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)	mg/L		0.00242	0.00258	0.00091	0.00088	0.00061	0.00060	0.00055	0.00055	0.00105	0.00089	0.00146	0.00153	0.00134	0.00144	0.00468	0.00454	0.00147	0.00144	0.00038	0.00029
Iron (Fe)	mg/L		0.475	0.388	0.142	0.150	0.208	0.226	0.090	0.115	0.150	0.163	0.194	0.191	0.152	0.154	0.205	0.202	0.119	0.127	0.028	0.028
Lead (Pb)	mg/L		0.000188	0.000123	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)	mg/L		0.0062	0.0057	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)	mg/L		7.14	7.19	4.32	4.42	2.39	2.36	1.71	1.73	4.07	4.11	2.96	2.99	2.38	2.33	3.90	3.95	2.08	2.07	5.73	5.81
Manganese (Mn)	mg/L		0.00288	0.00225	0.000633	0.000719	0.00298	0.00285	0.000648	0.000797	0.000557	0.00112	0.00147	0.00129	0.000476	0.000948	0.00268	0.00228	0.000416	0.000429	0.00245	0.00234
Mercury (Hg)	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.000130	0.000127	0.000080	0.000061	<0.000050	<0.000050	<0.000050	<0.000050	0.000092	0.000112	0.000121	0.000122	0.000065	0.000085	0.000433	0.000456	0.000092	0.000092	0.000052	<0.000050
Nickel (Ni)	mg/L		0.00421	0.00395	0.00101	0.00107	0.00059	0.00063	0.00038	0.00032	0.00190	0.00189	0.00122	0.00131	0.00097	0.00099	0.00102	0.00104	0.00107	0.00109	0.00025	0.00030
Phosphorus (P)	mg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)	mg/L		1.41	1.32	1.21	1.22	0.850	0.850	0.882	0.875	0.782	0.777	0.784	0.782	0.758	0.754	1.77	1.78	0.540	0.545	1.60	1.62
Selenium (Se)	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	0.00020	0.00028	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon (Si)	mg/L		5.72	5.26	1.35	1.37	1.81	1.83	0.752	0.771	3.01	2.99	1.66	1.67	2.74	2.72	2.44	2.45	1.03	1.02	0.635	0.623
Silver (Ag)	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000011	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)	mg/L		19.3	19.2	19.7	20.1	5.51	5.46	9.60	9.74	11.4	11.2	9.49	9.53	4.03	4.00	7.62	7.64	5.28	5.35	14.7	14.9
Strontium (Sr)	mg/L		0.0359	0.0352	0.0269	0.0268	0.0185	0.0180	0.0124	0.0125	0.0293	0.0291	0.0247	0.0251	0.0252	0.0257	0.0738	0.0726	0.0312	0.0312	0.0867	0.0877
Thallium (Tl)	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)	mg/L		0.000072	0.000067	0.000022	0.000024	0.000010	<0.000010	<0.000010	<0.000010	0.000020	0.000019	0.000066	0.000067	0.000079	0.000085	0.000953	0.000969	0.000039	0.000040	<0.000010	<0.000010
Vanadium (V)	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	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)	mg/L		0.0037	0.0020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0017	0.0020	0.0023	0.0011	<0.0010	0.0012	0.0016	0.0012	0.0012	<0.0010	0.0011	<0.0010	<0.0010
Organic Parameters																						
Microcystin	µg/L	0.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian water quality guidelines for the protection of freshwater aquatic life, Canadian Council of Ministers of the Environment, Updated December 2007

b) 0.005 mg/L at pH <6.5; 0.1 mg/L at pH ≥ 6.5

c) Equation for correcting the guideline value for hardness = $10^{[0.86[\log(\text{hardness})] - 3.2]}$ / 1000

d) Interim guideline

e) 0.002 mg/L at [$CaCO_3$] = 0-120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120-180 mg/L; ¤0.004 mg/L at [$CaCO_3$] = >180 mg/L

f) 0.001 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.004 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.007 mg/L at [$CaCO_3$] = >180 mg/L

g) 0.025 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.110 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.150 mg/L at [$CaCO_3$] = >180 mg/L

h) RDL = Realized detection limit

Appendix 3.3-1. Stream and River Water Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:				Aim. R.	Aim. R.	Aim. OF	Aim. OF	Koig. R.	Koig. R.
Depth Zone:				Surface	Surface	Surface	Surface	Surface	Surface
Replicate:		**CCME Guideline**		1	2	1	2	1	2
Date Sampled:		**for the Protection**		16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10
ALS Sample ID:	**Units**	**of Freshwater Aquatic Life[a]**	**RDL[h]**	L933177-17	L933177-18	L933177-19	L933177-20	L933177-21	L933177-22
Physical Tests									
Conductivity	µS/cm		2.0	59.6	59.8	47.4	49.5	52.0	51.6
Hardness (as $CaCO_3$)	mg/L		0.50	18.0	18.0	11.4	11.4	12.6	12.6
pH	pH	6.5-9.0	0.10	7.34	7.31	7.15	7.29	7.31	7.26
Total Suspended Solids	mg/L	dependent on background levels	3.0	<3.0	<3.0	<3.0	<3.0	9.6	9.6
Total Dissolved Solids	mg/L		10	56	38	39	26	34	30
Turbidity	NTU	dependent on background levels	0.10	1.28	1.41	1.30	1.39	4.02	4.54
Anions and Nutrients									
Acidity (as $CaCO_3$)	mg/L		1.0						
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L		1.0-2.0	12.6	12.8	8.2	8.0	9.5	9.4
Alkalinity, Carbonate (as $CaCO_3$)	mg/L		1.0-2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L		1.0-2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as $CaCO_3$)	mg/L		1.0-2.0	12.6	12.8	8.2	8.0	9.5	9.4
Ammonia as N	mg/L	pH- and temperature-dependent	0.0050-0.010	<0.0050	0.0065	0.0068	<0.0050	<0.0050	<0.0050
Bromide (Br)	mg/L		0.050-0.25	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	mg/L		0.50-2.50	8.15	8.18	8.04	7.95	7.72	7.76
Fluoride (F)	mg/L		0.020-0.10	0.022	0.024	0.020	0.021	0.021	<0.020
Nitrate (as N)	mg/L	2.9	0.0050-0.025	0.0176	0.0173	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	0.0010-0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.050	0.355	0.371	0.300	0.261	0.319	0.318
Ortho Phosphate as P	mg/L		0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphorus	mg/L		0.0020	0.0064	0.0059	0.0081	0.0087	0.0185	0.0173
Sulphate (SO_4)	mg/L		0.50-2.5	2.73	2.77	1.24	1.23	1.48	1.48
Organic / Inorganic Carbon									
Total Organic Carbon	mg/L		0.20-0.50	5.24	5.35	4.12	4.07	4.21	4.24
Total Metals									
Aluminum (Al)	mg/L	0.005-0.1[b]	0.0010-0.0030	0.0507	0.0506	0.0475	0.0450	0.162	0.166
Antimony (Sb)	mg/L		0.000010-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)	mg/L	0.005	0.000050-0.000250	0.000159	0.000136	0.000134	0.000163	0.000232	0.000222
Barium (Ba)	mg/L		0.000050-0.00010	0.00300	0.00292	0.00179	0.00178	0.00318	0.00342
Beryllium (Be)	mg/L		0.0000050-0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)	mg/L		0.000050-0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.0010-0.0050	0.0122	0.0121	0.0151	0.0144	0.0147	0.0131
Cadmium (Cd)	mg/L	0.000017 [c,d]	0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)	mg/L		0.02-0.05	4.77	4.71	2.60	2.65	3.12	3.19
Chromium (Cr)	mg/L	Cr(VI): 0.001 Cr(III): 0.0089[d]	0.00020-0.00060	0.00048	0.00047	0.00045	0.00040	0.00063	0.00064
Cobalt (Co)	mg/L		0.000050-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00014	0.00015
Copper (Cu)	mg/L	0.002-0.004[e]	0.00010-0.0010	0.00143	0.00141	0.00098	0.00099	0.00165	0.00132
Iron (Fe)	mg/L	0.3	0.010-0.030	0.176	0.172	0.074	0.075	0.279	0.336
Lead (Pb)	mg/L	0.001-0.007[f]	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000081	0.000093
Lithium (Li)	mg/L		0.00020-0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)	mg/L		0.0050-0.10	1.82	1.76	1.36	1.38	1.44	1.45
Manganese (Mn)	mg/L		0.000050-0.00020	0.00354	0.00371	0.00700	0.00665	0.0209	0.0222
Mercury (Hg)	mg/L	Inorganic Mercury: 0.000026 Methylmercury: 0.000004[d]	0.000010-0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L	0.073[d]	0.000050	0.000053	<0.000050	0.000054	0.000068	0.000070	<0.000050
Nickel (Ni)	mg/L	0.025-0.150[g]	0.00010-0.00020	0.00065	0.00064	0.00038	0.00033	0.00052	0.00057
Phosphorus (P)	mg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)	mg/L		0.050-2.0	0.649	0.641	0.682	0.686	0.704	0.727
Selenium (Se)	mg/L	0.001	0.00020-0.0010	0.00022	<0.00020	0.00023	<0.00020	<0.00020	0.00023
Silicon (Si)	mg/L		0.050	0.723	0.700	0.323	0.315	0.561	0.614
Silver (Ag)	mg/L	0.0001	0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)	mg/L		0.010-2.0	4.26	4.13	4.18	4.27	4.18	4.27
Strontium (Sr)	mg/L		0.000050-0.00010	0.0153	0.0149	0.0126	0.0128	0.0131	0.0133

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian water quality guidelines for the protection of freshwater aquatic life, Canadian Council of Ministers of the Environment, Updated December 2007

b) 0.005 mg/L at pH <6.5; 0.1 mg/L at pH ≥ 6.5

c) Equation for correcting the guideline value for hardness = $10^{[0.86[\log(\text{hardness})] - 3.2]}$ / 1000

d) Interim guideline

e) 0.002 mg/L at [$CaCO_3$] = 0-120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120-180 mg/L; ¤0.004 mg/L at [$CaCO_3$] = >180 mg/L

f) 0.001 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.004 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.007 mg/L at [$CaCO_3$] = >180 mg/L

g) 0.025 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.110 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.150 mg/L at [$CaCO_3$] = >180 mg/L

h) RDL = Realized detection limit

Appendix 3.3-1. Stream and River Water Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:				Aim. R.	Aim. R.	Aim. OF	Aim. OF	Koig. R.	Koig. R.
Depth Zone:				Surface	Surface	Surface	Surface	Surface	Surface
Replicate:		CCME Guideline		1	2	1	2	1	2
Date Sampled:		for the Protection		16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10	16-Sep-10
ALS Sample ID:	Units	of Freshwater Aquatic Life[a]	RDL[h]	L933177-17	L933177-18	L933177-19	L933177-20	L933177-21	L933177-22
Total Metals (continued)									
Thallium (Tl)	mg/L	0.0008	0.0000020-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)	mg/L		0.00010-0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)	mg/L		0.00020-0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)	mg/L		0.0000020-0.000010	0.000036	0.000038	0.000023	0.000023	0.000035	0.000041
Vanadium (V)	mg/L		0.000050-0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00050
Zinc (Zn)	mg/L	0.03	0.0010-0.0040	0.0012	<0.0010	0.0016	<0.0010	0.0015	0.0020
Dissolved Metals									
Aluminum (Al)	mg/L		0.0010-0.0030	0.0101	0.0105	0.0087	0.0097	0.0102	0.0104
Antimony (Sb)	mg/L		0.000010-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)	mg/L		0.000030-0.00010	0.000135	0.000142	0.000136	0.000123	0.000170	0.000172
Barium (Ba)	mg/L		0.000050-0.00010	0.00241	0.00240	0.00126	0.00124	0.00144	0.00147
Beryllium (Be)	mg/L		0.0000050-0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)	mg/L		0.000050-0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.0010-0.010	0.0073	0.0069	0.0086	0.0091	0.0077	0.0088
Cadmium (Cd)	mg/L		0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)	mg/L		0.02-0.05	4.43	4.48	2.45	2.42	2.84	2.86
Chromium (Cr)	mg/L		0.00010-0.00050	<0.00020	0.00023	<0.00020	<0.00020	<0.00020	<0.00020
Cobalt (Co)	mg/L		0.000050-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)	mg/L		0.00010-0.00050	0.00117	0.00121	0.00077	0.00088	0.00089	0.00088
Iron (Fe)	mg/L		0.010-0.030	0.045	0.046	0.013	0.013	0.013	0.014
Lead (Pb)	mg/L		0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)	mg/L		0.00020-0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)	mg/L		0.0050-0.10	1.68	1.66	1.29	1.31	1.34	1.33
Manganese (Mn)	mg/L		0.000050-0.00020	0.000724	0.000872	0.000175	0.000179	0.000183	0.000177
Mercury (Hg)	mg/L		0.000010-0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.000050	<0.000050	0.000058	<0.000050	<0.000050	0.000052	<0.000050
Nickel (Ni)	mg/L		0.00010-0.00020	0.00057	0.00058	0.00031	0.00035	0.00031	0.00033
Phosphorus (P)	mg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)	mg/L		0.050-2.0	0.587	0.592	0.630	0.625	0.615	0.605
Selenium (Se)	mg/L		0.00010-0.0010	0.00021	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Silicon (Si)	mg/L		0.050	0.629	0.628	0.216	0.217	0.260	0.266
Silver (Ag)	mg/L		0.0000050-0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)	mg/L		0.010-2.0	3.93	3.92	3.97	4.03	4.12	3.97
Strontium (Sr)	mg/L		0.000050-0.00010	0.0140	0.0139	0.0116	0.0117	0.0119	0.0118
Thallium (Tl)	mg/L		0.0000020-0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)	mg/L		0.00010-0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)	mg/L		0.00020-0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)	mg/L		0.0000020-0.000010	0.000024	0.000024	0.000016	0.000017	0.000015	0.000018
Vanadium (V)	mg/L		0.000050-0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)	mg/L		0.0010-0.0030	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic Parameters									
Microcystin	µg/L		0.20	-	-	-	-	-	-

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian water quality guidelines for the protection of freshwater aquatic life, Canadian Council of Ministers of the Environment, Updated December 2007

b) 0.005 mg/L at pH <6.5; 0.1 mg/L at pH ≥ 6.5

c) Equation for correcting the guideline value for hardness = $10^{[0.86[\log(\text{hardness})] - 3.2]}$ / 1000

d) Interim guideline

e) 0.002 mg/L at [$CaCO_3$] = 0-120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120-180 mg/L; ¤0.004 mg/L at [$CaCO_3$] = >180 mg/L

f) 0.001 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.004 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.007 mg/L at [$CaCO_3$] = >180 mg/L

g) 0.025 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60-120 mg/L; ¤0.110 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.150 mg/L at [$CaCO_3$] = >180 mg/L

h) RDL = Realized detection limit

Appendix 3.4-1

Lake Sediment Quality Descriptions, Hope Bay Belt Project, 2010

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Appendix 3.4-1. Lake Sediment Quality Descriptions, Hope Bay Belt Project, 2010

Watershed	Lake	Date	Depth Zone	Grab Depth (m)	Grab thickness (mm)	Physical Description	Munsell Colour Classification	Biological Material	Debris Material	Notes	Photos (# taken)
Aimaokatalok	Stickleback Lake	19-Aug-10	Shallow	2.5	45	Loose brown organic clay material	7.5 YR 4/2	Dense algal mat on surface with roots throughout	None	Difficult to obtain samples due to aquatic vegetation	Yes (5)
	Trout Lake	17-Aug-10	Shallow	2.5	35	Brown sandy layer (~5 mm) over grey clay	7.5 YR 3/4 sand surface; 2.5 YR 4/1 clay bottom	None	~ 1 % roots/ detritus	None	Yes (1)
	Aim. Lk. Stn. 13	13-Aug-10	Shallow	3.7	33	Sandy brown layer (5 mm) over grey clay	7.5 YR 3/4 - sand surface; 2.5 Y 6/1 clay bottom	None	pebbles throughout	None	Yes (1)
	Aim. Lk. Stn. 2	18-Aug-10	Shallow	3	45	Reddish brown sandy clay (~5 mm) over bluish grey clay	7.5 YR 4/4 sandy clay surface; 2.5 YR 5/1 clay bottom	None	None	None	Yes (2)
	Aim. Lk. Stn. 12	21-Aug-10	Shallow	0.3	15	Reddish brown loose sediment (~3 mm) over dense grey sandy layer	2.5 YR 4/6 surface; 2.5 YR 5/1 sandy bottom	~1% small macrophyte	None	None	Yes (3)
	Aim. Lk. Stn. 11	17-Aug-10	Shallow	2.5	33	Brownish red sand (~20 mm) overlaying redish brown sand (~5 mm) midlayer over grey clay	7.5 YR 4/3 - sand surface; 7.5 YR 4/4 sand mid layer; 5 YR 5/1 clay bottom	None	None	None	Yes (6)
	Aim. Lk. Stn. 6	14-Aug-10	Deep	28	67	Brown silt layer (<5 mm) over grey clay	7.5 YR 4/3 - silt surface; 2.5 YR 5/1 clay bottom	None	None	None	Yes (1)
Windy	Windy	23-Aug-10	Shallow								No
		22-Aug-09	Deep	16.5	82	Silt (1 cm) over clay	2.5 Y5/4 - surface; GLEY 1 6/10 GY - bottom	None	None	None	No
Doris	Wolverine	27-Aug-10	Shallow	2	55	silt, fine sand, homogenous, visible thick algal mat	7.5 YR 5/2	Algal mat on surface	woody fragments	None	No
	Patch	26-Aug-10	Shallow	3.5	50	Brown surface over homogenous clay layer	5 YR 5/2 - surface; 2.5 YR 5/1 - clay bottom	Thick plant layer on surface (~20mm)	None	None	Yes (3)
Reference B	Ref. Lk. B	23-Aug-10	Mid	5.5		Loose reddish brown silt (1 mm) over bluish grey clay		None	None	None	Yes (3)

Appendix 3.4-2

Lake Sediment Quality Photographs, Hope Bay Belt Project, 2010

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Patch Lake, Shallow Depth, ~ 3.5 m



Reference Lake B, Mid Depth, ~ 5.5 m



Aim. Lake Station 2, Shallow Depth, ~ 3.0 m



Aim. Lake Station 5, Shallow Depth, ~ 2.5 m



Aim. Lake Station 6, Deep Depth, ~ 28 m



Aim. Lake Station 13, Shallow Depth, ~ 3.7 m



Aim. Lake Station 11, Shallow Depth, ~ 2.5 m



Aim. Lake Station 12, Shallow Depth, ~ 0.3m



Stickleback Lake, Shallow Depth, ~ 2.5 m



Trout Lake, Shallow Depth, ~ 2.5 m

Appendix 3.4-3

Lake Sediment Quality Analytical Results, Hope Bay Belt Project, 2010

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Appendix 3.4-3. Lake Sediment Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:		CCME Guidelines for the Protection of Aquatic Life[a]			Aim. Stn 13	Aim. Stn 13	Aim. Stn 13	Aim. Stn 6	Aim. Stn 6	Aim. Stn 6	Trout	Trout	Trout	Stickleback	Stickleback	Stickleback	Aim. Stn 11	Aim. Stn 11	Aim. Stn 11
Depth (m):					3.7	3.7	3.7	28	27	28.5	2.75	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Replicate:					1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Date Sampled:					14-Aug-10	14-Aug-10	14-Aug-10	14-Aug-10	14-Aug-10	14-Aug-10	17-Aug-10	17-Aug-10	17-Aug-10	19-Aug-10	19-Aug-10	19-Aug-10	17-Aug-10	17-Aug-10	17-Aug-10
ALS Sample ID:	Units	ISQG[b]	PEL[c]	RDL[d]	L921177-1	L921177-2	L921177-3	L921177-4	L921177-5	L921177-6	L923218-1	L923218-2	L923218-3	L923218-4	L923218-5	L923218-6	L923218-7	L923218-8	L923218-9
Physical Tests																			
Moisture	%			0.10	44.2	55.4	59.3	60.9	63.0	57.9	63.5	71.5	58.8	89.3	15.5	89.0	23.0	28.4	23.5
pH	pH			0.10	5.66	6.34	6.36	6.20	6.39	6.19	6.24	6.03	6.00	6.29	6.20	6.21	6.70	6.60	6.66
Particle Size																			
% Gravel (>2mm)	%			0.10-1.0	<1.0	17.4	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
% Sand (2.0mm - 0.063mm)	%			0.10-1.0	7.2	11.3	6.7	7.4	7.7	11.3	0.83	0.79	2.12	1.20	1.33	0.56	70.4	49.6	49.4
% Silt (0.063mm - 4µm)	%			0.10-1.0	43.8	36.1	47.9	43.3	45.2	43.1	64.9	59.7	66.4	79.8	73.3	69.1	27.8	46.9	46.6
% Clay (<4µm)	%			0.10-1.0	49.1	35.3	45.4	49.3	47.1	45.6	34.3	39.5	31.5	19.0	25.4	30.4	1.86	3.48	4.02
Leachable Anions & Nutrients																			
Total Nitrogen	%			0.020	0.077	0.127	0.106	0.176	0.172	0.120	0.245	0.331	0.218	1.49	1.36	1.28	0.032	0.038	0.036
Organic / Inorganic Carbon																			
Total Organic Carbon	%			0.10	0.64	0.98	0.87	1.63	1.50	0.97	2.80	3.85	2.64	18.4	15.5	16.1	0.26	0.33	0.29
Plant Available Nutrients																			
Available Ammonium	mg/kg			0.80-2.4	2.0	15.6	3.1	8.7	7.0	5.8	10.2	7.53	9.97	32.3	33.6	17.7	1.82	1.36	0.98
Available Nitrate	mg/kg			2.0-8.6	<4.3	<4.3	<5.0	<5.0	<6.0	<6.0	<3.0	<3.0	<2.0	<3.8	<3.8	<5.0	<2.0	<2.0	<2.0
Nitrite	mg/kg			0.40-1.7	<0.86	<0.86	<1.0	<1.0	<1.2	<1.2	<0.60	<0.60	<0.40	<0.75	<0.75	<1.0	<0.40	<0.40	<0.40
Available Phosphate	mg/kg			2.0-4.0	4.1	5.1	2.5	9.4	15.4	9.5	3.5	4.3	3.8	9.7	11.7	7.4	4.0	3.9	3.4
Metals																			
Aluminum (Al)	mg/kg			50	24100	21700	21500	27500	25000	21600	13700	16700	14700	13700	15200	15200	2980	5320	5140
Antimony (Sb)	mg/kg			10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	5.9	17.0	0.05-0.50	7.47	13.2	7.18	3.22	3.10	4.23	2.28	2.27	2.11	5.06	4.83	4.28	1.40	3.25	1.86
Barium (Ba)	mg/kg			1.0	151	133	136	170	152	134	74.9	91.3	83.4	90.3	94.0	90.2	17.3	28.6	26.3
Beryllium (Be)	mg/kg			0.50	0.83	0.80	0.71	1.01	0.89	0.76	<0.50	0.56	<0.50	<0.50	0.56	0.58	<0.50	<0.50	<0.50
Bismuth (Bi)	mg/kg			20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.6	3.5	0.10	0.13	0.11	0.11	0.22	0.20	<0.10	<0.10	<0.10	<0.10	0.15	0.14	0.13	<0.10	<0.10	<0.10
Calcium (Ca)	mg/kg			50	5940	5520	5480	5550	5160	4830	5600	6140	5650	10800	11400	10400	1740	2420	2410
Chromium (Cr)	mg/kg	37.3	90.0	2.0	64.5	59.4	59.4	77.7	70.2	60.5	39.1	47.9	42.6	39.9	43.8	43.5	7.6	14.7	14.5
Cobalt (Co)	mg/kg			2.0	16.0	15.4	15.1	15.3	14.1	12.7	7.0	8.4	7.8	10.3	10.5	10.8	2.8	3.5	3.5
Copper (Cu)	mg/kg	35.7	197	1.0	25.3	23.1	21.8	25.3	23.9	20.4	16.1	20.8	18.5	46.3	47.0	49.0	2.2	4.6	4.2
Iron (Fe)	mg/kg			50	39200	39900	36000	32500	30800	32100	21100	23500	21100	24100	22900	21000	6520	13800	9680
Lead (Pb)	mg/kg	35	91.3	2.0	10.7	9.8	10.4	12.8	10.7	8.8	6.4	6.3	5.8	6.6	6.7	6.8	<2.0	2.5	2.5
Lithium (Li)	mg/kg			2.0	40.8	37.1	37.5	47.6	42.9	39.3	21.9	27.2	24.2	22.4	24.4	24.2	5.6	9.0	9.0
Magnesium (Mg)	mg/kg			50	13000	12100	12000	14900	13600	12200	6910	8420	7440	7470	7980	7930	1530	2740	2630
Manganese (Mn)	mg/kg			1.0	881	1130	1110	557	711	672	186	205	176	437	358	262	215	230	206
Mercury (Hg)	mg/kg	0.17	0.486	0.0050	0.0133	0.0237	0.0200	0.0414	0.0435	0.0249	0.0206	0.0240	0.0230	0.0434	0.0346	0.0362	<0.0050	0.0051	<0.0050
Molybdenum (Mo)	mg/kg			0.20	1.61	2.25	2.06	1.28	1.10	0.76	0.68	0.78	0.72	1.65	1.54	1.64	0.27	0.42	0.45
Nickel (Ni)	mg/kg			5.0	31.1	29.2	29.0	36.3	32.5	28.9	18.9	22.8	20.9	31.7	32.4	32.7	<5.0	6.0	5.8
Phosphorus (P)	mg/kg			50	1150	1100	927	774	781	900	762	758	762	977	919	870	426	668	550
Potassium (K)	mg/kg			200	6230	5280	5320	6440	5910	5470	2560	3180	2730	3490	3770	3580	570	1080	1030
Selenium (Se)	mg/kg			0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.59	0.60	0.64	<0.50	<0.50	<0.50
Silver (Ag)	mg/kg			0.10	0.48	0.19	0.14	0.16	0.17	0.14	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg			200	1010	840	830	890	890	820	460	520	470	1020	800	830	<200	220	200
Strontium (Sr)	mg/kg			0.50	45.2	40.0	39.0	49.6	43.7	39.5	31.4	35.8	32.1	55.1	57.5	58.3	8.69	13.2	12.9
Sulphur (S)	mg/kg			100-500	160	220	210	350	290	190	730	1020	690	3780	3170	2980	170	190	180
Thallium (Tl)	mg/kg			0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg			5.0	<5.0	<5.0	<5.0	5.4	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg			1.0	1500	1340	1340	1550	1460	1350	927	1080	937	614	780	786	242	421	417
Uranium (U)	mg/kg			0.050	-	-	-	-	-		1.11	1.28	1.21	1.66	1.64	1.67	0.349	0.564	0.607
Vanadium (V)	mg/kg			2.0	82.0	85.1	72.6	83.7	75.9	67.1	44.6	53.6	47.3	47.4	51.7	52.1	10.1	19.2	18.4
Zinc (Zn)	mg/kg	123	315	1.0	76.3	77.0	74.9	111	101	82.6	54.1	65.6	58.3	59.4	61.5	62.4	11.3	19.8	19.0

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian sediment quality guidelines for the protection of freshwater aquatic life, Council of Ministers of the Environment, Updated 2002

b) ISQG = Interim Sediment Quality Guideline

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.4-3. Lake Sediment Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:		CCME Guidelines for the Protection of Aquatic Life[a]			Aim. Stn 5	Aim. Stn 5	Aim. Stn 5	Ref. B Shallow	Ref. B Shallow	Ref. B Shallow	Aim. Stn 2	Aim. Stn 2	Aim. Stn 2	Aim. Stn 12	Aim. Stn 12	Aim. Stn 12	Windy Deep	Windy Deep	Windy Deep
Depth (m):					2.5	2.5	2.5	5.5	5.5	5.5	3	3	2.5	0.3	0.3	0.3	16.5	17	16.5
Replicate:					1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Date Sampled:					18-Aug-10	18-Aug-10	18-Aug-10	23-Aug-10	23-Aug-10	23-Aug-10	18-Aug-10	18-Aug-10	18-Aug-10	22-Aug-10	22-Aug-10	22-Aug-10	22-Aug-10	22-Aug-10	22-Aug-10
ALS Sample ID:	Units	ISQG[b]	PEL[c]	RDL[d]	L923218-10	L923218-11	L923218-12	L926325-1	L926325-2	L926325-3	L926325-4	L926325-5	L926325-6	L926325-7	L926325-8	L926325-9	L926325-10	L926325-11	L926325-12
Physical Tests																			
Moisture	%			0.10	33.2	29.4	26.4	87.4	88.2	88.7	47.0	62.6	32.5	34.2	51.0	20.6	65.2	66.9	71.4
pH	pH			0.10	6.55	6.57	6.72	6.13	6.37	6.37	6.14	5.54	6.50	6.71	6.74	6.92	6.63	6.62	6.60
Particle Size																			
% Gravel (>2mm)	%			0.10-1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.16	<0.10	0.14	<0.10	<0.10	0.50	<0.10	<0.10	<0.10
% Sand (2.0mm - 0.063mm)	%			0.10-1.0	20.8	37.3	69.2	2.14	1.96	1.73	37.2	7.23	70.4	50.7	19.1	54.6	0.28	0.20	0.25
% Silt (0.063mm - 4µm)	%			0.10-1.0	45.7	46.1	26.5	93.8	93.1	94.7	59.0	88.0	25.8	48.8	78.3	44.5	58.9	64.4	72.4
% Clay (<4µm)	%			0.10-1.0	33.5	16.6	4.33	4.11	4.97	3.59	3.70	4.81	3.63	0.54	2.60	0.33	40.8	35.4	27.4
Leachable Anions & Nutrients																			
Total Nitrogen	%			0.020	0.043	0.053	0.043	0.697	0.699	0.712	0.113	0.198	0.045	0.045	0.110	0.030	0.147	0.157	0.152
Organic / Inorganic Carbon																			
Total Organic Carbon	%			0.10	0.32	0.45	0.34	8.43	8.46	8.54	0.91	1.61	0.28	0.29	0.91	<0.10	1.03	1.13	1.06
Plant Available Nutrients																			
Available Ammonium	mg/kg			0.80-2.4	1.90	2.50	2.29	18.5	19.2	22.7	5.46	26.1	1.23	1.27	2.98	<0.80	5.6	6.1	6.8
Available Nitrate	mg/kg			2.0-8.6	<2.0	<2.0	<2.0	<3.3	<3.8	<3.3	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<4.3	<5.0	<5.0
Nitrite	mg/kg			0.40-1.7	<0.40	<0.40	<0.40	<0.67	<0.75	<0.67	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.86	<1.0	<1.0
Available Phosphate	mg/kg			2.0-4.0	5.7	4.6	4.3	17.9	16.1	17.6	4.5	3.3	3.7	<2.0	<2.0	<2.0	20.6	15.1	15.4
Metals																			
Aluminum (Al)	mg/kg			50	15300	9260	3720	19600	19700	19700	8010	12000	4960	2820	5660	2770	30100	28800	28600
Antimony (Sb)	mg/kg			10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	5.9	17.0	0.05-0.50	5.85	3.31	2.22	1.68	2.12	1.72	1.57	4.47	1.83	0.558	1.58	0.615	9.95	12.9	9.10
Barium (Ba)	mg/kg			1.0	88.8	51.9	19.5	93.6	93.7	95.1	46.6	71.5	27.4	13.0	30.8	12.2	176	171	169
Beryllium (Be)	mg/kg			0.50	0.55	<0.50	<0.50	0.69	0.74	0.73	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.94	0.90	0.89
Bismuth (Bi)	mg/kg			20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.6	3.5	0.10	<0.10	<0.10	<0.10	0.29	0.26	0.29	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.13	0.12	0.13
Calcium (Ca)	mg/kg			50	4150	2830	1790	3960	4180	4230	2580	3570	1720	2220	2650	2140	6680	6300	6220
Chromium (Cr)	mg/kg	37.3	90.0	2.0	42.4	27.1	10.4	52.1	51.8	51.2	23.5	37.4	13.7	9.6	15.8	9.2	81.5	78.7	77.4
Cobalt (Co)	mg/kg			2.0	10.6	7.5	3.6	8.9	9.0	8.9	5.7	9.4	3.5	<2.0	3.8	<2.0	16.8	16.4	16.2
Copper (Cu)	mg/kg	35.7	197	1.0	16.6	9.5	3.4	60.1	61.3	61.8	8.7	16.7	4.9	3.3	4.6	2.0	44.7	44.0	43.0
Iron (Fe)	mg/kg			50	30500	16600	9120	24400	24200	24600	11800	19700	9830	5310	8630	5380	41600	43200	39700
Lead (Pb)	mg/kg	35	91.3	2.0	6.2	4.2	2.1	7.3	7.4	7.6	4.0	5.6	2.3	2.3	2.9	<2.0	11.0	10.8	11.9
Lithium (Li)	mg/kg			2.0	26.7	17.4	7.0	28.6	29.1	28.9	14.0	20.1	9.1	5.0	9.4	4.9	55.7	54.1	53.3
Magnesium (Mg)	mg/kg			50	8190	5420	1990	8120	8040	8050	4440	6400	2620	1480	2920	1400	19000	18200	18200
Manganese (Mn)	mg/kg			1.0	690	405	260	203	199	202	254	267	250	66.7	145	60.4	842	889	727
Mercury (Hg)	mg/kg	0.17	0.486	0.0050	0.0056	0.0074	<0.0050	0.0315	0.0279	0.0310	0.0134	0.0236	<0.0050	<0.0050	<0.0050	<0.0050	0.0223	0.0225	0.0217
Molybdenum (Mo)	mg/kg			0.20	1.49	0.81	0.39	2.64	2.91	2.43	0.53	1.98	0.39	<0.20	0.31	<0.20	1.83	2.16	1.88
Nickel (Ni)	mg/kg			5.0	20.9	13.5	<5.0	28.1	28.3	27.9	11.3	18.3	6.1	<5.0	7.3	<5.0	42.9	41.4	41.1
Phosphorus (P)	mg/kg			50	914	632	473	817	837	825	528	801	430	567	482	518	1060	1160	1000
Potassium (K)	mg/kg			200	3740	2160	720	3270	3290	3310	1770	2670	1040	480	1200	440	8240	7890	7830
Selenium (Se)	mg/kg			0.50	<0.50	<0.50	<0.50	0.54	0.51	0.53	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Silver (Ag)	mg/kg			0.10	<0.10	<0.10	<0.10	0.14	0.14	0.15	<0.10	0.42	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	0.11
Sodium (Na)	mg/kg			200	560	300	<200	470	460	470	300	430	<200	<200	230	<200	1740	1610	1640
Strontium (Sr)	mg/kg			0.50	30.4	16.8	9.42	29.9	30.7	31.0	15.8	22.5	9.94	9.12	15.2	9.23	45.9	43.3	42.6
Sulphur (S)	mg/kg			100-500	200	210	180	1630	1730	1620	230	600	<100	<100	170	<100	410	420	410
Thallium (Tl)	mg/kg			0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg			5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg			1.0	959	575	308	667	669	674	550	787	346	289	457	306	1770	1650	1670
Uranium (U)	mg/kg			0.050	1.38	0.952	0.528	5.28	5.48	5.40	0.856	1.17	0.504	0.685	0.582	0.617	2.46	2.39	2.65
Vanadium (V)	mg/kg			2.0	51.5	33.8	14.6	55.0	55.3	54.8	27.5	41.4	16.8	12.6	19.5	13.9	86.6	84.1	83.1
Zinc (Zn)	mg/kg	123	315	1.0	50.7	37.0	15.3	106	110	104	36.7	56.0	19.4	9.4	21.2	9.0	88.3	85.8	85.5

