Appendix V5-4I

Doris North Project Aquatic Studies 2006

DORIS NORTH PROJECT
AQUATIC STUDIES
2006

Engineering Earth's Development, Preserving Earth's Integrity

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DORIS NORTH PROJECT
AQUATIC STUDIES
2006

DRAFT REPORT

Prepared for:
Miramar Hope Bay Ltd.
North Vancouver, BC

Prepared by:
Golder Associates Ltd.
#300, 10525 – 170 St
Edmonton, AB
T5P 4W2

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Cover Photo: Aerial view of Roberts Bay, August 2005.

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EXECUTIVE SUMMARY

Miramar Hope Bay Limited (MHBL) proposes to construct and operate an underground gold mine in the West Kitikmeot Region of Nunavut. The project is located 685 km northeast of Yellowknife and 125 km southwest of Cambridge Bay. The mine is on Inuit owned land, approximately 5 km south of the Arctic Ocean. The nearest communities are Umingmaktok, located 75 km to the southwest and Bathurst Inlet located 160 km to the southwest.

Additional baseline information collected during the 2006 aquatic studies program included seasonal monitoring of stream discharge; lake level monitoring; collecting water quality and limnology data in selected lakes and streams in the study area; determining fish species and relative abundance in potentially affected systems; assessing fish use of near-shore areas in Roberts Bay; conducting habitat assessments in selected lakes; quantifying Arctic char smolt out-migration to Roberts Bay; investigating Arctic char use of tributaries to Roberts Lake and small lakes in the Roberts Bay drainage; and identifying potential Arctic char spawning sites in Roberts Lake. This information will be used to support the environmental assessment, permitting and monitoring requirements for MHBL.

Hydrology

Lake water level and stream discharge monitoring in 2006 showed that the bulk of runoff was due to snowmelt. Doris, Tail, and Roberts lakes water surface elevations and Doris, Tail, Roberts, and Little Roberts outflows were monitored from the end of June to mid-September, 2006. Doris and Tail lakes water surface elevations were also monitored over the winter of 2005-2006. Measured lake levels indicate that spring melt began in the upper watersheds in late May, and peak stream discharge occurred approximately 11 June. Water yields were measured at approximately 68 mm for the Little Roberts Lake watershed.

Snow course surveys were undertaken in the Doris North project area on 30 April 2006 to measure the snowpack available to contribute to spring runoff. Twenty-two survey plots on seven terrain types were measured, and the mean snow water equivalent depth was 79 mm.

Rainfall measurements at the Doris North meteorological station indicated that 44.5 mm of rain fell between 1 May and 8 September 2006. Temperature, relative humidity and solar radiation data recorded at the Doris North meteorological station were used to estimate lake evaporation. The estimated values for 2006 were 286 mm for Doris Lake and 308 mm for Tail Lake. These values are greater than the long-term mean estimates, and are consistent with an early spring in 2006.

Rainfall and snowfall in 2006 were both below the long-term average in the Doris North project area.

Physical Limnology and Water Quality

Lakes in the study area generally were isothermic and uniformly mixed during the open-water season, although Roberts Lake exhibited weak thermal stratification during August sampling.

Canadian Council of Ministers of the Environment (CCME 2006) water quality guidelines for aluminum, selenium, copper, and arsenic were exceeded in one or more water quality samples collected in selected lakes within the study area and the marine environment of Roberts Bay. Roberts Bay was the only site where total mercury concentrations approached guideline levels. Certain lake outflows were also found to exceed the CCME guidelines for aluminum, iron, and selenium at various times during the study period.

Fish Communities

In total, 1290 fish representing 11 species were encountered in the Doris North Project area during fisheries surveys conducted in 2006. Fish sampling was conducted in Roberts Lake, Little Roberts Outflow, 20 small lakes in the Roberts Lake drainage, 12 small streams in the Roberts Lake drainage and in the marine environment of Roberts Bay. Overall, the most common fish species captured was ninespine stickleback (46.4%), followed by Arctic char (25.8%), lake trout (11.0%), cisco (7.4%), broad whitefish (4.7%), lake whitefish (3.4%), Arctic flounder (2.6%), capelin (2.5%), Greenland cod (2.3%), and fourhorn sculpin (1.6%).

Lake Communities

Fish sampling was conducted in Roberts Lake and in 20 small lakes within the Roberts Lake drainage area. Sampling gear included fyke nets, gill nets and backpack electrofisher in Roberts Lake. Small lakes adjacent to Roberts Lake were sampled with gill nets, backpack electrofisher, minnow traps, beach seines, and angling. Ninespine stickleback dominated the small-fish catch in the lakes. Other species captured included Arctic char, lake trout, lake whitefish, broad whitefish, and cisco.

Stream Communities

Fish sampling was conducted in Little Roberts Outflow and in 12 small streams that drain into Roberts Lake. A fish fence installed in Little Roberts Outflow between 19 June and 22 July 2006 resulted in the capture of 260 fish that represented three species. The majority of fish were Arctic char (74.2%), and lake trout represented 25.4% of the catch. One broad whitefish was captured during the sampling period. Fish were caught in five of the 12 sampled streams that drain into Roberts Lake. Arctic char were also the dominant species in the tributary streams to Roberts Lake; ninespine stickleback and lake trout were also captured in these streams.

Marine Communities

A directional Arctic fyke net was used to assess fish movements in Roberts Bay from 10 to 12 July 2006. The east bound fish contributed 58% to the total catch. Arctic char and lake trout were generally represented by large size-classes, whereas Greenland cod, capelin, Arctic flounder, and fourhorn sculpin were small in size.

Arctic Char in Roberts Lake System

Fish sampling at the fish fence was conducted to quantify Arctic char smolt migration from the Roberts Lake system into the marine environment of Roberts Bay. In total, 178 Arctic char were captured moving downstream; these included 86 smolt sized fish (tentatively based on fish between 200 and 350 mm in fork length). The size distribution of Arctic char moving downstream varied considerably with time, with large size-classes (>600 mm in fork length) moving downstream earlier than the smolts and older juveniles. The results of the 2006 Arctic char out-migration study indicates that it is feasible to monitor smolt migration using a fence and trap design, at least for the flow regime present in late June and July 2006.

Arctic char were captured in six of the 20 lakes and five of the 12 streams sampled in the drainage basin of Roberts Lake. Small lakes and streams with good connection to Roberts Lake appeared to provide habitat for anadromous populations of Arctic char migrating from the marine environment of Roberts Bay. Fish sampling of small lakes with poor connectivity to Roberts Lake yielded small Arctic char with bright spawning coloration. It is likely that these lakes are able to support resident populations of Arctic char. Some of the smaller lakes were too shallow to support overwintering of Arctic char.

Approximately 10.6 km of shoreline was surveyed for Arctic char spawning habitat along the western end of Roberts Lake. Suitable spawning locations (i.e., 3 to 6 m depth with gravel or gravel/cobble substrate) were identified at 54 areas within the surveyed section of the lake. Adult males were observed at four potential spawning sites; however spawning activities were not observed at the time of survey.

ACKNOWLEDGEMENTS

The authors would like to thank Terri Maloof (Manager, Environmental Permitting and Compliance), and Larry Connell (General Manager, Environment) of Miramar Mining Corporation / Miramar Hope Bay Ltd. for offering us the opportunity to work on this project. Able and enthusiastic assistance provided by Richard Ehakataiok of Cambridge Bay and Tom Agluk of Gjoa Haven is also gratefully acknowledged.

The following Golder Associates personnel participated in the field program and/or preparation of the report:

Gary Ash	- Study Director and Senior Reviewer
Suzanne Earle	- Aquatic Biologist and Contributing Author
Edyta Jasinska	- Aquatic Scientist and Contributing Author
Nathan Schmidt	- Senior Hydrologist and Senior Reviewer
Kent Kristensen	- Fisheries Biologist
Tim Antill	- Fisheries Biologist
Paul Emery	- Fisheries Biologist
Rob Stack	- Fisheries Biologist
Heidi Swanson	- Aquatic Biologist
Jim Campbell	- Fisheries Biologist
Evan Hayes	- Junior Biological Technician
Tony Ye	- Hydrologist and Contributing Author
Bernard Trevor	- Hydrologist
Rob Wesson	- Drafting
Jacek Patalas	- Editorial Review
Carrie Norman	- Word Processing

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1.0 INTRODUCTION

1.1 GENERAL

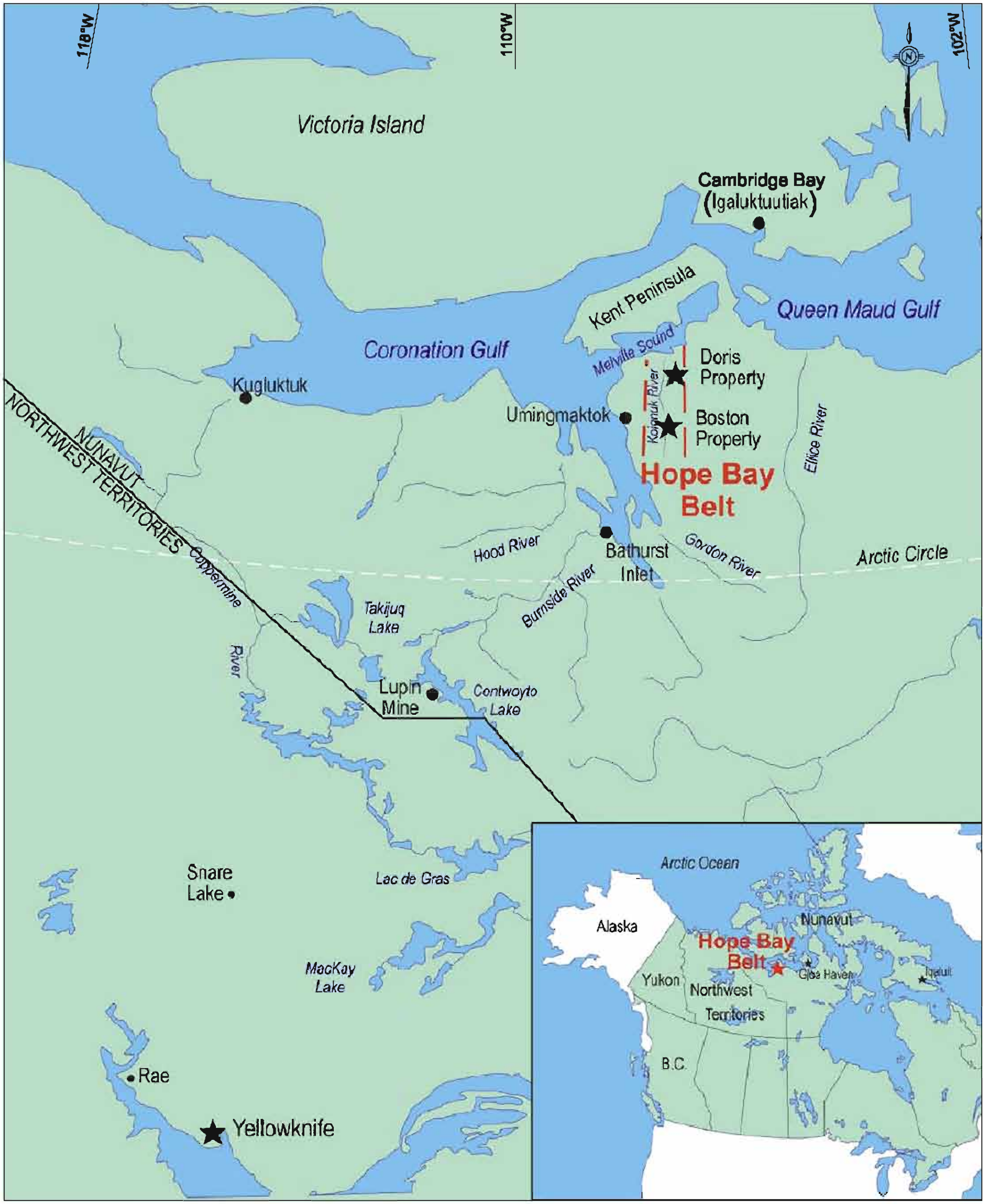
Miramar Hope Bay Limited (MHBL) proposes to construct and operate a new underground gold mine ("Doris North Project") in the West Kitikmeot Region of Nunavut. The project is located 685 km northeast of Yellowknife and 125 km southwest of Cambridge Bay (Figure 1.1). The mine is on Inuit owned land, approximately 5 km south of the Arctic Ocean. The nearest communities are Umingmaktok, located 75 km to the southwest, and Bathurst Inlet located 160 km to the southwest.

Environmental baseline studies within the Doris North area were carried out in 1995 (Klohn Crippen 1995), 1996 (Rescan 1997), 1997 (Rescan 1998), 1998 (Rescan 1999), and 2000 (Rescan 2001). All data collected up to 2000 were summarized in a data compilation report (RL&L/Golder 2002). Additional studies were conducted by Golder in 2002, 2003, 2004 and 2005.

In 2002, the main focus of the aquatic studies was to investigate fish populations in Roberts Lake and in the near-shore areas of Roberts Bay (RL&L/Golder 2003a).The 2003 field season focused on monitoring use of the Roberts Lake system by Arctic char; assessing fish use of near-shore habitat in Doris, Roberts and Little Roberts lakes and Roberts Bay; bathymetry and water quality in selected lakes; habitat mapping in Roberts Lake; and seasonal monitoring of discharge and water temperature in selected streams (RL&L/Golder 2003b).

The focus of the 2004 field season was on continued monitoring of use of the Roberts Lake system by Arctic char; assessing large and small fish use of near-shore habitat in Tail and Roberts lakes; water quality sampling in selected lakes and streams (Roberts, Little Roberts, Doris, and Tail lakes; Little Roberts, Doris, and Tail outflows; Roberts Bay); snowcourse surveys and monitoring of rainfall and other meteorological parameters in the Doris Lake watershed; and seasonal monitoring of water surface elevations on Doris, Tail and Roberts lakes and discharge in Doris, Tail, Roberts, and Little Roberts outflows (Golder 2005).

In 2005, field studies were continued to expand the baseline data collected during the previous studies, and to address data gaps identified during the Nunavut Impact Review Board (NIRB) hearings in July 2004 and identified in the submission of the "No Net Loss" Plan (NNLP) Revision 4 to Department of Fisheries and Oceans (DFO) in May 2005.



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SCALE KILOMETRES

REFERENCE

BASE MAP PROVIDED BY RESCAN, FEBRUARY 17, 1998

MIRAMAR HOPE BAY LTD.

TITLE

HOPE BAY BELT
PROJECT LOCATION MAP

Golder Associates
Calgary, Alberta

PROJECT	06-1373-028	
DESIGN	JP	12/07/02
CADD	PSR	18/11/03
CHECK	DM	20/12/07
REVIEW	GA	20/12/07

FILE No.	Project Location		
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FIGURE: 1.1

R:\CAD\7000\022-7009\ Drawing file: Project Location Map.dwg Jul 12, 2002 - 2:38pm

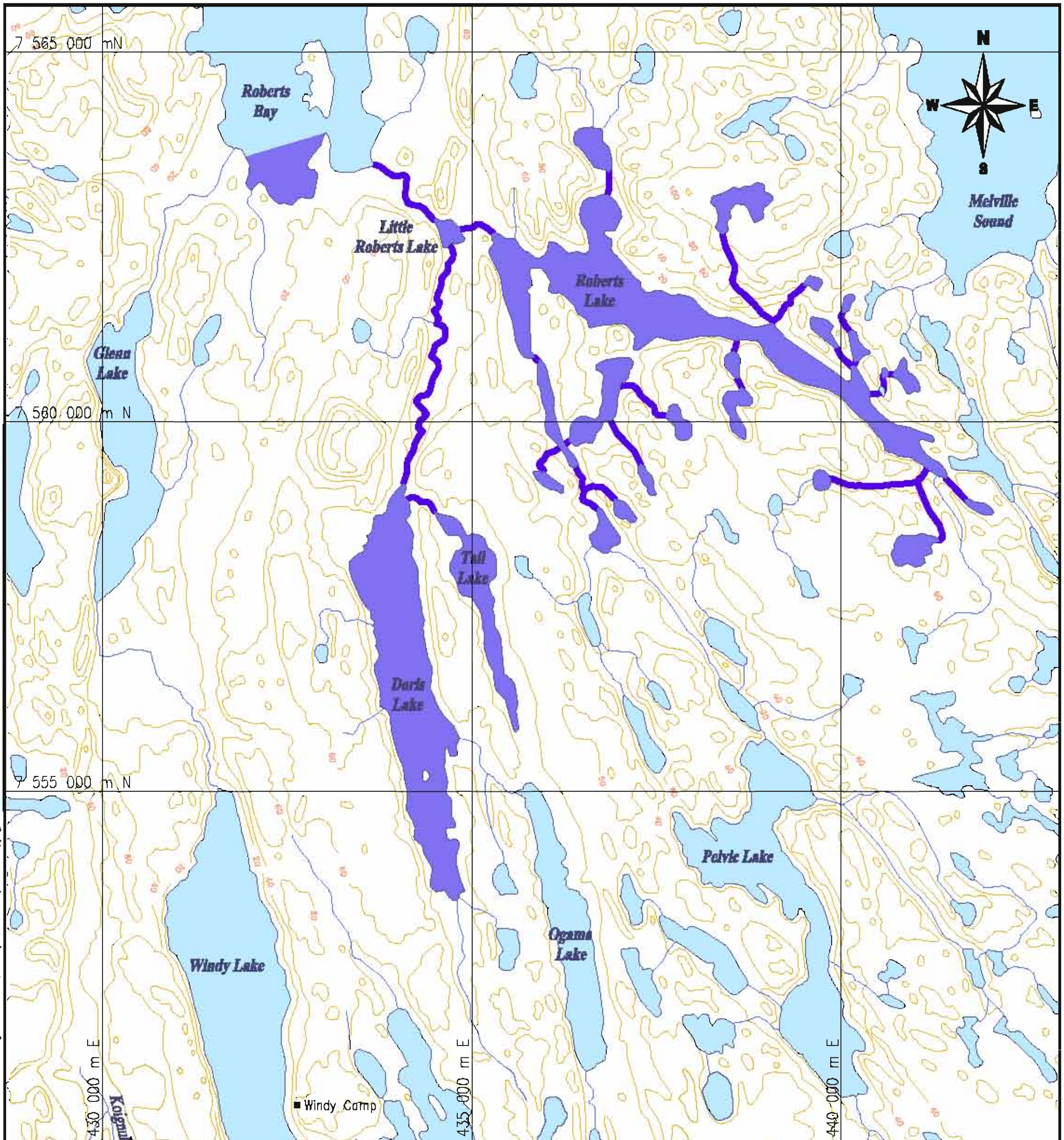
Field studies were conducted in 2006 to continue documenting baseline conditions in the Doris North Project area. The specific objectives of the 2006 field program included:

- sampling of water quality in selected lakes and streams (Roberts, Little Roberts, Doris, and Tail lakes; Roberts, Little Roberts, Doris, and Tail outflows; Roberts Bay), with particular emphasis on Doris Lake and Doris outflow to provide additional data for use in the water management plan;
- snowcourse surveys in the Doris Lake watershed;
- meteorological monitoring of rainfall and other parameters to support lake evaporation estimates in the Doris Lake watershed;
- seasonal monitoring of water surface elevations on Doris, Tail and Roberts lakes and discharge in Doris, Tail, Roberts and Little Roberts outflows;
- monitoring out-migration of Arctic char smolts in Little Roberts Outflow;
- assessing the feasibility of quantifying smolt out-migration into Roberts Bay;
- collecting information that could be used for comparisons with post-enhancement monitoring;
- assessing Arctic char use of tributaries to Roberts Lake and small lakes in the Roberts Lake drainage;
- assessing Arctic char spawning sites in Roberts Lake; and
- assessing fish use of Roberts Bay in the area of the proposed jetty.

The field program was conducted between 30 May and 13 September 2006. The results are summarized for each study component in the following sections.

1.2 SAMPLING PROGRAM IN 2006

Lakes that were sampled as part of the baseline studies within the project area in 2006 included Roberts, Little Roberts, Doris, and Tail lakes as well as small tributary lakes surrounding Roberts Lake (Figure 1.2). Also sampled were Roberts, Little Roberts, Doris, and Tail outflows, as well as several small tributaries to Roberts Lake. The marine environment of Roberts Bay, the main receiving waterbody downstream of the proposed mining development, was sampled near the mouth of Little Roberts Outflow. Data collection sites and sampling methods used in 2006 are summarized in Table 1.1.



Note: 20 m contour interval
Reference: Base map provided by Rescan, January 22, 2001.

MIRAMAR HOPE BAY LTD.

LEGEND

- Sampled lake
- Sampled river

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Title

Waterbodies Sampled in the Doris North Project Area, 2006

Golder Associates
Edmonton, Alberta

Project No.		06-1373-026	File No.	1731671
Design	BE	12/10/07	Scale As shown	Rev. 1
Cadd	RW	12/10/07	**Figure: 1.2**	
Check	DM	20/12/07		
Review	GA	20/12/07		

Table 1.1 Doris North Project Aquatic Sampling Program, 2006

Waterbody	Discharge/ Water Level	Water Quality	Fish Capture Methods						
			Angling	Beach Seine	Electro-fishing	Fyke Net	Fish Fence	Gill Nets	Minnow Traps
Doris Lake	√	√							
Tail Lake	√	√							
Roberts Lake	√	√	√		√	√		√	
Doris Outflow	√	√	√						
Tail Outflow	√	√							
Roberts Outflow	√	√							
Little Roberts Outflow	√	√			√		√		
Roberts Lake Tributaries									
Small Lakes in Roberts Lake Drainage			√	√	√			√	√
Roberts Bay		√	√			√			

1.3 OVERVIEW OF REPORT

To facilitate subsequent integration of the 2006 data with the previous data collected, the format and organization of the present report follows closely the outline used in the previous reports (RL&L/Golder 2002, 2003a and 2003b, Golder 2005, and Golder 2006). As such, this report is organized by major disciplines, with a separate discussion for each sampled waterbody. Environmental disciplines are presented as separate sections in the following order: hydrology, physical limnology and water quality, and fish communities. Data and analytical results are provided as appendices at the end of the report.

2.0 HYDROLOGY

2.1 METHODS

2.1.1 Hydrometry

Hydrographs of Doris Lake and outflow, Tail Lake and outflow, Roberts Lake and outflow, and outflow of Little Roberts Lake were derived using the following methods:

- At each hydrometric station, a KPSI 730-series solid-state pressure transducer and Optimum Instruments DD-320 data logger were installed. Each data logger was programmed to record water pressure measurements at 15-minute intervals. Each station was referenced to an elevation benchmark.
- Transducers at the Doris Lake (H74) and Tail Lake (H75) stations were left in place over the winter. The transducer and thermistor at each of these locations were installed below the bottom of the lake ice to provide lake level and temperature readings over the course of the year.
- Transducers at Doris Outflow (H71) and Tail Outflow (H76) stations were installed after the peak flow, as permitted by ice conditions and site access. Discharges prior to the installation dates were derived using upstream lake water level elevations.
- Transducers at Roberts Outflow (H72) and Little Roberts Outflow (H73) stations were installed prior to the peak flow, as permitted by ice conditions and site access. Due to a data logger failure at Roberts Outflow, it was necessary to estimate early-season flows based on a combination of manual discharge measurements and flows measured at nearby stations.
- During selected data logger downloads, the water surface elevations were surveyed from the permanent benchmark, and the pressure transducer readings were recorded.
- During the first and subsequent visits to stations with flowing water, stream discharge measurements were performed according to the Water Survey of Canada standard described by Terzl et al. (1994). The data loggers at each station were downloaded periodically, and pressure transducer readings coincident with each discharge measurement were noted.
- During the last site visit of 2006, the pressure transducer and data logger were removed from the flowing water stations to prevent ice damage over the winter. The pressure transducers and thermistors at Doris Lake (H74) and Tail Lake (H75) were left in place to record measurements over the winter.
- When all data were available for flowing water stations, the record of water surface elevation versus discharge was used to check the existing stage-discharge rating curve for each station and revise it, if necessary. This rating curve was then applied to the continuous

record of water surface elevations, as measured by the pressure transducer and recorded by the data logger at each station, to derive a continuous record of discharges.

2.1.2 Snow Course Surveys

Snow course surveys were undertaken on 30 April 2006, using the following methods:

Plot Selection

Plot locations within the Doris Lake watershed were selected on the basis of terrain type. These included:

- Open Lake (flat areas on lakes);
- Exposed Lowland (flat areas at the top of slopes);
- Sheltered Lowland (flat areas at the toe of slopes); and
- North, East, South and West Aspects (slopes facing these directions).

The purpose of this was to identify differences in snow accumulation between terrain types. As much as possible, the locations used in 2004 and 2005 were sampled again in 2006.

Snow Depth Measurement

At each plot, 30 depth measurements were taken at randomly selected locations on a large circle with approximately 10 m between measurements. These depth measurements were taken by inserting a metal metre stick into the snowpack and reading the snowline mark.

Snow Density Measurement

Three density measurements were recorded at each plot, using a snow density sampler. The sampler was carefully inserted to avoid compacting the snowpack. The snow depth was read on the tube, when the corer reached the soil surface. The corer was then inserted/twisted more deeply into the ground to ensure that a plug of soil was extracted with the sampler to prevent granular snow from falling out. After extracting the sampler and carefully removing the soil plug, the sampler weight was measured with and without the snow core, to allow calculations of the weight of snow and snow water equivalent.

2.1.3 Rainfall

The Doris North meteorological station is located near the Doris Lake hydrometric station and has sensors to measure the following parameters:

- air temperature (mean for each hour, as well as value and time of maximum and minimum);
- relative humidity (maximum and minimum for each hour);
- vapor pressure (mean for each hour, as well as value and time of maximum and minimum);
- global solar radiation (mean and total for each hour);
- wind speed and direction (value and time of maximum for each hour, as well as mean horizontal wind speed, unit vector of mean wind direction, and standard deviation of wind direction, for each hour; and
- rainfall (accumulated depth of rainfall for each hour).

Rainfall at this station was recorded using a tipping bucket rain gauge; the rainfall record was used to derive total daily and monthly rainfall during the summer months.

2.1.4 Lake Evaporation

The program WREVAP (Morton et al. 1985) was used to estimate the lake evaporation from Doris and Tail lakes. The WREVAP model requires accurate temperature, humidity and solar radiation data from a nearby station with surroundings similar to the area of interest. These data were available from the Doris North meteorological station, described in Section 2.1.3. The program is not recommended for use near “sharp environmental discontinuities, such as a high-latitude coastline… because of advection of heat and water vapour in the lower layers of the atmosphere.” However, the program documentation indicates “that the effects of such advections can decrease to near zero with [in] 300 m, but this finding may not be generally applicable.” Doris Lake is approximately 4 km from the Roberts Bay coastline at its closest point, so it is assumed that the WREVAP model is applicable. Lake evaporation was calculated using the CRLE (Complementary Relationship Lake Evaporation) model component.

2.2 HYDROMETRY RESULTS

2.2.1 Doris Lake and Doris Outflow

Factsheets describing the locations of the hydrometric site and equipment installed at Doris Lake (Station H74) and Doris Outflow (Station H71) are provided in Appendix A. The appendix also contains stage-discharge data; the derived stage-discharge rating curve based on data collected from 2003 to 2006; tabulated mean daily discharge and water level data; and manual discharge measurement data and calculation sheets.

The Doris Lake hydrometric station was visited four times during the 2006 field program, and a continuous hydrograph was derived for the 17 September 2005 to 9 September 2006 period, based on continuous logger data. The Doris Outflow hydrometric station was visited 10 times during the 2006 field program, and a continuous hydrograph was derived for the 31 May to 30 September 2006 period. Discharges between 31 May and 25 June were derived using the measured lake water surface elevations, and discharges between 8 September and 30 September (freeze-up) were estimated, under the assumption that they receded on a linear basis. Details of each site visit are provided in Table 2.1. The hydrograph for Doris Lake in 2005 is presented in Figure 2.1, showing data collected subsequent to the 2005 annual report. The hydrographs for Doris Lake and Doris Outflow in 2006 are presented in Figure 2.2.

Table 2.1 Site Visits to Doris Lake and Doris Outflow Hydrometric Stations, 2006

Date	Activities	Lake	Water Level (geodetic)	Outflow	Discharge
31 May	Downloaded data from Doris Lake logger and surveyed water surface elevation; ice-covered conditions.	✓	21.718 m		
25 June	Downloaded data from Doris Lake logger and surveyed water surface elevation; ice-covered conditions on lake. Installed transducer in Doris Outflow; free of ice. Surveyed water surface elevation and measured discharge at Doris Outflow.	✓	21.781 m	✓	1.236 m^3/s
30 June	Measured discharge at Doris Outflow.			✓	1.059 m^3/s
7 July	Surveyed water level and measured discharge at Doris Outflow.			✓	0.736 m^3/s
21 July	Measured discharge at Doris Outflow.			✓	0.426 m^3/s
28 July	Measured discharge at Doris Outflow.			✓	0.306 m^3/s
7 August	Measured discharge at Doris Outflow.			✓	0.200 m^3/s
11 August	Downloaded data from Doris Lake logger and surveyed water surface elevation. Measured discharge at Doris Outflow.	✓	21.449 m	✓	0.170 m^3/s
25 August	Measured discharge at Doris Outflow.			✓	0.109 m^3/s
1 September	Measured discharge at Doris Outflow.			✓	0.064 m^3/s
8 September	Surveyed water level and measured discharge at Doris Outflow. Removed Doris Outflow transducer.			✓	0.067 m^3/s
9 September	Downloaded data from Doris Lake logger and surveyed water surface elevation.	✓	21.348 m		

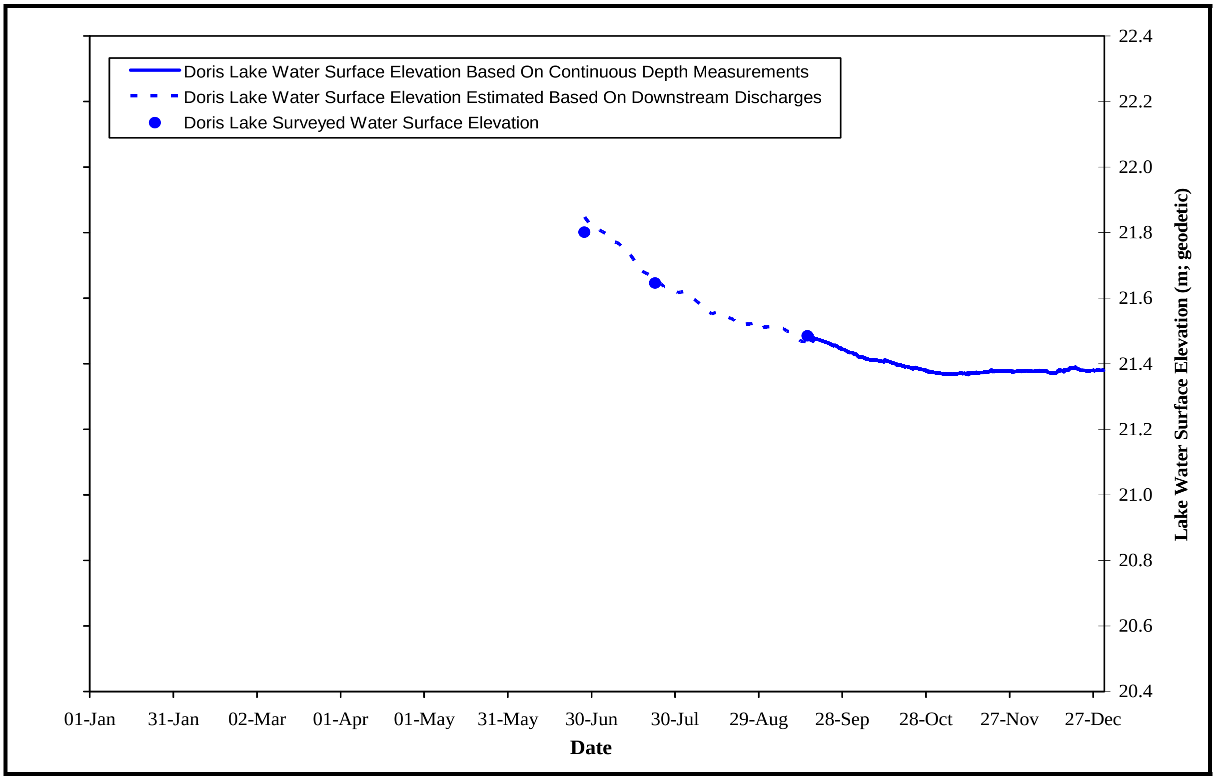


Figure 2.1 **Hydrograph for Doris Lake, 2005.**

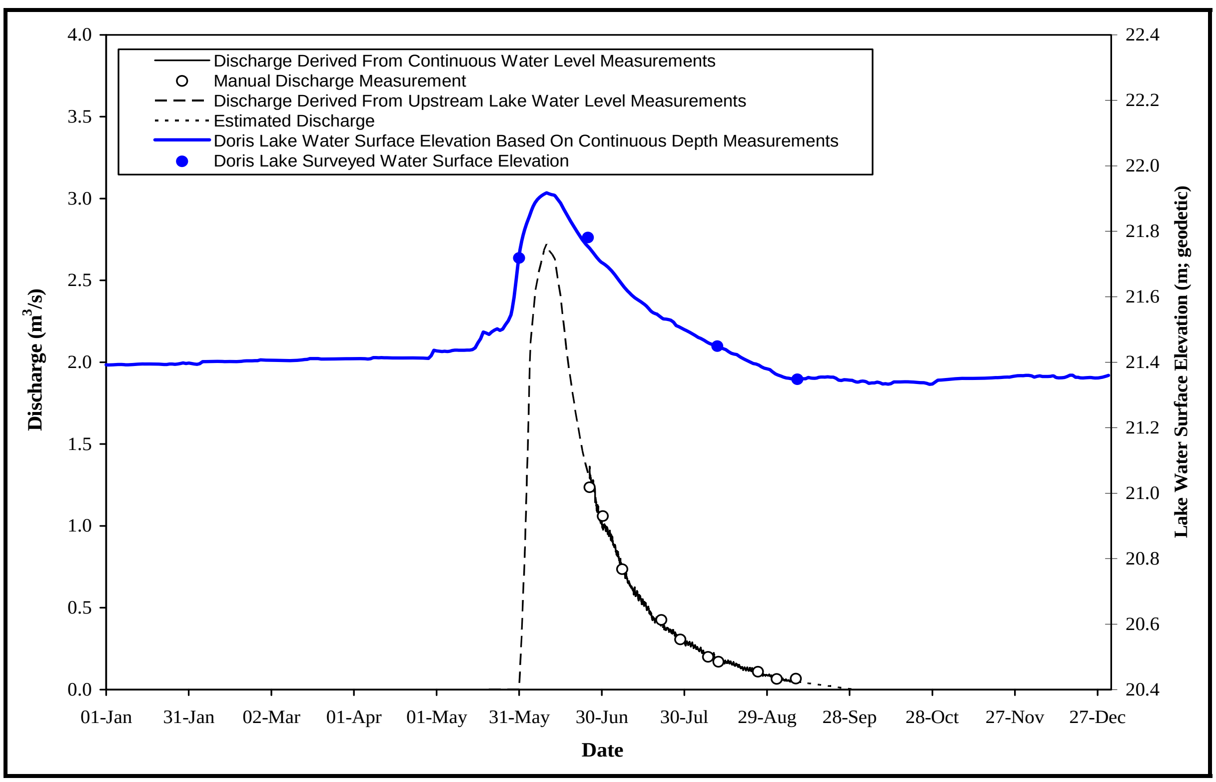


Figure 2.2 **Hydrographs for Doris Lake and Doris Outflow, 2006.**

2.2.2 Tail Lake and Tail Outflow

Factsheets describing the locations of the hydrometric site and equipment installed at Tail Lake (Station H75) and Tail Outflow (Station H76) are provided in Appendix A. The appendix also contains stage-discharge data; the derived stage-discharge rating curve based on data collected from 2004 to 2006; tabulated mean daily discharge and water level data; and manual discharge measurement data and calculation sheets.

The Tail Lake hydrometric station was visited four times during the 2006 field program, and a continuous hydrograph was derived for the 17 September 2005 to 9 September 2006 period, with the exception of five missing days due to data logger malfunction in November 2005. The Tail Outflow hydrometric station was visited 11 times during the 2006 field program, and a continuous hydrograph was derived for the 31 May to 30 September 2006 period. Discharges between 31 May and 25 June were derived using the measured lake water surface elevations, and discharges between 8 September and 30 September were estimated based on linear recession to freeze-up. Details of each site visit are provided in Table 2.2.

The hydrograph for Tail Lake in 2005 is presented in Figure 2.3, showing data collected subsequent to the 2005 annual report. The hydrographs for Tail Lake and Tail Outflow in 2006 are presented in Figure 2.4.

2.2.3 Roberts Lake and Roberts Outflow

A factsheet describing the location of the hydrometric site and equipment installed at Roberts Lake and Roberts Outflow (Station H72) is provided in Appendix A. The appendix also contains stage-discharge data; the derived stage-discharge rating curve based on data collected from 2003 to 2006; tabulated mean daily discharge and water level data; and manual discharge measurement data and calculation sheets.

