Hope Bay Mining Limited

NEWMONT™
NORTH AMERICA

2009 Freshwater Baseline Report, Hope Bay Belt Project

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Hope Bay Mining Limited

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Executive Summary

Engineers and Scientists

Executive Summary

Environmental baseline studies were conducted by Rescan Environmental Services Ltd. (Rescan) in 2009, on behalf of Hope Bay Mining Ltd. (HBML), for the Hope Bay Belt Project. The Hope Bay Belt Property is located approximately 125 km southwest of Cambridge Bay, Nunavut, on the south shore of Melville Sound. The nearest communities are Omingmaktok (Bay Chimo; 75 km to the southwest of the property), Cambridge Bay, and Kingaok (Bathurst Inlet; 160 km to the southwest of the property).

The environmental baseline program conducted in 2009 was based on the plan to develop multiple deposits in the belt. The 2009 program was also based on Newmont's priorities as of early 2009, which included regulatory compliance with the existing Doris North Project permits and licences. Baseline work was primarily focused on the north end of the belt in 2009. This report presents the findings of the 2009 freshwater baseline study, and includes a comparison to historically collected data. Freshwater fisheries data are presented as a separate report.

The primary objective of the 2009 freshwater program was to collect additional aquatic baseline data relevant to the planned project to support permitting and project design. This report presents the methods used to collect and analyze the freshwater aquatic data for 2009 as well as a comparison of the results to historical site data.

The 2009 aquatic 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 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 future mining activities. Two reference lakes 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 13 lakes and 12 streams/rivers were sampled in 2009.

Analytical results from all samples collected as part of the 2009 freshwater baseline program are provided as appendices to this report. The following text provides a brief summary of the various components sampled as part of the 2009 freshwater baseline program.

<u>Lake Physical Limnology</u>

During winter, the dissolved oxygen concentration in Project area lakes ranged from nearly anoxic (≤1 mg/L) in the bottom waters of Ogama, Little Roberts, and Wolverine lakes to supersaturated in the surface waters of several lakes (maximum of 16.9 mg/L in Glenn Lake). During the summer, dissolved oxygen levels ranged from 7.8 mg/L in Patch North to 13.2 mg/L in Reference Lake A. Winter water temperatures ranged between 0.2 and 2.1°C, with coldest temperatures near the surface ice and water warming with depth. During summer, lakes were generally well-mixed or weakly stratified.

Water clarity in most lakes surveyed was relatively low, as secchi depths were typically less than 2 m. Reduced water clarity was likely attributable to the re-suspension of fine sediments along the shorelines of lakes resulting from wave action and high winds common to the area. Euphotic zone depth ranged from 3.7 to 30.4 m and extended through the entire water column at most lakes, except the deepest or most turbid.

River water temperatures during winter ranged from 0 to 0.3°C at the sites surveyed along the Koignuk River. Dissolved oxygen concentrations were extremely high (16.19 mg/L) at the upstream site of the Koignuk River, and very low (2.17 mg/L) at the downstream site.

Lake Water Quality

Lakes in the study area were neutral to slightly basic (with pH ranging from 6.9 to 8.3) and contained variable concentrations of metals and nutrients. Water column parameters did not vary significantly with depth, as most lakes were shallow and well-mixed to weakly stratified. Seasonal water quality trends were apparent in some lakes, with winter concentrations of certain parameters greatly exceeding summer levels. This trend was particularly evident for total dissolved solids, total organic carbon, sulphate, total phosphorus, ammonia, nitrate, and several metals (e.g., chromium, copper, iron, and lead).

Nitrate concentrations ranged from below detection in several lakes to 0.177 mg/L in Ogama Lake. Lakes within the Doris and Little Roberts watersheds contained the highest nitrate levels. Concentrations of nitrite were generally below analytical detection limits. Ammonia concentrations ranged from below detection in several lakes to 0.133 mg/L in Wolverine Lake. The highest concentrations of ammonia were measured in Wolverine and Nakhaktok lakes, which are the lakes located furthest upstream in the Doris and Windy watersheds, respectively.

Total phosphorus concentrations ranged from 0.002 mg/L at Reference Lake B to 0.095 mg/L at Nakhaktok Lake. Based on the Canadian Council of Ministers of the Environment (CCME) recommended trigger ranges for total phosphorus, Windy Lake and Reference Lakes A and B would be categorized as ultra-oligotrophic to oligotrophic (depending on the season), Imniagut, Patch North and South, P.O., and Naiqunnguut lakes would be categorized as oligotrophic, while Little Roberts Lake (during winter only) and Nakhaktok Lake would be considered eutrophic systems. Doris Lake North and South ranged from mesotrophic to meso-eutrophic depending on the season.

Glenn Lake (in the Windy Watershed) tended to contain the highest average aluminum, copper, iron, and molybdenum concentrations, and the Windy Watershed as a whole had higher molybdenum levels than the other watersheds. Nickel concentrations in Imniagut Lake were markedly higher than other lakes, while zinc levels in Doris S also tended to be higher than other lakes. Average metal concentrations in lakes were generally below CCME guidelines, with the following exceptions: aluminum in P.O., Ogama, Naiqunnguut, and Glenn lakes; chromium in Wolverine and Glenn lakes; copper in Ogama, Naiqunnguut, and Glenn lakes; iron in Wolverine and Glenn lakes; and zinc in Doris Lake South. These elevated concentrations occur naturally within study area lakes.

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, except at Nakhaktok Lake. An increase in fine sediments (clay and silt) within a lake was generally associated with an increase in all parameters evaluated with the exception of phosphorus. There were few clear trends in sediment chemistry among lake sites, though sediments from Wolverine and Imniagut lakes in the Doris Watershed contained relatively high concentrations of total organic carbon, ammonium, total nitrogen, and total sulphur. Lake sediments were naturally elevated in arsenic, chromium, and copper, and concentrations of these metals were often higher than CCME interim sediment quality guidelines. Within-site annual variability was comparable in magnitude to within-year variability observed among sites.

Lake Phytoplankton

Lake phytoplankton biomass (as chlorophyll *a*) ranged from 0.3 to 26.9 µg chl *a*/L, and was highest in Ogama, Doris North and South, and Little Roberts lakes (in the Doris Watershed) and Nakhaktok Lake (in the Windy Watershed). Trends in phytoplankton abundance and biomass were similar. Phytoplankton taxonomic composition varied substantially among lakes, though cyanobacteria (blue-green algae) were consistently dominant at sites with high levels of phytoplankton abundance and biomass. In other lakes, the taxonomic assemblage was mainly composed of chlorophytes, cryptophytes, and diatoms. Phytoplankton richness and diversity ranged from 6 to 20 genera/sample and from 0.08 to 0.87, respectively, across all sites and seasons. Genera richness and diversity were consistently lowest at Nakhaktok and Doris North and South lake sites. Phytoplankton diversity and richness generally followed similar trends.

The taxonomic composition of epontic algae (algae living on the underside of the ice) in a particular lake was similar to the winter phytoplankton composition in that lake. The assemblage of epontic algae was mainly composed of cyanobacteria in Doris Lake North and South, chrysophytes and dinoflagellates in Little Roberts Lake, cryptophytes in Patch Lake North and South, and chrysophytes in Ogama Lake. Epontic richness ranged from 6 to 17 genera and followed a similar trend as diversity, which ranged from 0.26 to 0.88. Richness and diversity levels were consistently lowest at Doris South and highest at Ogama Lake.

Lake Zooplankton

In general, zooplankton abundance varied widely among lakes with no obvious watershed-specific trends. Zooplankton abundance ranged from 2,200 to 282,000 organisms/m^3, and Imniagut and Nakhaktok lakes contained the highest abundance levels. The zooplankton assemblage in lakes typically consisted of cladocerans, copepods, rotifers and protists. Zooplankton genera richness ranged from 3 to 12 genera/sample, and diversity ranged from 0.14 to 0.78. Richness and diversity were particularly low in Windy and Glenn lakes, but were relatively similar among the other sites surveyed.

Lake Benthos

Lake benthos densities ranged from 116 to 23,600 organisms/m^2. The highest levels of benthos density were found in Wolverine (13,300 organisms/m^2), Imniagut (23,600 organisms/m^2), Nakhaktok (7,700 organisms/m^2), and Little Roberts lakes (11,800 organisms/m^2). Lake benthic communities were generally dominated by dipterans (80% of individuals found), although pelecypods, ostracods, and oligochaetes were also prevalent. Benthic genera richness averaged 6 genera/sample, with an average diversity of 0.54. Benthic diversity and richness were generally highest in samples collected from the shallow depth zone, and Windy and Glenn lakes tended to have the lowest levels of diversity and richness.

Stream Water Quality

Streams and rivers in the study area were neutral to slightly basic (with pH ranging from 6.9 to 8.1). Seasonal trends were apparent in some Hope Bay Belt streams and rivers. Parameters such as nitrate, ammonia, total phosphorus, copper, chromium, and nickel tended to be highest in winter or during freshet and lowest during the summer. These trends were most apparent in Glenn Outflow Downstream and the Koignuk River sites. Turbidity levels were variable across streams, and were particularly high in Glenn Outflow Downstream during freshet.

Nitrate and ammonia concentrations were frequently below detection limits, and reached a maximum of 0.56 and 0.044 mg/L (for nitrate and ammonia respectively) in Koignuk River Upstream during winter. Nitrite concentrations were always below detection limits. Total phosphorus levels were variable across stream sites, ranging from 0.002 mg/L (Wolverine Outflow in June) to 0.053 mg/L (Glenn Outflow Downstream in June). Within a watershed, total phosphorus concentrations generally increased with distance downstream. In the Doris Watershed, the lowest levels of total phosphorus were observed in Wolverine and Patch outflows, which would be categorized as ultra-oligotrophic and oligotrophic, respectively, based on the CCME trigger ranges for total phosphorus. Stream sites located furthest downstream in the Doris and Little Roberts watersheds (Doris and Little Roberts outflows) would be categorized as mesotrophic to meso-eutrophic. A similar trend was apparent in the Windy watershed, where the upstream Windy Outflow would be categorized as ultra-oligotrophic to oligotrophic, while the downstream Glenn Outflow Downstream would be considered mesotrophic to eutrophic. River sites ranged from oligotrophic to mesotrophic in the Angimajuq and from oligotrophic to meso-eutrophic in the Koignuk (depending on the season).

In general, concentrations of total metals were highest in Glenn Outflow Downstream and lowest in Windy Outflow. Molybdenum levels tended to be highest within the streams of the Windy Watershed compared to the other watersheds. These trends are consistent with the lake water quality data, indicating that the water quality of streams reflects the water quality of the upstream lakes that feed them. Average metal concentrations in streams and rivers were generally below CCME guidelines, with the following exceptions: aluminum in all streams/rivers except Wolverine, Doris, and Reference Lake A and B outflows; chromium in P.O. Outflow, Glenn Outflow Downstream, and the Koignuk River sites; copper in Glenn Outflow Downstream and Koignuk Midstream and Downstream; iron in P.O., Ogama, and Little Roberts outflows, Glenn Outflow Downstream, and the Angimajuq and Koignuk River sites; and lead in Koignuk Midstream. These elevated metal concentrations occur naturally within study area streams and rivers.

Stream Sediment Quality

Stream sediments consisted of a highly variable mixture of gravel, sand, silt and clay. Sediments in Reference Lake A Outflow were predominantly composed of sand, while sediments in the Angimajuq River Reference and in Reference Lake B, Ogama, and Doris outflows were mainly composed of gravel and sand. In all other surveyed streams, sediments were predominantly composed of a sand-silt mixture. There were few apparent trends in sediment chemistry among streams; however, stream sediments generally contained lower metal concentrations than lake sediments. Chromium concentrations in sediments were naturally elevated and were occasionally higher than CCME interim sediment quality guidelines.

Stream Periphyton

Periphyton biomass ranged from approximately 66 to 2,500 µg chl *a*/m^2, while density ranged from 58,000 to 400,000 individuals/cm^2 among stream sites. Biomass and density levels were particularly high in Ogama Outflow, the Koignuk River, and the Angimajuq River Reference. Diatoms were the dominant periphyton taxa in all streams surveyed. Genera richness ranged from 8 to 16 genera/sample and averaged 13 genera/sample. Periphyton diversity was relatively high at all sites (Simpson's diversity index between 0.57 and 0.87) except Windy Outflow (0.32).

Stream Benthos

Stream benthos density ranged from 770 to 25,100 organisms/m^2. Benthos density was highest in Doris Outflow. Ogama Outflow, Little Roberts Outflow, and the midstream portion of the Koignuk River also contained dense benthos communities. Stream benthos assemblages were dominated by dipterans, which represented~70% of the stream benthic organisms. Nematodes, oligochaetes, and ostracods were also common in study area streams. Benthic community richness ranged from 9 to 21 genera/sample, with an average of 15 genera/sample. Dipteran richness generally corresponded closely with community richness, and averaged 10 genera/sample. Simpson's diversity index averaged 0.73 for the entire benthic community, and 0.66 for dipterans.

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Engineers and Scientists

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1. Introduction

Engineers and Scientists

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.

Newmont Mining Corporation (Newmont) acquired the property in 2008, and initially decided to consider the property as a whole to evaluate various options for responsible, long-term development of the belt. However, as of the fall of 2009, Hope Bay Mining Ltd. (HBML), a fully owned subsidiary of Newmont, has decided to proceed with developing the already-permitted Doris North Project, which consists of a two-year underground gold mine in the north end of the belt.

The environmental baseline program conducted in 2009 was based on the plan to develop multiple deposits in the belt, as indicated in Figure 1-2. The 2009 program was also based on HBML's priorities as of early 2009, which included regulatory compliance with the existing Doris North Project permits and licences. Baseline programs for ecosystem mapping, vegetation, soils, and socio-community were deferred to 2010. Baseline work was primarily focused on the north end of the belt in 2009.

Results from the 2009 environmental baseline program are being reported in a series of reports, as follows:

- 2009 Hydrology Baseline Report;
- 2009 Meteorology Baseline Report;
- 2009 Freshwater Baseline Report;
- 2009 Freshwater Fish and Fish Habitat Baseline Report;
- 2009 Marine Baseline Report; and
- 2009 Marine Fish and Fish Habitat Baseline Report.

In addition, baseline information obtained during 2009 was used to generate various compliance reports as specified in the Doris North Project Certificate (e.g. the Wildlife Monitoring & Mitigation Program Report), the Doris North Type A Water Licence, and the Doris North Roberts Bay Jetty Fisheries Authorization. Archaeology work was also conducted in 2009 and is being reported separately.

This report presents the results from the 2009 Freshwater Baseline Report portion of the 2009 environmental baseline program. Results from the freshwater fish community and habitat work are provided in a separate report.

The 2009 freshwater baseline program involved collecting information for the following: lake water quality (both winter and summer), lake physical limnology (both winter and summer), lake sediment quality, lake phytoplankton (both winter and summer), lake zooplankton, lake benthos, stream water quality, stream sediment quality, stream periphyton, and stream benthos. Aquatic components were sampled from numerous lakes and streams contained within three drainage basins in the northern portion of the belt that could potentially be influenced by future Project activities. Aquatic components were also sampled in the Koignuk River, a major river adjacent to the property. Two reference lakes and their associated outflows located well away from potential Project activities were also included in the 2009 program, as was a reference river location on the Angimajuq River.

Analytical results from all samples collected as part of the 2009 freshwater baseline program are provided as appendices to this report. Chapter 2 of this report presents the sampling locations and methods used for the 2009 freshwater baseline work, and results from the samples collected are presented in graphical and tabular form in Chapter 3.

Figure 1-1

Hope Bay Belt Project Location

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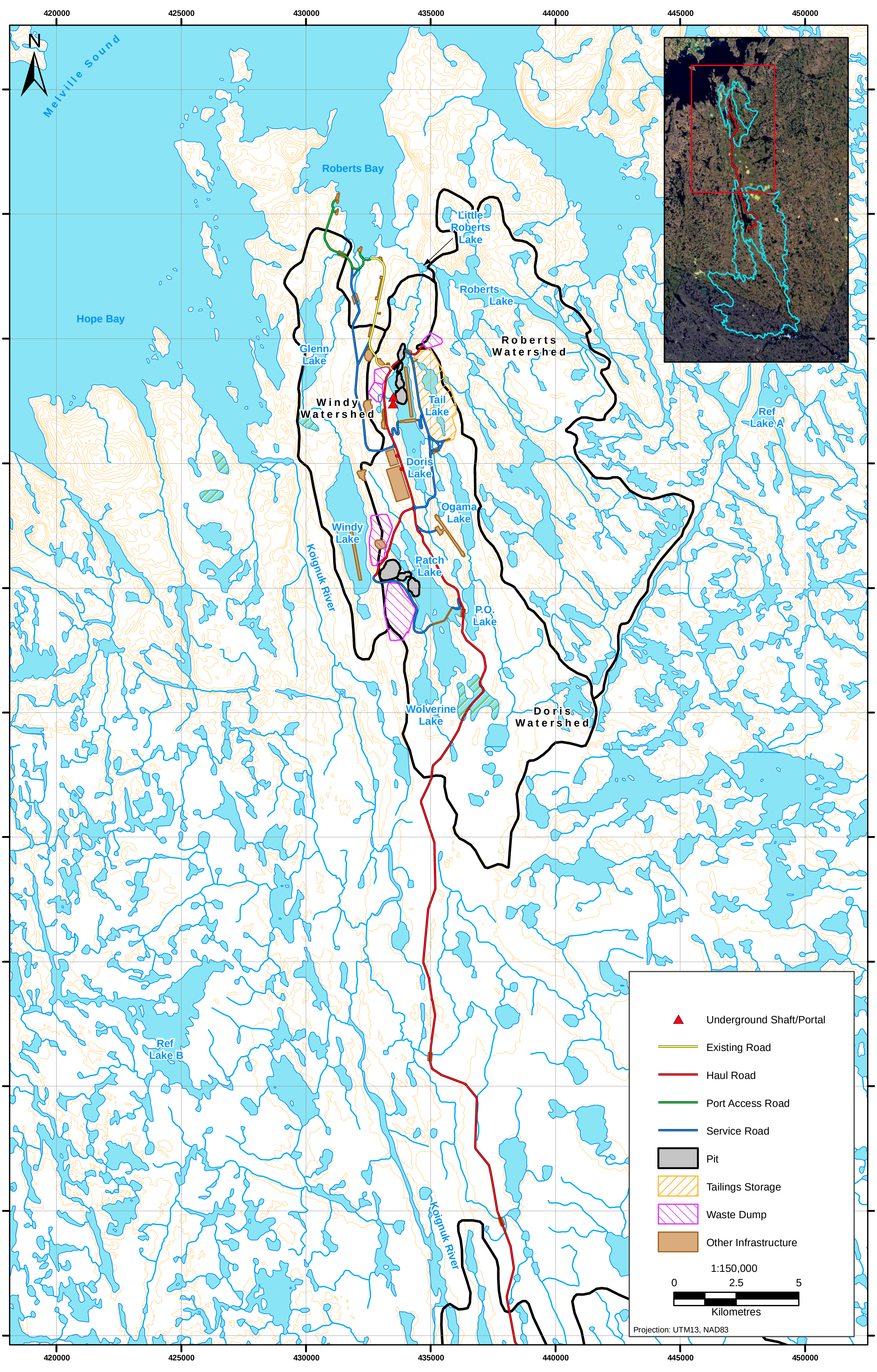


Figure 1-2

NEWMONT The Gold Company

Site Layout Options Considered for 2009 Baseline Program

Rescan Engineers & Scientists

2. Methods

Engineers and Scientists

2. Methods

2.1 MONITORING LOCATIONS AND SAMPLING PROGRAM

In 2009, baseline studies were conducted to complement existing data in preparation for an Environmental Impact Statement. These studies focused on the northern portion of the belt as well as reference areas well away from future Project activities.

The following components were sampled as part of the 2009 freshwater baseline program:

Lakes:

- Winter Lake Water Quality & Limnology;
- Winter Phytoplankton and Epontic Algal sampling;
- Open-water Season Lake Water Quality & Limnology;
- Lake Sediment Quality;
- Lake Phytoplankton Assemblages;
- Lake Zooplankton Assemblages; and
- Lake Benthic Invertebrate Communities.

Streams:

- Winter Stream Water Quality;
- Open-water Season Stream Water Quality;
- Stream Sediment Quality;
- Stream Periphyton Assemblages; and
- Stream Benthic Invertebrate Communities.

Tables 2.1-1 and 2.1-2 present the lakes and streams sampled, along with the aquatic components examined in 2009. Table 2.1-3 provides a summary of the sampling details for each aquatic component, including the sampling frequency and replication. Table 2.1-4 and 2.1-5 presents the dates each aquatic component was sampled at each site. Figure 2.1-1 presents an overview of the study area sampling locations in 2009 along with the major drainage basins. Figures 2.1-2a to 2.1-2m present lake maps depicting lake bathymetry (where available) and 2009 sampling locations.

2.2 PHYSICAL LIMNOLOGY

In 2009, physical limnology measurements were taken from both lakes and rivers in late April/early May and again from lakes in August. Sampling locations were selected from one of the following: a previously sampled site, the deepest section in the lake, or a spatially significant location (i.e., within and outside of mine footprints, or near future on-shore tailings or waste rock piles). 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, course-level bathymetry (using a depth sounder) was carried out prior to summer sampling and the sampling location moved if deeper areas were found.

Table 2.1-1. Lake Water, Sediment, and Aquatic Biology Sampling Locations, Hope Bay Belt Project, 2009

Watershed	Site Name	Abbreviated Name	Winter Water Quality & Limnology	Winter Algal Sampling	Summer Water Quality & Limnology	Sediment Quality	Aquatic Biology
Doris	Wolverine Lake	Wolverine	X		X	X (1)	X (1)
	Imniagut Lake	Imniagut			X	X (1)	X (1)
	Patch Lake South	Patch S	X	X	X	X (2)	X (2)
	Patch Lake North	Patch N	X	X	X	X (2)	X (2)
	P.O. Lake	P.O.			X	X (1)	X (1)
	Ogama Lake	Ogama	X	X	X	X (1)	X (1)
	Doris Lake South	Doris S	X	X	X	X (2)	X (2)
	Doris Lake North	Doris N	X	X	X	X (2)	X (2)
Little Roberts	Little Roberts Lake	Little Roberts	X	X	X	X (1)	X (1)
Roberts	Naiqunnguut Lake	Naiqunnguut	X		X	X (1)	X (1)
Windy	Nakhaktok Lake	Nakhaktok	X		X	X (2)	X (2)
	Windy Lake	Windy	X		X	X (2)	X (2)
	Glenn Lake	Glenn	X		X	X (2)	X (2)
Ref A	Reference Lake A	Ref Lk A	X		X	X (2)	X (2)
Ref B	Reference Lake B	Ref Lk B	X		X	X (2)	X (2)
Ref C	Reference Lake C	Ref Lk C	X				

Note: Values in parenthesis for lake benthos and sediment quality indicate the number of sampling depths per lake. Although sampled as indicated, data for Reference Lake C (discontinued reference site) are only presented in the appendices.

Table 2.1-2. Stream Water, Sediment and Aquatic Biology Sampling Locations, Hope Bay Belt Project, 2009

Watershed	Site Name	Abbreviated Name	Winter Water Quality & Limnology	Summer Water Quality	Sediment Quality	Aquatic Biology
Doris	Wolverine Outflow	Wolverine OF		X	X	X
	Patch Outflow	Patch OF		X	X	X
	P.O. Outflow	P.O. OF		X	X	X
	Ogama Outflow	Ogama OF		X	X	X
	Doris Outflow	Doris OF		X	X	X
Little Roberts	Little Roberts Outflow	Little Roberts OF		X	X	X
Windy	Windy Outflow	Windy OF		X	X	X
	Glenn Outflow Downstream	Glenn OF D/S		X	X	X
Koignuk River	Koignuk River Upstream	Koignuk U/S	X	X	X	X
	Koignuk River Midstream	Koignuk M/S	X	X	X	X
	Koignuk River Downstream	Koignuk D/S	X	X	X	X
Ref A	Reference Lake A Outflow	Ref Lk A OF		X	X	X
Ref B	Reference Lake B Outflow	Ref Lk B OF		X	X	X
Ref C	Reference Lake C Outflow	Ref Lk C OF		X		
Angimajuq	Angimajuq River Reference Site	Angimajuq R. Ref		X	X	X
Aimaokatalok River	Aimaokatalok River Reference Site	Aim. R. Ref	X			

Note: Although sampled as indicated, data from Ref C OF and Aim. R. Ref. (discontinued reference sites) are only presented in the appendices.

Table 2.1-3. Sampling Details for Water Quality, Sediment Quality, and Aquatic Biology, Hope Bay Belt Project, 2009

Monitoring Parameter	Sampling Frequency	Sample Replication and Depths	Sampling Dates/Timing
Lakes			
Winter Lake Water Quality			
Physical, nutrients, total & dissolved metals	1 x	n=1 @ 1 m below the ice and 2 m above water-sediment interface + 20% replication	April/early May; coincident with winter DO/T profiles
Summer Lake Water Quality			
Physical, nutrients, total & dissolved metals	1 x	n=1 @ 1 m below the surface and 2 m above water-sediment interface + 20% replication	August; coincident with biological lake surveys
Winter Limnology			
Dissolved oxygen/temperature profile	1 x	once over deepest area of lake, or at lake station	April/early May; coincident with winter water quality
Summer Limnology			
Dissolved oxygen/temperature profile; Secchi depth	1 x	once over deepest area of lake, or at lake station	August; coincident with biological lake surveys
Lake Sediment Quality			
Physical, nutrients, metals	1 x	n=3 @ shallow and mid or deep depth strata	August; coincident with lake surveys
Winter Phytoplankton*			
Microcystin concentrations	1 x	n= 1@ 1 m below ice	April/early May; coincident with winter water quality
Biomass (as chlorophyll *a*)	1 x	n= 1@ 1 m below ice	April/early May; coincident with winter water quality
Abundance and taxonomy	1 x	n= 1@ 1 m below ice	April/early May; coincident with winter water quality
Winter Epontic Algae*			
Taxonomy	1 x	n= 1; scraping from bottom of ice (qualitative sample)	April/early May; coincident with winter water quality
Summer Phytoplankton			
Biomass (as chlorophyll *a*)	1 x	n=3 @ 1 m	August; coincident with lake surveys
Abundance and taxonomy	1 x	n=3 @ 1 m	August; coincident with lake surveys
Zooplankton			
Abundance and taxonomy	1 x	n=3 vertical hauls from1 m above bottom	August coincident with lake surveys
Lake Benthos			
Density and taxonomy	1 x	n=3 @ shallow and mid or deep depth strata	August coincident with lake surveys
Streams/Rivers			
Winter River Water Quality			
Physical, nutrients, total & dissolved metals	1 x	n=2	Late April/early May

(continued)

Table 2.1-3. Sampling Details for Water Quality, Sediment Quality, and Aquatic Biology, Hope Bay Belt Project, 2009 (completed)

Monitoring Parameter	Sampling Frequency	Sample Replication and Depths	Sampling Dates/Timing
Summer Stream Water Quality			
Physical, nutrients, total & dissolved metals	3 x	n=2	freshet (early June), summer (August), fall (September)
Stream Sediment Quality			
Physical, nutrients, metals	1 x	n=3	July; coincident with stream water quality and periphyton plate installation
Periphyton			
Biomass (as chlorophyll *a*)	1 x	n=3	artificial samplers installed in July; retrieved in August
Density and taxonomy	1 x	n=3	artificial samplers installed in July; retrieved in August
Stream Benthos			
Density and taxonomy	1 x	n=3	July; coincident with stream water quality and periphyton plate installation

**At Patch (N and S), Ogama, Doris (N and S), and Little Roberts lakes only.*

2.2.1 Winter Lake Physical Limnology

Before collecting the physical profiles (and later water samples), a 10-inch diameter ice auger was used to drill a hole through the ice. Once the hole was drilled, a weighted metered line was used to measure the bottom depth, with extreme care taken to minimize any disturbance to lake sediments. Water column profiling and water quality sampling depths were calculated based on bottom depth.

Measurements for water column structure (including temperature and dissolved oxygen) were collected using a YSI dissolved oxygen/temperature meter. At shallow lake stations (<20 m), temperature and dissolved oxygen values were recorded at 0.5 m intervals, while at deep lake stations (>20 m), values were recorded at 1 m intervals. As the meter consumes oxygen while taking a reading, the probe was gently agitated to ensure a continual flushing of 'new' water. The profiles ended at ~1 m above the sediment surface to reduce suspension of bottom sediments.

2.2.2 Summer Lake Physical Limnology

Summer temperature and dissolved oxygen profiles were measured at the same locations that winter samples were collected, unless new bathymetric data prompted the relocation of a sampling site. Summer water column temperature and dissolved oxygen data were collected using the same equipment employed during winter sampling.

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 metered line through the water column on the shaded side of the boat until it disappeared from sight. The depth of disappearance was identified as the Secchi depth (D_s), which was then used to calculate the depth of the euphotic zone.

Table 2.1-4. Lake Sampling Dates, Hope Bay Belt Project, 2009

		Winter			Summer					
Watershed	Lake	DO/Temp	Water Quality	Phytoplankton and Epontic	DO/Temp & Secchi Depth	Water Quality	Sediment Quality	Phytoplankton	Zooplankton	Benthos
Doris	Wolverine	Apr. 26	Apr. 26 (3)	NC	Aug. 6	Aug. 6 (1)	Aug. 6 (3.5)	Aug. 6	Aug. 6	Aug. 6 (3.6)
	Imniagut	NC	NC	NC	Aug. 7	Aug. 8 (1)	Aug. 8 (3)	Aug. 7	Aug. 8	Aug. 8 (3)
	Patch S	Apr. 24	Apr. 23 (3, 12.5)	Apr. 24	Aug. 11	Aug. 14 (1)	Aug. 11 (3, 14)	Aug. 11	Aug. 11	Aug. 11 & 12 (3, 13.7)
	Patch N	Apr. 23	Apr. 23 & 24 (3)	Apr. 23	Aug. 9	Aug. 9 (1, 6)	Aug. 9 & 11 (2.6, 8.2)	Aug. 9	Aug. 9	Aug. 9 & 11 (2.7, 8.2)
	P.O.	Apr. 26	NC	NC	Aug. 10	Aug. 14 (1)	Aug. 10 (3)	Aug. 10	Aug. 10	Aug. 10 (3.3)
	Ogama	May 5	May 5 (3)	Apr. 26	Aug. 14	Aug. 14 (1, 3)	Aug. 15 (4.3)	Aug. 14	Aug. 14	Aug. 14 (4.3)
	Doris S	Apr. 22	Apr. 22 & 24 (3, 4)	Apr. 21	Aug. 17	Aug. 17 (1, 8)	Aug. 17 (4.3, 10.9)	Aug. 16	Aug. 17	Aug. 17 (4.3, 10.9)
	Doris N	Apr. 21	Apr. 21 & 24 (3, 11.5)	Apr. 22	Aug. 15	Aug. 15 (1, 11.5)	Aug. 15 (4.1, 14.2)	Aug. 15	Aug. 16	Aug. 15 (4.1, 14.2)
Little Roberts	Little Roberts	May 5	May 5 (3)	May 5	Aug. 7	Aug. 9 (1)	Aug. 7 (2.6)	Aug. 7	Aug. 7	Aug. 7 (2.6)
Roberts	Naiqunnguut	Apr. 26	Apr. 26 (2)	NC	Aug. 10	Aug. 14 (1)	Aug. 10 (4.4)	Aug. 10	Aug. 10	Aug. 10 (4.4)
Windy	Nakhaktok	Apr. 27	Apr. 27 (4)	NC	Aug. 6	Aug. 6 (1, 6)	Aug. 6 (3.5, 7.5)	Aug. 6	Aug. 6	Aug. 6 (3.5, 7.6)
	Windy	Apr. 27	Apr. 27 (4, 15.5)	NC	Aug. 9	Aug. 10 (1, 16)	Aug. 9 (3.7, 18)	Aug. 6	Aug. 9	Aug. 9 (3.4, 18)
	Glenn	May 6	May 3 (3, 9.5)	NC	Aug. 8	Aug. 9 (1, 17.5)	Aug. 8 (4.5, 19.5)	Aug. 8	Aug. 8	Aug. 8 (4.5, 19.5)
Ref A	Ref Lk A	May 31	May 31 (3, 26)	NC	Aug. 13	Aug. 14 (1, 29)	Aug. 12 & 13 (3.4, 31.5)	Aug. 12	Aug. 12 & 13	Aug. 13 (3.4, 31.5)
Ref B	Ref Lk B	May 31	May 31 (3, 6)	NC	Aug. 16	Aug. 16 (1, 7.5)	Aug. 16 (4.7, 9.4)	Aug. 16	Aug. 16	Aug. 16 (4.7, 9.4)
Ref C	Ref Lk C	May 31	May 31 (3, 11)	NC	NC	NC	NC	NC	NC	NC

Values in parenthesis are the approximate sampling depths in meters
NC - Not Collected
Note that data collected for Ref Lk C are not discussed in this report; this was a discontinued reference site.

Table 2.1-5. Stream Sampling Dates, Hope Bay Belt Project, 2009

		Winter		Summer				
						Periphyton		
Watershed	Stream	DO/Temp	Water Quality	Water Quality	Sediment Quality	Installation	Retrieval	Benthos
Doris	Wolverine OF	NC	NC	Jun.21	NC	NC	NC	NC
	Patch OF	NC	NC	Jun. 21, Aug. 18, Sep. 14	Jul. 23	Jul. 23	Aug. 18	Jul. 23
	P.O. OF	NC	NC	Jun. 21, Aug. 18, Sep. 14	Jul. 23	Jul. 23	Aug. 18	Jul. 23
	Ogama OF	NC	NC	Jun. 21, Aug. 18, Sep. 15	Jul.22 & 23	Jul. 23	Aug. 18	Jul. 23
	Doris OF	NC	NC	Jun. 21, Aug. 18, Sep. 15	Jul. 21	Jul. 21	Aug. 18	Jul. 21
Little Roberts	Little Rob. OF	NC	NC	Jun. 21, Aug. 18, Sep. 14	Jul. 22	Jul. 21	Aug. 18	Jul. 22
Windy	Windy OF	NC	NC	Jun. 21, Aug. 18, Sep. 15	Jul.22 & 23	Jul. 22	Aug. 18	Jul. 22
	Glenn OF D/S	NC	NC	Jun. 21, Aug. 18, Sep. 15	Jul. 23	Jul. 21	Aug. 18	Jul. 23
Koignuk River	Koignuk U/S	May 4	May 4	Jun. 21, Aug. 21, Sep. 14	Jul. 24	Jul. 26	Aug. 21	Jul. 24
	Koignuk M/S	May 23	May 23	Jun. 21, Aug. 22, Sep. 14	Jul. 24	Jul. 24	Aug. 22	Jul. 24
	Koignuk D/S	May 4	May 4	Jun. 21, Aug. 21, Sep. 14	Jul. 24	Jul. 24	Aug. 21	Jul. 24
Ref A	Ref Lk A OF	NC	NC	Jun. 21, Aug. 23, Sep. 15	Jul. 26	Jul. 26	Aug. 23	Jul. 26
Ref B	Ref Lk B OF	NC	NC	Jun. 21, Aug. 23, Sep. 14	Jul. 26	Jul. 26	Aug. 23	Jul. 26
Angimajuq	Angimajuq R. Ref	NC	NC	Jun. 21, Aug. 23, Sep. 15	Jul. 26	Jul. 26	Aug. 23	Jul. 26
Aimaokatolok River	Aim. R. Ref	May 1	May 1	NC	NC	NC	NC	NC

NC - Not Collected

Note that data collected for Aim. R. Ref are not discussed in this report; this was a discontinued reference site.

PROJECT # 1009-002-05 GIS # HB-01-010 October 26 2009

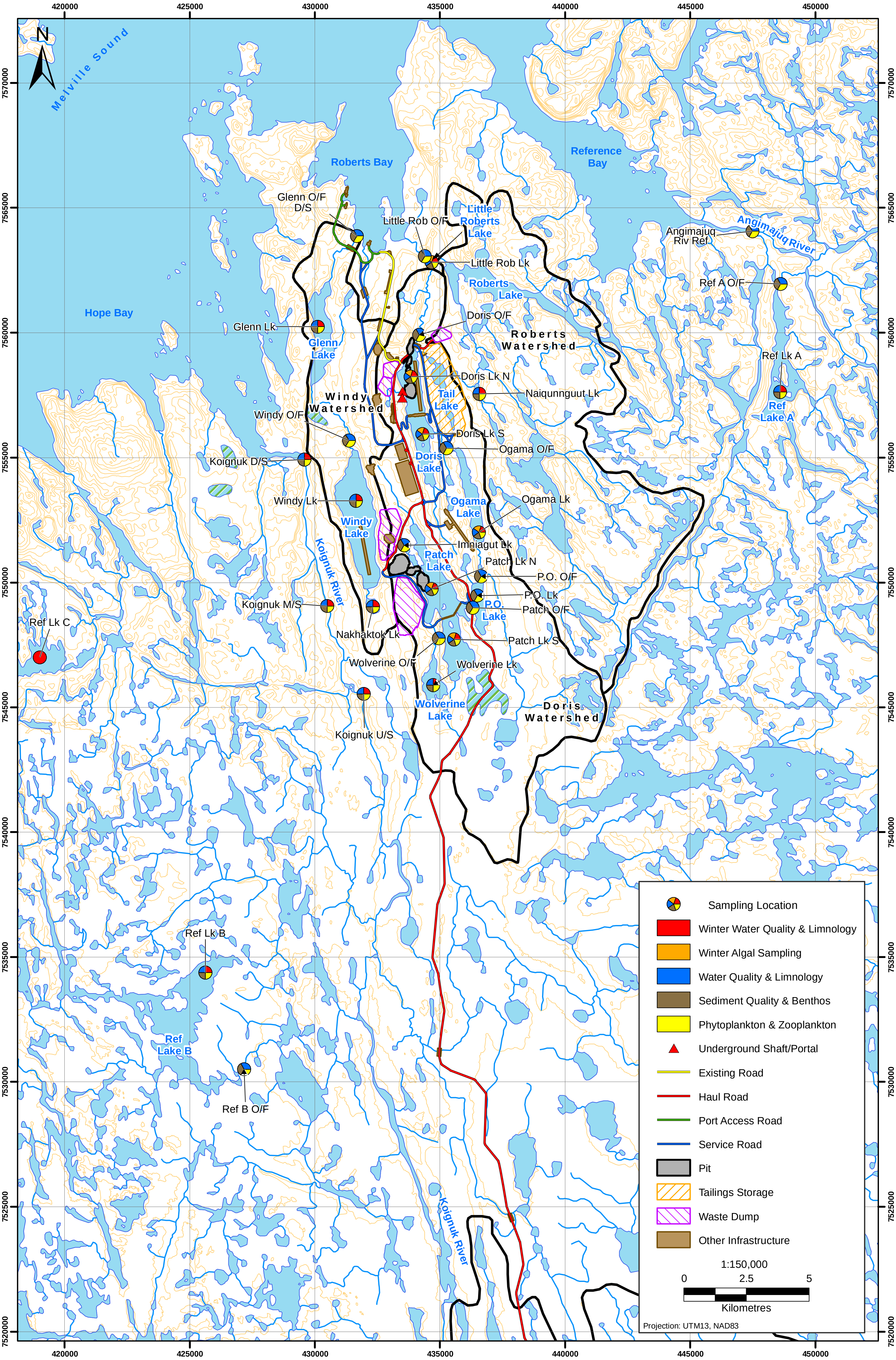


Figure 2.1-1

NEWMONT The Gold Company

Water Quality, Sediment Quality, and Aquatic Biology Sampling Locations, Hope Bay Belt Project, 2009

Rescan Engineers & Scientists

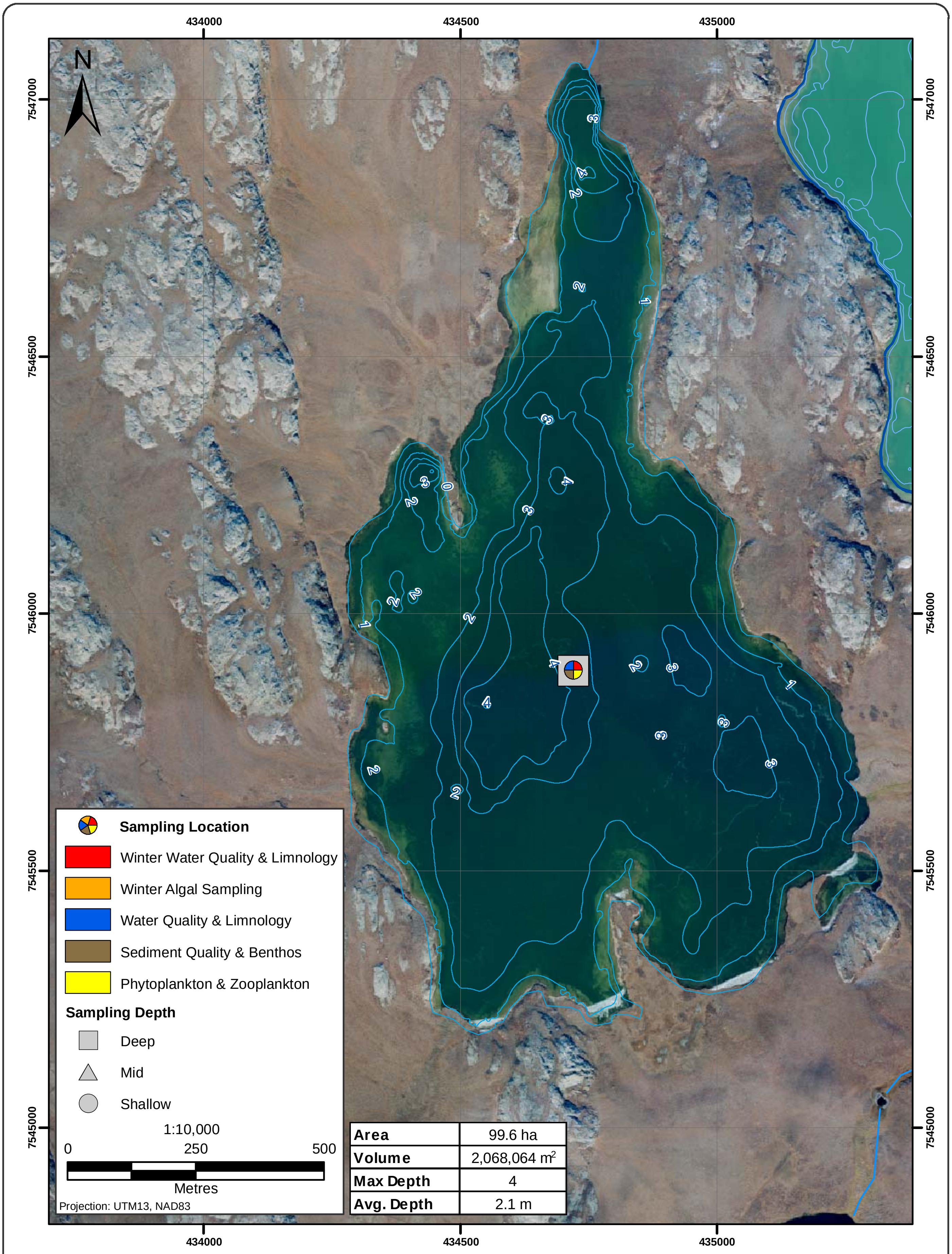


Figure 2.1-2a

Environmental Sampling Locations for Wolverine Lake

NEWMONT The Gold Company

Rescan Engineers & Scientists

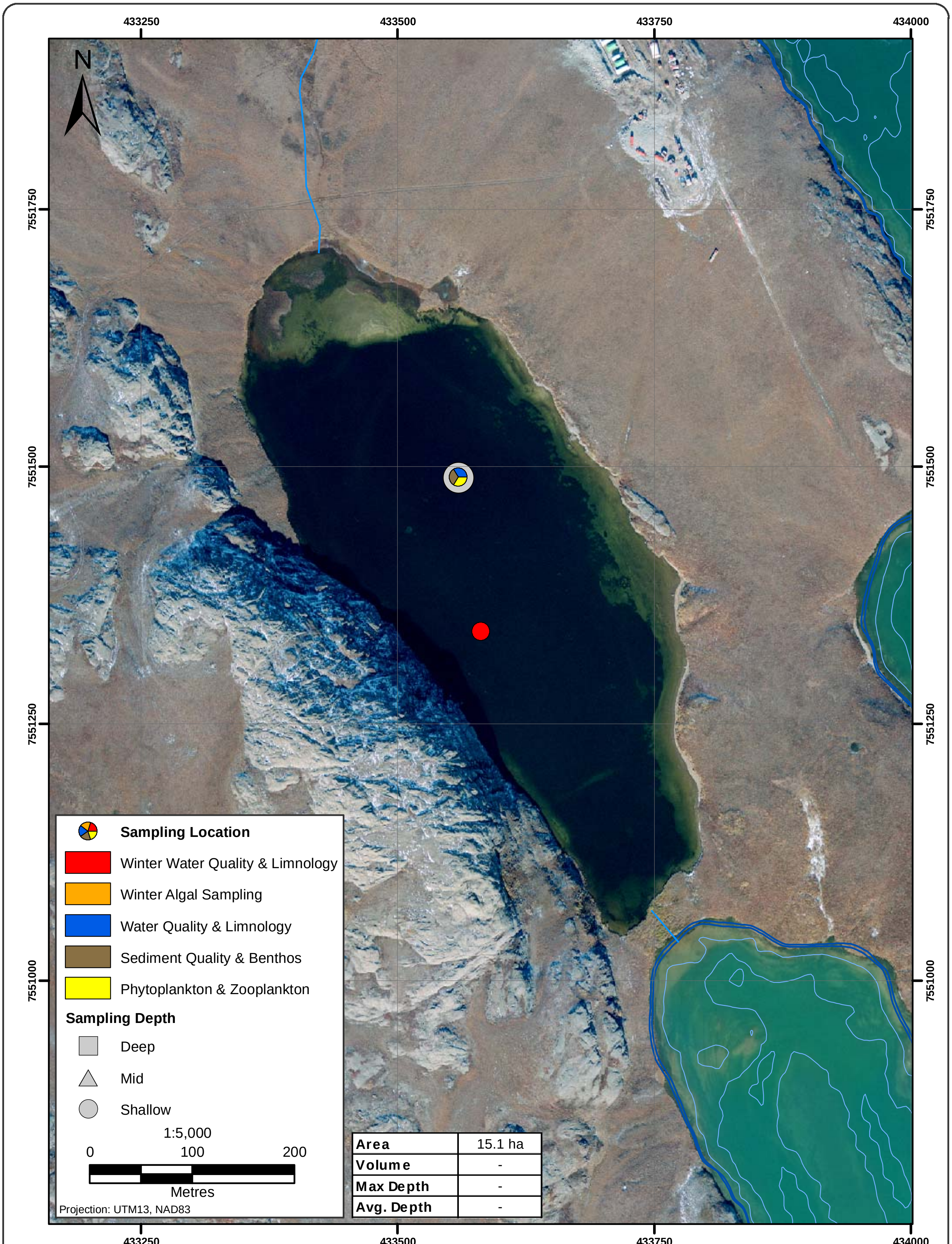


Figure 2.1-2b

NEWMONT The Gold Company

Environmental Sampling Locations for Imniagut Lake

Rescan Engineers & Scientists

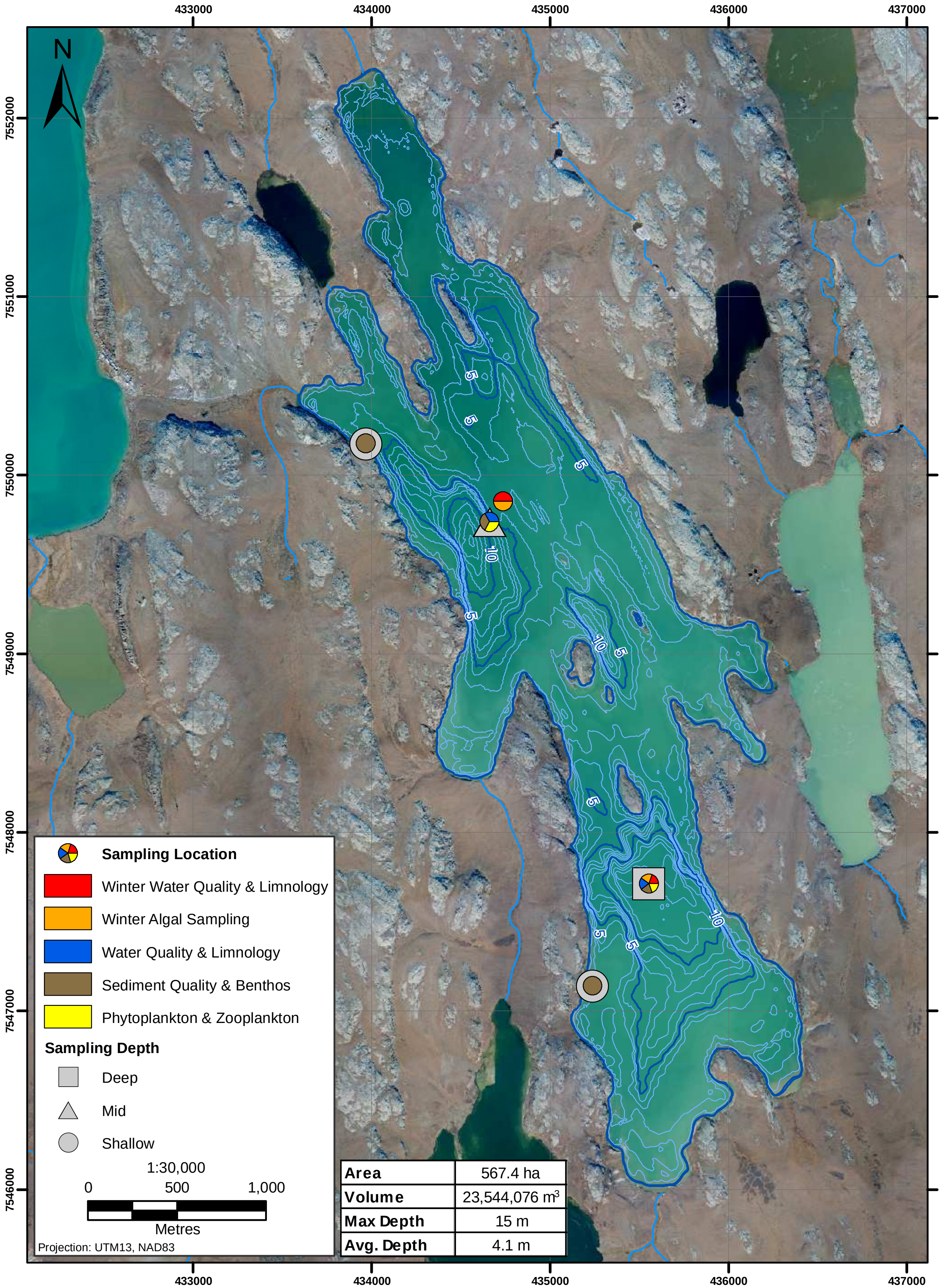
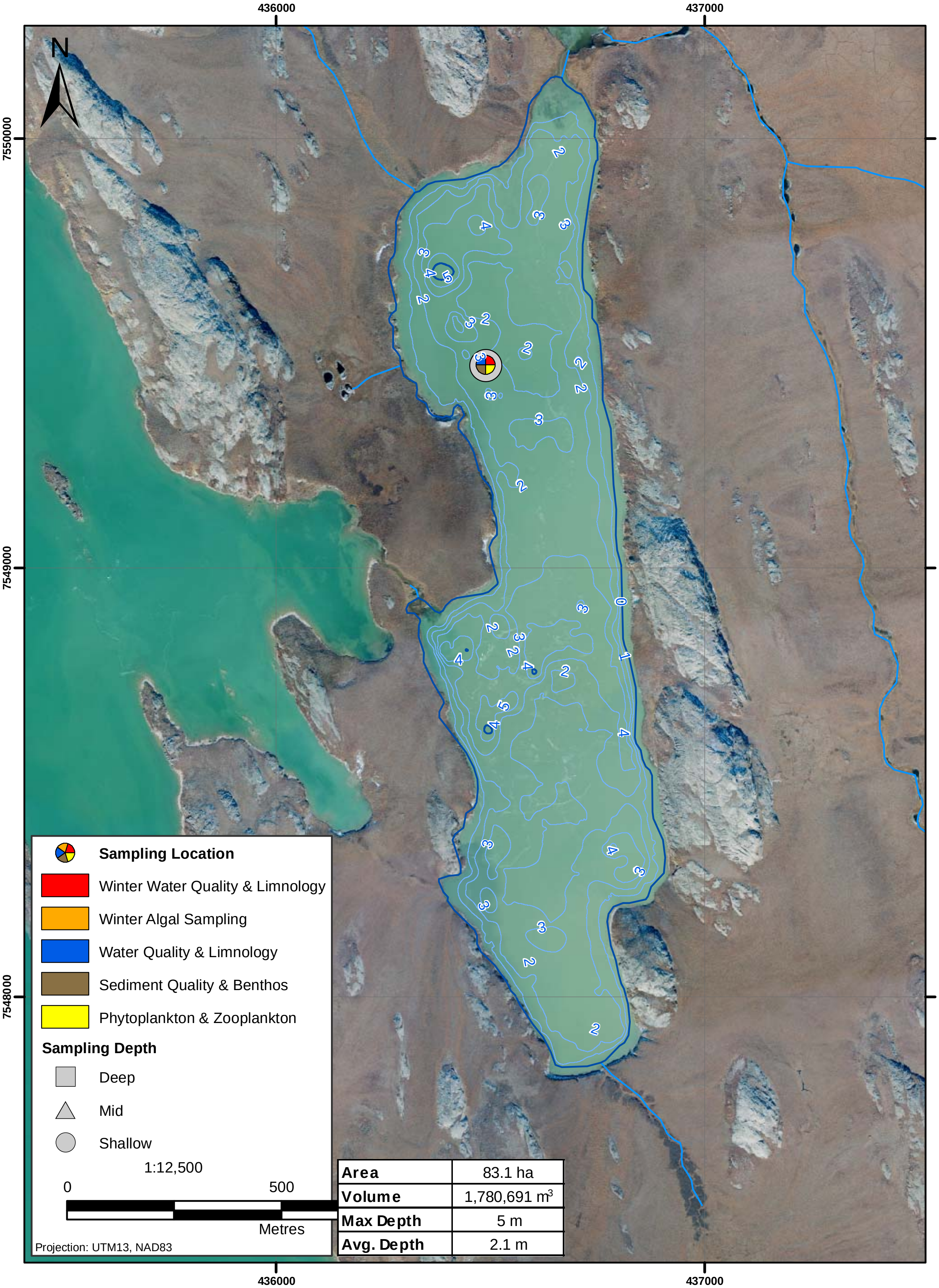


Figure 2.1-2c

NEWMONT The Gold Company

Environmental Sampling Locations for Patch Lake

Rescan Engineers & Scientists



Area	83.1 ha
Volume	1,780,691 m^3
Max Depth	5 m
Avg. Depth	2.1 m

Figure 2.1-2d

Environmental Sampling Locations for P.O. Lake

NEWMONT The Gold Company

Rescan Engineers & Scientists

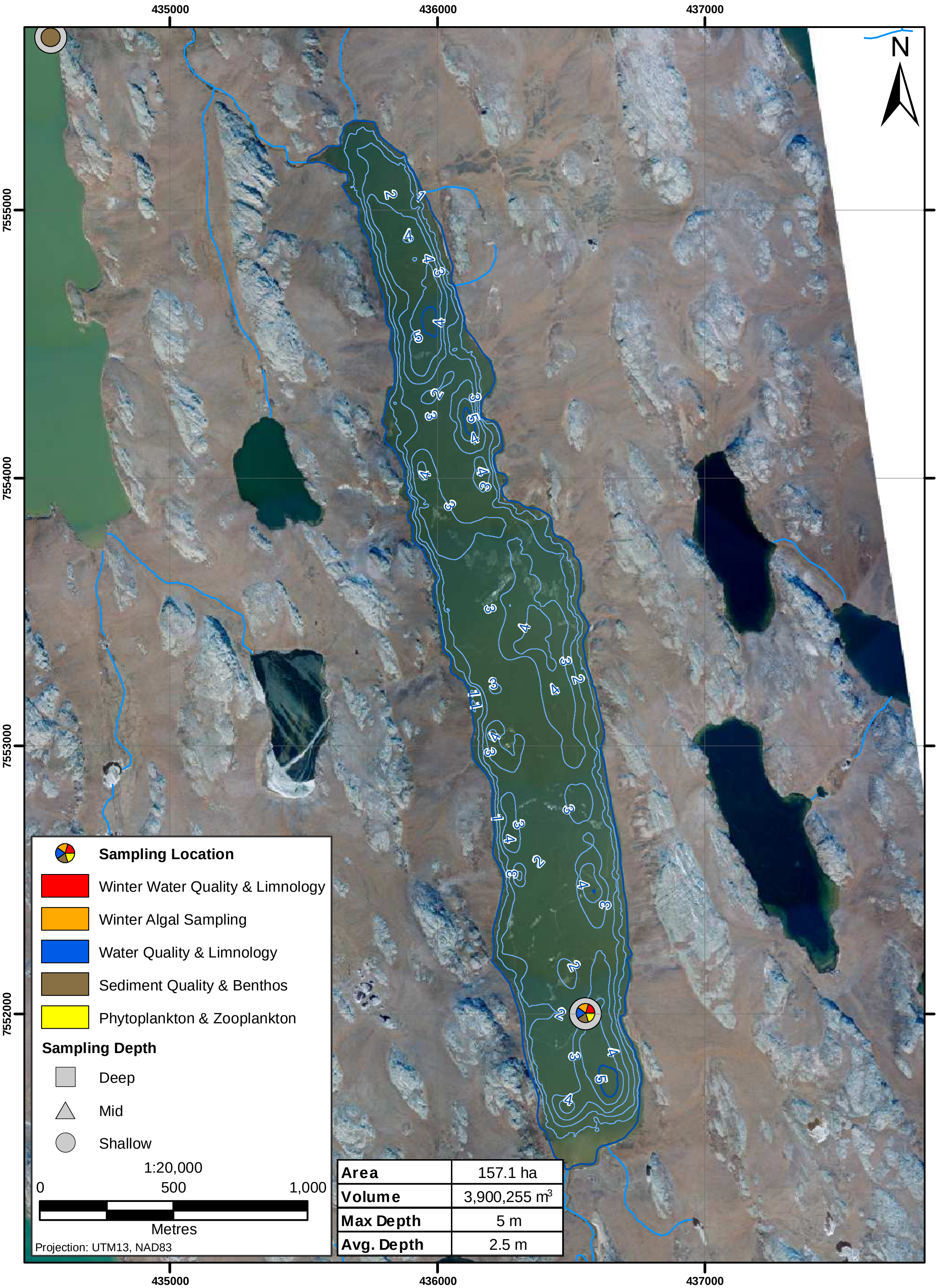
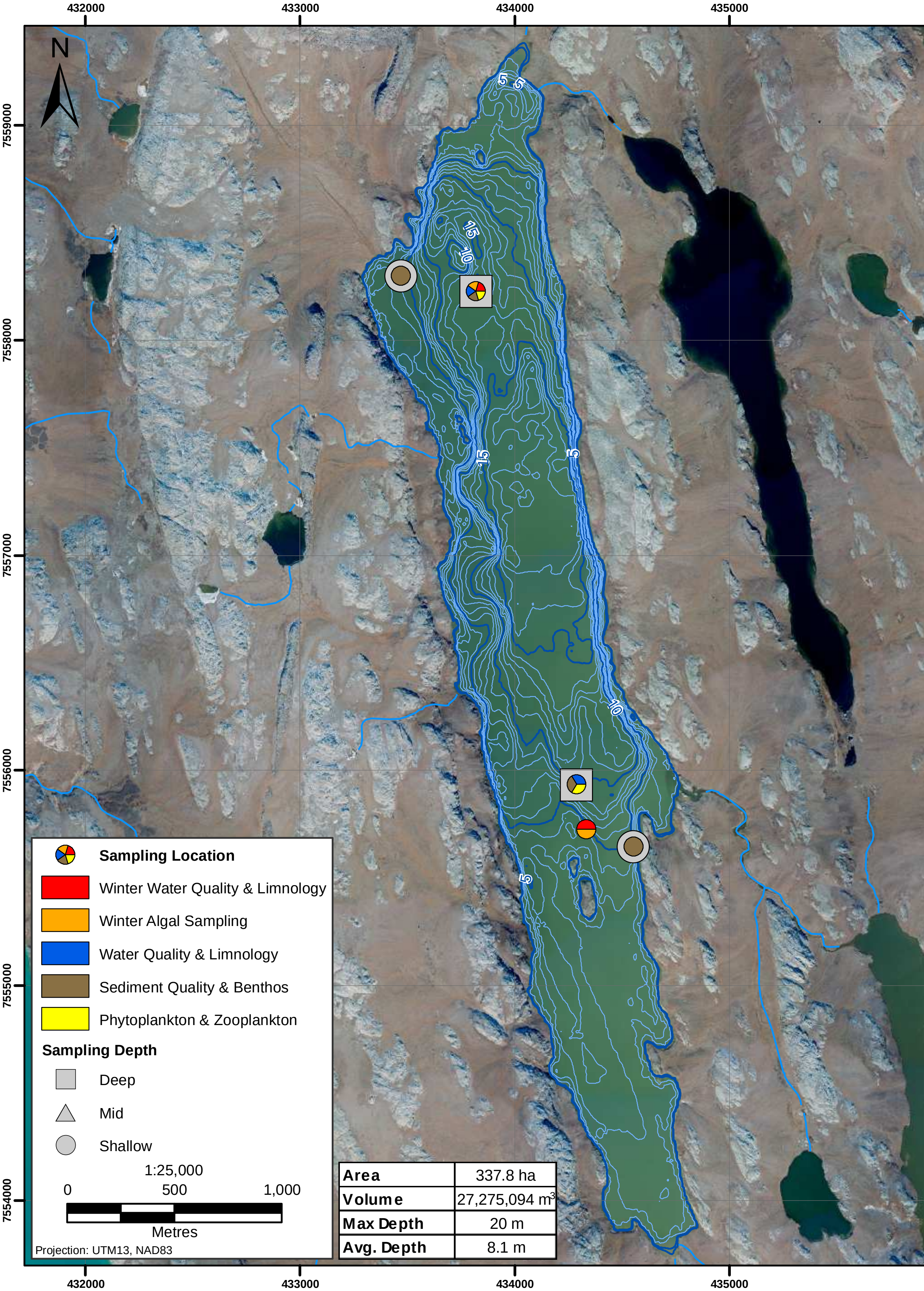


Figure 2.1-2e

NEWMONT
The Gold Company

Environmental Sampling Locations for Ogama Lake

Rescan
Engineers & Scientists



Area	337.8 ha
Volume	27,275,094 m^3
Max Depth	20 m
Avg. Depth	8.1 m

Figure 2.1-2f

NEWMONT The Gold Company

Environmental Sampling Locations for Doris Lake

Rescan Engineers & Scientists

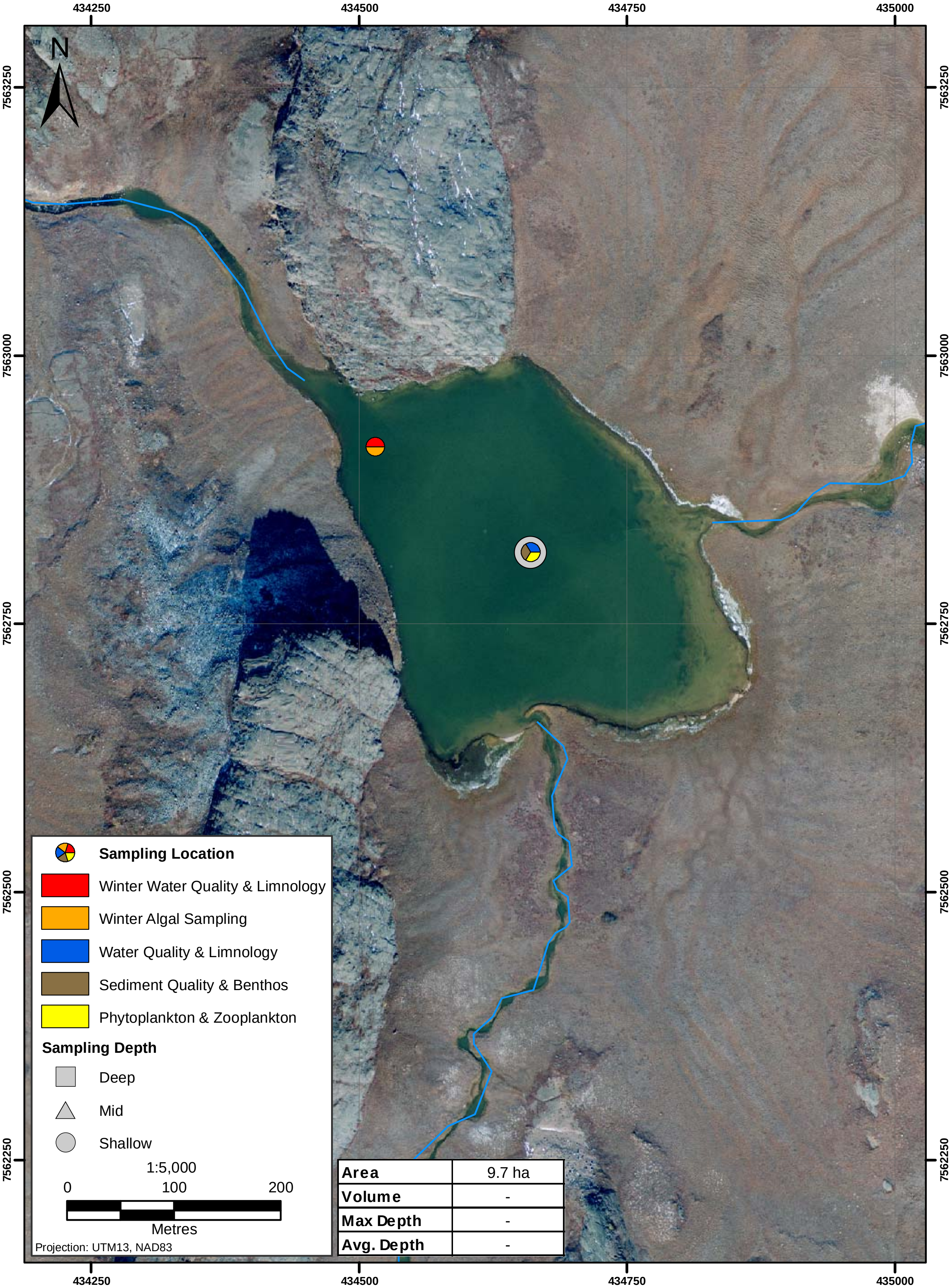
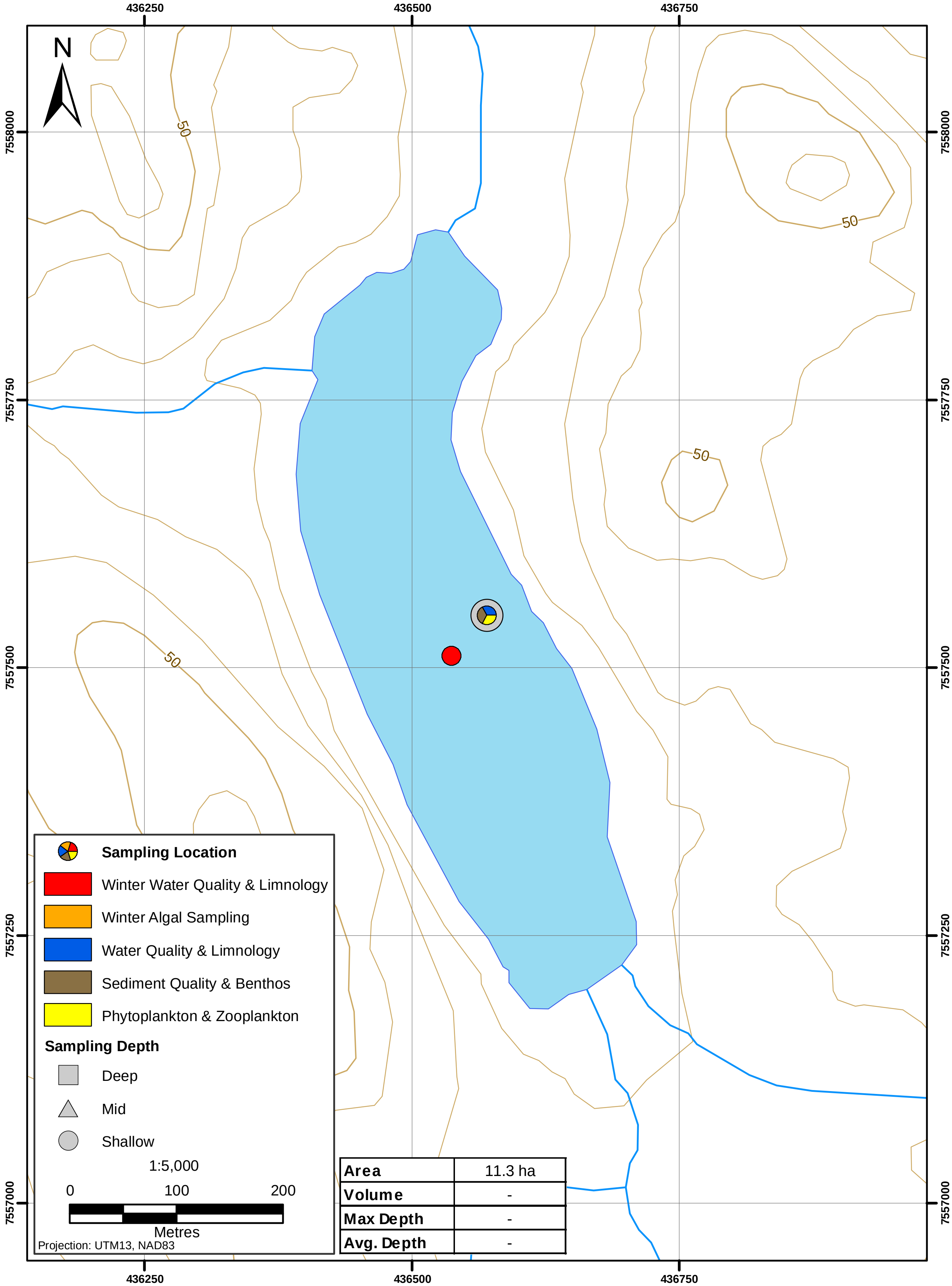


Figure 2.1-2g

NEWMONT The Gold Company

Environmental Sampling Locations for Little Roberts Lake

Rescan Engineers & Scientists



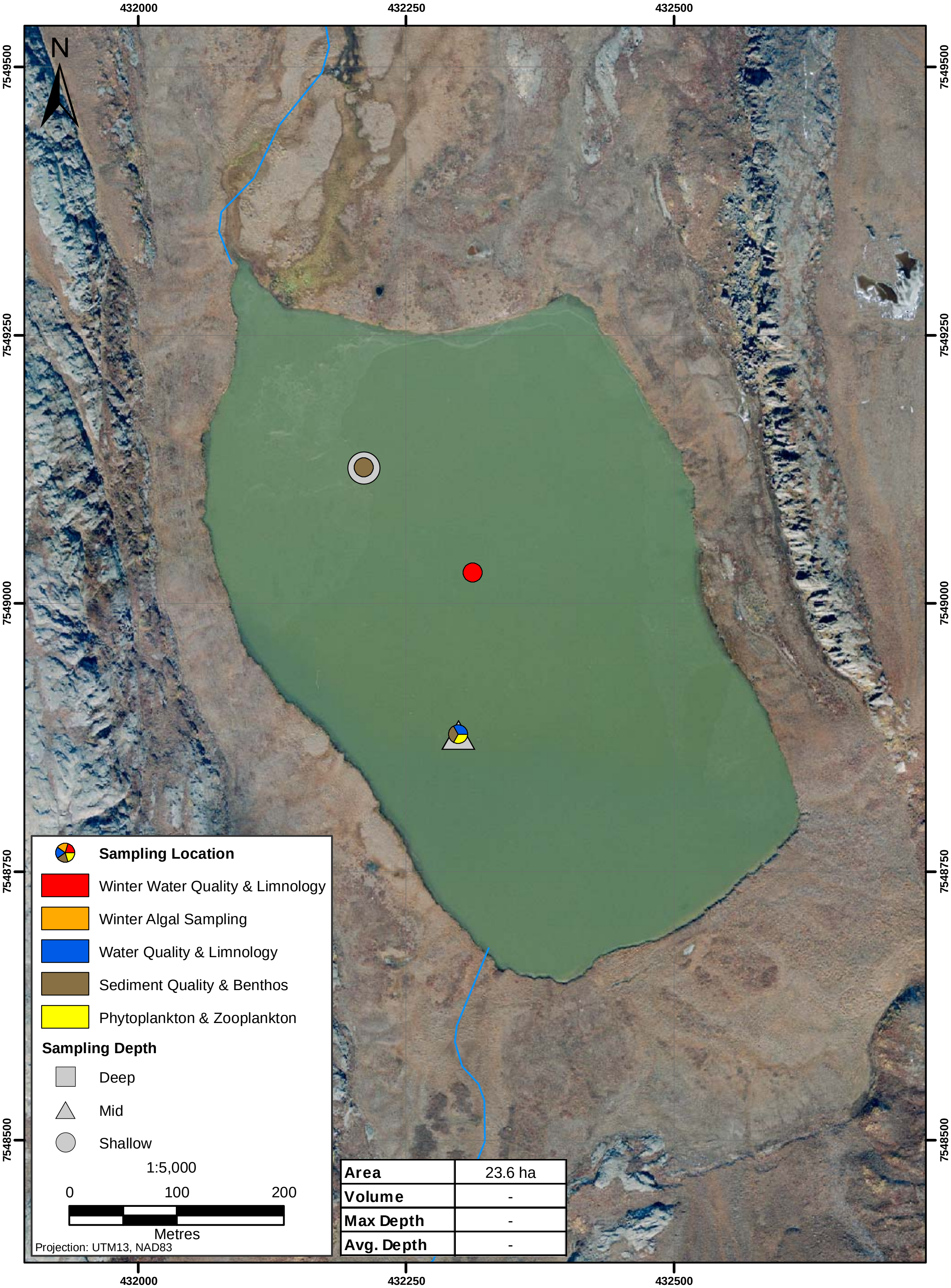
Area	11.3 ha
Volume	-
Max Depth	-
Avg. Depth	-

Figure 2.1-2h

Environmental Sampling Locations for Naiqunnguut Lake

NEWMONT The Gold Company

Rescan™ Engineers & Scientists



Area	23.6 ha
Volume	-
Max Depth	-
Avg. Depth	-

Figure 2.1-2i

NEWMONT The Gold Company

Environmental Sampling Locations for Nakhaktok Lake

Rescan Engineers & Scientists

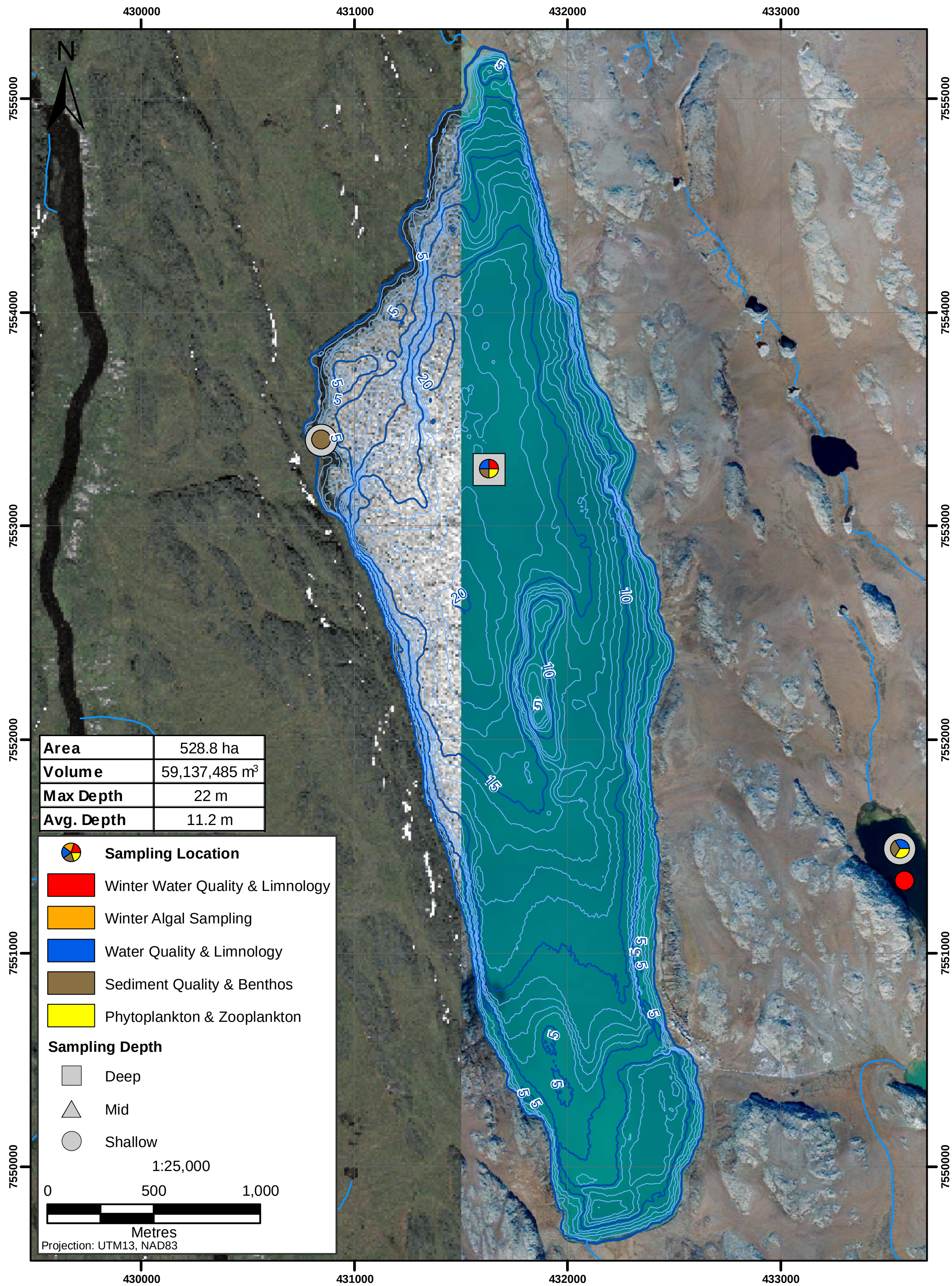
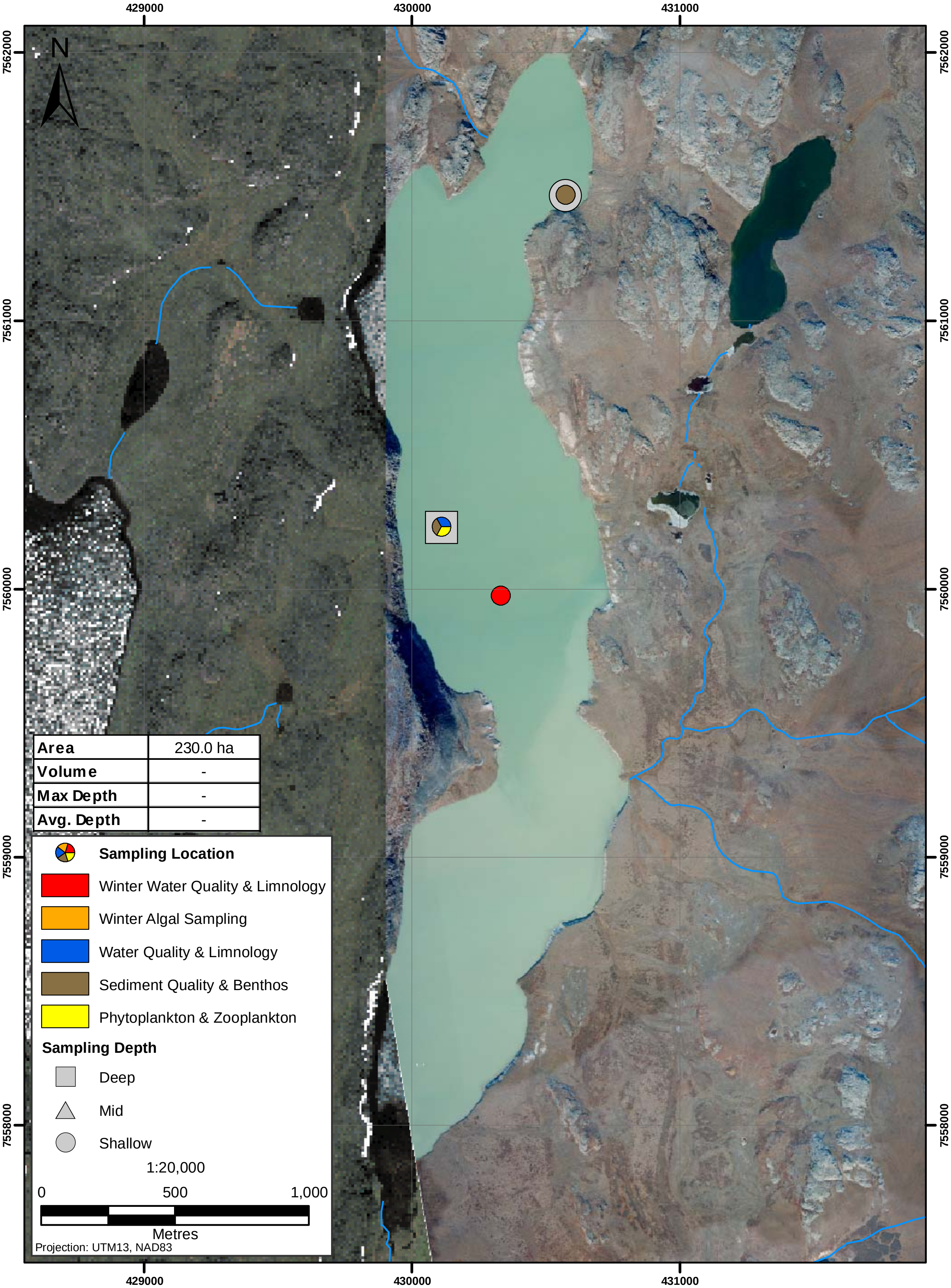


Figure 2.1-2j

Environmental Sampling Locations for Windy Lake

NEWMONT The Gold Company

Rescan Engineers & Scientists

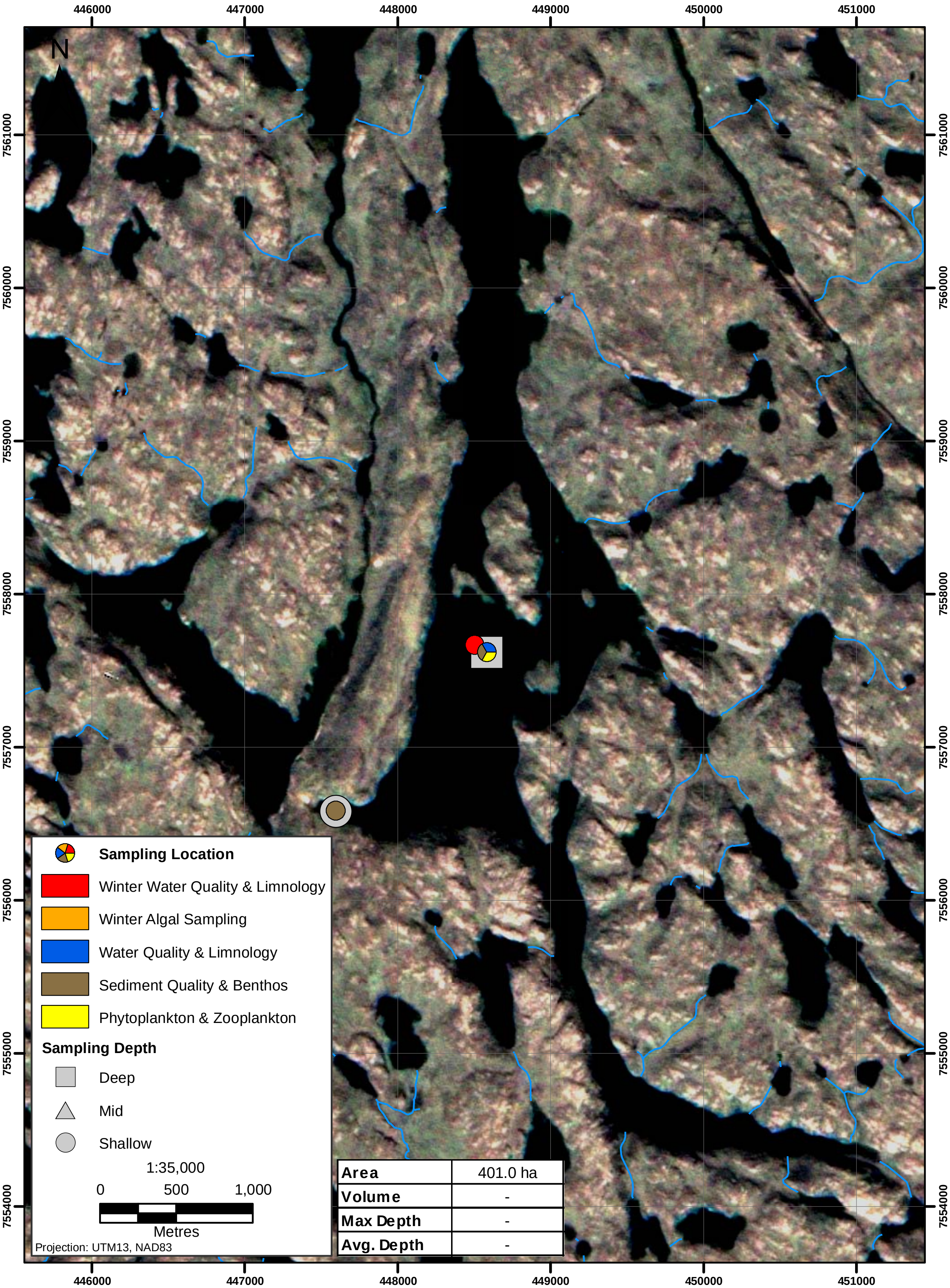


NEWMONT
The Gold Company

Environmental Sampling Locations for Glenn Lake

Figure 2.1-2k

Rescan
Engineers & Scientists



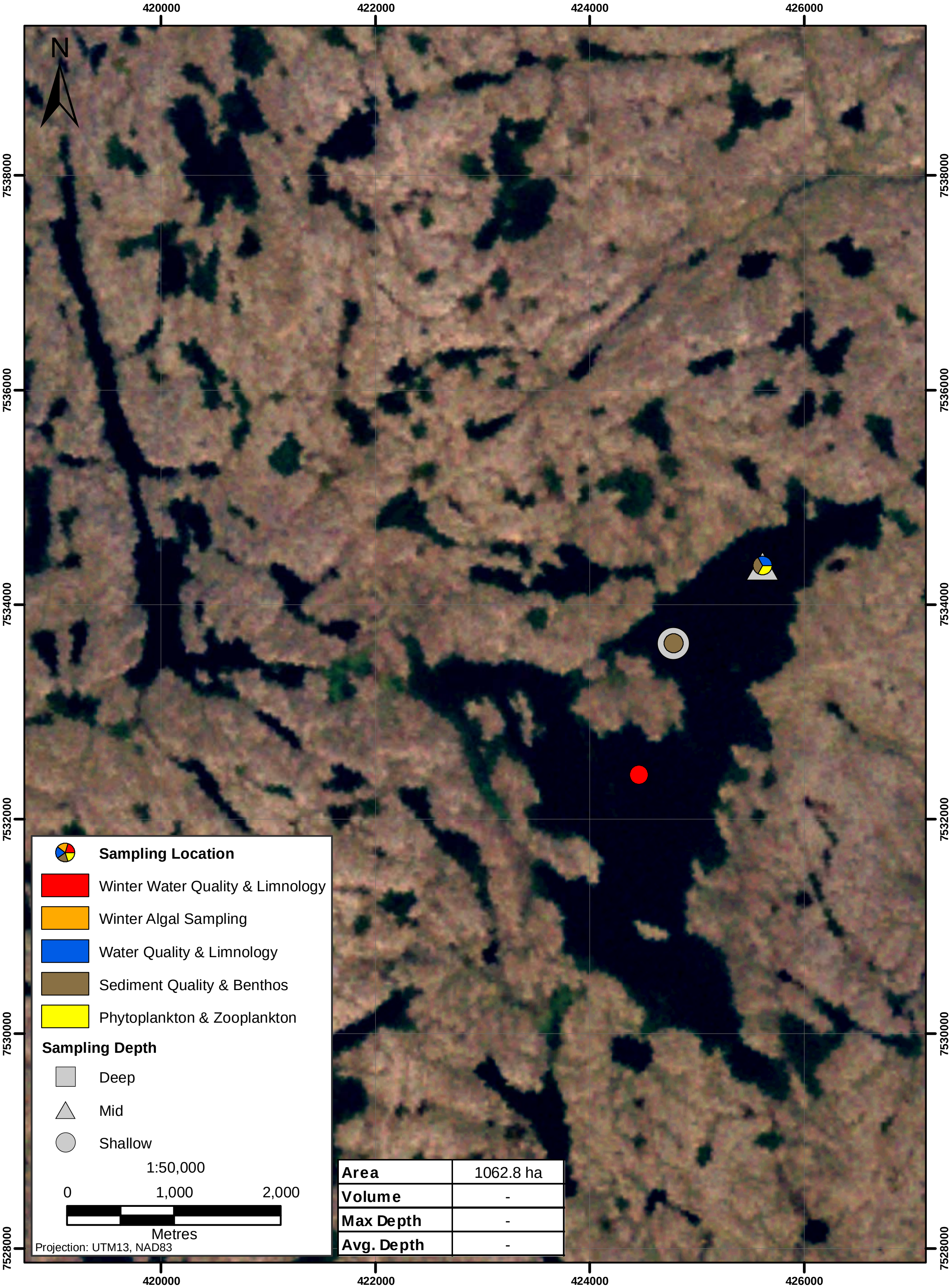
Area	401.0 ha
Volume	-
Max Depth	-
Avg. Depth	-

Figure 2.1-2l

NEWMONT The Gold Company

Environmental Sampling Locations for Reference Lake A

Rescan Engineers & Scientists



Area	1062.8 ha
Volume	-
Max Depth	-
Avg. Depth	-

Figure 2.1-2m

NEWMONT The Gold Company

Environmental Sampling Locations for Reference Lake B

Rescan Engineers & Scientists

2.3 LAKE WATER QUALITY

Lake water quality samples were collected in late April/early May and August, 2009. Samples collected in April/May reflect the late winter 'worst case scenario' for under-ice water quality. During this period, oxygen concentrations are lowest and metal concentrations are potentially maximal, which makes this time period biologically important to characterize. Samples collected in August characterize the summer lake water quality.

2.3.1 Winter Lake Water Quality

Winter lake water quality samples were collected in late April/early May at all sites, except the reference lakes. Late April/early May sampling was conducted by snowmobile. The reference lakes could not be safely accessed by snowmobile, due to their remoteness. These lakes were, therefore, only sampled in late May, when helicopters were brought to site.

Lake winter water quality samples were collected with modified Skinny Niskin bottles. The Niskins bottles were acid-cleaned at ALS laboratories and contained acid-cleaned clear silicone in the interior of the bottle to avoid metal contamination by the standard black rubber tubing. A dual rope system was used for bottle closure and to ensure the collection of discrete samples. Generally, GO-FLO bottles are preferable to other sampling devices (such as the Niskin) in low metal concentration situations, but GO-FLOs are prone to freezing open in very cold temperatures restricting their ability to collect discrete water 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 metered cord to a depth 0.5 m lower than the desired sampling depth, before being raised to the sampling depth and closed. Water from the Niskin was transferred into the appropriate sample containers.

All water samples were analyzed for general physical parameters, nutrients, total organic carbon (TOC), and total and dissolved metals, at the lowest feasible detection limits, by ALS Environmental Services (ALS). Preservatives were added to total metals (ultra-pure nitric acid), TOC (hydrochloric acid), and total Kjeldahl nitrogen (TKN; sulphuric acid) sample containers. Dissolved metal samples were sent as quickly as possible to ALS for filtration and analyses. Dissolved metal samples were filtered under clean conditions at the laboratory to avoid contamination issues related to field filtration and to achieve the lowest detection limits.

Winter water samples were collected from a few lakes, at 1 m depth, for microcystin-LR analysis. Microcystin is a toxin released by cyanobacteria that can have negative effects on humans and other life forms. Microcystin-LR (a variant of the microcystin toxin) was identified by the on-site environmental staff as a parameter of concern in winter camp drinking water, which is withdrawn from Doris Lake. Extensive water quality testing, pre- and post-treatment, is undertaken by the on-site environmental staff on a regular basis. However, Rescan was asked to sample microcystin-LR within the Doris Watershed to determine the spatial extent of the elevated microcystin concentrations.

All water samples were kept cold and sent to ALS in Yellowknife on the first available flight from camp. Samples were then sent to ALS's Vancouver laboratory where the lowest metal detection limits were available. Dissolved metals samples were filtered by ALS in their Vancouver laboratory.

Table 2.3-1 presents the water quality parameters analyzed for lakes and streams and the analytical detection limits. Detection limits were the lowest achievable by the lab, and lower than, or equal to, the CCME guidelines for the protection of aquatic life. Detection limits were occasionally higher than the theoretical minimum presented in Table 2.3-1. This occurred when dilution of a sample was required to compensate for other interfering parameters. Annual realized detection limit ranges are indicated on graphs.

Table 2.3-1. Water Quality Parameters and Detection Limits, Hope Bay Belt Project, 2009

Parameter	Units	Detection Limit
Physical Tests		
Conductivity	mS/cm	2
Hardness (as $CaCO_3$)	mg/L	0.5
pH	pH units	0.1
Total Suspended Solids	mg/L	3
Total Dissolved Solids	mg/L	10
Turbidity	NTU	0.1
Anions and Nutrients		
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	2
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	2
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	2
Alkalinity, Total (as $CaCO_3$)	mg/L	2
Ammonia (as N)	mg/L	0.005
Bromide (Br)	mg/L	0.05
Chloride (Cl)	mg/L	0.5
Fluoride (F)	mg/L	0.02
Nitrate (as N)	mg/L	0.005
Nitrite (as N)	mg/L	0.001
Total Kjeldahl Nitrogen	mg/L	0.05
Ortho Phosphate (as P)	mg/L	0.001
Total Phosphate (as P)	mg/L	0.002
Sulfate (SO4)	mg/L	0.5
Total and Dissolved Metals		
Aluminum (Al)-Total	mg/L	0.001
Antimony (Sb)-Total	mg/L	0.0001
Arsenic (As)-Total	mg/L	0.00003
Barium (Ba)-Total	mg/L	0.00005
Beryllium (Be)-Total	mg/L	0.0002
Bismuth (Bi)-Total	mg/L	0.0005
Boron (B)-Total	mg/L	0.001
Cadmium (Cd)-Total	mg/L	0.00001
Calcium (Ca)-Total	mg/L	0.02
Chromium (Cr)-Total	mg/L	0.0001
Cobalt (Co)-Total	mg/L	0.0001
Copper (Cu)-Total	mg/L	0.0001
Iron (Fe)-Total	mg/L	0.01
Lead (Pb)-Total	mg/L	0.00005

(continued)

Table 2.3-1. Water Quality Parameters and Detection Limits, Hope Bay Belt Project, 2009 (completed)

Parameter	Units	Detection Limit
Lithium (Li)-Total	mg/L	0.005
Magnesium (Mg)-Total	mg/L	0.005
Manganese (Mn)-Total	mg/L	0.00005
Mercury (Hg)-Total	mg/L	0.00001
Molybdenum (Mo)-Total	mg/L	0.00005
Nickel (Ni)-Total	mg/L	0.0001
Phosphorus (P)-Total	mg/L	0.3
Potassium (K)-Total	mg/L	0.05
Selenium (Se)-Total	mg/L	0.0001
Silicon (Si)-Total	mg/L	0.05
Silver (Ag)-Total	mg/L	0.00001
Sodium (Na)-Total	mg/L	0.01
Strontium (Sr)-Total	mg/L	0.0001
Thallium (Tl)-Total	mg/L	0.0001
Tin (Sn)-Total	mg/L	0.0001
Titanium (Ti)-Total	mg/L	0.01
Uranium (U)-Total	mg/L	0.00001
Vanadium (V)-Total	mg/L	0.00005
Zinc (Zn)-Total	mg/L	0.001
Organic Parameters		
Total Organic Carbon	mg/L	0.5
Microcystin	ug/L	0.20

2.3.2 Summer Lake Water Quality

Summer water quality samples were collected in August, 2009, using metal-clean techniques. A 5 L Teflon-lined GO-FLO bottle was used for water collection (Plate 2.3-1). As done with the skinny Niskin sampler, the GO-FLO was lowered on a metered 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 discussed in winter lake water quality.

Summer lake sampling locations were the same as those sampled in the winter, except for some instances where coarse summer bathymetric surveys found deeper lake basins (see lake sampling maps Figures 2.1-2a – 2.1-2m). 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.

2.3.3 Quality Assurance/Quality Control (QA/QC)

A quality assurance and quality control program (QA/QC), including the use of replicates, blanks, and chain of custody forms, was incorporated into the design of this study.

Replicate samples accounted for approximately 20% of lake water samples collected during each sampling period. Replicate samples were taken from multiple depths to ensure any variation with depth was quantified. The equipment blanks, field blanks, and travel blanks comprised ~5% of the total number of lake water quality samples collected.

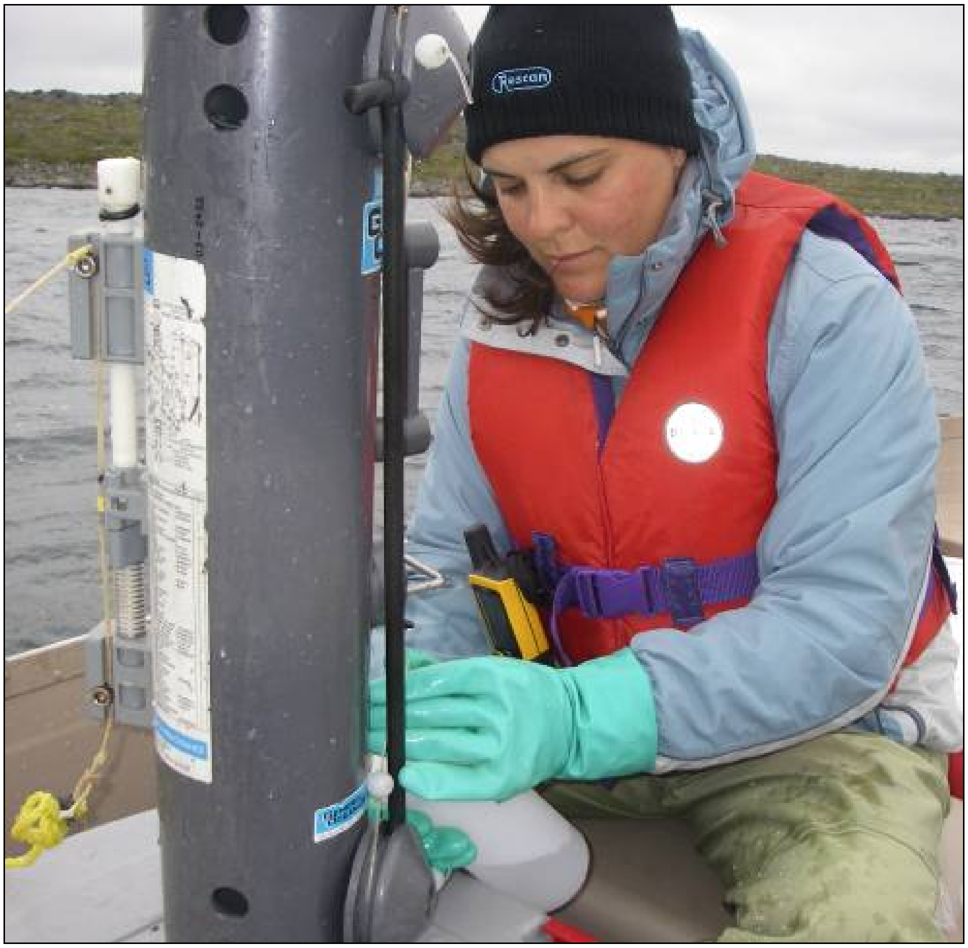


Plate 2.3-1. Lake water quality sampling with the use of a 5L GO-FLO.

Equipment blanks were collected in the field by first rinsing an acid-washed or lake water rinsed GO-FLO with double de-ionized water (DDI water; provided by ALS) then filling the GO-FLO bottle with DDI water, allowing the water to sit for a few minutes (as would occur with a real sample), and then drawing sub-samples from the bottle. Equipment blanks were preserved and handled the same as real samples.

Field blanks were processed in the field by opening the bottles provided by ALS (containing DDI water) and exposing the sample to air for a few minutes. The bottles were preserved and handled the same as real samples.

Travel blanks were provided by ALS and were never opened, but were otherwise handled in the same way as real samples.

2.4 STREAM AND RIVER WATER QUALITY

Under-ice water quality samples were collected from study area rivers for the first time in 2009. Stream and river water quality samples were also collected in June (freshet), August and September.

2.4.1 Winter River Water Quality and Limnology

The Koignuk and Aimaokatalok rivers were sampled for water quality in late April/early May to determine the presence of under-ice water and to characterize the winter water quality and dissolved oxygen content. Data collected from the Aimoakatalok River are presented in the appendices to this report, but are not discussed as this reference site was discontinued. Near the end of winter, the under-ice water quality is expected to reflect the 'worst case scenario' for oxygen and many metals.

To access the water, a 6-inch diameter ice auger was used to drill a hole through the surface ice, and a grab sample of the underlying water was collected. Because some sections of the Koignuk River sampled were less than 2 m deep (the approximate ice thickness in the area), ice occasionally extended to the river bottom. If little or no water was found on initial drilling, additional holes were drilled based on visible topography and basic river dynamics. When sufficient water was found under the ice, a clean narrow-necked collection bottle, attached to a 3 m pole, was lowered into the hole to just below the bottom of the ice and allowed to passively fill. The collected water was used to fill clean sample containers.

Two replicate samples were collected from each site to help identify any contaminated samples. Contamination risk is elevated in rivers (in comparison to lakes) as they are shallower than most of the sampled lakes, making their sediments more susceptible to disturbance during drilling.

All water samples were transported and analyzed as described for winter lake water quality.

Under-ice dissolved oxygen and temperature readings were be collected at 0.5 m depth intervals as described in the Winter Lake Limnology section above.

2.4.2 Summer Stream 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).

Duplicate samples were collected at all stations to allow identification of natural variability, and ensure that water quality results are collected at each location. Natural variability is higher in streams compared to lakes due to heterogeneously suspended matter (such as leaves, small insects, etc.), which, if accidentally collected, can alter results.

Stream water samples were collected using clean techniques. For each sample, the scientist stood facing upstream, being careful not to disturb sediments, and triple-rinsed the bottle and cap using stream water. The sample container was then filled and preserved as outlined in winter lake water quality section above.

All water samples were transported and analyzed as described for winter lake water quality.

2.4.3 Quality Assurance/Quality Control (QA/QC)

As with lake water quality, a quality assurance and quality control program (QA/QC) was included in the study design. The program included the use of replicates, blanks, and chain of custody forms. Replicate samples were collected from each sampling location. The field blanks and travel blanks comprised ~5% of the total number of water quality samples, and were collected in addition to any collected for lake QA/QC purposes.

Field blanks and travel blanks were collected as described in the lake water quality section above.

All blanks, as with all samples, were recorded on a chain of custody form and sent to ALS in Yellowknife. Blanks were tested for the same parameters listed in Table 2.3-1.

2.5 LAKE SEDIMENT QUALITY

Sediment quality samples were collected from lakes once during the open-water season in August.

Samples were collected from two of three different depth strata per lake: shallow depth (0 to 5 m), mid depth (5 to 10 m), and deep depth (>10 m depth). If a lake was less than 5 m deep, only one depth stratum was sampled, if a lake was 5 to 10 m deep, two depth strata were sampled, and if a lake was >10 m deep, only the shallow and deep depth strata were sampled. Triplicate samples were collected from each depth strata sampled. In order to avoid pseudo-replication, a long anchor was set and the boat was allowed to drift as samples were collected.

An Ekman grab sampler (surface area = 0.023 m^2) was used to collect two grabs per sample, in order to obtain enough sediment for all of the required analyses.

Sediment was carefully transferred onto a white plastic tray, photographed, and described for colour, texture, and other characteristics. The top 2–3 cm of sediment was collected and analyzed for grain size, moisture, nutrients, and solid-phase metals. In order to obtain enough material, and to ensure that samples for grain size corresponded to samples for sediment chemistry, ½ of the top layer from each grab was used for sediment chemistry and ½ for grain size. The same sampling procedure was followed for the second grab.

Table 2.5-1 presents the sediment quality parameters that were analyzed and their detection limits (note that realized detection limits may differ from these theoretical values; realized detection limit ranges are indicated on all graphs). 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 Vancouver laboratory for analysis.

Table 2.5-1. Sediment Quality Parameters and Detection Limits, Hope Bay Belt Project, 2009

Parameter	Units	Detection Limit
Physical Tests		
% Moisture	%	0.1
pH	pH	0.1
Particle Size		
% Gravel (>2 mm)	%	1
% Sand (2.0 mm - 0.063 mm)	%	1
% Silt (0.063 mm – 4 µm)	%	1
% Clay (<4 µm)	%	1

(continued)

Table 2.5-1. Sediment Quality Parameters and Detection Limits, Hope Bay Belt Project, 2009 (completed)

Parameter	Units	Detection Limit
Leachable Anions & Nutrients		
Total Nitrogen by LECO	%	0.02
Organic / Inorganic Carbon		
Total Organic Carbon	%	0.1
Plant Available Nutrients		
Available Ammonium-N	mg/kg	0.8
Available Nitrate-N	mg/kg	2
Nitrite-N	mg/kg	0.4
Available Phosphate-P	mg/kg	1
Metals		
Aluminum (Al)	mg/kg	50
Antimony (Sb)	mg/kg	10
Arsenic (As)	mg/kg	0.05
Barium (Ba)	mg/kg	1
Beryllium (Be)	mg/kg	0.5
Bismuth (Bi)	mg/kg	20
Cadmium (Cd)	mg/kg	0.1
Calcium (Ca)	mg/kg	50
Chromium (Cr)	mg/kg	2
Cobalt (Co)	mg/kg	2
Copper (Cu)	mg/kg	1
Iron (Fe)	mg/kg	50
Lead (Pb)	mg/kg	2
Lithium (Li)	mg/kg	2
Magnesium (Mg)	mg/kg	50
Manganese (Mn)	mg/kg	1
Mercury (Hg)	mg/kg	0.005
Molybdenum (Mo)	mg/kg	0.2
Nickel (Ni)	mg/kg	5
Phosphorus (P)	mg/kg	50
Potassium (K)	mg/kg	200
Selenium (Se)	mg/kg	0.5
Silver (Ag)	mg/kg	0.1
Sodium (Na)	mg/kg	200
Strontium (Sr)	mg/kg	0.5
Sulfur (S)	mg/kg	100
Thallium (Tl)	mg/kg	0.5
Tin (Sn)	mg/kg	5
Titanium (Ti)	mg/kg	1
Vanadium (V)	mg/kg	2
Zinc (Zn)	mg/kg	1

2.6 STREAM SEDIMENT QUALITY

Stream sediment samples were collected once during the open-water season in July.

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, and 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 Vancouver laboratory for analysis. Table 2.5-1 presents the sediment quality parameters that were analyzed and their detection limits.

2.7 PHYTOPLANKTON

Phytoplankton were sampled during the winter and summer of 2009. During the winter, a subset of lakes in the Doris Watershed, and Little Roberts Lake, were sampled for phytoplankton biomass (as chlorophyll *a*) and taxonomy, as well as for epontic algae. During the summer, phytoplankton biomass and taxonomy were collected at all survey lakes.

2.7.1 Winter Phytoplankton and Epontic Algal Sampling

Phytoplankton biomass (as chlorophyll *a*), abundance and taxonomy samples were collected from Patch, Ogama, Doris and Little Roberts lakes in April 2009, as were water samples for microcystin-LR (a toxin released by certain cyanobacteria on their decomposition) analysis. These winter samples were specifically collected to help identify the taxa responsible for evaluated microcystin concentrations in Doris Camp drinking water supply. Samples for epontic (algae that grow on the underside of lake ice) algal taxonomy will were also collected at the same time, for the same purpose.

Samples for all phytoplankton parameters were collected 1 metre below the ice surface, near the designated station location. Samples were collected using a skinny Niskin bottle concurrent with winter water quality samples. Single samples were collected at each site for each type of analyses.

Epontic samples were collected by attaching a 1L, wide-mouthed, sampling jar to a 3 m pole and lowering through the 10-inch diameter hole to the underside of the ice layer. The jar was then scraped along the underside of the ice to collect the epontic sample. Because the area sampled cannot be determine exactly, these samples were qualitative, and provided information on species present, but not densities. Single samples were collected at each site.

Filtration for phytoplankton biomass was conducted back at camp. Samples were filtered onto 45 µm pore size filters, and kept dark and frozen until analysis.

Taxonomic samples (both phytoplankton and epontic) were preserved with Lugol's Iodine Solution and were analyzed by G3 Consulting Ltd. in Surrey, BC. Biomass samples (frozen filters) and microcystin samples were sent to ALS Environmental in Vancouver. The filters were kept frozen during transportation.

2.7.2 Summer Phytoplankton Sampling

Samples for phytoplankton biomass (chlorophyll *a*), abundance, and taxonomy were collected from lakes in August.

Samples were collected 1 m below the surface near the designated station location. Triplicate samples were collected for phytoplankton biomass (as chlorophyll *a*), abundance, and taxonomy. Replicate samples were collected 5 to 20 m apart by setting a long anchor.

Phytoplankton samples were collected using a 5 L GO-FLO bottle concurrent with summer water quality samples. Filtration for phytoplankton biomass was conducted back at camp. Samples were filtered onto 45 µm pore size filters and were kept dark and frozen until analysis.

Taxonomic samples were preserved with Lugol's Iodine Solution and be sent to G3 Consulting Ltd. in Surrey, BC for enumeration and identification. Biomass samples (frozen filters) were sent to ALS Environmental in Yellowknife. The filters were kept frozen during transportation.

2.8 PERIPHYTON

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

Periphyton samples were obtained using 10 cm x 10 cm Plexiglas plates. The plates were affixed to submerged rocks with fishing line and placed in the stream such that they remained submerged until retrieval. Five plates were submerged per site, but only three plates were processed (to ensure that there were three plates to process after a month's time). The plates were installed a minimum distance of three times the channel width apart from each other, except on large rivers.

One quarter of each plate was collected for periphyton biomass (as chlorophyll *a*), and the remaining three-quarters of the plate was collected for periphyton taxonomy.

Periphyton biomass samples were filtered back at camp onto 45 µm pore size filters, and the filters kept dark and frozen until analysis. The filters were sent to ALS Environmental in Vancouver for analysis. Taxonomic samples were preserved with Lugol's Iodine Solution and sent to G3 Consulting Ltd. for taxonomic identification.

2.9 ZOOPLANKTON

Zooplankton abundance and taxonomy samples were collected from lakes once during the open-water season in August. Samples were collected in triplicate vertical hauls at each location. Replicate samples were collected 5 to 20 m apart, by leaving slack in the anchor line, using a 118 µm mesh zooplankton net. The net was lowered to within 1 to 2 m of the lake bottom and brought to the surface at a speed of 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. Taxonomic samples were preserved with 5% buffered formalin and sent to G3 Consulting Ltd. in Surrey, BC, for enumeration and identification.

2.10 LAKE BENTHOS

Lake benthos samples were collected from lakes once during the open-water season in August.

Samples were collected from the same depths and locations as the lake sediment quality samples. Triplicate samples were collected at a shallow (0–5 m) and a deep or mid depth (generally the water quality sampling location) within each lake. Replicate samples were collected approximately 20 m apart if possible.

Lake benthos samples were collected using an Ekman grab sampler. 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.

2.11 STREAM BENTHOS

Stream benthos samples were collected during the open-water season in July 2009.

Three replicate 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.

2.12 DATA MANAGEMENT AND ANALYSIS

Data management took place with the use of Microsoft Office Excel (2003). All graphically represented data and the calculation of means and standard errors were produced using Sigma Plot software. Diversity indices, including genera richness and Simpson's diversity index, were calculated with the use of PRIMER v6.1.

2.12.1 Physical Limnology

The 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 is calculated as follows:

$$k' = 1.7/D_s ;$$

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

$$EZD = 6.9/k'$$

2.12.2 Water Quality

All parameters for which CCME water quality guidelines for the Protection of Aquatic Life exist, as well as other parameters of interest, were graphed for all study lakes and streams, unless values were consistently below analytical detection limits. For analysis and graphing purposes, any values below analytical detection limits were replaced with half of the realized sample detection limit.

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

2.12.3 Sediment Quality

All parameters for which CCME sediment quality guidelines exist, as well as other parameters of interest, were graphed for all study lakes and streams, unless values were consistently below analytical detection limits. For analysis and graphing purposes, any values below analytical detection limits were replaced with half of the realized sample detection limit.

2.12.4 Aquatic Biology

The number of organisms per sample was converted to density or abundance (organisms/m^2 for benthos; organisms/m^3 for zooplankton; cells/cm^2 for periphyton; and cells/L for phytoplankton) by dividing each sample by the area/volume sampled and calculating the mean of all replicates. Volume sampled for zooplankton was calculated (as outlined in the General Oceanics instruction manual) by multiplying the number of flowmeter counts by a rotator constant of 26,873 and dividing by 999,999. This number was then multiplied by the ¼ of the squared diameter of the net opening then multiplied by π.

Arithmetic means and associated standard errors were represented on all graphs with the use of Sigma plot. Genera richness and diversity (Simpson's diversity index) were calculated using PRIMER v6.1 statistics software (2006). Richness is defined as the number of separate genera/sample present in a sample. In assessing genus richness, multiple species of the same genus were pooled together. For sites where the only data available occurred at a higher taxonomic level (*e.g.*, Family or Order), a single genus was considered to be present in the sample unless otherwise stated. Damaged or immature (d/i) individuals were removed from diversity analyses only if more than one other genera/sample was found within the taxonomic group (as a clear assumption as to which group the d/i individuals might belong to could not be made). Otherwise, these individuals were included in the number of the identified taxon, or, in the absence of an identified taxon, included as a separate genus.

The Simpson's diversity index incorporates richness and abundance to calculate a measure of diversity that can be compared among samples.

Simpson's Index is a dominance-type index and is calculated based on the formula:

$$D_s = 1 - \sum_{i=1}^{s} [\, n_i(n_i - 1)] \,/\, [N(N-1)]$$

where n_i is the number of individuals in the i^{th} species 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 dominance, the number of species, and relative degree of distribution of each species (evenness).

2.13 HISTORICAL DATA

Summaries of historical collection methodologies, sample collection depths, timing, and replication, are presented in Tables 2.13-1 through 2.13-8. A summary of the historical data collection sites for the northern portion of the Hope Bay Belt area are presented as maps in Figures 2.13-1 through 2.13-5. Only results from locations sampled in 2009 are presented in this report.

Table 2.13-1. Summary of Historical Lake Water Quality Sampling Conducted for the Hope Bay Belt Project

Year	1995	1996	1997	1998	1999
Sampling month(s)	May*, June*, July, Aug	Apr*, Aug	Apr*, July, Aug	Apr*	July
Sampling Depths	Surface and shoreline surface grab at all sites. Vertical profiles at Doris N and S in August.	Metered depths throughout length of column.	Shallow depth at all sites. Deep depth sampled at Doris S	Shallow depth	Shallow depth and Shoreline surface grab
Analytical Results for Metals	Total (all sites) and dissolved (1 sample at Doris N)	Total and dissolved	Total and dissolved	Total	Total
Replication	n = 1 at each sampling event/depth	n = 1 at each sampling event/depth	n = 1 + ca. 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
QA/QC	Split samples, Travel/Field Blanks, Inter Lab Sample	Split samples, Travel/Field Blanks	Split samples, Replicates, Travel Blanks	Split samples, Replicates, Travel Blanks	Replicates
Field Methodology	Grab samples at surface. 2 L Aquatic Research Instruments sampler for depth sampling.	2 L Go-Flo sampler for depth sampling.	5 L Go-Flo sampler for depth sampling.	5 L Go-Flo sampler for depth sampling.	Grab samples at surface. 5 L Go-Flo for depth sampling.

Table 2.13-1. Summary of Historical Lake Water Quality Sampling Conducted for the Hope Bay Belt Project (continued)

Year	2000	2003	2004	2005	2006
Sampling month(s)	July, Aug	July, Aug, Sept	June*, July, Aug, Sept	July, Aug, Sept	May* or June*, July, Aug, Sept
Sampling Depths	Shallow depth and Mid Depth	Shallow depth	Shallow and deep depths	Shallow and deep depths	Shallow and deep depths
Analytical Results for Metals	Total	Total and dissolved	Total and dissolved	Total and dissolved	Total and dissolved
Replication	n = 2 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
QA/QC	Replicates, Travel/Field Blanks	Split samples, Travel Blank (due to laboratory error, blank was contaminated)	Replicates, Travel/Field/Equipment Blanks	Field/Equipment Blanks	Replicates, Field Blanks
Field Methodology	5 L Go-Flo for depth sampling.	Samples collected at a 1 m depth using VanDorn water bottle	Shallow samples collected with geopump and Tygon tubing. Deep samples collected with Kemmerer water sampler.	Kemmerer water sampler used for shallow and deep depths	Kemmerer water sampler used for shallow and deep depths

Table 2.13-1. Summary of Historical Lake Water Quality Sampling Conducted for the Hope Bay Belt Project (completed)

Year	2007	2008	2009
Sampling month(s)	May*, July, Aug, Sept	May*, July, Aug, Sept	April/May*, Aug
Sampling 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
Replication	n = 1 at each sampling event/depth	n = 1 at each sampling event/depth	n = 1 + 20% replication at each sampling event/depth
QA/QC	Replicates, Field Blanks	Replicates, Field/Equipment Blanks	Replicates, Field/Equipment Blanks
Field Methodology	Kemmerer water sampler used for shallow and deep depths	Kemmerer water sampler used for shallow and deep depths	GO-FLO or Skinny Niskin (Winter) water sampler used for shallow and deep depths

Not all sites were sampled on all sampling occasions

**Denotes under-ice sampling events*

Table 2.13-2. Summary of Historical Stream Water Quality Sampling Conducted for the Hope Bay Belt Project

Year	1996	1997	1998	2000	2003	2004
Sampling month(s)	June, Aug	June, July, Aug	June, July, Aug	June, Sept	July, Aug, Sept	sampled multiple times per month in June, July, Aug, Sept at Doris OF, monthly at other sites
Analytical Results for Metals	Total and dissolved	Total and dissolved	Total	Total	Total	Total and dissolved
Replication	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	n = 1 at each sampling event/location	n = 1 at each sampling event/location

Table 2.13-2. Summary of Historical Stream Water Quality Sampling Conducted for the Hope Bay Belt Project (completed)

Year	2005	2006	2007	2008	2009
Sampling month(s)	sampled multiple times per month in June, July, Aug, Sept at Doris OF, monthly at other sites	sampled multiple times per month in June, July, Aug, Sept at Doris OF, monthly at other sites	sampled multiple times per month in June, July, Aug, Sept at Doris OF, monthly at other sites	June, July, Aug, Sept	April/May*, June, Aug, Sept
Analytical Results for Metals	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 = 2 at each sampling event/location

Not all sites were sampled on all sampling occasions

**Denotes under-ice sampling events*

Table 2.13-3. Summary of Historical Lake Sediment Quality Sampling Conducted for the Hope Bay Belt Project

	1996	1997	2007	2009
Sampling month(s)	August	July	August	August
Sampling methods	Ekman grab; 0-1 cm & 1-3 cm	Ekman grab; 0-2cm	Gravity Core and Ekman; 0-5 cm	Eckman Grab 0-2 cm
Data collected	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
Replicates	n = 1 for each horizon	n = 1	n = 5 (corer); n = 1 (Ekman)	n = 3

Not all sites were sampled on all sampling occasions

Table 2.13-4. Summary of Historical Stream Sediment Quality Sampling Conducted for the Hope Bay Belt Project

	2009
Sampling month(s)	July
Sampling methods	Ekman grab; depositional areas
Data collected	Sediment Chemistry & particle size
Replicates	n = 3

Not all sites were sampled on all sampling occasions

Table 2.13-5. Summary of Historical Lake Phytoplankton Sampling Conducted for the Hope Bay Belt Project

	1996	1997	2000	2007	2009
Sampling month(s)	Aug	July, Aug*	July	July, Aug, Sept	Aug
Sampling methods	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	Depth-intergrated sample from whole euphotic zone	5 L Go-Flo sample from 1 m depth
Data collected	Abundance and Taxonomy	Abundance and Taxonomy Chl *a**	Abundance and Taxonomy	Abundance, Biovolume, and Taxonomy Chl *a*	Abundance and Taxonomy Chl *a*
Replication	n = 3	n = 3 per sampling event	n = 3	n = 1 per sampling event	n = 3

Not all sites were sampled on all sampling occasions

**At Doris Lake South only*

Table 2.13-6. Summary of Historical Stream Periphyton Sampling Conducted for the Hope Bay Belt Project

	1996	1997	2000	2009
Sampling month(s)	instantaneous; Aug	June to July; July to Aug	July to Aug	July to Aug
Sampling methods	Rock scrapings using a syring brush, fine bristled brush, or plastic spatula and ruler	Plexiglass plate, submersed for ca. 1 month	Plexiglass plate, submersed for ca. 1 month	Plexiglass plate, submersed for ca. 1 month
Data collected	Abundance and Taxonomy	Abundance and Taxonomy;	Abundance and Taxonomy Chl *a**	Abundance and Taxonomy; Chl *a*
Replicates	n = 3	n = 3	n = 3	n = 3

Not all sites were sampled on all sampling occasions

**At Doris Outflow only*

Table 2.13-7. Summary of Historical Lake Zooplankton Sampling Conducted for the Hope Bay Belt Project

	1996	1997	2000	2007	2009
Sampling month(s)	Aug	July, Aug*	July	July, Aug, Sept	Aug
Sampling Depths	Vertical Tow	Vertical Tow from ~ 2 m above lake bottom	Vertical Tow from ~ 1 m above lake bottom	Vertical or horizontal tows	Vertical Tow from ~ 1 m above lake bottom
Analytical Results for	Abundance and Taxonomy	Abundance and Taxonomy	Abundance and Taxonomy	Biomass (calculated), Abundance and Taxonomy	Abundance and Taxonomy
Replication	n = 3	n = 3	n = 3	n = 1	n = 3
Field Methodology	118 µm mesh net, 0.3 m diameter; vertical haul; preserved in 10% formalin	118 µm mesh net, 0.3 m diameter; vertical haul; preserved in 10% formalin	180 µm mesh net, 0.3 m diameter, with flowmeter; vertical haul; preserved in 5% formalin	153 µm mesh Wisconsin net, 0.25 m diameter; vertical haul; preserved in 10% formalin	118 µm mesh net, 0.3 m diameter; vertical haul; preserved in 5% formalin

**Not all sites were sampled on all sampling occasions*

Table 2.13-8. Summary of Historical Lake Benthos Sampling Conducted for the Hope Bay Belt Project

	1996	1997	2000	2007	2009
Sampling month(s)	Aug	July	July	Aug	Aug
Sampling Equipment	Ekman; 493 µm	Ekman; 493 µm	Ekman; 500 µm	Ekman; 243 µm	Ekman; 500 µm
Sampled Depth Zones	Deepest location	Shallow & Mid or Deep	Shallow, Mid, & Deep	Shallow & Mid or Deep	Shallow & Mid or Deep
Replicates/depth	n = 3	n = 3	n = 3	n = 3-5	n = 3

Note: numbers in parantheses indicate number of depth zones sampled
Not all sites were sampled on all sampling occasions

Table 2.13-9. Summary of Historical Stream Benthos Sampling Conducted for the Hope Bay Belt Project

	1996	1997	2000	2009
Sampling month(s)	Aug	Aug (& July at some sites)	Aug	July
Sampling Equipment	Hester Dendy; 8 plates; total area = 0.0448 m^2	Hester Dendy; 8 plates; total area = 0.0448 m^2	Hester Dendy; 9 plates; total area = 0.09 m^2	Hess Sampler; total area = 0.096 m^2
Replicates	2-5	1-3	3	3

Note: numbers in parantheses indicate number of replicates per sampling month
Not all sites were sampled on all sampling occasions

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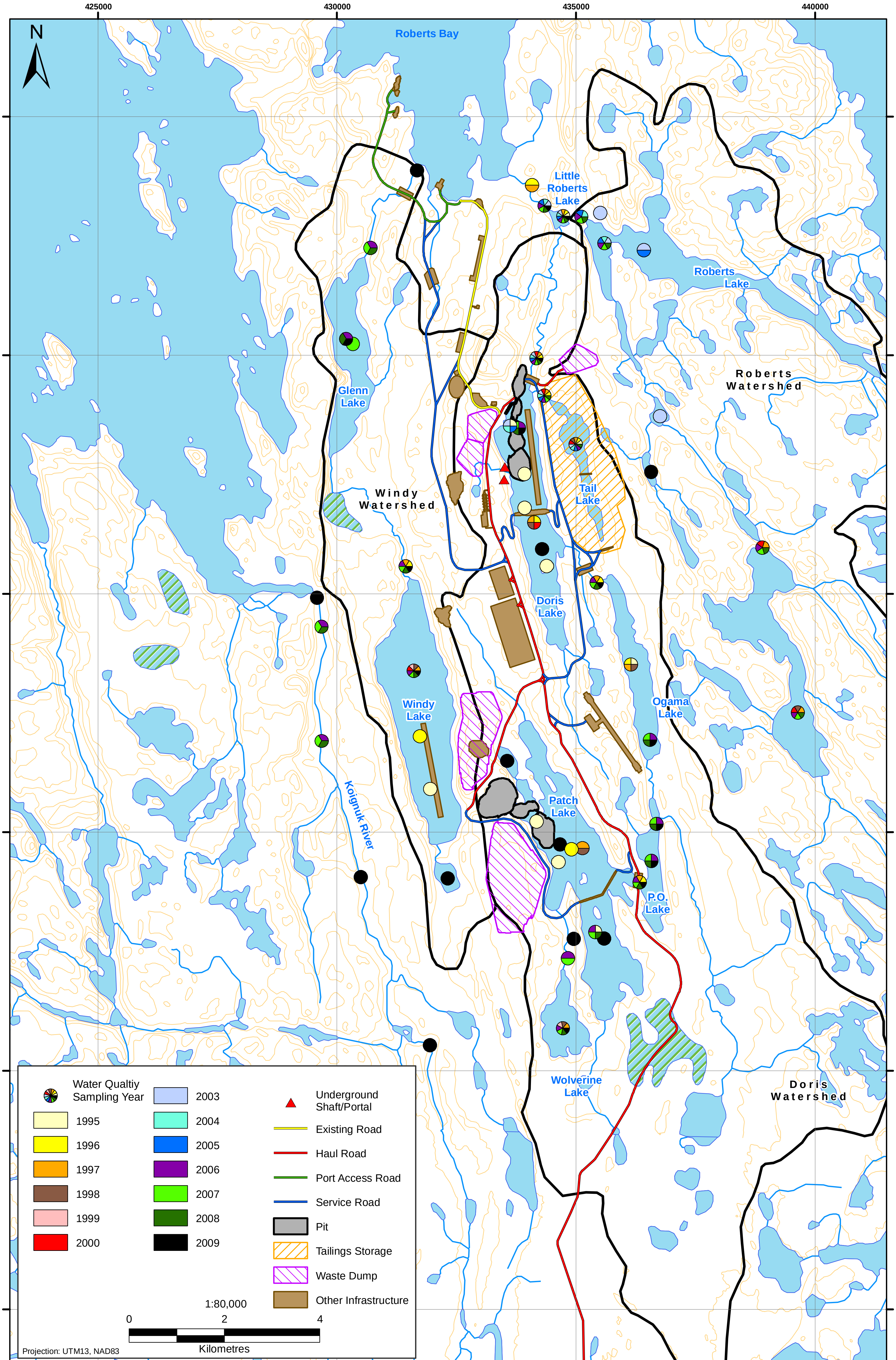

Figure 2.13-1

Historical Water Quality Sampling Locations, Hope Bay Belt Project

NEWMONT The Gold Company

Rescan Engineers & Scientists

Figure 2.13-1

PROJECT # 1009-002-05 GIS # HB-01-015a January 22, 2010

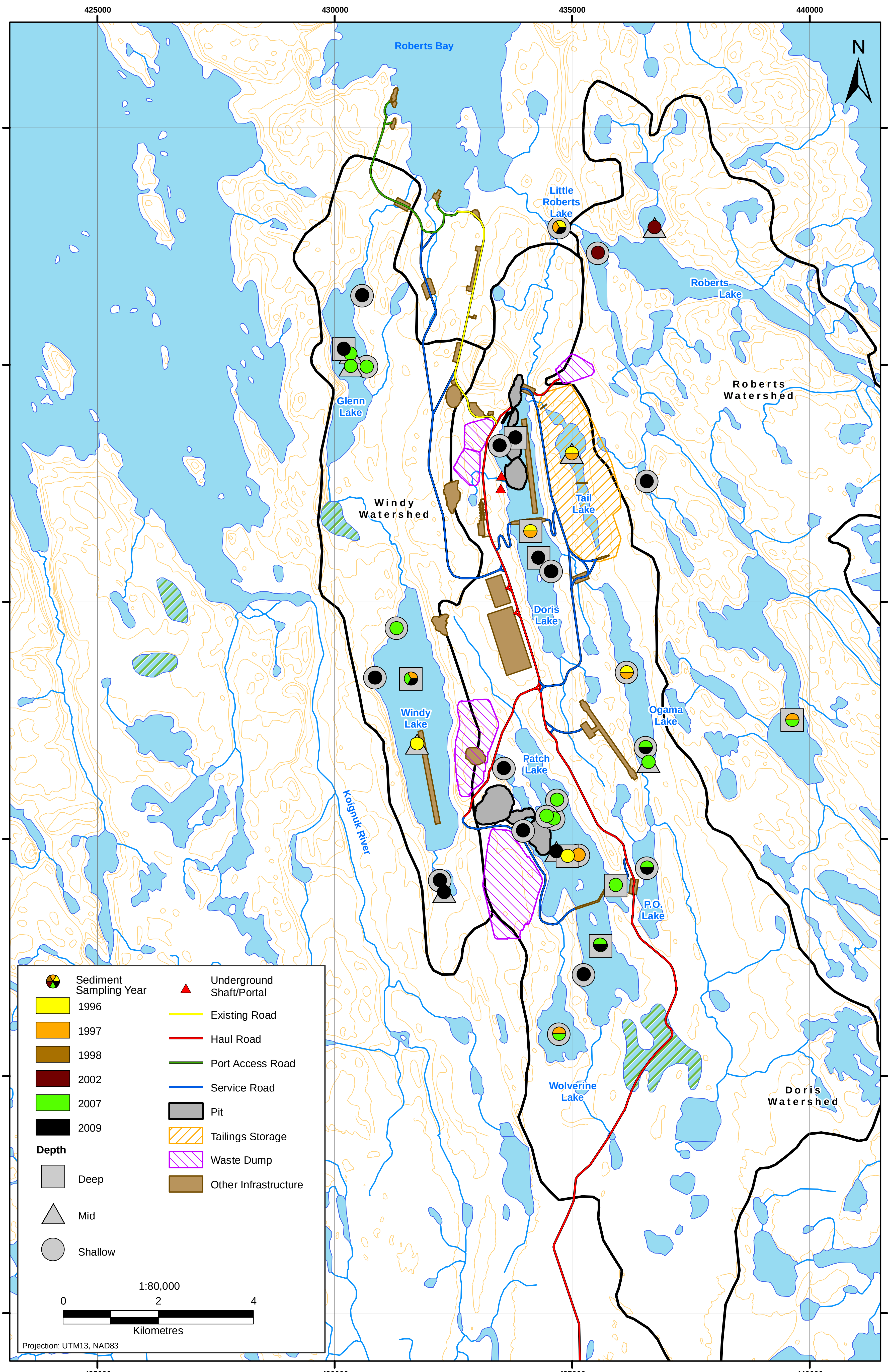

Figure 2.13-2

NEWMONT The Gold Company

Historical Sediment Quality Sampling Locations, Hope Bay Belt Project

Figure 2.13-2

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PROJECT # 1009-002-05 GIS # HB-01-016a January 22, 2010

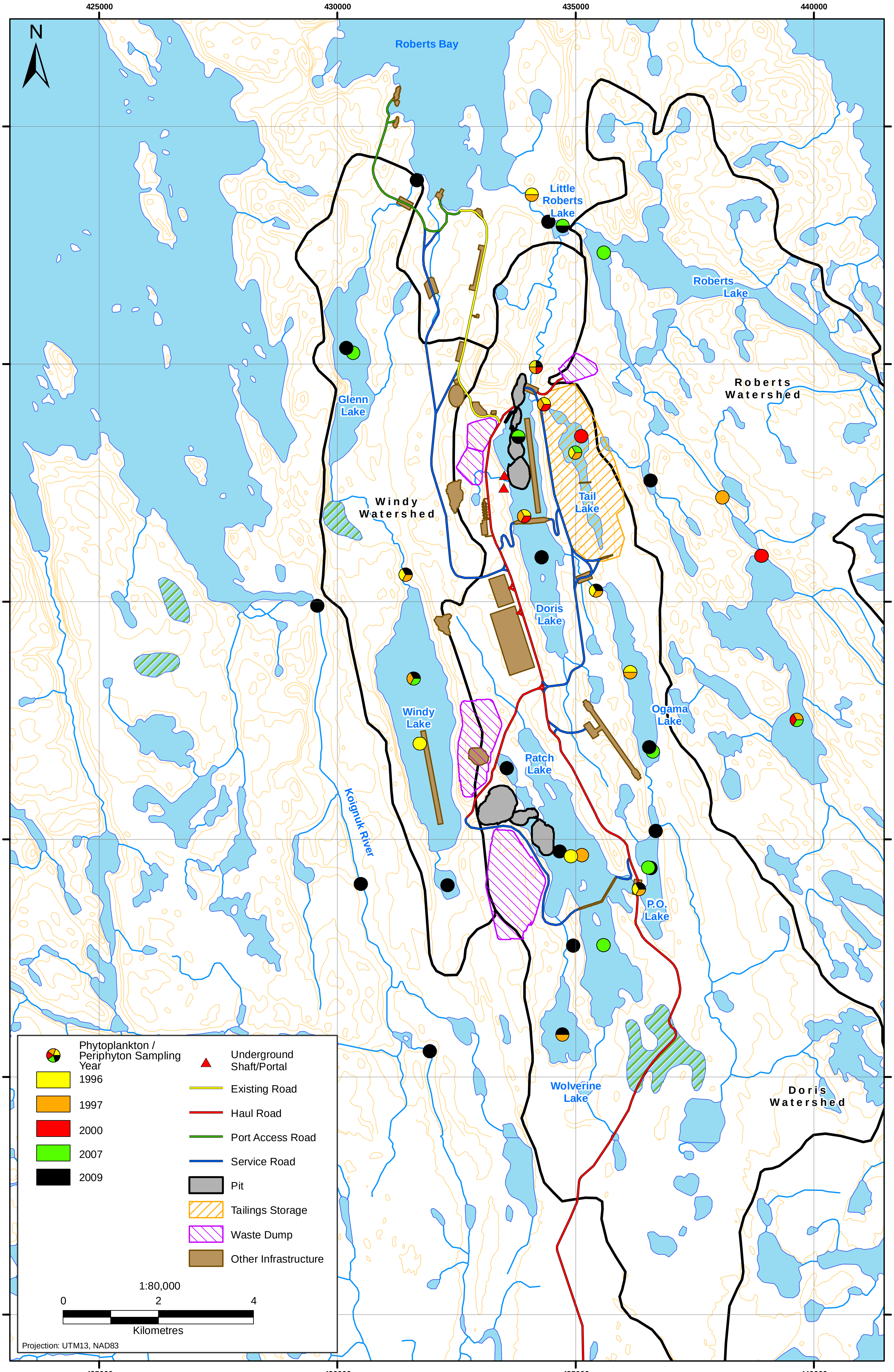

Figure 2.13-3

NEWMONT The Gold Company

Historical Phytoplankton and Periphyton Sampling Locations, Hope Bay Belt Project

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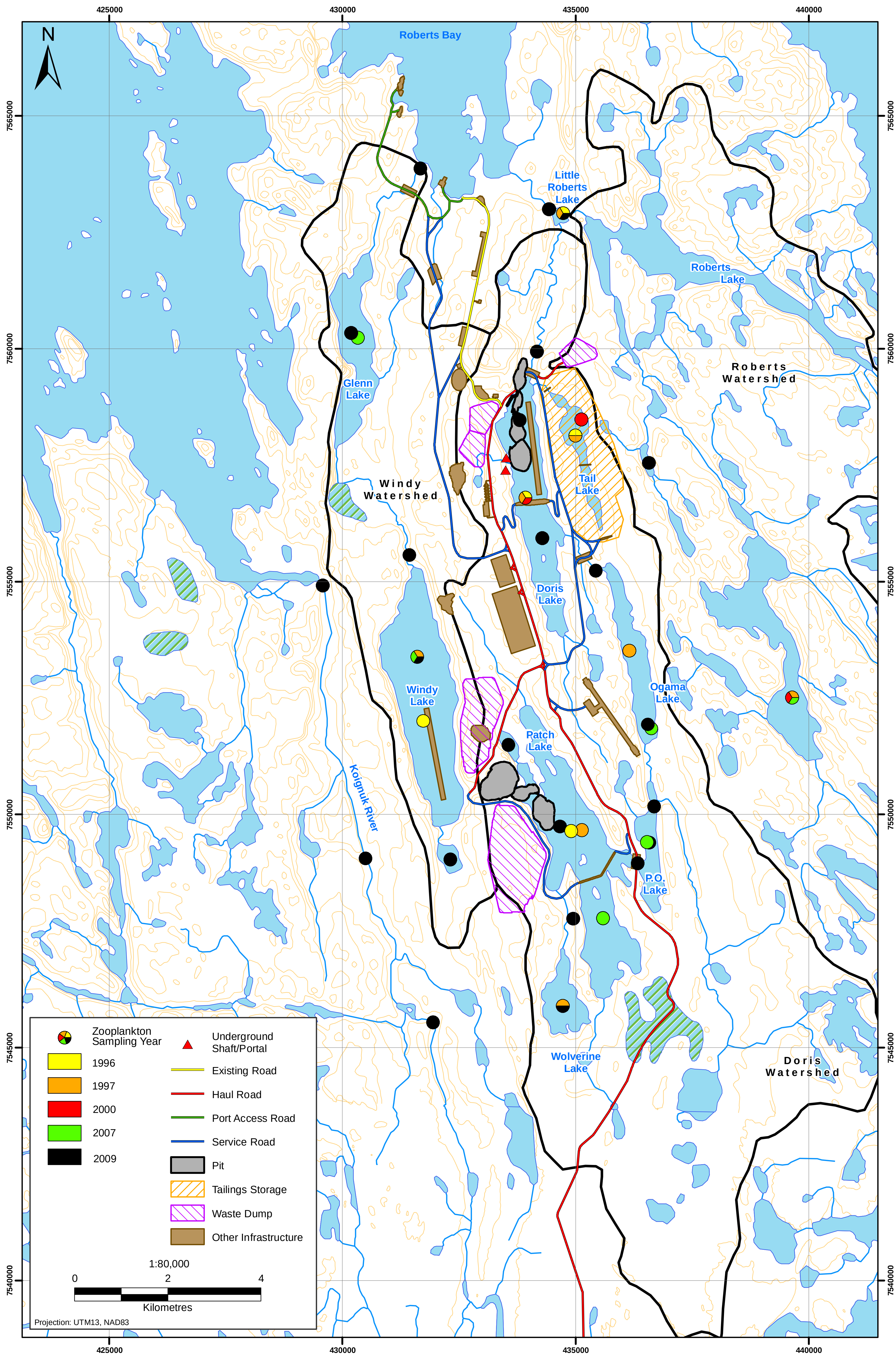

Figure 2.13-4

NEWMONT The Gold Company

Historical Zooplankton Sampling Locations, Hope Bay Belt Project

Rescan Engineers & Scientists

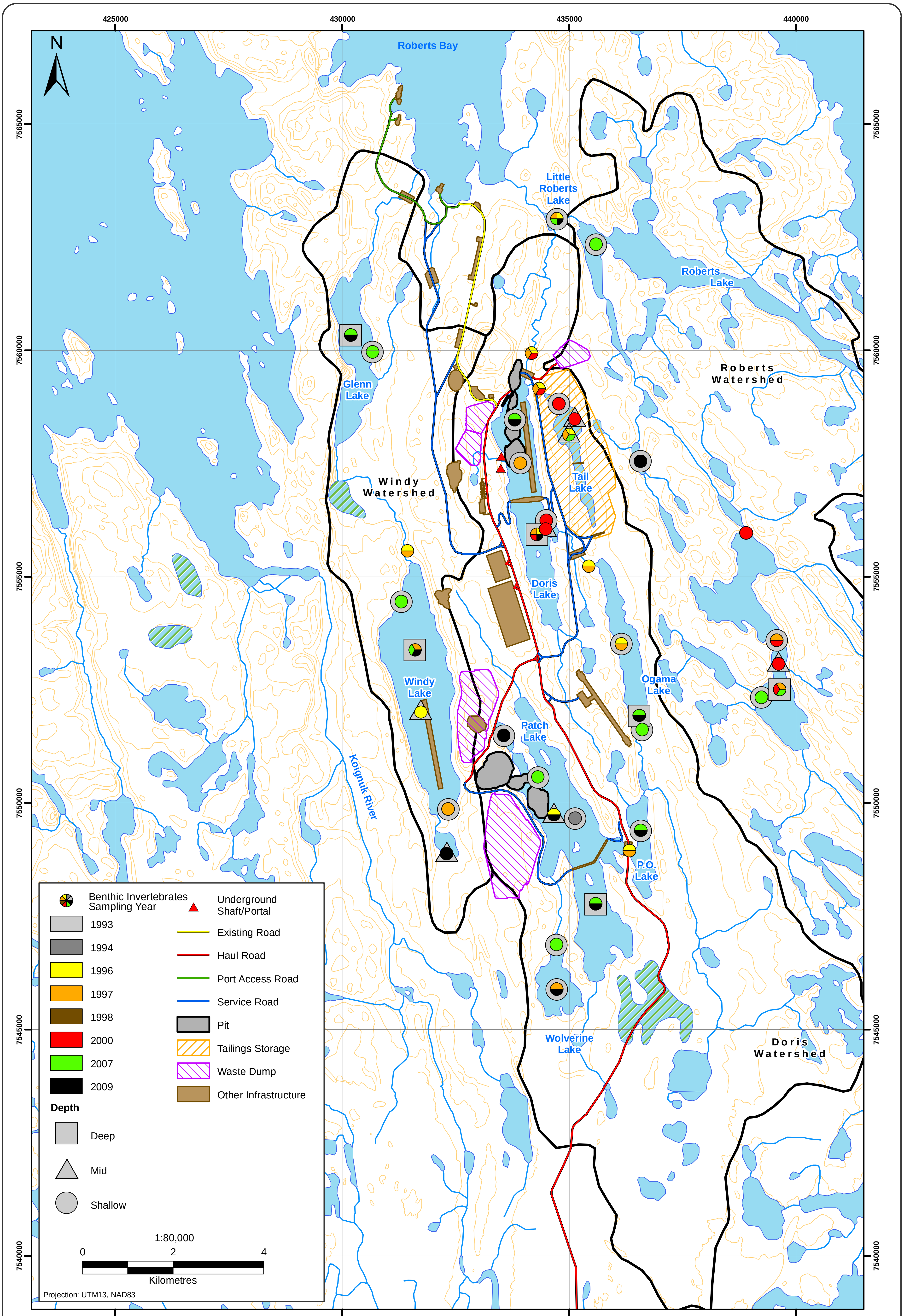

Figure 2.13-5

NEWMONT The Gold Company

Historical Benthic Invertebrate Sampling Locations, Hope Bay Belt Project

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3. Results and Discussion

3. Results and Discussion

3.1 PHYSICAL LIMNOLOGY

Lake oxygen and temperature profiles were collected twice in 2009: April/May and August. River oxygen and temperature profiles were collected in May 2009. Secchi depth measurements were taken in August. Tables 2.1-4 and 2.1-5 present the 2009 sampling dates.

3.1.1 Winter

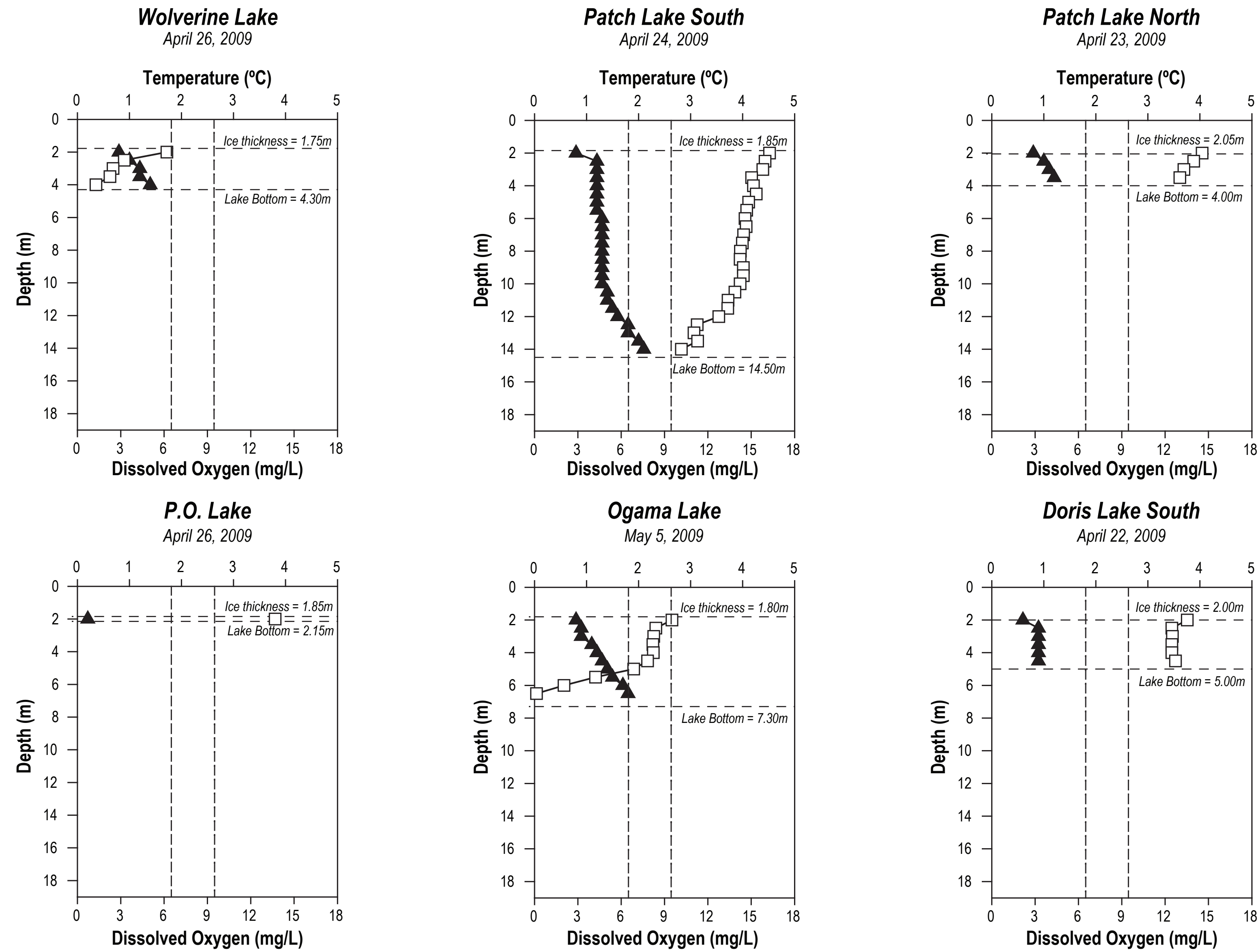
3.1.1.1 Lakes

Winter physical limnological characteristics were measured during April/May of 2009 (Figures 3.1-1a to 3.1-1c). Raw data are presented in Appendix 3.1-1.

Winter dissolved oxygen and temperature profiles were typical of ice-covered Arctic lakes. On all lakes, the ice cover was approximately 2 m thick, and water temperatures were coldest just below the ice (0.2 to 0.8°C). In deep lakes, temperature gradually warmed throughout the water column to maximum temperatures of approximately 2°C near the water-sediment interface. In some shallow lakes (e.g., Nakhaktok and Wolverine lakes), the water did not warm appreciably with depth.

Dissolved oxygen concentrations were highest near the water-ice interface, averaging 13.0 mg/L, and gradually declined throughout the water columns in inverse proportion to water temperature, reaching minimum concentrations near the water-sediment interface. Table 3.1-1 shows the maximum and minimum dissolved oxygen concentrations measured in lakes during winter and summer. The amount of oxygen depletion at depth varied among lakes. Wolverine, Ogama, and Little Roberts lakes were virtually anoxic (≤1 mg/L) at depth, indicating that there was oxygen-consuming decomposition occurring in sediments. These lakes are unlikely to be suitable overwintering habitats for fish because of naturally occurring hypoxic conditions that develop under the ice cover. At Little Roberts Lake, surface oxygen concentrations were highly supersaturated (17.6 mg/L; 121% saturation) and bottom oxygen concentrations were very low (0.13 mg/L), possibly as a consequence of high levels of algal production near the surface and decomposition near the bottom. Field observations indicated that Little Roberts Lake was relatively free of snow-cover (particularly near the outflow, where winds were funnelled between two large rock outcrops), with very clear ice, allowing excellent light penetration for algal growth (see Plate 3.1-1). Phytoplankton and epontic samples collected from Little Roberts Lake were particularly green (see Plate 3.1-2), suggesting that this lake is a productive system.

The Canadian Council of Ministers of the Environment (CCME) has established guideline oxygen concentrations for the protection of (cold-water) aquatic life of 9.5 mg/L for early life stages and 6.5 mg/L for other life stages (CCME 2007). Most lakes had dissolved oxygen concentrations above these guidelines in the upper portions of the water column; however, bottom water concentrations were below guidelines in Wolverine, Ogama, Doris North, Little Roberts, Nakhaktok, and Windy lakes, and in Reference lakes A and B. Oxygen concentrations in Wolverine Lake were consistently lower than 6.5 mg/L throughout the water column.



Note: Vertical dashed lines represent CCME guidlines for aquatic life; 9.5 mg/L O_2 for early life, 6.5 mg/L for other life stages.

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Winter Dissolved Oxygen and Temperature Profiles, Hope Bay Lakes, April/May 2009

Figure 3.1-1a

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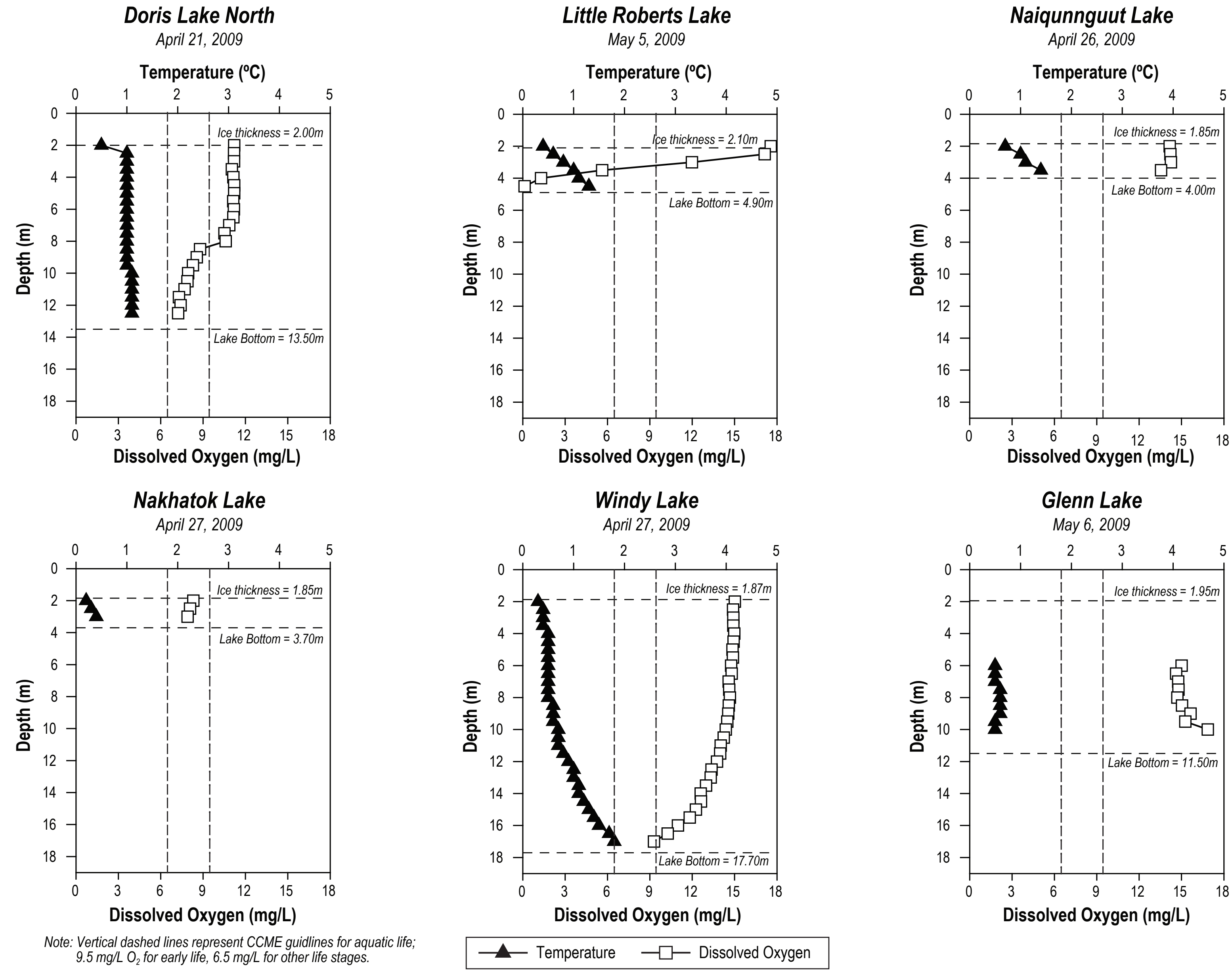
Figure 3.1-1a



Note: Vertical dashed lines represent CCME guidlines for aquatic life; 9.5 mg/L O_2 for early life, 6.5 mg/L for other life stages.

Figure 3.1-1b

NEWMONT NORTH AMERICA

Winter Dissolved Oxygen and Temperature Profiles, Hope Bay Lakes, April/May 2009

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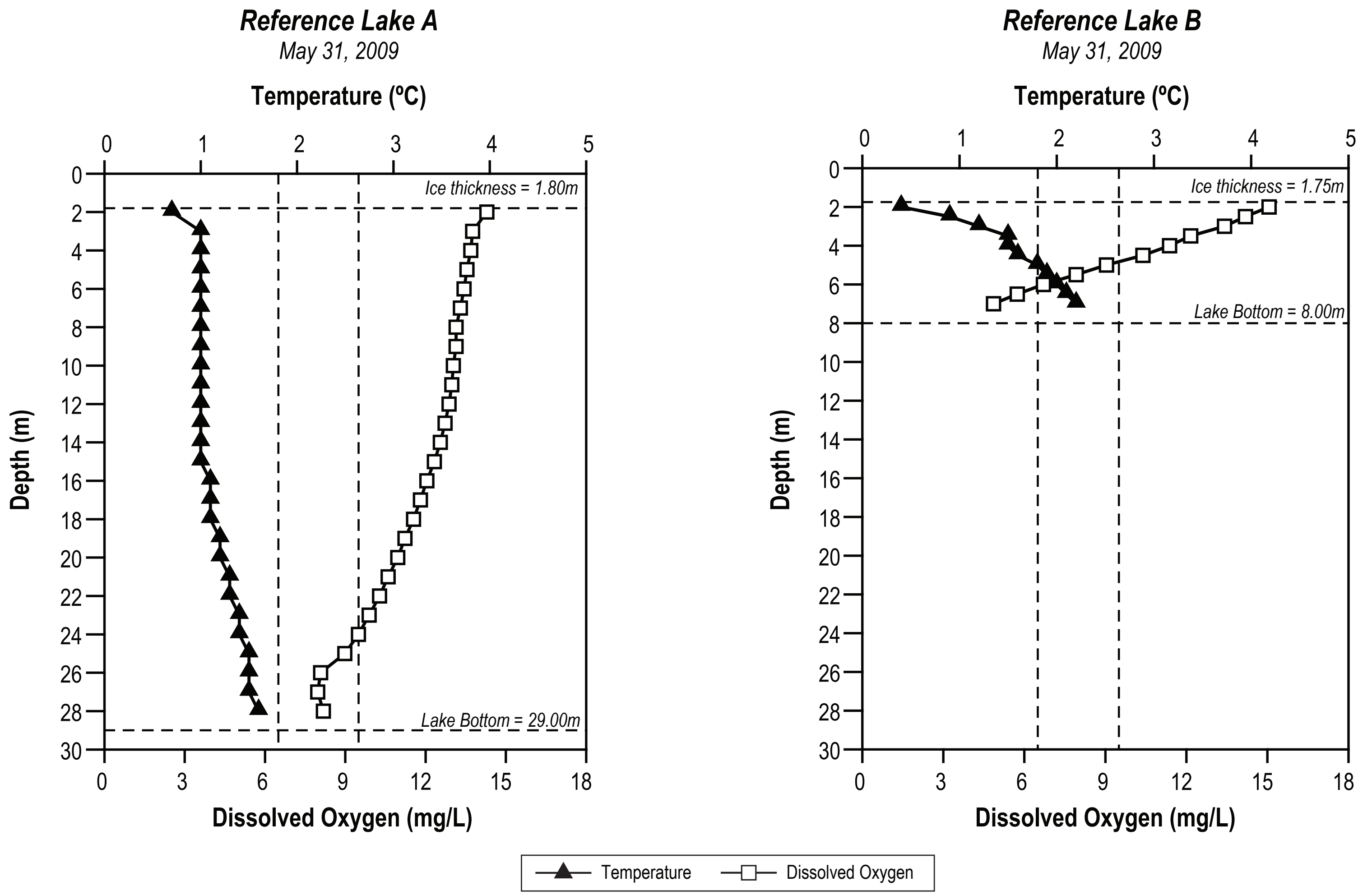


Note: Vertical dashed lines represent CCME guidelines for aquatic life; 9.5 amg/L O_2 for early life stages, 6.5 mg/L O_2 for other life stages

Figure 3.1-1c

NEWMONT NORTH AMERICA

Winter Dissolved Oxygen and Temperature Profiles, Hope Bay Lakes, April/May 2009

Figure 3.1-1c

Rescan Engineers & Scientists

Table 3.1-1. Lake Dissolved Oxygen Concentrations, Winter and Summer 2009

	Winter					Summer				
		Dissolved Oxygen Concentration (mg/L)		Dissolved Oxygen Saturation (%)			Dissolved Oxygen Concentration (mg/L)		Dissolved Oxygen Saturation (%)	
Lake	Bottom Depth (m)	min.	max.	min.	max.	Bottom Depth (m)	min.	max.	min.	max.
Wolverine	4.3	**1.3**	**6.2**	**8.6**	43.4	3.7	10.8	11.1	105	106
Imniagut	-	too shallow to sample				4.0	9.7	10.7	96.2	99.6
Patch South	14.5	10.2	16.3	73.4	114	14.0	10.5	10.7	92.9	95.4
Patch North	4.0	13.0	14.6	92.3	102	8.5	**7.7**	10.5	73.0	95.6
P.O.	2.15	13.7	13.7	94.3	94.3	3.25	10.7	10.9	95.3	96.2
Ogama	7.3	**0.14**	9.5	1.0	66.4	5.0	10.8	11.4	95.8	102
Doris South	5.0	12.5	13.5	87.3	93.0	10.8	11.0	11.8	96.6	105
Doris North	13.5	**7.2**	11.2	51.0	81.7	13.5	11.3	11.6	100	104
Little Roberts	4.9	**0.13**	17.6	1.0	121	2.6	10.7	10.8	94.5	95.4
Naiqunnguut	4.0	13.6	14.3	96.4	101	4.5	10.2	10.4	90.1	92.2
Nakhaktok	3.7	**7.9**	**8.3**	54.4	57.4	7.7	**9.2**	11.5	84.5	108
Windy	17.7	**9.3**	15.0	67.0	104	18.0	11.6	11.8	99.7	101
Glenn	11.5	14.6	16.9	101	117	19.7	10.9	11.5	95.3	96.9
Reference A	29.0	**8.0**	14.3	56.9	99.7	31.5	10.9	13.2	95.0	104
Reference B	8.0	**4.9**	15.1	35.3	104	9.5	11.1	11.2	99.7	101

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.

Plate 3.1-1. Little Roberts Lake looking towards the outflow (NW), May 5 2009.

Plate 3.1-2. Epontic algal sample collected from Little Roberts Lake, May 5 2009.

3.1.1.2 Rivers

The Koignuk River was sampled in May 2009. Data are presented in Table 3.1-2. This was the first time a river was sampled in the Project area during the winter period. Collecting winter dissolved oxygen data was attempted at three sites along the Koignuk River (as well as a site on the Aimaokatalok River, data for which are presented in Appendix 3.1-2) in May 2009. The Koignuk River midstream location was not sampled for dissolved oxygen or temperature because of difficulties in site snowmobile access in early May and equipment malfunctions in late May.

Ice thickness on the Koignuk ranged from 1.70 to 1.85 m. Under-ice river water was assumed to exist only in isolated pools separated by frozen sections of river because of the thickness of the ice. The following observations supported this assumption:

- no flow was measured at any Koignuk River locations (see 2009 Hydrology Baseline Report (Rescan 2009));
- there was no evidence of freshwater input at the confluence with Hope Bay (no decrease in ocean salinity; see 2009 Marine Baseline Report (Rescan 2010); and
- many shallow riffle areas are known to exist along the rivers length.

Water temperatures at the Koignuk upstream and downstream areas were low (0.2–0.3°C and 0.0°C, respectively), suggesting that these water bodies were highly influenced by the ice cover. Oxygen concentrations were notably higher at the upstream Koignuk site, averaging 16.2 mg/L, compared to the downstream location, where concentrations averaged 2.2 mg/L. It is unclear why there was such a discrepancy in oxygen levels between sites.

Table 3.1-2. River Dissolved Oxygen and Temperature Profiles, Winter 2009

Site	Date Sampled	Ice Thickness (m)	Bottom Depth (m)	Sampling Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
Koignuk River Upstream	4-May-09	1.85	3.7	2.0	0.2	15.91	109.6
				2.5	0.3	16.42	113.2
				3.0	0.3	16.24	112.1
Koignuk River Midstream	23-May-09	1.80	2.9	O_2 meter not working, attempted to return at later date but water on surface prevented sampling			
Koignuk River Downstream	4-May-09	1.70	2.7	2.0	0.0	2.15	17.8
				2.5	0.0	2.19	18.2

CCME guideline for dissolved oxygen is 9.5 mg/L for early life stages, 6.5 mg/L for other life stages

3.1.2 Summer - Lakes

Open-water season limnological characteristics were measured in August 2009. Figures 3.1-2a to 3.1-2c present open-water season dissolved oxygen and temperature profiles. Based on temperature profiles, lakes were generally well-mixed, or weakly stratified (Doris, Nakhaktok, and Glenn lakes), with the exception of Reference Lake A. Temperatures for most lakes ranged from 8°C to 13.3°C. Reference Lake A, the deepest lake sampled, had a well-established thermocline at 9 to 10 m depth. Surface water temperatures reached ~10°C and dropped to 4–5°C in the bottom layer.

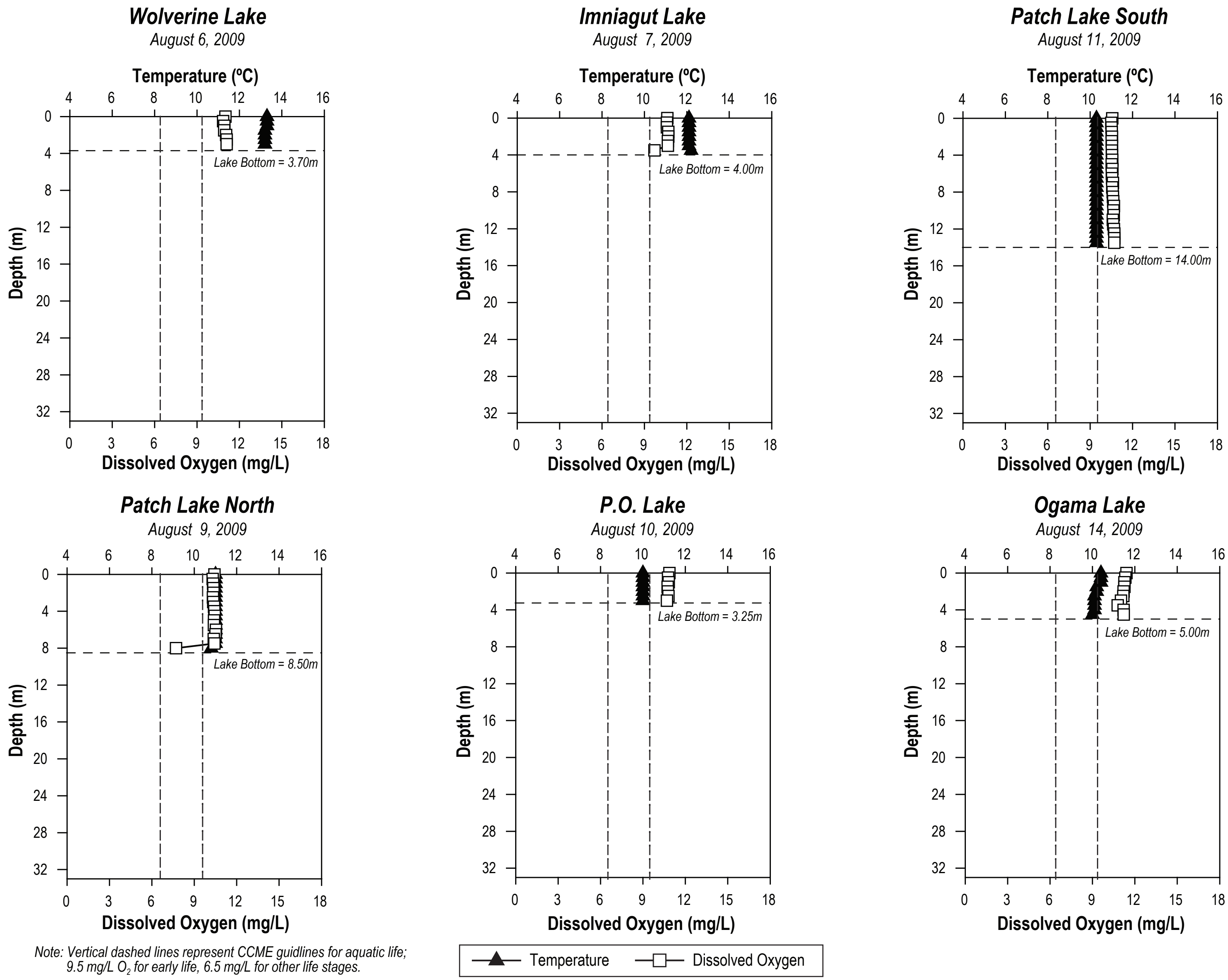
Summer dissolved oxygen concentrations generally remained stable throughout the water columns of all lakes, mirroring patterns seen in water temperature. Some oxygen depletion near the lake bottom was noted at Imniagut, Patch N, and Nakhaktok lakes, indicating oxygen consumption due to decomposition (Table 3.1-1). Conversely, Reference Lake A exhibited a slight increase in oxygen with depth. This increase was inversely related to water temperature, and likely reflects the increased oxygen carrying capacity of colder water. Overall, lakes were well oxygenated, with water column oxygen concentrations ranging from 7.7 mg/L (Patch N, 8 m depth) to 13.2 mg/L (Reference Lake A, 26 m depth).

Secchi depths and calculated euphotic zones for all lakes during the open-water sampling periods are presented in Table 3.1-3. Secchi depth, a measure of water clarity, ranged from 0.9 m (Nakhaktok Lake) to 7.5 m (Reference Lake B), with an average of 2.4 m. Water clarity was highest in the reference lakes, and lakes with the smallest watershed areas such as Wolverine and Imniagut, with the exception of Nakhaktok Lake.

The euphotic depth (the zone where photosynthesis can take place), calculated from the secchi depth, ranged from 3.7 to 30.4 m. The euphotic zone extended throughout the entire water column at Wolverine, Imniagut, Patch N, Little Roberts, Naiqunnguut, and Reference Lake B.

3.1.3 Physical Limnology Summary

During winter, the dissolved oxygen concentration in Project area lakes ranged from nearly anoxic (≤1 mg/L) in the bottom waters of Ogama, Little Roberts, and Wolverine lakes to supersaturated in the surface waters of several lakes (maximum of 16.9 mg/L in Glenn Lake). During the summer, dissolved oxygen levels ranged from 7.8 mg/L in Patch North to 13.2 mg/L in Reference Lake A. Winter water temperatures ranged between 0.2 and 2.1°C, with coldest temperatures near the surface ice and water warming with depth. During summer, lakes were generally well-mixed or weakly stratified.



Note: Vertical dashed lines represent CCME guidlines for aquatic life; 9.5 mg/L O_2 for early life, 6.5 mg/L for other life stages.

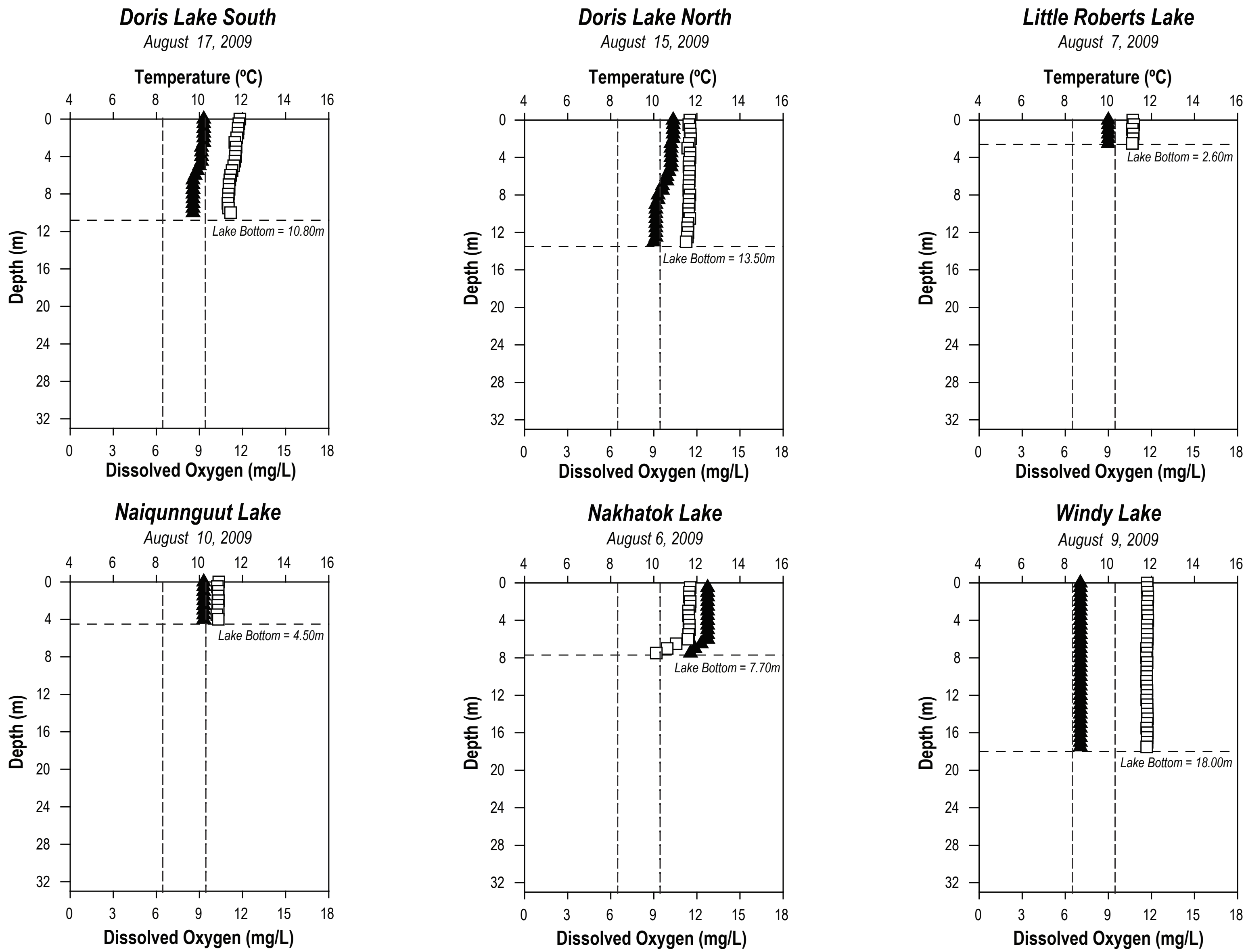
Figure 3.1-2a

NEWMONT NORTH AMERICA

Summer Dissolved Oxygen and Temperature Profiles, Hope Bay Lakes, August 2009

Figure 3.1-2a

Rescan™ Engineers & Scientists



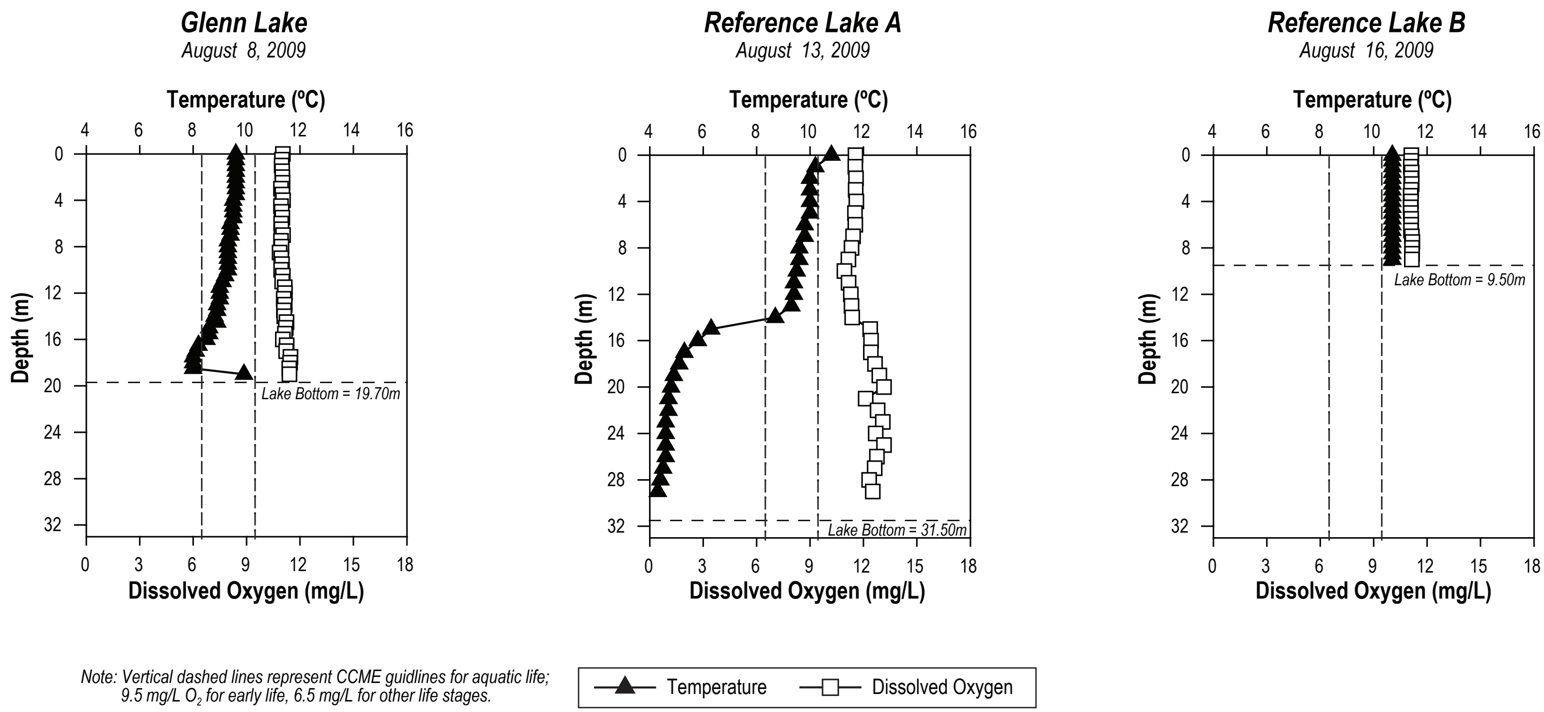
Note: Vertical dashed lines represent CCME guidlines for aquatic life; 9.5 mg/L O_2 for early life, 6.5 mg/L for other life stages.