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian sediment quality guidelines for the protection of freshwater aquatic life, Council of Ministers of the Environment, Updated 2002

b) ISQG = Interim Sediment Quality Guideline

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.4-3. Lake Sediment Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:		CCME Guidelines for the Protection of Aquatic Life[a]			Windy Shallow	Windy Shallow	Windy Shallow	Wolverine Dike	Wolverine Dike	Wolverine Dike	Patch Dike	Patch Dike	Patch Dike
Depth (m):					3	3	3	2	2	2.5	3.5	3.5	3.5
Replicate:					1	2	3	1	2	3	1	2	3
Date Sampled:					23-Aug-10	23-Aug-10	23-Aug-10	27-Aug-10	27-Aug-10	27-Aug-10	26-Aug-10	26-Aug-10	26-Aug-10
ALS Sample ID:	Units	ISQG[b]	PEL[c]	RDL[d]	L926325-13	L926325-14	L926325-15	L930638-4	L930638-5	L930638-6	L930638-7	L930638-8	L930638-9
Physical Tests													
Moisture	%			0.10	35.4	26.4	28.2	68.6	68.2	83.3	73.2	72.7	74.5
pH	pH			0.10	7.05	7.14	7.24	5.91	6.09	5.85	6.05	6.15	6.10
Particle Size													
% Gravel (>2mm)	%			0.10-1.0	2.05	<0.10	<0.10	<0.10	<0.10	<0.10	0.72	<0.10	<0.10
% Sand (2.0mm - 0.063mm)	%			0.10-1.0	77.2	73.3	74.7	1.04	1.30	1.18	5.76	4.02	8.04
% Silt (0.063mm - 4µm)	%			0.10-1.0	16.7	21.8	18.9	59.7	66.5	73.2	60.1	63.7	59.8
% Clay (<4µm)	%			0.10-1.0	4.13	4.87	6.40	39.3	32.2	25.6	33.5	32.2	32.2
Leachable Anions & Nutrients													
Total Nitrogen	%			0.020	0.032	0.041	0.037	0.391	0.407	0.726	0.269	0.355	0.303
Organic / Inorganic Carbon													
Total Organic Carbon	%			0.10	0.16	0.23	0.23	4.94	3.97	7.27	2.45	3.39	2.69
Plant Available Nutrients													
Available Ammonium	mg/kg			0.80-2.4	1.31	1.52	1.48	8.6	9.5	27.5	14.5	16.2	21.8
Available Nitrate	mg/kg			2.0-8.6	<2.0	<2.0	<2.0	<5.0	<5.5	<6.7	<8.6	<8.6	<7.5
Nitrite	mg/kg			0.40-1.7	<0.40	<0.40	<0.40	<1.0	<1.1	<1.3	<1.7	<1.7	<1.5
Available Phosphate	mg/kg			2.0-4.0	<2.0	<2.0	<2.0	<2.0	<2.0	11.7	4.0	2.4	3.1
Metals													
Aluminum (Al)	mg/kg			50	7240	7980	7930	26500	26300	21900	18900	21400	19700
Antimony (Sb)	mg/kg			10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	5.9	17.0	0.05-0.50	4.05	4.21	4.90	6.24	4.78	3.24	4.63	4.14	3.70
Barium (Ba)	mg/kg			1.0	29.2	34.7	35.2	145	146	132	111	120	110
Beryllium (Be)	mg/kg			0.50	<0.50	<0.50	<0.50	0.88	0.88	0.75	0.64	0.69	0.66
Bismuth (Bi)	mg/kg			20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.6	3.5	0.10	<0.10	<0.10	<0.10	0.12	0.11	0.10	<0.10	<0.10	<0.10
Calcium (Ca)	mg/kg			50	2340	2450	2320	6420	6070	6050	5340	5640	5750
Chromium (Cr)	mg/kg	37.3	90.0	2.0	24.0	25.4	24.0	72.5	73.4	63.6	55.5	61.3	58.0
Cobalt (Co)	mg/kg			2.0	6.1	6.4	6.2	13.7	13.2	11.5	11.3	12.2	11.5
Copper (Cu)	mg/kg	35.7	197	1.0	10.3	11.9	12.4	39.7	37.6	36.2	29.2	29.8	29.6
Iron (Fe)	mg/kg			50	15100	14800	14000	33000	32200	28700	27000	28800	27600
Lead (Pb)	mg/kg	35	91.3	2.0	3.1	3.2	3.1	10.5	10.4	9.0	8.3	8.6	8.1
Lithium (Li)	mg/kg			2.0	12.0	13.5	13.5	50.0	50.7	42.1	38.8	43.0	39.6
Magnesium (Mg)	mg/kg			50	4680	5090	5030	16000	16000	13900	12200	13200	12200
Manganese (Mn)	mg/kg			1.0	197	273	251	396	385	452	552	521	438
Mercury (Hg)	mg/kg	0.17	0.486	0.0050	<0.0050	<0.0050	<0.0050	0.0119	0.0157	0.0223	0.0167	0.0156	0.0163
Molybdenum (Mo)	mg/kg			0.20	0.60	0.63	0.68	1.86	1.58	1.54	1.19	1.14	1.11
Nickel (Ni)	mg/kg			5.0	13.1	14.4	13.9	40.1	39.9	35.5	32.4	34.2	32.8
Phosphorus (P)	mg/kg			50	442	417	374	698	696	966	859	763	843
Potassium (K)	mg/kg			200	1290	1550	1550	6790	6770	7270	6260	6370	6620
Selenium (Se)	mg/kg			0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Silver (Ag)	mg/kg			0.10	<0.10	<0.10	<0.10	0.14	0.15	0.11	0.24	0.17	0.26
Sodium (Na)	mg/kg			200	290	350	340	1370	1270	1240	960	1050	1020
Strontium (Sr)	mg/kg			0.50	11.4	12.9	12.6	39.8	37.5	36.2	31.7	34.3	34.2
Sulphur (S)	mg/kg			100-500	200	220	200	1860	1290	2080	1060	1330	1040
Thallium (Tl)	mg/kg			0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg			5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg			1.0	509	556	552	1670	1660	1310	1230	1380	1310
Uranium (U)	mg/kg			0.050	1.08	0.676	0.607	2.40	2.31	2.00	1.66	1.75	1.61
Vanadium (V)	mg/kg			2.0	31.6	30.0	28.4	75.5	73.7	64.2	57.9	63.0	59.1
Zinc (Zn)	mg/kg	123	315	1.0	20.7	23.7	22.5	77.5	77.2	68.5	60.9	65.0	60.7

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian sediment quality guidelines for the protection of freshwater aquatic life, Council of Ministers of the Environment, Updated 2002

b) ISQG = Interim Sediment Quality Guideline

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.5-1

Stream and River Sediment Quality Analytical Results, Hope Bay Belt Project, 2010

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Appendix 3.5-1. Stream and River Sediment Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:		CCME Guidelines for the Protection of Aquatic Life[a]			Koig. U/S	Koig. U/S	Koig. U/S	Koig. D/S	Koig. D/S	Koig. D/S	AWRa	AWRa	AWRa	AWRb	AWRb	AWRb	AWRc	AWRc	AWRc
Replicate:					1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Date Sampled:					14-Aug-10	14-Aug-10	14-Aug-10	14-Aug-10	14-Aug-10	14-Aug-10	15-Aug-10	15-Aug-10	15-Aug-10	15-Aug-10	15-Aug-10	15-Aug-10	15-Aug-10	15-Aug-10	15-Aug-10
ALS Sample ID:	Units	ISQG[b]	PEL[c]	RDL[d]	L920950-1	L920950-2	L920950-3	L920950-4	L920950-5	L920950-6	L920950-7	L920950-8	L920950-9	L920950-10	L920950-11	L920950-12	L920950-13	L920950-14	L920950-15
Physical Tests																			
Moisture	%			0.10	34.8	20.8	22.4	15.5	11.3	14.1	17.6	35.9	14.6	59.7	60.2	37.8	52.1	52.6	51.4
pH	pH			0.10	6.61	6.17	7.12	7.11	7.21	7.21	5.33	6.20	4.45	5.02	5.63	5.30	6.68	5.40	6.18
Particle Size																			
% Gravel (>2mm)	%			0.10	0.29	0.22	0.49	2.23	29.3	3.64	<0.10	0.26	1.50	1.38	1.22	2.39	0.38	1.36	<0.10
% Sand (2.0mm - 0.063mm)	%			0.10	39.5	42.8	35.9	97.0	65.9	92.6	69.2	53.1	77.0	16.4	17.9	63.2	64.4	44.2	55.1
% Silt (0.063mm - 4µm)	%			0.10	44.6	47.4	39.4	<0.10	3.21	2.23	21.7	26.5	15.7	59.7	51.5	26.7	30.0	46.7	36.9
% Clay (<4µm)	%			0.10	15.6	9.65	24.3	0.75	1.59	1.52	9.12	20.2	5.83	22.6	29.4	7.81	5.25	7.68	7.99
Leachable Anions & Nutrients																			
Total Nitrogen	%			0.020	0.082	0.059	0.093	<0.020	<0.020	<0.020	0.067	0.159	0.041	0.417	0.497	0.200	0.200	0.380	0.244
Organic / Inorganic Carbon																			
Total Organic Carbon	%			0.10	1.21	0.72	1.51	<0.10	0.12	0.11	1.01	2.77	0.57	6.49	6.85	2.79	3.45	6.51	3.79
Plant Available Nutrients																			
Available Ammonium	mg/kg			0.80-12	6.23	10.7	1.35	0.92	<1.2	0.80	11.1	13.0	9.25	16.5	34.2	4.1	7.4	5.1	3.6
Available Nitrate	mg/kg			2.0-30	<2.0	<2.0	<2.0	<2.0	<3.0	<2.0	<3.0	<3.3	<2.0	<6.0	<6.0	<5.0	<5.0	<7.5	<5.0
Nitrite	mg/kg			0.40-6.0	<0.40	<0.40	<0.40	<0.40	<0.60	<0.40	<0.60	<0.67	<0.40	<1.2	<1.2	<1.0	<1.0	<1.5	<1.0
Available Phosphate	mg/kg			2.0-13	5.0	3.0	4.3	<2.0	<2.0	<2.0	<2.0	2.3	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.3
Metals																			
Aluminum (Al)	mg/kg			50	11700	8960	12500	7790	8290	7240	6260	11000	4850	19600	13900	11300	5310	7720	10300
Antimony (Sb)	mg/kg			10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	5.9	17.0	0.050	4.06	4.16	5.56	3.05	4.19	2.53	1.30	2.26	2.05	2.85	3.54	2.15	0.334	1.12	1.03
Barium (Ba)	mg/kg			1.0	66.9	47.2	67.1	14.7	19.7	17.2	26.2	58.2	18.6	94.0	77.5	54.2	22.8	38.1	45.2
Beryllium (Be)	mg/kg			0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.65	0.52	<0.50	<0.50	<0.50	<0.50
Bismuth (Bi)	mg/kg			20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.6	3.5	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	<0.10
Calcium (Ca)	mg/kg			50	4280	3320	4620	1670	2260	1810	2190	3330	1910	4260	3720	2820	2470	3030	3830
Chromium (Cr)	mg/kg	37.3	90.0	2.0	40.1	29.9	40.9	26.3	22.7	22.7	17.5	33.8	14.4	56.7	40.0	30.9	14.5	20.6	24.7
Cobalt (Co)	mg/kg			2.0	8.6	7.1	10.4	6.9	7.3	5.9	4.2	7.3	3.5	10.4	9.0	6.2	2.2	3.6	5.0
Copper (Cu)	mg/kg	35.7	197	1.0	26.3	15.1	25.5	8.2	10.2	11.4	5.5	11.7	3.8	16.8	13.0	9.6	5.5	7.7	8.9
Iron (Fe)	mg/kg			50	21900	16700	22800	15200	18500	14900	15500	18800	12200	29800	29200	19100	6910	19800	14600
Lead (Pb)	mg/kg	35	91.3	2.0	7.3	5.1	7.3	<2.0	3.2	2.3	3.2	5.2	2.2	7.8	6.1	5.1	2.6	3.4	5.4
Lithium (Li)	mg/kg			2.0	21.2	16.1	23.2	11.9	13.6	11.4	11.3	19.5	8.9	32.9	24.5	19.1	12.0	11.7	18.9
Magnesium (Mg)	mg/kg			50	8090	5920	8880	6090	6620	5710	3920	6720	3250	10700	7960	6330	2610	3420	4530
Manganese (Mn)	mg/kg			1.0	240	216	295	201	288	193	101	177	85.5	297	413	217	106	116	187
Mercury (Hg)	mg/kg	0.17	0.486	0.0050	0.0052	<0.0050	0.0056	<0.0050	<0.0050	<0.0050	<0.0050	0.0070	<0.0050	0.0252	0.0183	0.0217	0.0055	0.0108	0.0176
Molybdenum (Mo)	mg/kg			0.20	0.69	0.65	1.15	0.29	0.41	0.30	0.34	0.29	0.21	0.77	0.60	0.48	<0.20	0.40	0.32
Nickel (Ni)	mg/kg			5.0	21.3	16.8	23.6	16.9	17.5	16.0	9.3	18.4	7.7	27.4	20.3	15.8	5.9	8.9	11.5
Phosphorus (P)	mg/kg			50	591	526	571	277	321	279	379	499	334	738	656	523	388	495	528
Potassium (K)	mg/kg			200	2780	1920	2960	570	740	690	1150	2330	770	3280	2380	1870	670	870	1270
Selenium (Se)	mg/kg			0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Silver (Ag)	mg/kg			0.10	0.17	<0.10	0.13	<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			200	760	330	1140	<200	<200	<200	<200	360	<200	580	460	360	<200	290	450
Strontium (Sr)	mg/kg			0.50	29.8	18.7	29.9	7.22	6.89	8.57	13.2	23.2	10.4	31.6	25.8	18.9	12.5	18.5	22.6
Sulphur (S)	mg/kg			100-500	550	350	550	230	350	160	210	340	140	760	840	380	360	580	410
Thallium (Tl)	mg/kg			0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg			5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg			1.0	866	651	855	322	335	445	459	699	376	1140	757	644	358	456	594
Uranium (U)	mg/kg			0.050	1.78	1.18	1.91	0.348	0.478	0.406	0.668	1.05	0.462	1.38	1.20	1.00	0.606	0.770	0.791
Vanadium (V)	mg/kg			2.0	48.4	33.7	48.6	25.2	32.3	26.2	21.6	36.4	18.7	54.7	41.4	35.1	12.4	24.6	22.9
Zinc (Zn)	mg/kg	123	315	1.0	37.1	29.3	38.9	26.1	29.5	24.3	19.7	37.2	15.6	80.6	58.6	46.5	16.9	19.5	32.7

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian sediment quality guidelines for the protection of freshwater aquatic life, Council of Ministers of the Environment, Updated 2002

b) ISQG = Interim Sediment Quality Guideline

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.5-1. Stream and River Sediment Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:		CCME Guidelines for the Protection of Aquatic Life[a]			Aim. NE IF	Aim. NE IF	Aim. NE IF	AWRd	AWRd	AWRd	Trout OF	Trout OF	Trout OF	Stickleback OF	Stickleback OF	Stickleback OF	S6	S6	S6
Replicate:					1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Date Sampled:					16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	16-Aug-10	18-Aug-10	18-Aug-10	18-Aug-10
ALS Sample ID:	Units	ISQG[b]	PEL[c]	RDL[d]	L921331-1	L921331-2	L921331-3	L921331-4	L921331-5	L921331-6	L921331-7	L921331-8	L921331-9	L921331-10	L921331-11	L921331-12	L923089-1	L923089-2	L923089-9
Physical Tests																			
Moisture	%			0.10	25.4	32.8	39.7	93.3	87.8	88.4	80.6	81.1	75.2	29.8	14.7	15.4	90.4	85.7	87.8
pH	pH			0.10	5.42	5.45	5.46	6.27	5.79	5.97	6.54	5.93	5.99	6.50	6.85	6.76	5.81	5.96	5.68
Particle Size																			
% Gravel (>2mm)	%			0.10	<0.10	0.13	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	5.88	3.34	-	-	<0.10
% Sand (2.0mm - 0.063mm)	%			0.10	73.1	84.0	71.3	-	18.1	12.2	7.10	5.14	14.7	77.9	84.0	93.3	-	-	3.23
% Silt (0.063mm - 4µm)	%			0.10	24.0	14.8	27.6	-	48.2	57.8	67.4	72.4	41.6	13.3	8.54	2.73	-	-	52.5
% Clay (<4µm)	%			0.10	2.90	1.08	1.04	-	33.7	30.0	25.5	22.5	43.7	8.85	1.58	0.61	-	-	44.3
Leachable Anions & Nutrients																			
Total Nitrogen	%			0.020	0.110	0.108	0.163	1.80	1.16	1.22	0.776	0.782	0.498	0.126	0.045	0.021	1.86	2.19	2.01
Organic / Inorganic Carbon																			
Total Organic Carbon	%			0.10	1.37	1.17	2.05	27.6	17.5	19.4	12.0	11.7	8.07	1.78	0.57	0.25	31.7	35.2	33.5
Plant Available Nutrients																			
Available Ammonium	mg/kg			0.80-12	6.8	11.7	21.0	40	28.9	18	21	20	8.9	4.2	2.87	2.9	68.1	73.4	74
Available Nitrate	mg/kg			2.0-30	<3.3	<3.8	<5.0	<30	<20	<30	<30	<30	<20	<3.8	<2.3	<3.0	<30	<30	<20
Nitrite	mg/kg			0.40-6.0	<0.67	<0.75	<1.0	<6.0	<4.0	<6.0	<6.0	<6.0	<4.0	<0.75	<0.46	<0.60	<6.0	<6.0	<4.0
Available Phosphate	mg/kg			2.0-13	6.7	8.1	6.9	<10	<5.7	<11	<8.0	<13	<8.9	5.4	3.5	2.2	<8.0	<8.0	<8.0
Metals																			
Aluminum (Al)	mg/kg			50	5850	6320	6010	5370	7120	12300	15000	17000	19100	7920	4250	3510	7610	9690	4650
Antimony (Sb)	mg/kg			10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	5.9	17.0	0.050	0.857	0.730	0.786	13.4	17.8	3.88	2.60	2.65	3.25	1.34	0.817	0.594	2.43	2.33	1.32
Barium (Ba)	mg/kg			1.0	30.7	33.2	33.7	64.3	61.8	65.3	88.1	101	112	37.4	16.2	13.8	54.1	66.7	53.7
Beryllium (Be)	mg/kg			0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.52	0.58	0.70	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bismuth (Bi)	mg/kg			20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.6	3.5	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	0.10	0.14	<0.10	<0.10	<0.10	0.37	0.26	0.36
Calcium (Ca)	mg/kg			50	2120	2210	2260	8010	5210	6710	6910	6810	7250	2850	1580	1230	5510	6840	5400
Chromium (Cr)	mg/kg	37.3	90.0	2.0	17.2	19.7	16.6	13.0	18.1	30.6	43.1	47.6	52.4	20.0	11.5	7.4	14.2	24.2	9.0
Cobalt (Co)	mg/kg			2.0	4.0	4.8	4.1	4.1	6.7	5.4	8.2	9.2	10.8	4.0	2.5	2.1	2.5	3.4	2.9
Copper (Cu)	mg/kg	35.7	197	1.0	5.4	6.0	5.7	21.5	13.8	26.3	19.6	20.6	27.6	7.9	4.3	4.6	35.3	46.6	31.9
Iron (Fe)	mg/kg			50	11400	12900	9830	131000	141000	43900	27900	29800	26700	11000	7050	6300	33700	33600	58300
Lead (Pb)	mg/kg	35	91.3	2.0	3.7	3.1	3.3	4.4	4.3	5.0	6.3	6.6	7.6	3.2	<2.0	<2.0	5.1	4.2	2.2
Lithium (Li)	mg/kg			2.0	10.8	11.5	10.5	4.9	10.5	18.4	21.5	25.2	29.1	13.6	9.9	8.3	3.9	8.0	<2.0
Magnesium (Mg)	mg/kg			50	3240	3570	3030	2520	2800	4600	7390	8310	9480	4070	2930	2480	1710	3040	1130
Manganese (Mn)	mg/kg			1.0	88.9	102	91.9	468	700	259	242	249	311	91.0	64.5	55.8	78.9	102	114
Mercury (Hg)	mg/kg	0.17	0.486	0.0050	0.0080	0.0073	0.0080	0.0812	0.0528	0.0415	0.0376	0.0432	0.0335	0.0058	<0.0050	<0.0050	0.102	0.134	0.108
Molybdenum (Mo)	mg/kg			0.20	0.24	0.20	0.21	3.36	2.69	1.40	1.15	0.84	1.18	0.28	<0.20	<0.20	5.12	5.84	3.38
Nickel (Ni)	mg/kg			5.0	7.5	8.4	7.8	9.6	10.3	13.7	22.1	23.2	25.4	9.6	5.8	<5.0	13.1	16.2	12.1
Phosphorus (P)	mg/kg			50	497	500	511	2200	1160	939	929	972	794	404	273	245	782	831	841
Potassium (K)	mg/kg			200	990	1160	1090	1620	1480	1710	2720	3200	3770	1320	640	500	680	1060	500
Selenium (Se)	mg/kg			0.50	<0.50	<0.50	<0.50	0.54	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.59	0.61	<0.50
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	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg			200	220	210	250	500	400	500	590	640	730	290	<200	<200	230	290	<200
Strontium (Sr)	mg/kg			0.50	12.6	12.6	13.5	40.6	29.5	36.2	42.9	43.7	48.2	19.2	9.26	6.86	31.3	39.0	31.7
Sulphur (S)	mg/kg			100-500	510	560	590	3460	2250	2480	1740	1480	1310	300	180	150	3450	3750	3810
Thallium (Tl)	mg/kg			0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg			5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg			1.0	448	478	433	146	262	468	727	831	980	508	254	207	147	195	63.0
Uranium (U)	mg/kg			0.050													3.77	4.39	2.75
Vanadium (V)	mg/kg			2.0	22.5	29.3	20.7	23.5	26.2	31.0	46.2	52.7	61.4	23.8	12.9	10.6	36.2	27.2	12.2
Zinc (Zn)	mg/kg	123	315	1.0	24.9	28.3	26.9	41.2	39.8	36.2	70.9	83.1	86.0	25.6	14.4	13.4	49.6	38.0	70.0

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian sediment quality guidelines for the protection of freshwater aquatic life, Council of Ministers of the Environment, Updated 2002

b) ISQG = Interim Sediment Quality Guideline

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.5-1. Stream and River Sediment Quality Analytical Results, Hope Bay Belt Project, 2010

Site Abbreviation:		CCME Guidelines for the Protection of Aquatic Life[a]			Koig. R.	Koig. R.	Koig. R.	Aim. R.	Aim. R.	Aim. R.	AWRe	AWRe	AWRe
Replicate:					1	2	3	1	2	3	1	2	3
Date Sampled:					18-Aug-10	18-Aug-10	18-Aug-10	18-Aug-10	18-Aug-10	18-Aug-10	18-Aug-10	18-Aug-10	18-Aug-10
ALS Sample ID:	Units	ISQG[b]	PEL[c]	RDL[d]	L923089-3	L923089-4	L923089-10	L923089-5	L923089-6	L923089-11	L923089-7	L923089-8	L923089-12
Physical Tests													
Moisture	%			0.10	65.2	18.9	37.0	30.8	41.8	33.8	51.9	69.6	84.3
pH	pH			0.10	6.44	5.90	6.28	5.31	5.11	5.24	6.48	6.51	6.66
Particle Size													
% Gravel (>2mm)	%			0.10	7.99	0.23	2.00	4.88	<0.10	0.13	<0.10	<0.10	<0.10
% Sand (2.0mm - 0.063mm)	%			0.10	51.0	81.6	71.7	75.8	77.3	63.6	62.7	52.9	43.8
% Silt (0.063mm - 4µm)	%			0.10	17.2	17.6	16.4	14.8	20.1	27.3	25.4	31.1	29.2
% Clay (<4µm)	%			0.10	23.9	0.61	9.94	4.57	2.56	8.97	11.9	16.0	27.0
Leachable Anions & Nutrients													
Total Nitrogen	%			0.020	0.901	0.074	0.279	0.165	0.204	0.210	0.313	0.346	1.19
Organic / Inorganic Carbon													
Total Organic Carbon	%			0.10	18.2	1.09	3.72	2.40	3.34	3.17	6.06	6.49	19.9
Plant Available Nutrients													
Available Ammonium	mg/kg			0.80-12	12.3	5.48	17.9	10.7	7.9	10.2	4.7	6.0	19.6
Available Nitrate	mg/kg			2.0-30	<10	<2.0	<2.0	<3.8	<3.8	<3.8	<6.0	<6.0	<20
Nitrite	mg/kg			0.40-6.0	<2.0	<0.40	<0.40	<0.75	<0.75	<0.75	<1.2	<1.2	<4.0
Available Phosphate	mg/kg			2.0-13	<4.0	<2.0	<2.0	2.2	2.3	<2.0	2.9	2.5	<4.0
Metals													
Aluminum (Al)	mg/kg			50	6930	5690	8300	7060	6490	8400	8270	9640	7670
Antimony (Sb)	mg/kg			10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	5.9	17.0	0.050	2.52	0.057	5.76	1.00	1.06	1.17	1.36	1.39	3.33
Barium (Ba)	mg/kg			1.0	79.4	18.7	37.4	34.9	31.7	43.1	50.5	57.2	56.9
Beryllium (Be)	mg/kg			0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bismuth (Bi)	mg/kg			20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.6	3.5	0.10	0.31	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Calcium (Ca)	mg/kg			50	15100	2080	3100	2010	2020	2370	5190	5520	7490
Chromium (Cr)	mg/kg	37.3	90.0	2.0	20.7	14.8	20.6	19.5	18.3	23.2	23.8	27.7	22.7
Cobalt (Co)	mg/kg			2.0	15.4	4.0	8.1	4.0	3.6	4.8	4.1	6.3	6.7
Copper (Cu)	mg/kg	35.7	197	1.0	58.4	9.9	15.3	11.6	11.7	12.1	8.9	7.5	11.9
Iron (Fe)	mg/kg			50	51200	9960	23000	12600	10000	12800	14400	17700	36600
Lead (Pb)	mg/kg	35	91.3	2.0	5.1	<2.0	3.0	3.4	3.4	4.1	3.3	3.5	3.3
Lithium (Li)	mg/kg			2.0	8.7	10.0	13.6	11.8	11.2	13.1	14.4	17.3	11.3
Magnesium (Mg)	mg/kg			50	3790	3220	4720	3550	3380	4020	3890	4640	3740
Manganese (Mn)	mg/kg			1.0	1870	127	519	96.1	81.1	104	170	306	347
Mercury (Hg)	mg/kg	0.17	0.486	0.0050	0.0711	<0.0050	0.0123	0.0127	0.0140	0.0108	0.0246	0.0277	0.0428
Molybdenum (Mo)	mg/kg			0.20	1.16	<0.20	0.51	0.28	0.31	0.30	0.47	0.56	1.31
Nickel (Ni)	mg/kg			5.0	19.8	8.9	14.3	9.3	9.4	11.3	11.3	12.9	13.4
Phosphorus (P)	mg/kg			50	839	354	521	442	435	447	516	591	784
Potassium (K)	mg/kg			200	1120	650	1080	930	900	910	1290	1630	1290
Selenium (Se)	mg/kg			0.50	0.73	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Silver (Ag)	mg/kg			0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg			200	330	<200	210	260	220	280	390	410	400
Strontium (Sr)	mg/kg			0.50	45.5	9.09	16.5	12.7	11.3	15.3	23.9	25.9	29.2
Sulphur (S)	mg/kg			100-500	1840	230	550	330	430	400	530	600	1680
Thallium (Tl)	mg/kg			0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg			5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg			1.0	314	386	478	437	389	504	449	561	275
Uranium (U)	mg/kg			0.050	2.57	0.536	1.04	0.760	0.785	0.948	0.791	0.713	0.770
Vanadium (V)	mg/kg			2.0	33.0	19.5	29.4	24.1	22.2	28.1	18.4	23.5	31.0
Zinc (Zn)	mg/kg	123	315	1.0	64.8	19.1	39.4	27.7	27.8	28.7	44.3	65.3	87.1

Shaded cells indicate values that are both above analytical detection limits and exceed CCME guidelines for the protection of freshwater aquatic life.

a) Canadian sediment quality guidelines for the protection of freshwater aquatic life, Council of Ministers of the Environment, Updated 2002

b) ISQG = Interim Sediment Quality Guideline

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.6-1

Phytoplankton Biomass Results, Hope Bay Belt Project, 2010

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Appendix 3.6-1. Phytoplankton Biomass Results, Hope Bay Belt Project, 2010

Site ID	Replicate	Date Sampled	ALS Sample ID	Chlorophyll *a* (µg/L)	Mean	SE
Stickleback	1	19-Aug-10	L962121-13	0.579		
Stickleback	2	19-Aug-10	L962121-14	1.13	0.976	0.200
Stickleback	3	19-Aug-10	L962121-15	1.22		
Trout	1	16-Aug-10	L962121-10	0.618		
Trout	2	16-Aug-10	L962121-11	1.58	0.927	0.327
Trout	3	16-Aug-10	L962121-12	0.583		
Aim. Stn 13	1	13-Aug-10	L962121-1	0.254		
Aim. Stn 13	2	13-Aug-10	L962121-2	0.357	0.502	0.198
Aim. Stn 13	3	13-Aug-10	L962121-3	0.894		
Aim. Stn 5	1	12-Aug-10	L924968-1	1.01		
Aim. Stn 5	2	12-Aug-10	L924968-2	0.990	0.990	0.011
Aim. Stn 5	3	12-Aug-10	L924968-3	0.971		
Aim. Stn 11	1	15-Aug-10	L962121-7	0.634		
Aim. Stn 11	2	15-Aug-10	L962121-8	0.344	0.568	0.115
Aim. Stn 11	3	15-Aug-10	L962121-9	0.726		
Aim. Stn 6	1	14-Aug-10	L962121-4	0.299		
Aim. Stn 6	2	14-Aug-10	L962121-5	0.52	0.572	0.175
Aim. Stn 6	3	14-Aug-10	L962121-6	0.897		
Windy Deep	1	21-Aug-10	L924968-4	0.460		
Windy Deep	2	21-Aug-10	L924968-5	0.452	0.454	0.003
Windy Deep	3	21-Aug-10	L924968-6	0.451		

SE = standard error of the mean

Appendix 3.6-2

Phytoplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, 2010

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Appendix 3.6-2. Phytoplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, August 2010