The Roberts Lake and Roberts Outflow hydrometric station was visited seven times during the 2006 field program, and a continuous hydrograph was derived for the 31 May to 30 September period. Discharges between 31 May and 29 June were estimated based on discharges at the Doris and Little Roberts lake outlets, and discharges between 9 September and 30 September (freeze-up) were estimated, under the assumption that they receded on a linear basis. Details of each site visit are provided in Table 2.3. The hydrographs for this station are presented in Figure 2.5.

Table 2.2 Site Visits to Tail Lake and Tail Outflow Hydrometric Stations, 2006.

Date	Activities	Lake	Water Level (geodetic)	Outflow	Discharge
28 May	Downloaded data from Tail Lake logger and surveyed water surface elevation; ice-covered conditions.	✓	28.320 m		
25 June	Installed transducer and measured discharge in Tail Outflow; free of ice.			✓	0.029 m^3/s
30 June	Measured discharge at Tail Outflow.			✓	0.024 m^3/s
3 July	Downloaded data from Tail Lake logger; surface water elevation not surveyed.	✓	n/a		
7 July	Measured discharge at Tail Outflow.			✓	0.014 m^3/s
21 July	Measured discharge at Tail Outflow.			✓	0.012 m^3/s
28 July	Measured discharge at Tail Outflow.			✓	0.006 m^3/s
7 August	Measured discharge at Tail Outflow.			✓	0.004 m^3/s
11 August	Measured discharge at Tail Outflow and surveyed water surface elevation.			✓	0.004 m^3/s
12 August	Downloaded data from Tail Lake logger and surveyed water surface elevation.	✓	28.138 m		
18 August	Measured discharge at Tail Outflow.			✓	0.001 m^3/s
25 August	Measured discharge at Tail Outflow.			✓	0.001 m^3/s
1 September	Measured discharge at Tail Outflow.			✓	0.0001 m^3/s
8 September	Surveyed water level and measured discharge at Tail Outflow. Removed Tail Outflow transducer.			✓	0.0006 m^3/s
9 September	Downloaded data from Tail Lake logger; surface water elevation not surveyed.	✓	n/a		

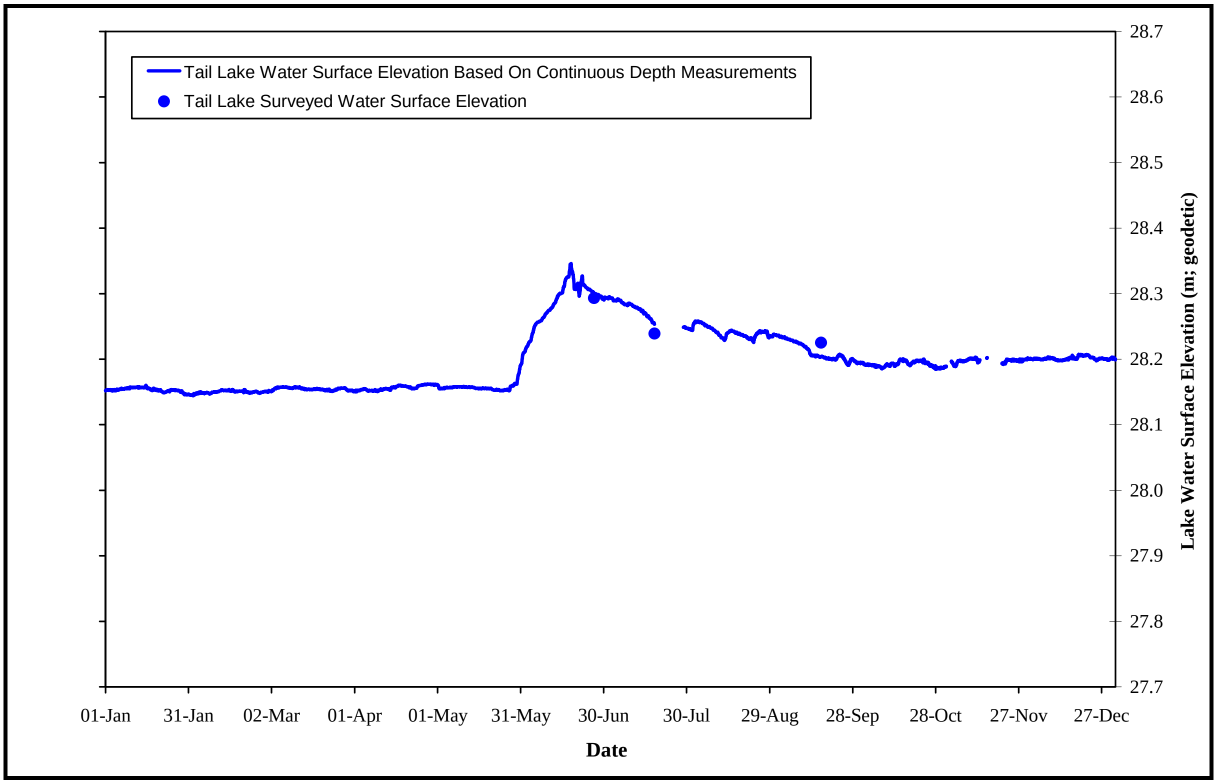


Figure 2.3 Hydrograph for Tail Lake, 2005

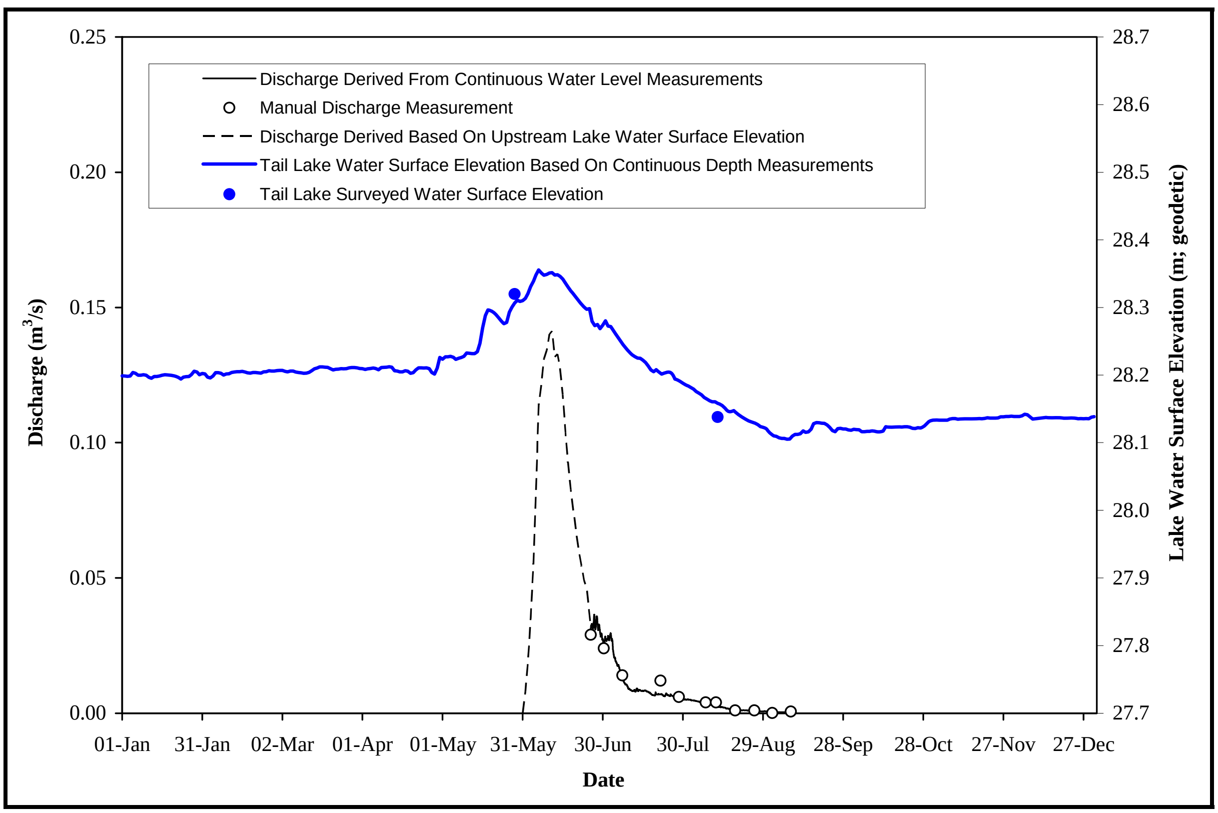


Figure 2.4 Hydrographs for Tail Lake and Tail Outflow, 2006.

Table 2.3 Site Visits to Roberts Lake and Roberts Outflow Hydrometric Station, 2006.

Date	Activities	Lake	Water Level (geodetic)	Outflow	Discharge
30 May	Installed transducer and logger on Roberts Lake. Surveyed lake water level on Roberts Lake. Ice-covered conditions with no discharge at the outflow.	✓	6.371 m	✓	0.000 m^3/s
21 June	Checked transducer and logger at Roberts Lake; logger had stopped recording. Surveyed lake water level on Roberts Lake and measured discharge at Roberts Outflow.	✓	6.311 m	✓	1.447 m^3/s
29 June	Replaced data logger at Roberts Lake.	✓	n/a		
9 July	Measured discharge at Roberts Outflow.			✓	0.579 m^3/s
12 July	Measured discharge at Roberts Outflow.			✓	0.512 m^3/s
10 August	Surveyed lake water level on Roberts Lake and measured discharge at Roberts Outflow.	✓	5.967 m	✓	0.196 m^3/s
8 September	Removed transducer and logger from Roberts Lake. Surveyed lake water level on Roberts Lake and measured discharge at Roberts Outflow.	✓	5.937 m	✓	0.034 m^3/s

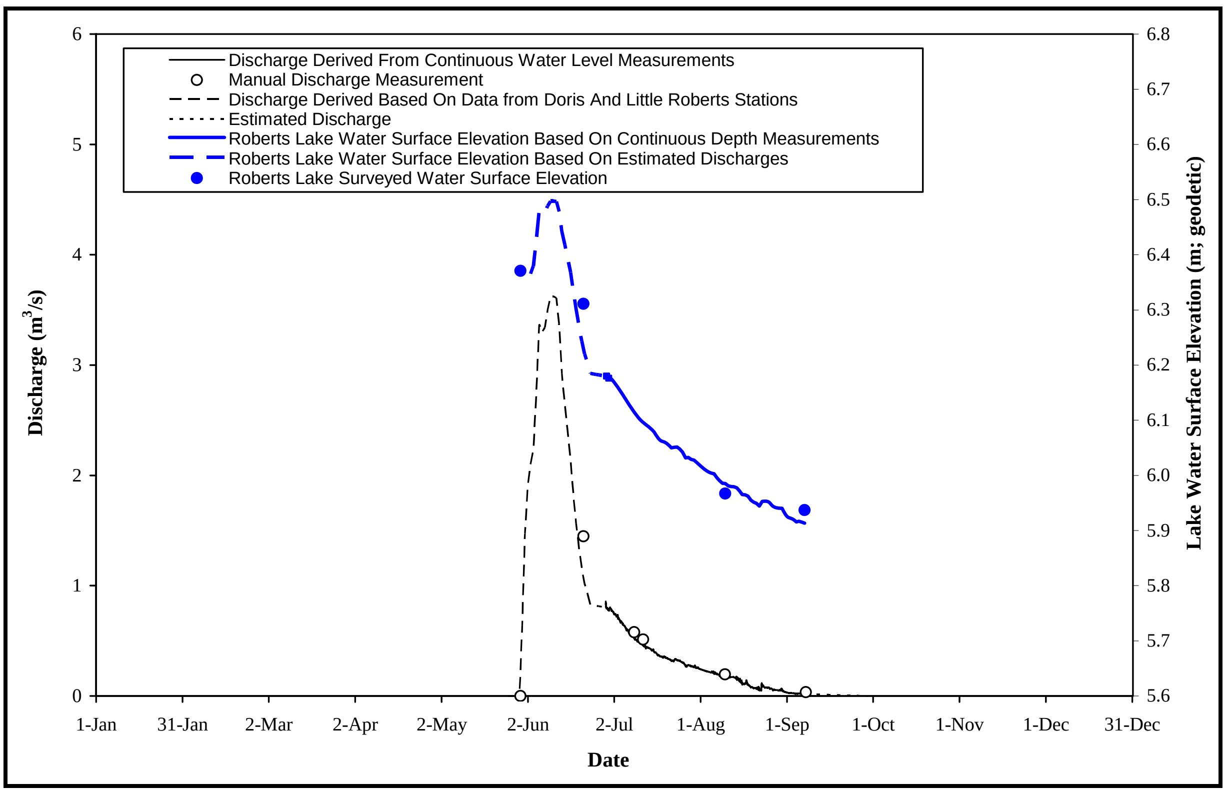


Figure 2.5 Hydrographs for Roberts Lake and Roberts Outflow, 2006.

2.2.4 Little Roberts Outflow

A factsheet describing the location of the hydrometric site and equipment installed at Little Roberts Outflow (Station H73) is provided in Appendix A. The appendix also contains stage-discharge data; the derived stage-discharge rating curve; tabulated mean daily discharge and water level data; and manual discharge measurement data and calculation sheets.

The Little Roberts Outflow hydrometric station was visited five times during the 2006 field program, and a continuous hydrograph was derived for the period 26 May to 30 September. Discharges between 26 May and 30 May were estimated based on linear increase from presumed first melt, and discharges between 8 September and 30 September were estimated based on linear recession to freeze-up. Details of each site visit are provided in Table 2.4, and the hydrograph from the station is presented in Figure 2.6.

Table 2.4 Site Visits to Little Roberts Outflow Hydrometric Station, 2006.

Date	Activities	Discharge
30 May	Installed data logger and pressure transducer. Surveyed water level at Little Roberts Outflow. Open water with some border ice observed.	n/a
21 June	Surveyed water level and measured discharge at Little Roberts Outflow.	2.984 m^3/s
9 July	Measured discharge at Little Roberts Outflow.	1.062 m^3/s
10 August	Surveyed water level and measured discharge at Little Roberts Outflow.	0.315 m^3/s
8 September	Surveyed water level and measured discharge at Little Roberts Outflow. Removed transducer.	0.043 m^3/s

2.2.5 Other Streams

Manual discharge measurements were undertaken to support fisheries work at Roberts Lake tributary E14 on 10 August 2006. No continuous water level or discharge measurements were acquired at this site. The calculated discharge at this site was 0.002 m^3/s.

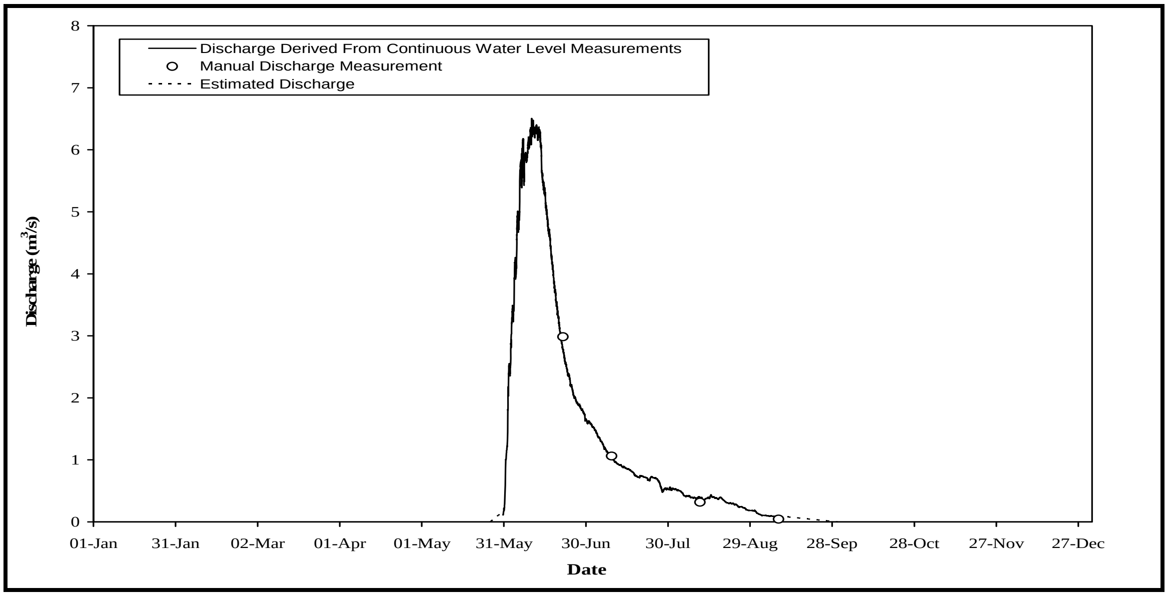


Figure 2.6 Hydrograph for Little Roberts Outflow, 2006.

2.2.6 Discussion

The 2006 hydrometry program had two layers of redundancy built in to ensure that there were no significant data gaps in the event of equipment disturbance or failure. As in earlier years, the Little Roberts Outflow hydrometric station was installed as a redundant measure, to allow discharges for the Doris Outflow or Roberts Outflow hydrometric stations to be back-calculated if either of those stations was to malfunction. The Doris Lake and Tail Lake water level stations were installed in 2004. These stations provided direct measurements of lake water surface elevation, and also could provide surrogate data for discharge measurements if required. The lake water level stations were reinstalled in September 2004 into deeper water to provide year-round data.

In 2006, the Doris Lake, Doris Outflow, Tail Lake, Tail Outflow and Little Roberts Outflow stations operated continuously with no malfunctions. An early season data gap occurred at the Roberts Outflow station due to equipment malfunction. The missing lake level and flow data were estimated based on manual discharge measurements and data from the other stations. The estimates neglect potential flow routing effects of Little Roberts Lake, but can be considered reliable for monthly and annual water yields.

Monthly and annual water yields for the four monitored watersheds (Doris Lake, Tail Lake, Roberts Lake and Little Roberts Lake) were calculated based on the measured hydrographs and watershed areas. These water yields are presented in Table 2.5, where the baseline mean water yield for each watershed is also shown. The data show that 2006 was a dry year compared to the Mean Annual Water Yield.

Table 2.5 Calculated Water Yields for Doris, Tail, Roberts and Little Roberts Watersheds.

Watershed	Total Annual Discharge (m^3) [a]	Watershed Area (km^2)	Water Yield (mm)	
			2006 Annual	Mean Annual [b]
Tail Lake	233,000	4.4	53.1	111
Doris Lake	6,791,000	93.1	72.9	134
Roberts Lake	7,007,000	97.8	71.6	134
Little Roberts Lake	13,574,000	189.9	68.3	134

[a] Hydrograph estimated before and after monitoring period.
[b] Derived from Ellice River 1971 to 2000 data (AMEC 2003).

The fisheries No Net Loss Plan (NNLP) for the Doris North project examined Roberts and Doris outflow discharges to evaluate the effectiveness of proposed fish passage mitigation at Roberts Outflow. Weekly water yields were examined and it was estimated that at the Roberts Outflow, for weeks with water yields of 2.0 mm or greater, passage of spawning Arctic char was unimpeded. For water yields of 1.4 mm or less, limited or no passage was possible, and for intermediate water yields, passage was uncertain. Table 2.6 presents an update of weekly water yield data during the Arctic char spawning period, commencing in the first week of August.

Table 2.6 Measured Weekly Water Yields during Arctic Char Upstream Migration.

Week (From start of August)	Location and Monitoring Year												
	Doris	Doris	Doris	Doris	Roberts	Doris	Roberts	Doris	Roberts	Doris	Roberts	Doris	Roberts
	1996	1997	1998	2000	2002	2003		2004		2005		2006	
W1	1.4	2.7	1.7	2.5		3.3	2.9	3.3	1.9	4.2	4.4	1.6	2.8
W2	1.2	2.3	1.4	1.8		2.8	2.3	2.6	1.3	3.5	3.8	1.2	2.4
W3	1.1	2.3	1.3	1.4	1.1	3.2	4.3	2	1.1	3.2	3.6	0.9	2.2
W4	1.9	2.3	1.3	1.4	0.7	3.5	4.9	1.7	0.9	2.9	3.5	0.7	1.5
W5	2.4	2.3	1.3	1.3	0.5	3.6	3.8	1.4	0.7	2.7	3.4	0.4	0.8
W6		2.3	1.6	1.4		4	3.9	1.1	0.7	2.6	2.9	0.3	0.6
W7		3.2	2.1	3.6				1.1	0.5	2.1	2.2	0.2	0.4
W8		3.6	2.6	4.7				0.8	0.4	1.3	1.3	0.1	0.2

Note: Red shading indicates weeks of no or very limited fish passage; green indicates weeks of full fish passage; yellow indicates weeks where fish passage is uncertain. Note that most of the upstream Arctic char migration is complete by week W6

2.3 SNOW COURSE SURVEYS

The water equivalent of a snowpack (the equivalent depth of water if the snowpack is melted) is a product of snow depth and snow density. At each snow course survey plot, snow depths and snow densities were measured as described in Section 2.1.2. Appendix A presents the terrain type and snowpack measurement data collected on 30 April 2006. The snow course survey sampling locations for the 2006 program are shown on Figure 2.7, and the snow course data are presented in Table 2.7 and Figure 2.8.

Twenty-two plots over seven terrain types were examined during the snow course survey. Measured snow densities were similar across all terrain types, whereas snow depths ranged from a mean of 18.5 cm for north aspect slope terrain to a mean of 45.7 cm for sheltered lowland terrain. Snow water equivalents ranged from 42.3 mm of water for north aspect terrain to 101.9 mm for sheltered lowland terrain.

Wind redistributes snowfall over the course of a winter, and exposed terrain, such as open lake areas, generally collects less snow than sheltered lowland areas. Similarly, prevailing winds redistribute snow unequally across slopes of differing aspect. These effects may result in significant differences between terrain types in some cases. However, this study involved a limited number of sampling sites in an area with little vegetation, and broad ranges of measured values were observed within each terrain type. As such, detailed calculation of the mean snow water equivalent, based on the relative proportion of each terrain type, is not recommended. An unweighted mean of the snow water equivalent values for various terrain types, equal to 79 mm, may be used in any site-specific water balance calculations.

2.4 RAINFALL

The Doris North meteorological station has been operating continuously since 27 February 2004. The last download for 2006 occurred on 9 September 2006. Rainfall data have been recorded in the months where air temperatures have been above 0°C, which generally included the months of May to September. It is possible that trace rainfall events, and localized rainfall events in parts of the watershed distant from the meteorological station, occurred over the course of the open water months and were not recorded. Monthly rainfall totals for 2005 (updated to include data recorded after the last 2005 download on 20 September) and 2006 are provided in Tables 2.8 and 2.9, respectively. Daily and annual cumulative rainfall are plotted in Figure 2.9 for 2005 and in Figure 2.10 for 2006.

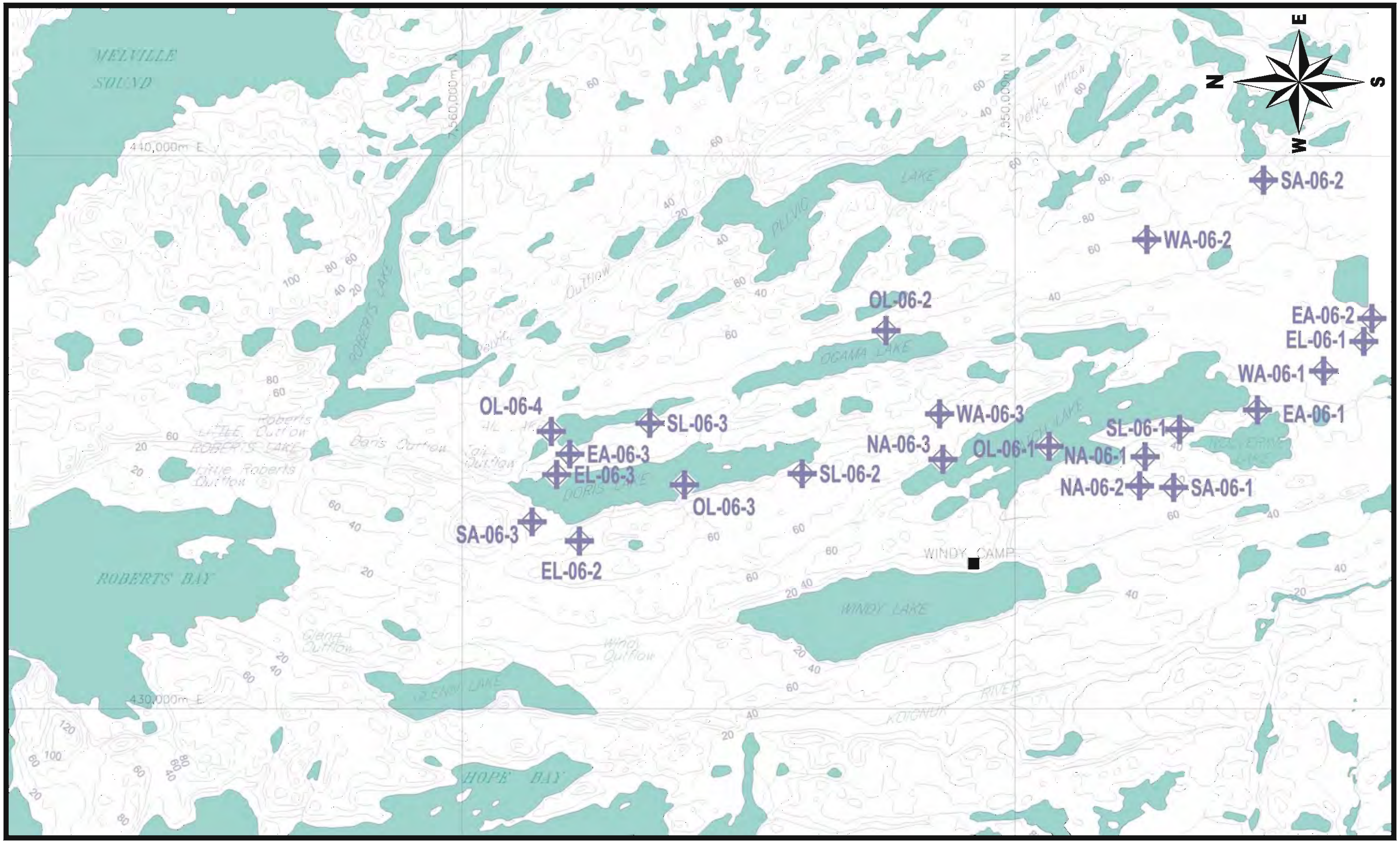
The Doris North meteorological station recorded fewer rainfall events and approximately 44% less rainfall in 2006 compared to 2005. The wettest period occurred between 30 June and 23 July (approximately), during which 28.4 mm of rain was recorded. Lake and stream hydrographs showed only a minor response to rainfall during this period.

Table 2.7 Snow Course Survey Data for Doris Lake Watershed, 30 April 2006.

Terrain Type	Survey Plot Number	Snow Density (g/cm^3)[a]	Snow Depth (cm)[b]	Snow Water Equivalent (mm)
Open Lake	**OL-06-1**	0.352	23.8	83.7
	OL-06-2	0.246	15.9	39.0
	OL-06-3	0.278	17.5	48.5
	OL-06-4	0.237	24.4	57.8
	2006 Mean	**0.278**	**20.4**	**57.2**
Exposed Lowland	**EL-06-1**	0.218	47.3	103.1
	EL-06-2	0.257	28.9	74.4
	EL-06-3	0.195	7.2	14.0
	2006 Mean	**0.223**	**27.8**	**63.8**
Sheltered Lowland	**SL-06-1**	0.197	54.5	107.4
	SL-06-2	0.205	40.9	83.7
	SL-06-3	0.273	41.9	114.6
	2006 Mean	**0.225**	**45.7**	**101.9**
North Aspect	**NA-06-1**	0.242	22.1	53.6
	NA-06-2	0.237	15.6	37.0
	NA-06-3	0.203	17.9	36.2
	2006 Mean	**0.227**	**18.5**	**42.3**
East Aspect	**EA-06-1**	0.248	38.5	95.3
	EA-06-2	0.288	34.5	99.3
	EA-06-3	0.257	23.0	59.2
	2006 Mean	**0.264**	**32.0**	**84.6**
South Aspect	**SA-06-1**	0.232	49.2	114.3
	SA-06-2	0.281	43.1	121.3
	SA-06-3	0.283	36.4	103.2
	2006 Mean	**0.266**	**42.9**	**113.0**
West Aspect	**WA-06-1**	0.280	30.8	86.5
	WA-06-2	0.250	28.9	72.2
	WA-06-3	0.244	46.1	112.6
	2006 Mean	**0.258**	**35.3**	**90.4**

[a] Mean based on three density samples per plot.
[b] Mean based on 30 snow depth measurements per plot.

L:\2006\1373\06-1373-026\4000\For David McKeown Feb 05-08\2.7 - Snow Course - Doris Lake Apr.03-2006.dwg Feb 06, 2008 - 4:46pm



LEGEND

SNOW COURSE SURVEY SITE 2006

NOTE : CONTOUR INTERVAL 20 m

REFERENCE

BASE MAP PROVIDED BY RESCAN,
22 JANUARY 2001.
PROJECTION: NAD27 UTM ZONE 13.

2 0 2
SCALE KILOMETRES

MIRAMAR HOPE BAY LTD.

TITLE

SNOW COURSE SURVEY PLOT LOCATIONS FOR DORIS LAKE WATERSHED APRIL 30, 2006

Golder Associates, Edmonton, Alberta

PROJECT		06-1373-026	FILE No.	Doris Lk Apr.03-06	
DESIGN	DM	20/12/07	SCALE	As shown	REV. 0
CADD	JEF	21/12/07			
CHECK	DM	22/12/07	FIGURE: 2.7		
REVIEW	GA	22/12/07			

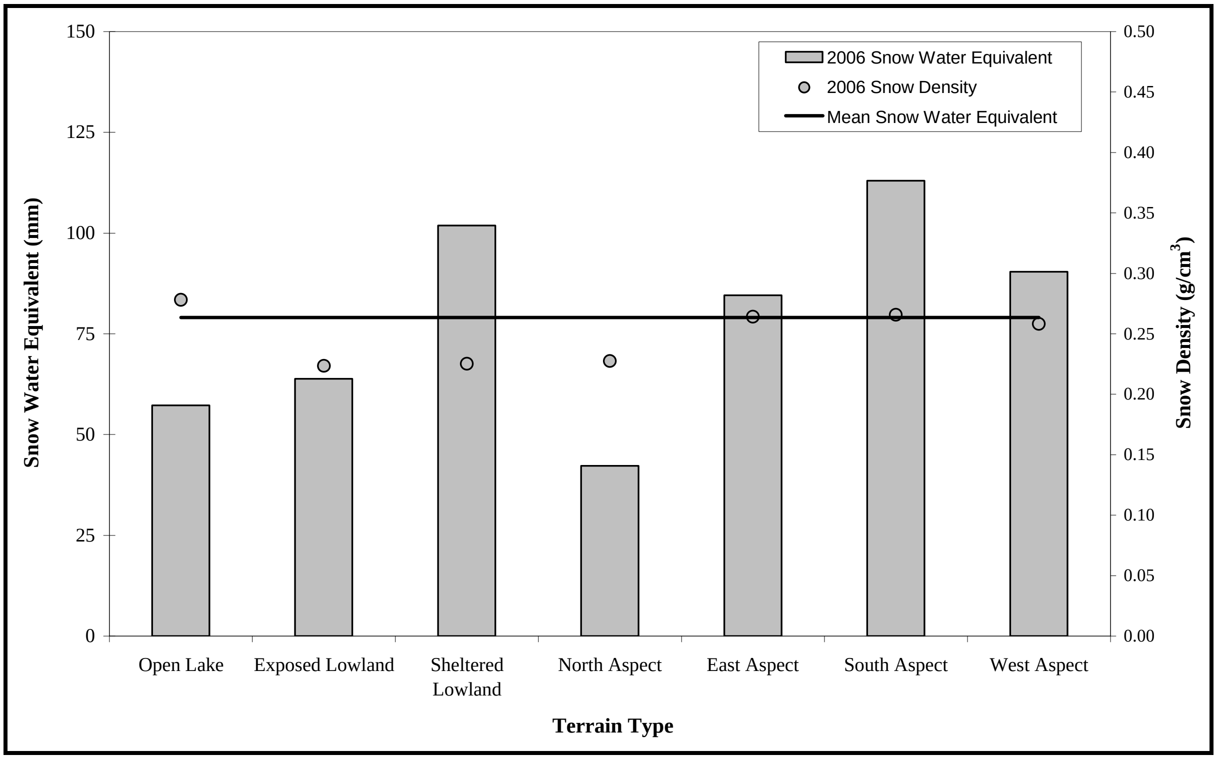


Figure 2.8 Snow Course Survey Data for Doris Lake Watershed, 30 April 2006.

Table 2.8 Updated Monthly Rainfall Measured at Doris North Meteorological Station, May to September 2005.

Month	Measured Rainfall	Estimated Rainfall [a]	Baseline Mean Rainfall [b]
May	0.0 mm	0.0 mm	3.2 mm
June	18.0 mm	21.4 mm	13.7 mm
July	27.2 mm	32.4 mm	24.2 mm
August	31.2 mm	37.1 mm	29.0 mm
September	3.0 mm	3.6 mm	14.4 mm
Total[c]	**79.5 mm**	**94.5 mm**	**84.5 mm**

[a] These values incorporate an undercatch factor of 1.19.

[b] Source: Table 8 of AMEC (2003). These values incorporate an undercatch factor of 1.19.

[c] Updated from the previously reported value of 77.2 mm on the basis of an additional 2.2 mm of rainfall recorded in late September, after the last download of 2005.

Table 2.9 Monthly Rainfall Measured at Doris North Meteorological Station, May to September 2006.

Month	Measured Rainfall	Estimated Rainfall [a]	Baseline Mean Rainfall [b]
May	0.0 mm	0.0 mm	3.2 mm
June	10.9 mm	13.0 mm	13.7 mm
July	22.1 mm	26.3 mm	24.2 mm
August	9.4 mm	11.2 mm	29.0 mm
September [c]	2.0 mm	2.4 mm	14.4 mm
Total [c]	**44.5 mm**	**52.8 mm**	**84.5 mm**

[a] These values incorporate an undercatch factor of 1.19.

[b] Source: Table 8 of AMEC (2003). These values incorporate an undercatch factor of 1.19.

[c] Contains data recorded until 9 September (the last download of 2006).

2.5 LAKE EVAPORATION

The CRLE component of the WREVAP model (Morton et al. 1985) was used to estimate lake evaporation for the Doris Lake watershed. Evaporation from Doris Lake and Tail Lake were calculated separately, because lake evaporation is affected by the mean lake depth. Three years of continuous climate data are required to run the model. Model runs presented in previous reports have been based on field data supplemented by representative monthly estimates to fill the data requirements. Three years of field data from the Doris North meteorological station are now available. These data were used to run the model and revise lake evaporation estimates for the period 2004 to 2006.

The values provided in Table 2.10 are based on the values generated by the WREVAP model. Values were adjusted to account for the presence of a lake ice cover from early October to mid-June, because it is known from prior experience that model results are generally overestimated for high-latitude regions. Baseline lake evaporation values (AMEC 2003) are provided for comparison, and detailed calculations are outlined in Appendix A.

The water balance shown in Table 2.11 indicates that the parameter “other losses” was greater than zero in 2006. This value encompasses evapo-transpiration, changes to groundwater storage and snow sublimation (baseline only).