Figure 3.1-2b

NEWMONT NORTH AMERICA

Summer Dissolved Oxygen and Temperature Profiles, Hope Bay Lakes, August 2009

Rescan Engineers & Scientists



Note: Vertical dashed lines represent CCME guidlines for aquatic life; 9.5 mg/L O_2 for early life, 6.5 mg/L for other life stages.

Figure 3.1-2c

NEWMONT NORTH AMERICA

Summer Dissolved Oxygen and Temperature Profiles, Hope Bay Lakes, August 2009

Figure 3.1-2c

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Table 3.1-3 Secchi Depths for Hope Bay Belt Lakes, August 2009

Watershed	Lake	Lake Depth (m)	Secchi Depth D_s (m)	Euphotic Zone Depth EZD (m)
Doris	Wolverine Lake	3.7	3.00	12.2
	Imniagut Lake	4.0	3.50	14.2
	Patch Lake South	14.0	2.00	8.1
	Patch Lake North	8.5	2.20	8.9
	P.O. Lake	3.3	1.25	5.1
	Ogama Lake	5.0	1.20	4.9
	Doris Lake South	10.8	1.40	5.7
	Doris Lake North	13.5	1.40	5.7
Little Roberts	Little Roberts Lake	2.6	1.70	6.9
Roberts	Naiqunnguut Lake	4.5	1.80	7.3
Windy	Nakhaktok Lake	7.7	0.90	3.7
	Windy Lake	18.0	3.00	12.2
	Glenn Lake	19.7	1.00	4.1
Ref A	Reference Lake A	31.5	4.70	19.1
Ref B	Reference Lake B	9.5	7.50	30.4

Note: Euphotic Zone Depth is the depth at which light penetration is 0.1%. See Section 2.12.1 for calculation.

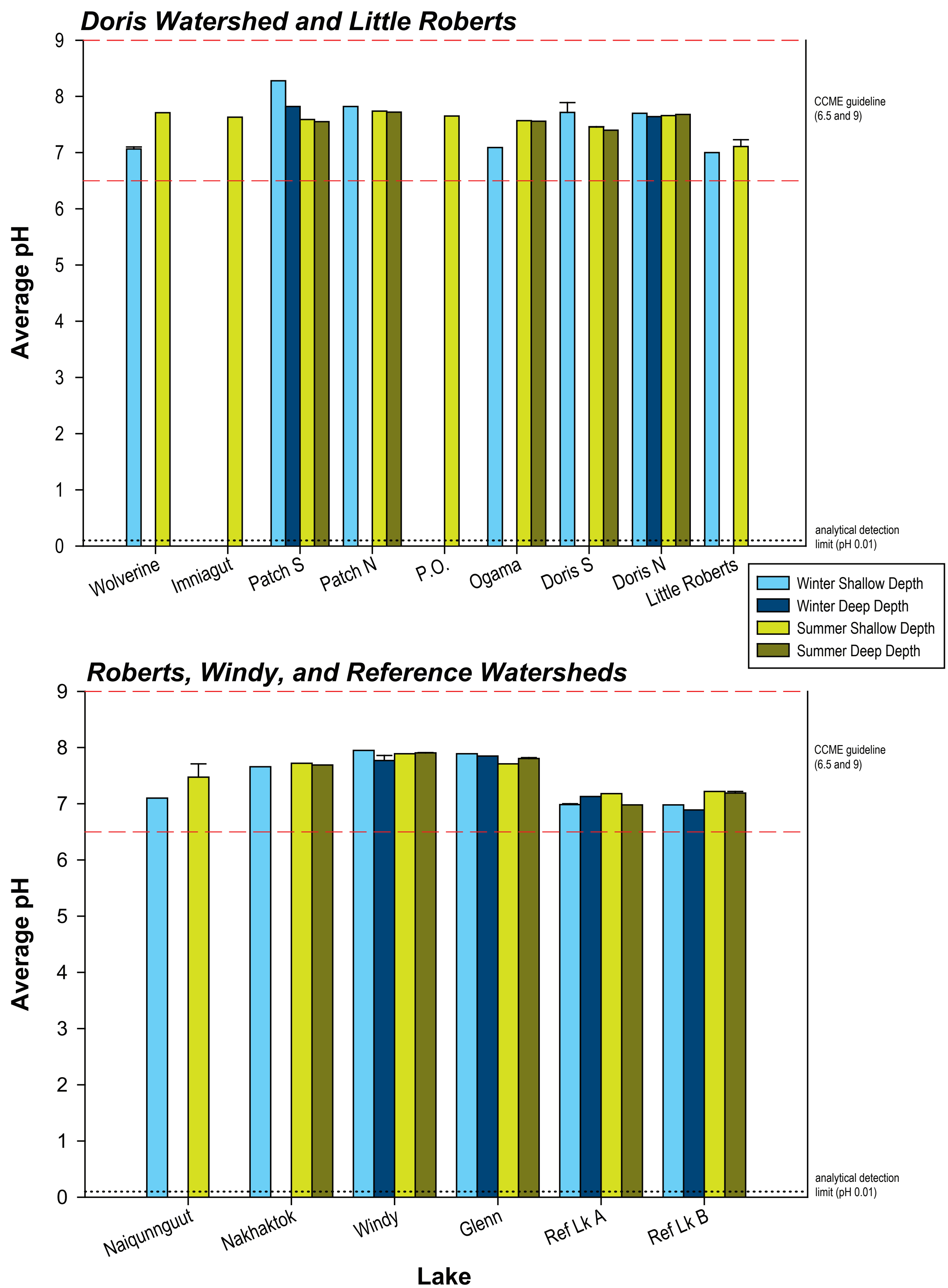
Water clarity in most lakes surveyed was relatively low, as secchi depths were typically less than 2 m. Reduced water clarity was likely attributable to the re-suspension of fine sediments along the shorelines of lakes resulting from wave action and high winds common to the area. Euphotic zone depth ranged from 3.7 to 30.4 m and extended through the entire water column at most lakes, except the deepest or most turbid.

River water temperatures during winter ranged from 0 to 0.3°C at the sites surveyed along the Koignuk River. Dissolved oxygen concentrations were extremely high (16.2 mg/L) at the upstream site of the Koignuk River, and very low (2.2 mg/L) at the downstream site.

3.2 LAKE WATER QUALITY

Lake water quality samples were collected in both winter and summer of 2009 (late April/May and August, respectively). Historical data collected between 1995 and 2009 are also available from some lakes in the study area (Figure 2.13-1). Lake water quality data collected in 2009 are presented graphically in Figures 3.2-1a to 3.2-1p, and annual lake water quality data are presented in Figures 3.2-2a to 3.2-2u.

The 2009 lake water quality program focused on characterizing the natural variation in water quality with water column depth, season (winter vs. summer), and geographical location. A total of 15 sites in 13 lakes within several different watersheds were sampled. Two reference lakes located ~10 km away from potential mining activities were also included in the 2009 sampling program. These reference lakes were selected based on fish community similarity to potentially impacted lakes. All raw water quality data for lakes are presented in Appendices 3.2-1 (winter data), 3.2-2 (summer data), and 3.2-3 (QA/QC data).



Note: Error bars represent standard error of the mean.

Figure 3.2-1a

Average pH, Hope Bay Lakes, 2009

NEWMONT NORTH AMERICA

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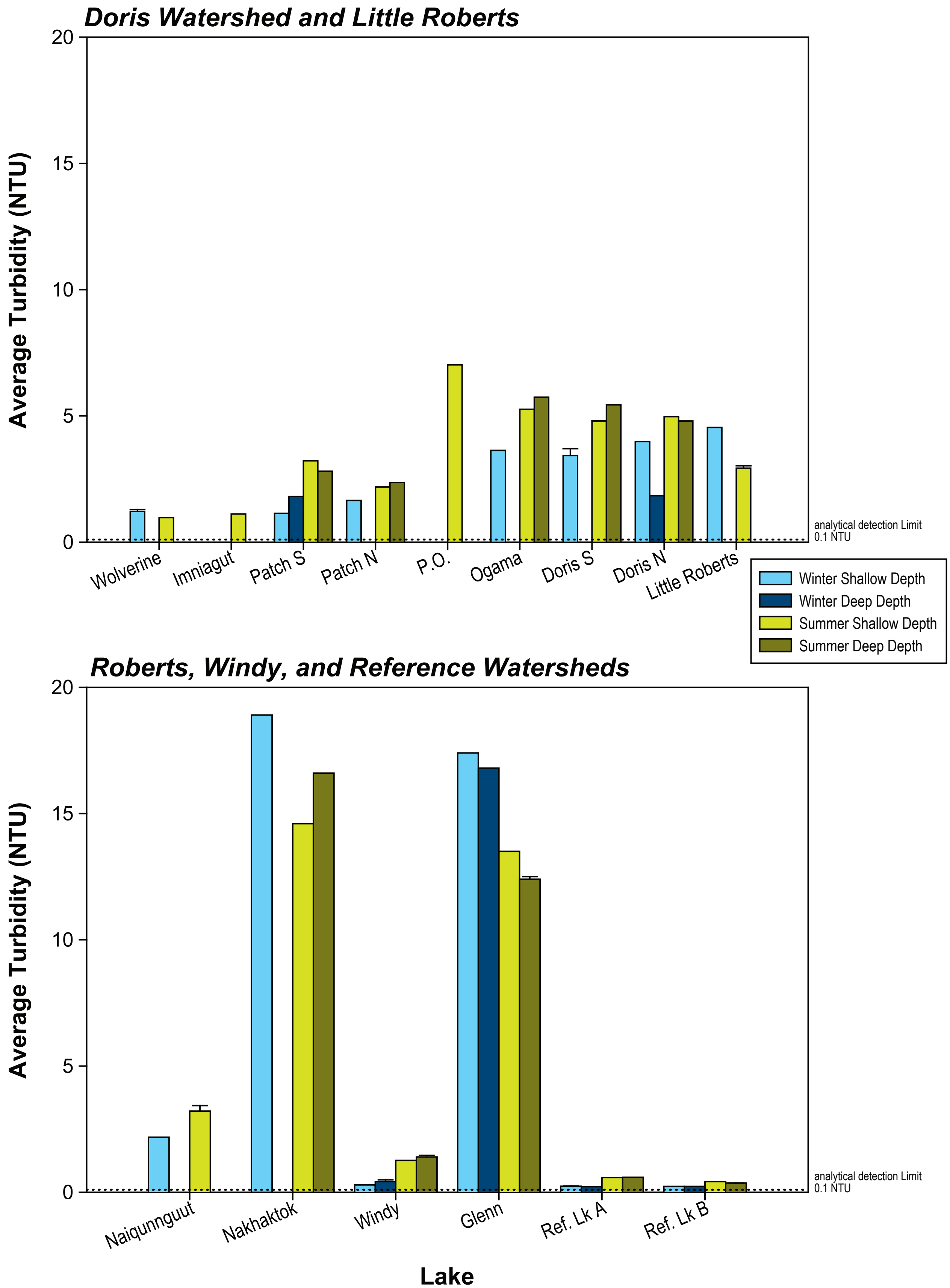

Note: Error bars represent standard error of the mean.

Figure 3.2-1b

Average Turbidity, Hope Bay Lakes, 2009

NEWMONT NORTH AMERICA
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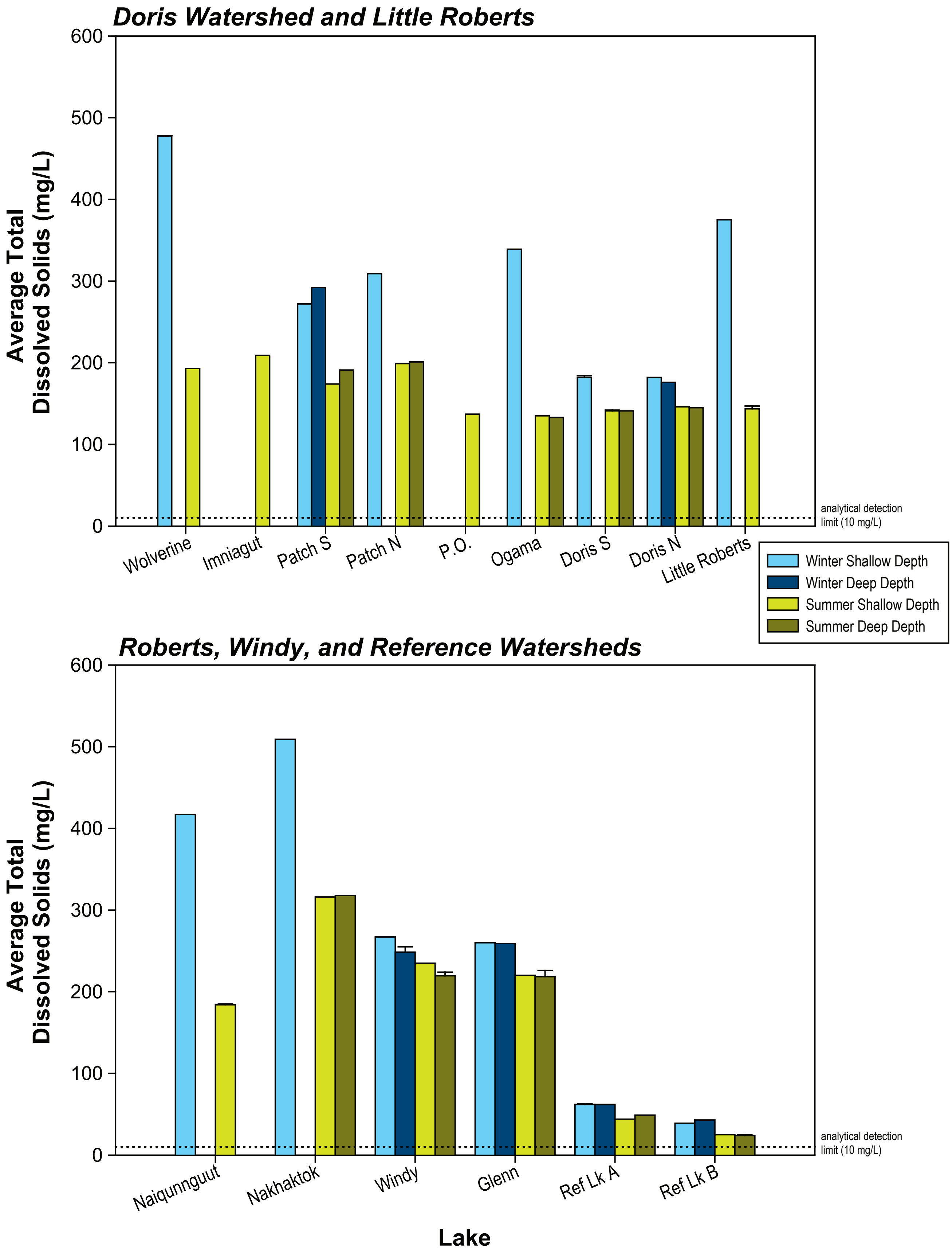


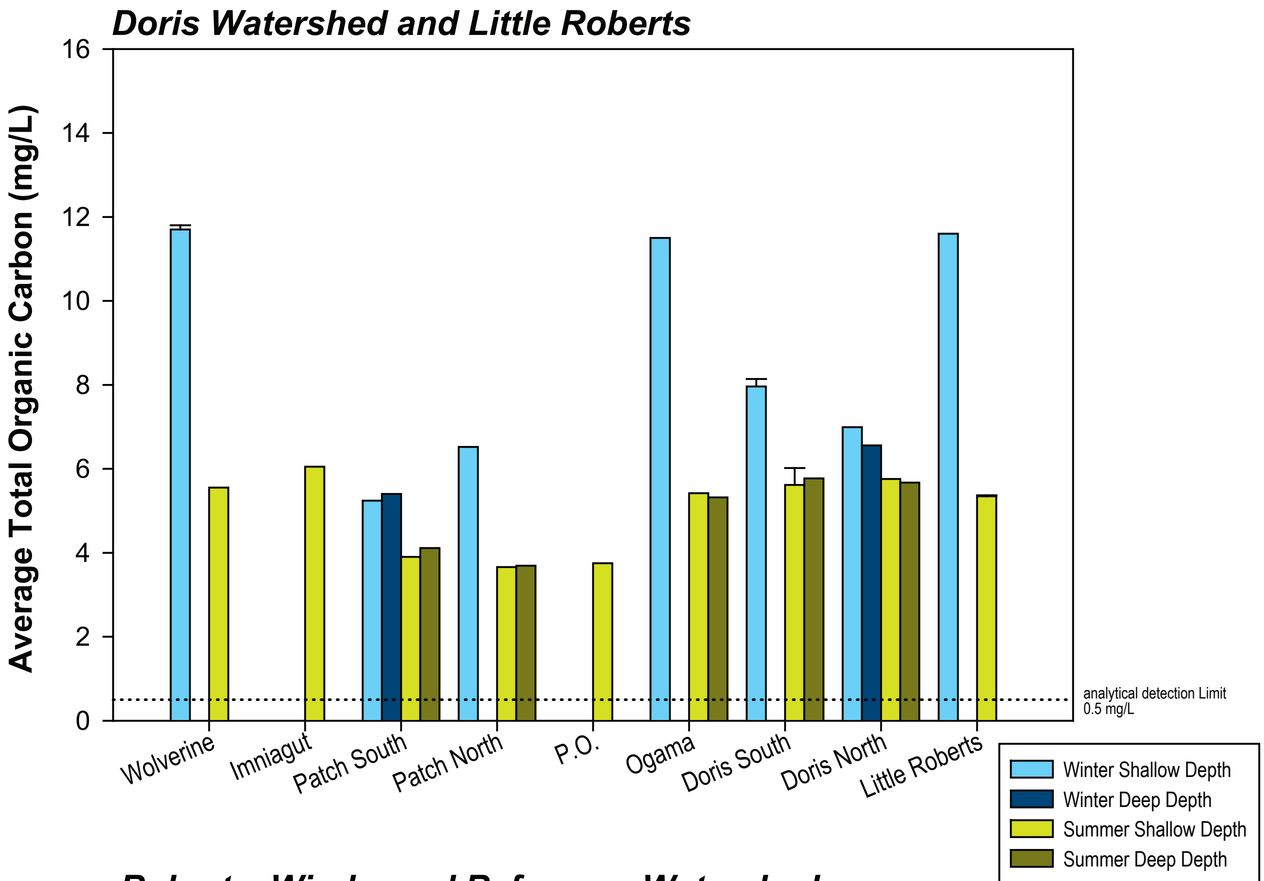
Note: Error bars represent standard error of the mean.

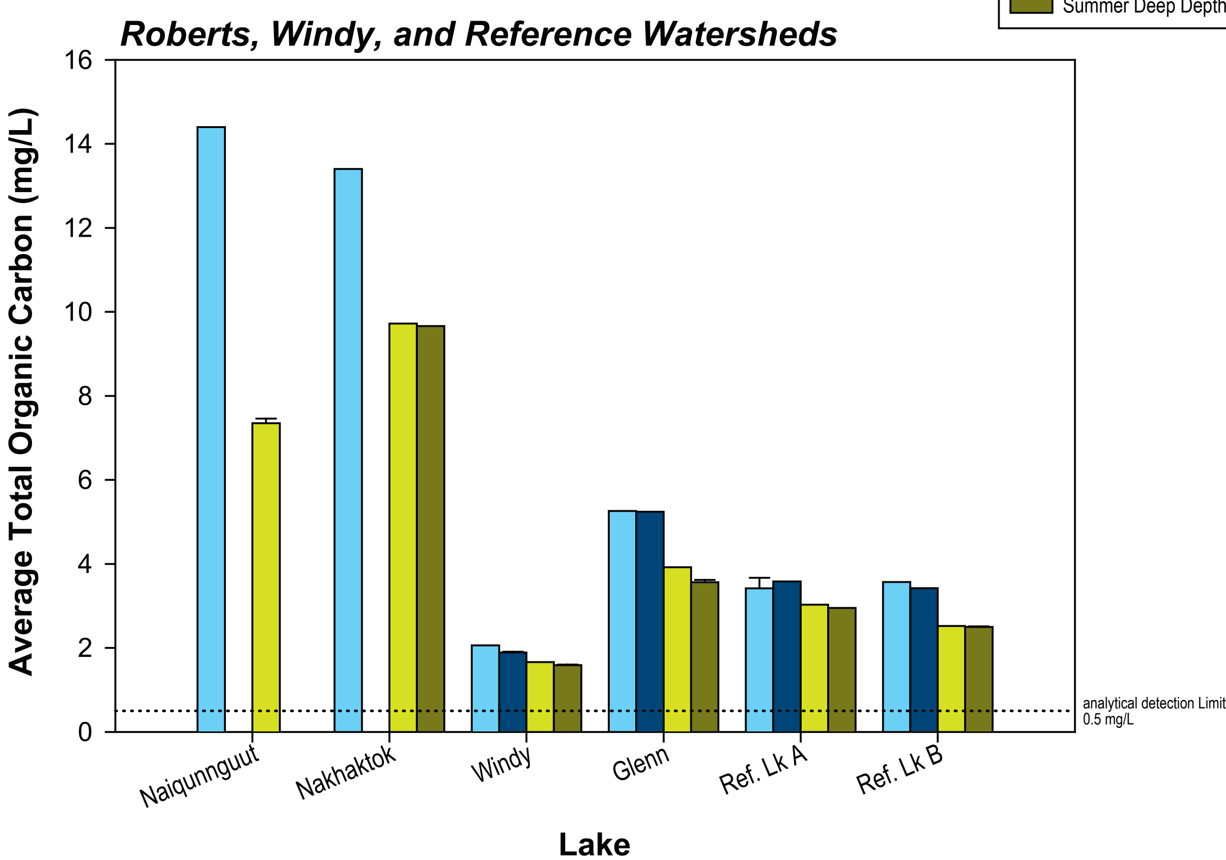
NEWMONT NORTH AMERICA

Average Total Dissolved Solids, Hope Bay Lakes, 2009

Figure 3.2-1c

Rescan Engineers & Scientists





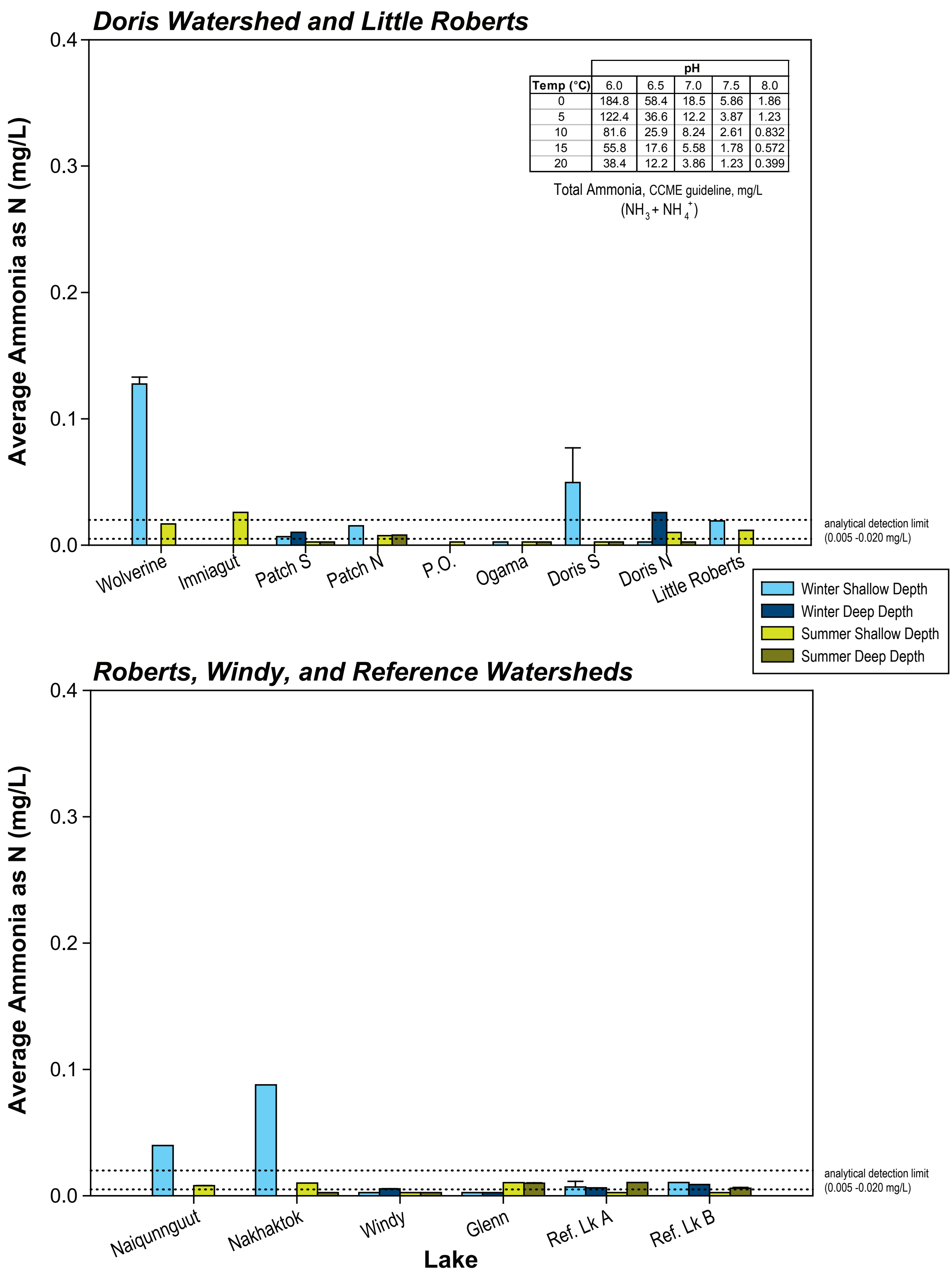
Note: Error bars represent standard error of the mean.

NEWMONT NORTH AMERICA

Average Total Organic Carbon, Hope Bay Lakes, 2009

Figure 3.2-1d

Rescan Engineers & Scientists

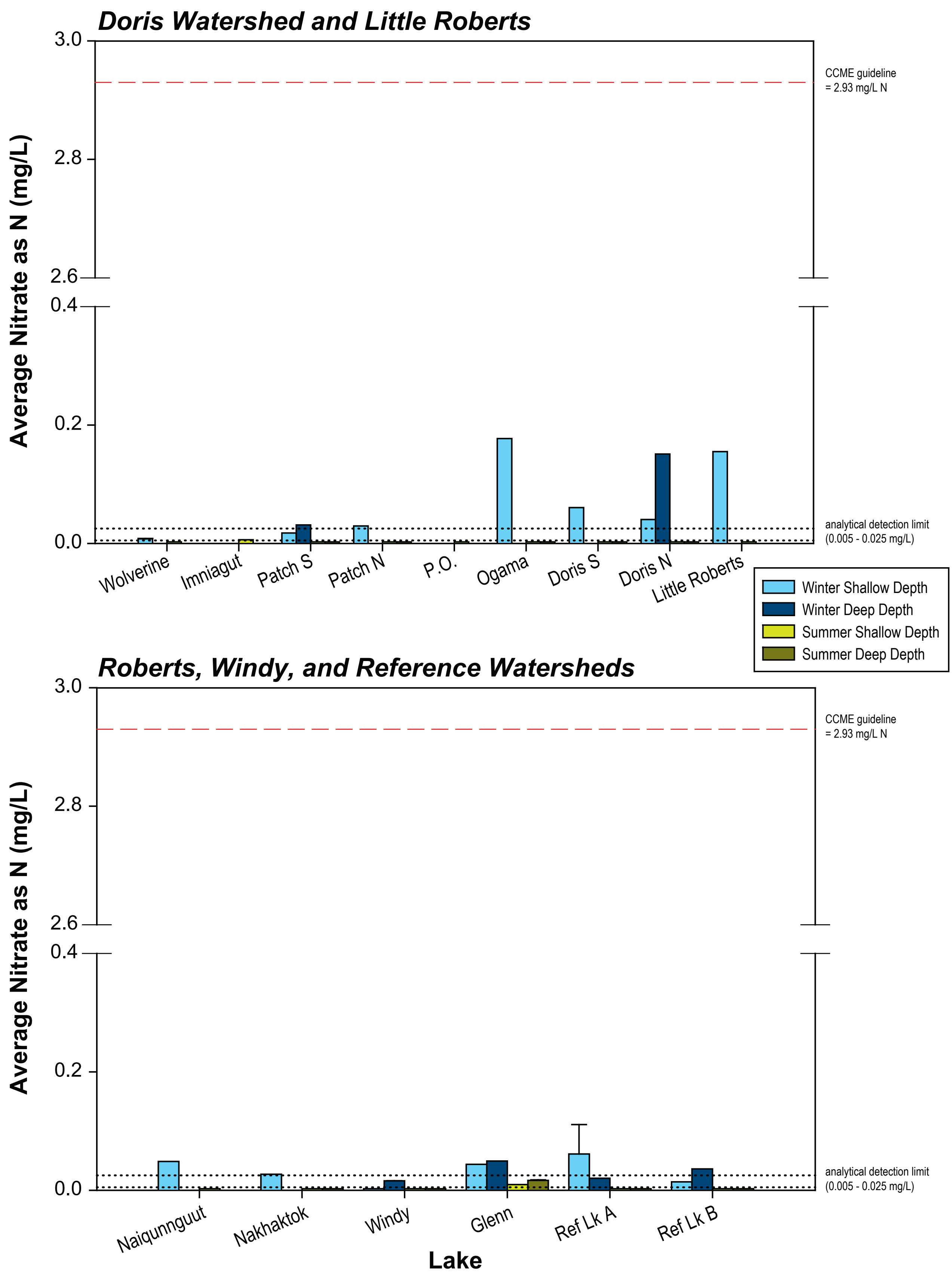


	pH				
Temp (°C)	6.0	6.5	7.0	7.5	8.0
0	184.8	58.4	18.5	5.86	1.86
5	122.4	36.6	12.2	3.87	1.23
10	81.6	25.9	8.24	2.61	0.832
15	55.8	17.6	5.58	1.78	0.572
20	38.4	12.2	3.86	1.23	0.399

Note: Error bars represent standard error of the mean.
CCME guidelines are temperature and pH dependent

Figure 3.2-1e

Average Ammonia, Hope Bay Lakes, 2009



Note: Error bars represent standard error of the mean.

Figure 3.2-1f

Average Nitrate, Hope Bay Lakes, 2009

NEWMONT NORTH AMERICA

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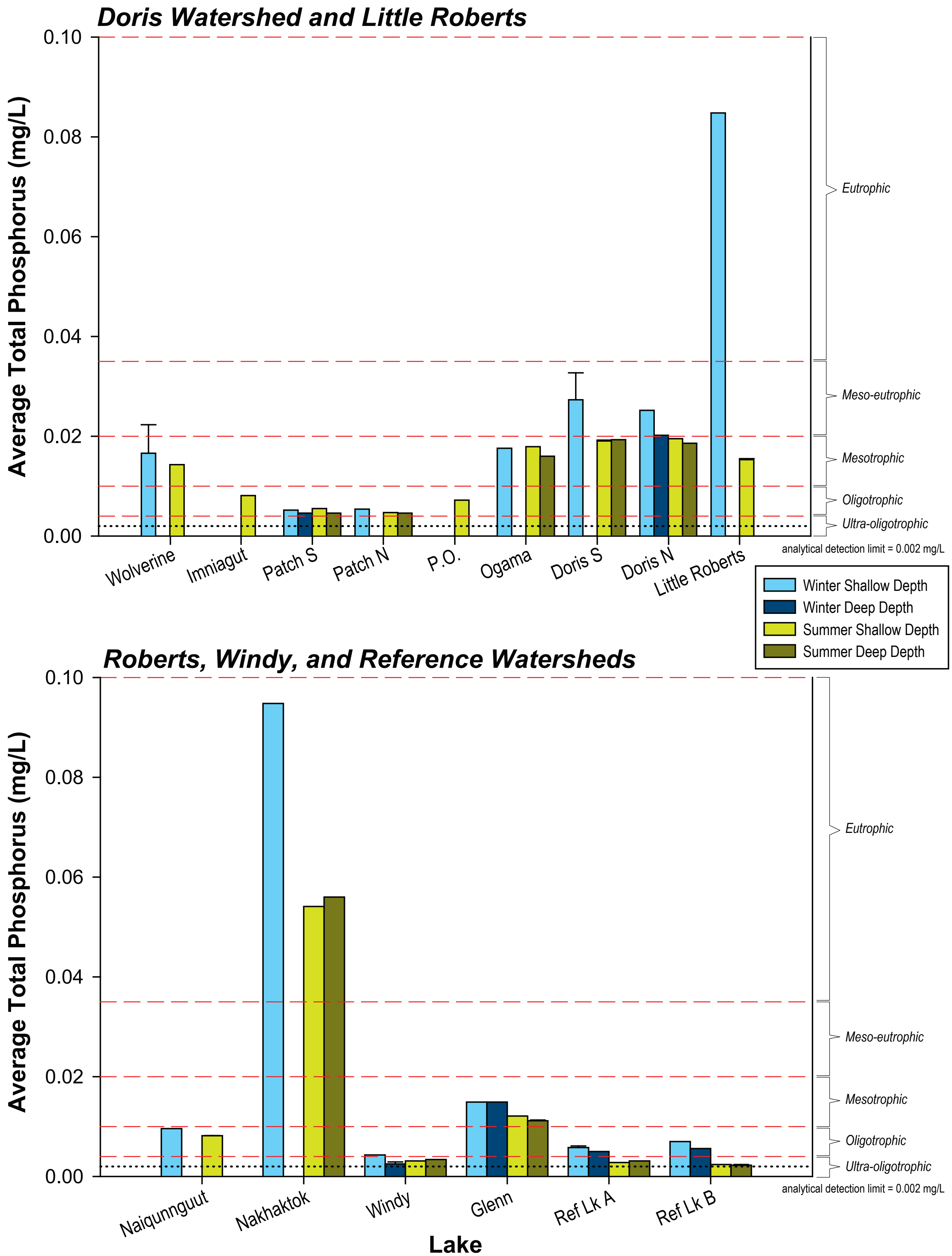

Note: Error bars represent standard error of the mean.
Dashed line represents CCME guideline (<0.004 = ultraoligotrophic; 0.004 - 0.010 = oligotrophic; 0.01 - 0.02 = mesotrophic; 0.02 - 0.035 = meso-eutrophic; 0.035 - 0.1 = eutrophic; >0.1 = hyper-eutrophic)

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Average Total Phosphorus, Hope Bay Lakes, 2009

Figure 3.2-1g

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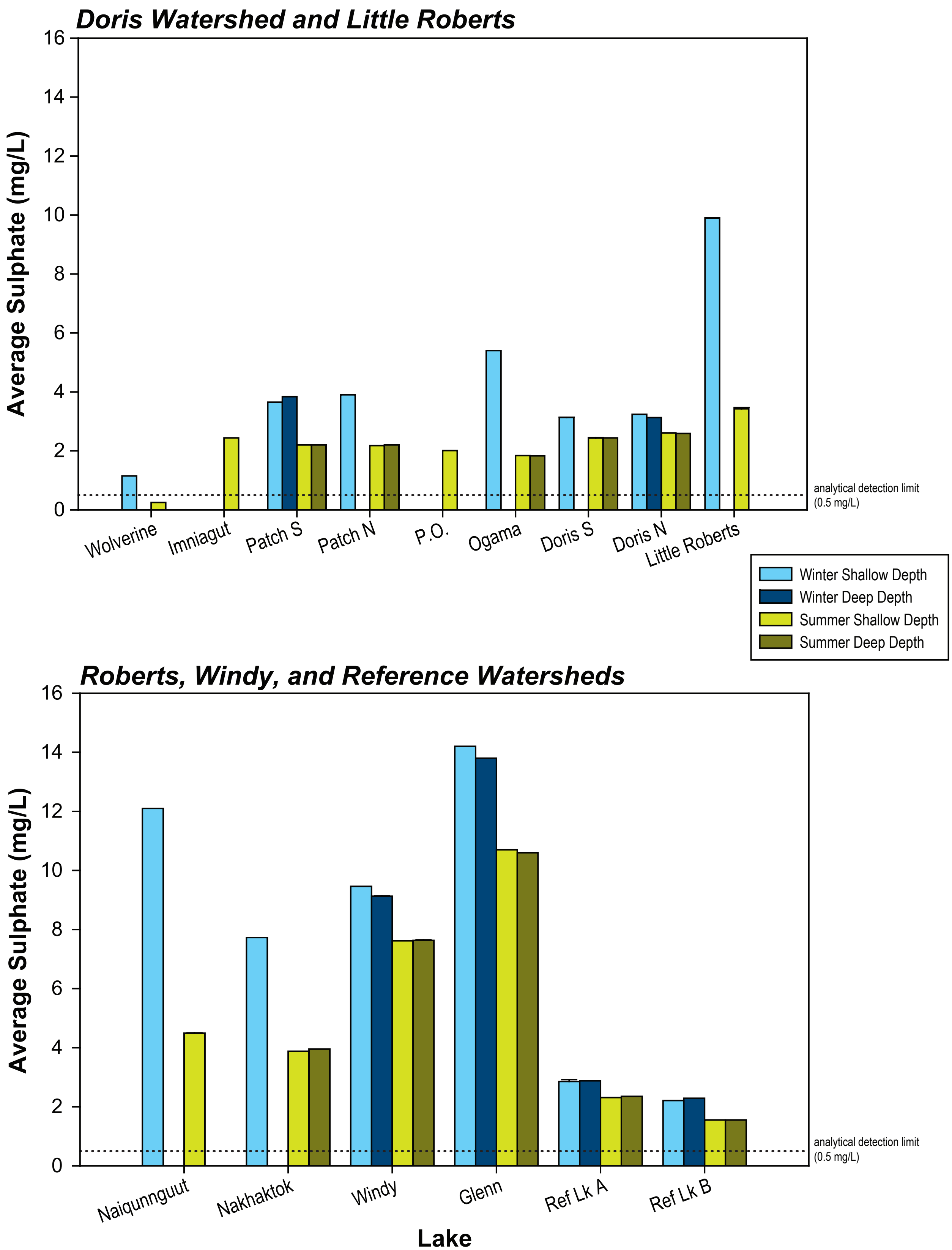


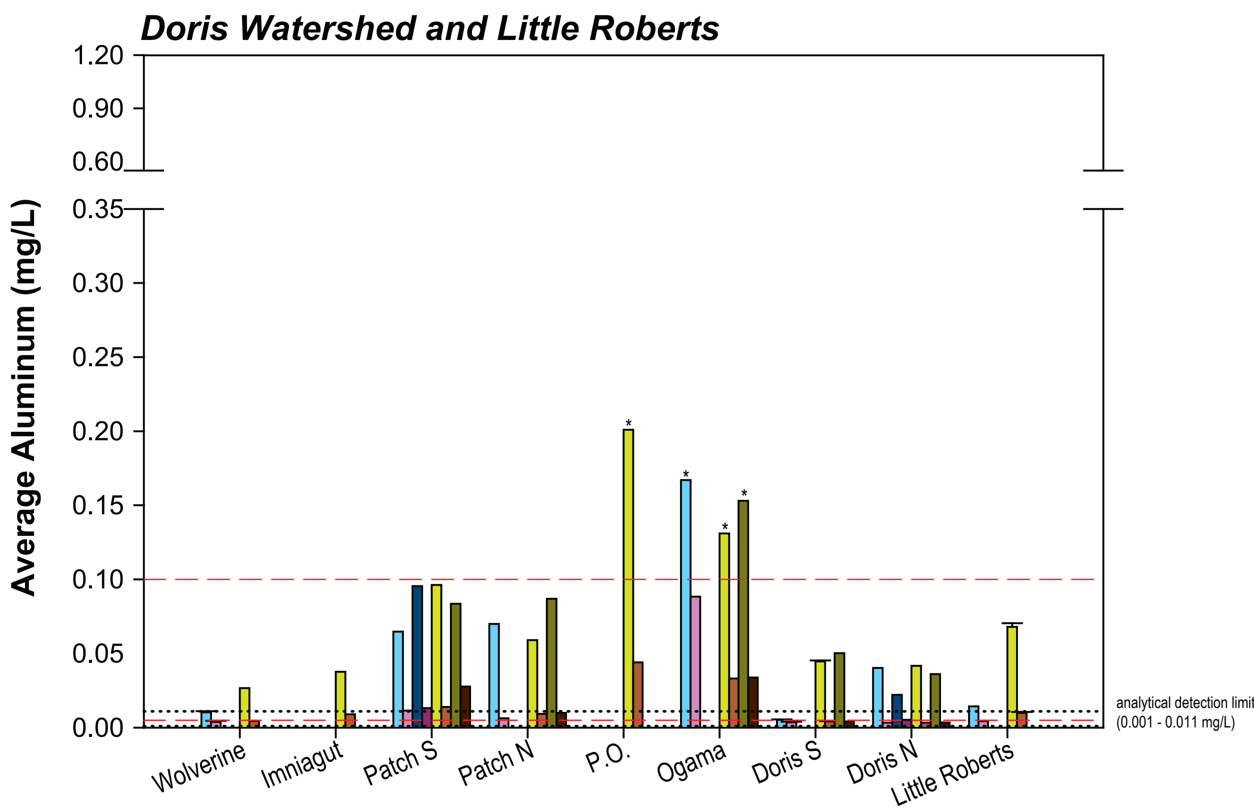
Note: Error bars represent standard error of the mean

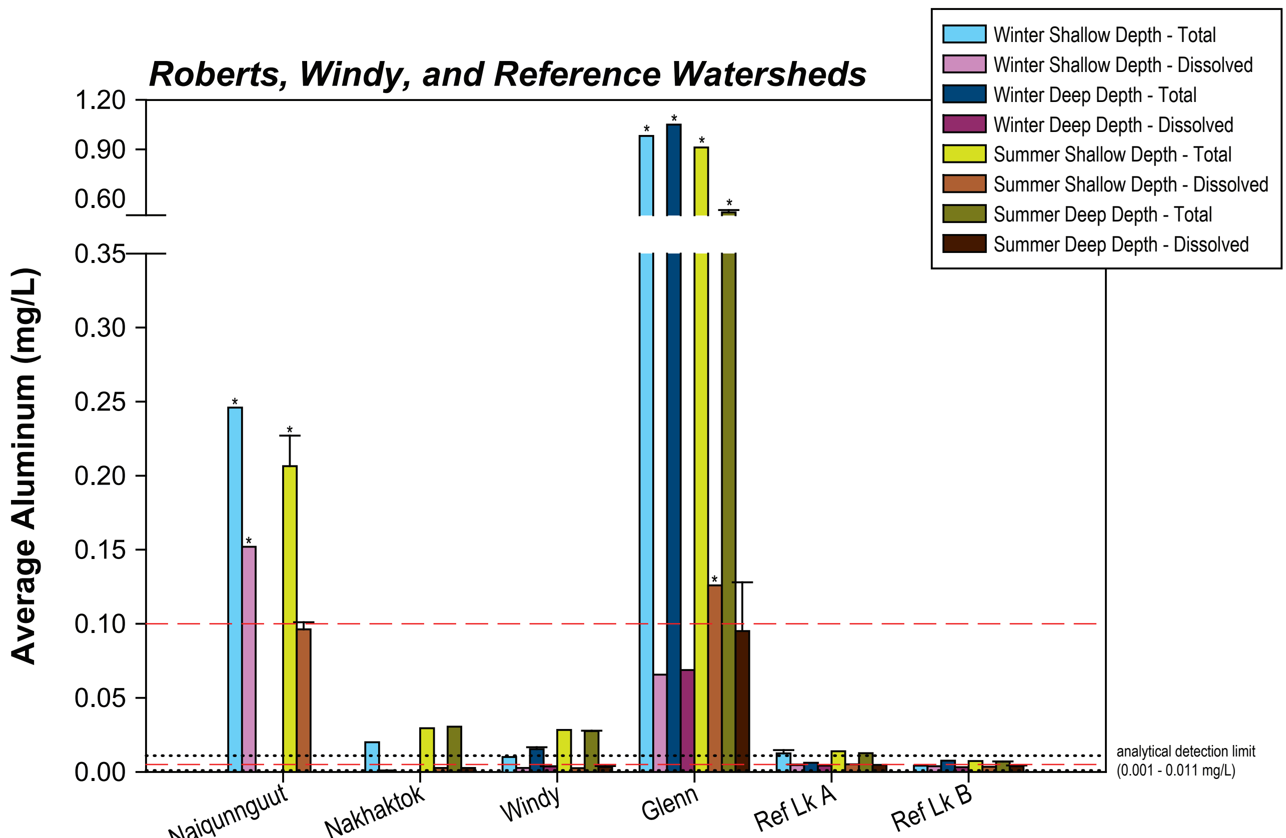
NEWMONT NORTH AMERICA

Average Sulphate, Hope Bay Lakes, 2009

Figure 3.2-1h

Rescan Engineers & Scientists





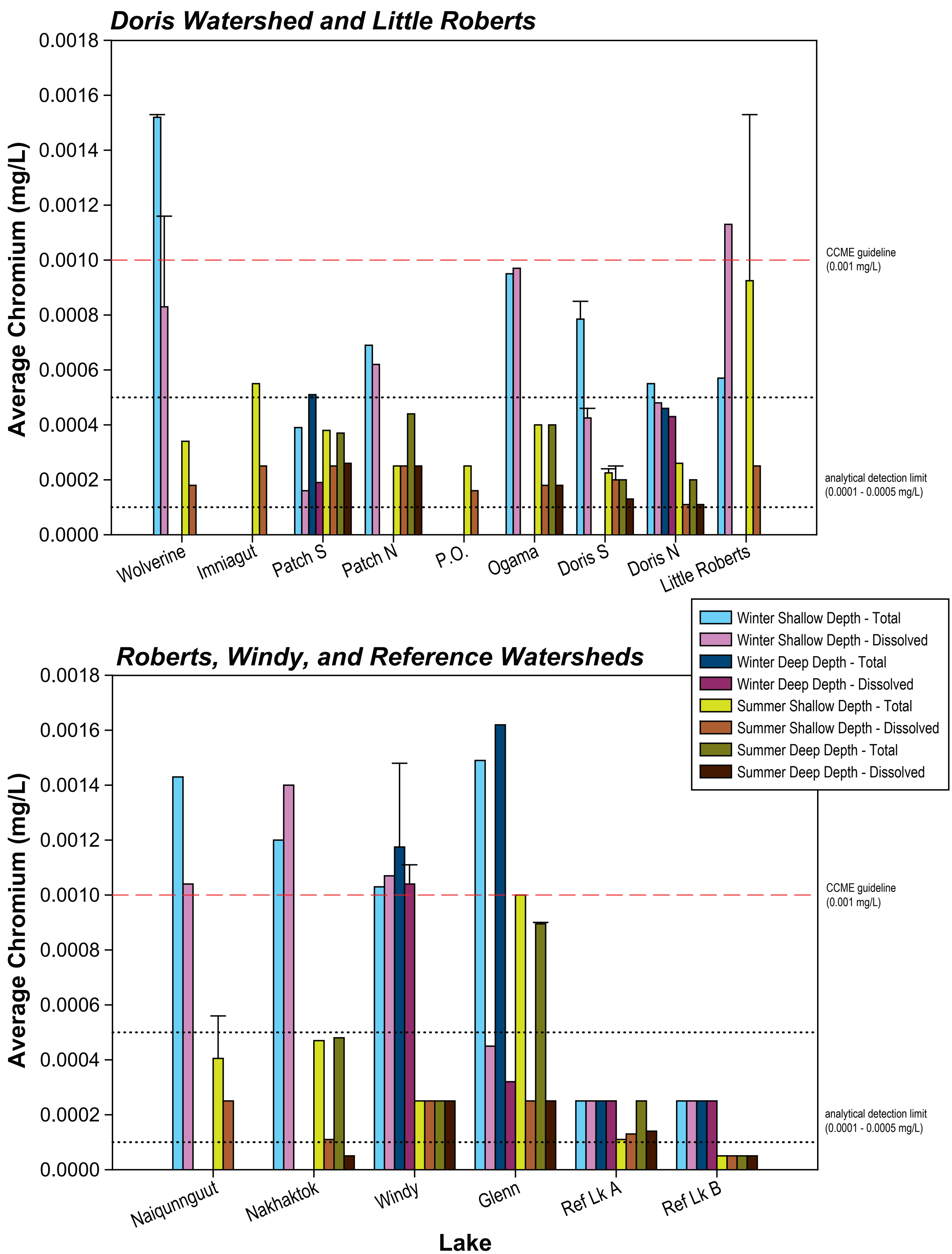
Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline and is pH dependent: 0.005 mg/L (at pH less than 6.5) or 0.1 mg/L (at pH greater than or equal to 6.5).
All water pH values were greater than 6.5 all sites
** Indicates values that are higher than their sample guideline.*

Figure 3.2-1i

NEWMONT NORTH AMERICA

Average Aluminum, Hope Bay Lakes, 2009

Rescan Engineers & Scientists



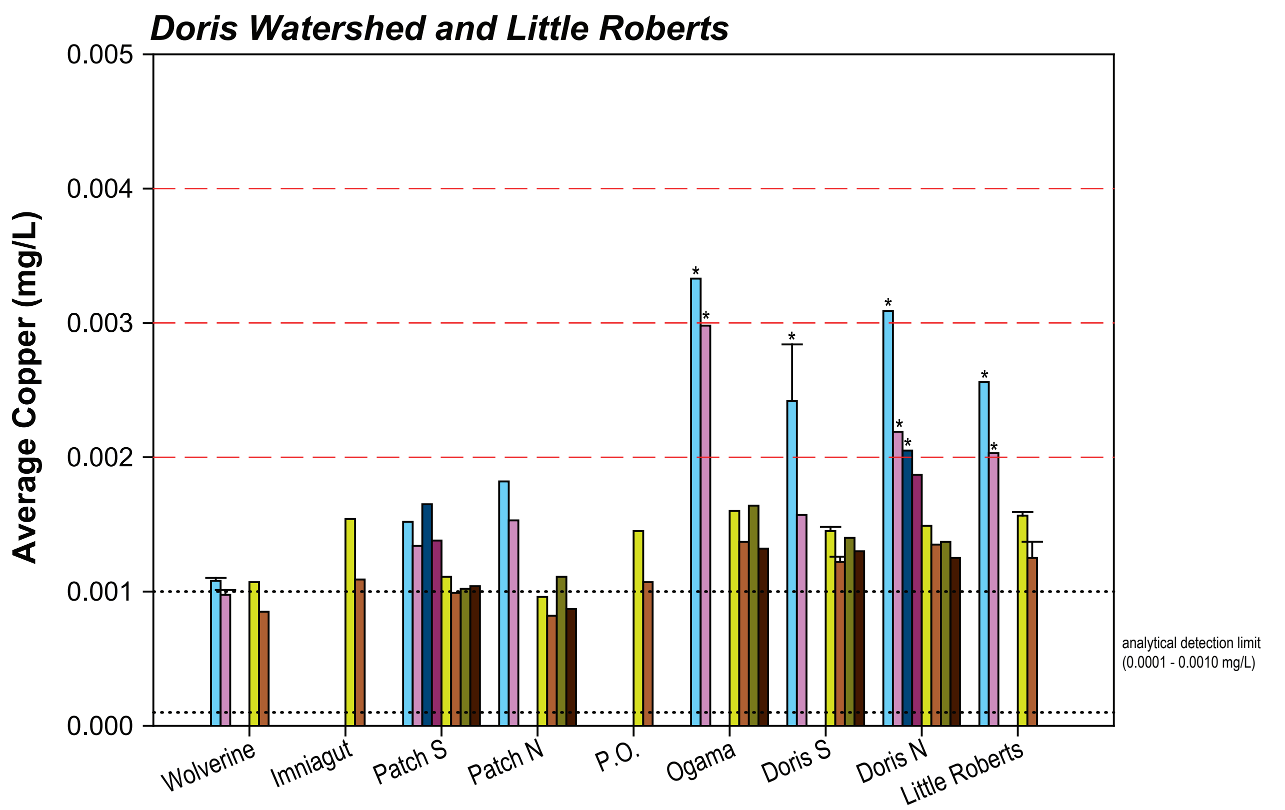
Note: Error bars represent standard error of the mean

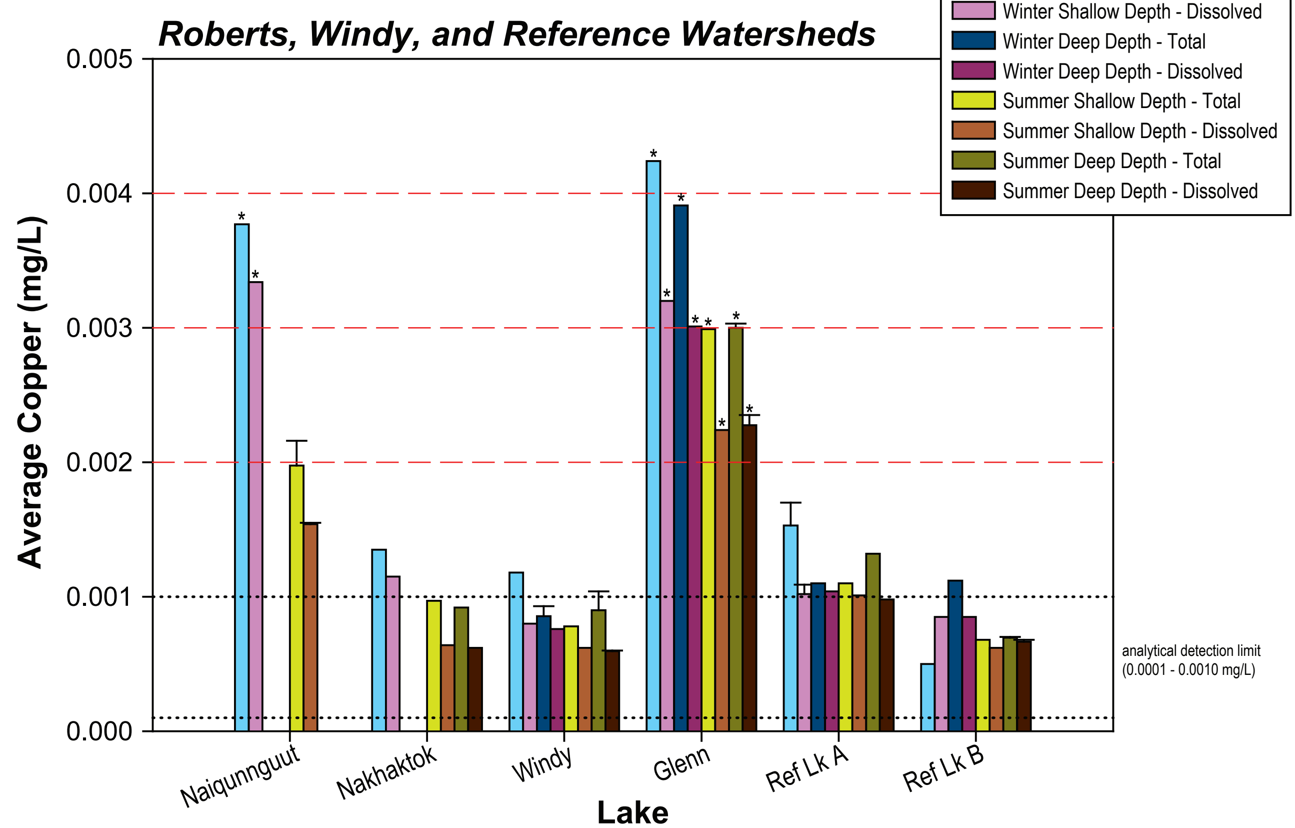
Figure 3.2-1j

NEWMONT NORTH AMERICA

Average Chromium, Hope Bay Lakes, 2009

Rescan Engineers & Scientists





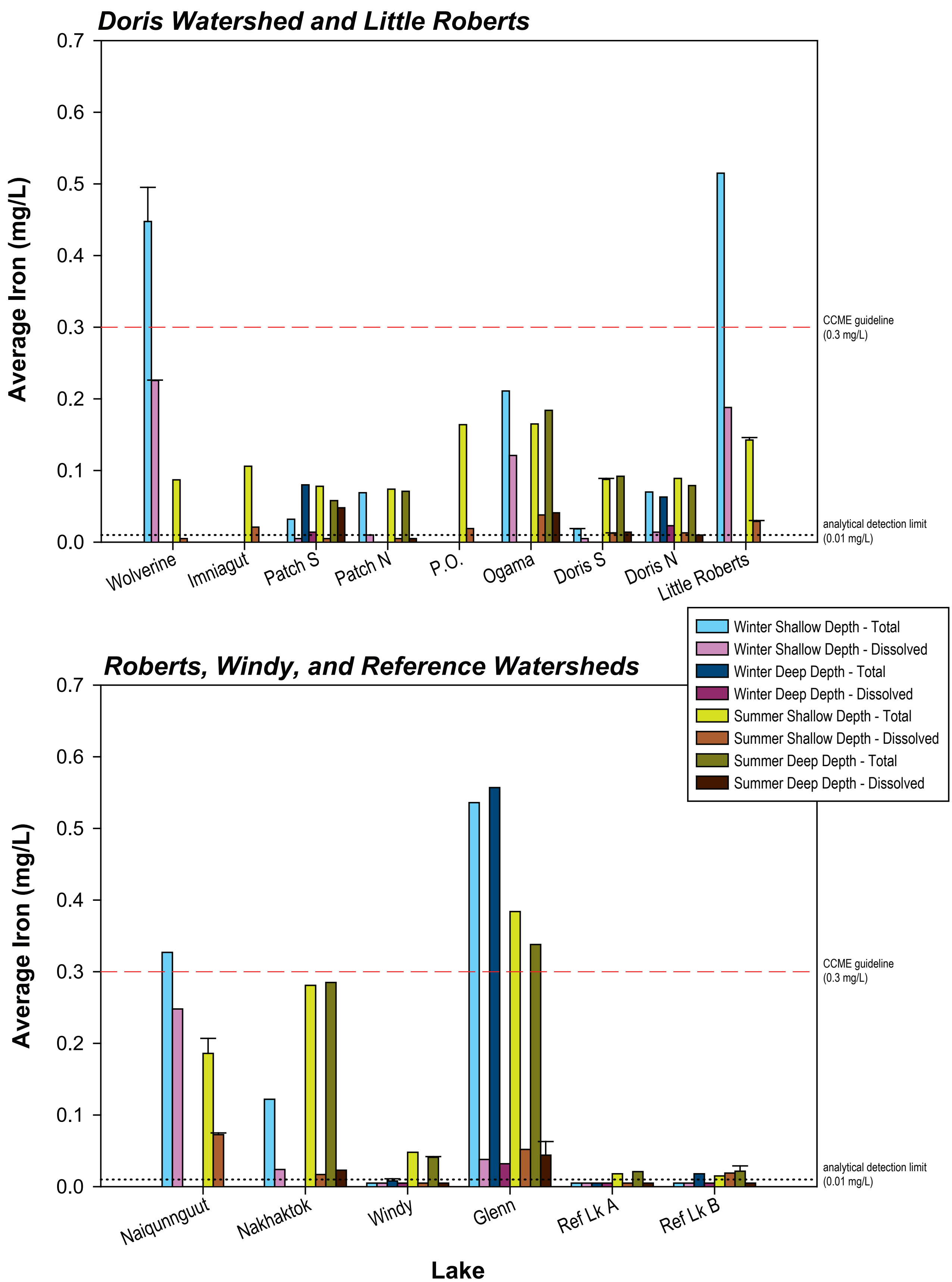
Note: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.002 mg/L at $[CaCO_3]$ = 0-120 mg/L;
0.003 mg/L at $[CaCO_3]$ = 120-180 mg/L; 0.004 mg/L at $[CaCO_3]$ = >180 mg/L).
** Indicates values that are higher than their sample guideline.*

Figure 3.2-1k

NEWMONT NORTH AMERICA

Average Copper, Hope Bay Lakes, 2009

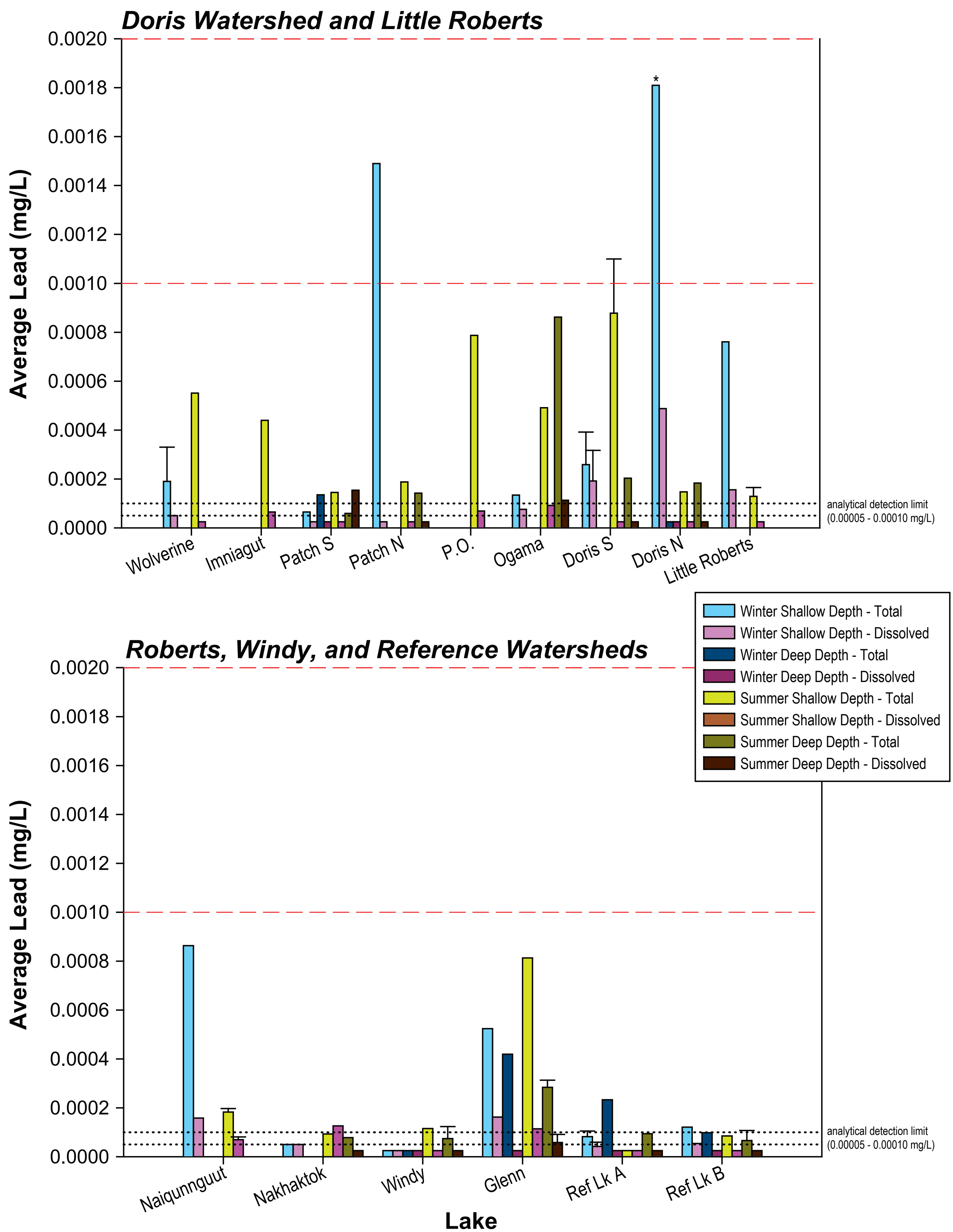
Rescan Engineers & Scientists



Note: Error bars represent standard error of the mean.

Figure 3.2-1l

Average Iron, Hope Bay Lakes, 2009



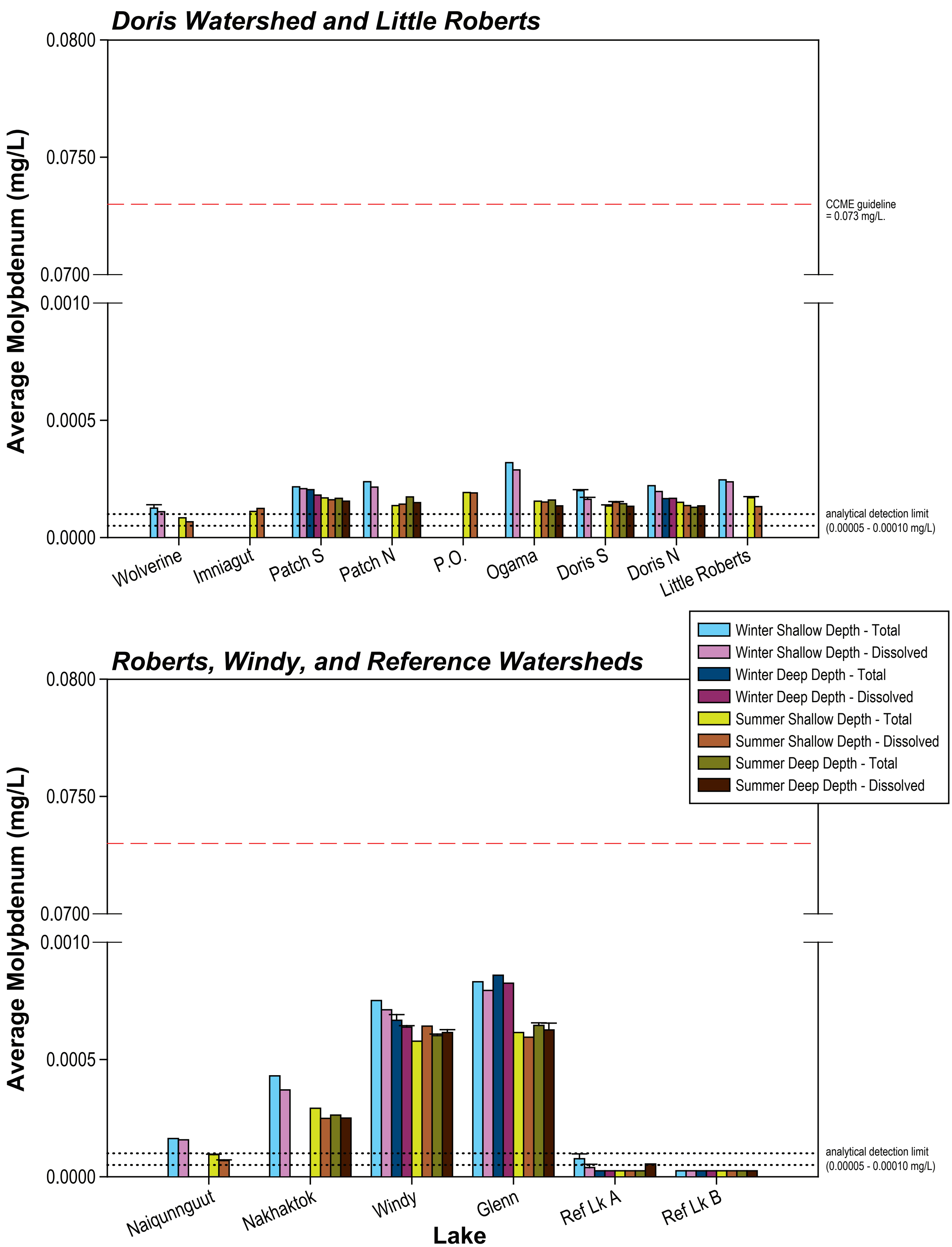
Note: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.001 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60-120 mg/L; 0.004 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.007 mg/L at [$CaCO_3$] = > 180 mg/L).
** Indicates values that are higher than their sample guideline*

Figure 3.2-1m

NEWMONT NORTH AMERICA

Average Lead, Hope Bay Lakes, 2009

Rescan Engineers & Scientists



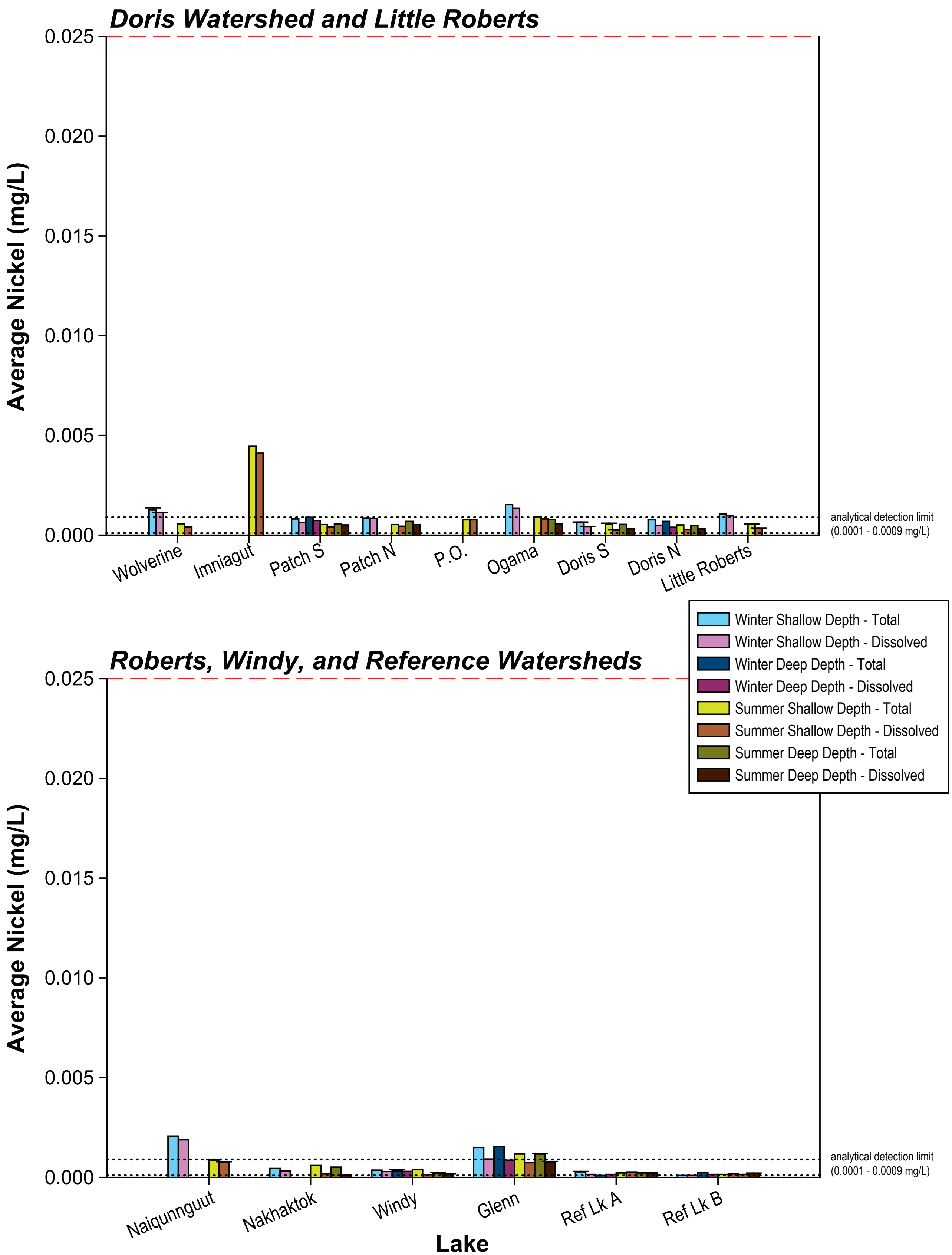
Notes: Error bars represent standard error of the mean
Dotted line represents analytical detection limit (0.00005 - 0.00010 mg/L)

NEWMONT NORTH AMERICA

Figure 3.2-1n

Average Molybdenum, Hope Bay Lakes, 2009

Rescan Engineers & Scientists



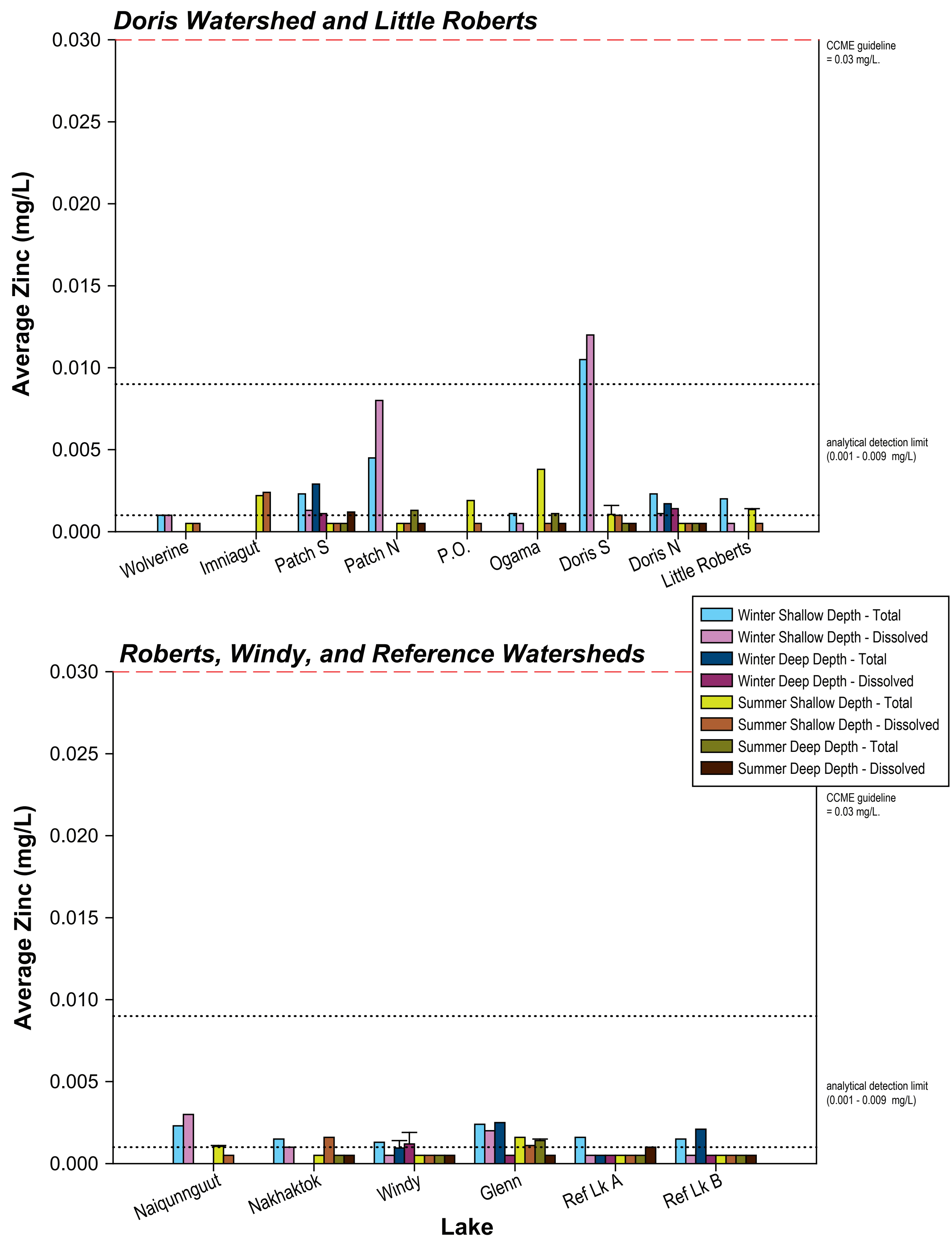
Note: Error bars represent standard error of the mean.
CCME guideline (0.025 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60-120 mg/L; 0.110 mg/L at [$CaCO_3$] = > 180 mg/L).

Figure 3.2-1o

NEWMONT NORTH AMERICA

Average Nickel, Hope Bay Lakes, 2009

Rescan Engineers & Scientists



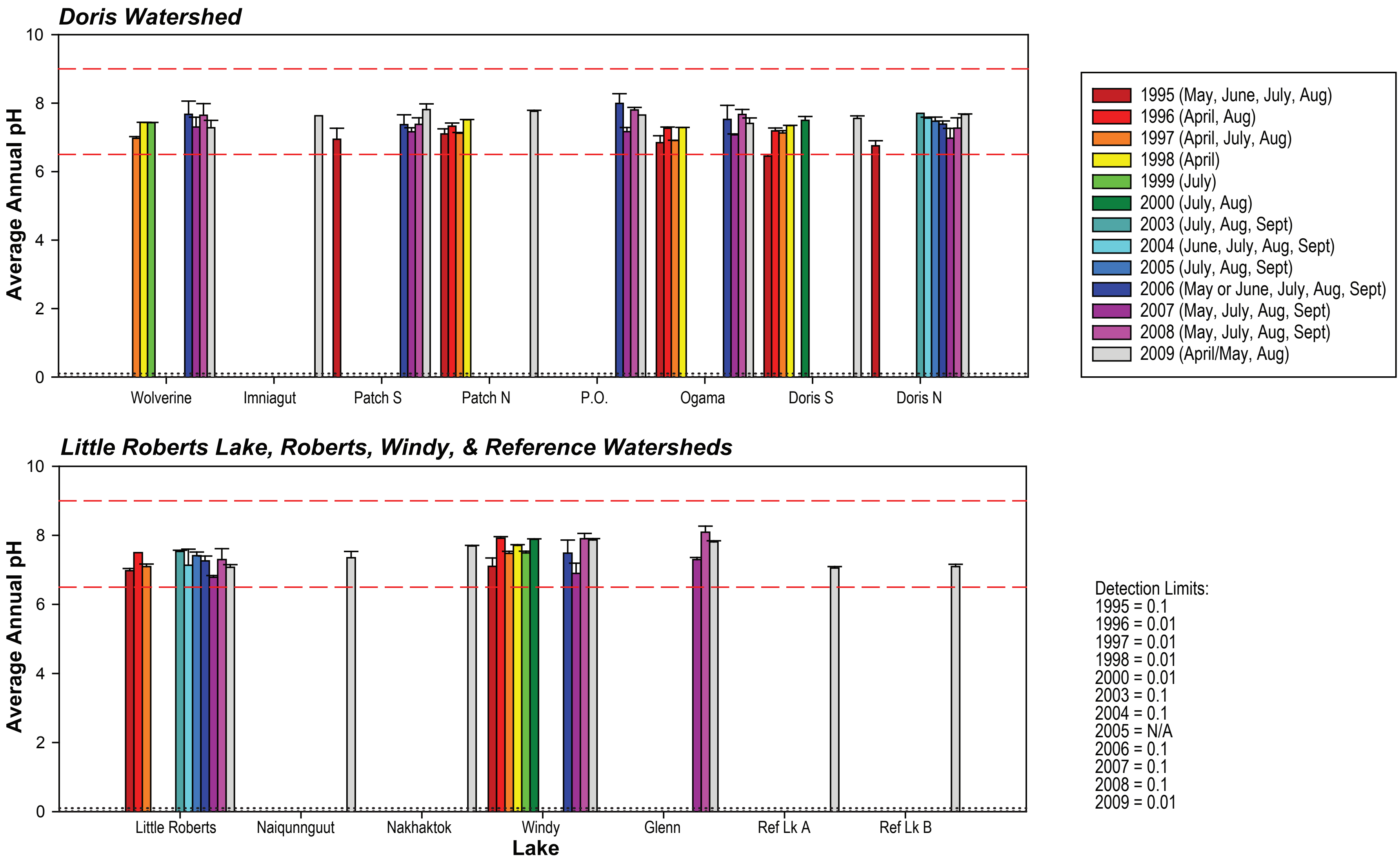
Note: Error bars represent standard error of the mean.
Replicate samples results for Doris Lake South-Winter-Shallow Depth are not graphed due to a suspected laboratory error; see text for details.

Figure 3.2-1p

NEWMONT NORTH AMERICA

Average Zinc, Hope Bay Lakes, 2009

Rescan Engineers & Scientists



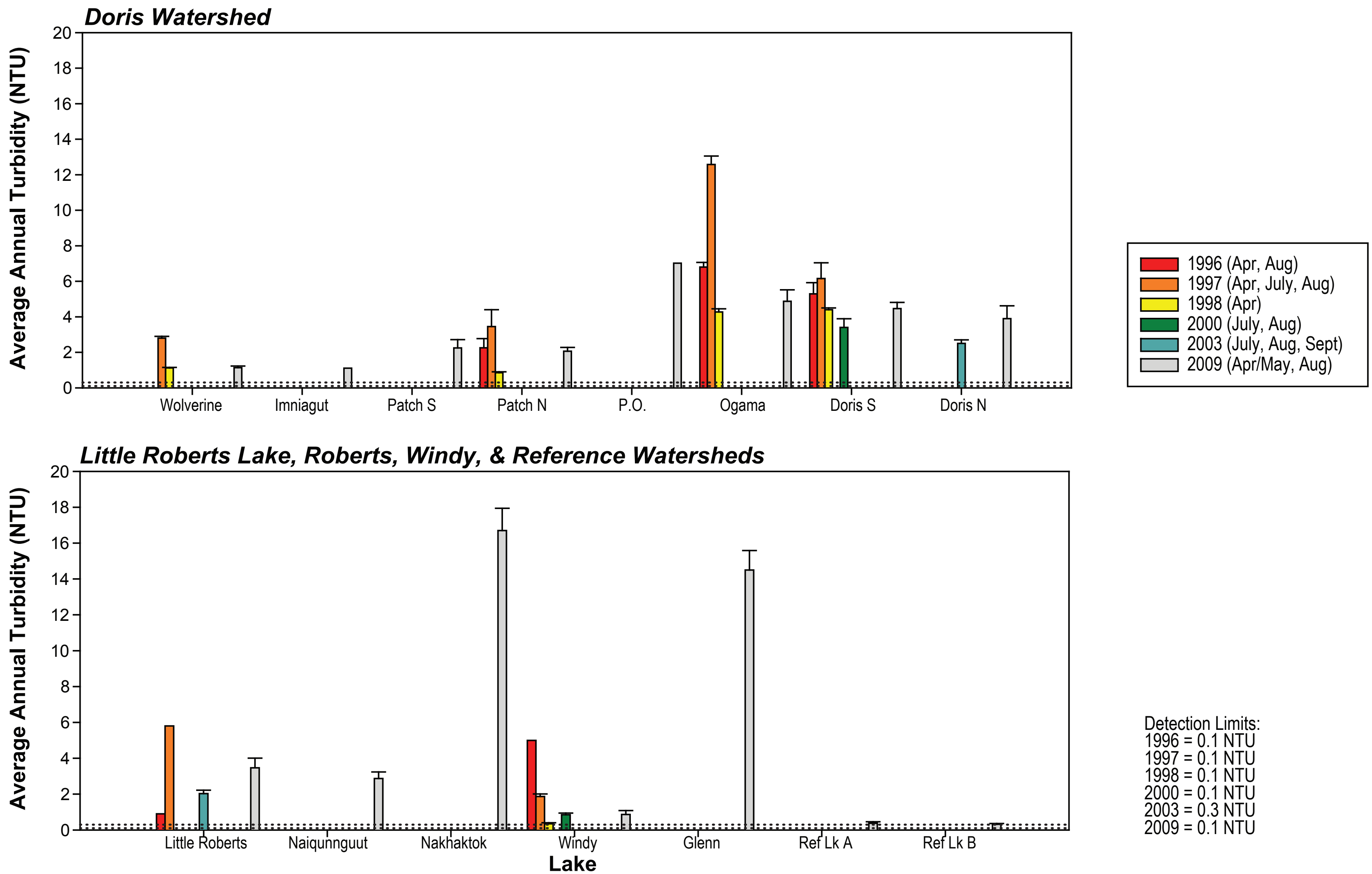
Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (6.5 and 9).
Dotted lines represent detection limits.

Figure 3.2-2a

NEWMONT NORTH AMERICA

Average Annual pH, Hope Bay Lakes, 1995 - 2009

Rescan Engineers & Scientists



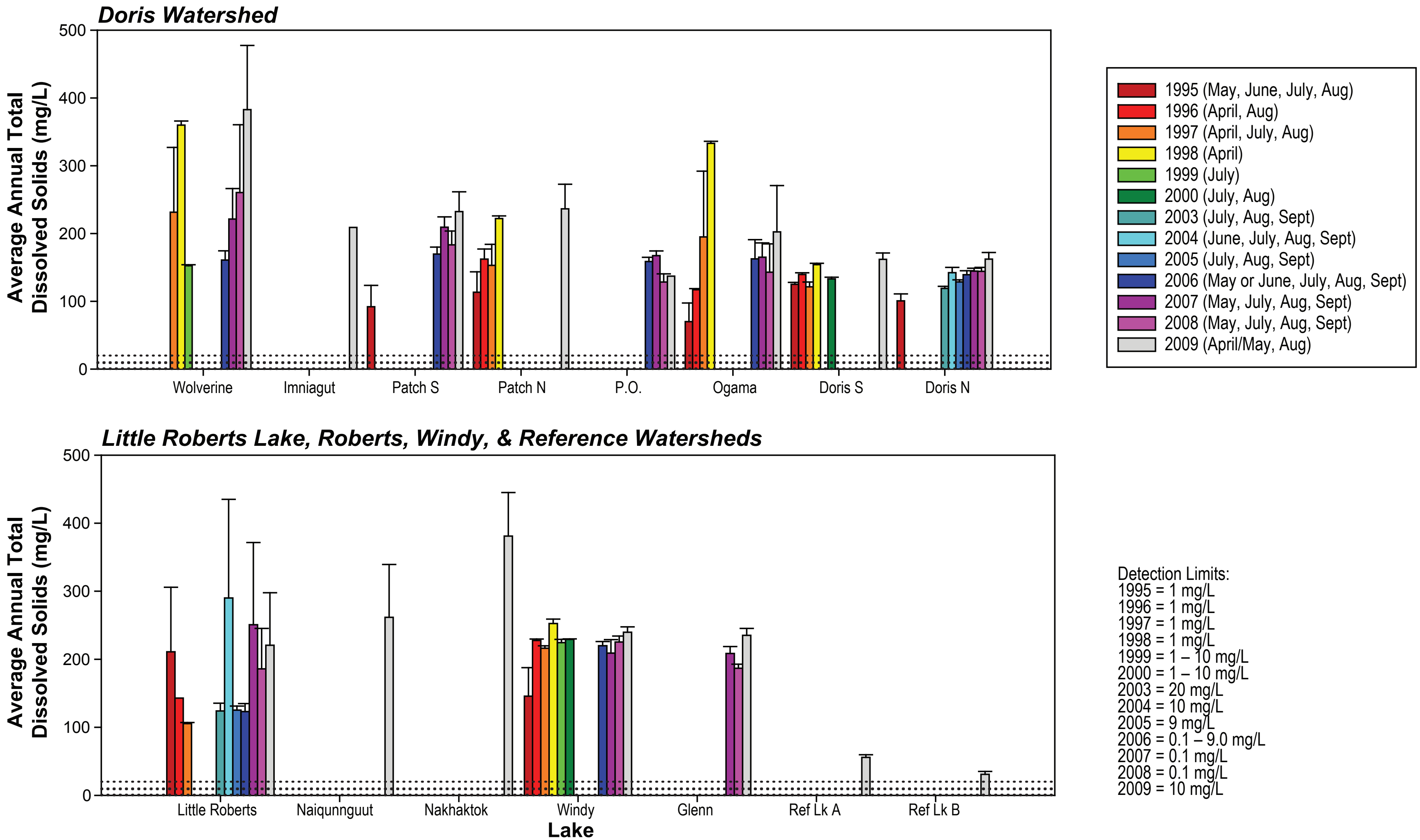
Notes: Error bars represent standard error of the mean.
Dotted lines represent detection limits.

Figure 3.2-2b

NEWMONT NORTH AMERICA

Average Annual Turbidity, Hope Bay Lakes, 1995 - 2009

Rescan Engineers & Scientists



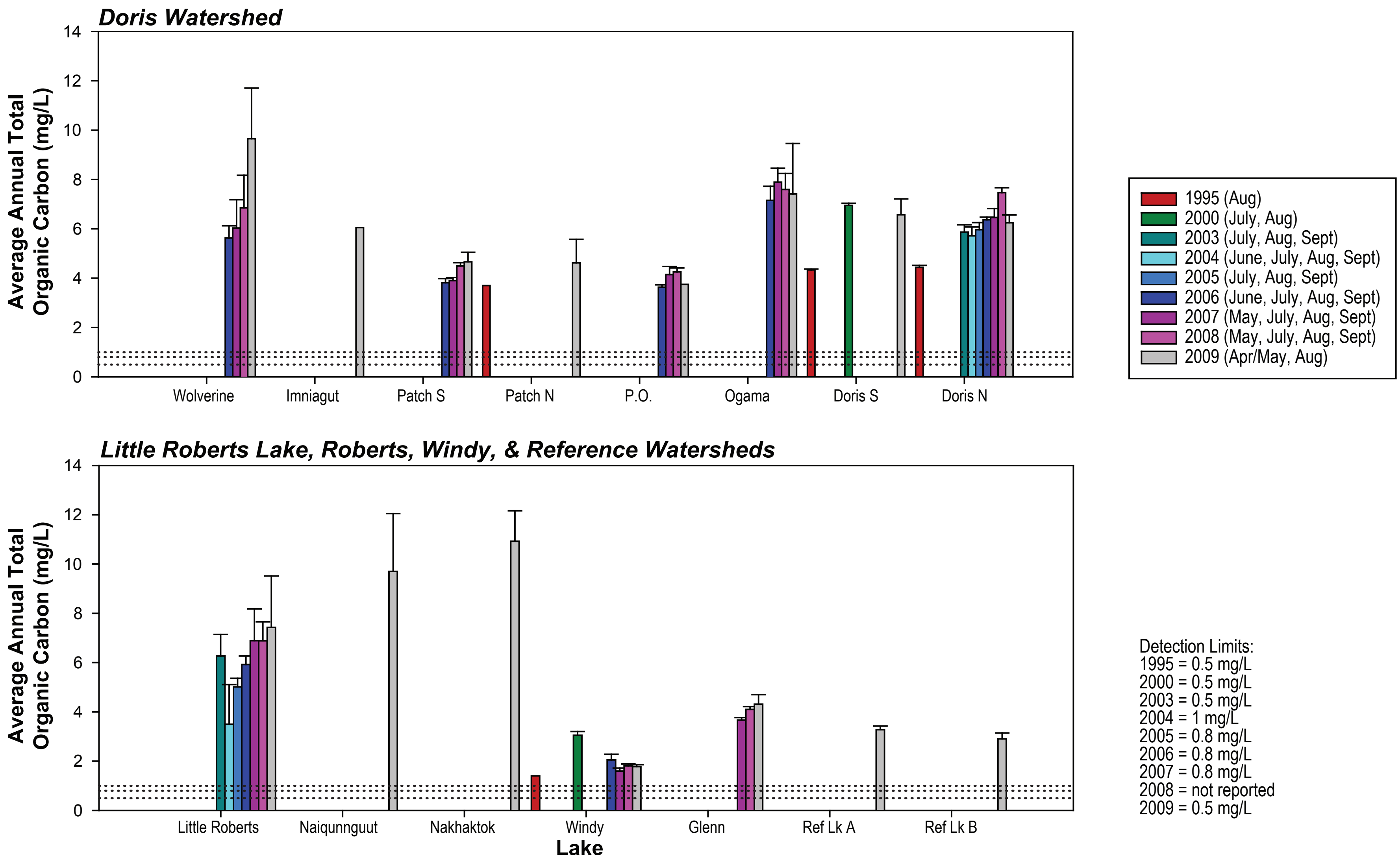
Notes: Error bars represent standard error of the mean.
Dotted lines represent detection limits.

Figure 3.2-2c

NEWMONT NORTH AMERICA

Average Annual Total Dissolved Solids, Hope Bay Lakes, 1995 - 2009

Rescan Engineers & Scientists



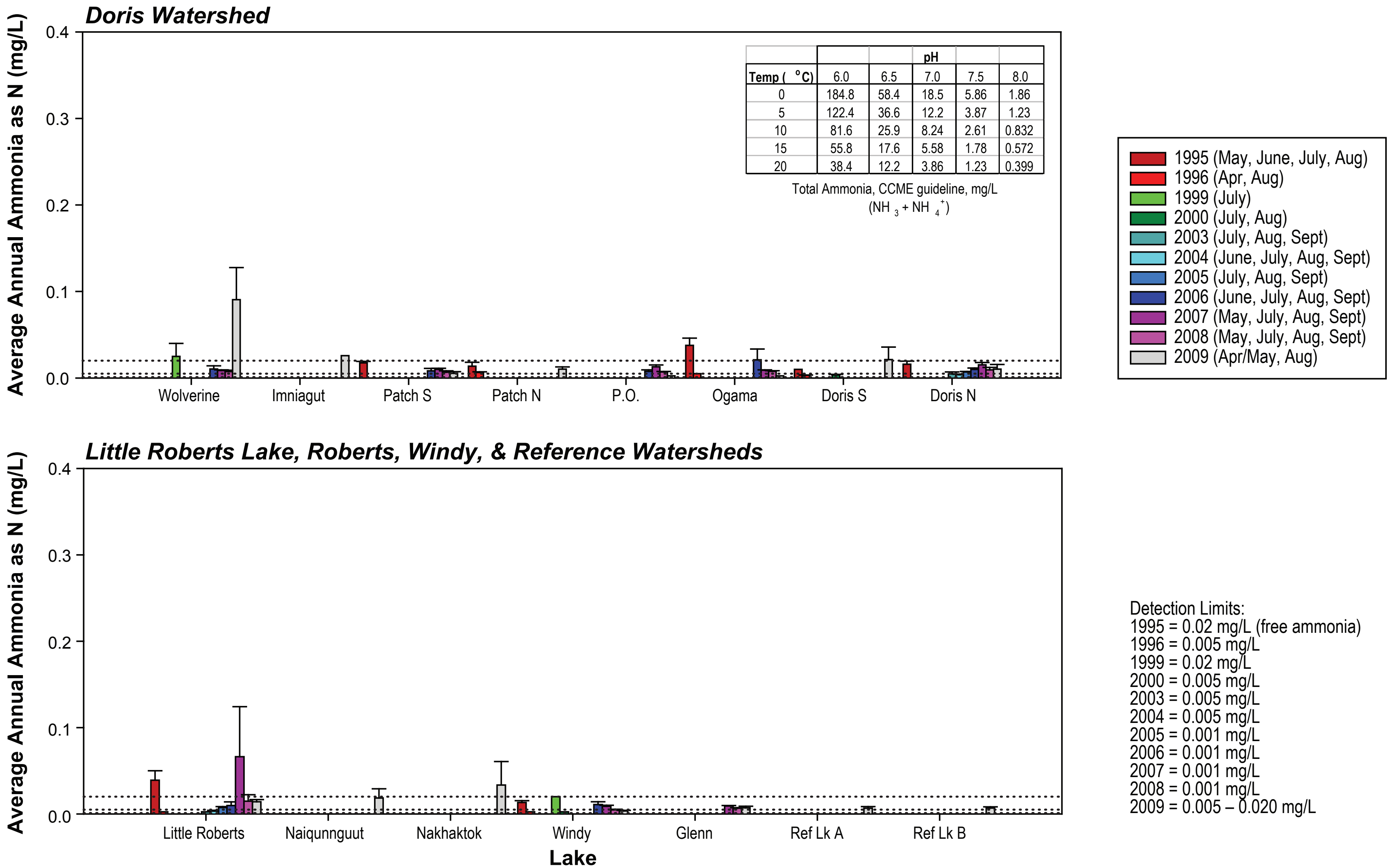
Notes: Error bars represent standard error of the mean.
Dotted lines represent detection limits.

Figure 3.2-2d

NEWMONT NORTH AMERICA

Average Annual Total Organic Carbon, Hope Bay Lakes, 1995 - 2009

Rescan Engineers & Scientists



	pH				
Temp (°C)	6.0	6.5	7.0	7.5	8.0
0	184.8	58.4	18.5	5.86	1.86
5	122.4	36.6	12.2	3.87	1.23
10	81.6	25.9	8.24	2.61	0.832
15	55.8	17.6	5.58	1.78	0.572
20	38.4	12.2	3.86	1.23	0.399

Total Ammonia, CCME guideline, mg/L ($NH_3 + NH_4^+$)

Notes: Error bars represent standard error of the mean.
CCME guidelines are temperature and pH dependent (see inset table).
Dotted lines represent detection limits.

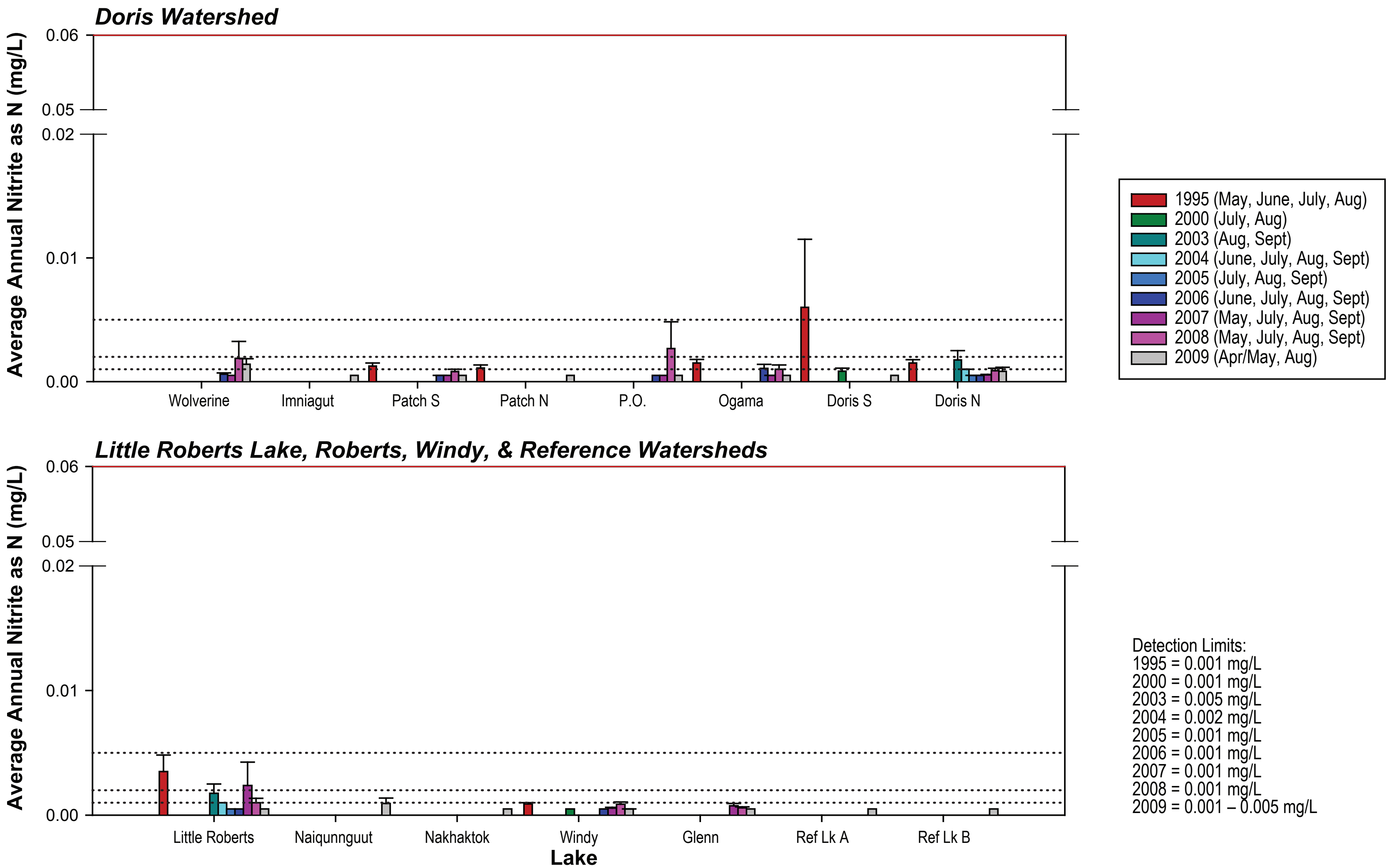
Figure 3.2-2e

NEWMONT NORTH AMERICA

Average Annual Ammonia, Hope Bay Lakes, 1995 - 2009

Figure 3.2-2e

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
CCME guideline = 0.06 mg/L.
Dotted lines represent detection limits.

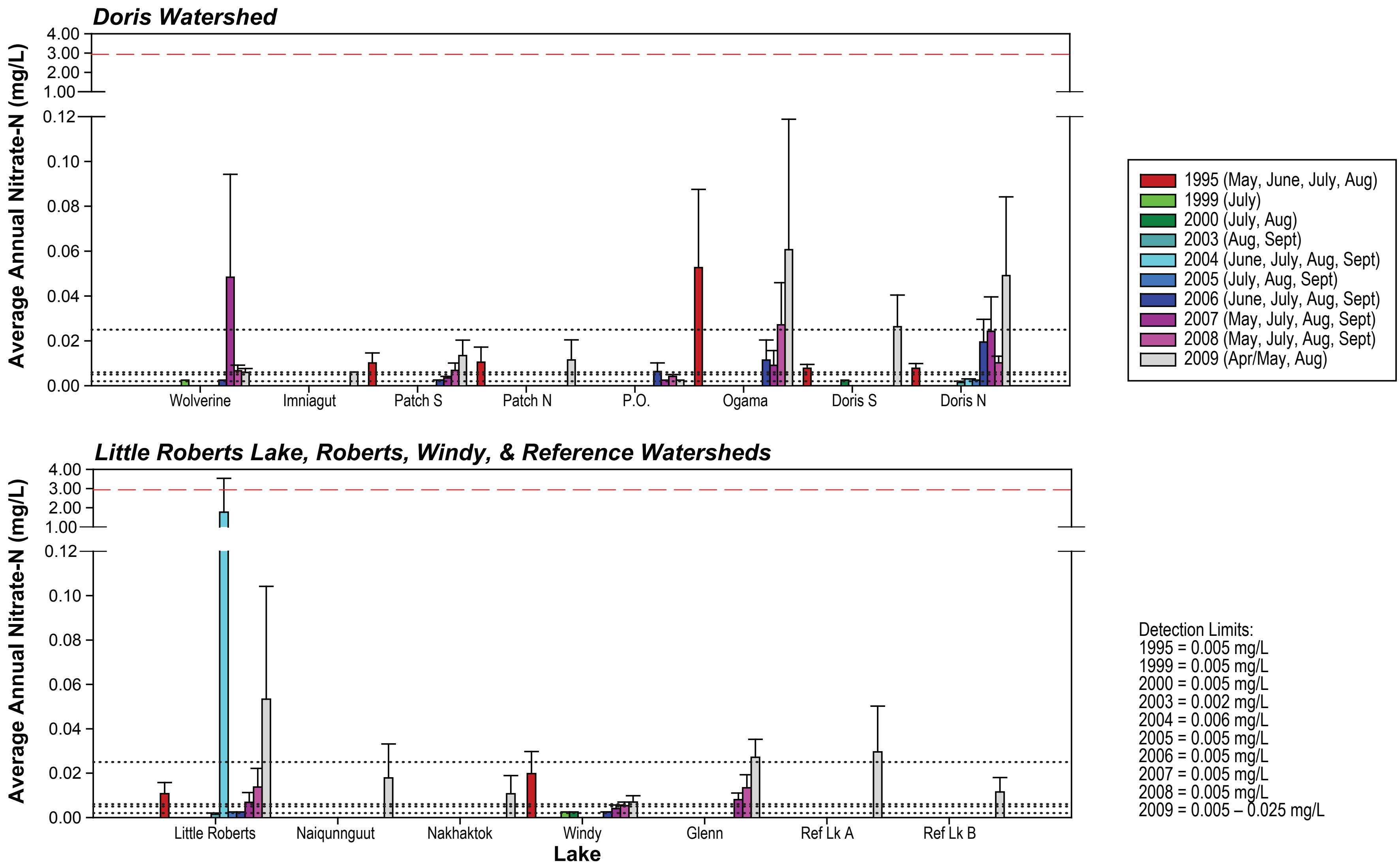
Figure 3.2-2f

Average Annual Nitrite, Hope Bay Lakes, 1995 - 2009

Figure 3.2-2f

NEWMONT NORTH AMERICA

Rescan Engineers & Scientists



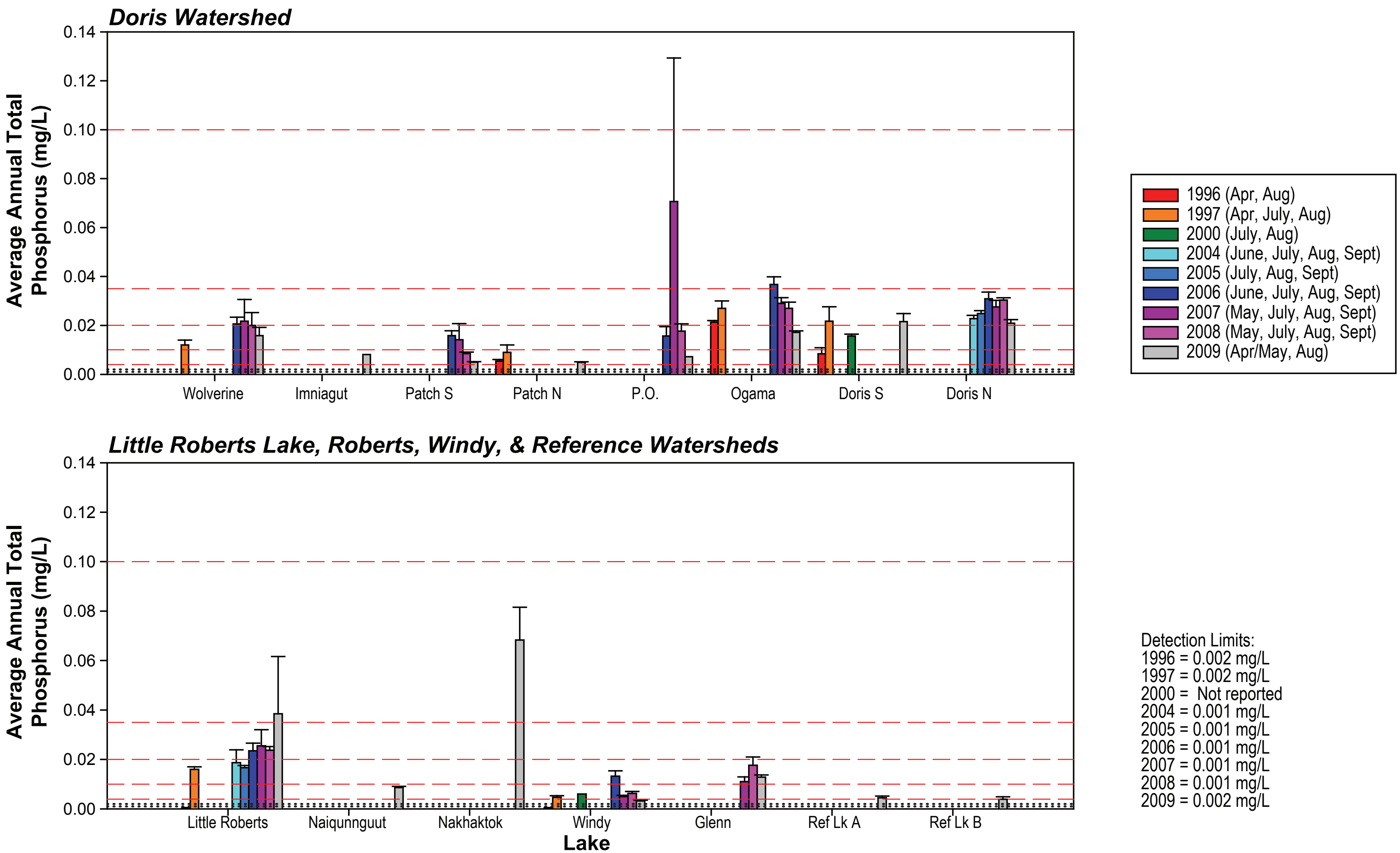
Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (2.93 mg/L).
Dotted lines represent detection limits.

NEWMONT NORTH AMERICA

Figure 3.2-2g

Average Annual Nitrate, Hope Bay Lakes, 1995 - 2009

Rescan Engineers & Scientists



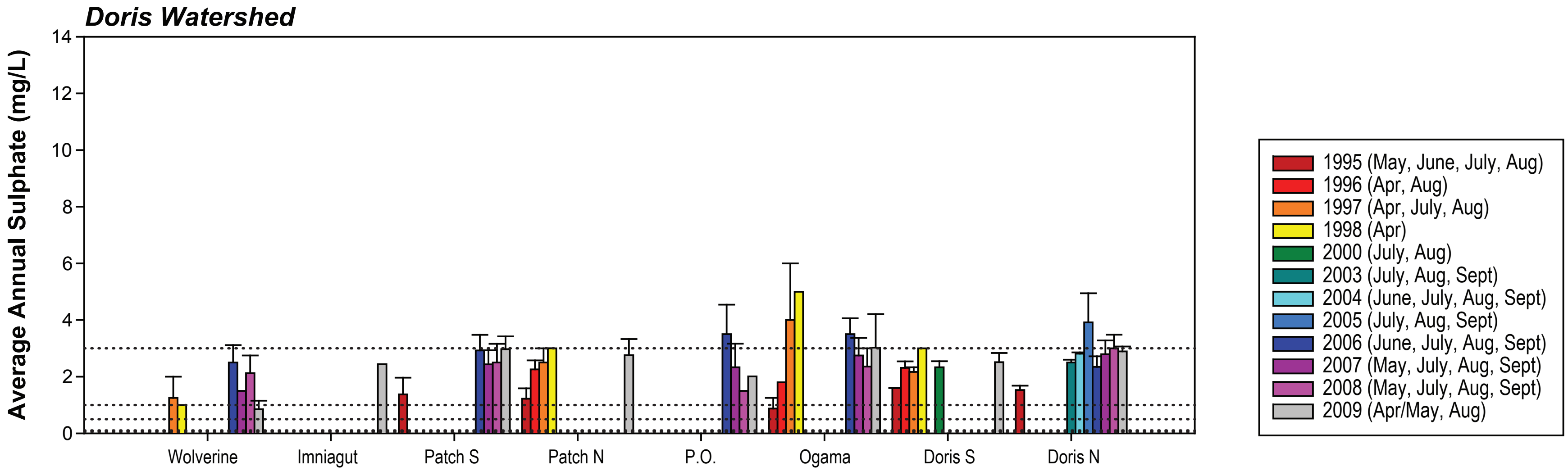
Notes: Error bars represent standard error of the mean.
Red dashed line indicates CCME guideline (2.93 mg/L).CCME trigger ranges (mg/L): <0.004 = ultraoligotrophic; 0.004 – 0.010 = oligotrophic; 0.01 – 0.02 = mesotrophic; 0.02 – 0.035 = meso-eutrophic; 0.035 - 0.1 = eutrophic; >0.1 = hyper-eutrophic.
Dotted lines represent detection limits.

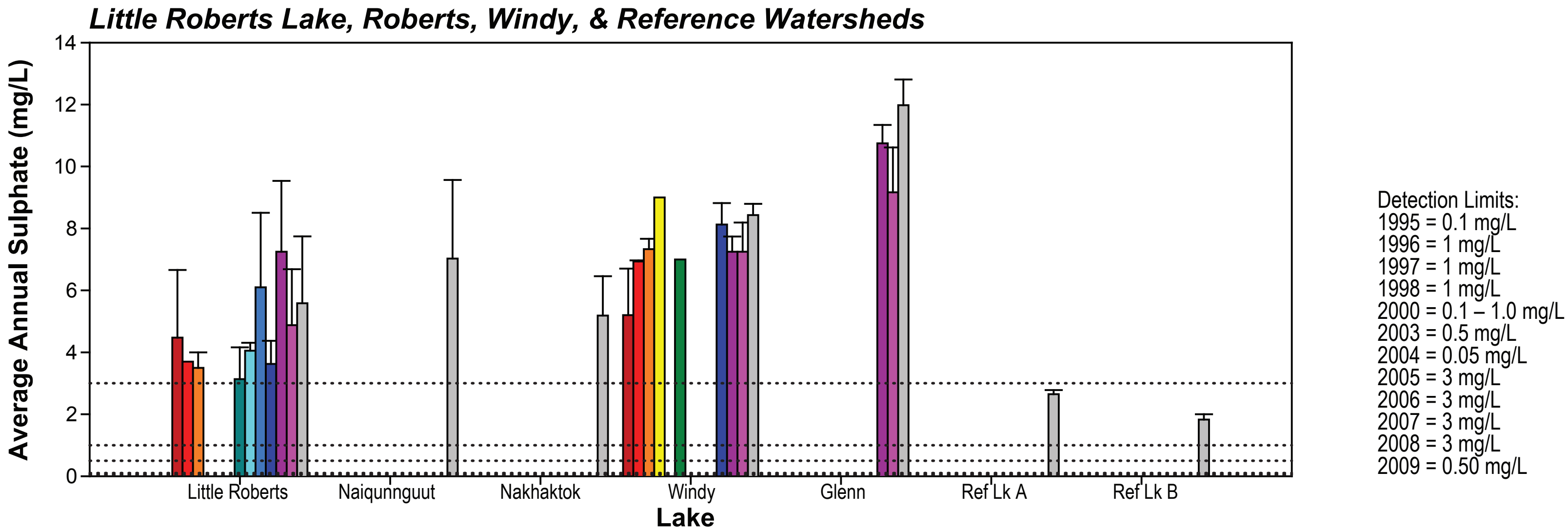
Figure 3.2-2h

NEWMONT NORTH AMERICA

Average Annual Total Phosphorus, Hope Bay Lakes, 1995 - 2009

Rescan Engineers & Scientists





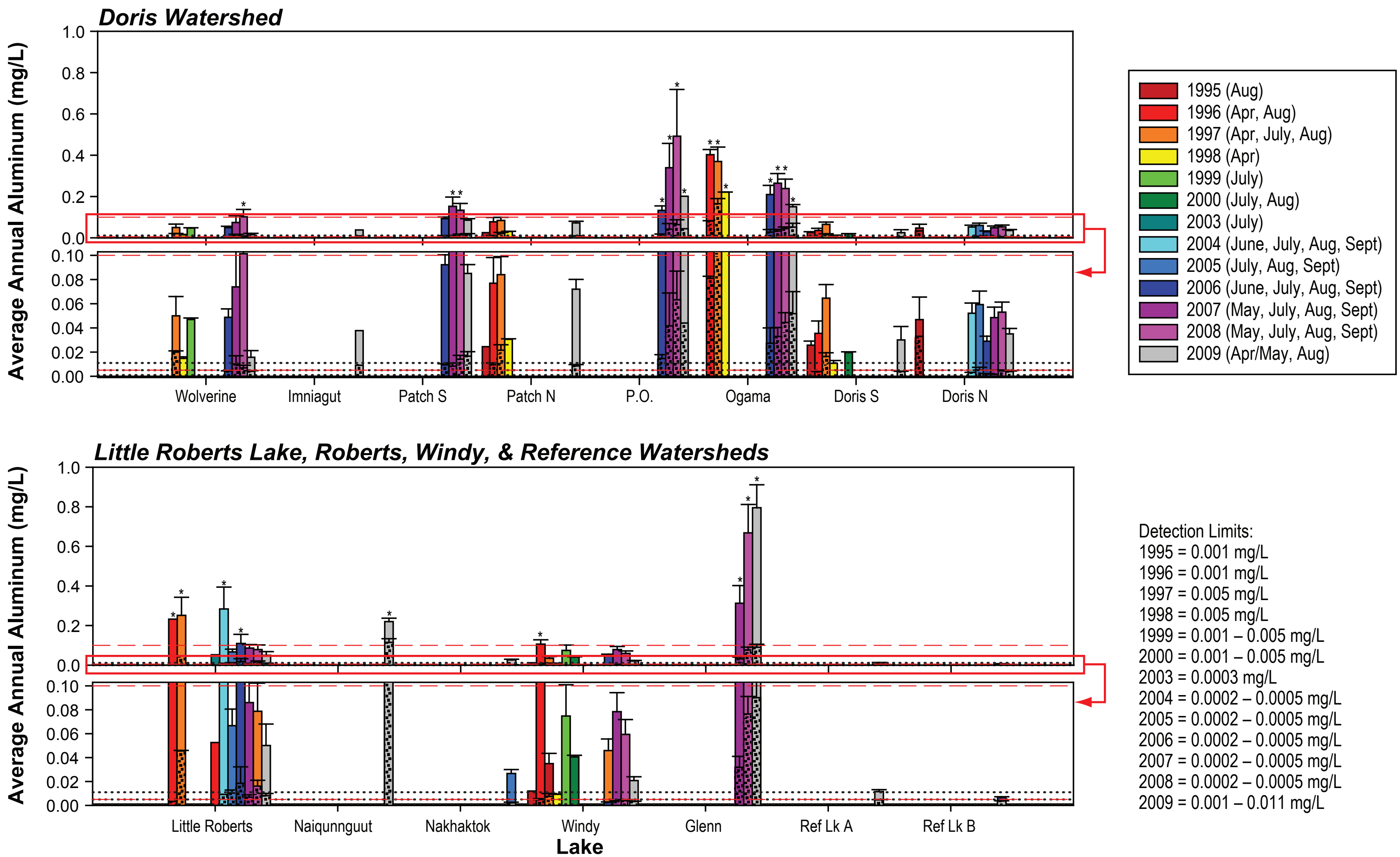
Notes: Error bars represent standard error of the mean.
Dotted lines represent detection limits.

Figure 3.2-2i

NEWMONT NORTH AMERICA

Average Annual Sulphate, Hope Bay Lakes, 1995 - 2009

Rescan Engineers & Scientists



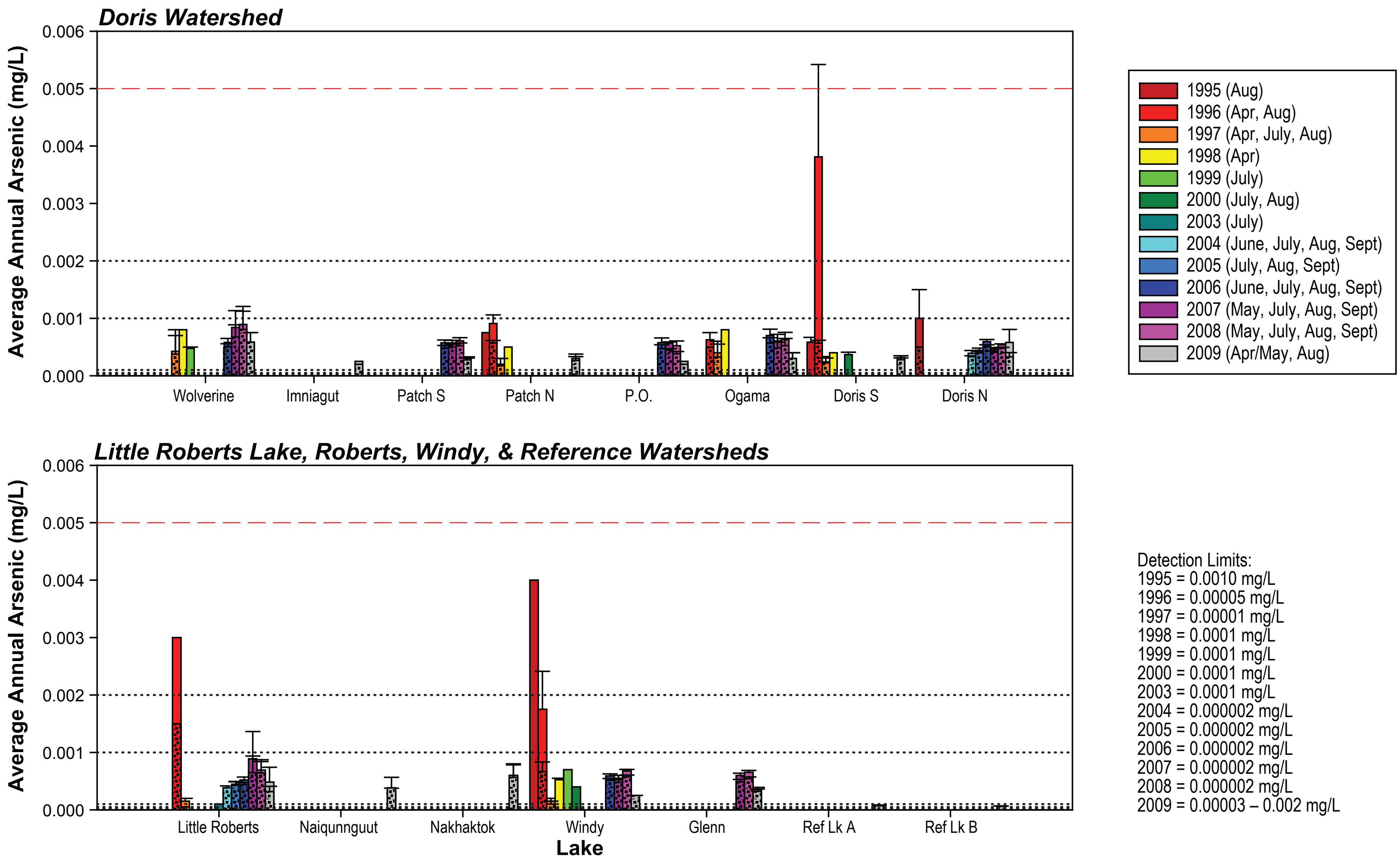
Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline and is pH dependent (0.005 mg/L at pH less than 6.5 and 0.1 mg/L at pH greater than or equal to 6.5).
Dotted lines represent detection limits.
Solid columns represent total Al and superimposed dotted columns represent dissolved Al.
** Indicates values that are higher than their sample guideline.*

Figure 3.2-2j

NEWMONT NORTH AMERICA

Average Annual Aluminum, Hope Bay Lakes, 1995 to 2009

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.005 mg/L).
Dotted lines represent detection limits.
Solid columns represent total As and superimposed dotted columns represent dissolved As. In some cases, dissoved As was equal to or slightly exceeded total As, and the total As column is hidden.

Figure 3.2-2k

NEWMONT NORTH AMERICA

Average Annual Arsenic, Hope Bay Lakes, 1995 to 2009

Rescan Engineers & Scientists

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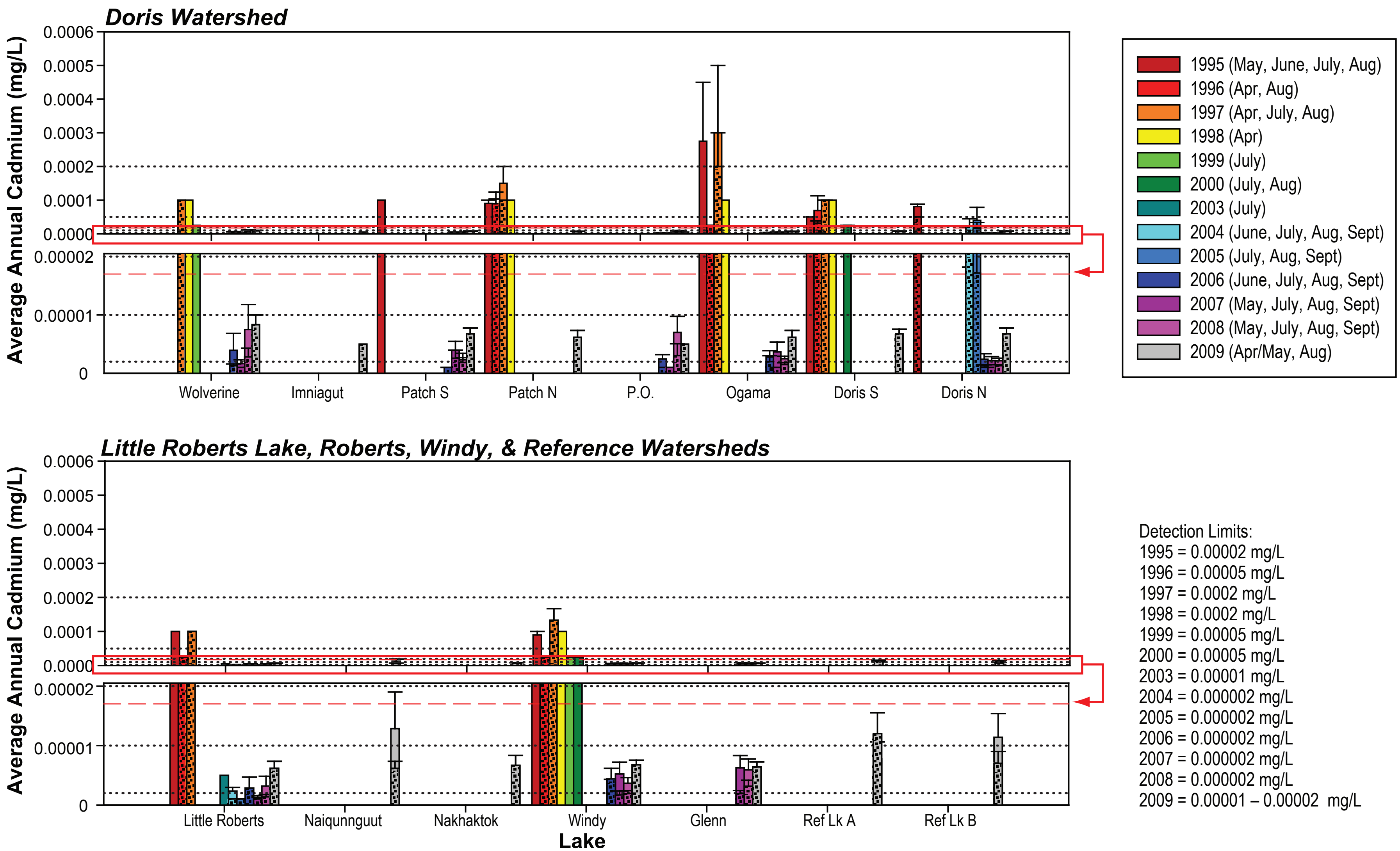


Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.000017 mg/L).
Dotted lines represent detection limits.
Solid columns represent total Cd and superimposed dotted columns represent dissolved Cd. In some cases, dissoved Cd was equal to or slightly exceeded total Cd, and the total Cd column is hidden.

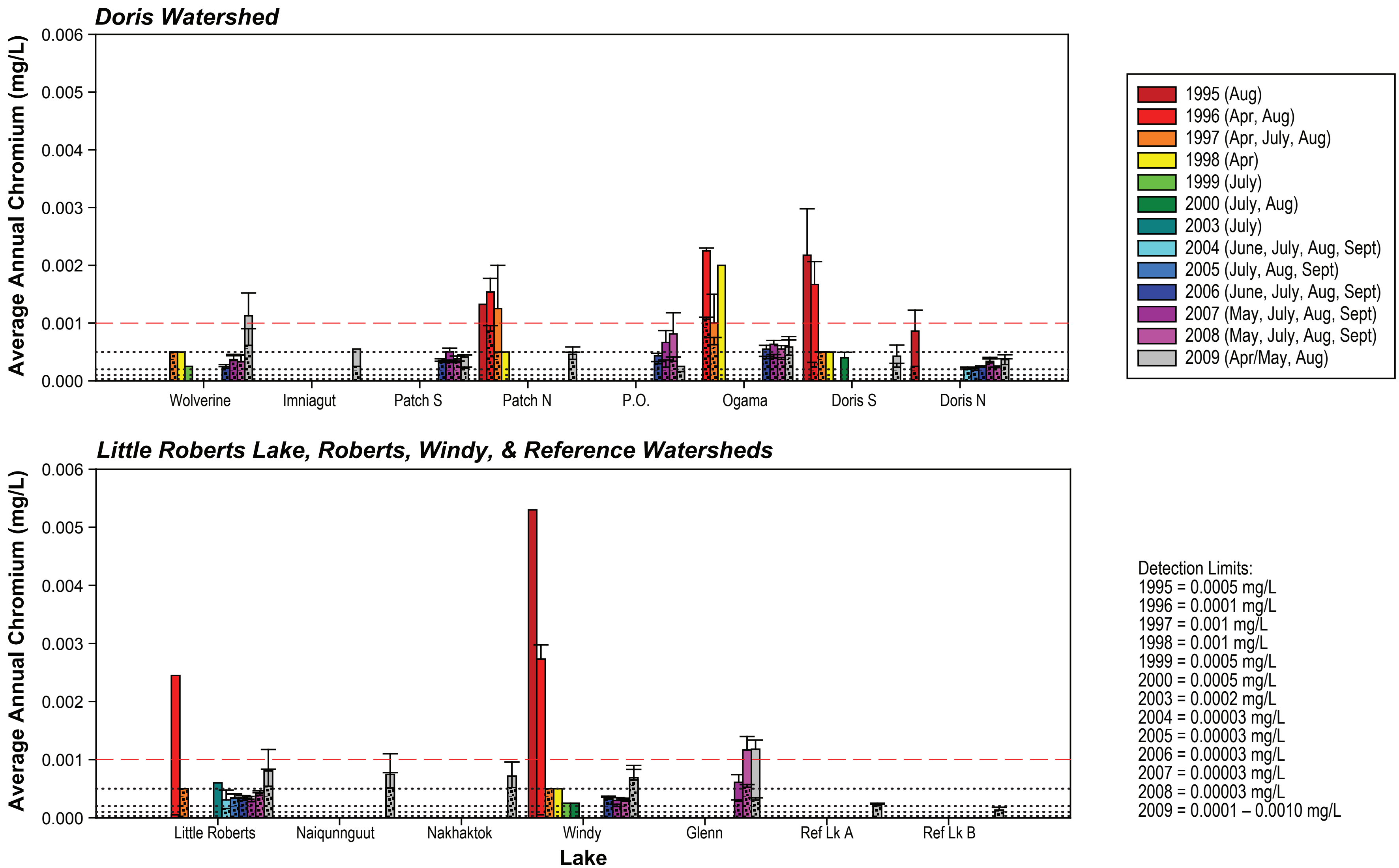
Figure 3.2-2l

NEWMONT NORTH AMERICA

Average Annual Cadmium, Hope Bay Lakes, 1995 to 2009

Rescan Engineers & Scientists

Figure 3.2-2l



Detection Limits:
1995 = 0.0005 mg/L
1996 = 0.0001 mg/L
1997 = 0.001 mg/L
1998 = 0.001 mg/L
1999 = 0.0005 mg/L
2000 = 0.0005 mg/L
2003 = 0.0002 mg/L
2004 = 0.00003 mg/L
2005 = 0.00003 mg/L
2006 = 0.00003 mg/L
2007 = 0.00003 mg/L
2008 = 0.00003 mg/L
2009 = 0.0001 – 0.0010 mg/L

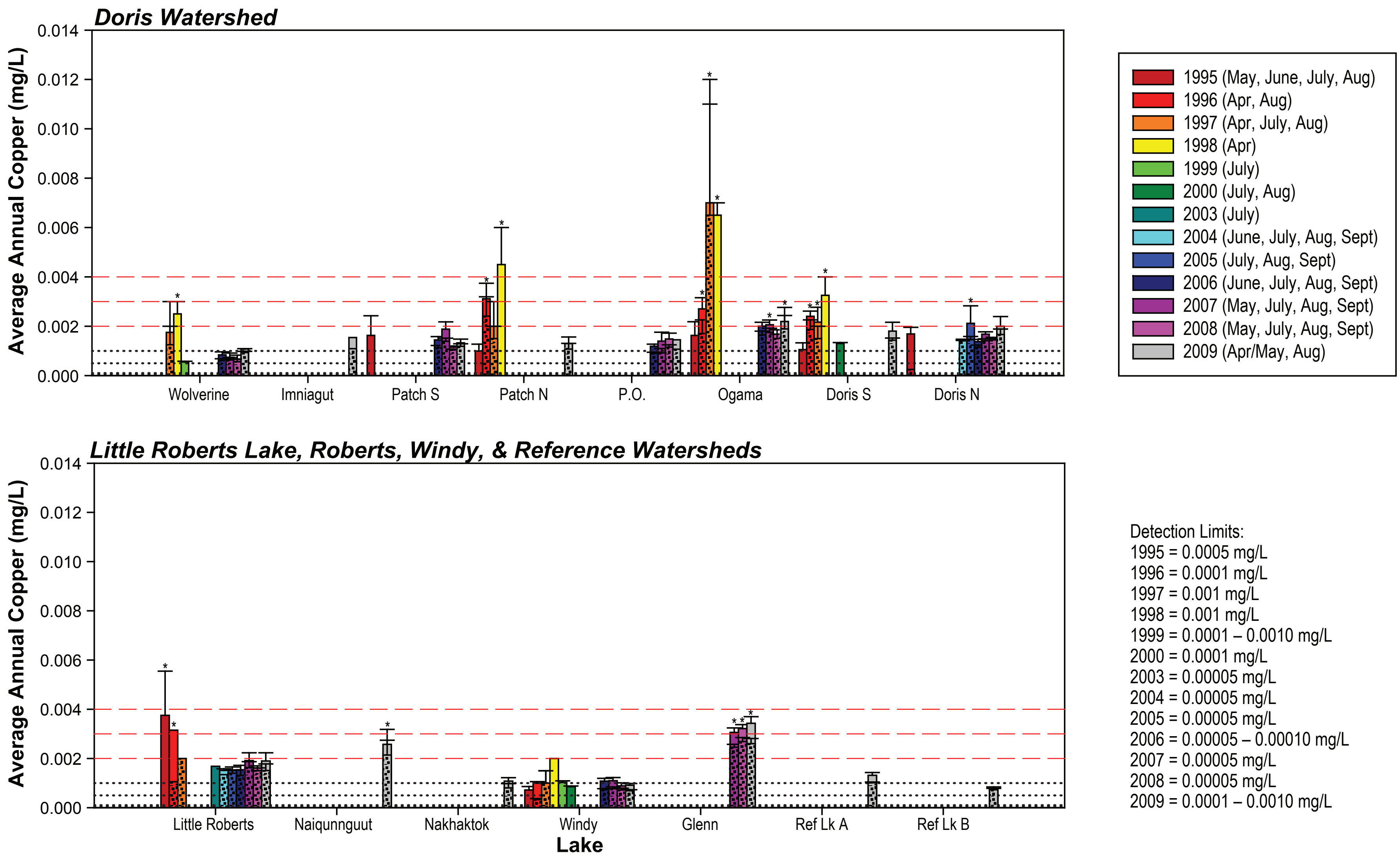
Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.001 mg/L).
Dotted lines represent detection limits.
Solid columns represent total Cr and superimposed dotted columns represent dissolved Cr. In some cases, dissoved Cr was equal to or slightly exceeded total Cr, and the total Cr column is hidden.

Figure 3.2-2m

NEWMONT NORTH AMERICA

Average Annual Chromium, Hope Bay Lakes, 1995 to 2009

Rescan Engineers & Scientists



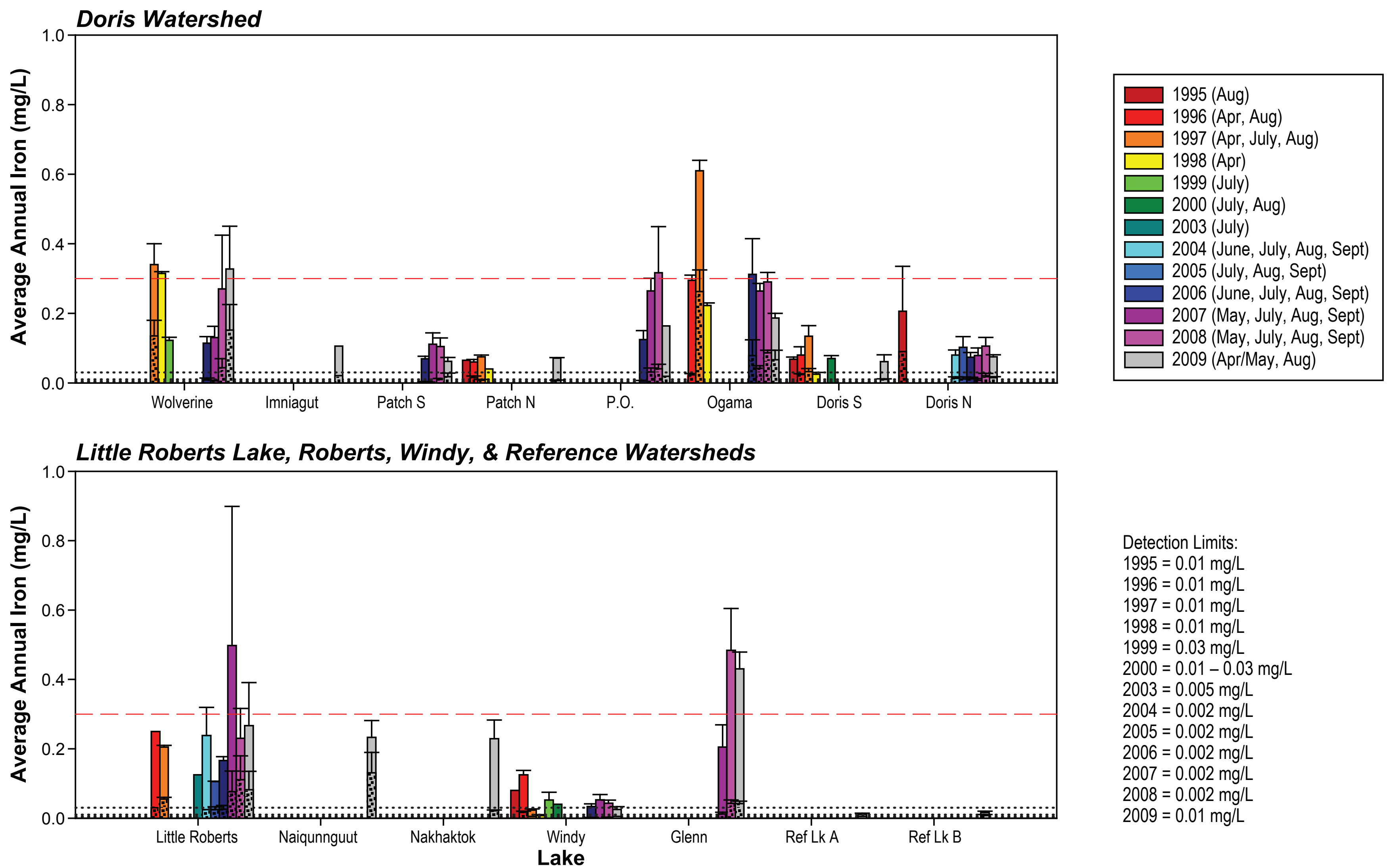
Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.002 mg/L at [$CaCO_3$] of 0–120 mg/L; 0.003 mg/L at [$CaCO_3$] of 120–180 mg/L; 0.004 at [$CaCO_3$] of >180 mg/L).
Dotted lines represent detection limits.
Solid columns represent total Cuand superimposed dotted columns represent dissolved Cu. In some cases, dissoved Cu was equal to or slightly exceeded total Cu, and the total Cu column is hidden.
** Indicates values that are higher than their sample guideline.*

Figure 3.2-2n

NEWMONT NORTH AMERICA

Average Annual Copper, Hope Bay Lakes, 1995 to 2009

Rescan Engineers & Scientists



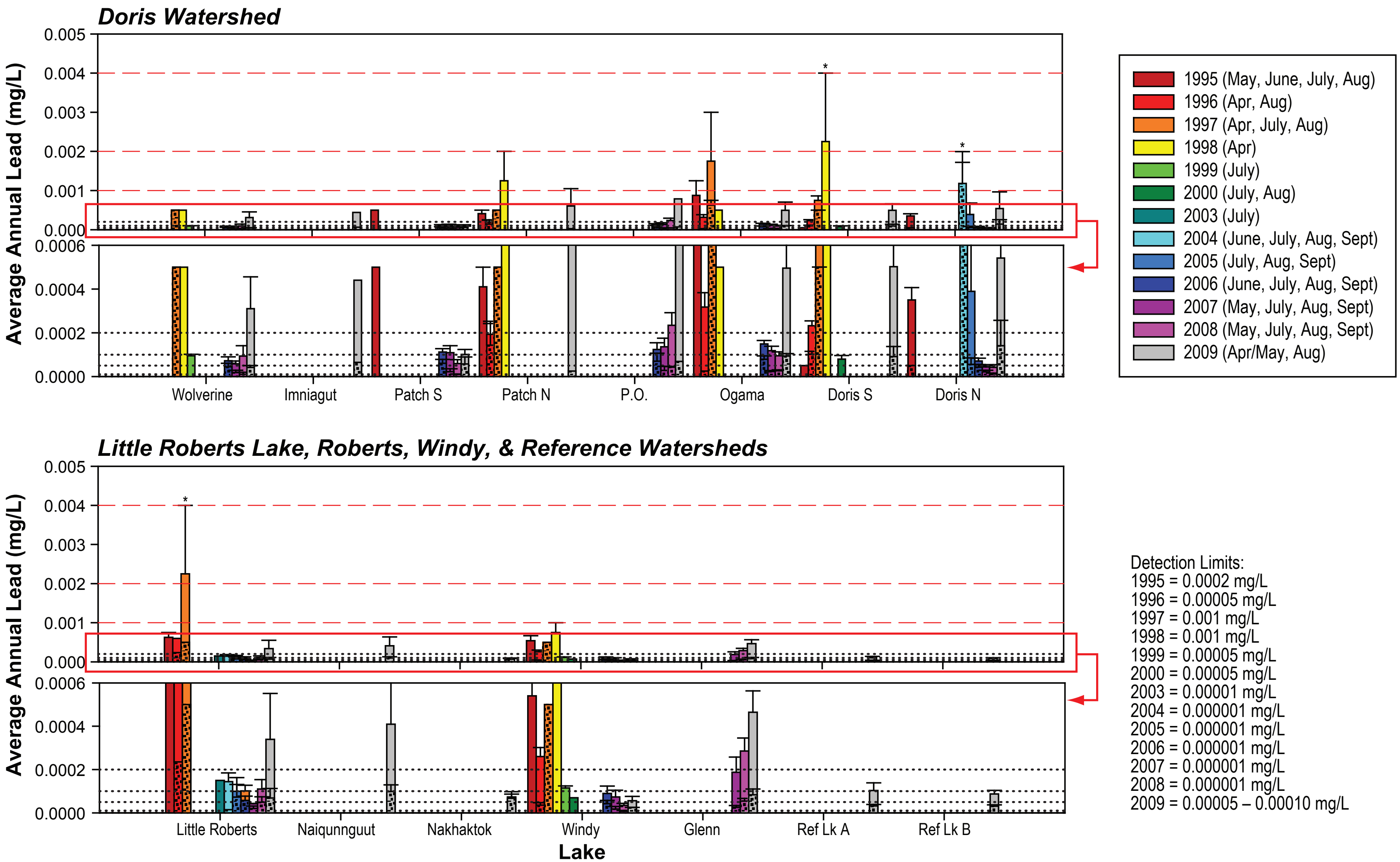
Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.3 mg/L).
Dotted lines represent detection limits.
Solid columns represent total Fe and superimposed dotted columns represent dissolved Fe.

Figure 3.2-2o

NEWMONT NORTH AMERICA

Average Annual Iron, Hope Bay Lakes, 1995 to 2009

Rescan Engineers & Scientists



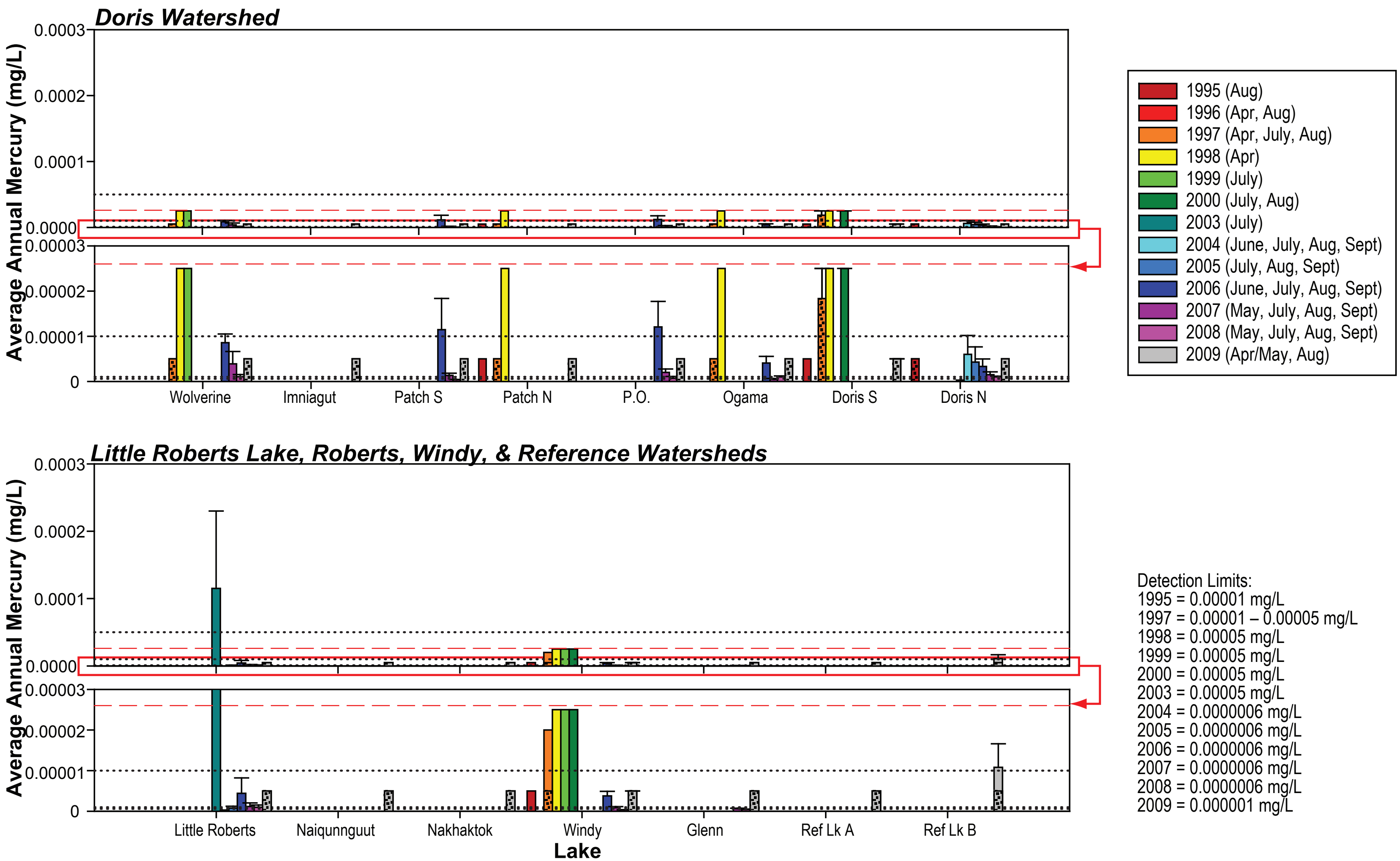
Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.001 mg/L at [$CaCO_3$] of 0–60 mg/L; 0.002 mg/L at [$CaCO_3$] of 60–120 mg/L; 0.004 mg/L at [$CaCO_3$] of 120–180 mg/L; 0.007 at [$CaCO_3$] of >180 mg/L).
Dotted lines represent detection limits.
Solid columns represent total Pb and superimposed dotted columns represent dissolved Pb. In some cases, dissoved Pb was equal to or slightly exceeded total Pb and the total Pb column is hidden.
** Indicates values that are higher than their sample guideline.*

Figure 3.2-2p

NEWMONT NORTH AMERICA

Average Annual Lead, Hope Bay Lakes, 1995 to 2009

Rescan Engineers & Scientists



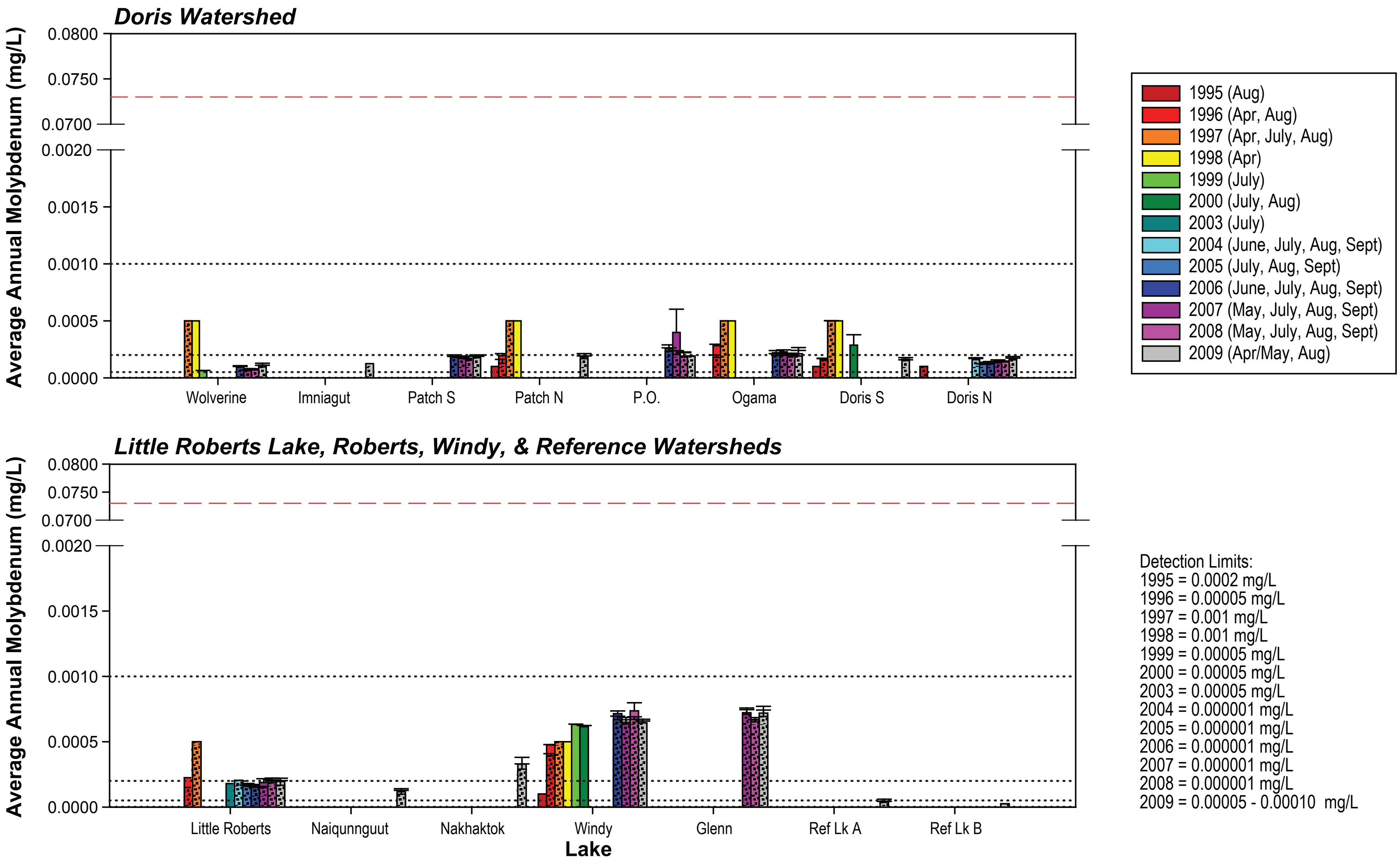
Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.000026 mg/L).
Dotted lines represent detection limits.
Solid columns represent total Hg and superimposed dotted columns represent dissolved Hg. In some cases, dissoved Hg was equal to or slightly exceeded total Hg and the total Hg column is hidden.

Figure 3.2-2q

NEWMONT NORTH AMERICA

Average Annual Mercury, Hope Bay Lakes, 1995 to 2009

Rescan Engineers & Scientists



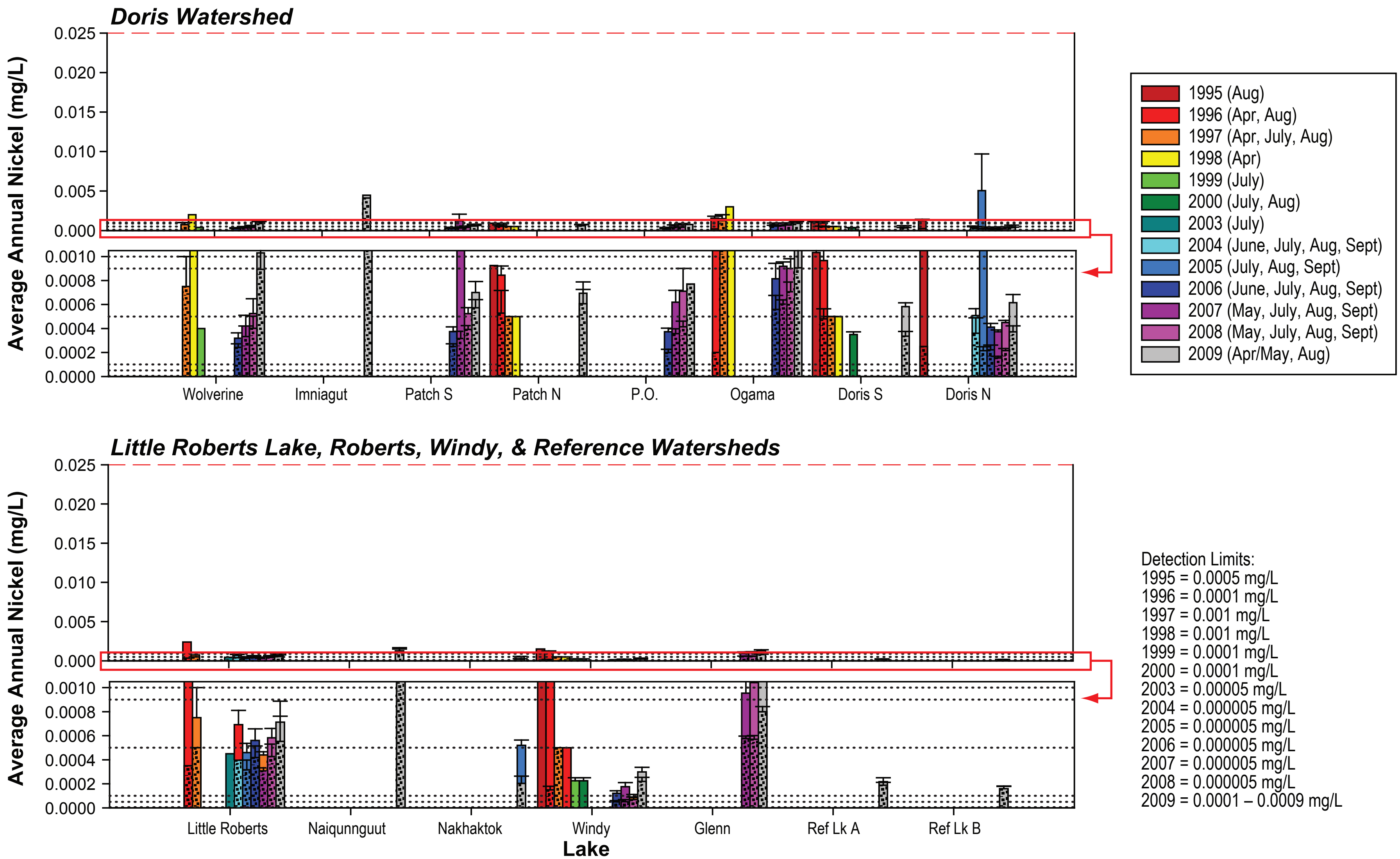
Notes: Error bars represent standard error of the mean.
CCME guideline = 0.073 mg/L.
Dotted lines represent detection limits.
Solid columns represent total Mo and superimposed dotted columns represent dissolved Mo. In some cases, dissoved Mo was equal to or slightly exceeded total Mo and the total Mo column is hidden.

Figure 3.2-2r

NEWMONT NORTH AMERICA

Average Annual Molybdenum, Hope Bay Lakes, 1995 to 2009

Rescan Engineers & Scientists



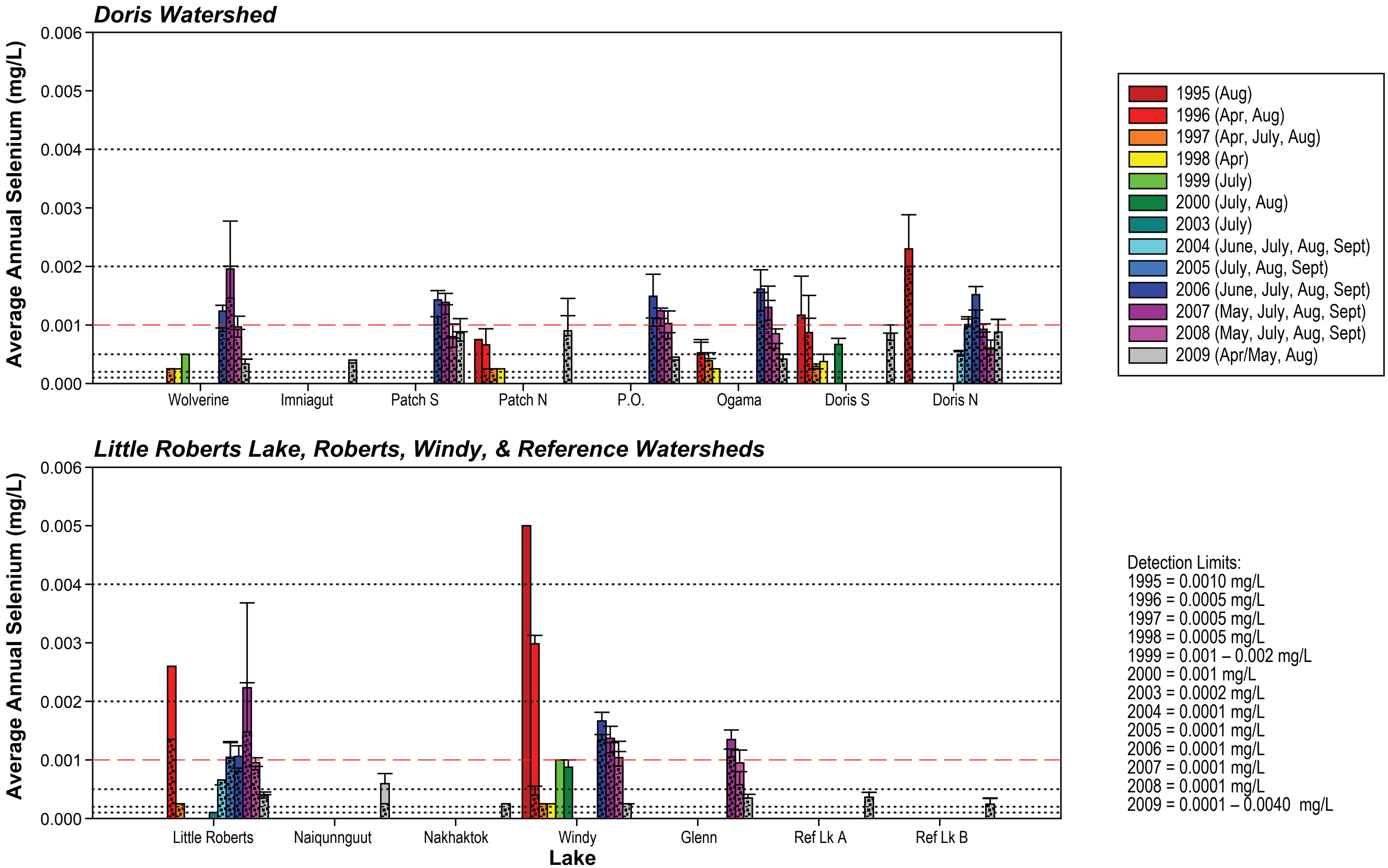
Notes: Error bars represent standard error of the mean.
CCME guideline = 0.025 mg/L at [$CaCO_3$] of 0–60 mg/L; 0.065 mg/L at [$CaCO_3$] of 60–120 mg/L; 0.110 mg/L at [$CaCO_3$] of 120–180; 0.150 mg/L at [$CaCO_3$] of >180 mg/L.
Dotted lines represent detection limits.
Solid columns represent total Ni and superimposed dotted columns represent dissolved Ni. In some cases, dissoved Ni was equal to or slightly exceeded total Ni and the total Ni column is hidden.

Figure 3.2-2s

NEWMONT NORTH AMERICA

Average Annual Nickel, Hope Bay Lakes, 1995 to 2009

Rescan Engineers & Scientists



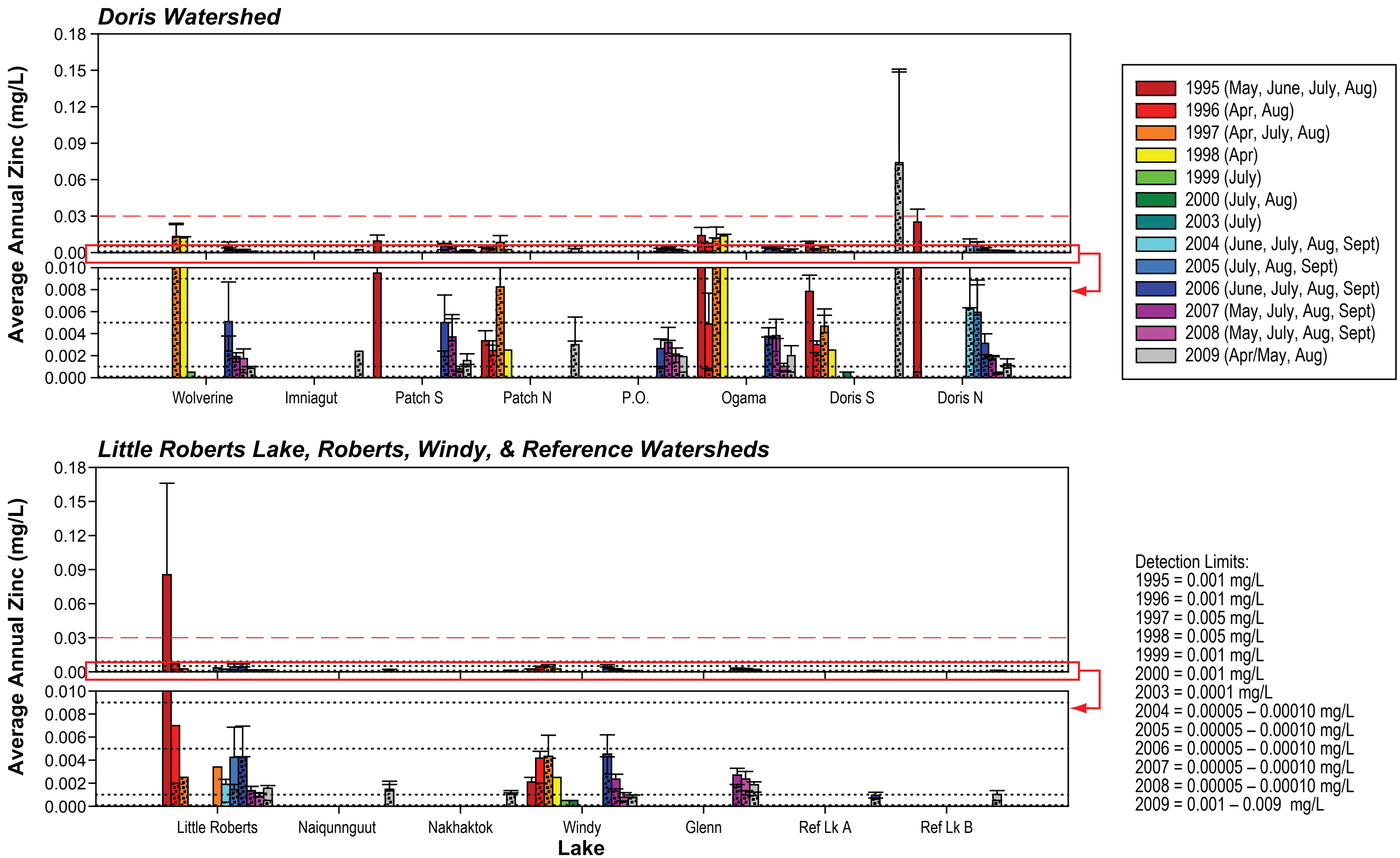
Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.001 mg/L).
Dotted lines represent detection limits.
Solid columns represent total Se and superimposed dotted columns represent dissolved Se. In some cases, dissoved Se was equal to or slightly exceeded total Se and the total Se column is hidden.

Figure 3.2-2t

NEWMONT NORTH AMERICA

Average Annual Selenium, Hope Bay Lakes, 1995 to 2009

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.03 mg/L).
Dotted lines represent detection limits.
Solid columns represent total Zn and superimposed dotted columns represent dissolved Zn. In some cases, dissoved Zn was equal to or slightly exceeded total Zn and the total Zn column is hidden.

Figure 3.2-2u

NEWMONT NORTH AMERICA

Average Annual Zinc, Hope Bay Lakes, 1995 to 2009

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Table 2.1-4 presents the 2009 lake water quality sample collection dates and the depths from which the samples were obtained. Historical methodological details of data collected in previous years, including sample collection depth, timing, and replication, are presented in Table 2.13-1.

All water quality samples collected were compared to guidelines for the protection of freshwater aquatic life published by the Canadian Council of Ministers of the Environment (CCME 2007).

3.2.1 Depth Variation

Lakes in the area were generally well mixed or only weakly stratified at the time of winter and summer sampling. Consequently, there were few differences with depth in the study area lakes. Samples collected 2 m above the water sediment interface were generally similar in their chemical characteristics to those collected near the surface (1 m below the surface in the summer, and 1 m below the ice in winter). Exceptions occurred at Patch S, Doris N, Windy, and Reference Lake B, which had elevated nitrate concentrations at depth during the winter. Doris N also had higher surface concentrations of lead than deep samples during the winter.

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. Samples collected in April/May reflect the late winter 'worst case scenario' for under-ice water quality, when oxygen concentrations are lowest and metal concentrations are potentially maximal.

In the Hope Bay Belt area lakes, winter levels of general parameters, nutrients, and metals were generally higher than summer levels. This trend was particularly apparent for nitrate, and was also evident for total dissolved solids (TDS), total organic carbon (TOC), sulphate, total phosphorus, ammonia, nitrate, and several metals (e.g., chromium, copper, iron, and lead). Winter nitrate levels were usually above detection limits and were highest in Ogama, Doris N and S, and Little Roberts lakes, where average winter nitrate concentrations ranged from 0.0636 mg/L to 0.177 mg/L. Nitrate concentrations in all lakes dropped to below detection limits during the summer, except at Imniagut and Glenn lakes.

3.2.3 Spatial Variation

The lakes in the study site are located within several different watersheds. Nakhaktok, Windy, and Glenn lakes are in the Windy Watershed; Wolverine, Imniagut, Patch, P.O., Ogama, and Doris lakes are in the Doris Watershed; and Naiqunnguut Lake is in the Roberts Watershed. Little Roberts Lake drains both the Doris and Roberts watersheds into Roberts Bay. Reference lakes A and B are each in separate watersheds.

All lakes surveyed were similar in pH, with near neutral to slightly basic pH levels ranging from 6.9 (Ref Lk B in winter at deep depth) to 8.3 (Patch S in winter at shallow depth). Several lakes in the study area were highly turbid, particularly Nakhaktok (averaging 16.7 NTU) and Glenn (averaging 14.5 NTU) lakes. Field observations noted that shorelines at these lakes were composed of easily suspended soft silt-clay. Interestingly, these two Windy Watershed lakes are connected through Windy Lake, which had the one of the lowest turbidity levels observed (averaging 0.86 NTU), and was noted to have a more sandy shoreline.

Average TDS concentrations ranged from 32.8 mg/L in Ref Lk B to 381 mg/L in Nakhaktok Lake. Patterns in TDS closely reflected those seen for hardness (as [CaCO3]), chloride, calcium, and sodium (data not plotted). Average TOC concentrations ranged from 1.78 mg/L at Windy Lake to 10.9 mg/L at both Naiqunnguut and Nakhaktok lakes. Sulphate concentrations were slightly higher in the Roberts and Windy watersheds (averaging 6.3 mg/L and 9.0 mg/L, respectively) compared to the Doris Watershed (2.9 mg/L) and the reference lakes (2.7 mg/L and 1.8 mg/L in Ref Lk A and B, respectively).

Total phosphorus (TP) concentrations were highly variable among study lakes, ranging from 0.002 mg/L at Ref Lk B (summer at both depths sampled) to 0.095 mg/L at Nakhaktok Lake (winter at shallow depth). Based on the CCME's recommended trigger ranges for TP (CCME 2004), Windy Lake and Reference Lakes A and B would be categorized as ultra-oligotrophic to oligotrophic (depending on the season), Imniagut, Patch N and S, P.O., and Naiqunnguut lakes would be categorized as oligotrophic, while Little Roberts Lake (during winter only) and Nakhaktok Lake would be considered eutrophic systems. Doris Lake N and S ranged from mesotrophic to meso-eutrophic depending on the season.

Nitrate and ammonia were the major forms of nitrogen in Hope Bay Belt lakes, while nitrite concentrations were generally below detection limits (<0.001 mg/L; see Appendices 3.2-1 and 3.2-2). Nitrate concentrations ranged from below detection (<0.005 mg/L) in several lakes to 0.177 mg/L in Ogama Lake (winter at shallow depth). The highest nitrate concentrations were observed in lakes within the Doris and Little Roberts watersheds: Ogama, Doris N and S, and Little Roberts lakes. Ammonia concentrations ranged from below detection (<0.005 mg/L) in several lakes to 0.133 mg/L in Wolverine Lake (winter at shallow depth). The highest concentrations of ammonia were measured in Wolverine and Nakhaktok lakes, which are the lakes located furthest upstream in the Doris and Windy watersheds, respectively.

In general, Glenn Lake (in the Windy Watershed) had the highest average aluminum, copper, iron, and molybdenum concentrations. The aluminum concentration in a lake can give an indication of the magnitude of terrestrial inputs, as aluminum is known to act as a tracer of terrestrial runoff due to its high crustal abundance. The Windy Watershed as a whole had higher molybdenum levels than the other watersheds. Nickel concentrations in Imniagut Lake were markedly higher than other lakes, while zinc levels in Doris S also tended to be higher than other lakes.

3.2.4 Comparison with CCME Guidelines

Nitrate, nitrite, and ammonia concentrations in all lakes were below CCME guidelines. Total aluminum levels in Glenn Lake averaged 0.80 mg/L, which is higher than the CCME aluminum guideline of 0.1 mg/L. Aluminum concentrations were also high relative to the CCME guideline in P.O., Ogama, and Naiqunnguut lakes. Other metals that were naturally elevated relative to CCME guidelines included: chromium (in Wolverine and Glenn lakes), copper (in Ogama, Naiqunnguut, and Glenn lakes), iron (in Wolverine and Glenn lakes), and zinc (in Doris Lake S).

In some lakes, concentrations of lead, chromium, copper, and iron were higher than CCME guidelines in winter samples, but dropped to below guidelines in summer samples. Glenn Lake was the exception to this trend, as elevated winter iron and copper concentrations did not drop to below guideline levels in summer.

Table 3.2-1 gives the percentage of lake water quality samples in which parameter concentrations are higher than CCME guidelines, and Table 3.2-2 shows the factor by which average concentrations are higher than CCME guidelines (using the average concentration of each parameter within a lake site across various depths and seasons).