Lake	Stickleback						Trout					
Date	19-Aug-10						16-Aug-10					
Replicate	1		2		3		1		2		3	
Taxa	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL
Cyanophyta												
Anabaena flos-aquae							43.3	40,605.7	57.9	58,239.5	43.8	44,066.5
Anabaena planctonica							13.8	3,024.8	25.2	55,329.4	12.5	34,388.8
Anabaena sp.			3.1	4,230.1								
Aphanothece sp.											1.6	187.9
Aphanizomenon flos-aquae												
Chroococcus minimus												
Oscillatoria sp.												
Subtotal	**0.0**	**0.0**	**3.1**	**4,230.1**	**0.0**	**0.0**	**57.1**	**43,630.5**	**83.1**	**113,568.9**	**57.9**	**78,643.1**
Chlorophyta												
Ankistrodesmus falcatus	3.1	77.2							2.5	126.0		
Botryococcus braunii												
Chlamydomonas sp.	6.2	2,007.9			7.0	2,272.5			7.6	2,456.6	1.6	508.9
Cladophora sp.												
Closteriopsis longissima												
Closterium sp.												
Cosmarium sp.	3.1	648.7	12.4	2,612.7							1.6	328.9
Crucigenia quadrata	9.3	787.7	12.4	1,057.5			2.0	334.5			1.6	133.1
Crucigenia tetrapedia	12.4	1,050.3	18.7	1,586.3	17.5	1,485.9			2.5	214.2		
Desmidium sp.									2.5	1,763.7	1.6	2,192.4
Elakatothrix gelatinosa												
Gloeocystis ampla							2.0	1,007.5				
Mougeotia sp.												
Oocystis lacustris												
Oocystis parva												
Oocystis pusilla	3.1	333.6										
Pediastrum boryanum												
Pediastrum duplex												
Pediastrum sp.												
Quadrigula closterioides												
Scenedesmus denticulatus												
Scenedesmus quadricauda	12.4	2,409.5	9.3	2,426.1	21.0	9,135.4						
Selenastrum minutum	3.1	61.8										
Sphaerocystis schroeteri			3.1	435.4								
Spirogyra sp.												
Staurastrum sp.							2.0	472.3				
Tetraedron minimum					3.5	629.3						
Tetraedron regulare											1.6	180.1
Tetraedron sp.												
Ulothrix sp.												
Subtotal	**52.5**	**7,376.6**	**56.0**	**8,118.0**	**48.9**	**13,523.0**	**5.9**	**1,814.2**	**15.1**	**4,560.4**	**7.8**	**3,343.4**
Chrysophyta												
Chrysococcus rufescens	12.4	1,050.3	28.0	2,379.4	17.5	1,485.9	2.0	167.3	10.1	856.6	1.6	133.1
Cryptomonas erosa	27.8	14,456.7	24.9	12,939.0	38.5	19,997.8	9.8	5,116.1	7.6	3,930.5	15.7	8,143.1
Dinobryon bavaricum							2.0	944.5				
Dinobryon sertularia	6.2	741.4	9.3	1,455.6	21.0	3,020.7	25.6	5,525.3	25.2	6,046.9	15.7	3,758.3
Kephyrion littorale												
Kephyrion obliquum												
Kephyrion sp.												
Mallomonas sp.												
Rhodomonas minuta	12.4	247.1	31.1	622.1	35.0	699.2	2.0	39.4	17.6	352.7		
Subtotal	**58.7**	**16,495.5**	**93.3**	**17,396.2**	**111.9**	**25,203.6**	**41.3**	**11,792.5**	**60.5**	**11,186.8**	**32.9**	**12,034.5**
Diatoms												
Achnanthes clevei	3.1	463.4							2.5	377.9		
Achnanthes flexella												
Achnanthes hauckiana												
Achnanthes lanceolata			3.1	559.9							3.1	563.8
Achnanthes lewisiana												
Achnanthes linearis			6.2	821.1	3.5	461.5	2.0	259.7			3.1	413.4
Achnanthes minutissima	24.7	1,235.6	9.3	466.6	21.0	1,048.8	3.9	196.8	5.0	252.0	3.1	156.6
Achnanthes peragalli												
Amphipleura pellucida	3.1	3,954.0										
Amphora ovalis									2.5	1,456.3		
Amphora perpusilla			3.1	516.3								
Anomoeoneis vitrea												

Appendix 3.6-2. Phytoplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, August 2010

Lake	Stickleback						Trout					
Date	19-Aug-10						16-Aug-10					
Replicate	1		2		3		1		2		3	
Taxa	Abundance cells/mL	Biovolume $\mu m^3/mL$	Abundance cells/mL	Biovolume $\mu m^3/mL$	Abundance cells/mL	Biovolume $\mu m^3/mL$	Abundance cells/mL	Biovolume $\mu m^3/mL$	Abundance cells/mL	Biovolume $\mu m^3/mL$	Abundance cells/mL	Biovolume $\mu m^3/mL$
Diatoms *(cont'd)*												
Asterionella formosa	61.8	23,106.0	24.9	8,758.7	42.0	13,844.7	19.7	9,090.8	12.6	6,928.8	12.5	7,441.5
Caloneis sp.												
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula					7.0	3,216.4						
Cyclotella comta												
Cyclotella meneghiniana												
Cyclotella ocellata												
Cyclotella stelligera	9.3	509.7	21.8	1,197.5	7.0	384.6						
Cymatopleura solea												
Cymbella affinis												
Cymbella cesatii												
Cymbella mexicana												
Cymbella microcephala	3.1	163.7			3.5	185.3						
Cymbella minuta							15.7	5,824.4	2.5	932.2	3.1	1,158.8
Cymbella naviculiformis												
Cymbella sinuata												
Cymbella sp.												
Diatoma tenue												
Diatoma tenue elongatum					3.5	7,551.6					1.6	3,382.5
Diatoma vulgare											4.7	9,207.9
Diatomella balfouriana							2.0	590.3				
Diploneis elliptica									2.5	655.1	4.7	1,221.5
Diploneis puella												
Epithemia sorex												
Epithemia turgida												
Eunotia elegans												
Eunotia pectinalis											1.6	1,127.5
Eunotia sp.												
Fragilaria construens					3.5	1,566.3						
Fragilaria construens venter			3.1	298.6	3.5	167.8	2.0	94.5	2.5	483.8		
Fragilaria crotonensis												
Fragilaria pinnata					3.5	419.5	5.9	460.4				
Fragilaria vaucheriae							3.9	1,700.1	2.5	725.6	6.3	1,804.0
Gomphonema acuminatum	3.1	5,374.9										
Gomphonema angustatum			9.3	1,679.6	3.5	629.3					4.7	845.6
Gomphonema clevei												
Gomphonema gracile			6.2	1,524.1								
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum												
Gomphonema ventricosum												
Gyrosigma spencerii												
Melosira granulata												
Melosira italica												
Navicula anglica												
Navicula capitata												
Navicula contenta biceps												
Navicula cryptocephala			3.1	575.4	3.5	332.1					1.6	289.7
Navicula cascadensis												
Navicula cryptocephala veneta			3.1	295.5					2.5	239.4		
Navicula cryptocephala venter												
Navicula decussis												
Navicula graciloides												
Navicula gregaria									5.0	881.8		
Navicula menisculus upsaliensis												
Navicula minima									2.5	110.9	3.1	137.8
Navicula minuscula												
Navicula mutica											1.6	86.1
Navicula pseudoscutiformis												
Navicula pupula									5.0	1,360.6		
Navicula rhynchocephala	3.1	911.3					3.9	1,161.0			1.6	462.0
Navicula seminulum									2.5	153.7		

Appendix 3.6-2. Phytoplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, August 2010

Lake	Stickleback						Trout					
Date	19-Aug-10						16-Aug-10					
Replicate	1		2		3		1		2		3	
Taxa	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL
Diatoms *(cont'd)*												
Navicula scutiformis												
Navicula sp.							3.9	590.3			3.1	469.8
Navicula tripunctata												
Navicula viridula											1.6	704.7
Neidium affine												
Nitzschia acicularis	12.4	3,459.7	6.2	1,741.8	7.0	1,957.8						
Nitzschia amphibia											3.1	300.7
Nitzschia capitellata	3.1	1,112.1							2.5	907.0	1.6	413.0
Nitzschia clausii												
Nitzschia communis												
Nitzschia constricta												
Nitzschia dissipata	3.1	831.0	3.1	836.7								
Nitzschia frustulum	9.3	1,112.1	3.1	373.2	3.5	419.5						
Nitzschia innominata												
Nitzschia linearis												
Nitzschia microcephala												
Nitzschia palea												
Nitzschia paleacea					3.5	342.6						
Nitzschia sp.												
Nitzschia tryblionella												
Pinnularia borealis							2.0	432.9				
Pinnularia sp.									2.5	1,007.8	1.6	626.4
Stauroneis sp.												
Stephanodiscus astraea minutula												
Stephanodiscus hantzschii												
Surirella ovata												
Surirella sp.												
Synedra cyclopum												
Synedra delicatissima							7.9	5,194.8	17.6	11,640.3	9.4	6,201.3
Synedra radians	18.5	6,672.3	15.6	5,598.6	28.0	10,068.8	9.8	3,541.9	12.6	4,535.2	18.8	6,765.0
Synedra rumpens			15.6	2,177.2	10.5	1,468.4						
Synedra tenera							2.0	590.3				
Synedra ulna	12.4	24,588.8			7.0	13,914.6						
Synedra sp.												
Tabellaria fenestrata												
Tabellaria flocculosa							2.0	3,482.9	5.0	4,459.6	3.1	1,847.8
Subtotal	**169.9**	**73,494.5**	**136.9**	**27,420.8**	**164.3**	**57,979.7**	**86.6**	**33,211.1**	**90.7**	**37,108.0**	**98.7**	**45,627.3**
Dinoflagellata												
Glenodinium sp.	24.7	17,298.6	21.8	15,240.7	42.0	29,367.4	7.9	5,509.6	10.1	7,054.7	12.5	8,769.4
Subtotal	**24.7**	**17,298.6**	**21.8**	**15,240.7**	**42.0**	**29,367.4**	**7.9**	**5,509.6**	**10.1**	**7,054.7**	**12.5**	**8,769.4**
Euglenoidea												
Euglena sp.							2.0	1,141.3	5.0	2,922.7	1.6	908.3
Trachelomonas charkowensis												
Trachelomonas hispida					3.5	7,341.9						
Trachelomonas pulchella												
Trachelomonas volvocina					3.5	6,590.2	2.0	3,709.1				
Subtotal	**0.0**	**0.0**	**0.0**	**0.0**	**7.0**	**13,932.1**	**3.9**	**4,850.4**	**5.0**	**2,922.7**	**1.6**	**908.3**
Unidentified												
Unidentified flagellate	**6.2**	**123.6**	**6.2**	**124.4**	**7.0**	**139.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
TOTAL	**312**	**114,789**	**317**	**72,530**	**381**	**140,146**	**203**	**100,808**	**265**	**176,401**	**211**	**149,326**

Appendix 3.6-2. Phytoplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, August 2010

Lake	Aim. Stn 13						Aim. Stn 5					
Date	13-Aug-10						12-Aug-10					
Replicate	1		2		3		1		2		3	
Taxa	Abundance cells/mL	Biovolume $\mu m^3/mL$	Abundance cells/mL	Biovolume $\mu m^3/mL$	Abundance cells/mL	Biovolume $\mu m^3/mL$	Abundance cells/mL	Biovolume $\mu m^3/mL$	Abundance cells/mL	Biovolume $\mu m^3/mL$	Abundance cells/mL	Biovolume $\mu m^3/mL$
Cyanophyta												
Anabaena flos-aquae												
Anabaena planctonica												
Anabaena sp.	2.0	1,345.1	2.4	4,906.9			2.1	1,412.0	2.1	1,396.5	2.2	3,803.1
Aphanothece sp.			2.4	144.3	3.7	392.2	10.4	1,090.1			2.2	134.2
Aphanizomenon flos-aquae			2.4	1,515.4								
Chroococcus minimus												
Oscillatoria sp.											2.2	2,080.5
Subtotal	**2.0**	**1,345.1**	**7.2**	**6,566.6**	**3.7**	**392.2**	**12.5**	**2,502.1**	**2.1**	**1,396.5**	**6.7**	**6,017.8**
Chlorophyta												
Ankistrodesmus falcatus			4.8	120.3	9.3	280.1	2.1	51.9				
Botryococcus braunii			2.4	3,463.7								
Chlamydomonas sp.			4.8	1,563.5			2.1	674.8				
Cladophora sp.												
Closteriopsis longissima												
Closterium sp.												
Cosmarium sp.	2.0	415.4	2.4	505.1	1.9	392.2					4.5	939.6
Crucigenia quadrata	5.9	504.4	2.4	204.5	9.3	1,587.4	2.1	176.5	2.1	174.6	2.2	190.2
Crucigenia tetrapedia			2.4	817.8	1.9	158.7	4.2	353.0				
Desmidium sp.							2.1	726.7	2.1	718.8	2.2	2,349.0
Elakatothrix gelatinosa												
Gloeocystis ampla							2.1	1,063.1	2.1	1,051.5		
Mougeotia sp.												
Oocystis lacustris												
Oocystis parva									2.1	82.1		
Oocystis pusilla	9.9	1,388.6	2.4	519.6								
Pediastrum boryanum												
Pediastrum duplex												
Pediastrum sp.	2.0	474.7	2.4	1,154.6								
Quadrigula closterioides												
Scenedesmus denticulatus												
Scenedesmus quadricauda	2.0	514.3	2.4	625.4	1.9	242.8						
Selenastrum minutum					1.9	37.3			2.1	123.2		
Sphaerocystis schroeteri	4.0	830.8			1.9	522.9						
Spirogyra sp.												
Staurastrum sp.												
Tetraedron minimum												
Tetraedron regulare												
Tetraedron sp.												
Ulothrix sp.												
Subtotal	**25.7**	**4,128.2**	**26.5**	**8,974.3**	**28.0**	**3,221.4**	**14.5**	**3,046.1**	**10.3**	**2,150.3**	**8.9**	**3,478.7**
Chrysophyta												
Chrysococcus rufescens					1.9	158.7	2.1	176.5	2.1	174.6	2.2	190.2
Cryptomonas erosa	13.8	7,200.2	28.9	15,009.3	26.1	13,595.4	14.5	7,558.2	10.3	5339.7	20.1	10,469.6
Dinobryon bavaricum			2.4	577.3								
Dinobryon sertularia			26.5	3,492.5	7.5	1,075.7	14.5	2,093.0	6.2	1,109.0	8.9	1,073.8
Kephyrion littorale					3.7	354.8	2.1	197.3	2.1	195.1	4.5	425.0
Kephyrion obliquum												
Kephyrion sp.			2.4	151.5	1.9	117.7			2.1	129.4		
Mallomonas sp.											2.2	850.1
Rhodomonas minuta	77.1	1,542.9	50.5	1,010.2	56.0	1,120.5	2.1	41.5	2.1	41.1	17.9	357.9
Subtotal	**91.0**	**8,743.1**	**110.6**	**20,240.9**	**97.1**	**16,422.7**	**35.3**	**10,066.5**	**24.6**	**6,988.9**	**55.9**	**13,366.7**
Diatoms												
Achnanthes clevei												
Achnanthes flexella												
Achnanthes hauckiana												
Achnanthes lanceolata					3.7	672.3						
Achnanthes lewisiana							2.1	259.6				
Achnanthes linearis	2.0	261.1	4.8	635.0	1.9	246.5	8.3	1,096.4			4.5	590.6
Achnanthes minutissima	2.0	98.9	2.4	120.3			4.2	207.6			4.5	223.7
Achnanthes peragalli							4.2	581.4				
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla			2.4	399.3	1.9	310.0	2.1	344.7			2.2	371.4
Anomoeoneis vitrea												

Appendix 3.6-2. Phytoplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, August 2010

Lake	Aim. Stn 13						Aim. Stn 5					
Date	13-Aug-10						12-Aug-10					
Replicate	1		2		3		1		2		3	
Taxa	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL
Diatoms *(cont'd)*												
Asterionella formosa	9.9	12,620.1	12.0	8,466.8	1.9	4,930.2	20.8	27,865.7	28.8	25,302.0	11.2	22,147.3
Caloneis sp.												
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula												
Cyclotella comta	7.9	17,960.9	9.6	21,840.4	11.2	25,435.3	6.2	14,140.5	2.1	4,662.0	8.9	20,312.9
Cyclotella meneghiniana												
Cyclotella ocellata	11.9	1,483.6	12.0	1,503.3	7.5	933.7	8.3	1,038.2	16.4	2,053.7	13.4	1,677.8
Cyclotella stelligera	7.9	435.2	2.4	132.3	14.9	821.7	8.3	456.8	16.4	903.6	11.2	615.2
Cymatopleura solea												
Cymbella affinis			2.4	4,329.6								
Cymbella cesatii												
Cymbella mexicana												
Cymbella microcephala												
Cymbella minuta	4.0	1,463.8	7.2	2,669.9			8.3	3,073.1			2.2	827.7
Cymbella naviculiformis												
Cymbella sinuata												
Cymbella sp.												
Diatoma tenue									4.1	1,191.2		
Diatoma tenue elongatum							2.1	1,495.0				
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica			4.8	1,250.8								
Diploneis puella												
Epithemia sorex												
Epithemia turgida												
Eunotia elegans												
Eunotia pectinalis											2.2	1,610.7
Eunotia sp.												
Fragilaria construens							2.1	1,162.8				
Fragilaria construens venter	2.0	379.8			1.9	179.3					2.2	134.0
Fragilaria crotonensis												
Fragilaria pinnata											2.2	134.2
Fragilaria vaucheriae									6.2	1,774.4		
Gomphonema acuminatum												
Gomphonema angustatum									4.1	739.3		
Gomphonema clevei												
Gomphonema gracile												
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum												
Gomphonema ventricosum									2.1	1,745.7		
Gyrosigma spencerii												
Melosira granulata					1.9	1,027.1						
Melosira italica	9.9	26,086.8	19.2	39,878.5			8.3	52,420.7			13.4	25,288.2
Navicula anglica							2.1	747.5				
Navicula capitata							2.1	996.7			2.2	1,073.8
Navicula contenta biceps												
Navicula cryptocephala											4.5	827.7
Navicula cascadensis											2.2	134.2
Navicula cryptocephala veneta												
Navicula cryptocephala venter												
Navicula decussis												
Navicula graciloides												
Navicula gregaria									2.1	359.4		
Navicula menisculus upsaliensis												
Navicula minima	2.0	87.0										
Navicula minuscula												
Navicula mutica												
Navicula pseudoscutiformis			2.4	420.9	1.9	326.8						
Navicula pupula					3.7	1,008.4						
Navicula rhynchocephala												
Navicula seminulum												

Appendix 3.6-2. Phytoplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, August 2010

Lake	Aim. Stn 13						Aim. Stn 5					
Date	13-Aug-10						12-Aug-10					
Replicate	1		2		3		1		2		3	
Taxa	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL
Diatoms *(cont'd)*												
Navicula scutiformis												
Navicula sp.					1.9	280.1	6.2	934.4	4.1	616.1	4.5	671.1
Navicula tripunctata												
Navicula viridula									2.1	924.2		
Neidium affine												
Nitzschia acicularis	4.0	1,107.7			3.7	1,045.8			8.2	2,300.2	2.2	626.4
Nitzschia amphibia												
Nitzschia capitellata	2.0	712.1	2.4	865.9	3.7	1,344.6	2.1	747.5	2.1	739.3		
Nitzschia clausii												
Nitzschia communis					1.9	84.0			2.1	92.4		
Nitzschia constricta												
Nitzschia dissipata			2.4	647.0							2.2	601.8
Nitzschia frustulum	2.0	237.4	2.4	288.6	1.9	224.1			4.1	492.9	2.2	268.5
Nitzschia innominata												
Nitzschia linearis												
Nitzschia microcephala									2.1	205.4		
Nitzschia palea							6.2	1,121.3	2.1	369.7		
Nitzschia paleacea												
Nitzschia sp.												
Nitzschia tryblionella												
Pinnularia borealis												
Pinnularia sp.			2.4	962.1							2.2	894.8
Stauroneis sp.												
Stephanodiscus astraea minutula					1.9	653.6			2.1	718.8	2.2	783.0
Stephanodiscus hantzschii												
Surirella ovata												
Surirella sp.												
Synedra cyclopum												
Synedra delicatissima												
Synedra radians	2.0	712.1			5.6	2,016.9	6.2	2,242.5	4.1	1,478.7	4.5	1,610.7
Synedra rumpens	2.0	276.9					8.3	1,162.8	8.2	1,150.1	8.9	1,252.8
Synedra tenera	4.0	1,186.8										
Synedra ulna												
Synedra sp.												
Tabellaria fenestrata												
Tabellaria flocculosa	2.0	1,167.1			1.9	1,101.8						
Subtotal	**77.1**	**66,277.2**	**91.4**	**84,410.8**	**74.7**	**42,642.4**	**118.4**	**112,095.1**	**123.2**	**47,819.1**	**116.3**	**82,678.6**
Dinoflagellata												
Glenodinium sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Euglenoidea												
Euglena sp.												
Trachelomonas charkowensis												
Trachelomonas hispida												
Trachelomonas pulchella												
Trachelomonas volvocina												
Subtotal	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Unidentified												
Unidentified flagellate	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
TOTAL	**196**	**80,494**	**236**	**120,193**	**204**	**62,679**	**181**	**127,710**	**160**	**58,355**	**188**	**105,542**

Appendix 3.6-2. Phytoplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, August 2010

Lake	Aim. Stn 11						Aim. Stn 6					
Date	15-Aug-10						14-Aug-10					
Replicate	1		2		3		1		2		3	
Taxa	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL
Cyanophyta												
Anabaena flos-aquae			5.8	7,777.9	17.8	27,451.9						
Anabaena planctonica												
Anabaena sp.												
Aphanothece sp.			8.7	2,220.2			3.1	276.1	2.1	62.9	5.9	1,061.2
Aphanizomenon flos-aquae												
Chroococcus minimus	3.1	85.9										
Oscillatoria sp.									2.1	3,901.7		
Subtotal	**3.1**	**85.9**	**14.5**	**9,998.0**	**17.8**	**27,451.9**	**3.1**	**276.1**	**4.2**	**3,964.6**	**5.9**	**1,061.2**
Chlorophyta												
Ankistrodesmus falcatus	6.1	153.4	23.2	696.5	11.9	445.4	9.2	299.1	16.8	461.5	8.8	221.1
Botryococcus braunii												
Chlamydomonas sp.			2.9	943.2			6.1	1,994.2	4.2	1,363.5	5.9	2,874.0
Cladophora sp.												
Closteriopsis longissima												
Closterium sp.												
Cosmarium sp.	3.1	644.3	17.4	3,656.8			6.1	1,288.6	4.2	881.0		
Crucigenia quadrata	12.3	1,043.1	11.6	986.7			3.1	260.8	10.5	891.5	5.9	501.1
Crucigenia tetrapedia												
Desmidium sp.			8.7	3,047.3	3.0	2,078.3	3.1	1,073.8	6.3	2,863.3		
Elakatothrix gelatinosa												
Gloeocystis ampla	12.3	5,262.3			8.9	3,420.4						
Mougeotia sp.												
Oocystis lacustris							3.1	3,779.8				
Oocystis parva												
Oocystis pusilla	3.1	662.7	5.8	1,253.7			3.1	662.7	2.1	453.1	2.9	1,273.4
Pediastrum boryanum			5.8	1,160.9								
Pediastrum duplex			2.9	789.4	3.0	302.8						
Pediastrum sp.												
Quadrigula closterioides												
Scenedesmus denticulatus							3.1	552.2				
Scenedesmus quadricauda			5.8	943.2	5.9	1,543.9			2.1	545.4		
Selenastrum minutum			2.9	174.1			3.1	61.4				
Sphaerocystis schroeteri			2.9	812.6			6.1	2,577.1	2.1	293.7	8.8	2,166.6
Spirogyra sp.												
Staurastrum sp.												
Tetraedron minimum												
Tetraedron regulare												
Tetraedron sp.												
Ulothrix sp.												
Subtotal	**36.8**	**7,765.8**	**90.0**	**14,464.5**	**32.7**	**7,790.8**	**46.0**	**12,549.8**	**48.2**	**7,753.0**	**32.4**	**7,036.2**
Chrysophyta												
Chrysococcus rufescens					3.0	252.4						
Cryptomonas erosa	36.8	19,144.5	5.8	3,018.3	5.9	3,087.8	15.3	7,976.9	14.7	7,635.5	11.8	6,131.2
Dinobryon bavaricum			8.7	1,044.8			6.1	736.3	12.6	1,812.4	2.9	353.7
Dinobryon sertularia	12.3	1,472.7	2.9	348.3	23.8	3,420.4	3.1	368.2			2.9	353.7
Kephyrion littorale									2.1	199.3		
Kephyrion obliquum												
Kephyrion sp.			8.7	548.5								
Mallomonas sp.									2.1	797.1		
Rhodomonas minuta	24.5	490.9	60.9	1,218.9	17.8	356.3	153.4	3,068.0	102.8	2,055.7	179.8	3,596.2
Subtotal	**73.6**	**21,108.0**	**87.1**	**6,178.8**	**50.5**	**7,116.8**	**177.9**	**12,149.4**	**134.3**	**12,500.0**	**197.5**	**10,434.9**
Diatoms												
Achnanthes clevei			2.9	435.3								
Achnanthes flexella												
Achnanthes hauckiana					3.0	142.5						
Achnanthes lanceolata												
Achnanthes lewisiana					3.0	371.1						
Achnanthes linearis	9.2	1,214.9	11.6	1,532.4	17.8	2,351.5					2.9	389.1
Achnanthes minutissima	12.3	613.6	23.2	1,393.1	17.8	890.7					2.9	147.4
Achnanthes peragalli												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla					11.9	1,971.5						
Anomoeoneis vitrea												

Appendix 3.6-2. Phytoplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, August 2010

Lake	Aim. Stn 11						Aim. Stn 6					
Date	15-Aug-10						14-Aug-10					
Replicate	1		2		3		1		2		3	
Taxa	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL
Diatoms *(cont'd)*												
Asterionella formosa	12.3	11,609.4	2.9	1,277.0	11.9	14,370.2	9.2	3,442.3	12.6	20,767.0	8.8	3,891.0
Caloneis sp.												
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula												
Cyclotella comta	3.1	6,964.4	11.6	39,527.8	3.0	6,739.8	9.2	20,893.3	10.5	23,808.6	14.7	33,456.5
Cyclotella meneghiniana												
Cyclotella ocellata	15.3	1,917.5	14.5	1,813.9	3.0	371.1	3.1	383.5	4.2	524.4	5.9	736.9
Cyclotella stelligera	6.1	337.5	11.6	638.5	17.8	979.8			2.1	115.4	8.8	486.4
Cymatopleura solea												
Cymbella affinis												
Cymbella cesatii												
Cymbella mexicana												
Cymbella microcephala												
Cymbella minuta	6.1	2,270.3			11.9	4,394.2						
Cymbella naviculiformis												
Cymbella sinuata												
Cymbella sp.												
Diatoma tenue												
Diatoma tenue elongatum					5.9	8,550.9						
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica												
Diploneis puella												
Epithemia sorex												
Epithemia turgida												
Eunotia elegans									2.1	461.5		
Eunotia pectinalis											2.9	2,122.4
Eunotia sp.												
Fragilaria construens												
Fragilaria construens venter	3.1	147.3			5.9	285.0						
Fragilaria crotonensis												
Fragilaria pinnata					5.9	356.3						
Fragilaria vaucheriae	12.3	3,534.4			8.9	3,847.9						
Gomphonema acuminatum												
Gomphonema angustatum												
Gomphonema clevei												
Gomphonema gracile												
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum												
Gomphonema ventricosum												
Gyrosigma spencerii												
Melosira granulata			2.9	1,596.2								
Melosira italica	3.1	14,450.4	2.9	2,733.9	17.8	21,815.5	9.2	34,681.0			2.9	5,553.5
Navicula anglica												
Navicula capitata												
Navicula contenta biceps												
Navicula cryptocephala							3.1	567.6				
Navicula cascadensis												
Navicula cryptocephala veneta	6.1	582.9										
Navicula cryptocephala venter					3.0	356.0						
Navicula decussis												
Navicula graciloides												
Navicula gregaria												
Navicula menisculus upsaliensis	3.1	628.9										
Navicula minima	6.1	270.0					3.1	135.0				
Navicula minuscula												
Navicula mutica												
Navicula pseudoscutiformis	6.1	1,073.8	2.9	507.9								
Navicula pupula	3.1	828.4										
Navicula rhynchocephala												
Navicula seminulum												

Appendix 3.6-2. Phytoplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, August 2010

Lake	Aim. Stn 11						Aim. Stn 6					
Date	15-Aug-10						14-Aug-10					
Replicate	1		2		3		1		2		3	
Taxa	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL
Diatoms *(cont'd)*												
Navicula scutiformis												
Navicula sp.	3.1	460.2			3.0	445.4						
Navicula tripunctata												
Navicula viridula												
Neidium affine												
Nitzschia acicularis					3.0	831.3			6.3	1,762.0	5.9	1,650.7
Nitzschia amphibia	3.1	294.5										
Nitzschia capitellata	3.1	1,104.5							4.2	1,510.3	2.9	1,061.2
Nitzschia clausii												
Nitzschia communis												
Nitzschia constricta												
Nitzschia dissipata	3.1	825.3			11.9	3,194.7						
Nitzschia frustulum			17.4	2,089.6	5.9	712.6						
Nitzschia innominata												
Nitzschia linearis												
Nitzschia microcephala												
Nitzschia palea	3.1	552.2										
Nitzschia paleacea	6.1	601.3										
Nitzschia sp.					3.0	356.3						
Nitzschia tryblionella												
Pinnularia borealis												
Pinnularia sp.												
Stauroneis sp.												
Stephanodiscus astraea minutula	12.3	4,295.2	2.9	1,015.8	5.9	2,078.3	6.1	2,147.6	10.5	3,670.9		
Stephanodiscus hantzschii			5.8	696.5			3.1	368.2				
Surirella ovata												
Surirella sp.												
Synedra cyclopum												
Synedra delicatissima												
Synedra radians	18.4	6,626.9			11.9	4,275.4			4.2	1,510.3	8.8	3,183.5
Synedra rumpens	6.1	859.0	11.6	1,625.2								
Synedra tenera					3.0	890.7			2.1	629.3		
Synedra ulna												
Synedra sp.												
Tabellaria fenestrata												
Tabellaria flocculosa	3.1	1,810.1			5.9	3,503.5			2.1	1,237.6		
Subtotal	**168.7**	**63,873.3**	**124.8**	**56,882.9**	**201.9**	**84,082.3**	**46.0**	**62,618.4**	**60.8**	**55,997.4**	**67.8**	**52,678.6**
Dinoflagellata												
Glenodinium sp.	0.0	0.0	0.0	0.0	0.0	0.0	3.1	2,147.6	4.2	2,936.7	0.0	0.0
Subtotal	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**3.1**	**2,147.6**	**4.2**	**2,936.7**	**0.0**	**0.0**
Euglenoidea												
Euglena sp.												
Trachelomonas charkowensis												
Trachelomonas hispida												
Trachelomonas pulchella												
Trachelomonas volvocina									2.1	3,954.1		
Subtotal	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2.1**	**3,954.1**	**0.0**	**0.0**
Unidentified												
Unidentified flagellate	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
TOTAL	**282**	**92,833**	**316**	**87,524**	**303**	**126,442**	**276**	**89,741**	**254**	**87,106**	**304**	**71,211**

Appendix 3.6-2. Phytoplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, August 2010

Lake	Windy Deep						Ref. B Deep					
Date	21-Aug-10						24-Aug-10					
Replicate	1		2		3		1		2		3	
Taxa	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL
Cyanophyta												
Anabaena flos-aquae												
Anabaena planctonica												
Anabaena sp.							1.4	978.2				
Aphanothece sp.											1.7	410.0
Aphanizomenon flos-aquae	54.3	61,601.3	42.4	53,393.6	50.8	64,055.1						
Chroococcus minimus												
Oscillatoria sp.												
Subtotal	**54.3**	**61,601.3**	**42.4**	**53,393.6**	**50.8**	**64,055.1**	**1.4**	**978.2**	**0.0**	**0.0**	**1.7**	**410.0**
Chlorophyta												
Ankistrodesmus falcatus			1.0	25.2	1.5	36.3	1.4	36.0	9.7	291.0	1.7	42.7
Botryococcus braunii												
Chlamydomonas sp.									1.6	525.4		
Cladophora sp.												
Closteriopsis longissima												
Closterium sp.												
Cosmarium sp.												
Crucigenia quadrata											1.7	145.2
Crucigenia tetrapedia												
Desmidium sp.												
Elakatothrix gelatinosa							2.9	483.4			6.8	287.0
Gloeocystis ampla												
Mougeotia sp.												
Oocystis lacustris									1.6	995.8		
Oocystis parva												
Oocystis pusilla							4.3	932.2	3.2	1,047.5	5.1	913.3
Pediastrum boryanum												
Pediastrum duplex												
Pediastrum sp.												
Quadrigula closterioides							2.9	207.2	1.6	155.2	5.1	1,599.0
Scenedesmus denticulatus												
Scenedesmus quadricauda												
Selenastrum minutum												
Sphaerocystis schroeteri							4.3	1,661.6	3.2	2,715.7	6.8	2,391.7
Spirogyra sp.												
Staurastrum sp.												
Tetraedron minimum												
Tetraedron regulare												
Tetraedron sp.												
Ulothrix sp.												
Subtotal	**0.0**	**0.0**	**1.0**	**25.2**	**1.5**	**36.3**	**15.8**	**3,320.3**	**21.0**	**5,730.4**	**27.3**	**5,378.9**
Chrysophyta												
Chrysococcus rufescens												
Cryptomonas erosa	1.3	656.9	1.0	524.7			15.8	8,228.8	14.5	7,565.2	12.0	6,218.3
Dinobryon bavaricum												
Dinobryon sertularia												
Kephyrion littorale							1.4	136.7	1.6	153.6	6.8	649.2
Kephyrion obliquum							2.9	417.2	1.6	234.4		
Kephyrion sp.							8.6	543.8	9.7	611.0	10.3	645.8
Mallomonas sp.												
Rhodomonas minuta							97.8	1,956.5	106.7	2,133.8	104.2	2,084.2
Subtotal	**1.3**	**656.9**	**1.0**	**524.7**	**0.0**	**0.0**	**126.6**	**11,282.9**	**134.2**	**10,697.9**	**133.3**	**9,597.4**
Diatoms												
Achnanthes clevei												
Achnanthes flexella												
Achnanthes hauckiana												
Achnanthes lanceolata					5.8	1,045.8						
Achnanthes lewisiana												
Achnanthes linearis	1.3	166.8							1.6	213.4		
Achnanthes minutissima	5.1	252.7	3.0	151.3			2.9	143.9	1.6	80.8		
Achnanthes peragalli												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla	11.4	1,887.4	3.0	502.5	5.8	1,157.3						
Anomoeoneis vitrea												

Appendix 3.6-2. Phytoplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, August 2010