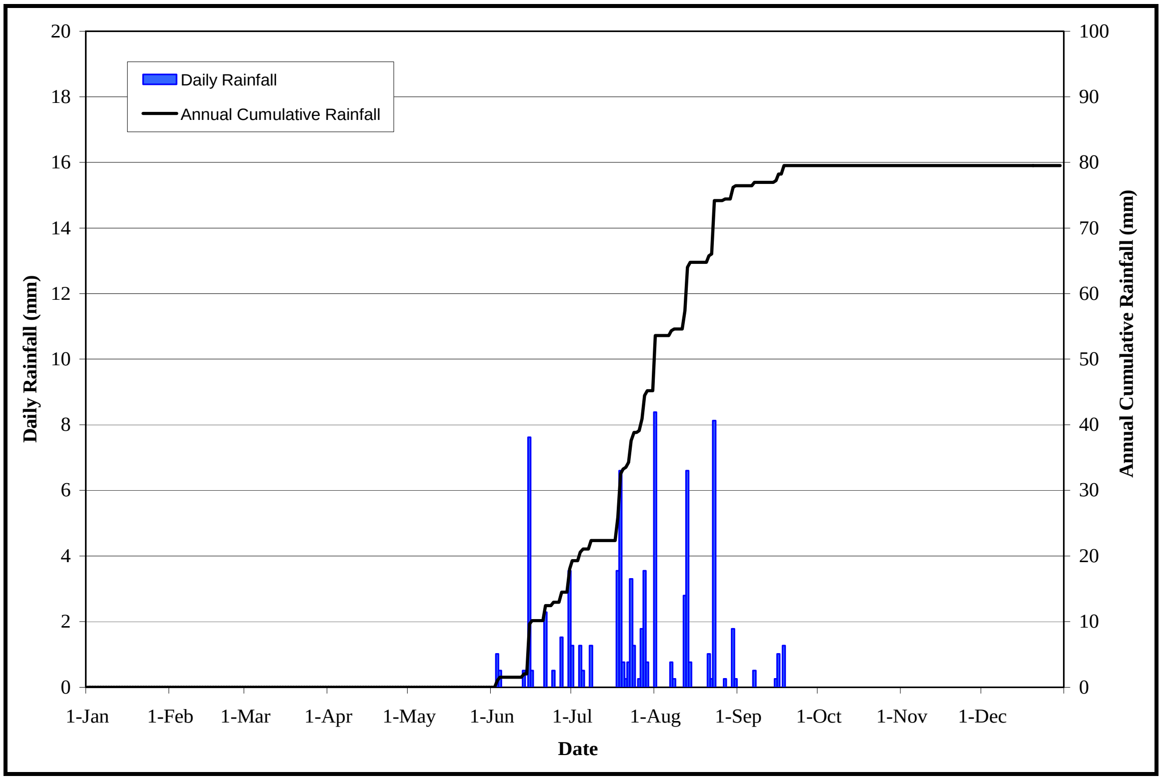


Figure 2.9 **Updated Rainfall Data from Doris North Meteorological Station, May to September 2005**

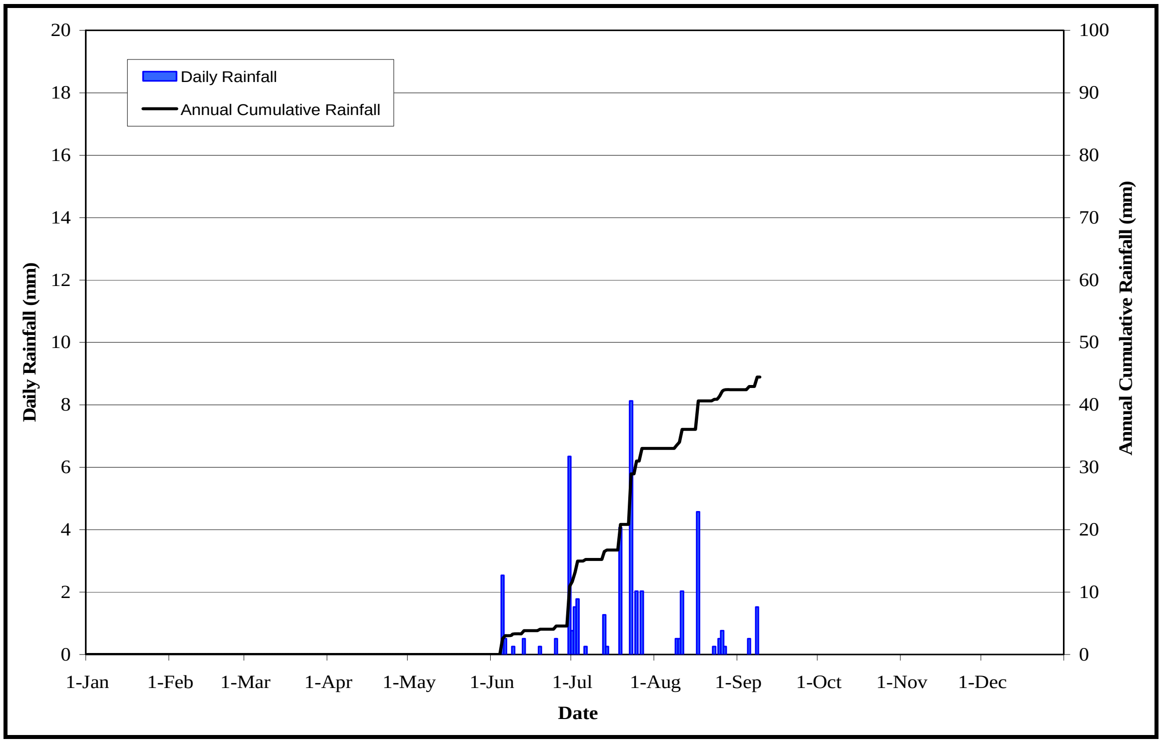


Figure 2.10 **Rainfall Data from Doris North Meteorological Station, May to September 2006**

Table 2.10 Doris Lake Watershed Lake Evaporation, 2004 to 2006.

Month	Lake Evaporation (mm)		
	Baseline Report [a]	Doris Lake CRLE [b]	Tail Lake CRLE [b]
June 2004	35	7	23
July 2004	95	51	86
August 2004	77	85	79
September 2004	13	66	38
2004 Annual Total	**220**	**209**	**226**
June 2005	35	10	29
July 2005	95	68	92
August 2005	77	81	69
September 2005	13	57	37
2005 Annual Total	**220**	**216**	**227**
June 2006	35	28	40
July 2006	95	83	114
August 2006	77	104	98
September 2006	13	85	56
2006 Annual Total [c]	**220**	**286**	**308**

[a] Source: AMEC (2003).

[b] Calculated using WREVAP model component CRLE (Morton et al. 1985). Calculated values for October and 50% of June were neglected due to ice cover.

[c] Solar radiation and air temperature measured at the Doris North meteorological station were greater in 2006 than for either 2004 or 2005. Data recorded subsequent to the final meteorological station download on 9 September 2006 were estimated.

Table 2.11 Water Balance for 2006 Runoff at Doris Lake and Tail Lake

Parameter	Doris Lake		Tail Lake	
	Baseline	2006	Baseline	2006
Rainfall (mm) [a]	86	53	86	53
Snow Water Equivalent (mm) [b]	121	79	121	79
Total Annual Input (mm)	207	132	207	132
Water Yield (mm)	134	73	111	53
Lake Evaporation (mm) [c]	42	54	40	55
Calculated Other Losses (mm) [d]	35	5	56	24

[a] Baseline and measured values adjusted using undercatch factor of 1.19.

[b] Baseline values only adjusted for undercatch using factor of 1.71.

[c] Based on 19% lake area in the Doris Lake watershed and 18% lake area in the Tail Lake watershed.

[d] Baseline values include snowfall sublimation; monitoring values do not.

3.0 PHYSICAL LIMNOLOGY AND WATER QUALITY

3.1 METHODS

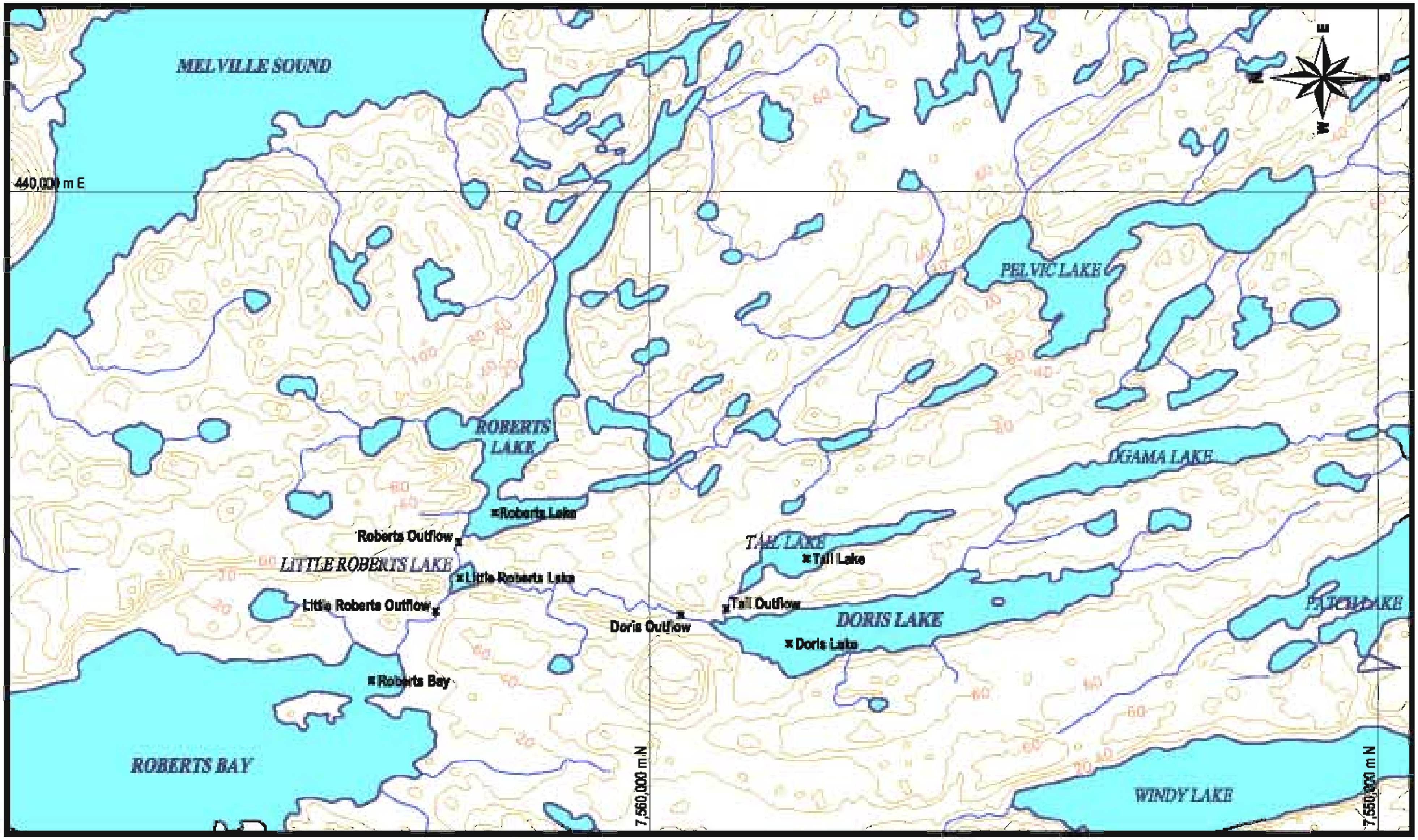
An extensive water quality program was conducted in the Doris North study area between 30 May and 13 September 2006 to strengthen the project's water management strategy. Four lakes (Doris, Tail, Roberts and Little Roberts) and their corresponding outflow streams (Figure 3.1) were sampled at least once per month; Doris Outflow, the stream that would receive tailings decant, was sampled 14 times over the course of this study (Table 3.1). As in previous years, one marine site in Roberts Bay was included in the water quality program because the four Doris North study streams flow into this bay, and have the potential to influence its water quality. Roberts Bay was sampled four times between May and September on approximately the same dates as the lake sites (Table 3.1).

This section of the report presents information on baseline water quality conditions in 2006 for the selected lakes, outflow streams and Roberts Bay (Figure 3.1). Detailed site-specific data are presented in Appendices B1 to B6.

3.1.1 Field Sampling Locations and Procedures

Lakes and Roberts Bay

Water quality stations in 2006 duplicated those used during the 2005 study; they were located in the deep basins of Doris Lake, Tail Lake, Roberts Lake, Little Roberts Lake and Roberts Bay (Figure 3.1). In Roberts Lake, where previously there were at least two water quality stations, in 2006 only one was sampled (referred to as site B in previous years; in the west basin of the lake) (Figure 3.1). Water quality stations were located using a Global Positioning System (hand-held Garmin 76; accuracy of ±10 m). To prevent contamination, equipment was thoroughly rinsed with ambient water before and after sampling. Samples were collected with a Kemmerer water sampler from 1.0 m below the water surface in the lakes and 3.0 m below water surface in Roberts Bay. In addition, near-bottom samples were collected from about 0.5 m above the bottom (to prevent sediment disturbance and contamination of samples) from Roberts Bay and the study lakes, except the shallowest, Little Roberts Lake. Water quality samples and measurements were collected, from the lakes and Roberts Bay, once under the ice and three times over the summer season (Table 3.1).



LEGEND

× Water quality sampling location

REFERENCE - Base map provided by Rescan, January 22, 2001.

NOTE - Contour interval 20 m.

MIRAMAR HOPE BAY LTD.

1.5 0 1.5

Scale Km

TITLE

Water Quality Sampling Locations In Doris North Project Area, 2006

Golder Associates
Edmonton, Alberta

PROJECT No.		06-1373-029	FILE No.		1731201
DESIGN	SE	17/01/07	SCALE	As shown	REV. 1
CADD	RW	17/01/07			
CHECK	DM	20/12/07			
REVIEW	GA	20/12/07			

Figure: 3.1

Table 3.1 Number of Water Quality Samples[a] Collected in the Doris North Project Area, 2006.

Date	Doris Outflow	Doris Lake	Tail Outflow	Tail Lake	Roberts Outflow	Roberts Lake	Little Roberts Outflow	Little Roberts Lake	Roberts Bay	Total
30 May						1		1		**2**
31 May		2[b]		1					1	**4**
18 Jun	1		1		1		1			**4**
24 Jun	1		1							**2**
30 Jun	1		1							**2**
07 Jul	1		1							**2**
13 Jul	1		1		1		1			**4**
14 Jul		2				2		1		**5**
20 Jul	1		1	2					2	**6**
28 Jul	1		1							**2**
04 Aug	1		1							**2**
10 Aug					1	2	1			**4**
11 Aug	1	2						1		**4**
12 Aug				2					2	**4**
18 Aug	1		1							**2**
26 Aug	1		1							**2**
01 Sep	1		1							**2**
09 Sep	2[c]		1		1		1			**5**
11 Sep						2			2	**4**
13 Sep		2		2				1		**5**
Total	**14**	**8**	**12**	**7**	**4**	**7**	**4**	**4**	**7**	**67**

Checked by: SE

Prepared by: EJJ

[a] Excluding QA/QC samples – these are listed in Table 3.3.

[b] When two samples were collected from lakes and Roberts Bay, one sample was collected near the top and one near the bottom of the water column.

[c] Apart from the usual WQ site, an additional location (site below falls) was sampled.

Water samples were collected for analyses of standard water quality parameters including major ions, nutrients, and metals. Sample bottles were provided by the laboratory, and were labeled with the sample location and date. When required, the appropriate preservative was added in the field. All samples were kept cool until delivery to the laboratory.

Field measurements of pH, conductivity, temperature, dissolved oxygen (DO) and Secchi depth were taken at each sampling site. DO and temperature were measured using a field-calibrated Oxyguard™ Beta dissolved oxygen and temperature meter (accuracy: ±0.1 mg/L DO and ±0.1°C). Dissolved oxygen and temperature profile data were collected monthly in the four lakes and Roberts Bay. Measurements were taken at 0.5 or 1.0 m intervals along a vertical transect from surface to near bottom. The deepest measurement for each profile was 0.5 m above the bottom to avoid contamination of the probe by fine sediments. Conductivity and pH were measured about 0.2 m below water surface with an Oakton WTW 340I pH and conductivity meter. The conductivity meter was calibrated in the field using standard solutions (447 and 1413 µS/cm). The pH meter was calibrated in the field using standard buffer solutions (pH 4 and 7).

Water transparency (Secchi depth) was measured with a standard Secchi disk (20 cm diameter), and was considered to be the depth at which the disk disappeared from sight. The lower limit of the euphotic zone (approximate depth to which 1% of incident light penetrates) was calculated to be approximately twice the Secchi depth.

Streams

Stream water quality was sampled on at least four occasions, starting on 18 June 2006 (Table 3.1). The water samples were collected approximately 0.1 m below the water surface from Doris, Tail, Roberts and Little Roberts outflow streams. The samples were analyzed for the same water quality parameters as the lake and marine samples. The sample treatments and handling was also identical for the lake and marine samples. Field measurements included pH, conductivity, temperature, and dissolved oxygen. Measurements were taken using the same methods and equipment employed at the lake and marine sites. In addition, temperature recorders (HOBO Water Temp Pro v2) were installed at each stream water quality station (Figure 3.1). The intent was to collect continuous water temperature readings from 18 June through to 9 September. To secure the temperature recorder, the unit was attached with a rope to a stake or a shrub on the stream bank. The temperature recorder also was secured within the stream channel by attaching it to a large rock or a lead weight. The temperature was recorded at six minute intervals. If the temperature recorder was exposed to the air (by an animal or fast moving current and/or drop in water level), the readings were readily identified (much higher daily fluctuations) and excluded from the temperature time series.

3.1.2 Laboratory Analytical Procedures and QA/QC

Water quality analyses, including nutrients (phosphorus, nitrogen, carbon), major ions (cations and anions), metals (total and dissolved), and other standard physicochemical parameters (e.g., total alkalinity, total suspended solids, true colour) were carried out by the Alberta Research Council (ARC) Laboratory in Vegreville, Alberta. The parameters analysed, and their minimum reported values (MRVs), are provided in Table 3.2. Selenium and arsenic samples from Roberts

Table 3.2 Water Quality Parameters and Corresponding Minimum Reported Values (MRV) from Laboratory Analyses of Water Samples for the Doris North Project, 2006.

Parameter	Unit	MRV	Parameter	Unit	MRV
Metals (Total and Dissolved)			***Nutrients***		
Aluminum (Al)[a]	µg/L	0.5	Ammonia-N[a]	mg/L	0.001
Antimony (Sb)	µg/L	0.005	Dissolved Organic Carbon	mg/L	0.2
Arsenic (As)[a]	µg/L	0.002	Fluoride (F)[a]	mg/L	0.01
Barium (Ba)	µg/L	0.004	Phosphorus, Total[b]	mg/L	0.001
Beryllium (Be)	µg/L	0.003	Sulphide	mg/L	0.001
Bismuth (Bi)	mg/L	0.001	Total Kjeldahl Nitrogen	mg/L	0.01
Boron (B)	µg/L	0.05	Total Organic Carbon (calc.)[c]	mg/L	0.8
Cadmium (Cd)[a]	µg/L	0.002	Total Suspended Solids[a]	mg/L	1
Calcium (Ca)	mg/L	0.004			
Chromium (Cr)[a]	µg/L	0.03	***Routine Water Analysis***		
Cobalt (Co)	µg/L	0.001	Chloride (Cl)	mg/L	0.3
Copper (Cu)[a]	µg/L	0.05	Color, True[b]	T.C.U.	1
Cyanide, Total[a]	mg/L	0.001	Nitrate+Nitrite-N	mg/L	0.005
Iron (Fe)[a]	µg/L	2	Nitrate-N (calc.)[a]	mg/L	0.005
Lead (Pb)[a]	µg/L	0.001	Nitrite-N[a]	mg/L	0.001
Magnesium (Mg)	mg/L	0.0001	Sulphate (SO_4)	mg/L	3
Manganese (Mn)	µg/L	0.003			
Mercury (Hg)[a]	ng/L	0.6	***pH, Conductivity and Total Alkalinity***		
Molybdenum (Mo)[a]	µg/L	0.001			
Nickel (Ni)[a]	µg/L	0.005	pH[a]	pH	0.1
Potassium (K)	µg/L	2	Conductivity (EC)	µS/cm	0.1
Selenium (Se)[a]	µg/L	0.1	Bicarbonate (HCO_3)	mg/L	1
Silver (Ag)[a]	µg/L	0.0005	Alkalinity, Total (as $CaCO_3$)	mg/L	1
Sodium (Na)	µg/L	2	Total Dissolved Solids (calc.)[c]	mg/L	9
Strontium (Sr)	µg/L	0.004			
Thallium (Tl)[a]	mg/L	0.0003			
Tin (Sn)	mg/L	0.03			
Uranium (U)	µg/L	0.0001			
Vanadium (V)	µg/L	0.005			
Zinc (Zn)[a]	µg/L	0.1			

Checked by: SE

Prepared by: EJJ

[a] Indicates parameters that are included in the Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME 2006).

[b] Jurisdictional guideline for NorthwestTerritories and Nunavut (Statistics Canada 2006) is used for evaluations of total phosphorus concentrations.

[c] calc. - calculated

Bay were analyzed by the ARC using an additional step to remove the chloride ion from the samples. High concentrations of chloride in marine samples produce falsely high readings for arsenic, but especially for selenium.

Quality assurance/quality control for the water sampling program was ensured through the use of field blanks and replicate samples (Table 3.3 and

Appendix B3). Field blanks were prepared in the field by filling sample containers with deionized water provided by the laboratory. Replicate samples were collected by filling multiple containers at a single site. All blank samples were preserved, if required, and given a unique name.

Table 3.3 Summary of the QA/QC Samples Collected in the Doris North Project Area, 2006.

Checked by: SE Prepared by: EJJ

Waterbody	QA/QC Sample Type	Number of Samples	Date	Location in Water Column	Total Metals Analyzed	Total Ultra Low Level Mercury Results (ng/L)
Doris Lake	Replicate	2	31 May	Top	yes	nd
		2	14 July	Top	yes	4.6 and 16
		2	11 Aug	Top	yes	2.1 and <0.6
Doris Lake	Replicate	2	13 Sep	Top	yes	1 and <0.6
		2	31 May	Bottom	yes	nd
Tail Lake	Blank DI Water	1	20 July	na	yes	<0.6
		1	12 Aug	na	yes	<0.6
		1	13 Sep	na	yes	<0.6

nd- not determined; na- not applicable

3.1.3 Data Interpretation

Concentrations of the various substances were compared against Canadian Water Quality Guidelines (CCME 2006). In cases where the Canadian Water Quality Guidelines (CCME) have not yet been developed, the Northwest Territories and Nunavut jurisdictional guidelines (Statistics Canada 2006) or the British Columbia water quality guidelines (BCMOE 2006) were used.

Aluminum

Water quality guidelines (WQG) for aluminum depend on the pH of water. The 100 µg/L water quality guideline (WQG) is used for waters with pH ≥ 6.5, while the 5 µg/L WQG is used for waters with pH < 6.5.

Cadmium

When water hardness is within 30 to 90 mg $CaCO_3$/L, the following formula was used to derive the guideline for total cadmium:

$$WQG=10^{\{0.86[\log(hardness)]-3.2\}}$$

where the water quality guideline (WQG) is in µg/L and hardness is measured as $CaCO_3$ equivalents in mg/L. When water hardness is ≤30 mg/L, the WQG for total cadmium is 0.01 µg/L. For water with hardness ≥90 mg $CaCO_3$/L, the WQG for total cadmium is 0.03 µg/L.

Copper

The CCME (2006) water quality guidelines for copper (total) are set for different water hardness levels ($CaCO_3$ concentrations) as follows:

WQG for Total Copper (µg/L)	Water Hardness (mg $CaCO_3$/L)
2	<120
3	120–180
4	>180

Copper is a metal of special concern in the Doris North area since it is typically associated with gold mining. Therefore, copper concentrations are discussed for each water body.

Mercury Concentrations

Mercury concentrations are discussed for each site regardless of their value, because mercury readily accumulates in aquatic biota (CCME 2006). Concentrations of this toxicant should be noted even if they do not exceed the CCME guidelines (16 ng/L for marine and 26 ng/L for fresh water). The main reason is that the guidelines, as yet, have not factored in mercury accumulation in aquatic biota *via* ingestion. Furthermore, the freshwater guidelines for one of the forms of mercury, namely methylmercury (MeHg), are much lower (4 ng/L); however, typical water quality analyses tend to give total and dissolved mercury concentrations, not the individual salts and species. Depending on environmental conditions, methylmercury can contribute from less than 10 to 30% of total mercury concentrations (CCME 2006).

Total Alkalinity – Acid Neutralizing Capacity

Total alkalinity is a common measure of the acid neutralizing capacity of water. As such, it provides an indication of a water body's sensitivity to acid deposition. According to Saffran and Trew (1996), acid sensitivity ranges of lakes are based on total $CaCO_3$ alkalinity. Their study was based on lake data only; no similar studies have been conducted on streams. The acid sensitivity ranges are defined as follows:

Acid Sensitivity of Lakes	Total Alkalinity (mg $CaCO_3$/L)
high sensitivity	<10
moderate sensitivity	11 to 20
low sensitivity	21 to 40
least sensitive	>40

Total Phosphorus

CCME guidelines for flowing waters presently not available for total phosphorus (TP); for still waters, CCME suggests a series of trigger ranges (CCME 2006). However, a number of Canadian jurisdictions have developed their own TP guidelines for lentic (still) and lotic (flowing) waters (Statistics Canada 2006). In Northwest Territories and Nunavut a 30 µg/L TP guideline is used for both lotic and lentic waters (Statistics Canada 2006). In this report, the TP concentrations from Doris North waters are compared against the Northwest Territories and Nunavut jurisdictional guideline.

Zinc

The 30 µg/L zinc CCME (2006) guideline was developed in 1987 and does not take into account water hardness. A number of Canadian provinces (Alberta, British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario and Saskatchewan) have adopted a more recent guideline (BCMOE 2001; Environment Canada 2005). Specifically, the total zinc guideline for the protection of freshwater life (used in the above Canadian jurisdictions) is 7.5 µg/L; this applies to water bodies with hardness ≤90 mg $CaCO_3$/L (Statistics Canada, 2006). Zinc is a metal of special concern in the Doris North area since it is typically associated with gold mining. Therefore, zinc concentrations are discussed for each water body.

Total vs Dissolved Metal Concentrations

In general, toxicity of the particulate fraction of a metal (included in the total concentration of a metal) is lower than that of the dissolved fraction. Although, the CCME guidelines pertain to the total metal concentrations, most of these guidelines were based on toxicological studies using dissolved metal concentrations. As such, when a dissolved metal concentration exceeds the CCME guidelines in a natural setting, it is likely to have more serious effects on the aquatic biota than when only the total concentration of a metal exceeds the guideline. *"Of particular concern is the apparent toxicity of some ionic metals to fish due to adsorption of the metal at the gill surface. Particulate bound forms of the same metal have much reduced toxicity. This is important when comparing the laboratory toxicity results with field situations where more metal binding agents are likely to be present, thereby usually reducing the toxicity of the metal. Conversely, fish tested in the laboratory are usually not fed and do not ingest particulate metals."* (CCME 2006).

The 2006 physical limnology and water quality data for Doris North sites were also compared to data collected between 1995 and 2005 (RL&L/Golder 2002, RL&L/Golder 2003a; RL&L/Golder 2003b; Golder 2005b, and Golder 2006).

3.2 LAKE WATER QUALITY

The analytical results for a number of parameters were outside the guideline limits in each of the four lakes during the 2006 sampling season (Table 3.4). Detailed discussions of physical limnology and water quality for each lake are provided under the respective lake headings. All field measurements of pH, conductivity, dissolved oxygen, water temperature and Secchi depth are provided in Appendix B1. Temperature and dissolved oxygen profiles are in Appendix B2. QA/QC data and laboratory results for water quality analyses in 2006 are presented in Appendices B3 and B4. Chlorophyll *a* and phaeophytin concentrations are provided in Appendix B6.

3.2.1 Doris Lake

Doris Lake was sampled for water quality on four occasions between 31 May and 19 September 2006.

The dissolved oxygen (DO) profile obtained during ice-covered conditions in May (Figure 3.2) indicated that the water column in Doris Lake was well oxygenated (>11.5 mg/L) to a depth of 12 m. The lowermost stratum of the lake (i.e., between 12.5 and 14 m depth) exhibited a sharp decrease in DO concentration; values recorded at 13.5 and 14 m depths (6.3 and 3.8 mg/L, respectively) were below the 6.5 mg/L minimum guideline for the protection of aquatic life (CCME 2006). The water temperature was uniform throughout the water column at around 1.7°C.

Similar to previous years, Doris Lake continued to be unstratified in July and September, with well oxygenated water extending all the way to the bottom (Figure 3.2). The one exceptionally low DO reading (4.8 mg/L at 14 m) recorded in July was most likely due to the disturbance of sediments with the DO measuring probe. Apart from this likely erroneous value, all DO values during the ice-free period in 2006 were above the minimum Canadian Water Quality Guideline (CWQG; CCME 2006) for the protection of aquatic life (6.5 mg/L) and for early life stages of fish (9.5 mg/L). In July, the surface-to-bottom temperature differences were greater than in previous years. The temperatures declined gradually from 15.2°C at the water surface to 7.8°C near the bottom.

Table 3.4 Summary of 2006 Lake Water Samples that Equaled or Exceeded Guidelines for the Protection of Aquatic Life in Freshwater

Site	Strata	Date	Field pH	TSS[a]	Al (Total)		Cd (Total)	Cu (Total)	Se (Total)	TP
			CCME	CCME	CCME	CCME	CCME	CCME	CCME	Juris. [b]
			6.5-9.0	25 mg/L[c]	100 µg/L for pH≥6.5	5 µg/L for pH<6.5	0.012 µg/L[d]	2 µg/L	1 µg/L	30 µg/L
Doris Lake	Under ice	31-May		2					***1.9***	
	Bottom	31-May	***6.47***[e]	<1		***24.1***			***2.1***	
	Top	14-Jul	6.91	3					***1.1***	
	Bottom	14-Jul		2					***1.1***	
	Top	11-Aug		2					***1.2***	
	Bottom	11-Aug		3					***1.2***	***51***
	Top	13-Sep	8.05	3					***1.5***	***30***
	Bottom	13-Sep		4					***1.2***	***48***
Tail Lake	Under ice	31-May	7.30	<1					***1.9***	
	Top	20-Jul	7.33	<1			***0.094***			
	Top	13-Sep	7.90	<1						***30***
Roberts Lake	Under ice	30-May	7.61	<1					***2.1***	
	Top	14-Jul	6.65	4	***130***					
	Bottom	14-Jul		4						
	Top	10-Aug	6.81	<1					***1.2***	
	Bottom	10-Aug		2					***1.2***	***38***
	Bottom	11-Sep		2				***3.78***	***1.1***	
Little Roberts Lake	Under ice	30-May	7.68	2	***245***					
		14-Jul	6.78	3					***1.0***	
		11-Aug	6.68	2					***1.1***	
		13-Sep	7.82	<1					***1.5***	***31***

[a] Total suspended solids (TSS)

[b] Juris. – Jurisdictional guideline for total phosphorus (TP) for Northwest Territories and Nunavut (Statistics Canada 2006); there is no single CCME guideline value but rather a set of trigger ranges (CCME 2006).

[c] The CCME guidelines for clear waters specify maximum increase of 25 mg/L from background levels for any short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg/L from background levels for longer term exposures (e.g., inputs lasting between 24 h and 30 d).

[d] The Cd CCME (Canadian Council of Ministers of the Environment) guideline was adjusted for hardness for the specific site (Tail Lake); all other sites had Cd concentrations below their site-adjusted CCME guidelines.

[e] Values exceeding guidelines are ***italicized and in bold type*****.**

The August measurements for DO and temperature could not be collected due to meter malfunction. In September, the lake was isothermic, with temperatures around 8.5°C throughout the water column.

The uniform temperature and lack of stratification in September were typical of Doris Lake conditions reported since 1995. In contrast, the July and August temperatures of the upper water column were more than 2°C higher then recorded in previous years. In 2006, the July maximum temperature of the upper water column was measured at 15.2°C, whereas in August, a maximum of 16.0°C was recorded (Appendix B1).

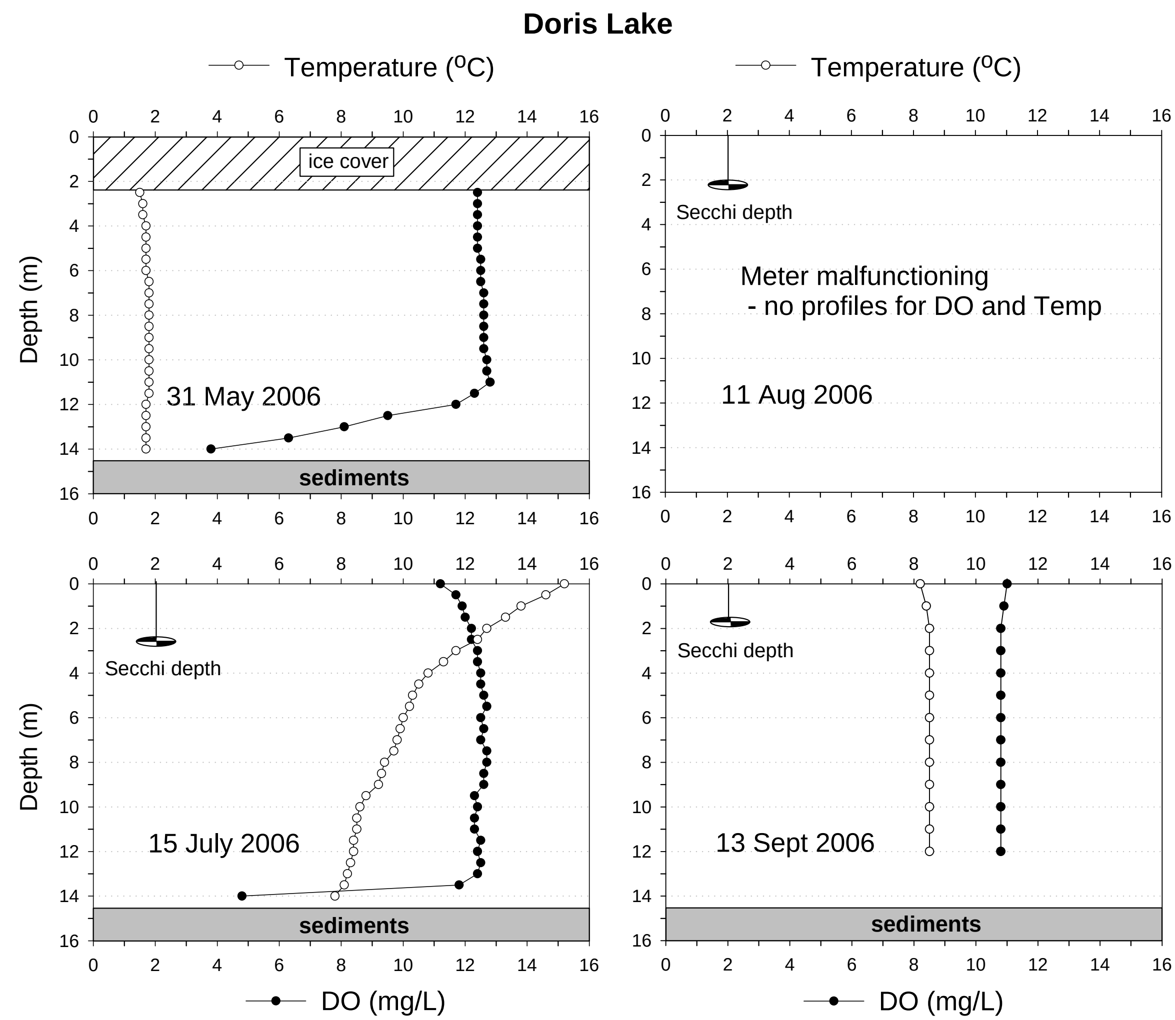


Figure 3.2 **Temperature and Dissolved Oxygen (DO) Profiles and Secchi Depth for Doris Lake, 2006.**

Total phosphorus (TP) in Doris Lake exceeded the 30 µg/L jurisdictional guideline for Northwest Territories and Nunavut on two occasions. Both times, 11 August and 13 September, the exceedances occurred in bottom samples (51 and 48 µg/L, respectively) (Table 3.4). The corresponding samples from the top of the water column were just below the guideline on 11 August (28 µg/L) and equal to the guideline on 13 September (30 µg/L). This indicates that the lake sediments are likely the main source of phosphorus in Doris Lake. All of the dissolved inorganic forms of nitrogen (ammonia, nitrate and nitrite) were well below the CCME guidelines.

The chlorophyll *a* sample collected on 13 September contained 15.3 mg/m^3 chlorophyll *a* and 5.1 mg/m^3 of phaeophytin. This chlorophyll *a* concentration showed that phytoplankton productivity was high in Doris Lake, at the level commonly observed in eutrophic lakes (USEPA 2000). The three-fold greater concentration of chlorophyll *a* compared to phaeophytin indicates that the phytoplankton population was composed of mainly live phytoplankton, even this late in the growing season (Appendix B6). The Doris Lake waters were clear, with typical total suspended solids (TSS) concentrations of 2 to 3 mg/L throughout the season. The Secchi depth was consistently around 2 m (Figure 3.2).

Conductivity in the lake (measured in the field) ranged between 180 and 251 µS/cm. The field pH was measured on three occasions in 2006. During one sampling event, the recorded value was just below the lower CCME guideline of pH 6.5 (Table 3.4). In previous studies, the pH in Doris Lake was recorded below the CCME guideline (pH 6.5) only in August 1995. In 1995, eight sites were sampled in Doris Lake; six sites ranged from pH 5.9 to pH 6.4, and two sites were measured at pH 6.5. The field pH of 8.05 recorded in the 2006 sampling season was the highest recorded to date for Doris Lake.

Total alkalinity ranged from 26.6 to 35.5 mg $CaCO_3$/L. The maximum total alkalinity value measured in 2006 was the highest recorded for Doris Lake since 1995. The lowest total alkalinity reported for Doris Lake (1.8 mg/L) was measured on 7 June 1995. For the 2006 sampling period, the mean total alkalinity in the lake was about 27 mg/L. Based on the Saffran and Trew (1996) classification, Doris Lake has a low sensitivity (susceptibility) to acidification.

During the 2006 sampling season, the total aluminum concentrations were below the CCME guideline (100 µg/L) when pH was ≥6.5. However, on the one occasion when pH was measured below pH 6.5, the total aluminum concentrations in Doris Lake samples exceeded the 5 µg/L CCME guideline (Table 3.4). In previous studies, total aluminum concentrations exceeded the 100 µg/L guideline only once; this occurred in summer 2005 (120 µg/L). The 5 µg/L guideline, which applies when the pH <6.5, was exceeded in August 1995; at the eight sites sampled, total aluminum concentration ranged from 18 to 120 µg/L.

In 2006, total copper concentrations in Doris Lake were below the 2 µg/L CCME (2006) guideline for waters with hardness <120 mg/L. Concentrations in Doris Lake water samples ranged from 0.88 to 1.77 µg/L.