3.2.5 2009 Lake Water Quality Assurance/Quality Control

Travel, field and equipment blank data for the 2009 lake water quality sampling program are presented in Appendix 3.2-3. In total, four travel blanks, three field blanks, and three equipment blanks (accounting for 17% of samples collected) were processed as part of the 2009 lake water quality program. Both travel and field blanks showed almost no sign of contamination (no detectable concentrations), with the exception of detectable concentrations of total and dissolved boron. For equipment blanks, approximately 17% of values were above detection limits, although most of these detectable concentrations were within 5x the detection limit—a range within which values are questionably reliable and should be interpreted with care. The equipment blank collected at Wolverine Lake in August had the highest incident of detectable values. Variables that had concentrations greater than 5x the detection limit only occurred within the equipment blanks, and included nitrate, total sodium, dissolved copper, and total and dissolved aluminum, chromium, lead, magnesium, manganese, and nickel. Within the Wolverine Lake equipment blank, detectable concentrations of nitrate, total chromium and total and dissolved lead exceeded their respective CCME guidelines. It is uncertain what caused this contamination, though contamination seen in equipment blanks, but not in travel and field blanks, would usually indicate that contamination was introduced through field sampling procedures or improper acid rinsing. However, samples collected directly after the equipment blank was collected at Wolverine Lake showed no evidence of nitrate, chromium, or lead contamination (i.e., Wolverine Lake August samples had concentrations close to the detection limits for all these parameters). Because no evidence of this contamination was apparent in the lake samples collected, no data corrections were made.

3.2.6 Annual Variation

Historical data are available from some lakes in the study area for the following periods: May, June, July, and August 1995; April and August 1996; April, July, and August 1997; April 1998; July 1999; July and August 2000; July 2003; June, July, August, and September 2004; July, August, and September 2005; June, July, August, and September 2006; May, July, August, and September 2007; May, July, August, and September 2008; and May, June, August, and September 2009. Figure 2.13-1 provides a summary of the historical water quality sampling locations. Only historical sampling locations that were also sampled in 2009 are presented in this report. Note that historical sampling site locations may not correspond exactly with those sampled in 2009, and this may contribute to the variability observed among years.

The difference among annual data sets in terms of when (months of collection) and where (depth/location of collection) samples were collected can have a significant effect on annual averages for many parameters. 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 methodology and detection limits.

Table 3.2-1. Lake Water Quality, Percent of Samples in which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2009

Lake	Total Number of Samples Collected	CCME Guideline Value[a]:	pH 6.5-9.0	Ammonia (as N) worst case 5.86 mg/L (assumes T=0, pH = 7.5)	Nitrate (as N) 2.93 mg/L	Nitrite (as N) 0.06 mg/L	Total Phosphate (as P) 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 mg/L	Chromium (Cr)-Total 0.001 mg/L
Doris											
Wolverine	3		0	0	0	0	Mesotrophic	0	0	0	67
Imniagut	1		0	0	0	0	Oligotrophic	0	0	0	0
Patch S	4		0	0	0	0	Oligotrophic	0	0	0	0
Patch N	3		0	0	0	0	Oligotrophic	0	0	0	0
P.O.	1		0	0	0	0	Oligotrophic	100	0	0	0
Ogama	3		0	0	0	0	Mesotrophic	100	0	0	0
Doris S	6		0	0	0	0	Mesotrophic to Meso-eutrophic	17	0	0	17
Doris N	4		0	0	0	0	Mesotrophic to Meso-eutrophic	0	0	0	0
Little Roberts											
Little Roberts	3		0	0	0	0	Mesotrophic to Eutrophic	0	0	0	33
Roberts											
Naiqunnguut	3		0	0	0	0	Oligotrophic	100	0	33	33
Windy											
Nakhaktok	3		0	0	0	0	Eutrophic	0	0	33	0
Windy	6		0	0	0	0	Ultra-oligotrophic to Oligotrophic	0	0	33	0
Glenn	5		0	0	0	0	Mesotrophic	100	0	0	60
Ref A											
Ref Lk A	5		0	0	0	0	Ultra-oligotrophic to Oligotrophic	0	0	20	0
Ref B											
Ref Lk B	5		0	0	0	0	Ultra-oligotrophic to Oligotrophic	0	0	40	0
Total Sites			**0**	**0**	**0**	**0**	**-**	**5**	**0**	**5**	**5**

All values represent percentages of 2009 samples higher than the CCME guidelines

(continued)

** Elevated values were due to non-detect values being greater then the guideline when halved for calculations. No detectable concentrations were above guidelines at these sites.*

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

b) <0.004 = ultraoligotrophic; 0.004 - 0.010 = oligotrophic; 0.01 - 0.02 = mesotrophic; 0.02 - 0.035 = meso-eutrophic; 0.035 - 0.1 = eutrophic; >0.1 = hyper-eutrophic

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

d) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

e) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = > 180 mg/L

f) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.150 mg/L at [CaCO3] = > 180 mg/L

Table 3.2-1. Lake Water Quality, Percent of Samples in which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2009 (completed)

Lake	Total Number of Samples Collected	CCME Guideline Valuea:	Copper (Cu)-Total 0.002-0.004d mg/L	Iron (Fe)-Total 0.3 mg/L	Lead (Pb)-Total 0.001-0.007e mg/L	Mercury (Hg)-Total 0.000026 mg/L	Molybdenum (Mo)-Total 0.073 mg/L	Nickel (Ni)-Total 0.025-0.110f mg/L	Selenium (Se)-Total 0.001 mg/L	Silver (Ag)-Total 0.0001 mg/L	Thallium (Ag)-Total 0.00088 mg/L	Zinc (Zn)-Total 0.03 mg/L
Doris												
Wolverine	3		0	67	0	0	0	0	0	0	0	0
Imniagut	1		0	0	0	0	0	0	0	0	0	0
Patch S	4		0	0	0	0	0	0	50*	0	0	0
Patch N	3		0	0	0	0	0	0	33*	0	0	0
P.O.	1		0	0	0	0	0	0	0	0	0	0
Ogama	3		33	0	0	0	0	0	0	0	0	0
Doris S	6		50	17	17	0	0	0	67*	0	0	17
Doris N	4		50	0	25	0	0	0	50	0	0	0
Little Roberts												
Little Roberts	3		33	33	0	0	0	0	0	0	0	0
Roberts												
Naiqunnguut	3		67	33	0	0	0	0	0	0	0	0
Windy												
Nakhaktok	3		0	0	0	0	0	0	0	0	0	0
Windy	6		0	0	0	0	0	0	0	0	0	0
Glenn	5		100	100	0	0	0	0	0	0	0	0
Ref A												
Ref Lk A	5		0	0	0	0	0	0	0	0	0	0
Ref B												
Ref Lk B	5		0	0	0	20	0	0	0	0	0	0
Total Sites			**6**	**5**	**2**	**1**	**0**	**0**	**1**	**0**	**0**	**1**

All values represent percentages of 2009 samples higher than the CCME guidelines

** Elevated values were due to non-detect values being greater then the guideline when halved for calculations. No detectable concentrations were above guidelines at these sites.*

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

b) <0.004 = ultraoligotrophic; 0.004 - 0.010 = oligotrophic; 0.01 - 0.02 = mesotrophic; 0.02 - 0.035 = meso-eutrophic; 0.035 - 0.1 = eutrophic; >0.1 = hyper-eutrophic

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

d) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

e) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = > 180 mg/L

f) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.150 mg/L at [CaCO3] = > 180 mg/L

Table 3.2-2. Lake Water Quality, Average Factor by which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2009

Lake	Total Number of Samples Collected	CCME Guideline Value[a]:	pH 6.5-9.0	Ammonia (as N) worst case 5.86 mg/L (assumes T=0, pH = 7.5)	Nitrate (as N) 2.93 mg/L	Nitrite (as N) 0.06 mg/L	Total Phosphorus Trophic Statusb	Aluminum (Al)-Total 0.005-0.1c mg/L	Arsenic (As)-Total 0.005 mg/L	Cadmium (Cd)-Total 0.000017 mg/L	Chromium (Cr)-Total 0.001 mg/L
Doris											
Wolverine	3		-	-	-	-	Mesotrophic	-	-	-	1.1
Imniagut	1		-	-	-	-	Oligotrophic	-	-	-	-
Patch S	4		-	-	-	-	Oligotrophic	-	-	-	-
Patch N	3		-	-	-	-	Oligotrophic	-	-	-	-
P.O.	1		-	-	-	-	Oligotrophic	2.0	-	-	-
Ogama	3		-	-	-	-	Mesotrophic	1.5	-	-	-
Doris S	6		-	-	-	-	Mesotrophic to Meso-eutrophic	-	-	-	-
Doris N	4		-	-	-	-	Mesotrophic to Meso-eutrophic	-	-	-	-
Little Roberts											
Little Roberts	3		-	-	-	-	Mesotrophic to Eutrophic	-	-	-	-
Roberts											
Naiqunnguut	3		-	-	-	-	Oligotrophic	2.2	-	-	-
Windy											
Nakhaktok	3		-	-	-	-	Eutrophic	-	-	-	-
Windy	6		-	-	-	-	Ultra-oligotrophic to Oligotrophic	-	-	-	-
Glenn	5		-	-	-	-	Mesotrophic	8.0	-	-	1.2
Ref A											
Ref Lk A	5		-	-	-	-	Ultra-oligotrophic to Oligotrophic	-	-	-	-
Ref B											
Ref Lk B	5		-	-	-	-	Ultra-oligotrophic to Oligotrophic	-	-	-	-
Total Sites			**0**	**0**	**0**	**0**	**-**	**4**	**0**	**0**	**2**

All values represent the factor by which 2009 lake averages are higher than CCME guidelines

(continued)

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

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 = ultraoligotrophic; 0.004 - 0.010 = oligotrophic; 0.01 - 0.02 = mesotrophic; 0.02 - 0.035 = meso-eutrophic; 0.035 - 0.1 = eutrophic; >0.1 = hyper-eutrophic

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

d) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

e) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = > 180 mg/L

f) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.150 mg/L at [CaCO3] = > 180 mg/L

Table 3.2-2. Lake Water Quality, Average Factor by which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2009 (completed)

Lake	Total Number of Samples Collected	CCME Guideline Value[a]:	Copper (Cu)-Total 0.002-0.004[d] mg/L	Iron (Fe)-Total 0.3 mg/L	Lead (Pb)-Total 0.001-0.007[e] mg/L	Mercury (Hg)-Total 0.000026 mg/L	Molybdenum (Mo)-Total 0.073 mg/L	Nickel (Ni)-Total 0.025-0.110[f] mg/L	Selenium (Se)-Total 0.001 mg/L	Silver (Ag)-Total 0.0001 mg/L	Thallium (Ag)-Total 0.00088 mg/L	Zinc (Zn)-Total 0.03 mg/L
Doris												
Wolverine	3		-	1.1	-	-	-	-	-	-	-	-
Imniagut	1		-	-	-	-	-	-	-	-	-	-
Patch S	4		-	-	-	-	-	-	-	-	-	-
Patch N	3		-	-	-	-	-	-	-	-	-	-
P.O.	1		-	-	-	-	-	-	-	-	-	-
Ogama	3		1.1	-	-	-	-	-	-	-	-	-
Doris S	6		-	-	-	-	-	-	-	-	-	2.2
Doris N	4		-	-	-	-	-	-	-	-	-	-
Little Roberts												
Little Roberts	3		-	-	-	-	-	-	-	-	-	-
Roberts												
Naiqunnguut	3		1.3	-	-	-	-	-	-	-	-	-
Windy												
Nakhaktok	3		-	-	-	-	-	-	-	-	-	-
Windy	6		-	-	-	-	-	-	-	-	-	-
Glenn	5		1.7	1.4	-	-	-	-	-	-	-	-
Ref A												
Ref Lk A	5		-	-	-	-	-	-	-	-	-	-
Ref B												
Ref Lk B	5		-	-	-	-	-	-	-	-	-	-
Total Sites			**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**

All values represent the factor by which 2009 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

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 = ultraoligotrophic; 0.004 - 0.010 = oligotrophic; 0.01 - 0.02 = mesotrophic; 0.02 - 0.035 = meso-eutrophic; 0.035 - 0.1 = eutrophic; >0.1 = hyper-eutrophic

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

d) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

e) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = > 180 mg/L

f) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.150 mg/L at [CaCO3] = > 180 mg/L

Since differences in sampling times, locations, and methodology have such a large effect on annual averages, the sampling information for each year, presented in Table 2.13-1, should be taken into consideration when reviewing annual lake water quality data presented in Figures 3.2-2a to 3.2-2u.

Average concentrations of aluminum were naturally higher than the CCME guideline of 0.1 mg/L in P.O., Ogama, and Glenn lakes during the years for which data are available. In some lakes, levels of chromium and arsenic were highest in samples collected from1995 to1996, and declined in subsequent years. Historical levels of molybdenum tended to be higher in the Windy Watershed than in the Doris Watershed.

3.2.7 Lake Water Quality Summary

Lakes in the study area were neutral to slightly basic (with pH ranging from 6.9 to 8.3) and contained variable concentrations of metals and nutrients. Water column parameters did not vary significantly with depth, as most lakes were shallow and well-mixed to weakly stratified. Seasonal water quality trends were apparent in some lakes, with winter concentrations of certain parameters greatly exceeding summer levels. This trend was particularly evident for TDS, TOC, sulphate, total phosphorus, ammonia, nitrate, and several metals (e.g., chromium, copper, iron, and lead).

Nitrate concentrations ranged from below detection in several lakes to 0.177 mg/L in Ogama Lake. Lakes within the Doris and Little Roberts watersheds contained the highest nitrate levels. Concentrations of nitrite were generally below analytical detection limits. Ammonia concentrations ranged from below detection in several lakes to 0.133 mg/L in Wolverine Lake. The highest concentrations of ammonia were measured in Wolverine and Nakhaktok lakes, which are the lakes located furthest upstream in the Doris and Windy watersheds, respectively.

Total phosphorus concentrations ranged from 0.002 mg/L at Ref Lk B to 0.095 mg/L at Nakhaktok Lake. Based on CCME's recommended trigger ranges for total phosphorus, Windy Lake and Reference Lakes A and B would be categorized as ultra-oligotrophic to oligotrophic (depending on the season), Imniagut, Patch N and S, P.O., and Naiqunnguut lakes would be categorized as oligotrophic, while at the other extreme, Little Roberts Lake (during winter only) and Nakhaktok Lake would be considered eutrophic systems. Doris Lake N and S ranged from mesotrophic to meso-eutrophic depending on the season.

Glenn Lake (in the Windy Watershed) tended to contain the highest average aluminum, copper, iron, and molybdenum concentrations, and the Windy Watershed as a whole had higher molybdenum levels than the other watersheds. Nickel concentrations in Imniagut Lake were markedly higher than other lakes, while zinc levels in Doris S also tended to be higher than other lakes. Average metal concentrations in lakes were generally below CCME guidelines, with the following exceptions: aluminum in P.O., Ogama, Naiqunnguut, and Glenn lakes; chromium in Wolverine and Glenn lakes; copper in Ogama, Naiqunnguut, and Glenn lakes; iron in Wolverine and Glenn lakes; and zinc in Doris Lake South. These elevated concentrations occur naturally within study area lakes.

The 2009 sampling program supplemented the historical water quality database and provided low-detection limit data for an expanded number of lakes.

3.3 STREAM WATER QUALITY

Stream and river water quality samples were collected four times in 2009: May (under ice; Koignuk River only), June (freshet), August, and September. Historical data collected between 1996 and 2009 are also available from some streams in the study area (Figure 2.13-1). Stream water quality data collected in 2009 are presented graphically in Figures 3.3-1a to 3.3-1p, and annual historical stream water quality data are presented in Figures 3.3-2a to3.3-2t.

The 2009 stream water quality program focused on characterizing the potential natural variation in stream water quality with time (between May and September) and geographical location. A total of 14 sites within 12 streams and rivers were sampled during 2009. Samples were obtained from streams within a number of different watersheds. One reference river (Angimajuq River) and two reference streams (the outflows of the Reference lakes) were included in the sampling program. All raw stream water quality data for 2009 are provided in Appendix 3.3-1.

Table 2.1-5 presents the stream water quality sample collection dates for the 2009 sampling program. Methodological details of data collected in previous years, including sample collection timing and replication, are presented in Table 2.13-2.

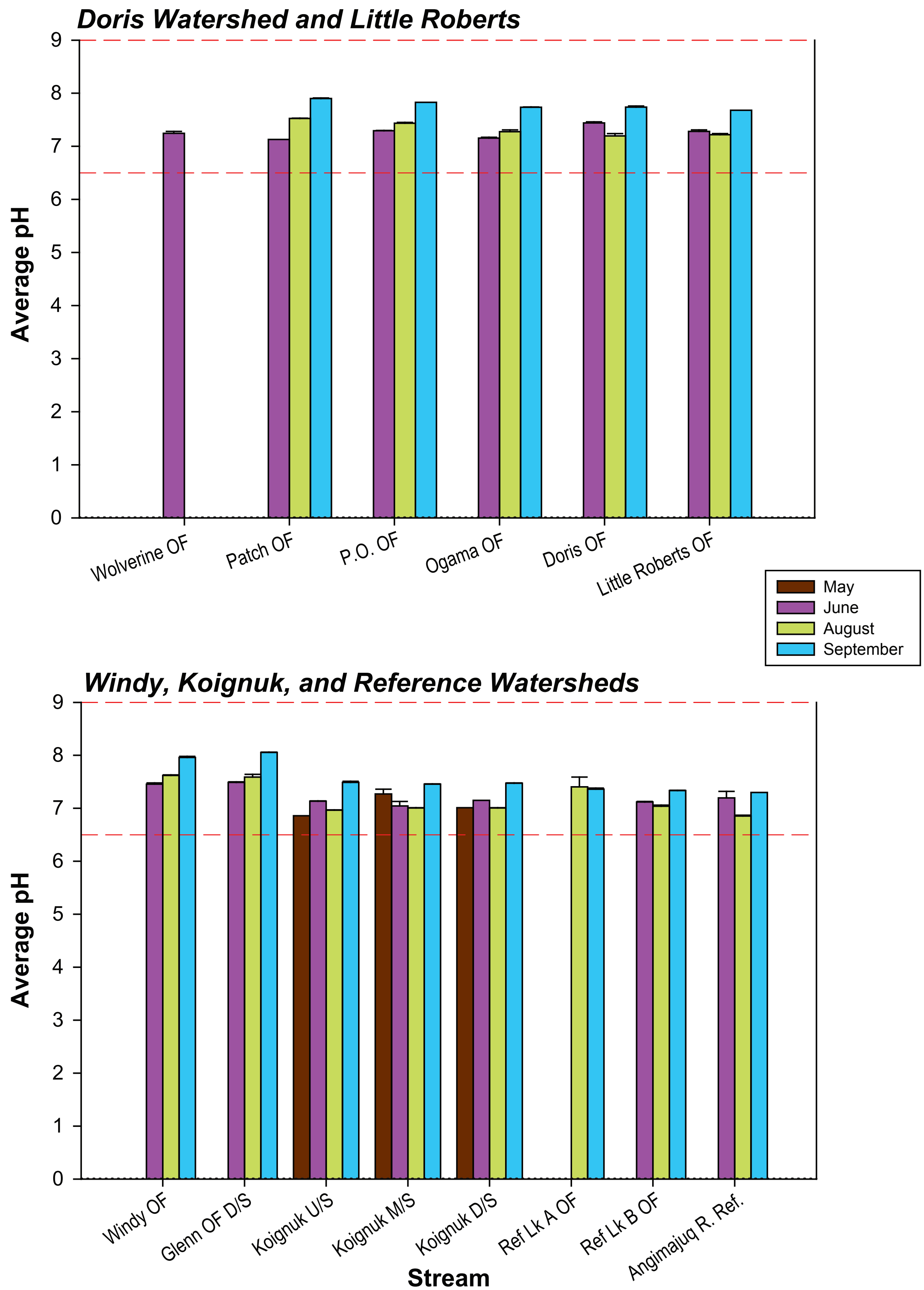
All water quality samples collected were compared to CCME guidelines for the protection of freshwater aquatic life (CCME 2007).

3.3.1 Seasonal Variation

During the winter, concentrations of many nutrients and metals are expected to be high due to natural processes, including solute exclusion resulting from ice formation, changes in redox chemistry, and decreased biological uptake. During the freshet in June, snow and ice melt flows into streams and rivers, and the effect on water quality can be variable. A freshet can transport allochthonous materials into downstream waterbodies, particularly if the elevated discharge flows through a highly erodible watershed. This could result in increased concentrations of 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.

The only river sites sampled in winter (May) were the three Koignuk River sites: upstream (U/S), midstream (M/S), and downstream (D/S). Streams in the area completely freeze during the winter months. The Koignuk River under-ice samples had low turbidity but high TDS and TOC concentrations compared to summer levels. Concentrations of nitrate, sulphate, and copper were also substantially higher in winter than in summer at all three sites along the Koignuk River. Nitrate levels in the Koignuk peaked in winter, ranging from 0.30 to 0.46 mg/L, then declined to approximately 0.014 mg/L during the freshet, and finally dropped to below detection limits in the summer. At two of the three sites in the Koignuk River, winter concentrations of ammonia, chromium, molybdenum, nickel, and zinc were elevated relative to summer levels. At the midstream Koignuk site, lead levels were also highest in winter.

Concentrations of ammonia and nitrate were generally below analytical detection limits in study area streams and rivers. However, most detectable concentrations tended to occur in May or June, while most undetectable concentrations tended to occur in August or September (e.g., ammonia was below detection in 23% of May and June samples compared to 94% of August and September samples). If values of half the detection limit are substituted for samples that are below detection limits, the average concentrations of nitrate and ammonia would both follow the trend: winter > freshet > summer.



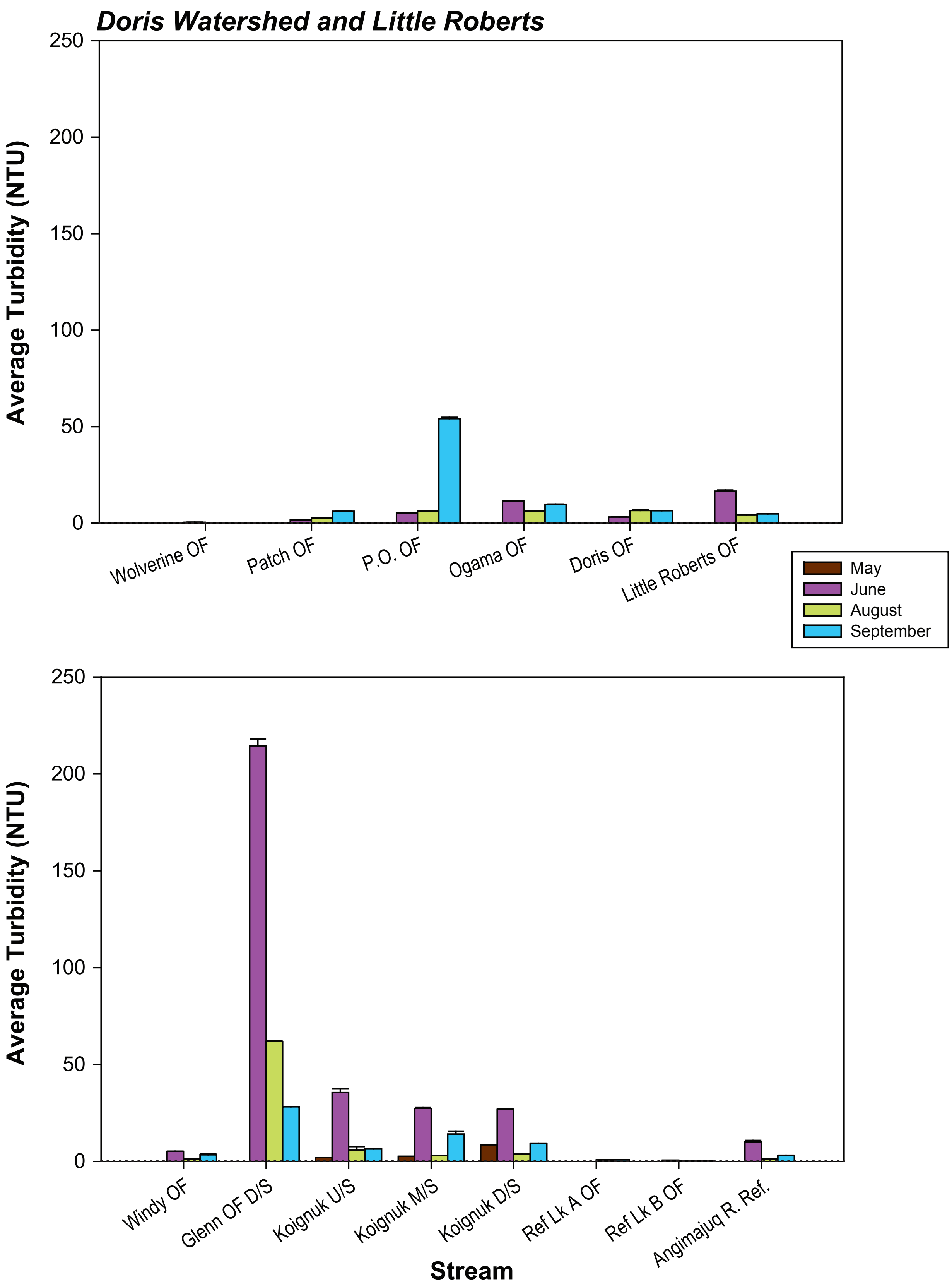
Notes: Error bars represent standard error of the mean
Dashed line represents CCME guideline (6.5 and 9)
Dotted line represents analytical detection limit (pH 0.01)

NEWMONT NORTH AMERICA

Average pH, Hope Bay Streams, 2009

Figure 3.3-1a

Rescan Engineers & Scientists



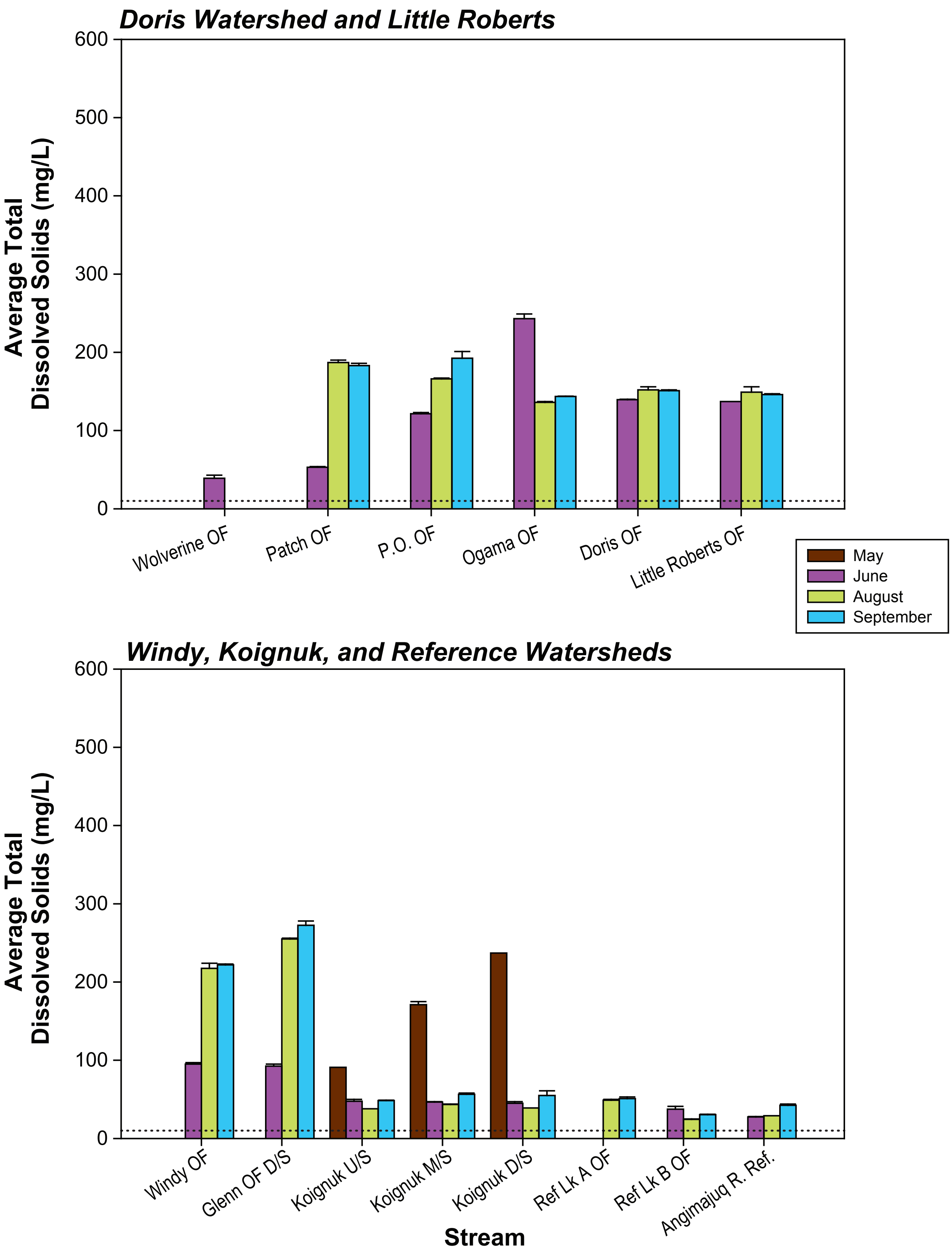
Notes: Error bars represent standard error of the mean
Dotted line represents analytical detection limit (0.1 NTU)

Figure 3.3-1b

Average Turbidity, Hope Bay Streams, 2009

NEWMONT NORTH AMERICA

Rescan Engineers & Scientists



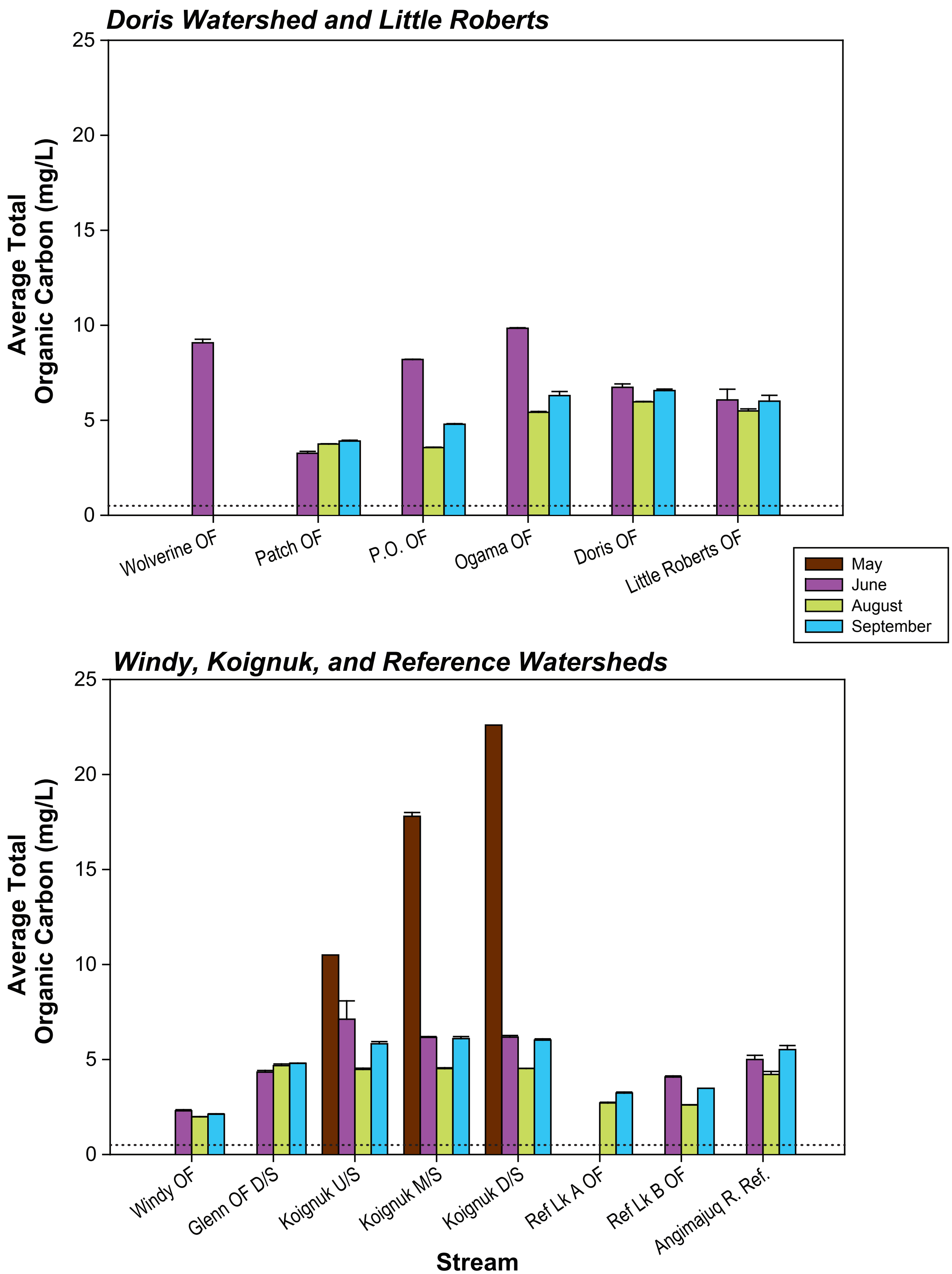
Notes: Error bars represent standard error of the mean
Dotted line represents analytical detection limit (10 mg/L)

Average Total Dissolved Solids, Hope Bay Streams, 2009

Figure 3.3-1c

NEWMONT NORTH AMERICA

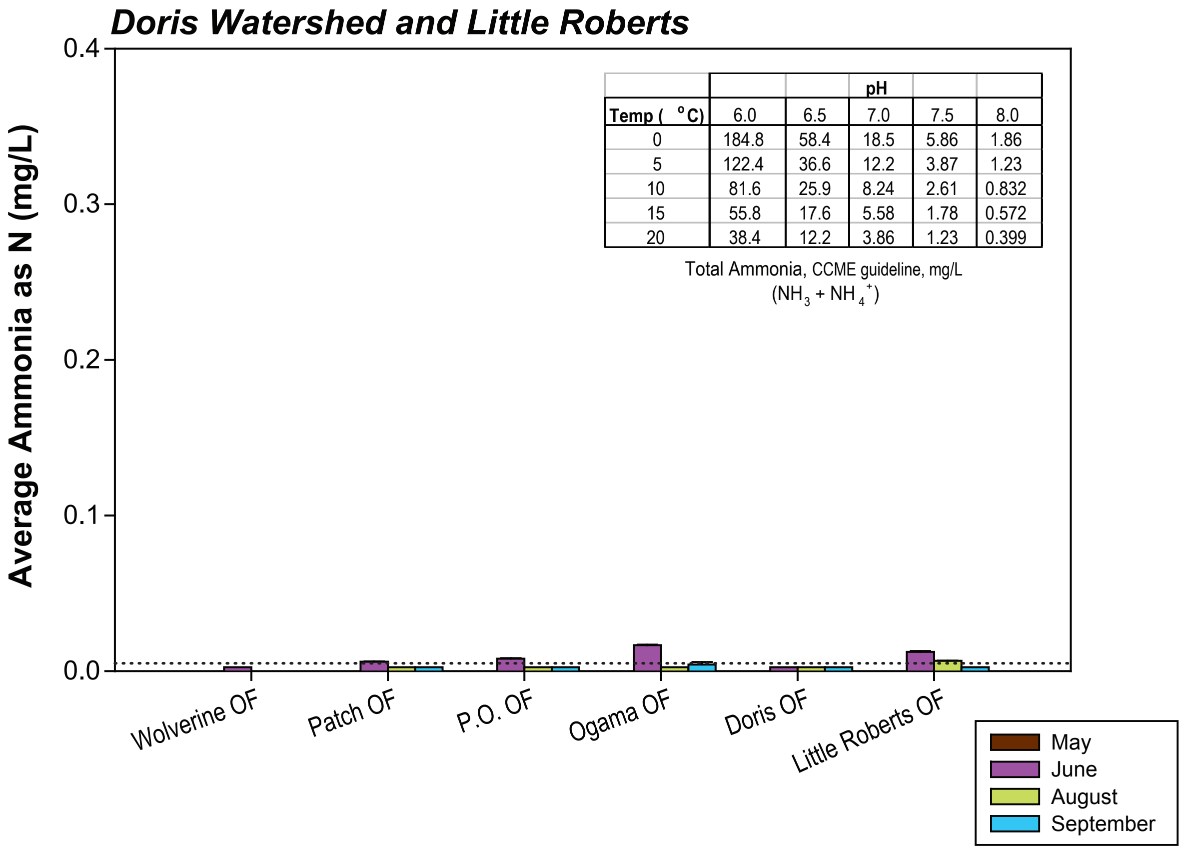
Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean
Dotted line represents analytical detection limit (0.5 mg/L)

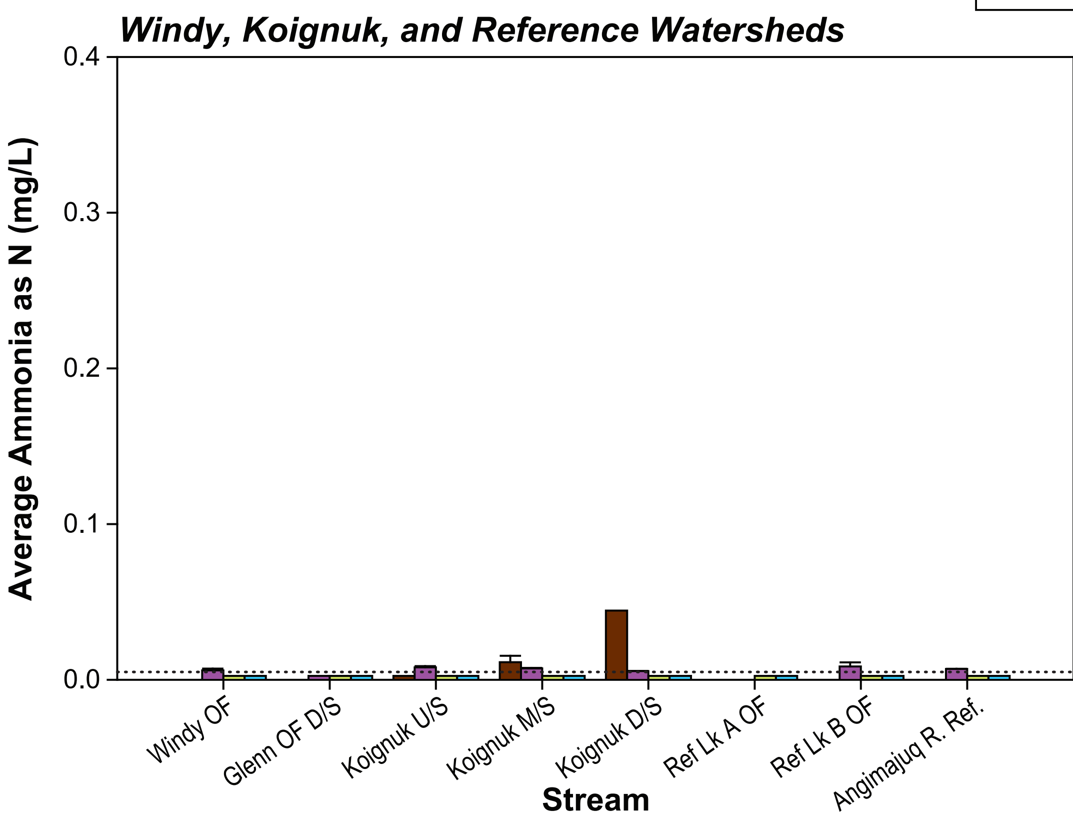
Figure 3.3-1d

Average Total Organic Carbon, Hope Bay Streams, 2009



	pH				
Temp (°C)	6.0	6.5	7.0	7.5	8.0
0	184.8	58.4	18.5	5.86	1.86
5	122.4	36.6	12.2	3.87	1.23
10	81.6	25.9	8.24	2.61	0.832
15	55.8	17.6	5.58	1.78	0.572
20	38.4	12.2	3.86	1.23	0.399

Total Ammonia, CCME guideline, mg/L
($NH_3 + NH_4^+$)



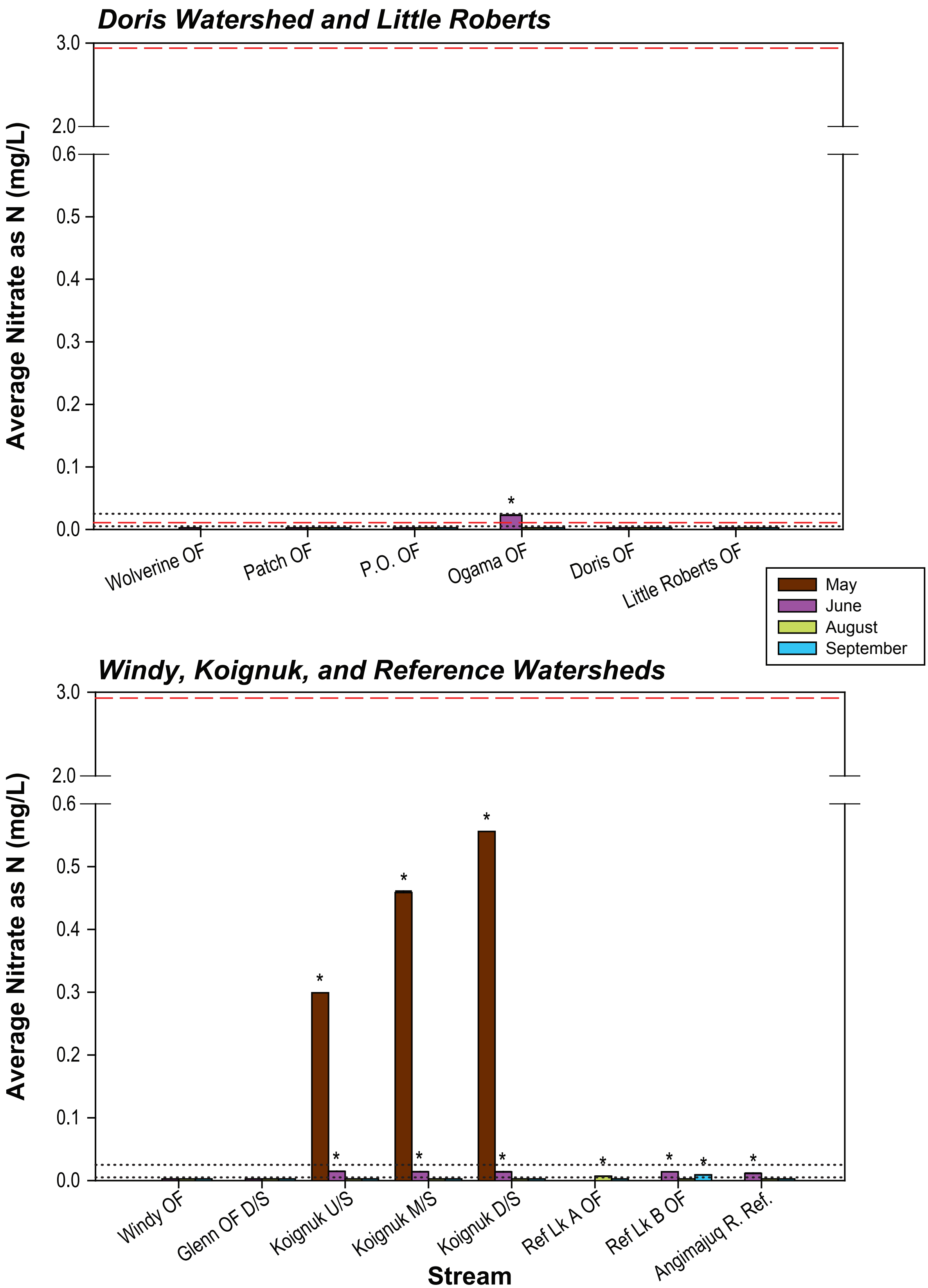
Notes: Error bars represent standard error of the mean
CCME guidelines are temperature and pH dependent
Dotted line represents analytical detection limit (0.005 mg/L)

Figure 3.3-1e

Average Ammonia, Hope Bay Streams, 2009

NEWMONT NORTH AMERICA

Rescan Engineers & Scientists



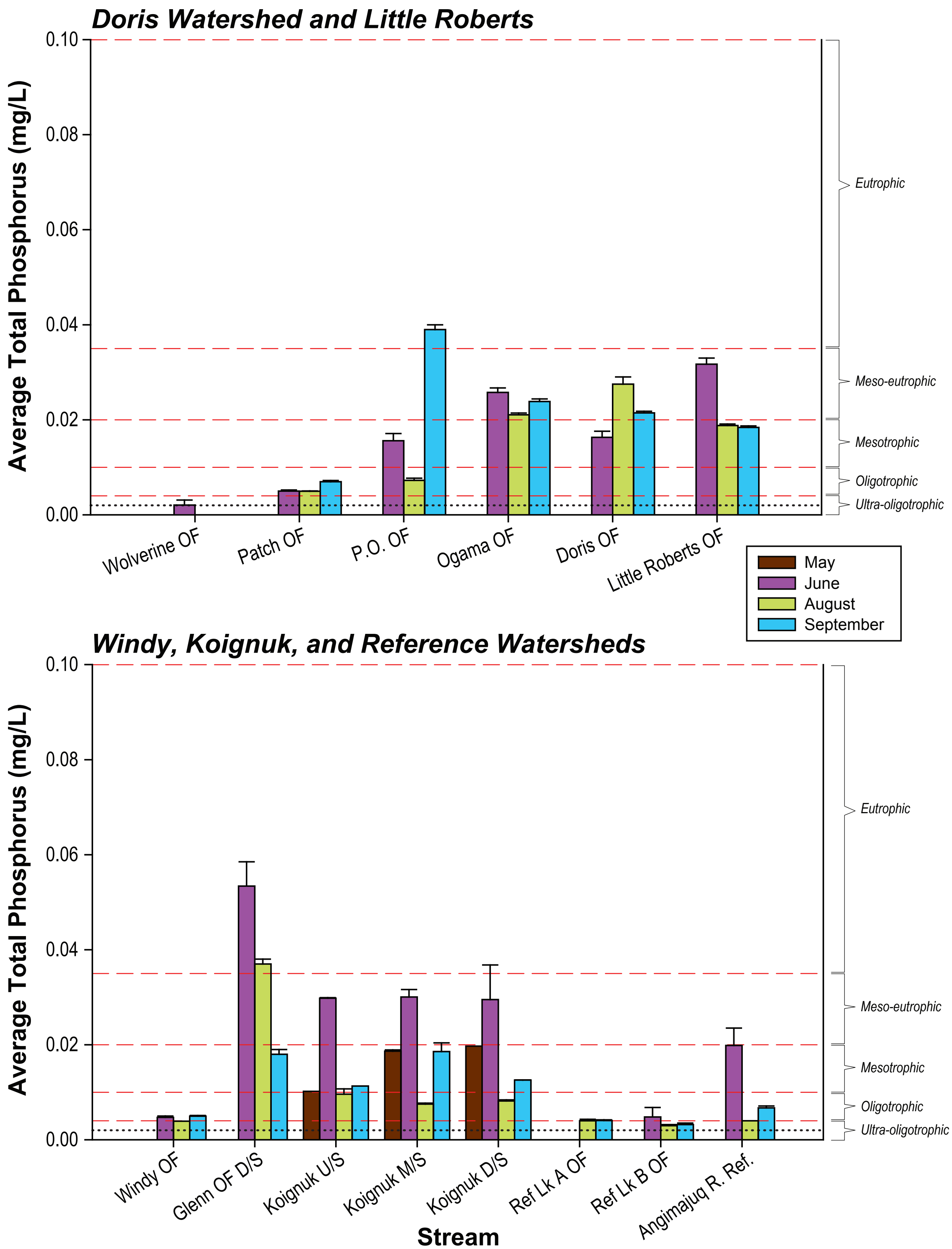
Notes: Error bars represent standard error of the mean
** Samples with nitrate detected, all other samples were below detection limits*
CCME guideline = 2.93 mg/L N
Dotted line represents analytical detection limit (0.005 - 0.025 mg/L)

NEWMONT NORTH AMERICA

Average Nitrate, Hope Bay Streams, 2009

Figure 3.3-1f

Rescan Engineers & Scientists



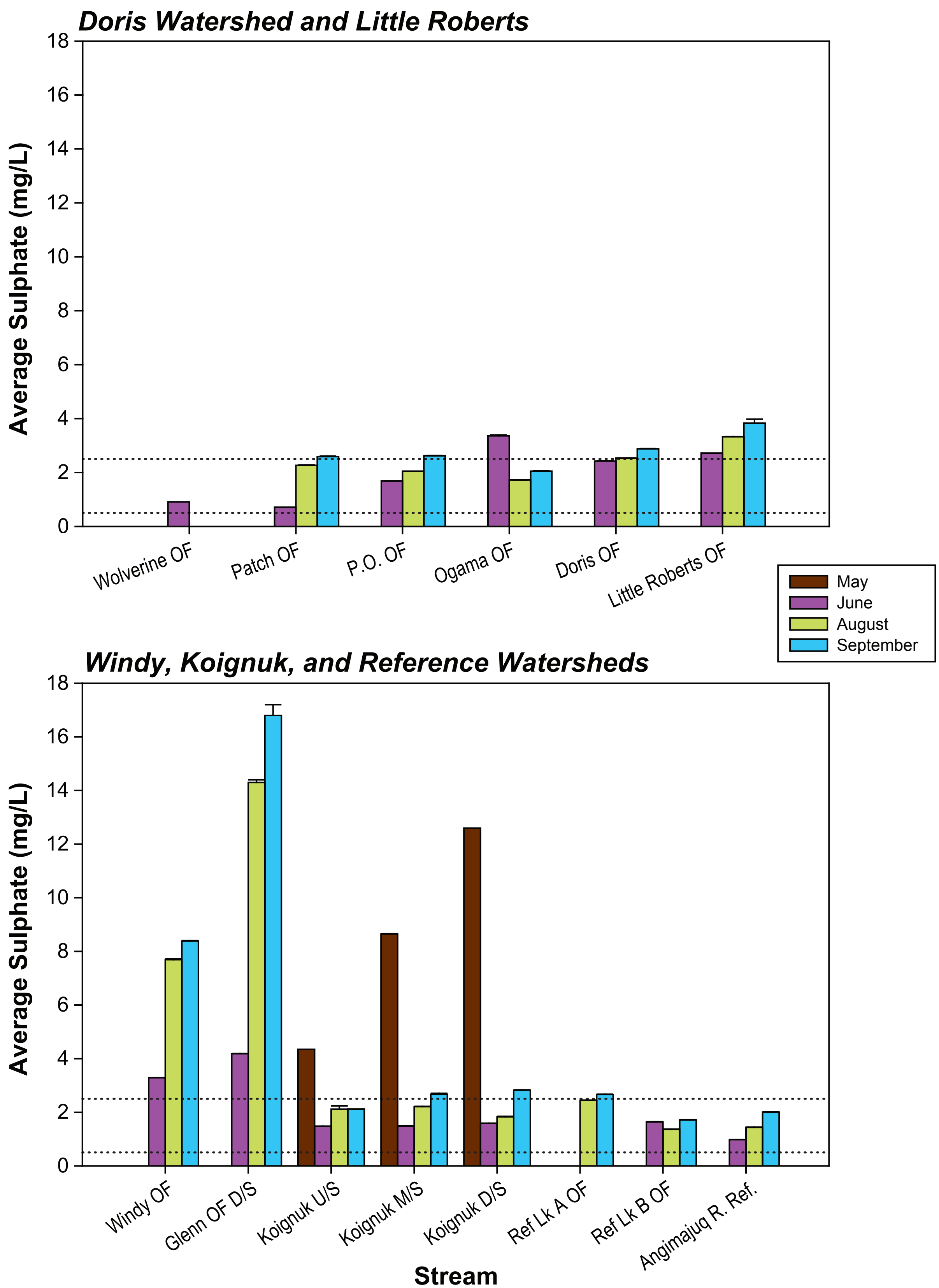
Notes: Error bars represent standard error of the mean
Dashed line represents CCME guideline (<0.004 = ultraoligotrophic;
0.004 - 0.010 = oligotrophic; 0.01 - 0.02 = mesotrophic; 0.02 - 0.035 = meso-eutrophic;
0.035 - 0.1 = eutrophic; >0.1 = hyper-eutrophic)
Dotted line represents analytical detection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

NEWMONT NORTH AMERICA

Average Total Phosphorus, Hope Bay Streams, 2009

Figure 3.3-1g

Rescan Engineers & Scientists



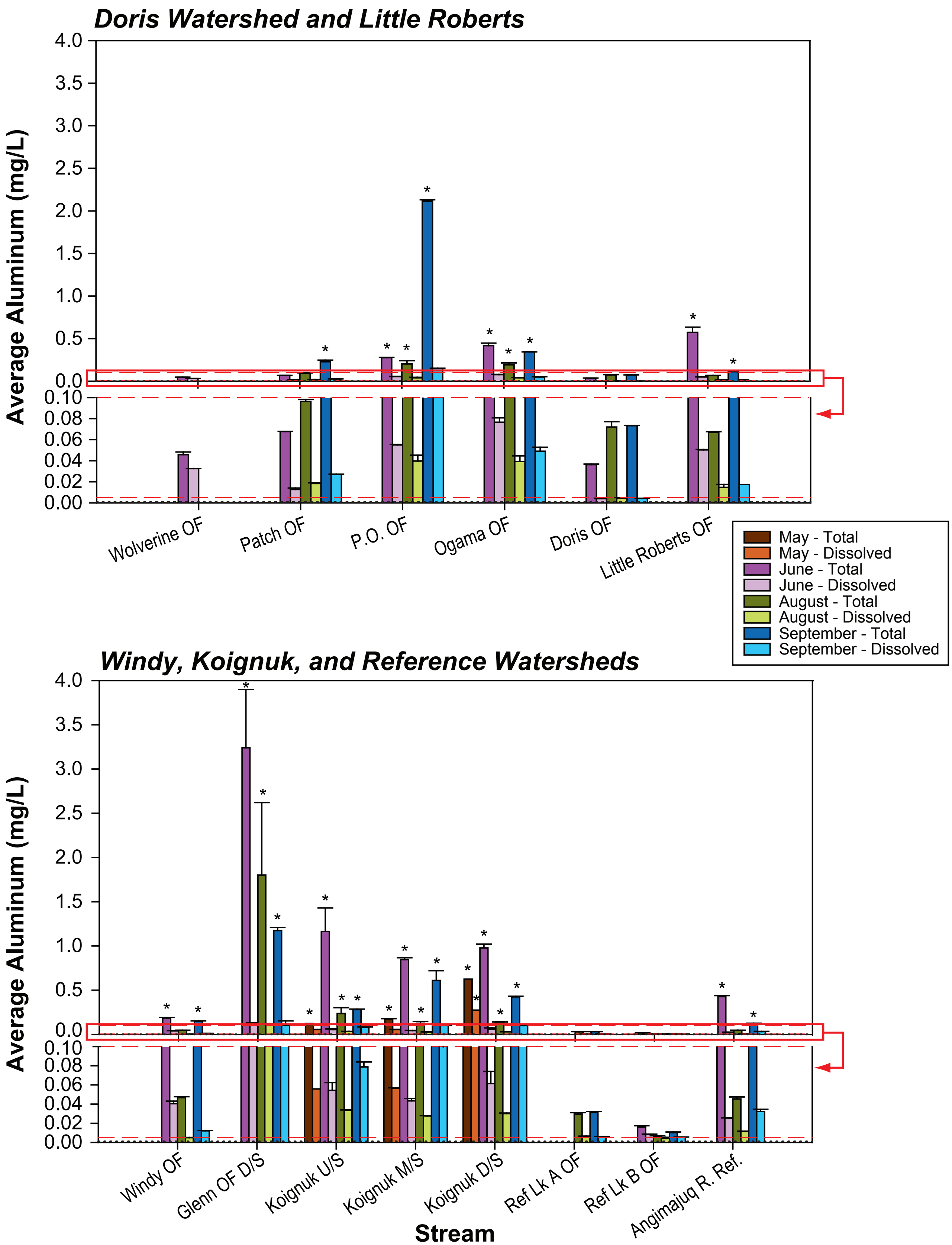
Notes: Error bars represent standard error of the mean
Dotted line represents analytical detection limit (0.5 - 2.5 mg/L)
None of the samples were below detection limits

NEWMONT NORTH AMERICA

Average Sulphate, Hope Bay Streams, 2009

Figure 3.3-1h

Rescan Engineers & Scientists



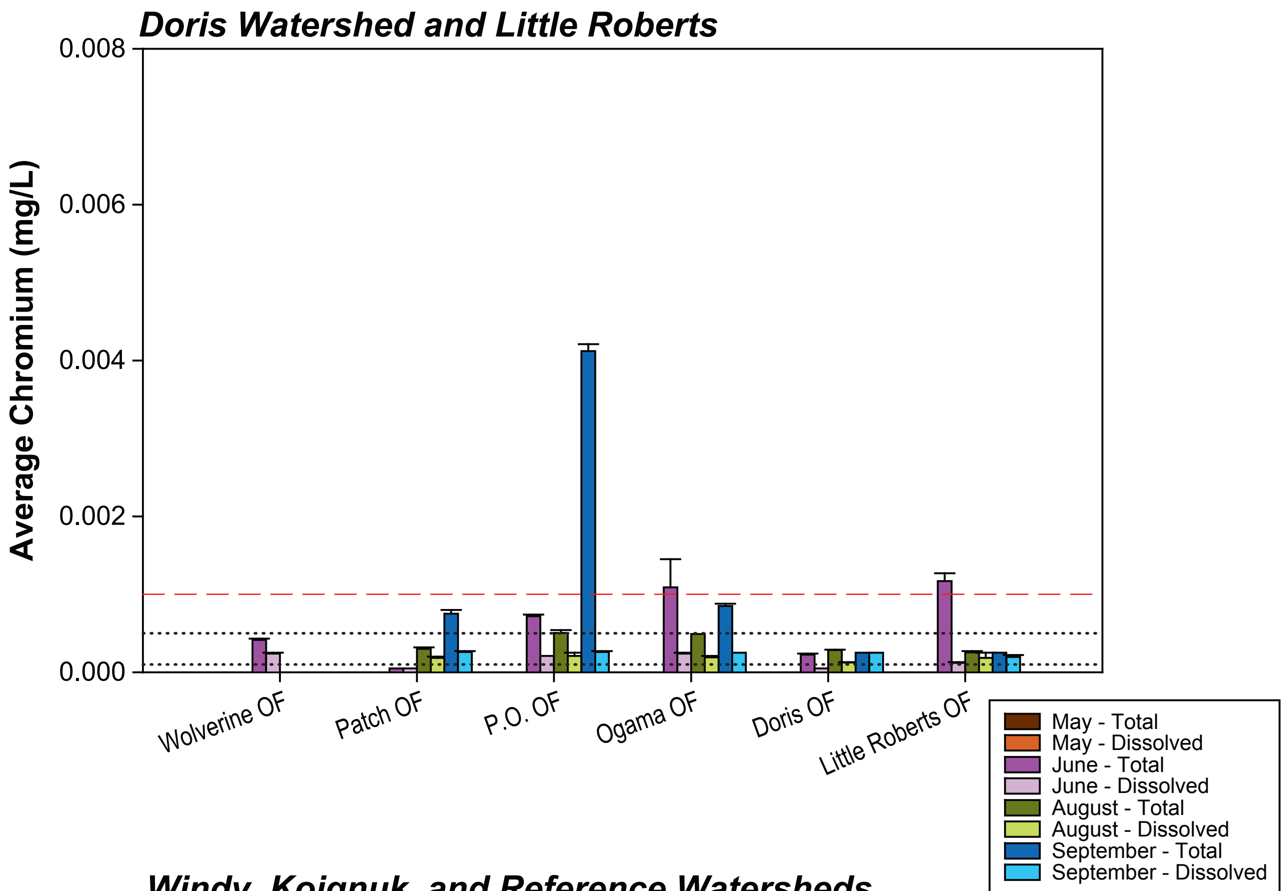
Notes: Error bars represent standard error of the mean
Red dashed line represents CCME guideline and is pH dependent: 0.005 mg/L (at pH lessthan 6.5) or 0.1 mg/L (at pH greater than or equal to 6.5);
** Indicated values that are higher than their sample guideline.*
Dotted line represents analytical detection limit (0.001 mg/L)

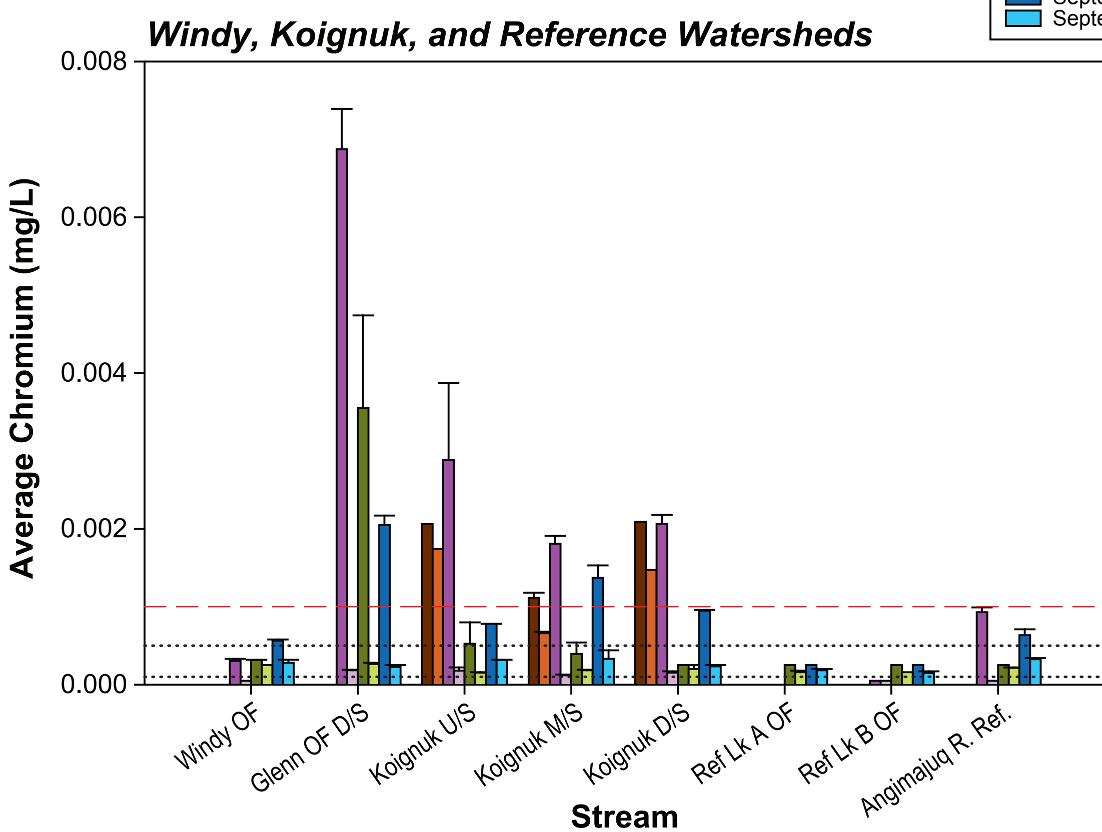
NEWMONT NORTH AMERICA

Average Aluminum, Hope Bay Streams, 2009

Figure 3.3-1i

Rescan Engineers & Scientists





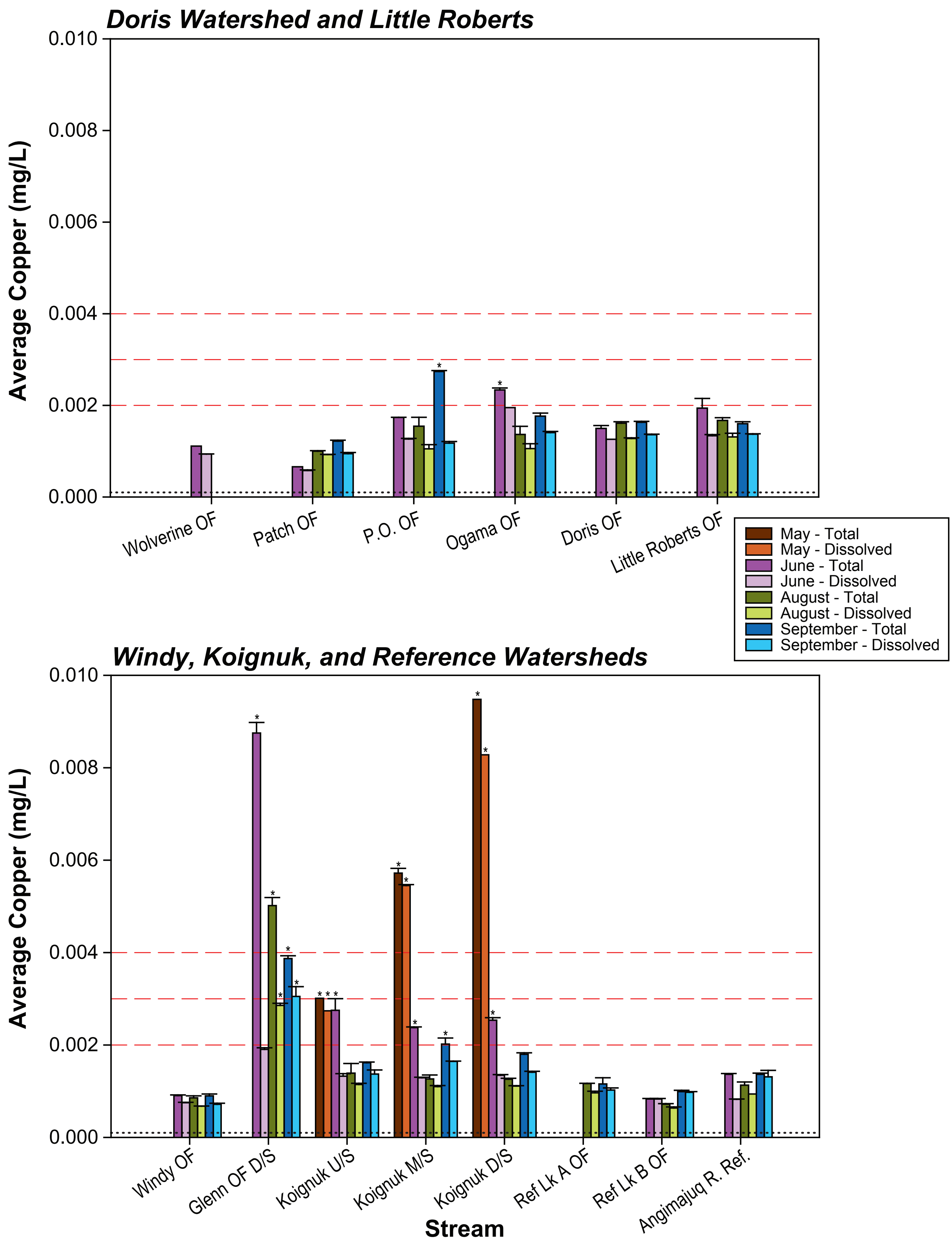
Notes: Error bars represent standard error of the mean
Red dashed line represents CCME guideline (0.001 mg/L)
Dotted line represents analytical detection limit (0.0001 - 0.00050 mg/L)

NEWMONT NORTH AMERICA

Average Chromium, Hope Bay Streams, 2009

Figure 3.3-1j

Rescan Engineers & Scientists



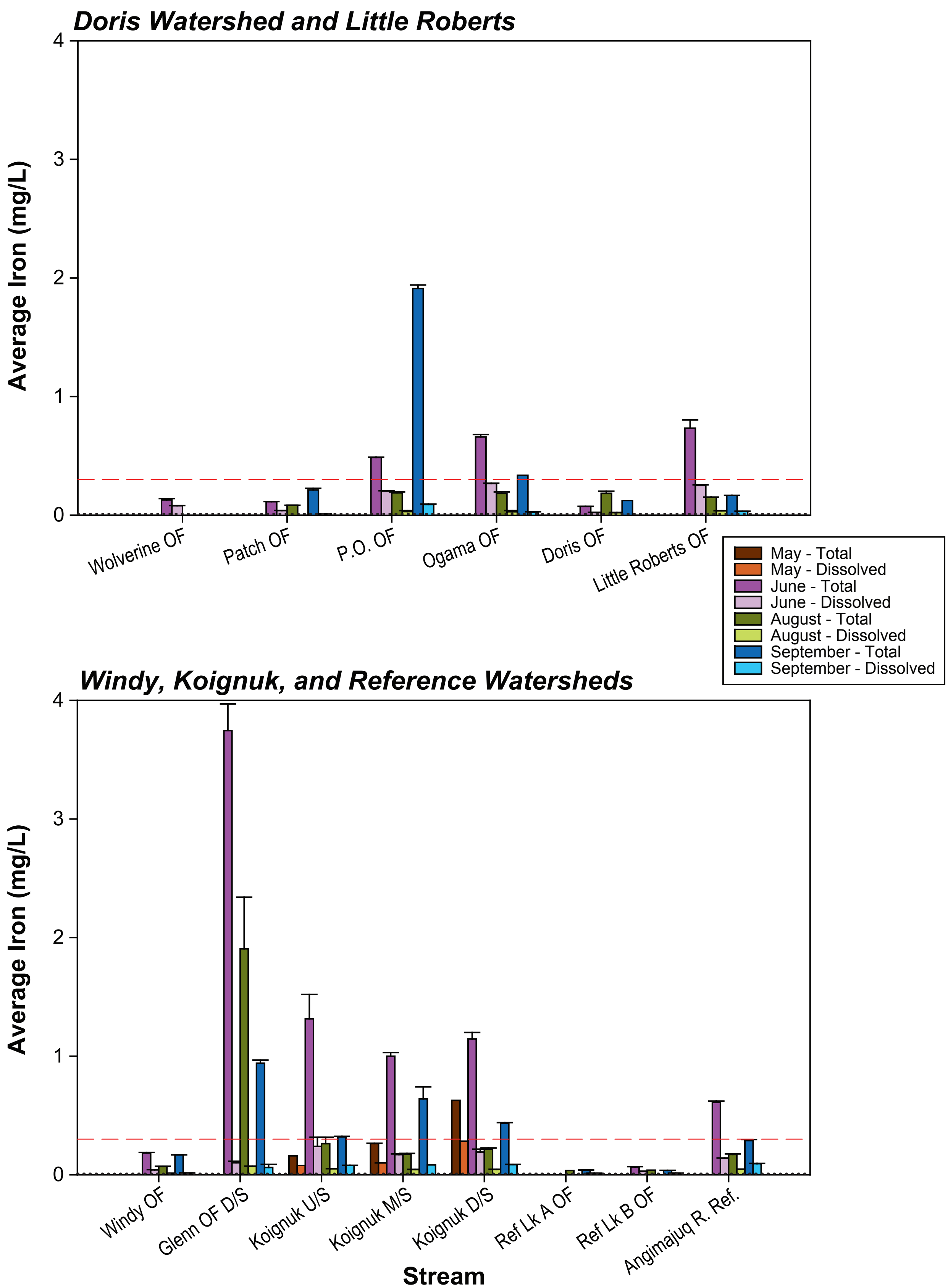
Notes: Error bars represent standard error of the mean
Red dashed line represents CCME guideline (0.002 mg/L at [$CaCO_3$] = 0-120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.004 mg/L at [$CaCO_3$] = >180 mg/L). All [$CaC0_3$] were < 180 mg/L.
** Indicated values that are higher than their sample guideline.*
Dotted line represents analytical detection limit (0.0001 mg/L)

NEWMONT NORTH AMERICA

Average Copper, Hope Bay Streams, 2009

Figure 3.3-1k

Rescan Engineers & Scientists



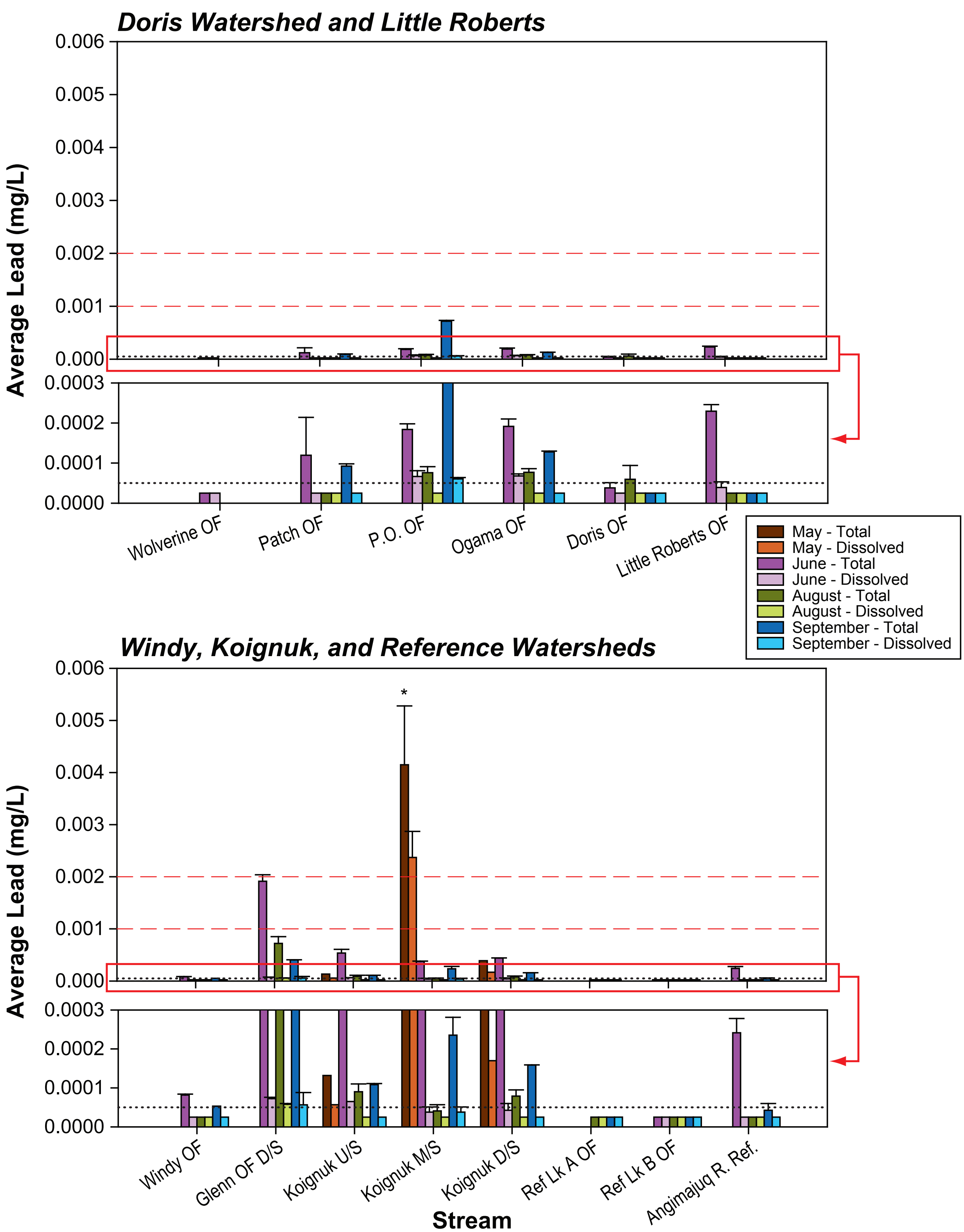
Notes: Error bars represent standard error of the mean
Red dashed line represents CCME guideline (0.3 mg/L)
Dotted line represents analytical detection limit (0.01 mg/L)

Figure 3.3-1l

Average Iron, Hope Bay Streams, 2009

NEWMONT NORTH AMERICA

Rescan Engineers & Scientists



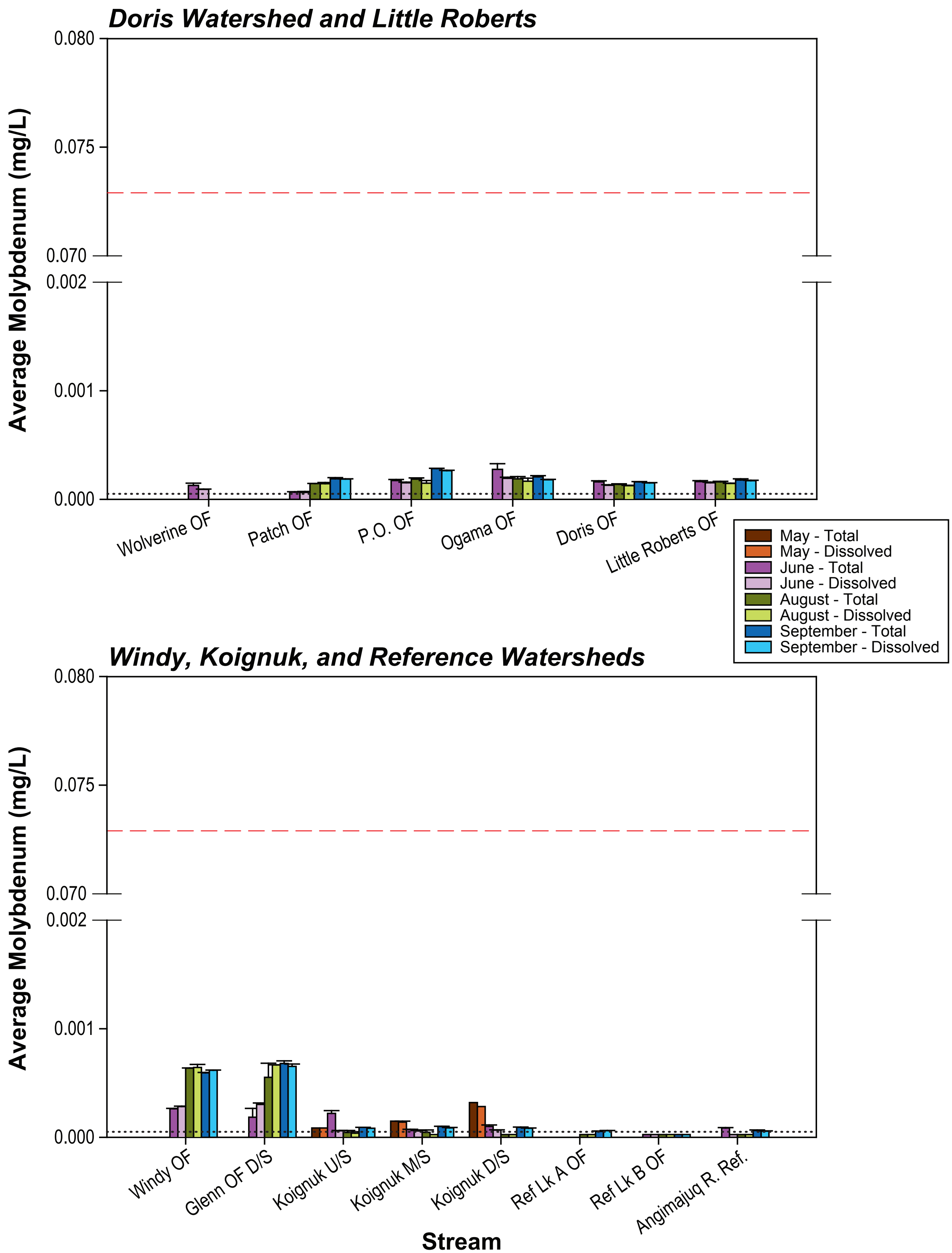
Notes: Error bars represent standard error of the mean
Red dashed line represents CCME guideline (0.001 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60-120 mg/L; 0.004 mg/L at [$CaCO_3$] = 120-180 mg/L; 0.007 mg/L at [$CaCO_3$] = > 180 mg/L). All [$CaCO_3$] were < 180 mg/L);
* Indicates values that are higher than their hardness-specific guideline.
Dotted line represents analytical detection limit (0.00005 mg/L)

NEWMONT NORTH AMERICA

Figure 3.3-1m

Average Lead, Hope Bay Streams, 2009

Rescan Engineers & Scientists



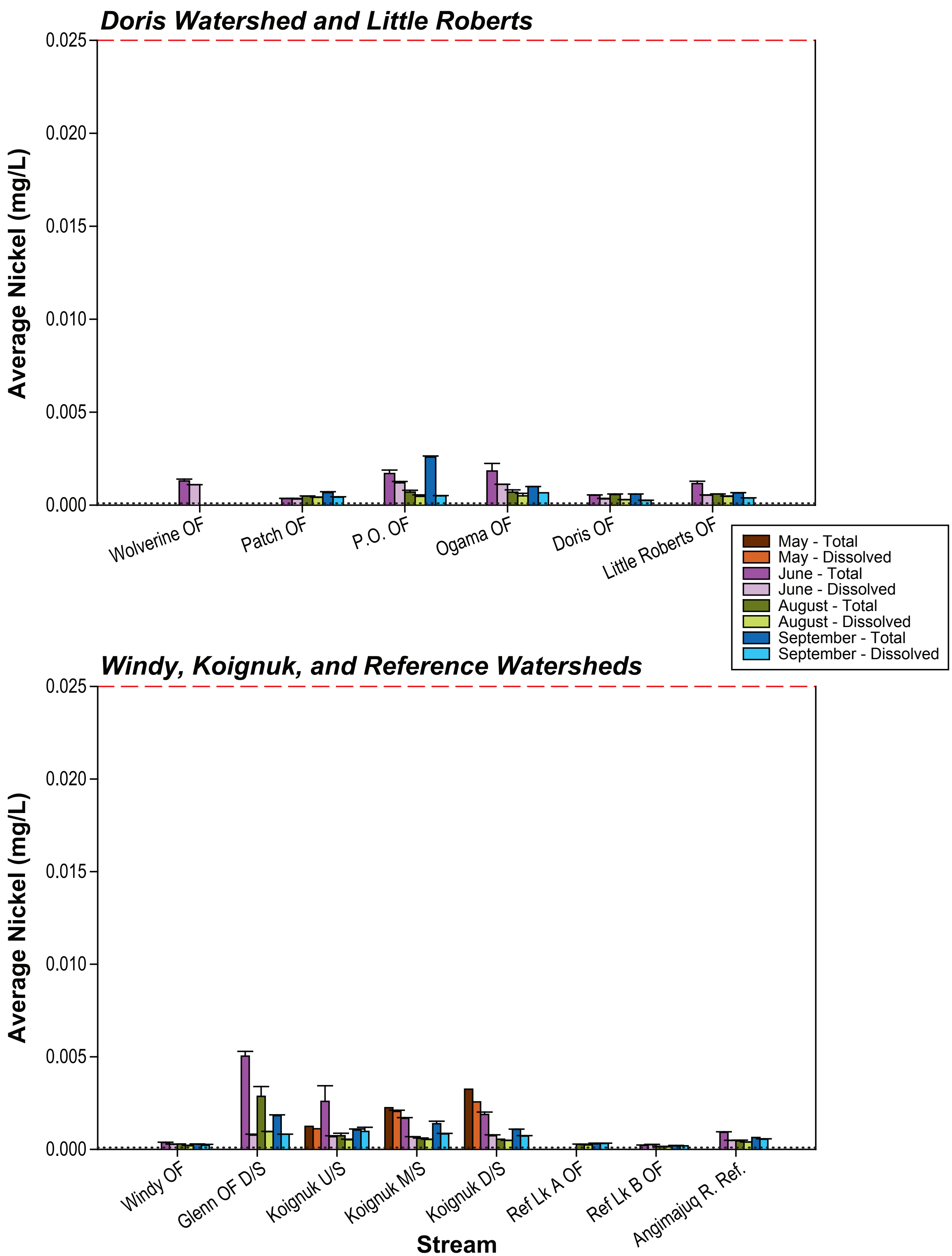
Notes: Error bars represent standard error of the mean
CCME guideline = 0.073 mg/L.
Dotted line represents analytical detection limit (0.00005 mg/L)

NEWMONT NORTH AMERICA

Average Molybdenum, Hope Bay Streams, 2009

Figure 3.3-1n

Rescan Engineers & Scientists



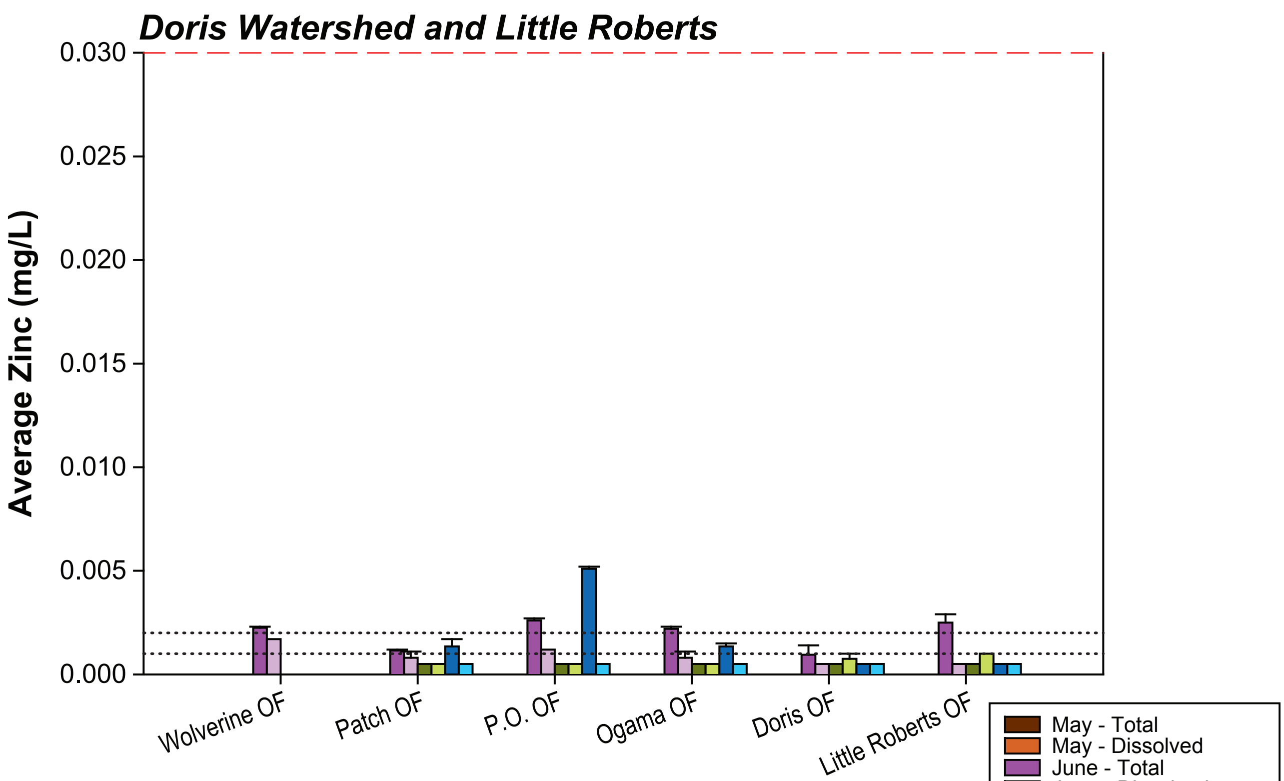
Notes: Error bars represent standard error of the mean
CCME guideline (0.025 mg/L at [$CaCO_3$] = 0-60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60-120 mg/L; 0.110 mg/L at [$CaCO_3$] = > 180 mg/L).
Dotted line represents analytical detection limit (0.0001 mg/L)

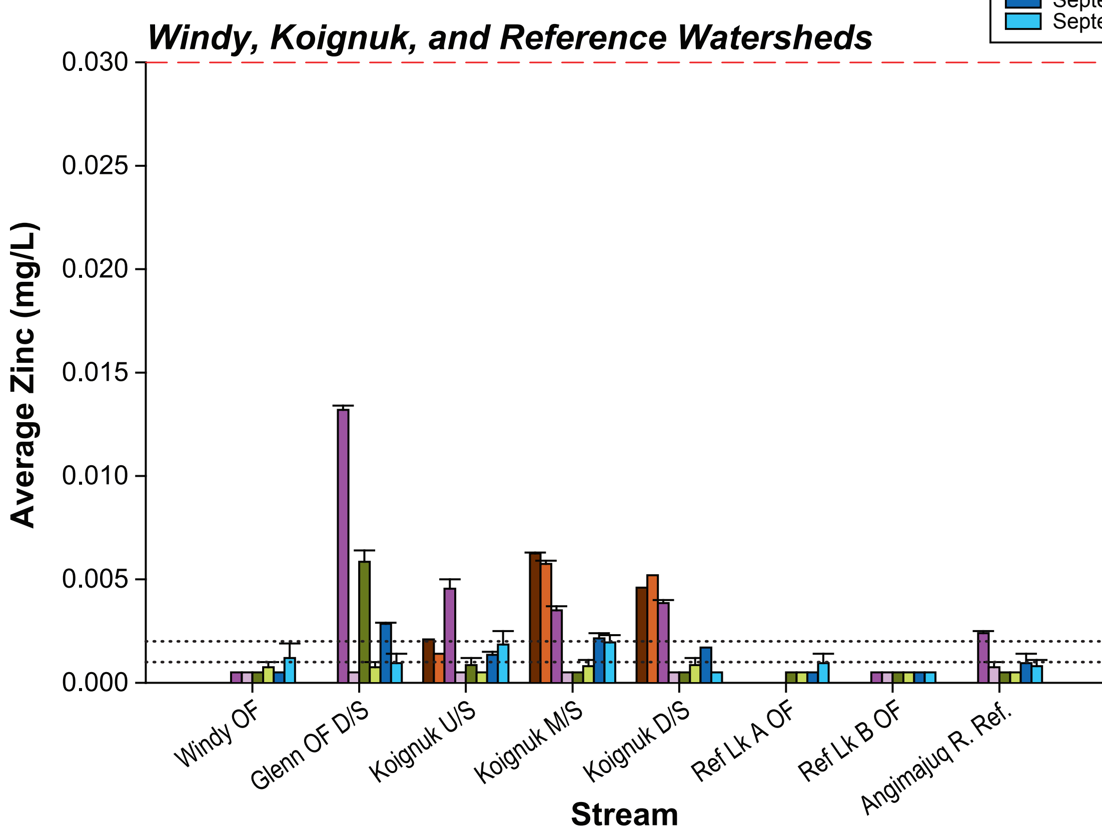
NEWMONT NORTH AMERICA

Average Nickel, Hope Bay Streams, 2009

Figure 3.3-1o

Rescan Engineers & Scientists





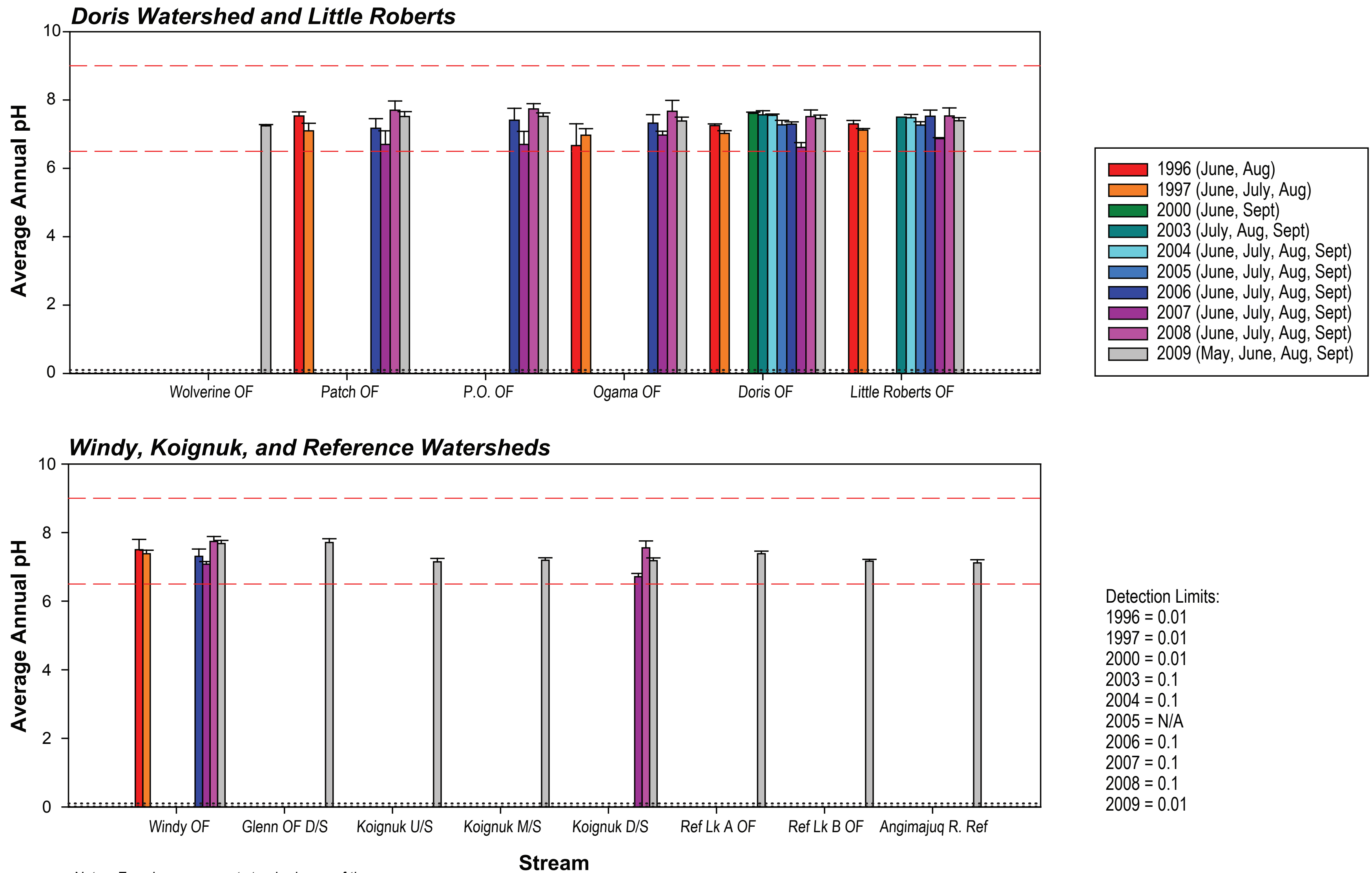
Notes: Error bars represent standard error of the mean
CCME guideline = 0.03 mg/L.
Dotted line represents analytical detection limit (0.001 - 0.002 mg/L)

NEWMONT NORTH AMERICA

Average Zinc, Hope Bay Streams, 2009

Figure 3.3-1p

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (6.5 and 9).
Dotted lines represent detection limits.

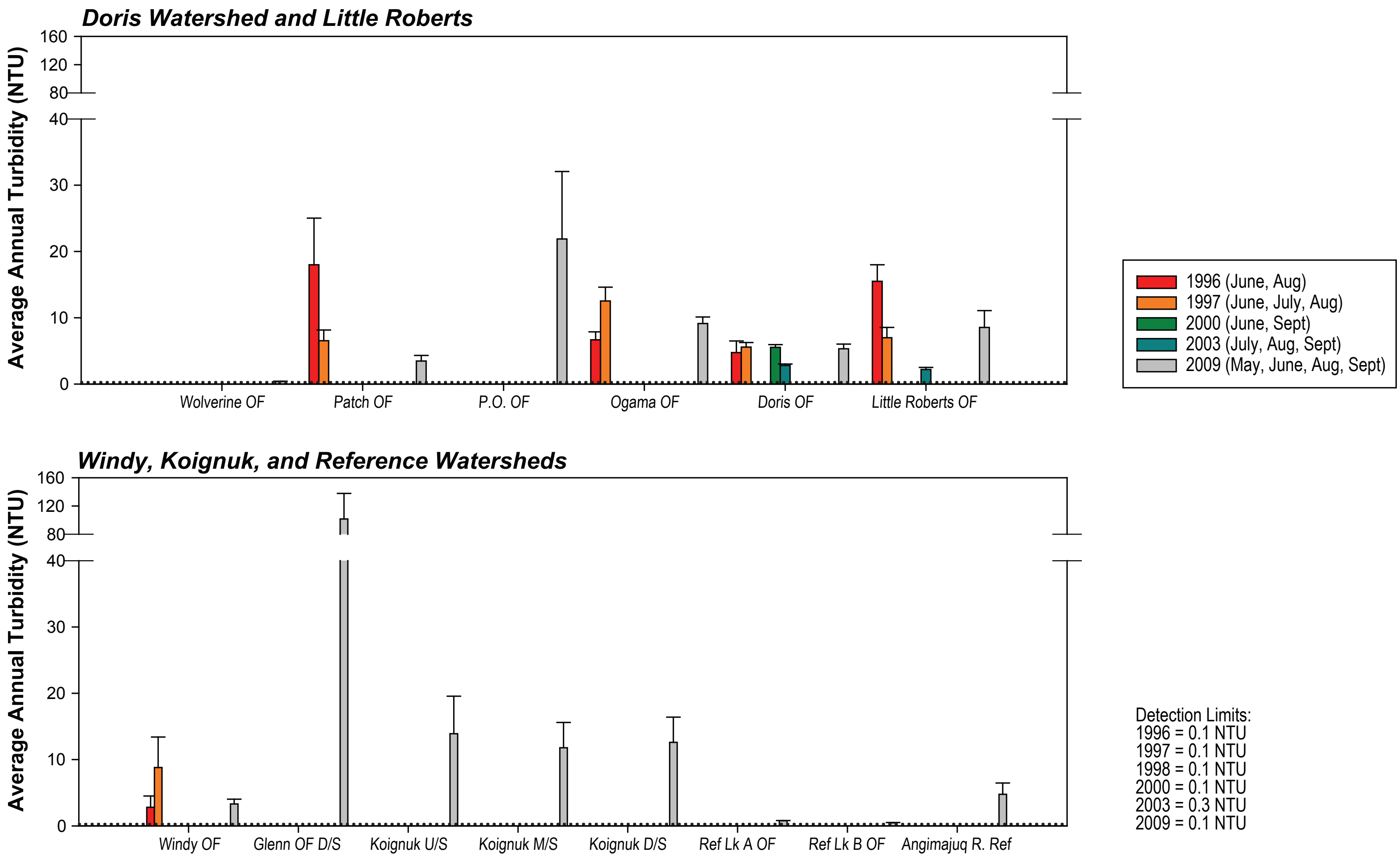
Figure 3.3-2a

NEWMONT NORTH AMERICA

Average Annual pH, Hope Bay Streams, 1996 to 2009

Figure 3.3-2a

Rescan Engineers & Scientists



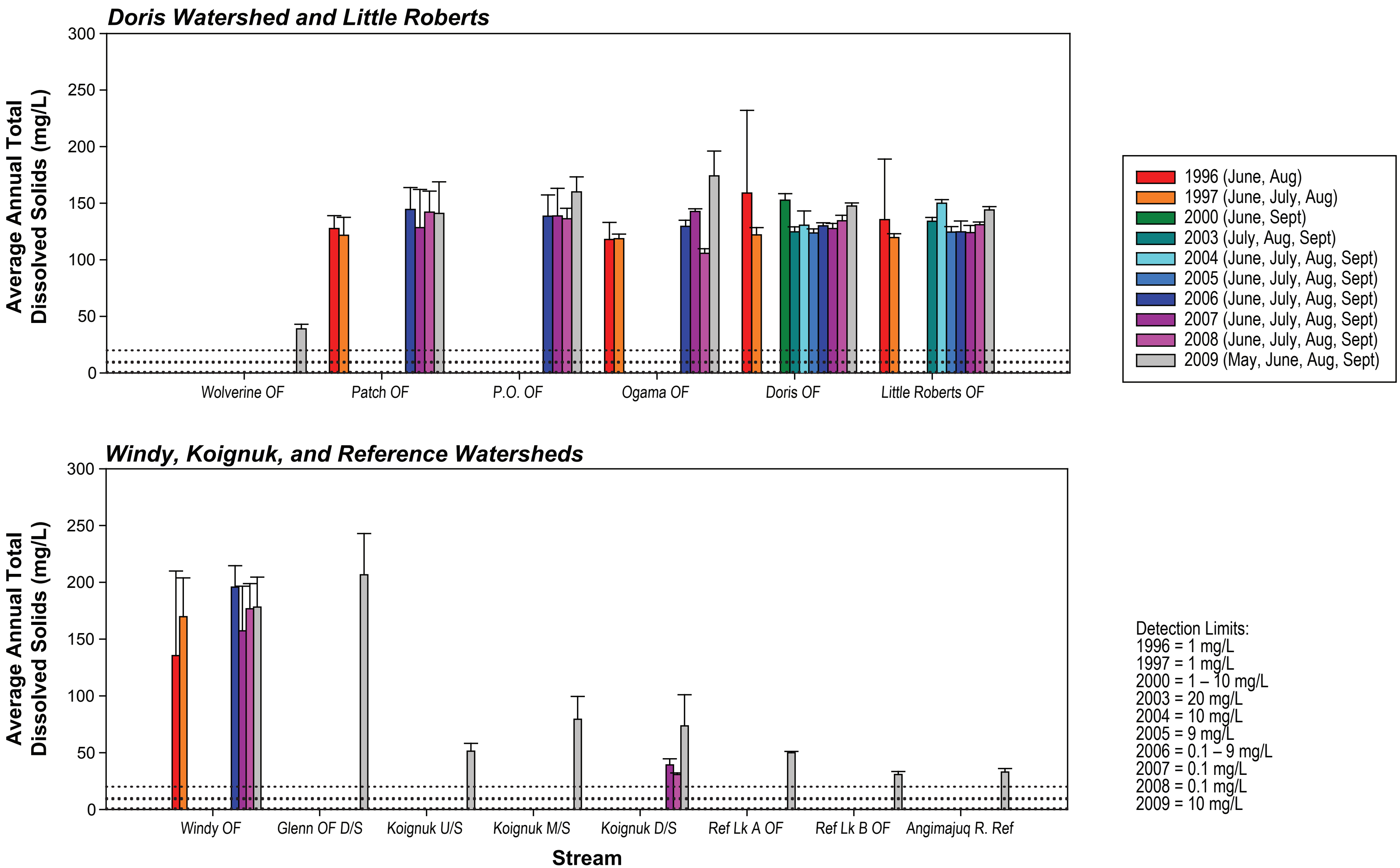
Notes: Error bars represent standard error of the mean.
Dotted lines represent detection limits.

Figure 3.3-2b

NEWMONT NORTH AMERICA

Average Annual Turbidity, Hope Bay Streams, 1996 to 2009

Rescan Engineers & Scientists



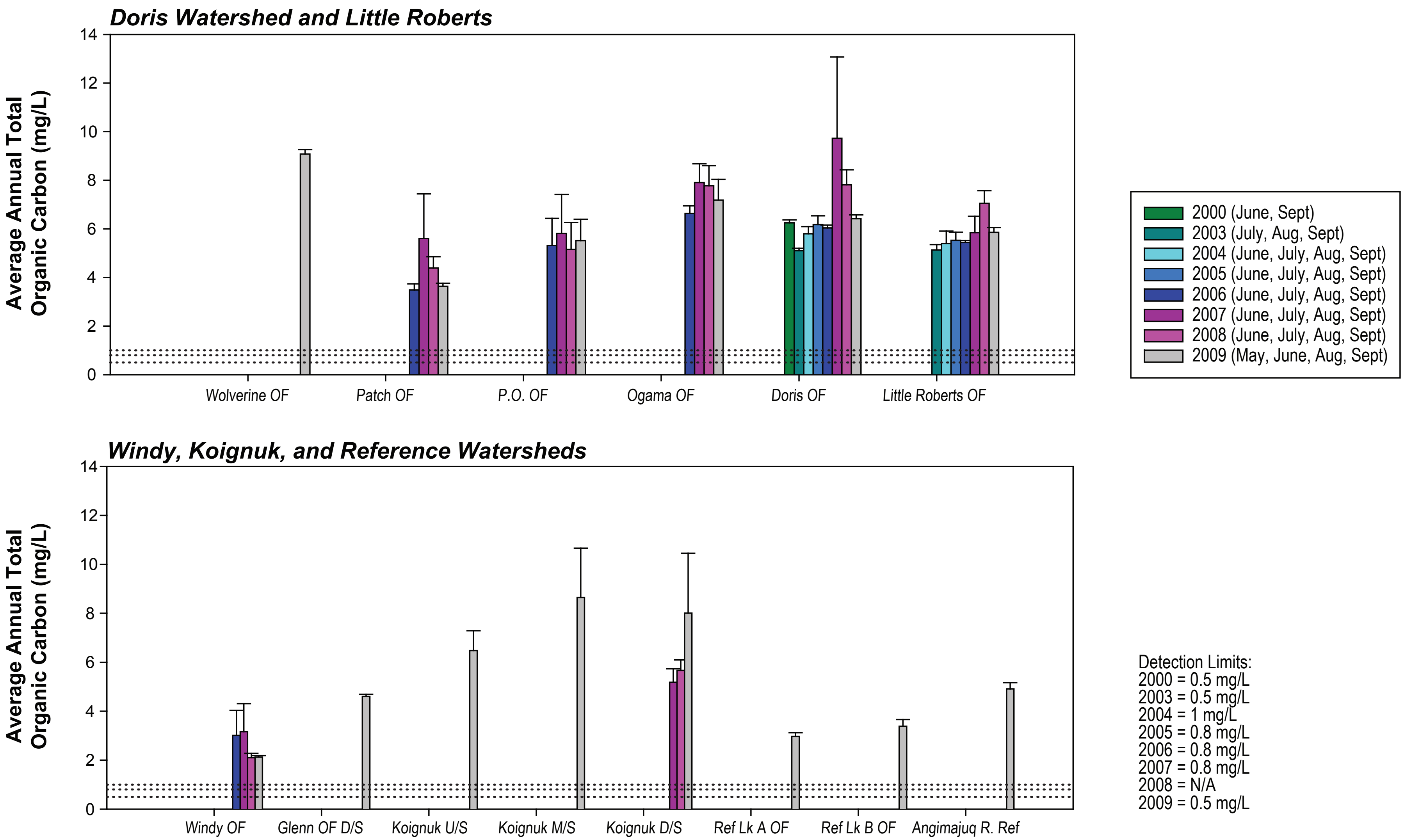
Notes: Error bars represent standard error of the mean.
Dotted lines represent detection limits.

Figure 3.3-2c

Average Annual Total Dissolved Solids, Hope Bay Streams, 1996 to 2009

NEWMONT NORTH AMERICA

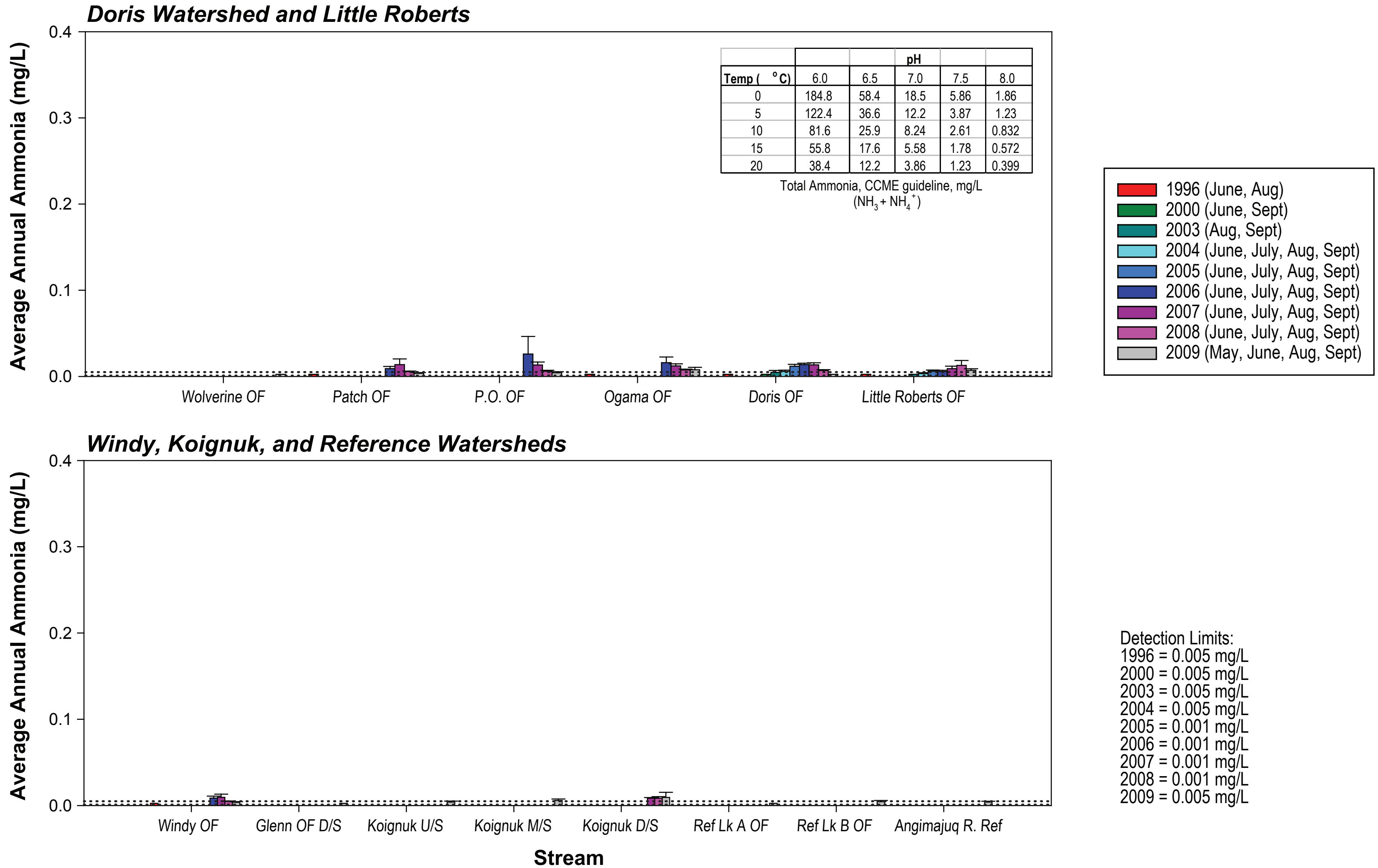
Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent detection limits.

Figure 3.3-2d

Average Annual Total Organic Carbon, Hope Bay Streams, 1996 to 2009



	pH				
Temp (°C)	6.0	6.5	7.0	7.5	8.0
0	184.8	58.4	18.5	5.86	1.86
5	122.4	36.6	12.2	3.87	1.23
10	81.6	25.9	8.24	2.61	0.832
15	55.8	17.6	5.58	1.78	0.572
20	38.4	12.2	3.86	1.23	0.399

Total Ammonia, CCME guideline, mg/L (NH_3 + NH_4^+)

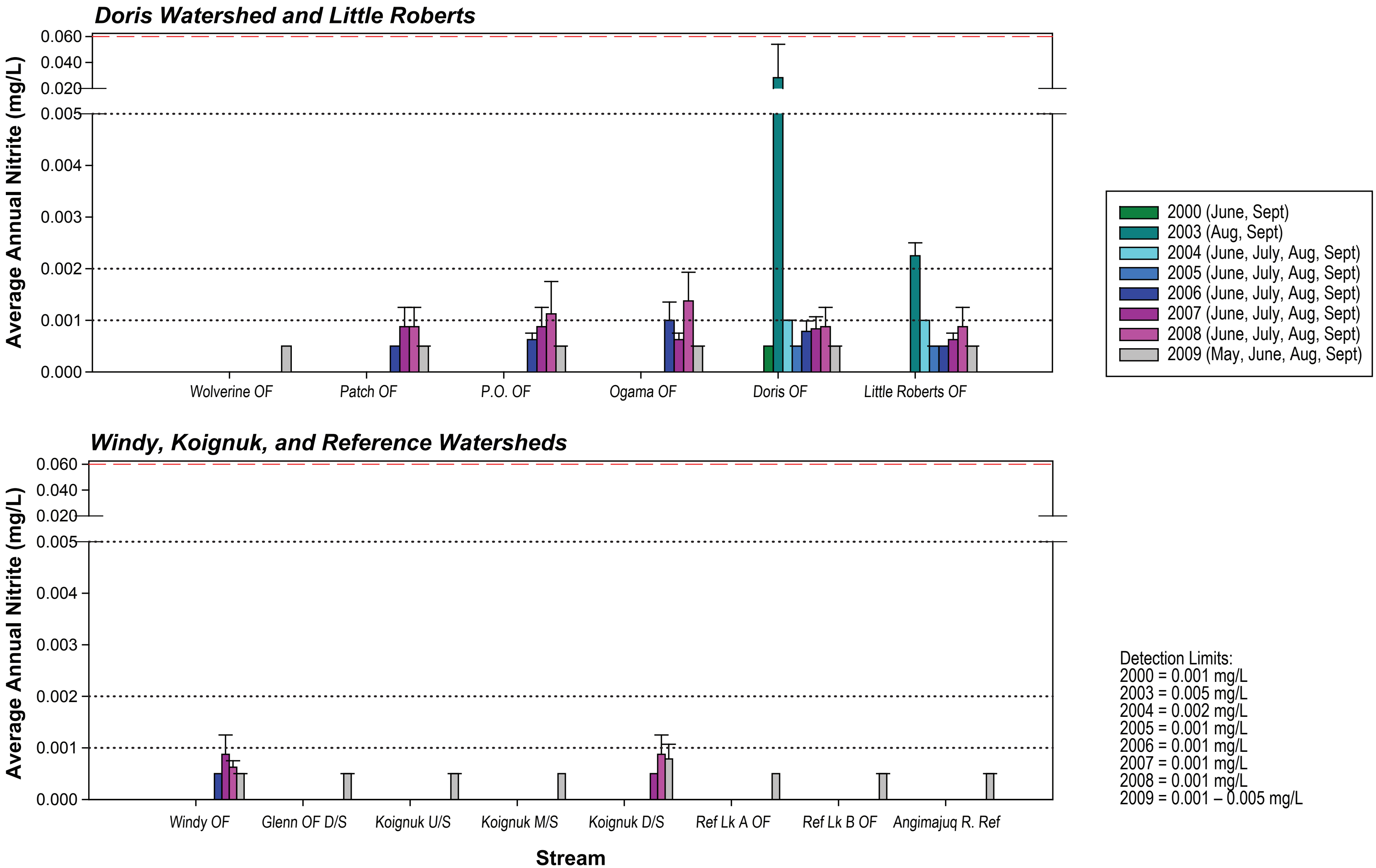
Notes: Error bars represent standard error of the mean.
CCME guidelines are temperature and pH dependent (see inset table).
Dotted lines represent detection limits.

Figure 3.3-2e

NEWMONT NORTH AMERICA

Average Annual Ammonia, Hope Bay Streams, 1996 to 2009

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.06 mg/L).
Dotted lines represent detection limits.

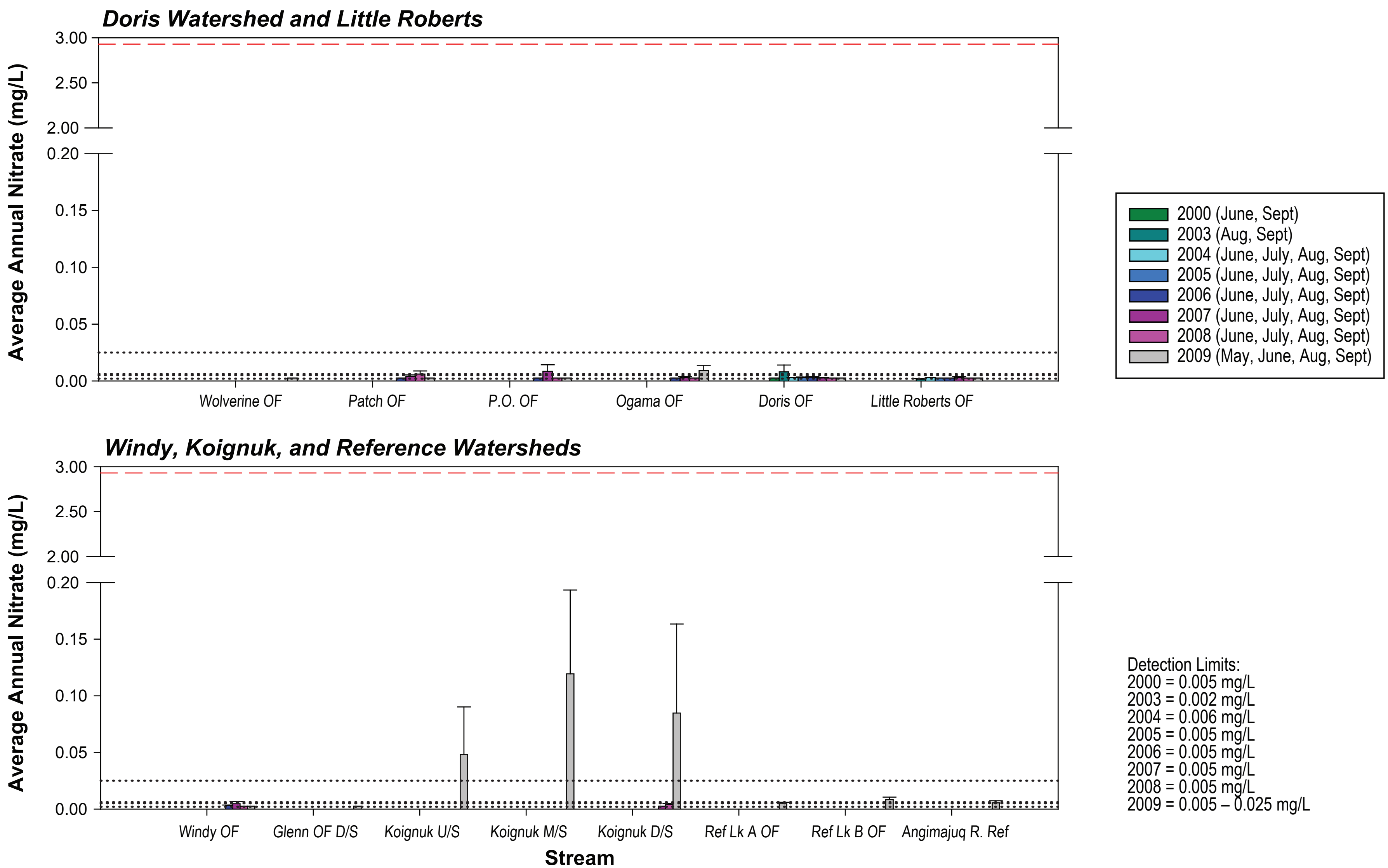
Figure 3.3-2f

NEWMONT NORTH AMERICA

Average Annual Nitrite, Hope Bay Streams, 1996 to 2009

Figure 3.3-2f

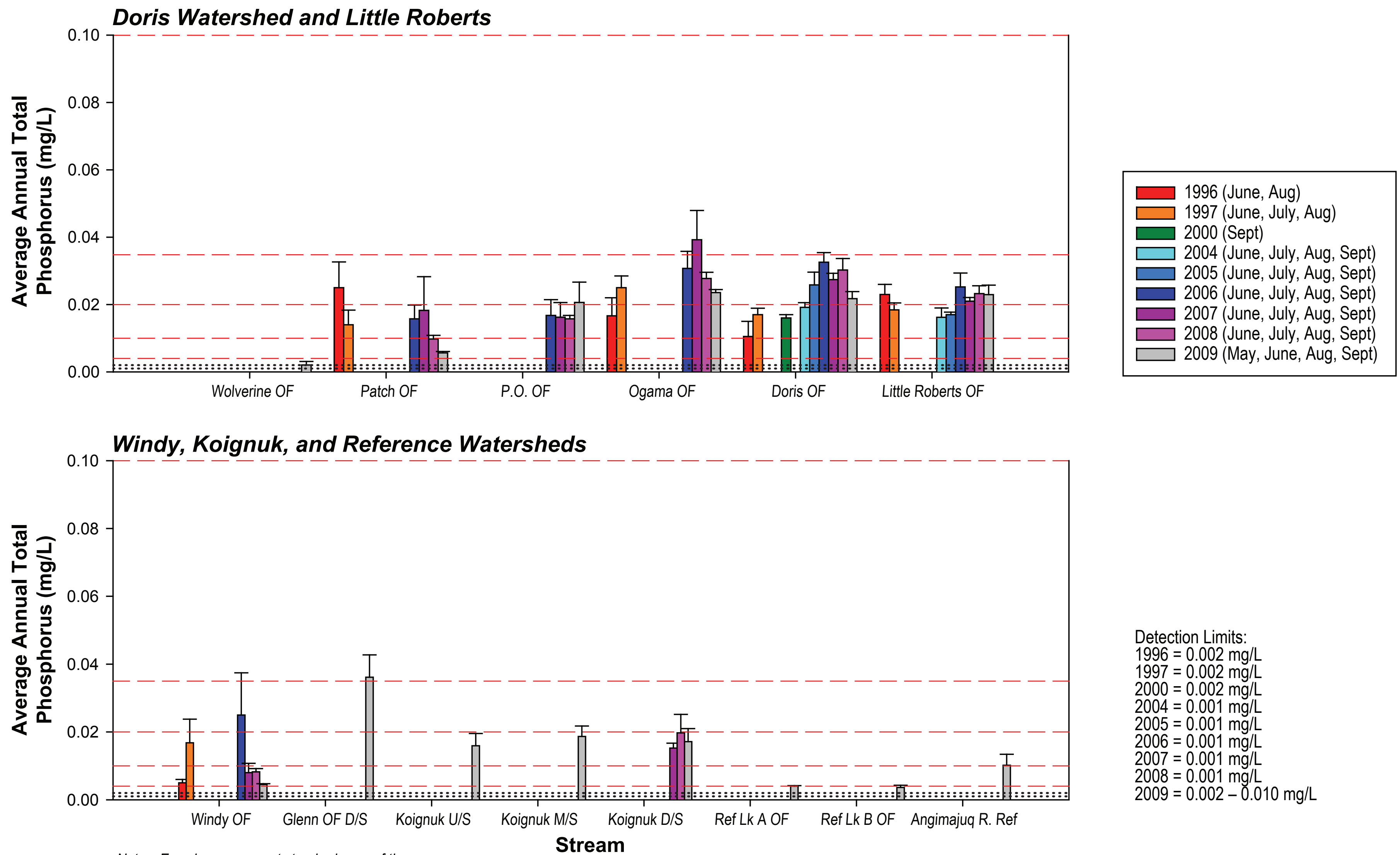
Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
CCME guideline = 2.93 mg/L.
Dotted lines represent detection limits.

Figure 3.3-2g

Average Annual Nitrate, Hope Bay Streams, 1996 to 2009



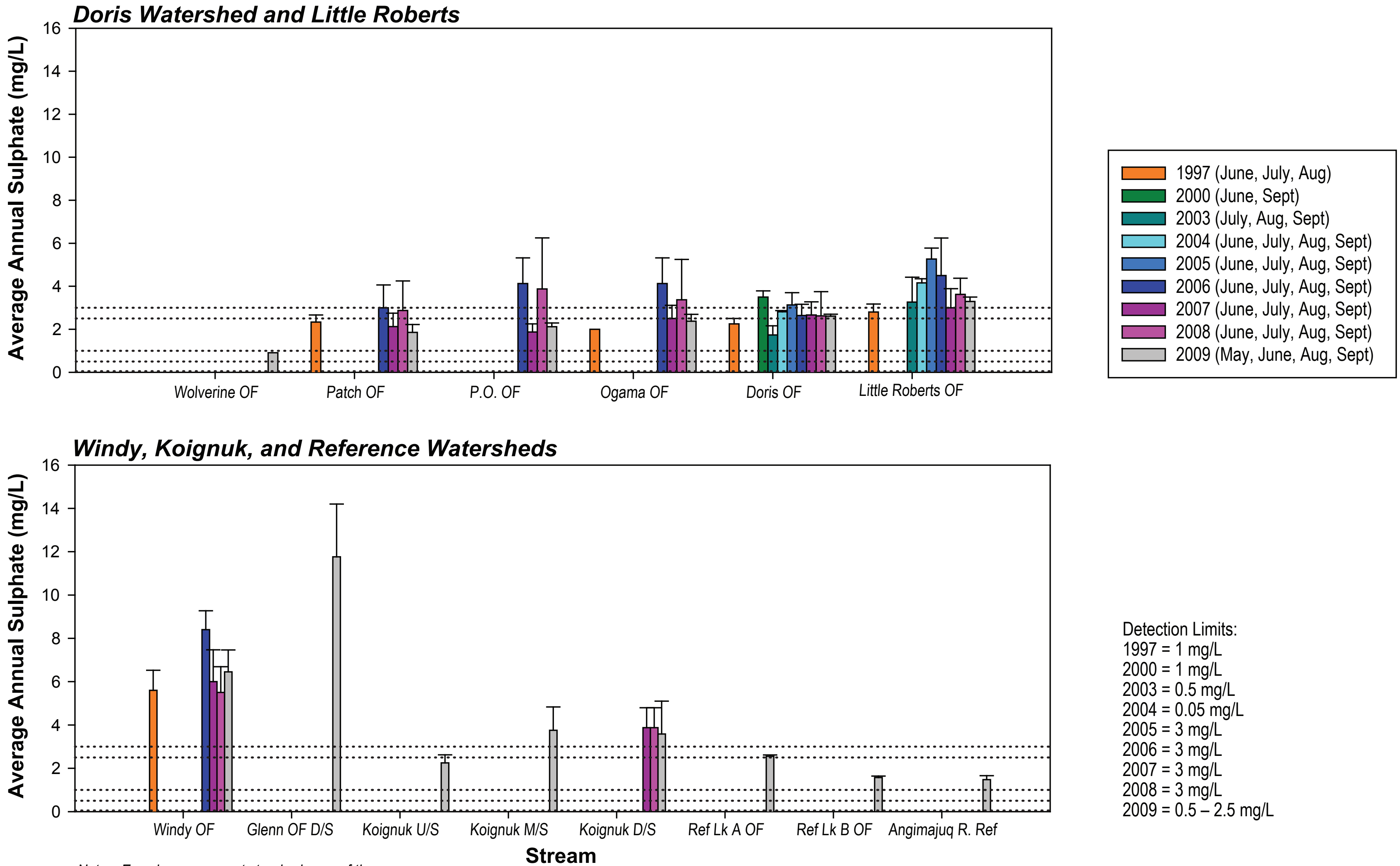
Notes: Error bars represent standard error of the mean.
Red dashed line indicates CCME trigger ranges (mg/L): <0.004 = ultraoligotrophic; 0.004 – 0.010 = oligotrophic; 0.01 – 0.02 = mesotrophic; 0.02 – 0.035 = meso-eutrophic; 0.035 – 0.1 = eutrophic; >0.1 = hyper-eutrophic.
Dotted lines represent detection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

Figure 3.3-2h

NEWMONT NORTH AMERICA

Average Annual Total Phosphorus, Hope Bay Streams, 1996 to 2009

Rescan Engineers & Scientists



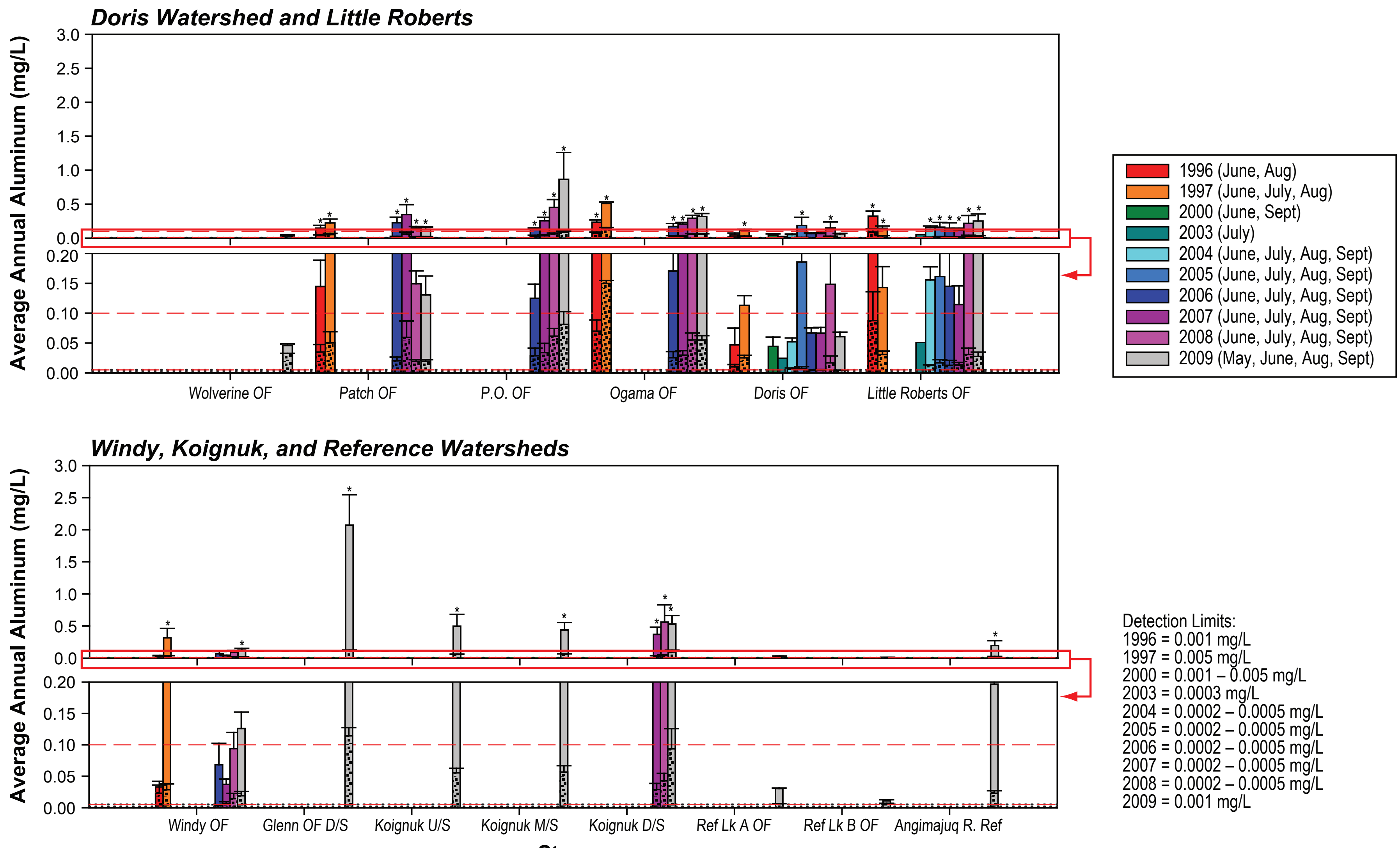
Notes: Error bars represent standard error of the mean.
Dotted lines represent detection limits.

Figure 3.3-2i

NEWMONT NORTH AMERICA

Average Annual Sulphate, Hope Bay Streams, 1996 to 2009

Rescan Engineers & Scientists



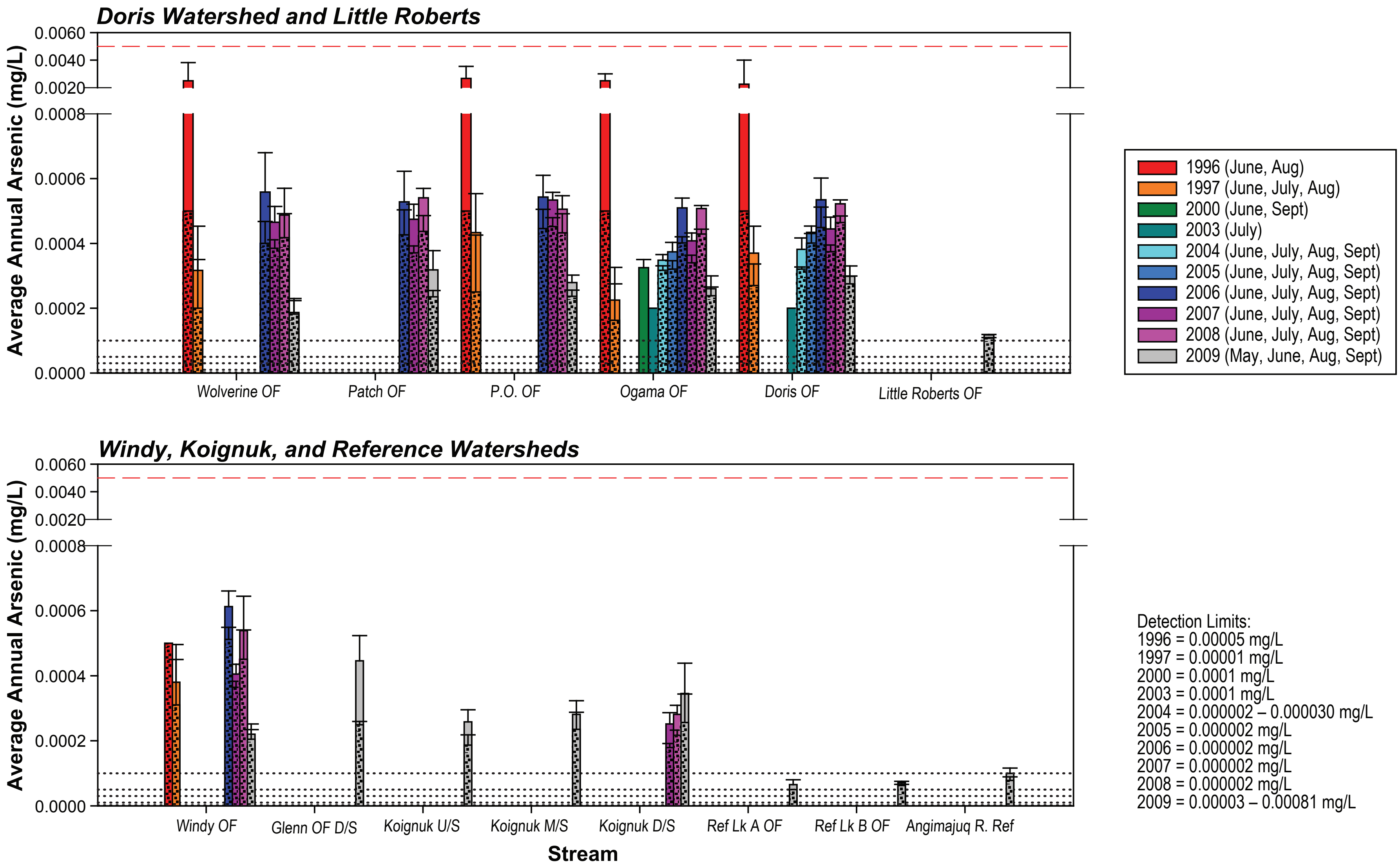
Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline and is pH dependent (0.005 mg/L at pH less than 6.5 and 0.1 mg/L at pH greater than or equal to 6.5).
Dotted lines represent detection limits.
Solid columns represent total Al and superimposed dotted columns represent dissolved Al.
** Indicated values are higher their sample guideline.*

Figure 3.3-2j

NEWMONT NORTH AMERICA

Average Annual Aluminum, Hope Bay Streams, 1996 to 2009

Rescan Engineers & Scientists



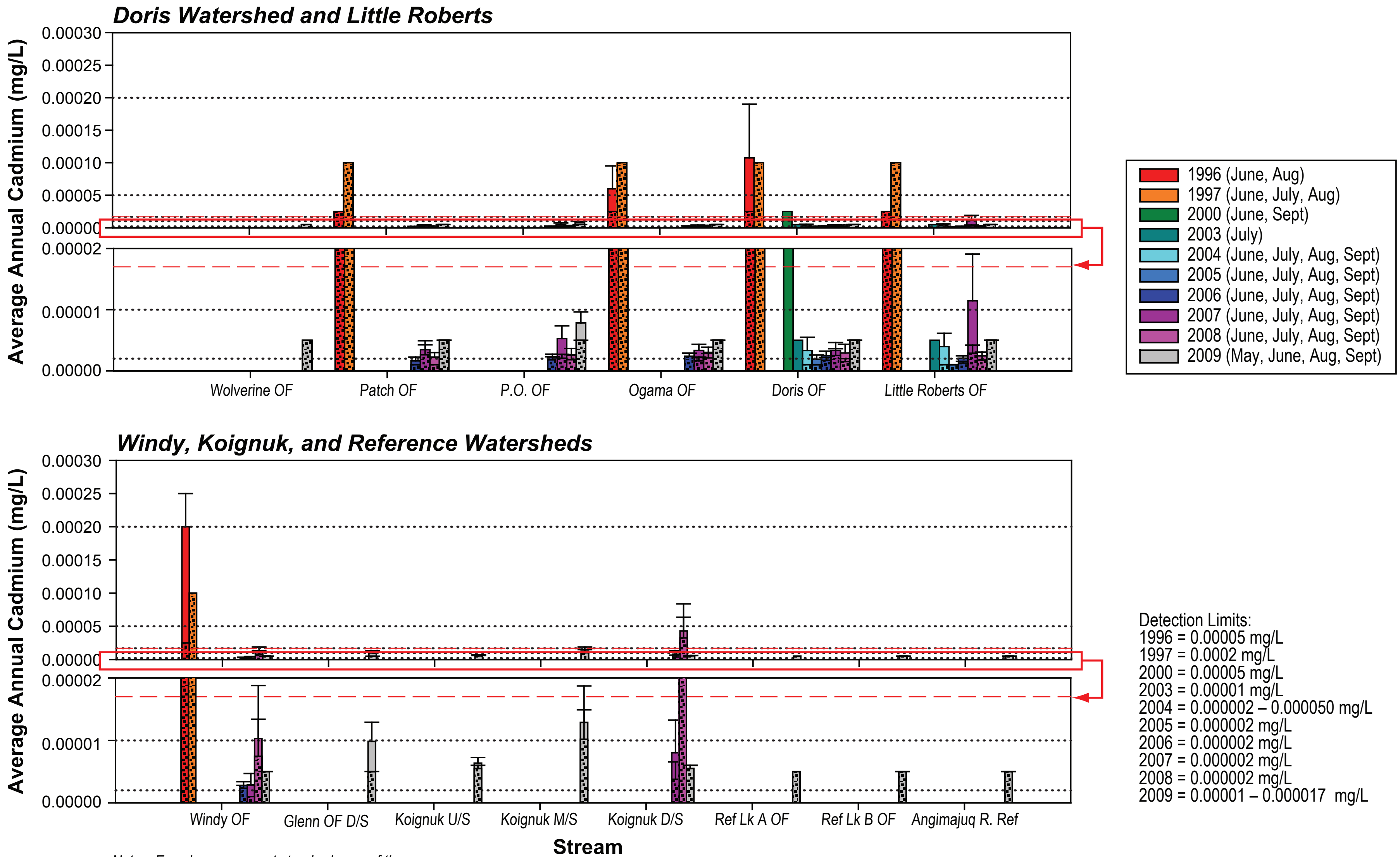
Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.005 mg/L).
Dotted lines represent detection limits.
Solid columns represent total As and superimposed dotted columns represent dissolved As. In some cases, dissoved As was equal to or slightly exceeded total As, and the total As column is hidden.

Figure 3.3-2k

NEWMONT NORTH AMERICA

Average Annual Arsenic, Hope Bay Streams, 1996 to 2009

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.000017 mg/L).
Dotted lines represent detection limits.
Solid columns represent total Cd and superimposed dotted columns represent dissolved Cd. In some cases, dissoved Cd was equal to or slightly exceeded total Cd, and the total Cd column is hidden.

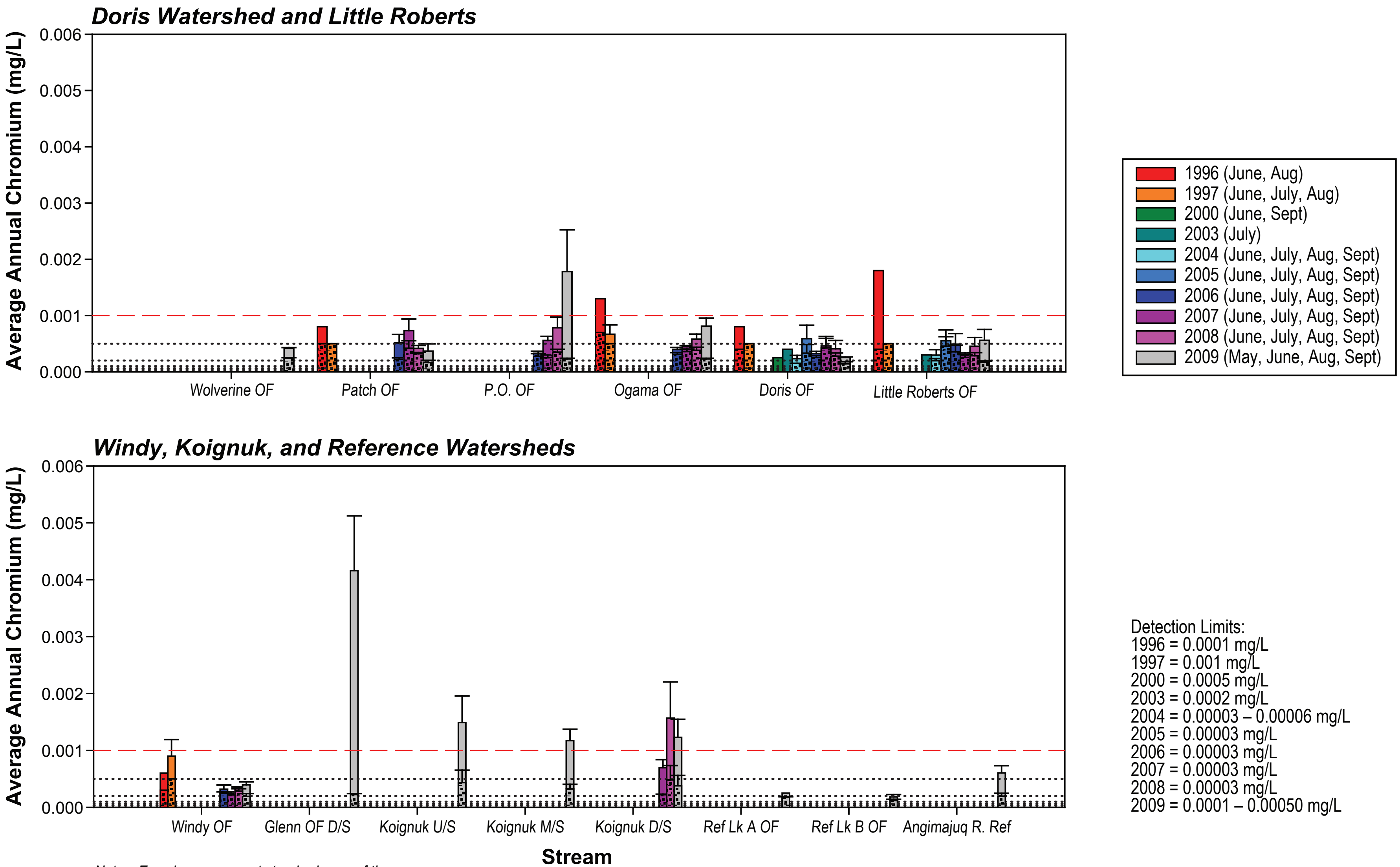
Figure 3.3-2l

NEWMONT NORTH AMERICA

Average Annual Cadmium, Hope Bay Streams, 1996 to 2009

Figure 3.3-2l

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.001 mg/L).
Dotted lines represent detection limits.
Solid columns represent total Cr and superimposed dotted columns represent dissolved Cr. In some cases, dissoved Cr was equal to or slightly exceeded total Cr, and the total Cr column is hidden.

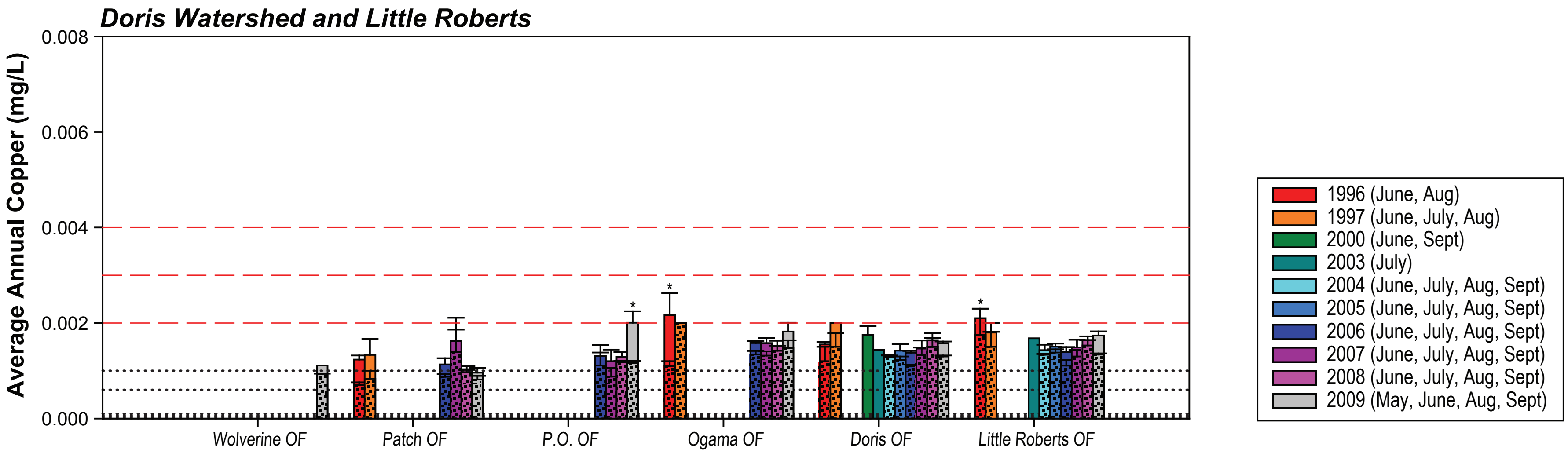
Figure 3.3-2m

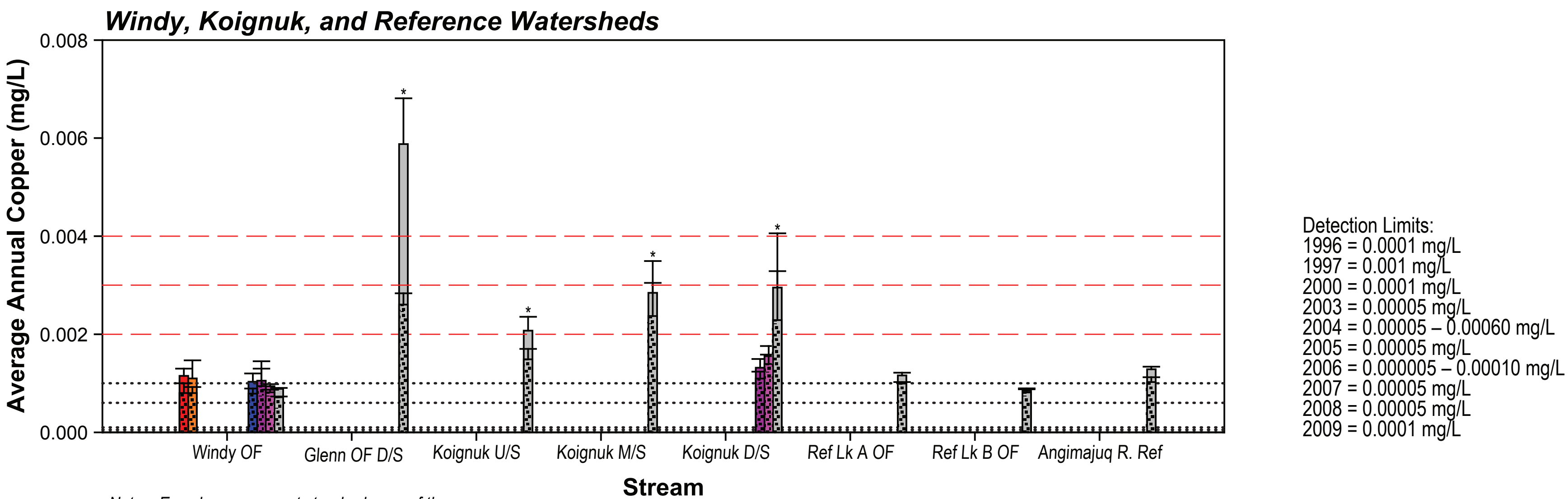
NEWMONT NORTH AMERICA

Average Annual Chromium, Hope Bay Streams, 1996 to 2009

Figure 3.3-2m

Rescan™ Engineers & Scientists





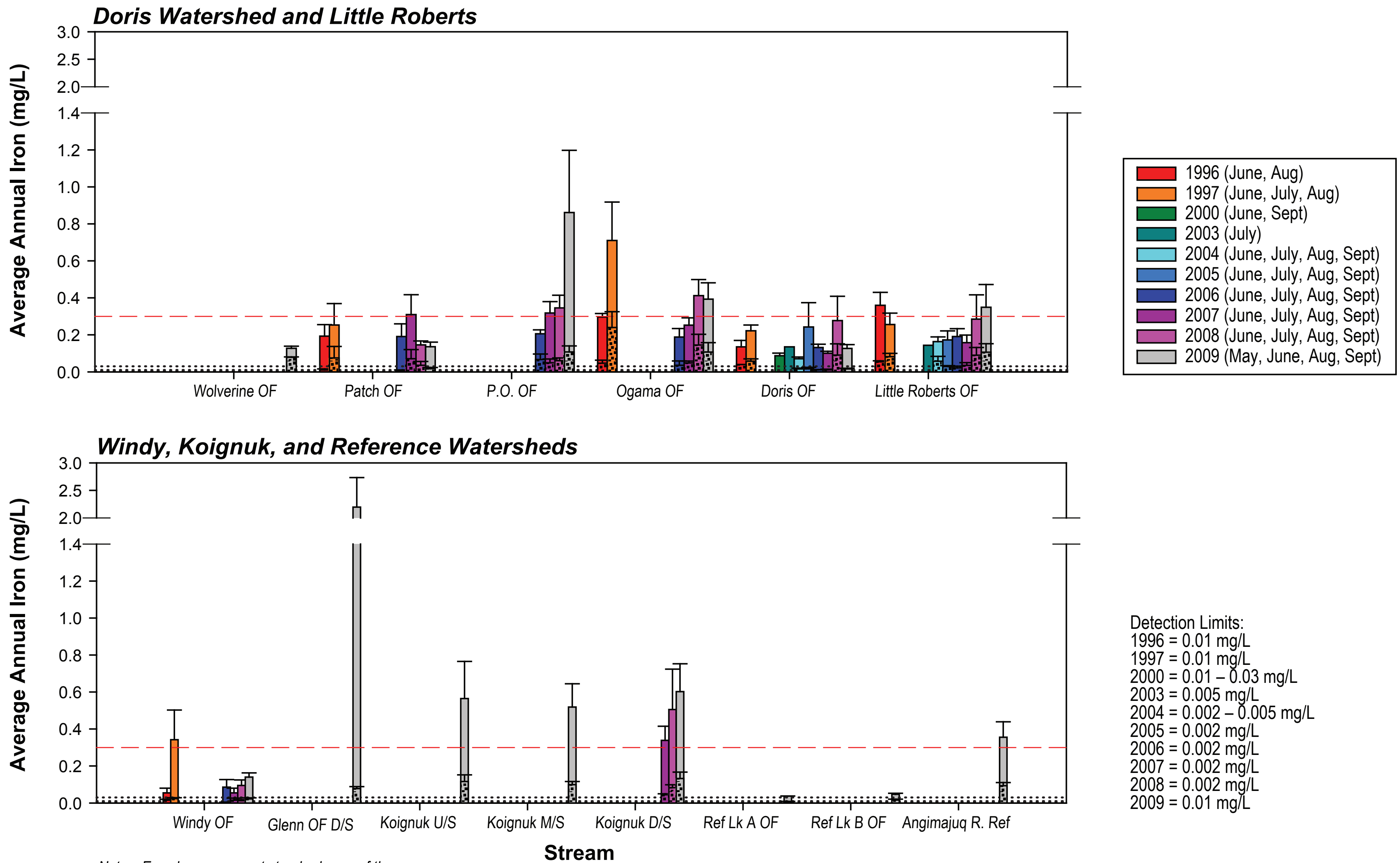
Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.002 mg/L at [$CaCO_3$] of 0–120 mg/L; 0.003 mg/L at [$CaCO_3$] of 120–180 mg/L; 0.004 at [$CaCO_3$] of >180 mg/L).
Dotted lines represent detection limits.
Solid columns represent total Cu and superimposed dotted columns represent dissolved Cu. In some cases, dissoved Cu was equal to or slightly exceeded total Cu, and the total Cu column is hidden.
** Indicated values are higher than their sample guideline.*

Figure 3.3-2n

NEWMONT NORTH AMERICA

Average Annual Copper Hope Bay Streams, 1996 to 2009

Rescan Engineers & Scientists



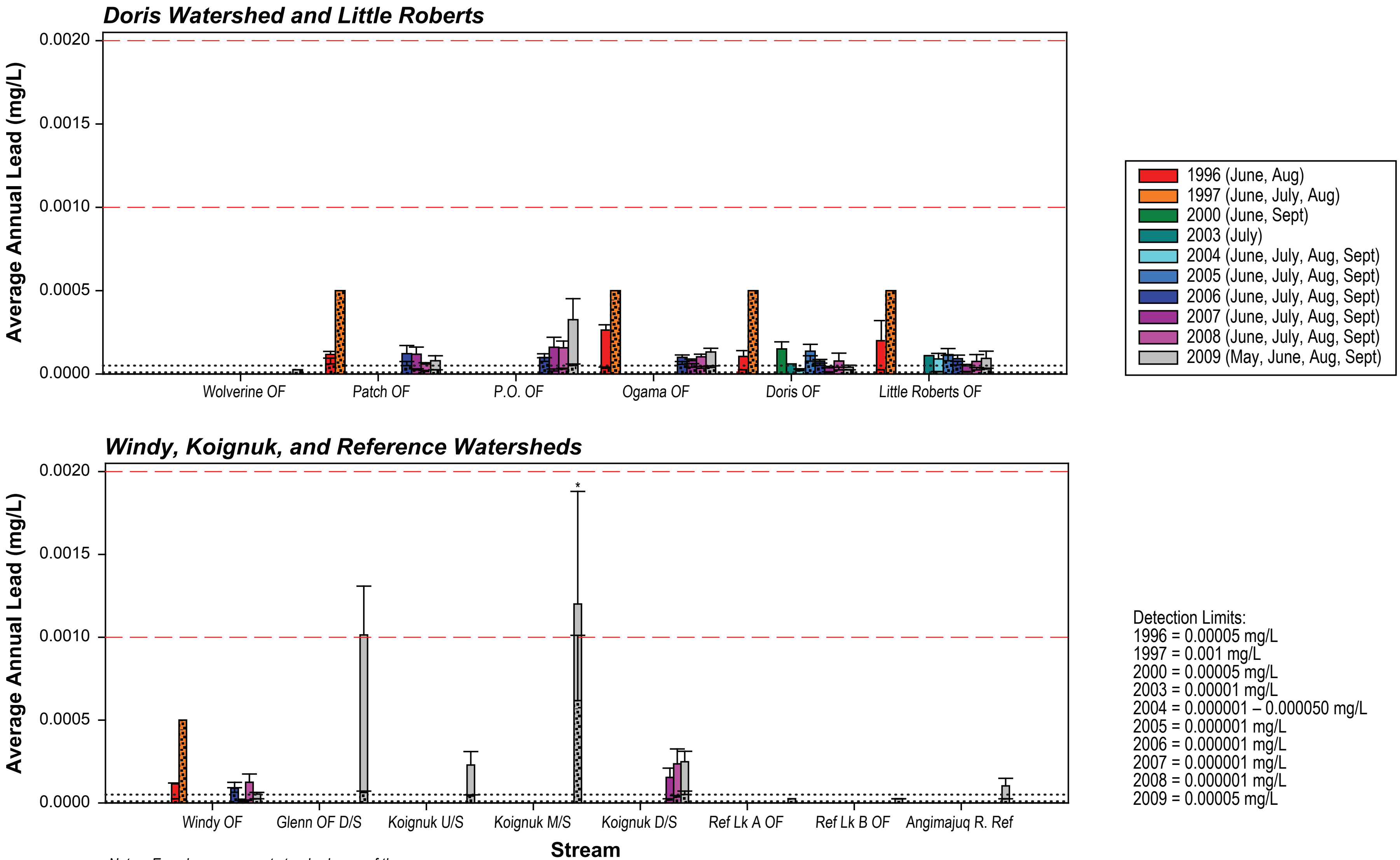
Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.3 mg/L).
Dotted lines represent detection limits.
Solid columns represent total Fe and superimposed dotted columns represent dissolved Fe.

Figure 3.3-2o

NEWMONT NORTH AMERICA

Average Annual Iron Hope Bay Streams, 1996 to 2009

Rescan Engineers & Scientists



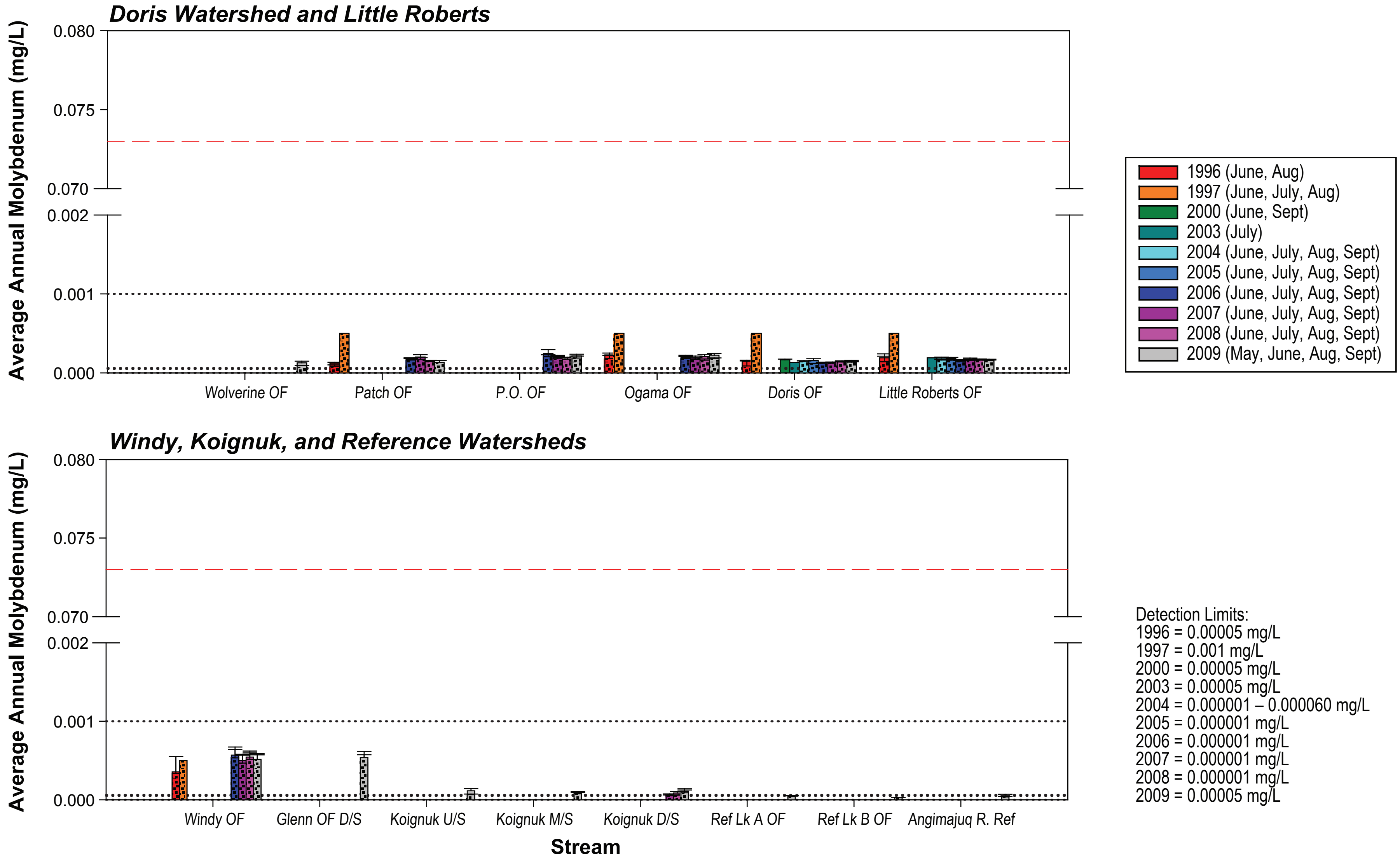
Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.001 mg/L at [$CaCO_3$] of 0–60 mg/L; 0.002 mg/L at [$CaCO_3$] of 60–120 mg/L; 0.004 mg/L at [$CaCO_3$] of 120–180 mg/L; 0.007 at [$CaCO_3$] of >180 mg/L).
Dotted lines represent detection limits.
Solid columns represent total Pb and superimposed dotted columns represent dissolved Pb. In some cases, dissoved Pb was equal to or slightly exceeded total Pb and the total Pb column is hidden.
** Indicated values that are higher than their sample guideline.*

Figure 3.3-2p

NEWMONT NORTH AMERICA

Average Annual Lead, Hope Bay Streams, 1996 to 2009

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
CCME guideline = 0.073 mg/L.
Dotted lines represent detection limits.
Solid columns represent total Mo and superimposed dotted columns represent dissolved Mo. In some cases, dissoved Mo was equal to or slightly exceeded total Mo and the total Mo column is hidden.

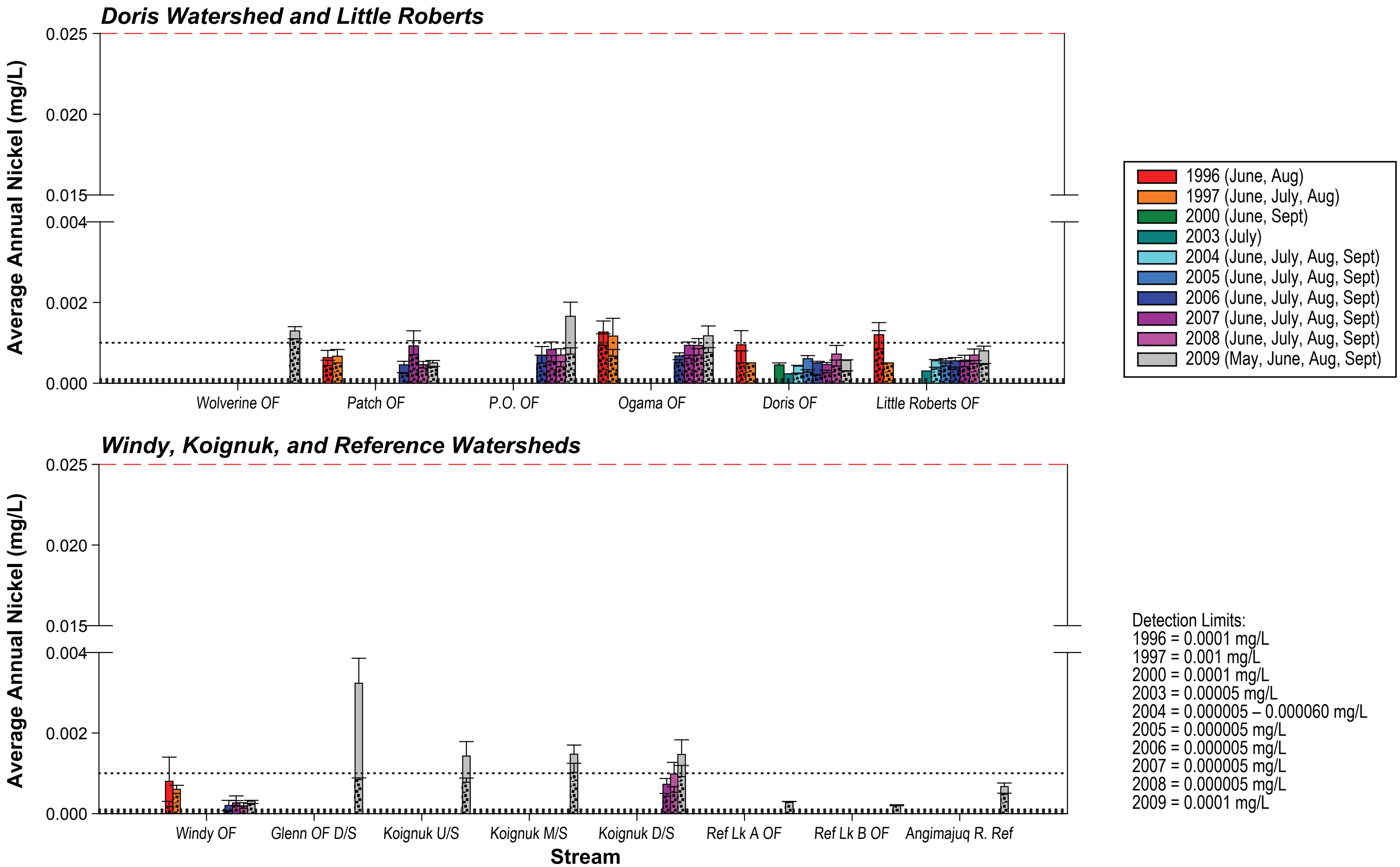
Figure 3.3-2q

NEWMONT NORTH AMERICA

Average Annual Molybdenum, Hope Bay Streams, 1996 to 2009

Rescan Engineers & Scientists

Figure 3.3-2q



Notes: Error bars represent standard error of the mean.
CCME guideline = 0.025 mg/L at [$CaCO_3$] of 0–60 mg/L; 0.065 mg/L at [$CaCO_3$] of 60–120 mg/L; 0.110 mg/L at [$CaCO_3$] of 120–180; 0.150 mg/L at [$CaCO_3$] of >180 mg/L.
Dotted lines represent detection limits.
Solid columns represent total Ni and superimposed dotted columns represent dissolved Ni. In some cases, dissoved Ni was equal to or slightly exceeded total Ni and the total Ni column is hidden.

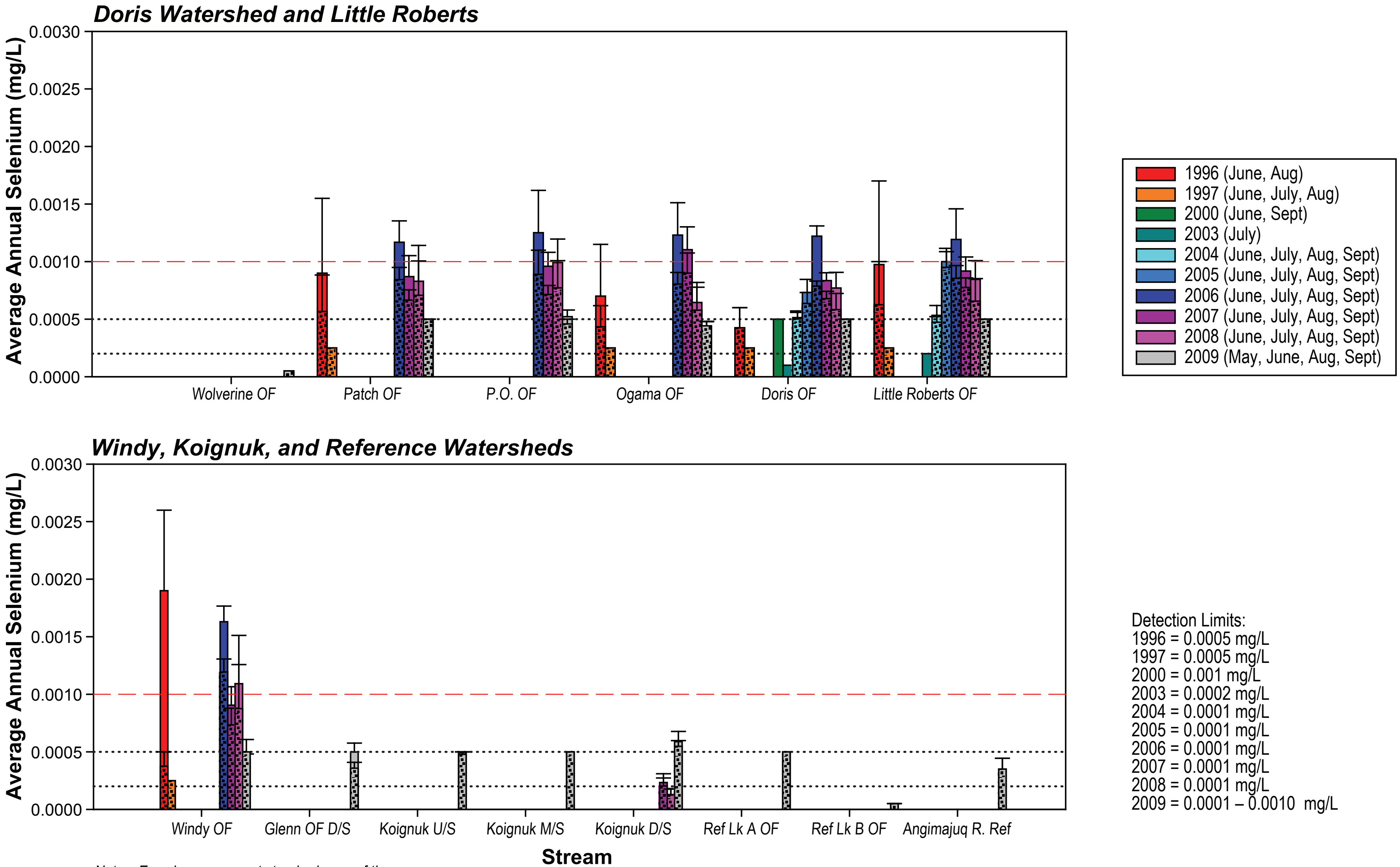
Figure 3.3-2r

NEWMONT NORTH AMERICA

Average Annual Nickel, Hope Bay Streams, 1996 to 2009

Rescan Engineers & Scientists

Figure 3.3-2r



Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.001 mg/L).
Dotted lines represent detection limits.
Solid columns represent total Se and superimposed dotted columns represent dissolved Se. In some cases, dissoved Se was equal to or slightly exceeded total Se and the total Se column is hidden.

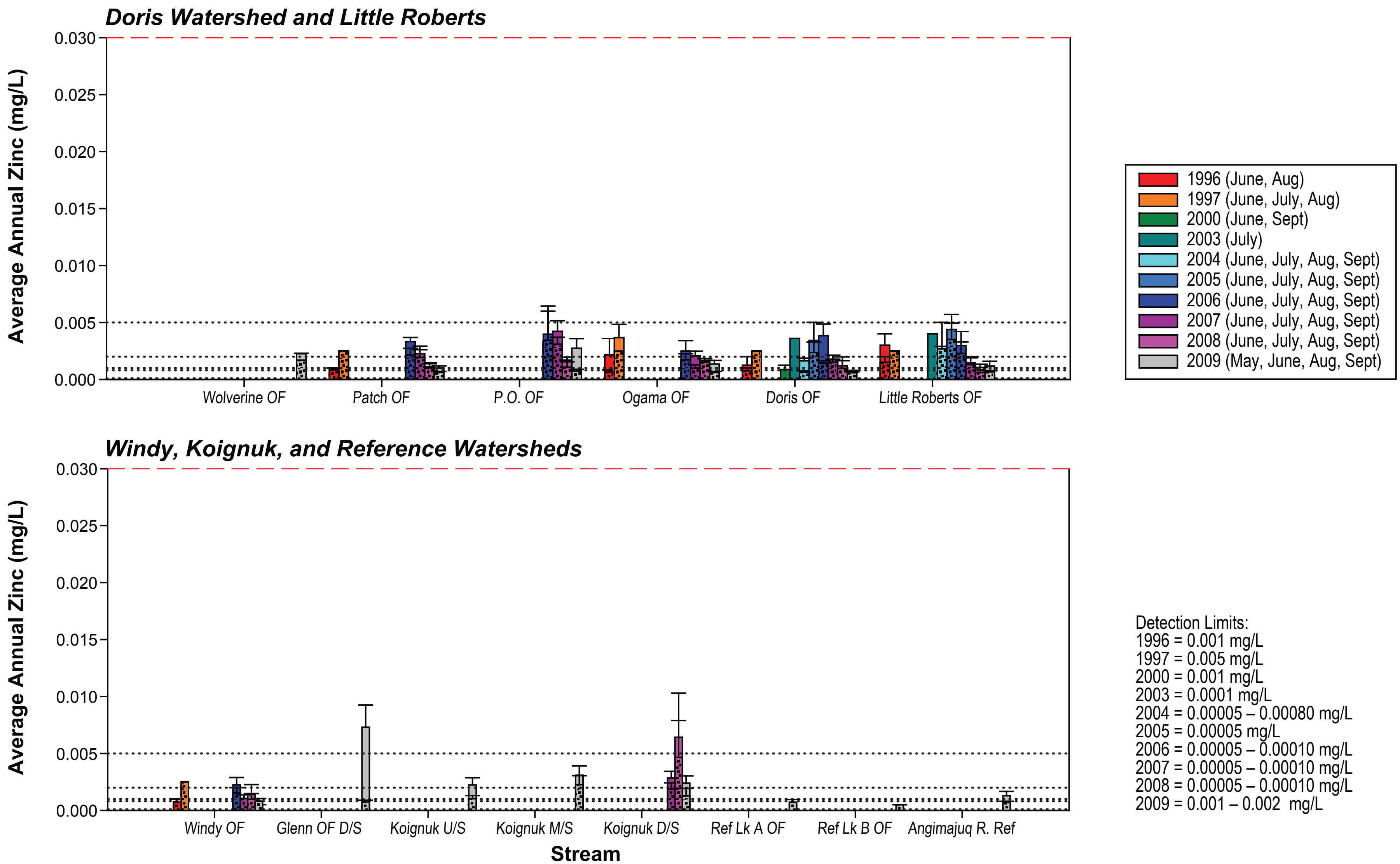
Figure 3.3-2s

NEWMONT NORTH AMERICA

Average Annual Selenium, Hope Bay Streams, 1996 to 2009

Figure 3.3-2s

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Red dashed line represents CCME guideline (0.03 mg/L).
Dotted lines represent detection limits.
Solid columns represent total Zn and superimposed dotted columns represent dissolved Zn. In some cases, dissoved Zn was equal to or slightly exceeded total Zn and the total Zn column is hidden.

Figure 3.3-2t

Average Annual Zinc, Hope Bay Streams, 1996 to 2009

NEWMONT NORTH AMERICA

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Glenn OF D/S runs from Glenn Lake, through soft marine sediments, to Roberts Bay. Samples taken from Glenn OF D/S exhibited clear seasonality in many water quality parameters. Levels of turbidity, total phosphorus, aluminum, chromium, copper, iron, nickel, lead, and zinc peaked during the June freshet sampling season, and then declined in subsequent summer samples. These peak freshet concentrations were often the highest observed during the entire 2009 stream sampling program. Based on the CCME's recommended trigger ranges for total phosphorus, Glenn OF D/S would be categorized as a eutrophic waterway during freshet (TP concentration of 0.053 mg/L), while the same stream would be considered mesotrophic in September (TP concentration of 0.018 mg/L). Similar (though less pronounced) seasonal trends were also seen in other streams and rivers (e.g., Little Robert OF, Angimajuq R. Ref).