Lake	Windy Deep						Ref. B Deep					
Date	21-Aug-10						24-Aug-10					
Replicate	1		2		3		1		2		3	
Taxa	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL
Diatoms *(cont'd)*												
Asterionella formosa												
Caloneis sp.												
Caloneis ventricosa												
Caloneis ventricosa minuta			3.0	847.5	1.5	406.7						
Cocconeis disculus	2.5	189.5	3.0	227.0								
Cocconeis placentula	1.3	581.1										
Cyclotella comta	16.4	37,280.1	15.1	34,354.7	17.4	39,566.0	4.3	9,796.8				
Cyclotella meneghiniana												
Cyclotella ocellata	18.9	2,368.7	10.1	1,261.2	20.3	2,541.9	8.6	1,078.9	11.3	1,414.4	18.8	2,349.0
Cyclotella stelligera									4.8	266.7	6.8	375.8
Cymatopleura solea					1.5	23,530.4						
Cymbella affinis												
Cymbella cesatii												
Cymbella mexicana												
Cymbella microcephala												
Cymbella minuta									1.6	598.1	1.7	1,264.2
Cymbella naviculiformis												
Cymbella sinuata												
Cymbella sp.												
Diatoma tenue												
Diatoma tenue elongatum												
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica			1.0	262.3								
Diploneis puella												
Epithemia sorex												
Epithemia turgida												
Eunotia elegans					1.5	319.5						
Eunotia pectinalis												
Eunotia sp.												
Fragilaria construens	1.3	283.0			1.5	1,626.8						
Fragilaria construens venter	3.8	236.5	7.1	576.3	11.6	948.2						
Fragilaria crotonensis												
Fragilaria pinnata	1.3	151.6	2.0	121.1	4.4	339.9						
Fragilaria vaucheriae												
Gomphonema acuminatum												
Gomphonema angustatum			1.0	181.6	1.5	261.4						
Gomphonema clevei												
Gomphonema gracile												
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum												
Gomphonema ventricosum												
Gyrosigma spencerii					1.5	653.6						
Melosira granulata												
Melosira italica												
Navicula anglica												
Navicula capitata	1.3	606.4	4.0	1,937.2	5.8	2,788.8						
Navicula contenta biceps												
Navicula cryptocephala												
Navicula cascadensis												
Navicula cryptocephala veneta	2.5	240.0	2.0	191.7	4.4	414.0						
Navicula cryptocephala venter												
Navicula decussis												
Navicula graciloides												
Navicula gregaria	1.3	221.1	2.0	353.1								
Navicula menisculus upsaliensis			1.0	206.8	1.5	297.8						
Navicula minima	1.3	55.6			1.5	63.9	2.9	126.6				
Navicula minuscula												
Navicula mutica												
Navicula pseudoscutiformis												
Navicula pupula									1.6	436.5		
Navicula rhynchocephala			1.0	297.6							1.7	504.0
Navicula seminulum												

Appendix 3.6-2. Phytoplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, August 2010

Lake	Windy Deep						Ref. B Deep					
Date	21-Aug-10						24-Aug-10					
Replicate	1		2		3		1		2		3	
Taxa	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL	Abundance cells/mL	Biovolume μm^3/mL
Diatoms *(cont'd)*												
Navicula scutiformis									1.6	452.6		
Navicula sp.			2.0	302.7								
Navicula tripunctata												
Navicula viridula	1.3	568.5										
Neidium affine												
Nitzschia acicularis												
Nitzschia amphibia												
Nitzschia capitellata												
Nitzschia clausii												
Nitzschia communis					1.5	65.4						
Nitzschia constricta												
Nitzschia dissipata					1.5	390.7						
Nitzschia frustulum	1.3	151.6			1.5	174.3	2.9	345.3				
Nitzschia innominata												
Nitzschia linearis												
Nitzschia microcephala												
Nitzschia palea												
Nitzschia paleacea	1.3	123.8									1.7	167.4
Nitzschia sp.					1.5	174.3						
Nitzschia tryblionella												
Pinnularia borealis												
Pinnularia sp.	1.3	505.3					1.4	575.4				
Stauroneis sp.					1.5	493.8						
Stephanodiscus astraea minutula												
Stephanodiscus hantzschii			1.0	121.1								
Surirella ovata					1.5	421.2						
Surirella sp.												
Synedra cyclopum												
Synedra delicatissima												
Synedra radians												
Synedra rumpens					2.9	406.7						
Synedra tenera												
Synedra ulna												
Synedra sp.												
Tabellaria fenestrata												
Tabellaria flocculosa											1.7	1,007.9
Subtotal	**74.5**	**45,869.6**	**61.5**	**41,895.8**	**98.8**	**78,088.5**	**23.0**	**12,066.9**	**24.2**	**3,462.5**	**32.5**	**5,668.3**
Dinoflagellata												
Glenodinium sp.	0.0	0.0	1.0	706.3	0.0	0.0	0.0	0.0	1.6	1,131.5	0.0	0.0
Subtotal	**0.0**	**0.0**	**1.0**	**706.3**	**0.0**	**0.0**	**0.0**	**0.0**	**1.6**	**1,131.5**	**0.0**	**0.0**
Euglenoidea												
Euglena sp.												
Trachelomonas charkowensis												
Trachelomonas hispida												
Trachelomonas pulchella												
Trachelomonas volvocina												
Subtotal	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Unidentified												
Unidentified flagellate	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
TOTAL	**130**	**108,128**	**107**	**96,545**	**151**	**142,180**	**167**	**27,648**	**181**	**21,022**	**195**	**21,055**

Appendix 3.6-2. Phytoplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, August 2010

Lake	Ref. D					
Date	11-Aug-10					
Replicate	1		2		3	
Taxa	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume um³/mL
Cyanophyta						
Anabaena flos-aquae						
Anabaena planctonica						
Anabaena sp.						
Aphanothece sp.			2.3	687.5		
Aphanizomenon flos-aquae						
Chroococcus minimus						
Oscillatoria sp.						
Subtotal	**0.0**	**0.0**	**2.3**	**687.5**	**0.0**	**0.0**
Chlorophyta						
Ankistrodesmus falcatus	5.2	130.5			2.7	68.6
Botryococcus braunii						
Chlamydomonas sp.	7.8	2,544.7	2.3	744.8	5.5	1,783.2
Cladophora sp.						
Closteriopsis longissima						
Closterium sp.						
Cosmarium sp.					2.7	576.1
Crucigenia quadrata			2.3	779.2		
Crucigenia tetrapedia	2.6	221.8				
Desmidium sp.					2.7	6,721.1
Elakatothrix gelatinosa						
Gloeocystis ampla						
Mougeotia sp.						
Oocystis lacustris						
Oocystis parva						
Oocystis pusilla						
Pediastrum boryanum						
Pediastrum duplex						
Pediastrum sp.						
Quadrigula closterioides						
Scenedesmus denticulatus			2.3	412.5		
Scenedesmus quadricauda			2.3	595.8		
Selenastrum minutum						
Sphaerocystis schroeteri						
Spirogyra sp.						
Staurastrum sp.						
Tetraedron minimum						
Tetraedron regulare						
Tetraedron sp.						
Ulothrix sp.						
Subtotal	**15.7**	**2,897.0**	**9.2**	**2,532.3**	**13.7**	**9,148.9**
Chrysophyta						
Chrysococcus rufescens					2.7	233.2
Cryptomonas erosa	18.3	9,500.2	13.8	7,150.0	16.5	8,559.1
Dinobryon bavaricum						
Dinobryon sertularia	2.6	313.2				
Kephyrion littorale	10.4	991.8	6.9	653.1	2.7	260.6
Kephyrion obliquum	2.6	378.4	4.6	664.6		
Kephyrion sp.	7.8	493.3	2.3	144.4	8.2	518.5
Mallomonas sp.					2.7	1,042.5
Rhodomonas minuta			2.3	45.8	2.7	54.9
Subtotal	**41.8**	**11,676.9**	**29.8**	**8,657.9**	**35.7**	**10,668.7**
Diatoms						
Achnanthes clevei						
Achnanthes flexella						
Achnanthes hauckiana						
Achnanthes lanceolata						
Achnanthes lewisiana						
Achnanthes linearis	28.7	3,789.7	32.1	4,235.0	16.5	2,172.7
Achnanthes minutissima	57.4	2,870.9	48.1	2,406.3	41.1	2,057.5
Achnanthes peragalli						
Amphipleura pellucida						
Amphora ovalis						
Amphora perpusilla	2.6	433.3				
Anomoeoneis vitrea						

Appendix 3.6-2. Phytoplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, August 2010

Lake	Ref. D					
Date	11-Aug-10					
Replicate	1		2		3	
Taxa	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume um³/mL
Diatoms *(cont'd)*						
Asterionella formosa					2.7	603.5
Caloneis sp.						
Caloneis ventricosa						
Caloneis ventricosa minuta						
Cocconeis disculus						
Cocconeis placentula						
Cyclotella comta					2.7	6,227.3
Cyclotella meneghiniana						
Cyclotella ocellata			2.3	286.5		
Cyclotella stelligera	54.8	3,014.5	55.0	3,025.0	79.6	4,375.6
Cymatopleura solea						
Cymbella affinis						
Cymbella cesatii						
Cymbella mexicana						
Cymbella microcephala						
Cymbella minuta	7.8	2,897.0	4.6	1,695.8	2.7	1,015.0
Cymbella naviculiformis						
Cymbella sinuata						
Cymbella sp.						
Diatoma tenue					5.5	1,591.1
Diatoma tenue elongatum	2.6	1,879.2	9.2	6,600.0	5.5	3,950.4
Diatoma vulgare	5.2	10,231.0	2.3	4,491.7	2.7	5,376.9
Diatomella balfouriana						
Diploneis elliptica						
Diploneis puella						
Epithemia sorex						
Epithemia turgida						
Eunotia elegans						
Eunotia pectinalis	2.6	1,879.2				
Eunotia sp.						
Fragilaria construens	2.6	1,461.6				
Fragilaria construens venter	2.6	125.3	2.3	440.0		
Fragilaria crotonensis						
Fragilaria pinnata	5.2	313.2	2.3	137.5	5.5	329.2
Fragilaria vaucheriae	5.2	1,503.3	11.5	3,300.0	8.2	2,370.2
Gomphonema acuminatum						
Gomphonema angustatum	2.6	469.8				
Gomphonema clevei						
Gomphonema gracile						
Gomphonema sp.						
Gomphonema subclavatum						
Gomphonema tenellum						
Gomphonema ventricosum						
Gyrosigma spencerii						
Melosira granulata						
Melosira italica						
Navicula anglica						
Navicula capitata						
Navicula contenta biceps						
Navicula cryptocephala						
Navicula cascadensis						
Navicula cryptocephala veneta					2.7	260.6
Navicula cryptocephala venter						
Navicula decussis						
Navicula graciloides						
Navicula gregaria						
Navicula menisculus upsaliensis						
Navicula minima						
Navicula minuscula						
Navicula mutica						
Navicula pseudoscutiformis			2.3	401.0		
Navicula pupula	2.6	704.7				
Navicula rhynchocephala						
Navicula seminulum						

Appendix 3.6-2. Phytoplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, August 2010

Lake	Ref. D					
Date	11-Aug-10					
Replicate	1		2		3	
Taxa	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume µm³/mL	Abundance cells/mL	Biovolume um³/mL
Diatoms *(cont'd)*						
Navicula scutiformis						
Navicula sp.					2.7	411.5
Navicula tripunctata						
Navicula viridula						
Neidium affine						
Nitzschia acicularis					2.7	768.1
Nitzschia amphibia						
Nitzschia capitellata					2.7	987.6
Nitzschia clausii						
Nitzschia communis						
Nitzschia constricta						
Nitzschia dissipata	2.6	702.1				
Nitzschia frustulum	5.2	626.4	2.3	275.0	2.7	329.2
Nitzschia innominata						
Nitzschia linearis						
Nitzschia microcephala						
Nitzschia palea	2.6	469.8	2.3	412.5	2.7	493.8
Nitzschia paleacea						
Nitzschia sp.					2.7	329.2
Nitzschia tryblionella						
Pinnularia borealis						
Pinnularia sp.					5.5	2,194.6
Stauroneis sp.						
Stephanodiscus astraea minutula						
Stephanodiscus hantzschii						
Surirella ovata						
Surirella sp.						
Synedra cyclopum						
Synedra delicatissima						
Synedra radians	7.8	2,818.8			2.7	987.6
Synedra rumpens	7.8	1,096.2	4.6	641.7	5.5	768.1
Synedra tenera						
Synedra ulna						
Synedra sp.						
Tabellaria fenestrata						
Tabellaria flocculosa	2.6	1,539.9	2.3	1,352.1		
Subtotal	**211.4**	**38,825.7**	**183.3**	**29,700.0**	**205.7**	**37,599.8**
Dinoflagellata						
Glenodinium sp.	5.2	3,653.9	2.3	1,604.2	2.7	1,920.3
Subtotal	**5.2**	**3,653.9**	**2.3**	**1,604.2**	**2.7**	**1,920.3**
Euglenoidea						
Euglena sp.						
Trachelomonas charkowensis						
Trachelomonas hispida						
Trachelomonas pulchella						
Trachelomonas volvocina						
Subtotal	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Unidentified						
Unidentified flagellate	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
TOTAL	**274**	**57,054**	**227**	**43,182**	**258**	**59,338**

Appendix 3.7-1

Periphyton Biomass Results, Hope Bay Belt Project, 2010

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Appendix 3.7-1. Periphyton Biomass Results, Hope Bay Belt Project, 2010

Site ID	Date Sampler Installed	Date Sampler Retrieved	Number of Days Immersed	Area sampled (cm^2)	ALS Sample ID	Chlorophyll *a* ($\mu g/cm^2$)	Mean	SE
Aim. NE IF	10-Aug-10	07-Sep-10	28	75	L940830-21	0.227	0.196	0.021
Aim. NE IF	10-Aug-10	07-Sep-10	28	75	L940830-20	0.207		
Aim. NE IF	10-Aug-10	07-Sep-10	28	75	L940830-22	0.156		
Aim R.	10-Aug-10	08-Sep-10	29	75	L940830-29	0.187	0.111	0.038
Aim R.	10-Aug-10	08-Sep-10	29	75	L940830-30	0.080		
Aim R.	10-Aug-10	08-Sep-10	29	75	L940830-31	0.066		
Stickleback OF	10-Aug-10	08-Sep-10	29	75	L940830-27	0.165	0.161	0.002
Stickleback OF	10-Aug-10	08-Sep-10	29	75	L940830-28	0.161		
Stickleback OF	10-Aug-10	08-Sep-10	29	75	L940830-26	0.157		
Trout OF	10-Aug-10	08-Sep-10	29	75	L940830-23	0.180	0.132	0.027
Trout OF	10-Aug-10	08-Sep-10	29	75	L940830-24	0.129		
Trout OF	10-Aug-10	08-Sep-10	29	75	L940830-25	0.086		
AWRd	10-Aug-10	07-Sep-10	28	75	L940830-18	0.048	0.041	0.005
AWRd	10-Aug-10	07-Sep-10	28	75	L940830-17	0.043		
AWRd	10-Aug-10	07-Sep-10	28	75	L940830-19	0.032		
AWRc	10-Aug-10	07-Sep-10	28	75	L940830-16	0.164	0.084	0.043
AWRc	10-Aug-10	07-Sep-10	28	75	L940830-15	0.069		
AWRc	10-Aug-10	07-Sep-10	28	75	L940830-14	0.019		
Aim. OF	10-Aug-10	08-Sep-10	29	75	L940830-34	0.731	0.440	0.155
Aim. OF	10-Aug-10	08-Sep-10	29	75	L940830-32	0.389		
Aim. OF	10-Aug-10	08-Sep-10	29	75	L940830-33	0.201		
Koig. R.	10-Aug-10	08-Sep-10	29	75	L940830-36	0.423	0.285	0.069
Koig. R.	10-Aug-10	08-Sep-10	29	75	L940830-35	0.229		
Koig. R.	10-Aug-10	08-Sep-10	29	75	L940830-37	0.203		
Koig. U/S	10-Aug-10	07-Sep-10	28	75	L940830-10	0.233	0.216	0.021
Koig. U/S	10-Aug-10	07-Sep-10	28	75	L940830-9	0.199		
Koig. D/S	10-Aug-10	07-Sep-10	28	75	L940830-13	0.015	0.010	0.002
Koig. D/S	10-Aug-10	07-Sep-10	28	75	L940830-11	0.009		
Koig. D/S	10-Aug-10	07-Sep-10	28	75	L940830-12	0.007		
AWRb	10-Aug-10	07-Sep-10	28	75	L940830-5	0.528	0.283	0.123
AWRb	10-Aug-10	07-Sep-10	28	75	L940830-3	0.183		
AWRb	10-Aug-10	07-Sep-10	28	75	L940830-4	0.137		
AWRa	10-Aug-10	07-Sep-10	28	75	L940830-2	0.212	0.197	0.021
AWRa	10-Aug-10	07-Sep-10	28	75	L940830-1	0.181		
Ref B OF	09-Aug-10	07-Sep-10	29	75	L940830-7	0.052	0.036	0.015
Ref B OF	09-Aug-10	07-Sep-10	29	75	L940830-6	0.050		
Ref B OF	09-Aug-10	07-Sep-10	29	75	L940830-8	0.006		
Ref D OF	10-Aug-10	09-Sep-10	30	75	L940830-38	0.312	0.217	0.021
Ref D OF	10-Aug-10	09-Sep-10	30	75	L940830-39	0.121		

SE = standard error of the mean

Appendix 3.7-2

Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2010

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Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site ID	Aim. NE IF						Aim. R.					
Date (Installation to Retrieval)	10-Aug-10 to 7-Sep-10						10-Aug-10 to 8-Sep-10					
Replicate	1		2		3		1		2		3	
Taxa	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)
Cyanophyta												
Anabaena flos-aquae	-	-	484.9	324,914.0	-	-	-	-	-	-	-	-
Anabaena sp.	-	-	-	-	-	-	-	-	-	-	-	-
Aphanothece sp.	-	-	484.9	43,645.2	-	-	1,405.0	84,299.1	152.9	45,864.4	-	-
Oscillatoria sp.	1,658.1	1,028,014.7	-	-	-	-	-	-	-	-	-	-
Subtotal	**1,658**	**1,028,015**	**970**	**368,559**	**0**	**0**	**1,405**	**84,299**	**153**	**45,864**	**0**	**0**
Chrysophyta												
Chrysococcus rufescens	1,658.1	140,937.5	1,939.8	164,881.7	-	-	-	-	-	-	-	-
Kephyrion littorale	-	-	-	-	-	-	-	-	152.9	14,523.7	-	-
Kephyrion sp.	-	-	-	-	-	-	1,405.0	88,514.0	152.9	9,631.5	-	-
Subtotal	**1,658**	**140,938**	**1,940**	**164,882**	**0**	**0**	**1,405**	**88,514**	**306**	**24,155**	**0**	**0**
Cryptophyta												
Cryptomonas erosa	-	-	-	-	1,708.3	888,333.3	2,810.0	1,461,183.8	152.9	79,498.3	-	-
Rhodomonas minuta	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**0**	**0**	**1,708**	**888,333**	**2,810**	**1,461,184**	**153**	**79,498**	**0**	**0**
Diatoms												
Achnanthes clevei	-	-	-	-	-	-	-	-	-	-	-	-
Achnanthes flexella	-	-	-	-	-	-	702.5	340,708.7	-	-	-	-
Achnanthes hauckiana	-	-	-	-	-	-	-	-	-	-	-	-
Achnanthes lanceolata	-	-	-	-	-	-	-	-	-	-	-	-
Achnanthes linearis	3,316.2	437,735.3	1,454.8	192,038.7	2,562.5	338,250.0	1,405.0	185,457.9	-	-	-	-
Achnanthes minutissima	63,007.4	3,150,367.6	16,973.1	848,655.9	23,062.5	1,153,125.0	9,132.4	547,943.9	1,223.1	61,152.5	762.6	38,128.0
Amphora ovalis	-	-	-	-	-	-	-	-	-	-	-	-
Amphora perpusilla	-	-	-	-	-	-	-	-	-	-	-	-
Anomoeoneis vitrea	-	-	-	-	-	-	-	-	-	-	217.9	26,144.9
Asterionella formosa	-	-	-	-	-	-	-	-	-	-	-	-
Caloneis sp.	-	-	-	-	-	-	-	-	-	-	-	-
Caloneis ventricosa	-	-	-	-	-	-	-	-	-	-	108.9	26,689.6
Caloneis ventricosa minuta	-	-	-	-	-	-	702.5	393,395.6	-	-	-	-
Cocconeis placentula	-	-	-	-	-	-	-	-	-	-	-	-
Cyclotella comta	-	-	-	-	-	-	-	-	-	-	-	-
Cyclotella meneghiniana	-	-	-	-	854.2	649,166.7	-	-	-	-	-	-
Cyclotella ocellata	-	-	-	-	-	-	-	-	-	-	-	-
Cyclotella stelligera	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella affinis	1,658.1	2,984,558.8	-	-	-	-	702.5	1,264,486.0	-	-	-	-
Cymbella cesatii	-	-	-	-	-	-	1,405.0	259,922.1	-	-	-	-
Cymbella mexicana	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella microcephala	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella minuta	29,845.6	11,042,867.6	7,759.1	3,157,969.9	17,937.5	6,636,875.0	1,405.0	519,844.2	917.3	339,396.6	871.5	322,454.1
Cymbella naviculiformis	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella sinuata	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella sp.	-	-	-	-	-	-	-	-	-	-	-	-
Diatoma tenue	3,316.2	961,691.2	1,939.8	562,537.6	854.2	247,708.3	2,107.5	611,168.2	2,446.1	709,369.5	1,198.3	382,260.6
Diatoma tenue elongatum	-	-	-	-	-	-	2,107.5	5,614,317.8	458.6	330,223.7	435.7	470,608.7
Diatoma vulgare	-	-	484.9	950,494.6	-	-	-	-	-	-	-	-
Diploneis puella	-	-	-	-	-	-	-	-	-	-	-	-
Epithemia sorex	-	-	-	-	-	-	-	-	-	-	-	-
Epithemia turgida	-	-	-	-	-	-	-	-	-	-	-	-
Eunotia elegans	-	-	-	-	-	-	-	-	-	-	-	-
Eunotia pectinalis	-	-	-	-	-	-	1,405.0	1,517,383.2	152.9	110,074.6	108.9	78,434.8
Eunotia sp.	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria construens	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria construens venter	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria crotonensis	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria pinnata	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria vaucheriae	6,632.4	2,292,141.2	1,454.8	418,993.5	-	-	4,215.0	1,456,687.9	611.5	176,119.3	435.7	188,243.5
Gomphonema angustatum	3,316.2	596,911.8	-	-	-	-	-	-	-	-	-	-
Gomphonema clevei	-	-	-	-	-	-	-	-	-	-	-	-
Gomphonema gracile	-	-	-	-	-	-	-	-	-	-	-	-
Gomphonema sp.	-	-	-	-	-	-	-	-	152.9	30,576.3	-	-
Gomphonema subclavatum	-	-	484.9	290,967.7	-	-	-	-	-	-	-	-
Gomphonema tenellum	-	-	-	-	-	-	-	-	-	-	-	-
Melosira italica	-	-	-	-	-	-	-	-	-	-	-	-
Navicula capitata	-	-	-	-	-	-	-	-	-	-	-	-
Navicula contenta biceps	-	-	-	-	-	-	-	-	-	-	-	-
Navicula cryptocephala	1,658.1	306,746.3	484.9	89,715.1	1,708.3	316,041.7	-	-	-	-	-	-
Navicula cascadensis	-	-	-	-	-	-	-	-	-	-	-	-
Navicula cryptocephala veneta	-	-	484.9	46,069.9	1,708.3	162,291.7	-	-	-	-	108.9	10,349.0
Navicula decussis	-	-	-	-	-	-	-	-	-	-	-	-
Navicula graciloides	-	-	-	-	-	-	-	-	-	-	-	-

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site ID	Aim. NE IF						Aim. R.					
Date (Installation to Retrieval)	10-Aug-10 to 7-Sep-10						10-Aug-10 to 8-Sep-10					
Replicate	1		2		3		1		2		3	
Taxa	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)
Diatoms *(cont'd)*	-	-	-	-	-	-	-	-	-	-	-	-
Navicula gregaria	-	-	-	-	-	-	-	-	-	-	-	-
Navicula menisculus upsaliensis	-	-	-	-	-	-	-	-	-	-	-	-
Navicula minima	-	-	-	-	1,708.3	75,166.7	-	-	-	-	-	-
Navicula minuscula	-	-	-	-	854.2	38,437.5	-	-	-	-	-	-
Navicula pseudoscutiformis	-	-	-	-	-	-	-	-	-	-	-	-
Navicula pupula	-	-	-	-	-	-	-	-	-	-	-	-
Navicula rhynchocephala	1,658.1	489,136.0	-	-	-	-	-	-	-	-	-	-
Navicula sp.	-	-	484.9	72,741.9	-	-	702.5	105,373.8	-	-	-	-
Navicula tripunctata	-	-	-	-	-	-	-	-	-	-	-	-
Navicula viridula	-	-	-	-	-	-	-	-	-	-	-	-
Neidium affine	-	-	-	-	-	-	-	-	-	-	108.9	934,681.2
Nitzschia acicularis	3,316.2	928,529.4	484.9	135,784.9	2,562.5	717,500.0	-	-	-	-	108.9	30,502.4
Nitzschia amphibia	-	-	-	-	-	-	-	-	-	-	108.9	10,458.0
Nitzschia capitellata	-	-	-	-	-	-	1,405.0	505,794.4	305.8	110,074.6	217.9	78,434.8
Nitzschia clausii	-	-	-	-	-	-	702.5	224,797.5	-	-	-	-
Nitzschia communis	-	-	-	-	-	-	702.5	31,612.1	-	-	-	-
Nitzschia constricta	3,316.2	2,885,073.5	-	-	-	-	1,405.0	1,629,781.9	-	-	108.9	63,183.6
Nitzschia dissipata	1,658.1	446,025.7	-	-	-	-	-	-	-	-	-	-
Nitzschia frustulum	28,187.5	4,397,250.0	2,909.7	418,993.5	11,104.2	1,465,750.0	9,834.9	1,888,299.1	1,528.8	201,803.4	980.4	129,417.4
Nitzschia innominata	-	-	-	-	-	-	702.5	33,719.6	-	-	-	-
Nitzschia linearis	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia microcephala	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia palea	-	-	-	-	854.2	153,750.0	702.5	126,448.6	-	-	108.9	19,608.7
Nitzschia paleacea	1,658.1	162,492.6	969.9	95,049.5	1,708.3	167,416.7	702.5	68,844.2	-	-	-	-
Nitzschia sp.	-	-	484.9	58,193.5	-	-	702.5	84,299.1	-	-	-	-
Nitzschia tryblionella	-	-	-	-	-	-	-	-	-	-	-	-
Pinnularia sp.	-	-	-	-	-	-	-	-	-	-	108.9	43,574.9
Stauroneis sp.	-	-	-	-	-	-	702.5	238,847.4	-	-	-	-
Stephanodiscus astraea minutula	-	-	-	-	-	-	-	-	-	-	-	-
Surirella ovata	-	-	-	-	-	-	-	-	-	-	-	-
Surirella sp.	-	-	-	-	-	-	-	-	-	-	-	-
Synedra cyclopum	-	-	-	-	-	-	-	-	-	-	-	-
Synedra radians	-	-	969.9	349,161.3	-	-	7,024.9	2,528,972.0	611.5	220,149.2	435.7	156,869.6
Synedra rumpens	4,974.3	696,397.1	2,424.7	339,462.4	5,125.0	717,500.0	2,107.5	295,046.7	1,375.9	192,630.5	1,307.2	183,014.5
Synedra tenera	1,658.1	994,852.9	-	-	-	-	-	-	152.9	45,864.4	326.8	98,043.5
Synedra ulna	-	-	484.9	965,043.0	-	-	-	-	-	-	-	-
Synedra sp.	-	-	-	-	-	-	-	-	-	-	-	-
Tabellaria fenestrata	-	-	-	-	-	-	-	-	-	-	-	-
Tabellaria flocculosa	1,658.1	978,272.1	484.9	286,118.3	1,708.3	1,007,916.7	8,429.9	14,423,570.1	1,834.6	2,164,800.0	1,198.3	2,262,407.7
Subtotal	**160,835**	**33,751,049**	**41,220**	**9,277,991**	**74,313**	**13,846,896**	**61,117**	**34,896,722**	**11,772**	**4,692,235**	**9,369**	**5,553,509**
Chlorophyta												
Ankistrodesmus falcatus	6,632.4	165,808.8	3,394.6	84,865.6	9,395.8	234,895.8	2,107.5	52,686.9	2,599.0	64,974.6	435.7	10,893.7
Chlamydomonas sp.	3,316.2	1,077,757.4	969.9	315,215.1	2,562.5	832,812.5	-	-	-	-	-	-
Cladophora sp.	-	-	-	-	-	-	-	-	-	-	-	-
Closteriopsis longissima	-	-	484.9	172,640.9	-	-	-	-	-	-	-	-
Closterium sp.	-	-	-	-	-	-	-	-	152.9	290,474.6	-	-
Cosmarium sp.	1,658.1	348,198.5	-	-	-	-	2,107.5	442,570.1	917.3	192,630.5	435.7	91,507.2
Desmidium sp.	1,658.1	580,330.9	484.9	169,731.2	854.2	896,875.0	-	-	152.9	53,508.5	108.9	38,128.0
Gloeocystis ampla	-	-	-	-	-	-	-	-	-	-	-	-
Mougeotia sp.	1,658.1	2,347,852.9	-	-	-	-	-	-	-	-	-	-
Oocystis pusilla	-	-	484.9	104,748.4	-	-	-	-	-	-	-	-
Pediastrum duplex	1,658.1	225,500.0	-	-	-	-	-	-	-	-	-	-
Scenedesmus denticulatus	-	-	-	-	-	-	702.5	126,448.6	-	-	217.9	39,217.4
Scenedesmus quadricauda	18,239.0	4,742,132.4	484.9	126,086.0	854.2	222,083.3	-	-	-	-	108.9	28,323.7
Selenastrum minutum	1,658.1	33,161.8	-	-	-	-	-	-	-	-	-	-
Spirogyra sp.	-	-	-	-	-	-	-	-	-	-	-	-
Staurastrum sp.	-	-	-	-	854.2	410,000.0	702.5	168,598.1	152.9	36,691.5	-	-
Ulothrix sp.	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**36,478**	**9,520,743**	**6,304**	**973,287**	**14,521**	**2,596,667**	**5,620**	**790,304**	**3,975**	**638,280**	**1,307**	**208,070**
Euglenoidea												
Trachelomonas charkowensis	-	-	-	-	-	-	-	-	152.9	4,127.8	-	-
Trachelomonas hispida	-	-	-	-	-	-	-	-	-	-	-	-
Trachelomonas pulchella	-	-	-	-	-	-	-	-	-	-	-	-
Trachelomonas volvocina	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**153**	**4,128**	**0**	**0**
Dinoflagellata												
Glenodinium sp.	-	-	-	-	-	-	-	-	-	-	108.9	76,256.0
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**109**	**76,256**
TOTAL	**200,629**	**44,440,744**	**50,434**	**10,784,719**	**90,542**	**17,331,896**	**72,357**	**37,321,023**	**16,511**	**5,484,160**	**10,785**	**5,837,836**