Total mercury concentrations in Doris Lake were usually near, or below, the analytical limits of detection, but on 14 July 2006, they increased to 16 ng/L (greater than half of the guideline concentration of 26 ng/L). In the 1995 to 2000 and 2003 sampling periods, all total mercury concentrations were below the 10 ng/L detection limit. In 2004, the maximum total mercury concentration was 30.7 ng/L (on 16 August), exceeding the CCME guideline of 26 ng/L on this one occasion. Total mercury concentrations in the remainder of 2004 samples were very low. Similarly, the total mercury concentration in 2005 was high (21 ng/L) during only one sampling event (19 July).

Total selenium concentrations in 2006 ranged from 1.06 to 2.08 µg/L. All values exceeded the CCME guideline (1 µg/L), including both top and bottom samples of the water column (Table 3.4). Similar concentrations of total selenium have been recorded for Doris Lake during open water sampling periods since 1995; however, 2006 was the first year that the concentrations exceeded CCME guidelines in every sample and on every sampling event.

The total zinc concentrations ranged from 0.74 to 3.98 µg/L; none of the 2006 Doris Lake samples exceeded the 30 µg/L CCME guideline for zinc.

3.2.2 Tail Lake

Tail Lake was sampled for water quality on four occasions between 31 May and 13 September 2006.

The May, July, August and September profiles for DO showed that Tail Lake was well oxygenated throughout the water column on all four sampling dates (Figure 3.3). The shallower depth (5 m) measured in under-ice conditions (Figure 3.3) was probably due to sampling being done in a shallower spot near the usual water quality sampling station (determined using a GPS unit and therefore subject to the associated limitations in terms of accuracy). The DO concentrations were highest in July and September. In previous studies going back to 1995, well oxygenated conditions were typical for Tail Lake with one exception. In July 1997, DO concentrations for the entire water column were around 5 mg/L (i.e., below the 6.5 mg/L CCME guideline for the protection of aquatic life). Tail Lake showed no thermal stratification on all four sampling dates (Figure 3.3). Such uniform temperature profiles were also measured in Tail Lake in earlier studies. However, the 2006 July and August temperature profiles (temperature range 14.6 - 16.9°C) were the warmest on record. Previously, the recorded maximum temperature in Tail Lake was 14.5°C (in August 1995 and July 2003).

Tail Lake TP concentrations in the 2006 water samples ranged from 14 to 30 µg/L; the maximum value recorded reached the jurisdictional guideline for Northwest Territories and Nunavut (Table 3.4). This value was measured in a near-surface water sample collected on 13 September. The bottom sample collected on the same day contained only 19 µg/L TP. All of the dissolved inorganic forms of nitrogen were well below the CCME guidelines. The chlorophyll *a* sample (13 September) contained 2.8 mg/m^3 chlorophyll *a* and 2.3 mg/m^3 of phaeophytin. The low concentrations, and similar proportions of chlorophyll *a* and phaeophytin, indicate that this was the end of the growing season for phytoplankton in Tail Lake (Appendix B6). Furthermore, the phytoplankton productivity in this lake was typical of an oligotrophic system, at least in September (USEPA 2000).

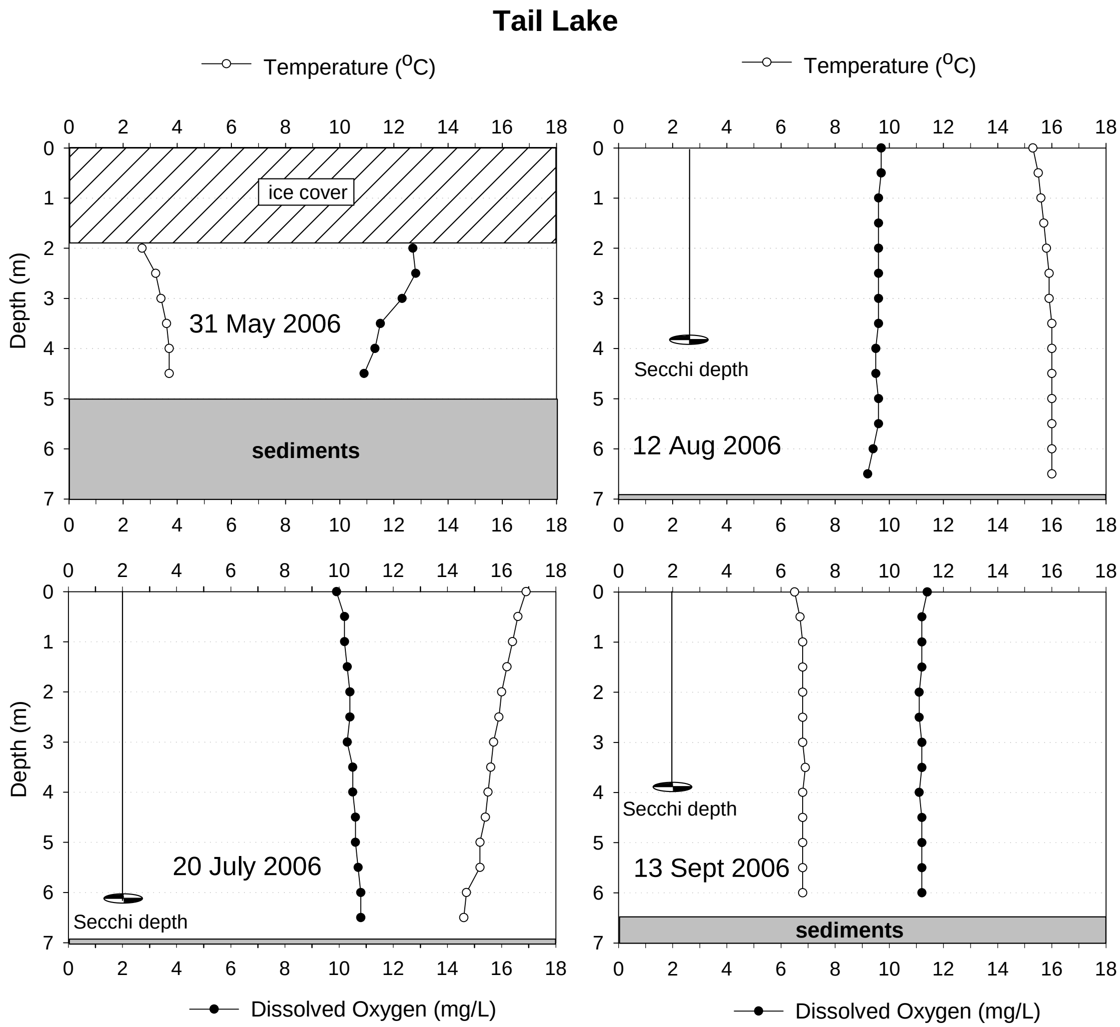


Figure 3.3 Temperature and Dissolved Oxygen (DO) Profiles and Secchi Depth for Tail Lake, 2006.

Tail Lake waters were very clear, with TSS concentrations below the <1 mg/L detection limit throughout the season. The July Secchi depth of 6.1 m (Figure 3.3) was the greatest recorded for Tail Lake over the last 10 years. Readings from previous years indicate that Tail Lake is typically very clear, although the Secchi depth was around 1.5 m on two occasions (July 1997 and September 2003). Tail Lake field conductivity measurements during the open water sampling period in 2006 ranged from 119 to 140 µS/cm.

Measurements of pH in the field during 2006 ranged between pH 7.30 and pH 7.90. Based on previous studies, these pH readings were typical for Tail Lake and well within the CCME guideline of pH 6.5-9.0. In past studies, recorded pH values occasionally fell outside (below) the CCME guideline; the lowest reading (pH 5.50) was recorded on 18 August 1995 at one of the three sites sampled on this date (the other two sites had pH of 5.80 and 6.00).

Total alkalinity ranged from 24.8 to 31.6 mg $CaCO_3$/L. Similar values were obtained in the past for Tail Lake. Based on the Saffran and Trew (1996) classification, Tail Lake has a low susceptibility to acidification.

Total aluminum concentrations were well below the CCME 100 µg/L guideline in 2006. In previous surveys, the total aluminum concentrations exceeded the CCME guidelines on several occasions (18 Aug 1995, 27 August 1996, 18 April 1997, 16 July 1997 and 18 Aug 2004); the maximum concentration, 309 µg/L, was recorded in 1996.

Total cadmium concentrations were typically below CCME guidelines except for one water sample. This water sample was collected from the upper water column in Tail Lake on 20 July 2006; the total cadmium concentration was 0.094 µg/L and the dissolved cadmium concentration was 0.061 µg/L (Table 3.4). However, the companion water sample taken near the bottom contained no detectable total or dissolved cadmium. Temperature and dissolved oxygen profiles also taken at the time showed that the water column was uniformly mixed and well oxygenated (Figure 3.3), suggesting that an upwelling event from sediments at the time was unlikely. It is possible that the surface sample was contaminated, perhaps with motor oil, which contains small amounts of cadmium (CCME 2006).

In 2006, total copper concentrations in Tail Lake were all below the 2 µg/L CCME (2006) guideline for waters with hardness <120 mg/L; the water samples ranged from 1.07 to 1.55 µg/L.

Total mercury concentrations were either below or just above the detection limit during all sampling events in 2006 and in previous studies.

Total selenium concentration exceeded the CCME guideline on one occasion (31 May 2006), when it reached 1.85 µg/L (Table 3.4). During the remaining six sampling events, the concentrations of total selenium were about half of the CCME guideline of 1 µg/L. Previously, the highest total selenium concentration in Tail Lake (4 µg/L) had been recorded in August 1995.

The 30 µg/L CCME guideline for zinc was not exceeded in any of the Tail Lake water samples during 2006. However, the 7.5 µg/L total zinc guideline for water bodies with hardness ≤90 mg $CaCO_3$/L, adopted by most other Canadian jurisdictions (Statistics Canada 2006), was exceeded on one occasion. The exceedance (8.2 µg/L) occurred in the 31 May under-ice water sample. On the remaining sampling dates in 2006, the total zinc concentrations ranged from 1.03 to 5.07 µg/L. These concentrations are typical for Tail Lake. In the past, however, high total zinc concentrations of 56 µg/L (near-surface sample) and 85 µg/L (mid-water-column sample) were measured; these values were recorded at two sites in the southwest portion of the lake on 18 August 1995. The total suspended solids readings at the two sites were both low (3 and <1 mg/L), making it less likely that sediment contamination was responsible for the high zinc concentrations.

3.2.3 Roberts Lake

Roberts Lake was sampled for water quality on four occasions between 30 May and 11 September 2006.

On all four sampling events in 2006 (May, July, August and September), Roberts Lake was well oxygenated throughout the water column (Figure 3.4). The 1.5 - 2 m discrepancies in depth (Figure 3.4) were probably due to unevenness of the lake bottom in the vicinity of the water quality sampling station. The station was located using GPS, which involves a few metres of associated error. In August, the DO concentrations were slightly lower (9.0 mg/L) at the two near-bottom sites located at depths between 7.0 and 7.5 m. Apart from these two measurements, all DO values were above the minimum guideline (CCME 2006) for early life stages of fish (9.5 mg/L), and were above the 6.5 mg/L guideline for the protection of aquatic life. Similar DO conditions were reported in the previous water quality studies of Roberts Lake (RL&L/Golder 2003a,b. Golder, 2005b. 2006).

During ice-covered conditions in May, Roberts Lake was nearly isothermic, with temperatures around 3°C throughout the water column. In July, the lake was isothermic at around 10°C, with a slight drop to 8.4°C near the bottom.

In August, a moderate thermocline was recorded between 4.5 and 6 m depths; the temperature dropped from 16.4 to 12.1°C over this depth interval (Figure 3.4). In previous studies, isothermic conditions were typical during open water conditions but weak thermoclines were observed in July on two occasions. It should be noted that during the previous three summers, the water temperatures in Roberts Lake were considerably cooler; the previous maximum temperature (11.9°C) was recorded in August 2005.

The TP concentrations in Roberts Lake during the 2006 sampling period ranged from 13 to 38 µg/L. Only the bottom sample from 10 August (38 µg/L), exceeded the 30 µg/L jurisdictional guideline for Northwest Territories and Nunavut. The near-surface companion water sample contained 27 µg/L TP. All of the dissolved inorganic forms of nitrogen were well below the CCME guidelines.

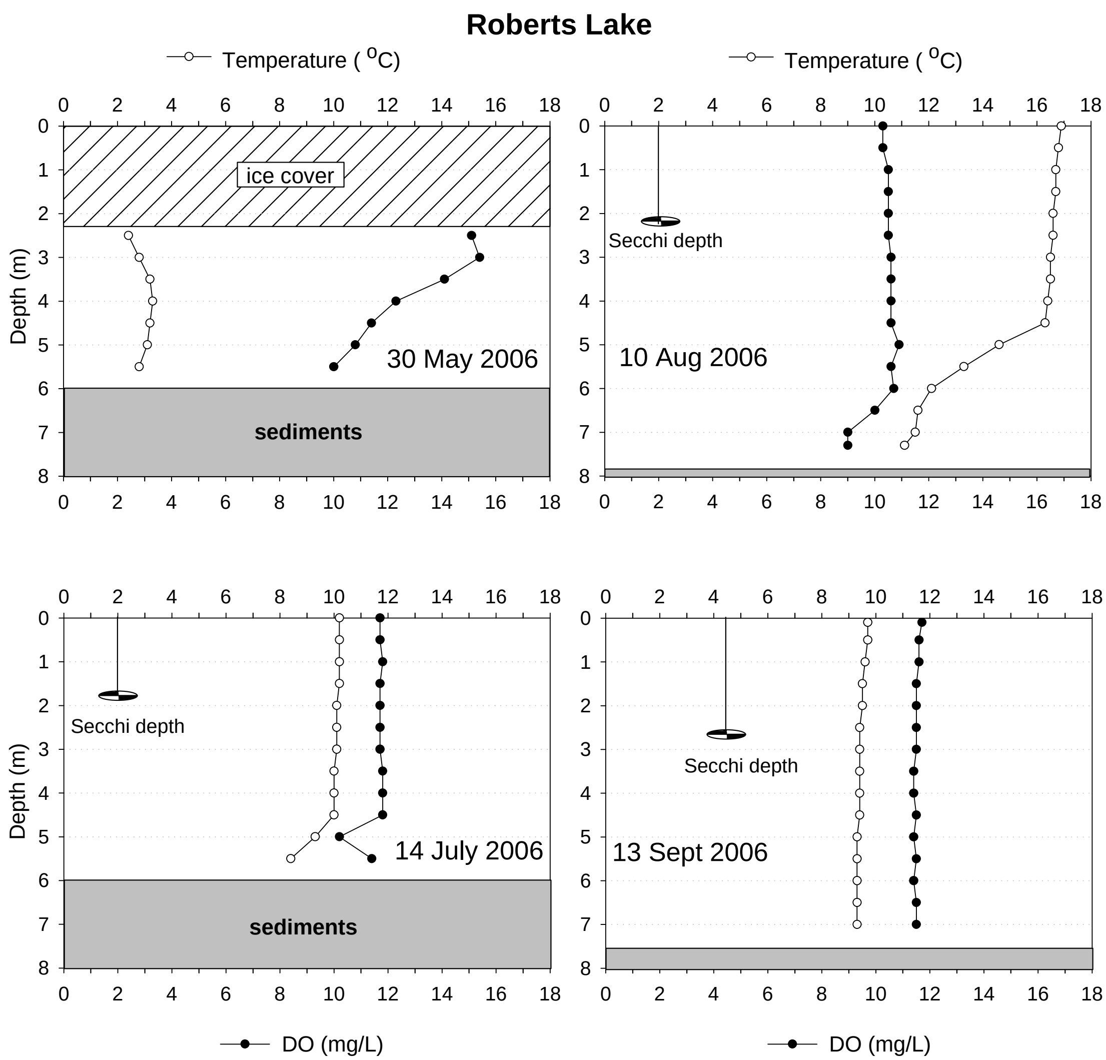


Figure 3.4 Temperature and Dissolved Oxygen (DO) Profiles and Secchi Depth for Roberts Lake, 2006.

The chlorophyll *a* concentrations in the 11 September water sample contained 7.2 mg/m^3 chlorophyll *a* and 4.0 mg/m^3 of phaeophytin. This chlorophyll *a* concentration indicates that Roberts Lake has good primary (phytoplankton) productivity, typical of mesotrophic lakes (USEPA 2000). The concentration of phaeophytin (decomposition product of chlorophyll) was greater than 50% of chlorophyll *a* concentration (Appendix B6)n which is a common occurrence at the end of the growing season. The lake water was clear, with TSS concentrations ranging from <1 to 4 mg/L throughout the sampling period.

Similar values for TSS were recorded in the previous studies of Roberts Lake. The Secchi depth measurements in 2006 ranged between 1.8 m in July and 2.7 m in September (Figure 3.4). Phytoplankton blooms were not observed in 2006; therefore, the lower Secchi disk reading in July probably reflected higher concentrations of suspended sediments in July compared to August and September.

Conductivity values measured in the field during the open water season ranged from 171 to 222 µS/cm. Field measurements of pH ranged between pH 6.65 and pH 8.15. The pH value of 8.15 was the highest recorded to date for Roberts Lake. All pH readings were within the CCME guideline of pH 6.5-9.0.

Total alkalinity ranged from 19.4 to 25.3 mg $CaCO_3$/L. These values fell within the range (17-26 mg/L) of total alkalinity measurements collected in Roberts Lake since 2003. Based on the Saffran and Trew (1996) classification, Roberts Lake has a moderate to low susceptibility to acidification.

The total aluminum concentrations exceeded the CCME guideline of 100 µg/L (when pH≥6.5) on one occasion (14 July 2006); values of 130 and 137 µg/L were recorded at the surface and near the bottom, respectively (Table 3.4). In 2004 and 2005, the total aluminum CCME guideline was exceeded in July and September; in July 2005, a value of 248 µg/L was recorded. In 2003, total aluminum concentrations ranged from 27.5 to 41.6 µg/L, and pH was consistently above pH 6.5.

Roberts Lake was the only freshwater site in the study area where copper concentrations exceeded the CCME guideline. The guideline value of 2 µg/L (for waters with hardness <120 mg $CaCO_3$/L) was exceeded by both the total (3.78 µg/L) and dissolved (3.06 µg/L) copper concentrations in the near-bottom sample collected on 11 September 2006. The 6 m deep water column at the site was uniformly well oxygenated, and there was no evidence of contamination by bottom sediment. In the previous studies of Roberts Lake, the total copper concentrations were always below the CCME guideline.

Total mercury concentrations did not exceed the CCME guideline (26 ng/L) at any time. However, the top and bottom samples of the water column, from three sampling events, contained low but persistent amounts of mercury (between 2.1 and 9.9 ng/L). Only one of the water samples (bottom sample from September) had total mercury concentration below the detection limit (<0.6 ng/L). Between 2004 and 2005, the CCME guideline for total mercury was exceeded just once in Roberts Lake (70 ng/L); this occurred in a near-bottom sample collected in September 2004.

Total selenium concentrations in Roberts Lake either exceeded or were close to the CCME guideline of 1 µg/L on all four sampling dates (Table 3.4). The greatest total selenium concentration (2.14 µg/L) was associated with an under ice sample collected on 30 May 2006. In previous studies of Roberts Lake, total selenium concentrations had not exceeded the CCME guideline.

In 2006, total zinc concentrations in Roberts Lake ranged from 0.77 to 2.46 µg/L and did not exceed either the 30 µg/L (CCME) or the 7.5 µg/L guideline (most other Canadian jurisdictions).

3.2.4 Little Roberts Lake

Little Roberts Lake was sampled for water quality on four occasions between 30 May and 13 September 2006.

On all four sampling events (May, July, August and September), Little Roberts Lake was well oxygenated throughout the water column (Figure 3.5). The DO concentrations recorded were well above the minimum Canadian Water Quality Guideline (CWQG; CCME 2006) for early life stages of fish (9.5 mg/L). In previous studies, the lake ranged from being well oxygenated to very poorly oxygenated (2-3 mg/L throughout the water column in July 2004). The sampling location used in May 2006 was 2.7 m deep, with only about 0.7 m of free water below the ice. Under these conditions, the DO and temperature measurements were restricted to one depth (2.5 m). The discrepancies in depth of sampling between the various sampling events (Figure 3.4) were probably due to irregularities in the lake bottom around the water quality sampling station, the few metres of error associated with locating the site using a GPS unit. Based on the uniform DO and temperature profiles recorded during the three sampling events, Little Roberts Lake was well mixed during the open water season. The August 2006 temperature profile, with temperatures of about 16°C (Figure 3.5), was the warmest on record for Little Roberts Lake. The highest water temperature recorded in the past was about 14°C (July 1997).

The TP concentrations in Little Roberts Lake during the 2006 sampling period ranged from 18 to 31 µg/L. Only the maximum concentration measured (31 µg/L on 13 September) exceeded the 30 µg/L jurisdictional guideline (Table 3.4). In 2006 and in previous sampling years, all of the dissolved inorganic forms of nitrogen measured were well below the CCME guidelines. The chlorophyll *a* concentrations in the 13 September 2006 water sample were 8.3 mg/m^3 for chlorophyll *a* and 5.0 mg/m^3 for phaeophytin. The chlorophyll *a* concentration indicates that Little Roberts Lake has good primary (phytoplankton) productivity, typical of mesotrophic lakes (USEPA 2000). The concentration of phaeophytin (decomposition product of chlorophyll) was greater than 50% of chlorophyll *a* concentration, which is a common occurrence at the end of the growing season (Appendix B6).

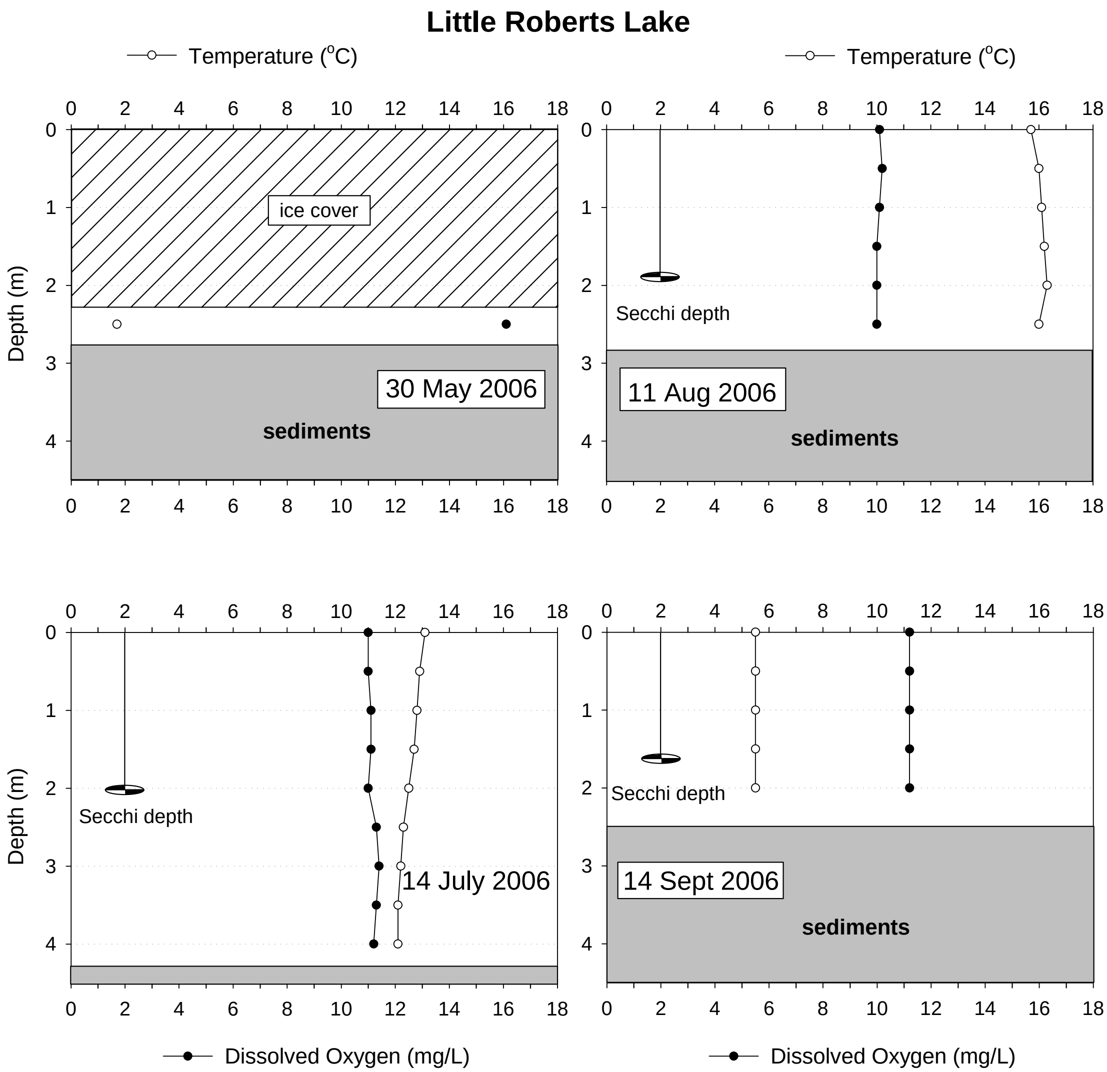


Figure 3.5 Temperature and Dissolved Oxygen (DO) Profiles and Secchi Depth for Little Roberts Lake, 2006.

The water column in Little Roberts Lake was clear; TSS concentrations ranged from <1 to 3 mg/L during the four sampling sessions in 2006. Similar values for TSS were recorded in the previous studies on Little Roberts Lake. The maximum TSS value (11 mg/L) was recorded in 1995; this reading was obtained on all three sampling occasions. The Secchi depth in 2006 ranged from 1.1 m in September to 2.0 m in July (Figure 3.5). These transparency readings are within the typical range recorded for this lake in previous years. Field conductivity measurements in the 2006 open water season ranged from 191 to 290 µS/cm.

Field pH measurements ranged between pH 6.68 and 7.82, which is typical for Little Roberts Lake and within the stated range of the CCME guideline. In the past, pH in the lake was below (outside) the CCME guideline (pH 6.5-9.0) on one occasion (pH of 6.2 recorded in September 2004).

Total alkalinity ranged from 22.1 to 26.6 mg $CaCO_3$/L; similar values were obtained in previous studies of Little Roberts Lake. Based on the Saffran and Trew (1996) classification, Little Roberts Lake has a low susceptibility to acidification.

The maximum total aluminum concentration, recorded in a 2006 under-ice sample, exceeded the 100 µg/L CCME guideline (when pH≥6.5) (Table 3.4). In previous studies, the total aluminum concentrations exceeded the CCME guidelines on several occasions. The maximum concentration, 582 µg/L, was recorded in August 2004.

Total copper concentrations in Little Roberts Lake did not exceed the 2 µg/L CCME (2006) guideline applicable to waters with hardness <120 mg/L. During the 2006 sampling period, total copper concentrations in Little Roberts Lake water samples ranged between 1.10 and 1.96 µg/L.

Total mercury concentrations in Little Roberts Lake in 2006 were below the CCME guideline but above the detection limits; the maximum recorded value was 12 ng/L. In the past, when ultra-low level mercury analyses were carried out (2004 and 2005), total mercury concentrations also did not exceed the CCME guideline (26 ng/L).

In 2006, the total selenium concentration reached the CCME guideline concentration (1 µg/L) on one occasion and exceeded it on the two other occasions. The highest concentration of selenium (1.51 µg/L) was recorded in September (Table 3.4). During past surveys, total selenium concentrations exceeded the CCME guideline three times (twice in August 1996 and once in August 2005); the highest reading was 2.8 µg/L.

Total zinc concentrations in Little Roberts Lake did not exceed the 30 µg/L CCME guideline during the 2006 sampling period; values ranged from 0.39 to 12.30 µg/L. The highest concentration occurred in an under-ice sample (30 May); this reading exceeded the 7.5 µg/L guideline for waters with hardness <90 mg/L (adopted by most other Canadian jurisdictions).

3.2.5 Summary

Doris Lake, Tail Lake, Roberts Lake, and Little Roberts Lake are characterized by clear water (TSS between <1 and 4 mg/L), and conductivities ranging from

119 µS/cm to 290 µS/cm. In 2006, pH readings at the various lake sample sites were typically within the CCME guideline (pH 6.5-9.0); only one measurement (pH 6.47; Doris Lake) was outside (slightly) the guidelines. The maximum pH recorded for the study lakes was pH 8.15 (Doris Lake). Based on the Saffran and Trew (1996) classification that uses total alkalinity values, the Doris North lakes have a low susceptibility to acidification.

All the lakes were well oxygenated during the open-water season, and all reached higher water temperatures throughout the water column than have been recorded in previous studies. During August, temperatures within the water columns of Tail and Little Roberts lakes were around 16°C; only minor fluctuations (less than 1°C) were recorded. For Doris Lake, temperature and DO data were not available for the month of August. In July, the temperature was 15.2°C at the water surface and declined gradually (no stratification) to 7.8°C near the bottom. In September, Doris Lake was isothermic at 8.5°C. Roberts Lake was the only water body sampled in 2006 to develop a thermocline during the open water season. The thermocline was recorded in August, at depths between 4.5 m and 6 m; temperature decreased from 16.4 to 12.1°C in this depth interval. In July and September, Roberts Lake was isothermic.

Only in Tail Lake were total aluminum concentrations consistently below the CCME guidelines. In Roberts Lake and Little Roberts Lake, the total aluminum concentrations exceeded the CCME guideline of 100 µg/L (for pH≥6.5) on one occasion (Table 3.4). In Doris Lake, the total aluminum CCME guideline (5 µg/L for pH<6.5) was exceeded once. In past surveys of the four study lakes, the total aluminum concentrations exceeded the guidelines on several occasions.

Total cadmium was below the CCME guideline, except for one sample collected at the surface of Tail Lake on 20 July. In this sample, the total cadmium concentration was 0.094 µg/L; it is suspected that this water sample was contaminated. In previous studies, total cadmium concentrations in Tail Lake were always below the CCME guideline, or below the limits of detection.

Roberts Lake was the only freshwater site where copper concentrations exceeded the CCME guideline. The guideline value of 2 µg/L was exceeded by both the total (3.78 µg/L) and dissolved (3.06 µg/L) copper concentrations in a bottom water sample collected on 11 September 2006. In past surveys of Roberts Lake, the recorded total copper concentrations were always below the CCME guideline.

Total selenium concentrations exceeded the CCME guideline (>1 µg/L) in Doris Lake, on all four sampling dates in 2006; this was the first year that exceedences have been recorded since the start of the sampling program. In Roberts Lake, total selenium concentrations exceeded the CCME guideline on three out of four sampling dates (Table 3.4). Roberts Lake has been tested for water quality only since 2003, and this was the first year that recorded total selenium concentrations were above the CCME guideline. In Little Roberts Lake, the total selenium concentrations exceeded the CCME guideline on two of four sampling events. During past surveys of Little Roberts Lake, total selenium concentrations exceeded the CCME guideline three times (twice in August 1996 and once in August 2005); the highest concentration recorded was 2.8 µg/L. In Tail Lake, total selenium concentrations exceeded the guideline on 31 May 2006 (1.85 µg/L). Elevated concentrations of total selenium have also been measured in Tail Lake on occasion during past surveys.

Total zinc concentrations did not exceed the 30 µg/L CCME guideline in any of the Doris North lakes sampled during 2006. However, the more recently developed 7.5 µg/L guideline for lakes with hardness <90 mg/L (adopted by Alberta, BC, Manitoba, New Brunswick, Nova Scotia, Ontario and Saskatchewan) was exceeded in the under-ice samples collected at the end of May from Tail Lake (8.24µg/L) and Little Roberts Lake (12.30 µg/L).

3.3 STREAM WATER QUALITY

During the 2006 sampling season, water quality sampling indicated that several parameters were outside the guideline limits; this occurred in each of the four outflow streams (Table 3.5).

Detailed discussions of physical characteristics and water quality are provided below. Field data (pH, conductivity, dissolved oxygen and water temperature) are provided in Appendix B1; laboratory analytical results for water quality are presented in Appendix B4.

3.3.1 Doris Outflow

Doris Outflow was sampled for water quality on 14 occasions between 18 June and 9 September 2006.

Doris Outflow was well oxygenated throughout the sampling season (Appendix B1), with all DO measurements above the 9.5 mg/L CCME guideline for protection of early life stages of fish. Data from the temperature recorder installed in the stream showed that water temperature reached a maximum of 19.7°C on 8 August; the peak occurred between 5:30 and 6:00 PM (Figure 3.6). The minimum temperature (2.8°C) for the 2006 sampling season was recorded on 21 June, between midnight and 2:00 AM (Figure 3.6).

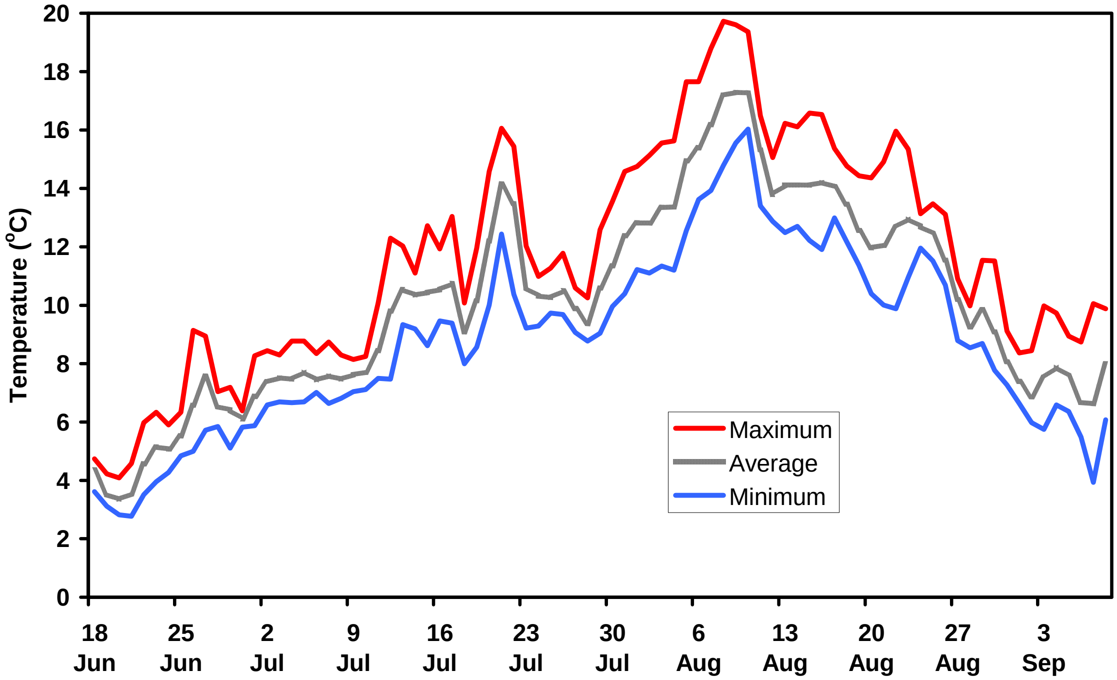


Figure 3.6 **Doris Outflow Daily Maximum, Minimum and Average Temperature, June to September, 2006.**

Total phosphorus concentrations in the outflow ranged from 19 to 50 µg/L; the 30 µg/L jurisdictional guideline was exceeded on seven occasions (Table 3.5). Between 28 July and 9 September, the concentration of TP consistently equaled or exceeded the jurisdictional guideline. The 2006 TP concentrations were the highest recorded for this site since sampling began in 1995. The stream's mean TP concentration of 33 µg/L was the highest of the four Doris North streams sampled in 2006.

All of the dissolved inorganic forms of nitrogen were well below the CCME guidelines. Doris Outflow was clear, with TSS concentrations of 2 to 4 mg/L throughout the season.

The stream's conductivity was similar to that of Doris Lake, ranging from 176 to 269 µS/cm (Doris Lake: 180 to 211 µS/cm). Field pH ranged from pH 6.20 to pH 7.95. The pH measured was below the CCME guideline (pH 6.5-9.0) on one occasion in 2006 (28 July). Similar pH values were obtained for the outflow during previous years.

Total aluminum concentrations exceeded the CCME guideline of 100 µg/L (for pH≥6.5) on two occasions, 18 June 2006 (106 µg/L) and 1 September 2006 (146 µg/L). In addition, total aluminum concentrations were above the CCME guideline of 5 µg/L (when pH<6.5) on 28 July 2006 (Table 3.5).

Table 3.5 Summary of 2006 Stream Water Samples that Equaled or Exceeded Guidelines for the Protection of Aquatic Life in Freshwater.

Site	Date	Field pH	TSS[a]	Al (Total)		Fe (Total)	Se (Total)	TP
		CCME	CCME	CCME	CCME	CCME	CCME	juris.[b]
		6.5-9.0	25 mg/L[c]	100 µg/L for pH≥6.5	5 µg/L for pH<6.5	300 µg/L	1 µg/L	30 µg/L
Doris Outflow	18-Jun	7.42	2	***106***				
	30-Jun	7.62	3				***1.0***	
	07-Jul	7.27	3				***1.4***	
	13-Jul	6.50	3				***1.2***	
	28-Jul	***6.20***[d]	4		***59.9***			***50***
	04-Aug	7.39	2				***1.3***	***45***
	11-Aug		2				***1.1***	***30***
	18-Aug	7.86	3				***1.6***	***35***
	26-Aug	7.86	4				***1.7***	***36***
	01-Sep	7.95	3	***146***		***356***	***1.6***	***39***
	09-Sep	7.70	3				***1.4***	***40***
	09-Sep[e]	7.60	2				***1.6***	***48***
Tail Outflow	07-Jul	7.18	<1					
	20-Jul	7.33	<1			***358***		
	04-Aug	***6.25***	<1		***16.8***	***301***		
	11-Aug		5			***507***	***1.2***	
	18-Aug	6.95	2			***634***	***1.5***	
	26-Aug	6.86	<1			***853***	***2.0***	
	01-Sep	6.93	3			***1150***	***2.2***	
	09-Sep	6.94	<1			***1070***	***1.9***	
Roberts Outflow	18-Jun	7.53	3	***383***		***313***		
	13-Jul	7.37	5	***228***			***1.1***	
	10-Aug	7.08	2				***1.2***	
	09-Sep	7.85	1				***1.2***	***33***
Little Roberts Outflow	18-Jun	7.57	5	***379***		***318***		
	13-Jul	6.72	3				***1.0***	
	10-Aug	7.43	<1				***1.3***	
	09-Sep	7.60	2				***1.9***	***35***

[a] Total suspended solids (TSS) values provide for information, as total metal levels are often correlated with TSS values.