The trend at P.O. OF was often the opposite of that seen in other streams, as peak levels of turbidity, total phosphorus, aluminum, chromium, and iron occurred in samples taken during September. Increases in molybdenum, TDS, and sulphate concentrations were also observed from June freshet to September in Windy OF and Glenn OF D/S.

3.3.2 Spatial Variation

All streams surveyed were similar in pH, with near neutral to slightly basic pH levels ranging from 6.9 (Koignuk U/S in May) to 8.1 (Patch OF in September). Turbidity was highly variable across sites, ranging from 0.37 NTU (Ref Lk B OF in August) to 215 NTU (Glenn OF D/S in June). Glenn OF D/S was a particularly turbid stream, averaging 102 NTU over all seasons sampled. The average turbidity in all other streams and rivers did not exceed 14 NTU.

Total phosphorus (TP) levels were variable across stream sites, ranging from 0.002 mg/L (Wolverine OF in June) to 0.053 mg/L (Glenn OF D/S in June). Within a watershed, TP concentrations generally increased with distance downstream. In the Doris Watershed, the lowest levels of TP were observed in Wolverine and Patch outflows, which would be categorized as ultra-oligotrophic and oligotrophic, respectively, based on the CCME trigger ranges for TP (CCME 2004). Stream sites located furthest downstream in the Doris and Little Roberts watersheds (Doris OF and Little Roberts OF) would be categorized as mesotrophic to meso-eutrophic. A similar trend was apparent in the Windy watershed, where the upstream Windy OF would be categorized as ultra-oligotrophic to oligotrophic, while the downstream Glenn OF D/S would be considered mesotrophic to eutrophic. River sites ranged from oligotrophic to mesotrophic in the Angimajuq and from oligotrophic to meso-eutrophic in the Koignuk (depending on the season).

Within the Koignuk River, several winter water quality parameters tended to increase in an upstream to downstream direction (e.g., TDS, TOC, nitrate, ammonia, sulphate, copper, iron, molybdenum, and nickel). During the freshet and summer sampling periods, there were no discernible spatial trends along this river.

In general, metal concentrations within Doris Watershed streams tended to be similar. A notable exception to this was P.O. OF samples taken in September, which contained elevated levels of aluminum, chromium, copper, iron, lead, nickel, and zinc compared to the other Doris Watershed stream samples. Within the Windy Watershed, total metal concentrations were markedly different between streams. Concentrations of aluminum, chromium, copper, iron, lead, nickel, and zinc in Glenn OF D/S were always the highest or among the highest measured in any stream in the study area, while Windy OF had among the lowest measured concentrations of these metals. Molybdenum was an exception to this pattern, as elevated concentrations of molybdenum were measured in both of these Windy Watershed streams (although still well below CCME guidelines). As seen for lake water quality, the

Windy Watershed as a whole had much higher molybdenum concentrations that the other watersheds in the study area. The Windy Watershed also contained higher levels of sulphate than the other watersheds.

3.3.3 Comparison with CCME Guidelines

Nitrate, nitrite, and ammonia concentrations in all streams and rivers were below CCME guidelines. Winter total copper concentrations along the Koignuk River ranged from 0.00301 to 0.00948 mg/L. These copper levels are elevated compared to the hardness dependent CCME guideline of 0.002 mg/L. At the midstream Koignuk site, the winter lead concentration of 0.00415 mg/L is higher than the hardness dependent CCME guideline of 0.002 mg/L.

During the June freshet at Glenn OF D/S, concentrations of aluminum, chromium, copper, iron, and lead were all higher than their respective CCME guidelines. While concentrations of these metals declined somewhat between freshet and late summer, all except lead continued to be higher than CCME guidelines during late summer.

With the exception of Ref Lk A and B OF, Doris OF, and Wolverine OF, average aluminum concentrations were higher than the CCME guideline of 0.1 mg/L in all streams and rivers surveyed. Concentrations of chromium, copper, and iron were also high relative to CCME guidelines in the Koignuk River, Glenn OF D/S, P.O. OF (chromium and iron only), Ogama OF (iron only), Little Roberts OF (iron only), and the Angimajuq R. Ref (iron only). Levels of aluminum, chromium, copper, andiron in Glenn OF D/S consistently surpassed guideline concentrations by the greatest factor. The average lead concentration in the Koignuk M/S site was higher than the hardness depended guideline for lead.

Table 3.3-1 gives the percentage of stream water quality samples in which parameter concentrations are higher than CCME guidelines, and Table 3.3-2 shows the factor by which average concentrations are higher than CCME guidelines (using the average concentration of each parameter within a stream/river site across various depths and seasons).

3.3.4 2009 Stream Water Quality Assurance/Quality Control

Travel and field blank data for the 2009 stream water quality sampling program are presented in Appendix 3.3-2. Three travel and three field blanks were collected in 2009, making up approximately 7% of samples analyzed. Only 2% of analytical results for field and travel blanks were above detection limits, and all of these were within 5x the detection limits. Variables above detection limits included ammonia, total boron, dissolved nickel, and zinc. Total boron concentrations were above detection limits in four out of the six blanks. No modifications were made to the dataset as a result of QA/QC samples.

3.3.5 Annual Variation

Historical data are available from some streams and rivers in the study area for the following periods: June and August 1996; June, July, and August 1997; June and September 2000; July 2003; June, July, August, and September 2004; June, July, August, and September 2005; June, July, August, and September 2006; June, July, August, and September 2007; June, July, August, and September 2008; and May, June, August, and September (this study). Figure 2.13-1 provides a summary of the historical water quality sampling locations. Table 2.13-2 presents a summary of the historical sampling times and methods. Only historical sampling locations that were also sampled in 2009 are discussed in this report. Note that historical sampling sites may not correspond exactly with those sampled in 2009, and this may contribute to the variability observed among years.

The differences among data sets in terms of when (months of collection) and where samples were collected can have a significant effect on annual averages for many parameters. Under-ice water samples can contain higher metal and nutrient concentrations than those collected in the summer, and parameters can also vary spatially along streams or rivers. Comparisons between years are further complicated by differences in analytical methodology and detection limits.

Since differences in sampling times, locations, and methodology have such a large effect on annual averages, the sampling information for each year, presented in Table 2.13-2, should be taken into consideration when reviewing annual stream water quality data presented in Figures 3.3-2a to 3.3-2t.

Historical concentrations of aluminum were frequently high in many Project area streams and rivers compared to the CCME guideline. As seen in 2009, Mo and sulphate concentrations in the Windy Watershed were consistently higher than molybdenum and sulphate concentrations in other watersheds in the study area during the years for which data are available.

3.3.6 Stream Water Quality Summary

Streams and rivers in the study area were neutral to slightly basic (with pH ranging from 6.9 to 8.1). Seasonal trends were apparent in some Hope Bay Belt streams and rivers. Parameters such as nitrate, ammonia, total phosphorus, copper, chromium, and nickel tended to be highest in winter or during freshet and lowest during the summer. These trends were most apparent in Glenn OF D/S and the Koignuk River. Turbidity levels were variable across streams, and were particularly high in Glenn OF D/S during freshet.

Nitrate and ammonia concentrations were frequently below detection limits, and reached maximum levels of 0.56 and 0.044 mg/L (for nitrate and ammonia respectively) in Koignuk River Upstream during winter. Nitrite concentrations were always below detection limits. Total phosphorus levels were variable across stream sites, ranging from 0.002 mg/L (Wolverine OF in June) to 0.053 mg/L (Glenn OF D/S in June). Within a watershed, total phosphorus concentrations generally increased with distance downstream. In the Doris Watershed, the lowest levels of total phosphorus were observed in Wolverine and Patch outflows, which would be categorized as ultra-oligotrophic and oligotrophic, respectively, based on the CCME trigger ranges for phosphorus (CCME 2004). Stream sites located furthest downstream in the Doris and Little Roberts watersheds (Doris OF and Little Roberts OF) would be categorized as mesotrophic to meso-eutrophic. A similar trend was apparent in the Windy Watershed, where the upstream Windy OF would be categorized as ultra-oligotrophic to oligotrophic, while the downstream Glenn OF D/S would be considered mesotrophic to eutrophic. River sites ranged from oligotrophic to mesotrophic in the Angimajuq and from oligotrophic to meso-eutrophic in the Koignuk (depending on the season).

In general, concentrations of total metals were highest in Glenn OF D/S and lowest in Windy OF. Molybdenum levels tended to be highest within the streams of the Windy Watershed compared to the other watersheds. These trends are consistent with the lake water quality data, indicating that the water quality of streams reflects the water quality of the upstream lakes that feed them. Average metal concentrations in streams and rivers were generally below CCME guidelines, with the following exceptions: aluminum in all streams/rivers except Wolverine OF, Doris OF, and Ref Lk A and B OF; chromium in P.O. OF, Glenn OF D/S, and the Koignuk River sites; copper in Glenn OF D/S, and Koignuk M/S and D/S; iron in P.O. OF, Ogama OF, Little Roberts OF, Glenn OF D/S, and the Angimajuq and Koignuk River sites; and lead in Koignuk M/S. These elevated concentrations occur naturally within study area streams and rivers.

Table 3.3-1. Stream Water Quality, Percent of Samples in which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2009

Stream	Total Number of Samples Collected	CCME Guideline Value[a]:	pH 6.5-9.0	Ammonia (as N) worst case 5.86 mg/L (assumes T=0, pH = 7.5)	Nitrate (as N) 2.93 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 mg/L	Chromium (Cr)-Total 0.001 mg/L
Doris											
Wolverine OF	2		0	0	0	0	Ultra-oligotrophic	0	0	0	0
Patch OF	6		0	0	0	0	Oligotrophic	33	0	0	0
P.O. OF	6		0	0	0	0	Oligotrophic to Eutrophic	100	0	0	33
Ogama OF	6		0	0	0	0	Meso-eutrophic	100	0	0	17
Doris OF	6		0	0	0	0	Mesotrophic to Meso-eutrophic	0	0	0	0
Little Roberts											
Little Roberts OF	6		0	0	0	0	Mesotrophic to Meso-eutrophic	67	0	0	33
Windy											
Windy OF	6		0	0	0	0	Ultra-oligotrophic to Oligotrophic	67	0	0	0
Glenn OF D/S	6		0	0	0	0	Mesotrophic to Eutrophic	100	0	33	100
Koignuk River											
Koignuk U/S	7		0	0	0	0	Oligotrophic to Meso-eutrophic	100	0	0	43
Koignuk M/S	8		0	0	0	0	Oligotrophic to Meso-eutrophic	100	0	25	75
Koignuk D/S	7		0	0	0	0	Oligotrophic to Meso-eutrophic	100	0	0	43
Ref A											
Ref Lk A OF	4		0	0	0	0	Oligotrophic	0	0	0	0
Ref B											
Ref Lk B OF	6		0	0	0	0	Ultra-oligotrophic to Oligotrophic	0	0	0	0
Angimajuq											
Angimajuq Riv Ref	6		0	0	0	0	Oligotrophic to Mesotrophic	67	0	0	0
Total Sites			**0**	**0**	**0**	**0**	**-**	**10**	**0**	**2**	**7**

All values represent percentages of 2009 samples higher than CCME guidelines

(continued)

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

b) <0.004 = ultraoligotrophic; 0.004 - 0.010 = oligotrophic; 0.01 - 0.02 = mesotrophic; 0.02 - 0.035 = meso-eutrophic; 0.035 - 0.1 = eutrophic; >0.1 = hyper-eutrophic

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

d) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

e) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = > 180 mg/L

f) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.150 mg/L at [CaCO3] = > 180 mg/L

Table 3.3-1. Stream Water Quality, Percent of Samples in which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2009 (completed)

Stream	Total Number of Samples Collected	CCME Guideline Value[a]:	Copper Cu)-Total 0.002-0.004[d] mg/L	Iron (Fe)-Total 0.3 mg/L	Lead (Pb)-Total 0.001-0.007[e] mg/L	Mercury (Hg)-Total 0.000026 mg/L	Molybdenum (Mo)-Total 0.073 mg/L	Nickel (Ni)-Total 0.025-0.110[f] mg/L	Selenium (Se)-Total 0.001 mg/L	Silver (Ag)-Total 0.0001 mg/L	Thallium (Ag)-Total 0.00088 mg/L	Zinc (Zn)-Total 0.03 mg/L
Doris												
Wolverine OF	2		0	0	0	0	0	0	0	0	0	0
Patch OF	6		0	0	0	0	0	0	0	0	0	0
P.O. OF	6		33	67	0	0	0	0	0	0	0	0
Ogama OF	6		33	67	0	0	0	0	0	0	0	0
Doris OF	6		0	0	0	0	0	0	0	0	0	0
Little Roberts												
Little Roberts OF	6		17	33	0	0	0	0	0	0	0	0
Windy												
Windy OF	6		0	0	0	0	0	0	0	0	0	0
Glenn OF D/S	6		100	100	33	0	0	0	0	0	0	0
Koignuk River												
Koignuk U/S	7		43	71	0	0	0	0	0	0	0	0
Koignuk M/S	8		63	50	25	0	0	0	0	0	0	0
Koignuk D/S	7		43	71	0	0	0	0	14	0	0	0
Ref A												
Ref Lk A OF	4		0	0	0	0	0	0	0	0	0	0
Ref B												
Ref Lk B OF	6		0	0	0	0	0	0	0	0	0	0
Angimajuq												
Angimajuq Riv Ref	6		0	33	0	0	0	0	0	0	0	0
Total Sites			**7**	**8**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**

All values represent percentages of 2009 samples higher than CCME guidelines

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

b) <0.004 = ultraoligotrophic; 0.004 - 0.010 = oligotrophic; 0.01 - 0.02 = mesotrophic; 0.02 - 0.035 = meso-eutrophic; 0.035 - 0.1 = eutrophic; >0.1 = hyper-eutrophi

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

d) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

e) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = > 180 mg/L

f) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.150 mg/L at [CaCO3] = > 180 mg/L

Table 3.3-2. Stream Water Quality, Average Factor by which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2009

Stream	Total Number of Samples Collected	CCME Guideline Value[a]:	pH 6.5-9.0	Ammonia (as N) worst case 5.86 mg/L (assumes T=0, pH = 7.5)	Nitrate (as N) 2.93 mg/L	Nitrite (as N) 0.06 mg/L	Total Phosphate (as P) 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 mg/L	Chromium (Cr) -Total 0.001 mg/L
Doris											
Wolverine OF	2		-	-	-	-	Ultra-oligotrophic	-	-	-	-
Patch OF	6		-	-	-	-	Oligotrophic	1.3	-	-	-
P.O. OF	6		-	-	-	-	Oligotrophic to Eutrophic	8.7	-	-	1.8
Ogama OF	6		-	-	-	-	Meso-eutrophic	3.2	-	-	-
Doris OF	6		-	-	-	-	Mesotrophic to Meso-eutrophic	-	-	-	-
Little Roberts											
Little Roberts OF	6		-	-	-	-	Mesotrophic to Meso-eutrophic	2.5	-	-	-
Windy											
Windy OF	6		-	-	-	-	Ultra-oligotrophic to Oligotrophic	1.3	-	-	-
Glenn OF D/S	6		-	-	-	-	Mesotrophic to Eutrophic	20.7	-	-	4.2
Koignuk River											
Koignuk U/S	7		-	-	-	-	Oligotrophic to Meso-eutrophic	5.0	-	-	1.5
Koignuk M/S	8		-	-	-	-	Oligotrophic to Meso-eutrophic	4.4	-	-	1.2
Koignuk D/S	7		-	-	-	-	Oligotrophic to Meso-eutrophic	5.3	-	-	1.2
Ref A											
Ref Lk A OF	4		-	-	-	-	Oligotrophic	-	-	-	-
Ref B											
Ref Lk B OF	6		-	-	-	-	Ultra-oligotrophic to Oligotrophic	-	-	-	-
Angimajuq											
Angimajuq R. Ref	6		-	-	-	-	Oligotrophic to Mesotrophic	2.0	-	-	-
Total Sites			**0**	**0**	**0**	**0**	**-**	**10**	**0**	**0**	**5**

All values represent the factor by which 2009 lake averages are higher than CCME guidelines *(continued)*

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

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 = ultraoligotrophic; 0.004 - 0.010 = oligotrophic; 0.01 - 0.02 = mesotrophic; 0.02 - 0.035 = meso-eutrophic; 0.035 - 0.1 = eutrophic; >0.1 = hyper-eutrophic

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

d) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

e) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = > 180 mg/L

f) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.150 mg/L at [CaCO3] = > 180 mg/L

Table 3.3-2. Stream Water Quality, Average Factor by which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2009 (completed)

Stream	Total Number of Samples Collected	CCME Guideline Value[a]:	Copper (Cu)-Total 0.002-0.004[d] mg/L	Iron (Fe)-Total 0.3 mg/L	Lead (Pb)-Total 0.001-0.007[e] mg/L	Mercury (Hg)-Total 0.000026 mg/L	Molybdenum (Mo)-Total 0.073 mg/L	Nickel (Ni)-Total 0.025-0.110[f] mg/L	Selenium (Se)-Total 0.001 mg/L	Silver (Ag)-Total 0.0001 mg/L	Thallium (Ag)-Total 0.00088 mg/L	Zinc (Zn)-Total 0.03 mg/L
Doris												
Wolverine OF	2		-	-	-	-	-	-	-	-	-	-
Patch OF	6		-	-	-	-	-	-	-	-	-	-
P.O. OF	6			2.9	-	-	-	-	-	-	-	-
Ogama OF	6		-	1.3	-	-	-	-	-	-	-	-
Doris OF	6		-	-	-	-	-	-	-	-	-	-
Little Roberts												
Little Roberts OF	6		-	1.2	-	-	-	-	-	-	-	-
Windy												
Windy OF	6		-	-	-	-	-	-	-	-	-	-
Glenn OF D/S	6		2.9	7.3		-	-	-	-	-	-	-
Koignuk River												
Koignuk U/S	7			1.9	-	-	-	-	-	-	-	-
Koignuk M/S	8		1.4	1.7	1.2	-	-	-	-	-	-	-
Koignuk D/S	7		1.5	2.0	-	-	-	-	-	-	-	-
Ref A												
Ref Lk A OF	4		-	-	-	-	-	-	-	-	-	-
Ref B												
Ref Lk B OF	6		-	-	-	-	-	-	-	-	-	-
Angimajuq												
Angimajuq R. Ref	6		-	1.2	-	-	-	-	-	-	-	-
Total Sites			**3**	**8**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

All values represent the factor by which 2009 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

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 = ultraoligotrophic; 0.004 - 0.010 = oligotrophic; 0.01 - 0.02 = mesotrophic; 0.02 - 0.035 = meso-eutrophic; 0.035 - 0.1 = eutrophic; >0.1 = hyper-eutrophic

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

d) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

e) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = > 180 mg/L

f) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.150 mg/L at [CaCO3] = > 180 mg/L

The 2009 sampling program supplemented the historical water quality database and provided low-detection limit data for an expanded number of streams and rivers.

3.4 LAKE SEDIMENT QUALITY

Lake sediment samples were collected from a total of 15 sites in 13 lakes, during August 2009 (see Table 2.1-4 for locations and dates of collection). All sediment samples collected were compared to CCME 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.

The 2009 sediment quality program focused on characterizing the natural variation in lake sediments with depth and by lake. Lakes sampled resided within a number of different watersheds and included two reference lakes located ~10 km away from the location of potential mining activities.

Lake sediment descriptions and photographs can be found in Appendix 3.4-1 and 3.4-2, respectively. All lake sediment quality analytical data for 2009 are provided in Appendix 3.4-3. Figure 3.4-1 presents results from particle size analyses. Graphical representations of selected sediment quality variables are presented in Figures 3.4-2a to 3.4-2l. Historical data are presented in Figures 3.4-3a to 3.4-3l.

3.4.1 Depth Variation

Lake sediments were largely composed of clay and silt, with lesser amounts of sand and little gravel. Finer sediments (silt and clays) were more dominant at depth, with sands and gravels accounting for less than 4% of the particle size composition at depths greater than 5 m at all sites except Nakhaktok Lake (sand + gravel = 11% at >5 m depth, 5% at <5 depth). Sands were dominant in the shallow depth zones of Patch N, Doris S, and Ref Lk A.

Many sediment parameters had higher concentrations at mid- to deep depth (>5 m) zones than in the shallow depth zone, likely due to the increase in finer sediments with depth. Parameters that increased in concentration with depth included: TOC, ammonium, total nitrogen, total sulphur, arsenic, cadmium, chromium, copper, lead, mercury, and zinc. This was consistent across all sites, except for Nakhaktok Lake, where the opposite was always observed, and Glenn Lake, which showed little difference with depth. Total phosphorus did not consistently increase with depth, although the highest concentration observed was at Ref Lk A, deep depth (77.2 mg/L).

3.4.2 Spatial Variation

There were few clear trends in parameter concentrations among sites. Spatial differences in parameters such as TOC, and nitrogen and phosphorus were relatively greater than differences in metal concentrations. Compared to other lakes, the upstream Windy Watershed lakes, Wolverine and Imniagut, had higher concentrations of TOC (averages of 7.83 and 7.82%, respectively), ammonium (averages of 73.3 and 66.2 mg/kg, respectively), total nitrogen (averages of 0.78 and 1.00 mg/kg, respectively), and total sulphur (averages of 2,010 and 3,500 mg/kg, respectively). No obvious watershed-wide patterns were observed.

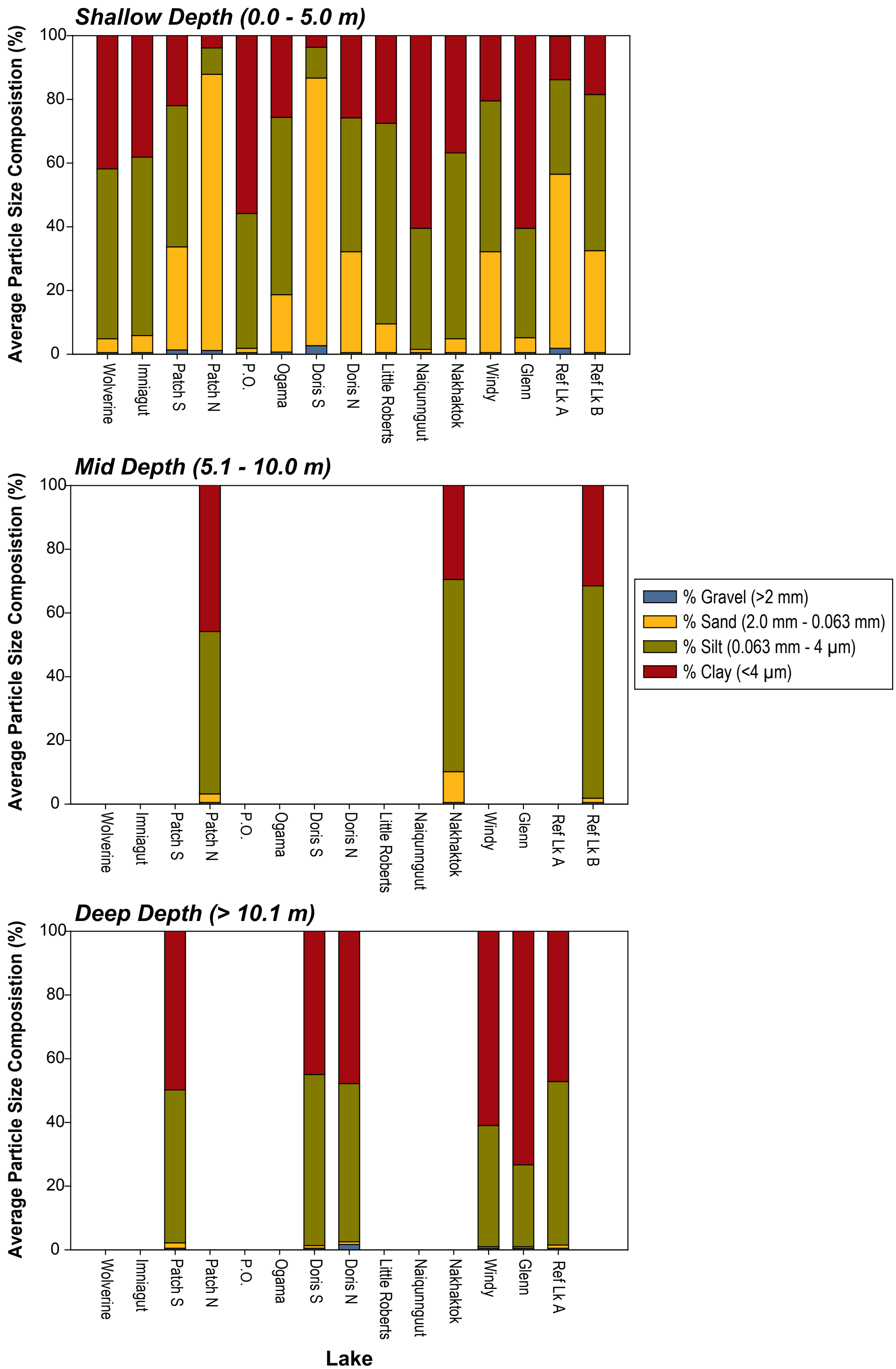

Figure 3.4-1

Sediment Particle Size Composition, Hope Bay Lakes, August 2009

NEWMONT NORTH AMERICA

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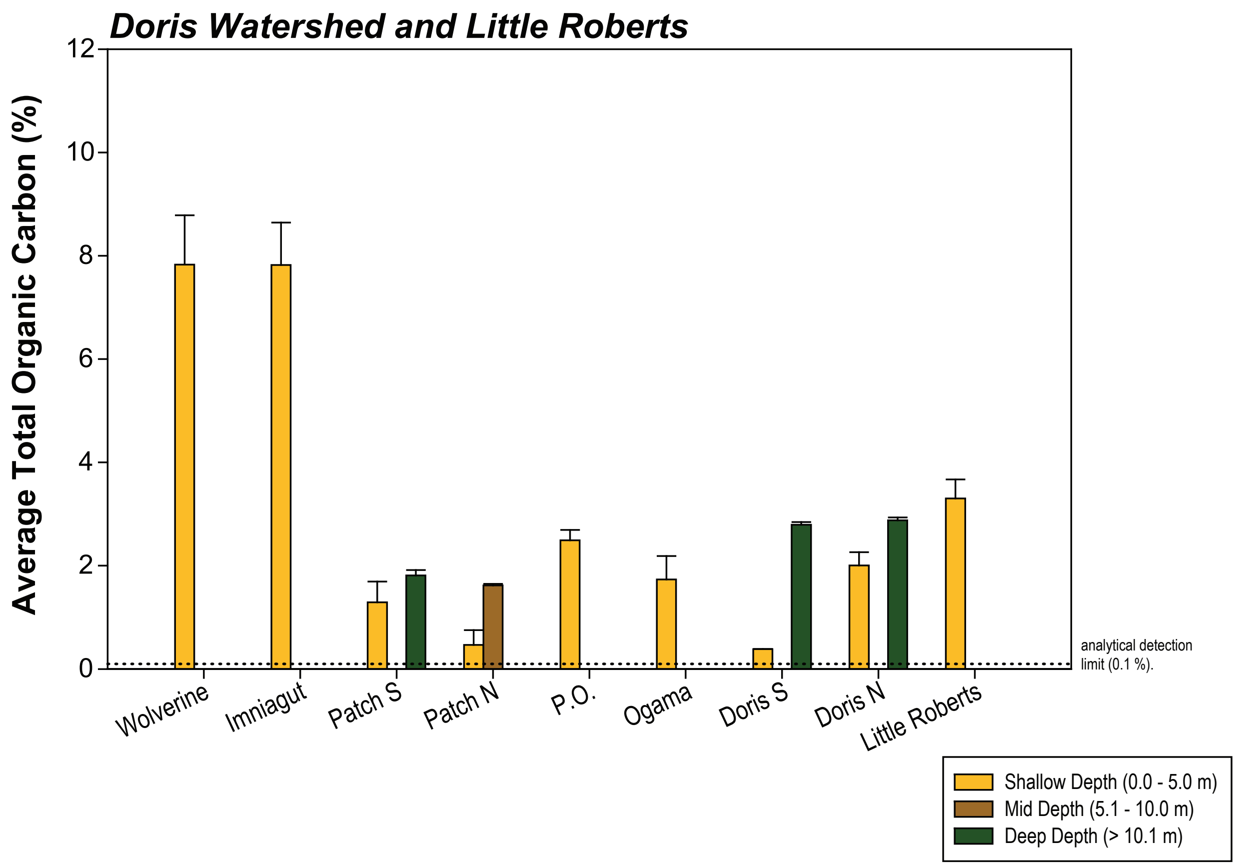
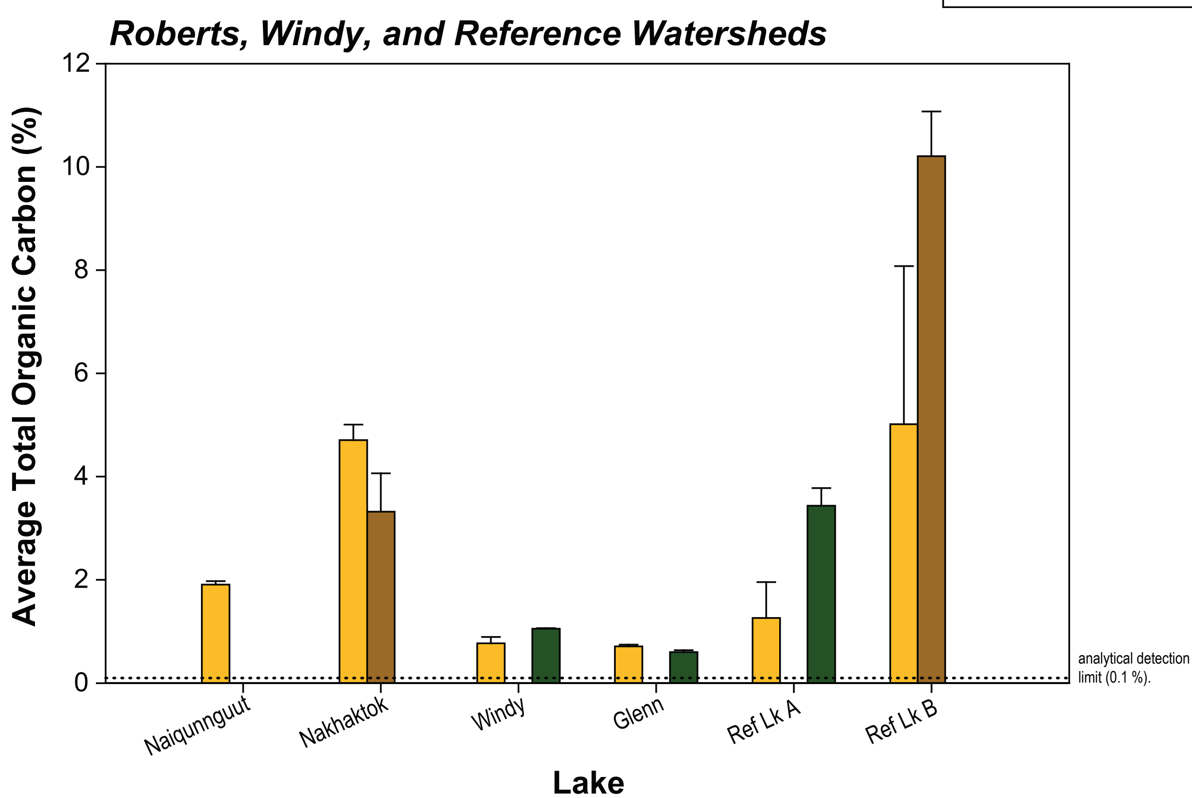




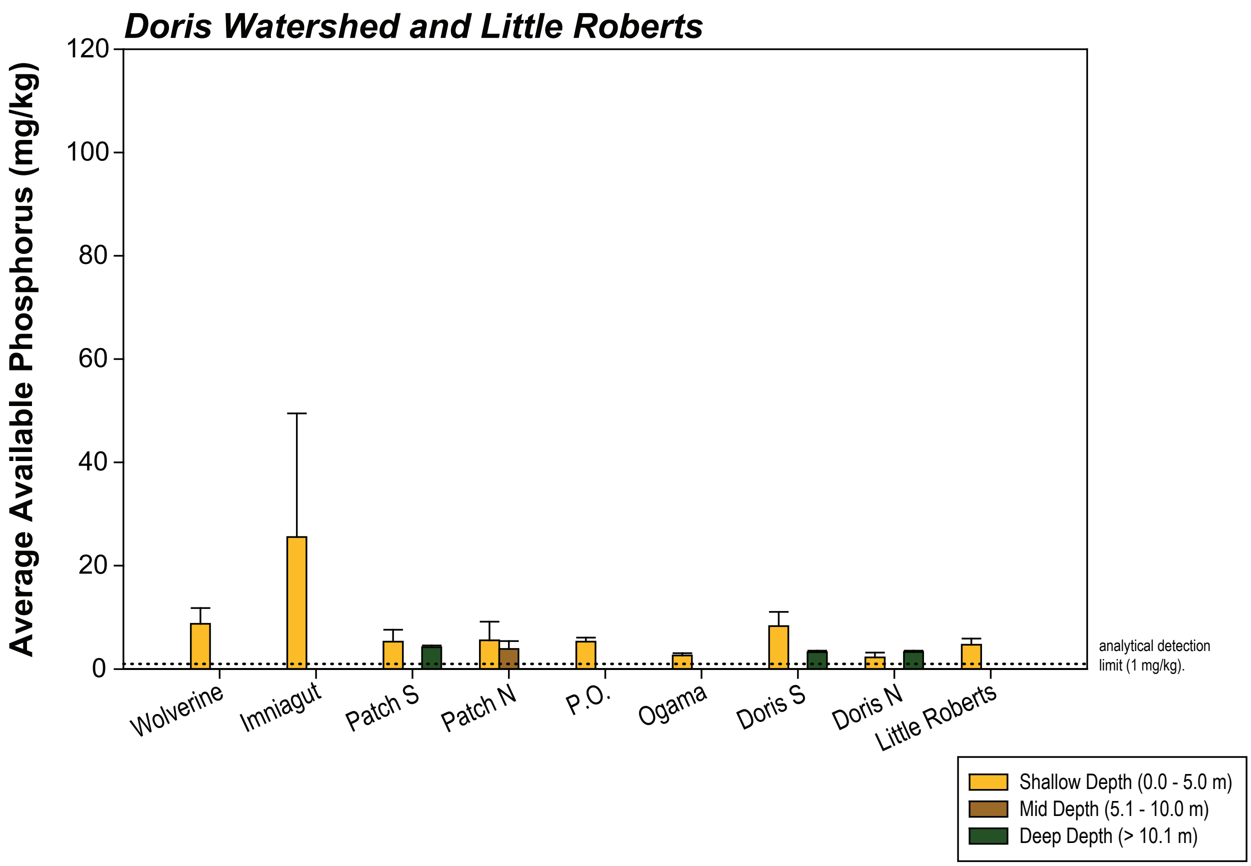
Notes: Error bars represent standard error of the mean.
No SQGs exist for total organic carbon.

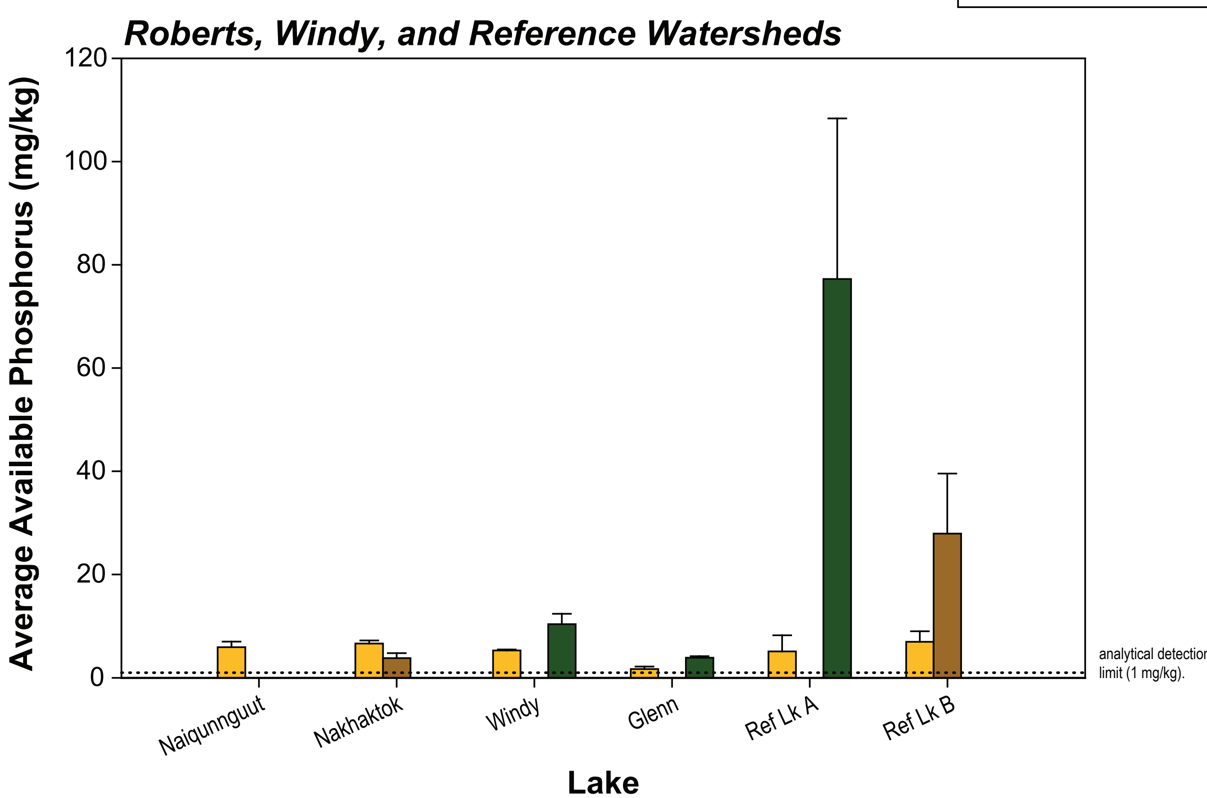
NEWMONT NORTH AMERICA

Average Concentration of Total Organic Carbon in Lake Sediments, Hope Bay Belt Project, 2009

Figure 3.4-2a

Rescan Engineers & Scientists





Notes: Error bars represent standard error of the mean.
No SQGs exist for available phosphorus.

NEWMONT NORTH AMERICA

Average Concentration of Available Phosphorus in Lake Sediments, Hope Bay Belt Project, 2009

Figure 3.4-2b

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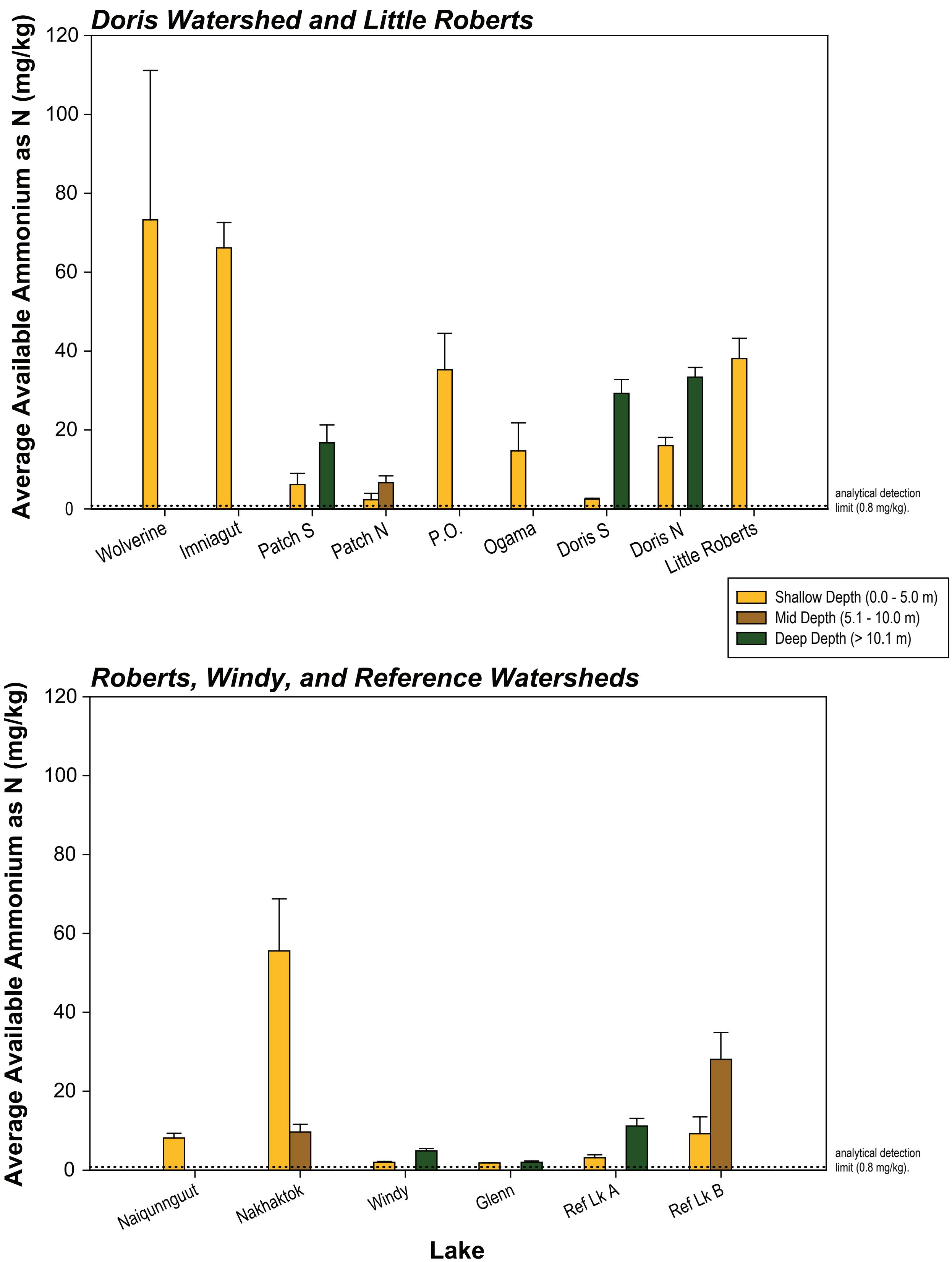

Notes: Error bars represent standard error of the mean.
No SQGs exist for ammonium as N.

NEWMONT NORTH AMERICA

Average Concentration of Available Ammonium as N in Lake Sediments, Hope Bay Belt Project, 2009

Figure 3.4-2c

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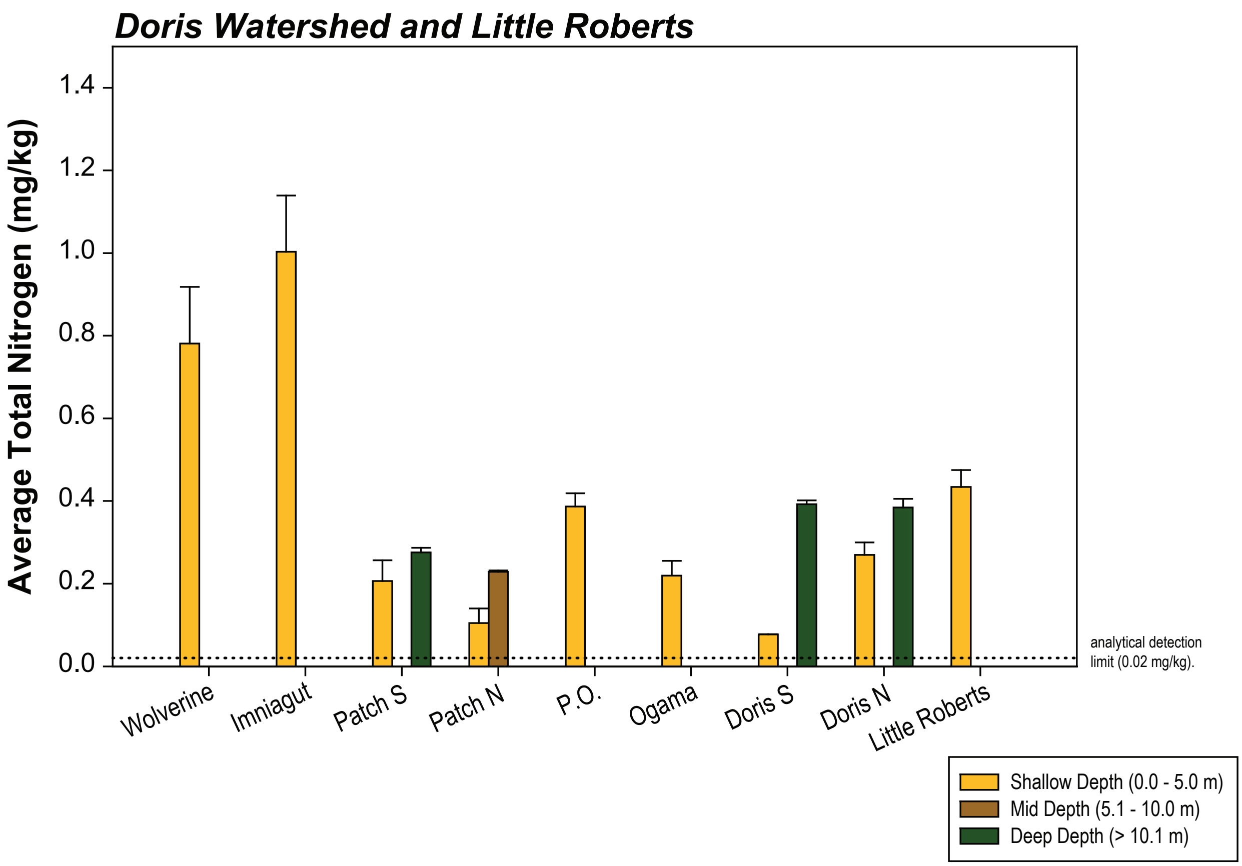
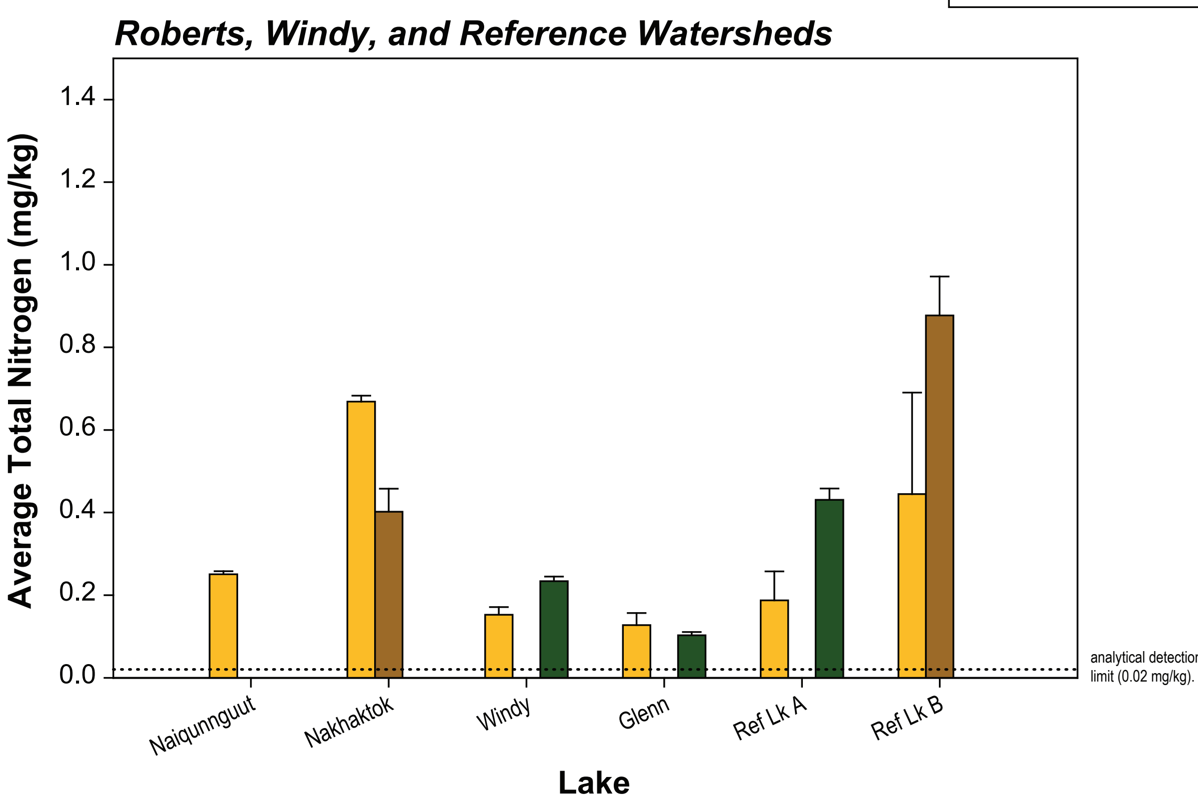




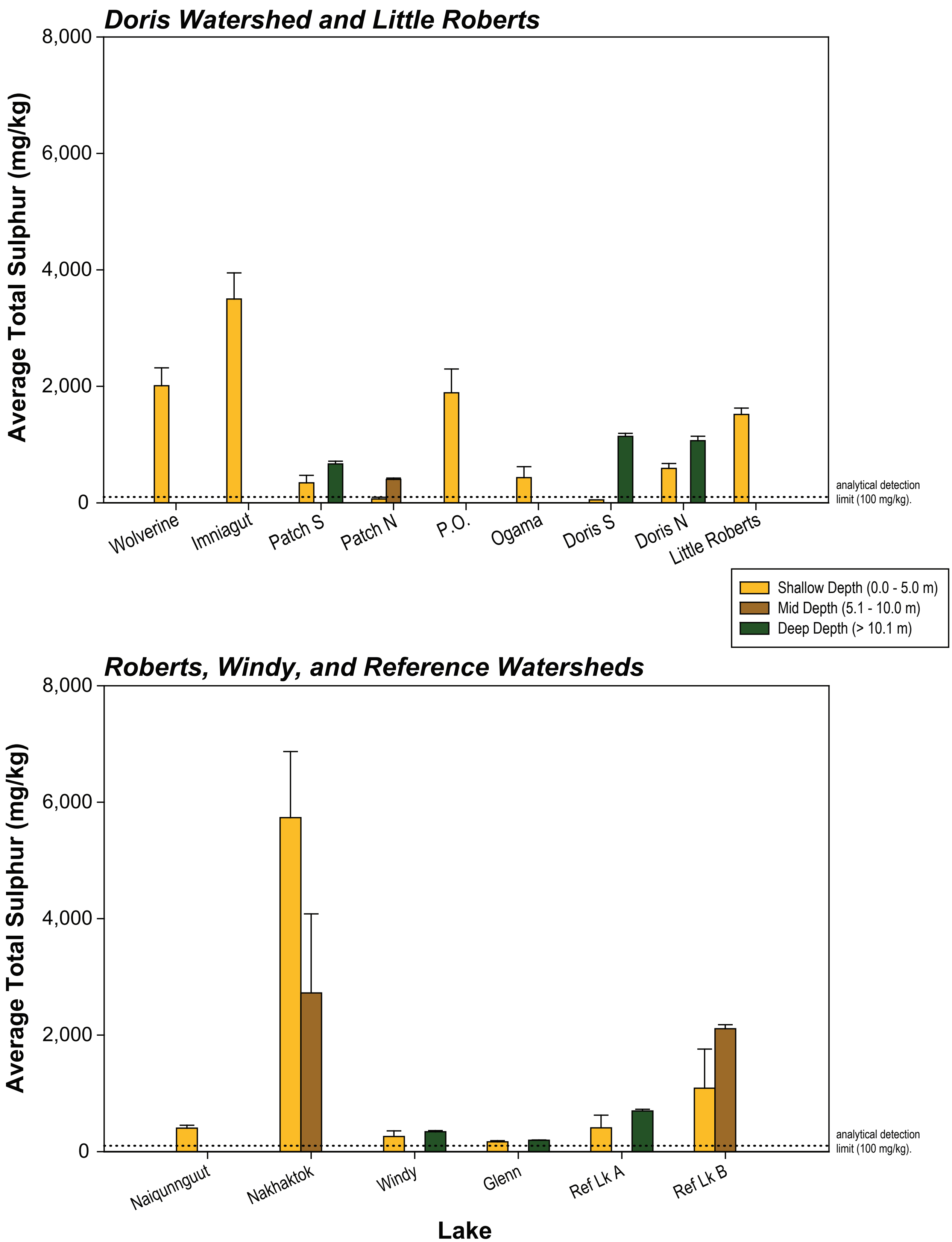
Notes: Error bars represent standard error of the mean.
No SQGs exist for total nitrogen.

NEWMONT NORTH AMERICA

Average Concentration of Total Nitrogen in Lake Sediments, Hope Bay Belt Project, 2009

Figure 3.4-2d

Rescan Engineers & Scientists



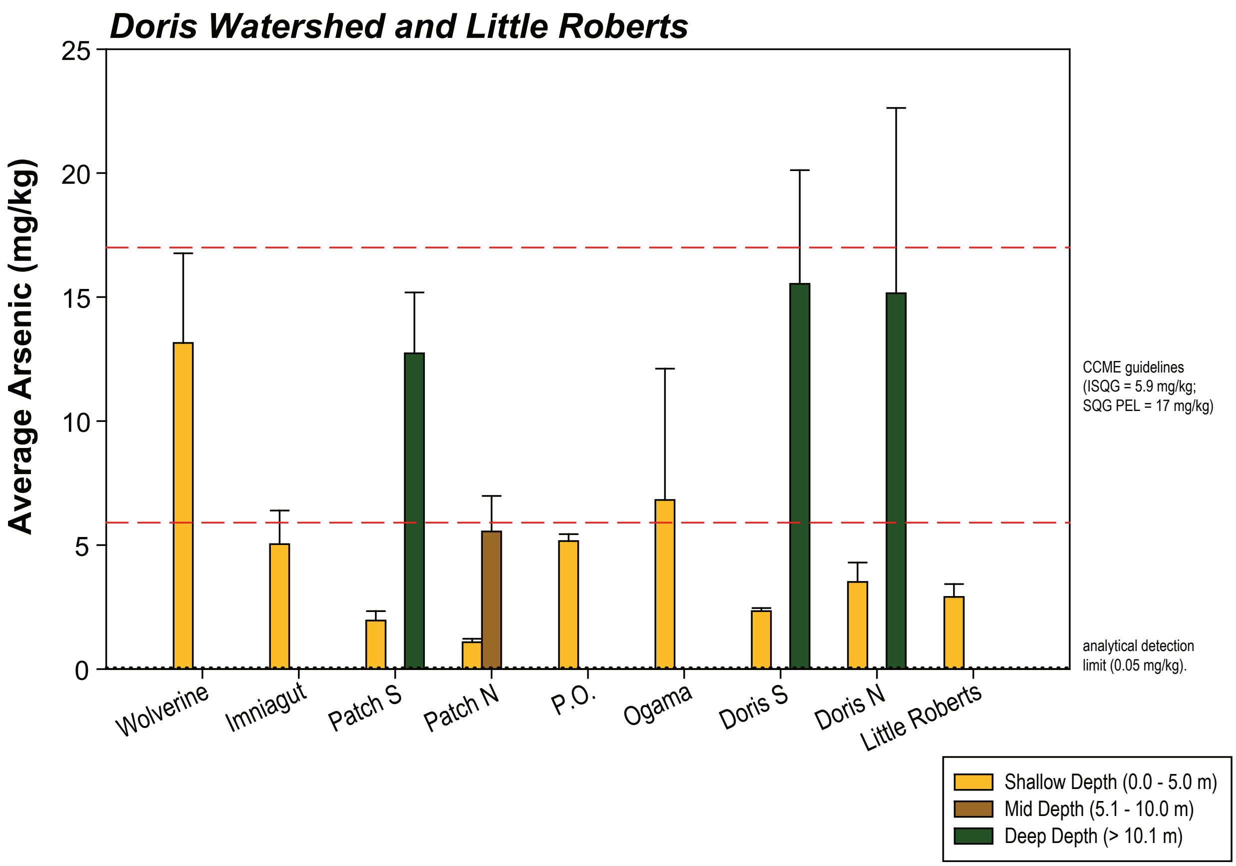
Notes: Error bars represent standard error of the mean.
No SQGs exist for total sulphur.

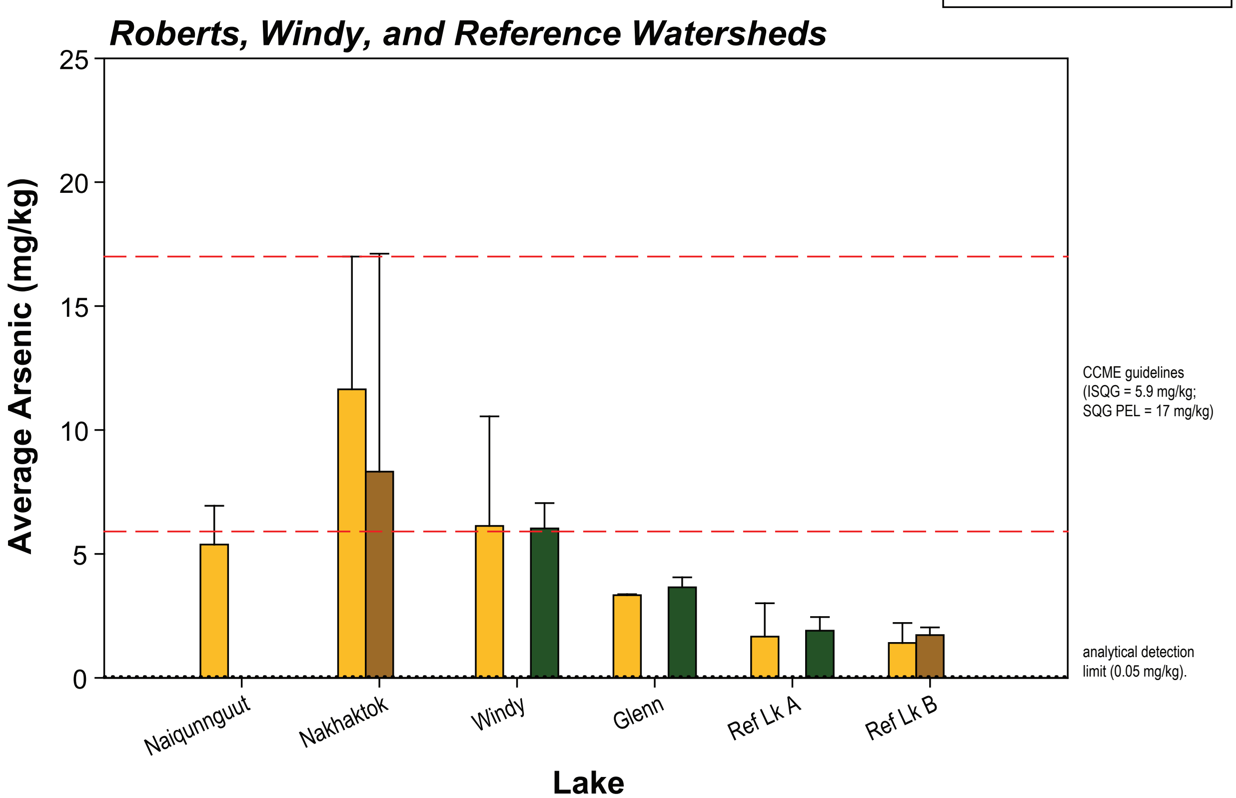
NEWMONT NORTH AMERICA

Average Concentration of Total Sulphur in Lake Sediments, Hope Bay Belt Project, 2009

Figure 3.4-2e

Rescan Engineers & Scientists





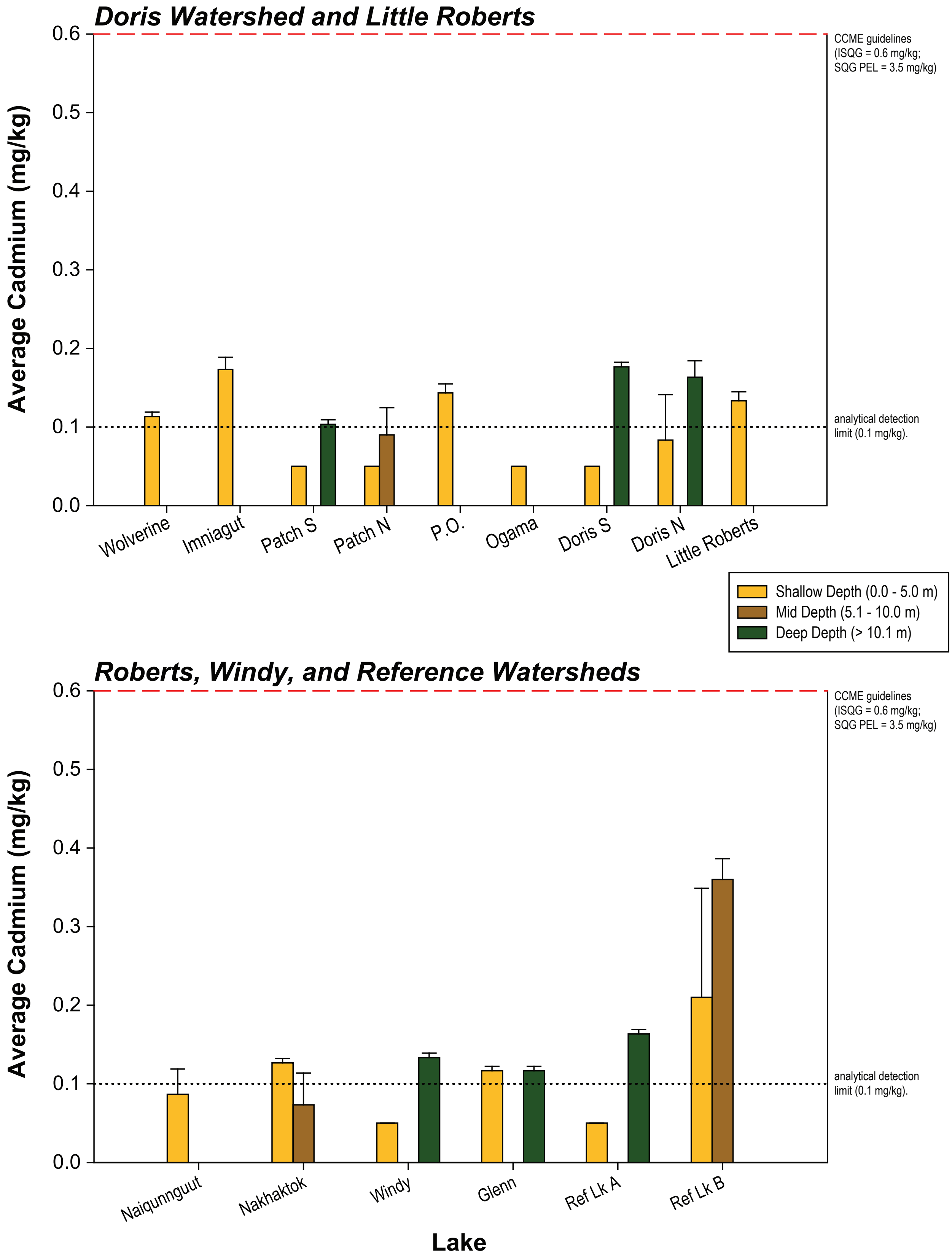
Note: Error bars represent standard error of the mean.

NEWMONT NORTH AMERICA

Average Concentration of Arsenic in Lake Sediments, Hope Bay Belt Project, 2009

Figure 3.4-2f

Rescan Engineers & Scientists



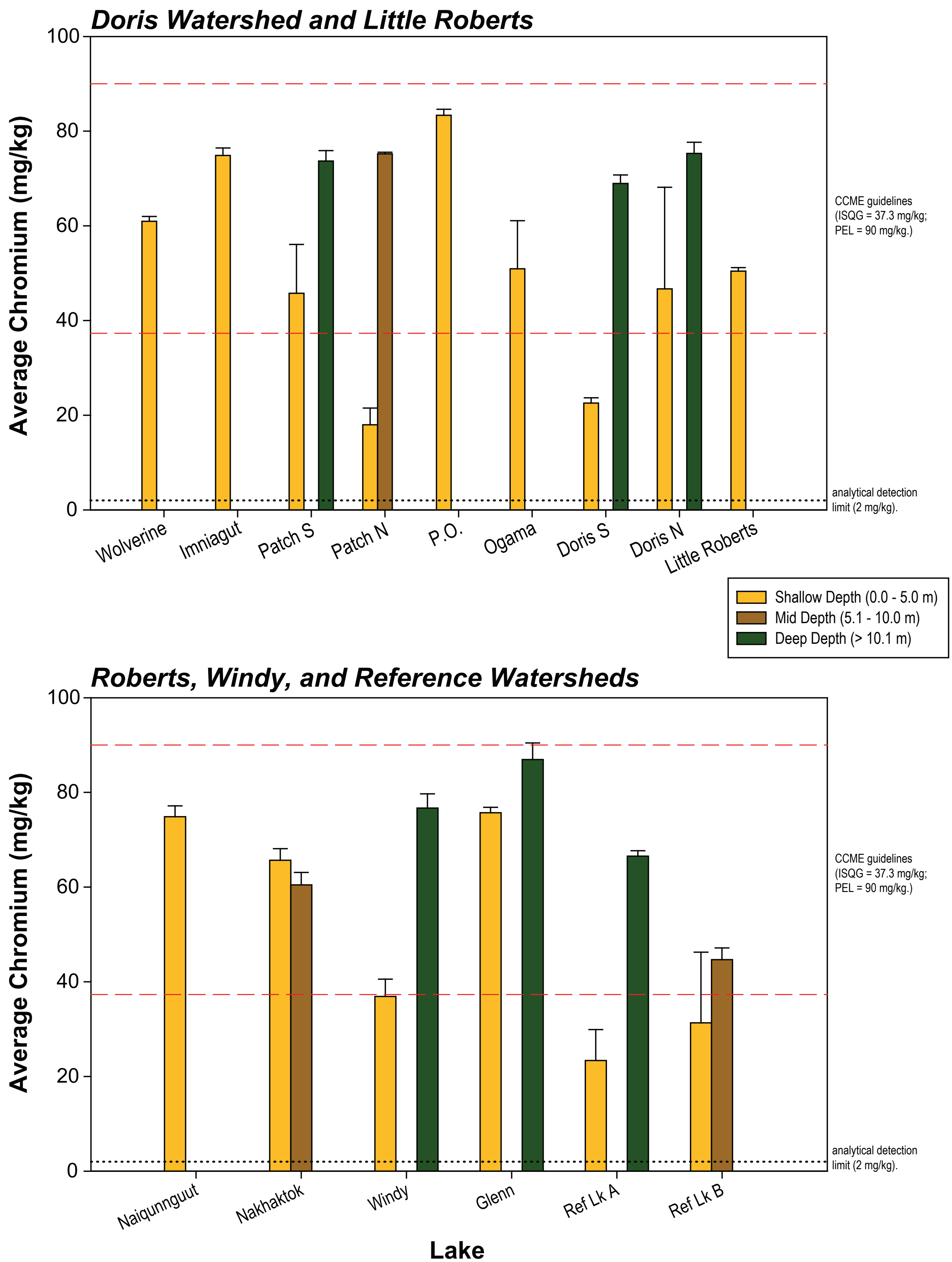
Note: Error bars represent standard error of the mean.

NEWMONT NORTH AMERICA

Average Concentration of Cadmium in Lake Sediments, Hope Bay Belt Project, 2009

Figure 3.4-2g

Rescan Engineers & Scientists



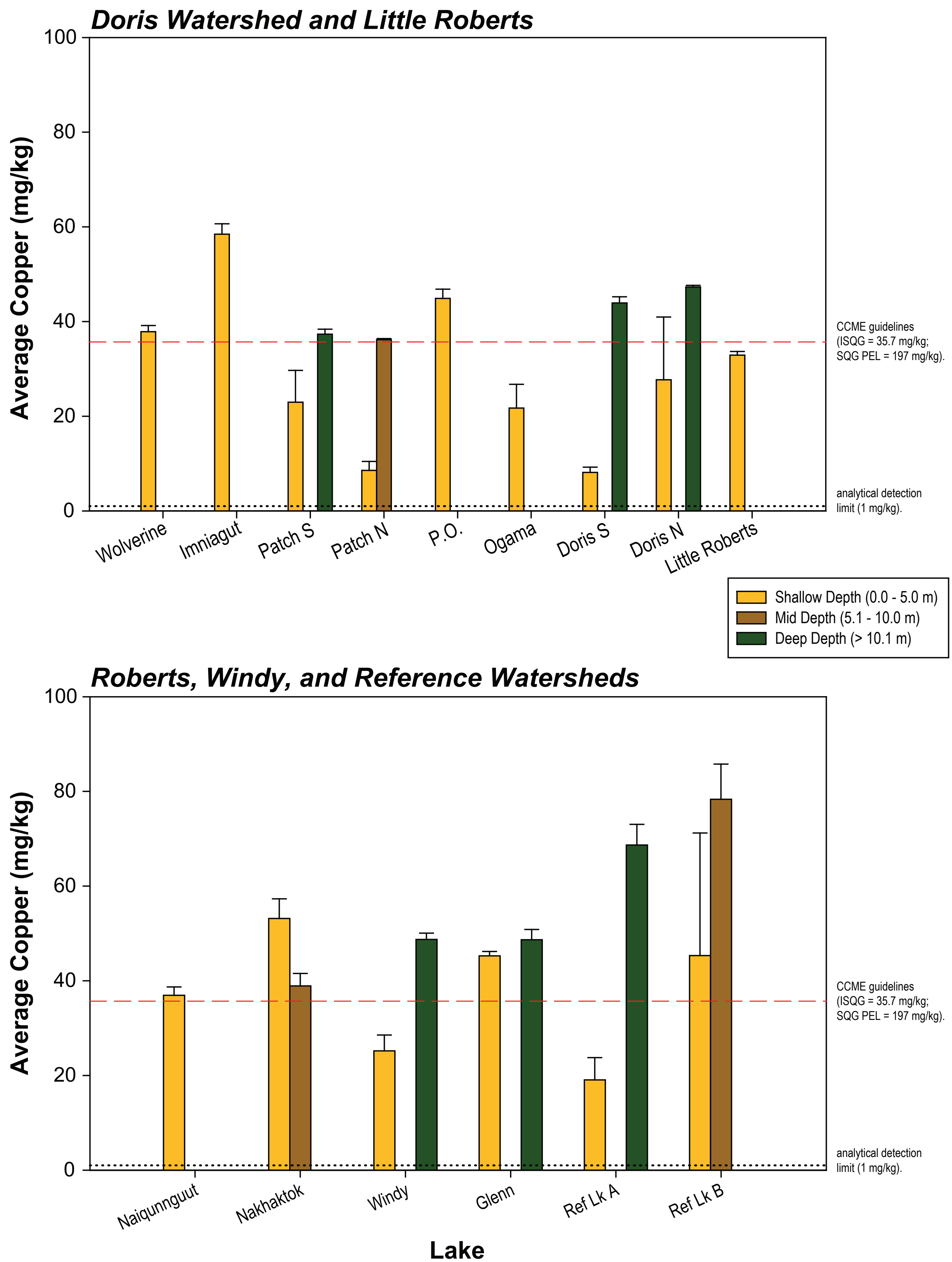
Note: Error bars represent standard error of the mean.

NEWMONT NORTH AMERICA

Average Concentration of Chromium in Lake Sediments, Hope Bay Belt Project, 2009

Figure 3.4-2h

Rescan Engineers & Scientists



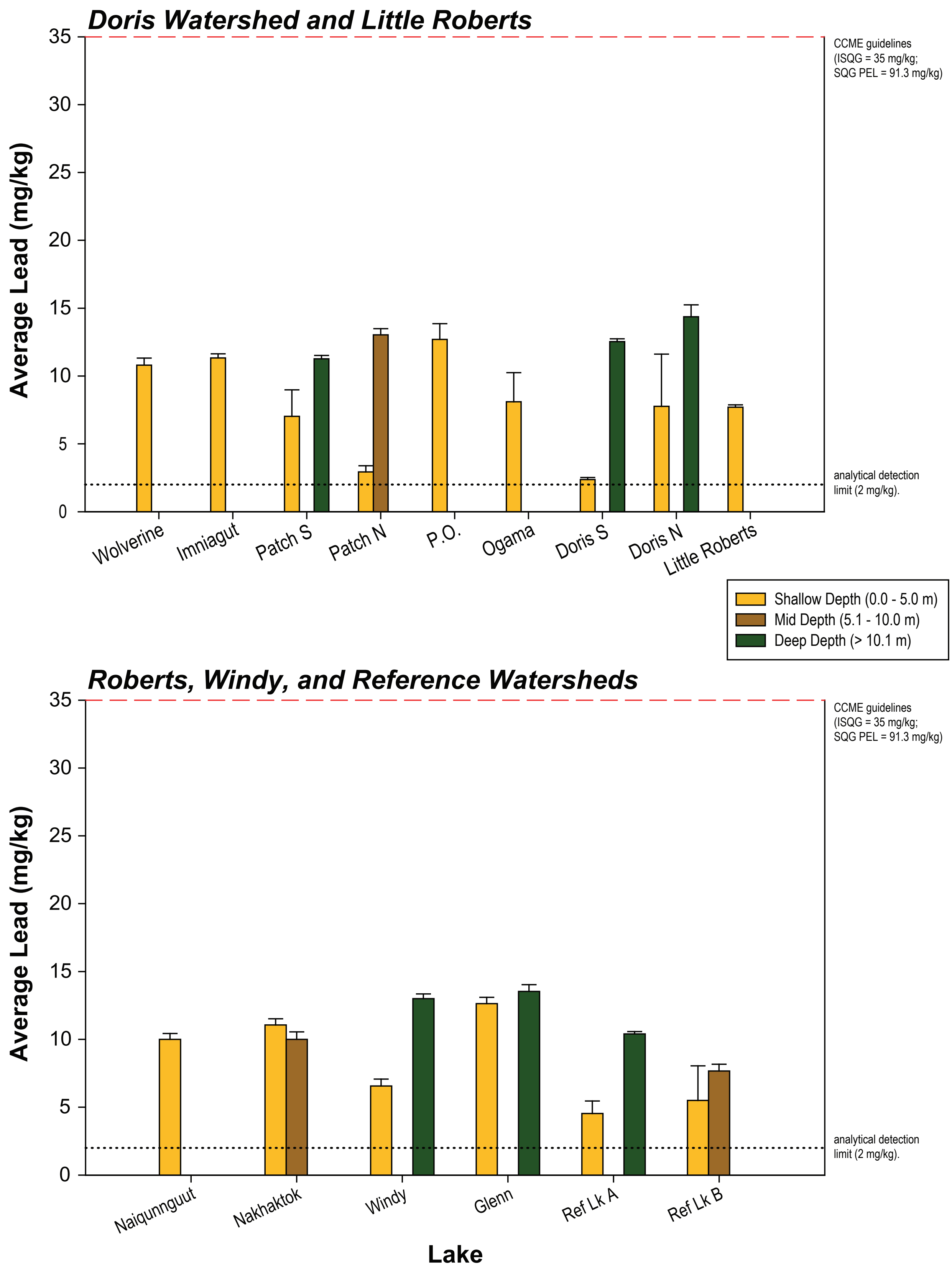
Note: Error bars represent standard error of the mean.

NEWMONT NORTH AMERICA

Average Concentration of Copper in Lake Sediments, Hope Bay Belt Project, 2009

Figure 3.4-2i

Rescan Engineers & Scientists



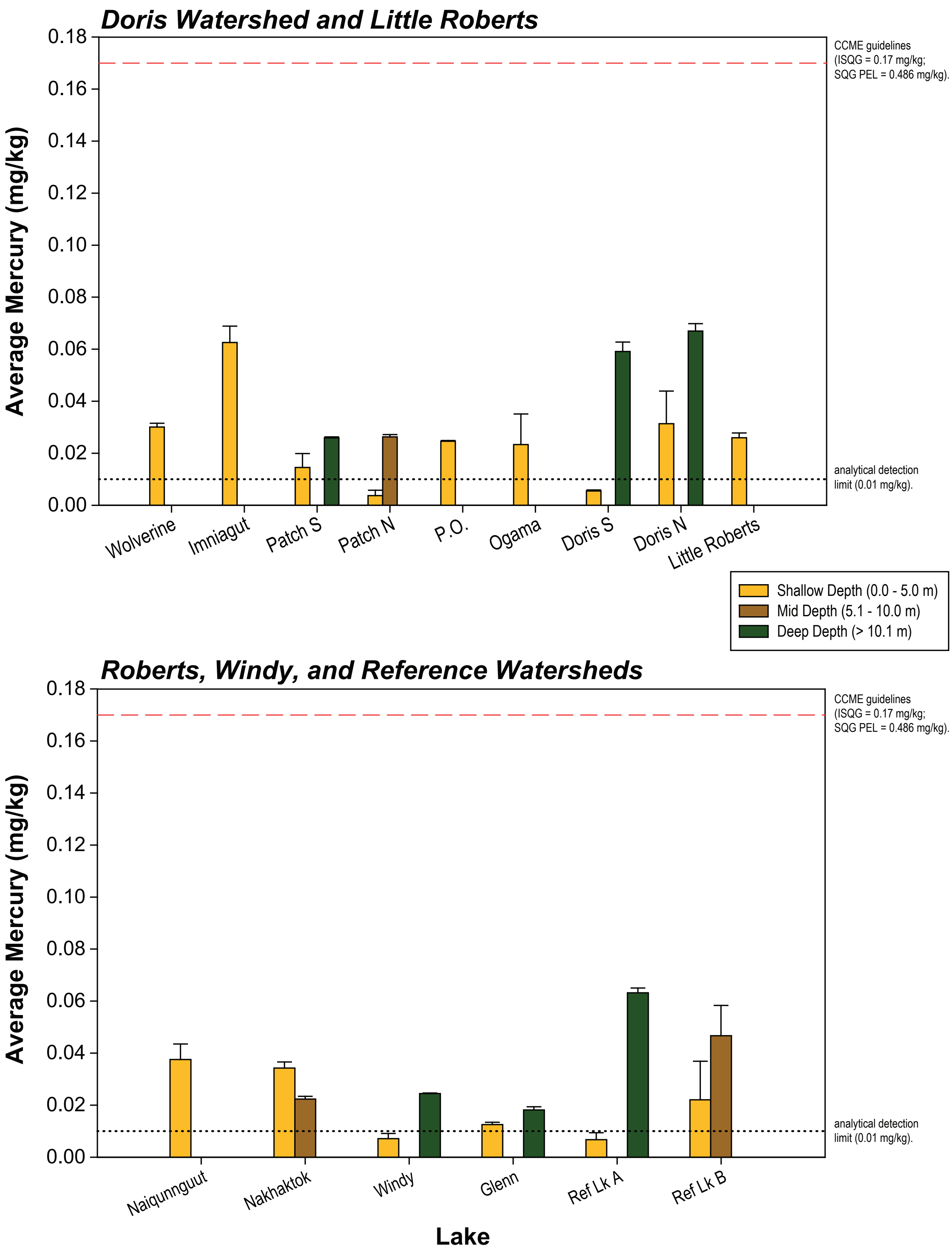
Notes: Error bars represent standard error of the mean.

Figure 3.4-2j

Average Concentration of Lead in Lake Sediments, Hope Bay Belt Project, 2009

NEWMONT NORTH AMERICA

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.

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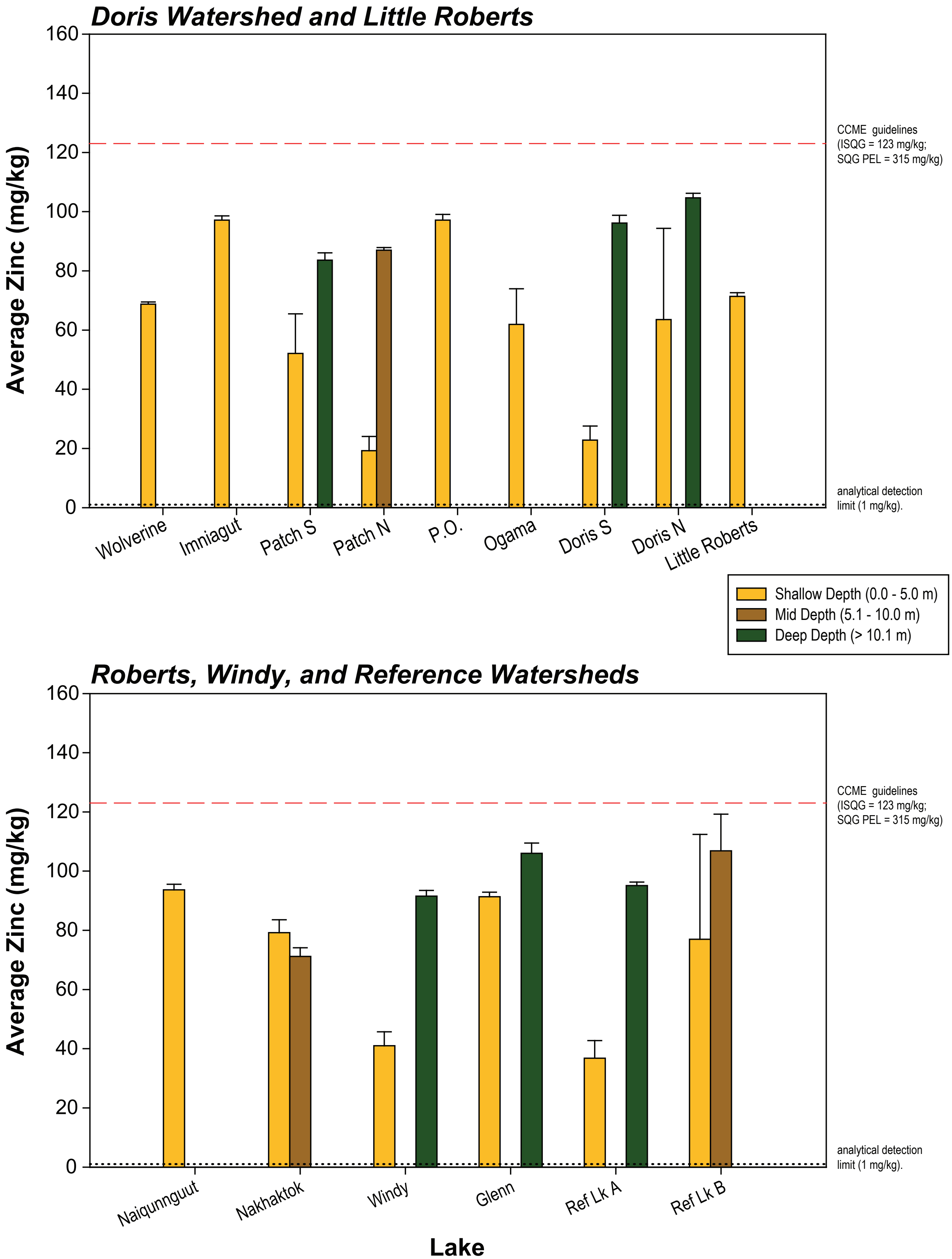
Figure 3.4-2k

Average Concentration of Mercury in Lake Sediments, Hope Bay Belt Project, 2009

Rescan Engineers & Scientists



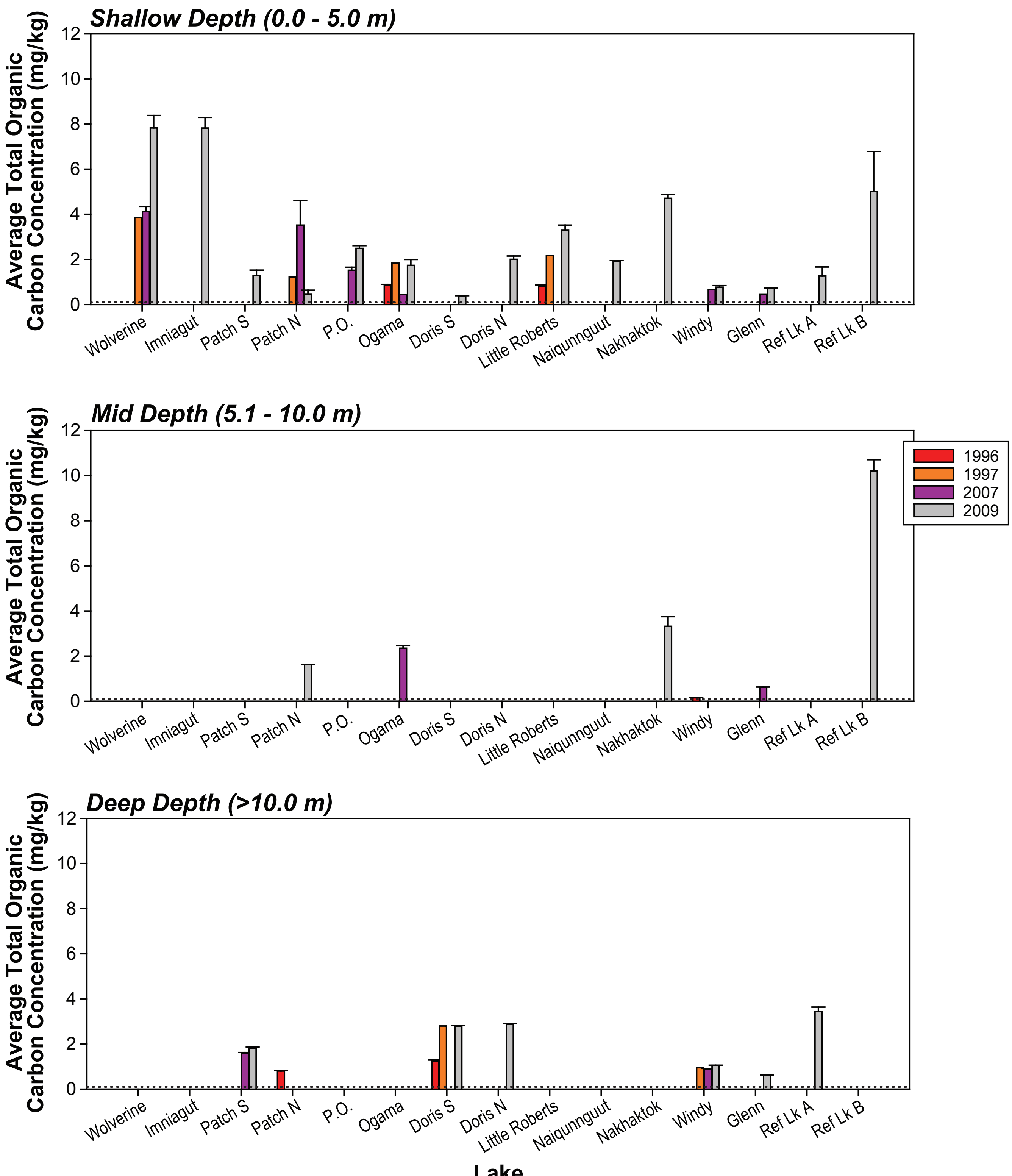
Note: Error bars represent standard error of the mean.

Figure 3.4-2l

Average Concentration of Zinc in Lake Sediments, Hope Bay Belt Project, 2009

NEWMONT NORTH AMERICA

Rescan Engineers & Scientists



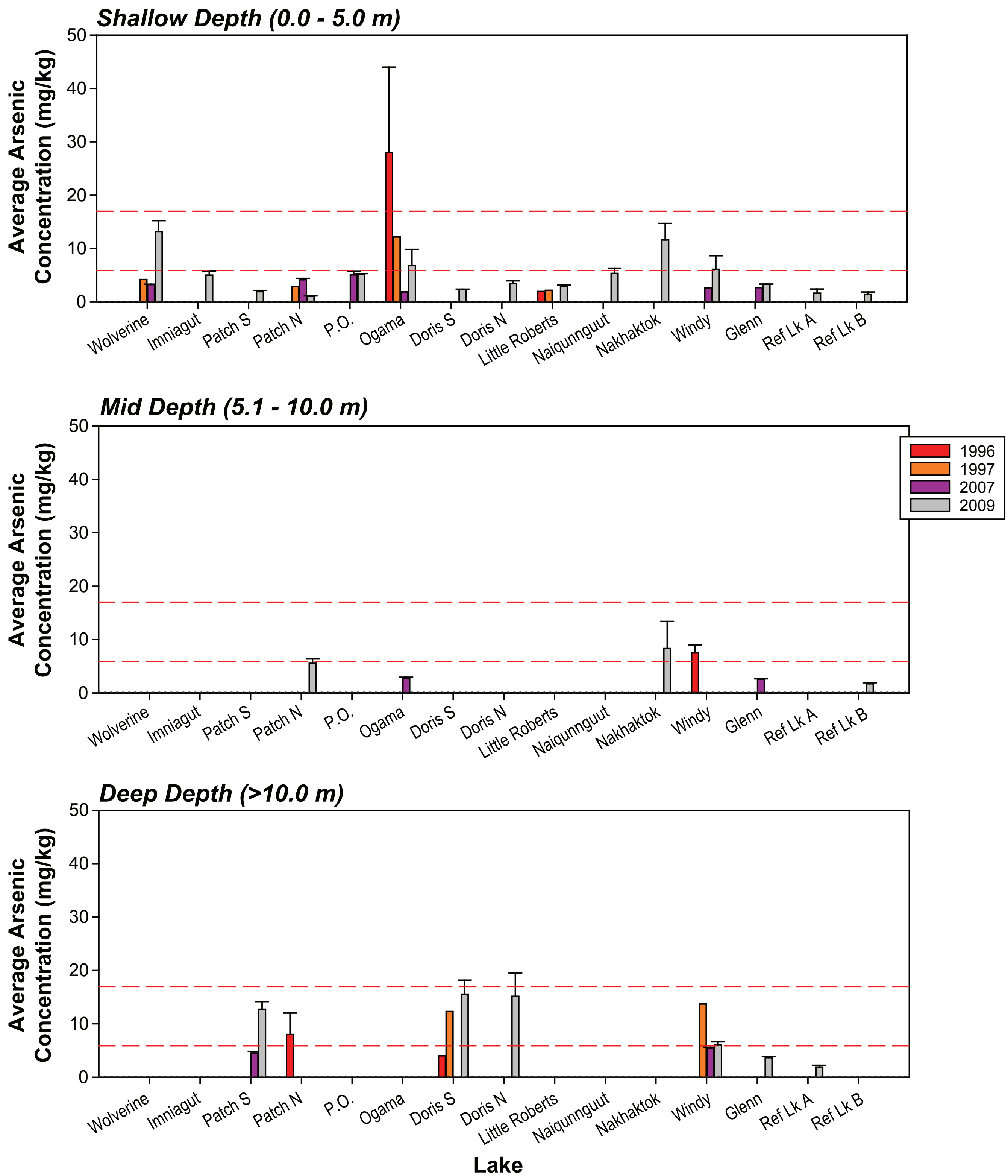
Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit (0.1 %).
No SQGs exist for total organic carbon.

NEWMONT NORTH AMERICA

Average Annual Concentrations of Total Organic Carbon in Lake Sediments, Hope Bay Belt Project, 1996 - 2009

Figure 3.4-3a

Rescan Engineers & Scientists



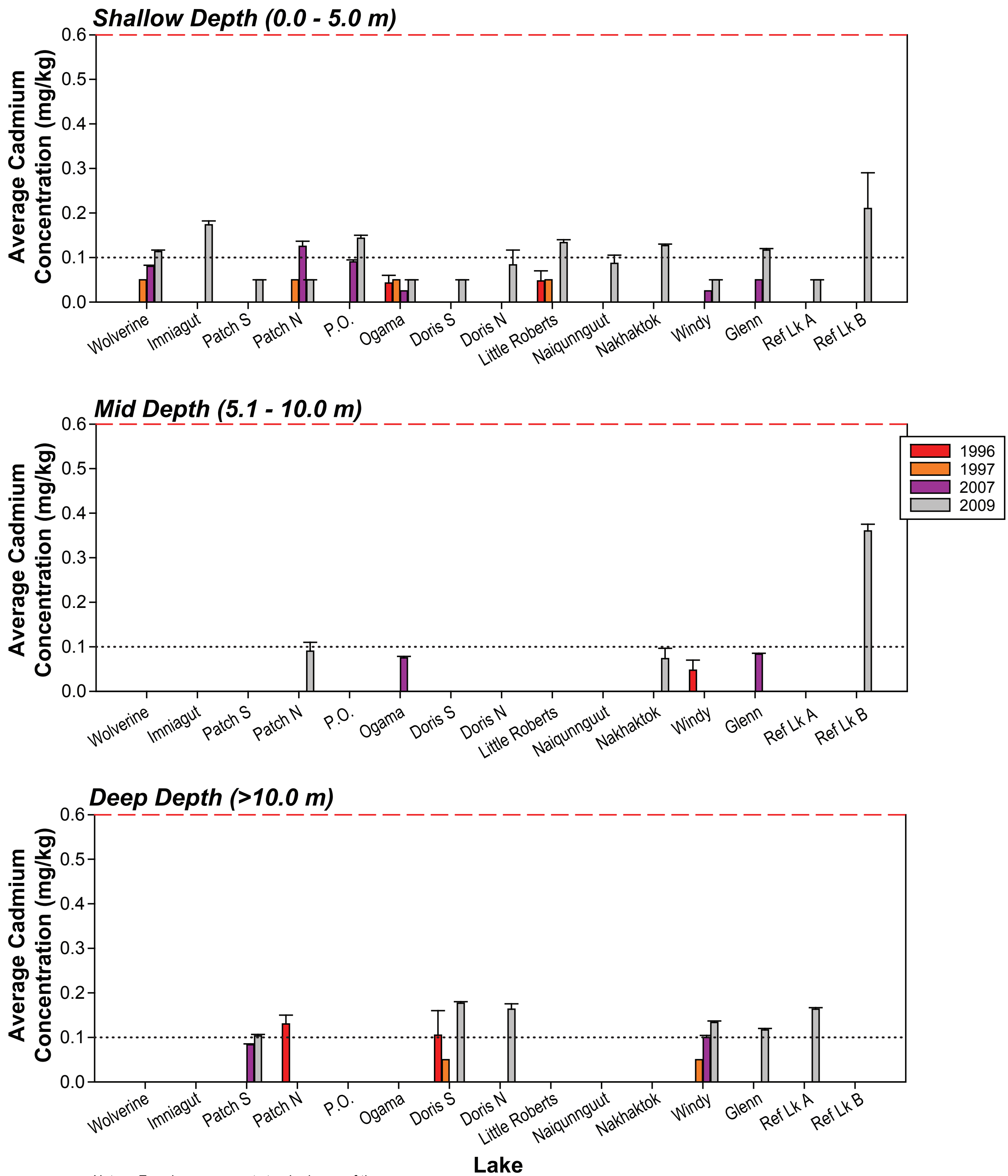
Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit (0.05 mg/kg).
Dashed line represents CCME guidelines (ISQG = 5.9 mg/kg; SQG PEL = 17 mg/kg)

NEWMONT NORTH AMERICA

Average Annual Concentrations of Arsenic in Lake Sediments, Hope Bay Belt Project, 1996 - 2009

Figure 3.4-3b

Rescan Engineers & Scientists



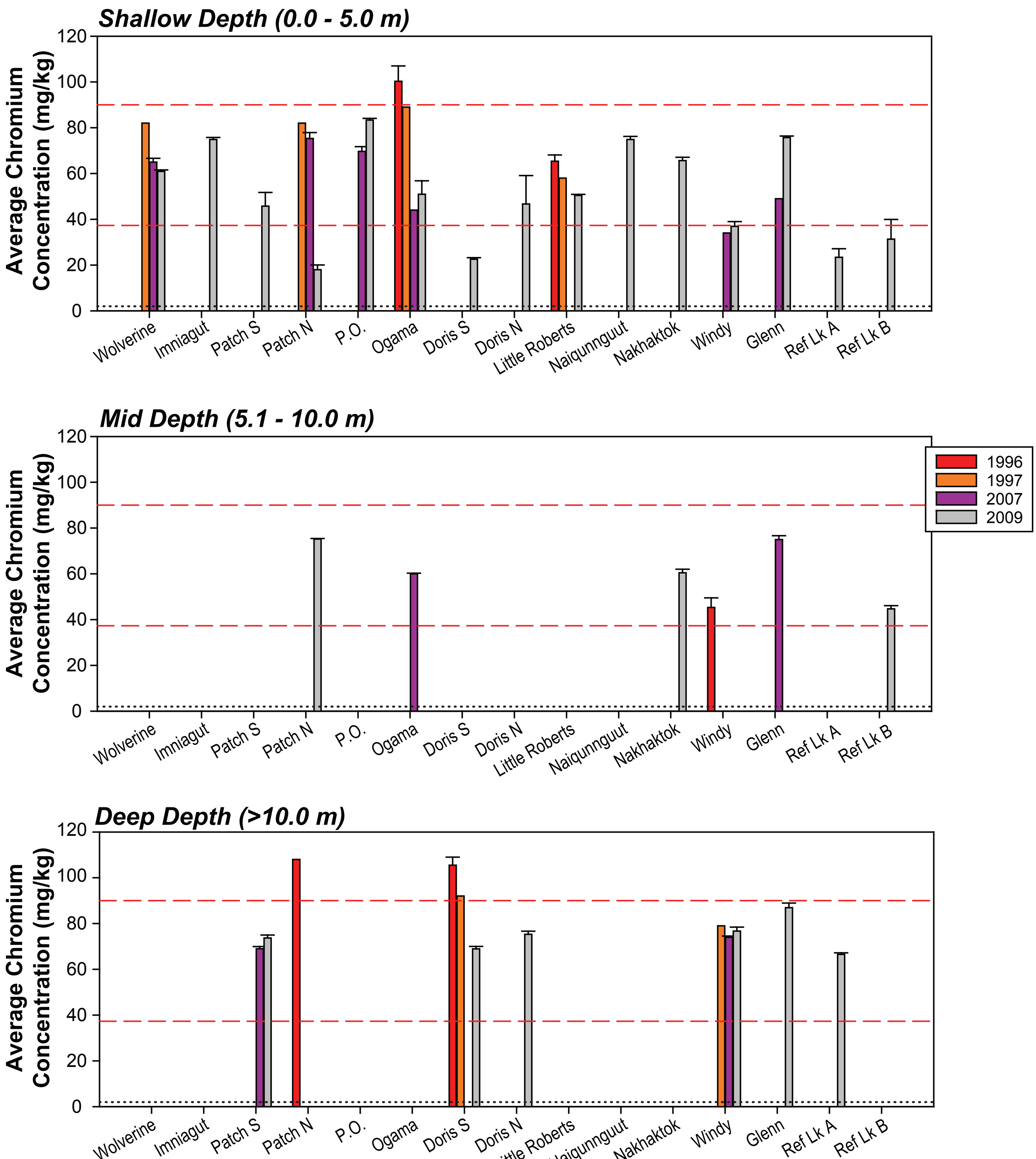
Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit (0.1 mg/kg).
Dashed line represents CCME guidelines (ISQG = 0.6 mg/kg; SQG PEL = 3.5 mg/kg)

NEWMONT NORTH AMERICA

Average Annual Concentrations of Cadmium in Lake Sediments, Hope Bay Belt Project, 1996 - 2009

Figure 3.4-3c

Rescan Engineers & Scientists



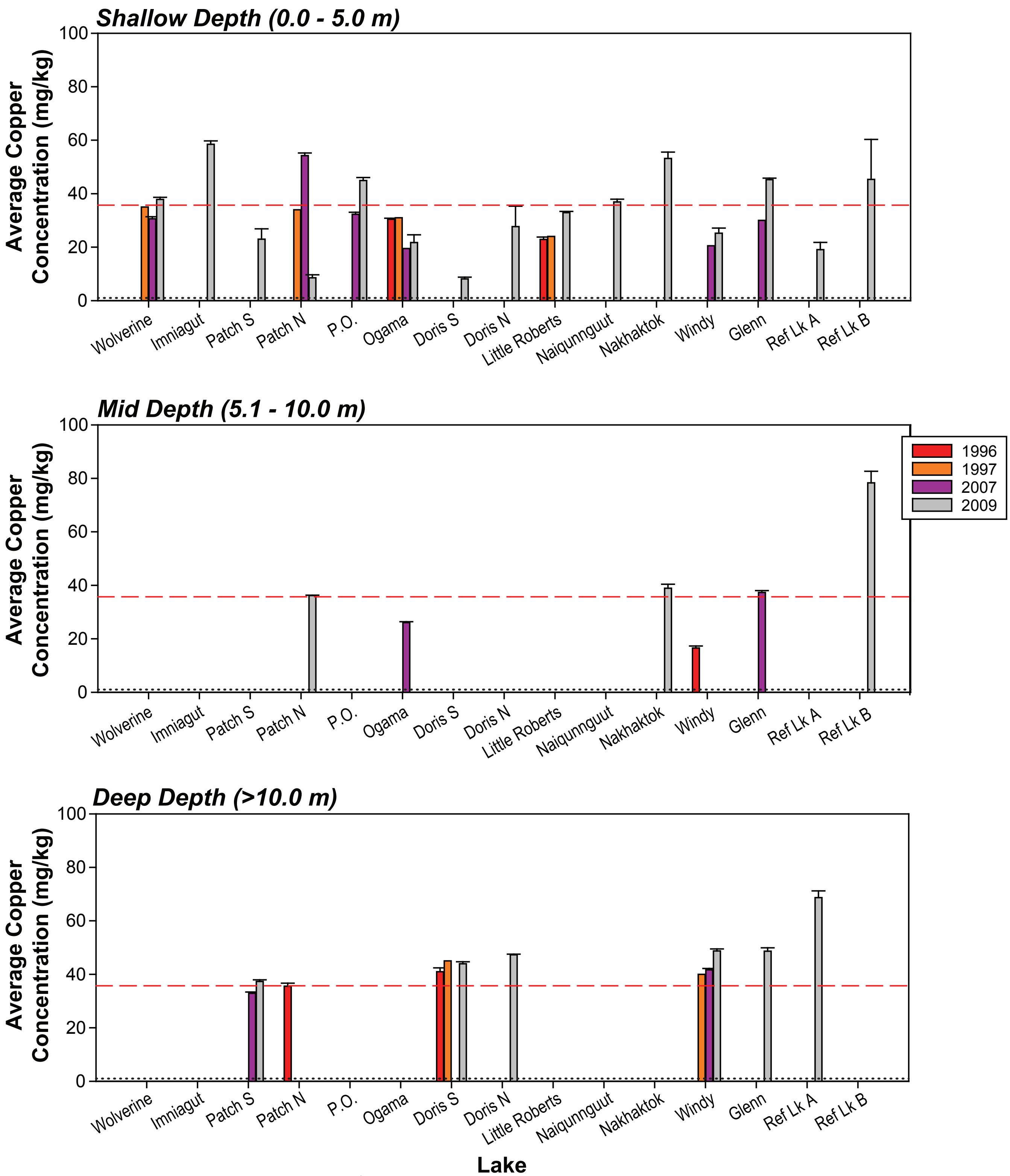
Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit (2 mg/kg).
Dashed lines indicates CCME guidelines (ISQG = 37.3 mg/kg; PEL = 90 mg/kg.)

Average Annual Concentrations of Chromium in Lake Sediments, Hope Bay Belt Project, 1996 - 2009

Figure 3.4-3d

NEWMONT NORTH AMERICA

Rescan Engineers & Scientists



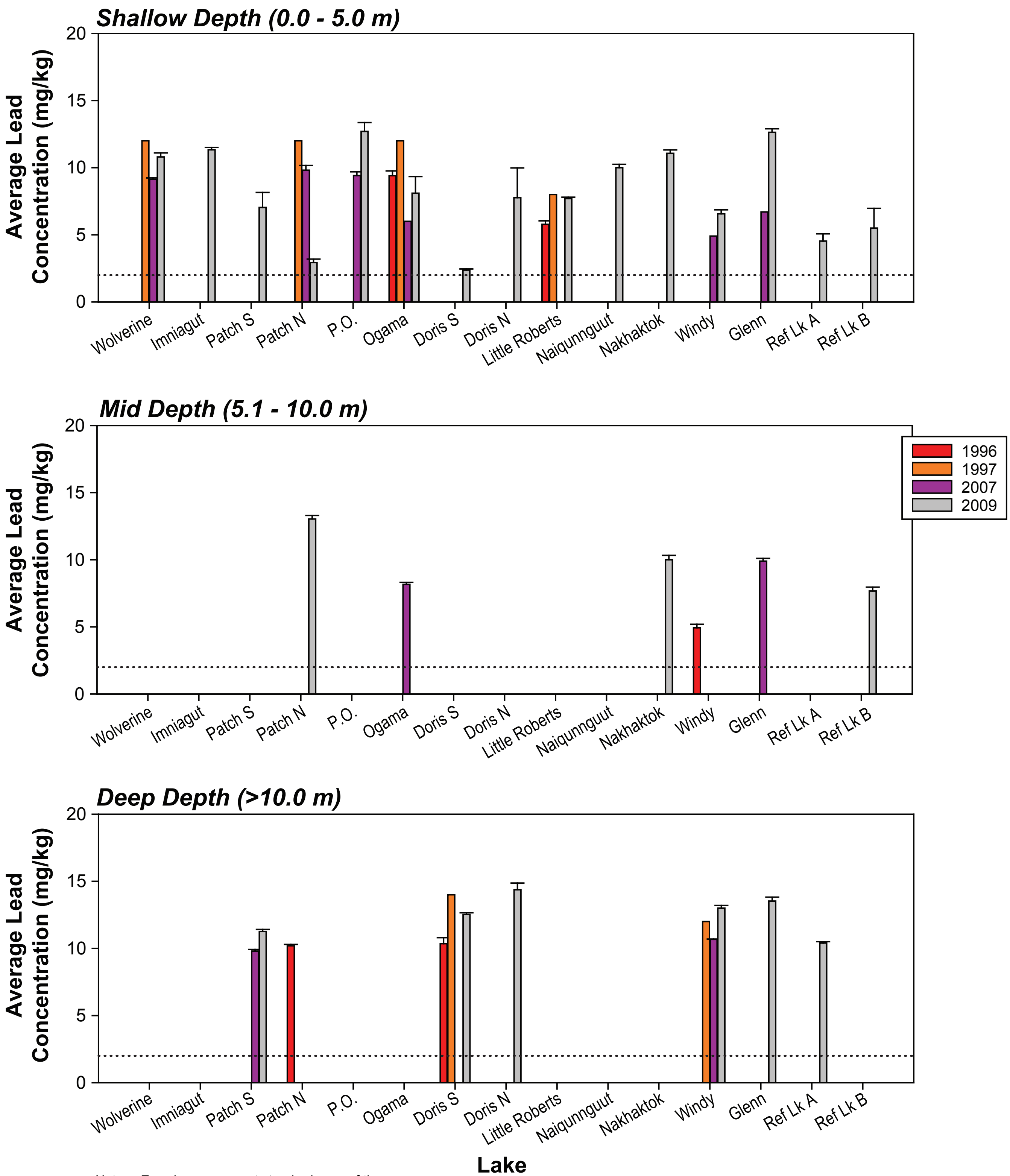
Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit (1 mg/kg).
Dashed line indicates CCME guidelines (ISQG = 35.7 mg/kg; SQG PEL = 197 mg/kg).

NEWMONT NORTH AMERICA

Average Annual Concentrations of Copper in Lake Sediments, Hope Bay Belt Project, 1996 - 2009

Figure 3.4-3e

Rescan Engineers & Scientists



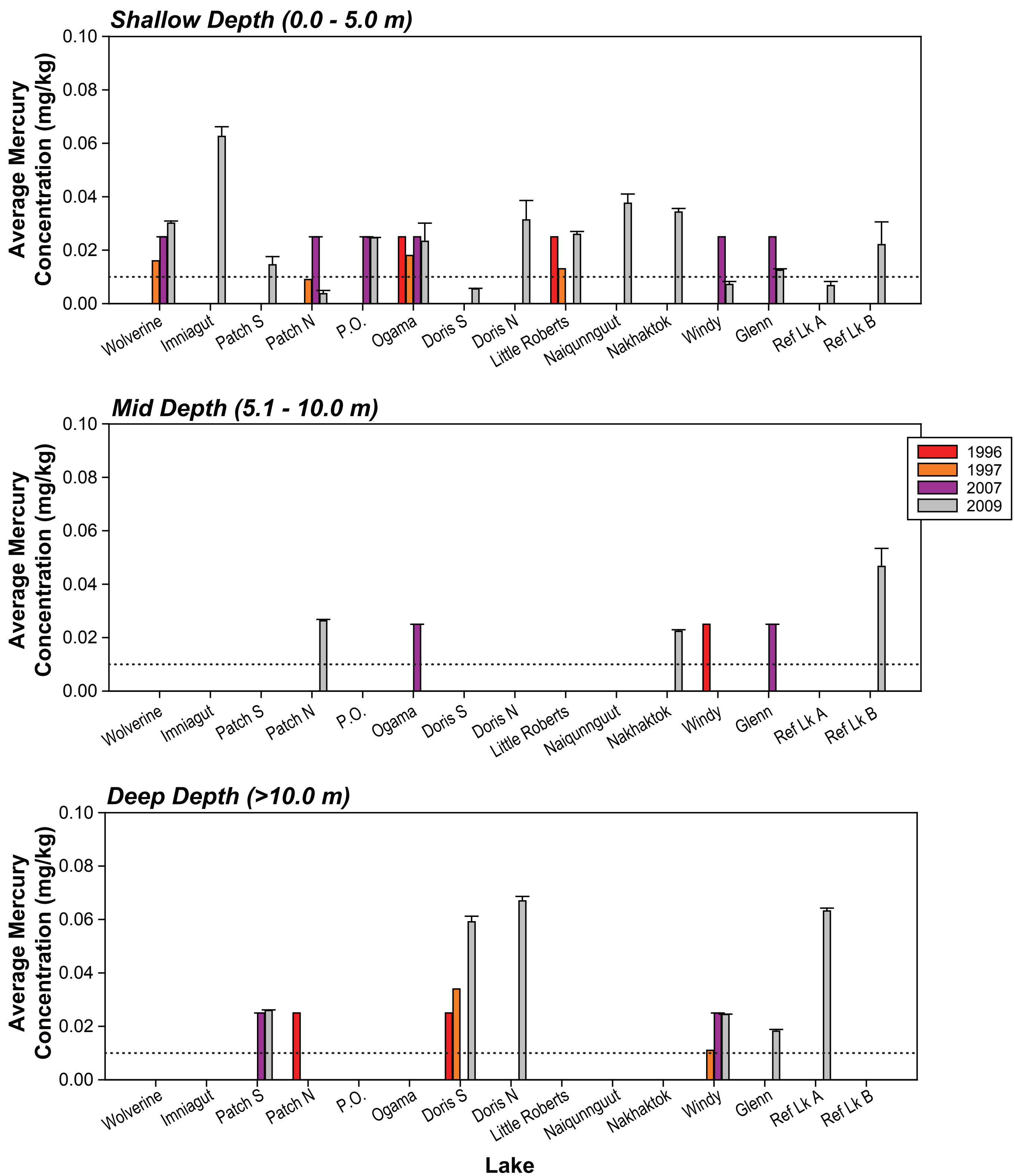
Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit (2 mg/kg).
Dashed line indicates CCME guidelines (ISQG = 35 mg/kg; SQG PEL = 91.3 mg/kg)

NEWMONT NORTH AMERICA

Average Annual Concentrations of Lead in Lake Sediments, Hope Bay Belt Project, 1996 - 2009

Figure 3.4-3f

Rescan Engineers & Scientists



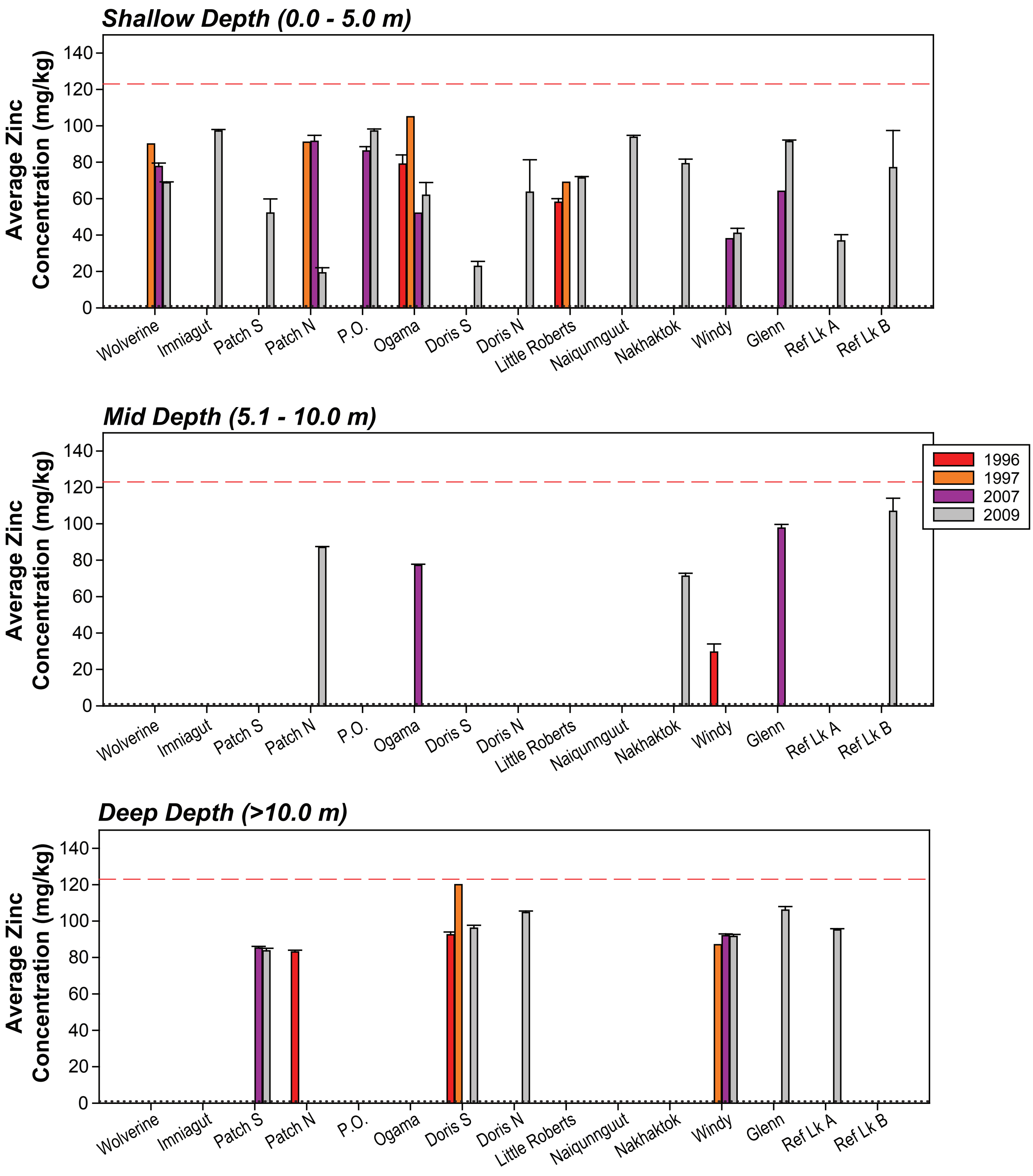
Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit (0.01 mg/kg).
Dashed line indicates CCME guidelines (ISQG = 0.17 mg/kg; SQG PEL = 0.486 mg/kg).

NEWMONT NORTH AMERICA

Average Annual Concentrations of Mercury in Lake Sediments, Hope Bay Belt Project, 1996 - 2009

Figure 3.4-3g

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted line represents analytical detection limit (1 mg/kg).
Dashed line indicates CCME guidelines (ISQG = 123 mg/kg; SQG PEL = 315 mg/kg)

NEWMONT NORTH AMERICA

Average Annual Concentrations of Zinc in Lake Sediments, Hope Bay Belt Project, 1996 - 2009

Figure 3.4-3h

Rescan Engineers & Scientists

Table 3.4-1. Lake Sediment Quality, Percent of Samples in which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2009

Lake	Total Number of Samples Collected	CCME Guideline value[a] (mg/kg):	Arsenic (As) 5.9	Cadmium (Cd) 0.6	Chromium (Cr) 37.3	Copper (Cu) 35.7	Lead (Pb) 35	Mercury (Hg) 0.17	Zinc (Zn) 123
			Percent of samples higher than ISQG[b] guidelines						
Doris									
Wolverine	3		100	0	100	100	0	0	0
Imniagut	3		33	0	100	100	0	0	0
Patch S	6		50	0	83	50	0	0	0
Patch N	6		17	0	50	50	0	0	0
P.O.	3		0	0	100	100	0	0	0
Ogama	3		33	0	100	0	0	0	0
Doris S	6		50	0	50	50	0	0	0
Doris N	6		50	0	83	67	0	0	0
Little Roberts									
Little Roberts	3		0	0	100	0	0	0	0
Roberts									
Naiqunnguut	3		33	0	100	67	0	0	0
Windy									
Nakhaktok	6		67	0	100	100	0	0	0
Windy	6		33	0	67	50	0	0	0
Glenn	6		0	0	100	100	0	0	0
Ref A	6								
Ref Lk A			0	0	50	50	0	0	0
Ref B									
Ref Lk B	6		0	0	83	83	0	0	0
Total Sites			**10**	**0**	**15**	**13**	**0**	**0**	**0**

(continued)

Table 3.4-1. Lake Sediment Quality, Percent of Samples in which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2009 (completed)

		CCME Guideline	Percent of samples higher than PEL[c] guidelines						
Lake	**Total Number of Samples Collected**	**value[a] (mg/kg):**	**Arsenic (As) 17**	**Cadmium (Cd) 3.5**	**Chromium (Cr) 90**	**Copper (Cu) 197**	**Lead (Pb) 91.3**	**Mercury (Hg) 0.486**	**Zinc (Zn) 315**
Doris									
Wolverine	3		0	0	0	0	0	0	0
Imniagut	3		0	0	0	0	0	0	0
Patch S	6		0	0	0	0	0	0	0
Patch N	6		0	0	0	0	0	0	0
P.O.	3		0	0	0	0	0	0	0
Ogama	3		0	0	0	0	0	0	0
Doris S	6		17	0	0	0	0	0	0
Doris N	6		17	0	0	0	0	0	0
Little Roberts									
Little Roberts	3		0	0	0	0	0	0	0
Roberts									
Naiqunnguut	3		0	0	0	0	0	0	0
Windy									
Nakhaktok	6		33	0	0	0	0	0	0
Windy	6		0	0	0	0	0	0	0
Glenn	6		0	0	17	0	0	0	0
Ref A	6		0	0	0	0	0	0	0
Ref Lk A									
Ref B									
Ref Lk B	6		0	0	0	0	0	0	0
Total Sites			**3**	**0**	**1**	**0**	**0**	**0**	**0**

All values represent percentages of 2009 samples that are higher than CCME guidelines.

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, Average Factor by which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2009

Lake	Total Number of Samples Collected	CCME Guideline Value[a] (mg/kg):	Factor by which samples are higher than ISQG[b] guidelines						
			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
Doris									
Wolverine	3		2.23	-	1.63	1.06	-	-	-
Imniagut	3		-	-	2.01	1.64	-	-	-
Patch S	6		1.24	-	1.60	-	-	-	-
Patch N	6		-	-	1.25	-	-	-	-
P.O.	3		-	-	2.24	1.26	-	-	-
Ogama	3		1.16	-	1.37	-	-	-	-
Doris S	6		1.51	-	1.23	-	-	-	-
Doris N	6		1.58	-	1.64	1.05	-	-	-
Little Roberts									
Little Roberts	3		-	-	1.35	-	-	-	-
Roberts									
Naiqunnguut	3		-	-	2.01	1.03	-	-	-
Windy									
Nakhaktok	6		1.69	-	1.69	1.29	-	-	-
Windy	6		1.03	-	1.52	1.04	-	-	-
Glenn	6		-	-	2.18	1.32	-	-	-
Ref A									
Ref Lk A	6		-	-	1.21	1.23	-	-	-
Ref B									
Ref Lk B	6		-	-	1.02	1.73	-	-	-
Total Sites			**7**	**0**	**15**	**10**	**0**	**0**	**0**

All values represent the factor by which 2009 lake averages are higher than CCME guidelines.

(continued)

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

Table 3.4-2. Lake Sediment Quality, Average Factor by which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2009 (completed)

		CCME Guideline	Factor by which samples are higher than PEL[c] guidelines						
	Total Number of	Value[a]:	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Zinc (Zn)
Lake	**Samples Collected**	**(mg/kg):**	**17**	**3.5**	**90**	**197**	**91.3**	**0.486**	**315**
Doris									
Wolverine	3		-	-	-	-	-	-	-
Imniagut	3		-	-	-	-	-	-	-
Patch S	6		-	-	-	-	-	-	-
Patch N	6		-	-	-	-	-	-	-
P.O.	3		-	-	-	-	-	-	-
Ogama	3		-	-	-	-	-	-	-
Doris S	6		-	-	-	-	-	-	-
Doris N	6		-	-	-	-	-	-	-
Little Roberts									
Little Roberts	3		-	-	-	-	-	-	-
Roberts									
Naiqunnguut	3		-	-	-	-	-	-	-
Windy									
Nakhaktok	6		-	-	-	-	-	-	-
Windy	6		-	-	-	-	-	-	-
Glenn	6		-	-	-	-	-	-	-
Ref A									
Ref Lk A	6								
Ref B									
Ref Lk B	6		-	-	-	-	-	-	-
Total Sites			**0**	**0**	**0**	**0**	**0**	**0**	**0**

All values represent the factor by which 2009 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

3.4.3 Comparison with 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 were higher than the ISQG for chromium (37.3 mg/kg) at all lake sites surveyed (generally at deep depth), and copper concentrations were higher than the ISQG for copper (35.7 mg/kg) at all lakes except for Ogama and Little Roberts. Arsenic concentrations were higher than the ISQG for arsenic (5.9 mg/kg) at Wolverine, Patch S, Ogama, Doris S and N, Nakhaktok, and Windy lakes. Although elevated levels of arsenic, chromium, and copper were observed across the study area, no site averages exceeded any CCME PELs (though some replicate samples did, particularly for arsenic). Table 3.4-1 summarizes the percentage of sediment samples in which metal concentrations were higher than CCME guidelines, and Table 3.4-2 presents the factor by which sediment metal concentrations were higher than CCME guidelines.

3.4.4 Annual Variation

Table 2.13-3 outlines the years for which historical sediment data are available as well as an overview of the sampling methodologies employed in each year. Figure 2.13-2 provides a summary of the historical sediment quality sampling locations. Only locations sampled in 2009 are discussed in this report. Note that historical sampling locations may not correspond exactly with those sampled in 2009, and this, in addition to methodological differences, may contribute to variability observed between years.

Historical sediment quality data are available from 1996, 1997 and 2007, although not all parameters analyzed in 2009 were analyzed historically. Phosphorus, sulphur, ammonium and total nitrogen were not sampled prior to 2009, and therefore these graphs have not been presented in this section. Of the parameters for which historical data are available, notable differences were observed between years. Concentrations of all parameters graphed varied by as much as two-fold between years, making within-site annual variability comparable in magnitude to between-site variability. The variability observed between years may be a product of differences in sampling location; however, the sites which encompassed the most spatial variability in sampling sites (e.g. Doris and Patch), were not significantly more variable than lakes with little sampling location difference between years (e.g., Little Roberts, Wolverine). Similarly, other differences in sampling methodology between years (e.g., sampling with the use of a corer (in 2007) as opposed to an Ekman grab (other years), or collection of deeper sediment horizons (2007 vs. other years)) did not obviously affect annual variability.

3.4.5 Lake Sediment Quality Summary

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, except at Nakhaktok Lake. An increase in fine sediments (clay and silt) within a lake was generally associated with an increase in all parameters evaluated with the exception of phosphorus. There were few clear trends in sediment chemistry among lake sites, though sediments from Wolverine and Imniagut lakes in the Doris Watershed contained relatively high concentrations of TOC, ammonium, total nitrogen, and total sulphur. Lake sediments were naturally elevated in arsenic, chromium, and copper, and concentrations of these metals were often higher than CCME ISQGs. Within-site annual variability was comparable in magnitude to within-year variability observed among sites.

3.5 STREAM AND RIVER SEDIMENT QUALITY

Stream and river sediment samples were collected in July, 2009 at all locations sampled for summer water quality. Sampling dates and locations can be found in Table 2.1-5.

Fourteen stream sites were sampled for sediment quality, including a reference river station (on the Angimajuq River) as well as two reference lake outflows (Ref Lk A and B). An 'upstream' location on the Koignuk River (Koignuk U/S) was also sampled to represent conditions upstream of any potential impact in the northern portion of the Hope Bay Belt (but this location may be downstream of potential future developments in the southern portion of the belt).

All raw sediment quality data are presented in Appendix 3.5-1. Figure 3.5-1 presents stream sediment particle size composition. Figures 3.5-2a to 3.5-2k present 2009 stream sediment quality results. No historical stream sediment quality data have been collected for the locations discussed in this report.

3.5.1 Spatial Variation

Stream sediments sampled in 2009 were a highly variable mixture of gravel, sand, silt and clay. Sediments in Ref Lk A OF were predominantly composed of sand, while sediments in the Angimajuq River Ref and in Ref Lk B OF, Ogama OF, and Doris OF were mainly composed of gravel and sand. In all other surveyed streams, sediments were predominantly composed of a sand-silt mixture. There was no apparent relationship between sediment particle size distribution and other chemical constituents.

There were few apparent trends in sediment chemistry among streams; however, stream sediments were generally lower in metal concentrations compared to lake sediments.

3.5.2 Comparison with CCME Guidelines

Stream and river sediments were naturally high in chromium. Concentrations of chromium in sediments collected from Ogama OF, Windy OF, Koignuk U/S, and Koignuk D/S were occasionally higher that the CCME ISQG for chromium (ISQG = 37.3 mg/kg). Sediment metal concentrations were always below the CCME PELs. Table 3.5-1 summarizes the percentage of sediment samples in which metal concentrations were higher than CCME guidelines, and Table 3.5-2 presents the factor by which sediment metal concentrations were higher than CCME guidelines.

3.5.3 Annual Variation

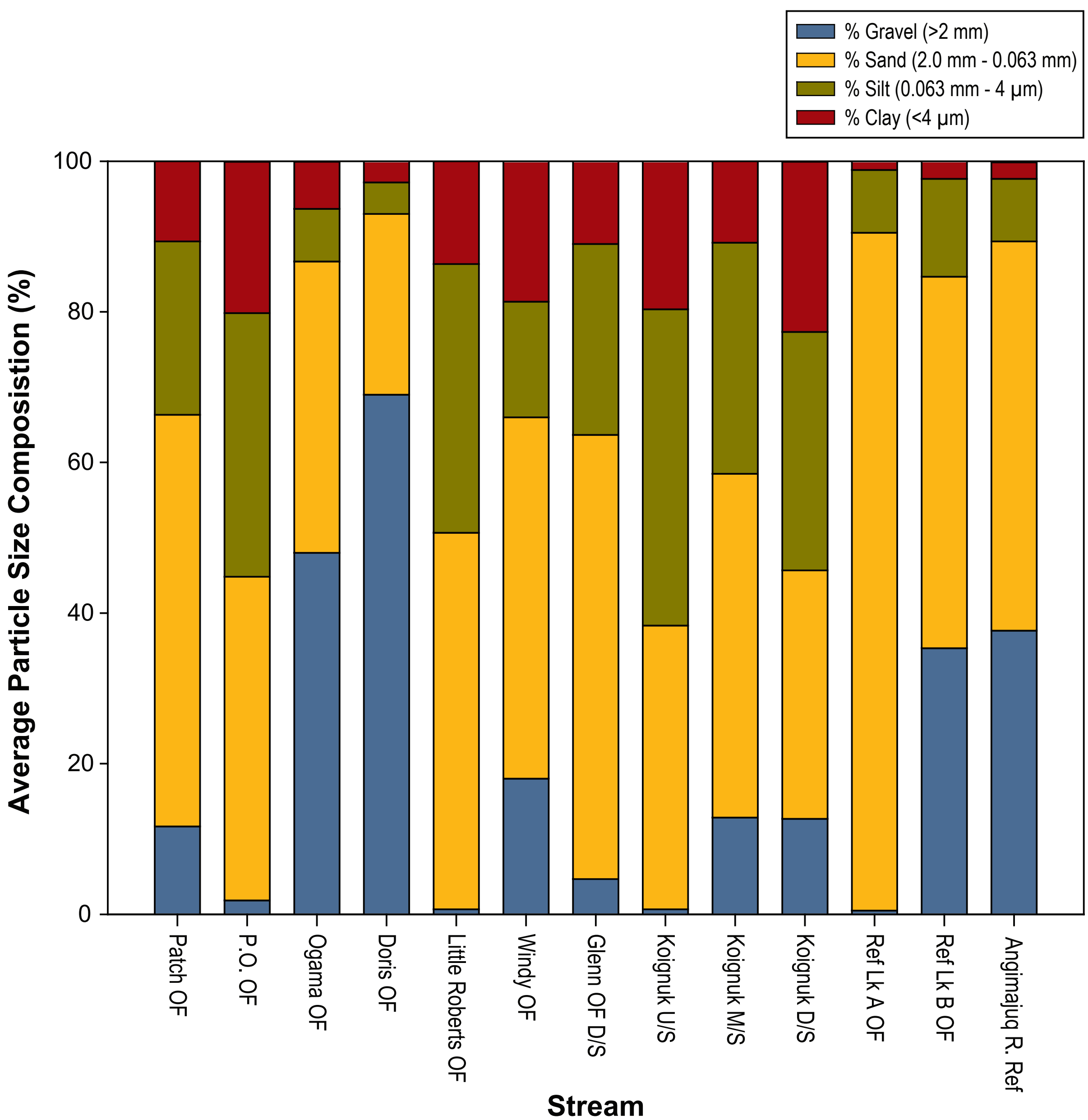
Prior to 2009, no stream sediment quality samples had been collected. To maintain consistency with other sections, Table 2.13-4 outlines the sampling methodology employed in 2009.

3.5.4 Stream and River Sediment Quality Summary

Stream sediments consisted of a highly variable mixture of gravel, sand, silt and clay. There were few apparent trends in sediment chemistry among streams; however, stream sediments generally contained lower metal concentrations than lake sediments. Chromium concentrations in sediments were naturally elevated and were occasionally higher than CCME ISQG guidelines. Annual variability in sediment quality could not be assessed because no stream sediment quality samples were collected prior to 2009.

3.6 PHYTOPLANKTON

Phytoplankton are free-floating autotrophic algae that play an important role in many aquatic systems as primary producers and prey for higher trophic levels. As well, phytoplankton have short generation times, and can respond rapidly to environmental change. Accordingly, they are key indicators of ecosystem health, particularly with regard to alterations in nutrient and metal chemistry.

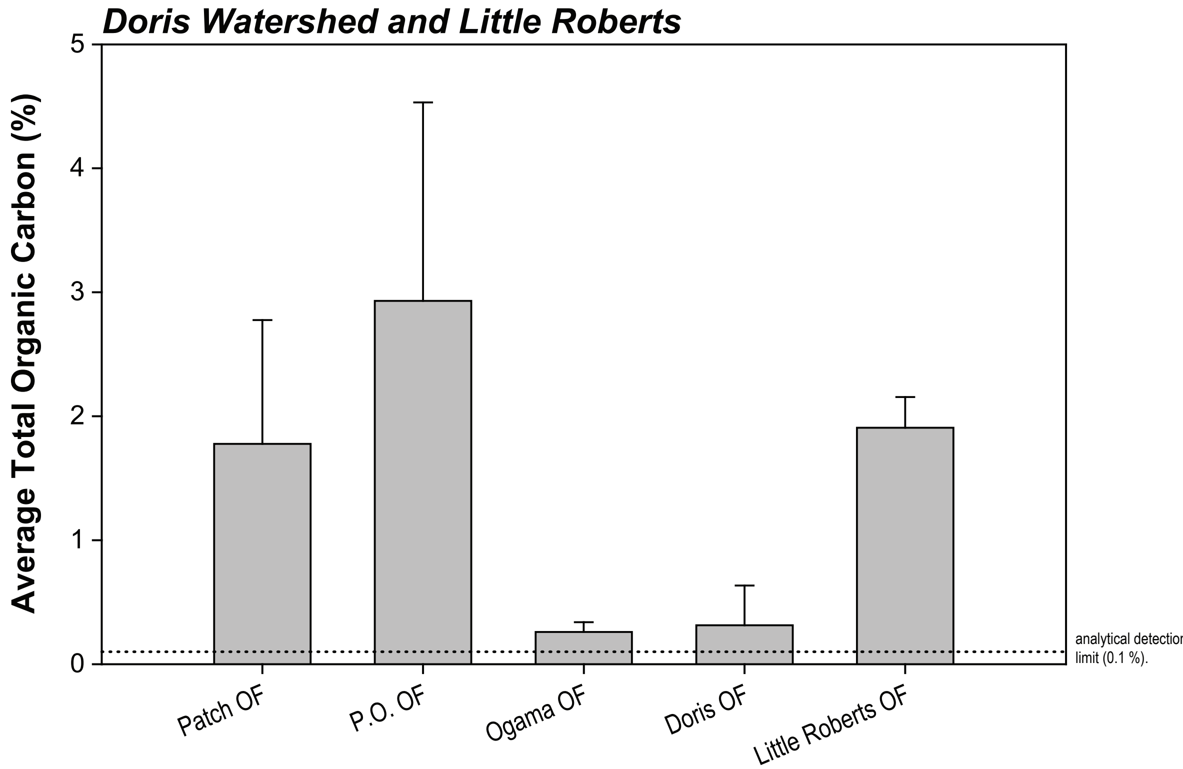


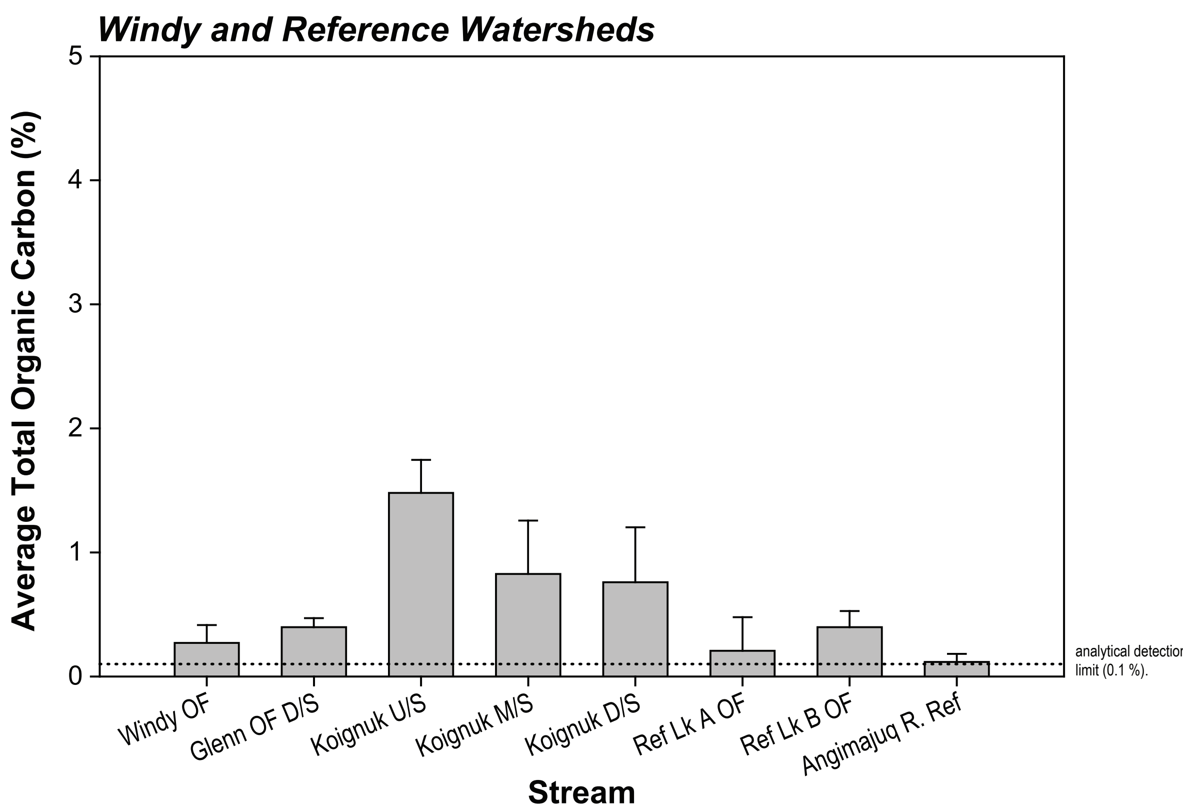
NEWMONT NORTH AMERICA

Sediment Particle Size Composition, Hope Bay Streams, 2009

Figure 3.5-1

Rescan Engineers & Scientists





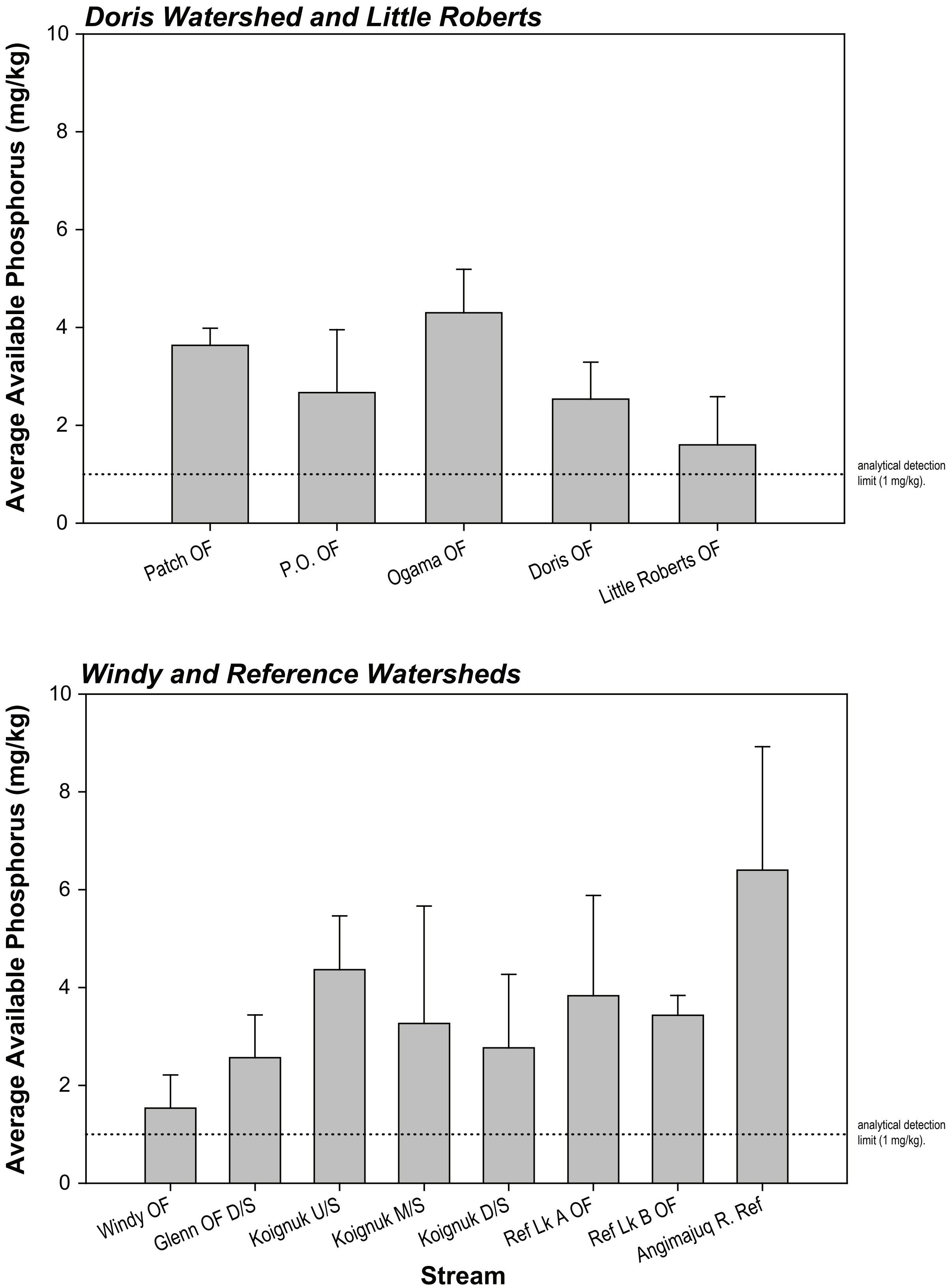
Notes: Error bars represent standard error of the mean.
No SQGs exist for total organic carbon.

NEWMONT NORTH AMERICA

Average Concentrations of Total Organic Carbon in Stream Sediments, Hope Bay Belt Project, 2009

Figure 3.5-2a

Rescan Engineers & Scientists



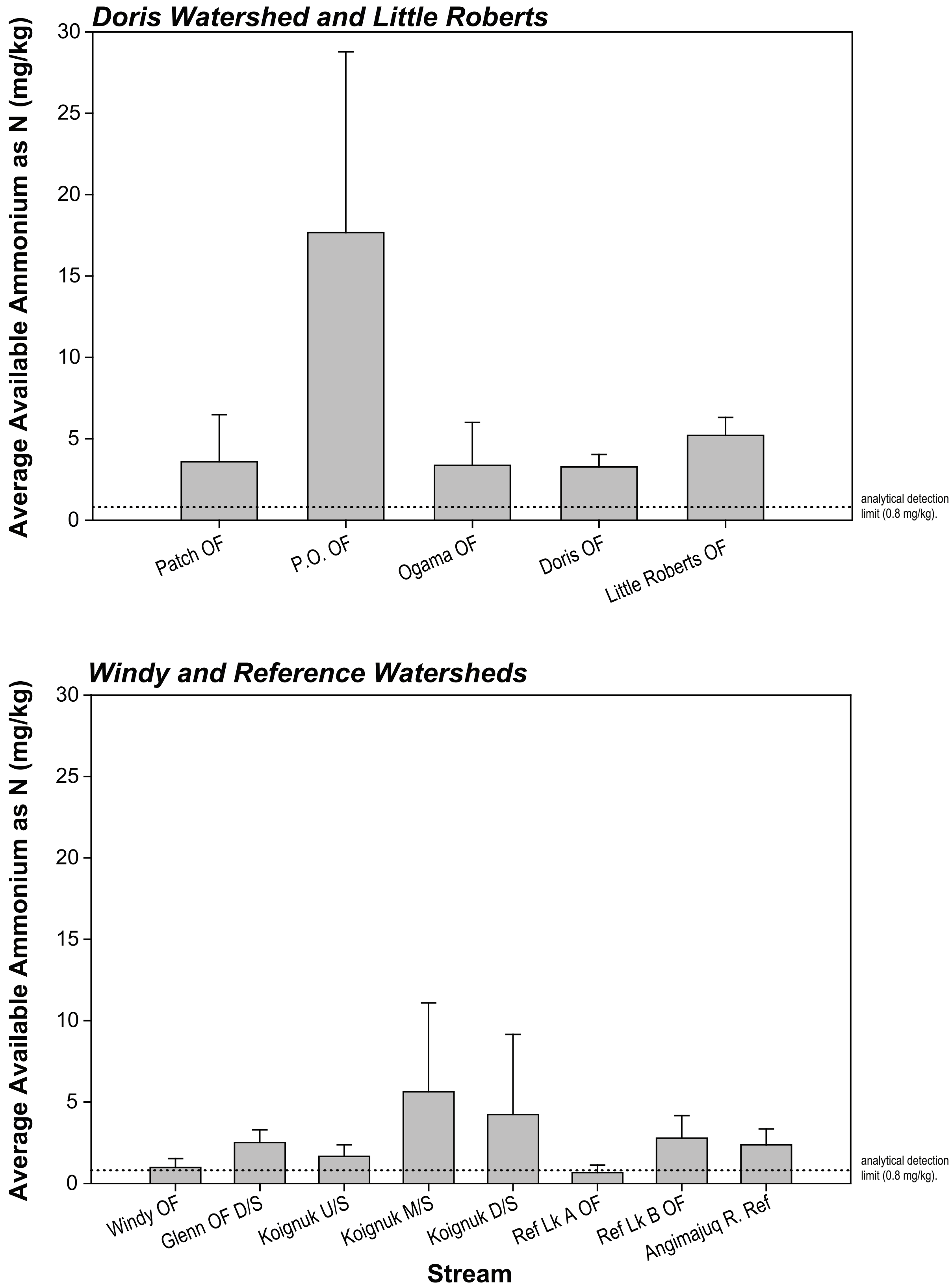
Notes: Error bars represent standard error of the mean.
No SQGs exist for available phosphorus.

NEWMONT NORTH AMERICA

Average Concentrations of Available Phosphorus in Stream Sediments, Hope Bay Belt Project, 2009

Figure 3.5-2b

Rescan Engineers & Scientists



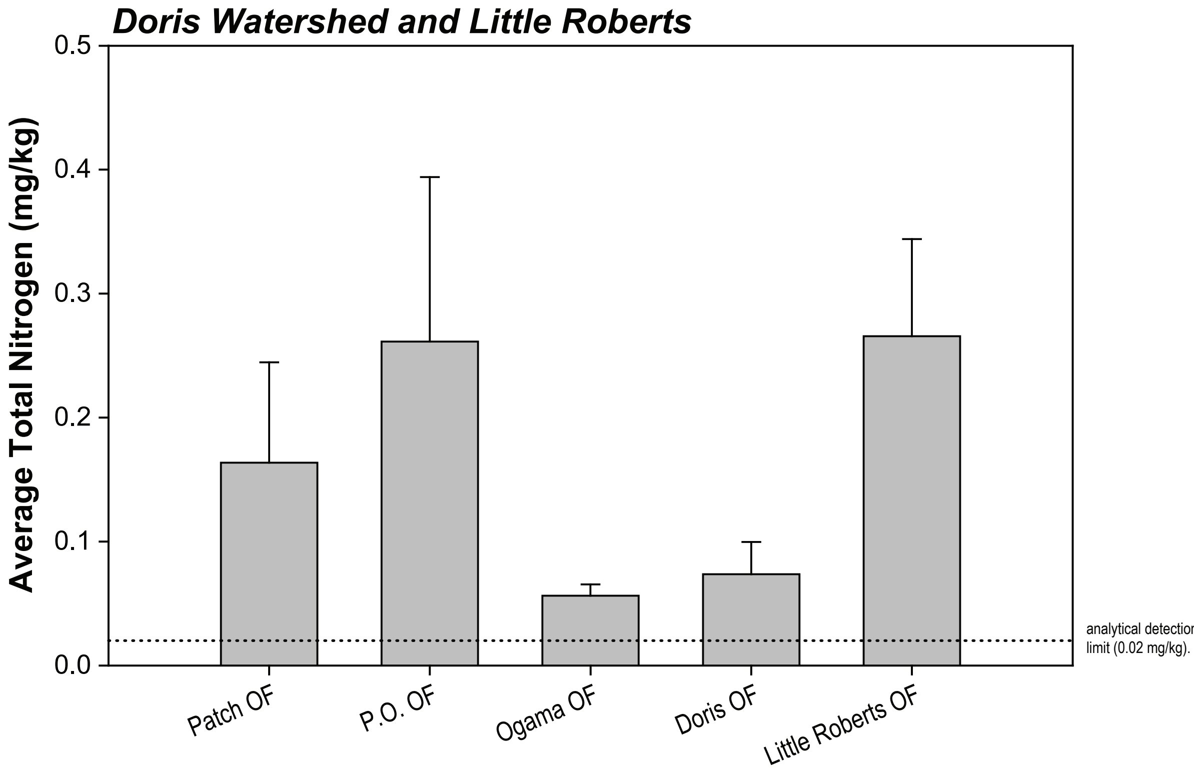
Notes: Error bars represent standard error of the mean.
No SQGs exist for ammonium as N.

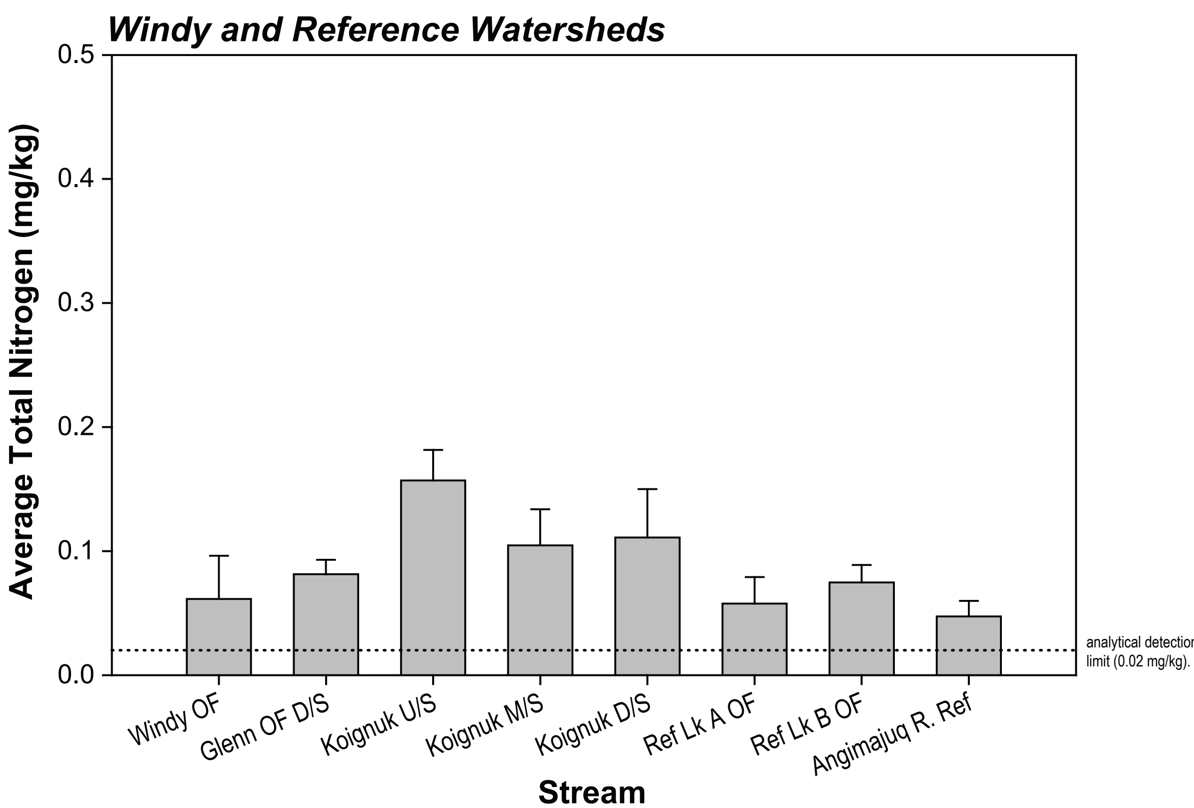
NEWMONT NORTH AMERICA

Average Concentrations of Average Available Ammonium as N in Stream Sediments, Hope Bay Belt Project, 2009

Figure 3.5-2c

Rescan Engineers & Scientists





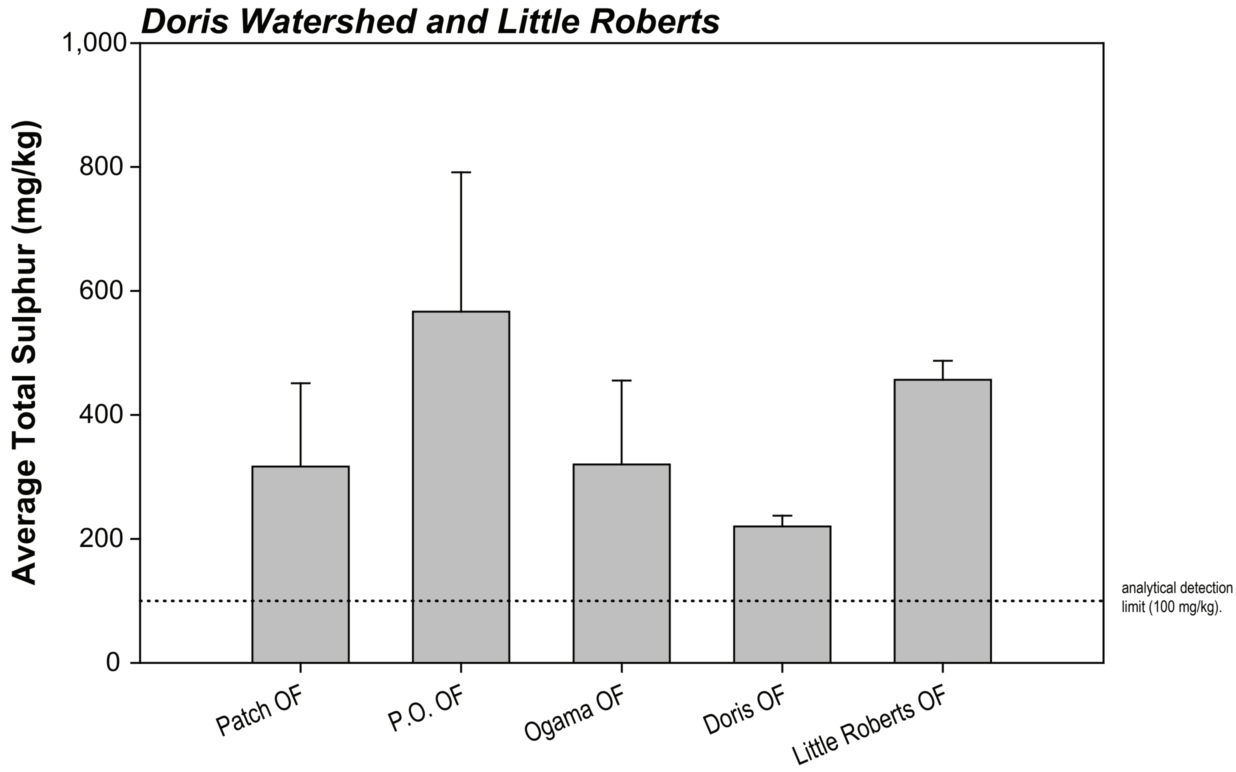
Notes: Error bars represent standard error of the mean.
No SQGs exist for total nitrogen.

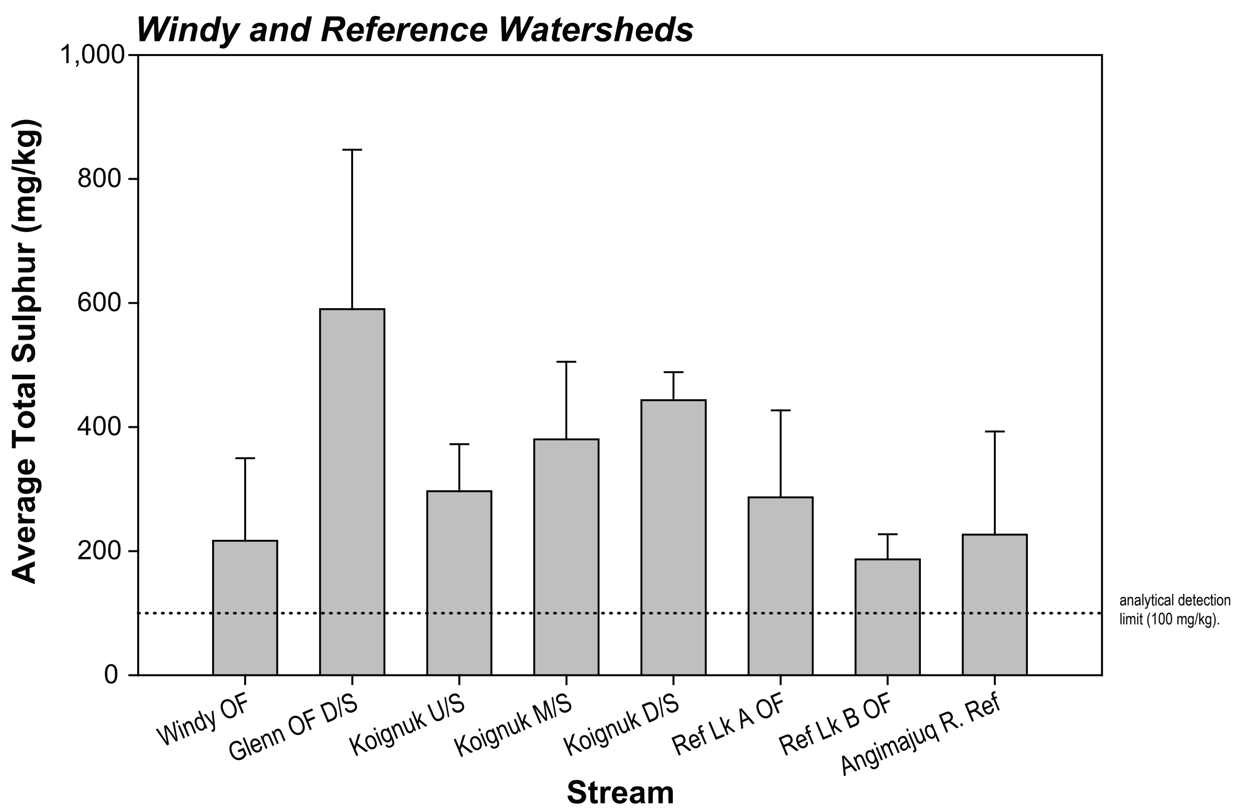
NEWMONT NORTH AMERICA

Average Concentrations of Total Nitrogen in Stream Sediments, Hope Bay Belt Project, 2009

Figure 3.5-2d

Rescan Engineers & Scientists





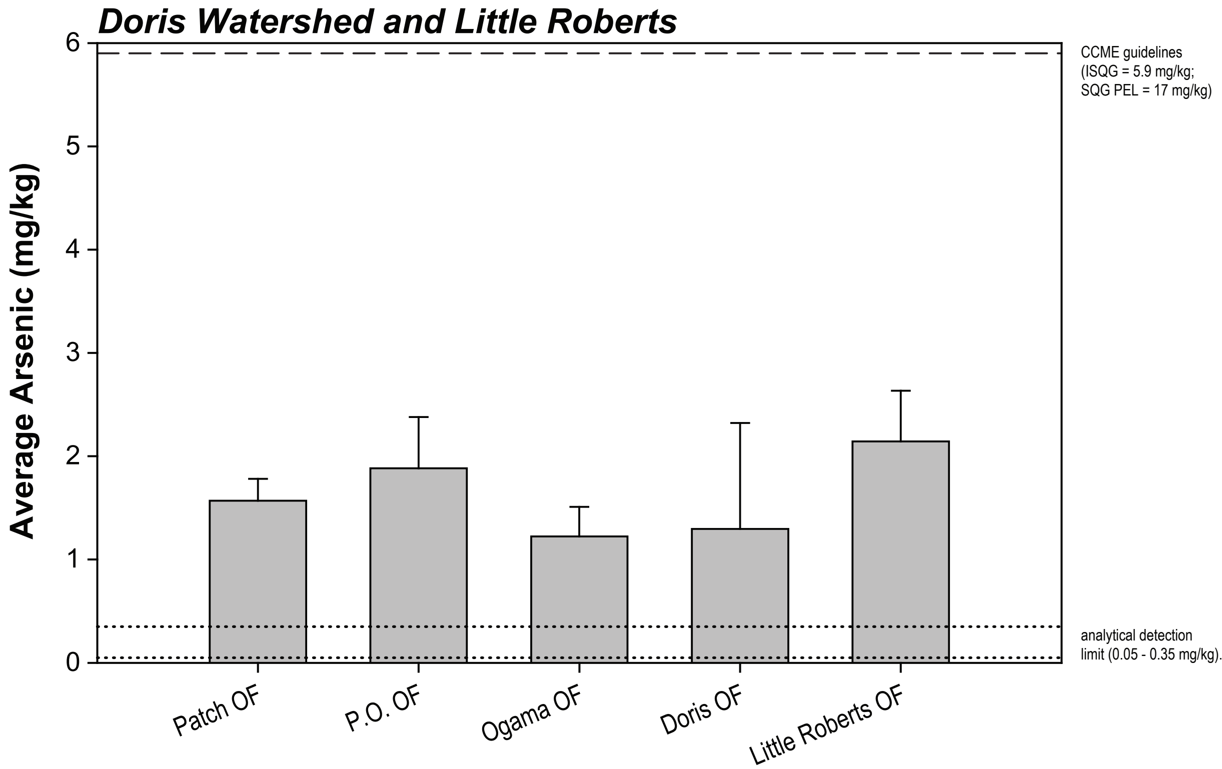
Notes: Error bars represent standard error of the mean.
No SQGs exist for total sulphur.

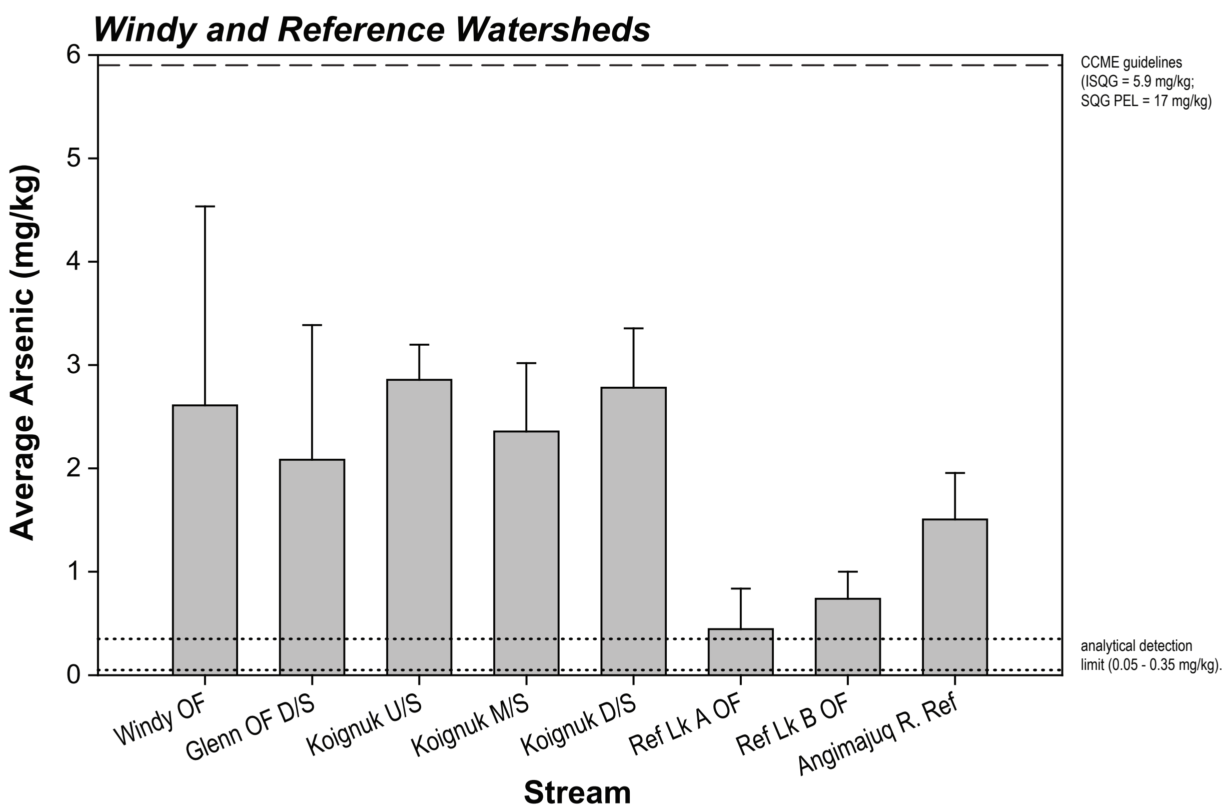
NEWMONT NORTH AMERICA

Average Concentrations of Total Sulphur in Stream Sediments, Hope Bay Belt Project, 2009

Figure 3.5-2e

Rescan Engineers & Scientists





Note: Error bars represent standard error of the mean.

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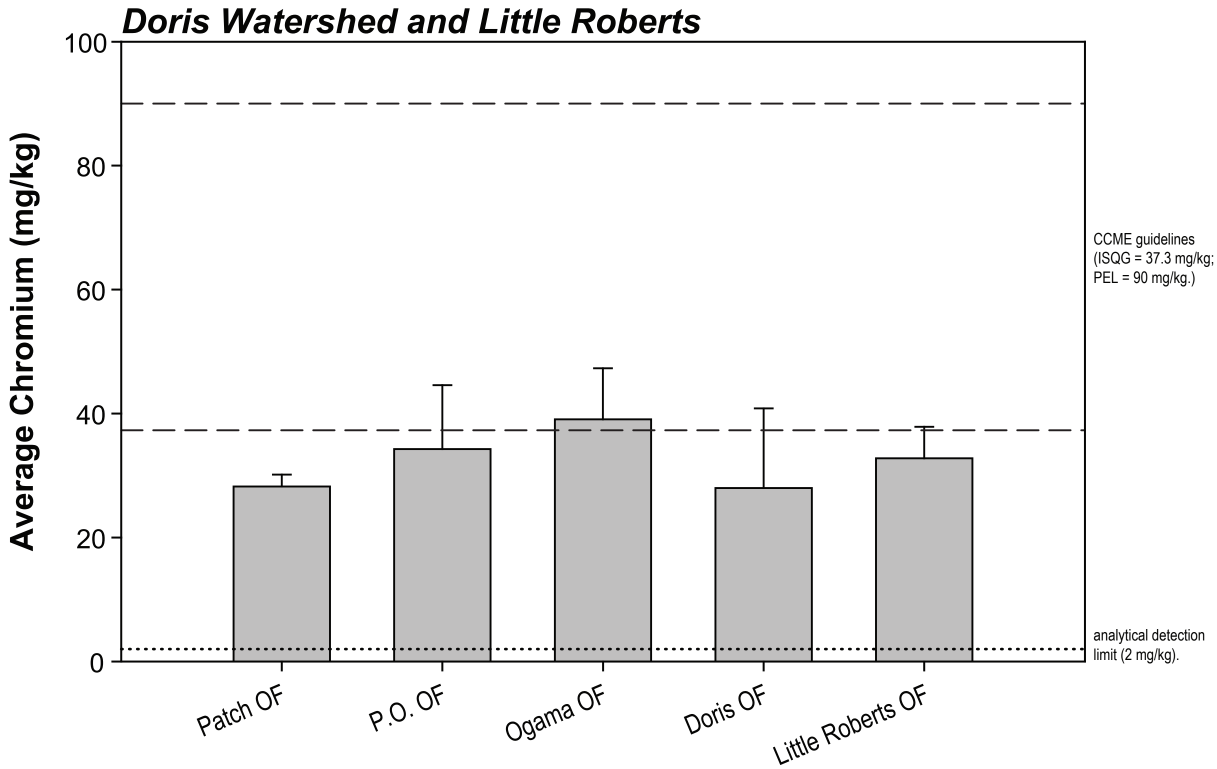
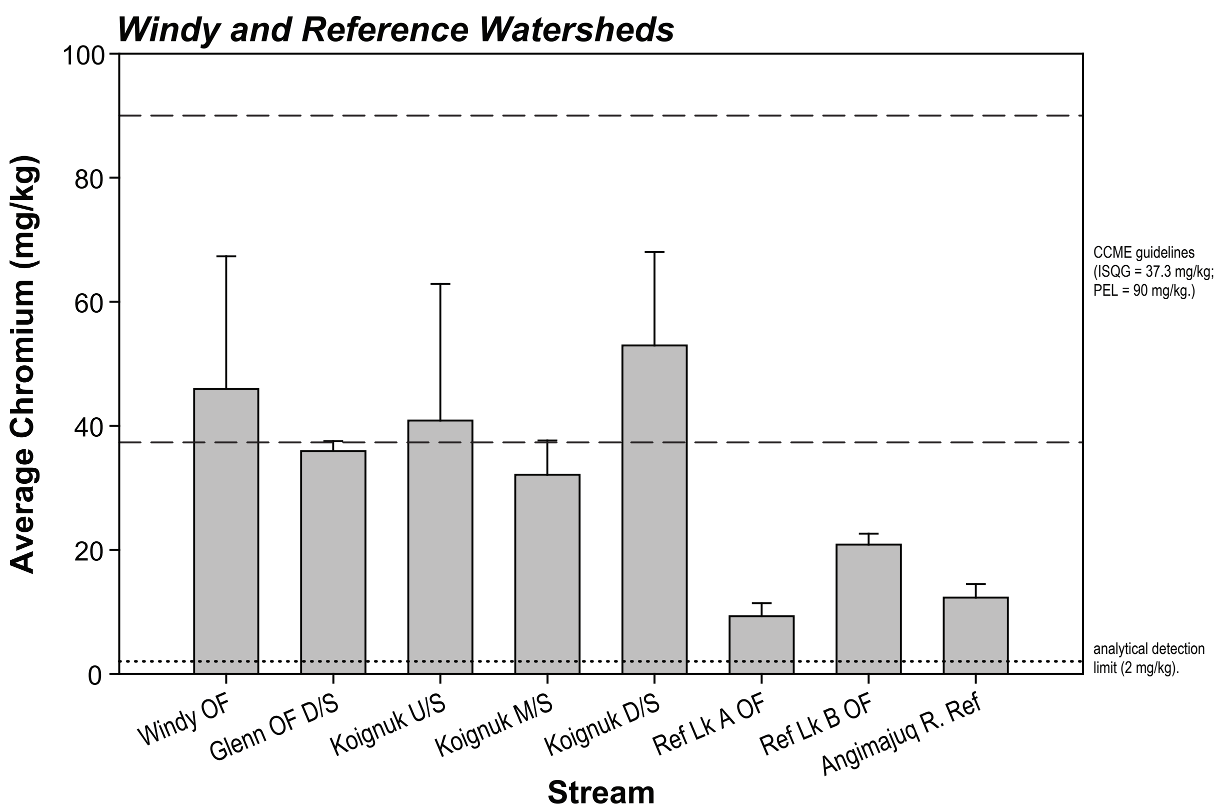
Figure 3.5-2f

Average Concentrations of Arsenic in Stream Sediments, Hope Bay Belt Project, 2009

Rescan Engineers & Scientists





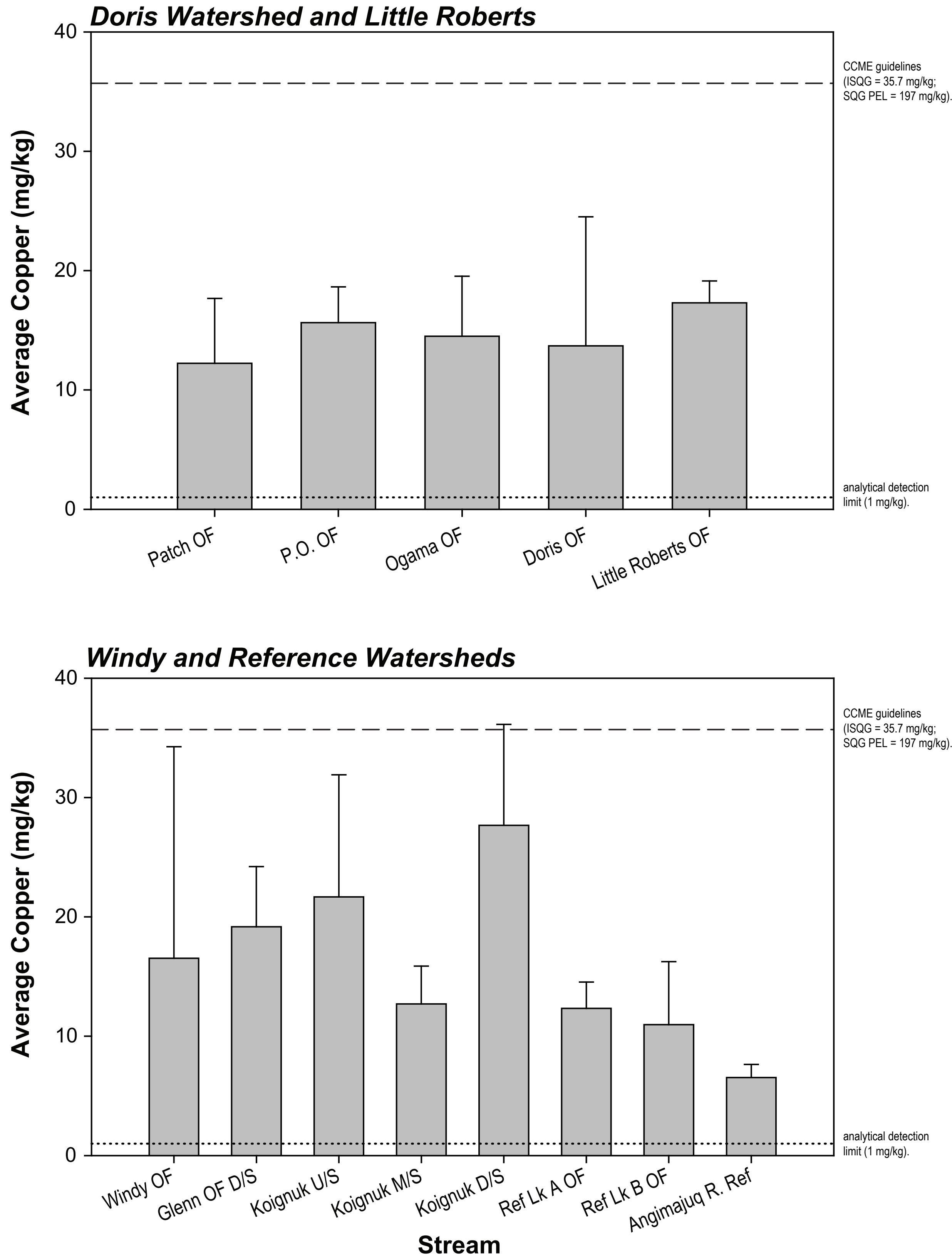
Notes: Error bars represent standard error of the mean.