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site ID	Stickleback OF						Trout OF					
Date (Installation to Retrieval)	10-Aug-10 to 8-Sep-10						10-Aug-10 to 8-Sep-10					
Replicate	1		2		3		1		2		3	
Taxa	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)
Cyanophyta												
Anabaena flos-aquae	-	-	-	-	-	-	-	-	-	-	-	-
Anabaena sp.	-	-	-	-	-	-	-	-	-	-	-	-
Aphanothece sp.	-	-	-	-	-	-	-	-	-	-	-	-
Oscillatoria sp.	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Chrysophyta												
Chrysococcus rufescens	394.2	33,509.6	359.1	30,521.5	-	-	-	-	-	-	-	-
Kephyrion littorale	-	-	-	-	-	-	-	-	-	-	-	-
Kephyrion sp.	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**394**	**33,510**	**359**	**30,521**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Cryptophyta												
Cryptomonas erosa	-	-	1,256.8	653,519.1	-	-	-	-	-	-	-	-
Rhodomonas minuta	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**1,257**	**653,519**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Diatoms												
Achnanthes clevei	-	-	-	-	-	-	-	-	-	-	-	-
Achnanthes flexella	-	-	-	-	-	-	-	-	-	-	-	-
Achnanthes hauckiana	-	-	-	-	-	-	-	-	-	-	-	-
Achnanthes lanceolata	-	-	-	-	-	-	-	-	-	-	-	-
Achnanthes linearis	1,576.9	208,153.8	-	-	1,281.3	169,125.0	18,008.7	2,377,145.8	13,009.6	1,717,269.2	35,559.6	4,693,869.2
Achnanthes minutissima	6,701.9	335,096.2	897.7	44,884.6	2,242.2	112,109.4	51,677.1	3,100,625.0	18,528.8	1,111,730.8	46,834.6	2,341,730.8
Amphora ovalis	-	-	-	-	-	-	-	-	-	-	-	-
Amphora perpusilla	788.5	130,884.6	-	-	640.6	106,343.8	1,566.0	389,927.1	-	-	-	-
Anomoeoneis vitrea	-	-	-	-	-	-	-	-	-	-	-	-
Asterionella formosa	-	-	-	-	-	-	-	-	394.2	86,730.8	-	-
Caloneis sp.	-	-	-	-	-	-	-	-	-	-	-	-
Caloneis ventricosa	-	-	718.2	175,947.5	-	-	-	-	-	-	-	-
Caloneis ventricosa minuta	-	-	-	-	-	-	-	-	-	-	-	-
Cocconeis placentula	-	-	-	-	-	-	-	-	-	-	-	-
Cyclotella comta	-	-	-	-	-	-	-	-	-	-	-	-
Cyclotella meneghiniana	-	-	-	-	-	-	-	-	-	-	-	-
Cyclotella ocellata	-	-	-	-	-	-	-	-	-	-	-	-
Cyclotella stelligera	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella affinis	-	-	359.1	646,337.6	-	-	-	-	-	-	-	-
Cymbella cesatii	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella mexicana	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella microcephala	-	-	179.5	9,515.5	-	-	-	-	-	-	-	-
Cymbella minuta	4,730.8	1,750,384.6	1,436.3	531,433.1	3,523.4	1,303,671.9	3,914.9	1,738,229.2	2,759.6	1,021,057.7	1,734.6	641,807.7
Cymbella naviculiformis	-	-	179.5	215,445.9	-	-	-	-	-	-	-	-
Cymbella sinuata	-	-	-	-	-	-	783.0	109,618.1	-	-	-	-
Cymbella sp.	-	-	-	-	-	-	-	-	-	-	-	-
Diatoma tenue	5,913.5	2,229,375.0	538.6	156,198.2	8,648.4	3,009,656.3	1,566.0	681,197.9	394.2	114,326.9	-	-
Diatoma tenue elongatum	-	-	538.6	387,802.5	-	-	-	-	-	-	-	-
Diatoma vulgare	-	-	-	-	-	-	-	-	-	-	-	-
Diploneis puella	-	-	-	-	-	-	-	-	-	-	-	-
Epithemia sorex	788.5	898,846.2	-	-	-	-	-	-	-	-	-	-
Epithemia turgida	-	-	-	-	-	-	-	-	-	-	-	-
Eunotia elegans	-	-	-	-	-	-	-	-	-	-	-	-
Eunotia pectinalis	-	-	718.2	620,484.1	320.3	230,625.0	-	-	788.5	567,692.3	867.3	1,248,923.1
Eunotia sp.	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria construens	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria construens venter	394.2	37,846.2	718.2	34,471.3	640.6	46,125.0	-	-	-	-	-	-
Fragilaria crotonensis	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria pinnata	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria vaucheriae	-	-	-	-	960.9	359,775.0	-	-	394.2	113,538.5	-	-
Gomphonema angustatum	1,576.9	283,846.2	-	-	8,007.8	2,162,109.4	4,697.9	1,099,312.5	1,576.9	425,769.2	6,938.5	1,998,276.9
Gomphonema clevei	-	-	-	-	640.6	57,656.3	-	-	-	-	-	-
Gomphonema gracile	-	-	-	-	-	-	-	-	-	-	-	-
Gomphonema sp.	-	-	179.5	35,907.6	-	-	-	-	-	-	-	-
Gomphonema subclavatum	-	-	-	-	1,601.6	960,937.5	783.0	939,583.3	-	-	-	-
Gomphonema tenellum	-	-	-	-	-	-	783.0	164,427.1	394.2	82,788.5	-	-
Melosira italica	394.2	371,365.4	-	-	-	-	-	-	-	-	-	-
Navicula capitata	-	-	-	-	-	-	-	-	-	-	-	-
Navicula contenta biceps	-	-	-	-	-	-	-	-	-	-	-	-
Navicula cryptocephala	394.2	72,932.7	359.1	66,429.1	320.3	59,257.8	-	-	-	-	-	-
Navicula cascadensis	-	-	-	-	-	-	-	-	-	-	-	-
Navicula cryptocephala veneta	-	-	538.6	51,168.4	-	-	-	-	-	-	-	-
Navicula decussis	-	-	-	-	-	-	-	-	-	-	-	-
Navicula graciloides	-	-	179.5	78,099.1	-	-	-	-	-	-	-	-

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site ID	Stickleback OF						Trout OF					
Date (Installation to Retrieval)	10-Aug-10 to 8-Sep-10						10-Aug-10 to 8-Sep-10					
Replicate	1		2		3		1		2		3	
Taxa	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)
Diatoms *(cont'd)*	-	-	-	-	-	-	-	-	-	-	-	-
Navicula gregaria	-	-	-	-	-	-	-	-	-	-	-	-
Navicula menisculus upsaliensis	-	-	-	-	-	-	-	-	-	-	-	-
Navicula minima	-	-	-	-	-	-	-	-	-	-	-	-
Navicula minuscula	-	-	-	-	-	-	-	-	-	-	-	-
Navicula pseudoscutiformis	-	-	-	-	-	-	-	-	-	-	-	-
Navicula pupula	-	-	-	-	-	-	-	-	-	-	-	-
Navicula rhynchocephala	-	-	179.5	52,963.8	-	-	-	-	-	-	-	-
Navicula sp.	-	-	-	-	-	-	-	-	-	-	-	-
Navicula tripunctata	-	-	179.5	201,082.8	-	-	-	-	-	-	-	-
Navicula viridula	-	-	179.5	80,792.2	-	-	-	-	-	-	-	-
Neidium affine	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia acicularis	788.5	220,769.2	-	-	320.3	89,687.5	-	-	788.5	220,769.2	-	-
Nitzschia amphibia	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia capitellata	-	-	179.5	64,633.8	-	-	783.0	281,875.0	-	-	-	-
Nitzschia clausii	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia communis	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia constricta	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia dissipata	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia frustulum	3,153.8	454,153.8	718.2	86,178.3	320.3	38,437.5	1,566.0	187,916.7	788.5	94,615.4	1,734.6	312,230.8
Nitzschia innominata	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia linearis	-	-	538.6	820,848.7	-	-	-	-	-	-	-	-
Nitzschia microcephala	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia palea	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia paleacea	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia sp.	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia tryblionella	-	-	-	-	-	-	-	-	-	-	-	-
Pinnularia sp.	394.2	157,692.3	538.6	215,445.9	640.6	512,500.0	783.0	313,194.4	-	-	-	-
Stauroneis sp.	394.2	134,038.5	179.5	61,043.0	-	-	-	-	-	-	-	-
Stephanodiscus astraea minutula	-	-	-	-	-	-	-	-	-	-	-	-
Surirella ovata	-	-	-	-	-	-	-	-	-	-	-	-
Surirella sp.	-	-	-	-	-	-	-	-	-	-	-	-
Synedra cyclopum	-	-	-	-	-	-	-	-	-	-	-	-
Synedra radians	-	-	179.5	64,633.8	320.3	115,312.5	-	-	-	-	-	-
Synedra rumpens	8,278.8	1,159,038.5	4,668.0	653,519.1	2,882.8	403,593.8	5,480.9	844,059.0	1,971.2	275,961.5	5,203.8	874,246.2
Synedra tenera	-	-	-	-	-	-	-	-	-	-	-	-
Synedra ulna	394.2	784,519.2	-	-	-	-	1,566.0	3,116,284.7	-	-	-	-
Synedra sp.	-	-	-	-	-	-	-	-	-	-	-	-
Tabellaria fenestrata	-	-	-	-	-	-	-	-	-	-	-	-
Tabellaria flocculosa	-	-	-	-	-	-	-	-	394.2	232,596.2	-	-
Subtotal	**36,663**	**9,228,942**	**15,081**	**5,355,266**	**33,313**	**9,736,923**	**93,958**	**15,343,396**	**42,183**	**6,064,846**	**98,873**	**12,111,085**
Chlorophyta												
Ankistrodesmus falcatus	394.2	9,855.8	-	-	-	-	-	-	-	-	-	-
Chlamydomonas sp.	-	-	-	-	-	-	-	-	-	-	-	-
Cladophora sp.	394.2	1,340,384.6	179.5	610,429.9	-	-	-	-	-	-	-	-
Closteriopsis longissima	-	-	-	-	-	-	-	-	-	-	-	-
Closterium sp.	-	-	-	-	-	-	-	-	-	-	-	-
Cosmarium sp.	-	-	-	-	-	-	-	-	-	-	-	-
Desmidium sp.	-	-	-	-	-	-	-	-	-	-	-	-
Gloeocystis ampla	-	-	-	-	-	-	-	-	-	-	-	-
Mougeotia sp.	-	-	179.5	190,669.6	-	-	-	-	-	-	-	-
Oocystis pusilla	-	-	-	-	-	-	783.0	84,562.5	-	-	-	-
Pediastrum duplex	-	-	-	-	-	-	-	-	-	-	-	-
Scenedesmus denticulatus	-	-	-	-	-	-	-	-	-	-	-	-
Scenedesmus quadricauda	-	-	-	-	-	-	-	-	-	-	-	-
Selenastrum minutum	-	-	-	-	-	-	-	-	-	-	-	-
Spirogyra sp.	-	-	-	-	-	-	-	-	-	-	-	-
Staurastrum sp.	-	-	-	-	-	-	-	-	-	-	-	-
Ulothrix sp.	-	-	-	-	-	-	-	-	-	-	867.3	138,769.2
Subtotal	**788**	**1,350,240**	**359**	**801,100**	**0**	**0**	**3,132**	**847,974**	**8,279**	**2,572,356**	**6,071**	**1,830,019**
Euglenoidea												
Trachelomonas charkowensis	-	-	-	-	-	-	-	-	-	-	-	-
Trachelomonas hispida	-	-	179.5	377,030.3	-	-	-	-	-	-	-	-
Trachelomonas pulchella	-	-	-	-	-	-	-	-	-	-	-	-
Trachelomonas volvocina	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**180**	**377,030**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Dinoflagellata												
Glenodinium sp.	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL	**37,846**	**10,612,692**	**17,236**	**7,217,436**	**33,313**	**9,736,923**	**97,090**	**16,191,370**	**50,461**	**8,637,202**	**104,944**	**13,941,104**

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site ID	AWRd						AWRc					
Date (Installation to Retrieval)	10-Aug-10 to 7-Sep-10						10-Aug-10 to 7-Sep-10					
Replicate	1		2		3		1		2		3	
Taxa	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)
Cyanophyta												
Anabaena flos-aquae	-	-	-	-	-	-	-	-	-	-	-	-
Anabaena sp.	-	-	-	-	-	-	-	-	-	-	-	-
Aphanothece sp.	-	-	-	-	-	-	-	-	-	-	-	-
Oscillatoria sp.	-	-	-	-	-	-	34.2	63,550.0	-	-	-	-
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**34**	**63,550**	**0**	**0**	**0**	**0**
Chrysophyta												
Chrysococcus rufescens	-	-	146.4	12,446.4	-	-	34.2	2,904.2	425.5	36,165.1	563.8	47,918.8
Kephyrion littorale	-	-	-	-	-	-	-	-	-	-	-	-
Kephyrion sp.	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**146**	**12,446**	**0**	**0**	**34**	**2,904**	**425**	**36,165**	**564**	**47,919**
Cryptophyta												
Cryptomonas erosa	76.2	39,614.9	73.2	38,071.4	-	-	-	-	-	-	-	-
Rhodomonas minuta	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**76**	**39,615**	**73**	**38,071**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Diatoms												
Achnanthes clevei	-	-	-	-	-	-	-	-	-	-	-	-
Achnanthes flexella	-	-	-	-	-	-	-	-	-	-	-	-
Achnanthes hauckiana	-	-	-	-	-	-	34.2	1,640.0	-	-	-	-
Achnanthes lanceolata	-	-	-	-	-	-	-	-	-	-	-	-
Achnanthes linearis	-	-	-	-	-	-	375.8	49,610.0	425.5	56,162.3	845.6	111,622.5
Achnanthes minutissima	-	-	-	-	-	-	615.0	30,750.0	2,340.1	117,004.7	704.7	35,234.4
Amphora ovalis	-	-	-	-	-	-	-	-	-	-	-	-
Amphora perpusilla	-	-	-	-	-	-	-	-	-	-	-	-
Anomoeoneis vitrea	-	-	-	-	-	-	-	-	-	-	-	-
Asterionella formosa	-	-	-	-	-	-	-	-	-	-	-	-
Caloneis sp.	-	-	-	-	-	-	-	-	106.4	25,528.3	422.8	131,917.5
Caloneis ventricosa	-	-	-	-	-	-	-	-	106.4	26,060.1	-	-
Caloneis ventricosa minuta	-	-	-	-	80.0	22,390.1	-	-	-	-	-	-
Cocconeis placentula	-	-	-	-	-	-	-	-	-	-	-	-
Cyclotella comta	-	-	-	-	-	-	-	-	-	-	-	-
Cyclotella meneghiniana	-	-	-	-	-	-	-	-	-	-	-	-
Cyclotella ocellata	-	-	-	-	-	-	-	-	-	-	-	-
Cyclotella stelligera	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella affinis	-	-	73.2	131,785.7	80.0	143,936.2	-	-	-	-	-	-
Cymbella cesatii	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella mexicana	-	-	73.2	402,678.6	-	-	-	-	106.4	585,023.6	-	-
Cymbella microcephala	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella minuta	-	-	219.6	81,267.9	159.9	59,173.8	-	-	850.9	314,849.1	1,268.4	563,186.3
Cymbella naviculiformis	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella sinuata	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella sp.	76.2	26,663.9	73.2	25,625.0	-	-	-	-	-	-	-	-
Diatoma tenue	-	-	-	-	-	-	341.7	118,900.0	106.4	30,846.7	-	-
Diatoma tenue elongatum	76.2	383,959.5	-	-	-	-	-	-	106.4	76,584.9	281.9	202,950.0
Diatoma vulgare	-	-	-	-	-	-	-	-	-	-	-	-
Diploneis puella	-	-	-	-	-	-	-	-	-	-	-	-
Epithemia sorex	-	-	-	-	-	-	-	-	-	-	-	-
Epithemia turgida	-	-	-	-	-	-	-	-	-	-	-	-
Eunotia elegans	-	-	-	-	-	-	34.2	7,516.7	425.5	93,603.8	281.9	62,012.5
Eunotia pectinalis	152.4	109,702.7	732.1	843,428.6	719.7	518,170.2	205.0	250,920.0	638.2	459,509.4	1,691.3	1,461,240.0
Eunotia sp.	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria construens	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria construens venter	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria crotonensis	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria pinnata	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria vaucheriae	-	-	-	-	80.0	23,029.8	34.2	9,840.0	-	-	281.9	81,180.0
Gomphonema angustatum	304.7	82,277.0	146.4	52,714.3	80.0	14,393.6	307.5	55,350.0	531.8	114,877.4	563.8	121,770.0
Gomphonema clevei	-	-	-	-	-	-	-	-	-	-	-	-
Gomphonema gracile	-	-	-	-	-	-	-	-	-	-	281.9	69,059.4
Gomphonema sp.	-	-	-	-	80.0	31,985.8	-	-	-	-	-	-
Gomphonema subclavatum	76.2	91,418.9	73.2	43,928.6	-	-	-	-	531.8	478,655.7	281.9	169,125.0
Gomphonema tenellum	-	-	-	-	-	-	-	-	-	-	-	-
Melosira italica	-	-	-	-	-	-	-	-	-	-	-	-
Navicula capitata	-	-	-	-	-	-	-	-	-	-	-	-
Navicula contenta biceps	-	-	-	-	-	-	34.2	2,733.3	-	-	-	-
Navicula cryptocephala	-	-	-	-	80.0	29,586.9	68.3	12,641.7	106.4	19,678.1	-	-
Navicula cascadensis	-	-	-	-	-	-	-	-	-	-	-	-
Navicula cryptocephala veneta	-	-	-	-	-	-	-	-	-	-	-	-
Navicula decussis	-	-	-	-	-	-	-	-	-	-	-	-
Navicula graciloides	-	-	-	-	-	-	68.3	29,725.0	-	-	-	-

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site ID	AWRd						AWRc					
Date (Installation to Retrieval)	10-Aug-10 to 7-Sep-10						10-Aug-10 to 7-Sep-10					
Replicate	1		2		3		1		2		3	
Taxa	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)
Diatoms *(cont'd)*	-	-	-	-	-	-	-	-	-	-	-	-
Navicula gregaria	-	-	-	-	159.9	27,987.6	102.5	17,937.5	-	-	-	-
Navicula menisculus upsaliensis	-	-	-	-	-	-	-	-	-	-	-	-
Navicula minima	-	-	-	-	-	-	-	-	106.4	4,680.2	-	-
Navicula minuscula	-	-	-	-	-	-	-	-	-	-	-	-
Navicula pseudoscutiformis	-	-	-	-	-	-	-	-	-	-	-	-
Navicula pupula	-	-	-	-	-	-	-	-	-	-	140.9	38,053.1
Navicula rhynchocephala	-	-	-	-	-	-	-	-	-	-	-	-
Navicula sp.	-	-	-	-	-	-	-	-	-	-	-	-
Navicula tripunctata	-	-	-	-	-	-	34.2	38,266.7	-	-	281.9	315,700.0
Navicula viridula	-	-	-	-	80.0	35,984.0	-	-	-	-	-	-
Neidium affine	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia acicularis	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia amphibia	152.4	14,627.0	-	-	-	-	-	-	-	-	-	-
Nitzschia capitellata	-	-	585.7	210,857.1	479.8	172,723.4	-	-	-	-	1,127.5	405,900.0
Nitzschia clausii	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia communis	-	-	-	-	-	-	-	-	-	-	422.8	19,026.6
Nitzschia constricta	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia dissipata	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia frustulum	-	-	439.3	52,714.3	159.9	19,191.5	273.3	32,800.0	531.8	76,584.9	2,677.8	321,337.5
Nitzschia innominata	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia linearis	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia microcephala	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia palea	-	-	73.2	13,178.6	80.0	80.0	-	-	-	-	-	-
Nitzschia paleacea	304.7	29,863.5	292.9	28,700.0	-	-	-	-	319.1	31,272.2	281.9	27,623.8
Nitzschia sp.	-	-	73.2	8,785.7	-	-	-	-	-	-	422.8	50,737.5
Nitzschia tryblionella	-	-	-	-	80.0	42,381.2	-	-	-	-	-	-
Pinnularia sp.	-	-	73.2	29,285.7	-	-	170.8	68,333.3	212.7	127,641.5	140.9	56,375.0
Stauroneis sp.	-	-	-	-	-	-	-	-	-	-	-	-
Stephanodiscus astraea minutula	-	-	-	-	-	-	-	-	-	-	-	-
Surirella ovata	-	-	-	-	-	-	-	-	-	-	-	-
Surirella sp.	-	-	-	-	-	-	-	-	-	-	-	-
Synedra cyclopum	-	-	-	-	-	-	-	-	-	-	-	-
Synedra radians	2,514.0	1,086,056.8	658.9	237,214.3	2,079.1	748,468.1	205.0	73,800.0	3,829.2	1,378,528.3	281.9	101,475.0
Synedra rumpens	304.7	42,662.2	-	-	-	-	170.8	23,916.7	1,063.7	148,915.1	986.6	138,118.8
Synedra tenera	-	-	-	-	-	-	-	-	212.7	63,820.8	140.9	42,281.3
Synedra ulna	76.2	151,603.0	-	-	479.8	954,776.6	34.2	67,991.7	106.4	211,672.2	281.9	560,931.3
Synedra sp.	-	-	-	-	-	-	-	-	-	-	-	-
Tabellaria fenestrata	152.4	365,675.7	146.4	351,428.6	159.9	767,659.6	68.3	164,000.0	319.1	1,301,943.4	704.7	2,367,750.0
Tabellaria flocculosa	152.4	89,895.3	292.9	172,785.7	639.7	754,865.2	273.3	322,533.3	957.3	2,428,698.8	563.8	565,441.3
Subtotal	**4,342**	**2,474,405**	**4,027**	**2,686,379**	**5,757**	**4,366,784**	**3,451**	**1,379,206**	**14,041**	**8,172,141**	**15,362**	**8,020,048**
Chlorophyta												
Ankistrodesmus falcatus	-	-	-	-	-	-	-	-	-	-	140.9	3,523.4
Chlamydomonas sp.	-	-	-	-	-	-	-	-	-	-	140.9	45,804.7
Cladophora sp.	-	-	439.3	3,733,928.6	639.7	2,718,794.3	-	-	-	-	-	-
Closteriopsis longissima	-	-	-	-	-	-	-	-	-	-	-	-
Closterium sp.	-	-	-	-	-	-	-	-	-	-	281.9	535,562.5
Cosmarium sp.	-	-	-	-	-	-	-	-	-	-	-	-
Desmidium sp.	-	-	-	-	-	-	-	-	-	-	-	-
Gloeocystis ampla	-	-	-	-	-	-	-	-	-	-	-	-
Mougeotia sp.	228.5	202,264.4	73.2	103,671.4	239.9	297,228.2	34.2	48,380.0	-	-	-	-
Oocystis pusilla	-	-	-	-	-	-	-	-	-	-	-	-
Pediastrum duplex	-	-	-	-	-	-	-	-	-	-	-	-
Scenedesmus denticulatus	-	-	-	-	-	-	-	-	-	-	-	-
Scenedesmus quadricauda	-	-	-	-	-	-	-	-	-	-	-	-
Selenastrum minutum	-	-	-	-	-	-	-	-	-	-	-	-
Spirogyra sp.	-	-	-	-	-	-	-	-	-	-	-	-
Staurastrum sp.	-	-	-	-	-	-	-	-	-	-	-	-
Ulothrix sp.	76.2	73135.1	-	80.0	25,588.7	-	-	-	212.7	85,094.3	-	-
Subtotal	**305**	**275,399**	**513**	**3,837,680**	**26,468**	**3,016,023**	**34**	**48,380**	**213**	**85,094**	**564**	**584,891**
Euglenoidea												
Trachelomonas charkowensis	-	-	-	-	-	-	-	-	-	-	-	-
Trachelomonas hispida	-	-	-	-	-	-	-	-	-	-	-	-
Trachelomonas pulchella	-	-	-	-	-	-	34.2	68,333.3	-	-	140.9	281,875.0
Trachelomonas volvocina	-	-	-	-	-	-	-	-	-	-	422.8	797,001.6
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**34**	**68,333**	**0**	**0**	**564**	**1,078,877**
Dinoflagellata												
Glenodinium sp.	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL	**4,723**	**2,789,420**	**4,759**	**6,574,576**	**32,226**	**7,382,806**	**3,588**	**1,562,373**	**14,679**	**8,293,401**	**17,053**	**9,731,734**

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site ID	Aim. OF		Koig. R.						Koig. U/S			
Date (Installation to Retrieval)	10-Aug-10 to 8-Sep-10		10-Aug-10 to 8-Sep-10						10-Aug-10 to 7-Sep-10			
Replicate	3		1		2		3		1		2	
Taxa	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)
Cyanophyta												
Anabaena flos-aquae	-	-	-	-	-	-	-	-	-	-	-	-
Anabaena sp.	3,822.0	2,598,983.1	-	-	2,398.9	3,262,553.2	1,555.2	2,115,034.5	-	-	-	-
Aphanothece sp.	-	-	-	-	-	-	-	-	-	-	-	-
Oscillatoria sp.	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**3,822**	**2,598,983**	**0**	**0**	**2,399**	**3,262,553**	**1,555**	**2,115,034**	**0**	**0**	**0**	**0**
Chrysophyta												
Chrysococcus rufescens	-	-	-	-	-	-	-	-	-	-	-	-
Kephyrion littorale	-	-	-	-	-	-	-	-	-	-	-	-
Kephyrion sp.	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Cryptophyta												
Cryptomonas erosa	-	-	-	-	-	-	-	-	-	-	-	-
Rhodomonas minuta	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Diatoms												
Achnanthes clevei	1,911.0	286,652.5	-	-	-	-	-	-	-	-	-	-
Achnanthes flexella	-	-	-	-	2,398.9	1,163,484.0	-	-	-	-	-	-
Achnanthes hauckiana	-	-	268.5	12,885.7	-	-	4,665.5	223,944.8	-	-	-	-
Achnanthes lanceolata	-	-	-	-	-	-	-	-	-	-	1,879.2	338,250.0
Achnanthes linearis	3,822.0	504,508.5	536.9	70,871.4	4,797.9	633,319.1	-	-	939.6	124,025.0	-	-
Achnanthes minutissima	28,665.3	1,433,262.7	13,422.6	805,357.1	59,973.4	3,598,404.3	34,213.8	1,710,689.7	85,502.1	4,702,614.6	35,704.2	1,785,208.3
Amphora ovalis	-	-	-	-	2,398.9	1,386,585.1	-	-	-	-	-	-
Amphora perpusilla	-	-	536.9	89,126.2	-	-	1,555.2	258,158.6	1,879.2	311,941.7	-	-
Anomoeoneis vitrea	-	-	-	-	-	-	-	-	-	-	-	-
Asterionella formosa	5,733.1	2,522,542.4	-	-	-	-	3,110.3	1,026,413.8	-	-	-	-
Caloneis sp.	-	-	-	-	-	-	-	-	-	-	3,758.3	902,000.0
Caloneis ventricosa	-	-	-	-	-	-	-	-	-	-	-	-
Caloneis ventricosa minuta	-	-	-	-	2,398.9	671,702.1	1,555.2	435,448.3	-	-	-	-
Cocconeis placentula	-	-	-	-	-	-	-	-	-	-	-	-
Cyclotella comta	1,911.0	4,338,008.5	-	-	-	-	-	-	-	-	1,879.2	4,265,708.3
Cyclotella meneghiniana	-	-	-	-	-	-	-	-	-	-	-	-
Cyclotella ocellata	1,911.0	238,877.1	-	-	-	-	-	-	-	-	-	-
Cyclotella stelligera	-	-	-	-	2,398.9	131,941.5	-	-	-	-	-	-
Cymbella affinis	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella cesatii	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella mexicana	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella microcephala	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella minuta	7,644.1	2,828,305.1	1,879.2	764,820.8	16,792.6	6,213,244.7	7,775.9	2,877,069.0	939.6	347,645.8	22,550.0	8,343,500.0
Cymbella naviculiformis	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella sinuata	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella sp.	-	-	-	-	-	-	-	-	-	-	-	-
Diatoma tenue	13,377.1	4,267,300.8	1,342.3	700,660.7	19,191.5	5,565,531.9	9,331.0	3,247,200.0	-	-	16,912.5	4,904,625.0
Diatoma tenue elongatum	3,822.0	2,751,864.4	-	-	-	-	-	-	-	-	-	-
Diatoma vulgare	-	-	-	-	2,398.9	4,701,914.9	-	-	-	-	-	-
Diploneis puella	-	-	-	-	-	-	1,555.2	404,344.8	-	-	-	-
Epithemia sorex	-	-	-	-	-	-	-	-	-	-	-	-
Epithemia turgida	-	-	-	-	-	-	-	-	-	-	-	-
Eunotia elegans	-	-	-	-	2,398.9	527,766.0	1,555.2	342,137.9	-	-	-	-
Eunotia pectinalis	-	-	-	-	2,398.9	1,727,234.0	3,110.3	2,239,448.3	-	-	1,879.2	1,353,000.0
Eunotia sp.	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria construens	-	-	-	-	2,398.9	3,761,531.9	3,110.3	1,219,255.2	-	-	-	-
Fragilaria construens venter	1,911.0	366,915.3	268.5	38,657.1	-	-	-	-	-	-	-	-
Fragilaria crotonensis	-	-	-	-	-	-	1,555.2	2,612,689.7	-	-	-	-
Fragilaria pinnata	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria vaucheriae	-	-	1,073.8	371,108.6	16,792.6	4,836,255.3	7,775.9	2,239,448.3	-	-	-	-
Gomphonema angustatum	-	-	268.5	48,321.4	-	-	1,555.2	279,931.0	3,758.3	1,150,050.0	62,012.5	11,162,250.0
Gomphonema clevei	-	-	-	-	-	-	-	-	-	-	-	-
Gomphonema gracile	1,911.0	468,199.2	-	-	2,398.9	587,739.4	3,110.3	762,034.5	-	-	-	-
Gomphonema sp.	-	-	268.5	53,690.5	-	-	-	-	-	-	1,879.2	375,833.3
Gomphonema subclavatum	-	-	-	-	-	-	-	-	939.6	563,750.0	3,758.3	2,255,000.0
Gomphonema tenellum	-	-	-	-	-	-	-	-	-	-	-	-
Melosira italica	5,733.1	10,801,067.8	268.5	252,882.1	-	-	-	-	-	-	-	-
Navicula capitata	-	-	-	-	-	-	-	-	-	-	-	-
Navicula contenta biceps	-	-	-	-	-	-	-	-	-	-	-	-
Navicula cryptocephala	-	-	-	-	4,797.9	887,606.4	1,555.2	287,706.9	939.6	173,822.9	-	-
Navicula cascadensis	-	-	-	-	-	-	-	-	-	-	-	-
Navicula cryptocephala veneta	1,911.0	181,546.6	268.5	25,503.0	2,398.9	227,898.9	1,555.2	147,741.4	2,818.8	267,781.3	5,637.5	535,562.5
Navicula decussis	-	-	-	-	-	-	-	-	939.6	180,400.0	-	-
Navicula graciloides	-	-	-	-	-	-	-	-	3,758.3	1,634,875.0	11,275.0	4,904,625.0

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site ID	Aim. OF	Koig. R.						Koig. U/S			
Date (Installation to Retrieval)	10-Aug-10 to 8-Sep-10	10-Aug-10 to 8-Sep-10						10-Aug-10 to 7-Sep-10			
Replicate	3	1		2		3		1		2	
Taxa	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)
Diatoms *(cont'd)*	-	-	-	-	-	-	-	-	-	-	-	-
Navicula gregaria	1,911.0	334,428.0	-	-	-	-	-	-	-	-	3,758.3	657,708.3
Navicula menisculus upsaliensis	-	-	-	-	-	-	-	-	-	-	-	-
Navicula minima	-	-	268.5	11,811.9	-	-	-	-	-	-	-	-
Navicula minuscula	-	-	-	-	-	-	-	-	-	-	-	-
Navicula pseudoscutiformis	-	-	268.5	46,979.2	-	-	-	-	-	-	1,879.2	328,854.2
Navicula pupula	-	-	-	-	-	-	-	-	-	-	1,879.2	507,375.0
Navicula rhynchocephala	-	-	-	-	-	-	-	-	-	-	1,879.2	554,354.2
Navicula sp.	-	-	-	-	-	-	-	-	1,879.2	422,812.5	1,879.2	281,875.0
Navicula tripunctata	-	-	-	-	-	-	-	-	-	-	-	-
Navicula viridula	-	-	-	-	2,398.9	1,079,521.3	-	-	-	-	-	-
Neidium affine	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia acicularis	1,911.0	535,084.7	268.5	75,166.7	2,398.9	671,702.1	-	-	-	-	-	-
Nitzschia amphibia	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia capitellata	5,733.1	2,063,898.3	805.4	289,928.6	4,797.9	1,727,234.0	6,220.7	2,239,448.3	-	-	1,879.2	676,500.0
Nitzschia clausii	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia communis	-	-	-	-	-	-	-	-	939.6	42,281.3	-	-
Nitzschia constricta	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia dissipata	1,911.0	514,063.6	268.5	72,213.7	-	-	4,665.5	1,255,024.1	-	-	11,275.0	3,032,975.0
Nitzschia frustulum	1,911.0	229,322.0	2,147.6	257,714.3	16,792.6	2,015,106.4	13,996.6	1,679,586.2	2,818.8	439,725.0	9,395.8	1,127,500.0
Nitzschia innominata	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia linearis	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia microcephala	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia palea	1,911.0	343,983.1	268.5	48,321.4	-	-	-	-	939.6	169,125.0	3,758.3	676,500.0
Nitzschia paleacea	5,733.1	561,839.0	268.5	26,308.3	4,797.9	470,191.5	-	-	-	-	-	-
Nitzschia sp.	1,911.0	229,322.0	-	-	-	-	-	-	-	-	-	-
Nitzschia tryblionella	-	-	-	-	-	-	-	-	-	-	-	-
Pinnularia sp.	3,822.0	1,528,813.6	-	-	-	-	-	-	939.6	375,833.3	3,758.3	1,503,333.3
Stauroneis sp.	-	-	-	-	2,398.9	815,638.3	-	-	-	-	-	-
Stephanodiscus astraea minutula	1,911.0	668,855.9	-	-	-	-	-	-	-	-	-	-
Surirella ovata	-	-	-	-	-	-	-	-	-	-	3,758.3	1,089,916.7
Surirella sp.	-	-	-	-	-	-	-	-	-	-	1,879.2	939,583.3
Synedra cyclopum	1,911.0	1,614,809.3	-	-	-	-	-	-	-	-	-	-
Synedra radians	-	-	-	-	2,398.9	863,617.0	1,555.2	559,862.1	-	-	-	-
Synedra rumpens	1,911.0	267,542.4	2,147.6	300,666.7	28,787.2	4,030,212.8	10,886.2	1,524,069.0	2,818.8	513,012.5	3,758.3	526,166.7
Synedra tenera	-	-	-	-	2,398.9	719,680.9	3,110.3	933,103.4	939.6	281,875.0	-	-
Synedra ulna	3,822.0	7,605,847.5	-	-	-	-	-	-	-	-	-	-
Synedra sp.	-	-	-	-	-	-	-	-	-	-	-	-
Tabellaria fenestrata	-	-	-	-	-	-	-	-	-	-	-	-
Tabellaria flocculosa	30,576.3	43,296,000.0	1,610.7	1,710,578.6	21,590.4	26,750,537.2	13,996.6	10,735,355.2	939.6	1,108,708.3	16,912.5	9,978,375.0
Subtotal	**147,148**	**90,782,860**	**28,724**	**6,073,574**	**235,096**	**75,300,207**	**143,076**	**39,240,110**	**114,629**	**12,810,279**	**236,775**	**63,006,579**
Chlorophyta												
Ankistrodesmus falcatus	-	-	-	-	2,398.9	239,893.6	3,110.3	77,758.6	-	-	-	-
Chlamydomonas sp.	-	-	-	-	-	-	-	-	-	-	-	-
Cladophora sp.	-	-	-	-	-	-	-	-	-	-	-	-
Closteriopsis longissima	-	-	-	-	-	-	-	-	-	-	-	-
Closterium sp.	-	-	-	-	-	-	-	-	-	-	-	-
Cosmarium sp.	-	-	-	-	-	-	-	-	-	-	-	-
Desmidium sp.	1,911.0	668,855.9	-	-	-	-	-	-	-	-	-	-
Gloeocystis ampla	-	-	-	-	-	-	-	-	-	-	-	-
Mougeotia sp.	-	-	-	-	-	-	-	-	-	-	-	-
Oocystis pusilla	-	-	-	-	-	-	-	-	-	-	-	-
Pediastrum duplex	-	-	-	-	-	-	-	-	-	-	-	-
Scenedesmus denticulatus	-	-	-	-	-	-	-	-	-	-	-	-
Scenedesmus quadricauda	1,911.0	496,864.4	-	-	-	-	1,555.2	404,344.8	-	-	-	-
Selenastrum minutum	-	-	-	-	-	-	-	-	-	-	-	-
Spirogyra sp.	-	-	-	-	-	-	-	-	-	-	-	-
Staurastrum sp.	-	-	-	-	-	-	-	-	-	-	-	-
Ulothrix sp.	3,822.0	917,288.1	-	-	7,196.8	3,051,446.8	1,555.2	746,482.8	-	-	-	-
Subtotal	**7,644**	**2,083,008**	**0**	**0**	**9,596**	**3,291,340**	**6,221**	**1,228,586**	**0**	**0**	**0**	**0**
Euglenoidea												
Trachelomonas charkowensis	-	-	-	-	-	-	-	-	-	-	-	-
Trachelomonas hispida	-	-	-	-	-	-	-	-	-	-	-	-
Trachelomonas pulchella	-	-	-	-	-	-	-	-	-	-	-	-
Trachelomonas volvocina	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Dinoflagellata												
Glenodinium sp.	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL	**158,614**	**95,464,852**	**28,724**	**6,073,574**	**247,090**	**82,319,495**	**150,852**	**42,583,731**	**114,629**	**12,810,279**	**236,775**	**63,006,579**