[b] juris. – Jurisdictional guideline for total phosphorus (TP) for Northwest Territories and Nunavut (Statistics Canada, 2006); there is no single CCME guideline value but rather a set of trigger ranges (CCME 2006).

[c] The CCME guidelines for clear waters specify maximum increase of 25 mg/L from background levels for any short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg/L from background levels for longer term exposures (e.g., inputs lasting between 24 h and 30 d).

[d] Values exceeding guidelines are italicized and in bold type.

[e] Additional sample taken below falls on Doris Outflow.

In previous surveys, total aluminum concentrations in Doris Outflow exceeded the 100 µg/L CCME guideline only during the 2005 sampling season. The

September guideline exceedance (146 µg/L) may have been due to bottom sediments being stirred up by stronger than average northerly winds, on the day before the sample was collected. The wind speed (average hourly maximum) on this day was 43 km/h; the average hourly maximum wind speed for the entire sampling period was 24 km/h. The dissolved aluminum concentration component of the total aluminum concentration (146 µg/L) was only 0.76 µg/L.

Total copper concentrations in Doris Outflow did not exceed the 2 µg/L CCME (2006) guideline for waters with hardness <120 mg/L. During the 2006 sampling period, total copper concentrations in outflow water samples ranged from 0.98 to 1.53 µg/L.

Total iron exceeded the 300 µg/L CCME guideline on 1 September 2006, when it reached 356 µg/L. The concentration of dissolved iron in this sample was only 5 µg/L, which was less than the average concentration recorded for the dissolved component at this site in 2006 (11 µg/L). A similar situation was observed once in 2005; on this occasion, total iron was measured at 888 µg/L and dissolved iron in the same sample was only 7.82 µg/L. Other than the 2006 sampling event, this was the only other time that total iron concentrations in Doris Outflow exceeded the CCME guideline.

Similar to previous years, total mercury concentrations recorded in 2006 were below or near the detection limits.

Total selenium concentrations were high in Doris Outflow in all samples. The CCME guideline (1 µg/L) was exceeded on nine occasions; values up to 1.69 µg/L were recorded (Table 3.5). The generally high values in the outflow reflected selenium concentrations in Doris Lake. Prior to 2005, the total selenium concentrations in Doris Outflow did not exceed CCME guideline.

The 30 µg/L CCME guideline for zinc was not exceeded in any of the 2006 Doris Outflow samples. The more recently developed 7.5 µg/L zinc guideline (for waters with hardness <90 mg/L) adopted by a number of Canadian jurisdictions (Statistics Canada, 2006) was exceeded on three occasions in 2006. During these sampling events (30 June, 7 July and 18 August), total zinc concentrations ranged from 8.4 to 12.2 µg/L. This was in contrast to Doris Lake where the total zinc concentrations were considerably lower, ranging from 1 to 5 µg/L. In previous studies of Doris Outflow, total zinc concentrations were always below the 7.5 µg/L guideline.

3.3.2 Tail Outflow

Tail Outflow was sampled for water quality on 13 occasions between 18 June and 9 September 2006.

Tail Outflow was well oxygenated throughout the 2006 sampling season, with the DO levels ranging from 7.2 to 10.0 mg/L (Appendix B1). Although some of these measurements were below the 9.5 mg/L CCME guideline for protection of early life stages of fish, none were below the 6.5 mg/L CCME guideline for the protection of aquatic life. Data from the temperature recorder installed in the stream showed that Tail Outflow's temperature reached a maximum of 16.7°C on 21 July; the peak occurred around 4.30 PM. The minimum temperature (0.6°C) was recorded on 7 September around 6:00 AM. In contrast to the other streams sampled, where water temperature was noticeably higher in August, Tail Outflow temperatures were warm (and similar) in July and August, and were only marginally cooler (about 1°C less) in June (Figure 3.7). Also, in September, the temperature in Tail Outflow dropped more sharply than in the other three streams (Figure 3.7). These differences in temperature regime of Tail Outflow are likely the function of its smaller size and slower flow: the smaller the stream channel the greater the influence of surrounding ground temperature on the stream temperature.

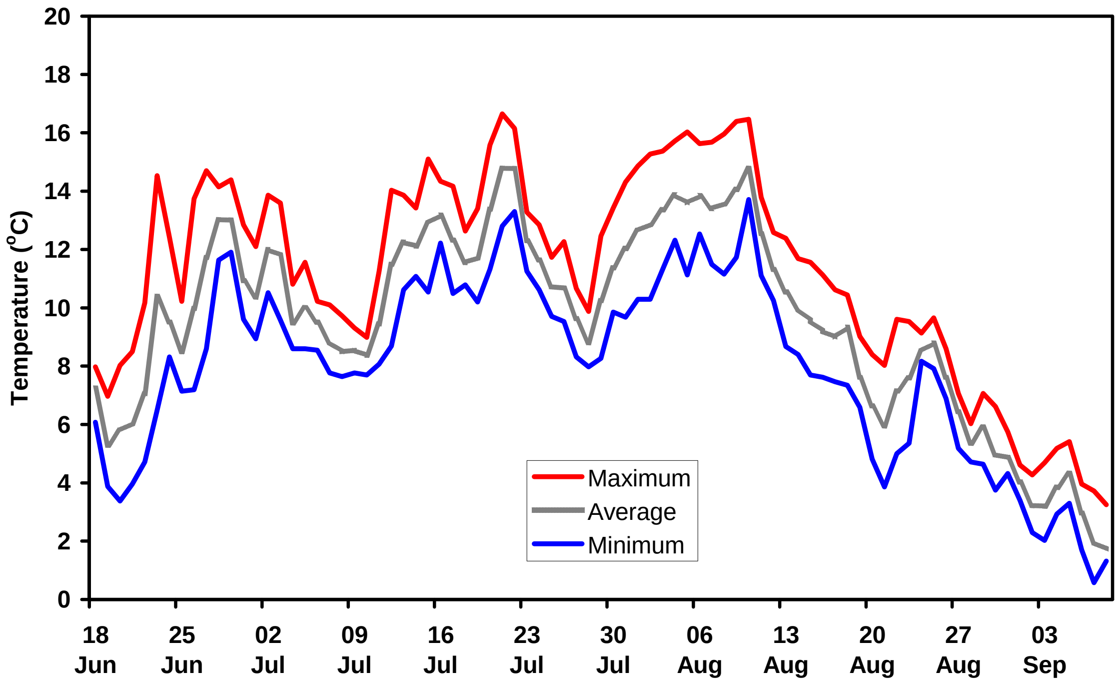


Figure 3.7 Tail Outflow Daily Maximum, Minimum and Average Temperature, June to September, 2006.

TP concentrations in Tail Outflow ranged from 6 to 26 µg/L during the 2006 sampling period and did not exceed the 30 µg/L jurisdictional guideline. All of the dissolved inorganic forms of nitrogen in 2006, and in past studies, were well below the CCME guideline. Similar to Tail Lake, Tail Outflow was very clear on most sampling occasions, with TSS levels of <1 mg/L recorded on 9 of

13 events. The highest TSS concentration recorded (5 mg/L) was within the range of values recorded in other streams in the study area.

Conductivity in Tail Outflow (values ranging from 103 to 418 µS/cm) was more variable than at other studied freshwater sites. In the past 10 years of study, this was the first time that conductivity in Tail Outflow exceeded 300 µS/cm. Field pH readings at Tail Outflow (ranging from pH 6.25 to 7.52) tended to be more acidic than values recorded at the other sites. The pH was below (outside) the CCME guideline (pH 6.5 to 9.0) on 4 August 2006. The total aluminum concentration on 4 August 2006 (16.8 µg/L) also exceeded the CCME guideline (5 µg/L for pH<6.5); the dissolved aluminum concentration in this water sample (5.6 µg/L) also was above the CCME guideline of 5 µg/L.

On the other 12 sampling dates in 2006, the total and dissolved aluminum concentrations in Tail Outflow were within the CCME guidelines. The CCME guideline for total aluminum was not exceeded in any of the previous studies of Tail Outflow (i.e., 1996, 1997, 2000, 2003, 2004, and 2005).

Total copper concentrations in Tail Outflow did not exceed the 2 µg/L CCME (2006) guideline for waters with hardness <120 mg/L. During the 2006 sampling period, total copper concentrations in Tail Outflow water samples ranged from 0.52 to 1.13 µg/L.

The total iron concentrations in Tail Outflow generally increased throughout the seasons, with a maximum concentration of 1150 µg/L recorded on 1 September. Overall, total iron concentrations exceeded the 300 µg/L CCME guideline once in July and on all six sampling events in August and September 2006. This was in sharp contrast to Tail Lake, where the concentrations of total iron were consistently well below the guideline. Similarly high concentrations were observed in Tail Outflow (but not in the lake) on several occasions in August and/or September 1996, 2000 and 2005. One possible source of iron may be iron-rich seepages into Tail Outflow upstream of the sampling site; the existence of such seepages would need to be verified.

Total mercury concentrations were consistently below the detection limit throughout the sampling period.

Total selenium concentrations exceeded the CCME guideline on all five sampling dates from 11 August to 9 September 2006, ranging from 1.15 to 2.23 µg/L. On the eight preceding sampling dates, the total selenium concentrations ranged from 0.4 to 0.7 µg/L, increasing in value from spring to summer. This was the first time that the total selenium concentrations in Tail Outflow have been recorded above the CCME guideline of 1 µg/L.

The 30 µg/L CCME guideline for zinc was not exceeded in any of the 2006 Tail Outflow samples. The more recently developed zinc guideline of 7.5 µg/L (for waters with hardness <90 mg/L) adopted by a number of Canadian jurisdictions (Statistics Canada, 2006) was exceeded on two occasions in July (16.0 µg/L) and August 2006 (11.1 µg/L). In the past, total zinc concentrations in Tail Outflow exceeded only the 7.5 µg/L guideline with a concentration of 8.24 µg/L in September 2004.

3.3.3 Roberts Outflow

Roberts Outflow was sampled for water quality on four occasions between 18 June and 9 September 2006.

Roberts Outflow was well oxygenated throughout the sampling season; all DO measurements were above the 9.5 mg/L CCME guideline for protection of early life stages of fish (Appendix B1). Data from the temperature recorder installed in the stream indicated that the water temperature was warmest in August with the maximum temperature reaching 18.0°C on 8 August at 3:45 PM (Figure 3.8). The minimum temperature of 2.5°C was recorded on 23 June at 4:20 AM.

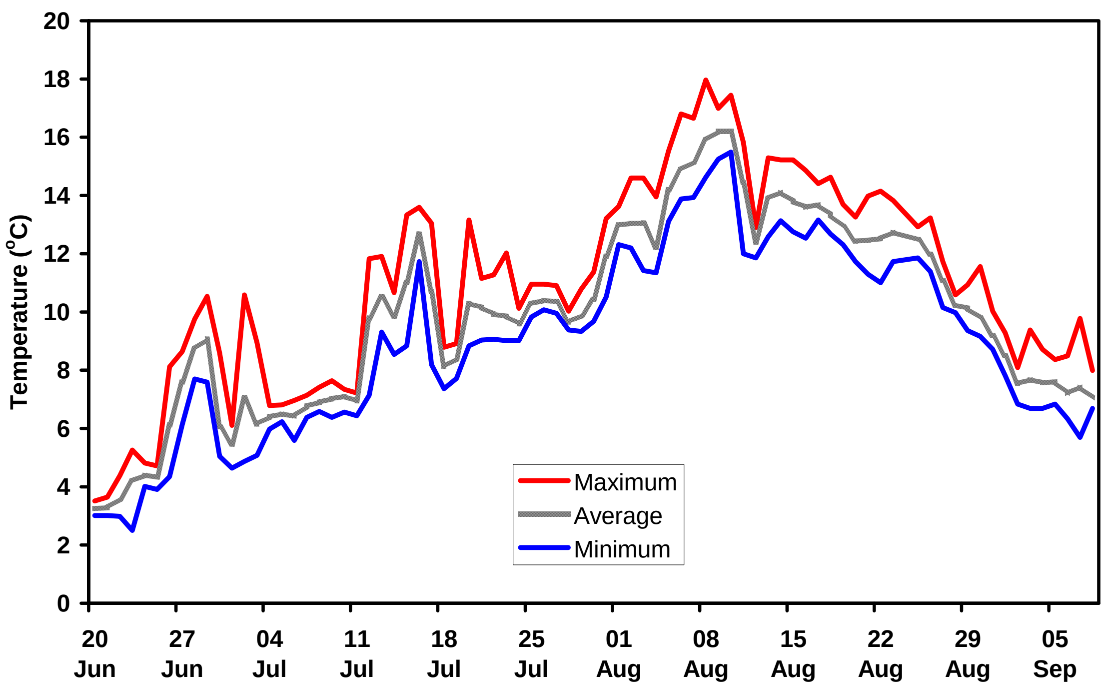


Figure 3.8 Roberts Outflow Daily Maximum, Minimum and Average Temperature, June to September, 2006.

TP concentrations in Roberts Outflow ranged from 17 to 33 µg/L. Only the maximum concentration, reached on 9 September, exceeded the 30 µg/L jurisdictional guideline for Northwest Territories and Nunavut (Statistics Canada, 2006). All of the dissolved inorganic forms of nitrogen were below the CCME guidelines. Roberts Outflow was clear, with TSS concentrations ranging from 1 to 5 mg/L throughout the season. The stream’s conductivity ranged from 174 to 220 µS/cm and was similar to that of Roberts Lake. Field pH ranged from pH 7.08 to 7.85, which is well within the CCME guideline of pH 6.5 – 9.0.

The total aluminum concentrations exceeded the CCME guideline of 100 µg/L (for pH≥6.5) on two of the four sampling dates in 2006: 18 June (383 µg/L) and 13 July (228 µg/L) (Table 3.5). In 2004 and 2005, total aluminum concentrations exceeded the CCME 100 µg/L guideline on all but one sampling occasions.

Total copper concentrations in Roberts Outflow did not exceed the 2 µg/L CCME (2006) guideline for waters with hardness <120 mg/L. During the 2006 sampling period, total copper concentrations in Roberts Outflow water samples ranged from 1.29 to 1.68 µg/L.

Total iron concentration in Roberts Outflow was higher than CCME guideline (300 µg/L) on 18 June, when it reached 313 µg/L (Table 3.5). The corresponding dissolved iron concentration for this date was elevated (30 µg/L) compared to the rest of the 2006 sampling season. In the past, the CCME guideline for total iron was exceeded in June 2005 (656 µg/L) at this site.

Total mercury concentrations in Roberts Outflow were consistently below the detection limits. Similarly low concentrations were recorded in the previous two years of Roberts Outflow sampling.

Total selenium concentrations exceeded the CCME guideline on three of the four sampling dates, with the greatest concentration recorded at 1.2 µg/L. These high selenium concentrations occurred at about the same time as in Roberts Lake. In the previous two years, total selenium concentrations in Roberts Outflow had not exceeded the CCME guideline.

The total zinc concentrations in Roberts Outflow did not exceeded the 30 µg/L CCME guideline on any of the 2006 sampling dates. The maximum total zinc concentration of 7.4 µg/L was reached on 10 August 2006; this is just below the more recently developed zinc guideline of 7.5 µg/L (for waters with hardness <90 mg/L) adopted by a number of Canadian jurisdictions (Statistics Canada 2006). On that same day, the total zinc concentrations in top and bottom water samples from Roberts Lake were < 2 µg/L and during the 2006 sampling season, the concentrations of total zinc in the lake ranged from 0.8 to 2.7 µg/L. In 2004 and 2005, the total zinc concentrations in the outflow remained below the 30 µg/L CCME guideline.

3.3.4 Little Roberts Outflow

Little Roberts Outflow was sampled for water quality on four occasions between 18 June and 9 September 2006.

Little Roberts Outflow was well oxygenated throughout the sampling season, with all DO measurements above the 9.5 mg/L CCME guideline for protection of early life stages of fish (Appendix B1). Data from the temperature recorder installed in the stream showed that water temperatures in 2006 were warmest in August, with the maximum temperature, 18.5°C, being reached on 8 August at 5:15 PM. During the monitoring period from 18 June to 9 September 2006, the minimum temperature, 3.7°C, was recorded on 21 June at 8:45 AM (Figure 3.9).

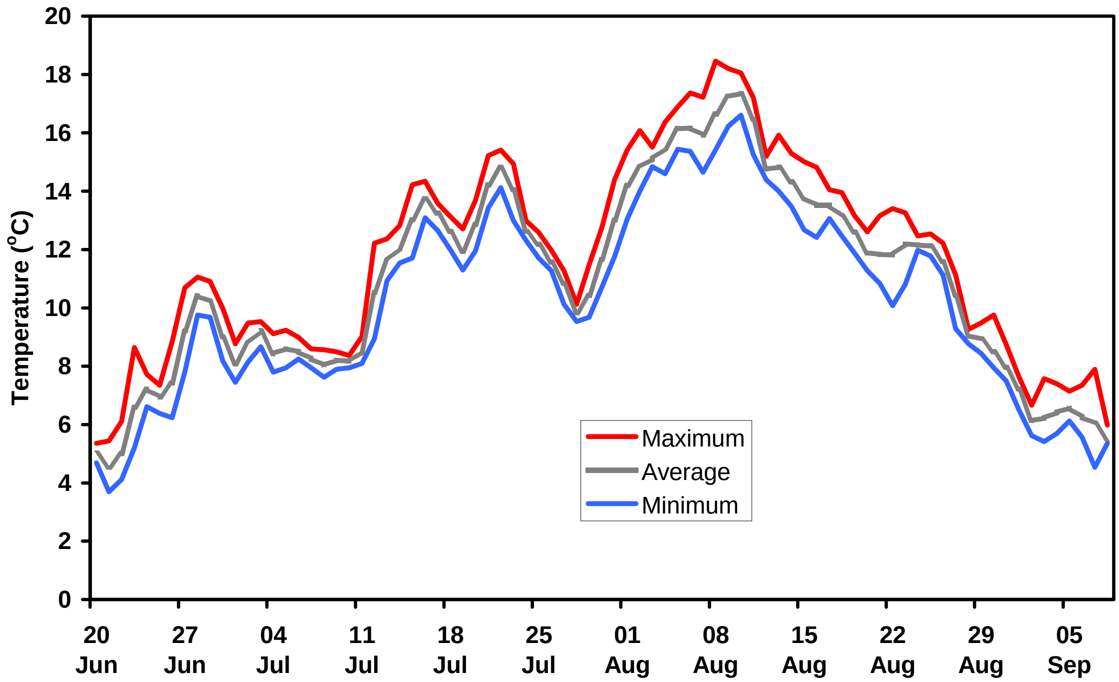


Figure 3.9 Little Roberts Outflow Daily Maximum, Minimum and Average Temperature, June to September, 2006.

TP concentrations in Little Roberts Outflow ranged from 18 to 35 µg/L during the 2006 sampling period. The 30 µg/L jurisdictional guideline (Statistics Canada 2006) was exceeded on only one occasion, 9 September, by the stream's maximum TP concentration. All of the dissolved inorganic forms of nitrogen were well below the CCME guidelines. Little Roberts Outflow was clear, with TSS concentrations ranging from <1 to 5 mg/L throughout the season. The stream's conductivity ranged from 191 to 275 µS/cm and was similar to that of Little Roberts Lake, when sampled around the same date. Field pH remained within the CCME guideline, ranging from pH 6.72 to 7.60.

The total aluminum concentrations exceeded the CCME guideline of 100 µg/L (for pH≥6.5) on 18 June 2006, when a concentration of 379 µg/L was recorded (Table 3.5). The westerly winds were particularly strong on 18 June and likely stirred up the sediments in the shallow upstream Little Roberts Lake causing the elevated concentrations of total aluminum (the TSS on this date was also highest, 5 mg/L of all the 2006 samples for the Little Roberts Outflow). On the remaining three sampling dates, the total aluminum concentrations were all below CCME guidelines. In the past, the total aluminum concentrations have frequently exceeded the CCME guideline of 100 µg/L, with the greatest concentration (498 µg/L) recorded on 28 June 2005. These past exceedences, also, were likely due to wind stirring up sediments in Little Roberts Lake.

Total copper concentrations in Little Roberts Outflow did not exceed the 2 µg/L CCME (2006) guideline for waters with hardness <120 mg/L. During the 2006 sampling period, total copper concentrations in Little Roberts Outflow water samples ranged from 1.09 to 1.52 µg/L.

Total iron in Little Roberts Outflow exceeded the CCME guideline (300 µg/L) on 18 June, with a concentration of 318 µg/L. In contrast to Doris Outflow, but similar to Roberts Outflow, the corresponding dissolved iron concentration for this date in Little Roberts Outflow, was also high (47 µg/L) compared to the rest of the 2006 sampling season. In past surveys, the CCME guideline for total iron was exceeded in June of 1996, 1997 and 2005, but remained below the guideline throughout the sampling period during 2003 and 2004.

Total mercury concentrations in Little Roberts Outflow were below or near the limits of detection in June, July and August, but a reading of 8.5 ng/L was recorded on 9 September 2006. The total mercury concentrations in the lake were measured four days later and were near the limit of detection at 0.9 ng/L. In past studies, total mercury concentrations remained below the CCME guideline.

Total selenium concentrations either exceeded or were equal to the CCME guideline value of 1 µg/L on three of the four sampling events. The greatest concentration was measured at 1.9 µg/L on 9 September. The high selenium concentrations occurred consistently at about the same time as in Little Roberts Lake. In the past, total selenium concentrations exceeded the CCME guideline on three sampling occasions: in August and September 2005 (1.34 and 1.35 µg/L, respectively) and in June 1996 (1.7 µg/L).

The total zinc concentrations in Little Roberts Outflow did not exceeded either the 30 µg/L CCME guideline or the 7.5 µg/L guideline (most Canadian jurisdictions) on any of the 2006 sampling dates. The total zinc concentrations ranged from 1.2 to 6.5 µg/L, with the maximum concentration recorded on 18 June.

3.3.5 Summary

Doris Outflow, Tail Outflow, Roberts Outflow, and Little Roberts Outflow are clear (TSS between <1 and 5 mg/L), freshwater streams with conductivities ranging from 103 µg/L to 418 µg/L. The greatest fluctuations in conductivity were measured in Tail Outflow.

The outflow streams were well oxygenated throughout the sampling season; DO measurements were above the 9.5 mg/L CCME guideline for protection of early life stages of fish at all sites, except for Tail Outflow, where the DO concentration occasionally slipped below this guideline. The slower flow and higher organic content (i.e., vegetation) of Tail Outflow, compared to other three streams, are the most likely causes of the occasional decrease in DO concentrations. Nevertheless, even in Tail Outflow, the DO concentrations were always measured above the 6.5 mg/L guideline for protection of aquatic life (CCME 2006). Similar trends were observed in previous studies.

Temperature recorder readings for the four streams showed that Doris Outflow achieved the warmest temperature of 19.7°C on 8 August 2006. August water temperatures were distinctly warmest in all streams except Tail Outflow. Overall, the maximum temperature of 16.7°C recorded in Tail Outflow was lower than in the other streams. Compared to the other three streams, the warm period in Tail Lake was more uniform and occurred earlier in the year (from July to August), with a sharper drop in temperatures in September.

The field pH measurements of the stream sites were occasionally outside (below) the CCME guideline of pH 6.5-9.0. Tail Outflow was slightly more acidic than the other three sites. Overall, the field pH of the streams ranged from pH 6.20 to pH 7.95.

Doris Outflow samples exceeded the total phosphorus (TP) 30 µg/L jurisdictional guideline for Northwest Territories and Nunavut on 8 of the 14 sampling dates. The TP range for Doris Outflow was 19 to 50 µg/L. Tail Outflow had the lowest TP concentrations of the four outflow streams, the TP not exceeding the 30 µg/L jurisdictional guideline in any of the samples collected in 2006. TP in Tail outflow ranged from 6 to 26 µg/L. TP in Roberts Outflow and Little Roberts Outflow exceeded the 30 µg/L guideline on one sampling date only (9 September), with concentrations of 33 and 35 mg/L, respectively.

In terms of nitrogen, all of its dissolved inorganic forms were well below the CCME guidelines in all of the studied streams.

Total aluminum concentrations were measured above the CCME guidelines in all four streams at various times during the 2006 sampling period. In Tail Outflow, only the 5 µg/L (for pH<6.5) CCME guideline was exceeded in 2006 (and in the past), whereas in the other three streams, the higher 100 µg/L (for pH≥6.5) CCME guideline was also exceeded.

Total copper concentrations did not exceed the 2 µg/L CCME (2006) guideline for waters with hardness <120 mg/L in any of the sampled outflow streams. During the 2006 sampling period, total copper concentrations in the four Doris North streams ranged from 0.52 to 1.68 µg/L.

The total iron concentrations exceeded the 300 µg/L CCME guideline in Roberts and Little Roberts outflows only in June. In Doris Outflow, the guideline was also exceeded only once, on 1 September (356 µg/L). In contrast, total iron in Tail Outflow reached progressively higher concentrations through August and September, reaching a maximum of 1150 µg/L. However, in Tail Lake, the concentrations of total iron were consistently well below the CCME guideline. Similarly high concentrations were observed in Tail Outflow (but not in the lake) on several occasions in August and/or September 1996, 2000 and 2005. This indicates that the source of iron in Tail Outflow is not Tail Lake.

Total selenium concentrations exceeded the 1 µg/L CCME guideline in all four streams in many of the samples. In Doris, Roberts and Little Roberts outflows, most samples exceeded the 1 µg/L guideline, reflecting the high selenium concentrations in their respective lakes. In the past, high concentrations of selenium were measured in Little Roberts Outflow only occasionally. In Doris Outflow, total selenium exceeded the CCME guideline for the first time in 2005. In Roberts and Tail outflows, the 2006 sampling period was the first time that the total selenium concentrations have been recorded above the CCME guideline. In Tail Outflow, the total selenium concentrations did not follow the same trend as in Tail Lake. In the outflow, the total selenium concentrations exceeded the guideline on five consecutive sampling occasions from 11 August to 9 September 2006, whereas earlier in the year, the concentrations were below the guideline. In Tail Lake, total selenium concentrations exceeded the 1 µg/L guideline only once, in June during under-ice conditions. It is possible that seepages with higher selenium (and iron) concentrations flow directly into the Tail Outflow, and their relative contribution to stream flow increase in August and September. The presence of such seepages should be verified.

Total zinc concentrations did not exceed the 30 µg/L CCME guideline in any of the streams. However, the more recently developed zinc guideline of 7.5 µg/L (for waters with hardness <90 mg/L) adopted by a number of Canadian jurisdictions (Statistics Canada, 2006) were exceeded during the 2006 sampling season on three occasions in Doris Outflow (8.4, 10.1 and 12.2 µg/L) and two occasions in Tail Outflow (11.1 and 18.0 µg/L). In the past, total zinc has been measured above this guideline only in Tail Outflow and on only one occasion

(September 2004). The high zinc concentrations in the streams were not indicative of zinc concentrations in their respective lakes.

3.4 MARINE WATER QUALITY

A number of parameters were measured outside the guideline limits in Roberts Bay during the 2006 sampling season (Table 3.6). Detailed discussion of physical limnology and water quality for this marine site is provided below under the Roberts Bay heading. All field measurements of pH, conductivity, dissolved oxygen, water temperature and Secchi depth are provided in Appendix B1. Temperature and dissolved oxygen profiles are in Appendix B2. Laboratory results of water quality analyses for the 2006 sampling program are presented in Appendix B5.

Table 3.6 Summary of 2006 Water Samples that Exceeded or were Equal to Guidelines for the Protection of Aquatic Life in Marine Environments.

Site	Strata	Date Guideline Exceeded	Cu (Total)	Hg (Total)	Zn (Total)
			BCG[a]	CCME	BCG (Chronic)
			3 µg/L	16 ng/L	10 µg/L
Roberts Bay	Top	20-Jul	***3.70***		
	Bottom	20-Jul	***3.57***		
	Top	12-Aug	***4.53***		
	Bottom	12-Aug	***4.24***	***16***	
	Top	11-Sep	***7.47***		***11.1***
	Bottom	11-Sep	***10.30***		***16.2***

[a] The maximum concentration of total copper in a marine system should not exceed 3 µg/L at any time (BCMOE 2006); there are no CCME guidelines for these parameters in a marine system.

3.4.1 Roberts Bay

Roberts Bay, the one marine site included in this study, was sampled for water quality on seven occasions between 31 May 2006 and 11 September 2006.

Conductivity ranged from 26 200 to 36 700 µS/cm. Even greater ranges in conductivity were recorded in the past, although the sampling sites varied within the Bay. Low conductivities from previous sampling events were around 6 000 µS/cm, whereas the highest values recorded were around 49 900 µS/cm (each occurred at different monitoring stations in the Bay in August 1997).

Roberts Bay DO profile obtained during under-ice conditions in May 2006 showed that the water column between the depth of 1.9 m (bottom of the ice) and 3.7 m was well oxygenated (13.8 to 15.3 mg/L). During the open water period in 2006, the

Roberts Bay waters were well oxygenated throughout the water column (5.5 m depth at the monitoring station). The minimum DO concentration of 10.5 mg/L measured was well above the CCME guideline of 8.0 mg/L for the protection of aquatic life in marine waters. The water temperature ranged from 0°C in May (under ice) to 14.3°C at the surface in July. The warmest temperature for the entire profile was obtained in August, when the entire water column was around 13°C (Figure 3.10). The Secchi depth varied from around 2 m in August to all the way to the bottom (5.5 m) in July and September. No algal blooms were noted in August and the lower visibility was possibly due to fine sediments disturbed at the shoreline by wave action and washed into the Bay (Figure 3.11).

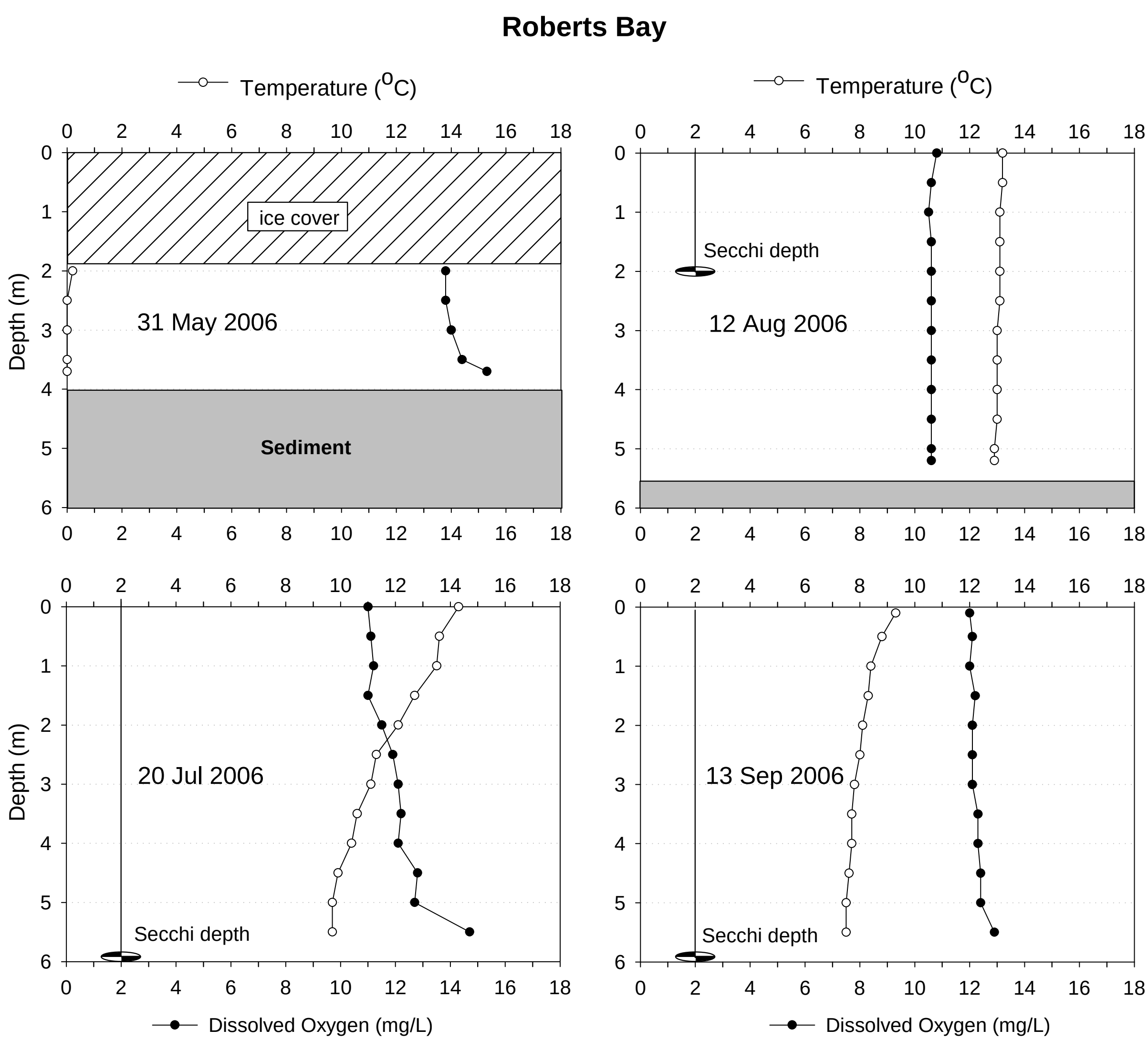


Figure 3.10 Temperature and Dissolved Oxygen (DO) Profiles and Secchi Depth for Roberts Bay, 2006.

Field pH for Roberts Bay was measured on four occasions and ranged from 6.6 to 8.0 pH units. On three occasions, the pH was measured below pH 7.0. According to

CCME guidelines for marine and estuarine waters, the pH should fall within the range of 7.0-8.7 units unless it can be demonstrated that such a pH is a result of natural processes. Within this range, pH should not vary by more than 0.2 pH units from the natural pH expected at that time. The results of the 2006 sampling in Roberts Bay indicate a naturally highly variable pH compared to the types of marine waters for which the 7.0-8.7 CCME guideline was proposed.

Figure 3.11 Disturbance and Dispersion of Fine Sediments by Wave Action Against the Shores of Roberts Bay, August 2006.

The CCME is still in the process of developing guidelines for many of the parameters for which environmental toxicity is well established in freshwater, but very poorly known for marine environments. For instance, currently there are no North American guidelines for concentrations of total phosphorus in marine environments, despite the awareness that high TP concentrations in marine waters can trigger toxic algal blooms. Australia has established such a guideline, however, and for total phosphorus in coastal marine waters, the trigger value is 25 µg/L. In this context, Roberts Bay's total phosphorus concentrations were high, ranging from 22 to 41 µg/L.

Similarly, there are no CCME guidelines for copper in the marine environment. British Columbia, however, has developed a 3 µg/L maximum concentration guideline for marine environments (BCMOE 2006). The total copper concentrations reached or exceeded this BC guideline in all but one (under-ice) sample collected from Roberts Bay (Table 3.6). The highest concentrations of total copper in Roberts

Bay occurred in September when the concentrations ranged from 7.47 µg/L in near-surface samples to 10.30 µg/L in bottom water samples.

The total mercury CCME guideline for marine waters is currently set at 16 ng/L. However, CCME cautions that this guideline might not protect adequately marine animals that ingest mercury. Roberts Bay was the only site where total mercury concentrations reached the guideline level. This high concentration of mercury (16 ng/L) was recorded in Roberts Bay on 12 August 2006 in the sample collected near the bottom. The corresponding sample taken near the water surface had no detectable total mercury concentration. Similarly, on 11 September 2006 total mercury concentration reached 10 ng/L at the bottom of the water column, but was only 1.4 ng/L near the surface.

Total selenium concentrations were either at, or closely above, 1 µg/L but did not exceed the 2 µg/L BC guideline for marine waters.

The total zinc concentrations in Roberts Bay exceeded the 10 µg/L BC guideline on 11 September 2006 (Table 3.6). In August, the bottom water sample had an elevated total zinc concentration of 8.9 µg/L. In September, total zinc concentrations reached 11.1 µg/L and 16.2 µg/L in top and bottom samples respectively. In past studies, total zinc concentrations in Roberts Bay had not exceeded the 10 µg/L guideline, although the measurement in August 1996 reached 9 µg/L.