NEWMONT NORTH AMERICA

Average Concentrations of Chromium in Stream Sediments, Hope Bay Belt Project, 2009

Figure 3.5-2g

Rescan Engineers & Scientists



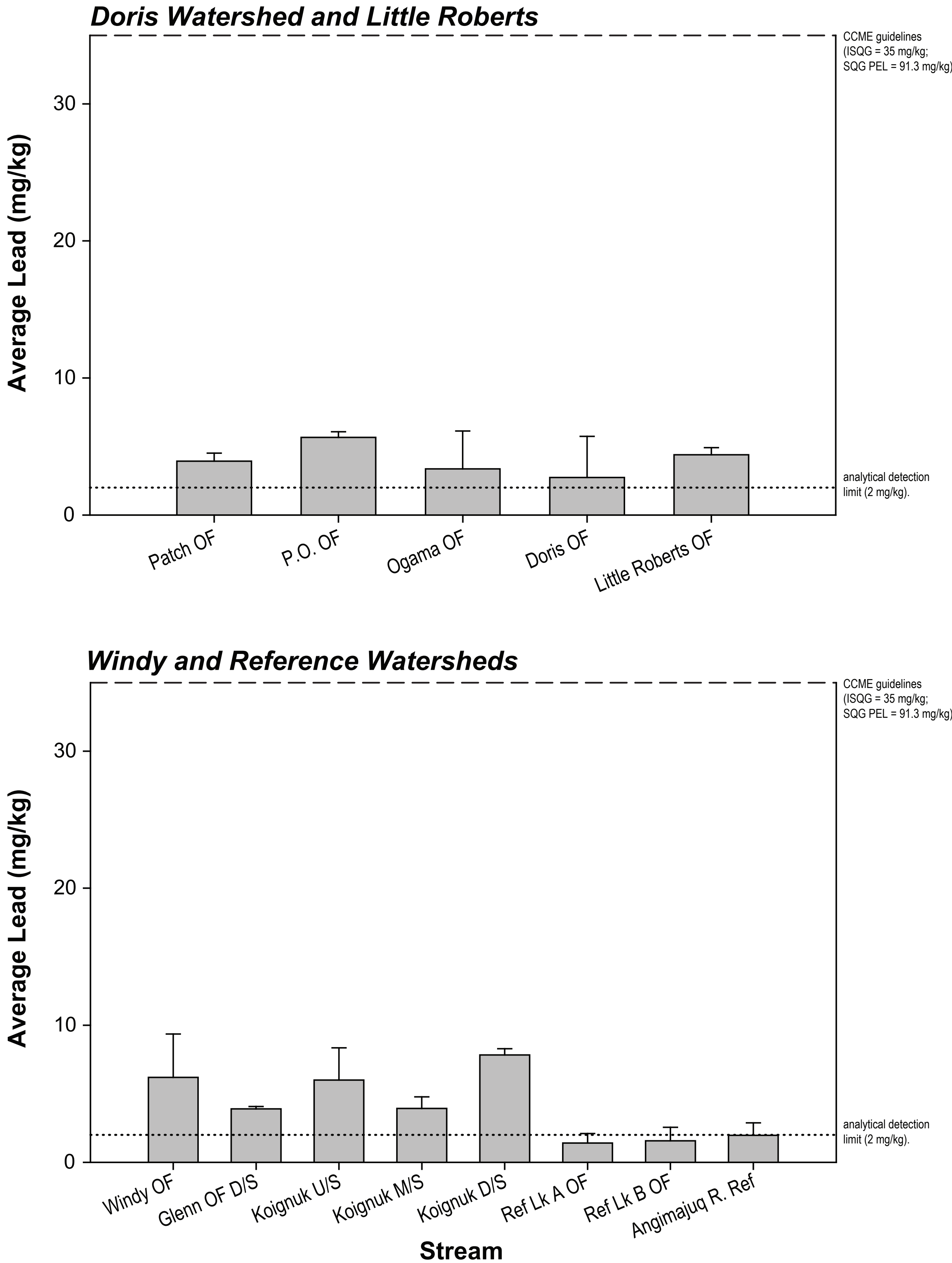
Notes: Error bars represent standard error of the mean.

NEWMONT NORTH AMERICA

Average Concentrations of Copper in Stream Sediments, Hope Bay Belt Project, 2009

Figure 3.5-2h

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.

Figure 3.5-2i

Average Concentrations of Lead in Stream Sediments, Hope Bay Belt Project, 2009

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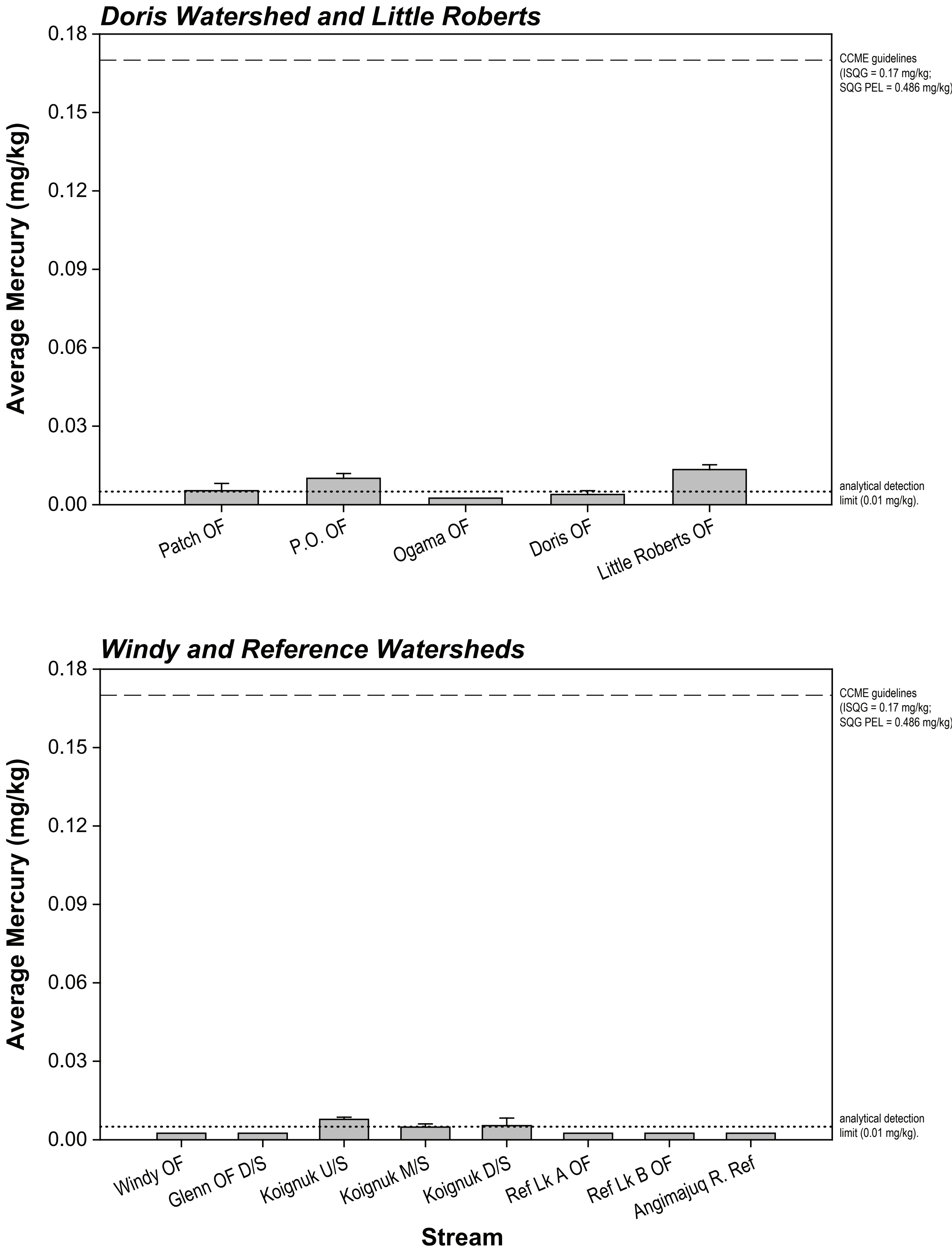


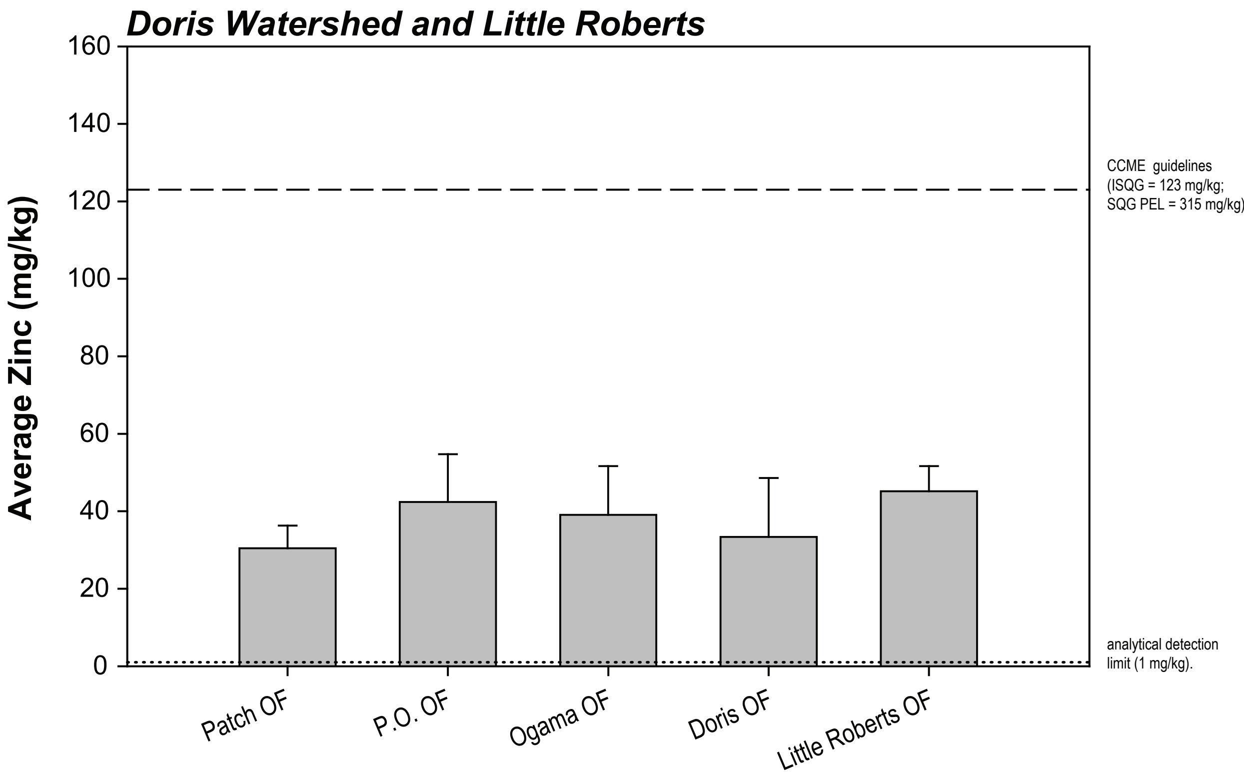
Note: Error bars represent standard error of the mean.

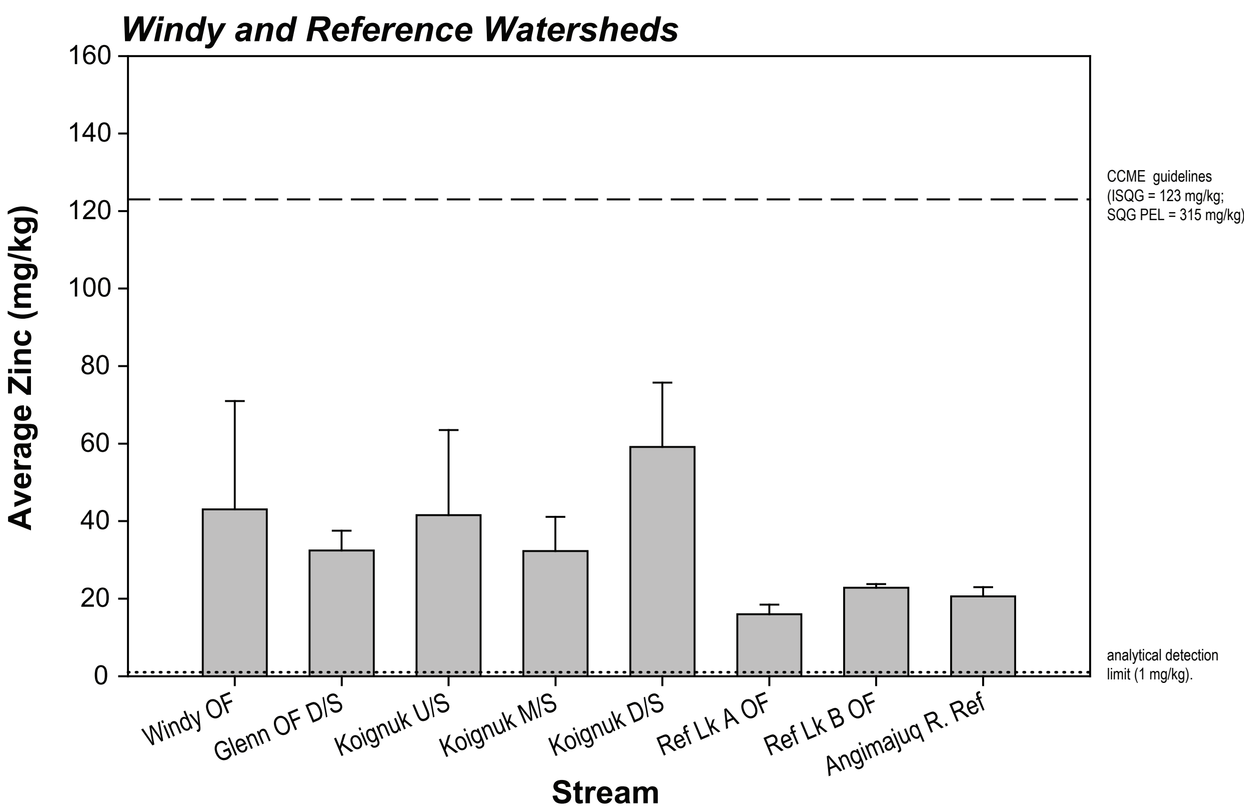
NEWMONT NORTH AMERICA

Average Concentrations of Mercury in Stream Sediments, Hope Bay Belt Project, 2009

Figure 3.5-2j

Rescan Engineers & Scientists





Notes: Error bars represent standard error of the mean.

Figure 3.5-2k

Average Concentrations of Zinc in Stream Sediments, Hope Bay Belt Project, 2009

NEWMONT NORTH AMERICA

Rescan Engineers & Scientists

Table 3.5-1. Stream Sediment Quality, Percent of Samples in which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2009

Stream	Total Number of Samples Collected	CCME Guideline value[a] (mg/kg):	Percent of samples higher than ISQG[b] guidelines						
			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
Doris									
Wolverine OF	0		-	-	-	-	-	-	-
Patch OF	3		0	0	0	0	0	0	0
P.O. OF	3		0	0	33	0	0	0	0
Ogama OF	3		0	0	0	33	0	0	0
Doris OF	3		0	0	33	0	0	0	0
Little Roberts									
Little Roberts OF	3		0	0	33	0	0	0	0
Windy									
Windy OF	3		0	0	67	33	0	0	0
Glenn OF D/S	3		0	0	33	0	0	0	0
Koignuk River									
Koignuk U/S	3		0	0	33	0	0	0	0
Koignuk M/S	3		0	0	33	0	0	0	0
Koignuk D/S	3		0	0	67	0	0	0	0
Ref A									
Ref Lk A OF	3		0	0	0	0	0	0	0
Ref B									
Ref Lk B OF	3		0	0	0	0	0	0	0
Angimajuq									
Angimajuq R. Ref	3		0	0	0	0	0	0	0
Total Sites			**0**	**0**	**8**	**2**	**0**	**0**	**0**

All values represent percentages of 2009 samples that are higher than CCME guidelines. *(continued)*

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 3.5-1. Stream Sediment Quality, Percent of Samples in which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2009 (completed)

Stream	Total Number of Samples Collected	CCME Guideline value[a] (mg/kg):	Arsenic (As) 17	Cadmium (Cd) 3.5	Chromium (Cr) 90	Copper (Cu) 197	Lead (Pb) 91.3	Mercury (Hg) 0.486	Zinc (Zn) 315
			Percent of samples higher than PEL[c] guidelines						
Doris									
Wolverine OF	0		-	-	-	-	-	-	-
Patch OF	3		0	0	0	0	0	0	0
P.O. OF	3		0	0	0	0	0	0	0
Ogama OF	3		0	0	0	0	0	0	0
Doris OF	3		0	0	0	0	0	0	0
Little Roberts									
Little Roberts OF	3		0	0	0	0	0	0	0
Windy									
Windy OF	3		0	0	0	0	0	0	0
Glenn OF D/S	3		0	0	0	0	0	0	0
Koignuk River									
Koignuk U/S	3		0	0	0	0	0	0	0
Koignuk M/S	3		0	0	0	0	0	0	0
Koignuk D/S	3		0	0	0	0	0	0	0
Ref A									
Ref Lk A OF	3		0	0	0	0	0	0	0
Ref B									
Ref Lk B OF	3		0	0	0	0	0	0	0
Angimajuq									
Angimajuq R. Ref	3		0	0	0	0	0	0	0
Total Sites			**0**	**0**	**0**	**0**	**0**	**0**	**0**

All values represent percentages of 2009 samples that are higher than CCME guidelines.
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 Sediment Quality, Average Factor by which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2009

		CCME Guideline	Factor by which samples are higher than ISQG[b] guidelines						
	Total Number of	value[a]	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Zinc (Zn)
Stream	**Samples Collected**	**(mg/kg):**	**5.9**	**0.6**	**37.3**	**35.7**	**35**	**0.17**	**123**
Doris									
Wolverine OF	0		-	-	-	-	-	-	-
Patch OF	3		-	-	-	-	-	-	-
P.O. OF	3		-	-	-	-	-	-	-
Ogama OF	3		-	-	1.05	-	-	-	-
Doris OF	3		-	-	-	-	-	-	-
Little Roberts									
Little Roberts OF	3		-	-	-	-	-	-	-
Windy									
Windy OF	3		-	-	1.23	-	-	-	-
Glenn OF D/S	3		-	-		-	-	-	-
Koignuk River									
Koignuk U/S	3		-	-	1.09	-	-	-	-
Koignuk M/S	3		-	-	-	-	-	-	-
Koignuk D/S	3		-	-	1.42	-	-	-	-
Ref A									
Ref Lk A OF	3		-	-	-	-	-	-	-
Ref B									
Ref Lk B OF	3		-	-	-	-	-	-	-
Angimajuq									
Angimajuq R. Ref	3		-	-	-	-	-	-	-
Total Sites			**0**	**0**	**4**	**0**	**0**	**0**	**0**

All values represent the factor by which 2009 stream averages are higher than CCME guidelines. *(continued)*

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

Table 3.5-2. Stream Sediment Quality, Average Factor by which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2009 (completed)

Stream	Total Number of Samples Collected	CCME Guideline value[a] (mg/kg):	Arsenic (As) 17	Cadmium (Cd) 3.5	Chromium (Cr) 90	Copper (Cu) 197	Lead (Pb) 91.3	Mercury (Hg) 0.486	Zinc (Zn) 315
			Factor by which samples are higher than PEL[c] guidelines						
Doris									
Wolverine OF	0		-	-	-	-	-	-	-
Patch OF	3		-	-	-	-	-	-	-
P.O. OF	3		-	-	-	-	-	-	-
Ogama OF	3		-	-	-	-	-	-	-
Doris OF	3		-	-	-	-	-	-	-
Little Roberts									
Little Roberts OF	3		-	-	-	-	-	-	-
Windy									
Windy OF	3		-	-	-	-	-	-	-
Glenn OF D/S	3		-	-	-	-	-	-	-
Koignuk River									
Koignuk U/S	3		-	-	-	-	-	-	-
Koignuk M/S	3		-	-	-	-	-	-	-
Koignuk D/S	3		-	-	-	-	-	-	-
Ref A									
Ref Lk A OF	3		-	-	-	-	-	-	-
Ref B									
Ref Lk B OF	3		-	-	-	-	-	-	-
Angimajuq									
Angimajuq R. Ref	3		-	-	-	-	-	-	-
Total Sites			**0**	**0**	**0**	**0**	**0**	**0**	**0**

All values represent the factor by which 2009 stream 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

3.6.1 Phytoplankton Biomass

Surface phytoplankton biomass (as chlorophyll *a*) ranged from 0.3 to 26.9 µg chl *a* /L in surveyed lakes, and was generally similar during summer and winter for the lakes sampled during both periods (Figure 3.6-1). The exception was at Little Roberts Lake, where biomass was markedly higher in winter (26.9 µg chl *a* /L) than in summer (2.1 µg chl *a* /L). Little Roberts Lake had a very transparent ice cover at the time of winter sampling, with little snow cover (due to strong winds); therefore, light penetration into the water column would likely have been sufficient to support photosynthesis year-round. Field observations made at the time of sample collection confirmed the greenish colour of the water, which suggests high algal densities. Relatively high phytoplankton biomass was also found at Nakhaktok Lake (18.0 µg chl *a* /L in summer), Doris N (7.6 and 8.1 µg chl *a* /L in winter and summer, respectively), Doris S (12.9 and 8.8 µg chl *a* /L in winter and summer, respectively), and Ogama (5.6 µg chl *a* /L in summer) lakes.

3.6.2 Phytoplankton Abundance

Patterns of phytoplankton abundance generally followed those seen for phytoplankton biomass. Summer phytoplankton abundance was highest at Nakhaktok Lake (16,900 cells/mL) and the downstream Doris Watershed lakes: Ogama (5,000 cells/mL), Doris S (4,500 cells/mL) and N (4,800 cells/mL), and Little Roberts (1,900 cells/mL; Figure 3.6-1). Summer phytoplankton abundance at all other sites surveyed did not exceed 550 cells/mL.

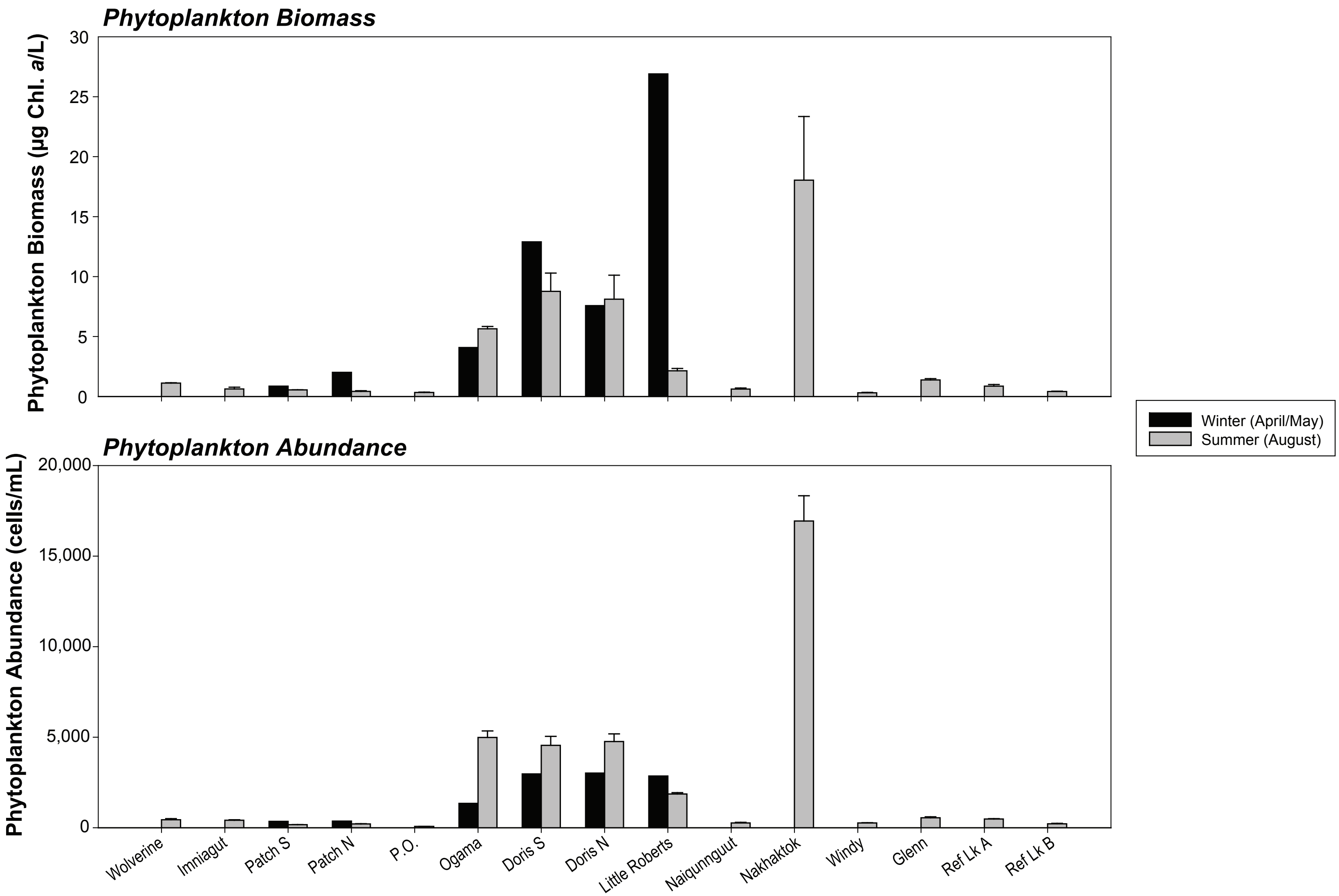
Winter phytoplankton abundance followed the trends observed during summer months, with Ogama, Doris, and Little Roberts lakes having elevated levels of abundance compared to Patch Lake. Phytoplankton biomass observed at Little Roberts Lake was disproportionally high relative to phytoplankton abundance data collected at the same time, and suggests the presence of large or chlorophyll *a*-rich phytoplankton during the winter.

3.6.3 Phytoplankton Taxonomic Composition

Lakes in the study area contained a diverse assemblage of phytoplankton taxa (Figure 3.6-2). During the summer, lakes with the highest levels of phytoplankton biomass and abundance (Ogama, Doris S and N, Little Roberts, and Nakhaktok) were dominated by cyanobacteria (blue-green algae), a taxa known to be dominant in eutrophic sites. Cyanobacteria, largely the nitrogen-fixing *Aphanizomenon flos-aquae*, comprised 60 to 88% of the phytoplankton communities at these lakes. Cyanobacteria were also abundant at these five sites during the winter, though Ogama Lake contained a relatively even mix of cyanobacteria (31%), chrysophytes (26%), and cryptophytes (27%), and Little Roberts Lake had high numbers of dionflagellates (31%) and chrysophytes (41%). Cyanobacteria made up less than 2% of the phytoplankton community at other sites. Diatoms, chlorophytes (green algae), and cryptophytes where also abundant in study area lakes.

3.6.4 Phytoplankton Richness and Diversity

During the summer, genera richness ranged from 8 genera/sample at Nakhaktok Lake to 20 genera/sample at Patch S and N, and averaged 15 genera/sample across all sites. Winter richness ranged from 6 to 17 genera/sample. Summer richness exceeded winter levels at all lakes except Ogama Lake (Figure 3.6-3).



Note: Error bars represent standard error of the mean
For each site, n=1 in winter; n=3 in summer

Figure 3.6-1

Winter and Summer Phytoplankton Biomass and Abundance, Hope Bay Lakes, 2009

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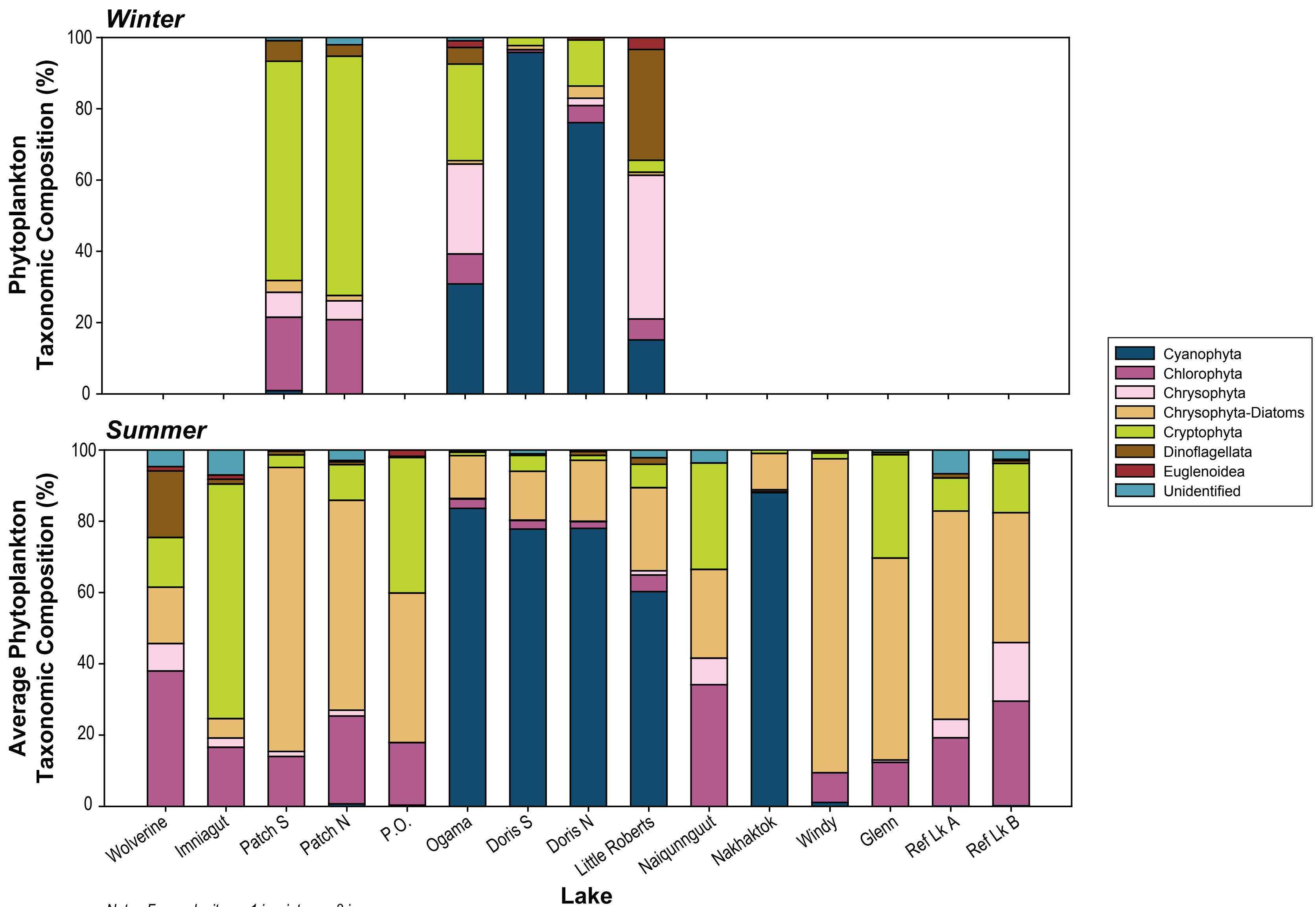

Note: For each site, n=1 in winter; n=3 in summer

Figure 3.6-2

Winter and Summer Phytoplankton Taxonomic Composition, Hope Bay Lakes, 2009

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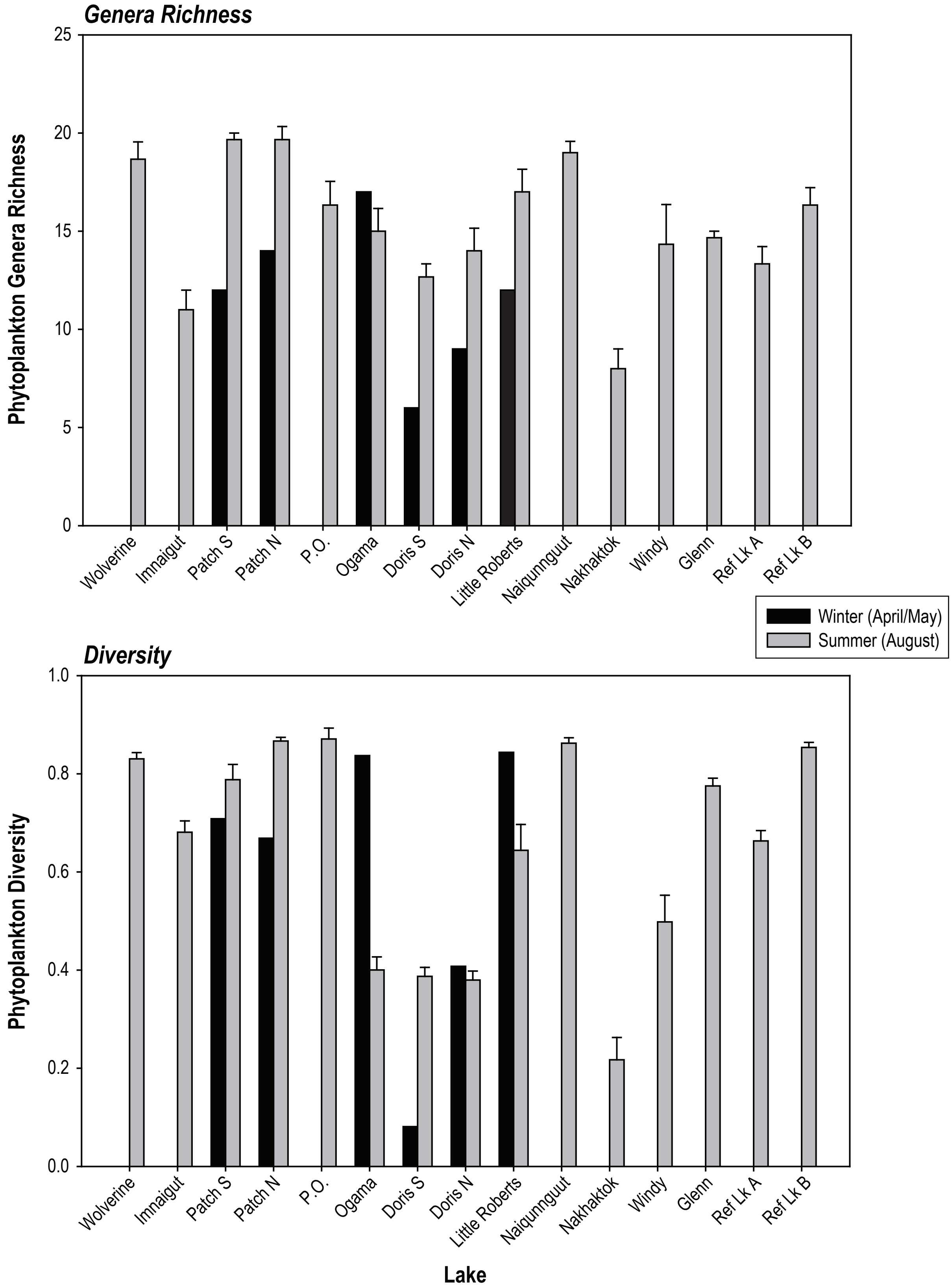

Note: Error bars represent standard error of the mean
For each site, n=1 in winter; n=3 in summer

NEWMONT NORTH AMERICA

Winter and Summer Phytoplankton Richness and Diversity, Hope Bay Lakes, 2009

Figure 3.6-3

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Simpson's diversity index is a combined measure of genera richness and the evenness with which abundances are distributed among these genera. During the summer, phytoplankton diversity was lowest at Nakhaktok Lake (0.22) and highest at Patch S and N (0.87; Figure 3.6-3). At Ogama and Little Roberts lakes, diversity was notably higher in the winter than summer (winter diversity of 0.84 at both sites), while the opposite was true at Doris S (winter Simpson's diversity index of 0.08).

3.6.5 Epontic Algae Taxonomic Composition and Diversity

Samples of epontic algae (algae living on the underside of the ice) were collected from six lake sites by scraping the underside of the lake ice. Because these were qualitative samples, epontic algal densities were not calculated.

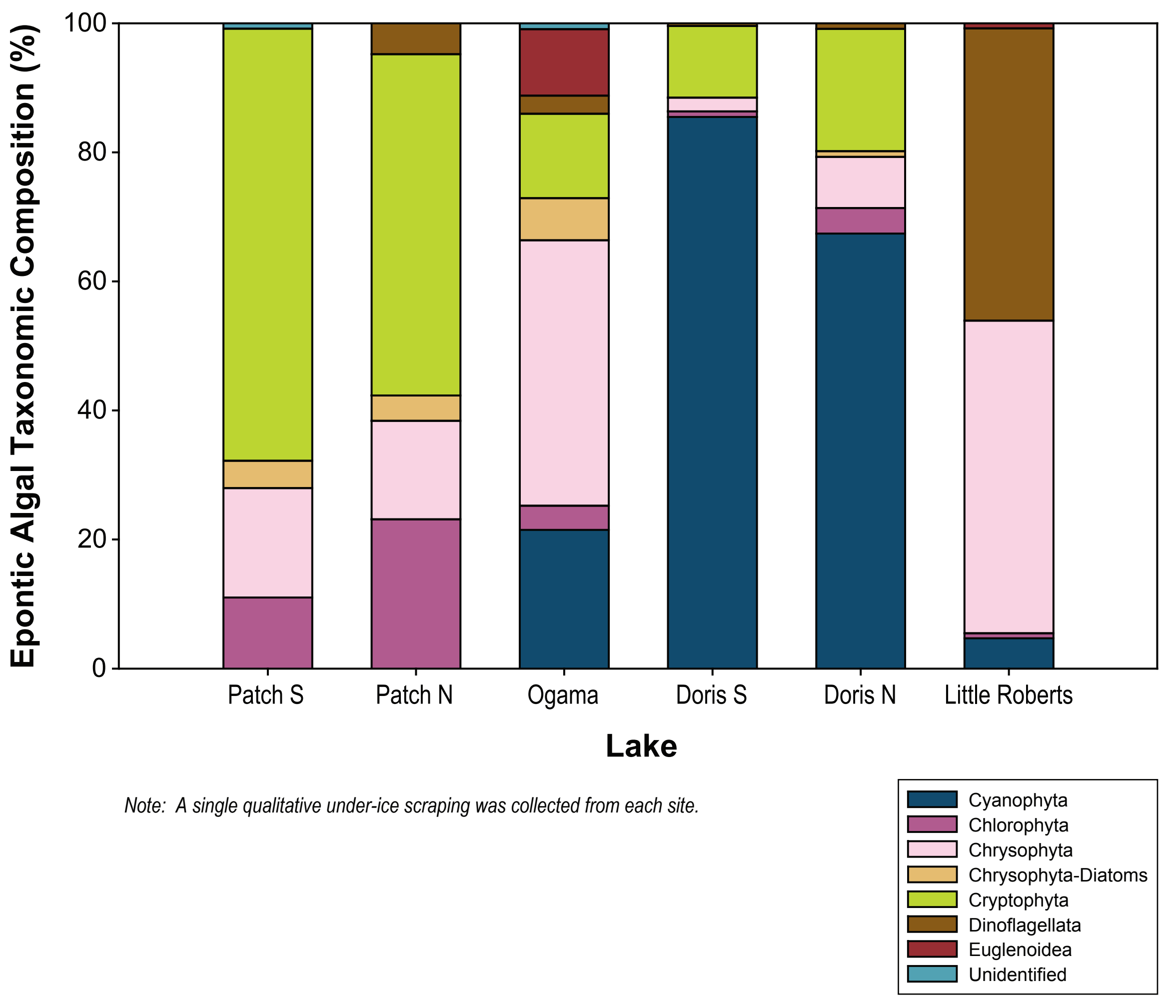
Epontic communities corresponded closely, in terms of broad taxonomic composition (i.e., percentages of cyanobacteria, chrysophytes, dinoflagellates, etc.), to winter phytoplankton communities (Figure 3.6-4). Epontic algal richness ranged from 6 genera/sample at Doris S to 17 genera/sample at Ogama Lake (Figure 3.6-5). Epontic algal diversity ranged from 0.26 at Doris S to 0.88 at Ogama Lake (Figure 3.6-5). Differences in epontic algal richness and diversity among lake sites followed similar trends.

3.6.6 Annual Comparison

Table 2.13-5 outlines the years for which historical phytoplankton data are available as well as an overview of the sampling methodologies employed in each year. Figure 2.13-3 provides a summary of the historical phytoplankton sampling locations. Only locations sampled in 2009 are discussed in this report. Note that historical sampling locations may not correspond exactly with those sampled in 2009, and this may contribute to variability observed between years. Winter phytoplankton data were not included in the annual averages as winter samples were collected only in 2009.

Prior to 2009, phytoplankton biomass data were only collected in 2000 and 2007, and only at Doris and Little Roberts lakes (Figure 3.6-6). Despite annual differences in sample collection location (see Figure 2.13-3), sampling date, and sampling methodologies (e.g., discrete samples vs. integrated sampler used in 2007), historical data supported 2009 findings that these two lakes have elevated levels of phytoplankton biomass.

Phytoplankton abundance data were collected in more years and at more sites than phytoplankton biomass data (Figure 3.6-7). Annual data were variable; however, Ogama, Doris S and N, Little Roberts, and Nakhaktok lakes tended to have historically high levels of abundance compared to other sites. The 2007 phytoplankton abundance data were notable since they tended to have the highest within-site variability (partially a product of combining samples from different months) and higher abundances than those observed in other years. In 2007, phytoplankton were collected from the entire euphotic zone with the use of a depth-integrated sampler, as opposed to the discrete samples collected in other years (from 1 m depth in 1997, 2000, and 2009; from 0.5 m in 1996). In addition, samples were collected in July, August, and September in 2007, while in other years, samples were collected in a single month (July in 1997 and 2000; August in 1996 and 2009).



Note: A single qualitative under-ice scraping was collected from each site.

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Epontic Algal Taxonomic Composition, Hope Bay Lakes, April/May 2009

Figure 3.6-4

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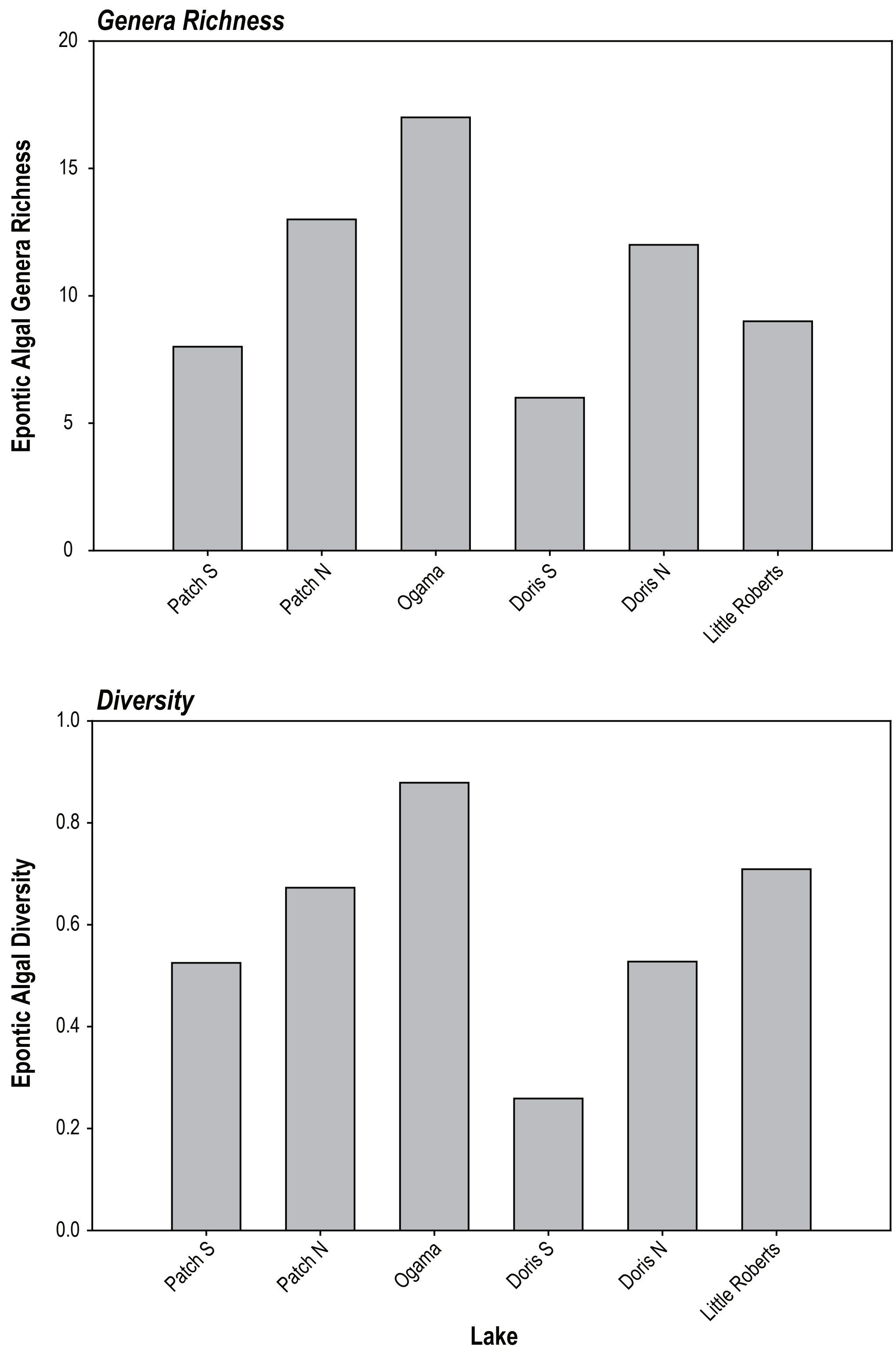

Note: A single qualitative under-ice scraping was collected from each lake

Figure 3.6-5

NEWMONT NORTH AMERICA

Epontic Algal Richness and Diversity, Hope Bay Lakes, April/May 2009

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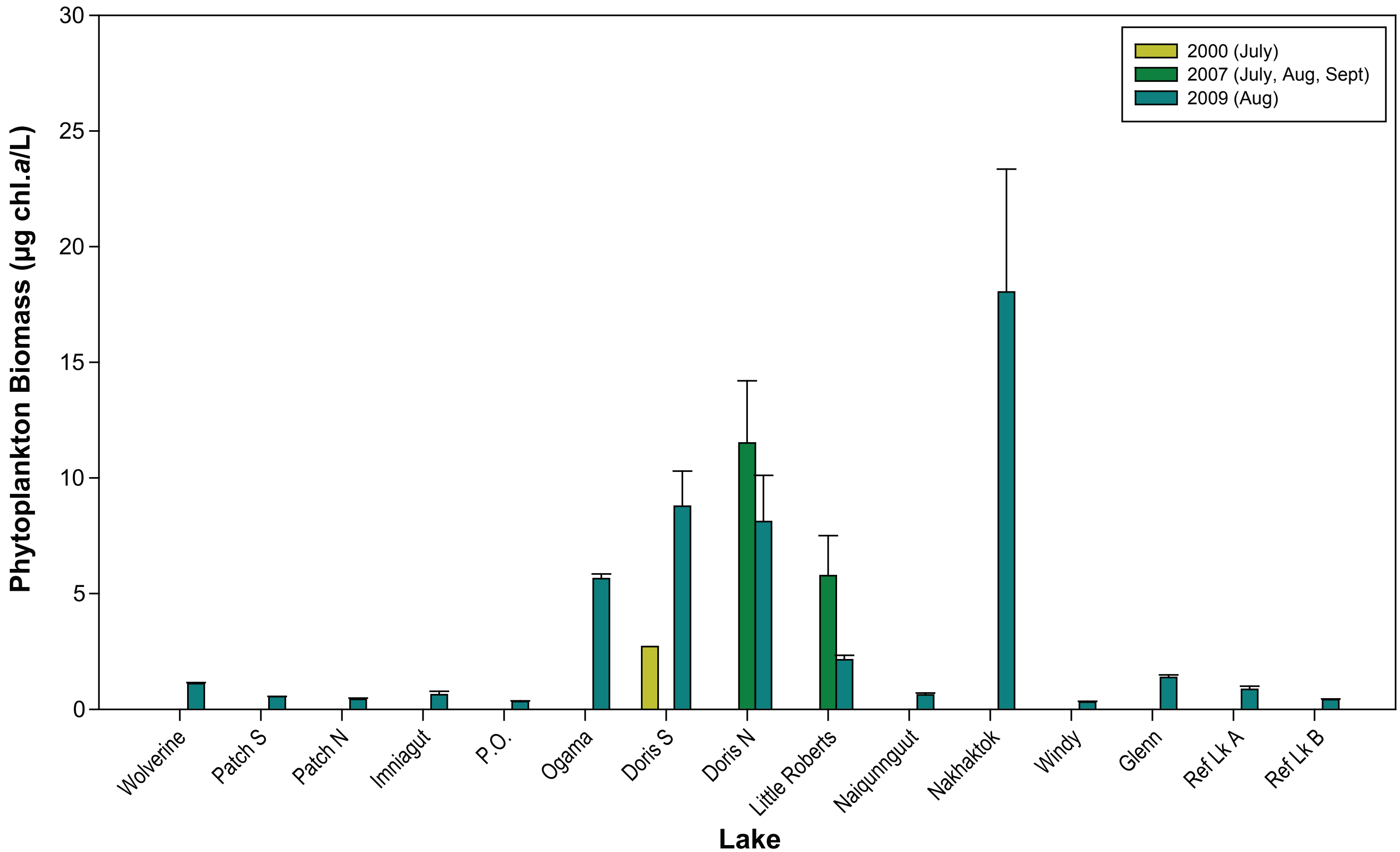

Note: Error bars represent standard error of the mean
Winter phytoplankton samples (collected in 2009) are not included in the annual averages

Figure 3.6-6

NEWMONT NORTH AMERICA

Average Annual Phytoplankton Biomass, Hope Bay Lakes, 1996 - 2009

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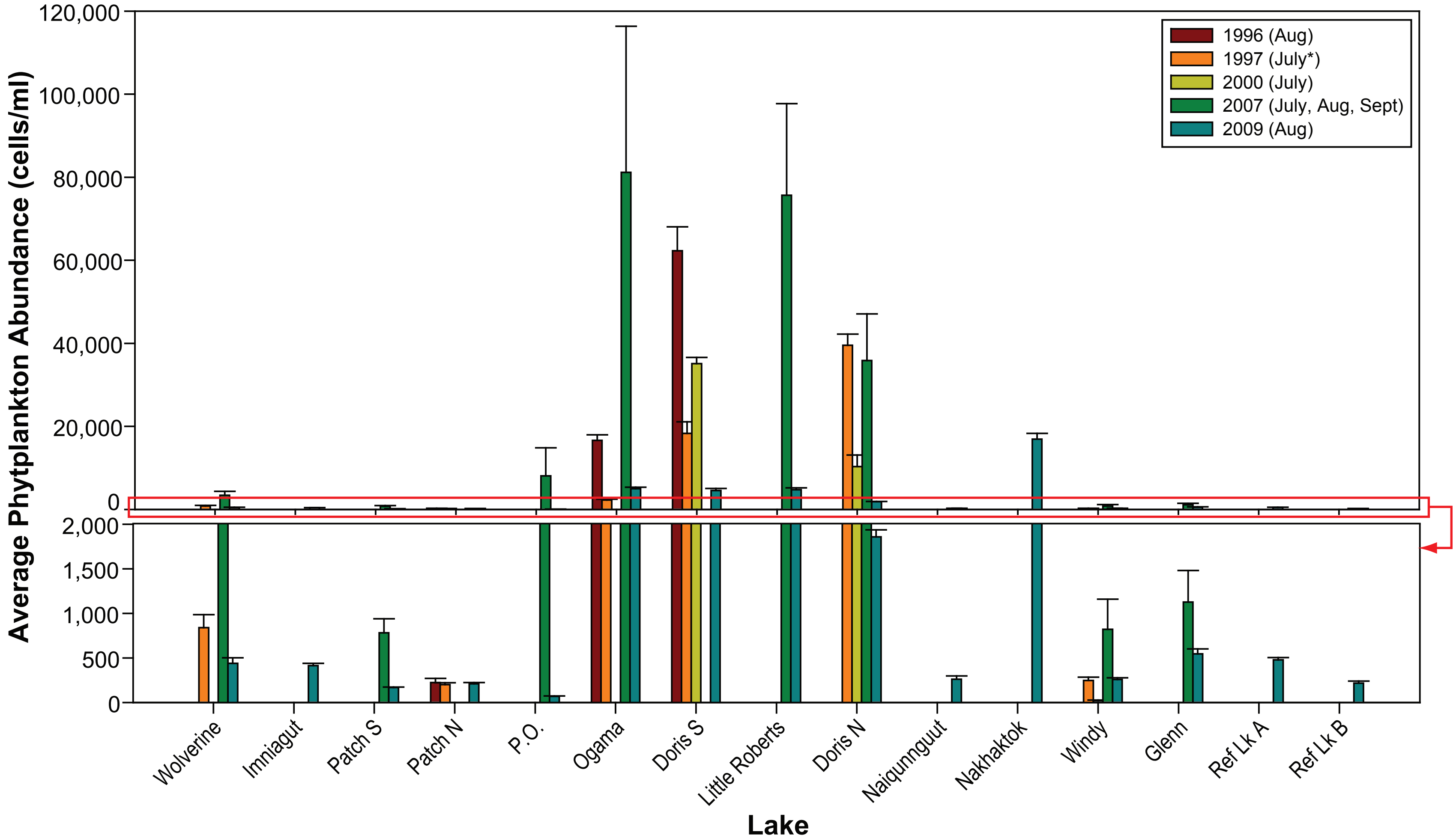

Note: Error bars represent standard error of the mean
** samples were also collected from Doris S in August 1997*
Winter phytoplankton samples (collected in 2009) are not included in the annual average

Figure 3.6-7

NEWMONT NORTH AMERICA

Average Annual Phytoplankton Abundance, Hope Bay Lakes, 1996-2009

Figure 3.6-7

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3.6.7 Phytoplankton Summary

Lake phytoplankton biomass (as chlorophyll *a*) ranged from 0.3 to 26.9 µg chl *a*/L, and was highest in Ogama, Doris N and S, and Little Roberts lakes (in the Doris Watershed) and Nakhaktok Lake (in the Windy Watershed). Trends in phytoplankton abundance and biomass were similar. Phytoplankton taxonomic composition varied substantially among lakes, though cyanobacteria were consistently dominant at sites with high levels of phytoplankton abundance and biomass. In other lakes, the taxonomic assemblage was mainly composed of chlorophytes, cryptophytes, and diatoms. Phytoplankton richness and diversity ranged from 6 to 20 genera/sample and from 0.08 to 0.87, respectively, across all sites and seasons. Genera richness and diversity were consistently lowest at Nakhaktok and Doris N and S lakes. Phytoplankton diversity and richness generally followed similar trends.

The taxonomic composition of epontic algae in a particular lake was similar to the winter phytoplankton composition in that lake. The assemblage of epontic algae was mainly composed of cyanobacteria in Doris N and S, chrysophytes and dinoflagellates in Little Roberts Lake, cryptophytes in Patch N and S, and chrysophytes in Ogama Lake. Epontic richness ranged from 6 to 17 genera and followed a similar trend as diversity, which ranged from 0.26 to 0.88. Richness and diversity levels were consistently lowest at Doris S and highest at Ogama Lake.

Limited historical phytoplankton biomass and abundance data were collected from the study sites. Overall, among-site differences in abundance observed in 2009 were similar to those observed in previous years, except in 2007 when sample collection methodologies deferred substantially from those used in other years.

3.7 PERIPHYTON

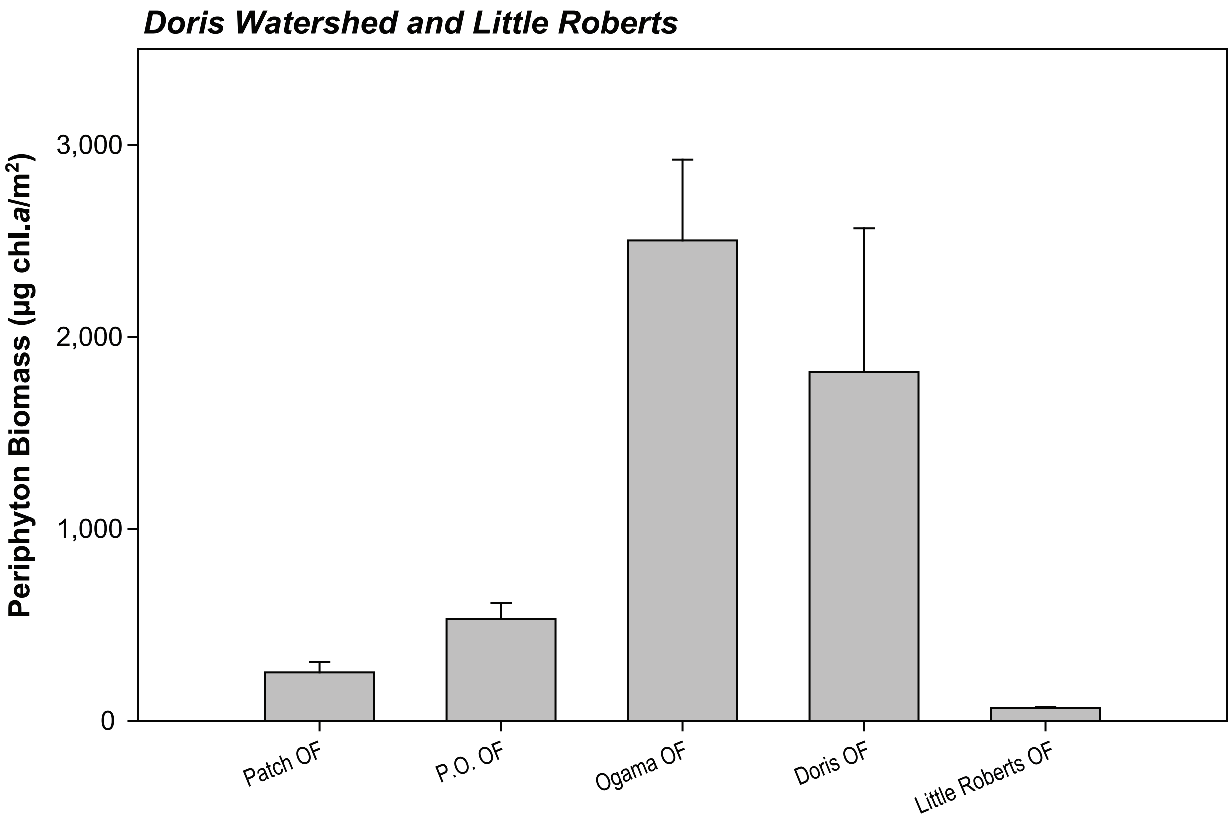
Periphyton are algae that grow on the surfaces of rocks or larger plants and are an important food item for many benthic invertebrates, which are in turn the main food source for fish in streams and rivers. Because of their short life cycles, periphyton are among the first organisms to respond to environmental stressors, and can exhibit taxon-specific changes to stressors, making them good indicators of current environmental conditions.

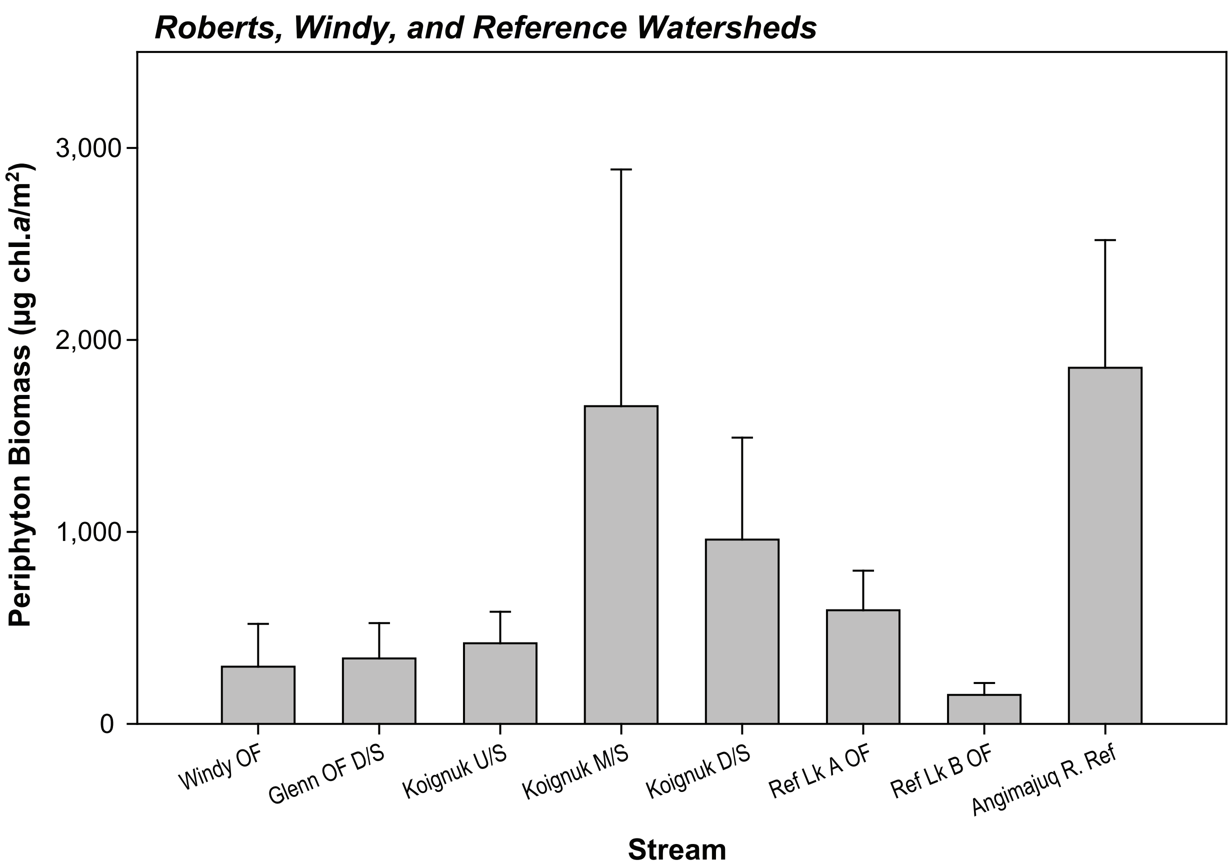
Periphyton samples were collected from 14 stream sites in the study area, including two reference streams located ~10 km away from potential mining activities, and a reference river station on the Angimajuq River. Periphyton samples were collected using artificial sampling plates that were installed between late July and late August. Although five samplers were placed at each sampling site, only three replicates were analyzed per site.

Appendices 3.7-1 and 3.7-2 present periphyton biomass and taxonomic data respectively. Table 2.1-5 provides sampling dates and locations.

3.7.1 Periphyton Biomass

Periphyton biomass (as chlorophyll *a*) ranged from a low of 66 µg chl *a*/m^2 at Little Roberts OF, to 2,500 µg chl *a*/m^2 at Ogama OF (Figure 3.7-1). Average concentrations over 1,500 µg chl *a*/m^2 were also found at Doris OF, Koignuk M/S, and Angimajuq R. Ref. The average periphyton biomass for all the streams sampled was 880 µg chl *a*/m^2.





Note: Error bars represent standard error of the mean
Samplers were immersed for 26-29 days between late July and late August.

NEWMONT NORTH AMERICA

Average Periphyton Biomass Hope Bay Streams, 2009

Figure 3.7-1

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3.7.2 Periphyton Density

Periphyton density ranged from 58,400 individuals/cm^2 at Little Roberts OF to approximately 400,000 individuals/cm^2 at Ogama OF, Koignuk U/S, and Angimajuq R. Ref (Figure 3.7-2). Despite being collected at the same time and from the same plates, periphyton density and biomass were weakly correlated (r = 0.26). Overall, periphyton density averaged 184,000 individuals/cm^2 across all sites, and there were no apparent watershed-specific density differences.

3.7.3 Periphyton Taxonomic Composition

Stream periphyton assemblages were almost exclusively composed of diatoms, which made up more than 96% of individuals of all stream site communities, with the exception of the Angimajuq R. Ref site (Figure 3.7-2). The taxonomic assemblage at Angimajuq R. Ref consisted of 88% diatoms, 9% chlorophytes (green algae), 2% non-diatom chrysophytes, and 1% cryptophytes. Green algae also composed between 1 and 3% of the periphyton at Koignuk U/S, M/S, and D/S, and at Ref Lk B OF. Low densities of cyanobacteria were also found at Ogama OF, Little Roberts OF, Glenn OF D/S, and Ref Lk A OF. The main diatom species found in stream periphyton communities were: *Diatoma tenue* (19% of all algae found), *Achnanthes minutissima* (13%), *Diatoma tenue elongatum* (12%), *Tabellaria flocculosa* (8%), *Synedra rumpens* (5%), *Gomphonema angustatum* (5%), and *Nitzschia frustulum* (4%). The dominant green alga was *Scenedesmus quadricauda* (0.7%), the dominant chrysophyte was *Kephyrion littorale* (0.3%), and the dominant cyanobacterium was *Oscillatoria sp.* (0.3%).

3.7.4 Periphyton Richness and Diversity

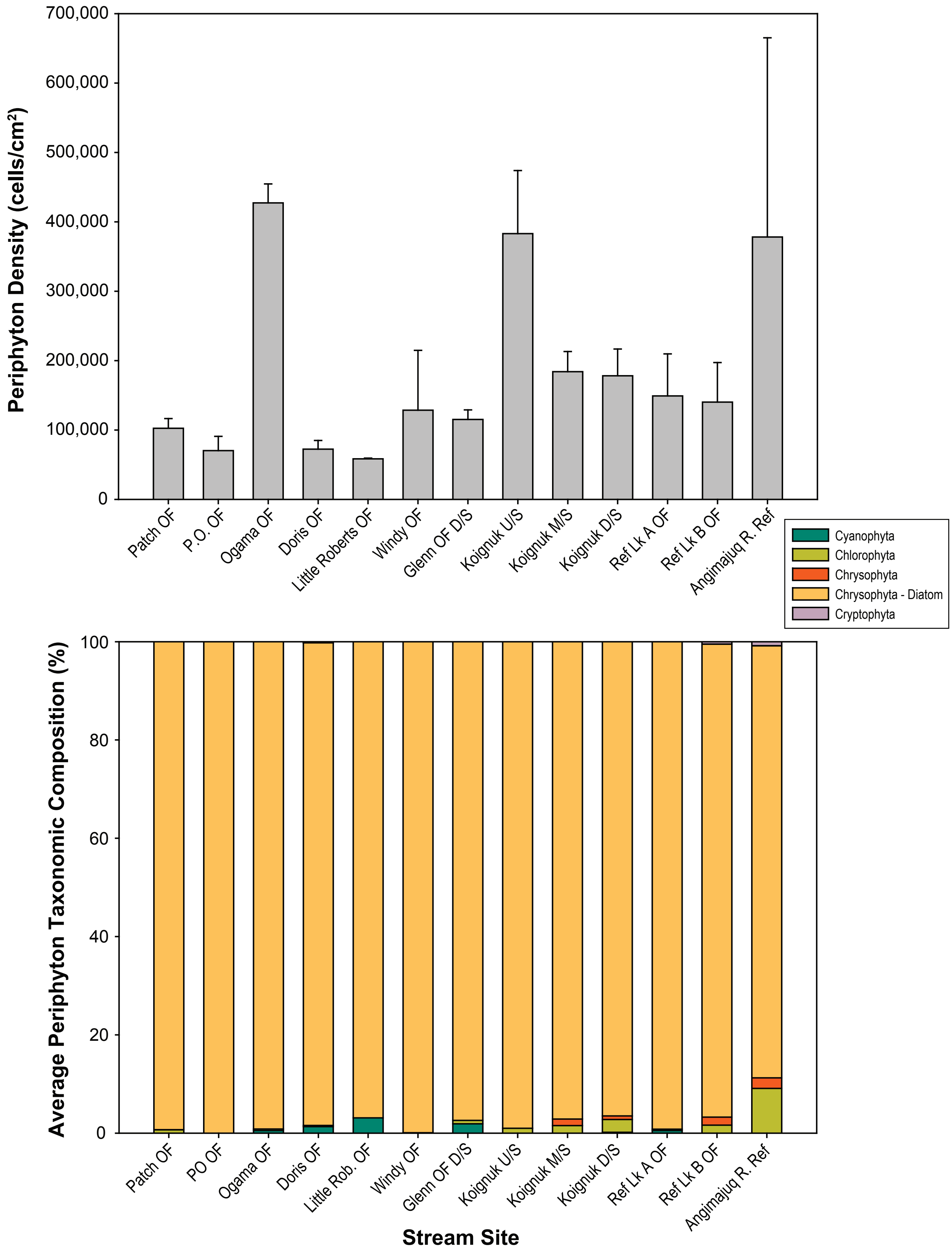
Average periphyton genera richness ranged from a low of 8 genera/sample at Windy and Ref Lk A outflows, to a high of 16 genera/sample at Little Roberts OF and Koignuk D/S. (Figure 3.7-3). Simpson's diversity was relatively high at all sites except Windy OF. At Windy OF, periphyton diversity averaged 0.32, but there was a high degree of variability between replicate samples. Diversity at all other sites ranged from 0.57 to 0.87, with an average of 0.78.

3.7.5 Annual Comparison

Table 2.13-6 outlines the years for which historical stream periphyton data are available as well as an overview of the sampling methodologies employed in each year. Figure 2.13-3 provides a summary of the historical periphyton sampling locations. Only locations sampled in 2009 are discussed in this report. Note that historical sampling locations may not correspond exactly with those sampled in 2009, and this may contribute to variability observed between years.

Historically, periphyton biomass has only been sampled once before: at Doris OF in 2000. The methodology used in 2000 was generally comparable to that used in 2009. In 2000, periphyton biomass at Doris OF averaged 5,300 µg chl *a*/m^2, which is higher than the biomass level observed in 2009 (1,800 µg chl *a*/m^2).

Periphyton density data were collected in 1996, 1997, 2000, and 2009 (Figure 3.7-4). In 1996, periphyton samples were collected by taking scraping from rocks collected within each stream. In all other years Plexiglas artificial substrate samplers were used to collect periphyton over an immersion time of approximately one month. As a result, periphyton density values collected in 1996 were markedly higher and more variable than those observed in other years.



Note: Error bars represent standard error of the mean of the total density
Samplers were immersed for 26-29 days between late July and late August

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Periphyton Density and Taxonomic Composition, Hope Bay Streams, 2009

Figure 3.7-2

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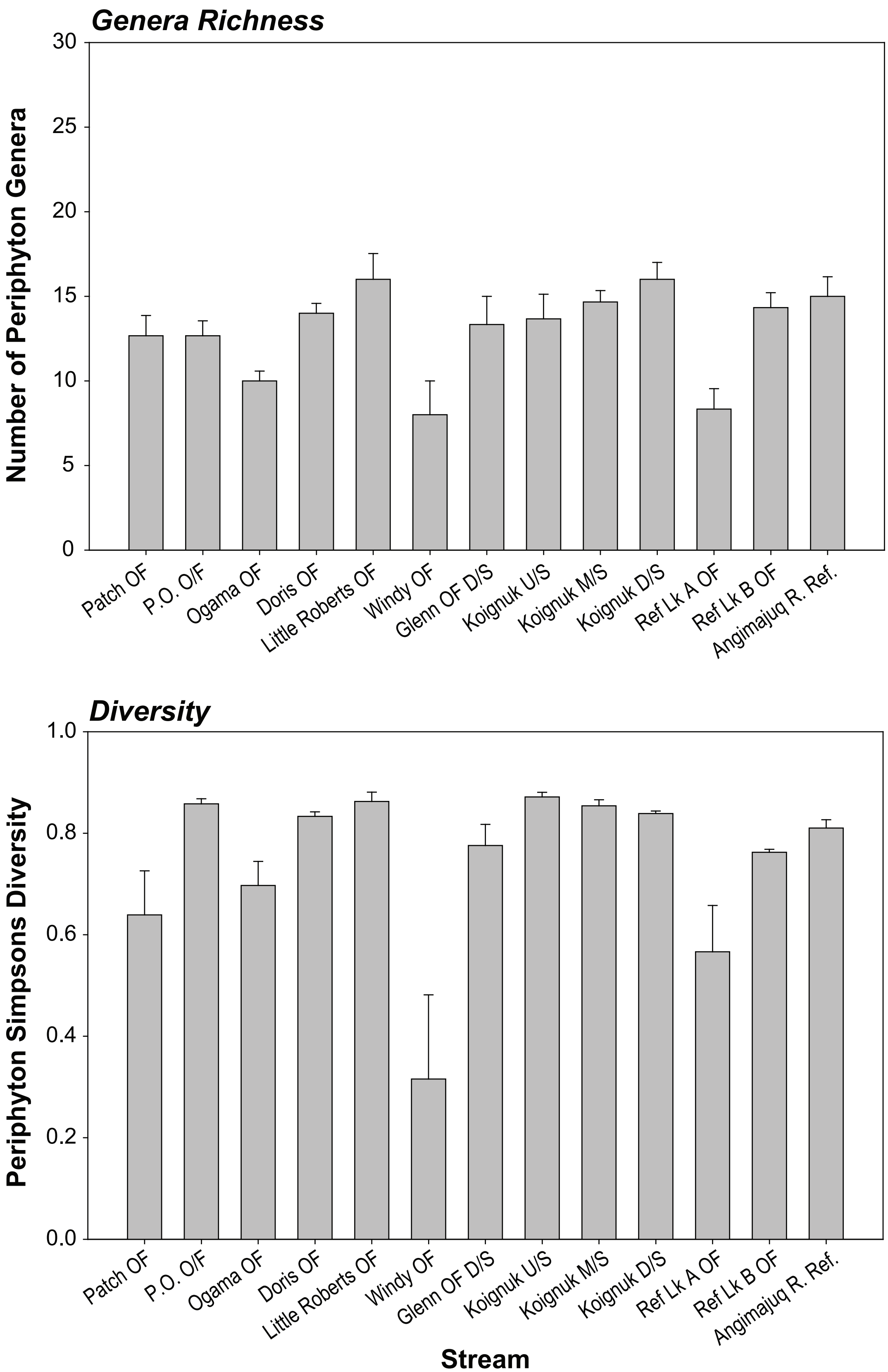

Note: Error bars represent standard error of the mean
Samplers were immersed for 26-29 days between late July and late August

Figure 3.7-3

Periphyton Richness and Diversity, Hope Bay Streams, 2009

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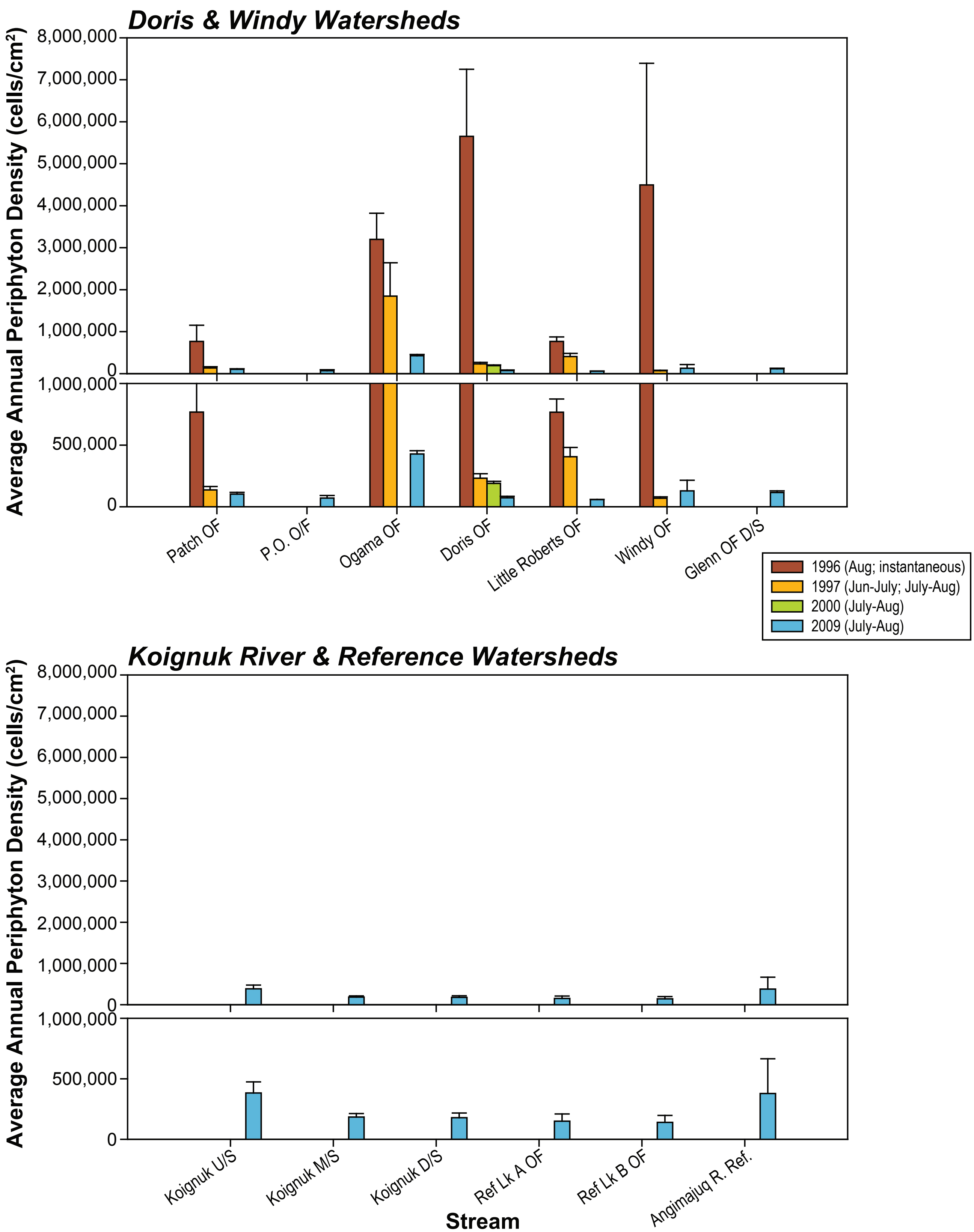

Note: Error bars represent standard error of the mean
1996 samples were collected as instantaneous rock scrapings
1997, 2000, and 2009 samples were collected with plexiglass samplers immersed for ca. 1 month;from June - July and July - August in 1997; from July - August in 2000 and 2009

Figure 3.7-4

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Average Annual Periphyton Density, Hope Bay Streams, 1996-2009

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3.7.6 Periphyton Summary

Periphyton biomass ranged from approximately 66 to 2,500 µg chl *a*/m^2, while density ranged from 58,000 to 400,000 individuals/cm^2 among stream sites. Biomass and density levels were particularly high in Ogama OF, the Koignuk River, and the Angimajuq R. Ref. Diatoms were the dominant periphyton taxa in all streams surveyed. Genera richness ranged from 8 to 16 genera/sample and averaged 13 genera/sample. Periphyton diversity was relatively high at all sites (Simpson's diversity index between 0.57 and 0.87) except Windy OF (0.32).

3.8 ZOOPLANKTON

Zooplankton, the heterotrophic component of aquatic plankton, are an important link in the aquatic food web, acting as consumers of phytoplankton and prey to many fish species. Zooplankton samples were collected from 15 lake sites in the study area in August, 2009, including two reference lakes. All raw zooplankton taxonomic data are presented in Appendix 3.8-1. Table 2.1-4 provides sampling dates and locations.

3.8.1 Zooplankton Abundance

Zooplankton abundances within the study area averaged 64,000 organisms/m^3, but were highly variable among lakes (Figure 3.8-1). Imniagut and Nakhaktok lakes had the highest zooplankton abundances of the lakes surveyed (~255,000 and 282,000 organisms/m^3, respectively). The lowest abundances were observed at Windy (~2,200 organisms/m^3) and Glenn (~2,900 organisms/m^3) lakes. Zooplankton abundances at other sites ranged between ~4,200 and 95,000 organisms/m^3.

3.8.2 Zooplankton Taxonomic Composition

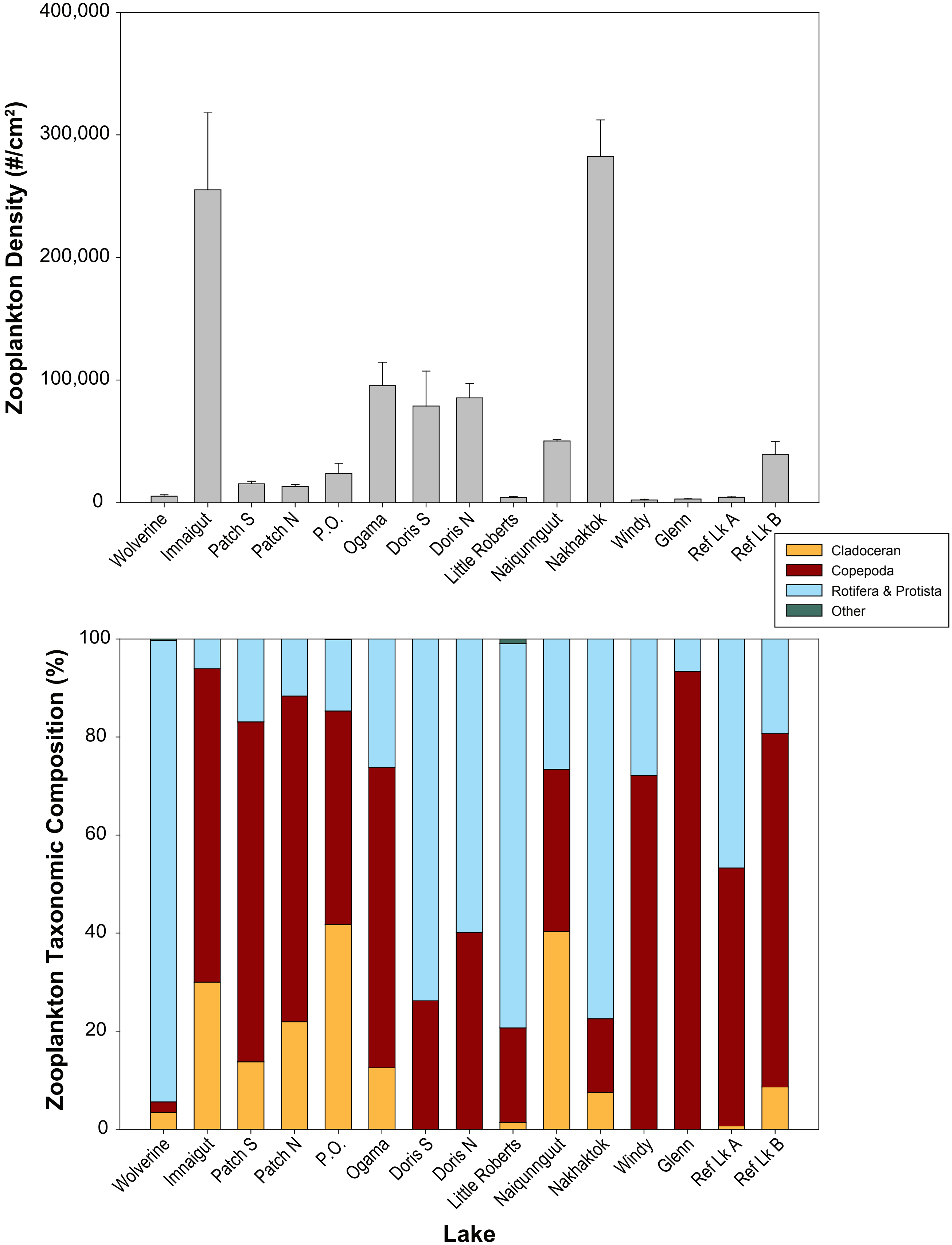
In general, lake zooplankton assemblages were composed mainly of cladocerans, copepods, and rotifers and protists (Figure 3.8-1). The zooplankton assemblage at Wolverine Lake was dominated by rotifers and protists, while Glenn Lake was heavily dominated by copepods. Many of the lakes in the Doris Watershed (Imniagut, Patch S and N, P.O., and Ogama lakes) and Naiqunnguut Lake in the Roberts Watershed were similar in their broad taxonomic composition, with a relatively even composition of cladocerans, copepods, rotifers and protists.

Common zooplankton species encountered in the area included: *Kellicottia longispina* (20% of zooplankton individuals found), *Keratella quadrata* (17%), and *Bosmina longirostris* (11%).

3.8.3 Zooplankton Richness and Diversity

For zooplankton diversity calculations (genera richness and Simpson's diversity index), cyclopoid copepodites and copepod nauplii were analyzed as independent genera, since they could not be correctly assigned to other copepod genera (because copepodites and nauplii are early developmental stages). An unidentified rotifer (which was only found in one sample and made up 0.3 % of that sample's assemblage), was removed from the dataset since it could not be allocated accurately to a genera-group.

Zooplankton genera richness varied greatly between lakes, with a low of 3 genera/sample at both Windy and Glenn Lakes, to a high of 12 at Wolverine, Little Roberts, Niaqunnguut, and Ref B lakes (Figure 3.8-2). The low richness observed at Windy and Glenn lakes was particularly conspicuous as all other sites possessed at least 7 genera, including Nakhaktok Lake (located just upstream of Windy Lake), which had an average of 11 genera.



Note: Error bars represent standard error of the mean of the total density

NEWMONT NORTH AMERICA

Zooplankton Abundance and Taxonomic Composition, Hope Bay Lakes, August 2009

Figure 3.8-1

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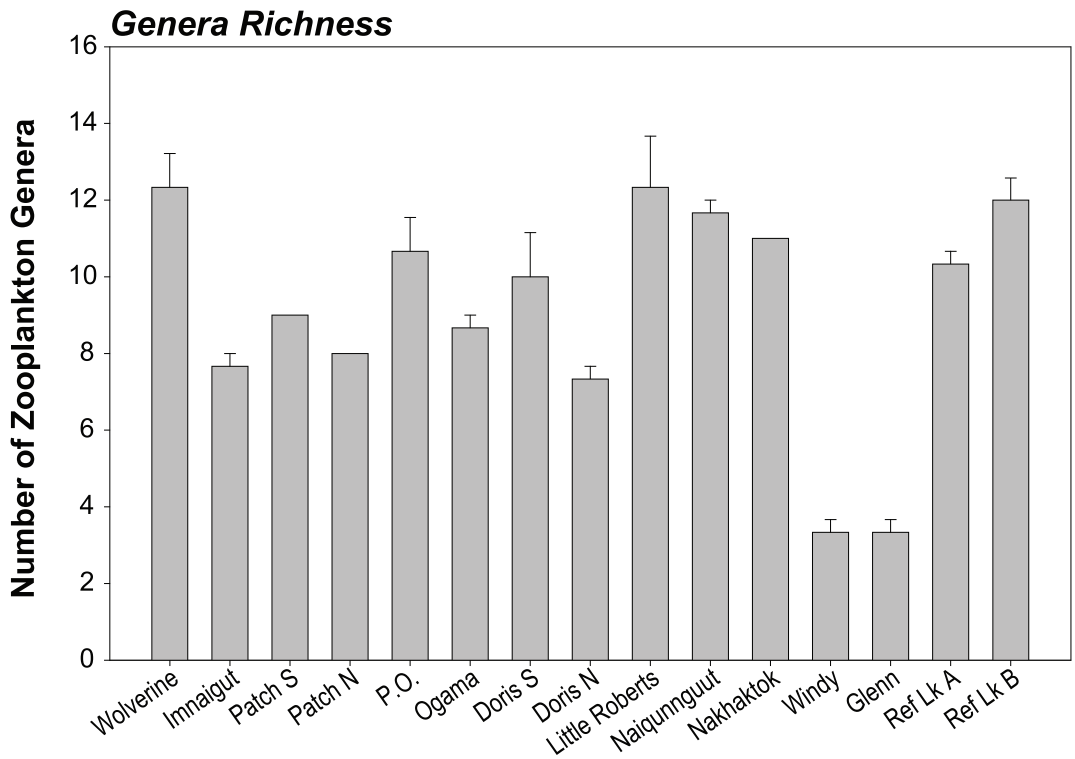

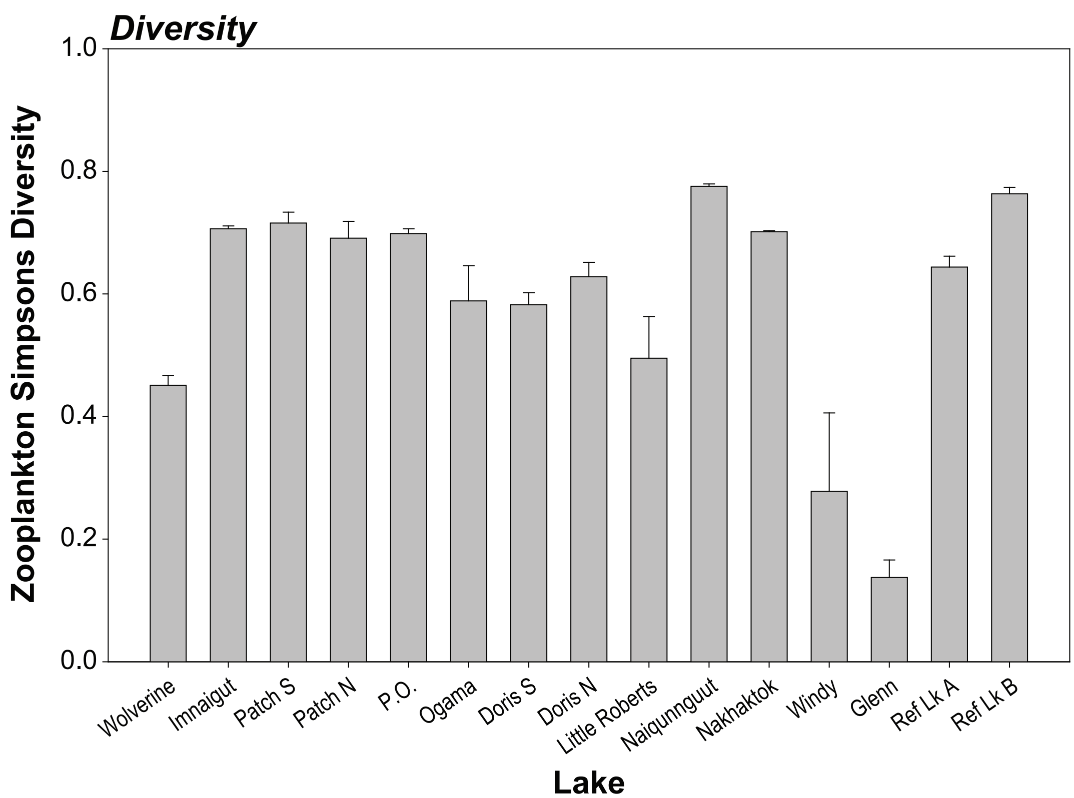

Note: Error bars represent standard error of the mean

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Zooplankton Richness and Diversity, Hope Bay Lakes, August 2009

Figure 3.8-2

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Lake zooplankton diversity was similar across most lakes, with the exception of Windy and Glenn lakes, where diversity levels were very low (0.28 and 0.14, respectively; Figure 3.8-2). Notably, the diversity at Nakhaktok Lake, located just upstream of Windy Lake, was quite high (0.70). Diversities at all other sites were ≥ 0.45, with the highest diversity observed at Naiqunnguut Lake (0.78) and Reference Lake B (0.76). No watershed-specific differences in diversity were observed.

3.8.4 Annual Comparison

Table 2.13-7 outlines the years for which historical zooplankton data are available as well as an overview of the sampling methodologies employed in each year. Figure 2.13-4 provides a summary of the historical zooplankton sampling locations. Only locations sampled in 2009 are discussed in this report. Note that historical sampling locations may not correspond exactly with those sampled in 2009, and this may contribute to the variability observed between years.

Zooplankton abundance was highly variable among years, and no consistent annual trends were apparent (Figure 3.8-3). Zooplankton abundances at P.O., Ogama and Doris lakes were higher in 2009 than other years observed, while at all other sites, zooplankton abundances were lowest in 2009. Differences in methodology (i.e., zooplankton net mesh sizes, timing of sampling, vertical vs. horizontal tows) could contribute to the high level of annual variability.

3.8.5 Zooplankton Summary

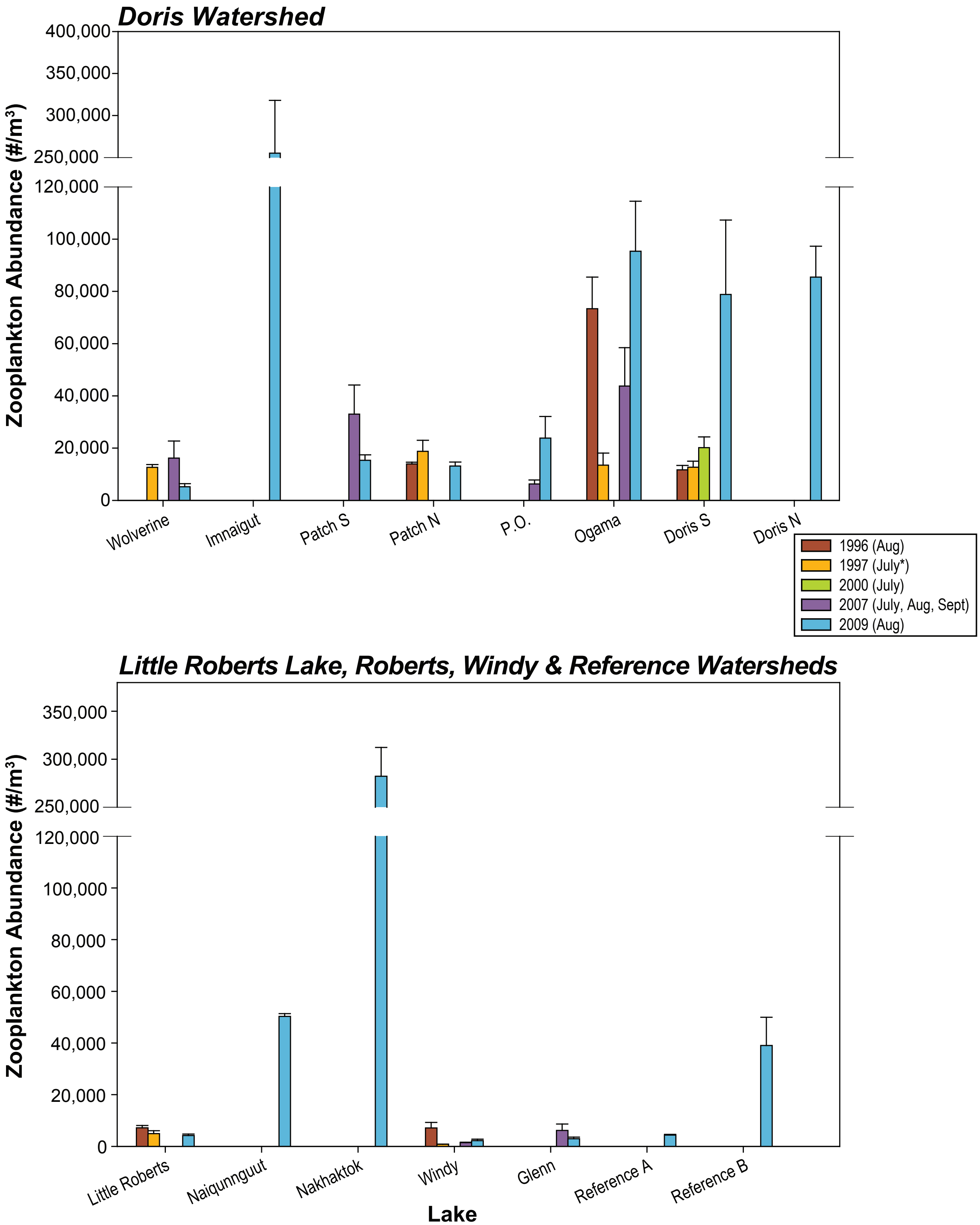
In general, zooplankton abundance varied widely among lakes with no obvious watershed-specific trends. Zooplankton abundance ranged from 2,200 to 282,000 organisms/m^3, and Imniagut and Nakhaktok lakes contained the highest abundance levels. The zooplankton assemblage in lakes typically consisted of cladocerans, copepods, rotifers and protists. Zooplankton genera richness ranged from 3 to 12 genera/sample, and diversity ranged from 0.14 to 0.78. Richness and diversity were particularly low in Windy and Glenn lakes, but were relatively similar among the other sites surveyed. Historical levels of zooplankton density were highly variable, and there were no discernible annual trends.

3.9 LAKE BENTHOS

Benthic macroinvertebrates (benthos) are organisms greater than 0.5 mm in size that inhabit lake and stream bottoms. Benthos are good indicators of environmental change as these organisms are in close contact with the sediments and feed on algae, bacteria, and detritus. Benthos also tend to be less mobile than fish, making them good indicators of local conditions. In addition to their potential use as indicator species, benthic organisms are important food sources for fish, particularly in streams.

Lake benthos samples were collected from 15 lake sites in August, 2009, including two reference lakes located ~10 km away from the location of potential mining activities. Benthos samples were collected from the same depth zones and locations as the sediment samples (shallow depth (0 to 5 m), mid depth (5.1 to 10 m), and/or deep depth (>10.1 m)). This sampling design allowed characterization of the potential natural variation in lake benthos with bathymetry and geographic location.

All raw lake benthos taxonomic data are presented in Appendix 3.9-1. Table 2.1-4 provides sampling dates and locations.



Note: Error bars represent standard error of the mean of the total density
** samples were also collected from Doris S in August 1997*

Average Annual Zooplankton Abundance, Hope Bay Lakes, 1996-2009

Figure 3.8-3

3.9.1 Lake Benthos Density

Lake benthos density ranged from 116 organisms/m^2 at Ref Lk A (deep depth) to 23,600 organisms/m^2 at Imniagut Lake (shallow depth; Figure 3.9-1). The highest levels of benthos density were found in Wolverine (13,300 organisms/m^2), Imniagut (23,600 organisms/m^2), Nakhaktok (7,700 organisms/m^2), and Little Roberts lakes (11,800 organisms/m^2). All other lakes had densities lower than 4,000 organisms/m^2. With the exception of Reference Lake B, benthos density tended to decrease slightly with depth. No watershed-specific density differences were apparent.

3.9.2 Lake Benthos Taxonomic Composition

Figures 3.9-2a–d present the taxonomic composition of the lake benthos communities surveyed. Lake benthic communities were generally dominated by dipterans (making up ~80% of individuals found). Pelecypoda, Ostracoda, and Oligochaeta (5%) were also common.

A few lakes differed conspicuously from other sites. The lakes with low benthos density, Windy and Glenn, were notable in that dipterans were the only benthic group found at deep depth, and dipterans and ostracods were the only taxa found at shallow depths. Reference Lake A (deep depth), and Reference Lake B (shallow depth) were also relatively taxon-poor, with only dipterans and oligochaetes found at Reference Lake A (deep depth), and only dipterans and pelecypods found at Reference Lake B (shallow depth). In contrast, the benthic assemblages at Wolverine, P.O., and, to a lesser extent, Imniagut lakes were not dominated by dipterans and included a more even mix of taxa.

3.9.3 Lake Benthos Diversity

Dipterans were typically the dominant taxonomic group in lake benthos samples. For this reason, benthic diversity (at the level of genus) was analyzed for both the whole community and the dipteran subset (Figure 3.9-3).

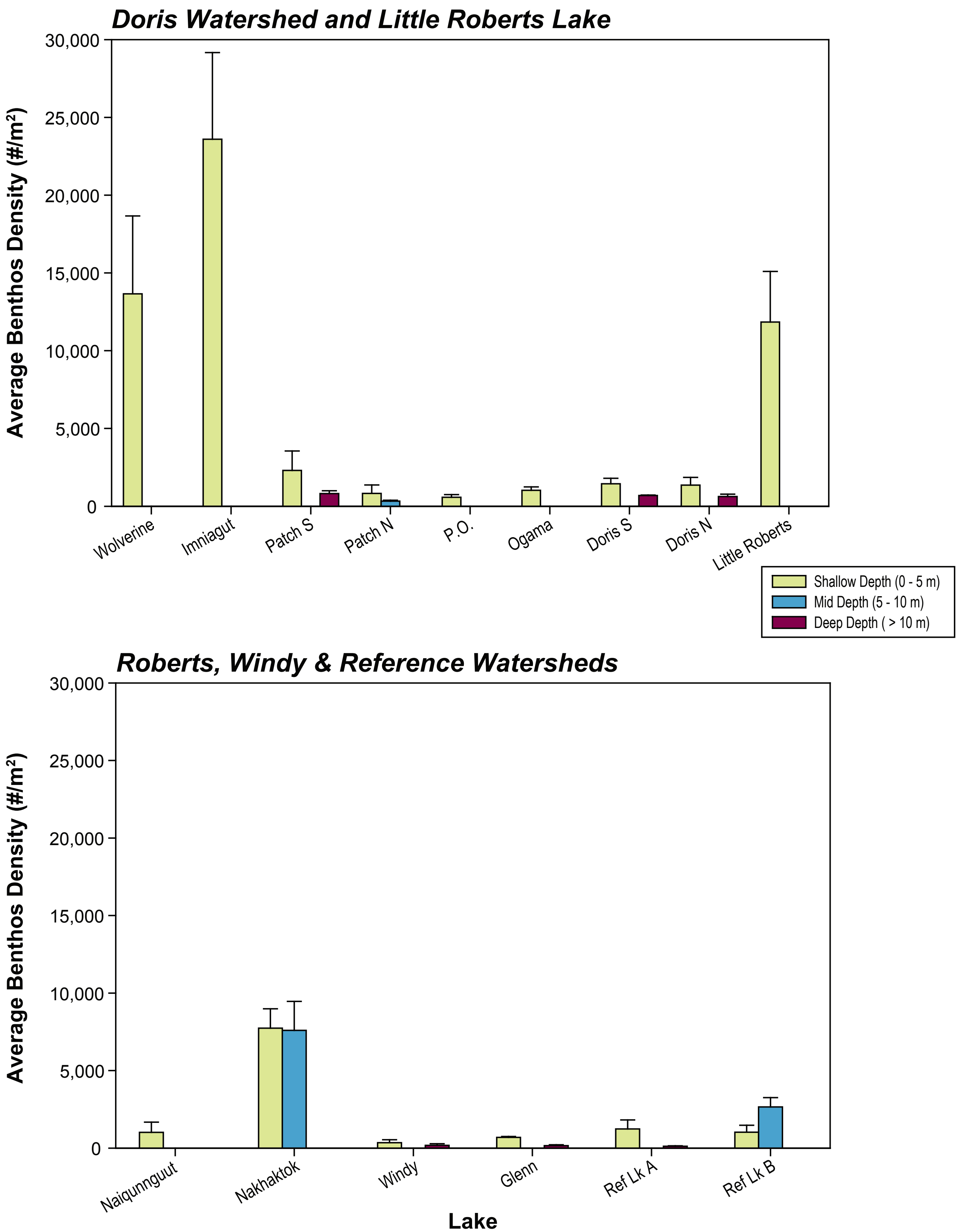
3.9.3.1 Community Diversity

Lake benthos genera richness averaged 6 genera/sample. Community richness was lowest at the deep depth locations in Windy and Glenn lakes, where an average of 1 genera/sample was found. Windy and Glenn lakes were also the most genera-poor sites sampled in the shallow depth zone, with an average richness of only 2 genera/sample. This is similar to the results from zooplankton surveys, in which Windy and Glenn lakes were found to have the lowest abundance and genera richness of all lakes surveyed. The highest genera richness was found at Little Roberts and Nakhaktok lakes (11 genera). Overall, average genera richness was highest at shallow depths (7 genera/sample) compared to the mid (5 genera/sample) or deep (4 genera/sample) depths. Within-site variability was relatively high at most sites.

Diversity was generally highest in the shallow depth zone (0.62) compared to the mid (0.44) and deep (0.42) depths. Within the shallow depth zone, diversity was lowest in Windy and Glenn lakes (0.40 and 0.30, respectively), but most lakes had comparable levels of diversity.

3.9.3.2 Dipteran Diversity

Mean dipteran richness was relatively low (3 genera/sample) and ranged from 1 to 7 genera/site. Dipteran diversity ranged from 0.03 at Nakhaktok Lake (mid depth), to a maximum of between 0.61 and 0.65 at Ref Lk B (shallow and mid depths), and Doris N (shallow depth).



Note: Error bars represent standard error of the mean

Figure 3.9-1

Average Benthos Densities by Depth Strata, Hope Bay Lakes, August 2009

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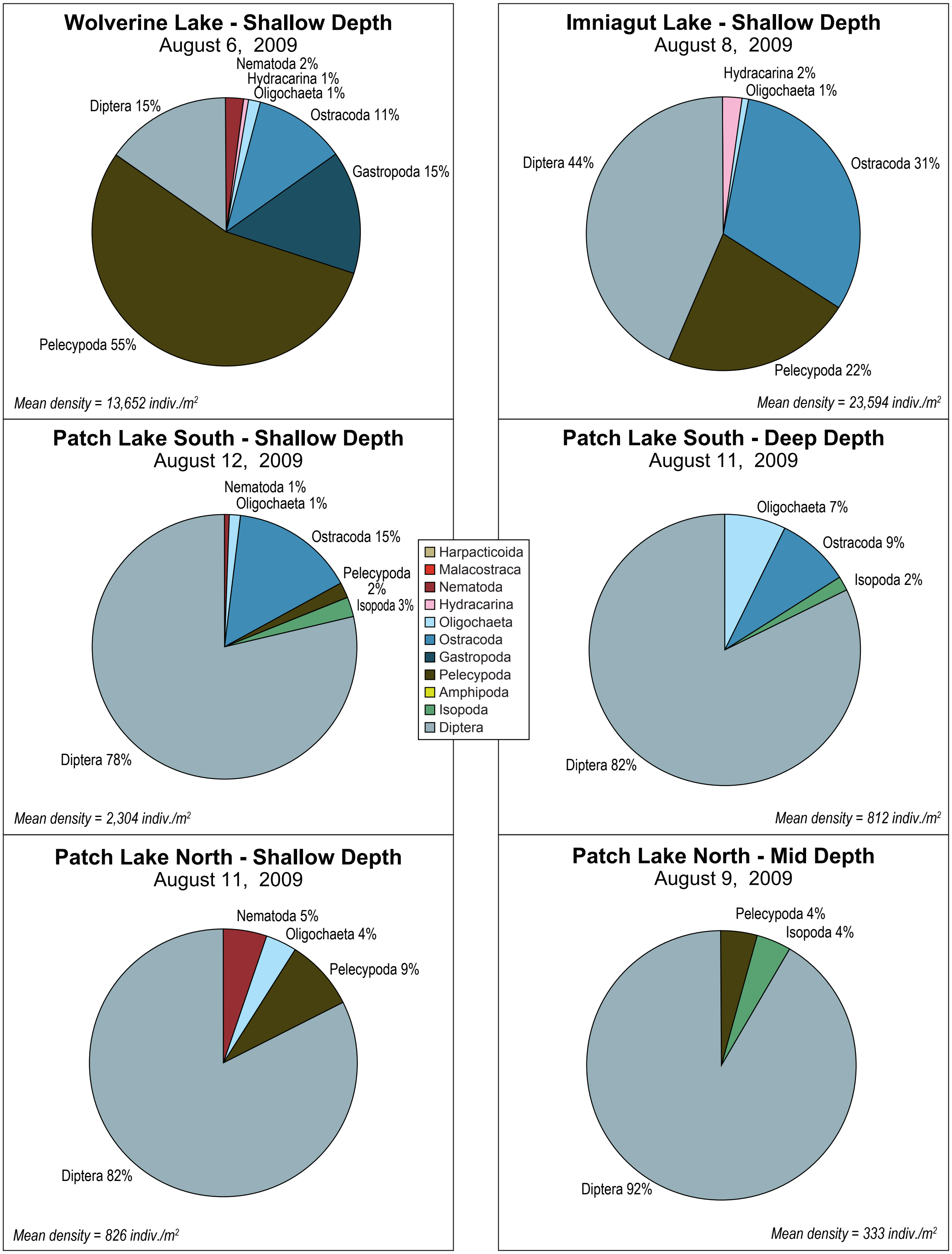

Figure 3.9-2a

Taxonomic Composition of Benthos Assemblages, Hope Bay Lakes, August 2009

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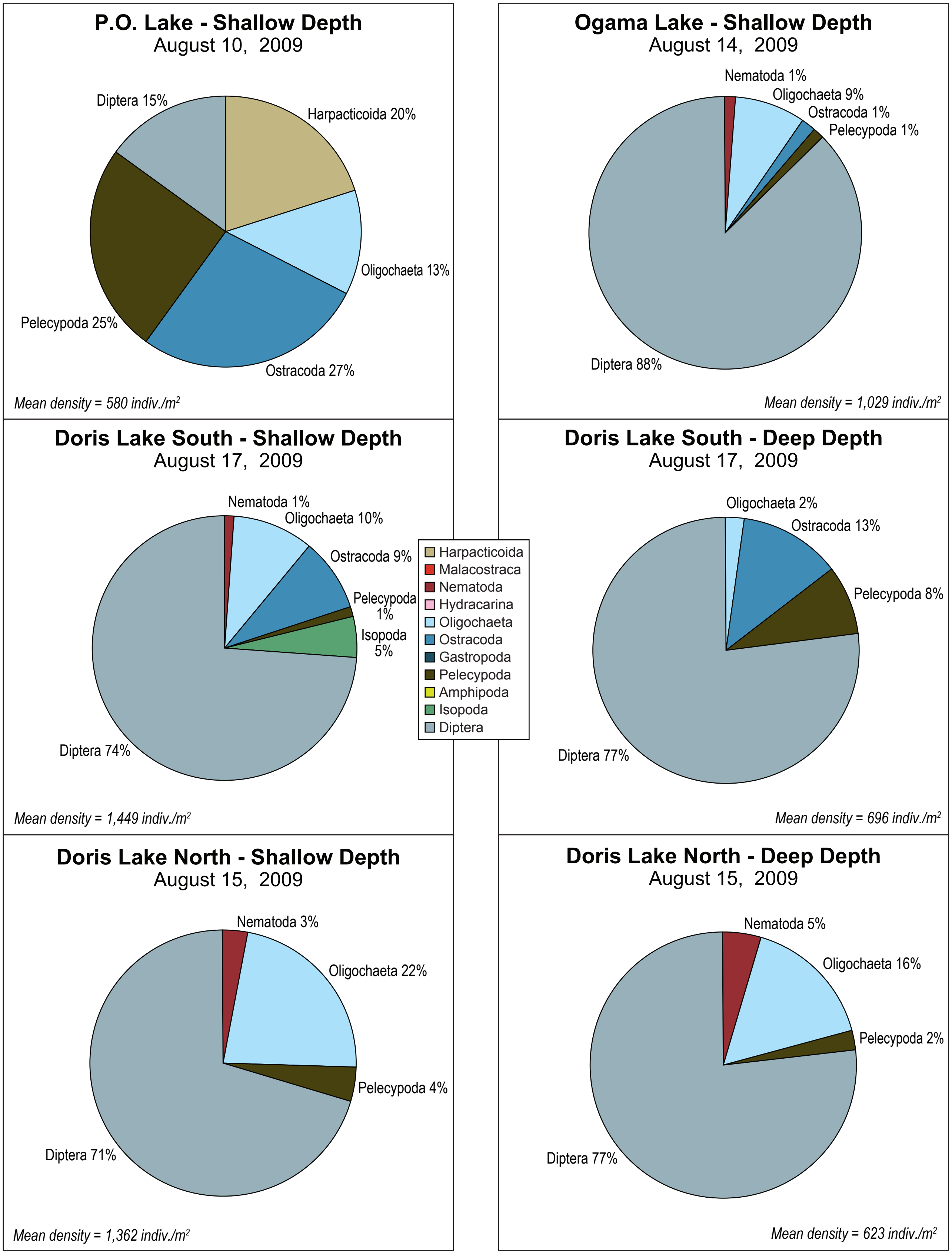

Figure 3.9-2b

Taxonomic Composition of Benthos Assemblages, Hope Bay Lakes, August 2009

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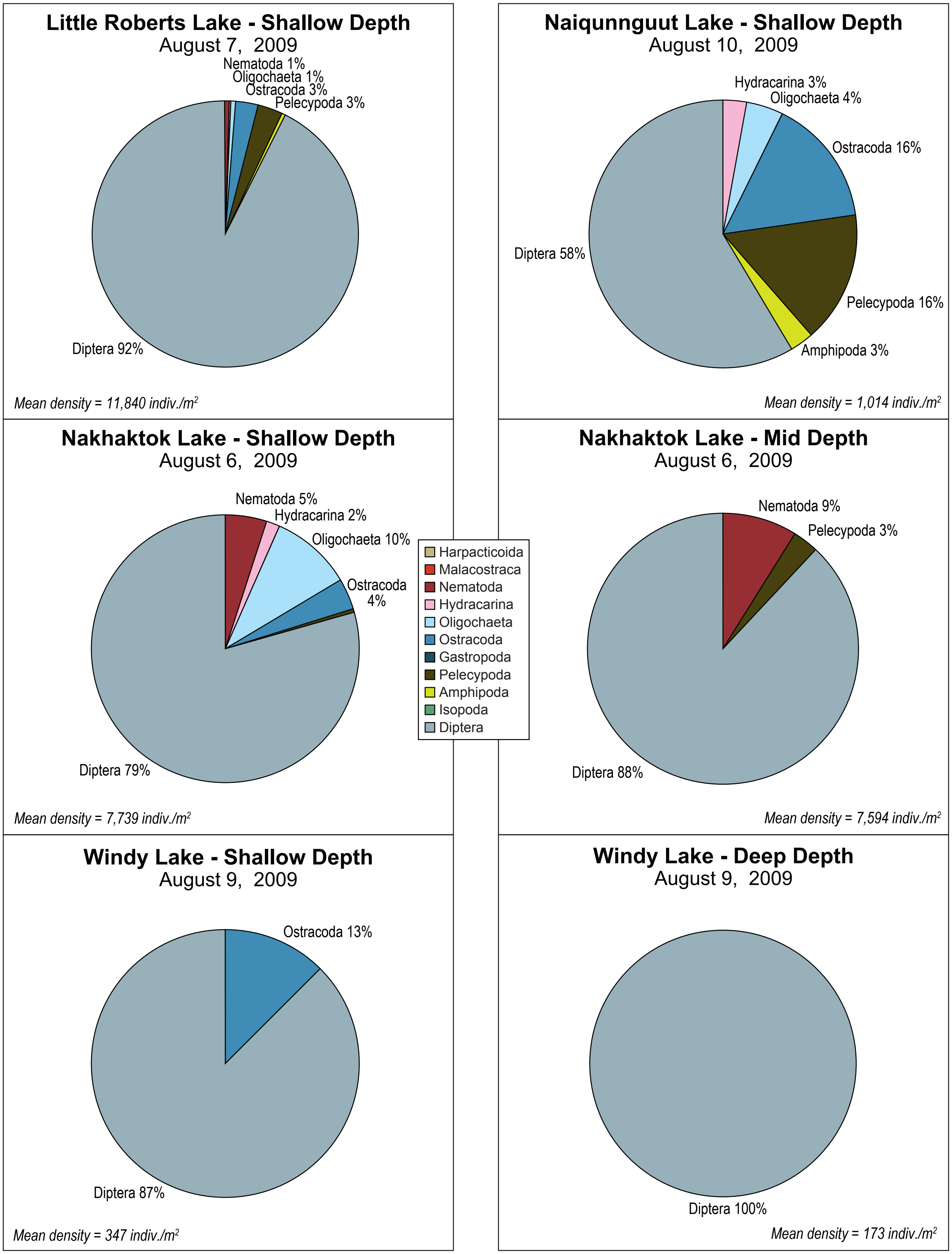

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Taxonomic Composition of Benthos Assemblages, Hope Bay Lakes, August 2009

Figure 3.9-2c

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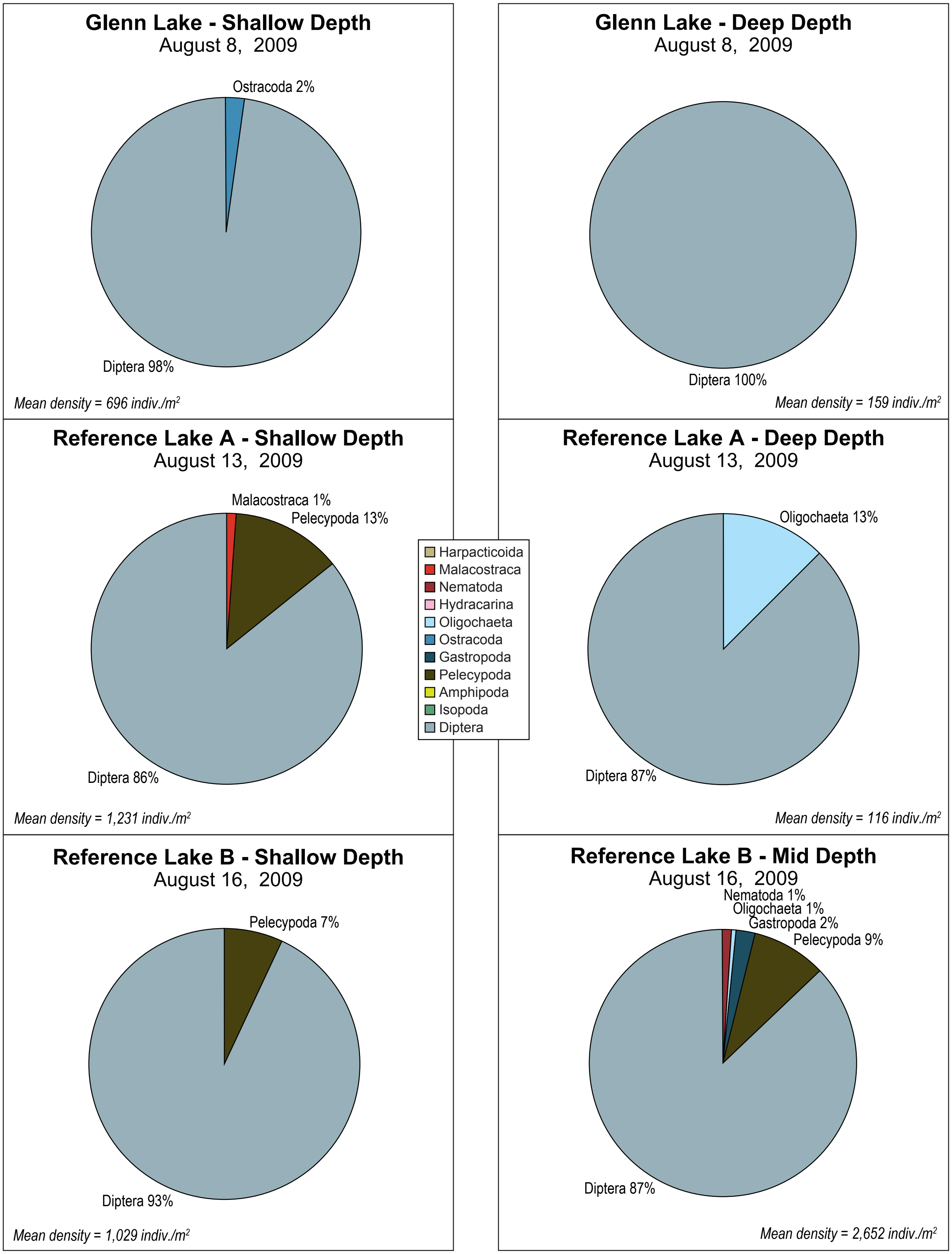

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Taxonomic Composition of Benthos Assemblages, Hope Bay Lakes, August 2009

Figure 3.9-2d

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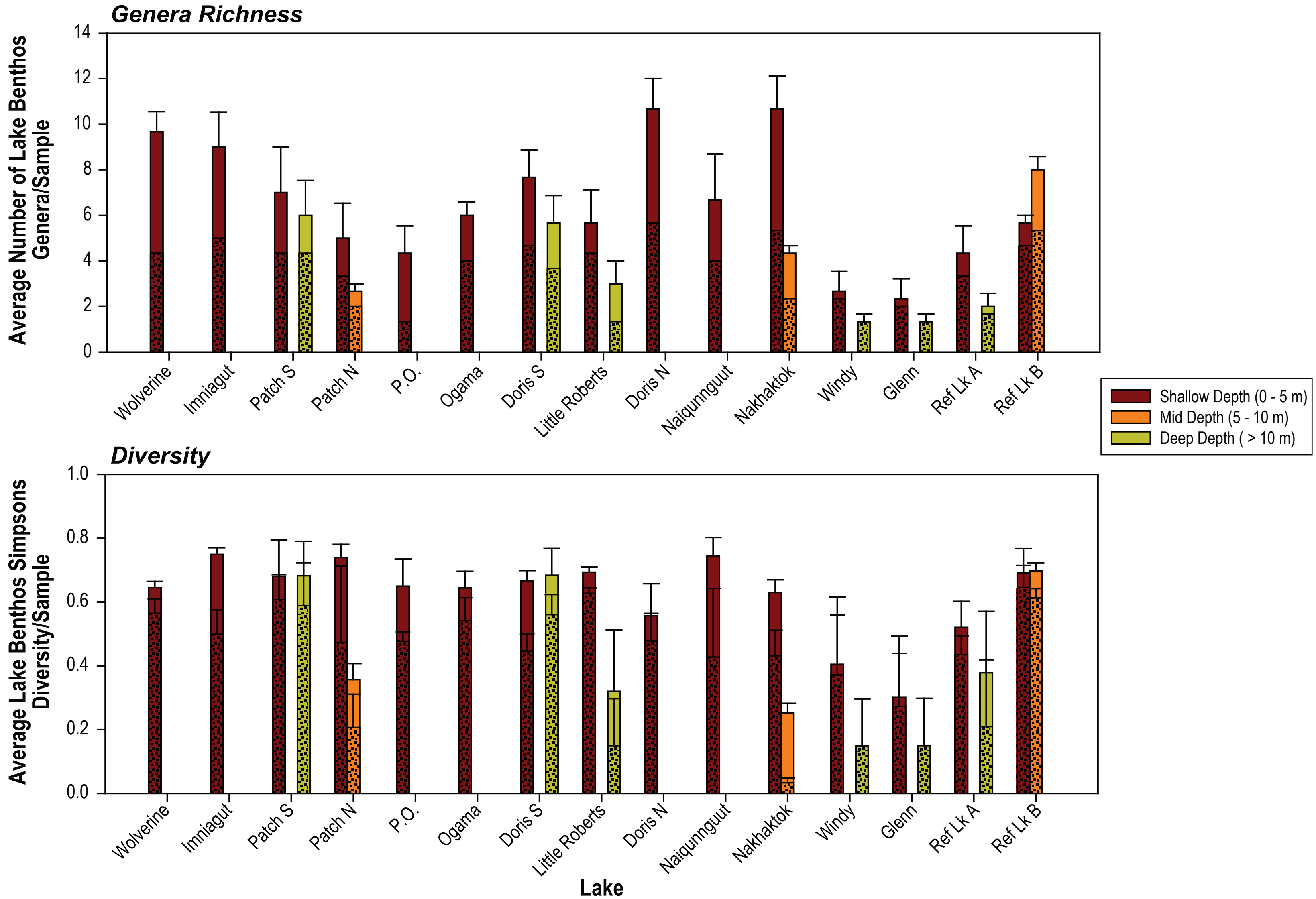


Note: Error bars represent standard errof of the mean of the total abundance
Superimposed bars represent the dipteran contribution to the benthos community total.

Figure 3.9-3

Average Benthos Richness and Diversity by Depth Strata, Hope Bay Lakes, August 2009

3.9.4 Annual Comparison

Table 2.13-8 outlines the years for which historical lake benthos data are available as well as an overview of the sampling methodologies employed in each year. Figure 2.13-5 provides a summary of the historical benthos sampling locations. Only locations sampled in 2009 are discussed in this report. Note that historical sampling locations may not correspond exactly with those sampled in 2009, and this may contribute to variability observed between years.

Lake benthos samples have been collected in the Project area on five occasions since 1996. The lakes in the 2009 baseline program were not all sampled in the past, and the majority of the lakes only have one or two years of baseline data. Differences in sampling methodology and timing of sample collection (Table 2.13-8) are important to consider during the examination of historical trends.

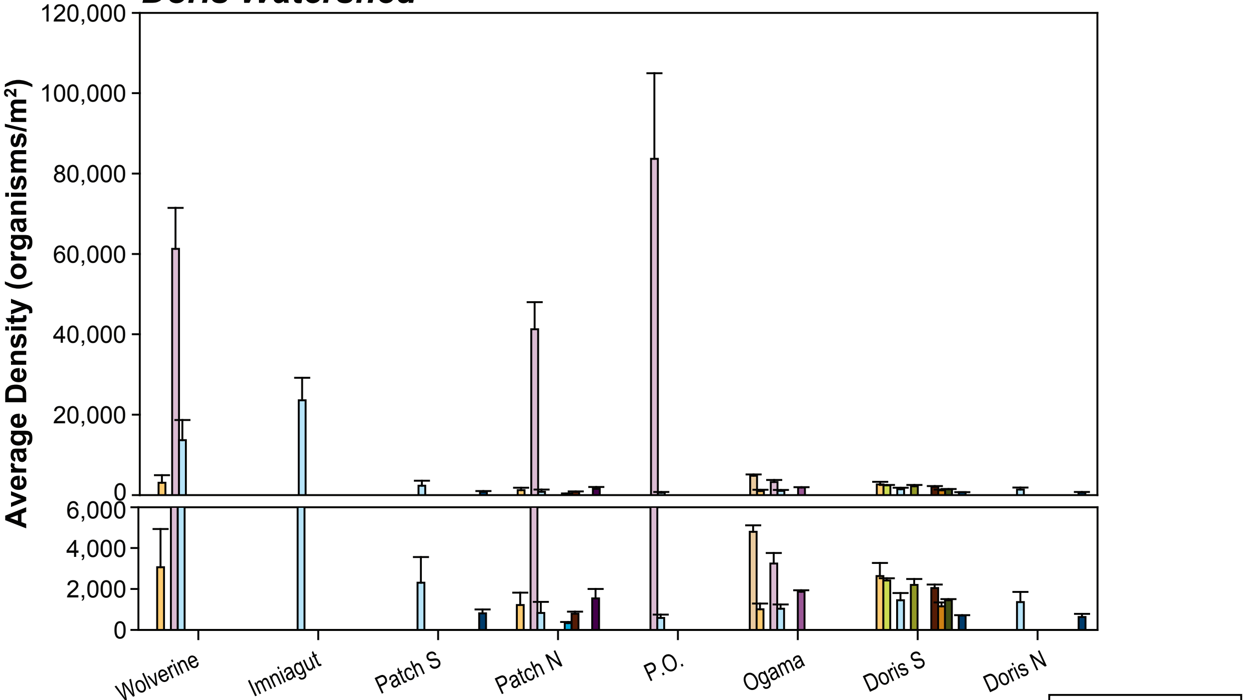
Wolverine, Imniagut, Little Roberts, and Nakhaktok lakes tended to have higher densities than the other lakes (max. 28,600 organisms/m^2 at Little Roberts Lake in 1996; Figure 3.9-4). Windy and Glenn lakes had consistently low benthos densities (<700 organisms/m^2), while Ogama, Doris Lake (S and N) and the reference lakes had densities ranging from 115 to 3,500 organisms/m^2. P.O. Lake and Patch Lake N (shallow) had high densities in 2007 and considerably lower densities in other study years.

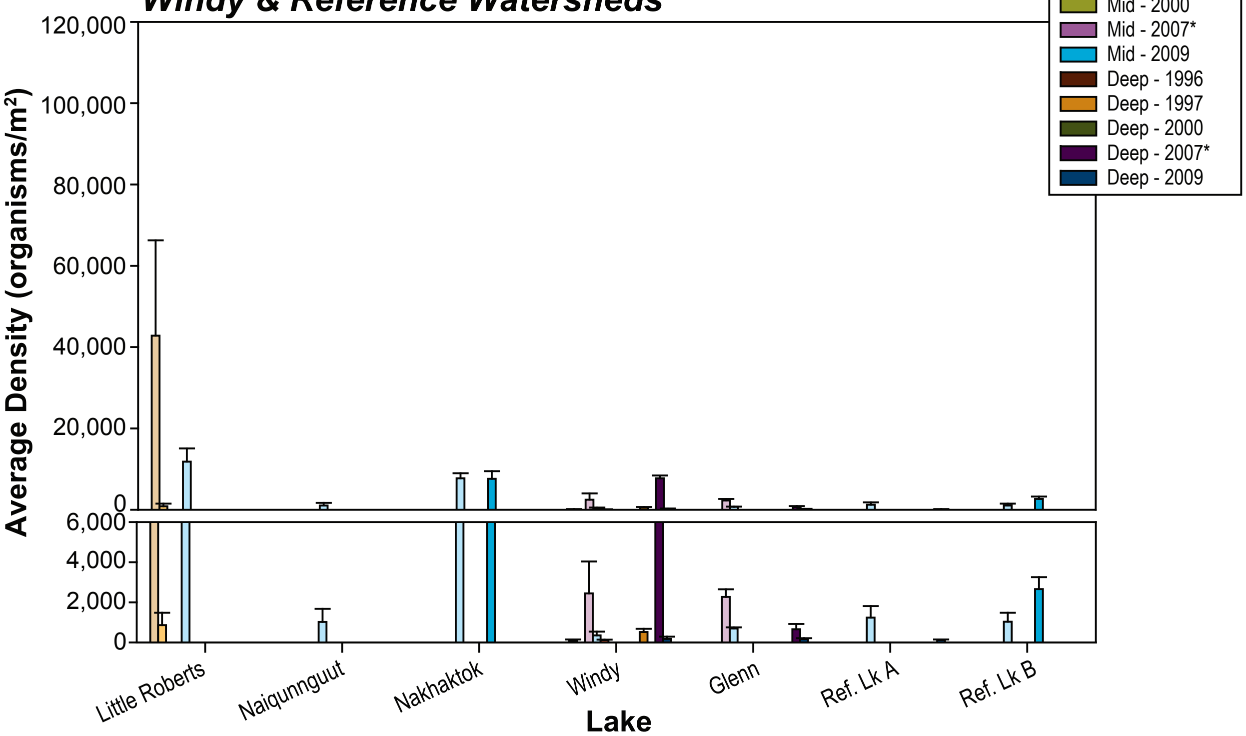
In many study area lakes, benthos densities measured in 2007 were particularly high. This is likely due to the difference in sieve size employed (243 μm in 2007 compared to 500 or 493 μm in all other years). The smaller sieve size used in 2007 would have retained many smaller benthic invertebrates, such as ostracods, small hydracarina, small nematodes, and early instars of chironomids, which would not have been collected in other years. Wolverine Lake, Patch Lake N (shallow), and P.O. Lake each had densities of over 40,000 invertebrates/m^2 in 2007, with ostracods making up approximately 65% of the benthic organisms. In all other years, ostracods made up only 0 to 6% of the benthos.

The timing of the sampling was also different between years. Climate and food availability can influence the seasonal recruitment cycle of benthic organisms. In many lentic habitats, sampling is conducted during the late summer/early fall when the majority of taxa are present and in more mature developmental stages (which facilitates taxonomic identification). The timing of benthos sampling in the Hope Bay Belt ranged from mid-July to late August (see Table 2.13-8), which may contribute to the variability observed among years.

3.9.5 Lake Benthos Summary

Lake benthos densities ranged from 116 to 23,600 organisms/m^2. The highest levels of benthos density were found in Wolverine (13,300 organisms/m^2), Imniagut (23,600 organisms/m^2), Nakhaktok (7,700 organisms/m^2), and Little Roberts lakes (11,800 organisms/m^2). Lake benthic communities were generally dominated by dipterans (80% of individuals found), although pelecypods, ostracods, and oligochaetes were also prevalent. Benthic genera richness averaged 6 genera/sample, with an average diversity of 0.54. Benthic diversity and richness were generally highest in samples collected from the shallow depth zone, and Windy and Glenn lakes tended to have the lowest levels of diversity and richness. Annual benthos densities were highly variable, which may be due to differences in sampling methodology and timing.





Note: Error bars represent standard error of the mean of the total density
Shallow = 0 - 5m; Mid = 5 - 10 m; Deep = > 10 m
** Samples collected in 2007 were sieved to 243 µm; samples collected in all other years were sieved to 500 µm*

Figure 3.9-4

Average Annual Benthos Densities by Depth Strata, Hope Bay Lakes, 1996-2009

3.10 STREAM BENTHOS

Stream benthos samples were collected from 13 stream locations in August, 2009, including two reference outflow sites and a reference river site along the Angimajuq River. Streams sampled for benthos were the same as those sampled for other parameters such as water quality, sediment quality, and periphyton.

All raw stream benthos taxonomic data are presented in Appendix 3.10-1. Table 2.1-5 provides sampling dates and locations.

3.10.1 Stream Benthos Density

Stream benthos density ranged from a high of 25,100 organisms/m^2 at Doris OF, to lows of 770 organisms/m^2 at both Koignuk D/S and Angimajuq R. Ref (Figure 3.10-1). Benthos densities were highly variable along the Koignuk River, with the midstream location having more than 10 times higher benthos density than the upstream or downstream locations.

3.10.2 Stream Benthos Taxonomic Composition

Stream benthos communities were dominated by dipterans, which represented~70% of the stream benthic organisms (Figure 3.10-2). Nematodes, oligochaetes, and ostracods were also common in the study area, although they were not present at all sites.

3.10.3 Stream Benthos Diversity

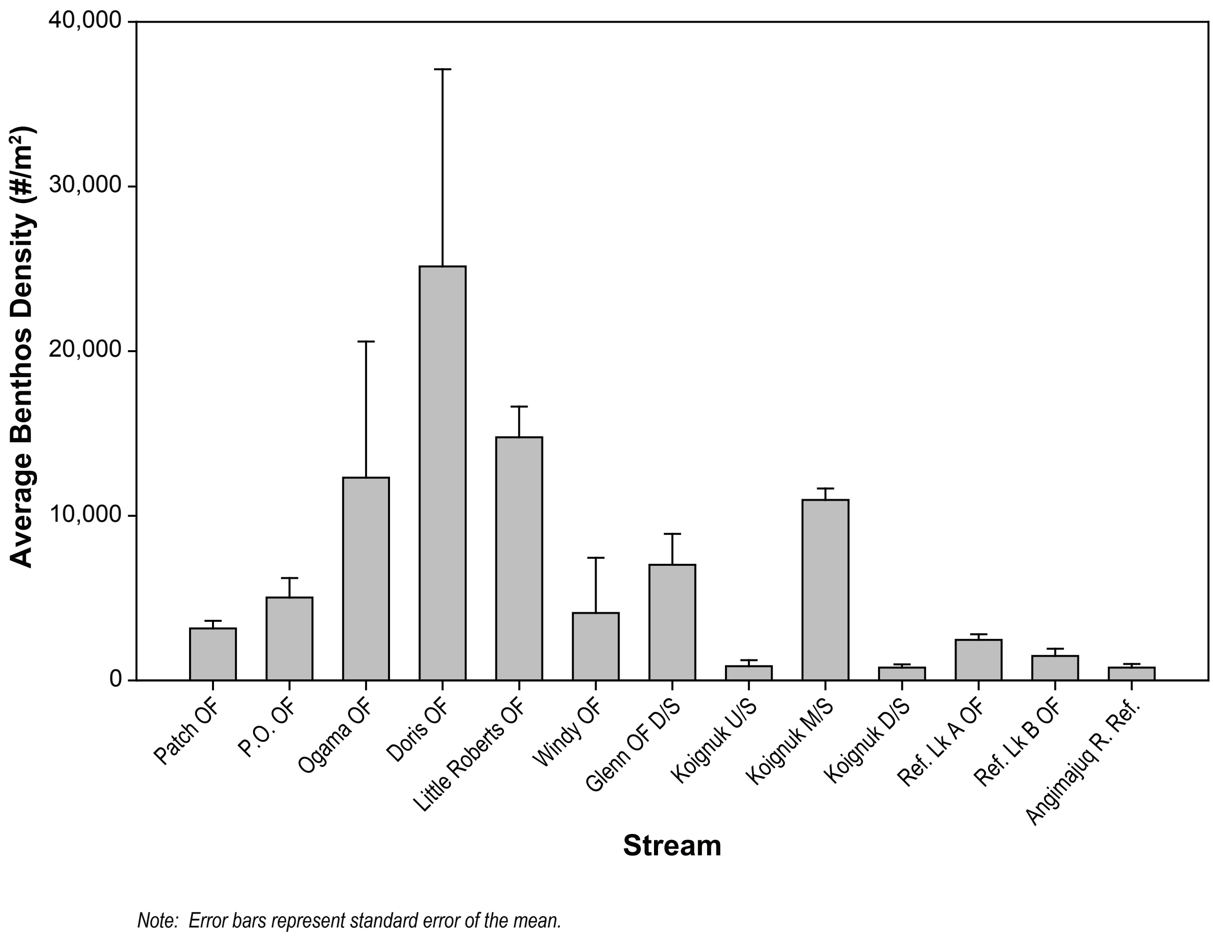
Similar to the lake benthos communities, dipterans were the dominant taxa found in stream benthic samples. Thus, benthic diversity was calculated for the whole community as well as the dipteran subset. Generally, Ephemeroptera, Plecoptera, and Trichoptera (EPT) are also common in streams; however, no more than one genera/sample of Ephemeroptera, Plecoptera or Trichoptera was found at any site. Accordingly, no separate analyses of EPT diversity and richness were conducted.

3.10.3.1 Community Diversity

Stream benthic richness was higher than lake richness, ranging from 9 to 21 genera/sample and averaging 15 genera/sample (Figure 3.10-3). Variability in richness among sites was lower in streams than in lakes. The lowest richness recorded was at Glenn OF D/S (10 genera/sample) and Ref Lk A OF (9 genera/sample). Richness tended to increase in an upstream to downstream direction within in the Doris Watershed, as 14 genera/sample were found in Patch and P.O. outflows, and 21 genera/sample were counted in Little Roberts OF. 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. Simpson's diversity index averaged 0.73 across stream sites.

3.10.3.2 Dipteran Diversity

Dipteran genera richness followed a similar trend as overall benthic richness (Figure 3.10-3). Dipteran richness ranged from 6 genera/sample at Glenn OF D/S and Ref Lk A OF to 15 genera/samples at Little Roberts OF, and averaged 10 genera/site. Dipteran diversity was similar community diversity at most sites, and averaged 0.66.



Note: Error bars represent standard error of the mean.

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Average Benthos Densities, Hope Bay Streams, July 2009

Figure 3.10-1

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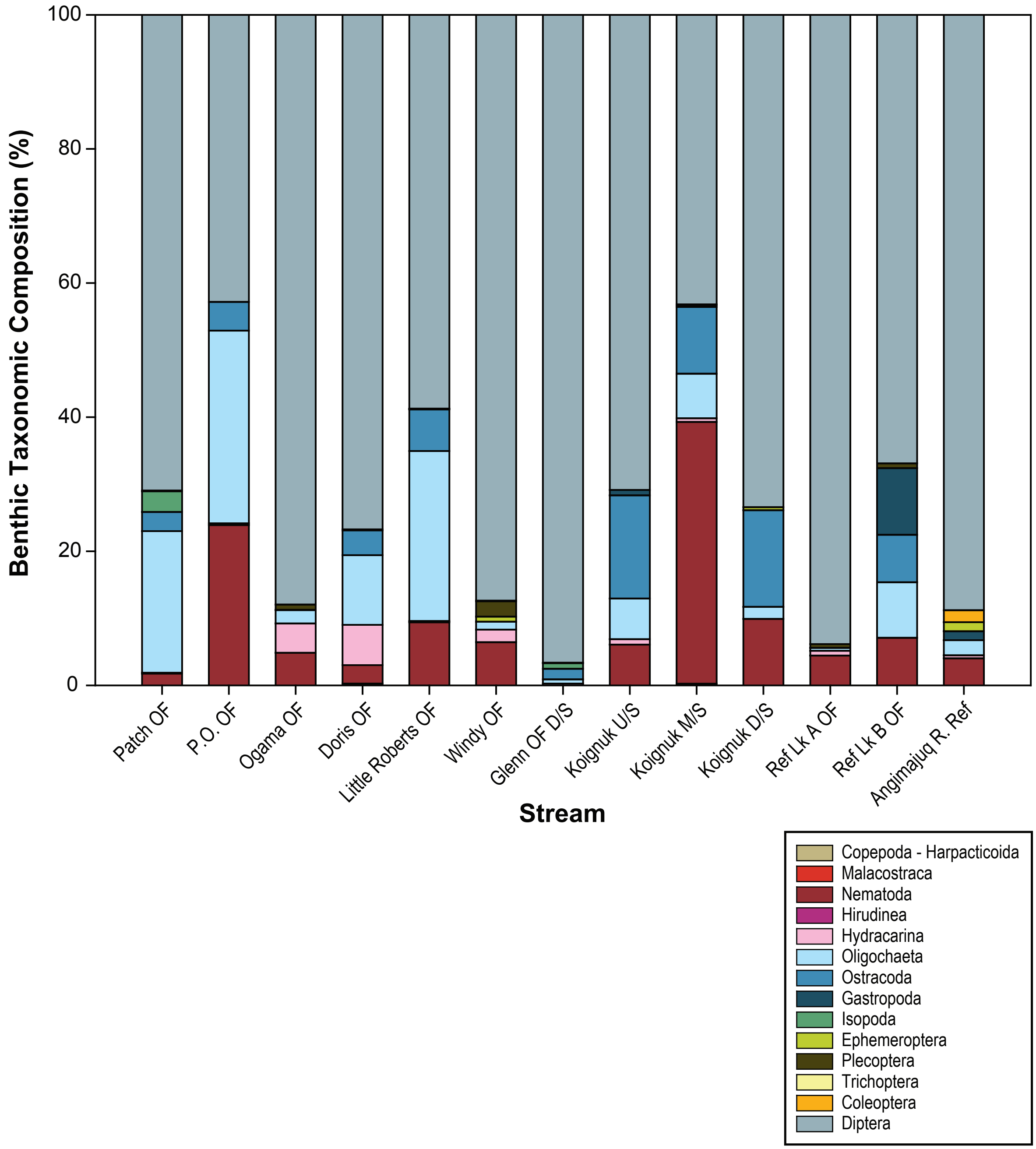

Taxonomic Composition of Benthos Assemblages, Hope Bay Streams, July 2009

Figure 3.10-2

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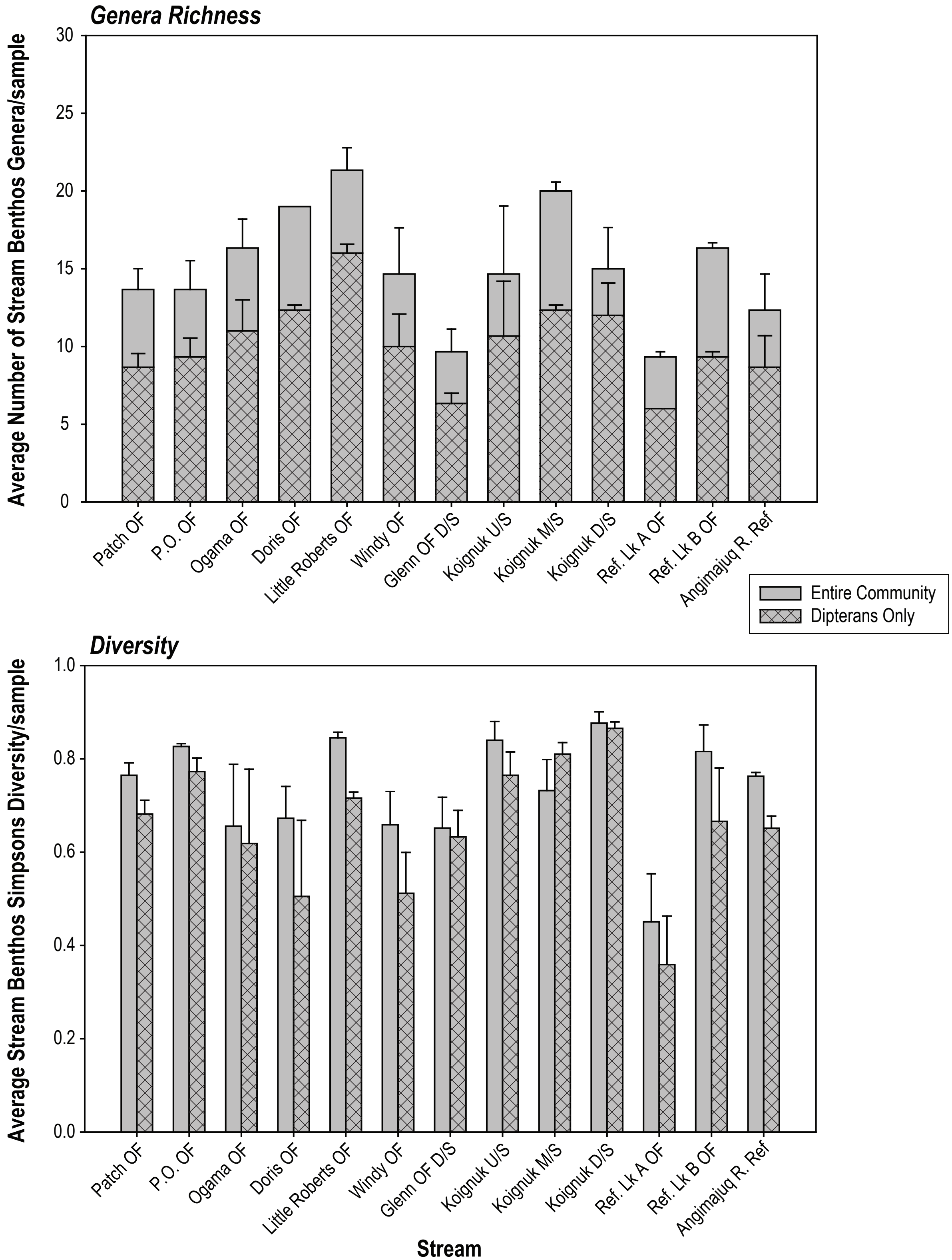

Note: Error bars represent standard errof of the mean of the total abundance
Superimposed bars represent the dipteran contribution to the benthos community total.

Figure 3.10-3

Average Benthos Richness and Diversity, Hope Bay Streams, July 2009

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3.10.4 Annual Comparison

No comparable historical data for stream benthic communities are available. Stream benthos samples were collected in 1996, 1997, and 2000 from as many as 5 of the 13 streams studied in 2009 (Table 2.13-9, Figure 2.13-5). However, these samples were collected using Hester-Dendy artificial substrate samplers, which tend to sample species that favour smooth hard substrates for colonization. *In situ* sampling methods were used in 2009 in order to better synchronize with possible future Metal Mining Effluent Regulations (MMER) monitoring requirements. Therefore, benthos data collected in 2009 using a Hess sampler were not compared with historical data.

It is preferable to remain consistent in sampling methodologies between years in order to retain as much historical comparability as possible. However, the benefits of historical comparability were outweighed by the following considerations:

- only a small amount of historical stream benthic data had been collected prior to 2009;
- prior to 2009, the most recent data collected was in 2000 (a large data gap);
- samples collected using Hess samplers (as collected in 2009) better reflect the full benthic community at each site; and
- the use of *in situ* methods such as the Hess sampler for benthos quantification is preferred in Environment Canada's Environmental Effects Monitoring (EEM) guidance document (Environment Canada 2002).

For these reasons, Hess samplers were used in 2009 instead of Hester-Dendy artificial substrate samplers.

3.10.5 Stream Benthos Summary

Stream benthos density ranged from 770 to 25,100 organisms/m^2. Benthos density was highest in Doris OF. Ogama OF, Little Roberts OF, and the midstream portion of the Koignuk River also contained dense benthos communities. Stream benthos assemblages were dominated by dipterans, which represented~70% of the stream benthic organisms. Nematodes, oligochaetes, and ostracods were also common in study area streams. Benthic community richness ranged from 9 to 21 genera/sample, with an average of 15 genera/sample. Dipteran richness generally corresponded closely with community richness, and averaged 10 genera/sample. Simpson's diversity index averaged 0.73 for the entire benthic community, and 0.66 for dipterans.

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Appendix 3.1-1

Lakes Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

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Appendix 3.1-1. Lake Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Lake	Wolverine Lake					
Date	26-Apr-2009			6-Aug-2009		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0				13.3	11.01	105.5
0.5		*ice thickness = 1.25 m*		13.3	10.84	104.5
1				13.3	10.93	105.2
1.5				13.2	10.92	105.2
2	0.8	6.2	43.4	13.2	11.06	105.7
2.5	1	3.25	23	13.2	11.1	106
3	1.2	2.47	17.5	13.2	11.1	105.8
3.5	1.2	2.26	15.9			
4	1.4	1.29	8.6			
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31		*bottom depth = 4.30 m*			*bottom depth = 3.70 m*	

Appendix 3.1-1. Lake Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Lake	Imniagut Lake					
Date	24-Apr-2009			7-Aug-2009		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0				12.1	10.62	98.8
0.5		*ice thickness = 1.99 m*		12.1	10.59	98.2
1				12.1	10.59	98.6
1.5				12.1	10.69	99.2
2				12.1	10.69	99.6
2.5		*Too shallow to sample*		12.1	10.66	99.6
3				12.1	10.66	99.4
3.5				12.2	9.71	96.2
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31		*bottom depth = 2.50 m*			*bottom depth = 4.00 m*	

Appendix 3.1-1. Lake Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Lake	Patch Lake South					
Date	24-Apr-2009			11-Aug-2009		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0				10.3	10.56	94.3
0.5		*ice thickness = 1.85 m*		10.3	10.49	93.6
1				10.3	10.51	93.9
1.5				10.3	10.52	93.9
2	0.8	16.27	113.7	10.3	10.54	94.1
2.5	1.2	15.96	112.8	10.3	10.52	93.9
3	1.2	15.8	112.2	10.3	10.54	94.1
3.5	1.2	15.03	106.4	10.3	10.53	94.2
4	1.2	15.15	107.5	10.3	10.54	92.9
4.5	1.2	15.35	109.2	10.3	10.56	93.6
5	1.2	14.82	105.6	10.3	10.52	94
5.5	1.2	14.69	104.2	10.3	10.57	94.2
6	1.3	14.57	103.5	10.3	10.53	94.2
6.5	1.3	14.65	103.8	10.3	10.55	93.9
7	1.3	14.47	102.6	10.3	10.61	94.2
7.5	1.3	14.39	102.1	10.3	10.56	94.3
8	1.3	14.25	101	10.3	10.59	94.3
8.5	1.3	14.23	100.8	10.3	10.61	94.8
9	1.3	14.45	102.6	10.3	10.63	94.9
9.5	1.3	14.45	102.8	10.3	10.68	95.2
10	1.3	14.23	100.9	10.3	10.64	95.1
10.5	1.4	13.87	98.4	10.3	10.67	95
11	1.4	13.4	95.2	10.3	10.60	94.6
11.5	1.5	13.38	95.5	10.3	10.63	95
12	1.6	12.76	91.6	10.3	10.68	95.2
12.5	1.8	11.26	80.6	10.3	10.71	95.4
13	1.8	11.04	79.5	10.3	10.71	95.3
13.5	2.0	11.29	81.6	10.3	10.71	95.4
14	2.1	10.16	73.4			
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31		*bottom depth = 14.50 m*			*bottom depth = 14.00 m*	

Appendix 3.1-1. Lake Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Lake	Patch Lake North					
Date	23-Apr-2009			9-Aug-2009		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0				11	10.43	94.5
0.5		*ice thickness = 2.05 m*		11	10.3	93.7
1				11	10.33	93.2
1.5				11	10.35	93.5
2	0.8	14.56	101.9	11	10.36	94.2
2.5	1	13.98	98.8	11	10.32	93.8
3	1.1	13.3	94.1	11	10.34	93.9
3.5	1.2	13.02	92.3	11	10.4	94.2
4				11	10.42	94.1
4.5				11	10.45	94.6
5				11	10.4	94.5
5.5				11	10.39	95.6
6				11	10.53	95.4
6.5				11	10.5	95.2
7				11	10.38	94.4
7.5				11	10.43	94.1
8				10.8	7.71	73
8.5						
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9.5						
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31		*bottom depth = 4.00 m*			*bottom depth = 8.50 m*	

Appendix 3.1-1. Lake Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Lake	P.O. Lake					
Date	26-Apr-2009			10-Aug-2009		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0				10	10.87	96.2
0.5		*ice thickness = 1.85 m*		10	10.78	95.4
1				10	10.82	95.3
1.5				10	10.75	95.4
2	0.2	13.69	94.3	10	10.77	95.7
2.5				10	10.80	95.7
3				10	10.70	95.5
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31		*bottom depth = 2.15 m*			*bottom depth = 3.25 m*	

Appendix 3.1-1. Lake Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Lake	Ogama Lake					
Date	5-May-2009			14-Aug-2009		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0		*ice thickness = 1.80 m*		10.4	11.41	102.2
0.5				10.4	11.33	101.4
1				10.4	11.26	100.5
1.5				10.2	11.26	100.4
2	0.8	9.51	66.4	10.2	11.2	99.8
2.5	0.9	8.4	58.9	10.1	11.18	99.2
3	0.9	8.25	57.9	10.1	11.02	98
3.5	1.1	8.19	57.7	10.1	10.79	95.8
4	1.2	8.22	57.9	10.1	11.2	98.5
4.5	1.3	7.83	55.6	10	11.21	99.4
5	1.4	6.87	48.6			
5.5	1.5	4.23	30.3			
6	1.7	2.04	14.5			
6.5	1.8	0.14	1			
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31		*bottom depth = 7.30 m*			*bottom depth = 5.00 m*	

Appendix 3.1-1. Lake Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Lake	Doris Lake South					
Date	22-Apr-2009			16-Aug-2009		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0				10.2	11.81	105.1
0.5		*ice thickness = 2.00 m*		10.2	11.75	104.5
1				10.2	11.7	104.1
1.5				10.2	11.68	103.9
2	0.6	13.53	93	10.2	11.59	103
2.5	0.9	12.46	87.3	10.2	11.46	102
3	0.9	12.5	87.7	10.1	11.55	102.9
3.5	0.9	12.46	87.7	10.1	11.52	102.4
4	0.9	12.46	87.3	10.1	11.5	102.1
4.5	0.9	12.72	89.3	10.1	11.47	102
5				10	11.39	101.1
5.5				9.9	11.27	99.5
6				9.8	11.17	98.5
6.5				9.7	11.12	97.8
7				9.7	11.06	97.4
7.5				9.7	11.07	97.5
8				9.7	11.02	97.1
8.5				9.7	11.01	96.8
9				9.7	10.98	96.6
9.5				9.7	11.02	96.8
10				9.7	11.16	98.4
10.5						
11						
11.5						
12						
12.5						
13						
13.5						
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14.5						
15						
15.5						
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31		*bottom depth = 5.00 m*			*bottom depth = 10.80 m*	

Appendix 3.1-1. Lake Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Lake	Doris Lake North					
Date	21-Apr-2009			15-Aug-2009		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0				10.9	11.5	104
0.5		*ice thickness = 2.00 m*		10.9	11.44	103.6
1				10.9	11.52	104
1.5				10.9	11.54	104.4
2	0.5	11.2	81.7	10.9	11.56	104.4
2.5	1	11.19	79.1	10.8	11.46	103.6
3	1	11.19	78.7	10.8	11.36	102.4
3.5	1	11.04	77.7	10.8	11.52	104
4	1	11.14	78.4	10.8	11.52	103.9
4.5	1	11.2	78.9	10.8	11.47	103.5
5	1	11.2	78.9	10.8	11.45	103.4
5.5	1	11.13	78.5	10.7	11.49	103.4
6	1	11.18	78.8	10.6	11.46	103.1
6.5	1	11.14	78.6	10.6	11.46	102.6
7	1	10.85	76.1	10.4	11.45	102.5
7.5	1	10.51	73.6	10.4	11.44	102.1
8	1	10.6	74	10.2	11.51	102.5
8.5	1	8.79	62.1	10.2	11.45	101.7
9	1	8.55	60.3	10.1	11.46	101.9
9.5	1	8.28	58.2	10.1	11.43	101.3
10	1.1	7.94	56	10.1	11.43	101.6
10.5	1.1	7.89	55.7	10.1	11.5	101.3
11	1.1	7.69	52.6	10.1	11.39	101.3
11.5	1.1	7.29	51.2	10.1	11.35	100.8
12	1.1	7.41	52.2	10.1	11.38	101.1
12.5	1.1	7.23	51	10.1	11.34	100.7
13				10	11.25	100
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14.5						
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31		*bottom depth = 13.50 m*			*bottom depth = 13.50 m*	

Appendix 3.1-1. Lake Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Lake	Little Roberts Lake					
Date	5-May-2009			7-Aug-2009		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0				10	10.7	94.9
0.5		*ice thickness = 2.10 m*		10	10.77	95.4
1				10	10.67	94.7
1.5				10	10.74	95.2
2	0.4	17.56	121.2	10	10.71	94.8
2.5	0.6	17.13	119.2	10	10.67	94.5
3	0.8	11.98	83.7			
3.5	1	5.62	39.9			
4	1.1	1.3	9.4			
4.5	1.3	0.13	1			
5						
5.5						
6						
6.5						
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7.5						
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8.5						
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31		*bottom depth = 4.90 m*			*bottom depth = 2.60 m*	

Appendix 3.1-1. Lake Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Lake	Naiqunnguut Lake					
Date	26-Apr-2009			10-Aug-2009		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0				10.2	10.35	92.2
0.5		*ice thickness = 1.85 m*		10.2	10.25	91.6
1				10.2	10.31	91.3
1.5				10.2	10.29	91.5
2	0.7	14.16	98.8	10.2	10.32	91.6
2.5	1	14.21	99.8	10.2	10.27	90.7
3	1.1	14.25	100.5	10.2	10.31	91
3.5	1.4	13.55	96.4	10.2	10.21	90.1
4				10.2	10.31	92
4.5						
5						
5.5						
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31		*bottom depth = 4.00 m*			*bottom depth = 4.50 m*	

Appendix 3.1-1. Lake Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Lake	Nakhaktok Lake					
Date	27-Apr-2009			6-Aug-2009		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0				12.5	11.48	107.9
0.5		*ice thickness = 1.85 m*		12.5	11.53	106.3
1				12.5	11.48	107.8
1.5				12.5	11.46	107.9
2	0.2	8.31	57.4	12.5	11.53	108.3
2.5	0.3	8.08	55.8	12.5	11.51	108.1
3	0.4	7.9	54.4	12.5	11.41	107.3
3.5				12.5	11.42	107.3
4				12.5	11.45	107.1
4.5				12.5	11.47	107.6
5				12.5	11.48	107.9
5.5				12.5	11.43	107.1
6				12.5	11.37	106.6
6.5				12.2	10.55	98.1
7				11.9	9.93	92.1
7.5				11.7	9.17	84.5
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8.5						
9						
9.5						
10						
10.5						
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31		*bottom depth = 3.70 m*			*bottom depth = 7.70 m*	

Appendix 3.1-1. Lake Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Lake	Windy Lake					
Date	27-Apr-2009			9-Aug-2009		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0				8.7	11.71	100.4
0.5		*ice thickness = 1.87 m*		8.7	11.7	100.4
1				8.7	11.73	100.7
1.5				8.7	11.75	100.8
2	0.3	15.02	103.4	8.7	11.74	100.6
2.5	0.4	14.89	102.9	8.7	11.71	100.5
3	0.4	14.91	103	8.7	11.73	100.5
3.5	0.4	14.91	103.5	8.7	11.73	100.6
4	0.5	14.98	103.8	8.7	11.75	100.7
4.5	0.5	14.93	103.7	8.7	11.71	100.4
5	0.5	14.85	103.1	8.7	11.7	100.4
5.5	0.5	14.88	103.2	8.7	11.72	100.5
6	0.5	14.75	102.4	8.7	11.72	100.4
6.5	0.5	14.79	102.7	8.7	11.7	100.5
7	0.5	14.58	101.4	8.7	11.66	99.8
7.5	0.5	14.62	101.4	8.7	11.69	99.7
8	0.5	14.67	101.5	8.7	11.64	99.8
8.5	0.6	14.59	101.4	8.7	11.7	100
9	0.6	14.55	101.3	8.7	11.68	100.1
9.5	0.6	14.48	101	8.7	11.68	100.2
10	0.7	14.38	100.3	8.7	11.68	100.2
10.5	0.7	14.23	99.5	8.7	11.66	100
11	0.7	14.02	98	8.7	11.68	100.3
11.5	0.8	13.98	97.8	8.7	11.69	100.2
12	0.9	13.75	96.6	8.7	11.69	100.2
12.5	1	13.37	94	8.7	11.67	100.1
13	1	13.31	93.6	8.7	11.7	100.1
13.5	1.1	12.98	91.6	8.7	11.7	100.4
14	1.1	12.6	89	8.7	11.71	100.4
14.5	1.2	12.62	89.1	8.7	11.73	100.5
15	1.3	12.26	87.1	8.7	11.7	100.3
15.5	1.4	11.82	84.1	8.7	11.67	100.3
16	1.5	10.99	78.5	8.7	11.72	100.3
16.5	1.7	10.26	73.6	8.7	11.7	100.2
17	1.8	9.29	67	8.7	11.7	100.3
17.5				8.7	11.67	100.4
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18.5						
19						
19.5						
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31		*bottom depth = 17.70 m*			*bottom depth = 18.00 m*	

Appendix 3.1-1. Lake Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Lake	Glenn Lake					
Date	4-May-2009			8-Aug-2009		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0	*ice thickness = 1.95 m*			9.6	11.04	96.7
0.5				9.6	10.99	96.5
1				9.6	10.97	96.3
1.5				9.6	11	96.4
2	-	-	-	9.6	11.01	96.6
2.5	-	-	-	9.6	11.02	96.5
3	-	-	-	9.6	10.93	95.9
3.5	-	-	-	9.6	11.01	96.6
4	-	-	-	9.5	11.05	96.8
4.5	-	-	-	9.5	10.93	96
5	-	-	-	9.5	10.97	96.2
5.5	-	-	-	9.5	11.01	96.3
6	0.5	15.01	103	9.4	10.94	95.8
6.5	0.5	14.62	101.1	9.4	10.96	95.7
7	0.5	14.76	102.4	9.4	11.05	96.5
7.5	0.6	14.78	101.6	9.3	10.93	95.3
8	0.6	14.71	102.2	9.3	10.96	95.6
8.5	0.6	15.04	104.4	9.3	10.85	94.9
9	0.6	15.64	107.5	9.3	10.95	95.5
9.5	0.5	15.27	106	9.3	10.99	96
10	0.5	16.86	117.3	9.3	10.94	95.4
10.5				9.2	11.04	96.2
11				9.1	11	95.4
11.5				9	11.14	96.2
12				9	11.15	96.3
12.5				9	11.09	96
13				8.9	11.14	96.2
13.5				8.9	11.1	96
14				8.8	11.12	95.7
14.5				8.9	11.24	96.3
15				8.6	11.2	96
15.5				8.6	11.15	95.8
16				8.5	11.04	94.6
16.5				8.2	11.25	95.7
17				8.1	11.22	95
17.5				8	11.46	96.6
18				8	11.45	96.6
18.5				8	11.4	96.9
19				9.9	11.41	95.9
19.5						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31	*bottom depth = 11.50 m*			*bottom depth = 19.70 m*		

Appendix 3.1-1. Lake Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Lake	Reference Lake A			Reference Lake A		
Date	31-May-2009			13-Aug-2009		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0				10.8	11.55	104.4
0.5		*ice thickness = 1.80 m*				
1				10.2	11.54	102.8
1.5						
2	0.7	14.29	99.7	10	11.58	102.8
2.5						
3	1	13.76	96.8	10	11.56	102.7
3.5						
4	1	13.69	96.3	10	11.6	102.5
4.5						
5	1	13.55	95.3	10	11.52	101.6
5.5						
6	1	13.44	94.5	9.8	11.54	101.7
6.5						
7	1	13.3	93.6	9.8	11.42	100.7
7.5						
8	1	13.14	92.4	9.6	11.33	99.3
8.5						
9	1	13.14	92.4	9.6	11.15	97.9
9.5						
10	1	13.04	91.7	9.5	10.93	95.5
10.5						
11	1	12.98	91.3	9.4	11.16	97.4
11.5						
12	1	12.88	90.6	9.4	11.29	98.6
12.5						
13	1	12.73	89.5	9.3	11.33	98.6
13.5						
14	1	12.55	88.3	8.7	11.37	97.4
14.5						
15	1	12.33	86.7	6.3	12.38	99.8
15.5						
16	1.1	12.05	85	5.8	12.43	98.7
16.5						
17	1.1	11.81	83.3	5.3	12.42	97.9
17.5						
18	1.1	11.55	81.4	5.1	12.65	99.3
18.5						
19	1.2	11.23	79.5	4.9	12.89	100.2
19.5						
20	1.2	10.96	77.5	4.8	13.15	102.2
21	1.3	10.6	75.2	4.7	12.12	97.1
22	1.3	10.28	72.9	4.7	12.79	99.3
23	1.4	9.89	70.4	4.6	13.09	101.4
24	1.4	9.49	67.5	4.6	12.69	98.1
25	1.5	8.98	64	4.6	13.15	102
26	1.5	8.08	57.6	4.6	12.76	98.6
27	1.5	7.97	56.9	4.5	12.63	97.6
28	1.6	8.18	58.5	4.4	12.32	95
29				4.3	12.52	96.2
30						
31		*bottom depth = 29.00 m*			*bottom depth = 31.50 m*	

Appendix 3.1-1. Lake Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Lake	Reference Lake B			Reference Lake B		
Date	31-May-2009			16-Aug-2009		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0				10.7	11.12	100.2
0.5		*ice thickness = 1.75 m*		10.7	11.11	100
1				10.7	11.09	99.8
1.5				10.7	11.13	100.2
2	0.4	15.06	104.2	10.7	11.11	99.9
2.5	0.9	14.19	99.5	10.7	11.13	100.2
3	1.2	13.41	94.8	10.7	11.11	100.1
3.5	1.5	12.16	86.7	10.7	11.08	99.7
4	1.5	11.38	81.1	10.7	11.1	100
4.5	1.6	10.39	74.3	10.7	11.08	99.8
5	1.8	9.04	65	10.7	11.09	99.9
5.5	1.9	7.92	57.1	10.7	11.11	100.1
6	2	6.71	48.5	10.7	11.11	100.1
6.5	2.1	5.74	41.6	10.7	11.1	100
7	2.2	4.86	35.3	10.7	11.14	100.2
7.5				10.7	11.17	100.5
8				10.7	11.15	100.4
8.5				10.7	11.15	100.4
9				10.7	11.14	104.4
9.5						
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31		*bottom depth = 8.00 m*			*bottom depth = 9.50 m*	

Appendix 3.1-1. Lake Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Lake	Reference Lake C		
Date	31-May-2009		
Depth (m)	Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
0			
0.5		*ice thickness = 1.90 m*	
1			
1.5			
2	0.3	14.24	98.2
2.5	0.8	13.69	95.7
3	1	13.44	94.5
3.5	1.1	13.42	94.7
4	1.1	13.42	94.7
4.5	1.1	13.31	93.9
5	1.1	13.19	93
5.5	1.1	13.06	92.1
6	1.2	12.83	90.8
6.5	1.2	12.63	89.3
7	1.2	12.42	87.8
7.5	1.2	12.13	85.8
8	1.3	11.72	83.1
8.5	1.3	11.33	80.4
9	1.4	10.86	77.2
9.5	1.5	10.33	73.7
10	1.5	9.84	70.1
10.5	1.6	9.44	67.5
11	1.7	8.55	61.3
11.5	1.8	8.25	59.3
12	2	8.25	59.7
12.5			
13			
13.5			
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14.5			
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15.5			
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31		*bottom depth = 13.00 m*	

Appendix 3.1-2

River Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Engineers and Scientists

Appendix 3.1-2. River Dissolved Oxygen/Temperature Profiles, Hope Bay Belt Project, 2009

Stream Date	Koignuk River Upstream 4-May-2009			Koignuk River Midstream 23-May-2009			Koignuk River Downstream 4-May-2009			Aimaokatalok River Reference (Average of Two Bored Holes) 1-May-2009		
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												
0.5	*ice thickness = 1.85 m*			*ice thickness = 1.80 m*			*ice thickness = 1.70 m*			*ice thickness = 1.55 m*		
1												
1.5												
2	0.2	15.91	109.6	O_2 meter not working, attempted to return at later date but surface water prevented sampling.			0	2.15	17.8	0.1	1.01	6.8
2.5	0.3	16.42	113.2				0	2.19	18.2			
3	0.3	16.24	112.1									
	bottom depth = 3.70 m			*bottom depth = 2.90 m*			*bottom depth = 2.70 m*			*bottom depth = 1.95 m*		

Appendix 3.2-1

Winter Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Engineers and Scientists

Appendix 3.2-1. Winter Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Depth zone Depth (m) Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Wolverine Lake Shallow Depth 3.0 1 26-Apr-09 L756728-1	Wolverine Lake Shallow Depth 3.0 2 26-Apr-09 L756728-3	Patch Lake South Shallow Depth 3.0 1 23-Apr-09 L756700-1	Patch Lake South Deep Depth 12.5 1 23-Apr-09 L756700-2	Patch Lake North Shallow Depth 3.0 1 23-Apr-09 L756053-1
Physical Tests							
Conductivity	mS/cm		818	813	446	486	537
Hardness (as CaCO3)	mg/L		157	147	83.6	90.4	103
pH	pH	6.5-9.0	7.1	7.03	8.28	7.82	7.82
Total Suspended Solids	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L		477	478	272	292	309
Turbidity	NTU		1.29	1.14	1.14	1.81	1.65
Anions and Nutrients							
Alkalinity, Bicarbonate (as CaCO3)	mg/L		97.5	97.5	48	57.5	58.2
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		97.5	97.5	48	57.5	58.2
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	0.122	0.133	0.0067	0.0101	0.0153
Bromide (Br)	mg/L		0.241	0.241	0.118	0.132	0.262
Chloride (Cl)	mg/L		207	206	114	123	129
Fluoride (F)	mg/L		0.132	0.124	0.058	0.077	0.071
Nitrate (as N)	mg/L	2.93	0.0068	0.0084	0.0175	0.0312	0.0294
Nitrite (as N)	mg/L	0.06	0.0019	0.0018	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.777	0.769	0.305	0.543	0.317
Ortho Phosphate as P	mg/L		0.0012	<0.0010	0.0014	<0.0010	<0.0010
Total Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.0109	0.0223	0.0052	0.0046	0.0054
Sulfate (SO4)	mg/L		1.15	1.15	3.65	3.84	3.9
Organic / Inorganic Carbon							
Total Organic Carbon	mg/L		11.8	11.6	5.24	5.4	6.52
Total Metals							
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	0.0111	0.0094	0.0648	0.0955	0.07
Antimony (Sb)-Total	mg/L		<0.00020	<0.00020	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	<0.0015	<0.0015	<0.00070	<0.00070	<0.00090
Barium (Ba)-Total	mg/L		0.0124	0.0113	0.00539	0.00613	0.00645
Beryllium (Be)-Total	mg/L		<0.00040	<0.00040	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.0010	<0.0010	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L		0.0439	0.0397	0.0362	0.0386	0.0439
Cadmium (Cd)-Total	mg/L	0.000017	<0.000020	<0.000020	<0.000017	<0.000017	<0.000017
Calcium (Ca)-Total	mg/L		22.7	21.6	18	19.3	20.7
Chromium (Cr)-Total	mg/L	0.001	0.00151	0.00153	0.00039	0.00051	0.00069
Cobalt (Co)-Total	mg/L		<0.00020	<0.00020	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.0011	0.00106	0.00152	0.00165	0.00182
Iron (Fe)-Total	mg/L	0.3	0.495	0.4	0.032	0.08	0.069
Lead (Pb)-Total	mg/L	0.001-0.007[d]	0.00033	<0.00010	0.000065	0.000135	0.00149
Lithium (Li)-Total	mg/L		0.01	<0.010	0.008	0.0084	0.0087
Magnesium (Mg)-Total	mg/L		24.5	23.7	10.8	11.8	13.6
Manganese (Mn)-Total	mg/L		0.191	0.109	0.00321	0.00907	0.00563
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	0.00014	0.00011	0.000216	0.000204	0.000238
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	0.00137	0.00115	0.00081	0.0009	0.00086
Phosphorus (P)-Total	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L		5.4	5.01	4.22	4.62	4.61
Selenium (Se)-Total	mg/L	0.001	<0.00050	<0.00050	<0.0020	<0.0030	<0.0040
Silicon (Si)-Total	mg/L		0.713	0.689	0.577	0.888	0.673

Appendix 3.2-1. Winter Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Depth zone Depth (m) Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Wolverine Lake Shallow Depth 3.0 1 26-Apr-09 L756728-1	Wolverine Lake Shallow Depth 3.0 2 26-Apr-09 L756728-3	Patch Lake South Shallow Depth 3.0 1 23-Apr-09 L756700-1	Patch Lake South Deep Depth 12.5 1 23-Apr-09 L756700-2	Patch Lake North Shallow Depth 3.0 1 23-Apr-09 L756053-1
Silver (Ag)-Total	mg/L	0.0001	<0.000020	<0.000020	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		114	108	52.7	58	60.3
Strontium (Sr)-Total	mg/L		0.115	0.108	0.0782	0.0847	0.126
Thallium (Tl)-Total	mg/L	0.0008	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00020	<0.00020	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Total	mg/L		0.000033	0.000033	0.000061	0.000058	0.000062
Vanadium (V)-Total	mg/L		0.00018	<0.00010	0.000114	0.000121	0.000513
Zinc (Zn)-Total	mg/L	0.03	<0.0020	<0.0020	0.0023	0.0029	<0.0090
Dissolved Metals							
Aluminum (Al)-Dissolved	mg/L		0.0031	0.0046	0.0115	0.0132	0.0063
Antimony (Sb)-Dissolved	mg/L		<0.00020	<0.00020	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L		<0.0015	<0.0015	<0.00060	<0.00070	<0.00080
Barium (Ba)-Dissolved	mg/L		0.0121	0.0111	0.0047	0.00477	0.00591
Beryllium (Be)-Dissolved	mg/L		<0.00040	<0.00040	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.0010	<0.0010	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.0425	0.0412	0.0344	0.0358	0.0412
Cadmium (Cd)-Dissolved	mg/L		<0.000020	<0.000020	<0.000017	<0.000017	<0.000017
Calcium (Ca)-Dissolved	mg/L		22.5	20.7	16.3	17.7	19.9
Chromium (Cr)-Dissolved	mg/L		<0.001	0.00116	0.00016	0.00019	0.00062
Cobalt (Co)-Dissolved	mg/L		<0.00020	<0.00020	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L		0.00094	0.00101	0.00134	0.00138	0.00153
Iron (Fe)-Dissolved	mg/L		0.226	0.225	<0.010	0.014	0.01
Lead (Pb)-Dissolved	mg/L		<0.00010	<0.00010	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		0.01	<0.010	0.007	0.0078	0.0076
Magnesium (Mg)-Dissolved	mg/L		24.5	23.2	10.4	11.2	12.9
Manganese (Mn)-Dissolved	mg/L		0.152	0.0857	0.000445	0.00191	0.0015
Mercury (Hg)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L		0.00011	0.00011	0.000208	0.000181	0.000215
Nickel (Ni)-Dissolved	mg/L		0.00113	0.00114	0.00063	0.00073	0.00084
Phosphorus (P)-Dissolved	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		5.35	4.97	3.93	4.26	4.27
Selenium (Se)-Dissolved	mg/L		<0.00050	<0.00050	<0.0020	<0.0020	<0.0030
Silicon (Si)-Dissolved	mg/L		0.72	0.672	0.473	0.714	0.534
Silver (Ag)-Dissolved	mg/L		<0.000020	<0.000020	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		116	107	50.4	54.8	58.9
Strontium (Sr)-Dissolved	mg/L		0.115	0.106	0.0752	0.0806	0.115
Thallium (Tl)-Dissolved	mg/L		<0.00020	<0.00020	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00020	<0.00020	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.000035	0.000031	0.000057	0.000053	0.000058
Vanadium (V)-Dissolved	mg/L		0.00025	0.00013	<0.000050	<0.000050	0.000356
Zinc (Zn)-Dissolved	mg/L		<0.0020	<0.0020	0.0013	0.0011	0.008
Organic Parameters							
Microcystin	ug/L		-	-	<0.20	-	<0.20
Cyanides							
Cyanide, Total	mg/L	0.005[f]	<0.0050	-	-	<0.0050	-