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site ID	Koig. D/S				AWRb						AWRa			
Date (Installation to Retrieval)	10-Aug-10 to 7-Sep-10				10-Aug-10 to 7-Sep-10						10-Aug-10 to 7-Sep-10			
Replicate	1		2		1		2		3		1		2	
Taxa	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)
Cyanophyta														
Anabaena flos-aquae	-	-	-	-	-	-	-	-	-		-	-	-	-
Anabaena sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aphanothece sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oscillatoria sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Chrysophyta														
Chrysococcus rufescens	-	-	-	-	-	-	-	-	-	-	2,285.5	194,265.2	8,752.3	743,944.1
Kephyrion littorale	-	-	-	-	-	-	-	-	-	-	-	-	514.8	48,909.8
Kephyrion sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2,285**	**194,265**	**9,267**	**792,854**
Cryptophyta														
Cryptomonas erosa	-	-	-	-	225.0	117,025.9	-	-	-	-	-	-	-	-
Rhodomonas minuta	-	-	-	-	225.0	4,501.0	-	-	379.0	7,579.8	76.2	1,523.6	-	-
Subtotal	**0**	**0**	**0**	**0**	**450**	**121,527**	**0**	**0**	**379**	**7,580**	**76**	**1,524**	**0**	**0**
Diatoms														
Achnanthes clevei	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Achnanthes flexella	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Achnanthes hauckiana	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Achnanthes lanceolata	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Achnanthes linearis	-	-	157.7	20,815.4	450.1	59,413.2	50,209.0	6,627,585.9	2,273.9	300,161.3	76.2	10,056.1	1,029.7	135,917.8
Achnanthes minutissima	1,261.0	63,051.0	157.7	7,884.6	2,925.6	146,282.4	26,425.8	1,321,289.1	5,684.9	312,668.1	-	-	1,544.5	77,226.0
Amphora ovalis	-	-	78.8	45,573.1	-	-	-	-	-	-	-	-	514.8	297,577.6
Amphora perpusilla	-	-	-	-	-	-	-	-	-	-	-	-	514.8	85,463.5
Anomoeoneis vitrea	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Asterionella formosa	-	-	78.8	17,346.2	-	-	-	-	379.0	83,378.2	-	-	-	-
Caloneis sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caloneis ventricosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caloneis ventricosa minuta	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cocconeis placentula	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyclotella comta	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyclotella meneghiniana	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyclotella ocellata	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyclotella stelligera	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella affinis	-	-	-	-	-	-	-	-	379.0	1,364,369.7	-	-	-	-
Cymbella cesatii	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella mexicana	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella microcephala	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella minuta	-	-	157.7	58,346.2	2,475.5	1,099,143.7	1,761.7	651,835.9	1,516.0	560,907.6	-	-	-	-
Cymbella naviculiformis	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella sinuata	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cymbella sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diatoma tenue	2,077.0	843,251.3	394.2	114,326.9	-	-	880.9	255,449.2	2,273.9	659,445.4	990.4	344,649.3	10,811.6	3,135,376.7
Diatoma tenue elongatum	-	-	78.8	113,538.5	-	-	-	-	-	-	228.5	164,554.1	2,059.4	1,482,739.7
Diatoma vulgare	-	-	-	-	225.0	882,195.6	-	-	-	-	-	-	1,544.5	3,027,260.3
Diploneis puella	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Epithemia sorex	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Epithemia turgida	-	-	-	-	-	-	-	-	-	-	-	-	2,059.4	##########
Eunotia elegans	-	-	-	-	-	-	-	-	379.0	83,378.2	-	-	514.8	113,264.8
Eunotia pectinalis	-	-	-	-	675.1	486,107.8	-	-	379.0	272,873.9	-	-	-	-
Eunotia sp.	-	-	-	-	-	-	-	-	758.0	341,092.4	-	-	-	-
Fragilaria construens	-	-	-	-	-	-	-	-	-	-	-	-	514.8	57,662.1
Fragilaria construens venter	-	-	-	-	-	-	-	-	-	-	-	-	1,029.7	49,424.7
Fragilaria crotonensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria pinnata	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fragilaria vaucheriae	-	-	78.8	22,707.7	2,250.5	648,143.7	880.9	253,687.5	3,031.9	873,196.6	-	-	-	-
Gomphonema angustatum	148.4	26,703.9	-	-	900.2	162,035.9	12,332.0	2,663,718.8	758.0	204,655.5	76.2	13,712.8	1,029.7	185,342.5
Gomphonema clevei	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gomphonema gracile	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gomphonema sp.	74.2	14,835.5	-	-	-	-	-	-	379.0	75,798.3	-	-	-	-
Gomphonema subclavatum	-	-	-	-	450.1	270,059.9	880.9	1,057,031.3	-	-	-	-	-	-
Gomphonema tenellum	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Melosira italica	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Navicula capitata	-	-	78.8	37,846.2	-	-	-	-	-	-	-	-	514.8	247,123.3
Navicula contenta biceps	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Navicula cryptocephala	-	-	-	-	-	-	-	-	379.0	70,113.4	-	-	-	-
Navicula cascadensis	-	-	-	-	-	-	-	-	379.0	22,739.5	-	-	-	-
Navicula cryptocephala veneta	741.8	70,468.8	709.6	67,413.5	-	-	-	-	379.0	36,004.2	-	-	6,692.9	635,827.6
Navicula decussis	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Navicula graciloides	74.2	32,267.3	394.2	171,490.4	-	-	-	-	-	-	-	-	2,059.4	895,821.9

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site ID	Koig. D/S				AWRb						AWRa			
Date (Installation to Retrieval)	10-Aug-10 to 7-Sep-10				10-Aug-10 to 7-Sep-10						10-Aug-10 to 7-Sep-10			
Replicate	1		2		1		2		3		1		2	
Taxa	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)
Diatoms *(cont'd)*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Navicula gregaria	741.8	129,810.9	1,103.8	193,173.1	-	-	-	-	-	-	-	-	-	-
Navicula menisculus upsaliensis	-	-	78.8	16,163.5	-	-	-	-	-	-	-	-	-	-
Navicula minima	74.2	3,263.8	-	-	-	-	-	-	-	-	-	-	1,544.5	88,346.6
Navicula minuscula	-	-	78.8	3,548.1	-	-	-	-	-	-	-	-	-	-
Navicula pseudoscutiformis	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Navicula pupula	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Navicula rhynchocephala	-	-	-	-	-	-	-	-	-	-	-	-	2,059.4	607,511.4
Navicula sp.	74.2	11,126.6	78.8	11,826.9	-	-	-	-	-	-	-	-	1,029.7	154,452.1
Navicula tripunctata	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Navicula viridula	-	-	-	-	-	-	-	-	-	-	76.2	34,282.1	1,544.5	695,034.2
Neidium affine	-	-	-	-	-	-	-	-	-	-	-	-	514.8	4,417,328.8
Nitzschia acicularis	74.2	20,769.7	-	-	-	-	-	-	-	-	76.2	21,331.1	-	-
Nitzschia amphibia	-	-	78.8	7,569.2	-	-	-	-	-	-	-	-	-	-
Nitzschia capitellata	74.2	26,703.9	-	-	225.0	162,035.9	-	-	-	-	76.2	27,425.7	-	-
Nitzschia clausii	74.2	23,736.8	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia communis	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia constricta	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia dissipata	-	-	-	-	-	-	-	-	-	-	-	-	1,544.5	415,476.0
Nitzschia frustulum	593.4	71,210.5	157.7	18,923.1	1,800.4	259,257.5	880.9	105,703.1	2,273.9	272,873.9	-	-	7,207.8	864,931.5
Nitzschia innominata	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia linearis	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitzschia microcephala	-	-	-	-	450.1	45,010.0	-	-	-	-	-	-	514.8	51,484.0
Nitzschia palea	222.5	21,808.2	-	-	-	-	880.9	158,554.7	1,137.0	204,655.5	-	-	1,544.5	278,013.7
Nitzschia paleacea	-	-	-	-	225.0	22,054.9	-	-	379.0	37,141.2	-	-	3,089.0	302,726.0
Nitzschia sp.	74.2	8,901.3	-	-	-	-	-	-	-	-	-	-	514.8	61,780.8
Nitzschia tryblionella	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pinnularia sp.	222.5	89,013.2	473.1	189,230.8	675.1	270,059.9	-	-	-	-	-	-	1,544.5	617,808.2
Stauroneis sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stephanodiscus astraea minutula	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surirella ovata	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surirella sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Synedra cyclopum	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Synedra radians	74.2	26,703.9	-	-	-	-	-	-	-	-	-	-	-	-
Synedra rumpens	222.5	31,154.6	78.8	11,038.5	2,700.6	378,083.8	4,404.3	616,601.6	4,926.9	689,764.7	152.4	21,331.1	3,089.0	432,465.8
Synedra tenera	-	-	-	-	1,800.4	540,119.8	880.9	264,257.8	3,031.9	909,579.8	-	-	-	-
Synedra ulna	445.1	885,680.9	157.7	313,807.7	1,350.3	3,493,224.6	1,761.7	5,258,730.5	-	-	152.4	303,206.1	514.8	1,024,532.0
Synedra sp.	-	-	-	-	-	-	-	-	758.0	212,235.3	-	-	-	-
Tabellaria fenestrata	-	-	-	-	900.2	3,240,718.6	880.9	2,114,062.5	758.0	1,819,159.7	-	-	-	-
Tabellaria flocculosa	148.4	87,529.6	-	-	675.1	398,338.3	880.9	2,078,828.1	379.0	223,605.0	-	-	-	-
Subtotal	**7,492**	**2,487,992**	**4,652**	**1,442,569**	**21,155**	**12,562,285**	**103,941**	**23,427,336**	**32,972**	**9,629,797**	**1,905**	**940,548**	**58,692**	**31,815,888**
Chlorophyta														
Ankistrodesmus falcatus	74.2	1,854.4	-	-	-	-	-	-	-	-	-	-	-	-
Chlamydomonas sp.	222.5	62,309.2	-	-	-	-	-	-	379.0	123,172.3	-	-	-	-
Cladophora sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Closteriopsis longissima	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Closterium sp.	-	-	-	-	-	-	-	-	379.0	720,084.0	-	-	-	-
Cosmarium sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Desmidium sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gloeocystis ampla	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mougeotia sp.	-	-	-	-	-	-	-	-	-	-	457.1	380,257.0	-	-
Oocystis pusilla	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pediastrum duplex	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scenedesmus denticulatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scenedesmus quadricauda	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenastrum minutum	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spirogyra sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Staurastrum sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ulothrix sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**297**	**64,164**	**0**	**0**	**0**	**0**	**0**	**0**	**758**	**843,256**	**457**	**380,257**	**0**	**0**
Euglenoidea														
Trachelomonas charkowensis	-	-	-	-	-	-	-	-	-	-	-	-	514.8	1,029,680.4
Trachelomonas hispida	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trachelomonas pulchella	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trachelomonas volvocina	-	-	-	-	-	-	-	-	-	-	-	-	1,029.7	1,940,947.5
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,545**	**2,970,628**
Dinoflagellata														
Glenodinium sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL	**7,789**	**2,552,156**	**4,652**	**1,442,569**	**21,605**	**12,683,812**	**103,941**	**23,427,336**	**34,109**	**10,480,634**	**4,723**	**1,516,594**	**69,503**	**35,579,369**

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site ID	Ref. B OF						Ref. D OF			
Date (Installation to Retrieval)	9-Aug-10 to 7-Sep-10						10-Aug-10 to 9-Sep-10			
Replicate	1		2		3		1		2	
Taxa	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)
Cyanophyta										
Anabaena flos-aquae	-	-	-	-	-	-	-	-	-	-
Anabaena sp.	-	-	-	-	-	-	-	-	2,349.0	1,597,291.7
Aphanothece sp.	-	-	-	-	-	-	-	-	-	-
Oscillatoria sp.	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2,349**	**1,597,292**
Chrysophyta										
Chrysococcus rufescens	-	-	-	-	-	-	1,695.5	144,116.5	-	-
Kephyrion littorale	-	-	-	-	-	-	-	-	2,349.0	223,151.0
Kephyrion sp.	191.1	12,039.4	-	-	-	-	-	-	-	-
Subtotal	**191**	**12,039**	**0**	**0**	**0**	**0**	**1,695**	**144,117**	**2,349**	**223,151**
Cryptophyta										
Cryptomonas erosa	-	-	-	-	-	-	-	-	-	-
Rhodomonas minuta	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Diatoms										
Achnanthes clevei	-	-	-	-	-	-	-	-	2,349.0	352,343.8
Achnanthes flexella	-	-	-	-	-	-	-	-	-	-
Achnanthes hauckiana	-	-	-	-	76.4	3,666.7	-	-	2,349.0	112,750.0
Achnanthes lanceolata	-	-	-	-	-	-	-	-	-	-
Achnanthes linearis	191.1	25,225.4	1,686.0	222,549.5	76.4	10,083.3	6,782.0	895,218.0	2,349.0	310,062.5
Achnanthes minutissima	3,822.0	229,322.0	2,950.5	147,523.4	1,222.2	61,111.1	54,255.6	2,984,060.2	56,375.0	3,100,625.0
Amphora ovalis	-	-	-	-	-	-	-	-	2,349.0	1,357,697.9
Amphora perpusilla	-	-	-	-	-	-	-	-	2,349.0	389,927.1
Anomoeoneis vitrea	-	-	-	-	-	-	-	-	-	-
Asterionella formosa	191.1	42,042.4	-	-	-	-	-	-	2,349.0	2,067,083.3
Caloneis sp.	-	-	-	-	-	-	-	-	-	-
Caloneis ventricosa	191.1	46,819.9	-	-	-	-	-	-	-	-
Caloneis ventricosa minuta	-	-	-	-	-	-	1,695.5	474,736.8	-	-
Cocconeis placentula	-	-	-	-	-	-	1,695.5	779,924.8	-	-
Cyclotella comta	-	-	-	-	-	-	-	-	-	-
Cyclotella meneghiniana	-	-	-	-	-	-	-	-	-	-
Cyclotella ocellata	191.1	23,887.7	-	-	76.4	9,548.6	-	-	2,349.0	293,619.8
Cyclotella stelligera	-	-	-	-	-	-	1,695.5	93,251.9	2,349.0	129,192.7
Cymbella affinis	191.1	343,983.1	421.5	1,138,037.4	76.4	137,500.0	-	-	-	-
Cymbella cesatii	-	-	-	-	-	-	-	-	-	-
Cymbella mexicana	-	-	-	-	-	-	-	-	-	-
Cymbella microcephala	191.1	10,128.4	210.7	11,169.6	76.4	4,048.6	1,695.5	89,860.9	4,697.9	248,989.6
Cymbella minuta	764.4	282,830.5	421.5	155,953.3	381.9	141,319.4	3,391.0	1,254,661.7	4,697.9	1,738,229.2
Cymbella naviculiformis	382.2	458,644.1	-	-	76.4	91,666.7	-	-	-	-
Cymbella sinuata	-	-	-	-	-	-	-	-	-	-
Cymbella sp.	-	-	-	-	-	-	-	-	-	-
Diatoma tenue	1,337.7	504,317.4	12,855.6	4,846,564.0	993.1	316,784.7	13,563.9	3,933,533.8	35,234.4	10,217,968.8
Diatoma tenue elongatum	191.1	137,593.2	1,053.7	758,691.6	-	-	-	-	16,442.7	11,838,750.0
Diatoma vulgare	191.1	374,559.3	-	-	-	-	-	-	-	-
Diploneis puella	-	-	-	-	-	-	-	-	-	-
Epithemia sorex	-	-	-	-	-	-	-	-	-	-
Epithemia turgida	-	-	-	-	-	-	-	-	-	-
Eunotia elegans	-	-	-	-	-	-	-	-	-	-
Eunotia pectinalis	382.2	412,779.7	-	-	-	-	1,695.5	1,220,751.9	-	-
Eunotia sp.	-	-	-	-	-	-	-	-	-	-
Fragilaria construens	-	-	-	-	-	-	3,391.0	2,278,736.8	-	-
Fragilaria construens venter	191.1	9,172.9	-	-	-	-	6,782.0	1,041,708.3	-	-
Fragilaria crotonensis	-	-	-	-	-	-	-	-	-	-
Fragilaria pinnata	191.1	11,466.1	-	-	-	-	5,086.5	610,375.9	2,349.0	140,937.5
Fragilaria vaucheriae	-	-	-	-	-	-	5,086.5	1,464,902.3	-	-
Gomphonema angustatum	-	-	210.7	37,934.6	-	-	1,695.5	305,188.0	-	-
Gomphonema clevei	-	-	-	-	-	-	-	-	-	-
Gomphonema gracile	191.1	46,819.9	-	-	-	-	-	-	-	-
Gomphonema sp.	-	-	-	-	-	-	-	-	-	-
Gomphonema subclavatum	191.1	114,661.0	-	-	-	-	-	-	-	-
Gomphonema tenellum	-	-	-	-	-	-	-	-	-	-
Melosira italica	-	-	-	-	-	-	-	-	-	-
Navicula capitata	-	-	-	-	-	-	-	-	-	-
Navicula contenta biceps	-	-	-	-	-	-	-	-	-	-
Navicula cryptocephala	-	-	-	-	152.8	28,263.9	1,695.5	313,665.4	-	-
Navicula cascadensis	-	-	-	-	-	-	-	-	-	-
Navicula cryptocephala veneta	191.1	18,154.7	210.7	20,021.0	76.4	7,256.9	1,695.5	161,071.4	4,697.9	446,302.1
Navicula decussis	-	-	-	-	-	-	1,695.5	325,533.8	-	-
Navicula graciloides	-	-	-	-	-	-	-	-	-	-

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site ID	Ref. B OF						Ref. D OF			
Date (Installation to Retrieval)	9-Aug-10 to 7-Sep-10						10-Aug-10 to 9-Sep-10			
Replicate	1		2		3		1		2	
Taxa	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)	Density (#/cm^2)	Biovolume (µm^3/cm^2)
Diatoms *(cont'd)*	-	-	-	-	-	-	-	-	-	-
Navicula gregaria	-	-	-	-	-	-	-	-	-	-
Navicula menisculus upsaliensis	-	-	-	-	-	-	-	-	-	-
Navicula minima	-	-	-	-	-	-	-	-	-	-
Navicula minuscula	-	-	-	-	-	-	-	-	-	-
Navicula pseudoscutiformis	-	-	-	-	-	-	-	-	-	-
Navicula pupula	-	-	-	-	-	-	-	-	-	-
Navicula rhynchocephala	-	-	-	-	-	-	-	-	2,349.0	692,942.7
Navicula sp.	191.1	28,665.3	-	-	-	-	1,695.5	254,323.3	-	-
Navicula tripunctata	-	-	-	-	-	-	-	-	2,349.0	2,630,833.3
Navicula viridula	-	-	-	-	-	-	-	-	2,349.0	2,114,062.5
Neidium affine	-	-	-	-	-	-	-	-	-	-
Nitzschia acicularis	-	-	-	-	152.8	42,777.8	3,391.0	949,473.7	2,349.0	657,708.3
Nitzschia amphibia	-	-	-	-	-	-	-	-	-	-
Nitzschia capitellata	382.2	137,593.2	-	-	-	-	-	-	2,349.0	845,625.0
Nitzschia clausii	382.2	122,305.1	210.7	67,439.3	-	-	-	-	-	-
Nitzschia communis	191.1	8,599.6	-	-	-	-	-	-	-	-
Nitzschia constricta	-	-	-	-	-	-	-	-	2,349.0	2,724,791.7
Nitzschia dissipata	-	-	-	-	-	-	1,695.5	456,086.5	-	-
Nitzschia frustulum	573.3	116,954.2	632.2	98,629.9	381.9	45,833.3	10,172.9	1,220,751.9	11,744.8	1,409,375.0
Nitzschia innominata	-	-	-	-	-	-	-	-	-	-
Nitzschia linearis	-	-	-	-	-	-	-	-	-	-
Nitzschia microcephala	-	-	-	-	-	-	-	-	-	-
Nitzschia palea	-	-	-	-	-	-	1,695.5	305,188.0	-	-
Nitzschia paleacea	-	-	210.7	20,653.3	-	-	3,391.0	332,315.8	-	-
Nitzschia sp.	191.1	22,932.2	-	-	-	-	-	-	-	-
Nitzschia tryblionella	-	-	-	-	-	-	-	-	-	-
Pinnularia sp.	-	-	-	-	-	-	-	-	-	-
Stauroneis sp.	-	-	-	-	-	-	-	-	-	-
Stephanodiscus astraea minutula	-	-	-	-	-	-	-	-	2,349.0	822,135.4
Surirella ovata	-	-	-	-	-	-	-	-	-	-
Surirella sp.	-	-	-	-	-	-	-	-	-	-
Synedra cyclopum	-	-	-	-	-	-	-	-	-	-
Synedra radians	-	-	421.5	151,738.3	229.2	82,500.0	-	-	2,349.0	845,625.0
Synedra rumpens	573.3	80,262.7	843.0	118,018.7	687.5	105,875.0	5,086.5	712,105.3	14,093.8	1,973,125.0
Synedra tenera	191.1	57,330.5	-	-	305.6	91,666.7	-	-	-	-
Synedra ulna	191.1	380,292.4	-	-	-	-	1,695.5	3,374,022.6	7,046.9	18,230,265.6
Synedra sp.	-	-	-	-	-	-	-	-	-	-
Tabellaria fenestrata	-	-	-	-	-	-	1,695.5	4,069,172.9	-	-
Tabellaria flocculosa	1,338	1,262,800	211	124,341	1,222	937,444	6,782.0	6,002,030.1	14,093.8	14,136,031.3
Subtotal	**13,377**	**5,310,143**	**22,550**	**7,919,265**	**6,264**	**2,117,347**	**150,898**	**35,902,652**	**209,057**	**79,827,000**
Chlorophyta										
Ankistrodesmus falcatus	191.1	4,777.5	-	-	-	-	-	-	-	-
Chlamydomonas sp.	-	-	-	-	-	-	-	-	-	-
Cladophora sp.	-	-	-	-	-	-	-	-	-	-
Closteriopsis longissima	-	-	-	-	-	-	-	-	-	-
Closterium sp.	-	-	-	-	152.8	290,277.8	-	-	-	-
Cosmarium sp.	573.3	120,394.1	-	-	152.8	32,083.3	-	-	-	-
Desmidium sp.	955.5	668,855.9	-	-	229.2	160,416.7	-	-	-	-
Gloeocystis ampla	-	-	-	-	76.4	19,555.6	-	-	-	-
Mougeotia sp.	382.2	202,950.0	-	-	152.8	40,562.5	-	-	-	-
Oocystis pusilla	-	-	-	-	-	-	-	-	-	-
Pediastrum duplex	-	-	-	-	-	-	-	-	-	-
Scenedesmus denticulatus	-	-	-	-	-	-	-	-	-	-
Scenedesmus quadricauda	-	-	-	-	-	-	-	-	-	-
Selenastrum minutum	-	-	-	-	-	-	-	-	-	-
Spirogyra sp.	-	-	-	-	229.2	1,604,166.7	-	-	-	-
Staurastrum sp.	-	-	-	-	152.8	55,000.0	-	-	-	-
Ulothrix sp.	382.2	152,881.4	1,053.7	640,672.9	381.9	146,666.7	1,695.5	135,639.1	7,046.9	1,691,250.0
Subtotal	**2,484**	**1,149,859**	**1,054**	**640,673**	**1,528**	**2,348,729**	**1,695**	**135,639**	**7,047**	**1,691,250**
Euglenoidea										
Trachelomonas charkowensis	-	-	-	-	-	-	-	-	2,349.0	4,697,916.7
Trachelomonas hispida	-	-	-	-	-	-	-	-	-	-
Trachelomonas pulchella	-	-	-	-	-	-	-	-	-	-
Trachelomonas volvocina	-	-	-	-	76.4	143,993.1	-	-	-	-
Subtotal	**0**	**0**	**0**	**0**	**76**	**143,993**	**0**	**0**	**2,349**	**4,697,917**
Dinoflagellata										
Glenodinium sp.	-	-	-	-	-	-	-	-	-	-
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL	**16,053**	**6,472,041**	**23,604**	**8,559,938**	**7,868**	**4,610,069**	**154,289**	**36,182,408**	**223,151**	**88,036,609**

Appendix 3.8-1

Zooplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, 2010

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Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, 2010

Lake/Sample ID	Stickleback			Trout			Aim. Stn 13		
Date	21-Aug-10			15-Aug-10			13-Aug-10		
Replicate	1	2	3	1	2	3	1	2	3
Depth (m)	1	1	1	1	1	1	1	1	1
Volume sampled (m^3)	0.58476	0.59615	0.53730	0.64552	0.52781	0.54489	1.04991	1.12016	1.00055
CLADOCERA									
Daphnia longiremis	0	0	0	15	38	55	486	803	1,399
Daphnia middendorffiana	0	0	0	0	0	0	0	1	1
Bosmina longirostris	121	102	86	21,688	62,523	56,892	86	134	130
Chydorus sphaericus	2	0	0	31	76	73	0	0	0
Holopedium gibberum	0	0	0	8	4	7	486	2,232	1,599
Macrothricidae (benthic)	0	0	0	0	19	2	0	0	0
Subtotal Cladocerans	**123**	**102**	**86**	**21,742**	**62,659**	**57,030**	**1,057**	**3,170**	**3,129**
ROTIFERA									
Asplanchna	250	1,426	354	13,942	6,063	22,023	0	9	0
Conochilus sp.	21	84	37	620	758	128	0	0	0
Filinia	3	10	9	0	0	0	0	0	0
Kellicottia longispina	120	252	205	119,284	191,359	306,483	11,049	9,374	16,291
Keratella cochlearis	2	5	2	310	0	0	0	0	10
Keratella quadrata	5	2	0	0	0	0	0	0	0
Plautius	0	0	0	0	0	0	0	0	0
Polyarthra	0	34	93	0	0	0	0	0	0
Testudinella	0	0	0	3	4	15	0	0	0
Unidentified Rotifera*	5	0	4	0	0	0	0	0	0
Subtotal Rotifers	**405**	**1,812**	**704**	**134,159**	**198,183**	**328,648**	**11,049**	**9,383**	**16,301**
COPEPODS - CALANOIDA									
Epischura lacustris	0	0	0	9	23	53	105	87	63
Epischura nevadensis	0	0	0	0	0	0	0	0	0
Epischura copepodites	0	2	0	37	59	114	18	12	18
Eurytemora canadensis	0	0	0	0	0	0	0	0	0
Heterocope septentrionalis copepodites	0	0	0	0	0	0	0	0	0
Leptodiaptomus ashlandi	0	0	0	2	0	0	143	232	190
Leptodiaptomus pribilofensis	0	0	0	2	0	0	147	234	193
Leptodiaptomus copepodites	0	0	0	0	0	0	6,858	7,320	5,937
Limnocalanus macrurus	0	0	0	0	0	0	17	23	14
Limnocalanus macrurus	0	0	0	0	0	0	0	0	0
Unidentified Calanoida (nauplius)*	5	3	0	31	114	37	0	0	0
Subtotal Copepods - Calanoida	**5**	**5**	**0**	**81**	**195**	**204**	**7,287**	**7,909**	**6,414**
COPEPODS - CYCLOPOIDA									
Cyclops bicuspidatus thomasi	0	0	0	0	0	0	10	0	0
Cyclops scutifer	0	0	0	0	0	0	1,143	1,785	2,099
Microcyclops varicans rubra	0	0	0	19	13	42	0	0	0
Eucyclops sp. (benthic)	0	0	0	0	0	2	0	0	0
Ergasilus sp. (ectoparasitic)	32	39	24	62	76	128	0	0	0
Unidentified Cyclopoida (copepodite)*	17	22	7	759	1,042	1,468	7,905	7,677	8,595
Unidentified Cyclopoida (nauplius)*	113	101	149	635	398	1,652	19	446	700
Subtotal Copepods - Cyclopoida	**162**	**161**	**181**	**1,475**	**1,529**	**3,292**	**9,077**	**9,909**	**11,394**
TOTAL	**696**	**2,080**	**970**	**157,457**	**262,567**	**389,174**	**28,470**	**30,371**	**37,238**

Note: Data represent numbers of zooplankton/m^3

Volume sampled is calculated based on flowmeter readings

** these taxa were excluded from the diversity analyses as they could not be accurately assigned to a genera*

Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, 2010

Lake/Sample ID	Aim. Stn 5			Aim. Stn 11			Aim. Stn 6		
Date	12-Aug-10			22-Aug-10			14-Aug-10		
Replicate	1	2	3	1	2	3	1	2	3
Depth (m)	1	1	1	1	1	1	26	26	26
Volume sampled (m^3)	1.49418	1.22269	1.19610	0.94549	0.88094	1.01574	1.76378	1.68784	1.43722
CLADOCERA									
Daphnia longiremis	348	900	920	116	9	59	1,417	1,066	2,018
Daphnia middendorffiana	0	1	1	0	1	0	2	0	0
Bosmina longirostris	194	180	117	137	37	69	51	53	49
Chydorus sphaericus	0	0	0	0	0	0	0	0	0
Holopedium gibberum	2,945	5,398	3,846	2,750	329	1,083	2,211	2,548	3,827
Macrothricidae (benthic)	0	0	0	0	0	0	0	0	0
Subtotal Cladocerans	**3,487**	**6,478**	**4,883**	**3,004**	**377**	**1,211**	**3,681**	**3,667**	**5,893**
ROTIFERA									
Asplanchna	0	0	0	42	6	0	6	0	14
Conochilus sp.	0	0	0	0	0	0	0	0	0
Filinia	0	0	0	0	0	0	0	0	0
Kellicottia longispina	5,756	12,105	6,270	11,211	12,146	11,125	5,103	8,295	12,524
Keratella cochlearis	67	0	84	0	11	0	0	0	0
Keratella quadrata	67	0	8	0	0	0	0	0	209
Plautius	0	0	0	0	0	10	0	0	0
Polyarthra	0	0	0	0	0	0	0	0	0
Testudinella	0	0	0	0	0	0	0	0	0
Unidentified Rotifera	0	0	0	0	0	0	0	0	0
Subtotal Rotifers	**5,890**	**12,105**	**6,362**	**11,253**	**12,163**	**11,135**	**5,108**	**8,295**	**12,747**
COPEPODS - CALANOIDA									
Epischura lacustris	54	68	39	106	44	24	47	44	97
Epischura nevadensis	0	0	0	0	0	0	0	0	0
Epischura copepodites	23	8	37	15	14	8	2	1	35
Eurytemora canadensis	2	0	0	0	0	0	1	0	0
Heterocope septentrionalis copepodites	0	0	0	0	0	0	0	0	0
Leptodiaptomus ashlandi	114	221	109	233	182	138	244	273	257
Leptodiaptomus pribilofensis	114	224	112	239	185	140	247	273	260
Leptodiaptomus copepodites	4,511	9,635	7,616	3,628	1,737	2,639	5,783	9,728	6,686
Limnocalanus macrurus	28	123	69	0	0	1	153	213	202
Limnocalanus macrurus	0	0	0	0	0	0	1	0	0
Unidentified Calanoida (nauplius)	20	327	167	0	1	10	0	0	0
Subtotal Copepods - Calanoida	**4,866**	**10,605**	**8,150**	**4,220**	**2,162**	**2,959**	**6,477**	**10,533**	**7,537**
COPEPODS - CYCLOPOIDA									
Cyclops bicuspidatus thomasi	7	25	17	0	0	0	11	0	0
Cyclops scutifer	435	548	978	338	87	405	714	824	1,099
Microcyclops varicans rubra	0	0	0	0	0	0	0	0	0
Eucyclops sp. (benthic)	0	0	0	0	0	0	0	0	0
Ergasilus sp. (ectoparasitic)	0	0	0	0	0	0	0	0	0
Unidentified Cyclopoida (copepodite)	2,008	5,480	4,933	148	125	108	6,237	7,702	8,349
Unidentified Cyclopoida (nauplius)	535	981	585	11	341	79	62	355	278
Subtotal Copepods - Cyclopoida	**2,985**	**7,034**	**6,513**	**497**	**553**	**592**	**7,025**	**8,881**	**9,727**
TOTAL	**17,227**	**36,222**	**25,908**	**18,974**	**15,255**	**15,897**	**22,291**	**31,376**	**35,905**

Note: Data represent numbers of zooplankton/m^3

Volume sampled is calculated based on flowmeter readings

** these taxa were excluded from the diversity analyses as they could not be accurately assigned to a genera*

Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results in Lakes, Hope Bay Belt Project, 2010