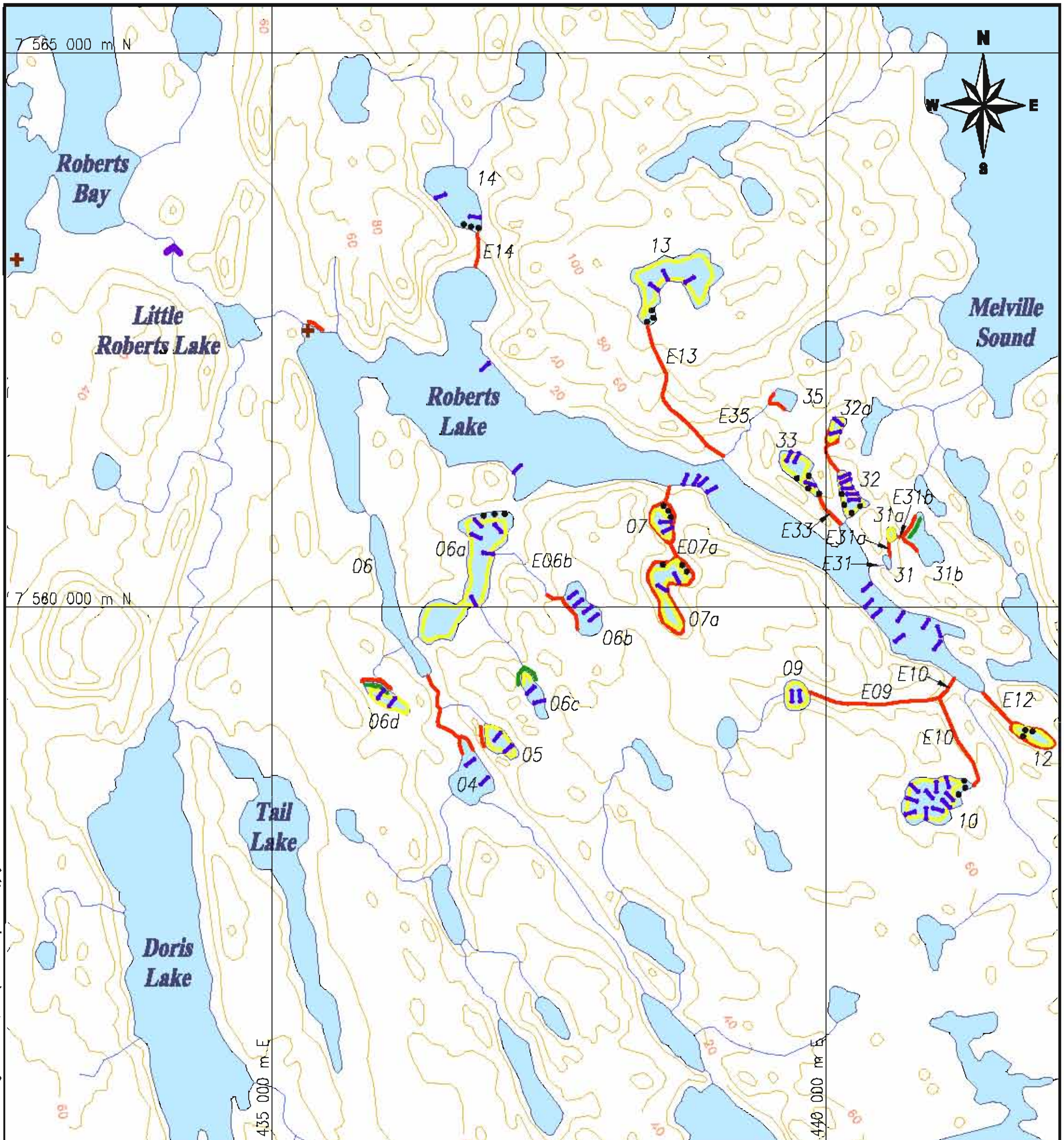
4.0 FISH POPULATIONS

Fish sampling was conducted in selected lakes and streams within the Doris North Project area to gather additional baseline data for the fisheries compensation monitoring requirements, as identified in the submission of the "No Net Loss" Plan (NNLP) Revision 5 to Fisheries and Oceans Canada (DFO) in October 2005 (Golder 2005a). The specific objectives of the 2006 study program to assess fish populations included:

- monitoring out-migration of Arctic char smolts in Little Roberts Outflow;
- assessing the feasibility of quantifying smolt out-migration into Roberts Bay;
- collecting information that could be used for comparisons with post enhancement monitoring;
- assessing Arctic char use of tributary streams to Roberts Lake and small lakes in the Roberts Lake drainage;
- assessing Arctic char spawning sites in Roberts Lake; and
- assessing fish use of Roberts Bay in the area of the proposed jetty.

4.1 METHODS

Figure 4.1 provides the fish sampling locations and methods used during the 2006 program. Fish sampling in Little Roberts Outflow was targeted primarily at monitoring out-migrating fish (including Arctic char smolts). A fish fence equipped with a trap was installed between Little Roberts Lake and Roberts Bay. Angling, dip netting, and beach seining were also conducted in holding areas upstream and downstream of the fish fence in Little Roberts Outflow. A two-directional Arctic fyke net was used to sample fish in Roberts Bay. In Roberts Lake, fish sampling was conducted using fyke nets, gill nets, backpack electrofishing, and underwater video. All reported data on fish from Roberts Lake were provided by the University of New Brunswick (H. Swanson, personal communication). The field program on Roberts Lake was a joint program with Ms. Heidi Swanson, who was partially funded by the Natural Sciences and Engineering Research Council and the Northern Scientific Training Program. These data will be used in a future PhD thesis and one or more primary publications by H. Swanson. Fish sampling was also conducted on small lakes in the Roberts Lake drainage using backpack electrofishing, Gee minnow traps, gill nets, beach seines, and angling. Selected tributaries to Roberts Lake were also sampled for fish using backpack electrofishing.



Note: 20 m contour interval

Reference: Base map provided by Rescan, January 22, 2001.

LEGEND

- Angling (AN)
- Backpack electrofishing (E✚)
- Gill net (GN)
- Seine (BS)
- Dip net (DN)
- Fyke net (FN)
- Minnow trap (MT)
- Fish fence

800 0 800

Scale Metres

MIRAMAR HOPE BAY LTD.

Title

Fish Sampling Sites in Doris North Project Area, 2006

Golder Associates
Edmonton, Alberta

Project No.		06-1373-028	File No.	1731664
Design	BE	21/10/07	Scale As shown	Rev. 1
Cadd	RW	21/10/07		
Check	DM	20/12/07	**Figure: 4.1**	
Review	GA	20/12/07		

4.1.1 Fish Fence

A fish fence with a trap was installed in Little Roberts Outflow to collect downstream fish migrants, including Arctic char smolts, as they move from the Roberts Lake drainage into the marine environment of Roberts Bay. The fence and trap were installed as soon as possible after spring break-up in the stream on 18 June. They were removed on 22 July 2006 after Arctic char smolt downstream migration was complete.

Fence construction consisted of five metal panels (each 3.1 m in length and 1.5 m in height) and a trap box (Figure 4.2). The panels consisted of metal frames with removable conduit rods (1.8 cm in diameter). The spacing between the rods was 1.9 cm and each panel was lined with vexar to prevent small fish from passing between the conduit rods. The panels were supported by wooden "A" frames and sandbagged into position. Fish migrating downstream were funnelled into the trap box located near the left downstream bank. Upstream migrants were captured (angling, dip net, beach seine) from holding areas situated downstream of the fish fence.

Figure 4.2 Fish Fence Set-up in Little Roberts Outflow.

The trap consisted of a metal frame (1.8 m long, 1.2 m wide, and 1.5 m high) perforated with holes for holding vertical conduit sections that formed the trap walls. The entrance to the trap consisted of a conduit funnel, similar in construction to the trap walls, allowing the opening width to be adjusted to maximize capture and minimize escape.

The fish fence was checked each day, when possible, to record daily movement patterns. Information collected during each trap check included date, time of day, water temperature, and life history data from captured fish. Fish migrating downstream were released immediately downstream of the fence, and upstream migrants were released immediately upstream of the fence.

4.1.2 Fyke Nets

Standard and modified Arctic fyke nets were used to sample fish in the study area; the type of net employed depended on the specific study objective for the waterbody. An Arctic fyke net was used in Roberts Bay, and a modified Arctic fyke net was used in Roberts Lake. In Roberts Bay, the Arctic fyke net consisted of two trap nets, two 15 m wings, and a 60 m lead to shore. The trap nets were 3.7 m long and 0.9 m wide, contained two throats (15 × 25 cm each), and were constructed of 1.27 cm dark grey knotless nylon mesh. Wings and lead were also constructed of 2.54 cm dark grey knotless nylon mesh, and were 1.7 m deep. The lead net panel was set perpendicular to shore and separated the two trap nets. Wing net panels were attached to either side of the trap entrances and were stretched out parallel to shore. The combination of the lead panel and wings acted to confine and guide fish into the traps. Using two separate trap nets allowed directional catch data to be recorded.

A modified Arctic fyke net was used to sample small fish in Roberts Lake. The fyke net was set near the outlet of Roberts Lake to catch fish moving from Roberts Outflow into Roberts Lake. This net consisted of a single trap net, two 7.6 m wings, and a 7.6 m lead to shore. The trap was 0.9 m wide and contained two throats (7.5 x 7.5 cm each). The trap, wings and lead were constructed of 1.0 cm dark grey knotless nylon mesh. The wings and lead were 0.9 m deep. Wing net panels were attached to either side of the trap entrance and were stretched out parallel to shore. Fyke net sets were held in place by T-bar posts.

Fyke nets were checked daily. Information recorded during each net check included date, time of day, water temperature and life history data from captured fish.

4.1.3 Backpack Electrofishing

A Smith-Root Model 12B backpack electrofisher was used to collect fish in small lakes and tributaries to Roberts Lake. The operator waded upstream and sampled in the vicinity of suspected fish holding areas (e.g., near boulders, undercut banks); the netter collected stunned fish and placed them in a holding bucket. Recorded information at each site included UTM coordinates at the beginning and end of sampling, date and time of sampling, distance sampled, sampling effort (seconds), and electrofisher settings. Captured fish were processed to obtain life history information, and subsequently released near the capture location.

4.1.4 Beach Seines

Beach seining for small fish was conducted in small lakes in the Roberts Lake drainage, but was restricted to sites with suitable substrate (i.e., sand or gravel). Beach seines were also used to capture fish holding upstream or downstream of the fish fence in Little Roberts Outflow. The beach seine was 9 m long (6 mm mesh) and was equipped with a collection bag (3 mm mesh). The length of each haul was recorded to allow calculation of catch-per-unit-effort. Life history information, UTM coordinates, date, time, water temperature and substrate type were recorded at each sampling location.

4.1.5 Minnow Traps

Gee™ minnow traps were used to capture small fish in small lakes and streams in the Roberts Lake drainage. The traps (40 cm long, 23 cm diameter in the middle, 19 cm diameter at each end) were two-piece wire enclosures with inverted funnel openings. They were baited with cat food or sardines and were set in near-shore habitats. Date, time, UTM coordinates, depth, water temperature, and substrate type were recorded for all minnow trap sets, and life history information was recorded for all captured fish.

4.1.6 Gill Nets

Variable mesh experimental gill nets were employed in Roberts Lake and in small tributary lakes to Roberts Lake. Each experimental gill net was comprised of two to three panels measuring 15.2 x 1.8 m. Mesh sizes ranged from 1.3 to 6.4 cm. Set times were generally kept short (less than 2 h) to minimize capture related mortalities. Information recorded at each gill net site included UTM coordinates, date and time of set and lift, water depth, and the number and species of fish captured.

4.1.7 Angling

Angling (barbless lures) was conducted by either casting from shore or boat, or by trolling behind a boat. Captured fish were processed to obtain life history information before being tagged and released. Other recorded data included date and time of capture, location, hours fished and number of rods used.

4.1.8 Fall Spawning Survey

Potential spawning sites for Arctic char were identified based on habitat selection criteria provided by DFO (2004); the criteria defined suitable depth (3 to 6 m) and substrate characteristics (gravel beds). An underwater video camera and GPS-based depth sounding equipment were the main tools used in this survey.

4.1.9 Habitat Surveys in the Roberts Lake Drainage

Shoreline habitat characteristics were visually assessed in small lakes surrounding Roberts Lake. Predominant substrate types were identified throughout the lakes, and depths were recorded using a hand held depth sounder. Surface area for each of these lakes was calculated from base map Hope Bay 77 A/3 produced by Energy, Mines and Resources Canada. Fish passage characteristics in tributary streams were examined to assess connectivity between Roberts Lake and the small upstream lakes.

4.1.10 Life History Data Collection

Life history information was collected from all fish captured. Fish were identified to species, measured (fork length or total length to the nearest mm), and weighed (g). Fish captured in Little Roberts Outflow that were greater than 300 mm in fork length were tagged with a uniquely numbered Hallprint™ T-bar anchor tag (30 mm in length). Tag-recapture data were used to assess fish movements. Additional life history data were collected from capture mortalities including ageing structures (e.g., scales, otoliths, fin rays), sex, maturity, reproductive status, and stomach contents.

Differences in strontium (Sr) concentrations between marine and freshwater systems are reflected in otolith composition and can provide information about anadromous behaviour (Swanson and Kidd, in prep). For this reason, otoliths from eight Arctic char were analyzed to determine Sr content. The Sr data were analyzed by graduate student Heidi Swanson at the University of New Brunswick. Sectioned otoliths were ablated and analyzed for elemental concentrations using an NU Wave UP-213 laser ablation system attached to a Thermo Finnigan Element 2 high resolution inductively coupled plasma mass spectrometer at the University of Manitoba (Swanson and Kidd, in prep.). Calcium was used as an internal standard within each otolith, and as such, all strontium concentrations were normalized for otolith-specific calcium concentrations.

To facilitate data recording and presentation of results, all captured fish were assigned a four-letter species code. The common and scientific names of fish species captured in 2006, as well as their coded abbreviations, are presented in Table 4.1.

Table 4.1 Common and Scientific Names of Fish Species Captured in the Doris North Project Area, 2006.

Family	Common Name	Scientific Name[a]	Code
Cottidae	Fourhorn sculpin	*Myoxocephalus quadricornis* (Linnaeus)	FRSC
Gasterosteidae	Ninespine stickleback	*Pungitius pungitius* (Linnaeus)	NNST
Gadidae	Greenland cod	*Gadus ogac* Richardson	GRCD
Osmeridae	Capelin	*Mallotus villosus* (Müller)	CAPE
Pleuronectidae	Arctic flounder	*Pleuronectes glacialis* Pallas	ARFL
Salmonidae	Arctic char	*Salvelinus alpinus* (Linnaeus)	ARCH
	Lake trout	*Salvelinus namaycush* (Walbaum)	LKTR
	Lake whitefish	*Coregonus clupeaformis* (Mitchill)	LKWH
	Broad whitefish	*Coregonus nasus* (Pallas)	BRWH
	Cisco	*Coregonus artedi* Lesueur	CISC

[a] From Nelson et al. (2004)

4.1.11 Data Analysis

All life history data from individual fish were subjected to a thorough QA/QC procedure prior to final tabulation (Appendices C1 and C2). The data were then used to calculate life history statistics for each species and waterbody; parameters included the following:

- length-frequency distribution;
- length-weight relationship (calculated using SigmaPlot™ software);
- mean length, weight, and condition factor (standard deviation, sample size, minimum and maximum values).

Fish condition factors were calculated as follows:

$$K = (W * 10^5) / L^3$$

where K = Fulton’s condition factor, W = weight in grams, and L = fork length in millimetres.

As an index of relative abundance, catch-per-unit effort (CPUE) values were calculated for each sampling method. CPUE values for fyke net, minnow trap, and fish fence catches are reported as number of fish captured per 24 hours of trap/net operation. CPUE values for gill net sets are reported as number of fish captured per 100 m^2 of each mesh size panel set for the equivalent of 24 hours. CPUE values for angling are reported as number of fish captured per hour of angling with one rod. Backpack electrofishing CPUE values are reported as number of fish per 100 seconds of electrofisher operating time. Beach seining CPUE units are reported as number of fish per 100 m^2 of area seined.

4.2 FISH MIGRATIONS IN LITTLE ROBERTS OUTFLOW

Evaluating the downstream migration of Arctic char in Little Roberts Outflow was a key objective of the study program. Anadromous populations of Arctic char are known, through previous studies associated with the Doris North Project, to make annual feeding migrations through Little Roberts Outflow to the marine environment of Roberts Bay. The proposed habitat compensation strategy, as outlined in the "No Net Loss" Plan Revision 5 (Golder 2005a), is expected to provide greater access between overwintering, spawning, and rearing habitats in Roberts Lake and productive ocean habitats, which should result in increased char abundance and growth.

To document the numbers of Arctic char smolt undertaking the seaward migration to Roberts Bay in 2006, and to provide a baseline for post-enhancement monitoring, a fish fence was installed in Little Roberts Outflow. The feasibility of using this type of fish fence to quantify the smolt out-migration from the Roberts Lake watershed is discussed in Section 4.2.4.

Fisheries monitoring, focusing on Arctic char upstream migrations in Roberts Outflow, has been conducted from 2002 to 2005. A field program implemented by Rescan (between 1995 and 2000) also involved tagging fish with anchor tags. Since the main objectives of the fish fence program in 2006 were different from previous years, the fish fence location was adjusted. In previous years, fish fences were installed at the downstream and upstream end of the boulder garden section of Roberts Outflow. The new fish fence location in Little Roberts Outflow was moved downstream to ensure that fish captured moving downstream were, in fact, continuing to Roberts Bay rather than remaining in Little Roberts Lake.

Daily sampling was conducted at the fish fence from 19 June (shortly after break-up) until 22 July. The fish fence was in place for 34 days, with sampling conducted on 29 days (logistical constraints prevented sampling on five days during the set up period). Fish were recorded moving both downstream and upstream from the fence. The catch rates and size characteristics for the various fish species sampled at the fish fence are summarized in Appendices C3 and C4; data from individual fish are presented in Appendix C1.

4.2.1 Species Composition and Relative Abundance

In total, 260 fish, representing three species, were encountered at the fish fence in Little Roberts Outflow during 34 days of operation (Table 4.2). Arctic char dominated the overall catch (74.2%), followed by lake trout (25.4%), and broad whitefish (0.4%). The majority of fish encountered at the fish fence (56%) were moving downstream and actively entered the trap. Fish that were reluctant to enter the trap were angled (32%), dip netted (6.5%), or beach seined (5.8%) to allow movement past the fish fence (i.e., they were released on the opposite side of the fence). Depending on which side of the fence the fish were captured, they were included (for the purpose of movement analysis) in the downstream or upstream migrant group.

Table 4.2 Number of Fish Encountered in Little Roberts Outflow, 2006.

Species	Trap		Angling		Dip Net		Beach Seine		Total	
	n	%	*N*	%	*n*	%	*n*	%	*n*	%
Arctic char	142	97.9	31	37.3	5	29.4	15	100.0	193	74.2
Lake trout	3	2.1	51	61.5	12	70.6	-	-	66	25.4
Broad whitefish	-	-	1	1.2	-	-	-	-	1	0.4
Total	**145**	**100.0**	**83**	**100.0**	**17**	**100.0**	**15**	**100.0**	**260**	**100.0**

4.2.2 Fish Movements

Arctic Char

Most Arctic char (92%) were documented moving downstream, with only 8% of the fish moving in the upstream direction (Appendices C1, C3). The number of Arctic char moving downstream in Little Roberts Outflow on a daily basis varied greatly (Figure 4.3). The maximum number of downstream migrants that passed through the trap in a single day was 29 fish on 1 July. The mean number of downstream migrants was about five fish per day (Appendix C3). The majority of Arctic char (57%) moved downstream prior to 2 July (Appendix C3).

Upstream movements of Arctic char were infrequent (Figure 4.3). The maximum number of Arctic char moving upstream during one day was three fish, which occurred on two occasions: 4 July and 6 July. The main upstream migration of Arctic char typically occurs later in the season after the fish fence had been removed from the stream.

Length-frequency distribution indicated two major size groups of Arctic char moving towards the sea: juveniles between 200 and 400 mm in fork length and adults between 600 to 800 mm fork length (Figure 4.4). Arctic char moving into Roberts Bay represented the current year, non-reproducing, portion of the population that included first time migrants (i.e., smolts), older juveniles, and post-reproductive adults. Fish moving upstream were all adults greater than 600 mm in fork length, which represent the larger adults that generally move back into freshwater earlier than the younger size-classes (Johnson 1980; Figure 4.4; Appendix C1).

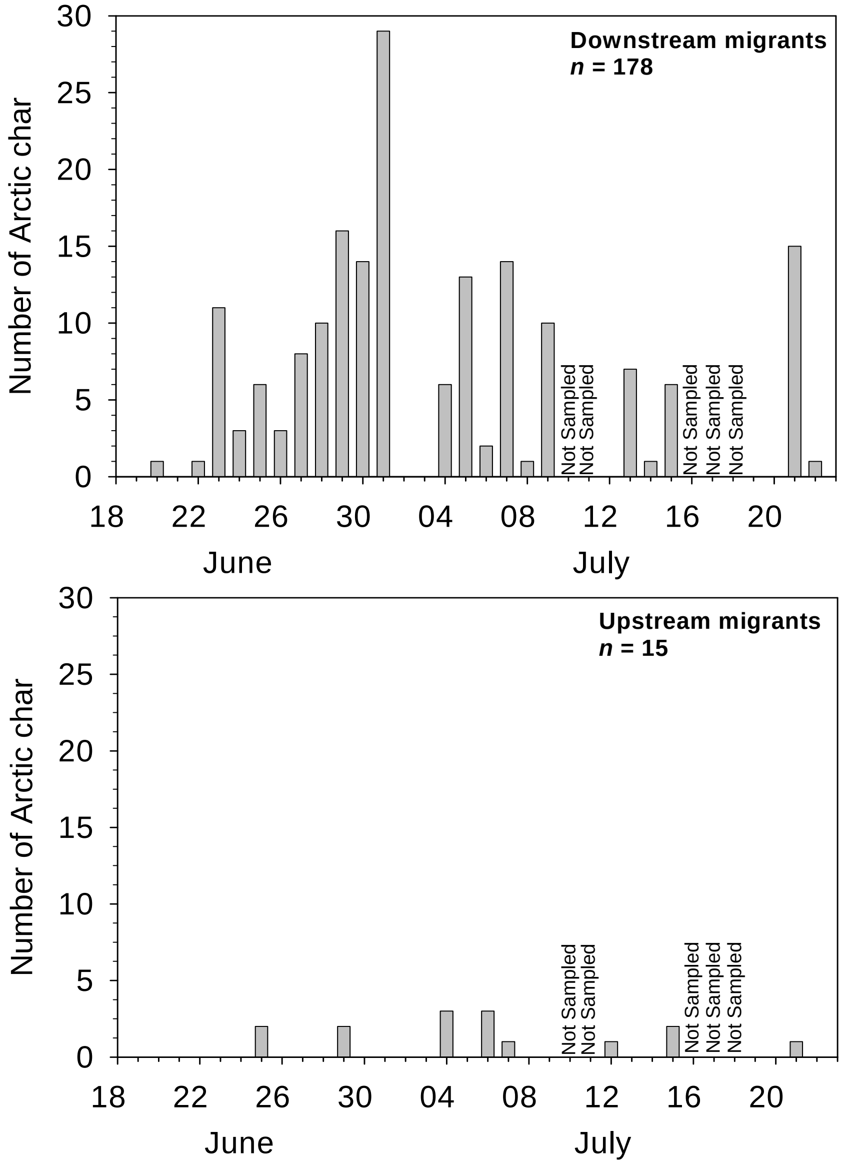


Figure 4.3 **Daily Catches of Arctic Char Moving Downstream and Upstream in Little Roberts Outflow, 2006.**

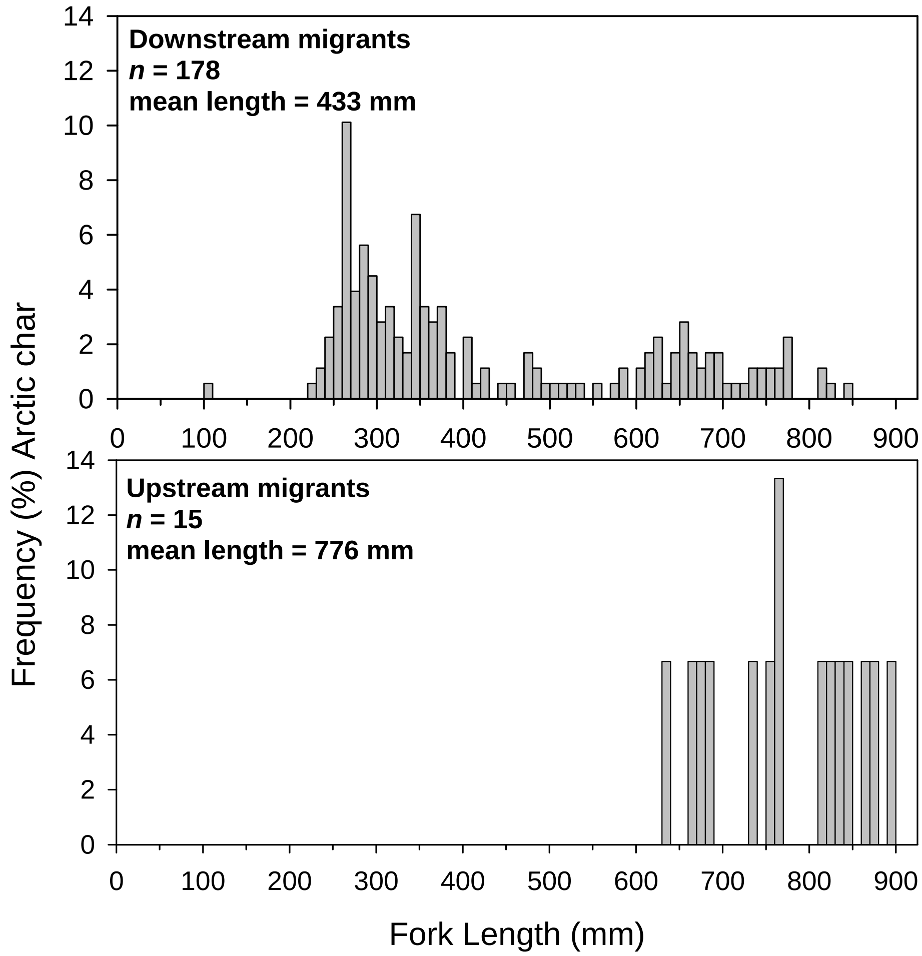


Figure 4.4 **Length-frequency Distribution of Arctic Char Moving Downstream and Upstream in Little Roberts Outflow, 2006**

The size distribution of Arctic char moving downstream varied throughout the sampling period (Figure 4.5). Larger size-classes (>550 mm in fork length) were dominant (92%) during the first week of fish fence operation (19-26 June). This tendency for larger fish to begin seaward migrations earlier in the year has also been reported by Johnson (1980). In subsequent weeks, there was a marked shift towards smaller size-classes (i.e., 200-400 mm fork length range) among the downstream migrants, with larger fish captured less frequently. Mean length of Arctic char migrating downstream became progressively smaller throughout the sampling period (Figure 4.5). The majority (91%) of Arctic char moving downstream during the last nine days of fish fence operations (14-22 July) were between 245 and 384 mm in fork length (Appendix C1).

A smolt is generally considered to be a fish migrating to the ocean for the first time (Johnson 1980). Arctic char young typically spend several years in freshwater before undertaking a seaward migration. The age at first migration can

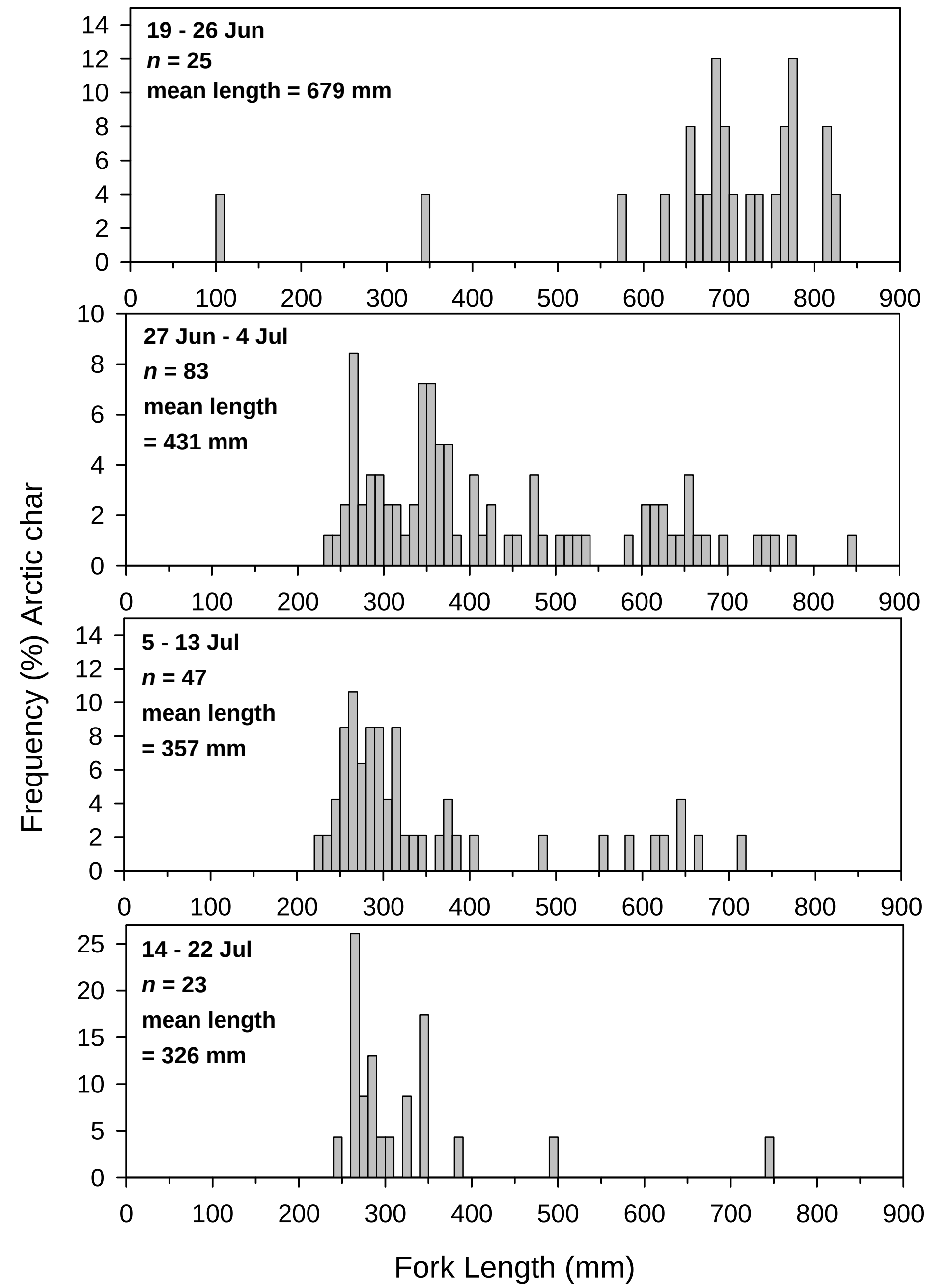


Figure 4.5 **Temporal Changes in Length-frequency Distribution of Arctic Char Moving Downstream in Little Roberts Outflow, 2006. (note changes to y-axis)**

vary between populations and individuals within a population but is thought to be between four and five years in the majority of systems (Johnson 1980). In the nearby system of Nauyuk Lake on Kent Peninsula, age at first migration ranged from three to eight years old (Johnson 1989). The number of smolts migrating downstream has also been reported to be quite variable between years. Arctic char smoltification is not always a clear transition; individual fish may make more than one seaward migration while remaining in the smolt size range. In addition, downstream movement of smolts does not necessarily indicate movement to the sea, as small char may migrate downstream but remain in freshwater habitat. A small Arctic char (108 mm) was captured in the fish fence but this fish was not included in the smolt count because it was assumed to be a young juvenile rather than a smolt. This fish moved downstream past the fish fence in Little Roberts Outflow but is unlikely to have been a smolt continuing on to the marine environment.

In general, Arctic char smolts comprise the smallest modal size class present in the seaward migration (Johnson 1980). For the purpose of this report, Arctic char between 200 to 350 mm in fork length were considered to be smolts (Figure 4.5). Based on this assumption, 86 smolts were encountered in Little Roberts Outflow. This assumed the size range for smolts is based on the modal peaks in the length frequency distribution. The age distribution of smolts in this system is currently unknown.

Otoliths from five fish captured at the fish fence were analyzed for strontium\calcium ratios to determine whether these fish had migrated to sea. It was determined that an Arctic char captured at the fish fence in Little Roberts Outflow in 2006 had previously migrated out to sea at approximately four and five years of age; presence in the sea was confirmed by Sr concentrations in excess of 2000 ppm (Figure 4.6). At the time of capture in 2006, this fish measured 341 mm in fork length and weighed 360 g. Strontium concentrations measured in the otolith of a second fish of similar size (334 mm in fork length and 350 g in weight) revealed that it had not yet completed a seaward migration (Figure 4.7). Additional otoliths will be analyzed from Arctic char collected at the fish fence in 2007 to help clarify the age at first migration in the Roberts Lake system.

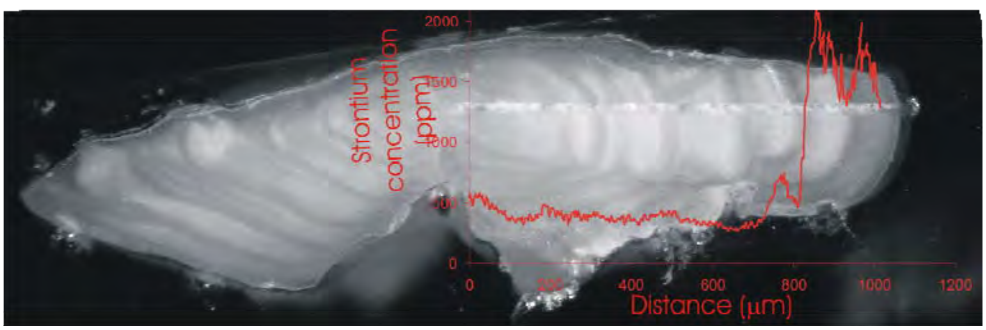


Figure 4.6 **Strontium Concentration (Normalized for Calcium Concentration) in an Otolith Collected from an Arctic Char (341 mm in Fork Length) Captured Moving Downstream at the Fish Fence in Little Roberts Outflow (Swanson and Kidd, in prep.). This Fish Migrated to Sea at Approximately Age 4 and 5.**

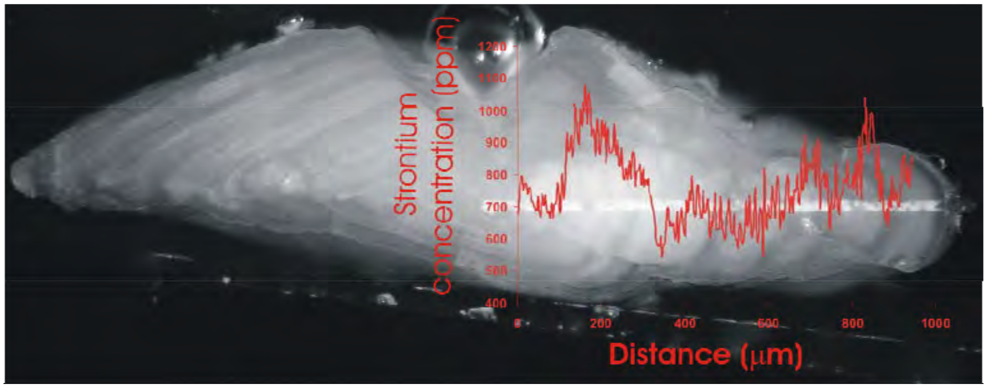


Figure 4.7 **Strontium Concentration (Normalized for Calcium Concentration) in an Otolith Collected from an Arctic Char (334 mm in Fork Length) Captured Moving Downstream at the Fish Fence in Little Roberts Outflow (Swanson and Kidd, in prep.). This Fish has not Migrated to Sea.**

Lake Trout

Anadromy (migration from fresh to salt water) is often a defining characteristic of salmonid fishes; however, these seaward migration patterns are expressed in differing degrees among the salmonid species (Quinn and Myers 2004). Based on an anadromous classification, which considers distance of migration, duration of stay at sea, state of maturity attained at sea, spawning strategies, and occurrence of freshwater forms, a high degree of anadromy has not been documented for lake trout, compared to other salmonid species (Quinn and Myers 2004). In the Roberts Lake system, however, the data indicate that the lake trout population contains both migratory and resident individuals. A seasonal out-migration of a portion of the lake trout population during the spring from Roberts Lake to the marine environment of Roberts Bay was first documented in 2002 (RL&L/Golder 2003a), and has been verified in subsequent years. This strategy of partial anadromy is likely maintained by the environmental instability in the area (Jonsson and Jonsson 1993). Individuals that migrate to the ocean likely gain access to good feeding opportunities in the marine system, which results in increased growth rates and higher reproductive potential (Jonsson and Jonsson 1993). Documenting the occurrence of this life history strategy in lake trout may provide some insight into the selective pressures that influence these migration patterns.

Similar to Arctic char, lake trout movement downstream occurred early in the monitoring period. Lake trout moved upstream relatively uniformly during the monitoring period (Figure 4.8). The maximum number of lake trout recorded moving upstream was 16 fish on 18 July; however, this large number of fish was encountered after the trap had not been checked for three days due to logistical constraints, and was augmented by angling downstream of the trap.