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.2-1. Winter Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Depth zone Depth (m) Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Patch Lake North Shallow Depth 3.0 2 24-Apr-09 L756700-6	Ogama Lake Shallow Depth 3.0 1 05-May-09 L760479-4	Doris Lake South Shallow Depth 3.0 1 22-Apr-09 L756053-2	Doris Lake South Shallow Depth 3.0 2 22-Apr-09 L756053-3	Doris Lake South Shallow Depth 3.0 1 24-Apr-09 L756700-4
Physical Tests							
Conductivity	mS/cm		-	555	308	309	-
Hardness (as CaCO3)	mg/L		-	95.4	53.9	54.7	-
pH	pH	6.5-9.0	-	7.09	7.54	7.89	-
Total Suspended Solids	mg/L		-	<3.0	<3.0	<3.0	-
Total Dissolved Solids	mg/L		-	339	180	184	-
Turbidity	NTU		-	3.63	3.15	3.7	-
Anions and Nutrients							
Alkalinity, Bicarbonate (as CaCO3)	mg/L		-	56.2	31.7	32.1	-
Alkalinity, Carbonate (as CaCO3)	mg/L		-	<2.0	<2.0	<2.0	-
Alkalinity, Hydroxide (as CaCO3)	mg/L		-	<2.0	<2.0	<2.0	-
Alkalinity, Total (as CaCO3)	mg/L		-	56.2	31.7	32.1	-
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	-	<0.0050	0.077	0.022	-
Bromide (Br)	mg/L		-	0.302	0.203	0.157	-
Chloride (Cl)	mg/L		-	136	76.8	76.2	-
Fluoride (F)	mg/L		-	0.102	0.05	0.048	-
Nitrate (as N)	mg/L	2.93	-	0.177	0.0606	0.0606	-
Nitrite (as N)	mg/L	0.06	-	<0.0010	<0.0010	<0.0010	-
Total Kjeldahl Nitrogen	mg/L		-	0.581	0.581	0.507	-
Ortho Phosphate as P	mg/L		-	0.0028	<0.0010	<0.0010	-
Total Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	-	0.0176	0.0327	0.0219	-
Sulfate (SO4)	mg/L		-	5.4	3.14	3.13	-
Organic / Inorganic Carbon							
Total Organic Carbon	mg/L		-	11.5	8.14	7.78	-
Total Metals							
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	-	0.167	<0.011	<0.010	-
Antimony (Sb)-Total	mg/L		-	<0.00010	<0.00010	<0.00010	-
Arsenic (As)-Total	mg/L	0.005	-	<0.0010	<0.00080	<0.00070	-
Barium (Ba)-Total	mg/L		-	0.00772	0.00418	0.00328	-
Beryllium (Be)-Total	mg/L		-	<0.00020	<0.00020	<0.00020	-
Bismuth (Bi)-Total	mg/L		-	<0.00050	<0.00050	<0.00050	-
Boron (B)-Total	mg/L		-	0.0415	0.0282	0.0293	-
Cadmium (Cd)-Total	mg/L	0.000017	-	<0.000017	<0.000017	<0.000017	-
Calcium (Ca)-Total	mg/L		-	16	9.96	10.4	-
Chromium (Cr)-Total	mg/L	0.001	-	0.00095	0.00085	0.00072	-
Cobalt (Co)-Total	mg/L		-	<0.00010	<0.00010	<0.00010	-
Copper (Cu)-Total	mg/L	0.002-0.004[c]	-	0.00333	0.002	0.00284	-
Iron (Fe)-Total	mg/L	0.3	-	0.211	0.018	0.019	-
Lead (Pb)-Total	mg/L	0.001-0.007[d]	-	0.000134	0.000392	0.000125	-
Lithium (Li)-Total	mg/L		-	0.0094	<0.0050	<0.0050	-
Magnesium (Mg)-Total	mg/L		-	13.8	8.02	8.05	-
Manganese (Mn)-Total	mg/L		-	0.0191	0.00287	0.00277	-
Mercury (Hg)-Total	mg/L	0.000026	-	<0.000010	<0.000010	<0.000010	-
Molybdenum (Mo)-Total	mg/L	0.073	-	0.000319	0.000204	0.000195	-
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	-	0.00153	0.00065	0.00064	-
Phosphorus (P)-Total	mg/L		-	<0.30	<0.30	<0.30	-
Potassium (K)-Total	mg/L		-	4.63	2.87	2.84	-
Selenium (Se)-Total	mg/L	0.001	-	<0.00050	<0.0030	<0.0020	-
Silicon (Si)-Total	mg/L		-	3.42	1.27	1.23	-

Appendix 3.2-1. Winter Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Depth zone Depth (m) Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Patch Lake North Shallow Depth 3.0 2 24-Apr-09 L756700-6	Ogama Lake Shallow Depth 3.0 1 05-May-09 L760479-4	Doris Lake South Shallow Depth 3.0 1 22-Apr-09 L756053-2	Doris Lake South Shallow Depth 3.0 2 22-Apr-09 L756053-3	Doris Lake South Shallow Depth 3.0 1 24-Apr-09 L756700-4
Silver (Ag)-Total	mg/L	0.0001	-	<0.000010	<0.000010	<0.000010	-
Sodium (Na)-Total	mg/L		-	65.7	39	40.5	-
Strontium (Sr)-Total	mg/L		-	0.0977	0.0507	0.0519	-
Thallium (Tl)-Total	mg/L	0.0008	-	<0.00010	<0.00010	<0.00010	-
Tin (Sn)-Total	mg/L		-	<0.00010	<0.00010	<0.00010	-
Titanium (Ti)-Total	mg/L		-	<0.010	<0.010	<0.010	-
Uranium (U)-Total	mg/L		-	0.000081	0.000038	0.000042	-
Vanadium (V)-Total	mg/L		-	0.00023	0.000464	0.000591	-
Zinc (Zn)-Total	mg/L	0.03	-	0.0011	0.372	0.0105	-
Dissolved Metals							
Aluminum (Al)-Dissolved	mg/L		-	0.0883	0.004	0.0032	-
Antimony (Sb)-Dissolved	mg/L		-	<0.00010	<0.00010	<0.00010	-
Arsenic (As)-Dissolved	mg/L		-	<0.0010	<0.00080	<0.00060	-
Barium (Ba)-Dissolved	mg/L		-	0.00676	0.00381	0.00312	-
Beryllium (Be)-Dissolved	mg/L		-	<0.00020	<0.00020	<0.00020	-
Bismuth (Bi)-Dissolved	mg/L		-	<0.00050	<0.00050	<0.00050	-
Boron (B)-Dissolved	mg/L		-	0.0423	0.0263	0.0269	-
Cadmium (Cd)-Dissolved	mg/L		-	<0.000017	<0.000017	<0.000017	-
Calcium (Ca)-Dissolved	mg/L		-	15.6	9.06	9.31	-
Chromium (Cr)-Dissolved	mg/L		-	0.00097	0.00046	0.00039	-
Cobalt (Co)-Dissolved	mg/L		-	<0.00010	<0.00010	<0.00010	-
Copper (Cu)-Dissolved	mg/L		-	0.00298	0.00157	0.00157	-
Iron (Fe)-Dissolved	mg/L		-	0.121	<0.010	<0.010	-
Lead (Pb)-Dissolved	mg/L		-	0.000076	0.000317	0.000066	-
Lithium (Li)-Dissolved	mg/L		-	0.0092	<0.0050	<0.0050	-
Magnesium (Mg)-Dissolved	mg/L		-	13.7	7.61	7.63	-
Manganese (Mn)-Dissolved	mg/L		-	0.0146	0.00249	0.00208	-
Mercury (Hg)-Dissolved	mg/L		-	<0.000010	<0.000010	<0.000010	-
Molybdenum (Mo)-Dissolved	mg/L		-	0.000288	0.000171	0.000154	-
Nickel (Ni)-Dissolved	mg/L		-	0.00134	0.00044	0.00042	-
Phosphorus (P)-Dissolved	mg/L		-	<0.30	<0.30	<0.30	-
Potassium (K)-Dissolved	mg/L		-	4.53	2.71	2.71	-
Selenium (Se)-Dissolved	mg/L		-	<0.00050	<0.0020	<0.0020	-
Silicon (Si)-Dissolved	mg/L		-	3.48	1.25	1.24	-
Silver (Ag)-Dissolved	mg/L		-	<0.000010	<0.000010	<0.000010	-
Sodium (Na)-Dissolved	mg/L		-	66.3	35.9	37.3	-
Strontium (Sr)-Dissolved	mg/L		-	0.0959	0.0462	0.0479	-
Thallium (Tl)-Dissolved	mg/L		-	<0.00010	<0.00010	<0.00010	-
Tin (Sn)-Dissolved	mg/L		-	<0.00010	<0.00010	<0.00010	-
Titanium (Ti)-Dissolved	mg/L		-	<0.010	<0.010	<0.010	-
Uranium (U)-Dissolved	mg/L		-	0.000071	0.000034	0.000033	-
Vanadium (V)-Dissolved	mg/L		-	<0.0010	0.000396	0.000498	-
Zinc (Zn)-Dissolved	mg/L		-	<0.0010	0.366	0.012	-
Organic Parameters							
Microcystin	ug/L		-	-	<0.20	-	-
Cyanides							
Cyanide, Total	mg/L	0.005[f]	<0.0050	-	<0.0050	-	<0.0050

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.2-1. Winter Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Depth zone Depth (m) Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Doris Lake North Shallow Depth 3.0 1 21-Apr-09 L755391-1	Doris Lake North Shallow Depth 3.0 1 24-Apr-09 L756700-5	Doris Lake North Deep Depth 11.5 1 21-Apr-09 L755391-2	Little Roberts Lake Shallow Depth 3.0 1 05-May-09 L760479-1
Physical Tests						
Conductivity	mS/cm		332	-	326	646
Hardness (as CaCO3)	mg/L		57.6	-	55.3	101
pH	pH	6.5-9.0	7.7	-	7.64	7
Total Suspended Solids	mg/L		3.5	-	<3.0	12.5
Total Dissolved Solids	mg/L		182	-	176	375
Turbidity	NTU		3.98	-	1.84	4.54
Anions and Nutrients						
Alkalinity, Bicarbonate (as CaCO3)	mg/L		33.5	-	32.7	60.9
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	-	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	-	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		33.5	-	32.7	60.9
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	<0.0050	-	0.0258	0.0192
Bromide (Br)	mg/L		0.163	-	0.167	0.379
Chloride (Cl)	mg/L		78.3	-	76.7	159
Fluoride (F)	mg/L		0.051	-	0.049	0.102
Nitrate (as N)	mg/L	2.93	0.0404	-	0.151	0.155
Nitrite (as N)	mg/L	0.06	<0.0010	-	0.0018	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.572	-	0.472	0.98
Ortho Phosphate as P	mg/L		<0.0010	-	<0.0010	<0.0010
Total Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.0252	-	0.0202	0.0848
Sulfate (SO4)	mg/L		3.24	-	3.13	9.9
Organic / Inorganic Carbon						
Total Organic Carbon	mg/L		6.99	-	6.56	11.6
Total Metals						
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	0.0402	-	0.0221	0.0143
Antimony (Sb)-Total	mg/L		0.00012	-	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	0.00082	-	0.0011	<0.0020
Barium (Ba)-Total	mg/L		0.00414	-	0.00387	0.00776
Beryllium (Be)-Total	mg/L		<0.00020	-	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.00050	-	<0.00050	<0.00050
Boron (B)-Total	mg/L		0.0289	-	0.0273	0.0519
Cadmium (Cd)-Total	mg/L	0.000017	<0.000017	-	<0.000017	<0.000017
Calcium (Ca)-Total	mg/L		10.5	-	9.83	15.3
Chromium (Cr)-Total	mg/L	0.001	0.00055	-	0.00046	0.00057
Cobalt (Co)-Total	mg/L		<0.00010	-	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.00309	-	0.00205	0.00256
Iron (Fe)-Total	mg/L	0.3	0.07	-	0.063	0.515
Lead (Pb)-Total	mg/L	0.001-0.007[d]	0.00181	-	<0.000050	0.000761
Lithium (Li)-Total	mg/L		<0.0050	-	<0.0050	0.0095
Magnesium (Mg)-Total	mg/L		8.14	-	7.77	14.6
Manganese (Mn)-Total	mg/L		0.00478	-	0.0122	0.0812
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	-	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	0.000221	-	0.000166	0.000246
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	0.00077	-	0.00069	0.00106
Phosphorus (P)-Total	mg/L		<0.30	-	<0.30	<0.30
Potassium (K)-Total	mg/L		3.09	-	2.88	5.22
Selenium (Se)-Total	mg/L	0.001	0.00133	-	0.00117	<0.00050
Silicon (Si)-Total	mg/L		1.35	-	1.42	2.1

Appendix 3.2-1. Winter Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name			Doris Lake North	Doris Lake North	Doris Lake North	Little Roberts Lake
Depth zone			Shallow Depth	Shallow Depth	Deep Depth	Shallow Depth
Depth (m)	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	3.0	3.0	11.5	3.0
Replicate			1	1	1	1
Date Sampled			21-Apr-09	24-Apr-09	21-Apr-09	05-May-09
ALS Sample ID			L755391-1	L756700-5	L755391-2	L760479-1
Silver (Ag)-Total	mg/L	0.0001	<0.000010	-	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		41.3	-	40	77.4
Strontium (Sr)-Total	mg/L		0.0466	-	0.0449	0.0975
Thallium (Tl)-Total	mg/L	0.0008	<0.00010	-	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	-	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		<0.010	-	<0.010	<0.010
Uranium (U)-Total	mg/L		0.000045	-	0.000038	0.000053
Vanadium (V)-Total	mg/L		0.000452	-	0.000529	<0.0010
Zinc (Zn)-Total	mg/L	0.03	0.0023	-	0.0017	0.002
Dissolved Metals						
Aluminum (Al)-Dissolved	mg/L		0.0033	-	0.0053	0.0044
Antimony (Sb)-Dissolved	mg/L		<0.00010	-	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L		0.000471	-	0.000444	<0.0010
Barium (Ba)-Dissolved	mg/L		0.00353	-	0.00366	0.00764
Beryllium (Be)-Dissolved	mg/L		<0.00020	-	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.00050	-	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.0283	-	0.0279	0.0517
Cadmium (Cd)-Dissolved	mg/L		<0.000017	-	<0.000017	<0.000017
Calcium (Ca)-Dissolved	mg/L		9.86	-	9.53	15.3
Chromium (Cr)-Dissolved	mg/L		0.00048	-	0.00043	0.00113
Cobalt (Co)-Dissolved	mg/L		<0.00010	-	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L		0.00219	-	0.00187	0.00203
Iron (Fe)-Dissolved	mg/L		0.014	-	0.023	0.188
Lead (Pb)-Dissolved	mg/L		0.000488	-	<0.000050	0.000156
Lithium (Li)-Dissolved	mg/L		<0.0050	-	<0.0050	0.0084
Magnesium (Mg)-Dissolved	mg/L		8.01	-	7.65	15.3
Manganese (Mn)-Dissolved	mg/L		0.00285	-	0.0102	0.0468
Mercury (Hg)-Dissolved	mg/L		<0.000010	-	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L		0.000196	-	0.000167	0.000237
Nickel (Ni)-Dissolved	mg/L		0.0005	-	0.0004	0.00097
Phosphorus (P)-Dissolved	mg/L		<0.30	-	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		2.96	-	2.81	5.28
Selenium (Se)-Dissolved	mg/L		0.00126	-	0.00125	<0.00050
Silicon (Si)-Dissolved	mg/L		1.27	-	1.41	2.13
Silver (Ag)-Dissolved	mg/L		<0.000010	-	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		40.8	-	40.4	78.7
Strontium (Sr)-Dissolved	mg/L		0.0459	-	0.0451	0.0975
Thallium (Tl)-Dissolved	mg/L		<0.00010	-	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	-	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	-	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.000039	-	0.000035	0.000042
Vanadium (V)-Dissolved	mg/L		0.000347	-	0.000446	<0.0010
Zinc (Zn)-Dissolved	mg/L		0.0011	-	0.0014	<0.0010
Organic Parameters						
Microcystin	ug/L		-	-	-	<0.20
Cyanides						
Cyanide, Total	mg/L	0.005[f]	-	<0.0050	-	-

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.2-1. Winter Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Naiqunnguut Lake	Nakhaktok	Windy Lake	Windy Lake	Windy Lake	Glenn	Glenn
Depth zone			Shallow Depth	Shallow Depth	Shallow Depth	Deep Depth	Deep Depth	Shallow Depth	Deep Depth
Depth (m)			2.0	4.0	4.0	15.5	15.5	3.0	9.5
Replicate			1	1	1	1	2	1	1
Date Sampled			26-Apr-09	27-Apr-09	27-Apr-09	27-Apr-09	27-Apr-09	03-May-09	03-May-09
ALS Sample ID			L756728-2	L758417-4	L758417-1	L758417-2	L758417-3	L761772-6	L761772-7
Physical Tests									
Conductivity	mS/cm		670	905	510	498	496	474	456
Hardness (as CaCO3)	mg/L		111	144	73	72.7	71.3	88.4	89.6
pH	pH	6.5-9.0	7.1	7.66	7.95	7.68	7.86	7.89	7.85
Total Suspended Solids	mg/L		<3.0	13.8	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L		417	509	267	255	242	260	259
Turbidity	NTU		2.18	18.9	0.29	0.35	0.49	17.4	16.8
Anions and Nutrients									
Alkalinity, Bicarbonate (as CaCO3)	mg/L		46	83.7	68.9	64.1	66.7	58.6	60.2
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		46	83.7	68.9	64.1	66.7	58.6	60.2
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	0.0397	0.0877	<0.0050	0.0053	0.0056	<0.0050	<0.0050
Bromide (Br)	mg/L		0.343	0.768	0.361	0.371	0.385	0.223	0.219
Chloride (Cl)	mg/L		177	220	114	111	111	98.3	95.9
Fluoride (F)	mg/L		0.086	0.104	0.083	0.082	0.084	0.072	0.072
Nitrate (as N)	mg/L	2.93	0.0485	0.0271	<0.0050	0.0162	0.0157	0.0437	0.0494
Nitrite (as N)	mg/L	0.06	0.0018	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.588	1.7	0.116	0.107	0.098	0.275	0.264
Ortho Phosphate as P	mg/L		0.0015	<0.0010	<0.0010	<0.0010	<0.0010	0.0025	0.0027
Total Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.0096	0.0948	0.0043	0.0021	0.0029	0.0149	0.0149
Sulfate (SO4)	mg/L		12.1	7.73	9.46	9.14	9.11	14.2	13.8
Organic / Inorganic Carbon									
Total Organic Carbon	mg/L		14.4	13.4	2.06	1.91	1.87	5.26	5.24
Total Metals									
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	0.246	0.02	0.0101	0.0167	0.0141	0.981	1.05
Antimony (Sb)-Total	mg/L		<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	<0.00090	<0.0020	<0.00040	<0.00050	<0.00050	<0.00090	<0.00090
Barium (Ba)-Total	mg/L		0.00838	0.00459	0.00263	0.00243	0.00228	0.0124	0.0127
Beryllium (Be)-Total	mg/L		<0.00020	<0.00040	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.00050	<0.0010	<0.00050	<0.00050	<0.00050	0.00062	0.00076
Boron (B)-Total	mg/L		0.0427	0.0742	0.0551	0.0517	0.0486	0.0474	0.0482
Cadmium (Cd)-Total	mg/L	0.000017	<0.000017	<0.000020	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017
Calcium (Ca)-Total	mg/L		14.9	20.3	13.8	13.5	11.9	15.5	15.2
Chromium (Cr)-Total	mg/L	0.001	0.00143	0.0012	0.00103	0.00087	0.00148	0.00149	0.00162
Cobalt (Co)-Total	mg/L		0.00013	<0.00020	<0.00010	<0.00010	<0.00010	0.00025	0.00026
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.00377	0.00135	0.00118	0.00093	0.00078	0.00424	0.00391
Iron (Fe)-Total	mg/L	0.3	0.327	0.122	<0.010	0.011	<0.010	0.536	0.557
Lead (Pb)-Total	mg/L	0.001-0.007[d]	0.000863	<0.00010	<0.000050	<0.000050	<0.000050	0.000524	0.000419
Lithium (Li)-Total	mg/L		0.0065	<0.010	<0.0050	<0.0050	<0.0050	0.0052	0.0054
Magnesium (Mg)-Total	mg/L		20.2	23.7	10.7	10.7	9.86	13.2	13.9
Manganese (Mn)-Total	mg/L		0.0624	0.0711	0.000862	0.00137	0.00115	0.00719	0.00722
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	0.000163	0.00043	0.000751	0.000691	0.000643	0.000831	0.000859
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	0.00207	<0.00090	0.00036	0.0004	0.00025	0.0015	0.00154
Phosphorus (P)-Total	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L		4.43	5.92	4.31	4.3	3.8	4.52	4.53
Selenium (Se)-Total	mg/L	0.001	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Silicon (Si)-Total	mg/L		4.03	4.82	0.285	0.422	0.432	3.04	3.13

Appendix 3.2-1. Winter Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Depth zone Depth (m) Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Naiqunnguut Lake Shallow Depth 2.0 1 26-Apr-09 L756728-2	Nakhaktok Shallow Depth 4.0 1 27-Apr-09 L758417-4	Windy Lake Shallow Depth 4.0 1 27-Apr-09 L758417-1	Windy Lake Deep Depth 15.5 1 27-Apr-09 L758417-2	Windy Lake Deep Depth 15.5 2 27-Apr-09 L758417-3	Glenn Shallow Depth 3.0 1 03-May-09 L761772-6	Glenn Deep Depth 9.5 1 03-May-09 L761772-7
Silver (Ag)-Total	mg/L	0.0001	0.000011	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		94.2	111	69.6	65.7	54.2	54.8	53.5
Strontium (Sr)-Total	mg/L		0.0965	0.0969	0.0651	0.065	0.0602	0.0828	0.0834
Thallium (Tl)-Total	mg/L	0.0008	<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	0.031	0.033
Uranium (U)-Total	mg/L		0.000086	0.000063	0.000184	0.000158	0.000146	0.000335	0.000329
Vanadium (V)-Total	mg/L		0.000096	<0.00010	0.000539	0.000755	0.000585	0.00148	0.00167
Zinc (Zn)-Total	mg/L	0.03	0.0023	<0.0030	0.0013	0.0014	<0.0010	0.0024	0.0025
Dissolved Metals									
Aluminum (Al)-Dissolved	mg/L		0.152	<0.0020	0.0027	0.0038	0.0037	0.0657	0.0688
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L		<0.0015	<0.0020	<0.00050	<0.00050	<0.00050	<0.00080	<0.00090
Barium (Ba)-Dissolved	mg/L		0.00697	0.00405	0.00212	0.00217	0.00215	0.00407	0.00404
Beryllium (Be)-Dissolved	mg/L		<0.00020	<0.00040	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.00050	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.0405	0.0679	0.0521	0.0482	0.0483	0.0451	0.0441
Cadmium (Cd)-Dissolved	mg/L		<0.000017	<0.000020	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017
Calcium (Ca)-Dissolved	mg/L		13.7	19.3	12.7	12.5	12.3	14.8	14.9
Chromium (Cr)-Dissolved	mg/L		0.00104	0.0014	0.00107	0.00097	0.00111	0.00045	0.00032
Cobalt (Co)-Dissolved	mg/L		0.0001	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L		0.00334	0.00115	0.0008	0.00076	0.00076	0.0032	0.00301
Iron (Fe)-Dissolved	mg/L		0.248	0.024	<0.010	<0.010	<0.010	0.038	0.032
Lead (Pb)-Dissolved	mg/L		0.000158	<0.00010	<0.000050	<0.000050	<0.000050	0.000162	<0.000050
Lithium (Li)-Dissolved	mg/L		0.0058	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Dissolved	mg/L		18.6	23.3	10.1	10.1	9.85	12.5	12.7
Manganese (Mn)-Dissolved	mg/L		0.0542	0.0145	0.000057	0.000194	0.000166	0.000897	0.000821
Mercury (Hg)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L		0.000157	0.00037	0.000712	0.000644	0.000632	0.000794	0.000825
Nickel (Ni)-Dissolved	mg/L		0.00188	0.00032	0.00029	0.0003	0.00029	0.00092	0.00086
Phosphorus (P)-Dissolved	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		4.16	5.57	3.99	3.94	3.83	4.14	4.13
Selenium (Se)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Silicon (Si)-Dissolved	mg/L		4.02	4.89	0.261	0.385	0.371	1.3	1.35
Silver (Ag)-Dissolved	mg/L		<0.000010	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		90.1	112	63.3	54.9	61.6	54.2	54.9
Strontium (Sr)-Dissolved	mg/L		0.0895	0.0913	0.0608	0.0609	0.0593	0.0743	0.0743
Thallium (Tl)-Dissolved	mg/L		<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.000084	0.000055	0.000178	0.000147	0.000147	0.000294	0.000285
Vanadium (V)-Dissolved	mg/L		<0.000050	0.00176	0.000618	0.000632	0.000609	0.000206	0.000276
Zinc (Zn)-Dissolved	mg/L		0.003	<0.0020	<0.0010	0.0019	<0.0010	0.002	<0.0010
Organic Parameters									
Microcystin	ug/L		-	-	-	-	-	-	-
Cyanides									
Cyanide, Total	mg/L	0.005[f]	<0.0050	-	-	-	-	-	-

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.2-1. Winter Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Depth zone Depth (m) Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Ref Lake A Shallow Depth 3.0 1 31-May-09 L771260-1	Ref Lake A Shallow Depth 3.0 2 31-May-09 L771260-2	Ref Lake A Deep Depth 26.0 1 31-May-09 L771260-3	Ref Lake B Shallow Depth 3.0 1 31-May-09 L771260-4	Ref Lake B Deep Depth 6.0 1 31-May-09 L771260-5	Ref Lake C Shallow Depth 3.0 1 31-May-09 L771260-6	Ref Lake C Deep Depth 11.0 1 31-May-09 L771260-7
Physical Tests									
Conductivity	mS/cm		111	107	108	63.1	64.9	48.7	54.4
Hardness (as CaCO3)	mg/L		23.2	22.3	22.5	19	18.9	14	15.4
pH	pH	6.5-9.0	6.97	7	7.13	6.98	6.89	6.97	6.89
Total Suspended Solids	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L		61	63	62	39	43	33	36
Turbidity	NTU		0.23	0.25	0.22	0.23	0.23	0.19	0.21
Anions and Nutrients									
Alkalinity, Bicarbonate (as CaCO3)	mg/L		15.2	14.4	14.9	12.8	13.2	10.9	11.5
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		15.2	14.4	14.9	12.8	13.2	10.9	11.5
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	0.0114	<0.0050	0.0062	0.0105	0.0089	0.014	0.0054
Bromide (Br)	mg/L		0.064	0.059	0.059	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	mg/L		21.1	20.7	20.7	9.2	9.39	6.43	6.96
Fluoride (F)	mg/L		0.032	0.03	0.032	<0.020	<0.020	<0.020	<0.020
Nitrate (as N)	mg/L	2.93	0.0115	0.111	0.0203	0.0141	0.0359	0.0328	0.128
Nitrite (as N)	mg/L	0.06	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.403	0.22	0.264	0.25	0.273	0.188	0.163
Ortho Phosphate as P	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.0061	0.0055	0.005	0.007	0.0056	0.0034	0.0034
Sulfate (SO4)	mg/L		2.92	2.79	2.88	2.21	2.29	1.7	1.9
Organic / Inorganic Carbon									
Total Organic Carbon	mg/L		3.67	3.16	3.58	3.57	3.42	3.09	2.93
Total Metals									
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	0.0104	0.0147	0.0061	0.0042	0.0076	0.0102	0.0133
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.000068	0.000069
Barium (Ba)-Total	mg/L		0.00207	0.00206	0.00194	0.00225	0.00282	0.00184	0.00233
Beryllium (Be)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L		0.0153	0.0187	0.0144	0.0079	0.0075	0.0097	0.0092
Cadmium (Cd)-Total	mg/L	0.000017	<0.000010	0.000019	<0.000010	0.000019	0.000023	0.000021	0.000063
Calcium (Ca)-Total	mg/L		3.63	3.44	3.33	4.17	4.57	3.29	3.61
Chromium (Cr)-Total	mg/L	0.001	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.00136	0.0017	0.0011	<0.0010	0.00112	0.00216	0.00412
Iron (Fe)-Total	mg/L	0.3	<0.010	<0.010	<0.010	<0.010	0.018	<0.010	0.012
Lead (Pb)-Total	mg/L	0.001-0.007[d]	0.000105	0.000059	0.000233	0.000121	0.000098	0.000207	0.00013
Lithium (Li)-Total	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Total	mg/L		3.8	3.82	3.55	1.93	2.2	1.66	1.8
Manganese (Mn)-Total	mg/L		0.000582	0.000773	0.000466	0.000643	0.00357	0.000551	0.00192
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	<0.000010	<0.000010	0.000034	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	0.000097	0.000056	<0.000050	<0.000050	<0.000050	0.000055	<0.000050
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	<0.00060	<0.00050	<0.00020	<0.00020	<0.00050	<0.00030	<0.00050
Phosphorus (P)-Total	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L		1.24	1.16	1.14	0.639	0.681	0.563	0.608
Selenium (Se)-Total	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00011	0.00016
Silicon (Si)-Total	mg/L		0.198	0.632	0.194	0.147	0.301	0.357	0.744

Appendix 3.2-1. Winter Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Depth zone Depth (m) Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Ref Lake A Shallow Depth 3.0 1 31-May-09 L771260-1	Ref Lake A Shallow Depth 3.0 2 31-May-09 L771260-2	Ref Lake A Deep Depth 26.0 1 31-May-09 L771260-3	Ref Lake B Shallow Depth 3.0 1 31-May-09 L771260-4	Ref Lake B Deep Depth 6.0 1 31-May-09 L771260-5	Ref Lake C Shallow Depth 3.0 1 31-May-09 L771260-6	Ref Lake C Deep Depth 11.0 1 31-May-09 L771260-7
Silver (Ag)-Total	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		12.7	13.2	11.6	4.9	5.38	4.24	4.65
Strontium (Sr)-Total	mg/L		0.0184	0.0182	0.0172	0.0202	0.0225	0.0167	0.0182
Thallium (Tl)-Total	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Total	mg/L		0.000052	0.000038	0.000044	0.00003	0.000031	0.000102	0.000099
Vanadium (V)-Total	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.000087	0.000087
Zinc (Zn)-Total	mg/L	0.03	0.0016	0.0016	<0.0010	0.0015	0.0021	0.0024	0.0022
Dissolved Metals									
Aluminum (Al)-Dissolved	mg/L		0.0041	0.005	0.0042	0.0038	0.0032	0.0065	0.0068
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.000069	0.00007
Barium (Ba)-Dissolved	mg/L		0.00201	0.00187	0.00192	0.00232	0.00252	0.00163	0.00188
Beryllium (Be)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.0149	0.0143	0.0143	0.0087	0.009	0.0089	0.0088
Cadmium (Cd)-Dissolved	mg/L		0.000024	0.000014	0.000012	0.000015	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Dissolved	mg/L		3.44	3.24	3.23	4.36	4.34	3.12	3.43
Chromium (Cr)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L		0.00109	0.00095	0.00104	0.00085	0.00085	0.00146	0.0015
Iron (Fe)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Dissolved	mg/L		0.000059	<0.000050	<0.000050	0.000054	<0.000050	0.0001	<0.000050
Lithium (Li)-Dissolved	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Dissolved	mg/L		3.54	3.44	3.5	1.97	1.95	1.5	1.67
Manganese (Mn)-Dissolved	mg/L		0.000178	0.000391	0.000217	0.000145	0.000493	0.000105	0.000418
Mercury (Hg)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L		0.000053	<0.000050	<0.000050	<0.000050	<0.000050	0.000052	<0.000050
Nickel (Ni)-Dissolved	mg/L		<0.00030	<0.00030	<0.00030	<0.00020	<0.00030	<0.00020	<0.00020
Phosphorus (P)-Dissolved	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		1.19	1.11	1.14	0.644	0.635	0.536	0.57
Selenium (Se)-Dissolved	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00010	0.00018
Silicon (Si)-Dissolved	mg/L		0.181	0.649	0.192	0.138	0.292	0.337	0.703
Silver (Ag)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		11.8	11.9	12	5.03	5.01	4.22	4.39
Strontium (Sr)-Dissolved	mg/L		0.0175	0.0173	0.0173	0.0207	0.0213	0.0157	0.0173
Thallium (Tl)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.00004	0.000029	0.000043	0.000027	0.000023	0.000083	0.000073
Vanadium (V)-Dissolved	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.000074	0.00007
Zinc (Zn)-Dissolved	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0027	<0.0010
Organic Parameters									
Microcystin	ug/L		-	-	-	-	-	-	-
Cyanides									
Cyanide, Total	mg/L	0.005[f]	-	-	-	-	-	-	-

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.2-2

Summer Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Engineers and Scientists

Appendix 3.2-2. Summer Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name			Wolverine Lake	Imniagut Lake	Patch Lake South	Patch Lake South	Patch Lake North	Patch Lake North	P.O. Lake	Ogama Lake
Depth zone			Shallow Depth	Shallow Depth	Shallow Depth	Deep Depth	Shallow Depth	Deep Depth	Shallow Depth	Shallow Depth
Depth (m)		CCME Guidelines	1	1	1	12	1	6	1	1
Replicate		for the Protection	1	1	1	1	1	1	1	1
Date Sampled		of Freshwater	06-Aug-09	08-Aug-09	11-Aug-09	11-Aug-09	09-Aug-09	09-Aug-09	10-Aug-09	14-Aug-09
ALS Sample ID	Units	Aquatic Life[a]	L802795-1	L803194-9	L805939-3	L805939-4	L803194-10	L803194-11	L805939-2	L806328-8
Physical Tests										
Conductivity	mS/cm		336	297	321	323	327	327	291	231
Hardness (as CaCO3)	mg/L		56.9	66.2	60.1	60.7	62	61	47.9	38.3
pH	pH	6.5-9.0	7.71	7.63	7.59	7.55	7.74	7.72	7.65	7.57
Total Suspended Solids	mg/L		<3.0	<3.0	3.2	5.7	<3.0	<3.0	5.7	5.7
Total Dissolved Solids	mg/L		193	209	174	191	199	201	137	135
Turbidity	NTU		0.97	1.11	3.22	2.81	2.18	2.36	7.02	5.26
Anions and Nutrients										
Alkalinity, Bicarbonate (as CaCO3)	mg/L		35.9	23.3	34	33.6	33.3	33.6	29.4	22.6
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		35.9	23.3	34	33.6	33.3	33.6	29.4	22.6
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	0.0168	0.0259	<0.0050	<0.0050	0.0075	0.008	<0.0050	<0.0050
Bromide (Br)	mg/L		0.155	0.183	0.205	0.177	0.2	0.191	0.17	0.105
Chloride (Cl)	mg/L		78.9	72.6	76	76.3	75.8	76.4	68.5	55.1
Fluoride (F)	mg/L		0.043	0.034	0.046	0.044	0.044	0.044	0.035	0.04
Nitrate (as N)	mg/L	2.93	<0.0050	0.0061	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.362	0.413	0.209	0.187	0.251	0.252	0.193	0.495
Ortho Phosphate as P	mg/L		<0.0010	0.0024	0.0011	<0.0010	<0.0010	<0.0010	0.001	<0.0010
Total Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.0143	0.0081	0.0055	0.0046	0.0047	0.0046	0.0072	0.0179
Sulfate (SO4)	mg/L		<0.50	2.44	2.2	2.2	2.18	2.2	2.01	1.84
Organic / Inorganic Carbon										
Total Organic Carbon	mg/L		5.55	6.05	3.9	4.11	3.66	3.69	3.75	5.42
Total Metals										
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	0.0267	0.0377	0.0963	0.0835	0.059	0.0869	0.201	0.131
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00040	<0.00050	<0.00050	<0.00040
Barium (Ba)-Total	mg/L		0.00361	0.005	0.0037	0.00368	0.00332	0.00361	0.00369	0.00363
Beryllium (Be)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L		0.0167	0.0205	0.0262	0.0277	0.0239	0.0266	0.0248	0.0211
Cadmium (Cd)-Total	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L		8.65	13.7	11.7	12.2	11.7	12.7	9.33	6.49
Chromium (Cr)-Total	mg/L	0.001	0.00034	0.00055	0.00038	0.00037	<0.00050	0.00044	<0.00050	0.0004
Cobalt (Co)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.00107	0.00154	0.00111	0.00102	0.00096	0.00111	0.00145	0.0016
Iron (Fe)-Total	mg/L	0.3	0.087	0.106	0.078	0.058	0.074	0.071	0.164	0.165
Lead (Pb)-Total	mg/L	0.001-0.007[d]	0.000551	0.00044	0.000145	0.000059	0.000188	0.000142	0.000787	0.000491
Lithium (Li)-Total	mg/L		<0.0050	0.0055	0.0053	0.0055	<0.0050	0.0053	<0.0050	<0.0050
Magnesium (Mg)-Total	mg/L		9.23	7.68	7.61	8.44	7.82	8.34	6.62	5.62
Manganese (Mn)-Total	mg/L		0.0111	0.00825	0.00411	0.00303	0.00427	0.00472	0.00531	0.00681
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	0.000084	0.000111	0.000169	0.000167	0.000136	0.000173	0.000192	0.000155
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	0.00057	0.00447	0.00053	0.00056	0.00053	0.00069	0.00077	0.00092
Phosphorus (P)-Total	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L		2.33	2.01	2.9	3.07	2.76	2.96	2.58	1.99
Selenium (Se)-Total	mg/L	0.001	<0.0010	<0.00080	<0.0010	<0.00090	<0.00090	<0.00050	<0.00090	<0.0010

Appendix 3.2-2. Summer Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name			Wolverine Lake	Imniagut Lake	Patch Lake South	Patch Lake South	Patch Lake North	Patch Lake North	P.O. Lake	Ogama Lake
Depth zone			Shallow Depth	Shallow Depth	Shallow Depth	Deep Depth	Shallow Depth	Deep Depth	Shallow Depth	Shallow Depth
Depth (m)		CCME Guidelines	1	1	1	12	1	6	1	1
Replicate		for the Protection	1	1	1	1	1	1	1	1
Date Sampled		of Freshwater	06-Aug-09	08-Aug-09	11-Aug-09	11-Aug-09	09-Aug-09	09-Aug-09	10-Aug-09	14-Aug-09
ALS Sample ID	Units	Aquatic Life[a]	L802795-1	L803194-9	L805939-3	L805939-4	L803194-10	L803194-11	L805939-2	L806328-8
Silicon (Si)-Total	mg/L		0.137	0.287	0.367	0.367	0.34	0.346	0.598	0.938
Silver (Ag)-Total	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		41.2	27.1	38	38.2	36.2	37.7	38	27.9
Strontium (Sr)-Total	mg/L		0.0413	0.0648	0.0694	0.0713	0.0662	0.0696	0.0567	0.0361
Thallium (Tl)-Total	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Total	mg/L		0.000029	0.000025	0.00006	0.00006	0.000052	0.000055	0.000064	0.000043
Vanadium (V)-Total	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	0.03	<0.0010	0.0022	<0.0010	<0.0010	<0.0010	0.0013	0.0019	0.0038
Dissolved Metals										
Aluminum (Al)-Dissolved	mg/L	0.005-0.1[b]	0.0045	0.009	0.0139	0.0277	0.0093	0.0099	0.044	0.0331
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.005	<0.00050	<0.00040	<0.00040	<0.00050	<0.00040	<0.00040	<0.00040	<0.00040
Barium (Ba)-Dissolved	mg/L		0.00316	0.00461	0.00295	0.00301	0.0028	0.0028	0.00222	0.0027
Beryllium (Be)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.0171	0.02	0.0253	0.0257	0.0247	0.0237	0.0239	0.0194
Cadmium (Cd)-Dissolved	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Dissolved	mg/L		8.19	13.7	11.4	11.2	11.9	11.7	8.89	6.36
Chromium (Cr)-Dissolved	mg/L	0.001	0.00018	<0.00050	<0.00050	0.00026	<0.00050	<0.00050	0.00016	0.00018
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002-0.004[c]	0.00085	0.00109	0.00099	0.00104	0.00082	0.00087	0.00107	0.00137
Iron (Fe)-Dissolved	mg/L	0.3	<0.010	0.021	<0.010	0.048	<0.010	<0.010	0.019	0.038
Lead (Pb)-Dissolved	mg/L	0.001-0.007[d]	<0.000050	0.000065	<0.000050	0.000154	<0.000050	<0.000050	0.000069	0.000092
Lithium (Li)-Dissolved	mg/L		<0.0050	0.0053	0.0051	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Dissolved	mg/L		8.86	7.76	7.69	7.94	7.83	7.71	6.25	5.43
Manganese (Mn)-Dissolved	mg/L		0.000127	0.000685	0.000111	0.00397	0.000117	0.000102	0.000189	0.000261
Mercury (Hg)-Dissolved	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	0.000067	0.000124	0.000161	0.000155	0.000142	0.000149	0.00019	0.000151
Nickel (Ni)-Dissolved	mg/L	0.025-0.150[e]	0.00041	0.00412	0.00042	0.00051	0.00045	0.00053	0.00077	0.00081
Phosphorus (P)-Dissolved	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		2.23	2.01	2.76	2.78	2.79	2.74	2.37	1.91
Selenium (Se)-Dissolved	mg/L	0.001	<0.0010	<0.00070	<0.00090	<0.00090	<0.0010	<0.00090	<0.00080	<0.0010
Silicon (Si)-Dissolved	mg/L		0.078	0.21	0.213	0.205	0.179	0.181	0.339	0.774
Silver (Ag)-Dissolved	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		40.5	27.6	37.9	36.9	36.7	36.1	35.1	27.3
Strontium (Sr)-Dissolved	mg/L		0.0393	0.0647	0.0663	0.0674	0.0653	0.0653	0.0543	0.0355
Thallium (Tl)-Dissolved	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.000026	0.00002	0.000056	0.000058	0.00005	0.000051	0.00005	0.000036
Vanadium (V)-Dissolved	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	<0.0010	0.0024	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010
Organic Parameters										
Microcystin	ug/L		-	-	-	-	-	-	-	-
Cyanides										
Cyanide, Total	mg/L	0.005[f]	-	-	-	-	-	-	-	-

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.2-2. Summer Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Depth zone Depth (m) Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Ogama Lake Deep Depth 3 1 14-Aug-09 L806328-7	Doris Lake South Shallow Depth 1 1 17-Aug-09 L807720-2	Doris Lake South Shallow Depth 1 2 17-Aug-09 L807720-3	Doris Lake South Deep Depth 8 1 17-Aug-09 L807720-1	Doris Lake North Shallow Depth 1 1 15-Aug-09 L806328-5	Doris Lake North Deep Depth 11.5 1 15-Aug-09 L806328-6	Little Roberts Lake Shallow Depth 1 1 09-Aug-09 L803194-1	Little Roberts Lake Shallow Depth 1 2 09-Aug-09 L803194-2
Physical Tests										
Conductivity	mS/cm		232	257	258	258	257	258	254	254
Hardness (as CaCO3)	mg/L		39	45.4	46.7	47.4	44	43.5	39.2	41
pH	pH	6.5-9.0	7.56	7.46	7.45	7.4	7.66	7.68	6.99	7.23
Total Suspended Solids	mg/L		5.2	4.7	5.7	4.2	4.2	4.2	3	3.5
Total Dissolved Solids	mg/L		133	140	142	141	146	145	140	147
Turbidity	NTU		5.74	4.81	4.76	5.44	4.97	4.8	2.84	3.02
Anions and Nutrients										
Alkalinity, Bicarbonate (as CaCO3)	mg/L		22.7	26.8	26.4	26.7	23.2	25.3	24.2	24.2
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		22.7	26.8	26.4	26.7	23.2	25.3	24.2	24.2
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	<0.0050	0.0117	0.0114
Bromide (Br)	mg/L		0.101	0.165	0.156	0.16	0.113	0.112	0.197	0.197
Chloride (Cl)	mg/L		54.9	61.2	60.7	61	61.4	61.3	59.2	58.1
Fluoride (F)	mg/L		0.04	0.038	0.038	0.037	0.039	0.044	0.035	0.035
Nitrate (as N)	mg/L	2.93	<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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.438	0.462	0.574	0.418	0.463	0.452	0.345	0.331
Ortho Phosphate as P	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.016	0.0192	0.0189	0.0193	0.0195	0.0186	0.0151	0.0155
Sulfate (SO4)	mg/L		1.83	2.45	2.42	2.44	2.61	2.59	3.47	3.38
Organic / Inorganic Carbon										
Total Organic Carbon	mg/L		5.32	5.21	6.02	5.77	5.76	5.67	5.37	5.32
Total Metals										
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	0.153	0.0441	0.0453	0.0502	0.0417	0.0361	0.0656	0.0704
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	<0.00040	0.00025	0.00026	0.00023	<0.00040	<0.00040	<0.00040	<0.00050
Barium (Ba)-Total	mg/L		0.00387	0.00318	0.00312	0.00319	0.0031	0.00298	0.00315	0.0031
Beryllium (Be)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L		0.0218	0.0221	0.0219	0.021	0.0241	0.0234	0.0232	0.023
Cadmium (Cd)-Total	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L		6.7	7.83	7.98	7.91	7.99	7.62	7	6.91
Chromium (Cr)-Total	mg/L	0.001	0.0004	0.00024	0.00021	0.0002	0.00026	0.0002	0.00032	0.00153
Cobalt (Co)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.00164	0.00148	0.00142	0.0014	0.00149	0.00137	0.00154	0.00159
Iron (Fe)-Total	mg/L	0.3	0.184	0.089	0.086	0.092	0.089	0.079	0.139	0.146
Lead (Pb)-Total	mg/L	0.001-0.007[d]	0.000862	0.0011	0.000656	0.000203	0.000147	0.000183	0.000093	0.000165
Lithium (Li)-Total	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Total	mg/L		5.9	6.49	6.61	6.53	6.41	6.06	6.24	6.18
Manganese (Mn)-Total	mg/L		0.00735	0.0123	0.0122	0.0138	0.0119	0.0106	0.00976	0.00992
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	0.00016	0.000139	0.000129	0.000144	0.00015	0.000129	0.000174	0.000165
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	0.00079	0.00048	0.0006	0.00054	0.00051	0.00049	0.00052	0.00056
Phosphorus (P)-Total	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L		2.06	2.21	2.26	2.24	2.32	2.21	2.08	2.1
Selenium (Se)-Total	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00090	<0.00090

Appendix 3.2-2. Summer Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name			Ogama Lake	Doris Lake South	Doris Lake South	Doris Lake South	Doris Lake North	Doris Lake North	Little Roberts Lake	Little Roberts Lake
Depth zone			Deep Depth	Shallow Depth	Shallow Depth	Deep Depth	Shallow Depth	Deep Depth	Shallow Depth	Shallow Depth
Depth (m)		CCME Guidelines	3	1	1	8	1	11.5	1	1
Replicate		for the Protection	1	1	2	1	1	1	1	2
Date Sampled		of Freshwater	14-Aug-09	17-Aug-09	17-Aug-09	17-Aug-09	15-Aug-09	15-Aug-09	09-Aug-09	09-Aug-09
ALS Sample ID	Units	Aquatic Life[a]	L806328-7	L807720-2	L807720-3	L807720-1	L806328-5	L806328-6	L803194-1	L803194-2
Silicon (Si)-Total	mg/L		1.01	0.953	0.983	1.01	0.962	0.951	0.836	0.815
Silver (Ag)-Total	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		29.4	31.2	31.8	31.7	33	31.6	31.4	31.2
Strontium (Sr)-Total	mg/L		0.0369	0.0403	0.0406	0.0405	0.0393	0.0381	0.0371	0.0371
Thallium (Tl)-Total	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		0.00047	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Total	mg/L		0.000049	0.000034	0.000035	0.000034	0.000033	0.000034	0.000037	0.000034
Vanadium (V)-Total	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	0.03	0.0011	<0.0010	0.0016	<0.0010	<0.0010	<0.0010	0.0014	0.0013
Dissolved Metals										
Aluminum (Al)-Dissolved	mg/L	0.005-0.1[b]	0.0338	0.0041	0.0044	0.0041	0.0033	0.0034	0.0093	0.0106
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.005	<0.00040	0.00024	0.00026	0.00022	<0.00040	<0.00040	<0.00040	<0.00050
Barium (Ba)-Dissolved	mg/L		0.00257	0.0025	0.00263	0.00271	0.00261	0.00256	0.00244	0.00249
Beryllium (Be)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.02	0.0207	0.0212	0.0214	0.0215	0.0211	0.0205	0.0205
Cadmium (Cd)-Dissolved	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Dissolved	mg/L		6.46	7.7	7.87	8.04	7.64	7.51	6.34	6.64
Chromium (Cr)-Dissolved	mg/L	0.001	0.00018	<0.00050	0.00015	0.00013	0.00011	0.00011	<0.00050	<0.00050
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002-0.004[c]	0.00132	0.00118	0.00126	0.0013	0.00135	0.00125	0.00113	0.00137
Iron (Fe)-Dissolved	mg/L	0.3	0.041	0.013	0.012	0.014	0.013	0.01	0.028	0.03
Lead (Pb)-Dissolved	mg/L	0.001-0.007[d]	0.000113	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Dissolved	mg/L		5.55	6.36	6.56	6.64	6.04	6	5.68	5.93
Manganese (Mn)-Dissolved	mg/L		0.000233	0.00008	0.000094	0.000156	0.00009	0.000085	0.00021	0.000232
Mercury (Hg)-Dissolved	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	0.000135	0.000153	0.000148	0.000133	0.000136	0.000135	0.000132	0.000132
Nickel (Ni)-Dissolved	mg/L	0.025-0.150[e]	0.00057	0.00026	0.00025	0.00031	0.00028	0.00031	0.00033	0.00036
Phosphorus (P)-Dissolved	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		1.94	2.15	2.22	2.26	2.21	2.16	1.9	1.99
Selenium (Se)-Dissolved	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00070	<0.00090
Silicon (Si)-Dissolved	mg/L		0.778	0.877	0.884	0.89	0.891	0.887	0.693	0.676
Silver (Ag)-Dissolved	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		27.8	31.1	31.8	32.2	31.6	31	28.7	29.9
Strontium (Sr)-Dissolved	mg/L		0.0357	0.0391	0.0403	0.0406	0.0386	0.038	0.034	0.0354
Thallium (Tl)-Dissolved	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.00004	0.000029	0.000029	0.00003	0.000029	0.000027	0.00003	0.000029
Vanadium (V)-Dissolved	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	<0.0010	<0.0020	<0.0020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic Parameters										
Microcystin	ug/L		-	-	-	-	-	-	-	-
Cyanides										
Cyanide, Total	mg/L	0.005[f]	-	-	-	-	-	-	-	-

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.2-2. Summer Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name			Naiqunnguut Lake	Naiqunnguut Lake	Nakhaktok Lake	Nakhaktok Lake	Windy Lake	Windy Lake	Windy Lake	Glenn Lake
Depth zone			Shallow Depth	Shallow Depth	Shallow Depth	Deep Depth	Shallow Depth	Deep Depth	Deep Depth	Shallow Depth
Depth (m)			1	1	1	6	1	16	16	1
Replicate			1	2	1	1	1	1	2	1
Date Sampled			10-Aug-09	10-Aug-09	06-Aug-09	06-Aug-09	10-Aug-09	10-Aug-09	10-Aug-09	09-Aug-09
ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	L805939-1	L805939-9	L802795-2	L802795-3	L803194-6	L803194-7	L803194-8	L803194-3
Physical Tests										
Conductivity	mS/cm		327	314	559	560	425	424	427	363
Hardness (as CaCO3)	mg/L		40.9	47.9	89.8	86.8	69	66.7	69.9	64.3
pH	pH	6.5-9.0	7.71	7.24	7.72	7.69	7.89	7.91	7.9	7.71
Total Suspended Solids	mg/L		<3.0	<3.0	10	11	<3.0	<3.0	<3.0	4.5
Total Dissolved Solids	mg/L		185	183	316	318	235	224	215	220
Turbidity	NTU		3	3.43	14.6	16.6	1.26	1.33	1.46	13.5
Anions and Nutrients										
Alkalinity, Bicarbonate (as CaCO3)	mg/L		22.2	21.9	56	57.7	46.4	46.2	46.7	45.6
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		22.2	21.9	56	57.7	46.4	46.2	46.7	45.6
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	0.0077	0.0081	<0.020	<0.0050	<0.0050	<0.0050	<0.0050	0.0103
Bromide (Br)	mg/L		0.247	0.234	0.419	0.426	0.327	0.326	0.334	0.269
Chloride (Cl)	mg/L		78.3	78.1	135	138	95.6	95.4	96	76.7
Fluoride (F)	mg/L		0.038	0.037	0.05	0.056	0.062	0.06	0.063	0.056
Nitrate (as N)	mg/L	2.93	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0095
Nitrite (as N)	mg/L	0.06	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.298	0.151	0.962	0.872	0.104	0.125	0.113	0.239
Ortho Phosphate as P	mg/L		0.0013	0.0015	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0012
Total Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.0081	0.0082	0.0541	0.056	0.0031	0.0034	0.0034	0.0121
Sulfate (SO4)	mg/L		4.5	4.48	3.88	3.95	7.62	7.61	7.65	10.7
Organic / Inorganic Carbon										
Total Organic Carbon	mg/L		7.46	7.24	9.72	9.66	1.66	1.6	1.58	3.92
Total Metals										
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	0.186	0.227	0.0295	0.0305	0.0283	0.0272	0.0278	0.911
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	<0.00040	<0.00050	<0.00080	<0.00080	<0.00050	<0.00050	<0.00050	<0.00050
Barium (Ba)-Total	mg/L		0.00434	0.00453	0.0031	0.00316	0.00219	0.00213	0.00217	0.0115
Beryllium (Be)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L		0.0229	0.025	0.0457	0.0454	0.0422	0.0441	0.0421	0.0387
Cadmium (Cd)-Total	mg/L	0.000017	0.000025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L		6.02	6.44	12.5	12.5	11.4	11.8	11.6	12.4
Chromium (Cr)-Total	mg/L	0.001	<0.00050	0.00056	0.00047	0.00048	<0.00050	<0.00050	<0.00050	0.001
Cobalt (Co)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00018
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.00179	0.00216	0.00097	0.00092	0.00078	0.00076	0.00104	0.00299
Iron (Fe)-Total	mg/L	0.3	0.165	0.207	0.281	0.285	0.048	0.042	0.04	0.384
Lead (Pb)-Total	mg/L	0.001-0.007[d]	0.000197	0.000168	0.000093	0.000078	0.000115	0.000123	<0.000050	0.000813
Lithium (Li)-Total	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Total	mg/L		7.3	8.89	15.2	15.3	9.16	9.33	9.42	9.31
Manganese (Mn)-Total	mg/L		0.00434	0.00552	0.0298	0.0341	0.00252	0.00249	0.00262	0.00594
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	0.000093	0.000096	0.000292	0.000263	0.000578	0.000595	0.000608	0.000615
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	0.00086	0.00088	0.0006	0.00051	0.00038	0.00024	0.00016	0.00117
Phosphorus (P)-Total	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L		2.03	2.19	3.68	3.67	3.6	3.75	3.73	3.58
Selenium (Se)-Total	mg/L	0.001	0.00081	0.00072	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

Appendix 3.2-2. Summer Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name			Naiqunnguut Lake	Naiqunnguut Lake	Nakhaktok Lake	Nakhaktok Lake	Windy Lake	Windy Lake	Windy Lake	Glenn Lake
Depth zone			Shallow Depth	Shallow Depth	Shallow Depth	Deep Depth	Shallow Depth	Deep Depth	Deep Depth	Shallow Depth
Depth (m)		CCME Guidelines	1	1	1	6	1	16	16	1
Replicate		for the Protection	1	2	1	1	1	1	2	1
Date Sampled		of Freshwater	10-Aug-09	10-Aug-09	06-Aug-09	06-Aug-09	10-Aug-09	10-Aug-09	10-Aug-09	09-Aug-09
ALS Sample ID	Units	Aquatic Life[a]	L805939-1	L805939-9	L802795-2	L802795-3	L803194-6	L803194-7	L803194-8	L803194-3
Silicon (Si)-Total	mg/L		1.67	1.7	3.02	3.05	0.303	0.289	0.293	2.17
Silver (Ag)-Total	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		45.1	42.2	70.4	74.4	51.5	53.1	53.3	42.8
Strontium (Sr)-Total	mg/L		0.0408	0.0411	0.0585	0.0595	0.0535	0.0546	0.0544	0.0588
Thallium (Tl)-Total	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.021
Uranium (U)-Total	mg/L		0.000043	0.000044	0.000036	0.000036	0.000165	0.000168	0.000169	0.000238
Vanadium (V)-Total	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011
Zinc (Zn)-Total	mg/L	0.03	0.0011	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0016
Dissolved Metals										
Aluminum (Al)-Dissolved	mg/L	0.005-0.1[b]	0.0914	0.101	0.0027	0.0026	0.0025	0.0027	0.004	0.126
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.005	<0.00040	<0.00040	<0.00070	<0.00070	<0.00050	<0.00050	<0.00050	<0.00050
Barium (Ba)-Dissolved	mg/L		0.00321	0.00335	0.00252	0.00249	0.0019	0.00188	0.00199	0.00405
Beryllium (Be)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.0202	0.0221	0.0431	0.0427	0.0438	0.0434	0.0453	0.0357
Cadmium (Cd)-Dissolved	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Dissolved	mg/L		5.56	5.98	12	11.6	11.9	11.5	12.1	11.5
Chromium (Cr)-Dissolved	mg/L	0.001	<0.00050	<0.00050	0.00011	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002-0.004[c]	0.00153	0.00155	0.00064	0.00062	0.00062	0.00059	0.0006	0.00224
Iron (Fe)-Dissolved	mg/L	0.3	0.07	0.075	0.017	0.023	<0.010	<0.010	<0.010	0.052
Lead (Pb)-Dissolved	mg/L	0.001-0.007[d]	0.000081	0.000058	0.000126	<0.000050	<0.000050	<0.000050	<0.000050	0.000114
Lithium (Li)-Dissolved	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Dissolved	mg/L		6.56	8.01	14.5	14.1	9.56	9.21	9.63	8.68
Manganese (Mn)-Dissolved	mg/L		0.00079	0.000892	0.000154	0.000135	0.000079	0.000092	0.000068	0.000726
Mercury (Hg)-Dissolved	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	0.000065	0.000072	0.000249	0.00025	0.000642	0.000603	0.000627	0.000595
Nickel (Ni)-Dissolved	mg/L	0.025-0.150[e]	0.00078	0.00077	0.00017	0.00012	0.00013	0.00014	0.00017	0.00073
Phosphorus (P)-Dissolved	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		1.88	2.02	3.49	3.36	3.82	3.71	3.85	3.16
Selenium (Se)-Dissolved	mg/L	0.001	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010
Silicon (Si)-Dissolved	mg/L		1.58	1.57	3.06	3.08	0.201	0.207	0.21	1.3
Silver (Ag)-Dissolved	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		41.1	40.8	74.5	76.2	53.1	51.9	54.3	40.2
Strontium (Sr)-Dissolved	mg/L		0.0372	0.0382	0.0572	0.0555	0.0555	0.0541	0.0556	0.0551
Thallium (Tl)-Dissolved	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.000038	0.000036	0.000032	0.000032	0.00017	0.000169	0.000166	0.000221
Vanadium (V)-Dissolved	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	<0.0010	<0.0010	0.0016	<0.0010	<0.0010	<0.0010	<0.0010	0.0011
Organic Parameters										
Microcystin	ug/L		-	-	-	-	-	-	-	-
Cyanides										
Cyanide, Total	mg/L	0.005[f]	-	-	-	-	-	-	-	-

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.2-2. Summer Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name			Glenn Lake	Glenn Lake	Reference Lake A	Reference Lake A	Reference Lake B	Reference Lake B	Reference Lake B
Depth zone			Deep Depth	Deep Depth	Shallow Depth	Deep Depth	Shallow Depth	Deep Depth	Deep Depth
Depth (m)			17.5	17.5	1	29	1	7.5	7.5
Replicate			1	2	1	1	1	1	2
Date Sampled			09-Aug-09	09-Aug-09	13-Aug-09	13-Aug-09	16-Aug-09	16-Aug-09	16-Aug-09
ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	L803194-5	L803194-4	L805939-5	L805939-6	L806328-3	L806328-2	L806328-4
Physical Tests									
Conductivity	mS/cm		366	366	92.9	94.8	43.5	44	43.6
Hardness (as CaCO3)	mg/L		68.4	65.2	19	18.8	12.3	12.4	12.3
pH	pH	6.5-9.0	7.82	7.79	7.18	6.98	7.22	7.16	7.22
Total Suspended Solids	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L		226	211	44	49	25	23	25
Turbidity	NTU		12.5	12.3	0.58	0.59	0.42	0.37	0.36
Anions and Nutrients									
Alkalinity, Bicarbonate (as CaCO3)	mg/L		45.5	45.8	12.5	13.5	8.8	8.9	8.9
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		45.5	45.8	12.5	13.5	8.8	8.9	8.9
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	0.0096	0.0102	<0.0050	0.0105	<0.0050	0.0066	0.0052
Bromide (Br)	mg/L		0.263	0.264	0.061	0.066	<0.050	<0.050	<0.050
Chloride (Cl)	mg/L		75.9	75.9	17.6	18	6.26	6.28	6.27
Fluoride (F)	mg/L		0.056	0.055	0.024	0.025	<0.020	<0.020	<0.020
Nitrate (as N)	mg/L	2.93	0.0175	0.0158	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.223	0.199	0.152	0.146	0.119	0.204	0.126
Ortho Phosphate as P	mg/L		0.0012	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.011	0.0113	0.0028	0.0031	0.0024	0.0021	0.0024
Sulfate (SO4)	mg/L		10.6	10.6	2.31	2.35	1.55	1.55	1.55
Organic / Inorganic Carbon									
Total Organic Carbon	mg/L		3.51	3.62	3.03	2.95	2.52	2.51	2.49
Total Metals									
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	0.531	0.503	0.0139	0.0127	0.0073	0.0069	0.0071
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	<0.00060	<0.00060	<0.00020	<0.00020	0.000066	0.000076	0.000071
Barium (Ba)-Total	mg/L		0.00808	0.00779	0.00172	0.00185	0.00153	0.00148	0.0015
Beryllium (Be)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L		0.0386	0.0384	0.0112	0.0118	0.0037	0.0031	0.0035
Cadmium (Cd)-Total	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L		12.8	12.7	2.76	2.86	3.02	2.94	2.99
Chromium (Cr)-Total	mg/L	0.001	0.0009	0.00089	0.00011	<0.00050	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L		0.00018	0.00016	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.00303	0.00297	0.0011	0.00132	0.00068	0.00069	0.0007
Iron (Fe)-Total	mg/L	0.3	0.338	0.338	0.018	0.021	0.015	0.014	0.029
Lead (Pb)-Total	mg/L	0.001-0.007[d]	0.000313	0.000254	<0.000050	0.000094	0.000085	<0.000050	0.000107
Lithium (Li)-Total	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Total	mg/L		9.58	9.53	2.64	2.8	1.16	1.14	1.14
Manganese (Mn)-Total	mg/L		0.00552	0.00537	0.00121	0.0013	0.00162	0.00162	0.00154
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	0.000656	0.000634	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	0.00118	0.00116	0.00022	0.00022	0.00015	0.00015	0.00013
Phosphorus (P)-Total	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L		3.67	3.65	0.931	0.977	0.434	0.427	0.43
Selenium (Se)-Total	mg/L	0.001	<0.00050	<0.00050	<0.00030	<0.00030	<0.00010	<0.00010	<0.00010

Appendix 3.2-2. Summer Lake Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Depth zone Depth (m) Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Glenn Lake Deep Depth 17.5 1 09-Aug-09 L803194-5	Glenn Lake Deep Depth 17.5 2 09-Aug-09 L803194-4	Reference Lake A Shallow Depth 1 1 13-Aug-09 L805939-5	Reference Lake A Deep Depth 29 1 13-Aug-09 L805939-6	Reference Lake B Shallow Depth 1 1 16-Aug-09 L806328-3	Reference Lake B Deep Depth 7.5 1 16-Aug-09 L806328-2	Reference Lake B Deep Depth 7.5 2 16-Aug-09 L806328-4
Silicon (Si)-Total	mg/L		2.1	2.11	0.207	0.257	0.102	0.103	0.099
Silver (Ag)-Total	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		43.7	43.5	9.41	9.92	3.41	3.39	3.35
Strontium (Sr)-Total	mg/L		0.0614	0.0605	0.0148	0.0156	0.0146	0.0143	0.0146
Thallium (Tl)-Total	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		0.018	0.019	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Total	mg/L		0.000243	0.000239	0.00004	0.000042	0.000028	0.000029	0.000031
Vanadium (V)-Total	mg/L		0.0012	0.0011	<0.0010	<0.0010	<0.000050	0.000055	<0.000050
Zinc (Zn)-Total	mg/L	0.03	0.0013	0.0015	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Metals									
Aluminum (Al)-Dissolved	mg/L	0.005-0.1[b]	0.128	0.0622	0.0051	0.0047	0.0035	0.0043	0.0034
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.005	<0.00050	<0.00050	<0.00020	<0.00020	0.000068	0.000066	0.000071
Barium (Ba)-Dissolved	mg/L		0.00434	0.00351	0.00173	0.00182	0.00148	0.00151	0.00153
Beryllium (Be)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.036	0.0346	0.0141	0.014	0.0053	0.004	0.0054
Cadmium (Cd)-Dissolved	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Dissolved	mg/L		12.3	11.7	2.94	2.86	3.02	3.04	3.02
Chromium (Cr)-Dissolved	mg/L	0.001	<0.00050	<0.00050	0.00013	0.00014	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002-0.004[c]	0.00235	0.0022	0.00101	0.00098	0.00062	0.00068	0.00065
Iron (Fe)-Dissolved	mg/L	0.3	0.063	0.025	<0.010	<0.010	0.019	<0.010	<0.010
Lead (Pb)-Dissolved	mg/L	0.001-0.007[d]	0.000091	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Dissolved	mg/L		9.15	8.72	2.83	2.82	1.16	1.17	1.15
Manganese (Mn)-Dissolved	mg/L		0.000791	0.000509	0.000084	0.000155	0.000066	0.000075	0.000088
Mercury (Hg)-Dissolved	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	0.000655	0.000597	<0.000050	0.000054	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.025-0.150[e]	0.0008	0.00069	0.00027	0.00022	0.00017	0.00021	0.00017
Phosphorus (P)-Dissolved	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		3.39	3.2	1	0.985	0.44	0.44	0.439
Selenium (Se)-Dissolved	mg/L	0.001	<0.00050	<0.0010	<0.00030	<0.00030	0.00012	<0.00010	<0.00010
Silicon (Si)-Dissolved	mg/L		1.3	1.12	0.176	0.231	0.084	0.085	0.087
Silver (Ag)-Dissolved	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		42.2	41.2	10.1	10	3.35	3.45	3.37
Strontium (Sr)-Dissolved	mg/L		0.0586	0.0559	0.0154	0.0153	0.0146	0.0147	0.0148
Thallium (Tl)-Dissolved	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00016	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.000228	0.000223	0.000039	0.000033	0.000025	0.000024	0.000023
Vanadium (V)-Dissolved	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Dissolved	mg/L	0.03	<0.0010	<0.0010	<0.0010	0.001	<0.0010	<0.0010	<0.0010
Organic Parameters									
Microcystin	ug/L		-	-	-	-	-	-	-
Cyanides									
Cyanide, Total	mg/L	0.005[f]	-	-	-	-	-	-	-

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.2-3

Lake Water Quality QA/QC, Hope Bay Belt Project, 2009

Engineers and Scientists

Appendix 3.2-3. Lake Water Quality QA/QC, Hope Bay Belt Project, 2009

Sample Name	Units	Travel Blank	Travel Blank	Travel Blank	Travel Blank	Field Blank	Field Blank, P.O. Lake	Field Blank, Reference Lake B	Equipment Blank, Doris Lake	Equipment Blank, Wolverine Lake	Equipment Blank, Imniagut Lake
Date Sampled		24-APR-09	27-APR-09	13-Aug-09	17-AUG-09	26-APR-09	10-Aug-09	16-Aug-09	21-APR-09	06-AUG-09	07-AUG-09
ALS Sample ID		L756700-7	L758417-5	L805939-8	L807720-4	L756728-5	L805939-7	L806328-1	L755391-3	L802795-4	L803194-12
Physical Tests											
Conductivity	mS/cm	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	9.5	2.1
Hardness (as CaCO3)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
pH	pH	5.60	5.93	5.55	5.67	5.61	5.57	5.78	5.55	4.87	5.37
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
Total Dissolved Solids	mg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Turbidity	NTU	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Anions and Nutrients											
Alkalinity, Bicarbonate (as CaCO3)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Carbonate (as CaCO3)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L	<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	<0.0050	<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
Chloride (Cl)	mg/L	<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
Nitrate (as N)	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.315	0.0562
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
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	0.0010
Total Phosphate as P	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Sulfate (SO4)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Organic / Inorganic Carbon											
Total Organic Carbon	mg/L	<0.50	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.62	<0.50
Total Metals											
Aluminum (Al)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0090	0.0084
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
Barium (Ba)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000055	<0.000050
Beryllium (Be)-Total	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L	0.0015	0.0014	<0.0010	<0.0010	0.0014	<0.0010	0.0045	0.0018	0.0026	<0.0010
Cadmium (Cd)-Total	mg/L	<0.000017	<0.000017	<0.000010	<0.000010	<0.000017	<0.000010	<0.000010	<0.000017	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.036	<0.020
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00108	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00034	0.00049	<0.00010
Iron (Fe)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00303	0.000295
Lithium (Li)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.110	<0.0050
Manganese (Mn)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000267	0.000061
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00057	<0.00010
Phosphorus (P)-Total	mg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Selenium (Se)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Silicon (Si)-Total	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.027	0.083	<0.010
Strontium (Sr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Thallium (Tl)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0017	0.0016	0.0020

Appendix 3.2-3. Lake Water Quality QA/QC, Hope Bay Belt Project, 2009

Sample Name	Units	Travel Blank	Travel Blank	Travel Blank	Travel Blank	Field Blank	Field Blank, P.O. Lake	Field Blank, Reference Lake B	Equipment Blank, Doris Lake	Equipment Blank, Wolverine Lake	Equipment Blank, Imniagut Lake
Date Sampled		**24-APR-09**	**27-APR-09**	**13-Aug-09**	**17-AUG-09**	**26-APR-09**	**10-Aug-09**	**16-Aug-09**	**21-APR-09**	**06-AUG-09**	**07-AUG-09**
ALS Sample ID		**L756700-7**	**L758417-5**	**L805939-8**	**L807720-4**	**L756728-5**	**L805939-7**	**L806328-1**	**L755391-3**	**L802795-4**	**L803194-12**
Dissolved Metals											
Aluminum (Al)-Dissolved	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0099	0.0062
Antimony (Sb)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	0.000036	<0.000030
Barium (Ba)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000131	<0.000050
Beryllium (Be)-Dissolved	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L	0.0018	0.0011	<0.0010	<0.0010	0.0014	<0.0010	0.0024	0.0014	<0.0010	<0.0010
Cadmium (Cd)-Dissolved	mg/L	<0.000017	<0.000017	<0.000010	<0.000010	<0.000017	<0.000010	<0.000010	<0.000017	<0.000010	<0.000010
Calcium (Ca)-Dissolved	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.027	<0.020
Chromium (Cr)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00099	<0.00010
Cobalt (Co)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00015	0.00060	<0.00010
Iron (Fe)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00341	0.000168
Lithium (Li)-Dissolved	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Dissolved	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0944	<0.0050
Manganese (Mn)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000287	<0.000050
Mercury (Hg)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00069	<0.00010
Phosphorus (P)-Dissolved	mg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Selenium (Se)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Silicon (Si)-Dissolved	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Silver (Ag)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	<0.010
Strontium (Sr)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Thallium (Tl)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Vanadium (V)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Dissolved	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0020	0.0022	0.0016
Organic Parameters											
Microcystin	ug/L	-	-	-	-	-	-	-	-		-
Cyanides											
Cyanide, Total	mg/L	<0.0050	-	-	-	<0.0050	-	-	-		-

Shaded cells indicate values above detection limits

Appendix 3.3-1

Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Engineers and Scientists

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Koignuk River Upstream 1 04-May-09 L760479-3	Koignuk River Midstream 1 23-May-09 L767934-1	Koignuk River Midstream 2 23-May-09 L767934-2	Koignuk River Downstream 1 04-May-09 L760479-2	Aimaokatalok River Reference Site 1 01-May-09 L759116-1	Aimaokatalok River Reference Site 2 01-May-09 L759116-2	Wolverine Outflow 1 21-Jun-09 L783643-5	Wolverine Outflow 2 21-Jun-09 L783643-6	Patch Outflow 1 21-Jun-09 L783643-7
Physical Tests											
Conductivity	mS/cm		129	255	256	337	121	124	42.6	42.4	94.2
Hardness (as CaCO3)	mg/L		33	63.2	63	78.5	34.2	34.3	13.5	13.4	12.8
pH	pH	6.5-9.0	6.86	7.36	7.18	7.01	6.82	6.86	7.28	7.21	7.13
Total Suspended Solids	mg/L		<3.0	<3.0	<3.0	<3.0	3.5	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L		91	167	175	237	92	92	35	43	52
Turbidity	NTU		2	2.54	2.64	8.56	1.6	1.55	0.43	0.36	1.68
Anions and Nutrients											
Alkalinity, Bicarbonate (as CaCO3)	mg/L		20.9	41	40.7	56.4	22.1	22.3	10.9	10.2	10
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		20.9	41	40.7	56.4	22.1	22.3	10.9	10.2	10
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	<0.0050	0.0154	0.0072	0.0444	0.202	0.239	<0.0050	<0.0050	0.0057
Bromide (Br)	mg/L		<0.050	0.062	0.065	<0.25	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	mg/L		21.8	44.4	44.2	61.1	18.5	18.9	4.39	4.4	20.8
Fluoride (F)	mg/L		0.051	0.056	0.057	<0.10	0.032	0.034	0.028	0.029	0.021
Nitrate (as N)	mg/L	2.93	0.299	0.456	0.461	0.556	0.264	0.268	<0.0050	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.516	1.01	0.97	1.15	1.13	0.935	0.348	0.317	0.134
Ortho Phosphate as P	mg/L		<0.0010	<0.0010	<0.0010	0.0086	0.0049	0.0047	<0.0010	<0.0010	<0.0010
Total Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.0102	0.0189	0.0184	0.0197	0.0209	0.0216	<0.0020	0.0031	0.0052
Sulfate (SO4)	mg/L		4.35	8.66	8.64	12.6	4.57	4.68	0.91	0.91	0.71
Organic / Inorganic Carbon											
Total Organic Carbon	mg/L		10.5	17.6	18	22.6	14	13.7	9.26	8.89	3.36
Total Metals											
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	0.126	0.178	0.172	0.625	0.0866	0.0856	0.0483	0.0432	0.0679
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00014	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	0.000418	0.00044	0.00046	0.000887	0.00031	0.00031	0.000119	0.000116	<0.00010
Barium (Ba)-Total	mg/L		0.00636	0.0118	0.0115	0.0156	0.0133	0.0132	0.0022	0.002	0.00177
Beryllium (Be)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L		0.0105	0.0184	0.019	0.0291	0.0096	0.0094	0.0045	0.0043	0.0076
Cadmium (Cd)-Total	mg/L	0.000017	<0.000017	0.000022	0.000051	<0.000017	0.000018	0.000021	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L		6.95	13.2	13.6	17.5	6.44	6.3	3.53	3.46	3.05
Chromium (Cr)-Total	mg/L	0.001	0.00206	0.00105	0.00118	0.00209	0.00258	0.00168	0.0004	0.00043	<0.00010
Cobalt (Co)-Total	mg/L		0.00011	0.00014	0.00014	0.00034	0.00162	0.00162	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.00301	0.00562	0.00582	0.00948	0.00374	0.00396	0.00111	0.00111	0.00066
Iron (Fe)-Total	mg/L	0.3	0.16	0.266	0.261	0.627	1.08	1.09	0.139	0.116	0.114
Lead (Pb)-Total	mg/L	0.001-0.007[d]	0.000132	0.00528	0.00302	0.000389	0.00136	0.000686	<0.000050	<0.000050	<0.000050
Lithium (Li)-Total	mg/L		<0.0050	<0.0050	<0.0050	0.0059	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Total	mg/L		3.76	7.36	7.48	9.77	4.65	4.59	1.51	1.47	2.12
Manganese (Mn)-Total	mg/L		0.00925	0.0121	0.0119	0.0108	0.213	0.215	0.000616	0.000506	0.0115
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	0.000086	0.000148	0.000148	0.00032	0.000081	0.000128	0.000107	0.000148	0.00007
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	0.00124	0.00225	0.00225	0.00325	0.00216	0.00219	0.0014	0.00119	0.00035

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Koignuk River Upstream	Koignuk River Midstream	Koignuk River Midstream	Koignuk River Downstream	Aimaokatalok River Reference Site	Aimaokatalok River Reference Site	Wolverine Outflow	Wolverine Outflow	Patch Outflow
Replicate			**1**	**1**	**2**	**1**	**1**	**2**	**1**	**2**	**1**
Date Sampled			**04-May-09**	**23-May-09**	**23-May-09**	**04-May-09**	**01-May-09**	**01-May-09**	**21-Jun-09**	**21-Jun-09**	**21-Jun-09**
ALS Sample ID			**L760479-3**	**L767934-1**	**L767934-2**	**L760479-2**	**L759116-1**	**L759116-2**	**L783643-5**	**L783643-6**	**L783643-7**
Phosphorus (P)-Total	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L		1.46	2.46	2.52	3.77	1.5	1.45	0.708	0.687	1.05
Selenium (Se)-Total	mg/L	0.001	0.00045	<0.0010	<0.0010	0.00112	<0.00050	<0.00050	<0.00010	<0.00010	<0.0010
Silicon (Si)-Total	mg/L		1.36	2.38	2.39	3.82	1.89	1.88	0.783	0.757	0.467
Silver (Ag)-Total	mg/L	0.0001	<0.000010	<0.000010	0.000012	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		10.8	22.3	22.3	33.4	8.88	8.9	3.08	3	9.72
Strontium (Sr)-Total	mg/L		0.0311	0.0598	0.0602	0.0867	0.0356	0.0346	0.00827	0.00812	0.0172
Thallium (Tl)-Total	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		<0.010	<0.010	<0.010	0.027	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Total	mg/L		0.000069	0.00014	0.000137	0.000251	0.000079	0.000074	0.000014	0.000013	0.000019
Vanadium (V)-Total	mg/L		0.000308	<0.00060	<0.00060	0.00144	0.00028	0.00028	0.000191	0.000117	<0.0010
Zinc (Zn)-Total	mg/L	0.03	0.0021	0.0063	0.0062	0.0046	0.0072	<0.0070	0.0022	0.0023	0.0011
Dissolved Metals											
Aluminum (Al)-Dissolved	mg/L	0.005-0.1[b]	0.0558	0.057	0.0561	0.274	0.0578	0.0516	0.0327	0.0323	0.0141
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.005	0.000376	0.00048	0.00047	0.000782	0.00028	0.00029	0.000109	0.000106	<0.00010
Barium (Ba)-Dissolved	mg/L		0.00579	0.0104	0.0101	0.012	0.0127	0.0129	0.00172	0.00171	0.000949
Beryllium (Be)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.0097	0.0184	0.0191	0.0287	0.0102	0.0087	0.0039	0.0037	0.0056
Cadmium (Cd)-Dissolved	mg/L	0.000017	<0.000017	<0.000017	0.000043	<0.000017	0.000019	0.000024	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Dissolved	mg/L		7.04	13.2	13.2	16.2	6.22	6.2	3.19	3.16	2.4
Chromium (Cr)-Dissolved	mg/L	0.001	0.00174	0.00064	0.00068	0.00147	0.00142	0.00137	0.00023	0.00025	<0.00010
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	0.00018	0.00147	0.00151	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002-0.004[c]	0.00274	0.00543	0.00547	0.00828	0.00343	0.00324	0.00093	0.00094	0.00056
Iron (Fe)-Dissolved	mg/L	0.3	0.078	0.1	0.099	0.283	0.819	0.635	0.077	0.081	0.04
Lead (Pb)-Dissolved	mg/L	0.001-0.007[d]	0.000057	0.00287	0.00187	0.00017	0.000893	0.000369	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		<0.0050	<0.0050	<0.0050	0.0056	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Dissolved	mg/L		3.74	7.31	7.29	9.23	4.54	4.57	1.34	1.34	1.66
Manganese (Mn)-Dissolved	mg/L		0.00719	0.00879	0.00887	0.00653	0.197	0.205	0.000334	0.000319	0.00649
Mercury (Hg)-Dissolved	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	0.000085	0.000131	0.000148	0.000283	<0.000050	<0.000050	0.000094	0.000089	0.000056
Nickel (Ni)-Dissolved	mg/L	0.025-0.150[e]	0.00111	0.00198	0.00211	0.00256	0.00202	0.00211	0.00109	0.0011	0.00029
Phosphorus (P)-Dissolved	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		1.41	2.49	2.45	3.44	1.44	1.43	0.629	0.62	0.814
Selenium (Se)-Dissolved	mg/L	0.001	0.00034	<0.0010	<0.0010	0.00084	<0.00050	<0.00050	<0.00010	<0.00010	<0.0010
Silicon (Si)-Dissolved	mg/L		1.28	2.19	2.16	3.52	1.9	1.9	0.77	0.795	0.245
Silver (Ag)-Dissolved	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		10.8	22	21.9	31.2	8.71	8.9	2.77	2.78	7.45
Strontium (Sr)-Dissolved	mg/L		0.0315	0.0596	0.0598	0.0822	0.0333	0.0341	0.00744	0.00742	0.0131
Thallium (Tl)-Dissolved	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	<0.010	<0.010	0.014	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.000064	0.000114	0.000118	0.000219	0.000068	0.000071	0.000011	0.000011	0.000014
Vanadium (V)-Dissolved	mg/L		0.000356	<0.00050	<0.00050	0.0011	0.00014	0.00012	0.000094	0.000079	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	0.0014	0.0059	0.0056	0.0052	<0.0050	<0.0050	0.0017	0.0017	<0.0010

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Patch Outflow 2 21-Jun-09 L783643-8	P.O. Outflow 1 21-Jun-09 L783643-11	P.O. Outflow 2 21-Jun-09 L783643-12	Ogama Outflow 1 21-Jun-09 L783643-9	Ogama Outflow 2 21-Jun-09 L783643-10	Doris Outflow 1 21-Jun-09 L783643-3	Doris Outflow 2 21-Jun-09 L783643-4	Little Roberts Outflow 1 21-Jun-09 L783643-19	Little Roberts Outflow 2 21-Jun-09 L783643-20
Physical Tests											
Conductivity	mS/cm		93.9	206	213	391	395	246	246	230	230
Hardness (as CaCO3)	mg/L		15.8	34.1	33.7	60.7	61.7	40.5	40.7	36	34.9
pH	pH	6.5-9.0	7.13	7.3	7.29	7.14	7.17	7.42	7.46	7.25	7.31
Total Suspended Solids	mg/L		<3.0	4	3.5	5.5	5	<3.0	3.5	16	17
Total Dissolved Solids	mg/L		54	120	123	237	249	140	139	137	137
Turbidity	NTU		1.66	5.35	5.19	11.7	11.2	3.29	2.89	16	17.1
Anions and Nutrients											
Alkalinity, Bicarbonate (as CaCO3)	mg/L		10.6	21.6	22.2	36	35.7	27.3	25.5	22.3	22
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		10.6	21.6	22.2	36	35.7	27.3	25.5	22.3	22
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	0.0062	0.0083	0.0077	0.017	0.0162	<0.0050	<0.0050	0.0129	0.0116
Bromide (Br)	mg/L		<0.050	0.101	0.104	0.221	0.218	0.133	0.126	0.13	0.129
Chloride (Cl)	mg/L		20.8	46.2	46	93.8	93.9	56.6	56.6	54.2	54.2
Fluoride (F)	mg/L		0.021	0.045	0.045	0.058	0.057	0.041	0.041	0.038	0.038
Nitrate (as N)	mg/L	2.93	<0.0050	<0.0050	<0.0050	0.0217	0.0232	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.145	0.378	0.435	0.493	0.498	0.499	0.528	0.48	0.481
Ortho Phosphate as P	mg/L		<0.0010	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	0.0013	0.0012
Total Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.0048	0.0171	0.0141	0.0267	0.0248	0.0176	0.015	0.033	0.0304
Sulfate (SO4)	mg/L		0.71	1.69	1.68	3.33	3.39	2.42	2.43	2.72	2.72
Organic / Inorganic Carbon											
Total Organic Carbon	mg/L		3.16	8.21	8.19	9.81	9.87	6.91	6.55	6.63	5.51
Total Metals											
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	0.0675	0.28	0.275	0.386	0.448	0.0358	0.0368	0.634	0.514
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	<0.00010	0.00031	0.00025	<0.00060	<0.00060	0.00019	0.00018	0.00034	0.00025
Barium (Ba)-Total	mg/L		0.00182	0.00611	0.00588	0.00875	0.00938	0.00325	0.00296	0.00894	0.00708
Beryllium (Be)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L		0.007	0.0185	0.0176	0.0303	0.031	0.02	0.02	0.0209	0.0173
Cadmium (Cd)-Total	mg/L	0.000017	<0.000010	0.000013	0.000014	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L		2.95	6.52	6.29	10.4	10.7	7.96	7.72	6.32	5.24
Chromium (Cr)-Total	mg/L	0.001	<0.00010	0.00074	0.0007	0.00073	0.00145	0.00021	0.00024	0.00127	0.00107
Cobalt (Co)-Total	mg/L		<0.00010	0.00018	0.00017	0.00025	0.00029	<0.00010	<0.00010	0.00035	0.00029
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.00066	0.00174	0.00173	0.00229	0.00238	0.00156	0.00143	0.00215	0.00173
Iron (Fe)-Total	mg/L	0.3	0.112	0.488	0.485	0.638	0.679	0.074	0.071	0.803	0.663
Lead (Pb)-Total	mg/L	0.001-0.007[d]	0.000214	0.000198	0.00017	0.000173	0.00021	0.000051	<0.000050	0.000246	0.000213
Lithium (Li)-Total	mg/L		<0.0050	<0.0050	<0.0050	0.0061	0.0063	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Total	mg/L		2.05	5.36	5.18	9.51	9.72	5.76	5.73	5.87	4.87
Manganese (Mn)-Total	mg/L		0.0114	0.0186	0.0189	0.0557	0.0583	0.0175	0.0123	0.0418	0.035
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	0.000063	0.000183	0.000162	0.000223	0.000328	0.00017	0.000151	0.000172	0.000154
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	0.00036	0.00188	0.00152	0.00143	0.00224	0.00055	0.00052	0.00128	0.00103

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Patch Outflow 2 21-Jun-09 L783643-8	P.O. Outflow 1 21-Jun-09 L783643-11	P.O. Outflow 2 21-Jun-09 L783643-12	Ogama Outflow 1 21-Jun-09 L783643-9	Ogama Outflow 2 21-Jun-09 L783643-10	Doris Outflow 1 21-Jun-09 L783643-3	Doris Outflow 2 21-Jun-09 L783643-4	Little Roberts Outflow 1 21-Jun-09 L783643-19	Little Roberts Outflow 2 21-Jun-09 L783643-20
Phosphorus (P)-Total	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L		1.03	2.41	2.32	3.55	3.66	2.27	2.25	2.47	2.01
Selenium (Se)-Total	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010
Silicon (Si)-Total	mg/L		0.473	1.45	1.46	3.25	3.43	1.05	1.01	2.39	1.94
Silver (Ag)-Total	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		9.46	25.6	25	47.6	48.7	29.5	29.5	30.9	25
Strontium (Sr)-Total	mg/L		0.0164	0.0336	0.0323	0.0579	0.0606	0.0361	0.0348	0.0346	0.0291
Thallium (Tl)-Total	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		<0.010	<0.010	<0.010	0.012	0.014	<0.010	<0.010	0.029	0.022
Uranium (U)-Total	mg/L		0.000022	0.000063	0.000061	0.000072	0.000079	0.000033	0.000032	0.00008	0.000066
Vanadium (V)-Total	mg/L		<0.0010	<0.0010	<0.0010	<0.00080	<0.00090	<0.0010	<0.0010	0.0014	0.0011
Zinc (Zn)-Total	mg/L	0.03	0.0012	0.0027	0.0025	0.0021	0.0023	0.0014	<0.0010	0.0029	0.0021
Dissolved Metals											
Aluminum (Al)-Dissolved	mg/L	0.005-0.1[b]	0.0114	0.0555	0.0545	0.0807	0.0724	0.0036	0.0044	0.0507	0.0499
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.005	<0.00010	0.00024	0.00024	<0.00050	<0.00050	0.0002	0.00021	0.00029	0.00027
Barium (Ba)-Dissolved	mg/L		0.00106	0.00314	0.00323	0.00529	0.0053	0.00261	0.00259	0.00306	0.00301
Beryllium (Be)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.007	0.0157	0.016	0.0283	0.0289	0.0186	0.0186	0.0192	0.0183
Cadmium (Cd)-Dissolved	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Dissolved	mg/L		2.94	5.75	5.78	9.69	9.94	7.37	7.47	5.71	5.57
Chromium (Cr)-Dissolved	mg/L	0.001	<0.00010	0.00021	0.00021	<0.00050	0.00023	<0.00010	<0.00010	0.00013	0.00011
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002-0.004[c]	0.00059	0.00128	0.00125	0.00195	0.00195	0.00126	0.00126	0.00136	0.00131
Iron (Fe)-Dissolved	mg/L	0.3	0.036	0.205	0.202	0.269	0.265	0.022	0.023	0.246	0.256
Lead (Pb)-Dissolved	mg/L	0.001-0.007[d]	<0.000050	0.000081	0.000052	0.000073	0.000063	<0.000050	<0.000050	<0.000050	0.000053
Lithium (Li)-Dissolved	mg/L		<0.0050	<0.0050	<0.0050	0.0052	0.0055	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Dissolved	mg/L		2.05	4.78	4.67	8.86	8.94	5.36	5.35	5.27	5.1
Manganese (Mn)-Dissolved	mg/L		0.0084	0.00234	0.00179	0.02	0.0218	0.00356	0.00406	0.0106	0.0118
Mercury (Hg)-Dissolved	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	0.000072	0.000158	0.000146	0.000183	0.000203	0.000134	0.000125	0.000158	0.000147
Nickel (Ni)-Dissolved	mg/L	0.025-0.150[e]	0.00036	0.00127	0.00112	0.00112	0.00111	0.00031	0.00036	0.00055	0.00051
Phosphorus (P)-Dissolved	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		1	2.07	2.06	3.21	3.24	2.1	2.1	2.06	2
Selenium (Se)-Dissolved	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.00090	<0.00090	<0.0010	<0.0010	<0.0010	<0.0010
Silicon (Si)-Dissolved	mg/L		0.259	1.05	1.03	2.69	2.7	0.993	1.01	1.17	1.18
Silver (Ag)-Dissolved	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		9.35	23.2	23	44.5	44.9	27.7	27.9	27.6	27.5
Strontium (Sr)-Dissolved	mg/L		0.0162	0.0302	0.03	0.0535	0.0553	0.0333	0.0337	0.0312	0.0308
Thallium (Tl)-Dissolved	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.000015	0.000044	0.000042	0.000056	0.000057	0.000026	0.000028	0.000047	0.000048
Vanadium (V)-Dissolved	mg/L		<0.0010	<0.0010	<0.0010	<0.00030	0.00027	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	0.0011	0.0012	0.0012	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Windy Outflow	Windy Outflow	Glenn Outflow Downstream	Glenn Outflow Downstream	Koignuk River Upstream	Koignuk River Upstream	Koignuk River Midstream	Koignuk River Midstream	Koignuk River Downstream
Replicate			1	2	1	2	1	2	1	2	1
Date Sampled			21-Jun-09	21-Jun-09	21-Jun-09	21-Jun-09	21-Jun-09	21-Jun-09	21-Jun-09	21-Jun-09	21-Jun-09
ALS Sample ID			L783643-25	L783643-27	L783643-26	L783643-28	L783643-15	L783643-16	L783643-17	L783643-18	L783643-13
Physical Tests											
Conductivity	mS/cm		183	181	145	145	61.7	62	63.2	61.7	64.8
Hardness (as CaCO3)	mg/L		28.9	29.2	25.6	25.4	14.8	15.2	15.3	15.1	15.2
pH	pH	6.5-9.0	7.43	7.48	7.48	7.5	7.14	7.13	7.13	6.96	7.15
Total Suspended Solids	mg/L		<3.0	<3.0	193	198	57.5	36	35	32.5	37
Total Dissolved Solids	mg/L		97	93	90	95	50	45	46	47	43
Turbidity	NTU		5.08	5.23	211	218	37.4	33.7	28	26.7	27.3
Anions and Nutrients											
Alkalinity, Bicarbonate (as CaCO3)	mg/L		21.6	21.8	19.1	17.7	10.5	11.1	10.4	10.3	11.6
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		21.6	21.8	19.1	17.7	10.5	11.1	10.4	10.3	11.6
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	0.0071	0.005	<0.0050	<0.0050	0.0073	0.0087	0.0076	0.0069	0.0057
Bromide (Br)	mg/L		0.099	0.1	0.058	0.06	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	mg/L		38.4	38.4	27.2	27.3	9.8	9.8	10.1	10.1	10.4
Fluoride (F)	mg/L		0.034	0.034	0.033	0.033	0.022	0.022	0.022	0.022	0.023
Nitrate (as N)	mg/L	2.93	<0.0050	<0.0050	<0.0050	<0.0050	0.0148	0.0145	0.0141	0.0139	0.0141
Nitrite (as N)	mg/L	0.06	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.136	0.124	0.253	0.242	0.416	0.368	0.389	0.315	0.365
Ortho Phosphate as P	mg/L		<0.0010	<0.0010	0.0042	0.0033	0.0013	0.0013	<0.0010	<0.0010	<0.0010
Total Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.005	0.0044	0.0483	0.0585	0.0299	0.0297	0.0285	0.0316	0.0368
Sulfate (SO4)	mg/L		3.29	3.29	4.18	4.19	1.48	1.47	1.49	1.48	1.59
Organic / Inorganic Carbon											
Total Organic Carbon	mg/L		2.35	2.24	4.24	4.42	8.08	6.15	6.12	6.2	6.26
Total Metals											
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	0.192	0.178	3.9	2.58	0.898	1.43	0.826	0.867	0.937
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	0.00016	0.00016	0.00069	0.00068	0.00028	0.00036	0.00027	0.00029	0.00032
Barium (Ba)-Total	mg/L		0.00308	0.00287	0.0346	0.0272	0.0114	0.0156	0.0104	0.0108	0.0111
Beryllium (Be)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L		0.0176	0.0169	0.0222	0.0186	0.0054	0.0058	0.0065	0.0063	0.0062
Cadmium (Cd)-Total	mg/L	0.000017	<0.000010	<0.000010	0.00002	0.000019	<0.000010	0.000011	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L		5.25	5.22	6.33	5.37	3.73	3.94	3.87	3.87	3.88
Chromium (Cr)-Total	mg/L	0.001	0.00033	0.00028	0.00739	0.00636	0.0019	0.00387	0.00171	0.00191	0.00194
Cobalt (Co)-Total	mg/L		<0.00010	<0.00010	0.00236	0.00221	0.00058	0.00084	0.00049	0.00053	0.00055
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.00092	0.00089	0.00898	0.00852	0.0025	0.003	0.00236	0.00239	0.00248
Iron (Fe)-Total	mg/L	0.3	0.179	0.188	3.97	3.52	1.11	1.52	0.969	1.03	1.09
Lead (Pb)-Total	mg/L	0.001-0.007[d]	0.000079	0.000084	0.00204	0.00179	0.000466	0.000607	0.000366	0.000383	0.000436
Lithium (Li)-Total	mg/L		<0.0050	<0.0050	0.007	0.0058	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Total	mg/L		3.87	3.81	5.52	4.86	2.05	2.32	2.11	2.11	2.19
Manganese (Mn)-Total	mg/L		0.0038	0.00364	0.0633	0.0557	0.0337	0.0391	0.0322	0.0329	0.035
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	0.000258	0.000266	0.000266	0.000103	0.000193	0.000246	0.000072	0.000073	0.000086
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	0.00038	0.00035	0.00529	0.00477	0.00175	0.00343	0.00164	0.00171	0.00175

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Windy Outflow 1 21-Jun-09 L783643-25	Windy Outflow 2 21-Jun-09 L783643-27	Glenn Outflow Downstream 1 21-Jun-09 L783643-26	Glenn Outflow Downstream 2 21-Jun-09 L783643-28	Koignuk River Upstream 1 21-Jun-09 L783643-15	Koignuk River Upstream 2 21-Jun-09 L783643-16	Koignuk River Midstream 1 21-Jun-09 L783643-17	Koignuk River Midstream 2 21-Jun-09 L783643-18	Koignuk River Downstream 1 21-Jun-09 L783643-13
Phosphorus (P)-Total	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L		1.78	1.74	3.27	2.73	1.16	1.36	1.18	1.18	1.2
Selenium (Se)-Total	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon (Si)-Total	mg/L		0.769	0.851	7.38	3.95	2.23	3.26	2.16	2.21	2.31
Silver (Ag)-Total	mg/L	0.0001	<0.000010	<0.000010	0.000013	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		20.8	20.4	17.3	15	5.45	5.7	5.85	5.8	6.06
Strontium (Sr)-Total	mg/L		0.0243	0.0235	0.0329	0.0262	0.0172	0.0189	0.018	0.018	0.0178
Thallium (Tl)-Total	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		<0.010	0.01	0.184	0.117	0.043	0.066	0.035	0.041	0.042
Uranium (U)-Total	mg/L		0.000086	0.00008	0.000447	0.00039	0.000112	0.000133	0.000087	0.000091	0.000098
Vanadium (V)-Total	mg/L		<0.0010	<0.0010	0.0089	0.0079	0.0021	0.0031	0.0018	0.002	0.0021
Zinc (Zn)-Total	mg/L	0.03	<0.0010	<0.0010	0.013	0.0134	0.0041	0.005	0.0033	0.0037	0.0037
Dissolved Metals											
Aluminum (Al)-Dissolved	mg/L	0.005-0.1[b]	0.0376	0.043	0.106	0.131	0.0462	0.0624	0.0457	0.0409	0.074
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.005	0.00014	0.00013	0.00027	0.00028	0.00016	0.00017	0.00016	0.00016	0.00018
Barium (Ba)-Dissolved	mg/L		0.00148	0.00154	0.00178	0.00204	0.00212	0.00234	0.00241	0.00234	0.00264
Beryllium (Be)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.0188	0.0184	0.0157	0.0161	0.0047	0.005	0.0061	0.005	0.005
Cadmium (Cd)-Dissolved	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Dissolved	mg/L		5.27	5.29	4.83	4.78	3.27	3.39	3.38	3.36	3.36
Chromium (Cr)-Dissolved	mg/L	0.001	<0.00010	<0.00010	0.00018	0.00019	0.00014	0.00022	0.00013	0.00011	0.00017
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002-0.004[c]	0.00074	0.00076	0.00194	0.00187	0.00127	0.00138	0.00128	0.0013	0.00133
Iron (Fe)-Dissolved	mg/L	0.3	0.038	0.043	0.089	0.114	0.162	0.316	0.176	0.164	0.215
Lead (Pb)-Dissolved	mg/L	0.001-0.007[d]	<0.000050	<0.000050	0.000069	0.000076	0.000065	0.000065	0.000051	<0.000050	0.00006
Lithium (Li)-Dissolved	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Dissolved	mg/L		3.82	3.88	3.3	3.28	1.6	1.63	1.66	1.63	1.64
Manganese (Mn)-Dissolved	mg/L		0.000492	0.000415	0.00383	0.0044	0.00647	0.00538	0.00624	0.00377	0.005
Mercury (Hg)-Dissolved	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	0.000278	0.000287	0.000316	0.00029	0.000062	0.000059	0.000062	0.000056	0.000068
Nickel (Ni)-Dissolved	mg/L	0.025-0.150[e]	0.00028	0.00027	0.00082	0.00071	0.00064	0.00073	0.00067	0.00068	0.00078
Phosphorus (P)-Dissolved	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		1.74	1.75	1.58	1.62	0.791	0.823	0.811	0.81	0.803
Selenium (Se)-Dissolved	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon (Si)-Dissolved	mg/L		0.41	0.404	0.968	1.07	0.631	0.71	0.638	0.642	0.758
Silver (Ag)-Dissolved	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		20.8	20.6	15.1	15.4	5	5.14	5.3	5.27	5.3
Strontium (Sr)-Dissolved	mg/L		0.0241	0.024	0.0214	0.0217	0.0142	0.0145	0.0144	0.0145	0.0145
Thallium (Tl)-Dissolved	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.000069	0.00007	0.000134	0.000139	0.000038	0.000039	0.000039	0.000037	0.000038
Vanadium (V)-Dissolved	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Koignuk River Downstream	Reference Lake B Outflow	Reference Lake B Outflow	Reference Lake C Outflow	Reference Lake C Outflow	Angimajuq River Reference Site	Angimajuq River Reference Site	Patch Outflow	Patch Outflow
Replicate			**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**
Date Sampled			**21-Jun-09**	**21-Jun-09**	**21-Jun-09**	**21-Jun-09**	**21-Jun-09**	**21-Jun-09**	**21-Jun-09**	**18-Aug-09**	**18-Aug-09**
ALS Sample ID			**L783643-14**	**L783643-21**	**L783643-22**	**L783643-23**	**L783643-24**	**L783643-1**	**L783643-2**	**L807856-14**	**L807856-15**
Physical Tests											
Conductivity	mS/cm		64.7	57.3	57.5	46.7	46.6	39.9	38.6	324	325
Hardness (as CaCO3)	mg/L		15.1	15.5	15.7	12	11.9	9.22	9	63.7	62.1
pH	pH	6.5-9.0	7.15	7.13	7.11	7.04	7.03	7.32	7.07	7.52	7.53
Total Suspended Solids	mg/L		40	<3.0	<3.0	<3.0	<3.0	16.5	17	<3.0	<3.0
Total Dissolved Solids	mg/L		47	34	41	30	29	27	28	190	184
Turbidity	NTU		26.4	0.6	0.57	0.67	0.69	9.17	10.8	2.64	2.7
Anions and Nutrients											
Alkalinity, Bicarbonate (as CaCO3)	mg/L		11.2	11.7	12.3	10	9.6	5.9	5.7	33.5	33.6
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		11.2	11.7	12.3	10	9.6	5.9	5.7	33.5	33.6
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	0.0055	0.0111	0.0059	<0.0050	<0.0050	0.007	0.0069	<0.0050	<0.0050
Bromide (Br)	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.191	0.192
Chloride (Cl)	mg/L		10.4	7.72	7.7	6.04	6.03	5.79	5.78	77.9	77
Fluoride (F)	mg/L		0.023	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.047	0.045
Nitrate (as N)	mg/L	2.93	0.0134	0.0138	0.0138	0.0216	0.0228	0.012	0.0105	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.421	0.258	0.256	0.17	0.168	0.308	0.299	0.183	0.188
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 Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.0222	0.0068	0.0028	<0.0020	0.0024	0.0162	0.0235	0.0049	0.005
Sulfate (SO4)	mg/L		1.58	1.63	1.65	1.45	1.46	0.98	0.98	2.28	2.25
Organic / Inorganic Carbon											
Total Organic Carbon	mg/L		6.09	4.13	4.02	2.77	2.77	4.77	5.22	3.73	3.76
Total Metals											
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	1.02	0.0145	0.0174	0.0188	0.0163	0.439	0.416	0.0982	0.0943
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	0.00032	0.000086	0.000079	0.000064	0.00006	0.000121	0.000119	0.00026	0.00025
Barium (Ba)-Total	mg/L		0.012	0.00262	0.00262	0.00193	0.00181	0.00697	0.0068	0.00352	0.00361
Beryllium (Be)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L		0.0061	0.0053	0.0043	0.0057	0.0067	0.0053	0.0047	0.0217	0.0224
Cadmium (Cd)-Total	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L		3.87	3.71	3.79	2.79	2.75	2.18	2.11	11.8	11.8
Chromium (Cr)-Total	mg/L	0.001	0.00218	<0.00010	<0.00010	<0.00010	<0.00010	0.00099	0.00087	0.00028	0.00032
Cobalt (Co)-Total	mg/L		0.00059	<0.00010	<0.00010	<0.00010	<0.00010	0.00035	0.00035	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.00259	0.00082	0.00084	0.00164	0.00155	0.00138	0.00135	0.00099	0.00101
Iron (Fe)-Total	mg/L	0.3	1.2	0.068	0.063	0.038	0.036	0.621	0.599	0.082	0.083
Lead (Pb)-Total	mg/L	0.001-0.007[d]	0.000442	<0.000050	<0.000050	<0.000050	<0.000050	0.000278	0.000205	<0.000050	<0.000050
Lithium (Li)-Total	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0054
Magnesium (Mg)-Total	mg/L		2.2	1.39	1.42	1.18	1.15	1.37	1.3	8.01	7.96
Manganese (Mn)-Total	mg/L		0.0355	0.00888	0.00939	0.00537	0.00528	0.0278	0.0271	0.00377	0.00376
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	0.000113	<0.000050	<0.000050	<0.000050	<0.000050	0.000089	0.000082	0.000143	0.000146
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	0.00201	0.00019	0.00023	0.0002	0.00019	0.00095	0.00089	0.00047	0.00049

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Koignuk River Downstream	Reference Lake B Outflow	Reference Lake B Outflow	Reference Lake C Outflow	Reference Lake C Outflow	Angimajuq River Reference Site	Angimajuq River Reference Site	Patch Outflow	Patch Outflow
Replicate			**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**
Date Sampled			**21-Jun-09**	**21-Jun-09**	**21-Jun-09**	**21-Jun-09**	**21-Jun-09**	**21-Jun-09**	**21-Jun-09**	**18-Aug-09**	**18-Aug-09**
ALS Sample ID			**L783643-14**	**L783643-21**	**L783643-22**	**L783643-23**	**L783643-24**	**L783643-1**	**L783643-2**	**L807856-14**	**L807856-15**
Phosphorus (P)-Total	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L		1.21	0.57	0.576	0.489	0.48	0.852	0.818	2.78	2.78
Selenium (Se)-Total	mg/L	0.001	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010
Silicon (Si)-Total	mg/L		2.58	0.257	0.264	0.396	0.403	1.2	1.23	0.392	0.389
Silver (Ag)-Total	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		5.86	3.97	3.97	3.56	3.52	3.32	3.27	35.8	35.9
Strontium (Sr)-Total	mg/L		0.018	0.0177	0.0182	0.0146	0.0146	0.012	0.0115	0.069	0.0687
Thallium (Tl)-Total	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		0.048	<0.010	<0.010	<0.010	<0.010	0.017	0.018	<0.010	<0.010
Uranium (U)-Total	mg/L		0.000102	0.000043	0.000044	0.000083	0.000081	0.000063	0.000069	0.000063	0.000061
Vanadium (V)-Total	mg/L		0.0023	0.000089	<0.000050	<0.000050	<0.000050	0.00101	0.000937	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	0.03	0.004	<0.0010	<0.0010	<0.0010	<0.0010	0.0025	0.0023	<0.0010	<0.0010
Dissolved Metals											
Aluminum (Al)-Dissolved	mg/L	0.005-0.1[b]	0.0485	0.0084	0.0086	0.0087	0.0083	0.0256	0.025	0.019	0.0178
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.005	0.00017	0.000078	0.00007	0.000051	0.000051	0.000073	0.000076	0.00025	0.00026
Barium (Ba)-Dissolved	mg/L		0.00231	0.00252	0.00255	0.00177	0.00172	0.00248	0.00245	0.00283	0.00275
Beryllium (Be)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.0049	0.005	0.0044	0.006	0.0062	0.0041	0.0036	0.0235	0.023
Cadmium (Cd)-Dissolved	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Dissolved	mg/L		3.36	3.86	3.89	2.84	2.82	1.88	1.84	12	11.7
Chromium (Cr)-Dissolved	mg/L	0.001	0.00014	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0002	0.00017
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002-0.004[c]	0.00136	0.00082	0.00084	0.00151	0.00148	0.00083	0.00082	0.00092	0.00093
Iron (Fe)-Dissolved	mg/L	0.3	0.167	0.03	0.03	0.013	<0.010	0.141	0.139	<0.010	<0.010
Lead (Pb)-Dissolved	mg/L	0.001-0.007[d]	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0053	0.0053
Magnesium (Mg)-Dissolved	mg/L		1.64	1.42	1.46	1.19	1.19	1.1	1.07	8.21	7.97
Manganese (Mn)-Dissolved	mg/L		0.00433	0.00326	0.00322	0.00157	0.00142	0.00393	0.00499	0.000136	0.000129
Mercury (Hg)-Dissolved	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	0.000063	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000154	0.000134
Nickel (Ni)-Dissolved	mg/L	0.025-0.150[e]	0.00068	0.00024	0.00027	0.00023	0.00021	0.00049	0.00048	0.00043	0.00041
Phosphorus (P)-Dissolved	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		0.796	0.582	0.602	0.502	0.492	0.641	0.624	2.79	2.71
Selenium (Se)-Dissolved	mg/L	0.001	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010
Silicon (Si)-Dissolved	mg/L		0.698	0.229	0.235	0.358	0.35	0.393	0.387	0.179	0.175
Silver (Ag)-Dissolved	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		5.3	4.04	4.12	3.64	3.64	3	3.01	36.7	36.1
Strontium (Sr)-Dissolved	mg/L		0.0143	0.0181	0.0186	0.0147	0.0146	0.0099	0.00978	0.0693	0.0676
Thallium (Tl)-Dissolved	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.000038	0.000041	0.00004	0.000075	0.000075	0.00003	0.000031	0.000061	0.000056
Vanadium (V)-Dissolved	mg/L		<0.0010	<0.000050	<0.000050	<0.000050	<0.000050	0.000085	0.000084	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	<0.0010	<0.0010

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	P.O. Outflow 1 18-Aug-09 L807856-12	P.O. Outflow 2 18-Aug-09 L807856-13	Ogama Outflow 1 18-Aug-09 L807856-10	Ogama Outflow 2 18-Aug-09 L807856-11	Doris Outflow 1 18-Aug-09 L807856-1	Doris Outflow 2 18-Aug-09 L807856-2	Little Roberts Outflow 1 18-Aug-09 L807856-3	Little Roberts Outflow 2 18-Aug-09 L807856-4	Windy Outflow 1 18-Aug-09 L807856-8
Physical Tests											
Conductivity	mS/cm		293	293	236	236	260	260	252	252	424
Hardness (as CaCO3)	mg/L		54.5	40.3	42	55	46.7	45.8	44.4	44.6	70.6
pH	pH	6.5-9.0	7.42	7.45	7.31	7.24	7.15	7.24	7.2	7.24	7.61
Total Suspended Solids	mg/L		3.3	3.3	4.3	5.3	<3.0	5.3	3.3	4.3	<3.0
Total Dissolved Solids	mg/L		167	165	135	137	156	148	142	156	211
Turbidity	NTU		6.23	6.32	6.2	6.17	6.88	6.04	4.36	4.35	1.35
Anions and Nutrients											
Alkalinity, Bicarbonate (as CaCO3)	mg/L		29.3	29.4	22.7	22.1	26.6	26.9	25	25	47.1
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		29.3	29.4	22.7	22.1	26.6	26.9	25	25	47.1
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0064	0.0067	<0.0050
Bromide (Br)	mg/L		0.17	0.184	0.161	0.154	0.159	0.17	0.174	0.179	0.3
Chloride (Cl)	mg/L		70.6	70.5	56.6	56.3	61.1	61.2	59.6	59.8	96.1
Fluoride (F)	mg/L		0.042	0.044	0.041	0.04	0.037	0.037	0.036	0.037	0.062
Nitrate (as N)	mg/L	2.93	<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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.175	0.179	0.439	0.454	0.558	0.498	0.388	0.357	0.11
Ortho Phosphate as P	mg/L		0.0015	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.0077	0.0068	0.0207	0.0214	0.029	0.026	0.0185	0.0191	0.0039
Sulfate (SO4)	mg/L		2.05	2.05	1.73	1.72	2.54	2.53	3.32	3.33	7.72
Organic / Inorganic Carbon											
Total Organic Carbon	mg/L		3.54	3.58	5.46	5.37	5.94	5.99	5.38	5.6	1.99
Total Metals											
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	0.241	0.164	0.172	0.214	0.0771	0.067	0.0676	0.0661	0.0476
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	<0.00030	0.00035	0.00037	<0.00042	0.00039	0.00038	0.00033	0.00042	<0.00042
Barium (Ba)-Total	mg/L		0.00417	0.00427	0.00432	0.004	0.00367	0.00348	0.00327	0.00327	0.00244
Beryllium (Be)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L		0.0252	0.0202	0.0205	0.025	0.0235	0.0226	0.0239	0.0243	0.0457
Cadmium (Cd)-Total	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L		10.3	7.05	7.26	10.3	8.54	8.38	7.49	7.46	12.6
Chromium (Cr)-Total	mg/L	0.001	0.00054	0.00047	0.00049	0.00049	0.00028	0.00029	0.00027	0.00024	0.00031
Cobalt (Co)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.00135	0.00174	0.00154	0.00119	0.00164	0.00158	0.00161	0.00173	0.0009
Iron (Fe)-Total	mg/L	0.3	0.182	0.195	0.195	0.173	0.202	0.166	0.151	0.148	0.072
Lead (Pb)-Total	mg/L	0.001-0.007[d]	0.000091	0.000061	0.000068	0.000086	0.000094	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Total	mg/L		0.0053	<0.0050	<0.0050	0.0054	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Total	mg/L		7.64	6.34	6.47	7.65	6.68	6.6	6.56	6.52	9.82
Manganese (Mn)-Total	mg/L		0.00638	0.0147	0.0152	0.00615	0.0201	0.0186	0.0115	0.0114	0.00265
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	0.000197	0.000175	0.000169	0.000209	0.000142	0.000134	0.000166	0.000156	0.000638
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	0.00059	0.0008	0.00082	0.00057	0.00053	0.0006	0.00059	0.0006	0.00029

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	P.O. Outflow	P.O. Outflow	Ogama Outflow	Ogama Outflow	Doris Outflow	Doris Outflow	Little Roberts Outflow	Little Roberts Outflow	Windy Outflow
Replicate			**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**
Date Sampled			**18-Aug-09**	**18-Aug-09**	**18-Aug-09**	**18-Aug-09**	**18-Aug-09**	**18-Aug-09**	**18-Aug-09**	**18-Aug-09**	**18-Aug-09**
ALS Sample ID			**L807856-12**	**L807856-13**	**L807856-10**	**L807856-11**	**L807856-1**	**L807856-2**	**L807856-3**	**L807856-4**	**L807856-8**
Phosphorus (P)-Total	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L		2.56	2.15	2.19	2.55	2.34	2.31	2.18	2.18	3.87
Selenium (Se)-Total	mg/L	0.001	<0.00070	0.00078	<0.0010	<0.00070	<0.0010	<0.0010	<0.0010	<0.0010	<0.00090
Silicon (Si)-Total	mg/L		0.68	1.05	1.07	0.638	1.08	1.07	0.886	0.887	0.337
Silver (Ag)-Total	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		35.7	30.1	31	35.4	32.5	32.1	32.1	31.9	53
Strontium (Sr)-Total	mg/L		0.0611	0.0401	0.0408	0.0611	0.0435	0.0426	0.0415	0.041	0.0601
Thallium (Tl)-Total	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Total	mg/L		0.000065	0.000045	0.000049	0.000068	0.000037	0.000035	0.000036	0.000039	0.000191
Vanadium (V)-Total	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	0.03	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Metals											
Aluminum (Al)-Dissolved	mg/L	0.005-0.1[b]	0.0453	0.0341	0.0341	0.0446	0.005	0.0042	0.0175	0.0118	0.0052
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.005	<0.00030	0.0003	0.00029	<0.00030	0.00027	0.00036	0.00027	0.00038	<0.00042
Barium (Ba)-Dissolved	mg/L		0.00229	0.0025	0.00259	0.00223	0.00272	0.00263	0.00259	0.00258	0.00201
Beryllium (Be)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.0225	0.0172	0.0184	0.0228	0.0219	0.0209	0.0221	0.0222	0.044
Cadmium (Cd)-Dissolved	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Dissolved	mg/L		9.85	6.57	6.81	9.96	8.18	8	7.35	7.39	12.3
Chromium (Cr)-Dissolved	mg/L	0.001	0.00017	<0.00050	0.00021	0.00017	0.00013	0.00012	<0.00050	0.00012	<0.00050
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002-0.004[c]	0.00096	0.00114	0.00116	0.00095	0.00126	0.00129	0.00139	0.00123	0.00067
Iron (Fe)-Dissolved	mg/L	0.3	0.02	0.038	0.038	0.018	0.022	0.019	0.037	0.035	0.013
Lead (Pb)-Dissolved	mg/L	0.001-0.007[d]	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Dissolved	mg/L		7.27	5.8	6.07	7.33	6.39	6.26	6.33	6.34	9.7
Manganese (Mn)-Dissolved	mg/L		0.000163	0.000419	0.00029	0.000173	0.000132	0.000174	0.000361	0.000211	0.000268
Mercury (Hg)-Dissolved	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	0.000173	0.000124	0.000138	0.000195	0.000122	0.000129	0.000149	0.000144	0.000614
Nickel (Ni)-Dissolved	mg/L	0.025-0.150[e]	0.00039	0.00055	0.00063	0.00037	0.00028	0.0003	0.00049	0.00044	0.00017
Phosphorus (P)-Dissolved	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		2.41	1.95	2.01	2.42	2.21	2.16	2.09	2.08	3.79
Selenium (Se)-Dissolved	mg/L	0.001	<0.00050	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.00070
Silicon (Si)-Dissolved	mg/L		0.301	0.781	0.771	0.3	0.914	0.909	0.75	0.745	0.248
Silver (Ag)-Dissolved	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		33.9	27.8	29	34	31.3	30.5	31.2	30.9	53.2
Strontium (Sr)-Dissolved	mg/L		0.0573	0.0365	0.0377	0.0573	0.0408	0.0403	0.0398	0.0401	0.0584
Thallium (Tl)-Dissolved	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.000056	0.000034	0.000039	0.00006	0.000026	0.000025	0.000031	0.000031	0.000178
Vanadium (V)-Dissolved	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020	<0.0020	<0.0020	<0.0020

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Windy Outflow 2 18-Aug-09 L807856-9	Glenn Outflow Downstream 1 18-Aug-09 L807856-6	Glenn Outflow Downstream 2 18-Aug-09 L807856-7	Koignuk River Upstream 1 21-Aug-09 L809215-9	Koignuk River Upstream 2 21-Aug-09 L809215-10	Koignuk River Midstream 1 22-Aug-09 L809215-7	Koignuk River Midstream 2 22-Aug-09 L809215-8	Koignuk River Downstream 1 21-Aug-09 L809215-11	Koignuk River Downstream 2 21-Aug-09 L809215-12
Physical Tests											
Conductivity	mS/cm		423	447	443	63.4	61.5	73.1	75.6	62.6	62.5
Hardness (as CaCO3)	mg/L		70.6	79.9	78.1	16.4	16.2	17.5	18.3	16.2	16.8
pH	pH	6.5-9.0	7.63	7.54	7.64	6.97	6.96	7	7.01	7	7.01
Total Suspended Solids	mg/L		<3.0	28.3	25.3	9	4.5	3	4	<3.0	<3.0
Total Dissolved Solids	mg/L		224	254	256	38	38	44	43	39	39
Turbidity	NTU		1.32	62.3	61.5	7.64	3.92	3.05	3.09	3.76	3.62
Anions and Nutrients											
Alkalinity, Bicarbonate (as CaCO3)	mg/L		47.4	47.9	48.5	9.2	10.2	9.3	9.5	9	9.7
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		47.4	47.9	48.5	9.2	10.2	9.3	9.5	9	9.7
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromide (Br)	mg/L		0.295	0.304	0.302	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	mg/L		95.1	98.4	97.5	11	10.6	13.7	14.1	10.5	10.5
Fluoride (F)	mg/L		0.062	0.058	0.059	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Nitrate (as N)	mg/L	2.93	<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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.111	0.244	0.25	0.255	0.27	<0.050	0.252	0.245	0.27
Ortho Phosphate as P	mg/L		<0.0010	0.0016	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.0039	0.038	0.036	0.0107	0.0085	0.0073	0.0077	0.0079	0.0084
Sulfate (SO4)	mg/L		7.66	14.4	14.2	2.24	1.99	2.2	2.22	1.85	1.81
Organic / Inorganic Carbon											
Total Organic Carbon	mg/L		1.97	4.59	4.76	4.54	4.41	4.56	4.48	4.52	4.53
Total Metals											
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	0.0459	2.62	0.983	0.171	0.302	0.108	0.146	0.142	0.141
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	<0.00042	<0.00081	<0.00060	0.00018	0.00021	0.00014	0.00015	0.00017	0.00017
Barium (Ba)-Total	mg/L		0.00238	0.0266	0.012	0.00319	0.00448	0.00318	0.00327	0.00301	0.00303
Beryllium (Be)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L		0.0433	0.044	0.0416	0.0058	0.0104	0.0048	0.0083	0.0048	0.0045
Cadmium (Cd)-Total	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L		12.2	14.5	14.1	3.03	3.75	3.23	3.63	3.08	3.2
Chromium (Cr)-Total	mg/L	0.001	0.00032	0.00474	0.00236	<0.00050	0.0008	<0.00050	0.00054	<0.00050	<0.00050
Cobalt (Co)-Total	mg/L		<0.00010	0.00103	0.00066	<0.00010	0.00015	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.00081	0.00519	0.00484	0.00118	0.0016	0.00118	0.00135	0.00128	0.00124
Iron (Fe)-Total	mg/L	0.3	0.069	2.34	1.47	0.209	0.316	0.167	0.18	0.204	0.226
Lead (Pb)-Total	mg/L	0.001-0.007[d]	<0.000050	0.000852	0.000591	0.00007	0.00011	<0.000050	0.000057	0.000095	0.000063
Lithium (Li)-Total	mg/L		<0.0050	0.0067	0.0058	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Total	mg/L		9.77	11.6	11.4	1.89	2.49	2.3	2.38	1.9	1.93
Manganese (Mn)-Total	mg/L		0.00257	0.032	0.0221	0.00662	0.00983	0.0109	0.00979	0.00628	0.00631
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	0.000635	0.000682	0.000423	<0.000050	0.000063	<0.000050	0.000067	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	0.00029	0.00339	0.00233	0.0006	0.00087	0.00057	0.00061	0.00055	0.00055

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name	**Units**	**CCME Guidelines for the Protection of Freshwater Aquatic Life[a]**	**Windy Outflow**	**Glenn Outflow Downstream**	**Glenn Outflow Downstream**	**Koignuk River Upstream**	**Koignuk River Upstream**	**Koignuk River Midstream**	**Koignuk River Midstream**	**Koignuk River Downstream**	**Koignuk River Downstream**
Replicate			**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**
Date Sampled			**18-Aug-09**	**18-Aug-09**	**18-Aug-09**	**21-Aug-09**	**21-Aug-09**	**22-Aug-09**	**22-Aug-09**	**21-Aug-09**	**21-Aug-09**
ALS Sample ID			**L807856-9**	**L807856-6**	**L807856-7**	**L809215-9**	**L809215-10**	**L809215-7**	**L809215-8**	**L809215-11**	**L809215-12**
Phosphorus (P)-Total	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L		3.75	4.76	4.23	0.632	0.811	0.637	0.708	0.618	0.623
Selenium (Se)-Total	mg/L	0.001	<0.00090	0.00051	<0.00080	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon (Si)-Total	mg/L		0.331	6.83	2.94	0.643	0.813	0.597	0.511	0.712	0.684
Silver (Ag)-Total	mg/L	0.0001	<0.000010	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	0.000017	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		51.1	53	56.6	5.66	8.32	7.17	6.98	5.43	5.54
Strontium (Sr)-Total	mg/L		0.0587	0.0729	0.0735	0.0138	0.018	0.0162	0.0171	0.014	0.0146
Thallium (Tl)-Total	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		<0.010	0.138	0.076	<0.010	0.011	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Total	mg/L		0.000187	0.0004	0.000383	0.000026	0.000041	0.000027	0.000031	0.000032	0.00003
Vanadium (V)-Total	mg/L		<0.0010	0.00531	<0.0040	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	0.03	<0.0010	0.0064	0.0053	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Metals											
Aluminum (Al)-Dissolved	mg/L	0.005-0.1[b]	0.0046	0.122	0.117	0.0331	0.0339	0.0279	0.0275	0.0296	0.0306
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.005	<0.00042	<0.00042	<0.00051	0.00015	0.00015	0.00013	0.00013	0.00015	0.00015
Barium (Ba)-Dissolved	mg/L		0.00203	0.00398	0.00389	0.0018	0.00187	0.00206	0.00209	0.00179	0.0018
Beryllium (Be)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.0426	0.0433	0.042	0.007	0.0077	0.0061	0.006	0.006	0.0059
Cadmium (Cd)-Dissolved	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Dissolved	mg/L		12.3	13.7	13.6	3.19	3.11	3.29	3.4	3.26	3.4
Chromium (Cr)-Dissolved	mg/L	0.001	<0.00050	0.00028	<0.00050	0.00016	0.00015	0.00018	0.00019	0.00015	<0.00050
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002-0.004[c]	0.00068	0.0029	0.00281	0.00112	0.00117	0.00112	0.00108	0.0011	0.00112
Iron (Fe)-Dissolved	mg/L	0.3	0.013	0.073	0.071	0.051	0.05	0.045	0.042	0.044	0.046
Lead (Pb)-Dissolved	mg/L	0.001-0.007[d]	<0.000050	0.00006	0.000056	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Dissolved	mg/L		9.69	11.1	10.7	2.04	2.04	2.26	2.38	1.96	2.01
Manganese (Mn)-Dissolved	mg/L		0.000271	0.00306	0.00397	0.000462	0.00053	0.000605	0.000753	0.000369	0.000432
Mercury (Hg)-Dissolved	mg/L	0.000026	0.000019	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	0.000671	0.000666	0.000667	<0.000050	0.000052	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.025-0.150[e]	0.00022	0.00097	0.00094	0.00055	0.00049	0.00052	0.00055	0.00047	0.00049
Phosphorus (P)-Dissolved	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		3.8	3.86	3.75	0.632	0.629	0.627	0.631	0.601	0.619
Selenium (Se)-Dissolved	mg/L	0.001	<0.00080	<0.00050	<0.00080	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon (Si)-Dissolved	mg/L		0.246	1.47	1.45	0.298	0.311	0.295	0.293	0.313	0.31
Silver (Ag)-Dissolved	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		51.2	54.5	52	6.42	7.07	6.99	7.55	5.63	5.82
Strontium (Sr)-Dissolved	mg/L		0.0589	0.0726	0.0715	0.0145	0.0144	0.0161	0.0163	0.0144	0.0148
Thallium (Tl)-Dissolved	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.000187	0.000311	0.000301	0.000025	0.000025	0.000022	0.000021	0.000026	0.000023
Vanadium (V)-Dissolved	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	<0.0010	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010	0.0011	0.0012	<0.0010

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Reference Lake A Outflow 1 23-Aug-09 L809215-1	Reference Lake A Outflow 2 23-Aug-09 L809215-2	Reference Lake B Outflow 1 23-Aug-09 L809215-3	Reference Lake B Outflow 2 23-Aug-09 L809215-4	Angimajuq River Reference Site 1 23-Aug-09 L809215-5	Angimajuq River Reference Site 2 23-Aug-09 L809215-6	Patch Outflow 1 14-Sep-09 L818985-17	Patch Outflow 2 14-Sep-09 L818985-18	P.O. Outflow 1 14-Sep-09 L818985-21
Physical Tests											
Conductivity	mS/cm		93.9	92.6	44.8	45	46.1	45.7	331	332	314
Hardness (as CaCO3)	mg/L		19.8	19.3	13.1	13.3	11.7	11.5	63.5	65	57.9
pH	pH	6.5-9.0	7.59	7.22	7.06	7.02	6.87	6.84	7.89	7.91	7.83
Total Suspended Solids	mg/L		<3.0	3	<3.0	<3.0	<3.0	<3.0	6.2	3.2	25.7
Total Dissolved Solids	mg/L		48	50	24	25	29	29	186	180	201
Turbidity	NTU		0.75	0.76	0.37	0.36	1.3	1.24	6.01	6.14	54.8
Anions and Nutrients											
Alkalinity, Bicarbonate (as CaCO3)	mg/L		12.1	12.4	9.2	8.9	6.6	6.6	34.8	34.9	31.3
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		12.1	12.4	9.2	8.9	6.6	6.6	34.8	34.9	31.3
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromide (Br)	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.154	0.153	0.145
Chloride (Cl)	mg/L		17.9	17.7	6.16	6.23	7.66	7.54	78.3	78.4	74.6
Fluoride (F)	mg/L		0.025	0.025	<0.020	<0.020	<0.020	<0.020	0.06	0.061	0.061
Nitrate (as N)	mg/L	2.93	0.0068	0.0069	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.147	0.151	0.156	0.172	0.222	0.228	0.247	0.244	0.277
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 Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.0037	0.0043	0.0032	0.0027	0.004	0.004	0.0072	0.0067	0.04
Sulfate (SO4)	mg/L		2.45	2.44	1.37	1.36	1.45	1.43	2.57	2.61	2.61
Organic / Inorganic Carbon											
Total Organic Carbon	mg/L		2.67	2.75	2.59	2.62	4.37	4.05	3.86	3.95	4.76
Total Metals											
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	0.031	0.0281	0.0069	0.0062	0.0435	0.0473	0.209	0.247	2.13
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	<0.00010	<0.00010	0.000069	0.000062	<0.00010	<0.00010	<0.00051	<0.00051	0.00058
Barium (Ba)-Total	mg/L		0.00195	0.00188	0.00132	0.00134	0.00233	0.00237	0.00495	0.00523	0.0207
Beryllium (Be)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L		0.0134	0.0122	0.0036	0.004	0.0041	0.0068	0.0291	0.0301	0.0335
Cadmium (Cd)-Total	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L		2.83	2.69	2.97	3.01	2.06	2.28	12.4	12.3	11.2
Chromium (Cr)-Total	mg/L	0.001	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0007	0.0008	0.00421
Cobalt (Co)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00084
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.00117	0.00116	0.00071	0.00073	0.00106	0.0012	0.0012	0.00124	0.00276
Iron (Fe)-Total	mg/L	0.3	0.036	0.036	0.038	0.038	0.166	0.175	0.198	0.226	1.94
Lead (Pb)-Total	mg/L	0.001-0.007[d]	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000087	0.000098	0.000733
Lithium (Li)-Total	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0053	0.0053	0.0072
Magnesium (Mg)-Total	mg/L		2.91	2.81	1.26	1.26	1.53	1.67	8.63	8.79	9.23
Manganese (Mn)-Total	mg/L		0.00193	0.00182	0.00241	0.00224	0.00235	0.00261	0.00686	0.00701	0.0304
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000178	0.000199	0.000286
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	0.00028	0.00026	0.00012	0.00016	0.00041	0.0005	0.00062	0.00072	0.00264

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Reference Lake A Outflow	Reference Lake A Outflow	Reference Lake B Outflow	Reference Lake B Outflow	Angimajuq River Reference Site	Angimajuq River Reference Site	Patch Outflow	Patch Outflow	P.O. Outflow
Replicate			**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**
Date Sampled			**23-Aug-09**	**23-Aug-09**	**23-Aug-09**	**23-Aug-09**	**23-Aug-09**	**23-Aug-09**	**14-Sep-09**	**14-Sep-09**	**14-Sep-09**
ALS Sample ID			**L809215-1**	**L809215-2**	**L809215-3**	**L809215-4**	**L809215-5**	**L809215-6**	**L818985-17**	**L818985-18**	**L818985-21**
Phosphorus (P)-Total	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L		0.966	0.937	0.42	0.422	0.522	0.578	2.93	2.95	3.28
Selenium (Se)-Total	mg/L	0.001	<0.0010	<0.0010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon (Si)-Total	mg/L		0.262	0.263	0.085	0.089	0.23	0.196	0.534	0.641	4.63
Silver (Ag)-Total	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000012	0.000011	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		10	9.9	3.29	3.29	4.04	4.38	39	40.2	40.3
Strontium (Sr)-Total	mg/L		0.0156	0.0149	0.0147	0.0143	0.0113	0.0124	0.0718	0.0693	0.0648
Thallium (Tl)-Total	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	0.012	0.102
Uranium (U)-Total	mg/L		0.000044	0.000046	0.00003	0.000031	0.000029	0.000036	0.000075	0.000075	0.000163
Vanadium (V)-Total	mg/L		<0.0010	<0.0010	<0.000050	<0.000050	<0.0010	<0.0010	<0.0010	<0.0010	0.0042
Zinc (Zn)-Total	mg/L	0.03	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0017	0.001	0.0052
Dissolved Metals											
Aluminum (Al)-Dissolved	mg/L	0.005-0.1[b]	0.0065	0.0064	0.003	0.0053	0.0117	0.0111	0.0272	0.0266	0.145
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.005	<0.00010	<0.00010	0.000054	0.000058	<0.00010	<0.00010	<0.00048	<0.00048	<0.00048
Barium (Ba)-Dissolved	mg/L		0.00171	0.00175	0.0013	0.00136	0.002	0.0021	0.00357	0.00324	0.00376
Beryllium (Be)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.014	0.0148	<0.0060	<0.0050	<0.0060	<0.0050	0.0271	0.0292	0.0282
Cadmium (Cd)-Dissolved	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Dissolved	mg/L		2.96	2.87	3.11	3.17	2.11	2.06	11.8	11.9	10.2
Chromium (Cr)-Dissolved	mg/L	0.001	0.00018	0.00014	0.00016	0.00016	0.00022	0.00021	0.00027	<0.00050	<0.00050
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002-0.004[c]	0.00093	0.001	0.00066	0.00061	0.00094	0.00094	0.00092	0.00097	0.00114
Iron (Fe)-Dissolved	mg/L	0.3	<0.010	<0.010	<0.010	<0.010	0.047	0.047	0.011	<0.010	0.087
Lead (Pb)-Dissolved	mg/L	0.001-0.007[d]	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000064
Lithium (Li)-Dissolved	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0051	0.0051	<0.0050
Magnesium (Mg)-Dissolved	mg/L		3.02	2.95	1.3	1.31	1.57	1.54	8.29	8.56	7.88
Manganese (Mn)-Dissolved	mg/L		0.000086	0.000085	0.000152	0.000194	0.000326	0.000323	0.00046	0.000179	0.00101
Mercury (Hg)-Dissolved	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000189	0.000183	0.00026
Nickel (Ni)-Dissolved	mg/L	0.025-0.150[e]	0.00023	0.00025	0.00013	0.00015	0.0004	0.00039	0.00045	0.0004	0.00051
Phosphorus (P)-Dissolved	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		1	0.978	0.447	0.448	0.526	0.511	2.78	2.83	2.42
Selenium (Se)-Dissolved	mg/L	0.001	<0.0010	<0.0010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon (Si)-Dissolved	mg/L		0.191	0.188	0.073	0.079	0.144	0.136	0.196	0.189	0.621
Silver (Ag)-Dissolved	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		10.5	10.4	3.48	3.48	4.12	4.03	38.3	39.2	35
Strontium (Sr)-Dissolved	mg/L		0.0158	0.0158	0.0151	0.0157	0.0112	0.011	0.067	0.0654	0.0558
Thallium (Tl)-Dissolved	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.000039	0.000036	0.000023	0.000024	0.000029	0.000028	0.000063	0.000064	0.000062
Vanadium (V)-Dissolved	mg/L		<0.0010	<0.0010	<0.000050	<0.000050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	P.O. Outflow 2 14-Sep-09 L818985-22	Ogama Outflow 1 15-Sep-09 L818985-19	Ogama Outflow 2 15-Sep-09 L818985-20	Doris Outflow 1 15-Sep-09 L818985-15	Doris Outflow 2 15-Sep-09 L818985-16	Little Roberts Outflow 1 14-Sep-09 L818985-5	Little Roberts Outflow 2 14-Sep-09 L818985-6	Windy Outflow 1 15-Sep-09 L818985-11	Windy Outflow 2 15-Sep-09 L818985-12
Physical Tests											
Conductivity	mS/cm		315	254	250	261	262	259	262	419	421
Hardness (as CaCO3)	mg/L		57.5	45.3	44.8	46.1	46.3	45.4	46.3	68.6	71.2
pH	pH	6.5-9.0	7.83	7.74	7.73	7.72	7.76	7.68	7.68	7.94	7.98
Total Suspended Solids	mg/L		28.7	7.7	6.7	7.2	6.2	4.2	3.7	<3.0	<3.0
Total Dissolved Solids	mg/L		184	144	143	152	150	145	147	221	223
Turbidity	NTU		53.4	9.64	9.85	6.45	6.32	4.61	4.87	2.85	4
Anions and Nutrients											
Alkalinity, Bicarbonate (as CaCO3)	mg/L		31.3	25.3	25.4	27.3	27.4	26.2	26	48	47.7
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		31.3	25.3	25.4	27.3	27.4	26.2	26	48	47.7
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	<0.0050	0.0058	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromide (Br)	mg/L		0.146	0.12	0.117	0.121	0.122	0.108	0.115	0.235	0.223
Chloride (Cl)	mg/L		75.4	59.1	58.6	61.8	61.6	55.6	60.9	95.3	95.2
Fluoride (F)	mg/L		0.061	0.055	0.055	0.053	0.052	0.046	0.048	0.08	0.079
Nitrate (as N)	mg/L	2.93	<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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.287	0.514	0.482	0.564	0.632	0.427	0.468	0.108	0.097
Ortho Phosphate as P	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0014
Total Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.038	0.0244	0.0233	0.0211	0.0218	0.0187	0.0181	0.0048	0.0051
Sulfate (SO4)	mg/L		2.63	2.06	2.04	2.89	2.87	3.68	3.98	8.4	8.37
Organic / Inorganic Carbon											
Total Organic Carbon	mg/L		4.82	6.08	6.51	6.64	6.48	6.31	5.7	2.14	2.09
Total Metals											
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	2.1	0.345	0.343	0.0731	0.0735	0.111	0.111	0.153	0.14
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	<0.00054	<0.00051	<0.00048	<0.00042	<0.00042	0.00024	<0.00042	<0.00042	0.00037
Barium (Ba)-Total	mg/L		0.0206	0.00588	0.00578	0.00339	0.00328	0.00367	0.00366	0.00313	0.00308
Beryllium (Be)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L		0.0323	0.025	0.0249	0.0239	0.0252	0.0247	0.0254	0.0409	0.0405
Cadmium (Cd)-Total	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L		10.9	7.62	7.37	8.43	8.46	7.69	7.8	11.5	11.6
Chromium (Cr)-Total	mg/L	0.001	0.00403	0.00088	0.00082	<0.00050	<0.00050	<0.00050	<0.00050	0.00058	0.00055
Cobalt (Co)-Total	mg/L		0.00081	0.00014	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.00272	0.0017	0.00183	0.00165	0.00161	0.00164	0.00156	0.00094	0.00086
Iron (Fe)-Total	mg/L	0.3	1.88	0.336	0.336	0.123	0.123	0.164	0.166	0.167	0.168
Lead (Pb)-Total	mg/L	0.001-0.007[d]	0.000702	0.00013	0.000126	<0.000050	<0.000050	<0.000050	<0.000050	0.000053	0.000053
Lithium (Li)-Total	mg/L		0.007	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Total	mg/L		9.06	7.03	6.82	6.62	6.78	6.54	6.73	9.24	9.56
Manganese (Mn)-Total	mg/L		0.0296	0.0182	0.0179	0.0158	0.0152	0.00827	0.00832	0.00338	0.00332
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	0.000279	0.000217	0.000196	0.000163	0.000159	0.000189	0.000166	0.000597	0.00059
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	0.00252	0.001	0.00099	0.0006	0.00058	0.00067	0.00064	0.00029	0.00027

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	P.O. Outflow 2 14-Sep-09 L818985-22	Ogama Outflow 1 15-Sep-09 L818985-19	Ogama Outflow 2 15-Sep-09 L818985-20	Doris Outflow 1 15-Sep-09 L818985-15	Doris Outflow 2 15-Sep-09 L818985-16	Little Roberts Outflow 1 14-Sep-09 L818985-5	Little Roberts Outflow 2 14-Sep-09 L818985-6	Windy Outflow 1 15-Sep-09 L818985-11	Windy Outflow 2 15-Sep-09 L818985-12
Phosphorus (P)-Total	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L		3.23	2.29	2.22	2.28	2.31	2.18	2.23	3.66	3.71
Selenium (Se)-Total	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010
Silicon (Si)-Total	mg/L		4.47	1.51	1.51	1.03	1.04	1.1	1.08	0.74	0.702
Silver (Ag)-Total	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		39.9	33.4	32.4	32.5	32.9	31.7	32.4	50.4	52.4
Strontium (Sr)-Total	mg/L		0.0631	0.0401	0.0393	0.0415	0.0415	0.0418	0.0411	0.054	0.0518
Thallium (Tl)-Total	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		0.099	0.013	0.013	<0.010	<0.010	<0.010	<0.010	0.011	0.011
Uranium (U)-Total	mg/L		0.000145	0.000063	0.000061	0.000037	0.000037	0.000042	0.00004	0.000203	0.000201
Vanadium (V)-Total	mg/L		0.0041	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	0.03	0.005	0.0015	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Metals											
Aluminum (Al)-Dissolved	mg/L	0.005-0.1[b]	0.152	0.0529	0.0452	0.0043	0.0041	0.0173	0.0173	0.0125	0.0116
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.005	<0.00048	<0.00048	<0.00048	<0.00039	<0.00039	0.00023	<0.00042	<0.00042	0.00033
Barium (Ba)-Dissolved	mg/L		0.00388	0.00308	0.00329	0.00258	0.00253	0.00274	0.00277	0.00216	0.00294
Beryllium (Be)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.0284	0.0229	0.0239	0.0228	0.0219	0.0232	0.0234	0.0448	0.0467
Cadmium (Cd)-Dissolved	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Dissolved	mg/L		10.1	7.18	7.17	8.03	8.02	7.49	7.59	11.7	12
Chromium (Cr)-Dissolved	mg/L	0.001	0.00027	<0.00050	<0.00050	<0.00050	<0.00050	0.00017	0.00022	0.00024	0.00032
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002-0.004[c]	0.00121	0.00143	0.00138	0.00135	0.00137	0.00138	0.00136	0.00069	0.00074
Iron (Fe)-Dissolved	mg/L	0.3	0.093	0.028	0.023	<0.010	<0.010	0.03	0.033	0.014	0.011
Lead (Pb)-Dissolved	mg/L	0.001-0.007[d]	0.000057	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Dissolved	mg/L		7.84	6.65	6.52	6.33	6.38	6.48	6.63	9.57	10
Manganese (Mn)-Dissolved	mg/L		0.00104	0.000381	0.00054	0.000123	0.000186	0.000202	0.000193	0.000209	0.000206
Mercury (Hg)-Dissolved	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	0.000267	0.000175	0.000184	0.000153	0.000149	0.000175	0.000167	0.000615	0.000619
Nickel (Ni)-Dissolved	mg/L	0.025-0.150[e]	0.00049	0.00066	0.00066	0.00026	0.00025	0.00039	0.00038	0.00016	0.00027
Phosphorus (P)-Dissolved	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		2.43	2.08	2.07	2.15	2.15	2.1	2.14	3.7	3.84
Selenium (Se)-Dissolved	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	0.001
Silicon (Si)-Dissolved	mg/L		0.641	0.922	0.884	0.884	0.87	0.874	0.877	0.35	0.349
Silver (Ag)-Dissolved	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		37.9	31.7	31.5	31.2	31.7	31.4	32.1	51.2	54.9
Strontium (Sr)-Dissolved	mg/L		0.0553	0.0382	0.0377	0.0391	0.0391	0.04	0.0394	0.0534	0.0542
Thallium (Tl)-Dissolved	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.000062	0.000042	0.000047	0.00003	0.00003	0.000035	0.000034	0.000192	0.0002
Vanadium (V)-Dissolved	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0019

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name	**Units**	**CCME Guidelines for the Protection of Freshwater Aquatic Life[a]**	**Glenn Outflow Downstream**	**Glenn Outflow Downstream**	**Koignuk River Upstream**	**Koignuk River Upstream**	**Koignuk River Midstream**	**Koignuk River Midstream**	**Koignuk River Downstream**	**Koignuk River Downstream**	**Reference Lake A Outflow**
Replicate			**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**
Date Sampled			**15-Sep-09**	**15-Sep-09**	**14-Sep-09**	**14-Sep-09**	**14-Sep-09**	**14-Sep-09**	**14-Sep-09**	**14-Sep-09**	**15-Sep-09**
ALS Sample ID			**L818985-25**	**L818985-26**	**L818985-1**	**L818985-2**	**L818985-3**	**L818985-4**	**L818985-23**	**L818985-24**	**L818985-7**
Physical Tests											
Conductivity	mS/cm		501	477	73.2	72.9	80.9	81.6	84.5	83.7	90.9
Hardness (as CaCO3)	mg/L		80.8	81.9	18.2	18.4	19.9	19.9	20.6	20.3	19.2
pH	pH	6.5-9.0	8.05	8.06	7.51	7.47	7.46	7.45	7.47	7.48	7.34
Total Suspended Solids	mg/L		5.7	8.2	4.7	3.7	9.7	16.2	6.2	6.2	<3.0
Total Dissolved Solids	mg/L		278	267	49	48	55	58	49	61	53
Turbidity	NTU		28.3	28	6.67	6.05	12.6	15.6	9.36	9.21	0.82
Anions and Nutrients											
Alkalinity, Bicarbonate (as CaCO3)	mg/L		49.3	49.1	11.8	11.9	12.7	12.6	12.9	12.8	12.2
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		49.3	49.1	11.8	11.9	12.7	12.6	12.9	12.8	12.2
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromide (Br)	mg/L		0.22	0.231	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	mg/L		112	106	12.7	12.6	14.4	14.6	14.9	14.9	18.3
Fluoride (F)	mg/L		0.077	0.076	0.032	0.031	0.032	0.033	0.031	0.031	0.035
Nitrate (as N)	mg/L	2.93	<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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.262	0.271	0.323	0.307	0.338	0.373	0.318	0.324	0.163
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 Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.019	0.017	0.0113	0.0113	0.0167	0.0204	0.0126	0.0125	0.0042
Sulfate (SO4)	mg/L		17.2	16.4	2.12	2.12	2.63	2.71	2.83	2.82	2.65
Organic / Inorganic Carbon											
Total Organic Carbon	mg/L		4.8	4.79	5.71	5.94	6	6.2	5.96	6.08	3.28
Total Metals											
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	1.21	1.14	0.279	0.286	0.5	0.72	0.432	0.416	0.0304
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	<0.00063	<0.00057	0.00018	0.00018	0.00023	0.00027	0.00026	0.00029	<0.00010
Barium (Ba)-Total	mg/L		0.0152	0.0137	0.00487	0.00511	0.00714	0.00935	0.00619	0.00629	0.00193
Beryllium (Be)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L		0.0485	0.0486	0.0082	0.0091	0.0098	0.0093	0.0113	0.0107	0.014
Cadmium (Cd)-Total	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L		14.4	14.2	3.83	3.92	4.06	4.24	4.36	4.29	2.9
Chromium (Cr)-Total	mg/L	0.001	0.00217	0.00193	0.00077	0.00078	0.00121	0.00153	0.00096	0.00094	<0.00050
Cobalt (Co)-Total	mg/L		0.00045	0.00042	0.00014	0.00014	0.00023	0.00031	0.00018	0.00018	<0.00010
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.00393	0.00381	0.0016	0.00163	0.00189	0.00215	0.00177	0.00183	0.00102
Iron (Fe)-Total	mg/L	0.3	0.966	0.914	0.316	0.324	0.537	0.741	0.44	0.429	0.038
Lead (Pb)-Total	mg/L	0.001-0.007[d]	0.000403	0.000406	0.000106	0.000111	0.00019	0.000281	0.000159	0.000158	<0.000050
Lithium (Li)-Total	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Total	mg/L		12.2	12.4	2.23	2.33	2.66	2.84	2.84	2.73	2.86
Manganese (Mn)-Total	mg/L		0.018	0.017	0.00794	0.00827	0.011	0.0135	0.00929	0.00933	0.00171
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	0.000704	0.000654	0.000092	0.00009	0.000101	0.000099	0.000089	0.000094	0.000052
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	0.00186	0.00178	0.00099	0.0011	0.00124	0.00152	0.00109	0.00108	0.00026

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Glenn Outflow Downstream	Glenn Outflow Downstream	Koignuk River Upstream	Koignuk River Upstream	Koignuk River Midstream	Koignuk River Midstream	Koignuk River Downstream	Koignuk River Downstream	Reference Lake A Outflow
Replicate			1	2	1	2	1	2	1	2	1
Date Sampled			15-Sep-09	15-Sep-09	14-Sep-09	14-Sep-09	14-Sep-09	14-Sep-09	14-Sep-09	14-Sep-09	15-Sep-09
ALS Sample ID			L818985-25	L818985-26	L818985-1	L818985-2	L818985-3	L818985-4	L818985-23	L818985-24	L818985-7
Phosphorus (P)-Total	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L		4.36	4.3	0.742	0.768	0.88	0.993	0.905	0.887	0.984
Selenium (Se)-Total	mg/L	0.001	0.00083	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon (Si)-Total	mg/L		3.84	3.58	1.09	1.11	1.58	2.11	1.45	1.43	0.254
Silver (Ag)-Total	mg/L	0.0001	<0.000010	<0.000010	0.00002	<0.000010	0.000015	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		61	56.9	6.5	6.76	7.76	8.3	8.76	8.6	10.4
Strontium (Sr)-Total	mg/L		0.0805	0.0757	0.017	0.0173	0.0187	0.0203	0.0187	0.0193	0.015
Thallium (Tl)-Total	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		0.057	0.053	<0.010	0.01	0.021	0.029	0.015	0.015	<0.010
Uranium (U)-Total	mg/L		0.000334	0.000323	0.00004	0.000038	0.000055	0.000065	0.000051	0.000053	0.000046
Vanadium (V)-Total	mg/L		<0.0030	<0.0030	<0.0010	<0.0010	<0.0010	0.0012	0.0011	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	0.03	0.0028	0.0029	0.0012	0.0015	0.0019	0.0024	0.0017	0.0017	<0.0010
Dissolved Metals											
Aluminum (Al)-Dissolved	mg/L	0.005-0.1[b]	0.0576	0.153	0.0839	0.0735	0.0953	0.104	0.0963	0.104	0.0063
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.005	<0.00048	<0.00048	0.00015	0.00015	0.00018	0.00017	0.00017	0.00019	<0.00010
Barium (Ba)-Dissolved	mg/L		0.00371	0.00502	0.00321	0.00408	0.00373	0.00393	0.00312	0.00329	0.00217
Beryllium (Be)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.0451	0.0458	0.0071	0.0069	0.0081	0.0081	0.0096	0.0093	0.0149
Cadmium (Cd)-Dissolved	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Dissolved	mg/L		13.4	13.5	3.69	3.75	3.95	3.9	4.03	4.01	2.95
Chromium (Cr)-Dissolved	mg/L	0.001	0.0002	<0.00050	0.00031	0.00032	0.00044	0.00022	<0.00050	0.00022	0.0002
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002-0.004[c]	0.00284	0.00326	0.00128	0.00146	0.00165	0.00164	0.00139	0.00143	0.00098
Iron (Fe)-Dissolved	mg/L	0.3	0.035	0.087	0.079	0.077	0.083	0.083	0.084	0.087	0.013
Lead (Pb)-Dissolved	mg/L	0.001-0.007[d]	<0.000050	0.000088	<0.000050	<0.000050	<0.000050	0.000051	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Dissolved	mg/L		11.5	11.7	2.18	2.19	2.44	2.46	2.55	2.49	2.87
Manganese (Mn)-Dissolved	mg/L		0.00454	0.0043	0.000684	0.00069	0.00145	0.000806	0.000712	0.000792	0.0002
Mercury (Hg)-Dissolved	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	0.000674	0.000631	0.000083	0.000083	0.000083	0.00009	0.00008	0.000085	0.000061
Nickel (Ni)-Dissolved	mg/L	0.025-0.150[e]	0.00081	0.00082	0.00074	0.00119	0.00086	0.0008	0.00074	0.0007	0.00033
Phosphorus (P)-Dissolved	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		3.81	3.83	0.671	0.669	0.728	0.73	0.749	0.735	0.982
Selenium (Se)-Dissolved	mg/L	0.001	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon (Si)-Dissolved	mg/L		1.32	1.56	0.772	0.734	0.875	0.913	0.849	0.876	0.174
Silver (Ag)-Dissolved	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		57.5	56.1	6.56	6.57	7.73	7.69	8.22	7.98	10.5
Strontium (Sr)-Dissolved	mg/L		0.0711	0.0702	0.0162	0.0161	0.0174	0.0173	0.0173	0.0176	0.0154
Thallium (Tl)-Dissolved	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.000281	0.000278	0.000029	0.000029	0.000037	0.000037	0.000037	0.000036	0.000039
Vanadium (V)-Dissolved	mg/L		<0.0010	<0.0010	<0.000050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	<0.0010	0.0014	0.0012	0.0025	0.0016	0.0023	<0.0010	<0.0010	0.0014

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Reference Lake A Outflow 2 15-Sep-09 L818985-8	Reference Lake B Outflow 1 14-Sep-09 L818985-9	Reference Lake B Outflow 2 14-Sep-09 L818985-10	Angimajuq River Reference Site 1 15-Sep-09 L818985-13	Angimajuq River Reference Site 2 15-Sep-09 L818985-14
Physical Tests							
Conductivity	mS/cm		92.4	47.8	48.8	64.5	64.1
Hardness (as CaCO3)	mg/L		19.1	14.3	14	15.2	14.9
pH	pH	6.5-9.0	7.38	7.34	7.33	7.3	7.3
Total Suspended Solids	mg/L		<3.0	<3.0	<3.0	3.7	<3.0
Total Dissolved Solids	mg/L		49	30	31	41	44
Turbidity	NTU		0.83	0.45	0.44	3.19	2.87
Anions and Nutrients							
Alkalinity, Bicarbonate (as CaCO3)	mg/L		12.9	10.3	10.3	8.7	8.5
Alkalinity, Carbonate (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		12.9	10.3	10.3	8.7	8.5
Ammonia as N	mg/L	worst case 5.86 (assumes T=0, pH=7.5)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromide (Br)	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	mg/L		18.5	6.88	6.84	11.8	11.9
Fluoride (F)	mg/L		0.034	<0.020	<0.020	0.029	0.029
Nitrate (as N)	mg/L	2.93	<0.0050	0.0089	0.0091	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L		0.147	0.193	0.186	0.334	0.322
Ortho Phosphate as P	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate as P	mg/L	<0.004 (ultraolig), or 0.004-0.010 (oligotrophic)	0.0039	0.0035	0.0029	0.0071	0.0063
Sulfate (SO4)	mg/L		2.67	1.72	1.71	2	2.01
Organic / Inorganic Carbon							
Total Organic Carbon	mg/L		3.18	3.48	3.48	5.31	5.73
Total Metals							
Aluminum (Al)-Total	mg/L	0.005-0.1[b]	0.0322	0.0109	0.0095	0.127	0.107
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	0.00011	0.000072	0.000058	0.00014	0.00012
Barium (Ba)-Total	mg/L		0.002	0.00162	0.00162	0.00391	0.00373
Beryllium (Be)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L		0.0134	0.0049	0.0041	0.0088	0.009
Cadmium (Cd)-Total	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L		2.9	3.51	3.46	2.8	2.74
Chromium (Cr)-Total	mg/L	0.001	<0.00050	<0.00050	<0.00050	0.00071	0.00056
Cobalt (Co)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.002-0.004[c]	0.00129	0.00102	0.00096	0.00139	0.00134
Iron (Fe)-Total	mg/L	0.3	0.039	0.037	0.036	0.296	0.279
Lead (Pb)-Total	mg/L	0.001-0.007[d]	<0.000050	<0.000050	<0.000050	0.00006	<0.000050
Lithium (Li)-Total	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Total	mg/L		2.84	1.32	1.26	2.2	2.09
Manganese (Mn)-Total	mg/L		0.00257	0.0028	0.00188	0.00329	0.00314
Mercury (Hg)-Total	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.073	0.000057	<0.000050	<0.000050	0.000067	0.000059
Nickel (Ni)-Total	mg/L	0.025-0.150[e]	0.00033	0.00021	0.00017	0.00064	0.00064

Appendix 3.3-1. Stream Water Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Replicate Date Sampled ALS Sample ID	Units	CCME Guidelines for the Protection of Freshwater Aquatic Life[a]	Reference Lake A Outflow 2 15-Sep-09 L818985-8	Reference Lake B Outflow 1 14-Sep-09 L818985-9	Reference Lake B Outflow 2 14-Sep-09 L818985-10	Angimajuq River Reference Site 1 15-Sep-09 L818985-13	Angimajuq River Reference Site 2 15-Sep-09 L818985-14
Phosphorus (P)-Total	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L		0.982	0.477	0.459	0.704	0.666
Selenium (Se)-Total	mg/L	0.001	<0.0010	<0.00010	<0.00010	<0.0010	<0.0010
Silicon (Si)-Total	mg/L		0.255	0.199	0.201	0.6	0.572
Silver (Ag)-Total	mg/L	0.0001	<0.000010	<0.000010	0.000031	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		10.2	3.53	3.37	6.79	6.33
Strontium (Sr)-Total	mg/L		0.0152	0.0156	0.0155	0.0148	0.0151
Thallium (Tl)-Total	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Total	mg/L		0.000045	0.000033	0.000033	0.000059	0.000057
Vanadium (V)-Total	mg/L		<0.0010	<0.000050	<0.000050	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	0.03	<0.0010	<0.0010	<0.0010	0.0014	<0.0010
Dissolved Metals							
Aluminum (Al)-Dissolved	mg/L	0.005-0.1[b]	0.0059	0.0056	0.0053	0.0345	0.0299
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.005	<0.00010	0.00006	0.000053	0.00011	0.00011
Barium (Ba)-Dissolved	mg/L		0.00191	0.00187	0.002	0.00336	0.00307
Beryllium (Be)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.015	0.006	0.0056	0.0072	0.007
Cadmium (Cd)-Dissolved	mg/L	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Dissolved	mg/L		2.93	3.53	3.49	2.69	2.66
Chromium (Cr)-Dissolved	mg/L	0.001	0.00017	0.00017	0.00013	0.00034	0.00031
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002-0.004[c]	0.00107	0.00099	0.00096	0.00145	0.00117
Iron (Fe)-Dissolved	mg/L	0.3	<0.010	0.012	0.013	0.095	0.091
Lead (Pb)-Dissolved	mg/L	0.001-0.007[d]	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Dissolved	mg/L		2.85	1.32	1.27	2.05	2
Manganese (Mn)-Dissolved	mg/L		0.000105	0.00059	0.000362	0.000631	0.000626
Mercury (Hg)-Dissolved	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	0.000062	<0.000050	<0.000050	0.000054	0.000059
Nickel (Ni)-Dissolved	mg/L	0.025-0.150[e]	0.0003	0.00019	0.00019	0.00057	0.00053
Phosphorus (P)-Dissolved	mg/L		<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	mg/L		0.99	0.481	0.466	0.637	0.624
Selenium (Se)-Dissolved	mg/L	0.001	<0.0010	<0.00010	<0.00010	<0.0010	<0.0010
Silicon (Si)-Dissolved	mg/L		0.171	0.179	0.187	0.462	0.449
Silver (Ag)-Dissolved	mg/L	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		10.4	3.55	3.38	6.35	6.17
Strontium (Sr)-Dissolved	mg/L		0.0154	0.0158	0.016	0.0145	0.0145
Thallium (Tl)-Dissolved	mg/L	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L		0.000043	0.000028	0.000029	0.000049	0.000047
Vanadium (V)-Dissolved	mg/L		<0.0010	<0.000050	<0.000050	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	<0.0010	<0.0010	<0.0010	0.0011	<0.0010

Shaded cells indicate values exceeding CCME guidelines

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 1995 (with updates to 2007)

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

c) 0.002 mg/L at [CaCO3] = 0-120 mg/L; 0.003 mg/L at [CaCO3] = 120-180 mg/L; 0.004 mg/L at [CaCO3] = > 180 mg/L

d) 0.001 mg/L at [CaCO3] = 0-60 mg/L; 0.002 mg/L at [CaCO3] = 60-120 mg/L; 0.004 mg/L at [CaCO3] = 120-180 mg/L; 0.007 mg/L at [CaCO3] = >180 mg/L

e) 0.025 mg/L at [CaCO3] = 0-60 mg/L; 0.065 mg/L at [CaCO3] = 60-120 mg/L; 0.110 mg/L at [CaCO3] = 120-180 mg/L; 0.15 mg/L at [CaCO3] = >180 mg/L

f) free cyanide measured as weak acid dissociable or equivalent by EPA standards

Appendix 3.3-2

Stream Water Quality QA/QC, Hope Bay Belt Project, 2009

Engineers and Scientists

Appendix 3.3-2. Stream Water Quality QA/QC, Hope Bay Belt Project, 2009

Sample Name	Units	TRAVEL BLANK	TRAVEL BLANK	FIELD BLANK	TRAVEL BLANK	FIELD BLANK AT GLENN OF D/S	FIELD BLANK
Date Sampled		**21-Jun-09**	**21-Aug-09**	**21-Jun-09**	**15-Sep-09**	**18-Aug-09**	**15-Sep-09**
ALS Sample ID		**L783643-29**	**L809215-13**	**L783643-30**	**L818985-28**	**L807856-5**	**L818985-27**
Physical Tests							
Conductivity	mS/cm	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Hardness (as CaCO3)	mg/L	-	<0.50	-	<0.50	<0.50	<0.50
pH	pH	5.51	5.74	5.56	5.73	5.69	5.77
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	<10	<10	<10	<10	<10	<10
Turbidity	NTU	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Anions and Nutrients							
Alkalinity, Bicarbonate (as CaCO3)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Carbonate (as CaCO3)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Ammonia as N	mg/L	0.0051	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromide (Br)	mg/L	<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
Fluoride (F)	mg/L	<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
Nitrite (as N)	mg/L	<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
Ortho Phosphate as P	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate as P	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Sulfate (SO4)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Organic / Inorganic Carbon							
Total Organic Carbon	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total Metals							
Aluminum (Al)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
Barium (Ba)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Beryllium (Be)-Total	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L	0.0034	<0.0010	0.0033	0.0019	<0.0010	0.0022
Cadmium (Cd)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Chromium (Cr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Iron (Fe)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Manganese (Mn)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Phosphorus (P)-Total	mg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Selenium (Se)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Silicon (Si)-Total	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Strontium (Sr)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Thallium (Tl)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Vanadium (V)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

Appendix 3.3-2. Stream Water Quality QA/QC, Hope Bay Belt Project, 2009

Sample Name	Units	TRAVEL BLANK	TRAVEL BLANK	FIELD BLANK	TRAVEL BLANK	FIELD BLANK AT GLENN OF D/S	FIELD BLANK
Date Sampled		**21-Jun-09**	**21-Aug-09**	**21-Jun-09**	**15-Sep-09**	**18-Aug-09**	**15-Sep-09**
ALS Sample ID		**L783643-29**	**L809215-13**	**L783643-30**	**L818985-28**	**L807856-5**	**L818985-27**
Dissolved Metals							
Aluminum (Al)-Dissolved	mg/L	-	-	-	-	<0.0010	-
Antimony (Sb)-Dissolved	mg/L	-	-	-	-	<0.00010	-
Arsenic (As)-Dissolved	mg/L	-	-	-	-	<0.000030	-
Barium (Ba)-Dissolved	mg/L	-	-	-	-	<0.000050	-
Beryllium (Be)-Dissolved	mg/L	-	-	-	-	<0.00020	-
Bismuth (Bi)-Dissolved	mg/L	-	-	-	-	<0.00050	-
Boron (B)-Dissolved	mg/L	-	-	-	-	<0.0010	-
Cadmium (Cd)-Dissolved	mg/L	-	-	-	-	<0.000010	-
Calcium (Ca)-Dissolved	mg/L	-	-	-	-	<0.020	-
Chromium (Cr)-Dissolved	mg/L	-	-	-	-	<0.00010	-
Cobalt (Co)-Dissolved	mg/L	-	-	-	-	<0.00010	-
Copper (Cu)-Dissolved	mg/L	-	-	-	-	<0.00010	-
Iron (Fe)-Dissolved	mg/L	-	-	-	-	<0.010	-
Lead (Pb)-Dissolved	mg/L	-	-	-	-	<0.000050	-
Lithium (Li)-Dissolved	mg/L	-	-	-	-	<0.0050	-
Magnesium (Mg)-Dissolved	mg/L	-	-	-	-	<0.0050	-
Manganese (Mn)-Dissolved	mg/L	-	-	-	-	<0.000050	-
Mercury (Hg)-Dissolved	mg/L	-	-	-	-	<0.000010	-
Molybdenum (Mo)-Dissolved	mg/L	-	-	-	-	<0.000050	-
Nickel (Ni)-Dissolved	mg/L	-	-	-	-	0.00037	-
Phosphorus (P)-Dissolved	mg/L	-	-	-	-	<0.30	-
Potassium (K)-Dissolved	mg/L	-	-	-	-	<0.050	-
Selenium (Se)-Dissolved	mg/L	-	-	-	-	<0.00010	-
Silicon (Si)-Dissolved	mg/L	-	-	-	-	<0.050	-
Silver (Ag)-Dissolved	mg/L	-	-	-	-	<0.000010	-
Sodium (Na)-Dissolved	mg/L	-	-	-	-	<0.010	-
Strontium (Sr)-Dissolved	mg/L	-	-	-	-	<0.00010	-
Thallium (Tl)-Dissolved	mg/L	-	-	-	-	<0.00010	-
Tin (Sn)-Dissolved	mg/L	-	-	-	-	<0.00010	-
Titanium (Ti)-Dissolved	mg/L	-	-	-	-	<0.010	-
Uranium (U)-Dissolved	mg/L	-	-	-	-	<0.000010	-
Vanadium (V)-Dissolved	mg/L	-	-	-	-	<0.000050	-
Zinc (Zn)-Dissolved	mg/L	-	-	-	-	0.0025	-

Shaded cells indicate values above detection limits

Appendix 3.4-1

Lake Sediment Quality Descriptions, Hope Bay Belt Project, 2009

Engineers and Scientists

Appendix 3.4-1. Lake Sediment Quality Descriptions, Hope Bay Belt Project, 2009

Watershed	Lake	Date	Depth Zone	Grab Depth (m)	Grab thickness (mm)	Physical Description	Munsell Colour Classification	Biological Material	Debris Material	Notes	Photos
Doris	Wolverine	6-Aug-09	Shallow	3.7	40	Soft silt	5Y 3/1	Algal matte on surface - variey of algal types			
	Imniagut	7-Aug-09	Shallow	3.5	45	Clay with algae matte on top (2-3 cm)	2.5Y 2.5/1	Algae with lots of chironomids		Very thick algae/macrophyte matte	210 to 212
	Patch South	12-Aug-09	Shallow	3	67	Algae matte on very thin (<1 mm) brown silty layer over grey clay	7.5Y 3/4 - silt, 2.5Y 3/1 - clay	Some worms in algae matte			
			Deep	14	53	Brown silty layer (1mm) over fine grey clay with black speckling	7.5Y 3/4 - silt, 2.5Y 4/1 - clay	None			243, 244
	Patch North	9-Aug-09	Shallow	2.25	21	Sand - course (10 mm) overlaying a grey clay (10 mm) with black speckles	7.5Y 2.5/3 - sand, 2.5Y 4/1 - clay	None			241, 242
			Deep	8	85	Silty layer (brown) over grey clay (very fine)	7.5Y 4/2 - silt, 2.5Y 3/1 - clay	None			231 to 233
	P.O. Lake	10-Aug-09	Shallow	3.25	32	Algae matte over a grey clay with black speckling. Very thin (<1mm) brown silty layer over top	2.5Y 3/1	Worms in algae matte. Amphipods.			236, 237
	Ogama	14-Aug-09	Shallow	4.8	60	<1 mm silty brown layer overlaying grey clay	7.5YR 3/4 - silt, 10YR 4/1 - clay	None			290 to 292
	Doris South	17-Aug-09	Shallow	4.1	48	Brown course sandy layer with small pebbles over grey clay. Brown layer < 0.5 cm thick with distinct horizon	7.5YR 2.5/3 - sand, 2.5Y 3/1 - clay	Chironomid larvae			311, 312
			Deep	10.8	52	Brown fine silty layer (~ 3mm) over a grey clay. Clay has black lines throughout.	7.5YR 2.5/3 - silt, 5Y 3/1 - clay	None			307 to 310
	Doris North	15-Aug-09	Shallow	4.5	50	Fine sandy layer (1mm) over grey/brown clay	7.5Y 3/4 - silt, 10Y 4/1 - clay	None			301, 302
			Deep	13.5	58	Fine brown silty/sandy layer (<1 mm) over grey clay. Clay has black horizontal lines	7.5Y 2.5/3 - silt, 2.5Y 4/1 - clay	None			299, 300
Little Roberts	Little Roberts	7-Aug-09	Shallow	2.6	30	Soft silt, no horizons	Gley1 3/10Y	Surface covered in algae and macrophytes			
Roberts	Naiqunnguut	10-Aug-09	Shallow	4.5	65	Silty brown layers over top of grey clay. Clay has black lines.	7.5Y 4/? - silt, 2.5Y 4/1 - clay	Layer of algae over top of brown silt			238, 240
Windy	Nakhaktok	6-Aug-09	Shallow	3.4	40	Soft silt with some algae on surface	Gley1 2.5/10Y	Algae on surface			
			Deep	7.7	45	Soft silt, no horizons but some lighter coloured material on surface	5Y 4/3 - surface, Gley1 2.5/10Y - bottom	Chironomids			
	Windy	9-Aug-09	Shallow	3.3	40	Soft silt/clay	2.5Y 4/4 - surface, 2.5Y 5/1 - bottom				
			Deep	18	40	Soft silt/clay	2.5Y 4/4 - surface, 2.5Y 5/1 - bottom				
	Glenn	8-Aug-09	Shallow	4.5	50	Soft silt/clay	2.5Y 5/3	None			
			Deep	19.5	50	Soft silt/clay	2.5Y 5/3	None			
Ref A	Ref Lk A	12-Aug-09	Shallow	3.5	53	< 1 mm brown sandy layer over grey clay	7.5Y 3/3 - sand, 10Y 4/1 - clay	None		Sandy with small (0.5 cm) pebbles	283, 284
			Deep	31.5	70	<1 mm brown silty layer over grey clay	7.5Y 4/4 - silt, 2.5Y 3/2 - clay	None			269, 270
Ref B	Ref Lk B	16-Aug-09	Shallow	4.5	20	Organic, silty layer over fine sand	2.5Y 3/2 - organic, 5YR 4/2 - sand	None			305, 306
			Deep	9.5	45	Organic and silty. No clay. No distinct layers	2.5Y 3/2	Some aquatic grasses			303, 304

Appendix 3.4-2

Lake Sediment Quality Photographs, Hope Bay Belt Project, 2009

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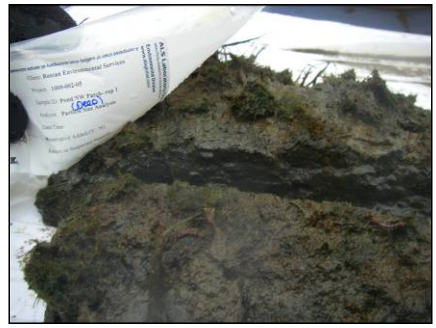
Appendix 3.4-2. Lake Sediment Quality Photographs, Hope Bay Belt Project, 2009

Wolverine Lake, Shallow Depth, ~4 m



Imniagut Lake, Shallow Depth, ~3 m

Patch Lake South, Shallow Depth, ~3 m

Patch Lake South, Deep Depth, ~14 m

Patch Lake North, Shallow Depth, ~3 m

Patch Lake North, Mid Depth, ~8 m depth

P.O. Lake, Shallow Depth, ~3 m

Ogama Lake, Shallow Depth, ~4 m

Doris Lake South, Shallow Depth, ~4 m

Doris Lake South, Deep Depth, ~11 m

Doris Lake North, Shallow Depth, ~4 m

Doris Lake North, Deep Depth, ~14 m

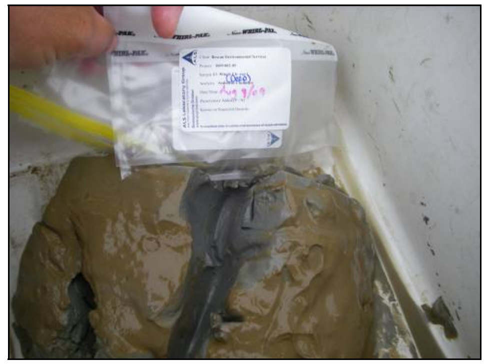
Little Roberts Lake, Shallow Depth, ~3 m