Lake/Sample ID	Windy Deep			Ref. B Deep			Ref. D		
Date	22-Aug-10			25-Aug-10			11-Aug-10		
Replicate	1	2	3	1	2	3	1	2	3
Depth (m)	17	17	17	8.5	8.5	8.5	1	1	1
Volume sampled (m^3)	0.64552	0.73285	0.55628	0.39870	0.33035	0.33035	1.23028	1.29483	1.14294
CLADOCERA									
Daphnia longiremis	0	0	0	3,010	1,937	1,816	2	6	3
Daphnia middendorffiana	0	0	0	577	484	605	0	0	0
Bosmina longirostris	3	3	5	2,759	1,877	2,724	3,007	3,475	7,437
Chydorus sphaericus	0	0	0	0	0	0	33	23	0
Holopedium gibberum	0	0	0	53	242	64	0	0	0
Macrothricidae (benthic)	0	0	0	0	0	0	0	15	9
Subtotal Cladocerans	**3**	**3**	**5**	**6,398**	**4,541**	**5,210**	**3,042**	**3,520**	**7,448**
ROTIFERA									
Asplanchna	0	0	0	0	0	0	0	54	0
Conochilus sp.	2,324	3,002	7,370	50	0	30	0	0	0
Filinia	0	0	0	0	0	0	0	0	0
Kellicottia longispina	2,014	3,275	6,292	22,072	7,568	9,081	2,357	1,236	2,975
Keratella cochlearis	0	0	0	0	0	0	0	8	0
Keratella quadrata	0	0	0	0	0	0	0	8	44
Plautius	0	0	0	0	0	0	0	0	0
Polyarthra	0	0	0	0	0	0	0	0	0
Testudinella	0	0	0	0	0	0	0	0	9
Unidentified Rotifera	0	0	0	0	0	0	0	23	9
Subtotal Rotifers	**4,338**	**6,277**	**13,662**	**22,122**	**7,568**	**9,111**	**2,357**	**1,328**	**3,036**
COPEPODS - CALANOIDA									
Epischura lacustris	0	0	0	0	0	0	1	0	0
Epischura nevadensis	0	0	0	45	30	15	0	0	0
Epischura copepodites	0	0	0	0	0	0	0	0	0
Eurytemora canadensis	0	0	0	0	0	0	0	0	0
Heterocope septentrionalis copepodites	0	0	0	0	0	0	0	0	0
Leptodiaptomus ashlandi	0	0	0	75	30	61	0	0	0
Leptodiaptomus pribilofensis	0	0	0	2,709	3,300	3,330	0	0	0
Leptodiaptomus copepodites	0	0	0	13,293	9,111	11,806	0	0	0
Limnocalanus macrurus	226	162	320	0	0	0	0	0	0
Limnocalanus macrurus	2	1	0	0	0	0	0	0	0
Unidentified Calanoida (nauplius)	0	0	0	0	0	0	0	0	0
Subtotal Copepods - Calanoida	**228**	**164**	**320**	**16,122**	**12,472**	**15,211**	**1**	**0**	**0**
COPEPODS - CYCLOPOIDA									
Cyclops bicuspidatus thomasi	0	0	0	0	0	0	0	0	1
Cyclops scutifer	0	0	0	1,104	726	757	0	0	0
Microcyclops varicans rubra	0	0	0	0	0	0	0	0	0
Eucyclops sp. (benthic)	0	0	0	0	0	0	0	0	1
Ergasilus sp. (ectoparasitic)	0	0	0	0	0	0	0	0	0
Unidentified Cyclopoida (copepodite)	0	0	0	5,267	2,603	4,541	0	3	17
Unidentified Cyclopoida (nauplius)	0	0	0	6,020	2,179	1,816	16	23	0
Subtotal Copepods - Cyclopoida	**0**	**0**	**0**	**12,390**	**5,509**	**7,114**	**16**	**26**	**19**
TOTAL	**4,568**	**6,443**	**13,987**	**57,033**	**30,089**	**36,646**	**5,416**	**4,875**	**10,504**

Note: Data represent numbers of zooplankton/m^3

Volume sampled is calculated based on flowmeter readings

** these taxa were excluded from the diversity analyses as they could not be accurately assigned to a genera*

Appendix 3.9-1

Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2010

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Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site					Stickleback					Trout					Aim. Stn 13					Aim. Stn 2				
Date Sampled					19-Aug-10					16/17-Aug-10					14/15-Aug-10					18-Aug-10				
Depth (m)					2.5	2.5	2.5	2.5	2.5	2.3	2.5	2.5	2.5	2.5	3.7	3.7	3.7	4	4	3	3	3	3	2.75
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5
Coelenterata	Hydridae	-	-	*Hydra*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Coelenterata Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Microturbellaria	Typhloplanidae	-	-	*Mesostoma*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Microturbellaria Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Hirudinea	Piscicolidae	-	-	*Piscicola punctata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Hirudinea Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta	-	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Enchytraeidae	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lumbriculidae	-	-	-	119	178	0	119	830	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0
	Naididae	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74
	Tubificidae	-	-	-	148	119	237	1,422	889	0	0	0	0	0	0	0	0	0	15	178	2,578	489	30	178
				Oligochaeta Subtotal	***267***	***296***	***237***	***1,541***	***1,719***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***15***	***178***	***2,607***	***489***	***30***	***252***
Gastropoda	Physidae	-	-	*Physa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Valvatidae	-	-	*Valvata sincera*	1,096	1,481	593	2,963	3,141	296	0	0	0	0	0	0	0	0	15	0	89	15	0	0
				Gastropoda Subtotal	***1,096***	***1,481***	***593***	***2,963***	***3,141***	***296***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***15***	***0***	***89***	***15***	***0***	***0***
Pelecypoda	Sphaeriidae	-	-	(i/d)	741	1,244	2,430	2,074	5,274	1,704	1,600	2,607	4,474	1,896	1,970	1,511	2,311	1,570	1,704	430	311	311	15	3,956
		-	-	*Sphaerium*	444	119	237	356	1,481	0	59	59	148	119	0	0	0	0	0	0	0	0	0	0
		-	-	*Pisidium*	2,222	415	1,067	2,015	2,904	593	474	267	326	237	237	59	178	74	15	74	178	193	0	44
				Pelecypoda Subtotal	***3,407***	***1,778***	***3,733***	***4,444***	***9,659***	***2,296***	***2,133***	***2,933***	***4,948***	***2,252***	***2,207***	***1,570***	***2,489***	***1,644***	***1,719***	***504***	***489***	***504***	***15***	***4,000***
Hydracarina	-	-	-	-	237	0	59	770	119	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0
				Hydracarina Subtotal	***237***	***0***	***59***	***770***	***119***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***15***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida	-	-	-	-	119	0	0	474	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74
				Copepoda - Harpacticoida Subtotal	***119***	***0***	***0***	***474***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***74***
Ostracoda	-	-	-	-	2,756	4,267	4,267	7,111	10,370	296	0	0	0	296	44	30	15	0	0	59	1,185	193	44	815
				Ostracoda Subtotal	***2,756***	***4,267***	***4,267***	***7,111***	***10,370***	***296***	***0***	***0***	***0***	***296***	***44***	***30***	***15***	***0***	***0***	***59***	***1,185***	***193***	***44***	***815***
Amphipoda	Epimeriidae	-	-	*Epimeria loricata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gammaridae	-	-	*Gammarus lacustris*	385	178	237	1,007	296	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Amphipoda Subtotal	***385***	***178***	***237***	***1,007***	***296***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca	Mysidae	-	-	*Mysis relicta*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	104	30	74	15	0
				Malacostraca Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***104***	***30***	***74***	***15***	***0***
Isopoda	Chaetiliidae	-	-	*Saduria entomon*	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	15	0	0	44
				Isopoda Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***15***	***0***	***0***	***0***	***15***	***0***	***0***	***44***
Ephemeroptera	Ameletidae	-	-	*Ameletus inopinatus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetidae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetidae	-	-	*Baetis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemerellidae	-	-	*Ephemerella*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Heptageniidae	-	-	(i/d) (Heptagenia???)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Ephemeroptera Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Plecoptera	Nemouridae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Nemoura*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Perlodidae	-	-	*Isoperla*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Skwala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Plecoptera Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Trichoptera	Apataniidae	-	-	*Apatania*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Micrasema*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brachycentridae	-	-	*Brachycentrus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydroptilidae	-	-	*Agraylea*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limnephilidae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Grensia praeterica*	30	0	0	0	59	0	59	0	0	0	0	0	0	0	0	0	0	0	0	0
	Phryganeidae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Agrypnia*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Trichoptera Subtotal	***30***	***0***	***0***	***0***	***59***	***0***	***59***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Coleoptera	Dytiscidae	-	-	*Agabus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Hydroporus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Oreodytes*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae	-	-	*Haliplus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Coleoptera Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Diptera	Chironomidae	-	-	(pupa)	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0
		Tanypodinae	Pentaneurini	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Ablabesmyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Thienemannimyia group sp.	0	0	59	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	74
			Procladiini	*Procladius*	207	474	178	237	533	489	1,896	681	622	296	385	311	1,526	341	844	74	119	770	15	207
		Diamesinae	Diamesini	*Diamesa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Potthastia longimana group	0	119	0	0	178	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Protanypini	*Protanypus*	0	0	0	0	0	0	296	59	119	593	0	0	0	15	0	0	15	0	0	0
		Prodiamesinae		*Monodiamesa*	0	0	0	0	0	0	0	0	0	0	15	0	0	0	15	15	89	15	0	30
		Orthocladiinae	-	(i/d)	0	0	0	59	0	0	0	0	0	0	0	0	0	0	0	237	74	0	59	222
			Orthocladiini	sp. #2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Abyskomyia	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	15	0	0	0	0

Data represents organisms/m²

i/d = immature or damaged individuals

**These taxa were not included in the total density calculation or other data analysis*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site					Stickleback					Trout					Aim. Stn 13					Aim. Stn 2				
Date Sampled					19-Aug-10					16/17-Aug-10					14/15-Aug-10					18-Aug-10				
Depth (m)					2.5	2.5	2.5	2.5	2.5	2.3	2.5	2.5	2.5	2.5	3.7	3.7	3.7	4	4	3	3	3	3	2.75
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5
Diptera (continued)	Chironomidae	Orthocladiinae	Orthocladiini	*Bryophaenocladius ?*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Cricotopus/Orthocladius	444	1,126	0	2,785	1,956	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0
				Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Doncricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Eukiefferiella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Euryhapsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Heterotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Heterotrissocladius	0	0	0	0	0	0	0	0	0	0	59	89	104	44	15	978	563	696	281	222
				Heterotrissocladius/Hydrobaenus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Mesocricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Paracladius / Doncricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Paracladius	0	0	59	0	0	0	0	0	0	0	30	44	15	15	0	59	0	0	0	0
				Parakiefferiella	0	0	0	0	0	0	0	0	0	0	0	15	0	0	15	59	0	0	133	0
				Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Psectrocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59	74
				Pseudosmittia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Rheosmittia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Synorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Zalutschia	0	0	0	0	0	17,511	38,993	25,570	21,156	26,785	0	0	0	0	0	0	0	104	0	0
		Chironominae	Chironomini	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Chironomus	741	59	2,963	10,015	11,793	474	237	474	1,037	2,015	30	0	0	0	0	15	222	15	0	0
				Cladopelma	148	474	237	0	356	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Cryptochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Demicryptochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Dicrotendipes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Parachironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Paracladopelma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	148	74	0	0
				Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Saetheria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Sergenta	622	1,837	59	1,541	5,926	0	0	0	0	0	0	0	0	0	0	178	1,141	89	0	785
				Stictochironomus	0	0	0	0	356	681	652	978	89	119	15	0	30	0	30	281	59	0	0	0
			Tanytarsini	(i/d)	59	119	0	0	0	0	0	0	0	0	0	0	0	0	0	0	148	0	15	0
				Cladotanytarsus	59	356	0	0	889	296	593	622	978	1,837	0	0	0	0	15	0	0	0	0	0
				Corynocera	1,067	2,904	770	0	4,089	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Micropsectra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,385	2,370	5,274	963	3,763
				Micropsectra / Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Paratanytarsus	533	1,067	178	2,252	3,496	0	0	0	0	0	0	0	0	0	0	0	59	0	74	622
				Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Stempellinella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Tanytarsus	1,037	1,778	1,067	474	1,481	622	7,348	3,467	2,400	1,837	89	0	207	59	15	637	207	430	963	459
	Empididae	-	-	(pupa)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Chelifera*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74	0	0
		-	-	*Clinocera*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Trichoclinocera*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephydridae	-	-	*Scatophila*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Muscidae	-	-	*Limnophora*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhagionidae	-	-	*Ptiolina*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Ormosia*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Simulidae	-	-	*Simulium*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Simulium* - pupa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tipulidae	-	-	*Tipula*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0
				Diptera Subtotal	***4,919***	***10,311***	***5,570***	***17,363***	***31,052***	***20,074***	***50,015***	***31,852***	***26,400***	***33,481***	***622***	***459***	***1,911***	***504***	***948***	***4,933***	***5,230***	***7,556***	***2,578***	***6,459***
Non Macrobenthic Invertebrates*																								
Nematoda	-	-	-	-	3,881	4,859	9,185	533	9,304	593	593	1,215	622	593	89	30	59	30	30	133	311	74	1,585	237
Copepoda - Calanoida	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	356	0	0	0	296	0	0	296	0	0	0	0	30	0	0	59	163	74	15	222
	Ergasilidae	-	-	*Ergasilus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chydoridae	-	-	*Eurycercus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44	0	0	74
	Chydoridae	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Daphnidae	-	-	*Daphnia*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Holopedidae	-	-	*Holopedium gibberum*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59	0	0	0	0
	Macrothricidae	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish	Gasterosteidae	-	-	*Pungitius pungitius* (Ninespine	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Salmonidae	-	-	*Salvelinus alpinus* (Arctic Char)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				TOTAL	***13,215***	***18,311***	***14,696***	***35,674***	***56,415***	***22,963***	***52,207***	***34,785***	***31,348***	***36,030***	***2,874***	***2,059***	***4,430***	***2,148***	***2,696***	***5,793***	***9,644***	***8,830***	***2,681***	***11,644***

Data represents organisms/m²

i/d = immature or damaged individuals

**These taxa were not included in the total density calculation or other data analysis*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site					Aim. Stn 12					Aim. Stn 5					Aim. Stn 11					Aim. Stn 6				
Date Sampled					21-Aug-10					18-Aug-10					17-Aug-10					14-Aug-10				
Depth (m)					0.3	0.3	0.3	0.3	0.3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	28	27	28.5	27.5	27.5
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5
Coelenterata	Hydridae	-	-	*Hydra*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Coelenterata Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Microturbellaria	Typhloplanidae	-	-	*Mesostoma*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Microturbellaria Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Hirudinea	Piscicolidae	-	-	*Piscicola punctata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Hirudinea Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta	-	-	-	(i/d)	0	0	0	0	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Enchytraeidae	-	-	-	0	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lumbriculidae	-	-	-	193	30	0	148	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Naididae	-	-	-	133	119	0	385	0	0	0	0	0	0	0	0	0	0	74	0	0	0	0	0
	Tubificidae	-	-	-	341	1,304	415	148	1,319	15	15	0	30	89	15	0	0	0	0	311	0	15	0	0
				Oligochaeta Subtotal	***667***	***1,511***	***415***	***681***	***1,407***	***15***	***15***	***0***	***30***	***89***	***15***	***0***	***0***	***0***	***74***	***311***	***0***	***15***	***0***	***0***
Gastropoda	Physidae	-	-	*Physa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Valvatidae	-	-	*Valvata sincera*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Gastropoda Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda	Sphaeriidae	-	-	(i/d)	0	0	0	0	0	59	963	3,156	1,659	1,511	2,652	2,030	1,837	1,452	2,178	548	1,007	548	1,096	756
		-	-	*Sphaerium*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Pisidium*	0	0	0	0	0	0	30	119	44	0	89	15	30	0	44	74	74	15	0	15
				Pelecypoda Subtotal	***0***	***0***	***0***	***0***	***0***	***59***	***993***	***3,274***	***1,704***	***1,511***	***2,741***	***2,044***	***1,867***	***1,452***	***2,222***	***622***	***1,081***	***563***	***1,096***	***770***
Hydracarina	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	15	0	0	15	0	30	0	44	15
				Hydracarina Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***15***	***0***	***0***	***15***	***0***	***30***	***0***	***44***	***15***
Copepoda - Harpacticoida	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Copepoda - Harpacticoida Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda	-	-	-	-	0	119	59	59	593	44	444	311	415	237	430	59	119	30	163	15	15	30	15	15
				Ostracoda Subtotal	***0***	***119***	***59***	***59***	***593***	***44***	***444***	***311***	***415***	***237***	***430***	***59***	***119***	***30***	***163***	***15***	***15***	***30***	***15***	***15***
Amphipoda	Epimeriidae	-	-	*Epimeria loricata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0
	Gammaridae	-	-	*Gammarus lacustris*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Amphipoda Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***15***	***0***	***0***	***0***	***0***	***0***
Malacostraca	Mysidae	-	-	*Mysis relicta*	0	0	0	0	15	0	15	15	0	0	15	15	0	0	15	0	0	0	0	0
				Malacostraca Subtotal	***0***	***0***	***0***	***0***	***15***	***0***	***15***	***15***	***0***	***0***	***15***	***15***	***0***	***0***	***15***	***0***	***0***	***0***	***0***	***0***
Isopoda	Chaetiliidae	-	-	*Saduria entomon*	0	0	0	0	0	0	0	15	0	15	0	0	30	15	44	0	0	0	0	0
				Isopoda Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***15***	***0***	***15***	***0***	***0***	***30***	***15***	***44***	***0***	***0***	***0***	***0***	***0***
Ephemeroptera	Ameletidae	-	-	*Ameletus inopinatus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetidae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetidae	-	-	*Baetis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemerellidae	-	-	*Ephemerella*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Heptageniidae	-	-	(i/d) (Heptagenia???)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Ephemeroptera Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Plecoptera	Nemouridae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Nemoura*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Perlodidae	-	-	*Isoperla*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Skwala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Plecoptera Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Trichoptera	Apataniidae	-	-	*Apatania*	0	0	0	0	0	0	0	0	0	0	0	0	30	0	15	0	0	0	0	0
		-	-	*Micrasema*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brachycentridae	-	-	*Brachycentrus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydroptilidae	-	-	*Agraylea*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limnephilidae	-	-	(i/d)	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Grensia praeterica*	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0
	Phryganeidae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Agrypnia*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Trichoptera Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***15***	***0***	***0***	***0***	***44***	***0***	***15***	***0***	***0***	***0***	***0***	***0***
Coleoptera	Dytiscidae	-	-	*Agabus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Hydroporus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Oreodytes*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae	-	-	*Haliplus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Coleoptera Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Diptera	Chironomidae	-	-	(pupa)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0
		Tanypodinae	Pentaneurini	(i/d)	0	0	0	0	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Ablabesmyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Thienemannimyia group sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0
			Procladiini	*Procladius*	163	222	44	193	207	0	44	30	30	0	0	15	0	0	30	89	252	400	400	0
		Diamesinae	Diamesini	*Diamesa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Potthastia longimana group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Protanypini	*Protanypus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	430
		Prodiamesinae		*Monodiamesa*	0	0	0	0	0	0	0	0	0	0	59	0	15	0	44	0	15	0	15	0
		Orthocladiinae	-	(i/d)	0	296	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Orthocladiini	sp. #2	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Abyskomyia	0	0	0	0	0	0	0	0	0	30	0	15	59	15	15	0	0	0	0	0

Data represents organisms/m²

i/d = immature or damaged individuals

**These taxa were not included in the total density calculation or other data analysis*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site					Aim. Stn 12					Aim. Stn 5					Aim. Stn 11					Aim. Stn 6				
Date Sampled					21-Aug-10					18-Aug-10					17-Aug-10					14-Aug-10				
Depth (m)					0.3	0.3	0.3	0.3	0.3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	28	27	28.5	27.5	27.5
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5
Diptera (continued)	Chironomidae	Orthocladiinae	Orthocladiini	*Bryophaenocladius ?*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Cricotopus/Orthocladius	119	474	0	0	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Doncricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Eukiefferiella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Euryhapsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Heterotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Heterotrissocladius	0	59	0	0	0	963	370	311	163	326	15	15	30	15	30	0	0	0	0	0
				Heterotrissocladius/Hydrobaenus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Mesocricotopus	0	0	0	0	0	0	0	0	74	0	15	0	0	0	0	0	0	0	0	0
				Paracladius / Doncricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Paracladius	0	0	0	0	0	15	15	30	15	30	59	44	30	15	30	0	0	0	0	0
				Parakiefferiella	593	2,430	252	119	607	163	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Psectrocladius	119	15	489	237	0	0	0	0	0	0	0	0	15	15	30	0	0	0	0	0
				Pseudosmittia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Rheosmittia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Synorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Zalutschia	0	0	0	0	0	0	0	0	0	0	74	0	0	0	0	15	15	0	0	15
		Chironominae	Chironomini	(i/d)	0	0	0	30	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Chironomus	0	30	0	15	44	0	0	0	0	0	0	0	0	0	0	59	0	0	15	15
				Cladopelma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Cryptochironomus	148	15	252	59	119	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Demicryptochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Dicrotendipes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
				Parachironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Paracladopelma	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0
				Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Saetheria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Sergenta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Stictochironomus	0	0	0	0	119	15	0	0	0	0	0	0	0	0	0	89	267	119	74	148
			Tanytarsini	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Cladotanytarsus	296	2,193	178	267	726	0	15	15	0	0	0	0	0	0	0	0	0	0	0	0
				Corynocera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Micropsectra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Micropsectra / Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0
				Paratanytarsus	15	356	133	30	311	30	15	0	0	30	30	0	0	0	178	0	0	0	0	0
				Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Stempellinella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Tanytarsus	207	1,185	252	267	1,659	4,267	2,919	4,059	2,904	3,141	948	341	622	489	607	15	0	30	44	148
	Empididae	-	-	(pupa)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Chelifera*	622	667	533	296	400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Clinocera*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Trichoclinocera*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephydridae	-	-	*Scatophila*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Muscidae	-	-	*Limnophora*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhagionidae	-	-	*Ptiolina*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Ormosia*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Simulidae	-	-	*Simulium*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Simulium* - pupa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tipulidae	-	-	*Tipula*	15	15	15	30	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Diptera Subtotal	***2,296***	***7,970***	***2,148***	***1,541***	***4,385***	***5,452***	***3,378***	***4,444***	***3,185***	***3,556***	***1,200***	***430***	***785***	***548***	***978***	***267***	***578***	***548***	***563***	***770***
Non Macrobenthic Invertebrates*																								
Nematoda	-	-	-	-	2,074	5,763	1,319	1,333	563	326	222	89	430	148	207	44	133	148	163	0	0	15	0	0
Copepoda - Calanoida	-	-	-	-	0	0	0	0	0	0	15	0	74	0	15	0	0	0	0	0	0	0	15	0
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0	0	0	0	0	0	0	30	0	0	15	0	207	0	0	0	0	0
	Ergasilidae	-	-	*Ergasilus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chydoridae	-	-	*Eurycercus*	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chydoridae	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Daphnidae	-	-	*Daphnia*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Holopedidae	-	-	*Holopedium gibberum*	0	0	0	0	0	0	15	15	15	0	0	0	0	15	0	0	0	0	0	0
	Macrothricidae	-	-	-	0	0	0	0	0	0	30	0	0	0	30	0	0	0	0	0	0	0	0	0
Fish	Gasterosteidae	-	-	*Pungitius pungitius* (Ninespine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Salmonidae	-	-	*Salvelinus alpinus* (Arctic Char)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				TOTAL	***2,963***	***9,600***	***2,622***	***2,281***	***6,400***	***5,570***	***4,844***	***8,059***	***5,348***	***5,407***	***4,400***	***2,563***	***2,844***	***2,044***	***3,541***	***1,215***	***1,704***	***1,156***	***1,719***	***1,570***

Data represents organisms/m²

i/d = immature or damaged individuals

**These taxa were not included in the total density calculation or other data analysis*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site					Windy Shallow					Windy Deep					Wolverine Dike					Patch Dike				
Date Sampled					23-Aug-10					22-Aug-10					27/29-Aug-10					26-Aug-10				
Depth (m)					3	3	3	3	3	16.5	17	17.5	17	17	2	2.5	2.5	2.5	2.5	3.5	3.5	3.5	3.75	3.75
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5
Coelenterata	Hydridae	-	-	*Hydra*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Coelenterata Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Microturbellaria	Typhloplanidae	-	-	*Mesostoma*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Microturbellaria Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Hirudinea	Piscicolidae	-	-	*Piscicola punctata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Hirudinea Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta	-	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Enchytraeidae	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lumbriculidae	-	-	-	0	0	0	0	0	0	0	0	0	0	0	119	0	119	0	0	0	0	0	0
	Naididae	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tubificidae	-	-	-	74	74	74	59	163	0	0	0	0	0	0	474	119	0	0	30	15	15	0	0
				Oligochaeta Subtotal	***74***	***74***	***74***	***59***	***163***	***0***	***0***	***0***	***0***	***0***	***0***	***593***	***119***	***119***	***0***	***30***	***15***	***15***	***0***	***0***
Gastropoda	Physidae	-	-	*Physa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Valvatidae	-	-	*Valvata sincera*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Gastropoda Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda	Sphaeriidae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	15	0	356	119	237	356	119	59	222	207	59
		-	-	*Sphaerium*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Pisidium*	0	0	0	0	0	0	0	0	0	0	119	356	0	119	0	59	15	74	104	0
				Pelecypoda Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***15***	***119***	***711***	***119***	***356***	***356***	***178***	***74***	***296***	***311***	***59***
Hydracarina	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Hydracarina Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Copepoda - Harpacticoida Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda	-	-	-	-	0	15	0	30	15	15	0	15	0	15	0	0	0	0	0	341	1,007	3,215	548	252
				Ostracoda Subtotal	***0***	***15***	***0***	***30***	***15***	***15***	***0***	***15***	***0***	***15***	***0***	***0***	***0***	***0***	***0***	***341***	***1,007***	***3,215***	***548***	***252***
Amphipoda	Epimeriidae	-	-	*Epimeria loricata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	15	0	0
	Gammaridae	-	-	*Gammarus lacustris*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0
				Amphipoda Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***30***	***15***	***0***	***0***
Malacostraca	Mysidae	-	-	*Mysis relicta*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Malacostraca Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Isopoda	Chaetiliidae	-	-	*Saduria entomon*	0	15	0	0	0	0	0	0	0	0	133	133	119	0	0	0	15	0	0	0
				Isopoda Subtotal	***0***	***15***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***133***	***133***	***119***	***0***	***0***	***0***	***15***	***0***	***0***	***0***
Ephemeroptera	Ameletidae	-	-	*Ameletus inopinatus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetidae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetidae	-	-	*Baetis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemerellidae	-	-	*Ephemerella*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Heptageniidae	-	-	(i/d) (Heptagenia???)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Ephemeroptera Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Plecoptera	Nemouridae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Nemoura*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Perlodidae	-	-	*Isoperla*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Skwala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Plecoptera Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Trichoptera	Apataniidae	-	-	*Apatania*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Micrasema*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brachycentridae	-	-	*Brachycentrus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydroptilidae	-	-	*Agraylea*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limnephilidae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Grensia praeterica*	0	0	0	0	0	0	0	0	0	0	0	119	0	0	0	0	0	0	0	0
	Phryganeidae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Agrypnia*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Trichoptera Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***119***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Coleoptera	Dytiscidae	-	-	*Agabus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Hydroporus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Oreodytes*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae	-	-	*Haliplus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Coleoptera Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Diptera	Chironomidae	-	-	(pupa)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Tanypodinae	Pentaneurini	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Ablabesmyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Thienemannimyia group sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	237	252	281	370	237
			Procladiini	*Procladius*	15	0	0	0	0	74	74	0	30	74	0	0	0	0	0	0	0	0	0	0
		Diamesinae	Diamesini	*Diamesa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Potthastia longimana group	0	0	0	0	0	0	0	0	0	0	0	0	0	119	0	0	0	0	0	0
			Protanypini	*Protanypus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Prodiamesinae		*Monodiamesa*	15	89	0	44	104	0	0	0	15	0	0	0	0	0	0	0	0	15	0	0
		Orthocladiinae	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0
			Orthocladiini	sp. #2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Abyskomyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Data represents organisms/m²

i/d = immature or damaged individuals

**These taxa were not included in the total density calculation or other data analysis*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site					Windy Shallow					Windy Deep					Wolverine Dike					Patch Dike				
Date Sampled					23-Aug-10					22-Aug-10					27/29-Aug-10					26-Aug-10				
Depth (m)					3	3	3	3	3	16.5	17	17.5	17	17	2	2.5	2.5	2.5	2.5	3.5	3.5	3.5	3.75	3.75
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5
Diptera (continued)	Chironomidae	Orthocladiinae	Orthocladiini	*Bryophaenocladius ?*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Cricotopus/Orthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	474	0	15	0	0	0
				Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Doncricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Eukiefferiella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Euryhapsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Heterotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Heterotrissocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Heterotrissocladius/Hydrobaenus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Mesocricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Paracladius / Doncricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Paracladius	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0
				Parakiefferiella	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Psectrocladius	0	0	0	0	0	0	0	0	0	0	0	0	474	0	0	0	0	0	0	0
				Pseudosmittia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Rheosmittia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Synorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Zalutschia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Chironominae	Chironomini	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Chironomus	0	0	0	0	0	30	0	0	0	0	0	0	356	0	0	0	0	0	0	0
				Cladopelma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Cryptochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Demicryptochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Dicrotendipes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Parachironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Paracladopelma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Saetheria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Sergenta	0	0	0	0	0	0	0	0	0	0	0	0	119	593	948	89	15	59	0	15
				Stictochironomus	0	0	0	0	0	15	0	0	0	0	0	0	593	0	237	0	15	0	0	15
			Tanytarsini	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Cladotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Corynocera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Micropsectra	0	0	0	0	0	0	0	0	0	0	0	474	0	0	0	44	400	459	119	0
				Micropsectra / Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Paratanytarsus	0	0	0	0	0	0	0	0	0	0	0	119	474	593	0	0	30	30	74	0
				Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Stempellinella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Tanytarsus	0	15	15	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	119	0
	Empididae	-	-	(pupa)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Chelifera*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Clinocera*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Trichoclinocera*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephydridae	-	-	*Scatophila*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Muscidae	-	-	*Limnophora*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhagionidae	-	-	*Ptiolina*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Ormosia*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Simulidae	-	-	*Simulium*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	*Simulium* - pupa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tipulidae	-	-	*Tipula*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Diptera Subtotal	***30***	***104***	***30***	***44***	***133***	***133***	***74***	***0***	***44***	***74***	***0***	***593***	***2,015***	***1,304***	***1,659***	***370***	***726***	***874***	***681***	***267***
Non Macrobenthic Invertebrates*																								
Nematoda	-	-	-	-	0	0	15	0	0	30	15	0	0	15	593	119	474	474	0	0	0	0	0	0
Copepoda - Calanoida	-	-	-	-	0	0	104	0	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	148	104	326	593	89
	Ergasilidae	-	-	*Ergasilus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	59	0
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chydoridae	-	-	*Eurycercus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chydoridae	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Daphnidae	-	-	*Daphnia*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	104	0	0
	Holopedidae	-	-	*Holopedium gibberum*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Macrothricidae	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish	Gasterosteidae	-	-	*Pungitius pungitius* (Ninespine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Salmonidae	-	-	*Salvelinus alpinus* (Arctic Char)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				TOTAL	***104***	***207***	***104***	***133***	***311***	***148***	***74***	***15***	***44***	***104***	***252***	***2,148***	***2,370***	***1,778***	***2,015***	***919***	***1,867***	***4,415***	***1,541***	***578***