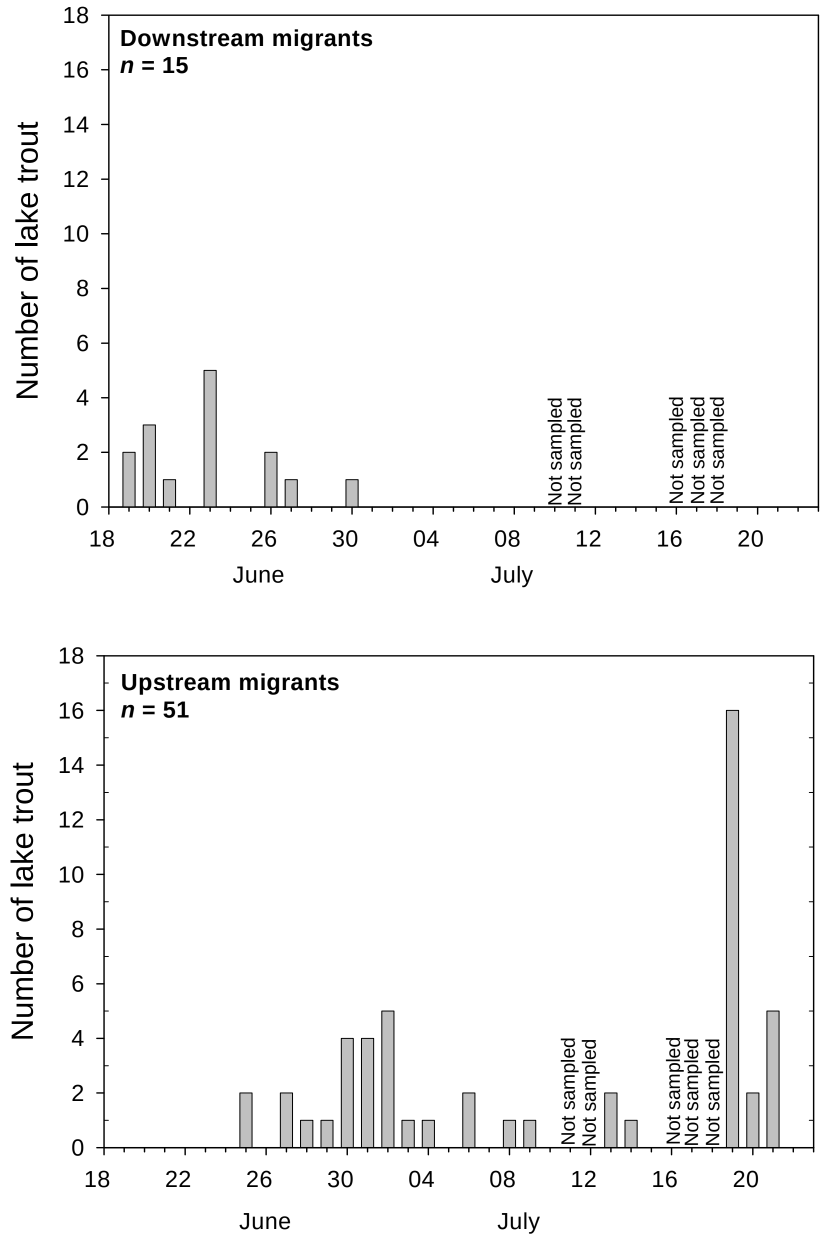


Figure 4.8 Daily Catches of Lake Trout in Little Roberts Outflow, 2006.

Although downstream movement of lake trout was infrequent, the timing of movement occurred early in the monitoring period. All lake trout were captured moving downstream prior to 1 July (Figure 4.8). The maximum daily downstream movement of lake trout (five individuals) occurred on 23 June. The mean number of lake trout moving downstream was less than one fish per day.

Lake trout measured at the fish fence were all greater than 400 mm in length (Figure 4.9). Lake trout moving downstream ranged from 416 to 882 mm, and lake trout moving upstream ranged in length from 600 to 900 mm (Figure 4.9; Appendix C1). Mean length of lake trout moving downstream was 610 mm (Figure 4.9). Lake trout moving upstream had a larger mean length of 780 mm (Figure 4.7).

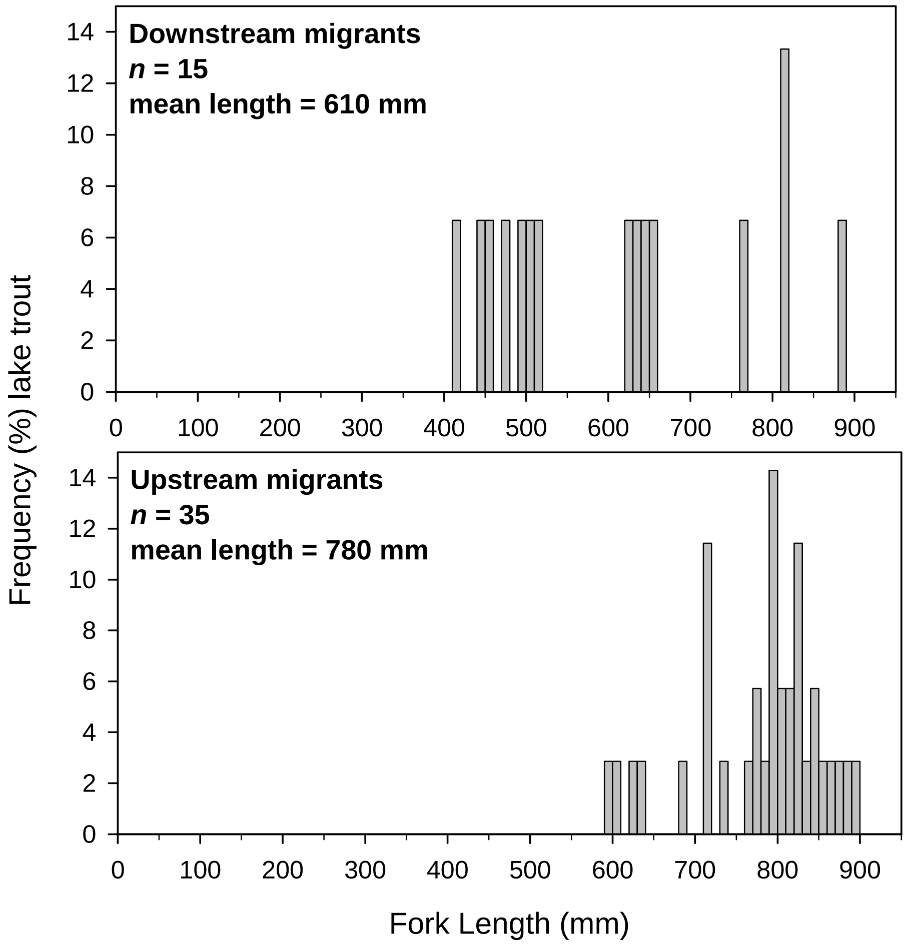


Figure 4.9 Length-frequency Distribution of Lake Trout in Little Roberts Outflow, 2006.

4.2.3 Recapture Frequency

The number of initial encounters (i.e., first-time captures) of fish that passed through the fish fence during 2006 included 152 Arctic char, 43 lake trout, and 1 broad whitefish. The number of recaptures from previous years (i.e., 2000, 2002, 2003, 2004, and 2005) encountered in the traps accounted for 21% of the total Arctic char catch in 2006 and 35% of the lake trout catch (Table 4.3). The single broad whitefish caught in the fish fence was a new encounter.

Table 4.3 Number of Fish Captured and Recaptured in the Little Roberts Outflow, 2006

Species	Initial Captures in 2006	Recaptures from Previous Years					Total Captures in 2006
		2005	2004	2003	2002	2000	
Arctic char	152	25	12	3	1	-	193
Lake trout	43	12	9	1	-	1	66
Broad whitefish	1	-	-	-	-	-	1
Total	**196**	**37**	**21**	**4**	**1**	**1**	**260**

4.2.4 Feasibility of Quantifying Smolt Out-migration

The timing of fish fence sampling in Little Roberts Outflow in 2006 encompassed most of the smolt out-migration period. Larger Arctic char (> 600 mm in fork length) migrated downstream earlier in the season (19-26 June), while the majority of smolts (200-350 mm in fork length) were captured in late June and throughout July (Figure 4.5). The number of smolts moving downstream decreased in the second half of July, suggesting that the majority of individuals migrated prior to this time.

On 21 July, just prior to removing the trap, fish sampling (beach seining and dip netting) was conducted in holding areas just upstream of the fish fence. The intent was to capture fish that may have been delayed or impeded in their downstream movements by the presence of a physical barrier (i.e., fish fence and trap). Fifteen Arctic char that were apparently reluctant to enter the trap were captured while congregating upstream of the fish fence. This type of sampling will need to be done each year to ensure all fish moving downstream are successfully processed. Despite these efforts, it is still possible that fish attempting to move downstream are delayed or impeded by the fish fence barrier.

Based on the results of the 2006 sampling program, it does appear feasible to monitor smolt out-migration in Little Roberts Outflow.

4.2.5 Size Characteristics of Migrating Fish

A summary of the lengths, weights and conditions factors of fish moving downstream a of the fish fence in Little Roberts Outflow is provided in Table 4.4; similar parameters for upstream migrating fish are provided in Table 4.5.

Table 4.4 Size Characteristics of Fish Moving Downstream in Little Roberts Outflow, 2006.

Species	Fork Length (mm)				Weight (g)				Condition Factor			
	n	**Mean**	SD	Range	*n*	**Mean**	SD	Range	*n*	**Mean**	SD	Range
Arctic char	*178*	**433**	179	108 - 845	*174*	**1064**	1281	10 - 5510	*172*	**0.85**	0.10	0.58 – 1.21
Lake trout	*15*	**610**	152	416 - 882	*15*	**2755**	2170	640 - 7505	*15*	**1.02**	0.19	0.48 - 1.32

Table 4.5 Size Characteristics of Fish Moving Upstream in Little Roberts Outflow, 2006.

Species	Fork Length (mm)				Weight (g)				Condition Factor			
	n	**Mean**	SD	Range	*n*	**Mean**	SD	Range	*n*	**Mean**	SD	Range
Arctic char	*15*	**776**	83	631 - 899	*15*	**4594**	1458	2205 - 8065	*15*	**0.96**	0.15	0.69 - 1.21
Lake trout	*51**	**780**	78	600 - 900	*35*	**5299**	1382	2070 - 8110	*35*	**1.09**	0.13	0.93 - 1.61
Broad Whitefish	*1*	**545**	-	545	*1*	**2000**	-	2000	*1*	**1.24**	-	1.24

* a subset of individuals was used to calculate the mean.

Arctic Char

Length-Frequency Distribution

The fork length of Arctic char captured moving downstream in Little Roberts Outflow (n=178) ranged from 108 to 845 mm (mean of 433 mm; Table 4.4). Upstream migrants (n=15) were larger (mean fork length of 776 mm), and exhibited a narrower size range (from 631 to 899 mm) (Table 4.5). The length-frequency distribution for Arctic char moving downstream displayed a bi-modal pattern, with peaks at approximately 250 and 650 mm (Figure 4.4).

Length-Weight Relationship

The length-weight regression equation for Arctic char captured moving downstream in Little Roberts Outflow (Figure 4.10) was described by the following equation, where W is weight in grams and L is fork length in millimetres:

$$W = 9.59 \times 10^{-6} * L^{2.980} \qquad (n=172; r^2=0.97)$$

Length-weight regression was not calculated for Arctic char moving upstream because of the small sample size (n=15).

The mean condition factor for Arctic char moving downstream was 0.85; condition factors for individual fish ranged from 0.58 to 1.04. Arctic char moving upstream had a higher condition factor than fish moving downstream. The difference likely reflects the increased weight and fat reserves accumulated during feeding in the productive marine environment. Mean condition factor for

Arctic char moving upstream was 0.96; values for individual fish ranged from 0.69 to 1.21 (Table 4.4 and 4.5).

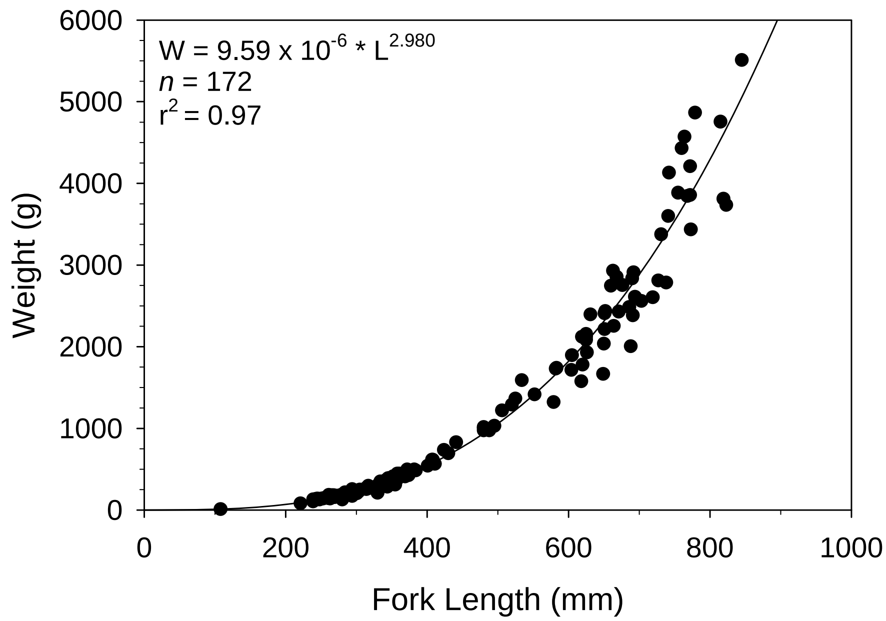


Figure 4.10 Length-weight Relationship of Arctic Char Moving Downstream in Little Roberts Outflow, 2006.

Lake Trout

Length-Frequency Distribution

Lake trout caught moving downstream at the fish fence ranged from 416 to 882 mm in fork length (mean = 610 mm; Table 4.5). Lake trout moving upstream were larger individuals (≥ 600 mm; Table 4.5). Fork length for these fish ranged from 600 to 900 mm (mean = 780 mm). The length-frequency distribution of all lake trout encountered at the fish fence indicates that most fish (90%) were greater or equal to 600 mm in fork length, with the largest fish tending to move in the upstream direction during the period of fence operation.

Length-Weight Relationship

Length-weight regression was not calculated for lake trout moving downstream due to small sample size (n=15).

The length-weight regression equation for lake trout caught moving upstream in Little Roberts Outflow (Figure 4.11) was described by the following equation, where W is weight in grams and L is fork length in millimetres:

$$W = 1.661 \times 10^{-4} * L^{2.591} \qquad (n=35;\ r^2=0.87)$$

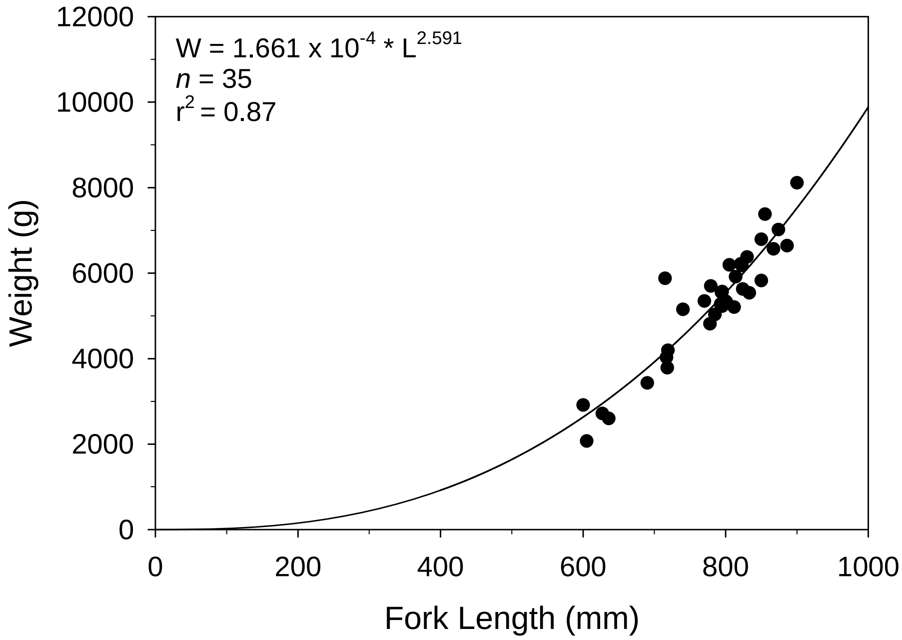


Figure 4.11 Length-weight Relationship of Lake Trout Moving Upstream in Little Roberts Outflow, 2006.

The mean condition factor for fish moving downstream was 1.02 (Table 4.4). Fish moving upstream had a mean condition factor of 1.09 (Table 4.5). Condition factors for individual fish ranged from 0.48 to 1.61 (Table 4.4 and 4.5).

Broad Whitefish

One broad whitefish was captured in Little Roberts Outflow. This individual, which was moving upstream, was 545 mm in fork length, weighed 2000 g and had a condition factor of 1.24 (Table 4.5).

4.3 ROBERTS LAKE

This section of the report summarizes fish capture and life history data collected in Roberts Lake in 2006. Fish capture methods included fyke nets, gill nets, and backpack electrofishing. Both large-bodied and small-bodied fish were targeted.

A summary of catch and sampling effort conducted in Roberts Lake is presented in Appendices C5, C6, and C7. Size statistics for fish sampled are summarized in Appendix C4, and data from individual fish are presented in Appendix C2. All reported data on fish from Roberts Lake were provided by the University of New Brunswick (H. Swanson, personal communication). The field program on Roberts Lake was a joint program with Ms. Heidi Swanson who was partially funded by the Natural Sciences and Engineering Research Council and the

Northern Scientific Training Program. These data will be used in a future PhD thesis and one or more primary publications by H. Swanson.

4.3.1 Species Composition and Relative Abundance

Fish sampling in Roberts Lake yielded a total of 402 individual fish representing six species (Table 4.6). Ninespine stickleback dominated the overall catch (67%), followed by cisco (15%), Arctic char (9%), lake whitefish (7%), and lake trout (3%). Gill nets and fyke nets were the most successful sampling methods for obtaining a wide range of species. Small size-classes of fish were frequently captured in a fyke net set at the lake outflow to obtain fish moving between Roberts Outflow and Roberts Lake. The,catch-per-unit-effort (CPUE) values for the various capture methods and fish species are presented in Table 4.7.

Table 4.6 Number of Fish Captured in Roberts Lake, 2006.

Capture Method	Arctic char	Lake trout	Lake whitefish	Cisco	Ninespine stickleback	Total
Backpack electrofishing	7	1				**8**
Fyke nets	26	2	1	36	270	**335**
Gill nets	1	10	25	23		**59**
Total	**34 (8.5%)**	**13 (3.2%)**	**26 (6.5%)**	**59 (14.7%)**	**270 (67.2%)**	**402 (100.0%)**

Table 4.7 Catch-Per-Unit Effort (CPUE[a]) for Fish Captured in Roberts Lake, 2006.

Capture Method	Effort	Arctic char	Lake trout	Lake whitefish	Cisco	Ninespine stickleback	Total
Backpack electrofishing	438 s	1.6	0.2				**1.8**
Fyke nets	145.5 h	3.8	0.3	0.2	5.9	44.4	**54.6**
Gill nets	23.4 h	1.3	12.7	31.7	29.2		**74.9**

[a] CPUE units: fyke net = fish/24 h; gill net = fish/100 m^2/24 h, electrofishing = fish/100 s.

4.3.2 Life History Data

Arctic Char

Length Frequency Distribution

Thirty-four Arctic char were captured in Roberts Lake and at the lake outflow. Life history data were collected for 33 individual fish. The majority (73%) of captured Arctic char were juveniles (i.e., individuals smaller than 300 mm in fork length). The presence of juveniles indicates that Arctic char are rearing in Roberts Lake, or in nearby stream habitats. Fork lengths for captured specimens ranged from 56 to 670 mm; the mean length of the sample was 236 mm (Figure 4.12; Appendix C4).

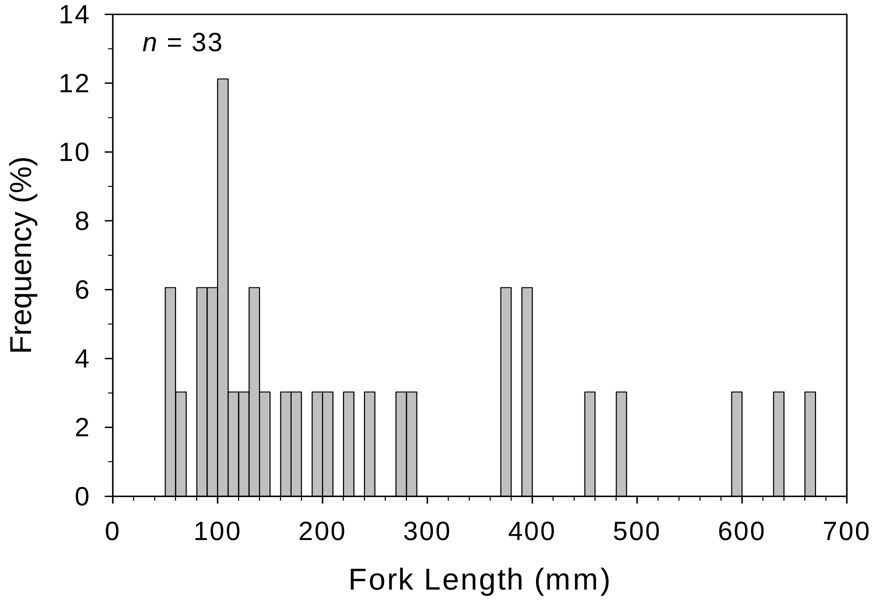


Figure 4.12 Length-frequency Distribution of Arctic Char in Roberts Lake, 2006.

Length-Weight Relationship

The length-weight relationship for Arctic char captured in Roberts Lake (Figure 4.13) was described by the following equation, where W is weight in grams and L is fork length in millimetres:

$$W = 1.024 \times 10^{-5} * L^{3.023} \qquad (n=30, r^2=0.99)$$

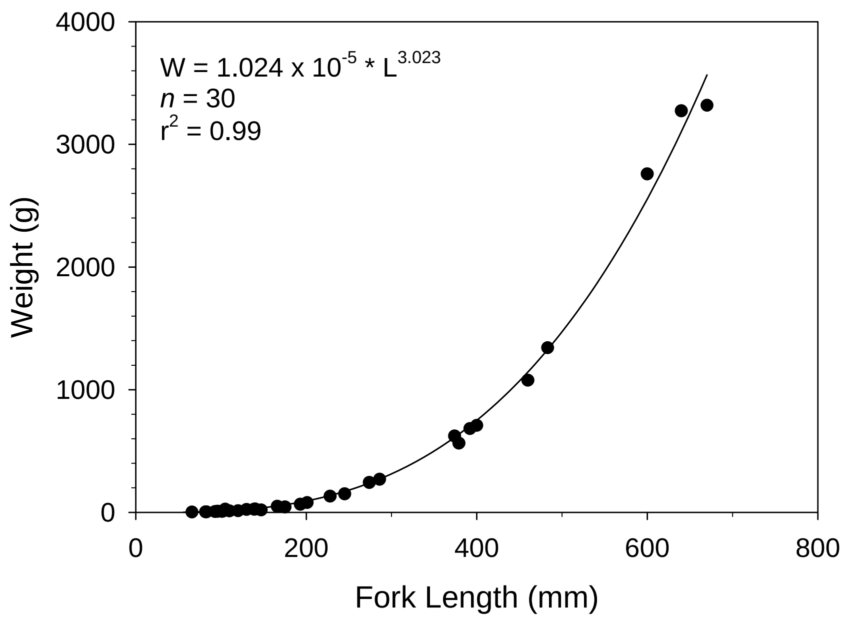


Figure 4.13 Length-weight Relationship of Arctic Char in Roberts Lake, 2006.

The mean condition factor for Arctic char in Roberts Lake was 1.00 (Appendix C4).

Lake Trout

Length Frequency Distribution

Thirteen lake trout were captured in Roberts Lake. Fork lengths (n=12) ranged from 149 to 728 mm (mean of 404 mm); the catch was evenly distributed across the size range represented (Appendix C2).

Length-Weight Relationship

The length-weight relationship for lake trout captured in Roberts Lake (Figure 4.14) was described by the following equation, where W is weight in grams and L is fork length in millimetres:

$$W = 3.422 \times 10^{-6} * L^{3.202} \qquad (n=12, r^2=0.99)$$

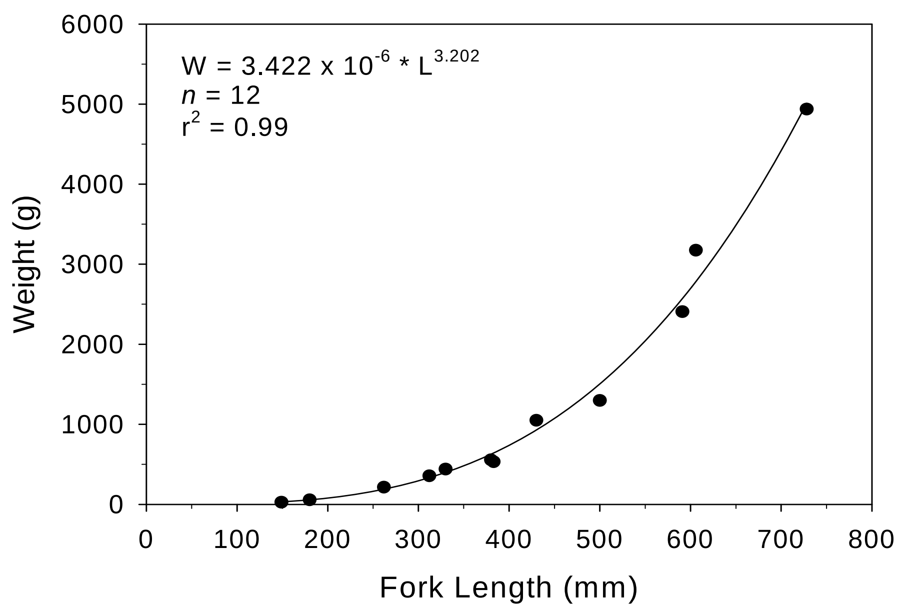


Figure 4.14 Length-weight Relationship of Lake Trout in Roberts Lake, 2006.

The mean condition factor for lake trout in Roberts Lake was 1.12. Condition factors for individual fish ranged from 0.73 to 1.43 (Appendix C4).

Lake Whitefish

Length Frequency Distribution

Twenty-six lake whitefish were captured in Roberts Lake. Fork lengths (n=10) ranged from 251 to 610 mm; the mean length of the sample was 432 mm (Appendix C4). Most (64%) of the measured lake whitefish were larger than 400 mm in fork length (Appendix C2).

Length-Weight Relationship

The length-weight relationship for lake whitefish captured in Roberts Lake (Figure 4.15) was described by the following equation, where W is weight in grams and L is fork length in millimetres:

$$W = 5.120 \times 10^{-5} * L^{2.797} \qquad (n=10, r^2=0.96)$$

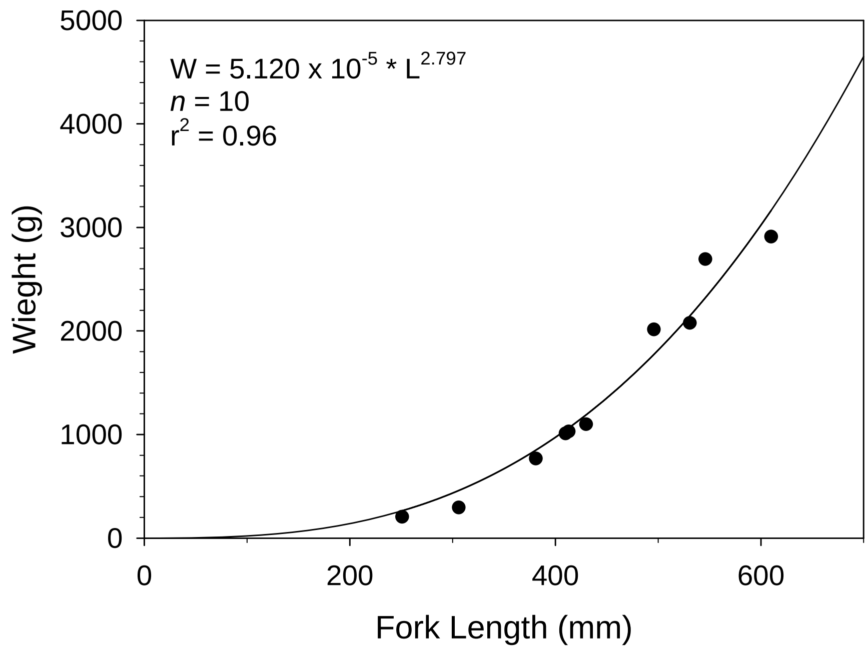


Figure 4.15 Length-weight Relationship of Lake Whitefish in Roberts Lake, 2006.

The mean condition factor was 1.40, with individual fish ranging between 1.03 and 1.65 (Appendix C4).

Cisco

Length Frequency Distribution

Fifty-nine cisco were captured in Roberts Lake. Fork lengths (n=47) ranged from 40 to 365 mm, and the distribution of the sample was trimodal. The first mode centered around 45 mm and was likely composed of young-of-the year fish. The second, and most abundant mode, was centered around 90 mm and was likely made up of yearlings. The third mode was comprised of adult fish between 310 and 365 mm in fork length (Figure 4.16). Approximately half of the captured fish were yearling fish with fork lengths in the 80-89 mm interval.

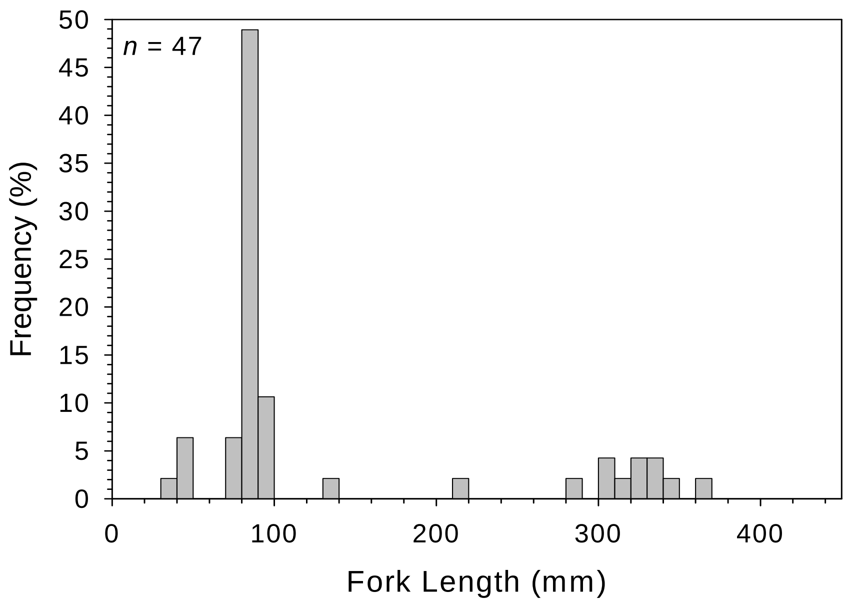


Figure 4.16 Length-frequency Distribution of Cisco in Roberts Lake, 2006.

Length-Weight Relationship

The length-weight relationship for cisco captured in Roberts Lake (Figure 4.17) was described by the following equation, where W is weight in grams and L is fork length in millimetres:

$$W = 2.072 \times 10^{-5} * L^{2.895} \qquad (n=35, r^2=0.98)$$

The mean condition factor for cisco in Roberts Lake was 0.85 (range 0.50 to 1.38; Appendix C4). Some of the low values for condition factor of cisco in Roberts Lake were likely a result of high variability in the weights of small fish, which has been previously documented (Anderson and Neumann 1996).

Ninespine Stickleback

Length Frequency Distribution

In total, 270 ninespine stickleback were captured by fyke netting in Roberts Lake. The mean length (total length) of the measured sample (n=268) was 50 mm, and the range was 36 to 69 mm (Appendix C4). The majority (72%) of ninespine stickleback captured were within the 46 to 55 mm size-class

(Figure 4.18). The ninespine stickleback captured were too small to allow accurate weight measurements.

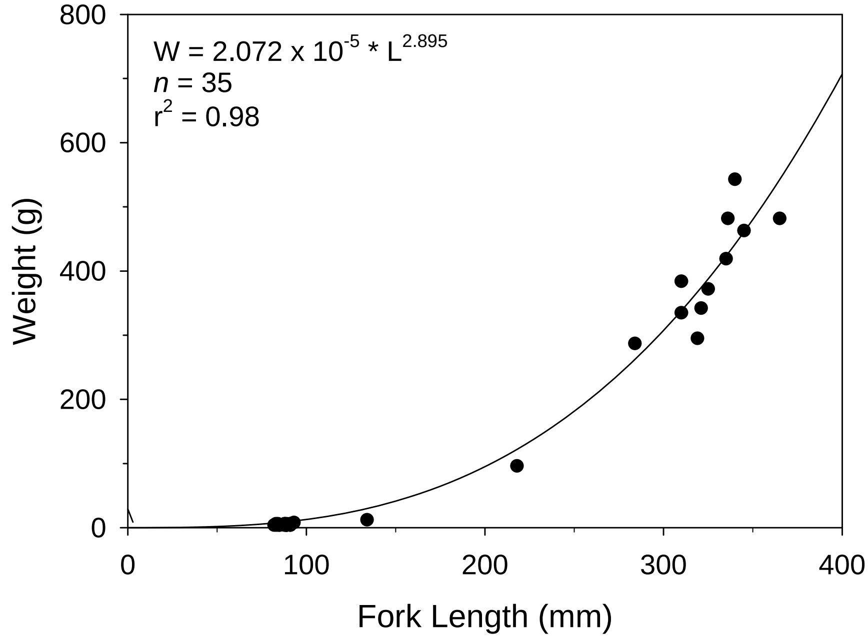


Figure 4.17 Length-weight Relationship of Cisco in Roberts Lake, 2006.

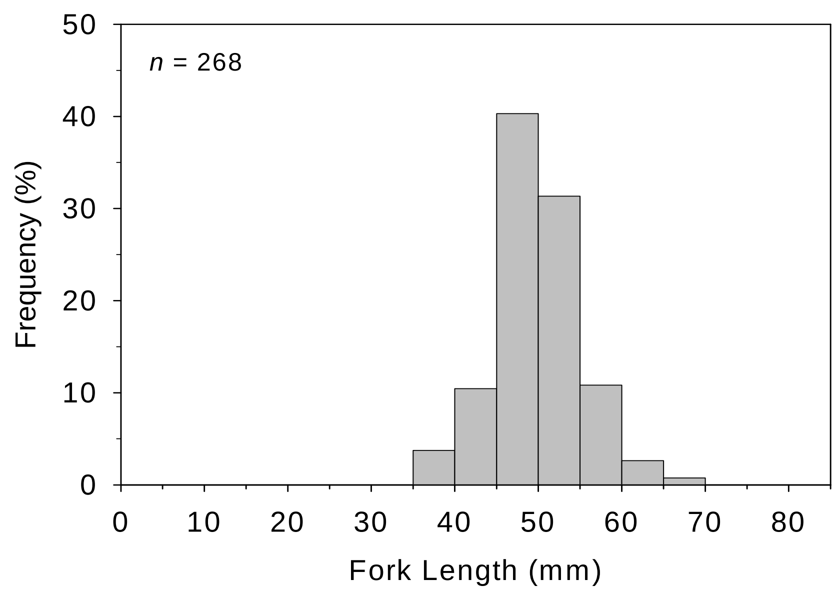


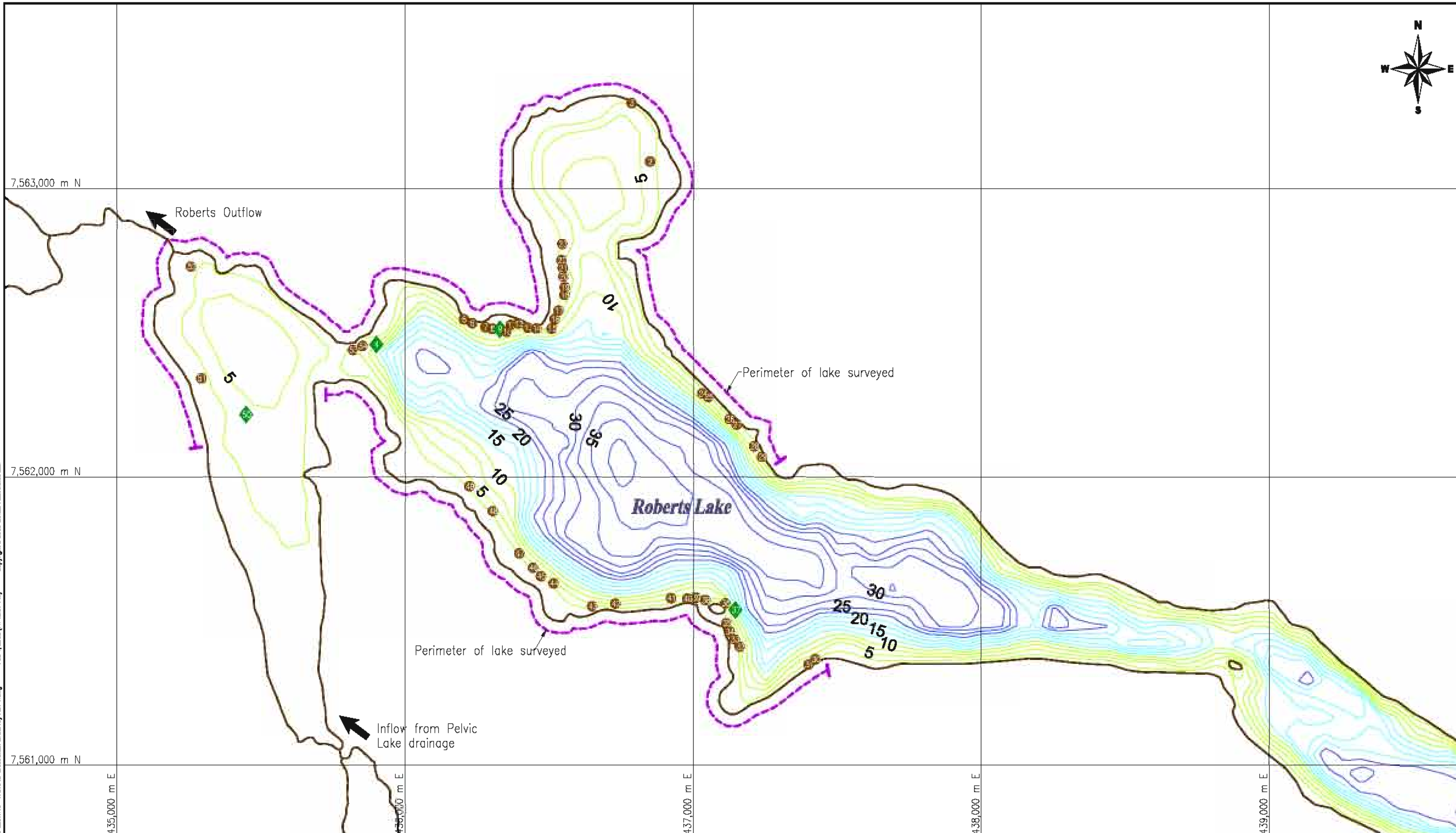
Figure 4.18 Length-frequency Distribution of Ninespine Stickleback in Roberts Lake, 2006.