Naiqunnguut Lake, Shallow Depth, ~4 m

Nakhaktok Lake, Shallow Depth, ~4 m

Nakhaktok Lake, Mid Depth, ~8 m

Windy Lake, Shallow Depth, ~4 m



Windy Lake, Deep Depth, ~18 m

Glenn Lake, Shallow Depth, ~5 m

Glenn Lake, Deep Depth, ~20 m

Reference Lake A, Shallow Depth, ~3 m

Reference Lake A, Deep Depth, ~32 m

Reference Lake B, Deep Depth, ~5 m

Reference Lake B, Mid Depth, ~9 m

Appendix 3.4-3

Lake Sediment Quality Analytical Results, Hope Bay Belt Project, 2009

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Appendix 3.4-3. Lake Sediment Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name			CCME Guidelines for the Protection of Aquatic Life[a]		Wolverine Lake	Wolverine Lake	Wolverine Lake	Imniagut Lake	Imniagut Lake	Imniagut Lake	Patch Lake South
Depth Zone					Shallow Depth	Shallow Depth	Shallow Depth	Shallow Depth	Shallow Depth	Shallow Depth	Shallow Depth
Depth (m)					3.5	3.5	3.5	3.5	2	3.5	3
Replicate					1	2	3	1	2	3	1
Date Sampled					06-Aug-09	06-Aug-09	06-Aug-09	08-Aug-09	08-Aug-09	08-Aug-09	11-Aug-09
ALS Sample ID	Units	RDL[d]	ISQG[b]	PEL[c]	L803135-1	L803135-2	L803135-3	L803135-13	L803135-14	L803135-15	L805915-4
Physical Tests											
% Moisture	%	0.1			85.3	85.2	79.8	81.7	84.4	82	58.4
pH	pH				5.49	5.3	5.26	5.78	5.91	5.8	6.19
Particle Size											
% Gravel (>2mm)	%	1			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
% Sand (2.0mm - 0.063mm)	%	1			4	6	3	3	11	2	18
% Silt (0.063mm - 4um)	%	1			56	52	52	59	52	57	54
% Clay (<4um)	%	1			40	41	46	38	37	41	28
Leachable Anions & Nutrients											
Total Nitrogen by LECO	%	0.02			0.71	0.939	0.695	1.02	1.13	0.859	0.249
Organic / Inorganic Carbon											
Total Organic Carbon	%	0.1			7.32	8.93	7.24	7.93	8.58	6.95	1.64
Plant Available Nutrients											
Available Ammonium-N	mg/kg	0.8			50.4	117	52.4	64.7	73.2	60.6	9.25
Available Nitrate-N	mg/kg	2			<2.0	<2.0	3.1	2.2	<2.0	2	<2.0
Nitrite-N	mg/kg	0.4			<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Available Phosphate-P	mg/kg	1			10.1	10.9	5.3	19.9	51.8	4.9	3.5
Metals											
Aluminum (Al)	mg/kg	50			22300	22100	22600	26000	25900	26500	19000
Antimony (Sb)	mg/kg	10			<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	0.05	5.9	17	9.06	15.9	14.5	4.25	4.27	6.6	2.2
Barium (Ba)	mg/kg	1			134	131	137	160	155	158	108
Beryllium (Be)	mg/kg	0.5			0.73	0.73	0.74	0.84	0.85	0.87	0.61
Bismuth (Bi)	mg/kg	20			<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.1	0.6	3.5	0.12	0.11	0.11	0.19	0.17	0.16	<0.10
Calcium (Ca)	mg/kg	50			5980	5620	5430	6940	7100	6430	5310
Chromium (Cr)	mg/kg	2	37.3	90	60.7	60.1	62.1	75.3	73.1	76.2	53.9
Cobalt (Co)	mg/kg	2			11.7	12.1	12	14.2	13.6	14.8	11.3
Copper (Cu)	mg/kg	1	35.7	197	38.3	36.4	38.9	60.8	56.5	58.1	27.8
Iron (Fe)	mg/kg	50			67400	79500	87000	40000	37600	45800	26100
Lead (Pb)	mg/kg	2	35	91.3	11.4	10.5	10.5	11.4	11	11.6	8.7
Lithium (Li)	mg/kg	2			42.1	41.3	42.5	48.4	48	49.3	36.4
Magnesium (Mg)	mg/kg	50			13700	13400	13600	16200	16000	16100	12000
Manganese (Mn)	mg/kg	1			402	546	542	443	477	426	324
Mercury (Hg)	mg/kg	0.005	0.17	0.486	0.0317	0.0291	0.0295	0.0646	0.0676	0.0555	0.0199
Molybdenum (Mo)	mg/kg	0.2			2.03	2.01	1.84	2.7	2.69	2.65	0.99
Nickel (Ni)	mg/kg	5			37	35.7	36.6	48.9	47.5	50	32
Phosphorus (P)	mg/kg	50			2090	1960	1980	1540	1470	1120	736
Potassium (K)	mg/kg	200			6460	6570	5700	7610	8010	7170	4970
Selenium (Se)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	0.73	0.52	<0.50
Silver (Ag)	mg/kg	0.1			0.15	0.13	0.15	0.17	0.15	0.15	0.16
Sodium (Na)	mg/kg	200			1270	1250	1180	1370	1400	1380	840
Strontium (Sr)	mg/kg	0.5			35.5	34.7	34.7	43.1	43.6	40.4	30.6
Sulfur (S)-Total	mg/kg	100			1780	2360	1890	3570	3910	3020	450
Thallium (Tl)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg	5			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg	1			1140	1100	1130	1340	1320	1350	1160
Vanadium (V)	mg/kg	2			69.7	68.5	71.7	79.7	77.6	81.9	58.4
Zinc (Zn)	mg/kg	1	123	315	69.6	68.2	68.4	98.6	95.7	97.1	62.9

Notes:

a) Canadian sediment quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, Updated Sept 2007

b) ISQG = Interim Sediment Quality Guidelines

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.4-3. Lake Sediment Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Depth Zone Depth (m) Replicate Date Sampled ALS Sample ID	Units	RDL[d]	CCME Guidelines for the Protection of Aquatic Life[a] ISQG[b]	PEL[c]	Patch Lake South Shallow Depth 3 2 11-Aug-09 L805915-5	Patch Lake South Shallow Depth 3 3 11-Aug-09 L805915-6	Patch Lake South Deep Depth 14 1 11-Aug-09 L805915-16	Patch Lake South Deep Depth 13.5 2 11-Aug-09 L805915-17	Patch Lake South Deep Depth 13.5 3 11-Aug-09 L805915-18	Patch Lake North Shallow Depth 2.25 1 11-Aug-09 L805915-1	Patch Lake North Shallow Depth 2.5 2 11-Aug-09 L805915-2
Physical Tests											
% Moisture	%	0.1			56.3	45.2	68.1	68.7	70.5	15.3	20.6
pH	pH				6.23	6.34	6.1	6.21	6.16	7.35	7.21
Particle Size											
% Gravel (>2mm)	%	1			<1.0	3	<1.0	<1.0	<1.0	1	2
% Sand (2.0mm - 0.063mm)	%	1			28	51	1	2	2	89	91
% Silt (0.063mm - 4um)	%	1			48	31	47	51	46	7	5
% Clay (<4um)	%	1			24	15	52	47	51	4	2
Leachable Anions & Nutrients											
Total Nitrogen by LECO	%	0.02			0.219	0.151	0.267	0.288	0.272	0.075	0.095
Organic / Inorganic Carbon											
Total Organic Carbon	%	0.1			1.38	0.85	1.75	1.93	1.75	0.24	0.37
Plant Available Nutrients											
Available Ammonium-N	mg/kg	0.8			5.67	3.65	17.7	11.8	20.7	1.2	1.65
Available Nitrate-N	mg/kg	2			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Nitrite-N	mg/kg	0.4			<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Available Phosphate-P	mg/kg	1			4.5	7.9	4.1	3.9	4.6	3.4	3.6
Metals											
Aluminum (Al)	mg/kg	50			17100	11600	28200	27300	26200	5830	4850
Antimony (Sb)	mg/kg	10			<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	0.05	5.9	17	2.15	1.51	9.89	14.2	14.1	1.24	0.98
Barium (Ba)	mg/kg	1			92.9	59.8	181	178	174	18.8	17.2
Beryllium (Be)	mg/kg	0.5			0.53	<0.50	0.86	0.83	0.79	<0.50	<0.50
Bismuth (Bi)	mg/kg	20			<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.1	0.6	3.5	<0.10	<0.10	0.11	0.1	0.1	<0.10	<0.10
Calcium (Ca)	mg/kg	50			5030	3540	6410	6370	5970	1970	1920
Chromium (Cr)	mg/kg	2	37.3	90	49.2	34.2	75.2	74.7	71.2	17.8	14.5
Cobalt (Co)	mg/kg	2			10.5	6.6	15.8	15.7	15	4.2	3.3
Copper (Cu)	mg/kg	1	35.7	197	25.8	15.3	38.3	37.5	36.2	9.4	6.4
Iron (Fe)	mg/kg	50			23600	16400	48100	50100	49600	11300	8920
Lead (Pb)	mg/kg	2	35	91.3	7.5	4.9	11.5	11	11.3	2.9	2.5
Lithium (Li)	mg/kg	2			32.1	21.3	53.6	52.6	51.1	9.8	8.6
Magnesium (Mg)	mg/kg	50			10700	7210	17200	16800	16200	4110	3210
Manganese (Mn)	mg/kg	1			329	218	1210	1530	1590	151	152
Mercury (Hg)	mg/kg	0.005	0.17	0.486	0.0144	0.0092	0.0263	0.0259	0.0255	<0.0050	<0.0050
Molybdenum (Mo)	mg/kg	0.2			0.97	0.54	1.51	1.54	1.76	0.32	0.21
Nickel (Ni)	mg/kg	5			29.6	19.4	43.7	42.8	41.6	10.4	8.6
Phosphorus (P)	mg/kg	50			666	569	1270	1350	1320	311	324
Potassium (K)	mg/kg	200			4400	2850	7390	7190	6880	970	790
Selenium (Se)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Silver (Ag)	mg/kg	0.1			0.11	<0.10	0.16	0.15	0.19	<0.10	<0.10
Sodium (Na)	mg/kg	200			760	500	1410	1360	1310	210	<200
Strontium (Sr)	mg/kg	0.5			28.1	20	42.9	42.1	40.2	9.38	8.96
Sulfur (S)-Total	mg/kg	100			380	200	690	610	700	<100	<100
Thallium (Tl)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg	5			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg	1			1060	733	1530	1510	1380	401	368
Vanadium (V)	mg/kg	2			53.2	37	81.8	81	77.4	25.5	19.9
Zinc (Zn)	mg/kg	1	123	315	56.3	37.1	85.7	84.3	80.9	18.2	15

Notes:

a) Canadian sediment quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, Updated Sept 2007

b) ISQG = Interim Sediment Quality Guidelines

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.4-3. Lake Sediment Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Depth Zone Depth (m) Replicate Date Sampled ALS Sample ID	Units	RDL[d]	CCME Guidelines for the Protection of Aquatic Life[a] ISQG[b]	PEL[c]	Patch Lake North Shallow Depth 3.25 3 11-Aug-09 L805915-3	Patch Lake North Mid Depth 8 1 09-Aug-09 L803135-16	Patch Lake North Mid Depth 8 2 09-Aug-09 L803135-17	Patch Lake North Mid Depth 8.5 3 09-Aug-09 L803135-18	P.O. Lake Shallow Depth 3.25 1 10-Aug-09 L805915-13	P.O. Lake Shallow Depth 2.75 2 10-Aug-09 L805915-14	P.O. Lake Shallow Depth 3 3 10-Aug-09 L805915-15
Physical Tests											
% Moisture	%	0.1			34.4	73.7	70.9	72.9	66.3	70.7	69.4
pH	pH				6.86	6.16	6.17	6.37	5.88	5.94	5.95
Particle Size											
% Gravel (>2mm)	%	1			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
% Sand (2.0mm - 0.063mm)	%	1			80	2	3	3	2	1	1
% Silt (0.063mm - 4um)	%	1			13	53	49	51	44	42	41
% Clay (<4um)	%	1			7	45	48	46	54	57	58
Leachable Anions & Nutrients											
Total Nitrogen by LECO	%	0.02			0.144	0.229	0.232	0.226	0.42	0.356	0.384
Organic / Inorganic Carbon											
Total Organic Carbon	%	0.1			0.79	1.59	1.65	1.61	2.71	2.31	2.45
Plant Available Nutrients											
Available Ammonium-N	mg/kg	0.8			4.14	8.37	4.85	6.64	44.2	25.7	35.8
Available Nitrate-N	mg/kg	2			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Nitrite-N	mg/kg	0.4			<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Available Phosphate-P	mg/kg	1			9.7	3.3	5.6	2.7	6.2	4.7	5
Metals											
Aluminum (Al)	mg/kg	50			7450	27500	27200	27100	30800	31400	31100
Antimony (Sb)	mg/kg	10			<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	0.05	5.9	17	1.01	4.46	5.01	7.17	5.44	4.88	5.16
Barium (Ba)	mg/kg	1			32.3	164	163	165	192	192	186
Beryllium (Be)	mg/kg	0.5			<0.50	0.88	0.87	0.87	0.97	1	0.97
Bismuth (Bi)	mg/kg	20			<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.1	0.6	3.5	<0.10	<0.10	0.11	0.11	0.13	0.15	0.15
Calcium (Ca)	mg/kg	50			2400	6390	6310	6450	7220	7590	7440
Chromium (Cr)	mg/kg	2	37.3	90	21.6	75.6	75	75	82.6	84.8	82.7
Cobalt (Co)	mg/kg	2			4.8	15.5	15.1	15.6	16.7	16.5	15.2
Copper (Cu)	mg/kg	1	35.7	197	9.9	36.2	36.4	35.9	42.7	46.4	45.6
Iron (Fe)	mg/kg	50			11600	42700	41100	44400	45900	41800	42300
Lead (Pb)	mg/kg	2	35	91.3	3.4	12.6	13.5	13	11.6	12.6	13.9
Lithium (Li)	mg/kg	2			13.5	54	53.3	53.7	58.4	59.9	60.5
Magnesium (Mg)	mg/kg	50			4890	17400	17400	17400	19600	19800	19500
Manganese (Mn)	mg/kg	1			216	879	728	1020	579	522	480
Mercury (Hg)	mg/kg	0.005	0.17	0.486	0.0061	0.0269	0.0267	0.0253	0.0247	0.0248	0.0243
Molybdenum (Mo)	mg/kg	0.2			0.32	1.52	1.49	1.66	1.67	2.49	2.26
Nickel (Ni)	mg/kg	5			13.7	45.1	44.6	44.2	47.6	48.1	46.8
Phosphorus (P)	mg/kg	50			378	1030	1040	1160	1220	1090	869
Potassium (K)	mg/kg	200			1530	7230	7260	7200	8700	8780	8840
Selenium (Se)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Silver (Ag)	mg/kg	0.1			<0.10	0.15	0.16	0.19	0.14	0.16	0.17
Sodium (Na)	mg/kg	200			290	1350	1370	1360	1570	1620	1650
Strontium (Sr)	mg/kg	0.5			12.6	43.4	42.9	44.5	46.2	48.4	48.2
Sulfur (S)-Total	mg/kg	100			100	410	420	380	2360	1650	1660
Thallium (Tl)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg	5			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg	1			484	1400	1390	1370	1550	1690	1720
Vanadium (V)	mg/kg	2			25.5	84.2	82.5	82.5	90.3	90.1	91.5
Zinc (Zn)	mg/kg	1	123	315	24.5	87.5	87.5	86	96.5	99.3	95.6

Notes:

a) Canadian sediment quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, Updated Sept 2007

b) ISQG = Interim Sediment Quality Guidelines

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.4-3. Lake Sediment Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Depth Zone Depth (m) Replicate Date Sampled ALS Sample ID	Units	RDL[d]	CCME Guidelines for the Protection of Aquatic Life[a] ISQG[b]	PEL[c]	Ogama Lake Shallow Depth 4.8 1 15-Aug-09 L807766-1	Ogama Lake Shallow Depth 4.2 2 15-Aug-09 L807766-2	Ogama Lake Shallow Depth 4 3 15-Aug-09 L807766-3	Doris Lake South Shallow Depth 4.1 1 17-Aug-09 L807766-4	Doris Lake South Shallow Depth 4.2 2 17-Aug-09 L807766-5	Doris Lake South Shallow Depth 4.5 3 17-Aug-09 L807766-6	Doris Lake South Deep Depth 10.8 1 17-Aug-09 L807766-7
Physical Tests											
% Moisture	%	0.1			56.6	51.2	56.3	31.2	32.9	29.9	73.4
pH	pH				5.99	6.55	6.03	6.78	6.86	6.84	6.37
Particle Size											
% Gravel (>2mm)	%	1			1	<1.0	<1.0	4	3	1	<1.0
% Sand (2.0mm - 0.063mm)	%	1			6	39	9	84	82	86	1
% Silt (0.063mm - 4um)	%	1			61	41	65	9	10	10	53
% Clay (<4um)	%	1			33	20	25	3	4	4	46
Leachable Anions & Nutrients											
Total Nitrogen by LECO	%	0.02			0.256	0.185	0.218	0.077	0.078	0.077	0.382
Organic / Inorganic Carbon											
Total Organic Carbon	%	0.1			2.21	1.31	1.68	0.38	0.39	0.38	2.78
Plant Available Nutrients											
Available Ammonium-N	mg/kg	0.8			18.5	6.51	19.1	2.71	2.3	2.38	25.6
Available Nitrate-N	mg/kg	2			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Nitrite-N	mg/kg	0.4			<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Available Phosphate-P	mg/kg	1			3.1	2.3	2.5	9.2	5.2	10.5	3.3
Metals											
Aluminum (Al)	mg/kg	50			22000	14600	19000	6140	8600	6400	27100
Antimony (Sb)	mg/kg	10			<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	0.05	5.9	17	5.31	2.45	12.7	2.45	2.2	2.35	13.4
Barium (Ba)	mg/kg	1			129	81	115	26.7	36.1	27.3	200
Beryllium (Be)	mg/kg	0.5			0.7	<0.50	0.6	<0.50	<0.50	<0.50	0.88
Bismuth (Bi)	mg/kg	20			<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.1	0.6	3.5	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.18
Calcium (Ca)	mg/kg	50			5500	4130	5010	2270	2560	2620	6180
Chromium (Cr)	mg/kg	2	37.3	90	59.9	39.9	53	23.1	23.3	21.3	68.6
Cobalt (Co)	mg/kg	2			13.7	8.4	12.1	4.6	6.7	5.1	15.8
Copper (Cu)	mg/kg	1	35.7	197	26.7	16.7	21.8	7.7	9.4	7.3	44
Iron (Fe)	mg/kg	50			39600	23500	43200	15900	18700	16300	60600
Lead (Pb)	mg/kg	2	35	91.3	10.2	5.9	8.2	2.2	2.5	2.4	12.7
Lithium (Li)	mg/kg	2			42	28.5	36.7	10.4	14.6	10.2	48.5
Magnesium (Mg)	mg/kg	50			13700	9320	12000	4650	6010	4540	16100
Manganese (Mn)	mg/kg	1			540	426	801	562	1050	580	2350
Mercury (Hg)	mg/kg	0.005	0.17	0.486	0.0366	0.0143	0.0191	0.0051	0.0059	0.0054	0.0567
Molybdenum (Mo)	mg/kg	0.2			1.14	0.75	1.57	0.83	0.95	0.75	2.71
Nickel (Ni)	mg/kg	5			35	22.5	29.7	13.9	16.1	13.1	47.2
Phosphorus (P)	mg/kg	50			975	609	1170	528	474	564	1400
Potassium (K)	mg/kg	200			5580	3680	4830	970	1390	1070	6820
Selenium (Se)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Silver (Ag)	mg/kg	0.1			0.13	<0.10	<0.10	<0.10	<0.10	<0.10	0.13
Sodium (Na)	mg/kg	200			1000	670	900	280	330	300	1740
Strontium (Sr)	mg/kg	0.5			32.9	24.4	30.4	12	13	13.4	41.9
Sulfur (S)-Total	mg/kg	100			630	260	410	<100	<100	<100	1080
Thallium (Tl)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg	5			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg	1			1360	957	1170	413	530	480	1400
Vanadium (V)	mg/kg	2			70.3	47.2	62.2	26.6	34.5	29.6	86.6
Zinc (Zn)	mg/kg	1	123	315	73	49.1	63.6	19.5	28.3	20.6	96.5

Notes:

a) Canadian sediment quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, Updated Sept 2007

b) ISQG = Interim Sediment Quality Guidelines

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.4-3. Lake Sediment Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Depth Zone Depth (m) Replicate Date Sampled ALS Sample ID	Units	RDL[d]	CCME Guidelines for the Protection of Aquatic Life[a] ISQG[b]	PEL[c]	Doris Lake South Deep Depth 11 2 17-Aug-09 L807766-8	Doris Lake South Deep Depth 11 3 17-Aug-09 L807766-9	Doris Lake North Shallow Depth 4.5 1 15-Aug-09 L807766-16	Doris Lake North Shallow Depth 3.8 2 15-Aug-09 L807766-17	Doris Lake North Shallow Depth 4 3 15-Aug-09 L807766-18	Doris Lake North Deep Depth 13.5 1 15-Aug-09 L807766-13	Doris Lake North Deep Depth 14 2 15-Aug-09 L807766-14
Physical Tests											
% Moisture	%	0.1			76.4	77.7	67.8	58.8	64.3	76.1	71.9
pH	pH				6.31	6.28	5.85	6.1	5.82	5.96	5.81
Particle Size											
% Gravel (>2mm)	%	1			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	4
% Sand (2.0mm - 0.063mm)	%	1			<1.0	1	6	60	29	1	<1.0
% Silt (0.063mm - 4um)	%	1			53	55	49	28	49	45	52
% Clay (<4um)	%	1			47	44	46	12	22	53	44
Leachable Anions & Nutrients											
Total Nitrogen by LECO	%	0.02			0.396	0.399	0.303	0.244	0.262	0.397	0.396
Organic / Inorganic Carbon											
Total Organic Carbon	%	0.1			2.75	2.85	2.11	1.71	2.19	2.93	2.89
Plant Available Nutrients											
Available Ammonium-N	mg/kg	0.8			29.6	32.6	15.2	18.4	14.5	31.6	32.4
Available Nitrate-N	mg/kg	2			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Nitrite-N	mg/kg	0.4			<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Available Phosphate-P	mg/kg	1			3.5	2.9	1.8	3.3	1.7	3.6	3.2
Metals											
Aluminum (Al)	mg/kg	50			27800	26100	27600	10000	16900	29100	30000
Antimony (Sb)	mg/kg	10			<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	0.05	5.9	17	12.4	20.8	4.41	3.04	3.09	14.1	8.26
Barium (Ba)	mg/kg	1			206	203	175	57.7	100	198	183
Beryllium (Be)	mg/kg	0.5			0.85	0.83	0.86	<0.50	0.51	0.97	0.96
Bismuth (Bi)	mg/kg	20			<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.1	0.6	3.5	0.18	0.17	0.15	<0.10	<0.10	0.18	0.14
Calcium (Ca)	mg/kg	50			6190	5980	6110	3180	4530	6020	6480
Chromium (Cr)	mg/kg	2	37.3	90	70.9	67.4	69.3	26.6	44.2	73.1	77.8
Cobalt (Co)	mg/kg	2			16.5	16.3	15.1	6	10.2	16.9	15.5
Copper (Cu)	mg/kg	1	35.7	197	45.2	42.6	41.1	14.6	27.4	47.7	47
Iron (Fe)	mg/kg	50			63500	67900	37600	18300	25900	59700	52500
Lead (Pb)	mg/kg	2	35	91.3	12.6	12.3	11.9	4.3	7.1	14.6	13.4
Lithium (Li)	mg/kg	2			49.3	46.8	49.9	17.5	31	53.4	54.9
Magnesium (Mg)	mg/kg	50			16500	15700	16300	6050	10400	17300	18000
Manganese (Mn)	mg/kg	1			2530	2970	817	552	496	1510	706
Mercury (Hg)	mg/kg	0.005	0.17	0.486	0.0574	0.0633	0.0443	0.0192	0.0305	0.0643	0.07
Molybdenum (Mo)	mg/kg	0.2			2.9	3.21	2.66	0.95	1.43	2.04	1.45
Nickel (Ni)	mg/kg	5			49.2	45.8	47.6	17.2	28.6	51.3	49.8
Phosphorus (P)	mg/kg	50			1360	1580	869	633	682	1400	1310
Potassium (K)	mg/kg	200			7000	6560	6980	2260	4010	7370	7650
Selenium (Se)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Silver (Ag)	mg/kg	0.1			0.17	0.14	0.13	<0.10	0.1	0.19	0.26
Sodium (Na)	mg/kg	200			1800	1710	1690	620	970	1800	1770
Strontium (Sr)	mg/kg	0.5			43	41.2	41.1	18	26.6	42.3	43.6
Sulfur (S)-Total	mg/kg	100			1160	1180	680	510	580	1150	1000
Thallium (Tl)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg	5			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg	1			1450	1330	1420	631	974	1490	1530
Vanadium (V)	mg/kg	2			87.2	84.2	80.9	32.7	52.9	92.5	91.6
Zinc (Zn)	mg/kg	1	123	315	98.6	93.3	96.1	34.8	59.7	105	106

Notes:

a) Canadian sediment quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, Updated Sept 2007

b) ISQG = Interim Sediment Quality Guidelines

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.4-3. Lake Sediment Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name			CCME Guidelines for the Protection of Aquatic Life[a]		Doris Lake North	Little Roberts Lake	Little Roberts Lake	Little Roberts Lake	Naiqunnguut Lake	Naiqunnguut Lake	Naiqunnguut Lake
Depth Zone					Deep Depth	Shallow Depth	Shallow Depth	Shallow Depth	Shallow Depth	Shallow Depth	Shallow Depth
Depth (m)					15	2.6	2.6	2.6	4.5	4.5	4.25
Replicate					3	1	2	3	1	2	3
Date Sampled					15-Aug-09	07-Aug-09	07-Aug-09	07-Aug-09	10-Aug-09	10-Aug-09	10-Aug-09
ALS Sample ID	Units	RDL[d]	ISQG[b]	PEL[c]	L807766-15	L803135-10	L803135-11	L803135-12	L805915-10	L805915-11	L805915-12
Physical Tests											
% Moisture	%	0.1			74.1	77.3	73.4	66.5	68.9	62.5	62.1
pH	pH				5.8	5.89	5.96	5.82	5.97	6.29	6.18
Particle Size											
% Gravel (>2mm)	%	1			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
% Sand (2.0mm - 0.063mm)	%	1			1	10	9	8	1	1	1
% Silt (0.063mm - 4um)	%	1			52	64	62	63	35	41	38
% Clay (<4um)	%	1			47	26	29	30	64	58	61
Leachable Anions & Nutrients											
Total Nitrogen by LECO	%	0.02			0.36	0.387	0.452	0.463	0.247	0.246	0.259
Organic / Inorganic Carbon											
Total Organic Carbon	%	0.1			2.82	2.88	3.48	3.55	1.85	1.98	1.9
Plant Available Nutrients											
Available Ammonium-N	mg/kg	0.8			36.2	36.7	43.8	33.7	8.88	6.8	8.82
Available Nitrate-N	mg/kg	2			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Nitrite-N	mg/kg	0.4			<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Available Phosphate-P	mg/kg	1			3.1	3.5	4.7	5.9	4.7	6.6	6.5
Metals											
Aluminum (Al)	mg/kg	50			29300	19300	19100	19200	28800	28400	29800
Antimony (Sb)	mg/kg	10			<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	0.05	5.9	17	23.1	3.48	2.78	2.46	7.17	4.31	4.64
Barium (Ba)	mg/kg	1			196	112	115	108	186	180	193
Beryllium (Be)	mg/kg	0.5			0.99	0.56	0.56	0.57	0.83	0.83	0.88
Bismuth (Bi)	mg/kg	20			<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.1	0.6	3.5	0.17	0.14	0.14	0.12	<0.10	0.11	0.1
Calcium (Ca)	mg/kg	50			6120	5730	5990	5660	7180	6930	7280
Chromium (Cr)	mg/kg	2	37.3	90	75	51.2	49.7	50.4	73.2	73.9	77.5
Cobalt (Co)	mg/kg	2			16.2	11.8	11.8	11.4	18.2	16.5	17
Copper (Cu)	mg/kg	1	35.7	197	47.2	33.3	33.4	32	35.1	38.6	37.1
Iron (Fe)	mg/kg	50			68300	31000	32400	29400	71300	52200	59800
Lead (Pb)	mg/kg	2	35	91.3	15.1	7.8	7.5	7.8	9.8	9.7	10.5
Lithium (Li)	mg/kg	2			52.4	35	35.1	34.6	52.8	51.9	54.3
Magnesium (Mg)	mg/kg	50			17000	13500	13100	13300	18800	18700	19700
Manganese (Mn)	mg/kg	1			1400	422	661	384	1060	979	973
Mercury (Hg)	mg/kg	0.005	0.17	0.486	0.0666	0.0253	0.028	0.0245	0.0444	0.0337	0.0346
Molybdenum (Mo)	mg/kg	0.2			2.18	1.73	1.46	1.67	1.7	1.6	1.57
Nickel (Ni)	mg/kg	5			50.3	29.6	29.7	29.3	39.2	39.3	41.1
Phosphorus (P)	mg/kg	50			1710	835	1110	808	1780	1130	1370
Potassium (K)	mg/kg	200			7400	5120	5490	5040	8030	7770	8170
Selenium (Se)	mg/kg	0.5			0.51	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Silver (Ag)	mg/kg	0.1			0.16	0.11	<0.10	0.12	0.14	0.15	0.14
Sodium (Na)	mg/kg	200			1830	1040	1090	1020	1520	1500	1540
Strontium (Sr)	mg/kg	0.5			43.6	31.5	33.9	31	45.6	42.3	44.3
Sulfur (S)-Total	mg/kg	100			1050	1480	1430	1640	370	460	380
Thallium (Tl)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg	5			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg	1			1440	1190	1080	1190	1400	1590	1530
Vanadium (V)	mg/kg	2			93.8	62.6	61.7	61.8	85.6	83.1	87.3
Zinc (Zn)	mg/kg	1	123	315	103	72.8	70.8	70.6	91.9	93.6	95.6

Notes:

a) Canadian sediment quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, Updated Sept 2007

b) ISQG = Interim Sediment Quality Guidelines

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.4-3. Lake Sediment Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Depth Zone Depth (m) Replicate Date Sampled ALS Sample ID	Units	RDL[d]	CCME Guidelines for the Protection of Aquatic Life[a] ISQG[b]	PEL[c]	Nakhaktok Lake Shallow Depth 3.5 1 06-Aug-09 L803135-4	Nakhaktok Lake Shallow Depth 3.5 2 06-Aug-09 L803135-5	Nakhaktok Lake Shallow Depth 3.5 3 06-Aug-09 L803135-6	Nakhaktok Lake Mid Depth 7.5 1 06-Aug-09 L803135-7	Nakhaktok Lake Mid Depth 7.5 2 06-Aug-09 L803135-8	Nakhaktok Lake Mid Depth 7.5 3 06-Aug-09 L803135-9	Windy Lake Shallow Depth 3.5 1 09-Aug-09 L803135-28
Physical Tests											
% Moisture	%	0.1			79.8	77.8	79.9	64.9	65.8	68.8	48.8
pH	pH				6.47	6.15	6.43	6.75	6.86	6.36	6.82
Particle Size											
% Gravel (>2mm)	%	1			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
% Sand (2.0mm - 0.063mm)	%	1			2	6	5	7	8	14	27
% Silt (0.063mm - 4um)	%	1			59	61	55	62	61	58	51
% Clay (<4um)	%	1			39	33	40	31	31	28	22
Leachable Anions & Nutrients											
Total Nitrogen by LECO	%	0.02			0.667	0.684	0.655	0.365	0.375	0.466	0.141
Organic / Inorganic Carbon											
Total Organic Carbon	%	0.1			4.58	5.05	4.49	2.8	2.99	4.17	0.68
Plant Available Nutrients											
Available Ammonium-N	mg/kg	0.8			41	66.8	58.9	8.49	8.5	11.9	1.85
Available Nitrate-N	mg/kg	2			<2.0	3.9	3	<2.0	2	<2.0	<2.0
Nitrite-N	mg/kg	0.4			<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Available Phosphate-P	mg/kg	1			6.1	6.5	7.3	4.6	4.1	2.7	5.1
Metals											
Aluminum (Al)	mg/kg	50			24500	23100	25100	23300	21800	22900	13000
Antimony (Sb)	mg/kg	10			<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	0.05	5.9	17	7.22	17.6	10.1	2.24	4.32	18.4	11.2
Barium (Ba)	mg/kg	1			142	156	148	124	116	116	69.6
Beryllium (Be)	mg/kg	0.5			0.77	0.75	0.78	0.73	0.69	0.79	<0.50
Bismuth (Bi)	mg/kg	20			<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.1	0.6	3.5	0.13	0.12	0.13	<0.10	<0.10	0.12	<0.10
Calcium (Ca)	mg/kg	50			6170	6390	6280	5430	5120	5530	4260
Chromium (Cr)	mg/kg	2	37.3	90	66.6	62.9	67.5	63.5	58.8	59.1	36.8
Cobalt (Co)	mg/kg	2			12.9	12.5	13.1	12.4	12.6	15.8	7.9
Copper (Cu)	mg/kg	1	35.7	197	55.2	48.4	55.9	37.9	36.9	41.9	23.9
Iron (Fe)	mg/kg	50			40100	68200	42400	30800	29300	39200	25000
Lead (Pb)	mg/kg	2	35	91.3	11.5	10.6	11.1	9.9	9.5	10.6	6.5
Lithium (Li)	mg/kg	2			46.4	44.1	47.5	43.6	41.6	45	24.5
Magnesium (Mg)	mg/kg	50			16100	15200	16200	15500	14700	15000	8590
Manganese (Mn)	mg/kg	1			351	440	360	314	295	315	341
Mercury (Hg)	mg/kg	0.005	0.17	0.486	0.0363	0.0317	0.0348	0.0226	0.0212	0.0232	0.007
Molybdenum (Mo)	mg/kg	0.2			4.14	3.82	4.03	1.83	2.12	7.31	1.48
Nickel (Ni)	mg/kg	5			41	37.6	41.3	36.5	34.5	37.4	20.5
Phosphorus (P)	mg/kg	50			1550	2530	1390	895	821	786	767
Potassium (K)	mg/kg	200			8080	7430	7840	6130	5790	5600	3270
Selenium (Se)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Silver (Ag)	mg/kg	0.1			0.15	0.12	0.15	0.14	0.13	0.15	<0.10
Sodium (Na)	mg/kg	200			1690	1560	1650	1860	1900	2190	670
Strontium (Sr)	mg/kg	0.5			39.1	44.3	40.1	38.6	39.5	46	22.8
Sulfur (S)-Total	mg/kg	100			6100	4460	6640	1720	2180	4270	210
Thallium (Tl)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg	5			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg	1			1330	1230	1370	1340	1250	1130	831
Vanadium (V)	mg/kg	2			73.9	74.3	75.6	66.6	62.3	68.6	44.2
Zinc (Zn)	mg/kg	1	123	315	80.7	74.3	82.6	74.4	70.4	68.8	40.3

Notes:

a) Canadian sediment quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, Updated Sept 2007

b) ISQG = Interim Sediment Quality Guidelines

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.4-3. Lake Sediment Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name			CCME Guidelines for the Protection of Aquatic Life[a]		Windy Lake	Windy Lake	Windy Lake	Windy Lake	Windy Lake	Glenn Lake	Glenn Lake
Depth Zone					Shallow Depth	Shallow Depth	Deep Depth	Deep Depth	Deep Depth	Shallow Depth	Shallow Depth
Depth (m)					3.5	4	18	18	18	4.5	4.5
Replicate					2	3	1	2	3	1	2
Date Sampled					09-Aug-09	09-Aug-09	09-Aug-09	09-Aug-09	09-Aug-09	08-Aug-09	08-Aug-09
ALS Sample ID	Units	RDL[d]	ISQG[b]	PEL[c]	L803135-29	L803135-30	L803135-25	L803135-26	L803135-27	L803135-22	L803135-23
Physical Tests											
% Moisture	%	0.1			49	39	64	62.7	62.1	62.6	65.1
pH	pH				6.78	6.98	6.65	6.61	6.56	7.15	7.16
Particle Size											
% Gravel (>2mm)	%	1			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
% Sand (2.0mm - 0.063mm)	%	1			19	49	<1.0	<1.0	<1.0	6	4
% Silt (0.063mm - 4um)	%	1			58	33	38	39	37	36	35
% Clay (<4um)	%	1			23	18	62	61	63	58	60
Leachable Anions & Nutrients											
Total Nitrogen by LECO	%	0.02			0.174	0.143	0.243	0.237	0.221	0.103	0.119
Organic / Inorganic Carbon											
Total Organic Carbon	%	0.1			0.91	0.72	1.04	1.06	1.06	0.68	0.72
Plant Available Nutrients											
Available Ammonium-N	mg/kg	0.8			2.23	1.88	5.29	5.15	4.21	1.8	1.78
Available Nitrate-N	mg/kg	2			3	3.1	2	2.6	<2.0	2.7	2.9
Nitrite-N	mg/kg	0.4			<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Available Phosphate-P	mg/kg	1			5.5	5.3	9.3	9.2	12.7	1.6	1.3
Metals											
Aluminum (Al)	mg/kg	50			14700	11900	29100	27700	30300	29500	30400
Antimony (Sb)	mg/kg	10			<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	0.05	5.9	17	3.12	4.06	7.2	5.34	5.54	3.33	3.37
Barium (Ba)	mg/kg	1			79.5	61.3	174	167	180	173	177
Beryllium (Be)	mg/kg	0.5			<0.50	<0.50	0.93	0.86	0.95	0.88	0.93
Bismuth (Bi)	mg/kg	20			<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.1	0.6	3.5	<0.10	<0.10	0.13	0.14	0.13	0.11	0.12
Calcium (Ca)	mg/kg	50			4640	3730	6680	6170	6860	7800	7950
Chromium (Cr)	mg/kg	2	37.3	90	40.6	33.3	76.5	73.8	79.8	74.8	77
Cobalt (Co)	mg/kg	2			8.6	7.5	16.1	15.7	16.2	16.9	17.2
Copper (Cu)	mg/kg	1	35.7	197	29	22.7	48.4	47.6	50.2	45	46.3
Iron (Fe)	mg/kg	50			21200	20000	40600	38900	41000	40300	41300
Lead (Pb)	mg/kg	2	35	91.3	7.1	6.1	12.6	13.2	13.2	12.1	12.9
Lithium (Li)	mg/kg	2			27.8	22.5	56.1	54.6	58.7	57.4	59.8
Magnesium (Mg)	mg/kg	50			9680	7880	19400	19000	20100	21200	21700
Manganese (Mn)	mg/kg	1			274	255	615	552	623	579	598
Mercury (Hg)	mg/kg	0.005	0.17	0.486	0.0092	0.0052	0.0246	0.0245	0.0242	0.0133	0.0127
Molybdenum (Mo)	mg/kg	0.2			1.24	1.19	1.71	1.75	1.82	1.26	1.3
Nickel (Ni)	mg/kg	5			23.5	20.4	44.2	43	45.9	42.2	42.8
Phosphorus (P)	mg/kg	50			641	560	968	897	946	730	721
Potassium (K)	mg/kg	200			3770	2900	8090	7660	8370	8590	8820
Selenium (Se)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Silver (Ag)	mg/kg	0.1			<0.10	<0.10	0.15	0.15	0.15	0.13	0.14
Sodium (Na)	mg/kg	200			760	560	1570	1440	1590	1650	1710
Strontium (Sr)	mg/kg	0.5			24.7	19.6	43.4	39.2	44.2	45.5	46
Sulfur (S)-Total	mg/kg	100			370	200	340	360	320	160	150
Thallium (Tl)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg	5			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg	1			921	764	1520	1360	1580	1650	1710
Vanadium (V)	mg/kg	2			49.2	41	86.5	82.1	88.9	86.3	89.1
Zinc (Zn)	mg/kg	1	123	315	46	36.7	91	89.9	93.7	90.4	93.1

Notes:

a) Canadian sediment quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, Updated Sept 2007

b) ISQG = Interim Sediment Quality Guidelines

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.4-3. Lake Sediment Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Depth Zone Depth (m) Replicate Date Sampled ALS Sample ID	Units	RDL[d]	CCME Guidelines for the Protection of Aquatic Life[a] ISQG[b]	PEL[c]	Glenn Lake Shallow Depth 4.5 3 08-Aug-09 L803135-24	Glenn Lake Deep Depth 19.5 1 08-Aug-09 L803135-19	Glenn Lake Deep Depth 19.5 2 08-Aug-09 L803135-20	Glenn Lake Deep Depth 19.5 3 08-Aug-09 L803135-21	Reference Lake A Shallow Depth 3.5 1 13-Aug-09 L805915-19	Reference Lake A Shallow Depth 2.5 2 13-Aug-09 L805915-20	Reference Lake A Shallow Depth 4.1 3 13-Aug-09 L805915-21
Physical Tests											
% Moisture	%	0.1			62.7	59	56.5	59.4	50.6	40.7	60.2
pH	pH				7.19	7.04	7.11	7.17	6.5	6.39	6.5
Particle Size											
% Gravel (>2mm)	%	1			<1.0	<1.0	<1.0	<1.0	1	4	<1.0
% Sand (2.0mm - 0.063mm)	%	1			4	<1.0	<1.0	<1.0	71	48	45
% Silt (0.063mm - 4um)	%	1			32	24	27	26	23	30	36
% Clay (<4um)	%	1			64	76	73	74	5	18	18
Leachable Anions & Nutrients											
Total Nitrogen by LECO	%	0.02			0.16	0.112	0.097	0.1	0.156	0.139	0.268
Organic / Inorganic Carbon											
Total Organic Carbon	%	0.1			0.74	0.64	0.59	0.57	1.08	0.67	2.03
Plant Available Nutrients											
Available Ammonium-N	mg/kg	0.8			1.88	2.38	1.74	1.79	2.29	3.49	3.63
Available Nitrate-N	mg/kg	2			2.6	2.9	<2.0	2.4	<2.0	<2.0	<2.0
Nitrite-N	mg/kg	0.4			<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Available Phosphate-P	mg/kg	1			2.2	3.6	4	4.1	7.1	1.5	6.7
Metals											
Aluminum (Al)	mg/kg	50			29600	35800	33200	33200	7570	11600	11600
Antimony (Sb)	mg/kg	10			<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	0.05	5.9	17	3.3	4.07	3.27	3.62	0.701	3.2	1.07
Barium (Ba)	mg/kg	1			171	222	207	207	41.1	56.8	64.7
Beryllium (Be)	mg/kg	0.5			0.91	1.07	1	0.98	<0.50	<0.50	<0.50
Bismuth (Bi)	mg/kg	20			<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.1	0.6	3.5	0.12	0.12	0.11	0.12	<0.10	<0.10	<0.10
Calcium (Ca)	mg/kg	50			7700	8760	7950	8180	2500	3840	3390
Chromium (Cr)	mg/kg	2	37.3	90	75.3	91	85.1	84.7	15.9	28	26.2
Cobalt (Co)	mg/kg	2			16.9	19.9	18.8	19.1	3.8	5.9	5.9
Copper (Cu)	mg/kg	1	35.7	197	44.5	51.1	47.9	47	16.3	16.4	24.5
Iron (Fe)	mg/kg	50			40300	48200	45800	45300	9930	17800	15000
Lead (Pb)	mg/kg	2	35	91.3	12.9	14	13	13.6	3.5	4.8	5.3
Lithium (Li)	mg/kg	2			58.3	70	66	65.2	16.1	22.8	22.5
Magnesium (Mg)	mg/kg	50			21000	26100	24600	24600	4480	7330	6550
Manganese (Mn)	mg/kg	1			566	654	620	615	115	207	201
Mercury (Hg)	mg/kg	0.005	0.17	0.486	0.0115	0.019	0.0168	0.0187	0.005	0.0054	0.0098
Molybdenum (Mo)	mg/kg	0.2			1.36	1.19	1.19	1.2	0.59	2.14	0.84
Nickel (Ni)	mg/kg	5			42.3	49.1	46.9	46.3	10.6	15.1	16.6
Phosphorus (P)	mg/kg	50			709	774	737	736	383	544	470
Potassium (K)	mg/kg	200			8540	11000	10100	10100	1500	2780	2570
Selenium (Se)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Silver (Ag)	mg/kg	0.1			0.15	0.18	0.15	0.15	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg	200			1640	2100	1920	1930	290	530	490
Strontium (Sr)	mg/kg	0.5			44.3	55.3	49.4	51.1	13.6	20.9	19.7
Sulfur (S)-Total	mg/kg	100			190	200	190	190	230	340	650
Thallium (Tl)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg	5			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg	1			1670	1940	1820	1800	490	787	723
Vanadium (V)	mg/kg	2			86.2	102	96.7	96.2	23.5	39.4	35.1
Zinc (Zn)	mg/kg	1	123	315	90.5	110	104	104	30.3	38.2	41.9

Notes:

a) Canadian sediment quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, Updated Sept 2007

b) ISQG = Interim Sediment Quality Guidelines

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.4-3. Lake Sediment Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name			CCME Guidelines for the Protection of Aquatic Life[a]		Reference Lake A	Reference Lake A	Reference Lake A	Reference Lake B	Reference Lake B	Reference Lake B	Reference Lake B
Depth Zone					Deep Depth	Deep Depth	Deep Depth	Shallow Depth	Shallow Depth	Shallow Depth	Mid Depth
Depth (m)					31.5	31.5	31.5	4.5	4.8	4.9	9.5
Replicate					1	2	3	1	2	3	1
Date Sampled					12-Aug-09	12-Aug-09	12-Aug-09	16-Aug-09	16-Aug-09	16-Aug-09	16-Aug-09
ALS Sample ID	Units	RDL[d]	ISQG[b]	PEL[c]	L805915-7	L805915-8	L805915-9	L807766-19	L807766-20	L807766-21	L807766-10
Physical Tests											
% Moisture	%	0.1			77.6	79.5	77.9	66.4	89.6	90.1	89.5
pH	pH				6.3	6.31	6.11	6.39	6.28	6.23	6.3
Particle Size											
% Gravel (>2mm)	%	1			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
% Sand (2.0mm - 0.063mm)	%	1			1	1	1	74	15	7	2
% Silt (0.063mm - 4um)	%	1			50	46	58	21	59	67	68
% Clay (<4um)	%	1			49	53	41	5	26	26	29
Leachable Anions & Nutrients											
Total Nitrogen by LECO	%	0.02			0.421	0.409	0.462	0.163	0.555	0.616	0.854
Organic / Inorganic Carbon											
Total Organic Carbon	%	0.1			3.26	3.22	3.83	1.76	5.44	7.84	9.8
Plant Available Nutrients											
Available Ammonium-N	mg/kg	0.8			9.28	13.2	11	4.27	11.8	11.6	23.7
Available Nitrate-N	mg/kg	2			<2.0	3	<2.0	<2.0	<2.0	<2.0	<2.0
Nitrite-N	mg/kg	0.4			<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Available Phosphate-P	mg/kg	1			92.9	97.4	41.4	6.2	5.4	9.3	19.6
Metals											
Aluminum (Al)	mg/kg	50			27600	28000	28000	6300	15800	16500	18500
Antimony (Sb)	mg/kg	10			<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	0.05	5.9	17	1.46	1.72	2.52	0.6	1.42	2.2	2.03
Barium (Ba)	mg/kg	1			156	159	163	22.9	74.1	76.9	81.8
Beryllium (Be)	mg/kg	0.5			0.82	0.85	0.86	<0.50	0.58	0.61	0.64
Bismuth (Bi)	mg/kg	20			<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.1	0.6	3.5	0.16	0.16	0.17	<0.10	0.28	0.3	0.38
Calcium (Ca)	mg/kg	50			5570	5640	5490	1910	3680	4120	4060
Chromium (Cr)	mg/kg	2	37.3	90	65.3	66.7	67.6	14.1	39.5	40.4	46
Cobalt (Co)	mg/kg	2			12.7	12.2	13	3.3	7.6	7.8	11
Copper (Cu)	mg/kg	1	35.7	197	65.3	67.1	73.6	15.5	58.6	61.9	85.3
Iron (Fe)	mg/kg	50			30400	30400	33800	10000	24400	27700	28100
Lead (Pb)	mg/kg	2	35	91.3	10.5	10.2	10.5	2.6	6.5	7.4	7.6
Lithium (Li)	mg/kg	2			47.8	48.4	46.7	11	23.7	23.9	26.6
Magnesium (Mg)	mg/kg	50			15600	15900	15800	3160	6300	6450	7230
Manganese (Mn)	mg/kg	1			336	330	350	99.7	225	261	259
Mercury (Hg)	mg/kg	0.005	0.17	0.486	0.0611	0.0639	0.0646	0.0052	0.0277	0.0332	0.0374
Molybdenum (Mo)	mg/kg	0.2			1.02	1.04	1.19	0.94	3.83	4.33	4.56
Nickel (Ni)	mg/kg	5			35.5	36.2	35.7	10.1	24	25.5	30.1
Phosphorus (P)	mg/kg	50			1100	1130	1430	310	688	817	1180
Potassium (K)	mg/kg	200			6490	6540	6460	840	2570	2670	2930
Selenium (Se)	mg/kg	0.5			<0.50	0.5	0.8	<0.50	<0.50	0.52	0.84
Silver (Ag)	mg/kg	0.1			0.19	0.18	0.2	<0.10	0.13	0.13	0.27
Sodium (Na)	mg/kg	200			1520	1530	1530	<200	420	430	550
Strontium (Sr)	mg/kg	0.5			38.2	38.2	38.1	11.2	25.1	26.7	27.9
Sulfur (S)-Total	mg/kg	100			690	670	730	320	1420	1530	2150
Thallium (Tl)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg	5			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg	1			1160	1130	1080	352	472	479	482
Vanadium (V)	mg/kg	2			68.8	71.4	78	20.9	51.4	53.4	55.2
Zinc (Zn)	mg/kg	1	123	315	93.8	95.7	95.9	36.2	95	99.8	115

Notes:

a) Canadian sediment quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, Updated Sept 2007

b) ISQG = Interim Sediment Quality Guidelines

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.4-3. Lake Sediment Quality Analytical Results, Hope Bay Belt Project, 2009

Site Name Depth Zone Depth (m) Replicate Date Sampled ALS Sample ID	Units	RDL[d]	CCME Guidelines for the Protection of Aquatic Life[a] ISQG[b]	 PEL[c]	Reference Lake B Mid Depth 9.5 2 16-Aug-09 L807766-11	Reference Lake B Mid Depth 9.2 3 16-Aug-09 L807766-12
Physical Tests						
% Moisture	%	0.1			90	90.4
pH	pH				6.27	6.39
Particle Size						
% Gravel (>2mm)	%	1			<1.0	<1.0
% Sand (2.0mm - 0.063mm)	%	1			1	1
% Silt (0.063mm - 4um)	%	1			70	62
% Clay (<4um)	%	1			29	37
Leachable Anions & Nutrients						
Total Nitrogen by LECO	%	0.02			0.797	0.981
Organic / Inorganic Carbon						
Total Organic Carbon	%	0.1			9.62	11.2
Plant Available Nutrients						
Available Ammonium-N	mg/kg	0.8			35.9	24.6
Available Nitrate-N	mg/kg	2			<2.0	<2.0
Nitrite-N	mg/kg	0.4			<0.40	<0.40
Available Phosphate-P	mg/kg	1			41.2	23
Metals						
Aluminum (Al)	mg/kg	50			18000	16200
Antimony (Sb)	mg/kg	10			<10	<10
Arsenic (As)	mg/kg	0.05	5.9	17	1.72	1.41
Barium (Ba)	mg/kg	1			83.8	79.7
Beryllium (Be)	mg/kg	0.5			0.62	0.56
Bismuth (Bi)	mg/kg	20			<20	<20
Cadmium (Cd)	mg/kg	0.1	0.6	3.5	0.37	0.33
Calcium (Ca)	mg/kg	50			3850	3900
Chromium (Cr)	mg/kg	2	37.3	90	46.2	41.8
Cobalt (Co)	mg/kg	2			9.8	8.4
Copper (Cu)	mg/kg	1	35.7	197	79.2	70.5
Iron (Fe)	mg/kg	50			25000	22700
Lead (Pb)	mg/kg	2	35	91.3	7.2	8.2
Lithium (Li)	mg/kg	2			26.2	24.3
Magnesium (Mg)	mg/kg	50			7240	6680
Manganese (Mn)	mg/kg	1			246	226
Mercury (Hg)	mg/kg	0.005	0.17	0.486	0.0428	0.0598
Molybdenum (Mo)	mg/kg	0.2			3.8	2.89
Nickel (Ni)	mg/kg	5			29.2	27.3
Phosphorus (P)	mg/kg	50			1090	1060
Potassium (K)	mg/kg	200			2930	2730
Selenium (Se)	mg/kg	0.5			0.64	0.53
Silver (Ag)	mg/kg	0.1			0.26	0.22
Sodium (Na)	mg/kg	200			540	480
Strontium (Sr)	mg/kg	0.5			27.5	26.5
Sulfur (S)-Total	mg/kg	100			2150	2030
Thallium (Tl)	mg/kg	0.5			<0.50	<0.50
Tin (Sn)	mg/kg	5			<5.0	<5.0
Titanium (Ti)	mg/kg	1			482	424
Vanadium (V)	mg/kg	2			53.6	47.9
Zinc (Zn)	mg/kg	1	123	315	113	92.6

Notes:

a) Canadian sediment quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, Updated Sept 2007

b) ISQG = Interim Sediment Quality Guidelines

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.5-1

Stream Sediment Quality Analytical Results, Hope Bay Belt Project, 2009

Engineers and Scientists

Appendix 3.5-1. Stream Sediment Quality Analytical Results, Hope Bay Belt Project, 2009

Stream			CCME Guidelines for the		Patch OF	Patch OF	Patch OF	P.O. OF	P.O. OF	P.O. OF	Ogama OF	Ogama OF	Ogama OF	Doris OF	Doris OF
Replicate					1	2	3	1	2	3	1	2	3	1	2
Date Sampled					23-Jul-09	23-Jul-09	23-Jul-09	23-Jul-09	23-Jul-09	23-Jul-09	23-Jul-09	23-Jul-09	22-Jul-09	21-Jul-09	21-Jul-09
ALS Sample ID	Units	RDL[d]	ISQG[b]	PEL[c]	L797002-7	L797002-8	L797002-9	L797002-4	L797002-5	L797002-6	L797002-19	L797002-20	L797002-21	L797002-16	L797002-17
Physical Tests															
% Moisture	%	0.1			54.3	30	25.2	49.5	74.7	27.3	12.9	16.7	10.9	7.13	41.1
pH	pH	0.1			5.83	6.46	6.34	5.61	6.39	5.77	7.37	6.97	7.02	7.25	6.93
Particle Size															
% Gravel (>2mm)	%	1			3	17	15	2	3	<1.0	58	50	36	78	59
% Sand (2.0mm - 0.063mm)	%	1			40	64	60	58	49	22	38	42	36	22	22
% Silt (0.063mm - 4um)	%	1			38	13	18	25	30	50	3	4	14	<1.0	10
% Clay (<4um)	%	1			19	7	8	14	17	28	1	3	14	<1.0	9
Leachable Anions & Nutrients															
Total Nitrogen by LECO	%	0.02			0.256	0.105	0.13	0.204	0.413	0.167	0.055	0.048	0.066	0.051	0.102
Organic / Inorganic Carbon															
Total Organic Carbon	%	0.1			2.89	0.96	1.48	2.44	4.72	1.63	0.22	0.21	0.35	<0.10	0.67
Plant Available Nutrients															
Available Ammonium-N	mg/kg	0.8			6.87	1.43	2.48	6.41	18	28.6	6.28	1.13	2.68	3.94	3.44
Available Nitrate-N	mg/kg	2			<2.0	<2.0	<2.0	2.4	7	2.1	<2.0	2.5	2.2	<2.0	4
Nitrite-N	mg/kg	0.4			<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Available Phosphate-P	mg/kg	1			4	3.6	3.3	1.2	3.2	3.6	5.3	4	3.6	3.4	2.2
Metals															
Aluminum (Al)	mg/kg	50			10700	9100	9280	9430	11100	16700	10200	10300	17200	7310	16300
Antimony (Sb)	mg/kg	10			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	0.05-0.35	5.9	17	1.73	1.65	1.33	1.44	1.79	2.42	1.01	1.11	1.55	0.7	2.48
Barium (Ba)	mg/kg	1			52.3	33	34.9	45.5	52.8	80.5	24.4	29.5	92.4	10.6	91.1
Beryllium (Be)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	0.55	<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
Cadmium (Cd)	mg/kg	0.1	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
Calcium (Ca)	mg/kg	50			3410	2410	2590	2970	4040	4370	2260	2100	4530	1970	5650
Chromium (Cr)	mg/kg	2	37.3	90	30.2	28.1	26.4	26.6	30.2	46	36.4	32.5	48.3	21.2	42.8
Cobalt (Co)	mg/kg	2			6.6	6	5.8	5.8	7	8.7	9.1	8.3	11.6	6.3	11
Copper (Cu)	mg/kg	1	35.7	197	18.4	10.2	8.1	13.7	14.1	19.1	13.9	9.8	19.8	10.3	25.8
Iron (Fe)	mg/kg	50			13900	15100	13900	12100	17000	21800	20600	19900	27900	16200	25800
Lead (Pb)	mg/kg	2	35	91.3	4.6	3.5	3.7	5.2	5.9	5.9	<2.0	2.7	6.4	<2.0	6.2
Lithium (Li)	mg/kg	2			19.1	17.2	16	16.7	20.8	30	13	16.5	30.9	13.6	29.8
Magnesium (Mg)	mg/kg	50			6200	6440	6030	5500	7410	9380	8640	8370	11900	7100	11600
Manganese (Mn)	mg/kg	1			187	163	144	140	231	243	278	311	340	195	479
Mercury (Hg)	mg/kg	0.005	0.17	0.486	0.0109	<0.0050	<0.0050	0.0081	0.0137	0.0084	<0.0050	<0.0050	<0.0050	<0.0050	0.0067
Molybdenum (Mo)	mg/kg	0.2			0.4	0.3	0.76	0.4	0.68	0.53	0.22	0.26	0.59	<0.20	0.64
Nickel (Ni)	mg/kg	5			16.5	16.4	14.5	14.6	17.2	23.8	22.9	21.3	27.3	16.4	24.3
Phosphorus (P)	mg/kg	50			475	338	332	444	637	669	388	375	547	418	610
Potassium (K)	mg/kg	200			2230	1510	1460	1860	2490	3900	1040	1270	4270	540	4280
Selenium (Se)	mg/kg	0.5-1.25			<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
Silver (Ag)	mg/kg	0.1			<0.10	<0.10	<0.10	<0.10	<0.10	0.11	<0.10	<0.10	0.11	<0.10	0.12
Sodium (Na)	mg/kg	200			500	300	340	440	560	670	<200	210	710	<200	870
Strontium (Sr)	mg/kg	0.5			20.7	13.3	14.7	17.2	24.1	25.6	9.36	11	22.3	7.82	28.7
Sulfur (S)-Total	mg/kg	100			470	220	260	620	760	320	450	180	330	230	230
Thallium (Tl)	mg/kg	0.5			<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			<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			700	524	542	633	718	1030	515	460	1080	299	1050
Vanadium (V)	mg/kg	2			34.6	31.5	30.9	29.7	36.2	49.5	44.8	41.4	61.5	28.8	55.1
Zinc (Zn)	mg/kg	1	123	315	37	28.7	25.7	31.5	39.9	55.8	31.6	32	53.6	23.8	50.9

Notes:

a) Canadian sediment quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, Updated Sept 2007

b) ISQG = Interim Sediment Quality Guidelines

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.5-1. Stream Sediment Quality Analytical Results, Hope Bay Belt Project, 2009

Stream			CCME Guidelines for the		Doris OF	Little Roberts OF	Little Roberts OF	Little Roberts OF	Windy OF	Windy OF	Windy OF	Glenn OF D/S	Glenn OF D/S	Glenn OF D/S
Replicate					3	1	2	3	1	2	3	1	2	3
Date Sampled					21-Jul-09	22-Jul-09	22-Jul-09	22-Jul-09	22-Jul-09	22-Jul-09	23-Jul-09	23-Jul-09	23-Jul-09	23-Jul-09
ALS Sample ID	Units	RDL[d]	ISQG[b]	PEL[c]	L797002-18	L797002-10	L797002-11	L797002-12	L797002-1	L797002-2	L797002-3	L797002-13	L797002-14	L797002-15
Physical Tests														
% Moisture	%	0.1			10.9	44.8	50.7	54.8	12.1	21.2	25.3	17.4	24	19
pH	pH	0.1			7.31	5.79	5.89	5.92	7.44	7.26	7.2	7.05	7	7.3
Particle Size														
% Gravel (>2mm)	%	1			70	1	<1.0	<1.0	51	2	1	2	9	3
% Sand (2.0mm - 0.063mm)	%	1			28	45	51	54	44	91	9	75	38	64
% Silt (0.063mm - 4um)	%	1			2	39	36	32	4	4	38	15	37	24
% Clay (<4um)	%	1			<1.0	15	13	14	1	3	52	8	16	9
Leachable Anions & Nutrients														
Total Nitrogen by LECO	%	0.02			0.068	0.249	0.351	0.197	0.035	0.048	0.101	0.069	0.092	0.083
Organic / Inorganic Carbon														
Total Organic Carbon	%	0.1			0.22	2.11	1.98	1.63	0.15	0.23	0.43	0.37	0.48	0.34
Plant Available Nutrients														
Available Ammonium-N	mg/kg	0.8			2.45	4.41	6.47	4.73	1.49	<0.80	1.05	2.61	1.69	3.24
Available Nitrate-N	mg/kg	2			<2.0	2.6	3.3	<2.0	<2.0	<2.0	2.8	<2.0	<2.0	<2.0
Nitrite-N	mg/kg	0.4			<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Available Phosphate-P	mg/kg	1			2	1.9	<1.0	2.4	1.3	1	2.3	3.3	2.8	1.6
Metals														
Aluminum (Al)	mg/kg	50			7390	14700	12300	11300	9690	8370	25400	9070	11600	12100
Antimony (Sb)	mg/kg	10			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	0.05-0.35	5.9	17	0.71	1.88	2.71	1.84	1.4	1.6	4.83	2.78	0.58	2.89
Barium (Ba)	mg/kg	1			14.9	77.1	63.4	56.9	12.9	19.4	164	37.5	57.5	58.6
Beryllium (Be)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.77	<0.50	<0.50	<0.50
Bismuth (Bi)	mg/kg	20			<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.1	0.6	3.5	<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			1920	4370	3940	3470	2260	1840	6380	3400	4450	4840
Chromium (Cr)	mg/kg	2	37.3	90	19.9	38.5	31.1	28.7	41.1	27.4	69.3	37.6	34.4	35.6
Cobalt (Co)	mg/kg	2			6.2	8.1	7.4	6.7	8.3	6.2	14.6	6.9	7.9	8.6
Copper (Cu)	mg/kg	1	35.7	197	5	19.3	16.9	15.7	6.6	6	37	13.4	21.3	22.8
Iron (Fe)	mg/kg	50			15700	19900	20900	16900	19200	15900	35700	16900	21500	21100
Lead (Pb)	mg/kg	2	35	91.3	<2.0	5	4.1	4.1	5.9	3.2	9.5	3.8	4.1	3.8
Lithium (Li)	mg/kg	2			14.1	26.3	22.4	20.7	11.7	13	48.3	15.5	21.2	21
Magnesium (Mg)	mg/kg	50			6010	9850	8170	7650	8270	6160	17300	7270	8690	8770
Manganese (Mn)	mg/kg	1			220	229	275	212	248	177	396	192	221	285
Mercury (Hg)	mg/kg	0.005	0.17	0.486	<0.0050	0.017	0.0123	0.011	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Molybdenum (Mo)	mg/kg	0.2			0.28	0.76	0.67	0.59	0.36	0.3	0.93	0.57	0.6	0.63
Nickel (Ni)	mg/kg	5			12.8	20.4	16.9	15.8	21.6	17.2	38.4	18.4	18.5	20.7
Phosphorus (P)	mg/kg	50			380	584	582	491	328	319	693	395	547	538
Potassium (K)	mg/kg	200			690	3510	2910	2540	610	920	7480	1940	3210	2790
Selenium (Se)	mg/kg	0.5-1.25			<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
Silver (Ag)	mg/kg	0.1			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.15	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg	200			<200	750	650	580	<200	<200	1310	1290	2350	1420
Strontium (Sr)	mg/kg	0.5			7.66	23.4	21.3	19.3	9.23	8.4	35.7	17.3	23.2	24
Sulfur (S)-Total	mg/kg	100			200	490	450	430	370	130	150	500	880	390
Thallium (Tl)	mg/kg	0.5			<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			<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			352	939	796	773	504	395	1600	602	868	812
Vanadium (V)	mg/kg	2			28.8	47.6	40.2	37.6	37.1	28.6	77.5	36.5	45.4	44.9
Zinc (Zn)	mg/kg	1	123	315	25.4	52.6	42.4	40.5	27.7	26.1	75.3	26.6	36	34.7

Notes:

a) Canadian sediment quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, Updated Sept 2007

b) ISQG = Interim Sediment Quality Guidelines

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.5-1. Stream Sediment Quality Analytical Results, Hope Bay Belt Project, 2009

Stream			CCME Guidelines for the		Koignuk U/S	Koignuk U/S	Koignuk U/S	Koignuk M/S	Koignuk M/S	Koignuk M/S	Koignuk D/S	Koignuk D/S	Koignuk D/S	Ref Lk A OF	Ref Lk A OF
Replicate					1	2	3	1	2	3	1	2	3	1	2
Date Sampled					24-Jul-09	24-Jul-09	24-Jul-09	24-Jul-09	24-Jul-09	24-Jul-09	24-Jul-09	24-Jul-09	24-Jul-09	26-Jul-09	26-Jul-09
ALS Sample ID	Units	RDL[d]	ISQG[b]	PEL[c]	L797822-7	L797822-8	L797822-9	L797822-4	L797822-5	L797822-6	L797822-1	L797822-2	L797822-3	L797822-10	L797822-11
Physical Tests															
% Moisture	%	0.1			37.6	42	39.2	42.9	13.4	35.3	42	25.6	27.1	19.3	23
pH	pH	0.1			5.91	6.93	6.99	6.04	7.21	6.25	6.73	7.54	8	7.16	7.03
Particle Size															
% Gravel (>2mm)	%	1			<1.0	<1.0	1	2	36	<1.0	1	32	5	<1.0	<1.0
% Sand (2.0mm - 0.063mm)	%	1			62	36	15	49	37	51	40	23	36	89	82
% Silt (0.063mm - 4um)	%	1			29	50	47	32	21	39	46	20	29	9	15
% Clay (<4um)	%	1			9	14	37	17	6	10	13	25	29	2	3
Leachable Anions & Nutrients															
Total Nitrogen by LECO	%	0.02			0.132	0.158	0.181	0.134	0.076	0.104	0.155	0.097	0.081	0.053	0.081
Organic / Inorganic Carbon															
Total Organic Carbon	%	0.1			1.27	1.39	1.78	1.26	0.4	0.82	1.23	0.7	0.35	<0.10	0.52
Plant Available Nutrients															
Available Ammonium-N	mg/kg	0.8			1.61	2.4	1	11.6	0.92	4.39	9.92	1.27	1.5	<0.80	1.2
Available Nitrate-N	mg/kg	2			<2.0	<2.0	2	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Nitrite-N	mg/kg	0.4			<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Available Phosphate-P	mg/kg	1			3.5	5.6	4	2.3	6	1.5	1.3	4.3	2.7	3.8	5.9
Metals															
Aluminum (Al)	mg/kg	50			8090	10400	23100	12600	8810	8030	11600	22100	22800	4610	5790
Antimony (Sb)	mg/kg	10			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	0.05-0.35	5.9	17	3.16	2.49	2.92	3.12	1.99	1.96	3.35	2.79	2.2	0.404	0.855
Barium (Ba)	mg/kg	1			40.3	52.8	136	69.5	40	42.7	63.2	129	138	14.8	22.5
Beryllium (Be)	mg/kg	0.5			<0.50	<0.50	0.76	<0.50	<0.50	<0.50	<0.50	0.67	0.71	<0.50	<0.50
Bismuth (Bi)	mg/kg	20			<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Cadmium (Cd)	mg/kg	0.1	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
Calcium (Ca)	mg/kg	50			3280	3650	6810	3940	3200	3240	4600	6540	6220	2280	2650
Chromium (Cr)	mg/kg	2	37.3	90	24.7	31.9	65.9	37.4	32.5	26.4	35.6	60.4	62.8	9.4	11.3
Cobalt (Co)	mg/kg	2			4.7	5.9	12.5	8.3	6.7	4.7	7.7	13.1	13.5	3.3	4.2
Copper (Cu)	mg/kg	1	35.7	197	17	14.6	33.4	15.1	13.9	9.1	17.9	32.2	32.9	12.2	14.6
Iron (Fe)	mg/kg	50			14600	16100	32300	22500	17700	22600	31400	32000	33200	7890	9310
Lead (Pb)	mg/kg	2	35	91.3	4.4	4.9	8.7	4.9	3.4	3.5	7.8	8.3	7.4	<2.0	2.2
Lithium (Li)	mg/kg	2			14.9	19.1	44.4	23.5	15.2	14.4	21.5	42.9	44.7	10.8	12.5
Magnesium (Mg)	mg/kg	50			4820	6350	14400	7920	6120	5090	7550	15200	16200	3390	3960
Manganese (Mn)	mg/kg	1			138	165	342	244	182	151	302	412	434	89.4	122
Mercury (Hg)	mg/kg	0.005	0.17	0.486	0.0063	0.009	0.0081	0.0068	<0.0050	0.0051	0.0112	<0.0050	<0.0050	<0.0050	<0.0050
Molybdenum (Mo)	mg/kg	0.2			0.76	0.51	0.8	0.59	0.29	0.33	0.64	0.66	0.58	0.25	<0.20
Nickel (Ni)	mg/kg	5			13.3	17.9	37.4	19.9	17.6	12	17.9	35.7	34.5	6.6	8.6
Phosphorus (P)	mg/kg	50			536	600	713	563	513	538	611	632	643	333	369
Potassium (K)	mg/kg	200			1970	2450	6680	2950	1730	1750	2840	6540	7040	690	990
Selenium (Se)	mg/kg	0.5-1.25			<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	0.1			<0.10	<0.10	0.12	<0.10	<0.10	<0.10	0.14	0.11	0.11	<0.10	<0.10
Sodium (Na)	mg/kg	200			980	760	1120	660	920	700	740	2070	2110	200	280
Strontium (Sr)	mg/kg	0.5			20.2	21.7	48	20.8	16.8	17.7	31.8	41.3	44	9.76	12.2
Sulfur (S)-Total	mg/kg	100			330	350	210	510	260	370	490	440	400	150	280
Thallium (Tl)	mg/kg	0.5			<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			<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			587	770	1460	846	633	623	856	1420	1490	338	413
Vanadium (V)	mg/kg	2			32.6	36.6	69.5	46	40.4	34.3	42	71.1	69.8	17.8	20.9
Zinc (Zn)	mg/kg	1	123	315	24.3	34	66.3	42.2	29.3	25.4	40	67.8	69.6	14.3	18.8

Notes:

a) Canadian sediment quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, Updated Sept 2007

b) ISQG = Interim Sediment Quality Guidelines

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.5-1. Stream Sediment Quality Analytical Results, Hope Bay Belt Project, 2009

Stream			CCME		Ref Lk A OF	Ref Lk B OF	Ref Lk B OF	Ref Lk B OF	Angimajuq R. Ref.	Angimajuq R. Ref.	Angimajuq R. Ref.
Replicate			Guidelines for		3	1	2	3	1	2	3
Date Sampled			the		26-Jul-09	26-Jul-09	26-Jul-09	26-Jul-09	26-Jul-09	26-Jul-09	26-Jul-09
ALS Sample ID	Units	RDL[d]	ISQG[b]	PEL[c]	L797822-12	L797822-13	L797822-14	L797822-15	L797822-16	L797822-17	L797822-18
Physical Tests											
% Moisture	%	0.1			20.9	12.3	17.7	15.9	11.2	9.92	13.9
pH	pH	0.1			7.06	6.78	6.1	6.63	7.13	6.99	6.22
Particle Size											
% Gravel (>2mm)	%	1			<1.0	62	13	31	57	40	16
% Sand (2.0mm - 0.063mm)	%	1			99	36	50	62	37	44	74
% Silt (0.063mm - 4um)	%	1			1	3	30	6	4	12	9
% Clay (<4um)	%	1			<1.0	<1.0	6	1	2	3	1
Leachable Anions & Nutrients											
Total Nitrogen by LECO	%	0.02			0.039	0.09	0.072	0.062	0.034	0.059	0.049
Organic / Inorganic Carbon											
Total Organic Carbon	%	0.1			<0.10	0.53	0.39	0.27	<0.10	0.18	0.12
Plant Available Nutrients											
Available Ammonium-N	mg/kg	0.8			<0.80	4.31	1.61	2.43	1.4	2.36	3.35
Available Nitrate-N	mg/kg	2			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Nitrite-N	mg/kg	0.4			<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Available Phosphate-P	mg/kg	1			1.8	3	3.8	3.5	7.1	8.5	3.6
Metals											
Aluminum (Al)	mg/kg	50			4580	7440	8240	6180	5640	5990	5080
Antimony (Sb)	mg/kg	10			<10	<10	<10	<10	<10	<10	<10
Arsenic (As)	mg/kg	0.05-0.35	5.9	17	0.074	0.502	1.02	0.694	1.78	1.75	0.987
Barium (Ba)	mg/kg	1			11.4	8.9	33.4	18.4	25.4	25.1	20.5
Beryllium (Be)	mg/kg	0.5			<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
Cadmium (Cd)	mg/kg	0.1	0.6	3.5	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Calcium (Ca)	mg/kg	50			1910	2220	3020	2490	2020	2300	1920
Chromium (Cr)	mg/kg	2	37.3	90	7.1	21.7	22	18.8	13.6	13.5	9.7
Cobalt (Co)	mg/kg	2			3.2	5.5	5.1	5.2	3.3	3.7	2.9
Copper (Cu)	mg/kg	1	35.7	197	10.2	4.9	14.5	13.5	6.4	7.7	5.5
Iron (Fe)	mg/kg	50			7580	13300	11700	11900	11100	12300	9200
Lead (Pb)	mg/kg	2	35	91.3	<2.0	<2.0	2.7	<2.0	2.8	2.1	<2.0
Lithium (Li)	mg/kg	2			11.8	12.8	13.3	11.2	13.7	14.3	12.7
Magnesium (Mg)	mg/kg	50			3860	5750	4600	4490	4280	4440	3800
Manganese (Mn)	mg/kg	1			89.4	222	125	136	98.4	109	94.6
Mercury (Hg)	mg/kg	0.005	0.17	0.486	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Molybdenum (Mo)	mg/kg	0.2			<0.20	0.21	0.23	<0.20	0.62	0.4	0.43
Nickel (Ni)	mg/kg	5			6.4	13.6	12	11.8	8.2	7.7	6.2
Phosphorus (P)	mg/kg	50			216	299	430	343	341	401	329
Potassium (K)	mg/kg	200			590	400	1420	700	1220	1280	900
Selenium (Se)	mg/kg	0.5-1.25			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Silver (Ag)	mg/kg	0.1			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg	200			<200	<200	220	<200	590	940	<200
Strontium (Sr)	mg/kg	0.5			8.78	9.78	16.4	10.6	12	14.4	9.79
Sulfur (S)-Total	mg/kg	100			430	210	140	210	250	380	<100
Thallium (Tl)	mg/kg	0.5			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg	5			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg	1			281	449	635	503	455	505	351
Vanadium (V)	mg/kg	2			15.9	23	26.5	24.6	31.8	34.2	18.4
Zinc (Zn)	mg/kg	1	123	315	14.8	23.1	23.6	21.8	20.7	22.9	18.1

Notes:

a) Canadian sediment quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, Updated Sept 2007

b) ISQG = Interim Sediment Quality Guidelines

c) PEL = Probable Effects Level

d) RDL = Realized detection limit

Appendix 3.6-1

Phytoplankton Biomass Results, Hope Bay Belt Project, 2009

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Appendix 3.6-1. Phytoplankton Biomass Results, Hope Bay Belt Project, 2009

Lake	Replicate	Date Sampled	ALS Sample ID	Chlorophyll a (µg/L)
Wolverine	Rep 1	06-AUG-09	L810632-4	1.11
Wolverine	Rep 2	06-AUG-09	L810632-5	1.18
Wolverine	Rep 3	06-AUG-09	L810632-6	1.05
Patch S		24-APR-09	L781431-3	0.868
Patch S	Rep 1	11-AUG-09	L810632-43	0.56
Patch S	Rep 2	11-AUG-09	L810632-44	0.539
Patch S	Rep 3	11-AUG-09	L810632-45	0.554
Patch N		23-APR-09	L781431-4	2.02
Patch N	Rep 1	09-AUG-09	L810632-19	0.498
Patch N	Rep 2	09-AUG-09	L810632-20	0.467
Patch N	Rep 3	09-AUG-09	L810632-21	0.322
Imniagut	Rep 1	07-AUG-09	L810632-16	0.476
Imniagut	Rep 2	07-AUG-09	L810632-17	0.493
Imniagut	Rep 3	07-AUG-09	L810632-18	0.918
P.O.	Rep 1	10-AUG-09	L810632-40	0.368
P.O.	Rep 2	10-AUG-09	L810632-41	0.356
P.O.	Rep 3	10-AUG-09	L810632-42	0.294
Ogama		26-APR-09	L781431-2	4.08
Ogama	Rep 1	14-AUG-09	L810632-22	5.87
Ogama	Rep 2	14-AUG-09	L810632-23	5.25
Ogama	Rep 3	14-AUG-09	L810632-24	5.82
Doris S		21-APR-09	L781431-5	12.9
Doris S	Rep 1	16-AUG-09	L810632-28	6.24
Doris S	Rep 2	16-AUG-09	L810632-29	11.5
Doris S	Rep 3	16-AUG-09	L810632-30	8.58
Doris N		22-APR-09	L781431-6	7.58
Doris N	Rep 1	15-AUG-09	L810632-34	12.1
Doris N	Rep 2	15-AUG-09	L810632-35	6.46
Doris N	Rep 3	15-AUG-09	L810632-36	5.78
Little Roberts		05-MAY-09	L781431-1	26.9
Little Roberts	Rep 1	07-AUG-09	L810632-13	2.21
Little Roberts	Rep 2	07-AUG-09	L810632-14	1.78
Little Roberts	Rep 3	07-AUG-09	L810632-15	2.44
Naiqunnguut	Rep 1	10-AUG-09	L810632-37	0.749
Naiqunnguut	Rep 2	10-AUG-09	L810632-38	0.648
Naiqunnguut	Rep 3	10-AUG-09	L810632-39	0.454
Nakhaktok	Rep 1	06-AUG-09	L810632-1	9.51
Nakhaktok	Rep 2	06-AUG-09	L810632-2	27.8
Nakhaktok	Rep 3	06-AUG-09	L810632-3	16.8
Windy	Rep 1	06-AUG-09	L810632-7	0.372
Windy	Rep 2	06-AUG-09	L810632-8	0.305
Windy	Rep 3	06-AUG-09	L810632-9	0.252
Glenn	Rep 1	08-AUG-09	L810632-10	1.29
Glenn	Rep 2	08-AUG-09	L810632-11	1.6
Glenn	Rep 3	08-AUG-09	L810632-12	1.24
Ref Lk A	Rep 1	12-AUG-09	L810632-25	0.639
Ref Lk A	Rep 2	12-AUG-09	L810632-26	1.12
Ref Lk A	Rep 3	12-AUG-09	L810632-27	0.827
Ref Lk B	Rep 1	16-AUG-09	L810632-31	0.47
Ref Lk B	Rep 2	16-AUG-09	L810632-32	0.389
Ref Lk B	Rep 3	16-AUG-09	L810632-33	0.387

Appendix 3.6-2

Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

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Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake				Wolverine								
Date				6-Aug-09								
Replicate	1		2		3							
	Abundance	Biovolume	Abundance	Biovolume	Abundance	Biovolume	Abundance (cells/mL)			Biovolume (mm3/mL)		
Taxa	cells/mL	mm3/mL	cells/mL	mm3/mL	cells/mL	mm3/mL	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Anabaena sp.												
Aphanizomenon flos-aquae												
Aphanothece sp.												
Oscillatoria sp.												
Oscillatoria limnetica												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chlorophyta												
Ankistrodesmus falcatus	8	209	13	318	15	371						
Chlamydomonas sp.	81	26,239	165	53,726	188	61,073						
Cosmarium sp.			4	890	10	2,077						
Crucigenia quadrata												
Desmidium sp.												
Dictyosphaerium ehrenbergianum												
Gloeocystis ampla												
Golenkinia radiata												
Oocystis pusilla			8	458								
Scenedesmus quadricauda			4	1,102								
Selenastrum minutum	3	56										
Sphaerocystis schroeteri												
Tetraedron minimum												
Tetraedron regulare												
Subtotal	**92**	**26,503**	**195**	**56,494**	**213**	**63,521**	**166**	**21**	**38%**	**48,839**	**6,981**	**32%**
Chrysophyta												
Chrysococcus rufescens	3	237	13	1,081	10	841						
Kephyrion littorale					15	1,409						
Kephyrion sp.			4	267	25	1,558						
Mallomonas sp.												
Subtotal	**3**	**237**	**17**	**1,348**	**49**	**3,808**	**23**	**3**	**5%**	**1,797**	**229**	**1%**
Chrysophyta - Diatoms												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis			4	560								
Achnanthes minutissima	3	139			5	247						
Achnanthes peragalli												
Achnanthes pinnata												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla					5	821						
Anomoeoneis vitrea												
Asterionella formosa	8	2,389										
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula												
Cyclotella atomus												
Cyclotella comta												
Cyclotella meneghiniana												
Cyclotella ocellata												
Cyclotella stelligera					5	272						
Cymatopleura solea												
Cymbella affinis												
Cymbella microcephala												
Cymbella minuta			4	1,568								
Denticula elegans												
Diatoma tenue												
Diatoma tenue elongatum			4	3,052								
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica												
Eunotia pectinalis												
Eunotia sp.												
Fragilaria construens												
Fragilaria construens venter												
Fragilaria crotonensis	3	9,354										
Fragilaria pinnata					5	297						
Fragilaria vaucheriae												
Gomphonema angustatum			4	763	5	890						
Gomphonema gracile												
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira ambigua												
Melosira italica												

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake						Wolverine						
Date						**6-Aug-09**						
Replicate	**1**		**2**		**3**							
	Abundance	**Biovolume**	**Abundance**	**Biovolume**	**Abundance**	**Biovolume**	**Abundance (cells/mL)**			**Biovolume (mm3/mL)**		
Taxa	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Navicula capitata												
Navicula cryptocephala			4	784	5	915						
Navicula cryptocephala veneta												
Navicula decussis												
Navicula graciloides												
Navicula gregaria												
Navicula minima												
Navicula minuscula												
Navicula pseudoscutiformis												
Navicula pupula												
Navicula radiosa												
Navicula reinhartii												
Navicula rhynchocephala												
Navicula sp.												
Navicula tripunctata												
Navicula viridula												
Neidium affine												
Nitzschia acicularis												
Nitzschia amphibia												
Nitzschia capitellata												
Nitzschia communis			4	191								
Nitzschia constricta												
Nitzschia dissipata												
Nitzschia frustulum												
Nitzschia linearis												
Nitzschia palea												
Nitzschia paleacea												
Nitzschia tryblionella												
Pinnularia sp.												
Rhoicosphenia curvata												
Stauroneis sp.												
Stephanodiscus astraea minutula												
Stephanodiscus binderanus												
Stephanodiscus hantzschii	6	668										
Surirella linearis												
Surirella ovata												
Synedra cyclopum												
Synedra delicatissima			4	2,798	15	9,791						
Synedra parasitica												
Synedra radians	33	12,027	21	7,630	49	17,803						
Synedra rumpens	3	390			5	692						
Synedra tenera												
Synedra ulna												
Tabellaria fenestrata	3	6,681										
Tabellaria flocculosa												
Subtotal	**58**	**31,648**	**51**	**17,345**	**99**	**31,728**	**69**	**2**	**16%**	**26,907**	**958**	**18%**
Cryptophyta												
Cryptomonas erosa	33	17,372	21	11,021	15	7,714						
Rhodomonas minuta	36	724	38	763	40	791						
Subtotal	**70**	**18,096**	**59**	**11,784**	**54**	**8,506**	**61**	**4**	**14%**	**12,795**	**2,822**	**8%**
Dinoflagellata												
Dinobryon bavaricum												
Dinobryon sertularia												
Dinobryon sp.	14	1,740	8	1,060	10	1,236						
Glenodinium sp.	70	48,719	89	62,309	74	51,924						
Hemidinium sp.	3	835			10	2,967						
Subtotal	**86**	**51,294**	**97**	**63,369**	**94**	**56,128**	**93**	**13**	**21%**	**56,930**	**9,748**	**38%**
Euglenoidea												
Euglena sp.	3	1,615	8	4,917	5	2,868						
Trachelomonas hispida												
Trachelomonas volvocina												
Subtotal	**3**	**1,615**	**8**	**4,917**	**5**	**2,868**	**5**	**2**	**1%**	**3,133**	**962**	**2%**
Unidentified												
Unidentified flagellate	11	223	25	509	25	495	**20**	**5**	**5%**	**409**	**93**	**0%**
Total:	**323**	**129,615**	**454**	**155,765**	**539**	**167,053**	**439**	**4**	**100%**	**150,811**	**1,972**	**100%**

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake	Imniagut											
Date	8-Aug-09											
Replicate	1		2		3							
	Abundance	Biovolume	Abundance	Biovolume	Abundance	Biovolume	Abundance (cells/mL)			Biovolume (mm3/mL)		
Taxa	cells/mL	mm3/mL	cells/mL	mm3/mL	cells/mL	mm3/mL	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Anabaena sp.												
Aphanizomenon flos-aquae												
Aphanothece sp.												
Oscillatoria sp.												
Oscillatoria limnetica												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chlorophyta												
Ankistrodesmus falcatus												
Chlamydomonas sp.	56	18,081	61	19,751	79	25,786						
Cosmarium sp.			6	1,343								
Crucigenia quadrata												
Desmidium sp.												
Dictyosphaerium ehrenbergianum	4	223										
Gloeocystis ampla												
Golenkinia radiata												
Oocystis pusilla												
Scenedesmus quadricauda												
Selenastrum minutum												
Sphaerocystis schroeteri												
Tetraedron minimum												
Tetraedron regulare												
Subtotal	**59**	**18,303**	**67**	**21,095**	**79**	**25,786**	**69**	**15**	**17%**	**21,728**	**5,167**	**29%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion sp.												
Mallomonas sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta - Diatoms												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis	4	490										
Achnanthes minutissima					4	209						
Achnanthes peragalli												
Achnanthes pinnata												
Amphipleura pellucida												
Amphora ovalis	4	2,144										
Amphora perpusilla	4	616										
Anomoeoneis vitrea												
Asterionella formosa												
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula												
Cyclotella atomus												
Cyclotella comta												
Cyclotella meneghiniana												
Cyclotella ocellata												
Cyclotella stelligera												
Cymatopleura solea												
Cymbella affinis												
Cymbella microcephala												
Cymbella minuta												
Denticula elegans												
Diatoma tenue												
Diatoma tenue elongatum	4	2,670			4	3,007						
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica												
Eunotia pectinalis												
Eunotia sp.												
Fragilaria construens												
Fragilaria construens venter	4	178										
Fragilaria crotonensis												
Fragilaria pinnata	4	223										
Fragilaria vaucheriae												
Gomphonema angustatum												
Gomphonema gracile												
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira ambigua												
Melosira italica												

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake					**Imniagut**							
Date					**8-Aug-09**							
Replicate	**1**		**2**		**3**							
	Abundance	**Biovolume**	**Abundance**	**Biovolume**	**Abundance**	**Biovolume**	**Abundance (cells/mL)**			**Biovolume (mm3/mL)**		
Taxa	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Navicula capitata												
Navicula cryptocephala												
Navicula cryptocephala veneta												
Navicula decussis												
Navicula graciloides												
Navicula gregaria												
Navicula minima												
Navicula minuscula												
Navicula pseudoscutiformis												
Navicula pupula												
Navicula radiosa												
Navicula reinhartii												
Navicula rhynchocephala												
Navicula sp.												
Navicula tripunctata												
Navicula viridula					4	1,879						
Neidium affine												
Nitzschia acicularis					4	1,169						
Nitzschia amphibia												
Nitzschia capitellata					4	1,503						
Nitzschia communis												
Nitzschia constricta												
Nitzschia dissipata												
Nitzschia frustulum			3	384								
Nitzschia linearis												
Nitzschia palea												
Nitzschia paleacea												
Nitzschia tryblionella												
Pinnularia sp.												
Rhoicosphenia curvata												
Stauroneis sp.												
Stephanodiscus astraea minutula												
Stephanodiscus binderanus												
Stephanodiscus hantzschii												
Surirella linearis												
Surirella ovata												
Synedra cyclopum												
Synedra delicatissima												
Synedra parasitica												
Synedra radians					4	1,503						
Synedra rumpens			10	1,343	4	585						
Synedra tenera												
Synedra ulna												
Tabellaria fenestrata												
Tabellaria flocculosa			3	3,774								
Subtotal	**22**	**6,320**	**16**	**5,502**	**29**	**9,855**	**22**	**0**	**5%**	**7,226**	**275**	**10%**
Cryptophyta												
Cryptomonas erosa	78	40,501	32	16,633	75	39,087						
Rhodomonas minuta	204	4,080	211	4,222	217	4,343						
Subtotal	**282**	**44,581**	**243**	**20,855**	**292**	**43,430**	**272**	**34**	**66%**	**36,288**	**7,125**	**48%**
Dinoflagellata												
Dinobryon bavaricum												
Dinobryon sertularia												
Dinobryon sp.	19	2,782	10	1,199	4	522						
Glenodinium sp.					17	11,693						
Hemidinium sp.												
Subtotal	**19**	**2,782**	**10**	**1,199**	**21**	**12,215**	**16**	**3**	**4%**	**5,399**	**2,591**	**7%**
Euglenoidea												
Euglena sp.			6	3,710	4	2,422						
Trachelomonas hispida												
Trachelomonas volvocina					4	7,872						
Subtotal	**0**	**0**	**6**	**3,710**	**8**	**10,294**	**5**	**1**	**1%**	**4,668**	**1,644**	**6%**
Unidentified												
Unidentified flagellate	33	668	29	576	25	501	**29**	**2**	**7%**	**581**	**48**	**1%**
Total:	**415**	**72,653**	**371**	**52,937**	**455**	**102,081**	**414**	**10**	**100%**	**75,890**	**1,680**	**100%**

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake					Patch S							
Date					11-Aug-09							
Replicate	1		2		3							
	Abundance	Biovolume	Abundance	Biovolume	Abundance	Biovolume	Abundance (cells/mL)			Biovolume (mm3/mL)		
Taxa	cells/mL	mm3/mL	cells/mL	mm3/mL	cells/mL	mm3/mL	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Anabaena sp.												
Aphanizomenon flos-aquae												
Aphanothece sp.												
Oscillatoria sp.												
Oscillatoria limnetica												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chlorophyta												
Ankistrodesmus falcatus	4	135	12	343	7	205						
Chlamydomonas sp.	11	3,501	9	2,899	10	3,331						
Cosmarium sp.	4	754	5	1,124	3	718						
Crucigenia quadrata												
Desmidium sp.					2	598						
Dictyosphaerium ehrenbergianum												
Gloeocystis ampla												
Golenkinia radiata												
Oocystis pusilla												
Scenedesmus quadricauda												
Selenastrum minutum												
Sphaerocystis schroeteri												
Tetraedron minimum			2	321								
Tetraedron regulare					2	196						
Subtotal	**18**	**4,390**	**29**	**4,688**	**24**	**5,048**	**23**	**1**	**14%**	**4,708**	**371**	**6%**
Chrysophyta												
Chrysococcus rufescens	2	153										
Kephyrion littorale												
Kephyrion sp.												
Mallomonas sp.												
Subtotal	**2**	**153**	**0**	**0**	**0**	**0**	**1**	**0**	**0%**	**51**	**0**	**0%**
Chrysophyta - Diatoms												
Achnanthes clevei	2	269										
Achnanthes exigua												
Achnanthes lanceolata					3	615						
Achnanthes lewisiana												
Achnanthes linearis			2	235	2	226						
Achnanthes minutissima	2	90	7	357	3	171						
Achnanthes peragalli	4	503			2	239						
Achnanthes pinnata												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla			2	296	7	1,361						
Anomoeoneis vitrea	2	215										
Asterionella formosa					3	1,879						
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus			2	134								
Cocconeis placentula	2	826										
Cyclotella atomus					2	34						
Cyclotella comta	22	48,906	16	36,448	12	27,145						
Cyclotella meneghiniana												
Cyclotella ocellata	61	7,630	50	6,244	51	6,406						
Cyclotella stelligera			2	98	2	94						
Cymatopleura solea			2	28,901								
Cymbella affinis	2	3,232										
Cymbella microcephala												
Cymbella minuta	2	664	2	660	2	632						
Denticula elegans												
Diatoma tenue												
Diatoma tenue elongatum	2	1,293										
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica	2	467	2	464	2	444						
Eunotia pectinalis												
Eunotia sp.												
Fragilaria construens												
Fragilaria construens venter			2	171	5	418						
Fragilaria crotonensis												
Fragilaria pinnata			2	107								
Fragilaria vaucheriae	2	517	5	2,620								
Gomphonema angustatum												
Gomphonema gracile	2	440										
Gomphonema sp.			2	357								
Gomphonema subclavatum			2	1,070								
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira ambigua												
Melosira italica												

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake				**Patch S**								
Date				**11-Aug-09**								
Replicate	**1**		**2**		**3**							
	Abundance	**Biovolume**	**Abundance**	**Biovolume**	**Abundance**	**Biovolume**	**Abundance (cells/mL)**			**Biovolume (mm3/mL)**		
Taxa	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Navicula capitata					3	1,640						
Navicula cryptocephala	4	664										
Navicula cryptocephala veneta					3	325						
Navicula decussis	2	345										
Navicula graciloides			4	1,552								
Navicula gregaria	2	314	4	624								
Navicula minima			4	157								
Navicula minuscula												
Navicula pseudoscutiformis	5	943	7	1,249	9	1,495						
Navicula pupula			2	482	2	461						
Navicula radiosa												
Navicula reinhartii												
Navicula rhynchocephala												
Navicula sp.	2	269	2	268								
Navicula tripunctata												
Navicula viridula	2	808										
Neidium affine												
Nitzschia acicularis	2	503			5	1,435						
Nitzschia amphibia												
Nitzschia capitellata												
Nitzschia communis												
Nitzschia constricta												
Nitzschia dissipata			2	480								
Nitzschia frustulum												
Nitzschia linearis			2	2,719								
Nitzschia palea			4	642	2	308						
Nitzschia paleacea			2	175	2	167						
Nitzschia tryblionella												
Pinnularia sp.			2	714	2	683						
Rhoicosphenia curvata												
Stauroneis sp.												
Stephanodiscus astraea minutula												
Stephanodiscus binderanus												
Stephanodiscus hantzschii												
Surirella linearis												
Surirella ovata												
Synedra cyclopum												
Synedra delicatissima												
Synedra parasitica												
Synedra radians	5	1,939	5	1,927	10	3,690						
Synedra rumpens					3	478						
Synedra tenera												
Synedra ulna	2	3,573										
Tabellaria fenestrata												
Tabellaria flocculosa												
Subtotal	**129**	**74,410**	**136**	**89,151**	**137**	**50,347**	**134**	**1**	**80%**	**71,303**	**977**	**89%**
Cryptophyta												
Cryptomonas erosa	4	1,867			2	888						
Rhodomonas minuta	4	72	5	107	3	68						
Subtotal	**7**	**1,939**	**5**	**107**	**5**	**957**	**6**	**1**	**4%**	**1,001**	**353**	**1%**
Dinoflagellata												
Dinobryon bavaricum												
Dinobryon sertularia	2	215	4	428								
Dinobryon sp.												
Glenodinium sp.	2	1,257			3	2,392						
Hemidinium sp.												
Subtotal	**4**	**1,472**	**4**	**428**	**3**	**2,392**	**4**	**0**	**2%**	**1,431**	**494**	**2%**
Euglenoidea												
Euglena sp.												
Trachelomonas hispida			2	3,746								
Trachelomonas volvocina												
Subtotal	**0**	**0**	**2**	**3,746**	**0**	**0**	**1**	**0**	**0%**	**1,249**	**0**	**2%**
Unidentified												
Unidentified flagellate							**0**	**0**	**0**	**0**	**0**	**0**
Total:	**160**	**82,363**	**175**	**98,120**	**169**	**58,744**	**168**	**1**	**100%**	**79,742**	**747**	**100%**

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake					Patch N							
Date					9-Aug-09							
Replicate	1		2		3							
	Abundance	Biovolume	Abundance	Biovolume	Abundance	Biovolume	Abundance (cells/mL)			Biovolume (mm3/mL)		
Taxa	cells/mL	mm3/mL	cells/mL	mm3/mL	cells/mL	mm3/mL	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Anabaena sp.												
Aphanizomenon flos-aquae	5	9,945										
Aphanothece sp.												
Oscillatoria sp.												
Oscillatoria limnetica												
Subtotal	**5**	**9,945**	**0**	**0**	**0**	**0**	**2**	**0**	**1%**	**3,315**	**0**	**4%**
Chlorophyta												
Ankistrodesmus falcatus	34	1,015	28	1,048	16	529						
Chlamydomonas sp.	16	5,130	13	4,127	7	2,349						
Cosmarium sp.	16	3,315	10	2,133	5	1,138						
Crucigenia quadrata												
Desmidium sp.												
Dictyosphaerium ehrenbergianum												
Gloeocystis ampla												
Golenkinia radiata												
Oocystis pusilla			3	1,097	2	781						
Scenedesmus quadricauda			3	330								
Selenastrum minutum												
Sphaerocystis schroeteri			3	356								
Tetraedron minimum												
Tetraedron regulare												
Subtotal	**65**	**9,460**	**58**	**9,090**	**31**	**4,796**	**52**	**3**	**25%**	**7,782**	**425**	**9%**
Chrysophyta												
Chrysococcus rufescens	2	192										
Kephyrion littorale												
Kephyrion sp.												
Mallomonas sp.												
Subtotal	**2**	**192**	**0**	**0**	**0**	**0**	**1**	**0**	**0%**	**64**	**0**	**0%**
Chrysophyta - Diatoms												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes lanceolata	2	406			4	650						
Achnanthes lewisiana												
Achnanthes linearis												
Achnanthes minutissima	2	113	8	381	2	90						
Achnanthes peragalli												
Achnanthes pinnata												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla			8	1,265	4	600						
Anomoeoneis vitrea												
Asterionella formosa	2	3,969										
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus	5	338	3	190	4	271						
Cocconeis placentula	2	1,037	3	1,168	5	2,494						
Cyclotella atomus												
Cyclotella comta	20	46,070	20	46,116	13	28,711						
Cyclotella meneghiniana												
Cyclotella ocellata	50	6,201	46	5,714	47	5,872						
Cyclotella stelligera												
Cymatopleura solea												
Cymbella affinis												
Cymbella microcephala												
Cymbella minuta												
Denticula elegans												
Diatoma tenue												
Diatoma tenue elongatum	2	1,624	3	1,828								
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica	2	586			2	470						
Eunotia pectinalis												
Eunotia sp.												
Fragilaria construens												
Fragilaria construens venter	5	649	5	1,463	4	1,735						
Fragilaria crotonensis												
Fragilaria pinnata	2	271			2	217						
Fragilaria vaucheriae			3	1,463								
Gomphonema angustatum												
Gomphonema gracile												
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii					2	813						
Hantzschia amphioxys												
Melosira ambigua												
Melosira italica												

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake					Patch N							
Date					9-Aug-09							
Replicate	1		2		3							
	Abundance	Biovolume	Abundance	Biovolume	Abundance	Biovolume	Abundance (cells/mL)			Biovolume (mm3/mL)		
Taxa	cells/mL	mm3/mL	cells/mL	mm3/mL	cells/mL	mm3/mL	Mean	SE	Percent	Mean	SE	Percent
Navicula capitata			3	1,219	4	1,735						
Navicula cryptocephala			3	470								
Navicula cryptocephala veneta			3	241								
Navicula decussis												
Navicula graciloides												
Navicula gregaria	2	395										
Navicula minima												
Navicula minuscula												
Navicula pseudoscutiformis					5	949						
Navicula pupula					2	488						
Navicula radiosa												
Navicula reinhartii			3	1,320	2	940						
Navicula rhynchocephala												
Navicula sp.	2	677										
Navicula tripunctata												
Navicula viridula					2	813						
Neidium affine												
Nitzschia acicularis	2	631										
Nitzschia amphibia												
Nitzschia capitellata												
Nitzschia communis												
Nitzschia constricta			3	1,473								
Nitzschia dissipata	2	607	3	683	4	972						
Nitzschia frustulum			3	305	2	217						
Nitzschia linearis												
Nitzschia palea					2	325						
Nitzschia paleacea												
Nitzschia tryblionella												
Pinnularia sp.												
Rhoicosphenia curvata												
Stauroneis sp.												
Stephanodiscus astraea minutula					2	632						
Stephanodiscus binderanus			3	838								
Stephanodiscus hantzschii			3	305								
Surirella linearis												
Surirella ovata												
Synedra cyclopum												
Synedra delicatissima												
Synedra parasitica												
Synedra radians	9	3,247	5	1,828	4	1,301						
Synedra rumpens	9	1,263	3	356	2	253						
Synedra tenera			5	2,285								
Synedra ulna												
Tabellaria fenestrata												
Tabellaria flocculosa												
Subtotal	**122**	**68,083**	**132**	**70,911**	**116**	**50,548**	**123**	**1**	**59%**	**63,180**	**1,147**	**77%**
Cryptophyta												
Cryptomonas erosa	14	7,036	8	3,961	13	6,577						
Rhodomonas minuta	14	271	10	203	5	108						
Subtotal	**27**	**7,306**	**18**	**4,165**	**18**	**6,685**	**21**	**1**	**10%**	**6,052**	**1,337**	**7%**
Dinoflagellata												
Dinobryon bavaricum												
Dinobryon sertularia	5	541			4	434						
Dinobryon sp.												
Glenodinium sp.	2	1,579	3	1,778								
Hemidinium sp.												
Subtotal	**7**	**2,120**	**3**	**1,778**	**4**	**434**	**4**	**1**	**2%**	**1,444**	**347**	**2%**
Euglenoidea												
Euglena sp.			3	1,473								
Trachelomonas hispida												
Trachelomonas volvocina												
Subtotal	**0**	**0**	**3**	**1,473**	**0**	**0**	**1**	**0**	**0%**	**491**	**0**	**1%**
Unidentified												
Unidentified flagellate			8	152	11	217	**9**	**2**	**4%**	**185**	**32**	**0%**
Total:	**228**	**97,105**	**221**	**87,568**	**179**	**62,680**	**209**	**1**	**100%**	**82,451**	**796**	**100%**

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake					**P.O.**							
Date					**10-Aug-09**							
Replicate	**1**		**2**		**3**							
	Abundance	**Biovolume**	**Abundance**	**Biovolume**	**Abundance**	**Biovolume**	**Abundance (cells/mL)**			**Biovolume (mm3/mL)**		
Taxa	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Cyanophyta												
Anabaena sp.												
Aphanizomenon flos-aquae	1	911										
Aphanothece sp.												
Oscillatoria sp.												
Oscillatoria limnetica												
Subtotal	**1**	**911**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**304**	**0**	**1%**
Chlorophyta												
Ankistrodesmus falcatus	4	108	7	338	6	186						
Chlamydomonas sp.	1	470	10	3,176	6	2,011						
Cosmarium sp.	1	304										
Crucigenia quadrata												
Desmidium sp.												
Dictyosphaerium ehrenbergianum												
Gloeocystis ampla												
Golenkinia radiata												
Oocystis pusilla												
Scenedesmus quadricauda												
Selenastrum minutum												
Sphaerocystis schroeteri												
Tetraedron minimum												
Tetraedron regulare												
Subtotal	**7**	**882**	**17**	**3,514**	**12**	**2,197**	**12**	**1**	**18%**	**2,197**	**447**	**10%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion sp.												
Mallomonas sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta - Diatoms												
Achnanthes clevei					2	309						
Achnanthes exigua												
Achnanthes lanceolata	4	781	1	135	1	248						
Achnanthes lewisiana	1	90			1	172						
Achnanthes linearis	1	191	5	695								
Achnanthes minutissima			3	150	1	69						
Achnanthes peragalli												
Achnanthes pinnata			1	49								
Amphipleura pellucida			1	962								
Amphora ovalis												
Amphora perpusilla			1	125								
Anomoeoneis vitrea												
Asterionella formosa			2	496								
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula			1	346	4	1,898						
Cyclotella atomus												
Cyclotella comta												
Cyclotella meneghiniana												
Cyclotella ocellata			2	282	2	258						
Cyclotella stelligera												
Cymatopleura solea												
Cymbella affinis												
Cymbella microcephala												
Cymbella minuta					6	2,289						
Denticula elegans												
Diatoma tenue			1	218								
Diatoma tenue elongatum			1	541								
Diatoma vulgare												
Diatomella balfouriana					1	206						
Diploneis elliptica												
Eunotia pectinalis												
Eunotia sp.					1	309						
Fragilaria construens												
Fragilaria construens venter					1	66						
Fragilaria crotonensis												
Fragilaria pinnata												
Fragilaria vaucheriae												
Gomphonema angustatum	3	520										
Gomphonema gracile												
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum			1	158								
Gyrosigma spencerii												
Hantzschia amphioxys			1	154								
Melosira ambigua												
Melosira italica												

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake				**P.O.**								
Date				**10-Aug-09**								
Replicate	**1**		**2**		**3**							
	Abundance	**Biovolume**	**Abundance**	**Biovolume**	**Abundance**	**Biovolume**	**Abundance (cells/mL)**			**Biovolume (mm3/mL)**		
Taxa	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Navicula capitata												
Navicula cryptocephala												
Navicula cryptocephala veneta	1	137	2	143	1	131						
Navicula decussis												
Navicula graciloides												
Navicula gregaria												
Navicula minima			2	66	2	91						
Navicula minuscula												
Navicula pseudoscutiformis												
Navicula pupula			1	203	1	371						
Navicula radiosa												
Navicula reinhartii												
Navicula rhynchocephala												
Navicula sp.	2	325										
Navicula tripunctata												
Navicula viridula					1	309						
Neidium affine												
Nitzschia acicularis			2	421								
Nitzschia amphibia												
Nitzschia capitellata	1	260	1	271								
Nitzschia communis												
Nitzschia constricta												
Nitzschia dissipata			2	607								
Nitzschia frustulum	1	173										
Nitzschia linearis												
Nitzschia palea	4	781			1	248						
Nitzschia paleacea												
Nitzschia tryblionella			1	398								
Pinnularia sp.					1	275						
Rhoicosphenia curvata					1	80						
Stauroneis sp.												
Stephanodiscus astraea minutula	1	253										
Stephanodiscus binderanus												
Stephanodiscus hantzschii												
Surirella linearis												
Surirella ovata												
Synedra cyclopum	1	1,221										
Synedra delicatissima					1	454						
Synedra parasitica												
Synedra radians	2	781	2	541								
Synedra rumpens	1	202			1	96						
Synedra tenera												
Synedra ulna												
Tabellaria fenestrata												
Tabellaria flocculosa			1	443								
Subtotal	**25**	**5,716**	**31**	**7,404**	**30**	**7,879**	**29**	**0**	**42%**	**7,000**	**57**	**31%**
Cryptophyta												
Cryptomonas erosa	25	12,778	21	10,944	15	7,865						
Rhodomonas minuta	6	116	8	165	3	69						
Subtotal	**30**	**12,894**	**29**	**11,110**	**19**	**7,934**	**26**	**4**	**38%**	**10,646**	**2,415**	**48%**
Dinoflagellata												
Dinobryon bavaricum												
Dinobryon sertularia												
Dinobryon sp.												
Glenodinium sp.					1	481						
Hemidinium sp.												
Subtotal	**0**	**0**	**0**	**0**	**1**	**481**	**0**	**0**	**0%**	**160**	**0**	**1%**
Euglenoidea												
Euglena sp.	1	419										
Trachelomonas hispida												
Trachelomonas volvocina	1	1,362	2	4,251								
Subtotal	**1**	**1,782**	**2**	**4,251**	**0**	**0**	**1**	**1**	**2%**	**2,011**	**1,153**	**9%**
Unidentified												
Unidentified flagellate							**0**	**0**	**0**	**0**	**0**	**0**
Total:	**65**	**22,184**	**79**	**26,278**	**62**	**18,490**	**69**	**0**	**100%**	**22,318**	**256**	**100%**

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake					Ogama							
Date					14-Aug-09							
Replicate	1		2		3							
	Abundance	Biovolume	Abundance	Biovolume	Abundance	Biovolume	Abundance (cells/mL)			Biovolume (mm3/mL)		
Taxa	cells/mL	mm3/mL	cells/mL	mm3/mL	cells/mL	mm3/mL	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Anabaena sp.					100	115,857						
Aphanizomenon flos-aquae	4,443	5,038,759	3,221	3,653,100	3,875	3,906,261						
Aphanothece sp.												
Oscillatoria sp.	311	462,819	215	306,250	334	497,102						
Oscillatoria limnetica												
Subtotal	**4,754**	**5,501,578**	**3,436**	**3,959,350**	**4,310**	**4,519,220**	**4,167**	**741**	**84%**	**4,660,050**	**796,435**	**91%**
Chlorophyta												
Ankistrodesmus falcatus			31	767								
Chlamydomonas sp.	111	36,102	153	49,855	100	32,572						
Cosmarium sp.												
Crucigenia quadrata												
Desmidium sp.												
Dictyosphaerium ehrenbergianum												
Gloeocystis ampla												
Golenkinia radiata												
Oocystis pusilla												
Scenedesmus quadricauda												
Selenastrum minutum												
Sphaerocystis schroeteri												
Tetraedron minimum												
Tetraedron regulare												
Subtotal	**111**	**36,102**	**184**	**50,622**	**100**	**32,572**	**132**	**25**	**3%**	**39,766**	**10,378**	**1%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion sp.												
Mallomonas sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta - Diatoms												
Achnanthes clevei												
Achnanthes exigua	22	2,488										
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis												
Achnanthes minutissima												
Achnanthes peragalli												
Achnanthes pinnata												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla												
Anomoeoneis vitrea												
Asterionella formosa	133	67,450	184	129,593	67	36,748						
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula												
Cyclotella atomus												
Cyclotella comta												
Cyclotella meneghiniana												
Cyclotella ocellata	44	5,554	61	7,670								
Cyclotella stelligera	89	4,888	61	3,375	67	3,675						
Cymatopleura solea												
Cymbella affinis												
Cymbella microcephala												
Cymbella minuta												
Denticula elegans												
Diatoma tenue												
Diatoma tenue elongatum	22	15,996			33	24,053						
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica	22	5,776	31	7,977								
Eunotia pectinalis												
Eunotia sp.												
Fragilaria construens												
Fragilaria construens venter	44	3,199										
Fragilaria crotonensis												
Fragilaria pinnata												
Fragilaria vaucheriae												
Gomphonema angustatum												
Gomphonema gracile												
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira ambigua	22	39,257	31	36,141								
Melosira italica	22	83,713	31	173,405	67	251,758						

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake					**Ogama**							
Date					**14-Aug-09**							
Replicate	**1**		**2**		**3**							
	Abundance	**Biovolume**	**Abundance**	**Biovolume**	**Abundance**	**Biovolume**	**Abundance (cells/mL)**			**Biovolume (mm3/mL)**		
Taxa	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Navicula capitata												
Navicula cryptocephala												
Navicula cryptocephala veneta												
Navicula decussis												
Navicula graciloides												
Navicula gregaria												
Navicula minima												
Navicula minuscula			31	1,381								
Navicula pseudoscutiformis												
Navicula pupula												
Navicula radiosa												
Navicula reinhartii												
Navicula rhynchocephala												
Navicula sp.	22	3,333										
Navicula tripunctata												
Navicula viridula												
Neidium affine												
Nitzschia acicularis	44	12,441	92	25,771								
Nitzschia amphibia												
Nitzschia capitellata												
Nitzschia communis												
Nitzschia constricta												
Nitzschia dissipata												
Nitzschia frustulum												
Nitzschia linearis												
Nitzschia palea												
Nitzschia paleacea												
Nitzschia tryblionella												
Pinnularia sp.												
Rhoicosphenia curvata												
Stauroneis sp.												
Stephanodiscus astraea minutula	44	15,552	123	42,952	134	46,770						
Stephanodiscus binderanus												
Stephanodiscus hantzschii	22	2,666			33	4,009						
Surirella linearis												
Surirella ovata			31	8,897								
Synedra cyclopum												
Synedra delicatissima												
Synedra parasitica												
Synedra radians	44	15,996	31	11,045								
Synedra rumpens	44	6,221										
Synedra tenera												
Synedra ulna	22	88,423										
Tabellaria fenestrata	22	53,320										
Tabellaria flocculosa												
Subtotal	**689**	**426,273**	**706**	**448,208**	**401**	**367,014**	**598**	**7**	**12%**	**413,832**	**9,348**	**8%**
Cryptophyta												
Cryptomonas erosa					33	17,372						
Rhodomonas minuta	44	889	31	614	33	668						
Subtotal	**44**	**889**	**31**	**614**	**67**	**18,040**	**47**	**3**	**1%**	**6,514**	**4,163**	**0%**
Dinoflagellata												
Dinobryon bavaricum												
Dinobryon sertularia	22	2,666										
Dinobryon sp.												
Glenodinium sp.					33	23,385						
Hemidinium sp.												
Subtotal	**22**	**2,666**	**0**	**0**	**33**	**23,385**	**19**	**6**	**0%**	**8,684**	**10,360**	**0%**
Euglenoidea												
Euglena sp.												
Trachelomonas hispida												
Trachelomonas volvocina												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Unidentified												
Unidentified flagellate			31	614	33	668	**32**	**1**	**1%**	**641**	**27**	**0%**
Total:	**5,621**	**5,967,508**	**4,387**	**4,459,408**	**4,944**	**4,960,900**	**4,984**	**123**	**100%**	**5,129,272**	**135,020**	**100%**

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake				Doris S								
Date				17-Aug-09								
Replicate	1		2		3							
	Abundance	Biovolume	Abundance	Biovolume	Abundance	Biovolume	Abundance (cells/mL)			Biovolume (mm3/mL)		
Taxa	cells/mL	mm3/mL	cells/mL	mm3/mL	cells/mL	mm3/mL	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Anabaena sp.												
Aphanizomenon flos-aquae	4,422	5,014,059	3,195	4,025,175	3,007	3,220,140						
Aphanothece sp.												
Oscillatoria sp.												
Oscillatoria limnetica												
Subtotal	**4,422**	**5,014,059**	**3,195**	**4,025,175**	**3,007**	**3,220,140**	**3,541**	**444**	**78%**	**4,086,458**	**518,765**	**88%**
Chlorophyta												
Ankistrodesmus falcatus												
Chlamydomonas sp.	111	35,925	150	48,858	43	13,960						
Cosmarium sp.												
Crucigenia quadrata												
Desmidium sp.			19	6,577								
Dictyosphaerium ehrenbergianum												
Gloeocystis ampla												
Golenkinia radiata												
Oocystis pusilla												
Scenedesmus quadricauda												
Selenastrum minutum												
Sphaerocystis schroeteri												
Tetraedron minimum												
Tetraedron regulare												
Subtotal	**111**	**35,925**	**169**	**55,435**	**43**	**13,960**	**108**	**30**	**2%**	**35,107**	**9,759**	**1%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale	22	2,100										
Kephyrion sp.												
Mallomonas sp.												
Subtotal	**22**	**2,100**	**0**	**0**	**0**	**0**	**7**	**0**	**0%**	**700**	**0**	**0%**
Chrysophyta - Diatoms												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis					21	2,835						
Achnanthes minutissima												
Achnanthes peragalli												
Achnanthes pinnata												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla			19	3,119								
Anomoeoneis vitrea												
Asterionella formosa	486	267,505	301	152,137	387	187,101						
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula					21	9,879						
Cyclotella atomus												
Cyclotella comta												
Cyclotella meneghiniana												
Cyclotella ocellata												
Cyclotella stelligera												
Cymatopleura solea												
Cymbella affinis												
Cymbella microcephala												
Cymbella minuta												
Denticula elegans												
Diatoma tenue												
Diatoma tenue elongatum	22	15,918										
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica					43	11,168						
Eunotia pectinalis												
Eunotia sp.												
Fragilaria construens												
Fragilaria construens venter	44	10,612										
Fragilaria crotonensis												
Fragilaria pinnata			19	2,255	21	2,577						
Fragilaria vaucheriae												
Gomphonema angustatum												
Gomphonema gracile												
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii			19	8,456								
Hantzschia amphioxys												
Melosira ambigua												
Melosira italica	133	374,861	75	212,421	107	202,306						

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake				**Doris S**								
Date				**17-Aug-09**								
Replicate	**1**		**2**		**3**							
	Abundance	**Biovolume**	**Abundance**	**Biovolume**	**Abundance**	**Biovolume**	**Abundance (cells/mL)**			**Biovolume (mm3/mL)**		
Taxa	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Navicula capitata					21	10,309						
Navicula cryptocephala												
Navicula cryptocephala veneta												
Navicula decussis												
Navicula graciloides												
Navicula gregaria												
Navicula minima												
Navicula minuscula												
Navicula pseudoscutiformis												
Navicula pupula	22	5,969										
Navicula radiosa												
Navicula reinhartii												
Navicula rhynchocephala	22	6,522										
Navicula sp.												
Navicula tripunctata												
Navicula viridula												
Neidium affine												
Nitzschia acicularis	22	6,190	38	10,523								
Nitzschia amphibia												
Nitzschia capitellata												
Nitzschia communis												
Nitzschia constricta												
Nitzschia dissipata												
Nitzschia frustulum												
Nitzschia linearis												
Nitzschia palea												
Nitzschia paleacea												
Nitzschia tryblionella												
Pinnularia sp.												
Rhoicosphenia curvata												
Stauroneis sp.												
Stephanodiscus astraea minutula												
Stephanodiscus binderanus												
Stephanodiscus hantzschii												
Surirella linearis												
Surirella ovata												
Synedra cyclopum												
Synedra delicatissima												
Synedra parasitica												
Synedra radians					21	7,731						
Synedra rumpens												
Synedra tenera												
Synedra ulna												
Tabellaria fenestrata												
Tabellaria flocculosa												
Subtotal	**752**	**687,576**	**470**	**388,912**	**644**	**433,905**	**622**	**29**	**14%**	**503,464**	**24,336**	**11%**
Cryptophyta												
Cryptomonas erosa			56	29,315	21	11,168						
Rhodomonas minuta	133	2,653	226	4,510	172	3,436						
Subtotal	**133**	**2,653**	**282**	**33,825**	**193**	**14,604**	**203**	**37**	**4%**	**17,027**	**5,007**	**0%**
Dinoflagellata												
Dinobryon bavaricum												
Dinobryon sertularia												
Dinobryon sp.												
Glenodinium sp.	44	30,951			21	15,033						
Hemidinium sp.												
Subtotal	**44**	**30,951**	**0**	**0**	**21**	**15,033**	**22**	**11**	**0%**	**15,328**	**7,959**	**0%**
Euglenoidea												
Euglena sp.												
Trachelomonas hispida												
Trachelomonas volvocina												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Unidentified												
Unidentified flagellate	44	884	56	1,128	43	859	**48**	**4**	**1%**	**957**	**86**	**0%**
Total:	**5,527**	**5,774,149**	**4,172**	**4,504,475**	**3,952**	**3,698,501**	**4,550**	**153**	**100%**	**4,659,041**	**178,210**	**100%**

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake					Doris N							
Date					16-Aug-09							
Replicate	1		2		3							
	Abundance	Biovolume	Abundance	Biovolume	Abundance	Biovolume	Abundance (cells/mL)			Biovolume (mm3/mL)		
Taxa	cells/mL	mm3/mL	cells/mL	mm3/mL	cells/mL	mm3/mL	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Anabaena sp.												
Aphanizomenon flos-aquae	4,422	5,571,176	3,070	4,255,280	3,648	4,366,410						
Aphanothece sp.												
Oscillatoria sp.												
Oscillatoria limnetica												
Subtotal	**4,422**	**5,571,176**	**3,070**	**4,255,280**	**3,648**	**4,366,410**	**3,713**	**391**	**78%**	**4,730,955**	**421,334**	**87%**
Chlorophyta												
Ankistrodesmus falcatus												
Chlamydomonas sp.	155	50,295	42	13,763	66	21,555						
Cosmarium sp.												
Crucigenia quadrata												
Desmidium sp.												
Dictyosphaerium ehrenbergianum												
Gloeocystis ampla												
Golenkinia radiata												
Oocystis pusilla												
Scenedesmus quadricauda												
Selenastrum minutum												
Sphaerocystis schroeteri												
Tetraedron minimum												
Tetraedron regulare												
Subtotal	**155**	**50,295**	**42**	**13,763**	**66**	**21,555**	**88**	**34**	**2%**	**28,538**	**11,109**	**1%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion sp.												
Mallomonas sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta - Diatoms												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes lanceolata	22	3,979	21	3,811								
Achnanthes lewisiana												
Achnanthes linearis					22	2,918						
Achnanthes minutissima												
Achnanthes peragalli	22	3,095										
Achnanthes pinnata												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla												
Anomoeoneis vitrea			21	2,541								
Asterionella formosa	553	267,505	508	268,313	553	279,664						
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula												
Cyclotella atomus												
Cyclotella comta												
Cyclotella meneghiniana					22	8,401						
Cyclotella ocellata												
Cyclotella stelligera	22	1,216	21	1,165								
Cymatopleura solea												
Cymbella affinis												
Cymbella microcephala												
Cymbella minuta												
Denticula elegans												
Diatoma tenue					22	6,411						
Diatoma tenue elongatum			21	15,245								
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica												
Eunotia pectinalis												
Eunotia sp.												
Fragilaria construens												
Fragilaria construens venter			21	3,049	22	1,061						
Fragilaria crotonensis												
Fragilaria pinnata	22	1,326			44	2,653						
Fragilaria vaucheriae												
Gomphonema angustatum												
Gomphonema gracile												
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira ambigua												
Melosira italica	111	229,081	106	259,293	111	437,337						

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake				**Doris N**								
Date				**16-Aug-09**								
Replicate	**1**		**2**		**3**							
	Abundance	**Biovolume**	**Abundance**	**Biovolume**	**Abundance**	**Biovolume**	**Abundance (cells/mL)**			**Biovolume (mm3/mL)**		
Taxa	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Navicula capitata												
Navicula cryptocephala												
Navicula cryptocephala veneta												
Navicula decussis												
Navicula graciloides												
Navicula gregaria												
Navicula minima			21	932								
Navicula minuscula	22	995										
Navicula pseudoscutiformis												
Navicula pupula					22	5,969						
Navicula radiosa	22	7,185										
Navicula reinhartii												
Navicula rhynchocephala												
Navicula sp.												
Navicula tripunctata												
Navicula viridula												
Neidium affine												
Nitzschia acicularis			21	5,929								
Nitzschia amphibia												
Nitzschia capitellata												
Nitzschia communis												
Nitzschia constricta												
Nitzschia dissipata												
Nitzschia frustulum												
Nitzschia linearis												
Nitzschia palea												
Nitzschia paleacea												
Nitzschia tryblionella												
Pinnularia sp.												
Rhoicosphenia curvata												
Stauroneis sp.												
Stephanodiscus astraea minutula												
Stephanodiscus binderanus												
Stephanodiscus hantzschii	22	2,653										
Surirella linearis												
Surirella ovata												
Synedra cyclopum												
Synedra delicatissima			21	13,975								
Synedra parasitica												
Synedra radians					22	7,959						
Synedra rumpens												
Synedra tenera												
Synedra ulna												
Tabellaria fenestrata												
Tabellaria flocculosa												
Subtotal	**818**	**517,036**	**783**	**574,252**	**840**	**752,374**	**814**	**31**	**17%**	**614,554**	**23,349**	**11%**
Cryptophyta												
Cryptomonas erosa			42	22,021	66	34,488						
Rhodomonas minuta	66	1,326	21	423								
Subtotal	**66**	**1,326**	**64**	**22,444**	**66**	**34,488**	**65**	**11**	**1%**	**19,420**	**8,305**	**0%**
Dinoflagellata												
Dinobryon bavaricum												
Dinobryon sertularia					22	2,653						
Dinobryon sp.												
Glenodinium sp.	44	30,951	85	59,286	22	15,475						
Hemidinium sp.												
Subtotal	**44**	**30,951**	**85**	**59,286**	**44**	**18,128**	**58**	**15**	**1%**	**36,122**	**12,191**	**1%**
Euglenoidea												
Euglena sp.												
Trachelomonas hispida												
Trachelomonas volvocina												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Unidentified												
Unidentified flagellate	22	442	21	423	22	442	**22**	**0**	**0%**	**436**	**6**	**0%**
Total:	**5,527**	**6,171,228**	**4,065**	**4,925,449**	**4,687**	**5,193,398**	**4,760**	**140**	**100%**	**5,430,025**	**178,174**	**100%**

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake					Little Roberts							
Date					7-Aug-09							
Replicate	1		2		3							
	Abundance	Biovolume	Abundance	Biovolume	Abundance	Biovolume	Abundance (cells/mL)			Biovolume (mm3/mL)		
Taxa	cells/mL	mm3/mL	cells/mL	mm3/mL	cells/mL	mm3/mL	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Anabaena sp.												
Aphanizomenon flos-aquae	34	43,050	15	18,942	87	109,281						
Aphanothece sp.												
Oscillatoria sp.												
Oscillatoria limnetica	1,196	841,867	917	674,937	1,110	746,023						
Subtotal	**1,230**	**884,917**	**932**	**693,879**	**1,197**	**855,304**	**1,120**	**233**	**60%**	**811,366**	**157,851**	**63%**
Chlorophyta												
Ankistrodesmus falcatus			45	1,128	35	867						
Chlamydomonas sp.	34	11,104	60	19,543	69	22,550						
Cosmarium sp.			15	3,157								
Crucigenia quadrata												
Desmidium sp.												
Dictyosphaerium ehrenbergianum												
Gloeocystis ampla												
Golenkinia radiata												
Oocystis pusilla												
Scenedesmus quadricauda												
Selenastrum minutum												
Sphaerocystis schroeteri												
Tetraedron minimum												
Tetraedron regulare												
Subtotal	**34**	**11,104**	**120**	**23,828**	**104**	**23,417**	**86**	**8**	**5%**	**19,450**	**3,909**	**2%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion sp.					17	1,093						
Mallomonas sp.												
Subtotal	**0**	**0**	**0**	**0**	**17**	**1,093**	**6**	**0**	**0%**	**364**	**0**	**0%**
Chrysophyta - Diatoms												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis	11	1,503	15	1,984								
Achnanthes minutissima	23	1,139	30	1,503								
Achnanthes peragalli												
Achnanthes pinnata												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla												
Anomoeoneis vitrea												
Asterionella formosa	34	17,288	75	42,995	156	123,643						
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula					17	7,979						
Cyclotella atomus												
Cyclotella comta	11	25,853										
Cyclotella meneghiniana												
Cyclotella ocellata	57	7,118	90	11,275	35	4,337						
Cyclotella stelligera					17	954						
Cymatopleura solea												
Cymbella affinis												
Cymbella microcephala												
Cymbella minuta	23	8,428										
Denticula elegans												
Diatoma tenue	34	9,908	45	13,079	17	5,030						
Diatoma tenue elongatum			60	43,296	17	12,489						
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica												
Eunotia pectinalis												
Eunotia sp.												
Fragilaria construens												
Fragilaria construens venter												
Fragilaria crotonensis												
Fragilaria pinnata												
Fragilaria vaucheriae												
Gomphonema angustatum												
Gomphonema gracile												
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira ambigua												
Melosira italica	125	236,023	75	354,035	104	245,101						

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake					**Little Roberts**							
Date					**7-Aug-09**							
Replicate	**1**		**2**		**3**							
	Abundance	**Biovolume**	**Abundance**	**Biovolume**	**Abundance**	**Biovolume**	**Abundance (cells/mL)**			**Biovolume (mm3/mL)**		
Taxa	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Navicula capitata			15	7,216								
Navicula cryptocephala												
Navicula cryptocephala veneta												
Navicula decussis												
Navicula graciloides												
Navicula gregaria												
Navicula minima												
Navicula minuscula												
Navicula pseudoscutiformis												
Navicula pupula												
Navicula radiosa												
Navicula reinhartii												
Navicula rhynchocephala												
Navicula sp.												
Navicula tripunctata												
Navicula viridula												
Neidium affine												
Nitzschia acicularis	11	3,189										
Nitzschia amphibia												
Nitzschia capitellata			15	5,412								
Nitzschia communis												
Nitzschia constricta												
Nitzschia dissipata	11	3,064										
Nitzschia frustulum	11	1,367										
Nitzschia linearis												
Nitzschia palea												
Nitzschia paleacea												
Nitzschia tryblionella												
Pinnularia sp.												
Rhoicosphenia curvata												
Stauroneis sp.												
Stephanodiscus astraea minutula			15	5,262								
Stephanodiscus binderanus												
Stephanodiscus hantzschii												
Surirella linearis					17	4,857						
Surirella ovata												
Synedra cyclopum												
Synedra delicatissima												
Synedra parasitica												
Synedra radians	23	8,200	45	16,236	17	6,245						
Synedra rumpens	11	1,594	15	2,105	17	2,428						
Synedra tenera												
Synedra ulna												
Tabellaria fenestrata												
Tabellaria flocculosa												
Subtotal	**387**	**324,674**	**496**	**504,398**	**416**	**413,064**	**433**	**6**	**23%**	**414,046**	**13,546**	**32%**
Cryptophyta												
Cryptomonas erosa	34	17,767	60	31,269								
Rhodomonas minuta	57	1,139	75	1,503	139	2,775						
Subtotal	**91**	**18,906**	**135**	**32,773**	**139**	**2,775**	**122**	**18**	**7%**	**18,151**	**5,965**	**1%**
Dinoflagellata												
Dinobryon bavaricum												
Dinobryon sertularia			15	1,804	35	4,163						
Dinobryon sp.												
Glenodinium sp.	23	15,944	45	31,570	17	12,142						
Hemidinium sp.					17	5,204						
Subtotal	**23**	**15,944**	**60**	**33,374**	**69**	**21,509**	**51**	**5**	**3%**	**23,609**	**4,509**	**2%**
Euglenoidea												
Euglena sp.												
Trachelomonas hispida												
Trachelomonas volvocina												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Unidentified												
Unidentified flagellate	23	456	30	601	69	1,388	**41**	**14**	**2%**	**815**	**289**	**0%**
Total:	**1,788**	**1,256,001**	**1,774**	**1,288,853**	**2,012**	**1,318,551**	**1,858**	**29**	**100%**	**1,287,801**	**21,575**	**100%**

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake					**Naiqunnguut**							
Date					**10-Aug-09**							
Replicate	**1**		**2**		**3**							
Taxa	**Abundance cells/mL**	**Biovolume mm3/mL**	**Abundance cells/mL**	**Biovolume mm3/mL**	**Abundance cells/mL**	**Biovolume mm3/mL**	**Abundance (cells/mL) Mean**	**SE**	**Percent**	**Biovolume (mm3/mL) Mean**	**SE**	**Percent**
Cyanophyta												
Anabaena sp.												
Aphanizomenon flos-aquae												
Aphanothece sp.												
Oscillatoria sp.												
Oscillatoria limnetica												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chlorophyta												
Ankistrodesmus falcatus	59	1,611	60	1,792	38	1,223						
Chlamydomonas sp.	40	13,087	20	6,471	10	3,219						
Cosmarium sp.												
Crucigenia quadrata	4	311	3	282								
Desmidium sp.												
Dictyosphaerium ehrenbergianum												
Gloeocystis ampla					4	1,014						
Golenkinia radiata												
Oocystis pusilla	18	2,965	3	717	6	1,701						
Scenedesmus quadricauda												
Selenastrum minutum												
Sphaerocystis schroeteri					2	555						
Tetraedron minimum												
Tetraedron regulare												
Subtotal	**121**	**17,974**	**86**	**9,262**	**59**	**7,711**	**89**	**6**	**34%**	**11,649**	**982**	**14%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion sp.												
Mallomonas sp.	4	1,391										
Subtotal	**4**	**1,391**	**0**	**0**	**0**	**0**	**1**	**0**	**0%**	**464**	**0**	**1%**
Chrysophyta - Diatoms												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes lanceolata												
Achnanthes lewisiana			3	415								
Achnanthes linearis												
Achnanthes minutissima	4	183										
Achnanthes peragalli												
Achnanthes pinnata												
Amphipleura pellucida												
Amphora ovalis					2	1,145						
Amphora perpusilla												
Anomoeoneis vitrea												
Asterionella formosa	7	11,275	10	13,799	4	2,179						
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula												
Cyclotella atomus												
Cyclotella comta	4	8,310	7	15,067								
Cyclotella meneghiniana												
Cyclotella ocellata					8	990						
Cyclotella stelligera												
Cymatopleura solea	4	59,304										
Cymbella affinis												
Cymbella microcephala												
Cymbella minuta												
Denticula elegans					2	1,486						
Diatoma tenue			3	962								
Diatoma tenue elongatum												
Diatoma vulgare												
Diatomella balfouriana					2	594						
Diploneis elliptica			3	863	2	515						
Eunotia pectinalis	4	2,636			2	1,426						
Eunotia sp.												
Fragilaria construens												
Fragilaria construens venter					2	190						
Fragilaria crotonensis												
Fragilaria pinnata												
Fragilaria vaucheriae					4	1,711						
Gomphonema angustatum			7	1,195								
Gomphonema gracile												
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira ambigua												
Melosira italica												

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake	Naiqunnguut											
Date	10-Aug-09											
Replicate	1		2		3							
	Abundance	Biovolume	Abundance	Biovolume	Abundance	Biovolume	Abundance (cells/mL)			Biovolume (mm3/mL)		
Taxa	cells/mL	mm3/mL	cells/mL	mm3/mL	cells/mL	mm3/mL	Mean	SE	Percent	Mean	SE	Percent
Navicula capitata			3	1,593	2	951						
Navicula cryptocephala	4	677	3	614								
Navicula cryptocephala veneta					2	188						
Navicula decussis												
Navicula graciloides												
Navicula gregaria												
Navicula minima			3	146								
Navicula minuscula			3	149	2	89						
Navicula pseudoscutiformis												
Navicula pupula												
Navicula radiosa												
Navicula reinhartii												
Navicula rhynchocephala												
Navicula sp.			3	498								
Navicula tripunctata					2	2,218						
Navicula viridula												
Neidium affine												
Nitzschia acicularis	7	2,050										
Nitzschia amphibia												
Nitzschia capitellata												
Nitzschia communis												
Nitzschia constricta					2	1,149						
Nitzschia dissipata					6	1,598						
Nitzschia frustulum			7	796								
Nitzschia linearis					2	3,019						
Nitzschia palea												
Nitzschia paleacea	4	359										
Nitzschia tryblionella												
Pinnularia sp.			3	1,327								
Rhoicosphenia curvata												
Stauroneis sp.												
Stephanodiscus astraea minutula												
Stephanodiscus binderanus												
Stephanodiscus hantzschii												
Surirella linearis												
Surirella ovata												
Synedra cyclopum					4	3,347						
Synedra delicatissima												
Synedra parasitica			3	465	2	277						
Synedra radians	4	1,318	7	2,389	6	2,139						
Synedra rumpens			3	465	4	555						
Synedra tenera			3	996								
Synedra ulna					2	3,942						
Tabellaria fenestrata			3	7,965	4	9,507						
Tabellaria flocculosa	7	10,799										
Subtotal	**48**	**96,910**	**80**	**49,703**	**67**	**39,215**	**65**	**0**	**25%**	**61,943**	**1,246**	**77%**
Cryptophyta												
Cryptomonas erosa	7	3,807	7	3,451	4	2,060						
Rhodomonas minuta	95	1,904	76	1,527	44	871						
Subtotal	**103**	**5,711**	**83**	**4,978**	**48**	**2,931**	**78**	**16**	**30%**	**4,540**	**464**	**6%**
Dinoflagellata												
Dinobryon bavaricum												
Dinobryon sertularia	22	2,636	17	1,991	16	1,901						
Dinobryon sp.												
Glenodinium sp.												
Hemidinium sp.												
Subtotal	**22**	**2,636**	**17**	**1,991**	**16**	**1,901**	**18**	**2**	**7%**	**2,176**	**231**	**3%**
Euglenoidea												
Euglena sp.												
Trachelomonas hispida												
Trachelomonas volvocina												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Unidentified												
Unidentified flagellate	22	439	7	133			**14**	**8**	**5%**	**286**	**153**	**0%**
Total:	**318**	**125,061**	**272**	**66,067**	**190**	**51,759**	**260**	**2**	**100%**	**80,962**	**850**	**100%**

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake				**Nakhaktok**								
Date				**6-Aug-09**								
Replicate	**1**		**2**		**3**							
	Abundance	**Biovolume**	**Abundance**	**Biovolume**	**Abundance**	**Biovolume**	**Abundance (cells/mL)**			**Biovolume (mm3/mL)**		
Taxa	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Cyanophyta												
Anabaena sp.												
Aphanizomenon flos-aquae	17,897	20,295,000	12,960	16,329,310	13,856	21,823,238						
Aphanothece sp.												
Oscillatoria sp.												
Oscillatoria limnetica												
Subtotal	**17,897**	**20,295,000**	**12,960**	**16,329,310**	**13,856**	**21,823,238**	**14,904**	**1,519**	**88%**	**19,482,516**	**1,637,163**	**93%**
Chlorophyta												
Ankistrodesmus falcatus					54	1,358						
Chlamydomonas sp.			52	16,848	54	17,660						
Cosmarium sp.												
Crucigenia quadrata												
Desmidium sp.												
Dictyosphaerium ehrenbergianum												
Gloeocystis ampla												
Golenkinia radiata												
Oocystis pusilla												
Scenedesmus quadricauda												
Selenastrum minutum												
Sphaerocystis schroeteri												
Tetraedron minimum												
Tetraedron regulare												
Subtotal	**0**	**0**	**52**	**16,848**	**109**	**19,018**	**54**	**1**	**0%**	**11,955**	**5,304**	**0%**
Chrysophyta												
Chrysococcus rufescens					54	4,619						
Kephyrion littorale												
Kephyrion sp.												
Mallomonas sp.												
Subtotal	**0**	**0**	**0**	**0**	**54**	**4,619**	**18**	**0**	**0%**	**1,540**	**0**	**0%**
Chrysophyta - Diatoms												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis												
Achnanthes minutissima												
Achnanthes peragalli												
Achnanthes pinnata												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla												
Anomoeoneis vitrea												
Asterionella formosa	179	39,373	104	22,809	163	96,829						
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula												
Cyclotella atomus												
Cyclotella comta												
Cyclotella meneghiniana												
Cyclotella ocellata												
Cyclotella stelligera												
Cymatopleura solea												
Cymbella affinis												
Cymbella microcephala												
Cymbella minuta												
Denticula elegans												
Diatoma tenue												
Diatoma tenue elongatum	1,074	1,082,400	985	850,990	2,445	2,112,636						
Diatoma vulgare	36	140,311										
Diatomella balfouriana												
Diploneis elliptica												
Eunotia pectinalis												
Eunotia sp.												
Fragilaria construens												
Fragilaria construens venter												
Fragilaria crotonensis												
Fragilaria pinnata												
Fragilaria vaucheriae												
Gomphonema angustatum												
Gomphonema gracile												
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira ambigua												
Melosira italica												

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake	Nakhaktok											
Date	6-Aug-09											
Replicate	1		2		3							
	Abundance	Biovolume	Abundance	Biovolume	Abundance	Biovolume	Abundance (cells/mL)			Biovolume (mm3/mL)		
Taxa	cells/mL	mm3/mL	cells/mL	mm3/mL	cells/mL	mm3/mL	Mean	SE	Percent	Mean	SE	Percent
Navicula capitata												
Navicula cryptocephala												
Navicula cryptocephala veneta												
Navicula decussis												
Navicula graciloides												
Navicula gregaria												
Navicula minima												
Navicula minuscula												
Navicula pseudoscutiformis												
Navicula pupula												
Navicula radiosa												
Navicula reinhartii												
Navicula rhynchocephala												
Navicula sp.												
Navicula tripunctata												
Navicula viridula												
Neidium affine												
Nitzschia acicularis												
Nitzschia amphibia												
Nitzschia capitellata												
Nitzschia communis												
Nitzschia constricta												
Nitzschia dissipata												
Nitzschia frustulum												
Nitzschia linearis												
Nitzschia palea												
Nitzschia paleacea												
Nitzschia tryblionella												
Pinnularia sp.												
Rhoicosphenia curvata												
Stauroneis sp.												
Stephanodiscus astraea minutula												
Stephanodiscus binderanus												
Stephanodiscus hantzschii												
Surirella linearis												
Surirella ovata												
Synedra cyclopum												
Synedra delicatissima												
Synedra parasitica												
Synedra radians	143	51,543	52	18,662								
Synedra rumpens												
Synedra tenera												
Synedra ulna												
Tabellaria fenestrata												
Tabellaria flocculosa												
Subtotal	**1,432**	**1,313,627**	**1,140**	**892,462**	**2,608**	**2,209,465**	**1,727**	**269**	**10%**	**1,471,851**	**242,292**	**7%**
Cryptophyta												
Cryptomonas erosa	36	18,613	104	53,913	54	28,255						
Rhodomonas minuta	36	716	156	3,110	54	1,087						
Subtotal	**72**	**19,329**	**259**	**57,023**	**109**	**29,342**	**146**	**19**	**1%**	**35,231**	**8,565**	**0%**
Dinoflagellata												
Dinobryon bavaricum			104	12,441	54	6,520						
Dinobryon sertularia					54	6,520						
Dinobryon sp.												
Glenodinium sp.			52	36,287								
Hemidinium sp.												
Subtotal	**0**	**0**	**156**	**48,729**	**109**	**13,041**	**88**	**13**	**1%**	**20,590**	**7,087**	**0%**
Euglenoidea												
Euglena sp.												
Trachelomonas hispida												
Trachelomonas volvocina												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Unidentified												
Unidentified flagellate							**0**	**0**	**0%**	**0**	**0**	**0%**
Total:	**19,400**	**21,627,956**	**14,567**	**17,344,371**	**16,845**	**24,098,723**	**16,937**	**952**	**100%**	**21,023,683**	**1,245,415**	**100%**

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake					Windy							
Date					9-Aug-09							
Replicate	1		2		3							
	Abundance	Biovolume	Abundance	Biovolume	Abundance	Biovolume	Abundance (cells/mL)			Biovolume (mm3/mL)		
Taxa	cells/mL	mm3/mL	cells/mL	mm3/mL	cells/mL	mm3/mL	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Anabaena sp.												
Aphanizomenon flos-aquae	4	4,228	2	2,797	2	923						
Aphanothece sp.												
Oscillatoria sp.												
Oscillatoria limnetica												
Subtotal	**4**	**4,228**	**2**	**2,797**	**2**	**923**	**3**	**1**	**1%**	**2,649**	**957**	**3%**
Chlorophyta												
Ankistrodesmus falcatus	22	671	13	666	16	535						
Chlamydomonas sp.	4	1,454	4	1,443	4	1,190						
Cosmarium sp.												
Crucigenia quadrata												
Desmidium sp.												
Dictyosphaerium ehrenbergianum												
Gloeocystis ampla												
Golenkinia radiata												
Oocystis pusilla												
Scenedesmus quadricauda												
Selenastrum minutum												
Sphaerocystis schroeteri												
Tetraedron minimum												
Tetraedron regulare												
Subtotal	**27**	**2,125**	**18**	**2,109**	**20**	**1,725**	**22**	**3**	**8%**	**1,986**	**171**	**2%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion sp.												
Mallomonas sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta - Diatoms												
Achnanthes clevei	2	336	2	333	2	275						
Achnanthes exigua												
Achnanthes lanceolata	2	403	2	400								
Achnanthes lewisiana												
Achnanthes linearis					2	242						
Achnanthes minutissima	2	112	2	111	4	183						
Achnanthes peragalli												
Achnanthes pinnata												
Amphipleura pellucida												
Amphora ovalis	2	1,293										
Amphora perpusilla	9	1,485	7	1,105	9	1,519						
Anomoeoneis vitrea												
Asterionella formosa												
Caloneis ventricosa												
Caloneis ventricosa minuta					2	513						
Cocconeis disculus	2	168	4	333	2	137						
Cocconeis placentula												
Cyclotella atomus												
Cyclotella comta	20	45,704	33	75,574	22	49,859						
Cyclotella meneghiniana												
Cyclotella ocellata	179	22,371	173	21,640	117	14,643						
Cyclotella stelligera												
Cymatopleura solea					2	29,652						
Cymbella affinis												
Cymbella microcephala												
Cymbella minuta												
Denticula elegans												
Diatoma tenue												
Diatoma tenue elongatum					2	1,318						
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica			2	577	2	476						
Eunotia pectinalis												
Eunotia sp.												
Fragilaria construens			2	497	4	820						
Fragilaria construens venter	7	741	7	415	4	439						
Fragilaria crotonensis												
Fragilaria pinnata					2	110						
Fragilaria vaucheriae												
Gomphonema angustatum			4	799								
Gomphonema gracile												
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira ambigua												
Melosira italica												

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake					**Windy**							
Date					**9-Aug-09**							
Replicate	**1**		**2**		**3**							
	Abundance	**Biovolume**	**Abundance**	**Biovolume**	**Abundance**	**Biovolume**	**Abundance (cells/mL)**			**Biovolume (mm3/mL)**		
Taxa	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Navicula capitata	7	3,221	2	1,065	5	2,636						
Navicula cryptocephala					2	339						
Navicula cryptocephala veneta	2	213			2	174						
Navicula decussis												
Navicula graciloides												
Navicula gregaria					2	320						
Navicula minima	4	197	2	98								
Navicula minuscula												
Navicula pseudoscutiformis												
Navicula pupula												
Navicula radiosa												
Navicula reinhartii												
Navicula rhynchocephala												
Navicula sp.	2	336										
Navicula tripunctata												
Navicula viridula												
Neidium affine												
Nitzschia acicularis												
Nitzschia amphibia					2	176						
Nitzschia capitellata												
Nitzschia communis												
Nitzschia constricta												
Nitzschia dissipata												
Nitzschia frustulum												
Nitzschia linearis					2	2,789						
Nitzschia palea												
Nitzschia paleacea					2	179						
Nitzschia tryblionella												
Pinnularia sp.					2	732						
Rhoicosphenia curvata												
Stauroneis sp.					2	622						
Stephanodiscus astraea minutula												
Stephanodiscus binderanus												
Stephanodiscus hantzschii												
Surirella linearis												
Surirella ovata					4	1,062						
Synedra cyclopum												
Synedra delicatissima												
Synedra parasitica												
Synedra radians												
Synedra rumpens												
Synedra tenera												
Synedra ulna												
Tabellaria fenestrata												
Tabellaria flocculosa												
Subtotal	**242**	**76,579**	**244**	**102,947**	**198**	**109,214**	**228**	**5**	**88%**	**96,246**	**2,092**	**94%**
Cryptophyta												
Cryptomonas erosa	2	1,163										
Rhodomonas minuta	2	45	4	89	4	73						
Subtotal	**4**	**1,208**	**4**	**89**	**4**	**73**	**4**	**1**	**2%**	**457**	**274**	**0%**
Dinoflagellata												
Dinobryon bavaricum												
Dinobryon sertularia												
Dinobryon sp.												
Glenodinium sp.			4	3,107								
Hemidinium sp.												
Subtotal	**0**	**0**	**4**	**3,107**	**0**	**0**	**1**	**0**	**1%**	**1,036**	**0**	**1%**
Euglenoidea												
Euglena sp.												
Trachelomonas hispida												
Trachelomonas volvocina												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Unidentified												
Unidentified flagellate			2	44			**2**	**0**	**1%**	**44**	**0**	**0%**
Total:	**277**	**84,140**	**275**	**111,092**	**223**	**111,935**	**259**	**4**	**100%**	**102,389**	**1,625**	**100%**

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake				**Glenn**								
Date				**8-Aug-09**								
Replicate	**1**		**2**		**3**							
	Abundance	**Biovolume**	**Abundance**	**Biovolume**	**Abundance**	**Biovolume**	**Abundance (cells/mL)**			**Biovolume (mm3/mL)**		
Taxa	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Cyanophyta												
Anabaena sp.												
Aphanizomenon flos-aquae												
Aphanothece sp.												
Oscillatoria sp.												
Oscillatoria limnetica												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chlorophyta												
Ankistrodesmus falcatus	5	226	18	1,517	29	1,312						
Chlamydomonas sp.	32	10,260	49	15,932	29	9,477						
Cosmarium sp.	5	947										
Crucigenia quadrata												
Desmidium sp.												
Dictyosphaerium ehrenbergianum												
Gloeocystis ampla												
Golenkinia radiata												
Oocystis pusilla					5	2,624						
Scenedesmus quadricauda					10	1,895						
Selenastrum minutum			6	123								
Sphaerocystis schroeteri												
Tetraedron minimum	5	812	6	1,103	5	875						
Tetraedron regulare												
Subtotal	**45**	**12,245**	**80**	**18,674**	**78**	**16,184**	**68**	**4**	**12%**	**15,701**	**1,378**	**5%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion sp.												
Mallomonas sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta - Diatoms												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis												
Achnanthes minutissima												
Achnanthes peragalli												
Achnanthes pinnata												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla												
Anomoeoneis vitrea												
Asterionella formosa												
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus	5	338										
Cocconeis placentula												
Cyclotella atomus												
Cyclotella comta	41	92,139	31	69,550	29	66,192						
Cyclotella meneghiniana												
Cyclotella ocellata	162	20,295	178	22,213	170	21,262						
Cyclotella stelligera			6	337								
Cymatopleura solea												
Cymbella affinis												
Cymbella microcephala												
Cymbella minuta												
Denticula elegans												
Diatoma tenue	5	1,308	6	1,777								
Diatoma tenue elongatum			6	4,412	5	3,499						
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica												
Eunotia pectinalis												
Eunotia sp.												
Fragilaria construens												
Fragilaria construens venter												
Fragilaria crotonensis												
Fragilaria pinnata												
Fragilaria vaucheriae												
Gomphonema angustatum	5	812										
Gomphonema gracile												
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira ambigua												
Melosira italica	41	107,060	49	124,682	68	217,915						

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake				Glenn								
Date				**8-Aug-09**								
Replicate	**1**		**2**		**3**							
	Abundance	**Biovolume**	**Abundance**	**Biovolume**	**Abundance**	**Biovolume**	**Abundance (cells/mL)**			**Biovolume (mm3/mL)**		
Taxa	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Navicula capitata												
Navicula cryptocephala												
Navicula cryptocephala veneta												
Navicula decussis												
Navicula graciloides												
Navicula gregaria												
Navicula minima												
Navicula minuscula												
Navicula pseudoscutiformis												
Navicula pupula												
Navicula radiosa												
Navicula reinhartii												
Navicula rhynchocephala												
Navicula sp.												
Navicula tripunctata												
Navicula viridula												
Neidium affine												
Nitzschia acicularis			12	3,432	5	1,361						
Nitzschia amphibia												
Nitzschia capitellata												
Nitzschia communis			6	276								
Nitzschia constricta												
Nitzschia dissipata												
Nitzschia frustulum												
Nitzschia linearis												
Nitzschia palea												
Nitzschia paleacea	9	884	31	3,003	15	1,429						
Nitzschia tryblionella												
Pinnularia sp.												
Rhoicosphenia curvata												
Stauroneis sp.												
Stephanodiscus astraea minutula	9	3,157			5	1,701						
Stephanodiscus binderanus												
Stephanodiscus hantzschii												
Surirella linearis												
Surirella ovata												
Synedra cyclopum												
Synedra delicatissima												
Synedra parasitica												
Synedra radians			6	2,206	5	1,750						
Synedra rumpens	5	631	12	1,716								
Synedra tenera	5	1,353										
Synedra ulna												
Tabellaria fenestrata												
Tabellaria flocculosa												
Subtotal	**284**	**227,978**	**343**	**233,602**	**301**	**315,108**	**310**	**9**	**57%**	**258,896**	**9,472**	**88%**
Cryptophyta												
Cryptomonas erosa	27	14,071	43	22,305	10	5,054						
Rhodomonas minuta	108	2,165	165	3,309	121	2,430						
Subtotal	**135**	**16,236**	**208**	**25,614**	**131**	**7,484**	**158**	**25**	**29%**	**16,445**	**3,351**	**6%**
Dinoflagellata												
Dinobryon bavaricum												
Dinobryon sertularia												
Dinobryon sp.	5	564	6	766								
Glenodinium sp.			6	4,289	5	3,402						
Hemidinium sp.												
Subtotal	**5**	**564**	**12**	**5,055**	**5**	**3,402**	**7**	**0**	**1%**	**3,007**	**937**	**1%**
Euglenoidea												
Euglena sp.												
Trachelomonas hispida												
Trachelomonas volvocina												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Unidentified												
Unidentified flagellate			6	123	5	97	**5**	**1**	**1%**	**110**	**13**	**0%**
Total:	**469**	**257,022**	**650**	**283,068**	**520**	**342,275**	**546**	**6**	**100%**	**294,122**	**5,303**	**100%**

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake	Ref Lk A											
Date	12-Aug-09											
Replicate	1		2		3							
	Abundance	Biovolume	Abundance	Biovolume	Abundance	Biovolume	Abundance (cells/mL)			Biovolume (mm3/mL)		
Taxa	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Cyanophyta												
Anabaena sp.												
Aphanizomenon flos-aquae												
Aphanothece sp.					4	1,158						
Oscillatoria sp.												
Oscillatoria limnetica												
Subtotal	**0**	**0**	**0**	**0**	**4**	**1,158**	**1**	**0**	**0%**	**386**	**0**	**0%**
Chlorophyta												
Ankistrodesmus falcatus	38	1,057	22	874	4	97						
Chlamydomonas sp.	56	18,044	52	17,044	58	18,824						
Cosmarium sp.												
Crucigenia quadrata					4	328						
Desmidium sp.			4	3,059								
Dictyosphaerium ehrenbergianum												
Gloeocystis ampla												
Golenkinia radiata												
Oocystis pusilla	9	1,845	9	1,416								
Scenedesmus quadricauda	4	555										
Selenastrum minutum	4	85										
Sphaerocystis schroeteri												
Tetraedron minimum	4	769			4	695						
Tetraedron regulare												
Subtotal	**115**	**22,356**	**87**	**22,393**	**70**	**19,944**	**91**	**6**	**19%**	**21,564**	**1,947**	**22%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion sp.												
Mallomonas sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta - Diatoms												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis												
Achnanthes minutissima	4	214										
Achnanthes peragalli												
Achnanthes pinnata												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla												
Anomoeoneis vitrea												
Asterionella formosa					12	5,861						
Caloneis ventricosa	4	1,046										
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula												
Cyclotella atomus												
Cyclotella comta	9	19,390	17	39,681	8	17,530						
Cyclotella meneghiniana												
Cyclotella ocellata	252	31,497	262	32,776	224	27,994						
Cyclotella stelligera	9	470	4	240	8	425						
Cymatopleura solea												
Cymbella affinis												
Cymbella microcephala			4	232								
Cymbella minuta												
Denticula elegans												
Diatoma tenue												
Diatoma tenue elongatum												
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica												
Eunotia pectinalis												
Eunotia sp.												
Fragilaria construens												
Fragilaria construens venter												
Fragilaria crotonensis												
Fragilaria pinnata												
Fragilaria vaucheriae												
Gomphonema angustatum												
Gomphonema gracile												
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira ambigua												
Melosira italica												

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake		Ref Lk A											
Date		12-Aug-09											
Replicate		1		2		3							
		Abundance	Biovolume	Abundance	Biovolume	Abundance	Biovolume	Abundance (cells/mL)			Biovolume (mm3/mL)		
Taxa		cells/mL	mm3/mL	cells/mL	mm3/mL	cells/mL	mm3/mL	Mean	SE	Percent	Mean	SE	Percent
Navicula capitata													
Navicula cryptocephala													
Navicula cryptocephala veneta													
Navicula decussis													
Navicula graciloides													
Navicula gregaria													
Navicula minima						4	170						
Navicula minuscula													
Navicula pseudoscutiformis													
Navicula pupula		4	1,153										
Navicula radiosa													
Navicula reinhartii													
Navicula rhynchocephala													
Navicula sp.													
Navicula tripunctata													
Navicula viridula													
Neidium affine													
Nitzschia acicularis				4	1,224								
Nitzschia amphibia													
Nitzschia capitellata													
Nitzschia communis													
Nitzschia constricta													
Nitzschia dissipata													
Nitzschia frustulum													
Nitzschia linearis													
Nitzschia palea													
Nitzschia paleacea													
Nitzschia tryblionella													
Pinnularia sp.													
Rhoicosphenia curvata													
Stauroneis sp.													
Stephanodiscus astraea minutula													
Stephanodiscus binderanus													
Stephanodiscus hantzschii													
Surirella linearis													
Surirella ovata													
Synedra cyclopum													
Synedra delicatissima													
Synedra parasitica													
Synedra radians				4	1,573	4	1,390						
Synedra rumpens													
Synedra tenera													
Synedra ulna													
Tabellaria fenestrata													
Tabellaria flocculosa													
	Subtotal	**282**	**53,770**	**297**	**75,726**	**259**	**53,371**	**279**	**22**	**58%**	**60,956**	**3,281**	**62%**
Cryptophyta													
Cryptomonas erosa		21	11,104	4	2,272	12	6,024						
Rhodomonas minuta		17	342	48	961	31	618						
	Subtotal	**38**	**11,446**	**52**	**3,234**	**42**	**6,641**	**44**	**6**	**9%**	**7,107**	**1,736**	**7%**
Dinoflagellata													
Dinobryon bavaricum													
Dinobryon sertularia		30	5,023	17	2,098	27	3,568						
Dinobryon sp.													
Glenodinium sp.		17	11,958										
Hemidinium sp.													
	Subtotal	**47**	**16,981**	**17**	**2,098**	**27**	**3,568**	**30**	**3**	**6%**	**7,549**	**2,182**	**8%**
Euglenoidea													
Euglena sp.													
Trachelomonas hispida													
Trachelomonas volvocina													
	Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Unidentified													
Unidentified flagellate		34	683	31	612	31	618	**32**	**1**	**7%**	**638**	**23**	**1%**
	Total:	**517**	**105,235**	**485**	**104,062**	**432**	**85,300**	**478**	**9**	**100%**	**98,199**	**1,492**	**100%**

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake					**Ref Lk B**							
Date					**16-Aug-09**							
Replicate	**1**		**2**		**3**							
	Abundance	**Biovolume**	**Abundance**	**Biovolume**	**Abundance**	**Biovolume**	**Abundance (cells/mL)**			**Biovolume (mm3/mL)**		
Taxa	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Cyanophyta												
Anabaena sp.												
Aphanizomenon flos-aquae												
Aphanothece sp.	3	752										
Oscillatoria sp.												
Oscillatoria limnetica												
Subtotal	**3**	**752**	**0**	**0**	**0**	**0**	**1**	**0**	**0%**	**251**	**0**	**1%**
Chlorophyta												
Ankistrodesmus falcatus	45	1,353	44	1,326	21	536						
Chlamydomonas sp.	35	11,400	29	9,580	11	3,715						
Cosmarium sp.												
Crucigenia quadrata												
Desmidium sp.												
Dictyosphaerium ehrenbergianum												
Gloeocystis ampla												
Golenkinia radiata					1	250						
Oocystis pusilla												
Scenedesmus quadricauda												
Selenastrum minutum												
Sphaerocystis schroeteri												
Tetraedron minimum												
Tetraedron regulare												
Subtotal	**80**	**12,753**	**74**	**10,907**	**34**	**4,501**	**63**	**6**	**29%**	**9,387**	**1,733**	**23%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion sp.												
Mallomonas sp.	3	952	2	933	4	1,629						
Subtotal	**3**	**952**	**2**	**933**	**4**	**1,629**	**3**	**1**	**1%**	**1,172**	**229**	**3%**
Chrysophyta - Diatoms												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis	3	331	5	648	4	566						
Achnanthes minutissima	5	251	10	491	4	214						
Achnanthes peragalli												
Achnanthes pinnata												
Amphipleura pellucida												
Amphora ovalis					1	826						
Amphora perpusilla												
Anomoeoneis vitrea												
Asterionella formosa												
Caloneis ventricosa	5	1,228			1	350						
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula												
Cyclotella atomus												
Cyclotella comta	3	5,688	5	11,152	1	3,244						
Cyclotella meneghiniana												
Cyclotella ocellata	40	5,011	44	5,527	46	5,716						
Cyclotella stelligera	8	413	2	135	4	236						
Cymatopleura solea												
Cymbella affinis												
Cymbella microcephala	3	133										
Cymbella minuta			2	909								
Denticula elegans												
Diatoma tenue												
Diatoma tenue elongatum												
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica												
Eunotia pectinalis												
Eunotia sp.												
Fragilaria construens												
Fragilaria construens venter			2	354								
Fragilaria crotonensis												
Fragilaria pinnata												
Fragilaria vaucheriae												
Gomphonema angustatum												
Gomphonema gracile												
Gomphonema sp.												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira ambigua												
Melosira italica												

Appendix 3.6-2. Summer Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake					**Ref Lk B**							
Date					**16-Aug-09**							
Replicate	**1**		**2**		**3**							
	Abundance	**Biovolume**	**Abundance**	**Biovolume**	**Abundance**	**Biovolume**	**Abundance (cells/mL)**			**Biovolume (mm3/mL)**		
Taxa	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**cells/mL**	**mm3/mL**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Navicula capitata												
Navicula cryptocephala												
Navicula cryptocephala veneta												
Navicula decussis												
Navicula graciloides												
Navicula gregaria												
Navicula minima			2	108	1	63						
Navicula minuscula												
Navicula pseudoscutiformis					1	250						
Navicula pupula	3	677	2	663								
Navicula radiosa												
Navicula reinhartii												
Navicula rhynchocephala	3	739			1	422						
Navicula sp.					1	214						
Navicula tripunctata												
Navicula viridula												
Neidium affine					1	12,261						
Nitzschia acicularis												
Nitzschia amphibia												
Nitzschia capitellata												
Nitzschia communis	3	113										
Nitzschia constricta												
Nitzschia dissipata												
Nitzschia frustulum					3	343						
Nitzschia linearis												
Nitzschia palea												
Nitzschia paleacea												
Nitzschia tryblionella												
Pinnularia sp.			2	983								
Rhoicosphenia curvata												
Stauroneis sp.	3	852			1	486						
Stephanodiscus astraea minutula												
Stephanodiscus binderanus												
Stephanodiscus hantzschii												
Surirella linearis												
Surirella ovata												
Synedra cyclopum	3	2,117										
Synedra delicatissima												
Synedra parasitica												
Synedra radians												
Synedra rumpens			2	344								
Synedra tenera												
Synedra ulna												
Tabellaria fenestrata												
Tabellaria flocculosa	3	1,478										
Subtotal	**80**	**19,030**	**81**	**21,314**	**74**	**25,191**	**79**	**2**	**36%**	**21,845**	**468**	**54%**
Cryptophyta												
Cryptomonas erosa	3	1,303	5	2,555								
Rhodomonas minuta	38	752	27	540	17	343						
Subtotal	**40**	**2,055**	**32**	**3,095**	**17**	**343**	**30**	**7**	**14%**	**1,831**	**398**	**5%**
Dinoflagellata												
Dinobryon bavaricum												
Dinobryon sertularia	30	3,969	37	4,422	30	3,961						
Dinobryon sp.												
Glenodinium sp.	3	1,754	2	1,719								
Hemidinium sp.												
Subtotal	**33**	**5,723**	**39**	**6,141**	**30**	**3,961**	**34**	**7**	**16%**	**5,275**	**589**	**13%**
Euglenoidea												
Euglena sp.			2	1,425								
Trachelomonas hispida												
Trachelomonas volvocina												
Subtotal	**0**	**0**	**2**	**1,425**	**0**	**0**	**1**	**0**	**0%**	**475**	**0**	**1%**
Unidentified												
Unidentified flagellate	8	150	2	49	7	143	**6**	**2**	**3%**	**114**	**33**	**0%**
Total:	**246**	**41,414**	**233**	**43,864**	**167**	**35,768**	**215**	**2**	**100%**	**40,349**	**358**	**100%**

Appendix 3.6-3

Winter Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Appendix 3.6-3. Winter Phytoplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Taxa		Patch Lake South	Patch Lake North	Ogama Lake	Doris Lake South	Doris Lake North	Little Roberts Lake
	Sample ID:	Patch Lake South	Patch Lake North	Ogama Lake	Doris Lake South	Doris Lake North	Little Roberts Lake
	Date:	23-Apr-09	23-Apr-09	26-Apr-09	22-Apr-09	23-Apr-09	5-May-09
	Replicate:	1	1	1	1	1	1
		Density (#/mL)	Density (#/mL)	Density (#/mL)	Density (#/mL)	Density (#/mL)	Density (#/mL)
Cyanobacteria							
Aphanizomenon flos-aquae		3.0		312.0	2847.0	2296.0	432.0
Oscillatoria limnetica				84.0			
	Subtotal	***3.0***	***0.0***	***396.0***	***2847.0***	***2296.0***	***432.0***
Chrysophyta							
Chrysochromulina sp.		13.0	7.0			21.0	
Chrysococcus rufescens		10.0	11.0	312.0		21.0	360.0
Dinobryon sertularia						103.0	696.0
Kephyrion sp.							96.0
Mallomonas sp.				12.0		21.0	
	Subtotal	***23.0***	***18.0***	***324.0***	***0.0***	***166.0***	***1152.0***
Chrysophyta - Diatoms							
Achnanthes lanceolata			4.0				
Achnanthes minutissima			4.0				
Cocconeis placentula			4.0				
Cyclotella stelligera		10.0	11.0				
Fragilaria pinnata				12.0			
Melosira ambigua				12.0			
Melosira granulata					34.0		
Navicula capitata				12.0			
Navicula cryptocephala veneta				12.0			
Navicula gregaria			4.0				
Navicula minima							24.0
Navicula sp.				12.0			
Pinnularia sp.			4.0				
Stephanodiscus astraea minutula		10.0					
Stephanodiscus hantzschii		13.0		12.0			
	Subtotal	***33.0***	***31.0***	***72.0***	***34.0***	***0.0***	***24.0***
Cryptophyta							
Cryptomonas erosa		26.0	32.0	72.0	57.0	123.0	24.0
Rhodomonas minuta		177.0	197.0	276.0	11.0	267.0	72.0
	Subtotal	***203.0***	***229.0***	***348.0***	***68.0***	***390.0***	***96.0***
Dinoflagellata							
Glenodinium sp.		16.0	7.0	48.0			312.0
Gymnodinium sp.				12.0			576.0
Hemidinium sp.		3.0	4.0				
	Subtotal	***19.0***	***11.0***	***60.0***	***0.0***	***0.0***	***888.0***
Euglenoid							
Euglena sp.				12.0		21.0	48.0
Trachelomonas volvocina				12.0			48.0
	Subtotal	***0.0***	***0.0***	***24.0***	***0.0***	***21.0***	***96.0***
Chlorophyta							
Ankistrodesmus falcatus		13.0	4.0	24.0	11.0		
Chlamydomonas sp.		55.0	67.0	84.0	11.0	144.0	168.0
	Subtotal	***68.0***	***71.0***	***108.0***	***22.0***	***144.0***	***168.0***
Unidentified Flagellate							
Unidentified flagellate1		3.0	7.0	12.0			
Total		**350.5**	**363.5**	**1338.0**	**2971.0**	**3017.0**	**2856.0**

Appendix 3.6-4

Winter Epontic Algae Taxonomic Results, Hope Bay Belt Project, 2009

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Appendix 3.6-4. Winter Epontic Algae Taxonomic Results, Hope Bay Belt Project, 2009

Lake	Patch S	Patch N	Ogama	Doris S	Doris N	Little Roberts
Date	23-Apr-09	22-Apr-09	26-Apr-09	22-Apr-09	23-Apr-09	5-May-09
Taxa	Percent	Percent	Percent	Percent	Percent	Percent
Cyanophyta						
Aphanizomenon flos-aquae			15.9	85.5	66.1	4.7
Oscillatoria limnetica			5.6		1.3	
Subtotal	**0.0**	**0.0**	**21.5**	**85.5**	**67.4**	**4.7**
Chlorophyta						
Ankistrodesmus falcatus		1.0	0.9		0.4	
Chlamydomonas sp.	11.0	21.2	2.8	0.9	3.5	
Scenedesmus quadricauda						0.8
Scenedesmus denticulatus		1.0				
Subtotal	**11.0**	**23.1**	**3.7**	**0.9**	**4.0**	**0.8**
Chrysophyta						
Chrysochromulina sp.	12.7	1.0	0.9		1.3	
Chrysococcus rufescens	1.7	5.7	24.3		1.8	6.3
Cryptomonas erosa	1.7	7.7	12.1	1.7	2.6	1.6
Dinobryon sertularia			2.8	0.4	2.2	39.8
Kephyrion littorale		1.0				0.8
Kephyrion sp.	0.8		0.9			
Subtotal	**16.9**	**15.3**	**41.1**	**2.1**	**7.9**	**48.4**
Chrysophyta - Diatoms						
Diploneis elliptica		1.0				
Melosira italica					0.4	
Navicula capitata			0.9			
Navicula cryptocephala veneta			0.9			
Navicula pseudoscutiformis			0.9			
Stephanodiscus astraea minutula		1.0	0.9		0.4	
Stephanodiscus hantzschii	4.2		2.8			
Synedra cyclopum		1.0				
Synedra rumpens		1.0				
Subtotal	**4.2**	**3.9**	**6.5**	**0.0**	**0.9**	**0.0**
Cryptophyta						
Rhodomonas minuta	**66.9**	**52.9**	**13.1**	**11.1**	**18.9**	
Dinoflagellata						
Glenodinium sp.		2.9	1.9	0.4	0.9	35.2
Hemidinium sp.		1.9				
Peridinium cinctum			0.9			10.2
Subtotal	**0.0**	**4.8**	**2.8**	**0.4**	**0.9**	**45.3**
Euglenoidea						
Euglena sp.			6.5			
Trachelomonas volvocina			3.7			0.8
Subtotal	**0.0**	**0.0**	**10.3**	**0.0**	**0.0**	**0.8**
Unidentified						
Unidentified flagellate	**0.8**		**0.9**			
Total	**100**	**100**	**100**	**100**	**100**	**100**

Appendix 3.7-1

Periphyton Biomass Results, Hope Bay Belt Project, 2009

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Appendix 3.7-1. Phytoplankton Biomass Results, Hope Bay Belt Project, 2009

Stream	Date Sampler Installed	Date Sampler Retrieved	Number of Days Immersed	Area sampled (m^2)	ALS Sample ID	Chlorophyll *a* ($\mu g/m^2$)	Mean	SE
Patch OF	23-July-09	18-Aug-09	26	0.0025	L810629-7	334.8		
Patch OF	23-July-09	18-Aug-09	26	0.0025	L810629-8	150	251.5	54.11
Patch OF	23-July-09	18-Aug-09	26	0.0025	L810629-9	269.6		
P.O. OF	23-July-09	18-Aug-09	26	0.0025	L810629-13	375.6		
P.O. OF	23-July-09	18-Aug-09	26	0.0025	L810629-14	552	529.2	82.89
P.O. OF	23-July-09	18-Aug-09	26	0.0025	L810629-15	660		
Ogama OF	23-July-09	18-Aug-09	26	0.0025	L810629-10	3040		
Ogama OF	23-July-09	18-Aug-09	26	0.0025	L810629-11	2792	2501.3	420.80
Ogama OF	23-July-09	18-Aug-09	26	0.0025	L810629-12	1672		
Doris OF	21-July-09	18-Aug-09	28	0.0025	L810629-4	3240		
Doris OF	21-July-09	18-Aug-09	28	0.0025	L810629-5	704	1816.0	748.52
Doris OF	21-July-09	18-Aug-09	28	0.0025	L810629-6	1504		
Little Roberts OF	21-July-09	18-Aug-09	28	0.0025	L810629-24	68.4		
Little Roberts OF	21-July-09	18-Aug-09	28	0.0025	L810629-25	55.2	66.1	5.77
Little Roberts OF	21-July-09	18-Aug-09	28	0.0025	L810629-26	74.8		
Windy OF	22-July-09	18-Aug-09	27	0.0025	L810629-33	70.8		
Windy OF	22-July-09	18-Aug-09	27	0.0025	L810629-34	744	297.1	223.47
Windy OF	22-July-09	18-Aug-09	27	0.0025	L810629-35	76.4		
Glenn OF D/S	21-July-09	18-Aug-09	28	0.0025	L810629-36	245.2		
Glenn OF D/S	21-July-09	18-Aug-09	28	0.0025	L810629-37	696	340.7	183.90
Glenn OF D/S	21-July-09	18-Aug-09	28	0.0025	L810629-38	80.8		
Koignuk U/S	26-July-09	21-Aug-09	26	0.0025	L810629-19	254.4		
Koignuk U/S	26-July-09	21-Aug-09	26	0.0025	L810629-20	584	419.2	164.80
Koignuk M/S	24-July-09	22-Aug-09	29	0.0025	L810629-21	428		
Koignuk M/S	24-July-09	22-Aug-09	29	0.0025	L810629-22	4120	1654.7	1232.67
Koignuk M/S	24-July-09	22-Aug-09	29	0.0025	L810629-23	416		
Koignuk D/S	24-July-09	21-Aug-09	28	0.0025	L810629-16	1960		
Koignuk D/S	24-July-09	21-Aug-09	28	0.0025	L810629-17	768	959.1	531.39
Koignuk D/S	24-July-09	21-Aug-09	28	0.0025	L810629-18	149.2		
Reference A OF	26-July-09	23-Aug-09	28	0.0025	L810629-27	856		
Reference A OF	26-July-09	23-Aug-09	28	0.0025	L810629-28	185.6	591.2	205.93
Reference A OF	26-July-09	23-Aug-09	28	0.0025	L810629-29	732		
Reference B OF	26-July-09	23-Aug-09	28	0.0025	L810629-30	261.2		
Reference B OF	26-July-09	23-Aug-09	28	0.0025	L810629-31	142.4	150.4	61.79
Reference B OF	26-July-09	23-Aug-09	28	0.0025	L810629-32	47.6		
Angimajuq R. Ref.	26-July-09	23-Aug-09	28	0.0025	L810629-1	732		
Angimajuq R. Ref.	26-July-09	23-Aug-09	28	0.0025	L810629-2	3032	1854.7	664.52
Angimajuq R. Ref.	26-July-09	23-Aug-09	28	0.0025	L810629-3	1800		