Data represents organisms/m²

i/d = immature or damaged individuals

**These taxa were not included in the total density calculation or other data analysis*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site					Ref. B Shallow				
Date Sampled					23-Aug-10				
Depth (m)					5.5	5.5	5.5	5.5	5.5
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5
Coelenterata	Hydridae	-	-	*Hydra*	0	0	0	0	0
				Coelenterata Subtotal	***0***	***0***	***0***	***0***	***0***
Microturbellaria	Typhloplanidae	-	-	*Mesostoma*	0	0	0	0	0
				Microturbellaria Subtotal	***0***	***0***	***0***	***0***	***0***
Hirudinea	Piscicolidae	-	-	*Piscicola punctata*	0	0	0	0	0
				Hirudinea Subtotal	***0***	***0***	***0***	***0***	***0***
Oligochaeta	-	-	-	(i/d)	30	0	0	0	0
	Enchytraeidae	-	-	-	0	0	0	0	0
	Lumbriculidae	-	-	-	0	44	104	59	15
	Naididae	-	-	-	0	0	0	0	0
	Tubificidae	-	-	-	0	30	15	0	104
				Oligochaeta Subtotal	***30***	***74***	***119***	***59***	***119***
Gastropoda	Physidae	-	-	*Physa*	0	0	0	0	0
	Valvatidae	-	-	*Valvata sincera*	0	30	0	0	0
				Gastropoda Subtotal	***0***	***30***	***0***	***0***	***0***
Pelecypoda	Sphaeriidae	-	-	(i/d)	370	519	341	119	178
		-	-	*Sphaerium*	15	0	15	0	0
		-	-	*Pisidium*	148	207	207	30	89
				Pelecypoda Subtotal	***533***	***726***	***563***	***148***	***267***
Hydracarina	-	-	-	-	0	0	30	0	15
				Hydracarina Subtotal	***0***	***0***	***30***	***0***	***15***
Copepoda - Harpacticoida	-	-	-	-	0	0	0	0	0
				Copepoda - Harpacticoida Subtotal	***0***	***0***	***0***	***0***	***0***
Ostracoda	-	-	-	-	15	89	15	59	30
				Ostracoda Subtotal	***15***	***89***	***15***	***59***	***30***
Amphipoda	Epimeriidae	-	-	*Epimeria loricata*	0	0	0	0	0
	Gammaridae	-	-	*Gammarus lacustris*	0	15	0	0	15
				Amphipoda Subtotal	***0***	***15***	***0***	***0***	***15***
Malacostraca	Mysidae	-	-	*Mysis relicta*	0	15	0	0	0
				Malacostraca Subtotal	***0***	***15***	***0***	***0***	***0***
Isopoda	Chaetiliidae	-	-	*Saduria entomon*	0	0	0	0	0
				Isopoda Subtotal	***0***	***0***	***0***	***0***	***0***
Ephemeroptera	Ameletidae	-	-	*Ameletus inopinatus*	0	0	0	0	0
	Baetidae	-	-	(i/d)	0	0	0	0	0
	Baetidae	-	-	*Baetis*	0	0	0	0	0
	Ephemerellidae	-	-	*Ephemerella*	0	0	0	0	0
	Heptageniidae	-	-	(i/d) (Heptagenia???)	0	0	0	0	0
				Ephemeroptera Subtotal	***0***	***0***	***0***	***0***	***0***
Plecoptera	Nemouridae	-	-	(i/d)	0	0	0	0	0
		-	-	*Nemoura*	0	0	0	0	0
	Perlodidae	-	-	*Isoperla*	0	0	0	0	0
		-	-	Skwala	0	0	0	0	0
				Plecoptera Subtotal	***0***	***0***	***0***	***0***	***0***
Trichoptera	Apataniidae	-	-	*Apatania*	0	0	0	0	0
		-	-	*Micrasema*	0	0	0	0	0
	Brachycentridae	-	-	*Brachycentrus*	0	0	0	0	0
	Hydroptilidae	-	-	*Agraylea*	0	0	0	0	0
	Limnephilidae	-	-	(i/d)	0	0	0	0	0
		-	-	*Grensia praeterica*	0	15	0	0	0
	Phryganeidae	-	-	(i/d)	0	0	0	0	0
		-	-	*Agrypnia*	0	0	0	0	0
				Trichoptera Subtotal	***0***	***15***	***0***	***0***	***0***
Coleoptera	Dytiscidae	-	-	*Agabus*	0	0	0	0	0
		-	-	*Hydroporus*	0	0	0	0	0
		-	-	*Oreodytes*	0	0	0	0	0
	Haliplidae	-	-	*Haliplus*	0	0	0	0	0
				Coleoptera Subtotal	***0***	***0***	***0***	***0***	***0***
Diptera	Chironomidae	-	-	(pupa)	0	0	0	0	0
		Tanypodinae	Pentaneurini	(i/d)	0	0	0	0	0
				Ablabesmyia	0	0	0	0	0
				Thienemannimyia group sp.	15	0	30	0	0
			Procladiini	*Procladius*	237	281	415	148	119
		Diamesinae	Diamesini	*Diamesa*	0	0	0	0	0
				Potthastia longimana group	0	0	0	0	0
			Protanypini	*Protanypus*	15	0	30	0	0
		Prodiamesinae		*Monodiamesa*	30	44	30	30	44
		Orthocladiinae	-	(i/d)	0	0	0	0	0
			Orthocladiini	sp. #2	0	0	0	0	0
				Abyskomyia	0	0	0	0	0

Data represents organisms/m²

i/d = immature or damaged individuals

**These taxa were not included in the total density calculation or other data analysis*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site					Ref. B Shallow				
Date Sampled					23-Aug-10				
Depth (m)					5.5	5.5	5.5	5.5	5.5
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5
Diptera (continued)	Chironomidae	Orthocladiinae	Orthocladiini	*Bryophaenocladius ?*	0	0	0	0	0
				Cricotopus/Orthocladius	0	0	0	0	0
				Corynoneura	0	0	0	0	0
				Doncricotopus	0	0	0	0	0
				Eukiefferiella	0	0	0	0	0
				Euryhapsis	0	0	0	0	0
				Heterotanytarsus	0	0	0	0	0
				Heterotrissocladius	0	0	0	0	0
				Heterotrissocladius/Hydrobaenus	0	0	0	0	0
				Mesocricotopus	0	0	0	0	0
				Paracladius / Doncricotopus	0	0	0	0	0
				Paracladius	0	0	0	0	0
				Parakiefferiella	0	0	0	0	0
				Parametriocnemus	0	0	0	0	0
				Psectrocladius	178	119	193	267	104
				Pseudosmittia	0	0	0	0	0
				Rheosmittia	0	0	0	0	0
				Synorthocladius	0	0	0	0	0
				Tvetenia	0	0	0	0	0
				Zalutschia	1,274	1,570	1,748	1,096	1,496
		Chironominae	Chironomini	(i/d)	0	0	15	0	0
				Chironomus	0	0	0	0	0
				Cladopelma	0	0	0	0	0
				Cryptochironomus	0	0	0	0	0
				Demicryptochironomus	0	0	0	0	0
				Dicrotendipes	0	0	0	0	0
				Parachironomus	15	15	15	30	0
				Paracladopelma	0	0	0	0	0
				Polypedilum	0	0	0	0	0
				Saetheria	0	0	0	0	0
				Sergenta	0	0	15	0	30
				Stictochironomus	30	74	15	0	104
			Tanytarsini	(i/d)	0	0	0	0	0
				Cladotanytarsus	15	0	0	0	0
				Corynocera	1,215	1,037	696	1,244	1,407
				Micropsectra	0	0	0	0	0
				Micropsectra / Tanytarsus	0	0	0	0	0
				Paratanytarsus	311	1,244	622	919	489
				Rheotanytarsus	0	0	0	0	0
				Stempellinella	0	0	0	0	0
				Tanytarsus	1,319	1,526	1,319	2,933	1,748
	Empididae	-	-	(pupa)	0	0	0	0	0
		-	-	*Chelifera*	0	0	0	0	0
		-	-	*Clinocera*	0	0	0	0	0
		-	-	*Trichoclinocera*	0	0	0	0	0
	Ephydridae	-	-	*Scatophila*	0	0	0	0	0
	Muscidae	-	-	*Limnophora*	0	0	0	0	0
	Rhagionidae	-	-	*Ptiolina*	0	0	0	0	0
		-	-	*Ormosia*	0	0	0	0	0
	Simulidae	-	-	*Simulium*	0	0	0	0	0
		-	-	*Simulium* - pupa	0	0	0	0	0
	Tipulidae	-	-	*Tipula*	0	0	0	0	0
				Diptera Subtotal	***4,652***	***5,911***	***5,141***	***6,667***	***5,541***
Non Macrobenthic Invertebrates*									
Nematoda	-	-	-	-	119	44	237	148	148
Copepoda - Calanoida	-	-	-	-	15	15	0	0	0
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	30	15	44	0	30
	Ergasilidae	-	-	*Ergasilus*	0	0	0	0	0
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0	0	0
	Chydoridae	-	-	*Eurycercus*	59	133	222	30	74
	Chydoridae	-	-	-	0	0	0	0	0
	Daphnidae	-	-	*Daphnia*	0	0	0	0	0
	Holopedidae	-	-	*Holopedium gibberum*	0	0	0	0	0
	Macrothricidae	-	-	-	0	0	0	0	0
Fish	Gasterosteidae	-	-	*Pungitius pungitius* (Ninespine	0	0	0	0	0
	Salmonidae	-	-	*Salvelinus alpinus* (Arctic Char)	0	0	0	0	0
				TOTAL	***5,230***	***6,874***	***5,867***	***6,933***	***5,985***

Data represents organisms/m²

i/d = immature or damaged individuals

**These taxa were not included in the total density calculation or other data analysis*

Appendix 3.10-1

Stream and River Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2010

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Appendix 3.10-1. Stream and River Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site					Aim. NE IF					Aim. R.					Stickleback OF					Trout OF					AWRc					Aim. OF				
Date Sampled					16-Aug-10					18-Aug-10					16-Aug-10					16-Aug-10					15-Aug-10					16-Aug-10				
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5
Coelenterata	Hydridae	-	-	Hydra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25,486	13,681	19,306	44,306	11,479
				Coelenterata Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***25,486***	***13,681***	***19,306***	***44,306***	***11,479***
Hirudinea	Piscicolidae	-	-	Piscicola punctata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Hirudinea Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta	-	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Enchytraeidae	-	-	-	0	0	0	0	0	0	0	7	10	94	0	0	0	0	0	0	0	0	0	0	14	17	45	0	14	490	76	431	559	3
	Lumbriculidae	-	-	-	0	194	69	14	125	28	17	0	0	7	0	17	90	42	49	0	21	153	56	243	0	0	0	0	7	31	226	101	31	28
	Naididae	-	-	-	28	0	0	0	0	0	0	0	0	3	0	0	0	0	0	1,111	1,389	427	347	611	31	83	59	63	87	0	0	0	0	0
	Tubificidae	-	-	-	500	1,139	639	556	472	0	0	0	0	0	625	722	549	549	194	69	69	3	7	215	0	0	0	7	0	3	10	69	149	3
				Oligochaeta Subtotal	***528***	***1,333***	***708***	***569***	***597***	***28***	***17***	***7***	***10***	***104***	***625***	***740***	***639***	***590***	***243***	***1,181***	***1,479***	***583***	***410***	***1,069***	***45***	***101***	***104***	***69***	***108***	***524***	***313***	***601***	***740***	***35***
Gastropoda	Physidae	-	-	Physa	7	0	83	42	0	83	14	3	0	3	0	0	0	0	0	31	10	73	28	17	0	0	0	0	0	0	0	0	0	0
	Valvatidae	-	-	Valvata sincera	28	125	14	0	42	14	10	0	10	0	0	0	7	3	7	319	21	125	149	149	0	0	0	0	0	3	17	7	0	0
				Gastropoda Subtotal	***35***	***125***	***97***	***42***	***42***	***97***	***24***	***3***	***10***	***3***	***0***	***0***	***7***	***3***	***7***	***351***	***31***	***198***	***177***	***167***	***0***	***0***	***0***	***0***	***0***	***3***	***17***	***7***	***0***	***0***
Pelecypoda	Sphaeriidae	-	-	(i/d)	14	28	0	0	0	7	3	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
		-	-	Sphaerium	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Pisidium	69	28	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Pelecypoda Subtotal	***83***	***56***	***0***	***0***	***0***	***14***	***7***	***0***	***3***	***3***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***3***
Hydracarina	-	-	-	-	42	14	28	28	14	76	56	76	59	118	0	0	0	0	7	49	153	208	111	97	45	63	94	7	3	3	0	0	0	0
				Hydracarina Subtotal	***42***	***14***	***28***	***28***	***14***	***76***	***56***	***76***	***59***	***118***	***0***	***0***	***0***	***0***	***7***	***49***	***153***	***208***	***111***	***97***	***45***	***63***	***94***	***7***	***3***	***3***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Copepoda - Harpacticoida Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda	-	-	-	-	1,083	2,222	1,972	417	1,069	115	205	28	28	42	2,500	507	521	163	979	486	69	69	0	139	42	83	111	14	28	417	694	208	417	69
				Ostracoda Subtotal	***1,083***	***2,222***	***1,972***	***417***	***1,069***	***115***	***205***	***28***	***28***	***42***	***2,500***	***507***	***521***	***163***	***979***	***486***	***69***	***69***	***0***	***139***	***42***	***83***	***111***	***14***	***28***	***417***	***694***	***208***	***417***	***69***
Amphipoda	Epimeriidae	-	-	Epimeria loricata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gammaridae	-	-	Gammarus lacustris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Amphipoda Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca	Mysidae	-	-	Mysis relicta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Malacostraca Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Isopoda	Chaetiliidae	-	-	Saduria entomon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Isopoda Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Ephemeroptera	Ameletidae	-	-	Ameletus inopinatus	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetidae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetidae	-	-	Baetis	0	0	0	0	0	0	0	3	10	21	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemerellidae	-	-	Ephemerella	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Heptageniidae	-	-	(i/d) (Heptagenia???)	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Ephemeroptera Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***3***	***14***	***38***	***0***	***0***	***0***	***0***	***0***	***3***	***3***	***3***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Plecoptera	Nemouridae	-	-	(i/d)	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Nemoura	0	0	0	0	0	24	3	14	7	52	28	0	0	0	0	69	319	1,073	1,052	736	14	94	0	14	14	0	0	0	3	0
	Perlodidae	-	-	Isoperla	0	0	0	0	0	0	0	0	10	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Skwala	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
				Plecoptera Subtotal	***0***	***0***	***0***	***0***	***0***	***24***	***7***	***17***	***17***	***94***	***28***	***0***	***0***	***0***	***0***	***69***	***323***	***1,073***	***1,052***	***736***	***14***	***94***	***0***	***14***	***14***	***0***	***0***	***0***	***3***	***0***
Trichoptera	Apataniidae	-	-	Apatania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Micrasema	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3	7	3	7	0	7	66	3	0	0	0	0	0	0	0
	Brachycentridae	-	-	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydroptilidae	-	-	Agraylea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limnephilidae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Grensia praeterica	0	0	0	0	0	0	0	0	0	0	0	38	250	42	69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Phryganeidae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Agrypnia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Trichoptera Subtotal	***0***	***0***	***0***	***0***	***0***	***3***	***0***	***0***	***0***	***0***	***0***	***38***	***250***	***42***	***69***	***3***	***7***	***3***	***7***	***0***	***7***	***66***	***3***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Coleoptera	Dytiscidae	-	-	Agabus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Hydroporus	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Oreodytes	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae	-	-	Haliplus	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	0	3	3	14	24	0	0	0	0	0
				Coleoptera Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***10***	***0***	***0***	***0***	***0***	***0***	***10***	***0***	***3***	***0***	***0***	***0***	***0***	***0***	***3***	***3***	***14***	***24***	***0***	***0***	***0***	***0***	***0***
Diptera	Chironomidae	-	-	(pupa)	0	0	0	0	0	3	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0
		Tanypodinae	Pentaneurini	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0
				Ablabesmyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Thienemannimyia group sp.	56	514	0	0	42	73	42	35	21	94	0	0	14	10	0	7	24	90	0	76	104	253	135	226	250	0	0	0	0	0
			Procladiini	Procladius	28	1,028	458	69	69	0	3	0	0	0	139	108	90	17	104	7	0	3	0	28	3	0	14	0	10	0	0	0	0	0
		Diamesinae	Diamesini	Diamesa	0	0	0	0	0	0	0	0	7	3	0	0	0	0	0	243	309	17	7	42	0	0	0	0	0	0	3	0	0	0
				Potthastia longimana group	0	0	0	0	0	0	0	0	10	35	0	0	0	0	0	3	69	0	0	0	0	0	0	0	0	219	139	69	142	0
			Protanypini	Protanypus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Prodiamesinae		Monodiamesa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Orthocladiinae	-	(i/d)	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	7	87	0	28	0	14	0	0	3	0	0	0	0	0
			Orthocladiini	sp. #2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Abyskomyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Bryophaenocladius ?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Cricotopus/Orthocladius	0	0	56	0	0	24	10	0	0	3	0	0	0	28	0	4,365	2,753	3,910	2,250	1,569	0	128	42	28	28	278	281	208	2,083	0

Data represents organisms/m ²

i/d = immature or damaged individuals

**These taxa were not included in the total density calculation or other data analysis*

Appendix 3.10-1. Stream and River Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site					Aim. NE IF					Aim. R.					Stickleback OF					Trout OF					AWRc					Aim. OF				
Date Sampled					16-Aug-10					18-Aug-10					16-Aug-10					16-Aug-10					15-Aug-10					16-Aug-10				
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5
Diptera (continued)				Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Doncricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Eukiefferiella	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	7	0	0	69	0	3	10	28	0	0	0	0	0	0	0
				Euryhapsis	0	0	0	0	0	278	90	73	104	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Heterotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Heterotrissocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Heterotrissocladius/Hydrobaenus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
				Mesocricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Paracladius / Doncricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	111	833	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Paracladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Parakiefferiella	0	0	0	0	0	0	0	0	0	0	139	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0
				Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0
				Psectrocladius	83	375	250	56	83	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	378	417	427	354	392	69	139	0	139	0
				Pseudosmittia	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	73	76	0	0	0	0	0	0	0	0	0	0	0	0	0
				Rheosmittia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
				Synorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	215	69	111	0	0	0	0	0	0	0	0	0	0
				Tvetenia	0	0	0	0	0	0	0	0	7	118	0	0	0	0	0	0	76	3	7	0	0	0	0	0	0	0	0	0	0	0
				Zalutschia	0	0	0	0	0	0	0	0	0	0	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Chironominae	Chironomini	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Chironomus	0	0	42	0	0	0	0	0	0	3	28	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
				Cladopelma	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Cryptochironomus	83	125	69	83	69	0	0	0	0	0	0	14	118	17	14	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Demicryptochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Dicrotendipes	28	375	97	153	69	0	7	3	0	3	0	0	0	0	0	3	0	0	7	0	0	0	0	7	3	0	0	0	0	0
				Parachironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Paracladopelma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Polypedilum	167	333	333	125	28	115	24	14	17	7	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
				Saetheria	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Sergenta	0	111	222	83	97	0	7	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Stictochironomus	0	139	28	208	167	7	0	0	0	0	389	104	319	87	97	0	0	0	0	0	0	3	0	10	0	0	0	0	0	0
			Tanytarsini	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Cladotanytarsus	306	319	83	111	28	31	24	0	0	10	0	0	0	35	0	0	0	139	0	56	0	0	0	0	0	0	0	0	0	0
				Corynocera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Micropsectra	222	56	0	0	28	21	10	0	3	63	0	0	0	0	0	0	0	0	0	0	3	42	0	0	14	139	0	0	0	0
				Micropsectra / Tanytarsus	0	222	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	14	0	0	0	0	0	0
				Paratanytarsus	28	181	28	28	111	3	14	7	17	0	0	0	0	0	0	0	208	0	0	0	247	319	313	80	233	80	69	0	3	0
				Rheotanytarsus	0	0	0	0	0	0	10	0	21	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Stempellinella	0	278	167	0	0	7	7	0	0	0	0	0	167	0	417	139	0	0	0	0	31	69	17	14	49	0	0	0	0	0
				Tanytarsus	56	1,778	278	125	28	0	0	0	0	0	278	83	167	31	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Empididae	-	-	(pupa)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0	0	0	0	0	0	0	0	0
		-	-	Chelifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Clinocera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	14	0	0	0	0	0	0	0
		-	-	Trichoclinocera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephydridae	-	-	Scatophila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Muscidae	-	-	Limnophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhagionidae	-	-	Ptiolina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Ormosia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Simulidae	-	-	Simulium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Simulium - pupa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tipulidae	-	-	Tipula	0	0	0	0	0	66	24	10	24	14	0	0	0	0	0	0	3	28	56	52	0	7	0	0	0	0	10	0	7	17
				Diptera Subtotal	***1,111***	***5,833***	***2,125***	***1,042***	***819***	***632***	***292***	***153***	***233***	***524***	***1,111***	***309***	***931***	***337***	***1,611***	***4,858***	***3,597***	***4,493***	***2,465***	***1,990***	***792***	***1,309***	***990***	***733***	***1,021***	***785***	***642***	***278***	***2,375***	***17***
Microturbellaria	Typhloplanidae	-	-	Mesostoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Microturbellaria Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Non Macrobenthic Invertebrates*																																
Copepoda - Calanoida	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	0	0	0
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	Acanthocyclops	0	56	0	0	28	59	66	10	3	3	0	0	0	0	0	0	0	0	0	0	0	31	14	28	0	0	0	0	139	0
	Ergasilidae	-	-	Ergasilus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladocera	Bosminidae	-	-	Bosmina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chydoridae	-	-	Eurycercus	21	69	0	0	0	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0	24	38	31	38	229	0	0	0	0	0
	Chydoridae	-	-	-	0	0	0	0	0	0	0	0	0	0	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Daphnidae	-	-	Daphnia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	208	0	139	0	0
	Holopedidae	-	-	Holopedium gibberum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	972	417	1,042	1,944	208
	Macrothricidae	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nematoda	-	-	-	-	28	167	0	56	83	3	14	3	14	3	139	63	118	56	278	0	0	0	0	28	3	21	0	31	31	69	385	642	1,455	3
Fish	Gasterosteidae	-	-	Pungitius pungitius (Ninespine Stickleback)	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Salmonidae	-	-	Salvelinus alpinus (Arctic Char))	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				TOTAL	***2,882***	***9,583***	***4,931***	***2,097***	***2,542***	***990***	***608***	***299***	***375***	***927***	***4,264***	***1,594***	***2,347***	***1,146***	***2,917***	***7,003***	***5,663***	***6,632***	***4,222***	***4,198***	***944***	***1,719***	***1,306***	***851***	***1,198***	***27,219***	***15,347***	***20,399***	***47,840***	***11,604***

Data represents organisms/m ^{2}

i/d = immature or damaged individuals

**These taxa were not included in the total density calculation or other data analysis*

Appendix 3.10-1. Stream and River Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site					Koig. R.					Koig. U/S					Koig. D/S					AWRb					AWRa				
Date Sampled					18-Aug-10					14-Aug-10					14-Aug-10					15-Aug-10					15-Aug-10				
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5
Coelenterata	Hydridae	-	-	Hydra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	139	0	0	0	0	0	0	0	0	0
				Coelenterata Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***139***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Hirudinea	Piscicolidae	-	-	Piscicola punctata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Hirudinea Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta	-	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Enchytraeidae	-	-	-	3	0	21	0	0	0	0	0	0	0	0	38	24	10	3	0	208	0	0	0	0	0	0	0	0
	Lumbriculidae	-	-	-	31	10	0	14	42	21	0	3	0	0	0	0	0	3	3	104	125	49	222	167	0	0	0	0	0
	Naididae	-	-	-	24	21	35	139	14	14	0	0	0	0	7	0	0	0	3	278	417	486	139	222	0	0	0	0	0
	Tubificidae	-	-	-	24	188	118	52	80	28	28	0	0	90	7	0	0	0	0	28	76	28	222	639	292	24	97	174	1,958
				Oligochaeta Subtotal	***83***	***219***	***174***	***205***	***135***	***63***	***28***	***3***	***0***	***90***	***14***	***38***	***24***	***14***	***10***	***410***	***826***	***563***	***583***	***1,028***	***292***	***24***	***97***	***174***	***1,958***
Gastropoda	Physidae	-	-	Physa	0	0	0	0	14	7	0	0	0	0	0	0	0	0	0	28	49	83	56	69	0	0	0	0	7
	Valvatidae	-	-	Valvata sincera	0	0	0	0	0	167	73	0	14	3	3	0	7	0	0	1,319	694	1,403	4,028	1,750	3	3	0	3	35
				Gastropoda Subtotal	***0***	***0***	***0***	***0***	***14***	***174***	***73***	***0***	***14***	***3***	***3***	***0***	***7***	***0***	***0***	***1,347***	***743***	***1,486***	***4,083***	***1,819***	***3***	***3***	***0***	***3***	***42***
Pelecypoda	Sphaeriidae	-	-	(i/d)	0	0	0	0	0	3	3	0	0	0	0	0	3	0	0	0	0	0	0	0	31	7	7	7	618
		-	-	Sphaerium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Pisidium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	3	3	21	181
				Pelecypoda Subtotal	***0***	***0***	***0***	***0***	***0***	***3***	***3***	***0***	***0***	***0***	***0***	***0***	***3***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***49***	***10***	***10***	***28***	***799***
Hydracarina	-	-	-	-	7	3	0	10	14	10	264	90	0	28	28	188	80	69	7	451	56	597	681	458	3	0	0	0	0
				Hydracarina Subtotal	***7***	***3***	***0***	***10***	***14***	***10***	***264***	***90***	***0***	***28***	***28***	***188***	***80***	***69***	***7***	***451***	***56***	***597***	***681***	***458***	***3***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Copepoda - Harpacticoida Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda	-	-	-	-	28	38	63	17	17	35	750	125	111	146	42	0	0	0	0	1,271	1,111	1,965	3,194	2,125	0	0	0	14	139
				Ostracoda Subtotal	***28***	***38***	***63***	***17***	***17***	***35***	***750***	***125***	***111***	***146***	***42***	***0***	***0***	***0***	***0***	***1,271***	***1,111***	***1,965***	***3,194***	***2,125***	***0***	***0***	***0***	***14***	***139***
Amphipoda	Epimeriidae	-	-	Epimeria loricata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gammaridae	-	-	Gammarus lacustris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Amphipoda Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca	Mysidae	-	-	Mysis relicta	0	3	0	21	3	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
				Malacostraca Subtotal	***0***	***3***	***0***	***21***	***3***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***3***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Isopoda	Chaetiliidae	-	-	Saduria entomon	0	0	0	0	0	0	0	45	73	42	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0
				Isopoda Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***45***	***73***	***42***	***3***	***3***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Ephemeroptera	Ameletidae	-	-	Ameletus inopinatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetidae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetidae	-	-	Baetis	0	0	0	0	0	0	0	0	0	0	0	3	0	7	0	0	0	0	0	0	0	0	0	0	0
	Ephemerellidae	-	-	Ephemerella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Heptageniidae	-	-	(i/d) (Heptagenia???)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Ephemeroptera Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***3***	***0***	***7***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Plecoptera	Nemouridae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Nemoura	0	3	10	0	3	3	0	0	0	0	0	0	0	0	0	563	222	153	431	347	0	0	0	3	0
	Perlodidae	-	-	Isoperla	3	0	0	0	0	0	0	0	0	0	0	10	7	3	10	0	0	0	0	0	0	0	0	0	0
		-	-	Skwala	10	0	0	7	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
				Plecoptera Subtotal	***14***	***3***	***10***	***7***	***3***	***3***	***0***	***0***	***0***	***0***	***0***	***10***	***10***	***3***	***10***	***563***	***222***	***153***	***431***	***347***	***0***	***0***	***0***	***3***	***0***
Trichoptera	Apataniidae	-	-	Apatania	10	3	28	14	0	14	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brachycentridae	-	-	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydroptilidae	-	-	Agraylea	0	0	0	0	0	10	69	7	3	0	0	0	0	0	0	14	0	0	14	0	0	0	0	0	0
	Limnephilidae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
		-	-	Grensia praeterica	0	0	0	0	0	0	0	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Phryganeidae	-	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
		-	-	Agrypnia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
				Trichoptera Subtotal	***10***	***3***	***28***	***14***	***0***	***24***	***73***	***14***	***3***	***7***	***0***	***0***	***0***	***0***	***0***	***14***	***0***	***0***	***14***	***0***	***3***	***0***	***0***	***0***	***14***
Coleoptera	Dytiscidae	-	-	Agabus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Hydroporus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Oreodytes	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae	-	-	Haliplus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	69	28	28	14	0	0	0	0	0
				Coleoptera Subtotal	***0***	***0***	***3***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***7***	***69***	***28***	***28***	***14***	***0***	***0***	***0***	***0***	***0***
Diptera	Chironomidae	-	-	(pupa)	0	0	0	0	0	3	0	0	0	0	0	0	7	0	3	7	69	14	139	0	0	0	0	0	0
		Tanypodinae	Pentaneurini	(i/d)	0	0	0	0	0	0	28	0	0	21	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Ablabesmyia	0	0	0	0	0	0	0	0	0	14	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Thienemannimyia group sp.	0	7	0	0	0	31	42	38	31	21	0	14	0	0	21	688	813	1,118	1,264	1,208	0	0	0	0	0
			Procladiini	Procladius	3	10	0	0	0	14	688	63	24	42	0	0	0	0	0	97	396	507	347	403	7	0	0	14	243
		Diamesinae	Diamesini	Diamesa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Potthastia longimana group	14	0	0	0	3	0	0	0	0	0	3	0	0	0	0	28	0	14	14	0	0	0	0	0	0
			Protanypini	Protanypus	0	0	3	0	0	0	35	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Prodiamesinae		Monodiamesa	0	24	7	0	0	0	80	108	38	153	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Orthocladiinae	-	(i/d)	0	7	0	0	0	0	0	0	0	0	3	0	0	0	0	146	0	208	14	111	0	0	0	0	0
			Orthocladiini	sp. #2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Abyskomyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Bryophaenocladius ?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Cricotopus/Orthocladius	7	7	7	0	10	0	0	0	0	0	0	3	0	0	0	2,278	347	1,771	444	0	0	0	0	0	0

Data represents organisms/m ²

i/d = immature or damaged individuals

**These taxa were not included in the total density calculation or other data analysis*

Appendix 3.10-1. Stream and River Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2010

Site					Koig. R.					Koig. U/S					Koig. D/S					AWRb					AWRa				
Date Sampled					18-Aug-10					14-Aug-10					14-Aug-10					15-Aug-10					15-Aug-10				
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5	Rep-1	Rep-2	Rep-3	Rep-4	Rep-5
Diptera (continued)				Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Doncricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	160	0	208	0	0	0	0	0	0	0
				Eukiefferiella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Euryhapsis	14	0	0	0	0	0	0	0	0	0	0	3	7	0	3	0	0	0	0	0	0	0	0	0	0
				Heterotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	139	0	0	0	0	0	0	0
				Heterotrissocladius	0	0	7	0	0	3	139	14	56	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Heterotrissocladius/Hydrobaenus	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Mesocricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Paracladius / Doncricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Paracladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Parakiefferiella	0	0	0	0	0	0	375	139	28	14	83	7	0	201	0	0	0	0	0	0	0	0	0	0	0
				Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Psectrocladius	31	0	21	17	28	24	31	14	0	0	7	0	0	0	0	56	0	21	69	139	0	0	0	0	0
				Pseudosmittia	49	28	56	3	3	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	17	0	7	14	0
				Rheosmittia	0	0	0	0	0	0	0	14	0	0	24	69	458	0	139	0	0	0	0	0	0	0	0	0	0
				Synorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
				Zalutschia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Chironominae	Chironomini	(i/d)	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Chironomus	0	0	0	0	0	0	396	52	135	486	17	0	3	0	0	0	0	0	0	0	0	0	0	0	0
				Cladopelma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Cryptochironomus	3	10	14	3	3	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0
				Demicryptochironomus	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
				Dicrotendipes	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Parachironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Paracladopelma	0	0	0	0	0	0	0	14	0	42	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Polypedilum	0	0	0	0	3	3	139	0	3	0	17	24	66	28	42	0	0	0	0	0	299	3	7	184	2,361
				Saetheria	0	0	0	0	0	0	0	0	0	0	0	42	132	56	56	0	0	0	0	0	0	0	0	0	0
				Sergenta	0	56	0	0	0	17	365	3	684	201	10	0	0	0	0	69	0	0	0	0	396	7	14	38	2,903
				Stictochironomus	76	292	219	66	35	0	1,681	750	1,684	597	17	3	0	0	0	0	0	0	0	0	0	0	0	0	0
			Tanytarsini	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Cladotanytarsus	10	236	122	21	21	0	28	28	0	0	104	354	101	10	17	0	0	0	0	0	0	7	0	0	0
				Corynocera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Micropsectra	0	0	0	0	0	0	0	0	0	0	17	10	0	0	0	0	0	0	0	0	0	0	0	0	0
				Micropsectra / Tanytarsus	0	3	0	0	0	0	0	0	0	0	7	0	0	0	0	278	347	764	139	444	0	0	0	0	0
				Paratanytarsus	167	167	108	184	160	0	0	0	0	0	0	0	0	0	0	486	0	7	139	0	0	0	0	0	0
				Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	104	0	0	0	0	0	0	0	0	0	0	0	0	0
				Stempellinella	0	3	0	0	0	0	28	14	56	0	59	0	0	0	0	69	0	208	139	0	0	0	0	0	28
				Tanytarsus	0	28	28	10	0	0	111	0	0	49	0	0	0	0	0	139	417	556	556	444	0	0	0	0	0
	Empididae	-	-	(pupa)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Chelifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Clinocera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Trichoclinocera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0
	Ephydridae	-	-	Scatophila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0
	Muscidae	-	-	Limnophora	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhagionidae	-	-	Ptiolina	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Ormosia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	3	0	0
	Simulidae	-	-	Simulium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		-	-	Simulium - pupa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tipulidae	-	-	Tipula	0	10	17	7	10	0	0	3	3	0	7	3	0	0	0	118	125	174	319	264	0	0	0	0	0
				Diptera Subtotal	***375***	***899***	***608***	***313***	***281***	***97***	***4,163***	***1,253***	***2,750***	***1,684***	***417***	***642***	***774***	***299***	***281***	***4,618***	***2,514***	***5,708***	***3,597***	***3,014***	***722***	***35***	***38***	***253***	***5,535***
Microturbellaria	Typhloplanidae	-	-	Mesostoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Microturbellaria Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Non Macrobenthic Invertebrates*																													
Copepoda - Calanoida	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	Acanthocyclops	0	0	0	0	0	10	111	0	0	56	3	0	0	0	0	0	556	69	417	111	0	0	0	0	0
	Ergasilidae	-	-	Ergasilus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladocera	Bosminidae	-	-	Bosmina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chydoridae	-	-	Eurycercus	0	0	7	0	7	21	14	0	0	0	35	0	0	0	0	139	701	271	653	194	0	0	0	0	0
	Chydoridae	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Daphnidae	-	-	Daphnia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Holopedidae	-	-	Holopedium gibberum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Macrothricidae	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nematoda	-	-	-	-	132	667	462	3	111	10	56	28	0	0	49	7	0	0	0	14	7	14	14	139	52	0	0	0	250
Fish	Gasterosteidae	-	-	Pungitius pungitius (Ninespine Stickleback)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0
	Salmonidae	-	-	Salvelinus alpinus (Arctic Char))	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				TOTAL	***517***	***1,170***	***885***	***587***	***469***	***410***	***5,354***	***1,531***	***2,951***	***2,000***	***507***	***885***	***899***	***396***	***309***	***8,819***	***5,542***	***10,500***	***12,611***	***8,806***	***1,073***	***73***	***146***	***476***	***8,486***

Data represents organisms/m ^{2}

i/d = immature or damaged individuals

**These taxa were not included in the total density calculation or other data analysis*