SE = standard error of the mean

Appendix 3.7-2

Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

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Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Patch OF						
Date						17-Aug-09						
Replicate	1		2		3							
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm^2)			Biovolume (mm^3/cm^2)		
Taxa	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Aphanizomenon flos-aquae												
Nostoc sp.												
Oscillatoria sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion obliquum												
Kephyrion sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta - Diatom												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes flexella												
Achnanthes hauckiana												
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis	1,811	239,084	1,139	150,333	1,903	251,190						
Achnanthes minutissima	1,811	90,562	1,139	56,944	2,854	142,722						
Achnanthes peragalli					951	133,207						
Achnanthes sp.												
Amphipleura pellucida					951	1,217,890						
Amphora ovalis												
Amphora perpusilla	1,811	300,667										
Anomoeoneis vitrea												
Asterionella formosa												
Caloneis sp.												
Caloneis ventricosa					951	233,112						
Caloneis ventricosa minuta												
Cocconeis disculus	906	67,922										
Cocconeis placentula	2,717	1,249,759	2,278	1,047,778	1,903	875,359						
Cyclotella comta												
Cyclotella ocellata	906	113,203	1,139	142,361	951	118,935						
Cyclotella stelligera												
Cymatopleura solea												
Cymbella affinis					951	1,712,658						
Cymbella cesatii												
Cymbella microcephala												
Cymbella minuta	906	670,161	3,417	1,264,167	3,806	1,408,186						
Cymbella naviculiformis												
Diatoma tenue	37,131	18,305,347	80,861	32,829,611	34,253	13,906,785						
Diatoma tenue elongatum	8,151	7,628,964	9,111	6,560,000	6,660	5,274,987						
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica												
Eunotia incisa												
Eunotia pectinalis	906	652,048										
Eunotia sp.												
Fragilaria capucina mesolepta												
Fragilaria construens												
Fragilaria construens venter					3,806	274,025						
Fragilaria pinnata	906	54,337										
Fragilaria vaucheriae	906	260,819										
Frustulia rhomboides												
Gomphonema acuminatum												
Gomphonema angustatum	1,811	326,024	7,972	1,435,000	3,806	685,063						
Gomphonema gracile												
Gomphonema subclavatum					1,903	2,283,544						
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira italica												
Navicula capitata	906	434,699										
Navicula contenta biceps												
Navicula cryptocephala												
Navicula cryptocephala veneta			2,278	216,389	2,854	271,171						
Navicula decussis												
Navicula graciloides					951	413,892						

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						**Patch OF**						
Date						**17-Aug-09**						
Replicate	**1**		**2**		**3**							
	Density	**Biovolume**	**Density**	**Biovolume**	**Density**	**Biovolume**	**Density (#/cm^2)**			**Biovolume (mm^3/cm^2)**		
Taxa	**(#/cm^2)**	**(mm^3/cm^2)**	**(#/cm^2)**	**(mm^3/cm^2)**	**(#/cm^2)**	**(mm^3/cm^2)**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Navicula gregaria					1,903	333,017						
Navicula minima	906	39,847										
Navicula minuscula												
Navicula mutica												
Navicula pseudoscutiformis	906	158,484										
Navicula pupula					951	256,899						
Navicula pygmaea												
Navicula rhynchocephala												
Navicula sp.	906	135,843			951	142,722						
Navicula tripunctata												
Navicula viridula												
Neidium affine												
Nitzschia acicularis	906	253,574	2,278	637,778	2,854	799,241						
Nitzschia amphibia												
Nitzschia capitellata					1,903	685,063						
Nitzschia clausii												
Nitzschia communis					951	42,816						
Nitzschia constricta					951	551,857						
Nitzschia dissipata	906	243,612										
Nitzschia frustulum	906	108,675	1,139	136,667	2,854	445,291						
Nitzschia linearis	906	1,380,169										
Nitzschia microcephala												
Nitzschia palea			2,278	410,000	2,854	513,797						
Nitzschia paleacea												
Nitzschia recta												
Nitzschia sigmoidea												
Nitzschia sp.												
Nitzschia tryblionella												
Pinnularia sp.					951	380,591						
Rhopalodia gibba												
Stauroneis sp.												
Stephanodiscus astraea minutula												
Surirella linearis												
Surirella ovata					951	275,928						
Synedra radians	4,528	1,630,120	4,556	1,640,000	2,854	1,027,595						
Synedra rumpens	5,434	912,867	5,694	956,667	9,515	1,332,068						
Synedra tenera	906	271,687										
Synedra ulna												
Tabellaria fenestrata												
Tabellaria flocculosa												
Unidentified flagellate			1,139	22,778								
Subtotal	**78,789**	**35,528,476**	**126,417**	**47,506,472**	**99,905**	**35,989,610**	**101,704**	**1,355**	**99%**	**39,674,853**	**585,741**	**99%**
Cryptophyta												
Cryptomonas erosa												
Rhodomonas minuta												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chlorophyta												
Ankistrodesmus falcatus												
Chlamydomonas sp.												
Closterium sp.												
Cosmarium sp.					951	199,810						
Desmidium sp.												
Scenedesmus denticulatus												
Scenedesmus quadricauda												
Staurastrum sp.												
Tetraedron minimum												
Ulothrix sp.			1,139	546,667								
Subtotal	**0**	**0**	**1,139**	**546,667**	**951**	**199,810**	**697**	**94**	**1%**	**248,826**	**173,428**	**1%**
Total:	**78,789**	**35,528,476**	**127,556**	**48,053,139**	**100,857**	**36,189,420**	**102,400**	**1,318**	**100%**	**39,923,678**	**569,565**	**100%**

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						P.O. OF						
Date						17-Aug-09						
Replicate		1		2		3						
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm^2)			Biovolume (mm^3/cm^2)		
Taxa	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Aphanizomenon flos-aquae												
Nostoc sp.												
Oscillatoria sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion obliquum												
Kephyrion sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta - Diatom												
Achnanthes clevei												
Achnanthes exigua	2,475	277,158										
Achnanthes flexella												
Achnanthes hauckiana					1,232	59,148						
Achnanthes lanceolata	619	111,358										
Achnanthes lewisiana			433	54,077								
Achnanthes linearis	1,237	163,325	1,298	171,315	6,161	813,279						
Achnanthes minutissima	1,856	157,757	2,596	129,784	14,787	739,344						
Achnanthes peragalli												
Achnanthes sp.			433	51,914								
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla					1,232	204,552						
Anomoeoneis vitrea												
Asterionella formosa												
Caloneis sp.												
Caloneis ventricosa					2,464	603,798						
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula					1,232	566,831						
Cyclotella comta												
Cyclotella ocellata	619	77,332	433	54,077								
Cyclotella stelligera												
Cymatopleura solea					1,232	19,962,295						
Cymbella affinis												
Cymbella cesatii												
Cymbella microcephala												
Cymbella minuta	3,712	1,648,099	1,730	640,269	3,697	1,367,787						
Cymbella naviculiformis												
Diatoma tenue	12,373	4,305,844	10,383	3,010,993	13,555	4,323,932						
Diatoma tenue elongatum	619	890,864	865	622,964								
Diatoma vulgare			433	847,923	1,232	4,830,383						
Diatomella balfouriana	619	185,597										
Diploneis elliptica	619	160,850										
Eunotia incisa												
Eunotia pectinalis												
Eunotia sp.												
Fragilaria capucina mesolepta												
Fragilaria construens												
Fragilaria construens venter	619	29,695			1,232	118,295						
Fragilaria pinnata					2,464	147,869						
Fragilaria vaucheriae	2,475	1,069,037	1,730	598,045	11,090	4,790,951						
Frustulia rhomboides												
Gomphonema acuminatum												
Gomphonema angustatum	3,093	556,790	1,298	233,612	6,161	1,109,016						
Gomphonema gracile												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira italica												
Navicula capitata												
Navicula contenta biceps												
Navicula cryptocephala	619	114,451	865	160,067								
Navicula cryptocephala veneta	2,475	235,089	1,730	164,393	2,464	234,126						
Navicula decussis												
Navicula graciloides			3,028	1,317,309								

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						P.O. OF						
Date						17-Aug-09						
Replicate		1		2		3						
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm^2)			Biovolume (mm^3/cm^2)		
Taxa	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Navicula gregaria	619	108,265	433	75,707	1,232	215,642						
Navicula minima												
Navicula minuscula			433	19,468								
Navicula mutica												
Navicula pseudoscutiformis					3,697	646,926						
Navicula pupula												
Navicula pygmaea	619	213,436										
Navicula rhynchocephala					1,232	363,511						
Navicula sp.	619	92,798	865	129,784	1,232	184,836						
Navicula tripunctata												
Navicula viridula												
Neidium affine												
Nitzschia acicularis	619	173,224	433	121,132								
Nitzschia amphibia												
Nitzschia capitellata												
Nitzschia clausii			433	138,436								
Nitzschia communis	619	27,840	433	19,468								
Nitzschia constricta	619	358,820			1,232	714,699						
Nitzschia dissipata			865	232,746	1,232	331,473						
Nitzschia frustulum	4,331	519,671	2,596	404,927	9,858	1,182,951						
Nitzschia linearis	619	942,831	865	1,318,607	1,232	1,877,934						
Nitzschia microcephala												
Nitzschia palea	619	111,358										
Nitzschia paleacea	619	60,628	433	42,396	3,697	724,557						
Nitzschia recta												
Nitzschia sigmoidea												
Nitzschia sp.					1,232	147,869						
Nitzschia tryblionella			433	229,285								
Pinnularia sp.			865	346,091	1,232	492,896						
Rhopalodia gibba												
Stauroneis sp.	619	210,343										
Stephanodiscus astraea minutula												
Surirella linearis												
Surirella ovata												
Synedra radians	1,237	445,432	865	311,482	1,232	443,607						
Synedra rumpens	3,712	519,671	3,894	545,094	4,929	690,055						
Synedra tenera	3,093	927,984	433	129,784	3,697	1,109,016						
Synedra ulna	1,856	4,801,387	1,730	5,165,410	1,232	9,808,634						
Tabellaria fenestrata	619	1,484,774			1,232	2,957,377						
Tabellaria flocculosa	619	365,007	865	510,484	1,232	727,022						
Unidentified flagellate												
Subtotal	**55,679**	**21,346,715**	**44,127**	**17,797,044**	**110,902**	**62,490,609**	**70,236**	**295**	**100%**	**33,878,123**	**252,325**	**100%**
Cryptophyta												
Cryptomonas erosa												
Rhodomonas minuta												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chlorophyta												
Ankistrodesmus falcatus												
Chlamydomonas sp.												
Closterium sp.												
Cosmarium sp.												
Desmidium sp.												
Scenedesmus denticulatus												
Scenedesmus quadricauda												
Staurastrum sp.												
Tetraedron minimum												
Ulothrix sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Total:	**55,679**	**21,346,715**	**44,127**	**17,797,044**	**110,902**	**62,490,609**	**70,236**	**295**	**100%**	**33,878,123**	**252,325**	**100%**

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Ogama OF						
Date						17-Aug-09						
Replicate	1		2		3							
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm^2)			Biovolume (mm^3/cm^2)		
Taxa	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Aphanizomenon flos-aquae												
Nostoc sp.												
Oscillatoria sp.					6,681	12,427,556						
Subtotal	**0**	**0**	**0**	**0**	**6,681**	**12,427,556**	**2,227**	**0**	**1%**	**4,142,519**	**0**	**4%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion obliquum												
Kephyrion sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta - Diatom												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes flexella												
Achnanthes hauckiana												
Achnanthes lanceolata	11,564	2,706,000	3,496	629,302								
Achnanthes lewisiana												
Achnanthes linearis			3,496	461,488	13,363	1,763,911						
Achnanthes minutissima	19,274	963,675	97,891	5,384,031	53,452	2,939,852						
Achnanthes peragalli												
Achnanthes sp.												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla												
Anomoeoneis vitrea												
Asterionella formosa					3,341	734,963						
Caloneis sp.												
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula												
Cyclotella comta												
Cyclotella ocellata												
Cyclotella stelligera												
Cymatopleura solea												
Cymbella affinis												
Cymbella cesatii												
Cymbella microcephala												
Cymbella minuta	3,855	1,426,239	3,496	1,293,566								
Cymbella naviculiformis												
Diatoma tenue	227,427	65,953,932	115,372	33,457,907	193,763	61,810,385						
Diatoma tenue elongatum	23,128	16,652,308	3,496	2,517,209	20,044	14,432,000						
Diatoma vulgare	3,855	7,555,214										
Diatomella balfouriana												
Diploneis elliptica			3,496	908,992	3,341	868,593						
Eunotia incisa												
Eunotia pectinalis					3,341	2,405,333						
Eunotia sp.												
Fragilaria capucina mesolepta												
Fragilaria construens			3,496	783,132								
Fragilaria construens venter					3,341	641,422						
Fragilaria pinnata	3,855	231,282	10,488	818,093	3,341	200,444						
Fragilaria vaucheriae	19,274	7,771,077	17,481	5,034,419	6,681	1,924,267						
Frustulia rhomboides												
Gomphonema acuminatum												
Gomphonema angustatum	92,513	19,982,769	94,395	22,088,512	36,748	6,614,667						
Gomphonema gracile												
Gomphonema subclavatum	3,855	2,312,821										
Gomphonema tenellum	3,855	809,487										
Gyrosigma spencerii												
Hantzschia amphioxys			3,496	716,705								
Melosira italica												
Navicula capitata												
Navicula contenta biceps												
Navicula cryptocephala			3,496	646,783	6,681	1,236,074						
Navicula cryptocephala veneta												
Navicula decussis												
Navicula graciloides												

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Ogama OF						
Date						17-Aug-09						
Replicate		1		2		3						
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm^2)			Biovolume (mm^3/cm^2)		
Taxa	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Navicula gregaria												
Navicula minima			3,496	153,829								
Navicula minuscula												
Navicula mutica												
Navicula pseudoscutiformis	3,855	674,573										
Navicula pupula												
Navicula pygmaea												
Navicula rhynchocephala												
Navicula sp.												
Navicula tripunctata												
Navicula viridula												
Neidium affine												
Nitzschia acicularis			3,496	978,915								
Nitzschia amphibia												
Nitzschia capitellata			3,496	1,258,605								
Nitzschia clausii												
Nitzschia communis												
Nitzschia constricta												
Nitzschia dissipata	3,855	1,036,915										
Nitzschia frustulum			6,992	839,070	3,341	801,778						
Nitzschia linearis												
Nitzschia microcephala												
Nitzschia palea	3,855	693,846			3,341	601,333						
Nitzschia paleacea			3,496	342,620								
Nitzschia recta												
Nitzschia sigmoidea												
Nitzschia sp.												
Nitzschia tryblionella												
Pinnularia sp.												
Rhopalodia gibba												
Stauroneis sp.												
Stephanodiscus astraea minutula												
Surirella linearis												
Surirella ovata												
Synedra radians	15,419	5,550,769	3,496	1,258,605	13,363	4,810,667						
Synedra rumpens	30,838	4,317,265	27,969	3,915,659	10,022	1,403,111						
Synedra tenera	3,855	1,156,410										
Synedra ulna			3,496	6,957,287								
Tabellaria fenestrata												
Tabellaria flocculosa												
Unidentified flagellate												
Subtotal	**474,128**	**139,794,581**	**419,535**	**90,444,729**	**377,504**	**103,188,800**	**423,722**	**6,174**	**99%**	**111,142,703**	**1,775,246**	**96%**
Cryptophyta												
Cryptomonas erosa												
Rhodomonas minuta												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chlorophyta												
Ankistrodesmus falcatus												
Chlamydomonas sp.	3,855	1,252,778										
Closterium sp.												
Cosmarium sp.												
Desmidium sp.												
Scenedesmus denticulatus												
Scenedesmus quadricauda												
Staurastrum sp.												
Tetraedron minimum												
Ulothrix sp.												
Subtotal	**3,855**	**1,252,778**	**0**	**0**	**0**	**0**	**1,285**	**0**	**0%**	**417,593**	**0**	**0%**
Total:	**477,983**	**141,047,359**	**419,535**	**90,444,729**	**384,185**	**115,616,356**	**427,234**	**5,969**	**100%**	**115,702,814**	**1,717,261**	**100%**

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Doris OF						
Date						17-Aug-09						
Replicate	1		2		3							
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm^2)			Biovolume (mm^3/cm^2)		
Taxa	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Aphanizomenon flos-aquae			1,023	1,610,714	1,845	1,975,546						
Nostoc sp.												
Oscillatoria sp.												
Subtotal	**0**	**0**	**1,023**	**1,610,714**	**1,845**	**1,975,546**	**956**	**411**	**1%**	**1,195,420**	**182,416**	**5%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion obliquum												
Kephyrion sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta - Diatom												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes flexella												
Achnanthes hauckiana	895	42,952			615	29,513						
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis	8,054	1,063,071	2,045	269,986	3,074	405,808						
Achnanthes minutissima	7,159	357,937	2,557	127,834	6,149	307,430						
Achnanthes peragalli					1,230	172,161						
Achnanthes sp.												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla	1,790	297,087										
Anomoeoneis vitrea												
Asterionella formosa	895	196,865	2,045	449,977	2,459	541,077						
Caloneis sp.												
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus					615	46,115						
Cocconeis placentula	895	411,627	1,023	470,431	615	282,836						
Cyclotella comta												
Cyclotella ocellata												
Cyclotella stelligera												
Cymatopleura solea												
Cymbella affinis												
Cymbella cesatii												
Cymbella microcephala												
Cymbella minuta	6,264	2,317,639			3,074	1,137,491						
Cymbella naviculiformis												
Diatoma tenue	9,843	3,710,907	16,363	4,745,215	14,142	4,511,230						
Diatoma tenue elongatum	3,579	3,092,571	3,068	2,208,980	1,230	885,399						
Diatoma vulgare					3,689	672,903						
Diatomella balfouriana			511	153,401								
Diploneis elliptica												
Eunotia incisa												
Eunotia pectinalis	895	644,286										
Eunotia sp.												
Fragilaria capucina mesolepta												
Fragilaria construens												
Fragilaria construens venter	6,264	932,067	2,557	196,354								
Fragilaria pinnata	1,790	161,071	1,023	61,361	2,459	177,080						
Fragilaria vaucheriae			1,023	294,531	2,459	849,983						
Frustulia rhomboides												
Gomphonema acuminatum												
Gomphonema angustatum	28,635	5,154,286	7,670	1,794,796	12,297	2,656,196						
Gomphonema gracile												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira italica	5,369	8,597,993	1,534	1,878,553	1,845	2,258,874						
Navicula capitata												
Navicula contenta biceps												
Navicula cryptocephala												
Navicula cryptocephala veneta	1,790	170,020			615	58,412						
Navicula decussis												
Navicula graciloides												

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Doris OF						
Date						17-Aug-09						
Replicate		1		2		3						
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm^2)			Biovolume (mm^3/cm^2)		
Taxa	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Navicula gregaria												
Navicula minima												
Navicula minuscula												
Navicula mutica												
Navicula pseudoscutiformis					615	107,601						
Navicula pupula												
Navicula pygmaea												
Navicula rhynchocephala	895	263,978			615	181,384						
Navicula sp.			511	76,701								
Navicula tripunctata												
Navicula viridula	895	402,679	511	230,102	615	276,687						
Neidium affine												
Nitzschia acicularis					615	172,161						
Nitzschia amphibia			511	49,088								
Nitzschia capitellata	895	644,286	511	184,082	1,230	442,699						
Nitzschia clausii												
Nitzschia communis	1,790	80,536			615	27,669						
Nitzschia constricta												
Nitzschia dissipata												
Nitzschia frustulum	1,790	322,143	3,068	625,878	3,689	531,239						
Nitzschia linearis												
Nitzschia microcephala												
Nitzschia palea												
Nitzschia paleacea	1,790	175,389										
Nitzschia recta												
Nitzschia sigmoidea												
Nitzschia sp.												
Nitzschia tryblionella												
Pinnularia sp.	895	357,937	511	204,535	615	245,944						
Rhopalodia gibba												
Stauroneis sp.												
Stephanodiscus astraea minutula												
Surirella linearis												
Surirella ovata												
Synedra radians			1,023	368,163								
Synedra rumpens	2,685	375,833	1,023	143,175	1,230	172,161						
Synedra tenera			2,045	736,327								
Synedra ulna												
Tabellaria fenestrata												
Tabellaria flocculosa												
Unidentified flagellate												
Subtotal	**95,748**	**29,773,159**	**51,134**	**15,269,469**	**66,405**	**17,150,051**	**71,096**	**541**	**98%**	**20,730,893**	**178,987**	**94%**
Cryptophyta												
Cryptomonas erosa												
Rhodomonas minuta			511	10,227								
Subtotal	**0**	**0**	**511**	**10,227**	**0**	**0**	**170**	**0**	**0%**	**3,409**	**0**	**0%**
Chlorophyta												
Ankistrodesmus falcatus												
Chlamydomonas sp.			511	166,185								
Closterium sp.												
Cosmarium sp.												
Desmidium sp.												
Scenedesmus denticulatus												
Scenedesmus quadricauda												
Staurastrum sp.												
Tetraedron minimum												
Ulothrix sp.												
Subtotal	**0**	**0**	**511**	**166,185**	**0**	**0**	**170**	**0**	**0%**	**55,395**	**0**	**0%**
Total:	**95,748**	**29,773,159**	**53,179**	**17,056,595**	**68,249**	**19,125,597**	**72,392**	**515**	**100%**	**21,985,117**	**170,786**	**100%**

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Little Rob. OF						
Date						17-Aug-09						
Replicate	1		2		3							
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm^2)			Biovolume (mm^3/cm^2)		
Taxa	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Aphanizomenon flos-aquae												
Nostoc sp.												
Oscillatoria sp.	2,435	3,471,665	1,296	2,008,764	1,702	1,371,721						
Subtotal	**2,435**	**3,471,665**	**1,296**	**2,008,764**	**1,702**	**1,371,721**	**1,811**	**333**	**3%**	**2,284,050**	**621,632**	**8%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion obliquum												
Kephyrion sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta - Diatom												
Achnanthes clevei												
Achnanthes exigua	609	68,167										
Achnanthes flexella												
Achnanthes hauckiana			648	31,103	567	27,230						
Achnanthes lanceolata			648	116,638								
Achnanthes lewisiana												
Achnanthes linearis	5,478	723,061	7,776	1,026,414	6,240	823,713						
Achnanthes minutissima	1,826	91,296	9,720	485,991	6,808	340,377						
Achnanthes peragalli	609	85,209	648	90,718								
Achnanthes sp.					567	68,075						
Amphipleura pellucida	609	779,055										
Amphora ovalis	609	351,792	1,296	749,075								
Amphora perpusilla			1,296	215,132	567	94,171						
Anomoeoneis vitrea												
Asterionella formosa	2,435	803,401	2,592	684,276	4,538	1,497,660						
Caloneis sp.												
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula												
Cyclotella comta												
Cyclotella ocellata	1,217	152,159	648	80,999	1,135	141,824						
Cyclotella stelligera												
Cymatopleura solea												
Cymbella affinis	1,217	2,191,093										
Cymbella cesatii												
Cymbella microcephala												
Cymbella minuta	5,478	2,026,761	3,240	1,198,779	1,135	419,799						
Cymbella naviculiformis												
Diatoma tenue	4,260	1,482,640	7,128	2,067,083	6,808	2,369,026						
Diatoma tenue elongatum	3,043	2,191,093	2,592	1,866,207	5,673	5,718,340						
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica	609	158,246			567	147,497						
Eunotia incisa												
Eunotia pectinalis			648	933,103								
Eunotia sp.												
Fragilaria capucina mesolepta			648	1,321,897								
Fragilaria construens												
Fragilaria construens venter	1,826	113,937			1,135	54,460						
Fragilaria pinnata	2,435	219,109	1,296	116,638	567	34,038						
Fragilaria vaucheriae			648	186,621	2,269	653,525						
Frustulia rhomboides												
Gomphonema acuminatum												
Gomphonema angustatum	1,826	328,664	1,944	454,888	2,836	510,566						
Gomphonema gracile												
Gomphonema subclavatum	609	365,182										
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira italica	1,826	2,924,014	648	2,441,621	2,836	4,275,140						
Navicula capitata			648	311,034								
Navicula contenta biceps	609	48,691										
Navicula cryptocephala			648	119,878								
Navicula cryptocephala veneta	1,217	115,641										
Navicula decussis												
Navicula graciloides	1,217	529,514										

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Little Rob. OF						
Date						17-Aug-09						
Replicate	1		2		3							
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm²)			Biovolume (mm³/cm²)		
Taxa	(#/cm²)	(mm³/cm²)	(#/cm²)	(mm³/cm²)	(#/cm²)	(mm³/cm²)	Mean	SE	Percent	Mean	SE	Percent
Navicula gregaria												
Navicula minima												
Navicula minuscula												
Navicula mutica												
Navicula pseudoscutiformis												
Navicula pupula												
Navicula pygmaea												
Navicula rhynchocephala			648	191,157								
Navicula sp.												
Navicula tripunctata												
Navicula viridula	609	273,887										
Neidium affine			648	5,559,741								
Nitzschia acicularis	609	170,418	648	181,437	1,702	476,528						
Nitzschia amphibia												
Nitzschia capitellata			648	233,276								
Nitzschia clausii												
Nitzschia communis												
Nitzschia constricta												
Nitzschia dissipata					567	152,603						
Nitzschia frustulum	7,912	1,424,211	3,240	388,793	2,269	326,762						
Nitzschia linearis			648	987,534								
Nitzschia microcephala												
Nitzschia palea	609	109,555			567	102,113						
Nitzschia paleacea			1,296	127,006								
Nitzschia recta												
Nitzschia sigmoidea												
Nitzschia sp.	609	73,036										
Nitzschia tryblionella												
Pinnularia sp.	609	243,455										
Rhopalodia gibba			648	16,588,506								
Stauroneis sp.			648	220,316								
Stephanodiscus astraea minutula												
Surirella linearis												
Surirella ovata												
Synedra radians					3,404	1,225,358						
Synedra rumpens	1,217	170,418	1,296	181,437	5,673	794,214						
Synedra tenera	609	182,591	648	194,397								
Synedra ulna	609	1,211,188										
Tabellaria fenestrata												
Tabellaria flocculosa	1,217	1,077,287	648	382,313								
Unidentified flagellate												
Subtotal	**54,169**	**20,684,771**	**57,023**	**39,734,007**	**58,431**	**20,253,020**	**56,541**	**229**	**97%**	**26,890,599**	**220,314**	**92%**
Cryptophyta												
Cryptomonas erosa												
Rhodomonas minuta												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chlorophyta												
Ankistrodesmus falcatus												
Chlamydomonas sp.												
Closterium sp.												
Cosmarium sp.												
Desmidium sp.												
Scenedesmus denticulatus												
Scenedesmus quadricauda												
Staurastrum sp.												
Tetraedron minimum												
Ulothrix sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Total:	**56,603**	**24,156,436**	**58,319**	**41,742,772**	**60,133**	**21,624,741**	**58,352**	**221**	**100%**	**29,174,650**	**215,045**	**100%**

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Windy OF						
Date						18-Aug-09						
Replicate	1		2		3							
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm^2)			Biovolume (mm^3/cm^2)		
Taxa	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Aphanizomenon flos-aquae												
Nostoc sp.												
Oscillatoria sp.					126	117,241						
Subtotal	**0**	**0**	**0**	**0**	**126**	**117,241**	**42**	**0**	**0%**	**39,080**	**0**	**0%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion obliquum												
Kephyrion sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta - Diatom												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes flexella												
Achnanthes hauckiana												
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis	557	73,496			252	33,281						
Achnanthes minutissima			5,782	289,103	63	3,152						
Achnanthes peragalli												
Achnanthes sp.												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla			1,927	319,940								
Anomoeoneis vitrea												
Asterionella formosa												
Caloneis sp.												
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula												
Cyclotella comta					63	143,085						
Cyclotella ocellata	557	69,599			126	15,758						
Cyclotella stelligera												
Cymatopleura solea												
Cymbella affinis												
Cymbella cesatii												
Cymbella microcephala												
Cymbella minuta					189	69,966						
Cymbella naviculiformis					63	75,639						
Diatoma tenue	13,920	5,651,420	26,983	10,172,556	693	241,290						
Diatoma tenue elongatum	64,031	55,322,667	240,919	208,153,846	3,089	2,890,938						
Diatoma vulgare			1,927	3,777,607								
Diatomella balfouriana												
Diploneis elliptica												
Eunotia incisa												
Eunotia pectinalis												
Eunotia sp.												
Fragilaria capucina mesolepta												
Fragilaria construens												
Fragilaria construens venter			1,927	185,026								
Fragilaria pinnata			1,927	115,641	189	14,750						
Fragilaria vaucheriae					63	18,153						
Frustulia rhomboides												
Gomphonema acuminatum												
Gomphonema angustatum	1,114	200,444										
Gomphonema gracile												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira italica					63	296,885						
Navicula capitata												
Navicula contenta biceps												
Navicula cryptocephala					63	11,661						
Navicula cryptocephala veneta					63	11,976						
Navicula decussis												
Navicula graciloides												

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Windy OF						
Date						18-Aug-09						
Replicate		1		2		3						
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm^2)			Biovolume (mm^3/cm^2)		
Taxa	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Navicula gregaria												
Navicula minima												
Navicula minuscula												
Navicula mutica												
Navicula pseudoscutiformis												
Navicula pupula												
Navicula pygmaea												
Navicula rhynchocephala												
Navicula sp.												
Navicula tripunctata												
Navicula viridula												
Neidium affine												
Nitzschia acicularis	557	155,901			63	17,649						
Nitzschia amphibia												
Nitzschia capitellata												
Nitzschia clausii												
Nitzschia communis												
Nitzschia constricta												
Nitzschia dissipata												
Nitzschia frustulum	1,114	133,630	5,782	693,846	819	98,331						
Nitzschia linearis												
Nitzschia microcephala												
Nitzschia palea	557	100,222			63	11,346						
Nitzschia paleacea			1,927	188,880								
Nitzschia recta												
Nitzschia sigmoidea												
Nitzschia sp.												
Nitzschia tryblionella												
Pinnularia sp.												
Rhopalodia gibba												
Stauroneis sp.												
Stephanodiscus astraea minutula												
Surirella linearis												
Surirella ovata												
Synedra radians	1,114	400,889	3,855	1,387,692	63	22,692						
Synedra rumpens	557	77,951	1,927	269,829	315	44,123						
Synedra tenera					126	37,820						
Synedra ulna												
Tabellaria fenestrata												
Tabellaria flocculosa												
Unidentified flagellate												
Subtotal	**84,075**	**62,186,219**	**294,885**	**225,553,966**	**6,429**	**4,058,496**	**128,463**	**6,174**	**100%**	**97,266,227**	**5,336,210**	**100%**
Cryptophyta												
Cryptomonas erosa												
Rhodomonas minuta												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chlorophyta												
Ankistrodesmus falcatus												
Chlamydomonas sp.												
Closterium sp.												
Cosmarium sp.					63	13,237						
Desmidium sp.												
Scenedesmus denticulatus												
Scenedesmus quadricauda												
Staurastrum sp.												
Tetraedron minimum					63	11,346						
Ulothrix sp.												
Subtotal	**0**	**0**	**0**	**0**	**126**	**24,583**	**42**	**0**	**0%**	**8,194**	**945**	**0%**
Total:	**84,075**	**62,186,219**	**294,885**	**225,553,966**	**6,681**	**4,200,320**	**128,547**	**5,751**	**100%**	**97,313,501**	**4,967,659**	**100%**

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID				Glenn OF D/S								
Date				18-Aug-09								
Replicate	1		2		3							
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm^2)			Biovolume (mm^3/cm^2)		
Taxa	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Aphanizomenon flos-aquae												
Nostoc sp.												
Oscillatoria sp.	4,772	5,917,884	1,012	1,882,963	783	970,903						
Subtotal	**4,772**	**5,917,884**	**1,012**	**1,882,963**	**783**	**970,903**	**2,189**	**1,293**	**2%**	**2,923,916**	**1,519,961**	**5%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion obliquum												
Kephyrion sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta - Diatom												
Achnanthes clevei	1,193	178,968	1,012	151,852								
Achnanthes exigua												
Achnanthes flexella												
Achnanthes hauckiana												
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis	3,579	472,476	2,025	267,259	3,915	516,771						
Achnanthes minutissima	7,159	429,524	12,148	668,148	9,396	563,750						
Achnanthes peragalli												
Achnanthes sp.												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla												
Anomoeoneis vitrea												
Asterionella formosa	2,386	524,974	1,012	445,432								
Caloneis sp.												
Caloneis ventricosa	2,386	584,630										
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula												
Cyclotella comta	1,193	2,708,386										
Cyclotella ocellata	1,193	149,140	4,049	506,173								
Cyclotella stelligera												
Cymatopleura solea												
Cymbella affinis												
Cymbella cesatii												
Cymbella microcephala												
Cymbella minuta	3,579	1,324,365	8,099	2,996,543	783	289,705						
Cymbella naviculiformis												
Diatoma tenue	9,545	3,875,259	10,123	3,229,383	6,264	1,998,181						
Diatoma tenue elongatum	32,214	25,513,714	33,407	28,864,000	34,451	29,766,000						
Diatoma vulgare	2,386	4,677,037	3,037	5,952,593	3,132	6,138,611						
Diatomella balfouriana					783	234,896						
Diploneis elliptica												
Eunotia incisa												
Eunotia pectinalis												
Eunotia sp.												
Fragilaria capucina mesolepta												
Fragilaria construens	1,193	2,672,593										
Fragilaria construens venter												
Fragilaria pinnata												
Fragilaria vaucheriae	2,386	1,030,857	1,012	291,556								
Frustulia rhomboides												
Gomphonema acuminatum												
Gomphonema angustatum	2,386	429,524	2,025	364,444	1,566	281,875						
Gomphonema gracile	2,386	1,431,746										
Gomphonema subclavatum			1,012	607,407								
Gomphonema tenellum												
Gyrosigma spencerii			1,012	455,556								
Hantzschia amphioxys												
Melosira italica	1,193	2,247,841	1,012	2,860,889								
Navicula capitata					783	375,833						
Navicula contenta biceps												
Navicula cryptocephala	1,193	220,728	1,012	187,284	1,566	289,705						
Navicula cryptocephala veneta	5,966	566,733	8,099	769,383	2,349	223,151						
Navicula decussis					783	150,333						
Navicula graciloides	1,193	519,008										

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						**Glenn OF D/S**						
Date						**18-Aug-09**						
Replicate	**1**		**2**		**3**							
	Density	**Biovolume**	**Density**	**Biovolume**	**Density**	**Biovolume**	**Density (#/cm^2)**			**Biovolume (mm^3/cm^2)**		
Taxa	**(#/cm^2)**	**(mm^3/cm^2)**	**(#/cm^2)**	**(mm^3/cm^2)**	**(#/cm^2)**	**(mm^3/cm^2)**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Navicula gregaria	4,772	835,185	1,012	177,160	2,349	411,068						
Navicula minima												
Navicula minuscula												
Navicula mutica	1,193	65,622										
Navicula pseudoscutiformis												
Navicula pupula			1,012	273,333								
Navicula pygmaea												
Navicula rhynchocephala												
Navicula sp.					2,349	352,344						
Navicula tripunctata												
Navicula viridula					783	352,344						
Neidium affine			1,012	8,685,926								
Nitzschia acicularis			1,012	283,457								
Nitzschia amphibia												
Nitzschia capitellata												
Nitzschia clausii	9,545	3,054,392	13,160	4,211,358	2,349	751,667						
Nitzschia communis												
Nitzschia constricta					783	454,132						
Nitzschia dissipata					783	210,623						
Nitzschia frustulum	7,159	1,030,857	3,037	473,778	6,264	751,667						
Nitzschia linearis					783	1,193,271						
Nitzschia microcephala												
Nitzschia palea	1,193	214,762	1,012	182,222	783	140,938						
Nitzschia paleacea												
Nitzschia recta												
Nitzschia sigmoidea	1,193	2,028,307										
Nitzschia sp.	1,193	143,175										
Nitzschia tryblionella					783	414,983						
Pinnularia sp.	2,386	954,497	1,012	404,938	1,566	626,389						
Rhopalodia gibba												
Stauroneis sp.												
Stephanodiscus astraea minutula												
Surirella linearis												
Surirella ovata												
Synedra radians	2,386	859,048	7,086	992,099	783	563,750						
Synedra rumpens	8,352	1,169,259	1,012	303,704	1,566	219,236						
Synedra tenera	1,193	357,937	2,025	4,029,136								
Synedra ulna	1,193	2,374,312										
Tabellaria fenestrata												
Tabellaria flocculosa												
Unidentified flagellate												
Subtotal	**126,471**	**62,644,854**	**122,494**	**68,635,012**	**87,694**	**47,271,220**	**112,220**	**704**	**97%**	**59,517,029**	**580,910**	**95%**
Cryptophyta												
Cryptomonas erosa												
Rhodomonas minuta												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chlorophyta												
Ankistrodesmus falcatus												
Chlamydomonas sp.												
Closterium sp.												
Cosmarium sp.												
Desmidium sp.												
Scenedesmus denticulatus												
Scenedesmus quadricauda												
Staurastrum sp.												
Tetraedron minimum												
Ulothrix sp.	2,386	1,527,196										
Subtotal	**2,386**	**1,527,196**	**0**	**0**	**0**	**0**	**795**	**0**	**1%**	**509,065**	**0**	**1%**
Total:	**133,630**	**70,089,934**	**123,506**	**70,517,975**	**88,477**	**48,242,123**	**115,204**	**674**	**100%**	**62,950,011**	**555,974**	**100%**

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID	Koignuk U/S											
Date	21-Aug-09											
Replicate	1		2		3							
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm^2)			Biovolume (mm^3/cm^2)		
Taxa	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Aphanizomenon flos-aquae												
Nostoc sp.												
Oscillatoria sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion obliquum												
Kephyrion sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta - Diatom												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes flexella			3,930	1,906,187								
Achnanthes hauckiana												
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis	2,714	358,195										
Achnanthes minutissima	21,709	1,085,439	43,233	2,161,656	42,262	2,113,119						
Achnanthes peragalli												
Achnanthes sp.												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla												
Anomoeoneis vitrea												
Asterionella formosa												
Caloneis sp.	2,714	651,264			6,037	1,448,996						
Caloneis ventricosa	8,141	1,994,495	11,791	2,888,758	18,112	4,437,550						
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula	2,714	1,248,255										
Cyclotella comta												
Cyclotella ocellata					6,037	754,685						
Cyclotella stelligera												
Cymatopleura solea					6,037	97,807,229						
Cymbella affinis												
Cymbella cesatii												
Cymbella microcephala												
Cymbella minuta	2,714	1,004,031	23,582	8,725,229	18,112	6,701,606						
Cymbella naviculiformis												
Diatoma tenue	37,990	12,118,929	35,373	10,258,039	54,337	15,757,831						
Diatoma tenue elongatum	2,714	1,953,791	11,791	8,489,412	12,075	8,693,976						
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica												
Eunotia incisa												
Eunotia pectinalis	2,714	1,953,791			6,037	4,346,988						
Eunotia sp.					12,075	5,433,735						
Fragilaria capucina mesolepta												
Fragilaria construens	2,714	303,923										
Fragilaria construens venter			3,930	188,654	6,037	289,799						
Fragilaria pinnata			3,930	235,817	6,037	362,249						
Fragilaria vaucheriae	2,714	781,516	7,861	3,395,765	12,075	3,477,590						
Frustulia rhomboides					6,037	6,520,482						
Gomphonema acuminatum												
Gomphonema angustatum			3,930	707,451	6,037	1,086,747						
Gomphonema gracile												
Gomphonema subclavatum			3,930	2,358,170								
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira italica												
Navicula capitata												
Navicula contenta biceps			3,930	314,423								
Navicula cryptocephala			3,930	727,102	6,037	1,116,934						
Navicula cryptocephala veneta	10,854	1,031,167	19,651	1,866,885	24,150	2,294,244						
Navicula decussis					6,037	1,159,197						
Navicula graciloides	2,714	1,180,415	3,930	1,709,673	6,037	2,626,305						

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Koignuk U/S						
Date						21-Aug-09						
Replicate		1		2		3						
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm^2)			Biovolume (mm^3/cm^2)		
Taxa	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Navicula gregaria			3,930	687,800								
Navicula minima			3,930	172,932	6,037	265,649						
Navicula minuscula												
Navicula mutica												
Navicula pseudoscutiformis												
Navicula pupula			7,861	2,122,353								
Navicula pygmaea												
Navicula rhynchocephala			3,930	1,159,434								
Navicula sp.	8,141	1,221,119	15,721	2,358,170	24,150	3,622,490						
Navicula tripunctata	2,714	3,039,230										
Navicula viridula	2,714	1,221,119										
Neidium affine												
Nitzschia acicularis			3,930	1,100,479	6,037	1,690,495						
Nitzschia amphibia												
Nitzschia capitellata												
Nitzschia clausii	10,854	3,473,406	15,721	5,030,763	24,150	7,727,979						
Nitzschia communis	2,714	122,112										
Nitzschia constricta												
Nitzschia dissipata	5,427	1,459,916	27,512	7,400,723	12,075	3,248,166						
Nitzschia frustulum	5,427	651,264	19,651	2,358,170	30,187	3,622,490						
Nitzschia linearis			3,930	5,989,752	6,037	9,201,124						
Nitzschia microcephala												
Nitzschia palea			11,791	2,122,353	6,037	1,086,747						
Nitzschia paleacea					18,112	1,775,020						
Nitzschia recta	5,427	1,818,111										
Nitzschia sigmoidea												
Nitzschia sp.	2,714	325,632										
Nitzschia tryblionella												
Pinnularia sp.	10,854	4,341,757	11,791	4,716,340	36,225	14,489,960						
Rhopalodia gibba												
Stauroneis sp.												
Stephanodiscus astraea minutula												
Surirella linearis												
Surirella ovata												
Synedra radians			7,861	2,829,804	6,037	2,173,494						
Synedra rumpens	51,558	7,218,171	31,442	4,401,917	42,262	5,916,734						
Synedra tenera			11,791	4,598,431	30,187	14,489,960						
Synedra ulna												
Tabellaria fenestrata												
Tabellaria flocculosa	5,427	3,202,046	23,582	13,913,203	24,150	14,248,461						
Unidentified flagellate												
Subtotal	**217,088**	**53,759,091**	**389,098**	**106,895,843**	**531,299**	**249,988,032**	**379,161**	**1,298**	**99%**	**136,880,989**	**1,130,706**	**99%**
Cryptophyta												
Cryptomonas erosa												
Rhodomonas minuta												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chlorophyta												
Ankistrodesmus falcatus												
Chlamydomonas sp.	2,714	881,919										
Closterium sp.												
Cosmarium sp.	2,714	569,856			6,037	1,267,871						
Desmidium sp.												
Scenedesmus denticulatus												
Scenedesmus quadricauda												
Staurastrum sp.												
Tetraedron minimum												
Ulothrix sp.												
Subtotal	**5,427**	**1,451,775**	**0**	**0**	**6,037**	**1,267,871**	**3,822**	**1,108**	**1%**	**906,549**	**201,876**	**1%**
Total:	**222,515**	**55,210,866**	**389,098**	**106,895,843**	**537,336**	**251,255,904**	**382,983**	**1,267**	**100%**	**137,787,538**	**1,095,822**	**100%**

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Koignuk M/S						
Date						22-Aug-09						
Replicate		1		2		3						
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm^2)			Biovolume (mm^3/cm^2)		
Taxa	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Aphanizomenon flos-aquae												
Nostoc sp.												
Oscillatoria sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta												
Chrysococcus rufescens	1,550	131,735										
Kephyrion littorale			2,836	269,465								
Kephyrion obliquum												
Kephyrion sp.			2,836	178,698								
Subtotal	**1,550**	**131,735**	**5,673**	**448,164**	**0**	**0**	**2,408**	**429**	**1%**	**193,300**	**40,424**	**0%**
Chrysophyta - Diatom												
Achnanthes clevei												
Achnanthes exigua			2,836	317,686								
Achnanthes flexella												
Achnanthes hauckiana												
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis	6,199	818,309	8,509	1,123,245	6,431	848,941						
Achnanthes minutissima	40,296	2,014,777	28,365	1,418,239	17,686	884,314						
Achnanthes peragalli												
Achnanthes sp.												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla												
Anomoeoneis vitrea												
Asterionella formosa			2,836	624,025	1,608	353,725						
Caloneis sp.												
Caloneis ventricosa					1,608	393,922						
Caloneis ventricosa minuta	1,550	433,952										
Cocconeis disculus	1,550	116,237										
Cocconeis placentula												
Cyclotella comta												
Cyclotella ocellata												
Cyclotella stelligera												
Cymatopleura solea												
Cymbella affinis	4,649	8,369,072			1,608	2,894,118						
Cymbella cesatii												
Cymbella microcephala												
Cymbella minuta	4,649	1,720,309	5,673	2,098,994	6,431	2,379,608						
Cymbella naviculiformis												
Diatoma tenue	23,247	7,415,928	36,874	11,762,874	14,471	4,616,118						
Diatoma tenue elongatum					1,608	1,157,647						
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica												
Eunotia incisa												
Eunotia pectinalis			2,836	2,042,264								
Eunotia sp.												
Fragilaria capucina mesolepta												
Fragilaria construens												
Fragilaria construens venter					1,608	308,706						
Fragilaria pinnata			5,673	340,377	3,216	192,941						
Fragilaria vaucheriae	3,100	892,701	2,836	1,633,811	3,216	926,118						
Frustulia rhomboides												
Gomphonema acuminatum					1,608	2,797,647						
Gomphonema angustatum	1,550	278,969	2,836	510,566								
Gomphonema gracile												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira italica												
Navicula capitata												
Navicula contenta biceps			2,836	226,918								
Navicula cryptocephala												
Navicula cryptocephala veneta	4,649	441,701	2,836	269,465	1,608	152,745						
Navicula decussis												
Navicula graciloides	1,550	674,175										

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Koignuk M/S						
Date						22-Aug-09						
Replicate	1		2		3							
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm^2)			Biovolume (mm^3/cm^2)		
Taxa	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Navicula gregaria												
Navicula minima												
Navicula minuscula												
Navicula mutica												
Navicula pseudoscutiformis												
Navicula pupula	1,550	418,454			1,608	434,118						
Navicula pygmaea												
Navicula rhynchocephala			5,673	1,673,522								
Navicula sp.			8,509	1,276,415								
Navicula tripunctata												
Navicula viridula												
Neidium affine												
Nitzschia acicularis	1,550	433,952	2,836	794,214	1,608	450,196						
Nitzschia amphibia												
Nitzschia capitellata	4,649	1,673,814	2,836	1,021,132								
Nitzschia clausii			2,836	907,673	1,608	514,510						
Nitzschia communis					1,608	72,353						
Nitzschia constricta					1,608	932,549						
Nitzschia dissipata	1,550	416,904	2,836	763,013	1,608	432,510						
Nitzschia frustulum	4,649	557,938	17,019	2,042,264	9,647	1,157,647						
Nitzschia linearis	1,550	2,361,938										
Nitzschia microcephala			2,836	283,648								
Nitzschia palea	1,550	278,969	5,673	1,021,132								
Nitzschia paleacea	3,100	303,766	8,509	833,925	9,647	945,412						
Nitzschia recta			2,836	950,220								
Nitzschia sigmoidea												
Nitzschia sp.												
Nitzschia tryblionella												
Pinnularia sp.	1,550	619,931	2,836	1,134,591	1,608	643,137						
Rhopalodia gibba												
Stauroneis sp.	1,550	526,942			1,608	546,667						
Stephanodiscus astraea minutula												
Surirella linearis			2,836	794,214	1,608	450,196						
Surirella ovata												
Synedra radians			5,673	2,042,264	1,608	578,824						
Synedra rumpens	10,849	1,518,832	11,346	1,588,428	8,039	1,125,490						
Synedra tenera	1,550	464,948	8,509	3,318,679	3,216	964,706						
Synedra ulna					4,824	9,598,824						
Tabellaria fenestrata	1,550	3,719,588	2,836	6,807,547								
Tabellaria flocculosa	32,546	28,803,557	25,528	15,061,698	32,157	18,972,549						
Unidentified flagellate												
Subtotal	**162,732**	**65,275,663**	**226,918**	**64,683,044**	**146,314**	**55,726,235**	**178,655**	**921**	**97%**	**61,894,981**	**471,195**	**99%**
Cryptophyta												
Cryptomonas erosa												
Rhodomonas minuta												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chlorophyta												
Ankistrodesmus falcatus			2,836	70,912								
Chlamydomonas sp.												
Closterium sp.												
Cosmarium sp.												
Desmidium sp.												
Scenedesmus denticulatus			5,673	1,021,132								
Scenedesmus quadricauda												
Staurastrum sp.												
Tetraedron minimum												
Ulothrix sp.												
Subtotal	**0**	**0**	**8,509**	**1,092,044**	**0**	**0**	**2,836**	**1,418**	**2%**	**364,015**	**475,110**	**1%**
Total:	**164,282**	**65,407,399**	**241,101**	**66,223,252**	**146,314**	**55,726,235**	**183,899**	**874**	**100%**	**62,452,295**	**447,039**	**100%**

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Koignuk D/S						
Date						21-Aug-09						
Replicate	1		2		3							
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm^2)			Biovolume (mm^3/cm^2)		
Taxa	**(#/cm^2)**	**(mm^3/cm^2)**	**(#/cm^2)**	**(mm^3/cm^2)**	**(#/cm^2)**	**(mm^3/cm^2)**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Cyanophyta												
Aphanizomenon flos-aquae												
Nostoc sp.	954	954,497										
Oscillatoria sp.												
Subtotal	**954**	**954,497**	**0**	**0**	**0**	**0**	**318**	**0**	**0%**	**318,166**	**0**	**1%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale					1,937	184,042						
Kephyrion obliquum												
Kephyrion sp.					1,937	122,049						
Subtotal	**0**	**0**	**0**	**0**	**3,875**	**306,091**	**1,292**	**0**	**1%**	**102,030**	**30,997**	**0%**
Chrysophyta - Diatom												
Achnanthes clevei												
Achnanthes exigua					1,937	216,976						
Achnanthes flexella			2,059	998,790								
Achnanthes hauckiana												
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis	5,727	755,962			7,749	1,022,887						
Achnanthes minutissima	21,953	1,097,672	41,187	2,059,361	52,307	2,615,335						
Achnanthes peragalli												
Achnanthes sp.												
Amphipleura pellucida												
Amphora ovalis	954	551,699										
Amphora perpusilla	954	158,447										
Anomoeoneis vitrea					1,937	232,474						
Asterionella formosa	954	209,989										
Caloneis sp.												
Caloneis ventricosa					3,875	949,270						
Caloneis ventricosa minuta			2,059	576,621								
Cocconeis disculus												
Cocconeis placentula												
Cyclotella comta												
Cyclotella ocellata					1,937	242,161						
Cyclotella stelligera												
Cymatopleura solea												
Cymbella affinis												
Cymbella cesatii												
Cymbella microcephala												
Cymbella minuta	2,863	1,059,492	6,178	2,285,890	9,686	3,583,978						
Cymbella naviculiformis												
Diatoma tenue	20,044	5,812,889	51,484	17,916,438	32,934	9,550,816						
Diatoma tenue elongatum	954	687,238	8,237	5,930,959								
Diatoma vulgare			2,059	4,036,347								
Diatomella balfouriana												
Diploneis elliptica												
Eunotia incisa												
Eunotia pectinalis			2,059	1,482,740	1,937	1,394,845						
Eunotia sp.												
Fragilaria capucina mesolepta												
Fragilaria construens												
Fragilaria construens venter					1,937	92,990						
Fragilaria pinnata			2,059	123,562								
Fragilaria vaucheriae	954	274,895	8,237	2,372,384	1,937	557,938						
Frustulia rhomboides												
Gomphonema acuminatum												
Gomphonema angustatum	1,909	515,429										
Gomphonema gracile												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira italica	1,909	2,697,410	4,119	3,879,836								
Navicula capitata												
Navicula contenta biceps												
Navicula cryptocephala	954	176,582			1,937	358,398						
Navicula cryptocephala veneta					3,875	368,084						
Navicula decussis												
Navicula graciloides					1,937	842,719						

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID				Koignuk D/S								
Date				21-Aug-09								
Replicate	1		2		3							
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm²)			Biovolume (mm³/cm²)		
Taxa	(#/cm²)	(mm³/cm²)	(#/cm²)	(mm³/cm²)	(#/cm²)	(mm³/cm²)	Mean	SE	Percent	Mean	SE	Percent
Navicula gregaria					3,875	678,050						
Navicula minima												
Navicula minuscula												
Navicula mutica												
Navicula pseudoscutiformis	1,909	334,074	2,059	360,388								
Navicula pupula												
Navicula pygmaea												
Navicula rhynchocephala	954	281,577										
Navicula sp.	1,909	286,349			3,875	581,186						
Navicula tripunctata	954	1,069,037										
Navicula viridula					1,937	871,778						
Neidium affine												
Nitzschia acicularis			6,178	1,729,863	3,875	1,084,880						
Nitzschia amphibia												
Nitzschia capitellata	2,863	1,030,857	2,059	741,370	5,812	2,092,268						
Nitzschia clausii												
Nitzschia communis												
Nitzschia constricta												
Nitzschia dissipata	2,863	770,279										
Nitzschia frustulum	2,863	343,619	16,475	1,976,986	5,812	697,423						
Nitzschia linearis												
Nitzschia microcephala												
Nitzschia palea					1,937	348,711						
Nitzschia paleacea			2,059	201,817								
Nitzschia recta												
Nitzschia sigmoidea												
Nitzschia sp.	954	114,540										
Nitzschia tryblionella												
Pinnularia sp.			2,059	823,744	1,937	774,914						
Rhopalodia gibba												
Stauroneis sp.					1,937	658,677						
Stephanodiscus astraea minutula												
Surirella linearis					1,937	542,440						
Surirella ovata												
Synedra radians	2,863	1,030,857			5,812	2,092,268						
Synedra rumpens	5,727	801,778	2,059	741,370	23,247	3,254,639						
Synedra tenera	5,727	1,718,095	12,356	1,729,863	5,812	1,743,557						
Synedra ulna			2,059	617,808								
Tabellaria fenestrata												
Tabellaria flocculosa	8,590	6,082,057	35,009	33,048,621	11,624	8,915,387						
Unidentified flagellate												
Subtotal	**98,313**	**27,860,823**	**212,114**	**83,634,758**	**205,352**	**46,365,047**	**171,927**	**1,283**	**96%**	**52,620,210**	**531,011**	**98%**
Cryptophyta												
Cryptomonas erosa												
Rhodomonas minuta												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chlorophyta												
Ankistrodesmus falcatus	954	23,862	2,059	51,484	3,875	96,864						
Chlamydomonas sp.			2,059	669,292								
Closterium sp.												
Cosmarium sp.	954	200,444			1,937	406,830						
Desmidium sp.												
Scenedesmus denticulatus												
Scenedesmus quadricauda			2,059	535,434								
Staurastrum sp.												
Tetraedron minimum												
Ulothrix sp.												
Subtotal	**1,909**	**224,307**	**6,178**	**1,256,210**	**5,812**	**503,694**	**4,633**	**369**	**3%**	**661,404**	**96,423**	**1%**
Total:	**101,177**	**29,039,628**	**218,292**	**84,890,968**	**215,039**	**47,174,832**	**178,169**	**1,144**	**100%**	**53,701,809**	**471,432**	**100%**

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Ref Lk A OF						
Date						23-Aug-09						
Replicate	1		2		3							
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm²)			Biovolume (mm³/cm²)		
Taxa	(#/cm²)	(mm³/cm²)	(#/cm²)	(mm³/cm²)	(#/cm²)	(mm³/cm²)	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Aphanizomenon flos-aquae												
Nostoc sp.												
Oscillatoria sp.			1,263	2,114,773	1,139	2,118,333						
Subtotal	**0**	**0**	**1,263**	**2,114,773**	**1,139**	**2,118,333**	**801**	**62**	**1%**	**1,411,035**	**1,780**	**2%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale												
Kephyrion obliquum												
Kephyrion sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta - Diatom												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes flexella												
Achnanthes hauckiana												
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis	6,095	804,486	5,474	722,611	27,333	3,608,000						
Achnanthes minutissima	4,063	203,153	2,948	147,386	30,750	1,537,500						
Achnanthes peragalli												
Achnanthes sp.												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla												
Anomoeoneis vitrea												
Asterionella formosa												
Caloneis sp.												
Caloneis ventricosa			421	103,170								
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula												
Cyclotella comta					1,139	2,585,278						
Cyclotella ocellata					9,111	1,138,889						
Cyclotella stelligera			842	46,321								
Cymatopleura solea												
Cymbella affinis												
Cymbella cesatii												
Cymbella microcephala												
Cymbella minuta	2,032	751,667	842	311,615	2,278	842,778						
Cymbella naviculiformis												
Diatoma tenue	83,293	31,401,383	13,896	4,835,933	14,806	5,152,333						
Diatoma tenue elongatum	111,734	104,583,243	14,739	12,734,118	22,778	19,680,000						
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica												
Eunotia incisa												
Eunotia pectinalis												
Eunotia sp.												
Fragilaria capucina mesolepta												
Fragilaria construens	2,032	455,063										
Fragilaria construens venter												
Fragilaria pinnata												
Fragilaria vaucheriae	2,032	585,081	421	121,277	1,139	328,000						
Frustulia rhomboides												
Gomphonema acuminatum												
Gomphonema angustatum	26,410	4,753,784	842	151,597								
Gomphonema gracile												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira italica												
Navicula capitata												
Navicula contenta biceps												
Navicula cryptocephala												
Navicula cryptocephala veneta												
Navicula decussis												
Navicula graciloides												

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Ref Lk A OF						
Date						**23-Aug-09**						
Replicate	**1**		**2**		**3**							
	Density	**Biovolume**	**Density**	**Biovolume**	**Density**	**Biovolume**	**Density (#/cm^2)**			**Biovolume (mm^3/cm^2)**		
Taxa	**(#/cm^2)**	**(mm^3/cm^2)**	**(#/cm^2)**	**(mm^3/cm^2)**	**(#/cm^2)**	**(mm^3/cm^2)**	**Mean**	**SE**	**Percent**	**Mean**	**SE**	**Percent**
Navicula gregaria												
Navicula minima												
Navicula minuscula												
Navicula mutica												
Navicula pseudoscutiformis					1,139	199,306						
Navicula pupula												
Navicula pygmaea												
Navicula rhynchocephala												
Navicula sp.												
Navicula tripunctata												
Navicula viridula												
Neidium affine												
Nitzschia acicularis												
Nitzschia amphibia												
Nitzschia capitellata												
Nitzschia clausii												
Nitzschia communis												
Nitzschia constricta												
Nitzschia dissipata												
Nitzschia frustulum												
Nitzschia linearis												
Nitzschia microcephala												
Nitzschia palea												
Nitzschia paleacea												
Nitzschia recta												
Nitzschia sigmoidea												
Nitzschia sp.												
Nitzschia tryblionella												
Pinnularia sp.												
Rhopalodia gibba												
Stauroneis sp.												
Stephanodiscus astraea minutula												
Surirella linearis												
Surirella ovata												
Synedra radians	2,032	731,351			3,417	1,230,000						
Synedra rumpens	16,252	3,185,441	4,632	648,497	28,472	3,986,111						
Synedra tenera												
Synedra ulna												
Tabellaria fenestrata												
Tabellaria flocculosa			421	248,450								
Unidentified flagellate												
Subtotal	**255,973**	**147,454,653**	**45,479**	**20,070,974**	**142,361**	**40,288,194**	**147,938**	**4,274**	**99%**	**69,271,274**	**3,367,808**	**98%**
Cryptophyta												
Cryptomonas erosa												
Rhodomonas minuta												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chlorophyta												
Ankistrodesmus falcatus												
Chlamydomonas sp.					1,139	370,139						
Closterium sp.												
Cosmarium sp.												
Desmidium sp.												
Scenedesmus denticulatus												
Scenedesmus quadricauda												
Staurastrum sp.												
Tetraedron minimum												
Ulothrix sp.												
Subtotal	**0**	**0**	**0**	**0**	**1,139**	**370,139**	**380**	**0**	**0%**	**123,380**	**0**	**0%**
Total:	**255,973**	**147,454,653**	**46,742**	**22,185,747**	**144,639**	**42,776,667**	**149,118**	**3,949**	**100%**	**70,805,689**	**3,084,374**	**100%**

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Ref Lk B OF						
Date						23-Aug-09						
Replicate		1		2		3						
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm^2)			Biovolume (mm^3/cm^2)		
Taxa	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	(#/cm^2)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Aphanizomenon flos-aquae												
Nostoc sp.												
Oscillatoria sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta												
Chrysococcus rufescens												
Kephyrion littorale	3,667	348,333	3,250	308,793								
Kephyrion obliquum												
Kephyrion sp.												
Subtotal	**3,667**	**348,333**	**3,250**	**308,793**	**0**	**0**	**2,306**	**208**	**2%**	**219,042**	**19,770**	**1%**
Chrysophyta - Diatom												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes flexella												
Achnanthes hauckiana					258	12,399						
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis	7,333	968,000	3,250	429,059	1,808	238,674						
Achnanthes minutissima	80,667	4,033,333	73,135	3,656,757	10,849	542,440						
Achnanthes peragalli												
Achnanthes sp.												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla												
Anomoeoneis vitrea					258	30,997						
Asterionella formosa												
Caloneis sp.												
Caloneis ventricosa			1,625	398,180	775	189,854						
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula												
Cyclotella comta			1,625	3,689,261	517	1,172,703						
Cyclotella ocellata	22,000	2,750,000	8,126	1,015,766	775	96,864						
Cyclotella stelligera												
Cymatopleura solea												
Cymbella affinis												
Cymbella cesatii			1,625	300,667								
Cymbella microcephala			1,625	86,137	258	13,690						
Cymbella minuta	11,000	4,070,000	9,751	3,608,000	775	286,718						
Cymbella naviculiformis												
Diatoma tenue	5,500	1,595,000	8,126	2,827,892	1,033	299,633						
Diatoma tenue elongatum			9,751	7,020,973	1,033	743,918						
Diatoma vulgare												
Diatomella balfouriana												
Diploneis elliptica												
Eunotia incisa			1,625	929,629								
Eunotia pectinalis					258	185,979						
Eunotia sp.												
Fragilaria capucina mesolepta												
Fragilaria construens												
Fragilaria construens venter												
Fragilaria pinnata			1,625	195,027	775	46,495						
Fragilaria vaucheriae												
Frustulia rhomboides												
Gomphonema acuminatum												
Gomphonema angustatum	3,667	660,000										
Gomphonema gracile	1,833	449,167	1,625	398,180								
Gomphonema subclavatum			1,625	975,135								
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira italica												
Navicula capitata												
Navicula contenta biceps												
Navicula cryptocephala												
Navicula cryptocephala veneta					258	24,539						
Navicula decussis												
Navicula graciloides												

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID												
Date						Ref Lk B OF 23-Aug-09						
Replicate	1		2		3							
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density (#/cm²)			Biovolume (mm³/cm²)		
Taxa	(#/cm²)	(mm³/cm²)	(#/cm²)	(mm³/cm²)	(#/cm²)	(mm³/cm²)	Mean	SE	Percent	Mean	SE	Percent
Navicula gregaria												
Navicula minima												
Navicula minuscula												
Navicula mutica												
Navicula pseudoscutiformis												
Navicula pupula												
Navicula pygmaea												
Navicula rhynchocephala												
Navicula sp.			1,625	243,784	258	38,746						
Navicula tripunctata												
Navicula viridula												
Neidium affine												
Nitzschia acicularis	5,500	1,540,000			517	144,651						
Nitzschia amphibia												
Nitzschia capitellata	5,500	1,980,000	3,250	1,170,162	775	278,969						
Nitzschia clausii												
Nitzschia communis					258	11,624						
Nitzschia constricta												
Nitzschia dissipata												
Nitzschia frustulum	29,333	4,224,000	14,627	2,106,292	3,100	409,155						
Nitzschia linearis												
Nitzschia microcephala												
Nitzschia palea	1,833	330,000	1,625	292,541								
Nitzschia paleacea	1,833	179,667	1,625	159,272								
Nitzschia recta												
Nitzschia sigmoidea												
Nitzschia sp.												
Nitzschia tryblionella												
Pinnularia sp.												
Rhopalodia gibba												
Stauroneis sp.	1,833	623,333										
Stephanodiscus astraea minutula	1,833	641,667										
Surirella linearis												
Surirella ovata												
Synedra radians	1,833	660,000	3,250	1,170,162	258	92,990						
Synedra rumpens	7,333	1,026,667	11,377	1,592,721	517	72,325						
Synedra tenera												
Synedra ulna												
Tabellaria fenestrata												
Tabellaria flocculosa	16,500	11,682,000	9,751	7,479,286	1,550	1,371,598						
Unidentified flagellate												
Subtotal	**205,333**	**37,412,833**	**172,274**	**39,744,883**	**26,864**	**6,304,959**	**134,824**	**1,819**	**96%**	**27,820,892**	**268,901**	**97%**
Cryptophyta												
Cryptomonas erosa	1,833	953,333										
Rhodomonas minuta					258	5,166						
Subtotal	**1,833**	**953,333**	**0**	**0**	**258**	**5,166**	**697**	**788**	**0%**	**319,500**	**474,084**	**1%**
Chlorophyta												
Ankistrodesmus falcatus	1,833	45,833										
Chlamydomonas sp.												
Closterium sp.												
Cosmarium sp.					775	162,732						
Desmidium sp.					258	180,813						
Scenedesmus denticulatus												
Scenedesmus quadricauda					258	67,159						
Staurastrum sp.												
Tetraedron minimum												
Ulothrix sp.	3,667	586,667										
Subtotal	**5,500**	**632,500**	**0**	**0**	**1,292**	**410,704**	**2,264**	**645**	**2%**	**347,735**	**98,058**	**1%**
Total:	**216,333**	**39,347,000**	**175,524**	**40,053,676**	**28,414**	**6,720,830**	**140,090**	**1,596**	**100%**	**28,707,169**	**238,362**	**100%**

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Angimajuq R. Ref						
Date						23-Aug-09						
Replicate	1		2		3							
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density ($\#/cm^2$)			Biovolume (mm^3/cm^2)		
Taxa	($\#/cm^2$)	(mm^3/cm^2)	($\#/cm^2$)	(mm^3/cm^2)	($\#/cm^2$)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Cyanophyta												
Aphanizomenon flos-aquae												
Nostoc sp.												
Oscillatoria sp.												
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**	**0**	**0**	**0%**
Chrysophyta												
Chrysococcus rufescens	9,515	808,755										
Kephyrion littorale	9,515	903,903	2,179	206,981								
Kephyrion obliquum			1,089	157,959								
Kephyrion sp.			2,179	137,261								
Subtotal	**19,030**	**1,712,658**	**5,447**	**502,200**	**0**	**0**	**8,159**	**1,896**	**2%**	**738,286**	**169,800**	**0%**
Chrysophyta - Diatom												
Achnanthes clevei												
Achnanthes exigua												
Achnanthes flexella												
Achnanthes hauckiana												
Achnanthes lanceolata												
Achnanthes lewisiana												
Achnanthes linearis			1,089	143,797	545	71,899						
Achnanthes minutissima	171,266	8,563,291	13,072	653,623	3,268	196,087						
Achnanthes peragalli												
Achnanthes sp.												
Amphipleura pellucida												
Amphora ovalis												
Amphora perpusilla												
Anomoeoneis vitrea												
Asterionella formosa			1,089	239,662								
Caloneis sp.												
Caloneis ventricosa												
Caloneis ventricosa minuta												
Cocconeis disculus												
Cocconeis placentula												
Cyclotella comta	9,515	21,598,523										
Cyclotella ocellata					545	68,086						
Cyclotella stelligera												
Cymatopleura solea												
Cymbella affinis												
Cymbella cesatii												
Cymbella microcephala					545	28,868						
Cymbella minuta	19,030	7,040,928			1,089	403,068						
Cymbella naviculiformis												
Diatoma tenue	57,089	16,555,696	4,357	1,263,671	6,536	2,274,609						
Diatoma tenue elongatum	85,633	80,152,405	25,056	21,648,000	16,341	15,294,783						
Diatoma vulgare	28,544	55,946,835	4,357	8,540,676	545	1,067,585						
Diatomella balfouriana												
Diploneis elliptica												
Eunotia incisa												
Eunotia pectinalis					545	392,174						
Eunotia sp.												
Fragilaria capucina mesolepta												
Fragilaria construens												
Fragilaria construens venter					2,179	104,580						
Fragilaria pinnata												
Fragilaria vaucheriae	9,515	2,740,253	1,089	313,739	545	156,870						
Frustulia rhomboides												
Gomphonema acuminatum												
Gomphonema angustatum												
Gomphonema gracile												
Gomphonema subclavatum												
Gomphonema tenellum												
Gyrosigma spencerii												
Hantzschia amphioxys												
Melosira italica												
Navicula capitata												
Navicula contenta biceps												
Navicula cryptocephala	9,515	1,760,232	1,089	201,534	545	100,767						
Navicula cryptocephala veneta												
Navicula decussis												
Navicula graciloides												

Appendix 3.7-2. Periphyton Density and Taxonomic Results, Hope Bay Belt Project, 2009

Sample ID						Angimajuq R. Ref						
Date						23-Aug-09						
Replicate		1		2		3						
	Density	Biovolume	Density	Biovolume	Density	Biovolume	Density ($\#/cm^2$)			Biovolume (mm^3/cm^2)		
Taxa	($\#/cm^2$)	(mm^3/cm^2)	($\#/cm^2$)	(mm^3/cm^2)	($\#/cm^2$)	(mm^3/cm^2)	Mean	SE	Percent	Mean	SE	Percent
Navicula gregaria												
Navicula minima												
Navicula minuscula												
Navicula mutica												
Navicula pseudoscutiformis												
Navicula pupula												
Navicula pygmaea												
Navicula rhynchocephala												
Navicula sp.												
Navicula tripunctata												
Navicula viridula												
Neidium affine												
Nitzschia acicularis												
Nitzschia amphibia												
Nitzschia capitellata	9,515	3,425,316	1,089	392,174	1,634	588,261						
Nitzschia clausii												
Nitzschia communis												
Nitzschia constricta												
Nitzschia dissipata												
Nitzschia frustulum	38,059	5,480,506	4,357	522,899	1,634	196,087						
Nitzschia linearis			1,089	3,320,406								
Nitzschia microcephala												
Nitzschia palea			1,089	196,087								
Nitzschia paleacea			1,089	106,758	1,634	160,138						
Nitzschia recta												
Nitzschia sigmoidea												
Nitzschia sp.	9,515	1,141,772	2,179	261,449								
Nitzschia tryblionella												
Pinnularia sp.			1,089	435,749								
Rhopalodia gibba												
Stauroneis sp.	19,030	4,567,089										
Stephanodiscus astraea minutula												
Surirella linearis												
Surirella ovata												
Synedra radians	47,574	17,126,582			1,634	588,261						
Synedra rumpens			3,268	457,536	545	76,256						
Synedra tenera	19,030	5,708,861	4,357	1,568,696	4,357	1,307,246						
Synedra ulna					1,089	2,167,850						
Tabellaria fenestrata												
Tabellaria flocculosa	304,473	287,422,110	23,966	21,210,072	19,609	19,667,522						
Unidentified flagellate												
Subtotal	**837,300**	**519,230,401**	**94,775**	**61,476,529**	**65,362**	**44,910,994**	**332,479**	**6,657**	**88%**	**208,539,308**	**5,640,659**	**96%**
Cryptophyta												
Cryptomonas erosa	9,515	4,947,679										
Rhodomonas minuta												
Subtotal	**9,515**	**4,947,679**	**0**	**0**	**0**	**0**	**3,172**	**0**	**1%**	**1,649,226**	**0**	**1%**
Chlorophyta												
Ankistrodesmus falcatus			2,179	245,109								
Chlamydomonas sp.	9,515	3,092,300	2,179	708,092								
Closterium sp.			1,089	2,069,807								
Cosmarium sp.			2,179	457,536	1,634	343,152						
Desmidium sp.												
Scenedesmus denticulatus	9,515	1,712,658										
Scenedesmus quadricauda	47,574	7,421,519			545	70,809						
Staurastrum sp.												
Tetraedron minimum	9,515	1,712,658										
Ulothrix sp.	9,515	1,522,363	6,536	2,457,623	1,089	348,599						
Subtotal	**85,633**	**15,461,498**	**14,162**	**5,938,167**	**3,268**	**762,560**	**34,354**	**3,463**	**9%**	**7,387,408**	**545,274**	**3%**
Total:	**951,477**	**541,352,236**	**114,384**	**67,916,896**	**68,630**	**45,673,554**	**378,164**	**4,965**	**100%**	**218,314,229**	**4,177,806**	**100%**

Appendix 3.8-1

Zooplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Engineers and Scientists

Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake/Sample ID	Wolverine	Wolverine	Wolverine			
Date	06-Aug-09	06-Aug-09	06-Aug-09			
Depth (m)	2.0	2.0	2.0	Mean	SE	Percent
Volume sampled (m^3)	0.14809	0.16897	0.1272	(Org/m^3)		
Replicate	1	2	3			
CLADOCERA						
Daphnia pulex*						
Daphnia longiremis	0	0	0			
immature Daphnia						
Bosmina longirostris	155	124	189			
Holopedium gibberum	0	0	0			
Chydorus sphaericus	20	6	31			
Alona costata	14	0	0			
Subtotal cladocerans	**189**	**130**	**220**	**180**	**26**	**3**
COPEPODA						
Epischura nevadensis	0	0	0			
epischurid copepodites	0	0	0			
Limnocalanus macrurus	0	0	0			
Limnocalanus copepodites	0	0	0			
Leptodiaptomus tyrrelli						
diaptomid copepodites						
Cyclops scutifer	0	0	0			
Diacyclops thomasi	0	0	0			
Ergasilius sp.	68	24	31			
cyclopoid copepodites*	7	12	39			
copepod nauplii*	41	36	79			
harpacticoid copepods						
Subtotal copepods	**115**	**71**	**149**	**112**	**23**	**2**
ROTIFERA & PROTISTA						
Asplanchna priodonta	351	633	409			
Keratella cochlearis	0	0	0			
Keratella crassa	27	12	31			
Keratella irregularis	0	0	0			
Keratella quadrata	7	0	31			
Kellicottia longispina	473	172	912			
Euchlanis parva	0	0	47			
Epiphanes sp.						
Ploesoma truncatum						
Notholca acuminata	0	12	16			
Polyarthra vulgaris	0	0	0			
Trichocerca multicrinis	68	65	47			
Filinia terminalis	0	0	0			
Conochilus unicornis	3079	2740	5613			
Conochiloides sp.	0	0	0			
unidentified rotifer*						
Difflugia sp.						
Philodina sp.	0	0	0			
peritrich colonies	0	0	0			
Subtotal rotifers & protista	**4004**	**3634**	**7107**	**4915**	**1101**	**94**
Other Zooplankters						
water mites	0	0	0			
Cypridopsis vidua	20	0	16			
Chaoborus larvae	0	0	8			
chironomid larvae	0	0	0			
Subtotal Others	**20**	**0**	**24**	**15**	**7**	**0**
TOTAL DENSITY	**4329**	**3835**	**7500**	**5221**	**1148**	**100**

Note: Data represent numbers of zooplankton/m^3

Volume sampled is calculated based on flowmeter readings

**these taxa were excluded form the diversity anlayses as they could not be accuratly assigned to a genera*

Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake/Sample ID	Imnaigut	Imnaigut	Imnaigut			
Date	08-Aug-09	08-Aug-09	08-Aug-09			
Depth (m)	2.0	2.0	2.0	Mean	SE	Percent
Volume sampled (m^3)	0.1348	0.08923	0.12151	(Org/m^3)		
Replicate	1	2	3			
CLADOCERA						
Daphnia pulex*						
Daphnia longiremis	0	0	0			
immature Daphnia						
Bosmina longirostris	25876	106866	96915			
Holopedium gibberum	0	0	0			
Chydorus sphaericus	0	0	0			
Alona costata	0	0	0			
Subtotal cladocerans	**25876**	**106866**	**96915**	**76552**	**25501**	**30**
COPEPODA						
Epischura nevadensis	0	0	0			
epischurid copepodites	0	0	0			
Limnocalanus macrurus	0	0	0			
Limnocalanus copepodites	0	0	0			
Leptodiaptomus tyrrelli						
diaptomid copepodites						
Cyclops scutifer	0	0	0			
Diacyclops thomasi	1899	8607	3687			
Ergasilius sp.	0	0	0			
cyclopoid copepodites*	52938	97542	72159			
copepod nauplii*	49140	123362	80060			
harpacticoid copepods						
Subtotal copepods	**103977**	**229511**	**155906**	**163131**	**36418**	**64**
ROTIFERA & PROTISTA						
Asplanchna priodonta	237	1434	2107			
Keratella cochlearis	0	0	0			
Keratella crassa	0	0	0			
Keratella irregularis	0	0	0			
Keratella quadrata	0	1434	0			
Kellicottia longispina	1899	7172	2634			
Euchlanis parva	0	0	0			
Epiphanes sp.						
Ploesoma truncatum						
Notholca acuminata	0	0	0			
Polyarthra vulgaris	0	0	0			
Trichocerca multicrinis	0	0	0			
Filinia terminalis	0	0	0			
Conochilus unicornis	8783	10758	10008			
Conochiloides sp.	0	0	0			
unidentified rotifer*						
Difflugia sp.						
Philodina sp.	0	0	0			
peritrich colonies	0	0	0			
Subtotal rotifers & protista	**10920**	**20799**	**14748**	**15489**	**2876**	**6**
Other Zooplankters						
water mites	0	0	0			
Cypridopsis vidua	0	0	66			
Chaoborus larvae	0	0	0			
chironomid larvae	0	0	0			
Subtotal Others	**0**	**0**	**66**	**22**	**22**	**0**
TOTAL DENSITY	**140772**	**357176**	**267634**	**255194**	**62779**	**100**

Note: Data represent numbers of zooplankton/m^3

Volume sampled is calculated based on flowmeter readings

**these taxa were excluded form the diversity anlayses as they could not be accuratly assigned to a genera*

Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake/Sample ID	Patch S	Patch S	Patch S			
Date	11-Aug-09	11-Aug-09	11-Aug-09			
Depth (m)	12.0	11.5	11.5	Mean	SE	Percent
Volume sampled (m^3)	0.45756	0.60375	0.59995	(Org/m^3)		
Replicate	1	2	3			
CLADOCERA						
Daphnia pulex*						
Daphnia longiremis	2028	1776	1787			
immature Daphnia						
Bosmina longirostris	350	159	160			
Holopedium gibberum	70	0	0			
Chydorus sphaericus	0	0	0			
Alona costata	0	0	0			
Subtotal cladocerans	**2448**	**1935**	**1947**	**2110**	**169**	**14**
COPEPODA						
Epischura nevadensis	0	0	0			
epischurid copepodites	0	0	0			
Limnocalanus macrurus	2832	2597	4720			
Limnocalanus copepodites	1329	663	1333			
Leptodiaptomus tyrrelli						
diaptomid copepodites						
Cyclops scutifer	0	0	0			
Diacyclops thomasi	70	27	133			
Ergasilius sp.	0	0	0			
cyclopoid copepodites*	6994	4770	6241			
copepod nauplii*	105	80	53			
harpacticoid copepods						
Subtotal copepods	**11330**	**8136**	**12481**	**10649**	**1300**	**69**
ROTIFERA & PROTISTA						
Asplanchna priodonta	0	0	0			
Keratella cochlearis	0	0	0			
Keratella crassa	0	0	0			
Keratella irregularis	0	0	0			
Keratella quadrata	0	27	27			
Kellicottia longispina	3777	1219	1627			
Euchlanis parva	0	0	0			
Epiphanes sp.						
Ploesoma truncatum						
Notholca acuminata	0	0	0			
Polyarthra vulgaris	0	0	0			
Trichocerca multicrinis	0	0	0			
Filinia terminalis	0	0	0			
Conochilus unicornis	909	133	80			
Conochiloides sp.	0	0	0			
unidentified rotifer*						
Difflugia sp.						
Philodina sp.	0	0	0			
peritrich colonies	0	0	0			
Subtotal rotifers & protista	**4686**	**1378**	**1734**	**2599**	**1048**	**17**
Other Zooplankters						
water mites	0	0	0			
Cypridopsis vidua	0	0	0			
Chaoborus larvae	0	0	0			
chironomid larvae	0	0	0			
Subtotal Others	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL DENSITY	**18463**	**11449**	**16161**	**15358**	**2064**	**100**

Note: Data represent numbers of zooplankton/m^3

Volume sampled is calculated based on flowmeter readings

**these taxa were excluded form the diversity anlayses as they could not be accuratly assigned to a genera*

Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake/Sample ID	Patch N	Patch N	Patch N			
Date	09-Aug-09	09-Aug-09	09-Aug-09			
Depth (m)	6.0	6.0	6.5	Mean	SE	Percent
Volume sampled (m^3)	0.2696	0.33605	0.2658	(Org/m^3)		
Replicate	1	2	3			
CLADOCERA						
Daphnia pulex*						
Daphnia longiremis	2048	976	2147			
immature Daphnia						
Bosmina longirostris	2522	595	341			
Holopedium gibberum	0	0	0			
Chydorus sphaericus	0	0	0			
Alona costata	0	0	0			
Subtotal cladocerans	**4570**	**1571**	**2488**	**2876**	**887**	**22**
COPEPODA						
Epischura nevadensis	0	0	0			
epischurid copepodites	0	0	0			
Limnocalanus macrurus	1306	1595	1806			
Limnocalanus copepodites	237	357	562			
Leptodiaptomus tyrrelli						
diaptomid copepodites						
Cyclops scutifer	0	0	0			
Diacyclops thomasi	297	71	141			
Ergasilius sp.	0	0	0			
cyclopoid copepodites*	7300	5833	5959			
copepod nauplii*	148	214	341			
harpacticoid copepods						
Subtotal copepods	**9288**	**8070**	**8809**	**8722**	**354**	**66**
ROTIFERA & PROTISTA						
Asplanchna priodonta	0	0	0			
Keratella cochlearis	0	0	0			
Keratella crassa	0	0	0			
Keratella irregularis	0	0	0			
Keratella quadrata	0	0	0			
Kellicottia longispina	1780	738	1806			
Euchlanis parva	0	0	0			
Epiphanes sp.						
Ploesoma truncatum						
Notholca acuminata	0	0	0			
Polyarthra vulgaris	0	0	0			
Trichocerca multicrinis	0	0	0			
Filinia terminalis	0	0	0			
Conochilus unicornis	89	71	100			
Conochiloides sp.	0	0	0			
unidentified rotifer*						
Difflugia sp.						
Philodina sp.	0	0	0			
peritrich colonies	0	0	0			
Subtotal rotifers & protista	**1869**	**809**	**1906**	**1528**	**360**	**12**
Other Zooplankters						
water mites	0	0	0			
Cypridopsis vidua	0	0	0			
Chaoborus larvae	0	0	0			
chironomid larvae	0	0	0			
Subtotal Others	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL DENSITY	**15727**	**10451**	**13203**	**13127**	**1524**	**100**

Note: Data represent numbers of zooplankton/m^3

Volume sampled is calculated based on flowmeter readings

**these taxa were excluded form the diversity anlayses as they could not be accuratly assigned to a genera*

Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake/Sample ID	P.O.	P.O.	P.O.			
Date	10-Aug-09	10-Aug-09	10-Aug-09			
Depth (m)	1.5	1.5	1.5	Mean	SE	Percent
Volume sampled (m^3)	0.11391	0.10062	0.10252	(Org/m^3)		
Replicate	1	2	3			
CLADOCERA						
Daphnia pulex*						
Daphnia longiremis	702	636	117			
immature Daphnia						
Bosmina longirostris	6321	16060	2614			
Holopedium gibberum	878	2067	215			
Chydorus sphaericus	35	159	59			
Alona costata	0	0	0			
Subtotal cladocerans	**7936**	**18922**	**3004**	**9954**	**4705**	**42**
COPEPODA						
Epischura nevadensis	0	0	0			
epischurid copepodites	0	0	0			
Limnocalanus macrurus	597	1511	332			
Limnocalanus copepodites	35	636	20			
Leptodiaptomus tyrrelli						
diaptomid copepodites						
Cyclops scutifer	0	0	0			
Diacyclops thomasi	0	0	0			
Ergasilius sp.	0	0	0			
cyclopoid copepodites*	9832	13595	4116			
copepod nauplii*	35	318	137			
harpacticoid copepods						
Subtotal copepods	**10499**	**16060**	**4604**	**10388**	**3308**	**44**
ROTIFERA & PROTISTA						
Asplanchna priodonta	0	0	0			
Keratella cochlearis	0	159	39			
Keratella crassa	0	0	0			
Keratella irregularis	0	0	0			
Keratella quadrata	176	239	20			
Kellicottia longispina	5197	2783	1697			
Euchlanis parva	0	0	0			
Epiphanes sp.						
Ploesoma truncatum						
Notholca acuminata	0	0	0			
Polyarthra vulgaris	70	0	0			
Trichocerca multicrinis	0	0	0			
Filinia terminalis	0	0	0			
Conochilus unicornis	0	0	0			
Conochiloides sp.	0	0	39			
unidentified rotifer*						
Difflugia sp.						
Philodina sp.	0	0	0			
peritrich colonies	0	0	0			
Subtotal rotifers & protista	**5443**	**3180**	**1795**	**3473**	**1063**	**15**
Other Zooplankters						
water mites	35	0	0			
Cypridopsis vidua	0	0	39			
Chaoborus larvae	0	0	0			
chironomid larvae	0	0	20			
Subtotal Others	**35**	**0**	**59**	**31**	**17**	**0**
TOTAL DENSITY	**23913**	**38162**	**9461**	**23845**	**8285**	**100**

Note: Data represent numbers of zooplankton/m^3

Volume sampled is calculated based on flowmeter readings

**these taxa were excluded form the diversity anlayses as they could not be accuratly assigned to a genera*

Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake/Sample ID	Ogama	Ogama	Ogama			
Date	14-Aug-09	14-Aug-09	14-Aug-09			
Depth (m)	3.0	3.0	3.0	Mean	SE	Percent
Volume sampled (m^3)	0.22024	0.18986	0.16328	(Org/m^3)		
Replicate	1	2	3			
CLADOCERA						
Daphnia pulex*						
Daphnia longiremis	0	169	196			
immature Daphnia						
Bosmina longirostris	6103	14495	14895			
Holopedium gibberum	0	0	0			
Chydorus sphaericus	0	0	0			
Alona costata	0	0	0			
Subtotal cladocerans	**6103**	**14664**	**15091**	**11952**	**2927**	**13**
COPEPODA						
Epischura nevadensis	145	0	392			
epischurid copepodites	363	0	0			
Limnocalanus macrurus	0	0	0			
Limnocalanus copepodites	0	0	0			
Leptodiaptomus tyrrelli						
diaptomid copepodites						
Cyclops scutifer	0	0	0			
Diacyclops thomasi	509	1011	1372			
Ergasilius sp.	0	0	0			
cyclopoid copepodites*	37342	74498	52916			
copepod nauplii*	1090	506	5096			
harpacticoid copepods						
Subtotal copepods	**39449**	**76015**	**59775**	**58413**	**10578**	**61**
ROTIFERA & PROTISTA						
Asplanchna priodonta	0	0	0			
Keratella cochlearis	0	0	0			
Keratella crassa	0	0	0			
Keratella irregularis	1598	1011	1176			
Keratella quadrata	6902	15338	26850			
Kellicottia longispina	3124	5731	12543			
Euchlanis parva	0	0	0			
Epiphanes sp.						
Ploesoma truncatum						
Notholca acuminata	0	0	0			
Polyarthra vulgaris	0	0	0			
Trichocerca multicrinis	0	0	0			
Filinia terminalis	73	169	588			
Conochilus unicornis	0	0	0			
Conochiloides sp.	0	0	0			
unidentified rotifer*						
Difflugia sp.						
Philodina sp.	0	0	0			
peritrich colonies	0	0	0			
Subtotal rotifers & protista	**11697**	**22248**	**41157**	**25034**	**8618**	**26**
Other Zooplankters						
water mites	0	0	0			
Cypridopsis vidua	0	0	0			
Chaoborus larvae	0	0	0			
chironomid larvae	0	0	0			
Subtotal Others	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL DENSITY	**57248**	**112927**	**116023**	**95399**	**19097**	**100**

Note: Data represent numbers of zooplankton/m^3

Volume sampled is calculated based on flowmeter readings

**these taxa were excluded form the diversity anlayses as they could not be accuratly assigned to a genera*

Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake/Sample ID	**Doris S**	**Doris S**	**Doris S**			
Date	**17-Aug-09**	**17-Aug-09**	**17-Aug-09**			
Depth (m)	**8.0**	**8.0**	**8.0**	**Mean**	**SE**	**Percent**
Volume sampled (m^3)	**0.38161**	**0.34554**	**0.37782**	**(Org/m^3)**		
Replicate	**1**	**2**	**3**			
CLADOCERA						
Daphnia pulex*						
Daphnia longiremis	0	0	11			
immature Daphnia						
Bosmina longirostris	0	0	0			
Holopedium gibberum	42	0	11			
Chydorus sphaericus	0	46	11			
Alona costata	0	0	0			
Subtotal cladocerans	**42**	**46**	**32**	**40**	**4**	**0**
COPEPODA						
Epischura nevadensis	0	0	0			
epischurid copepodites	0	0	0			
Limnocalanus macrurus	461	93	0			
Limnocalanus copepodites	42	139	11			
Leptodiaptomus tyrrelli						
diaptomid copepodites						
Cyclops scutifer	210	139	21			
Diacyclops thomasi	0	0	0			
Ergasilius sp.	0	0	0			
cyclopoid copepodites*	10650	11298	1588			
copepod nauplii*	15178	19124	2901			
harpacticoid copepods						
Subtotal copepods	**26540**	**30792**	**4521**	**20618**	**8142**	**26**
ROTIFERA & PROTISTA						
Asplanchna priodonta	0	46	0			
Keratella cochlearis	2851	2037	1101			
Keratella crassa	0	0	0			
Keratella irregularis	0	0	0			
Keratella quadrata	4360	4445	1186			
Kellicottia longispina	70270	58899	14017			
Euchlanis parva	0	0	0			
Epiphanes sp.						
Ploesoma truncatum						
Notholca acuminata	0	0	0			
Polyarthra vulgaris	0	0	0			
Trichocerca multicrinis	0	0	0			
Filinia terminalis	0	0	42			
Conochilus unicornis	6876	7038	1186			
Conochiloides sp.	0	0	0			
unidentified rotifer*						
Difflugia sp.						
Philodina sp.	0	0	42			
peritrich colonies	0	185	0			
Subtotal rotifers & protista	**84357**	**72651**	**17575**	**58194**	**20589**	**74**
Other Zooplankters						
water mites	0	0	0			
Cypridopsis vidua	0	0	0			
Chaoborus larvae	0	0	0			
chironomid larvae	0	0	0			
Subtotal Others	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL DENSITY	**110939**	**103490**	**22127**	**78852**	**28444**	**100**

Note: Data represent numbers of zooplankton/m^3

Volume sampled is calculated based on flowmeter readings

**these taxa were excluded form the diversity anlayses as they could not be accuratly assigned to a genera*

Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake/Sample ID	Doris N	Doris N	Doris N			
Date	16 Aug 2009	16 Aug 2009	16 Aug 2009			
Depth (m)	11.5	11.5	11.5	Mean	SE	Percent
Volume sampled (m^3)	0.45376	0.54869	0.47464	(Org/m^3)		
Replicate	1	2	3			
CLADOCERA						
Daphnia pulex*						
Daphnia longiremis	71	0	0			
immature Daphnia						
Bosmina longirostris	0	0	0			
Holopedium gibberum	0	0	67			
Chydorus sphaericus	0	0	0			
Alona costata	0	0	0			
Subtotal cladocerans	**71**	**0**	**67**	**46**	**23**	**0**
COPEPODA						
Epischura nevadensis	0	0	0			
epischurid copepodites	0	0	0			
Limnocalanus macrurus	212	467	405			
Limnocalanus copepodites	0	0	135			
Leptodiaptomus tyrrelli						
diaptomid copepodites						
Cyclops scutifer	0	117	0			
Diacyclops thomasi	0	0	0			
Ergasilius sp.	0	0	0			
cyclopoid copepodites*	14880	9098	16450			
copepod nauplii*	25388	11897	23799			
harpacticoid copepods						
Subtotal copepods	**40480**	**21579**	**40788**	**34282**	**6352**	**40**
ROTIFERA & PROTISTA						
Asplanchna priodonta	0	0	0			
Keratella cochlearis	3385	1050	2023			
Keratella crassa	0	0	0			
Keratella irregularis	0	0	0			
Keratella quadrata	2116	1166	1888			
Kellicottia longispina	49647	37092	48676			
Euchlanis parva	0	0	0			
Epiphanes sp.						
Ploesoma truncatum						
Notholca acuminata	0	0	0			
Polyarthra vulgaris	0	0	0			
Trichocerca multicrinis	0	0	0			
Filinia terminalis	0	0	0			
Conochilus unicornis	1693	1050	3506			
Conochiloides sp.	0	0	0			
unidentified rotifer*						
Difflugia sp.						
Philodina sp.	0	0	0			
peritrich colonies	0	0	0			
Subtotal rotifers & protista	**56841**	**40358**	**56093**	**51097**	**5374**	**60**
Other Zooplankters						
water mites	0	0	0			
Cypridopsis vidua	212	0	0			
Chaoborus larvae	0	0	0			
chironomid larvae	0	0	0			
Subtotal Others	**212**	**0**	**0**	**71**	**71**	**0**
TOTAL DENSITY	**97602**	**61937**	**96948**	**85496**	**11781**	**100**

Note: Data represent numbers of zooplankton/m^3

Volume sampled is calculated based on flowmeter readings

**these taxa were excluded form the diversity anlayses as they could not be accuratly assigned to a genera*

Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake/Sample ID	Little Roberts	Little Roberts	Little Roberts			
Date	07-Aug-09	07-Aug-09	07-Aug-09			
Depth (m)	1.7	1.7	1.7	Mean	SE	Percent
Volume sampled (m^3)	0.11581	0.1348	0.12151	(Org/m^3)		
Replicate	1	2	3			
CLADOCERA						
Daphnia pulex*	0	0	0			
Daphnia longiremis	0	0	0			
immature Daphnia	43	15	17			
Bosmina longirostris	17	15	58			
Holopedium gibberum	0	7	0			
Chydorus sphaericus	0	0	0			
Alona costata						
Subtotal cladocerans	**60**	**37**	**74**	**57**	**11**	**1**
COPEPODA						
Epischura nevadensis	0	0	0			
epischurid copepodites	0	0	0			
Limnocalanus macrurus	60	22	33			
Limnocalanus copepodites	17	7	17			
Leptodiaptomus tyrrelli	0	0	0			
diaptomid copepodites	0	0	0			
Cyclops scutifer	0	0	0			
Diacyclops thomasi	9	30	17			
Ergasilius sp.						
cyclopoid copepodites*	78	208	214			
copepod nauplii*	60	875	774			
harpacticoid copepods	0	7	8			
Subtotal copepods	**225**	**1150**	**1062**	**812**	**295**	**19**
ROTIFERA & PROTISTA						
Asplanchna priodonta	0	0	0			
Keratella cochlearis	9	7	8			
Keratella crassa						
Keratella irregularis						
Keratella quadrata	320	534	453			
Kellicottia longispina	2582	3405	2477			
Euchlanis parva	26	15	0			
Epiphanes sp.	9	7	0			
Ploesoma truncatum	0	22	0			
Notholca acuminata						
Polyarthra vulgaris						
Trichocerca multicrinis						
Filinia terminalis	0	0	0			
Conochilus unicornis	0	0	0			
Conochiloides sp.	0	0	8			
unidentified rotifer*	9	0	0			
Difflugia sp.	0	0	0			
Philodina sp.						
peritrich colonies						
Subtotal rotifers & protista	**2953**	**3991**	**2946**	**3297**	**347**	**78**
Other Zooplankters						
water mites	0	0	0			
Cypridopsis vidua	0	7	0			
Chaoborus larvae						
chironomid larvae	35	37	41			
Subtotal Others	**35**	**45**	**41**	**40**	**3**	**1**
TOTAL DENSITY	**3273**	**5223**	**4123**	**4206**	**564**	**100**

Note: Data represent numbers of zooplankton/m^3

Volume sampled is calculated based on flowmeter readings

**these taxa were excluded form the diversity anlayses as they could not be accuratly assigned to a genera*

Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake/Sample ID	Naiqunnguut	Naiqunnguut	Naiqunnguut			
Date	10-Aug-09	10-Aug-09	10-Aug-09			
Depth (m)	3.0	3.0	3.0	Mean	SE	Percent
Volume sampled (m^3)	0.18226	0.22213	0.21264	(Org/m^3)		
Replicate	1	2	3			
CLADOCERA						
Daphnia pulex*	0	0	0			
Daphnia longiremis	20278	17143	18209			
immature Daphnia	0	0	0			
Bosmina longirostris	2634	1513	1129			
Holopedium gibberum	0	0	0			
Chydorus sphaericus	0	0	0			
Alona costata						
Subtotal cladocerans	**22912**	**18655**	**19338**	**20302**	**1320**	**40**
COPEPODA						
Epischura nevadensis	0	0	0			
epischurid copepodites	0	0	0			
Limnocalanus macrurus	0	0	0			
Limnocalanus copepodites	0	0	0			
Leptodiaptomus tyrrelli	1756	1657	1505			
diaptomid copepodites	4740	2953	2483			
Cyclops scutifer	3775	2737	1881			
Diacyclops thomasi	0	0	0			
Ergasilius sp.						
cyclopoid copepodites*	7637	6339	6772			
copepod nauplii*	790	1873	3010			
harpacticoid copepods	0	0	0			
Subtotal copepods	**18698**	**15558**	**15651**	**16636**	**1032**	**33**
ROTIFERA & PROTISTA						
Asplanchna priodonta	0	0	75			
Keratella cochlearis	0	0	0			
Keratella crassa						
Keratella irregularis						
Keratella quadrata	966	936	602			
Kellicottia longispina	7637	15126	11738			
Euchlanis parva	0	0	0			
Epiphanes sp.	0	0	0			
Ploesoma truncatum	0	0	0			
Notholca acuminata						
Polyarthra vulgaris						
Trichocerca multicrinis						
Filinia terminalis	439	720	527			
Conochilus unicornis	615	432	226			
Conochiloides sp.	0	0	0			
unidentified rotifer*	0	0	0			
Difflugia sp.	0	0	0			
Philodina sp.						
peritrich colonies						
Subtotal rotifers & protista	**9656**	**17215**	**13168**	**13346**	**2184**	**27**
Other Zooplankters						
water mites	0	0	0			
Cypridopsis vidua	0	72	0			
Chaoborus larvae						
chironomid larvae	0	0	0			
Subtotal Others	**0**	**72**	**0**	**24**	**24**	**0**
TOTAL DENSITY	**51266**	**51501**	**48156**	**50308**	**1078**	**100**

Note: Data represent numbers of zooplankton/m^3

Volume sampled is calculated based on flowmeter readings

**these taxa were excluded form the diversity anlayses as they could not be accuratly assigned to a genera*

Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake/Sample ID	Nakhaktok	Nakhaktok	Nakhaktok			
Date	06-Aug-09	06-Aug-09	06-Aug-09			
Depth (m)	6.0	6.0	6.0	Mean	SE	Percent
Volume sampled (m^3)	0.28099	0.23922	0.24871	(Org/m^3)		
Replicate	1	2	3			
CLADOCERA						
Daphnia pulex*						
Daphnia longiremis	11616	14046	16340			
immature Daphnia						
Bosmina longirostris	5239	8026	7591			
Holopedium gibberum						
Chydorus sphaericus	0	268	257			
Alona costata	114	0	129			
Subtotal cladocerans	**16969**	**22339**	**24317**	**21208**	**2195**	**8**
COPEPODA						
Epischura nevadensis						
epischurid copepodites						
Limnocalanus macrurus	0	0	0			
Limnocalanus copepodites	0	0	0			
Leptodiaptomus tyrrelli						
diaptomid copepodites						
Cyclops scutifer						
Diacyclops thomasi	10250	16587	17369			
Ergasilius sp.						
cyclopoid copepodites*	20157	28225	24446			
copepod nauplii*	3872	4414	1930			
harpacticoid copepods						
Subtotal copepods	**34279**	**49226**	**43745**	**42417**	**4366**	**15**
ROTIFERA & PROTISTA						
Asplanchna priodonta						
Keratella cochlearis	3189	2675	3603			
Keratella crassa						
Keratella irregularis						
Keratella quadrata	107050	156776	142557			
Kellicottia longispina	45553	67419	52494			
Euchlanis parva						
Epiphanes sp.						
Ploesoma truncatum						
Notholca acuminata						
Polyarthra vulgaris						
Trichocerca multicrinis						
Filinia terminalis	3189	9631	3088			
Conochilus unicornis	14122	16587	27791			
Conochiloides sp.						
unidentified rotifer*						
Difflugia sp.						
Philodina sp.						
peritrich colonies						
Subtotal rotifers & protista	**173102**	**253088**	**229533**	**218574**	**23731**	**77**
Other Zooplankters						
water mites						
Cypridopsis vidua	114	134	0			
Chaoborus larvae						
chironomid larvae						
Subtotal Others	**114**	**134**	**0**	**83**	**42**	**0**
TOTAL DENSITY	**224464**	**324788**	**297595**	**282282**	**29956**	**100**

Note: Data represent numbers of zooplankton/m^3
Volume sampled is calculated based on flowmeter readings
**these taxa were excluded form the diversity anlayses as they could not be accuratly assigned to a genera*

Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake/Sample ID	Windy	Windy	Windy			
Date	09-Aug-09	09-Aug-09	09-Aug-09			
Depth (m)	16.0	16.0	16.0	Mean	SE	Percent
Volume sampled (m^3)	0.95309	0.99106	1.03852	(Org/m^3)		
Replicate	1	2	3			
CLADOCERA						
Daphnia pulex*						
Daphnia longiremis	0	0	0			
immature Daphnia						
Bosmina longirostris	0	0	0			
Holopedium gibberum						
Chydorus sphaericus	0	0	0			
Alona costata	0	0	0			
Subtotal cladocerans	**0**	**0**	**0**	**0**	**0**	**0**
COPEPODA						
Epischura nevadensis						
epischurid copepodites						
Limnocalanus macrurus	1746	1203	1587			
Limnocalanus copepodites	63	119	69			
Leptodiaptomus tyrrelli						
diaptomid copepodites						
Cyclops scutifer						
Diacyclops thomasi	0	0	0			
Ergasilius sp.						
cyclopoid copepodites*	0	0	0			
copepod nauplii*	0	0	4			
harpacticoid copepods						
Subtotal copepods	**1809**	**1322**	**1660**	**1597**	**144**	**72**
ROTIFERA & PROTISTA						
Asplanchna priodonta						
Keratella cochlearis	0	0	0			
Keratella crassa						
Keratella irregularis						
Keratella quadrata	0	0	0			
Kellicottia longispina	97	20	73			
Euchlanis parva						
Epiphanes sp.						
Ploesoma truncatum						
Notholca acuminata						
Polyarthra vulgaris						
Trichocerca multicrinis						
Filinia terminalis	0	0	0			
Conochilus unicornis	1461	44	154			
Conochiloides sp.						
unidentified rotifer*						
Difflugia sp.						
Philodina sp.						
peritrich colonies						
Subtotal rotifers & protista	**1557**	**65**	**227**	**616**	**473**	**28**
Other Zooplankters						
water mites						
Cypridopsis vidua	0	0	0			
Chaoborus larvae						
chironomid larvae						
Subtotal Others	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL DENSITY	**3366**	**1386**	**1887**	**2213**	**594**	**100**

Note: Data represent numbers of zooplankton/m^3

Volume sampled is calculated based on flowmeter readings

**these taxa were excluded form the diversity anlayses as they could not be accuratly assigned to a genera*

Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake/Sample ID	Glenn	Glenn	Glenn			
Date	08-Aug-09	08-Aug-09	08-Aug-09			
Depth (m)	17.5	17.5	17.5	Mean	SE	Percent
Volume sampled (m^3)	0.88094	0.88094	0.94549	(Org/m^3)		
Replicate	1	2	3			
CLADOCERA						
Daphnia pulex*						
Daphnia longiremis	0	0	0			
immature Daphnia						
Bosmina longirostris	0	0	0			
Holopedium gibberum						
Chydorus sphaericus	0	0	0			
Alona costata	0	0	0			
Subtotal cladocerans	**0**	**0**	**0**	**0**	**0**	**0**
COPEPODA						
Epischura nevadensis						
epischurid copepodites						
Limnocalanus macrurus	2411	3914	1620			
Limnocalanus copepodites	104	55	127			
Leptodiaptomus tyrrelli						
diaptomid copepodites						
Cyclops scutifer						
Diacyclops thomasi	0	0	0			
Ergasilius sp.						
cyclopoid copepodites*	5	0	0			
copepod nauplii*	0	0	0			
harpacticoid copepods						
Subtotal copepods	**2520**	**3969**	**1747**	**2745**	**651**	**93**
ROTIFERA & PROTISTA						
Asplanchna priodonta						
Keratella cochlearis	0	0	0			
Keratella crassa						
Keratella irregularis						
Keratella quadrata	0	0	0			
Kellicottia longispina	68	36	59			
Euchlanis parva						
Epiphanes sp.						
Ploesoma truncatum						
Notholca acuminata						
Polyarthra vulgaris						
Trichocerca multicrinis						
Filinia terminalis	0	0	0			
Conochilus unicornis	164	136	119			
Conochiloides sp.						
unidentified rotifer*						
Difflugia sp.						
Philodina sp.						
peritrich colonies						
Subtotal rotifers & protista	**232**	**173**	**178**	**194**	**19**	**7**
Other Zooplankters						
water mites						
Cypridopsis vidua	0	0	0			
Chaoborus larvae						
chironomid larvae						
Subtotal Others	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL DENSITY	**2752**	**4141**	**1925**	**2939**	**647**	**100**

Note: Data represent numbers of zooplankton/m^3

Volume sampled is calculated based on flowmeter readings

**these taxa were excluded form the diversity anlayses as they could not be accuratly assigned to a genera*

Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake/Sample ID	Ref Lk A	Ref Lk A	Ref Lk A			
Date	12-Aug-09	13-Aug-09	13-Aug-09			
Depth (m)	29.0	29.0	29.0	Mean	SE	Percent
Volume sampled (m^3)	1.32521	1.46001	1.39735	(Org/m^3)		
Replicate	1	2	3			
CLADOCERA						
Daphnia pulex*	24	29	4			
Daphnia longiremis	0	0	0			
immature Daphnia	0	0	0			
Bosmina longirostris	12	0	0			
Holopedium gibberum	6	7	4			
Chydorus sphaericus	0	0	4			
Alona costata						
Subtotal cladocerans	**42**	**37**	**12**	**30**	**9**	**1**
COPEPODA						
Epischura nevadensis	0	0	0			
epischurid copepodites	0	0	0			
Limnocalanus macrurus	1292	2148	1382			
Limnocalanus copepodites	133	139	80			
Leptodiaptomus tyrrelli	0	0	0			
diaptomid copepodites	169	168	115			
Cyclops scutifer	417	424	214			
Diacyclops thomasi	0	0	0			
Ergasilius sp.						
cyclopoid copepodites*	60	51	31			
copepod nauplii*	24	7	0			
harpacticoid copepods	0	0	4			
Subtotal copepods	**2095**	**2937**	**1824**	**2285**	**335**	**53**
ROTIFERA & PROTISTA						
Asplanchna priodonta	0	0	0			
Keratella cochlearis	0	0	0			
Keratella crassa						
Keratella irregularis						
Keratella quadrata	0	0	0			
Kellicottia longispina	1769	1680	2073			
Euchlanis parva	0	0	0			
Epiphanes sp.	0	0	0			
Ploesoma truncatum	0	0	0			
Notholca acuminata						
Polyarthra vulgaris						
Trichocerca multicrinis						
Filinia terminalis	0	0	0			
Conochilus unicornis	66	322	168			
Conochiloides sp.	0	0	0			
unidentified rotifer*	0	0	0			
Difflugia sp.	0	7	0			
Philodina sp.						
peritrich colonies						
Subtotal rotifers & protista	**1835**	**2009**	**2240**	**2028**	**117**	**47**
Other Zooplankters						
water mites	0	0	4			
Cypridopsis vidua	0	0	0			
Chaoborus larvae						
chironomid larvae	0	0	0			
Subtotal Others	**0**	**0**	**4**	**1**	**1**	**0**
TOTAL DENSITY	**3972**	**4983**	**4080**	**4345**	**320**	**100**

Note: Data represent numbers of zooplankton/m^3

Volume sampled is calculated based on flowmeter readings

**these taxa were excluded form the diversity anlayses as they could not be accuratly assigned to a genera*

Appendix 3.8-1. Zooplankton Abundance and Taxonomic Results, Hope Bay Belt Project, 2009

Lake/Sample ID	Ref Lk B	Ref Lk B	Ref Lk B			
Date	16-Aug-09	16-Aug-09	16-Aug-09			
Depth (m)	7.5	7.5	7.5	Mean	SE	Percent
Volume sampled (m^3)	0.35883	0.33415	0.3968	(Org/m^3)		
Replicate	1	2	3			
CLADOCERA						
Daphnia pulex*	312	1053	1129			
Daphnia longiremis	312	479	565			
immature Daphnia	0	0	0			
Bosmina longirostris	1828	3065	686			
Holopedium gibberum	134	383	161			
Chydorus sphaericus	0	0	0			
Alona costata						
Subtotal cladocerans	**2586**	**4980**	**2540**	**3369**	**806**	**9**
COPEPODA						
Epischura nevadensis	0	96	40			
epischurid copepodites	0	0	40			
Limnocalanus macrurus	0	0	0			
Limnocalanus copepodites	0	0	0			
Leptodiaptomus tyrrelli	401	766	282			
diaptomid copepodites	11995	23175	11976			
Cyclops scutifer	3790	5842	2581			
Diacyclops thomasi	0	0	0			
Ergasilius sp.						
cyclopoid copepodites*	3389	8140	2056			
copepod nauplii*	2051	5267	2540			
harpacticoid copepods	0	0	0			
Subtotal copepods	**21626**	**43286**	**19516**	**28143**	**7596**	**72**
ROTIFERA & PROTISTA						
Asplanchna priodonta	0	0	0			
Keratella cochlearis	0	0	0			
Keratella crassa						
Keratella irregularis						
Keratella quadrata	45	96	121			
Kellicottia longispina	2675	11013	6452			
Euchlanis parva	0	0	0			
Epiphanes sp.	0	0	0			
Ploesoma truncatum	0	0	0			
Notholca acuminata						
Polyarthra vulgaris						
Trichocerca multicrinis						
Filinia terminalis	0	0	0			
Conochilus unicornis	134	1437	645			
Conochiloides sp.	0	0	0			
unidentified rotifer*	0	0	0			
Difflugia sp.	0	0	0			
Philodina sp.						
peritrich colonies						
Subtotal rotifers & protista	**2854**	**12545**	**7218**	**7539**	**2802**	**19**
Other Zooplankters						
water mites	0	0	0			
Cypridopsis vidua	0	0	0			
Chaoborus larvae						
chironomid larvae	0	0	0			
Subtotal Others	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL DENSITY	**27066**	**60811**	**29274**	**39050**	**10899**	**100**

Note: Data represent numbers of zooplankton/m^3

Volume sampled is calculated based on flowmeter readings

**these taxa were excluded form the diversity anlayses as they could not be accuratly assigned to a genera*

Appendix 3.9-1

Lake Benthos and Taxonomic Results, Hope Bay Belt Project, 2009

Engineers and Scientists

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Wolverine	Wolverine	Wolverine			
Date Sampled						Aug 6/09	Aug 6/09	Aug 6/09			
Depth Zone						Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)						3.7	3.7	3.5			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	522	391	43			
	Subtotal					***522***	***391***	***43***	***319***	***143***	***2***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	43	0	43			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	0	435	0			
	Subtotal					***43***	***435***	***43***	***174***	***130***	***1***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	1870	304	3870			
	Subtotal					***1870***	***304***	***3870***	***2014***	***1032***	***15***
Pelecypoda		Sphaeriidae	-	-	(i/d)	1522	261	4435			
			-	-	*Pisidium*	6174	2435	7652			
	Subtotal					***7696***	***2696***	***12087***	***7493***	***2713***	***55***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	174	0	43			
	Subtotal					***174***	***0***	***43***	***72***	***52***	***1***
Ostracoda		-	-	-	-	696	0	3826			
	Subtotal					***696***	***0***	***3826***	***1507***	***1177***	***11***
Diptera		Chironomidae	-	-	(pupa)	348	0	0			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	435	913	130			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	43	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	0	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					Wolverine	Wolverine	Wolverine			
Date Sampled					Aug 6/09	Aug 6/09	Aug 6/09			
Depth Zone					Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)					3.7	3.7	3.5			
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	261	43	739			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	0	0	0			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	1087	43	1391			
				Rheotanytarsus	0	0	0			
				Tanytarsus	87	348	348			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***2265***	***1352***	***2612***	***2076***	***376***	***15***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***13265***	***5178***	***22525***	***13656***	***5012***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Imniagut	Imniagut	Imniagut			
Date Sampled						Aug 8/09	Aug 8/09	Aug 8/09			
Depth Zone						Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)						3.5	2	3.5			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	391	87			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	0	0	174			
	Subtotal					***0***	***391***	***261***	***217***	***115***	***1***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	1739	4087	2609			
			-	-	*Pisidium*	783	5913	609			
	Subtotal					***2522***	***10000***	***3217***	***5246***	***2385***	***22***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	130	870	522			
	Subtotal					***130***	***870***	***522***	***507***	***213***	***2***
Ostracoda		-	-	-	-	4522	10609	6957			
	Subtotal					***4522***	***10609***	***6957***	***7362***	***1769***	***31***
Diptera		Chironomidae	-	-	(pupa)	0	0	0			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	348	174			
					Thienemannimyia group	0	43	0			
				Procladiini	*Procladius*	652	1087	1739			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	0	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	43	696			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					Imniagut	Imniagut	Imniagut			
Date Sampled					Aug 8/09	Aug 8/09	Aug 8/09			
Depth Zone					Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)					3.5	2	3.5			
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	5304	7391	2609			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	0	0	0			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	783	2435	7130			
				Rheotanytarsus	0	0	0			
				Tanytarsus	0	0	348			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***6743***	***11350***	***12699***	***10264***	***1803***	***43***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	696	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	174	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	174			
	Daphnidae	-	-	(i/d)	43	0	0			
Total Benthos					***13917***	***33219***	***23656***	***23597***	***5572***	***100***

Data represents organisms/m²

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Patch South	Patch South	Patch South			
Date Sampled						Aug 12/09	Aug 12/09	Aug 12/09			
Depth Zone						Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)						3	3	3			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	0	43	0			
	Subtotal					***0***	***43***	***0***	***14***	***14***	***1***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	43	43	0			
	Subtotal					***43***	***43***	***0***	***29***	***14***	***1***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	87	0	0			
			-	-	*Pisidium*	43	0	0			
	Subtotal					***130***	***0***	***0***	***43***	***43***	***2***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	43	130	0			
	Subtotal					***43***	***130***	***0***	***58***	***38***	***3***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	870	174	0			
	Subtotal					***870***	***174***	***0***	***348***	***266***	***15***
Diptera		Chironomidae	-	-	(pupa)	43	0	0			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	391	130	0			
				Procladiini	*Procladius*	739	391	522			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	0	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	304	87	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					Patch S	Patch S	Patch S			
Date Sampled					Aug 12/09	Aug 12/09	Aug 12/09			
Depth Zone					Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)					3	3	3			
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	43	0	0			
				Chironomus	0	0	0			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	0	0	130			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	1957	304	87			
				Rheotanytarsus	0	0	0			
				Tanytarsus	217	87	0			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***3699***	***1003***	***742***	***1815***	***945***	***79***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	174	130	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***4786***	***1394***	***742***	***2307***	***1253***	***100***

Data represents organisms/m ^{2}
i/d = immature or damaged individuals
** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*
***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Patch South	Patch South	Patch South			
Date Sampled						Aug 11/09	Aug 11/09	Aug 11/09			
Depth Zone						Deep Depth	Deep Depth	Deep Depth	Mean	SE	%
Depth (m)						14	13.5	13.5			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	87	87	0			
	Subtotal					***87***	***87***	***0***	***58***	***29***	***7***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	0	0	0			
			-	-	*Pisidium*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	43			
	Subtotal					***0***	***0***	***43***	***14***	***14***	***2***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	0	87	130			
	Subtotal					***0***	***87***	***130***	***72***	***38***	***9***
Diptera		Chironomidae	-	-	(pupa)	0	43	0			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	87			
				Procladiini	*Procladius*	130	304	43			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	87	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	43	43			
					*Hydrobaenus**	0	43	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					Patch S	Patch S	Patch S			
Date Sampled					Aug 11/09	Aug 11/09	Aug 11/09			
Depth Zone					Deep Depth	Deep Depth	Deep Depth	Mean	SE	%
Depth (m)					14	13.5	13.5			
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	0	0	0			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	478	478	130			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	0	0	43			
				Rheotanytarsus	0	0	0			
				Tanytarsus	0	0	43			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***623***	***1014***	***405***	***680***	***178***	***82***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	43	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***710***	***1187***	***579***	***825***	***185***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Patch North	Patch North	Patch North			
Date Sampled						Aug 11/09	Aug 11/09	Aug 11/09			
Depth Zone						Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)						2.25	2.5	3.25			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	0	87	43			
	Subtotal					***0***	***87***	***43***	***43***	***25***	***5***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	0	87	0			
	Subtotal					***0***	***87***	***0***	***29***	***29***	***3***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	87	0	87			
			-	-	*Pisidium*	0	0	43			
	Subtotal					***87***	***0***	***130***	***72***	***38***	***9***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Diptera		Chironomidae	-	-	(pupa)	0	0	130			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	522			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	0	0	174			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	43	0	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	391			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					**Patch N**	**Patch N**	**Patch N**			
Date Sampled					**Aug 11/09**	**Aug 11/09**	**Aug 11/09**			
Depth Zone					**Shallow Depth**	**Shallow Depth**	**Shallow Depth**	**Mean**	**SE**	**%**
Depth (m)					**2.25**	**2.5**	**3.25**			
Major Group	**Family**	**Subfamily**	**Tribe**	**Genus**	**Rep-1**	**Rep-2**	**Rep-3**			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	43			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	0	0	0			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	0	0	0			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	87	0	304			
				Rheotanytarsus	0	0	0			
				Tanytarsus	87	87	174			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***220***	***89***	***1742***	***684***	***531***	***83***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	43			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***307***	***263***	***1916***	***829***	***544***	***100***

Data represents organisms/m²

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Patch North	Patch North	Patch North			
Date Sampled						Aug 9/09	Aug 9/09	Aug 9/09			
Depth Zone						Mid Depth	Mid Depth	Mid Depth	Mean	SE	%
Depth (m)						8	8	8.5			
Major Group		**Family**	**Subfamily**	**Tribe**	**Genus**	**Rep-1**	**Rep-2**	**Rep-3**			
Nematoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	0	0	0			
			-	-	*Pisidium*	0	0	43			
	Subtotal					***0***	***0***	***43***	***14***	***14***	***4***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	43			
	Subtotal					***0***	***0***	***43***	***14***	***14***	***4***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Diptera		Chironomidae	-	-	(pupa)	0	0	0			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	217	348	217			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	43	43	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					Patch N	Patch N	Patch N			
Date Sampled					Aug 9/09	Aug 9/09	Aug 9/09			
Depth Zone					Mid Depth	Mid Depth	Mid Depth	Mean	SE	%
Depth (m)					8	8	8.5			
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	0	0	0			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	0	0	0			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	0	0	0			
				Rheotanytarsus	0	0	0			
				Tanytarsus	0	43	0			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***269***	***443***	***226***	***313***	***66***	***92***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***269***	***443***	***313***	***342***	***52***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						P.O.	P.O.	P.O.			
Date Sampled						Aug 10/09	Aug 10/09	Aug 10/09			
Depth Zone						Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)						3.25	3.25	3.25			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	87			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	130	0	0			
	Subtotal					***130***	***0***	***87***	***72***	***38***	***12***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	0	87	43			
			-	-	*Pisidium*	130	174	0			
	Subtotal					***130***	***261***	***43***	***145***	***63***	***25***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	348			
	Subtotal					***0***	***0***	***348***	***116***	***116***	***20***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	43	174	261			
	Subtotal					***43***	***174***	***261***	***159***	***63***	***27***
Diptera		Chironomidae	-	-	(pupa)	0	0	43			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	43			
					Thienemannimyia group	43	0	87			
				Procladiini	*Procladius*	0	0	0			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	0	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009 (completed)

Site					P.O.	P.O.	P.O.			
Date Sampled					Aug 10/09	Aug 10/09	Aug 10/09			
Depth Zone					Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)					3.25	3.25	3.25			
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	0	0	0			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	0	0	0			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	0	0	0			
				Rheotanytarsus	0	0	0			
				Tanytarsus	0	0	0			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	43	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***90***	***3***	***177***	***90***	***50***	***15***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	43	261			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***395***	***438***	***916***	***583***	***167***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Ogama	Ogama	Ogama			
Date Sampled						Aug 14/09	Aug 14/09	Aug 14/09			
Depth Zone						Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)						4.8	4.2	4			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	0	43	0			
	Subtotal					***0***	***43***	***0***	***14***	***14***	***1***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	87	87	87			
	Subtotal					***87***	***87***	***87***	***87***	***0***	***8***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	0	43	0			
			-	-	*Pisidium*	0	0	0			
	Subtotal					***0***	***43***	***0***	***14***	***14***	***1***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	0	0	43			
	Subtotal					***0***	***0***	***43***	***14***	***14***	***1***
Diptera		Chironomidae	-	-	(pupa)	0	0	43			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	391	696	478			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	87	174			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	43	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					Ogama	Ogama	Ogama			
Date Sampled					Aug 14/09	Aug 14/09	Aug 14/09			
Depth Zone					Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)					4.8	4.2	4			
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	0	0	0			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	43	43	87			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	0	0	0			
				Rheotanytarsus	0	0	0			
				Tanytarsus	43	304	261			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***527***	***1135***	***1047***	***903***	***190***	***87***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***613***	***1309***	***1178***	***1033***	***213***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Doris South	Doris South	Doris South			
Date Sampled						Aug 17/09	Aug 17/09	Aug 17/09			
Depth Zone						Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)						4.1	4.2	4.5			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	0	0	43			
	Subtotal					***0***	***0***	***43***	***14***	***14***	***1***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	304	87	43			
	Subtotal					***304***	***87***	***43***	***145***	***81***	***10***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	0	0	43			
			-	-	*Pisidium*	0	0	0			
	Subtotal					***0***	***0***	***43***	***14***	***14***	***1***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	87	130			
	Subtotal					***0***	***87***	***130***	***72***	***38***	***5***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	174	0	217			
	Subtotal					***174***	***0***	***217***	***130***	***66***	***9***
Diptera		Chironomidae	-	-	(pupa)	0	0	0			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	174	43	87			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	0	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					Doris S	Doris S	Doris S			
Date Sampled					Aug 17/09	Aug 17/09	Aug 17/09			
Depth Zone					Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)					4.1	4.2	4.5			
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
				Parakiefferiella	43	0	43			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	0	0	0			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	1174	391	826			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	43	87	130			
				Paratanytarsus	0	0	0			
				Rheotanytarsus	0	0	0			
				Tanytarsus	43	87	43			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***1482***	***613***	***1135***	***1077***	***253***	***74***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***1961***	***787***	***1613***	***1454***	***348***	***100***

Data represents organisms/m²

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Doris South	Doris South	Doris South			
Date Sampled						Aug 17/09	Aug 17/09	Aug 17/09			
Depth Zone						Deep Depth	Deep Depth	Deep Depth	Mean	SE	%
Depth (m)						10.8	11	11			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	0	0	43			
	Subtotal					***0***	***0***	***43***	***14***	***14***	***2***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	43	43	87			
			-	-	*Pisidium*	0	0	0			
	Subtotal					***43***	***43***	***87***	***58***	***14***	***8***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	174	0	87			
	Subtotal					***174***	***0***	***87***	***87***	***50***	***12***
Diptera		Chironomidae	-	-	(pupa)	0	0	0			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	174	87	43			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	174	87	43			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					Doris S	Doris S	Doris S			
Date Sampled					Aug 17/09	Aug 17/09	Aug 17/09			
Depth Zone					Deep Depth	Deep Depth	Deep Depth	Mean	SE	%
Depth (m)					10.8	11	11			
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	43			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	0	0	43			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	174	435	304			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	0	0	0			
				Rheotanytarsus	0	0	0			
				Tanytarsus	0	0	0			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***533***	***620***	***489***	***547***	***38***	***77***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	43	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***750***	***663***	***707***	***707***	***25***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Doris North	Doris North	Doris North			
Date Sampled						Aug 15/09	Aug 15/09	Aug 15/09			
Depth Zone						Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)						4.5	3.8	4			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	0	130	0			
	Subtotal					***0***	***130***	***0***	***43***	***43***	***3***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	0	217	696			
	Subtotal					***0***	***217***	***696***	***304***	***205***	***22***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	0	0	43			
			-	-	*Pisidium*	0	0	130			
	Subtotal					***0***	***0***	***174***	***58***	***58***	***4***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Diptera		Chironomidae	-	-	(pupa)	0	43	0			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	0	1000	261			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	174	0	0			
			Prodiamesinae		*Monodiamesa*	0	87	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					Doris N	Doris N	Doris N			
Date Sampled					Aug 15/09	Aug 15/09	Aug 15/09			
Depth Zone					Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)					4.5	3.8	4			
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
				Parakiefferiella	0	43	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	130	43	304			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	130	391	0			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	0	0	43			
				Rheotanytarsus	0	0	0			
				Tanytarsus	0	174	43			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***439***	***1786***	***656***	***961***	***418***	***70***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***439***	***2134***	***1526***	***1366***	***496***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Doris North	Doris North	Doris North			
Date Sampled						Aug 15/09	Aug 15/09	Aug 15/09			
Depth Zone						Deep Depth	Deep Depth	Deep Depth	Mean	SE	%
Depth (m)						13.5	14	15			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	43	43	0			
	Subtotal					***43***	***43***	***0***	***29***	***14***	***5***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	261	43	0			
	Subtotal					***261***	***43***	***0***	***101***	***81***	***16***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	0	0	0			
			-	-	*Pisidium*	0	43	0			
	Subtotal					***0***	***43***	***0***	***14***	***14***	***2***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Diptera		Chironomidae	-	-	(pupa)	0	130	43			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	87	0	0			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	0	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					Doris N	Doris N	Doris N			
Date Sampled					Aug 15/09	Aug 15/09	Aug 15/09			
Depth Zone					Deep Depth	Deep Depth	Deep Depth	Mean	SE	%
Depth (m)					13.5	14	15			
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	174	652	348			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	0	0	0			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	0	0	0			
				Rheotanytarsus	0	0	0			
				Tanytarsus	0	0	0			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***274***	***797***	***406***	***492***	***157***	***77***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***579***	***927***	***406***	***637***	***153***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Little Roberts	Little Roberts	Little Roberts			
Date Sampled						Aug 7/09	Aug 7/09	Aug 7/09			
Depth Zone						Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)						2.6	2.6	2.6			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	43	43	130			
	Subtotal					***43***	***43***	***130***	***72***	***29***	***1***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	87	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	87	43	43			
	Subtotal					***174***	***43***	***43***	***87***	***43***	***1***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	43	0	304			
			-	-	*Pisidium*	304	348	130			
	Subtotal					***348***	***348***	***435***	***377***	***29***	***3***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	43	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***43***	***0***	***14***	***14***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	43	0			
	Subtotal					***0***	***43***	***0***	***14***	***14***	***0***
Ostracoda		-	-	-	-	130	348	478			
	Subtotal					***130***	***348***	***478***	***319***	***101***	***3***
Diptera		Chironomidae	-	-	(pupa)	130	87	0			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	1348	522	1826			
			Diamesinae	Diamesini	*Diamesa*	43	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	0	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	87	565	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site Date Sampled Depth Zone Depth (m) Major Group	Family	Subfamily	Tribe	Genus	Little Roberts Aug 7/09 Shallow Depth 2.6 Rep-1	Little Roberts Aug 7/09 Shallow Depth 2.6 Rep-2	Little Roberts Aug 7/09 Shallow Depth 2.6 Rep-3	Mean	SE	%
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	478	696	0			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	43	217	87			
				Stictochironomus	0	0	0			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	8652	12826	2000			
				Rheotanytarsus	0	0	0			
				Tanytarsus	1565	1000	696			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***12350***	***15916***	***4611***	***10959***	***3337***	***93***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	43	43	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***13046***	***16785***	***5698***	***11843***	***3257***	***100***

Data represents organisms/m^2
i/d = immature or damaged individuals
** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*
***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Naiqunnguut	Naiqunnguut	Naiqunnguut			
Date Sampled						Aug 10/09	Aug 10/09	Aug 10/09			
Depth Zone						Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)						4.5	4.5	4.25			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	87	43	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	0	0	0			
	Subtotal					***87***	***43***	***0***	***43***	***25***	***4***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	0	0	304			
			-	-	*Pisidium*	0	0	174			
	Subtotal					***0***	***0***	***478***	***159***	***159***	***16***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	87			
	Subtotal					***0***	***0***	***87***	***29***	***29***	***3***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	43	43			
	Subtotal					***0***	***43***	***43***	***29***	***14***	***3***
Ostracoda		-	-	-	-	87	0	391			
	Subtotal					***87***	***0***	***391***	***159***	***119***	***16***
Diptera		Chironomidae	-	-	(pupa)	0	0	0			
			Tanypodinae	Pentaneurini	(i/d)	43	0	43			
					Ablabesmyia	0	0	43			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	0	0	0			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	43	0	87			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	43	0	43			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site Date Sampled Depth Zone Depth (m) Major Group	Family	Subfamily	Tribe	Genus	Naiqunnguut Aug 10/09 Shallow Depth 4.5 Rep-1	Naiqunnguut Aug 10/09 Shallow Depth 4.5 Rep-2	Naiqunnguut Aug 10/09 Shallow Depth 4.25 Rep-3	Mean	SE	%
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	43	0	0			
		Chironominae	Chironomini	(i/d)	0	0	43			
				Chironomus	0	0	0			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	174			
				Stictochironomus	43	87	739			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	174	0	130			
				Rheotanytarsus	0	0	0			
				Tanytarsus	0	0	0			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***396***	***91***	***1309***	***599***	***366***	***59***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	43	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	43	0	0			
Total Benthos					***570***	***178***	***2309***	***1019***	***655***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site Date Sampled Depth Zone Depth (m) Major Group		Family	Subfamily	Tribe	Genus	Nakhaktok Aug 6/09 Shallow Depth 3.4 Rep-1	Nakhaktok Aug 6/09 Shallow Depth 3.5 Rep-2	Nakhaktok Aug 6/09 Shallow Depth 3.5 Rep-3	Mean	SE	%
Nematoda		-	-	-	-	435	304	435			
	Subtotal					***435***	***304***	***435***	***391***	***43***	***5***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	1000	478	348			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	130	174	130			
	Subtotal					***1130***	***652***	***478***	***754***	***195***	***10***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	0	43	0			
			-	-	*Pisidium*	0	0	0			
	Subtotal					***0***	***43***	***0***	***14***	***14***	***0***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	130	174	87			
	Subtotal					***130***	***174***	***87***	***130***	***25***	***2***
Ostracoda		-	-	-	-	609	261	43			
	Subtotal					***609***	***261***	***43***	***304***	***165***	***4***
Diptera		Chironomidae	-	-	(pupa)	0	0	0			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	43	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	0	174	348			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	0	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site / Date Sampled / Depth Zone / Depth (m) / Major Group	Family	Subfamily	Tribe	Genus	Nakhaktok Aug 6/09 Shallow Depth 3.4 Rep-1	Nakhaktok Aug 6/09 Shallow Depth 3.5 Rep-2	Nakhaktok Aug 6/09 Shallow Depth 3.5 Rep-3	Mean	SE	%
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	87			
				Chironomus	6565	3913	3174			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	957	1043	826			
				Stictochironomus	0	261	87			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	261	174	43			
				Rheotanytarsus	0	0	0			
				Tanytarsus	0	261	217			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***7786***	***5873***	***4786***	***6148***	***877***	***79***
Non-Benthic Invertebrates*										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***10090***	***7308***	***5830***	***7743***	***1249***	***100***

Data represents organisms/m²

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site Date Sampled Depth Zone Depth (m) Major Group		Family	Subfamily	Tribe	Genus	Nakhaktok Aug 6/09 Mid Depth 7.7 Rep-1	Nakhaktok Aug 6/09 Mid Depth 7.5 Rep-2	Nakhaktok Aug 6/09 Mid Depth 7.5 Rep-3	Mean	SE	%
Nematoda		-	-	-	-	261	1087	696			
	Subtotal					***261***	***1087***	***696***	***681***	***239***	***9***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	261	348	87			
			-	-	*Pisidium*	0	0	0			
	Subtotal					***261***	***348***	***87***	***232***	***77***	***3***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Diptera		Chironomidae	-	-	(pupa)	130	87	0			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	0	43	261			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	0	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site Date Sampled Depth Zone Depth (m) Major Group	Family	Subfamily	Tribe	Genus	Nakhaktok Aug 6/09 Mid Depth 7.7 Rep-1	Nakhaktok Aug 6/09 Mid Depth 7.5 Rep-2	Nakhaktok Aug 6/09 Mid Depth 7.5 Rep-3	Mean	SE	%
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	3261	7087	9087			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	0	0	0			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	0	0	0			
				Rheotanytarsus	0	0	0			
				Tanytarsus	43	0	43			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***3442***	***7225***	***9399***	***6689***	***1740***	***88***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***3964***	***8660***	***10181***	***7602***	***1871***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Windy	Windy	Windy			
Date Sampled						Aug 9/09	Aug 9/09	Aug 9/09			
Depth Zone						Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)						3.3	3.5	3.5			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	0	0	0			
			-	-	*Pisidium*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	0	130	0			
	Subtotal					***0***	***130***	***0***	***43***	***43***	***12***
Diptera		Chironomidae	-	-	(pupa)	0	43	43			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	0	174	0			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	43	87	174			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	261	43			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					Windy	Windy	Windy			
Date Sampled					Aug 9/09	Aug 9/09	Aug 9/09			
Depth Zone					Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)					3.3	3.5	3.5			
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	0	0	0			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	0	0	0			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	0	0	0			
				Rheotanytarsus	0	0	0			
				Tanytarsus	0	0	43			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***47***	***569***	***308***	***308***	***151***	***88***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***47***	***699***	***308***	***351***	***190***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Windy Lake	Windy Lake	Windy Lake			
Date Sampled						Aug 9/09	Aug 9/09	Aug 9/09			
Depth Zone						Deep Depth	Deep Depth	Deep Depth	Mean	SE	%
Depth (m)						18	18	18			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	0	0	0			
			-	-	*Pisidium*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Diptera		Chironomidae	-	-	(pupa)	0	0	0			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	130	0	0			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	0	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					Windy Lake	Windy Lake	Windy Lake			
Date Sampled					**Aug 9/09**	**Aug 9/09**	**Aug 9/09**			
Depth Zone					**Deep Depth**	**Deep Depth**	**Deep Depth**	**Mean**	**SE**	**%**
Depth (m)					**18**	**18**	**18**			
Major Group	**Family**	**Subfamily**	**Tribe**	**Genus**	**Rep-1**	**Rep-2**	**Rep-3**			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	261	43	87			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	0	0	0			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	0	0	0			
				Rheotanytarsus	0	0	0			
				Tanytarsus	0	0	0			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***409***	***61***	***105***	***192***	***109***	***100***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***409***	***61***	***105***	***192***	***109***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						**Glenn Lake**	**Glenn Lake**	**Glenn Lake**			
Date Sampled						**Aug 8/09**	**Aug 8/09**	**Aug 8/09**			
Depth Zone						**Shallow Depth**	**Shallow Depth**	**Shallow Depth**	**Mean**	**SE**	**%**
Depth (m)						**4.5**	**4.5**	**4.5**			
Major Group		**Family**	**Subfamily**	**Tribe**	**Genus**	**Rep-1**	**Rep-2**	**Rep-3**			
Nematoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	0	0	0			
			-	-	*Pisidium*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	0	0	43			
	Subtotal					***0***	***0***	***43***	***14***	***14***	***2***
Diptera		Chironomidae	-	-	(pupa)	0	174	348			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	609	522	174			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	0	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	87	43			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	87			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					Glenn Lake	Glenn Lake	Glenn Lake			
Date Sampled					Aug 8/09	Aug 8/09	Aug 8/09			
Depth Zone					Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)					4.5	4.5	4.5			
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	0	0	0			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	0	0	0			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	0	0	0			
				Rheotanytarsus	0	0	0			
				Tanytarsus	0	0	0			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***613***	***787***	***657***	***686***	***52***	***98***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***613***	***787***	***700***	***700***	***50***	***100***

Data represents organisms/m²

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Glenn Lake	Glenn Lake	Glenn Lake			
Date Sampled						Aug 8/09	Aug 8/09	Aug 8/09			
Depth Zone						Deep Depth	Deep Depth	Deep Depth	Mean	SE	%
Depth (m)						19.5	19.5	19.5			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	0	0	0			
			-	-	*Pisidium*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Diptera		Chironomidae	-	-	(pupa)	0	0	0			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	0	87	0			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	0	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	43	0	261			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	87	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					Glenn Lake	Glenn Lake	Glenn Lake			
Date Sampled					Aug 8/09	Aug 8/09	Aug 8/09			
Depth Zone					Deep Depth	Deep Depth	Deep Depth	Mean	SE	%
Depth (m)					19.5	19.5	19.5			
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	0	0	0			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	0	0	0			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	0	0	0			
				Rheotanytarsus	0	0	0			
				Tanytarsus	0	0	0			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***150***	***106***	***280***	***179***	***52***	***100***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***150***	***106***	***280***	***179***	***52***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Ref. Lake A	Ref. Lake A	Ref. Lake A			
Date Sampled						Aug 13/09	Aug 13/09	Aug 13/09			
Depth Zone						Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)						3.5	2.5	4.1			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	217	0	0			
			-	-	*Pisidium*	0	0	261			
	Subtotal					***217***	***0***	***261***	***159***	***81***	***13***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	43			
	Subtotal					***0***	***0***	***43***	***14***	***14***	***1***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Diptera		Chironomidae	-	-	(pupa)	0	0	0			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	261	130	348			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	0	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	43			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					Ref Lk A	Ref Lk A	Ref Lk A			
Date Sampled					Aug 13/09	Aug 13/09	Aug 13/09			
Depth Zone					Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)					3.5	2.5	4.1			
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	0	0	0			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	696	0	1435			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	43	43	0			
				Paratanytarsus	0	0	0			
				Rheotanytarsus	0	0	0			
				Tanytarsus	130	0	43			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***1134***	***176***	***1874***	***1061***	***491***	***86***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***1351***	***176***	***2178***	***1235***	***581***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Ref. Lake A	Ref. Lake A	Ref. Lake A			
Date Sampled						Aug 13/09	Aug 13/09	Aug 13/09			
Depth Zone						Deep Depth	Deep Depth	Deep Depth	Mean	SE	%
Depth (m)						31.5	31.5	31.5			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	0	43	0			
	Subtotal					***0***	***43***	***0***	***14***	***14***	***10***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	0	0	0			
			-	-	*Pisidium*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Diptera		Chironomidae	-	-	(pupa)	0	0	0			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	0	0	87			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	0	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					Ref Lk A	Ref Lk A	Ref Lk A			
Date Sampled					Aug 13/09	Aug 13/09	Aug 13/09			
Depth Zone					Deep Depth	Deep Depth	Deep Depth	Mean	SE	%
Depth (m)					31.5	31.5	31.5			
Major Group	**Family**	**Subfamily**	**Tribe**	**Genus**	**Rep-1**	**Rep-2**	**Rep-3**			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	0	0	43			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	87	43	0			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	0	0	43			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	0	0	0			
				Paratanytarsus	0	0	0			
				Rheotanytarsus	0	0	0			
				Tanytarsus	0	0	0			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***118***	***75***	***205***	***133***	***38***	***90***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***118***	***118***	***205***	***147***	***29***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Ref. Lake B	Ref. Lake B	Ref. Lake B			
Date Sampled						Aug 16/09	Aug 16/09	Aug 16/09			
Depth Zone						Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)						4.5	4.8	4.9			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	0			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Pelecypoda		Sphaeriidae	-	-	(i/d)	43	0	43			
			-	-	*Pisidium*	0	130	0			
	Subtotal					***43***	***130***	***43***	***72***	***29***	***7***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Diptera		Chironomidae	-	-	(pupa)	0	0	0			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	130	87	43			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	0	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	43	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					Ref Lk B	Ref Lk B	Ref Lk B			
Date Sampled					Aug 16/09	Aug 16/09	Aug 16/09			
Depth Zone					Shallow Depth	Shallow Depth	Shallow Depth	Mean	SE	%
Depth (m)					4.5	4.8	4.9			
Major Group	Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	87	43	696			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	43	0	0			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	0	0	0			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	130	87	0			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	0	0	0			
				Micropsectra	43	304	1087			
				Paratanytarsus	0	0	0			
				Rheotanytarsus	0	0	0			
				Tanytarsus	0	0	43			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***439***	***570***	***1874***	***961***	***458***	***93***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***483***	***700***	***1918***	***1034***	***447***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site						Ref. Lake B	Ref. Lake B	Ref. Lake B			
Date Sampled						Aug 16/09	Aug 16/09	Aug 16/09			
Depth Zone						Mid Depth	Mid Depth	Mid Depth	Mean	SE	%
Depth (m)						9.5	9.5	9.2			
Major Group		Family	Subfamily	Tribe	Genus	Rep-1	Rep-2	Rep-3			
Nematoda		-	-	-	-	43	0	43			
	Subtotal					***43***	***0***	***43***	***29***	***14***	***1***
Oligochaeta		Enchytraeidae	-	-	-	0	0	0			
		Lumbriculidae	-	-	-	0	0	43			
		Naididae	-	-	-	0	0	0			
		Tubificidae	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***43***	***14***	***14***	***1***
Gastropoda		Physidae	-	-	*Physa*	0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	87	87			
	Subtotal					***0***	***87***	***87***	***58***	***29***	***2***
Pelecypoda		Sphaeriidae	-	-	(i/d)	130	0	0			
			-	-	*Pisidium*	174	130	304			
	Subtotal					***304***	***130***	***304***	***246***	***58***	***9***
Amphipoda		Epimeriidae	-	-	*Epimeria loricata*	0	0	0			
		Gammaridae	-	-	*Gammarus lacustris*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Ostracoda		-	-	-	-	0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***
Diptera		Chironomidae	-	-	(pupa)	0	0	0			
			Tanypodinae	Pentaneurini	(i/d)	0	0	0			
					Ablabesmyia	0	0	0			
					Thienemannimyia group	0	0	0			
				Procladiini	*Procladius*	261	87	217			
			Diamesinae	Diamesini	*Diamesa*	0	0	0			
					Potthastia longimana group	0	0	0			
					Pseudokiefferiella	0	0	0			
				Protanypini	*Protanypus*	0	0	0			
			Prodiamesinae		*Monodiamesa*	0	0	0			
			Orthocladiinae	-	(i/d)	0	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	0	0	0			
					Corynoneura	0	0	0			
					Eukiefferiella	0	0	0			
					Euryhapsis	0	0	0			
					Heterotrissocladius	0	0	0			
					*Hydrobaenus**	0	0	0			
					Krenosmittia	0	0	0			
					Nanocladius	0	0	0			
					Mesocricotopus	0	0	0			
					Paracladius	0	0	0			
					Doncricotopus	0	0	0			

Appendix 3.9-1. Lake Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site					**Ref Lk B**	**Ref Lk B**	**Ref Lk B**			
Date Sampled					**Aug 16/09**	**Aug 16/09**	**Aug 16/09**			
Depth Zone					**Mid Depth**	**Mid Depth**	**Mid Depth**	**Mean**	**SE**	**%**
Depth (m)					**9.5**	**9.5**	**9.2**			
Major Group	**Family**	**Subfamily**	**Tribe**	**Genus**	**Rep-1**	**Rep-2**	**Rep-3**			
				Parakiefferiella	0	0	0			
				Parametriocnemus	0	0	0			
				Psilometriocnemus	0	0	0			
				Psectrocladius	0	0	0			
				Pseudosmittia	0	0	0			
				Synorthocladius	0	0	0			
				Thienemanniella	0	0	0			
				Tvetenia	0	0	0			
				Zalutschia	1478	739	1609			
		Chironominae	Chironomini	(i/d)	0	0	0			
				Chironomus	130	261	217			
				Cryptochironomus	0	0	0			
				Dicrotendipes	0	0	0			
				Parachironomus	0	0	0			
				Paracladopelma	0	0	0			
				Polypedilum	0	0	0			
				Sergenta	0	0	0			
				Stictochironomus	0	0	0			
			Tanytarsini	*Cladotanytarsus*	0	0	0			
				Constempellina	0	0	0			
				Corynocera	87	43	174			
				Micropsectra	43	0	0			
				Paratanytarsus	0	0	0			
				Rheotanytarsus	0	0	0			
				Tanytarsus	304	261	1000			
	Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0			
			-	*Bezzia*	0	0	0			
	Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0			
	Empididae	-	-	(pupa)	0	0	0			
		-	-	*Clinocera*	0	0	0			
	Ephydridae	-	-	*Scatophila*	0	0	0			
	Simulidae	-	-	*Metacnephia*	0	0	0			
		-	-	*Prosimulium*	0	0	0			
		-	-	*Simulium*	0	0	0			
	Tipulidae	-	-	*Tipula*	0	0	0			
Subtotal					***2314***	***1401***	***3227***	***2314***	***527***	***87***
Non-Benthic Invertebrates**										
Copepoda - Calanoida	-	-	-	-	0	0	0			
Copepoda - Cyclopoida	Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0			
Copepoda - Cyclopoida	Ergasilidae	-	-	*Ergasilus*	0	0	0			
Cladocera	Bosminidae	-	-	*Bosmina*	0	0	0			
	Daphnidae	-	-	(i/d)	0	0	0			
Total Benthos					***2662***	***1618***	***3705***	***2662***	***602***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the total*

Appendix 3.10-1

Stream Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

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Engineers and Scientists

Appendix 3.10-1. Stream Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site Date Sampled Major Group		Family	Subfamily	Tribe	Genus	Patch OF July 23/09 Rep-1	Patch OF July 23/09 Rep-2	Patch OF July 23/09 Rep-3	Mean	SE	%	P.O. OF July 23/09 Rep-1	P.O. OF July 23/09 Rep-2	P.O. OF July 23/09 Rep-3	Mean	SE	%
Coelenterata		Hydridae	-	-	*Hydra*	0	0	0				0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Nematoda		-	-	-	-	104	42	21				417	1604	1583			
	Subtotal					***104***	***42***	***21***	***56***	***25***	***2***	***417***	***1604***	***1583***	***1201***	***392***	***24***
Hirudinea		Piscicolidae	-	-	*Piscicola punctata*	0	0	0				0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta		Enchytraeidae	-	-	-	0	83	83				0	83	42			
		Lumbriculidae	-	-	-	21	0	0				135	1448	1615			
		Naididae	-	-	-	0	0	0				0	0	0			
		Tubificidae	-	-	-	271	1375	167				542	469	0			
	Subtotal					***292***	***1458***	***250***	***667***	***396***	***21***	***677***	***2000***	***1656***	***1444***	***396***	***29***
Gastropoda		Physidae	-	-	*Physa*	0	0	0				0	0	0			
		Valvatidae	-	-	*Valvata sincera*	0	0	0				0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		Chaetiliidae	-	-	*Saduria entomon*	83	198	10				0	0	0			
	Subtotal					***83***	***198***	***10***	***97***	***55***	***3***	***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		-	-	-	-	0	0	0				0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		Mysidae	-	-	*Mysis relicta*	0	0	0				0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		-	-	-	-	0	0	10				0	0	42			
	Subtotal					***0***	***0***	***10***	***3***	***3***	***0***	***0***	***0***	***42***	***14***	***14***	***0***
Ostracoda		-	-	-	-	0	271	0				0	354	292			
	Subtotal					***0***	***271***	***0***	***90***	***90***	***3***	***0***	***354***	***292***	***215***	***109***	***4***
Ephemeroptera		Ameletidae	-	-	*Ameletus inopinatus*	0	0	0				0	0	0			
		Baetidae	-	-	(i/d)	0	0	0				0	0	0			
		Baetidae	-	-	*Baetis*	0	0	0				0	0	0			
		Siphlonuridae	-	-	*Parameletus*	0	0	0				0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Plecoptera		Nemouridae	-	-	*Nemoura*	0	0	10				0	0	0			
	Subtotal					***0***	***0***	***10***	***3***	***3***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Trichoptera		Limnephilidae	-	-	(i/d)	0	0	0				0	0	0			
			-	-	*Grensia praeterica*	0	0	0				0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Coleoptera		Dytiscidae	-	-	*Oreodytes*	0	0	0				0	0	0			
	Subtotal					***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Diptera		Chironomidae	-	-	(pupa)	198	250	0				83	104	375			
			Tanypodinae	Pentaneurini	(i/d)	0	0	31				0	0	42			
					Ablabesmyia	0	0	0				0	31	0			
					Thienemannimyia group	0	0	0				10	42	31			
				Procladiini	*Procladius*	0	0	0				0	0	10			
			Diamesinae	Diamesini	*Diamesa*	0	0	0				0	0	0			
					Potthastia longimana group	0	0	0				0	0	0			
					Pseudokiefferiella	0	0	0				0	0	0			
				Protanypini	*Protanypus*	0	0	0				0	0	0			
			Prodiamesinae		*Monodiamesa*	0	0	0				0	0	0			
			Orthocladiinae	-	(i/d)	42	0	0				10	0	0			
				Orthocladiini	*Cricotopus/Orthocladius*	740	750	438				427	365	1031			
					Corynoneura	0	0	0				0	104	42			
					Eukiefferiella	0	0	0				0	0	0			
					Euryhapsis	0	0	0				0	0	0			
					Heterotrissocladius	0	0	0				0	0	0			
					*Hydrobaenus**	0	0	0				0	21	0			
					Krenosmittia	0	0	0				0	0	0			
					Nanocladius	0	0	0				0	0	0			
					Mesocricotopus	0	0	0				0	0	0			
					Paracladius	0	0	0				0	0	0			
					Doncricotopus	94	83	10				583	115	188			
					Parakiefferiella	0	83	0				10	0	125			
					Parametriocnemus	0	0	0				0	0	0			
					Psilometriocnemus	0	0	0				0	0	0			
					Psectrocladius	0	0	0				0	0	0			
					Pseudosmittia	0	0	0				0	0	0			
					Synorthocladius	0	0	0				0	0	0			
					Thienemanniella	0	0	0				0	0	0			
					Tvetenia	0	0	31				0	0	0			
					Zalutschia	0	0	0				0	0	0			
			Chironominae	Chironomini	(i/d)	0	0	0				0	0	0			
					Chironomus	0	0	0				0	0	0			
					Cryptochironomus	0	10	0				63	115	260			
					Dicrotendipes	0	0	0				0	0	0			
					Parachironomus	0	0	0				0	0	0			
					Paracladopelma	0	21	0				0	0	0			
					Polypedilum	10	0	21				0	0	0			
					Sergenta	0	0	0				0	0	0			
					Stictochironomus	0	31	63				427	208	115			
				Tanytarsini	*Cladotanytarsus*	0	21	0				0	0	0			
					Constempellina	0	0	0				0	0	167			
					Corynocera	0	0	0				0	0	0			
					Micropsectra	0	0	0				0	0	0			
					Paratanytarsus	146	104	10				63	417	625			
					Rheotanytarsus	0	0	0				0	0	0			
					Tanytarsus	0	0	0				0	21	229			
		Ceratopogonidae	Ceratopogoninae	-	(i/d)	0	0	0				0	0	0			
				-	*Bezzia*	0	0	0				0	0	0			
		Ceratopogonidae	Dasyheleinae	-	*Dasyhelea*	0	0	0				0	0	0			
		Empididae	-	-	(pupa)	0	0	0				0	0	0			
			-	-	*Clinocera*	0	0	0				0	0	0			
		Ephydridae	-	-	*Scatophila*	0	0	0				0	0	0			
		Simulidae	-	-	*Metacnephia*	542	0	1104				0	0	0			
			-	-	*Prosimulium*	0	0	0				0	0	0			
			-	-	*Simulium*	917	542	271				0	0	0			
		Tipulidae	-	-	*Tipula*	63	42	52				0	0	0			
	Subtotal					***2750***	***1938***	***2031***	***2240***	***257***	***71***	***1677***	***1542***	***3240***	***2153***	***545***	***43***
Non-Benthic Invertebrates**																	
Copepoda - Calanoida		-	-	-	-	0	0	0				0	0	0			
Copepoda - Cyclopoida		Cyclopidae	Cyclopinae	-	*Acanthocyclops*	0	0	0				0	0	83			
Cladocera		Chydoridae	-	-	*Eurycercus*	0	0	0				83	0	0			
Total Benthos						***3229***	***3906***	***2333***	***3156***	***456***	***100***	***2771***	***5500***	***6813***	***5028***	***1190***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the data analyses conducted*

Appendix 3.10-1. Stream Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site		Ogama OF	Ogama OF	Ogama OF	Mean	SE	%	Doris OF	Doris OF	Doris OF	Mean	SE	%	Little Roberts OF	Little Roberts OF	Little Roberts OF	Mean	SE	%
Date Sampled		**July 23/09**	**July 23/09**	**July 23/09**				**July 21/09**	**July 21/09**	**July 21/09**				**Jul 22/09**	**Jul 22/09**	**Jul 22/09**			
Major Group		**Rep-1**	**Rep-2**	**Rep-3**				**Rep-1**	**Rep-2**	**Rep-3**				**Rep-1**	**Rep-2**	**Rep-3**			
Coelenterata		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***
Nematoda		1344	250	198				427	1115	521				2375	792	1000			
	Subtotal	***1344***	***250***	***198***	***597***	***374***	***5***	***427***	***1115***	***521***	***688***	***215***	***3***	***2375***	***792***	***1000***	***1389***	***497***	***9***
Hirudinea		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***
Oligochaeta		83	0	0				833	0	750				0	0	0			
		83	21	0				1219	0	771				1708	240	1438			
		0	0	0				0	0	0				0	0	0			
		167	313	73				417	1969	1875				2333	1896	3615			
	Subtotal	***333***	***333***	***73***	***247***	***87***	***2***	***2469***	***1969***	***3396***	***2611***	***418***	***10***	***4042***	***2135***	***5052***	***3743***	***855***	***25***
Gastropoda		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***
Isopoda		0	0	0				0	10	0				0	0	0			
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***10***	***0***	***3***	***3***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		0	0	0				208	0	0				0	0	0			
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***208***	***0***	***0***	***69***	***69***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		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***
Hydracarina		323	490	802				563	3844	125				0	42	42			
	Subtotal	***323***	***490***	***802***	***538***	***140***	***4***	***563***	***3844***	***125***	***1510***	***1173***	***6***	***0***	***42***	***42***	***28***	***14***	***0***
Ostracoda		0	0	0				2292	83	417				1333	1000	417			
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***2292***	***83***	***417***	***931***	***687***	***4***	***1333***	***1000***	***417***	***917***	***268***	***6***
Ephemeroptera		0	0	0				0	0	0				0	0	0			
		0	0	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			
	Subtotal	***0***	***0***	***10***	***3***	***3***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Plecoptera		167	94	31				0	83	21				0	0	42			
	Subtotal	***167***	***94***	***31***	***97***	***39***	***1***	***0***	***83***	***21***	***35***	***25***	***0***	***0***	***0***	***42***	***14***	***14***	***0***
Trichoptera		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	10			
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***10***	***3***	***3***	***0***
Coleoptera		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***
Diptera		677	594	958				2844	188	260				1292	573	333			
		0	0	0				0	0	0				125	0	0			
		0	0	0				0	0	0				0	0	0			
		94	229	94				406	31	83				52	104	125			
		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			
		73	833	31				94	208	73				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				885	94	83				42	83	0			
		760	1198	188				2406	552	271				906	406	1167			
		0	0	0				0	0	0				208	250	167			
		0	0	0				0	94	0				0	0	0			
		0	42	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				52	0	0				250	0	83			
		0	0	0				0	0	0				0	0	0			
		0	0	0				2313	83	0				0	0	83			
		0	0	0				0	0	0				0	125	52			
		0	0	0				0	0	0				0	0	0			
		0	0	0				27823	250	9052				4104	3760	3594			
		0	0	0				625	167	104				1542	667	750			
		0	0	0				0	10	21				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				167	10	0			
		0	0	0				0	0	0				0	0	0			
		83	146	31				0	1510	167				0	83	0			
		0	10	0				0	0	0				0	0	0			
		167	42	0				0	0	0				0	0	125			
		0	0	0				0	0	0				0	0	0			
		0	42	0				0	0	0				83	10	0			
		0	0	0				188	0	63				0	0	0			
		0	10	0				0	0	0				167	156	146			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	52	42			
		0	42	0				0	0	0				52	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	10				0	167	10				333	948	240			
		0	0	0				0	0	0				125	83	0			
		0	42	0				2125	250	188				208	83	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	10	0				42	0	83				177	115	125			
		0	0	0				0	0	0				0	0	42			
		167	10	10				0	0	0				688	458	396			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		3010	31	73				3219	344	250				0	0	0			
		0	0	0				0	0	0				0	0	0			
		21469	1042	10				0	0	0				0	0	0			
		104	73	63				10	177	0				10	21	21			
	Subtotal	***26604***	***4396***	***1469***	***10823***	***7936***	***88***	***43031***	***4125***	***10708***	***19288***	***12023***	***77***	***10531***	***7990***	***7500***	***8674***	***940***	***59***
Non-Benthic Invertebrates**																			
Copepoda - Calanoida		0	0	0				0	0	0				0	0	0			
Copepoda - Cyclopoida		0	0	0				0	83	0				167	83	83			
Cladocera		0	0	0				0	0	0				1458	0	0			
Total Benthos		***28771***	***5563***	***2583***	***12306***	***8277***	***100***	***48990***	***11229***	***15188***	***25135***	***11982***	***100***	***18281***	***11958***	***14063***	***14767***	***1859***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the data analyses conducted*

Appendix 3.10-1. Stream Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site		Windy OF	Windy OF	Windy OF				Glenn OF D/S	Glenn OF D/S	Glenn OF D/S				Koignuk U/S	Koignuk U/S	Koignuk U/S			
Date Sampled		July 22/09	July 22/09	July 22/09	Mean	SE	%	July 23/09	July 23/09	July 23/09	Mean	SE	%	July 24/09	July 24/09	July 24/09	Mean	SE	%
Major Group		Rep-1	Rep-2	Rep-3				Rep-1	Rep-2	Rep-3				Rep-1	Rep-2	Rep-3			
Coelenterata		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***
Nematoda		594	115	73				0	0	0				0	42	115			
	Subtotal	***594***	***115***	***73***	***260***	***167***	***6***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***42***	***115***	***52***	***33***	***6***
Hirudinea		0	0	0				0	10	0				0	0	0			
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***10***	***0***	***3***	***3***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta		0	10	0				83	0	0				0	52	31			
		0	0	0				0	0	0				0	0	0			
		83	0	0				0	0	0				0	0	0			
		0	52	0				10	42	0				10	21	42			
	Subtotal	***83***	***63***	***0***	***49***	***25***	***1***	***94***	***42***	***0***	***45***	***27***	***1***	***10***	***73***	***73***	***52***	***21***	***6***
Gastropoda		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	21			
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***21***	***7***	***7***	***1***
Isopoda		0	0	0				167	10	0				0	0	0			
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***167***	***10***	***0***	***59***	***54***	***1***	***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		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***
Malacostraca		0	10	0				0	0	0				0	0	0			
	Subtotal	***0***	***10***	***0***	***3***	***3***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		198	31	0				0	42	0				0	0	21			
	Subtotal	***198***	***31***	***0***	***76***	***61***	***2***	***0***	***42***	***0***	***14***	***14***	***0***	***0***	***0***	***21***	***7***	***7***	***1***
Ostracoda		0	0	0				250	83	0				52	208	135			
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***250***	***83***	***0***	***111***	***73***	***2***	***52***	***208***	***135***	***132***	***45***	***15***
Ephemeroptera		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		83	10	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
	Subtotal	***83***	***10***	***0***	***31***	***26***	***1***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Plecoptera		240	0	42				10	0	0				0	0	0			
	Subtotal	***240***	***0***	***42***	***94***	***74***	***2***	***10***	***0***	***0***	***3***	***3***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Trichoptera		0	10	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
	Subtotal	***0***	***10***	***0***	***3***	***3***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Coleoptera		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***
Diptera		0	0	0				52	63	167				21	188	31			
		0	10	0				0	0	0				0	0	10			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	63	31			
		0	0	0				0	0	0				0	10	10			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	10	0			
		0	0	0				260	10	125				0	0	0			
		1448	31	21				1771	1125	0				0	31	10			
		125	10	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		31	10	0				4229	1729	3406				0	10	10			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	31	10			
		0	0	0				0	0	42				0	0	0			
		0	0	0				0	0	0				0	63	31			
		42	0	0				0	10	10				10	292	208			
		0	0	31				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	10	21			
		0	0	0				0	0	83				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		167	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		10	0	0				3031	573	2240				0	0	0			
		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				0	0	0				10	63	0			
		0	0	0				0	0	0				0	31	115			
		0	0	0				0	0	0				0	10	0			
		0	0	0				0	0	10				21	208	73			
		0	0	0				0	0	0				42	10	0			
		0	0	10				0	42	0				0	10	0			
		0	0	0				740	490	94				0	0	0			
		0	0	0				0	0	0				0	0	0			
		83	31	0				0	0	0				0	0	31			
		10	0	0				0	0	0				0	0	0			
		0	0	0				0	42	0				0	42	42			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		21	0	0				0	0	0				0	0	0			
		83	10	21				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		73	10	0				0	0	0				0	0	0			
		7042	625	52				0	0	0				0	0	0			
		229	31	21				0	0	0				0	0	0			
		208	63	167				10	0	0				0	0	0			
	Subtotal	***9583***	***833***	***323***	***3580***	***3005***	***87***	***10094***	***4083***	***6177***	***6785***	***1761***	***97***	***104***	***1083***	***635***	***608***	***283***	***71***
Non-Benthic Invertebrates*																			
Copepoda - Calanoida		83	0	10				83	0	42				0	0	0			
Copepoda - Cyclopoida		0	0	0				0	0	0				0	104	31			
Cladocera		0	0	0				0	0	0				0	42	31			
Total Benthos		***10781***	***1073***	***438***	***4097***	***3347***	***100***	***10615***	***4271***	***6177***	***7021***	***1879***	***100***	***167***	***1406***	***1000***	***858***	***365***	***100***

Data represents organisms/m^2
i/d = immature or damaged individuals
** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*
***These taxa have not been included in the data analyses conducted*

Appendix 3.10-1. Stream Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

Site		Koignuk M/S	Koignuk M/S	Koignuk M/S				Koignuk D/S	Koignuk D/S	Koignuk D/S				Ref Lk A OF	Ref Lk A OF	Ref Lk A OF			
Date Sampled		July 24/09	July 24/09	July 24/09	Mean	SE	%	July 24/09	July 24/09	July 24/09	Mean	SE	%	July 26/09	July 26/09	July 26/09	Mean	SE	%
Major Group		Rep-1	Rep-2	Rep-3				Rep-1	Rep-2	Rep-3				Rep-1	Rep-2	Rep-3			
Coelenterata		0	0	0				0	0	0				0	0	115			
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***115***	***38***	***38***	***2***
Nematoda		2542	5406	4875				73	73	83				83	177	63			
	Subtotal	***2542***	***5406***	***4875***	***4274***	***880***	***39***	***73***	***73***	***83***	***76***	***3***	***10***	***83***	***177***	***63***	***108***	***35***	***4***
Hirudinea		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***
Oligochaeta		667	250	333				0	0	0				0	0	0			
		42	104	198				10	31	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		83	260	250				0	0	0				10	0	21			
	Subtotal	***792***	***615***	***781***	***729***	***57***	***7***	***10***	***31***	***0***	***14***	***9***	***2***	***10***	***0***	***21***	***10***	***6***	***0***
Gastropoda		0	0	0				0	0	0				0	0	0			
		63	21	10				0	0	0				0	0	0			
	Subtotal	***63***	***21***	***10***	***31***	***16***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Isopoda		21	0	0				0	0	0				0	0	0			
	Subtotal	***21***	***0***	***0***	***7***	***7***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		0	83	0				0	0	0				0	0	0			
	Subtotal	***0***	***83***	***0***	***28***	***28***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		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***
Hydracarina		94	0	83				0	0	0				31	21	0			
	Subtotal	***94***	***0***	***83***	***59***	***30***	***1***	***0***	***0***	***0***	***0***	***0***	***0***	***31***	***21***	***0***	***17***	***9***	***1***
Ostracoda		1021	1083	1167				52	167	115				0	0	0			
	Subtotal	***1021***	***1083***	***1167***	***1090***	***42***	***10***	***52***	***167***	***115***	***111***	***33***	***14***	***0***	***0***	***0***	***0***	***0***	***0***
Ephemeroptera		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			
		0	0	10				0	0	0				0	0	0			
	Subtotal	***0***	***0***	***10***	***3***	***3***	***0***	***0***	***10***	***0***	***3***	***3***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Plecoptera		0	0	0				0	0	0				31	10	0			
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***31***	***10***	***0***	***14***	***9***	***1***
Trichoptera		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***
Coleoptera		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***
Diptera		2979	740	1177				125	323	156				10	0	125			
		0	0	0				0	0	0				0	0	0			
		42	83	63				0	0	0				0	0	0			
		0	0	0				21	73	21				0	31	0			
		250	21	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				219	135	625			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	10	0				0	0	0			
		0	0	0				0	0	0				0	10	10			
		208	0	73				10	42	0				52	31	73			
		0	0	0				0	0	0				125	83	10			
		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			
		167	167	188				0	0	0				2188	2281	729			
		0	0	0				0	0	0				0	42	0			
		0	0	0				0	0	0				0	0	0			
		250	83	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		63	21	208				42	10	0				0	0	10			
		1417	438	10				63	104	31				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				10	0	0			
		354	177	531				10	21	10				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				10	0	0				0	0	0			
		0	21	10				0	10	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	10	0				0	0	0				0	0	0			
		94	0	0				31	21	31				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		375	188	396				10	31	52				0	0	0			
		0	0	0				10	21	0				0	0	0			
		521	198	94				42	10	10				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		21	0	83				10	115	10				0	0	0			
		0	0	0				0	0	0				0	0	0			
		1073	1052	333				63	83	21				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			
		0	0	0				0	0	0				0	0	0			
		0	0	0				0	0	0				0	0	0			
		0	0	0				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				10	0	0			
		0	0	10				0	10	0				0	0	0			
	Subtotal	***7813***	***3198***	***3177***	***4729***	***1542***	***43***	***458***	***896***	***344***	***566***	***168***	***73***	***2615***	***2615***	***1594***	***2274***	***340***	***92***
Non-Benthic Invertebrates**																			
Copepoda - Calanoida		0	0	0				0	0	0				0	0	0			
Copepoda - Cyclopoida		333	500	1000				21	73	31				0	10	31			
Cladocera		3229	2990	5010				63	260	260				0	0	0			
Total Benthos		***12344***	***10406***	***10104***	***10951***	***702***	***100***	***594***	***1177***	***542***	***771***	***204***	***100***	***2771***	***2823***	***1792***	***2462***	***335***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the data analyses conducted*

Appendix 3.10-1. Stream Benthos Density and Taxonomic Results, Hope Bay Belt Project, 2009

								Angimajuq R.	Angimajuq R.	Angimajuq R.			
Site		**Ref Lk B OF**	**Ref Lk B OF**	**Ref Lk B OF**				**Ref**	**Ref**	**Ref**			
Date Sampled		**July 26/09**	**July 26/09**	**July 26/09**	**Mean**	**SE**	**%**	**July 26/09**	**July 26/09**	**July 26/09**	**Mean**	**SE**	**%**
Major Group		**Rep-1**	**Rep-2**	**Rep-3**				**Rep-1**	**Rep-2**	**Rep-3**			
Coelenterata		21	0	21				0	0	0			
	Subtotal	***21***	***0***	***21***	***14***	***7***	***1***	***0***	***0***	***0***	***0***	***0***	***0***
Nematoda		73	31	208				42	42	10			
	Subtotal	***73***	***31***	***208***	***104***	***53***	***7***	***42***	***42***	***10***	***31***	***10***	***4***
Hirudinea		0	0	0				0	0	0			
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Oligochaeta		10	0	0				0	0	0			
		52	219	42				0	21	31			
		0	0	0				0	0	0			
		10	0	31				0	0	0			
	Subtotal	***73***	***219***	***73***	***122***	***49***	***8***	***0***	***21***	***31***	***17***	***9***	***2***
Gastropoda		135	146	31				0	0	0			
		0	10	115				31	0	0			
	Subtotal	***135***	***156***	***146***	***146***	***6***	***10***	***31***	***0***	***0***	***10***	***10***	***1***
Isopoda		0	0	0				0	0	0			
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Copepoda - Harpacticoida		0	0	0				0	0	0			
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Malacostraca		0	0	0				0	0	0			
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Hydracarina		0	0	0				0	10	0			
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***10***	***0***	***3***	***3***	***0***
Ostracoda		0	125	188				0	0	0			
	Subtotal	***0***	***125***	***188***	***104***	***55***	***7***	***0***	***0***	***0***	***0***	***0***	***0***
Ephemeroptera		0	0	0				0	0	10			
		0	0	0				10	0	0			
		0	0	0				10	0	0			
		0	0	0				0	0	0			
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***21***	***0***	***10***	***10***	***6***	***1***
Plecoptera		10	10	10				0	0	0			
	Subtotal	***10***	***10***	***10***	***10***	***0***	***1***	***0***	***0***	***0***	***0***	***0***	***0***
Trichoptera		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***
Coleoptera		0	0	0				31	10	0			
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***31***	***10***	***0***	***14***	***9***	***2***
Diptera		104	83	42				198	208	281			
		0	0	0				0	0	0			
		0	0	0				0	0	0			
		52	104	52				31	0	0			
		0	0	21				0	0	0			
		0	0	0				0	0	0			
		0	0	0				0	0	0			
		0	0	0				0	0	0			
		0	0	0				0	0	0			
		0	0	0				0	0	0			
		0	0	0				0	0	0			
		10	0	0				385	208	0			
		10	0	0				0	0	0			
		0	0	0				0	0	0			
		0	0	10				10	0	0			
		0	0	0				0	0	0			
		0	0	0				0	0	10			
		0	0	0				0	0	0			
		0	0	0				21	0	0			
		0	0	0				0	0	10			
		0	0	0				0	0	0			
		0	0	0				10	0	0			
		0	0	0				0	10	0			
		229	73	0				260	21	0			
		0	0	0				0	0	0			
		0	146	94				10	0	0			
		0	0	0				0	0	0			
		10	10	0				10	0	0			
		0	0	0				0	0	21			
		0	0	0				0	0	0			
		0	0	0				0	0	0			
		0	0	0				21	0	0			
		0	0	0				0	0	0			
		10	0	63				0	0	0			
		0	0	0				0	0	0			
		0	0	0				0	0	0			
		0	0	0				52	10	0			
		0	0	0				0	0	0			
		0	0	0				0	0	0			
		10	52	167				0	0	0			
		0	0	0				21	0	0			
		0	21	0				0	0	0			
		0	0	0				0	0	0			
		0	0	0				0	0	0			
		0	94	1177				42	10	0			
		0	0	0				0	0	0			
		0	73	10				10	21	10			
		0	0	0				0	0	0			
		0	0	0				0	10	0			
		0	0	0				0	0	0			
		52	0	0				0	0	0			
		0	10	0				0	0	0			
		0	0	0				0	0	73			
		0	0	0				0	0	0			
		0	0	0				0	0	0			
		0	0	0				0	10	0			
		42	73	42				0	63	0			
	Subtotal	***531***	***740***	***1677***	***983***	***352***	***66***	***1083***	***573***	***406***	***688***	***204***	***89***
Non-Benthic Invertebrates**													
Copepoda - Calanoida		0	0	0				0	0	0			
Copepoda - Cyclopoida		0	10	115				0	10	10			
Cladocera		10	0	83				0	0	0			
Total Benthos		***844***	***1281***	***2323***	***1483***	***439***	***100***	***1208***	***656***	***458***	***774***	***224***	***100***

Data represents organisms/m^2

i/d = immature or damaged individuals

** May contain some early developmental stages of Heterotrissocladius, which are difficult to differentiate from Heterobaenus*

***These taxa have not been included in the data analyses conducted*