4.3.3 Arctic Char Fall Spawning Survey in Roberts Lake

An investigation to locate and describe anadromous Arctic char spawning sites in Roberts Lake was conducted on 11 and 12 September 2006. The original intent was to capture Arctic char at suitable spawning locations throughout Roberts Lake. Individual Arctic char were to be sampled to assess spawning condition and obtain otoliths for strontium analysis. The presence of strontium within the annuli (i.e., age rings) of an otolith can be used to identify anadromous (i.e., sea-run) individuals. However, logistical and weather constraints necessitated the sampling be conducted in mid September. Because it was deemed too early in the fall to conduct an Arctic char spawning survey, the work plan was modified. The revised work plan involved searching for suitable Arctic char spawning locations based on preferred depth (3 to 6 m; DFO 2004) and substrate characteristics (gravel beds; DFO 2004), using an underwater video camera and GPS based depth sounding equipment. Observations of adult Arctic char, in spawning colouration, associated with suitable spawning habitat was also used as an indicator of probably spawning locations.

Approximately 10.6 km of shoreline was surveyed along the western end of Roberts Lake (Figure 4.19). Fifty-four locations were identified as potentially suitable Arctic char spawning areas (i.e., 3 to 6 m depth with gravel or gravel/cobble substrate) (Appendix C11). Arctic char males were observed at four of these locations (i.e., one individual per site). Male Arctic char are easily distinguished by the presence of a fully developed kype. Female or sex-unknown Arctic char were not observed during the survey.

It is possible that the observed males had moved into these areas to establish and guard spawning territories. This generally takes place before females move in to build redds and prior to spawning (DFO 2004). The presence of large mature males in near-spawning condition in Roberts Lake is evidence that anadromous Arctic char are spawning in Roberts Lake.



LEGEND

- Shoreline
- 2.5 – 10.0 m contour line
- 12.5 – 20.0 m contour line
- 22.5 – 37.5 m contour line
- 1–54 Suitable spawning substrate (Gr, Gr/Co)
- Male adult ARCH observed (#4, 10, 37 & 50)

MIRAMAR HOPE BAY LTD.

Reference: Transects for bathymetry provided by Golder Associates Ltd., August 2003.

Scale: 250 – 0 – 250 Metres

Title

Arctic Char Spawning Locations In Roberts Lake, 2006

Golder Associates, Edmonton, Alberta

Project No.	06-1373-028		File No.	1731848
Design	SE	02/10/07	Scale: As shown	Rev. 1
Cadd	RW	02/10/07		
Check	DM	20/12/07		
Review	GA	20/12/07		

Figure: 4.19

Images used: MHB-logo-PMS.png - Miramar Mining Corp 01.jpg -
Drawing path and name: N:\CAD\RobertL\06-1373-028\4.19 - 1731848 arcticCharFallSurvey Rev 1.dwg Feb 1, 2008 (Fri 12:07 PM)

4.4 SMALL WATERBODIES IN ROBERTS LAKE DRAINAGE

The “No Net Loss” Plan Revision 5 (Golder 2005a) outlines the importance of constructing a fish passage way through the boulder garden that currently hinders fish passage at the outflow of Roberts Lake. The addition of fish passage works would increase the accessibility to Roberts Lake for fish migrating to and from the ocean, and would increase the availability of critical rearing, feeding, spawning, and overwintering habitat for Arctic char.

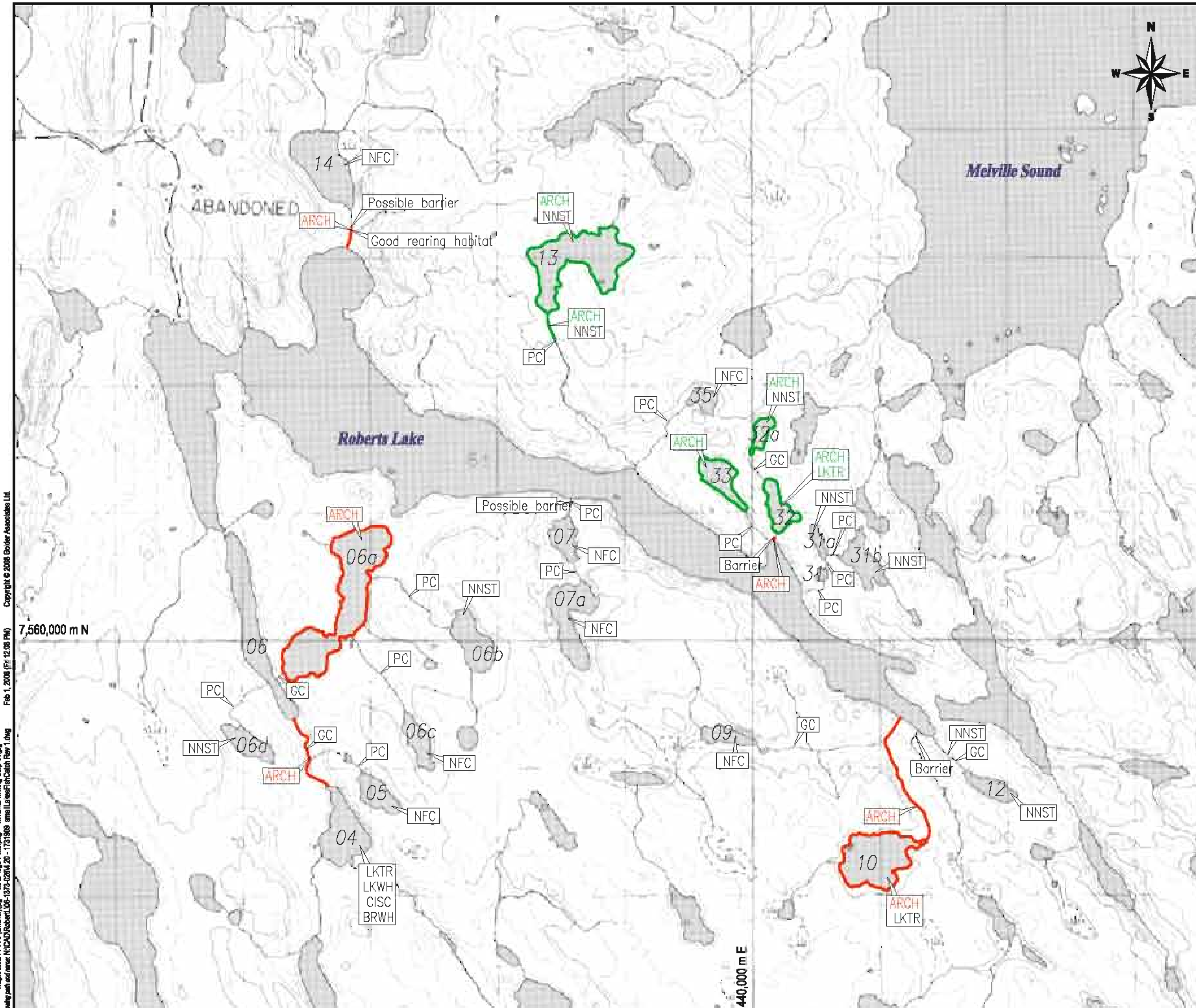
The proposed stream habitat enhancement (by providing greater access into Roberts Lake) is expected to increase biomass and reproductive success of Arctic char in Roberts Lake, and in surrounding waterbodies. This section of the report focuses on Arctic char use of tributaries to Roberts Lake and small lakes in the Roberts Lake drainage area. If these waterbodies provide overwintering and rearing habitat, the potential exists to further increase the productive capacity of the Roberts Lake system, assuming that they are accessible to fish from Roberts Lake. In addition, information on the use of these lakes by resident or anadromous Arctic char will assist with the interpretation of monitoring results in subsequent years.

Fish capture methods used during the tributary and small lake sampling program included backpack electrofishing, gill netting, minnow trapping, angling, and beach seining.

The catch and size statistics for fish sampled in these lakes and streams are summarized in Appendices C5 to C10; data from individual fish are presented in Appendix C2.

4.4.1 Lake 04/ Stream E04

Lake 04 is situated on the southwest side of Roberts Lake and is connected by Stream E04 to Lake 06 near the west basin of Roberts Lake (Figure 4.20). Lake 04 has a surface area of 13.9 ha. A field survey of Lake 04 and Stream E04 was conducted on 12 August. Fish passage from Roberts Lake to Lake 04 was possible at this time through Stream E04, which had a well-defined channel (Figure 4.21) and provided suitable rearing habitat for Arctic char (Figure 4.22). Lake 04 was turbid and had a predominantly silt bottom. Spot depth measurements indicated the lake was mostly shallow, but depths of up to 4.3 m were recorded. The deeper areas were adjacent to steep bedrock banks along the east shoreline of the lake.



LEGEND

06	Lake identifier
ARCH	Lacustrine Arctic Char
ARCH	Possible Sea–run Arctic Char
BRWH	Broad Whitefish
CISC	Cisco
LKTR	Lake Trout
LKWH	Lake Whitefish
NNST	Ninespine Stickleback
NFC	No fish caught
GC	Good stream connectivity between lakes
PC	Poor stream connectivity between lakes

Reference: **Base map Hope Bay 77 A/3 produced by Energy, Mines and Resources Canada**
North American Datum 1927
Zone 13W
Contour interval 10 m

MIRAMAR HOPE BAY LTD.

Title

Fish Catch In Small Waterbodies Within The Roberts Lake Drainage, 2006

Golder Associates
Edmonton, Alberta

Project No.		06-1373-026
Design	SE	31/10/07
Cadd	RW	31/10/07
Check	DM	20/12/07
Review	GA	20/12/07

File No. 1731909
Scale As shown Rev. 1

Figure: 4.20

Figure 4.21 Overview of Stream E04.

Figure 4.22 Stream E04 Provides Suitable Rearing Habitat for Arctic char.

Fish sampling in this system included backpack electrofishing (effort of 420 s) in Stream E04 and gill netting (3.3 h) in Lake 04. In total, 33 fish, representing three species, were captured in the stream; 64 fish, representing four species, were captured in the lake (Table 4.8, 4.9). Ninespine stickleback (n=15), lake trout (n=12), and Arctic char (n=6) were captured in Stream E04 (Table 4.9). Gill netting effort in Lake 04 yielded high catch rates (i.e., 64 fish caught during 3.3 hours of netting). Cisco (n=36) was the predominant species in the overall catch in Lake 04, followed by lake whitefish (n=20), broad whitefish (n=5), and lake trout (n=3; Table 4.8). Also, ninespine stickleback were observed (but not captured) along the shoreline.

Fish captured in Lake 04 were generally larger than fish captured in Stream 04 (Table 4.8; 4.9). Lake trout from the lake had a mean fork length of 308 mm; individuals from the stream had a mean fork length of 153 mm. Arctic char captured in the stream ranged from 101 to 186 mm, with a mean length of 141 mm (Table 4.9). Although Arctic char were not captured in Lake 04, there are sufficient water depths in some areas of the lake to support overwintering. Given the good connectivity between Lake 04 and Roberts Lake, it would be possible for anadromous Arctic char to overwinter in Lake 04.

Table 4.8 Size Characteristics for Fish Captured in Lake 04, 2006.

Species	Fork Length (mm)				Weight (g)				Condition Factor			
	n	Mean	SD	Range	*n*	Mean	SD	Range	*n*	Mean	SD	Range
Lake trout	*3*	308	40	270 – 350	*3*	308	99	220 – 415	*3*	1.04	0.08	0.97 – 1.12
Lake whitefish	*20*	305	42	206 – 378	*19*	401	151	175 - 700	*19*	1.28	0.07	1.13 – 1.40
Broad whitefish	*5*	342	42	300 – 398	*5*	551	234	340 – 880	*5*	1.32	0.10	1.19 – 1.41
Cisco	*36*	193	29	119 – 248	*36*	78	39	20 – 200	*36*	1.03	0.20	0.66 – 1.76

Table 4.9 Size Characteristics for Fish Captured in Stream E04, 2006.

Species	Fork Length (mm)				Weight (g)				Condition Factor			
	n	Mean	SD	Range	*n*	Mean	SD	Range	*n*	Mean	SD	Range
Arctic char	*6*	141	33	101 – 186	*6*	35	22	5 - 60	*6*	1.08	0.33	0.49 – 1.35
Lake trout	*12*	153	109	59 - 436	*11*	124	237	5 - 785	*11*	1.10	0.31	0.71 – 1.6
Ninespine stickleback	*15*	38	14	20 - 68	-	-	-	-	-	-	-	-

4.4.2 Lake 05

Lake 05 (surface area of 5.8 ha) is situated south of Roberts Lake and is immediately adjacent to Lake 04 (Figure 4.20; Figure 4.23). Field surveys were conducted on 30 June and 11 August. The outflow from the lake was not well-defined and the connection to Stream E04 was poor. Fish passage from Roberts Lake was not possible at the time of field surveys. Water depths up to 5.4 m were recorded during spot measurements in the lake.

Fish sampling effort in Lake 05 consisted of backpack electrofishing (469 s) along the shoreline, gill netting (4.7 h) and beach seining (1008 m^2). Fish were not encountered during the sampling program. *Gammarus* (a freshwater shrimp) were abundant in the lake, a further indication that fish are not present in the lake (i.e., fish would normally deplete the *Gammarus* population). Lake 05 seems to have sufficient depth to support fish overwintering; however, fish may not be able to reach the lake due to poor connectivity to Stream E04 (and ultimately Roberts Lake).

4.4.3 Lake 06a

Lake 06a has a surface area of 36 ha and is situated south of Roberts Lake (Figure 4.20; Figure 4.24). The lake is connected to a small lake (Lake 06) near the west basin of Roberts Lake. Most of Lake 06a is shallow, with maximum depths up to 3 m recorded. Field surveys of this lake were conducted on 5 July, 13 August, and 7 September.

Gill net sampling yielded six Arctic char; the fish were distributed in eight gill net sets (total effort of 14.7 h). Total angling effort of 11.2 rod-h resulted in the capture of one Arctic char. No fish were caught by minnow trapping (10.3 h) in the lake. The captured Arctic char were generally large in size, ranging from 380 to 506 mm (Table 4.10), and had a mean condition factor of 1.10. It is likely that these fish are able to move into Lake 06a from Roberts Lake. This lake may provide overwintering habitat for anadromous Arctic char, although much of the lake may freeze to the bottom during winter.

Figure 4.23 Overview of Lake 05.

Figure 4.24 Overview of Lake 06a Looking South.

Table 4.10 Size Characteristics for Fish Captured in Lake 06a, 2006.

Species	Fork Length (mm)				Weight (g)				Condition Factor			
	n	Mean	SD	Range	*n*	Mean	SD	Range	*n*	Mean	SD	Range
Arctic char	6	453	48	380 – 506	6	1059	356	588 - 1595	6	1.10	0.08	1.00 – 1.23

4.4.4 Lake 06b

Lake 06b is located south of Roberts Lake and has a surface area of 9.7 ha. It is not directly connected to Roberts Lake as it drains through low lying sedges and willows toward Lake 06a (Figure 4.20). There was no flowing water in the connecting channel at the time of the survey (10 August). As such, passage of fish was not possible. Steep bedrock banks were observed on the north shore of the lake (Figure 4.25), and emergent vegetation surrounded the shoreline in other areas of the lake (Figure 4.26). Silt and boulder substrates were dominant throughout the lake. Water depths (spot measurements) up to 6 m were recorded in the lake.

No fish were caught in gill nets (7.0 h); however, backpack electrofishing (441s) around the shoreline of the lake was successful in capturing ninespine stickleback (n=93). The captured individuals had a mean total length of 47 mm, and individual lengths ranged from 32 to 63 mm (Appendix C2).

Figure 4.25 Steep Bedrock Banks on the Northeast Shore of Lake 06b.

Figure 4.26 Emergent Vegetation Along Shoreline of Lake 06b.

4.4.5 Lake 06c

Lake 06c is located on the south side of Roberts Lake and south of Lakes 06a and 06b (Figure 4.20). The lake has a surface area of 5.5 ha. Field surveys were conducted on 11 August. There was no defined channel at the outflow of the lake. Water was flowing through a network of dense willows until approximately 200 m downstream of the lake, where it joined a small channel that flows into Lake 06a (Figure 4.27).

Lake 06c had abundant emergent vegetation surrounding the lake shore and islands (Figure 4.28). The lake bottom was predominantly silt substrate with boulder and bedrock adjacent to the banks. Spot measurements indicated that most of the lake was very shallow (<1m), except for a small area with a depth of 4 m. As such, most of the lake is expected to freeze to the bottom during winter, and therefore would be unlikely to provide suitable overwintering habitat for Arctic char.

Fish sampling in Lake 06c included backpack electrofishing (417 s), gill netting (6.1 h), and beach seining (864 m^2). No fish were caught or observed.

Figure 4.27 **Small Channel Flowing from Lake 06c towards Lake 06a.**

Figure 4.28 **Overview of Lake 06c Looking South.**

4.4.6 Lake 06d

Lake 06d is located on the south side of Roberts Lake and has a surface area of 5.8 ha (Figure 4.20; Figure 4.29). It is a predominantly shallow lake, with the majority of spot depths measured at less than 2 m. Aquatic vegetation is abundant around the perimeter of the lake (Figure 4.30). Field surveys were conducted on 12 August and 13 August. No inflows or outflows were observed at the time of the survey.

Figure 4.29 **Overview of Lake 06d.**

Figure 4.30 **Emergent Vegetation Along Shoreline of Lake 06d.**

Fish sampling effort included angling (1.5 rod-h), backpack electrofishing (620 s), gill netting (6.1 h), and beach seining (324 m^2). No fish were caught by angling or in gill nets. Eighty-six ninespine stickleback were caught by beach seine and backpack electrofishing. The captured fish had a mean total length of 40 mm, with the lengths ranging from 19 to 65 mm (Appendix C2).

4.4.7 Lake 07 / Stream E07

Lake 07 is located on the south side of Roberts Lake (Figure 4.20). The lake has a surface area of 5.1 ha. The majority of the lake was shallow, and a maximum depth of approximately 3 m was recorded during spot depth measurements. The entire channel of Stream E07 from the outflow of Lake 07 was overgrown with thick willows. The stream had a high gradient and contained numerous chutes and falls throughout its length from the outlet at Lake 07 to its confluence with Roberts Lake. Fish passage from Roberts Lake upstream to Lake 07 was considered unlikely. Field surveys were conducted on 2 July.

Fish sampling in Lake 07 included minnow trapping (13.0 h), gill netting (4.2 h), and backpack electrofishing (547 s). Backpack electrofishing (232 s) was conducted along the entire length of Stream E07 from Roberts Lake to Lake 07. No fish were caught during fish sampling efforts. Lake 07 is unlikely to provide overwintering habitat for Arctic char, due to shallow depths.

4.4.8 Lake 07a / Stream E07a

Lake 07a has a surface area of 14.3 ha and is situated on the south side of Roberts Lake, just upstream of Lake 07 (Figure 4.20). The two lakes are connected by a small channel, which is heavily overgrown with willows. Depths up to 4 m were recorded in Lake 07a, but the lake was generally less than 2 m deep. Field surveys were conducted on 1 July.

Gill netting (3.3 h), minnow trapping (9.3 h), and backpack electrofishing (969 s) were conducted in Lake 07a. Backpack electrofishing (353 s) was also conducted in Stream 07a, between Lakes 07 and 07a. No fish were caught during sampling efforts in the lake or stream.

4.4.9 Lake 09 / Stream E09

Lake 09 is a small lake (4.2 ha) on the southeast side of Roberts Lake (Figure 4.20). The lake is shallow, with most areas less than 2 m in depth. Stream E09 had a well defined channel and likely allows for fish passage to Lake 09 from Roberts Lake. Field surveys were conducted on 30 June.

Gill net sampling (19.6 h) was conducted in Lake 09 and backpack electrofishing (839 s) was conducted along Stream E09 from the outflow at Lake 09 to the junction with Stream E10. Fish were not captured during sampling efforts.

Overwintering use of Lake 09 by Arctic char is unlikely because of the shallow nature of the lake.

4.4.10 Lake 10 / Stream E10

Lake 10 is located at the southeast end of Roberts Lake (Figure 4.20). The lake has a surface area of 19.8 ha. It is connected to Roberts Lake by Stream E10 (Figure 4.31). Water depths up to 13.6 m were recorded during spot depth measurements in the lake; deep areas (> 5 m) were common throughout the lake. Boulder and bedrock substrate was predominant along the west shoreline of the lake. Low lying areas along the south shoreline had abundant sand and gravel substrate. Field surveys were conducted on Lake 10 and Stream E10 on 29 June, 6 September, and 7 September.

Fish sampling in the lake included angling (8 rod-h), gill netting (13.4 h), and minnow trapping (9.8 h). Backpack electrofishing (1643 s) was conducted along Stream E10 from the outflow of Lake 10 to the confluence with Roberts Lake. Both Arctic char and lake trout were caught during fish sampling in the lake. The three Arctic char captured had a mean length of 447 mm, a mean weight of 943 g, and a mean condition factor of 1.04 (Table 4.11). The nine lake trout captured had a mean length of 401 mm, mean weight of 766 g and a condition factor of 1.19 (Table 4.11). Juvenile Arctic char (n=18) were captured throughout Stream E10 from Lake 10 to Roberts Lake (Figure 4.32). They had a mean length of 95 mm (Table 4.12). Migration of Arctic char from Roberts Lake into Lake 10 is feasible and Lake 10 likely provides overwintering habitat for anadromous populations of Arctic char.

Figure 4.31 Looking Upstream at Stream E10 From Confluence With Roberts Lake. Arctic Char Were Present Throughout This Tributary.

Figure 4.32 Juvenile Arctic Char Captured in Stream E10.

Table 4.11 Summary Statistics for Fish in Lake 10, 2006.

Species	Fork Length (mm)				Weight (g)				Condition Factor			
	n	Mean	SD	Range	*n*	Mean	SD	Range	*n*	Mean	SD	Range
Arctic char	*3*	447	46	402 - 494	*3*	943	270	665 - 1205	*3*	1.04	0.05	1.00 – 1.09
Lake trout	*9*	401	41	346 - 489	*9*	766	174	510 - 955	*9*	1.19	0.17	0.80 – 1.37

Table 4.12 Summary Statistics for Fish in Stream E10, 2006.

Species	Fork Length (mm)			
	n	Mean	SD	Range
Arctic char	*18*	95	35	53 - 158

4.4.11 Lake 12 / Stream E12

Lake 12 is located at the east end of Roberts Lake (Figure 4.20; Figure 4.33). The lake has a surface area of 4.5 ha. The field survey was conducted on 28 June. At the time of survey, fish passage appeared to be possible through Stream E12, which is a small channel connecting Lake 12 to Roberts Lake (Figure 4.34). Spot depth measurements in the lake indicated a maximum depth of at least 5.7 m.

Figure 4.33 Overview of Lake 12.

Figure 4.34 View of Stream E12 Connecting Lake 12 to Roberts Lake.

Fish sampling in Lake 12 included gill netting (3.7 h), angling (8.8 rod-h), backpack electrofishing (645 s), and minnow trapping (12.3 h). Gill netting, angling, and electrofishing in Lake 12 did not result in fish captures; however, two ninespine stickleback were captured using minnow traps. Backpack electrofishing (983 s) conducted in Stream E12 from the outlet at Lake 12 to the confluence with Roberts Lake resulted in the capture of eight ninespine stickleback within this reach.

4.4.12 Lake 13 / Stream E13

Lake 13 is situated on the north side of Roberts Lake (Figure 4.20; Figure 4.35). The lake has a surface area of 25.9 ha. Water depths up to 4.5 m were recorded during spot depth measurements. Field surveys were conducted on 6 July and 13 August. The outflow of Lake 13 (Stream E13) flows directly into Roberts Lake; however, fish passage from Roberts Lake at the time of sampling is unlikely due to subsurface flows through a high gradient section of the stream.

Fish sampling methods in Lake 13 included angling (3.0 rod-h), gill netting (2.6 h), and minnow trapping (12.8 h) and resulted in the capture of 17 Arctic char. The captured fish had a mean fork length of 246 mm and a mean weight of 123 g (Table 4.13). The condition factor of Arctic char in the lake was low, with a mean value of 0.79. Spawning coloration was observed on some of the Arctic char captured, despite the small size and poor condition of the fish. It is likely that Arctic char captured in Lake 13 are resident lacustrine fish that do not undergo seasonal migrations to marine habitat. More information on this topic will become available after the completion of strontium analyses.

Backpack electrofishing (1740 s) was also conducted along Stream E13 from its confluence with Roberts Lake to the outflow at Lake 13. Two ninespine stickleback and two juvenile Arctic char were captured during backpack electrofishing efforts in the upper reach of Stream E13 (Table 4.14; Figure 4.36). These juvenile Arctic char were likely members of the resident population in Lake 13, because fish passage from Roberts Lake did not appear possible.

Figure 4.35 Overview of Lake 13.

Figure 4.36 Upper Reach Habitat of Stream E13.

Table 4.13 Summary Statistics for Fish in Lake 13, 2006.

Species	Fork Length (mm)				Weight (g)				Condition Factor			
	n	Mean	SD	Range	*n*	Mean	SD	Range	*n*	Mean	SD	Range
Arctic char	*17*	246	37	202 - 343	*17*	123	59	70 - 310	*17*	0.79	0.11	0.50 – 0.96

Table 4.14 Summary Statistics for Fish in Stream E13, 2006.

Species	Fork Length (mm)			
	n	Mean	SD	Range
Arctic char	*2*	68	1	67 - 68
Ninespine stickleback	*2*	61	4	58 - 63

4.4.13 Lake 14 / Stream E14

Lake 14 is located on the northwest side of Roberts Lake (Figure 4.20). The lake has a surface area of 18.5 ha. The lake is primarily shallow (<2 m), but a small area with depths up to 4.2 m was recorded at the northwest end of the lake. Downstream of the outflow from Lake 14, Stream E14 was completely overgrown with willows and characterized by high gradient. There was a 1.5 m vertical drop preventing fish passage upstream into Lake 14 from Roberts Lake. Lower reaches of Stream E14, in proximity to its confluence with Roberts Lake, provided excellent rearing habitat for Arctic char (Figure 4.37). Field surveys were carried out on 4 July.

Figure 4.37 Potential Arctic Char Rearing Habitat in Stream E14.

Figure 4.38 Juvenile Arctic Char Captured in the Lower Reaches of Stream E14.

Gill nets (3.0 h) and minnow traps (9.4 h) were set in Lake 14 to sample for fish. Backpack electrofishing (676 s) was conducted in Stream E14. Fish were not captured in the lake, but eight juvenile Arctic char were captured in the lower reaches of the Stream E14 (Figure 4.38). The Arctic char had a mean length of

67 mm and ranged in size from 20 to 117 mm. The barrier to fish passage in Stream E14 likely prevents Arctic char from moving into Lake 14.

4.4.14 Lake 31 / Stream E31

Lake 31 is located a short distance from Roberts Lake near the north side of the lake (Figure 4.20). The lake is very small, with a surface area of 0.6 ha. Lake 31 is shallow (primarily <2 m) with abundant aquatic vegetation throughout the lake. Stream E31, which flows from Lake 31 to Roberts Lake, was not well defined and was characterized by a steep gradient.

No fish sampling was conducted in this lake due to the shallow nature of the lake and poor suitability as sport fish habitat (Figure 4.39).

4.4.15 Lake 31a

Lake 31a is situated on the north side of Roberts Lake and is adjacent to Lake 31 (Figure 4.20). The lake has a surface area of 1.7 ha. The lake shore is vegetated along much of the shoreline. Steep bedrock shores are present along the west side of the lake (Figure 4.40). The lake bottom is comprised primarily of silt substrate. There is a marsh area connecting Lake 31a to Lake 31. The area between the two lakes was wet, but did not exhibit a defined channel or flow conditions at the time of the survey (9 August).

Figure 4.39 Overview of Lake 31 from the Outflow.

Figure 4.40 Overview of Lake 31a Looking North. Steep Bedrock Banks are Visible on the West Side of the Lake.

Fish sampling in Lake 31a included angling (1.2 rod-h) and backpack electrofishing (501 s). Twenty-three ninespine stickleback were captured during backpack electrofishing efforts. Ninespine stickleback in the lake had a mean length of 49 mm (Appendix C2).

4.4.16 Lake 31b

Lake 31b is on the north side of Roberts Lake and is connected to lakes 31a and 31 (Figure 4.20). The lake has a surface area of 7.6 ha. The outflow to Lake 31a passes through dense willows and has no defined channel. Fractured bedrock islands are present in the lake (Figure 4.41). Boulder, cobble, gravel, and sand substrate were observed near shore around the lake perimeter. The lake bottom became dominated by silt substrate further off shore. A maximum depth of 3.7 m was recorded during spot measurements in the lake. Field surveys in Lake 31b were conducted on 9 August.

Figure 4.41 Overview Across Lake 31b. Fractured Bedrock Islands are Present on the Lake.

Fish sampling in Lake 31b included gill netting (12.4 h) and beach seining (108 m^2). No fish were caught during gill netting efforts. Beach seine sampling resulted in the captured of 87 ninespine stickleback. Ninespine stickleback captured in Lake 31b had a mean length of 39 mm (Appendix C2).

4.4.17 Lake 32 /Stream E32

Lake 32 is located on the north side of Roberts Lake (Figure 4.20). The lake has a surface area of 5.5 ha. It is connected to Roberts Lake by Stream E32. A small waterfall (1.5 m high), located approximately 20 m upstream of the confluence of Stream E32 with Roberts Lake, likely presents a barrier to fish passage. Field surveys were conducted on 22 July and 26 July.

Fish sampling in Lake 32 included gill netting (0.8 h), angling (12.4 rod-h), and minnow trapping (388.1 h). Backpack electrofishing (226 s) was conducted along Stream E32 from the outflow at Lake 32 to its confluence with Roberts Lake. Arctic char and lake trout were captured during gill netting and angling in Lake 32. The Arctic char (n=18) had a mean fork length of 382 mm, a mean weight of 526g and a mean condition factor of 0.94 (Table 4.15). Ten lake trout captured in the lake had a mean fork length of 389 mm, mean weight of 764 g, and a mean condition factor of 1.23 (Table 4.15).

Table 4.15 Summary Statistics for Fish in Lake 32, 2006.

Species	Fork Length (mm)				Weight (g)				Condition Factor			
	n	Mean	SD	Range	*n*	Mean	SD	Range	*n*	Mean	SD	Range
Arctic char	*18*	382	28	311 - 415	*18*	526	108	295 - 685	*18*	0.94	0.11	0.66 - 1.15
Lake trout	*10*	389	51	325 - 512	*10*	764	403	440 - 1880	*10*	1.23	0.12	0.99 - 1.40

Due to the barrier to fish passage in Stream E32, it is likely that Arctic char and lake trout captured in Lake 32 were members of resident populations. Arctic char were observed in spawning colours (Figure 4.42). A juvenile Arctic char (53 mm in fork length) was captured in the lower reach of Stream E32, just upstream of the confluence with Roberts Lake and below the blockage to fish passage in Stream E32 (Table 4.16). To confirm the presence of a resident population of Arctic char in Lake 32, an otolith from a fish measuring 411 mm was analyzed for Sr concentration. Despite the small size, this fish was approximately 15 years old and Sr concentrations remained below 1100 ppm, indicating this fish has not undergone a seaward migration (Figure 4.43).

Figure 4.42 Arctic Char in Spawning Colouration Captured in Lake 32.

Table 4.16 Summary Statistics for Fish in Stream E32, 2006.

Species	Fork Length (mm)			
	n	Mean	SD	Range
Arctic char	*1*	53	-	53

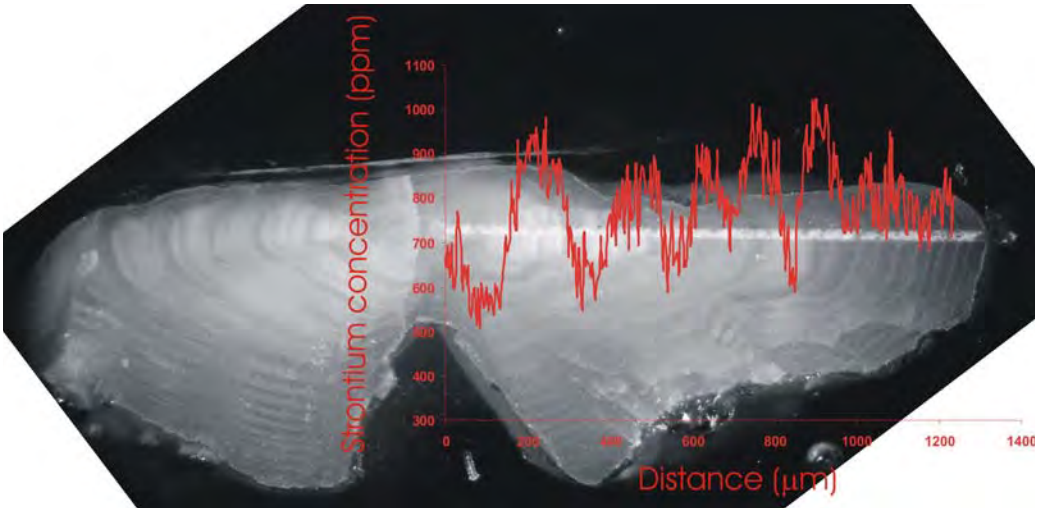


Figure 4.43 **Strontium Concentration (Normalized for Calcium Concentration) in an Otolith Collected from an Arctic Char (411 mm in Fork Length) from Lake 32 (Swanson and Kidd, in prep.). This Fish has Not Migrated to Sea.**

4.4.18 Lake 32a

Lake 32a is located on the north side of Roberts Lake and is connected by a small tributary to Lake 32 (Figure 4.20; Figure 4.44). The lake has a surface area of 2.8 ha. Lake 32a is small but has deeper sections (up to 8 m) throughout. Coarse substrate is present along much of the shoreline. Field surveys were conducted on 10 August.

Fish sampling effort included backpack electrofishing (676 s), gill netting (4.3 h), and angling (0.8 rod-h). Arctic char and ninespine stickleback were captured in the lake. Eleven ninespine stickleback (mean length of 34 mm) were captured during backpack electrofishing (Table 4.17). Eight Arctic char were caught during gill netting efforts, although two fish escaped before measurements could be taken. The six Arctic char captured in Lake 32a had a mean fork length of 332 mm, mean weight of 328 g, and a mean condition factor of 0.89 (Table 4.17). Arctic char were observed to have spawning colouration, despite the small size of some of these fish (Figure 4.45). Fish passage was considered possible between Lake 32 and Lake 32a; however, movement of fish from Roberts Lake to these lakes was not deemed possible. As such, Lake 32a likely provides overwintering, spawning, and rearing habitat to support a lacustrine population of Arctic char.

Figure 4.44 Overview of Lake 32a Looking South from Lake Outflow.

Figure 4.45 Arctic Char in Spawning Colours from Lake 32a.

Table 4.17 Summary Statistics for Fish in Lake 32a, 2006.

Species	Fork Length (mm)				Weight (g)				Condition Factor			
	n	Mean	SD	Range	*n*	Mean	SD	Range	*n*	Mean	SD	Range
Arctic char	*6*	332	13	316 - 349	*6*	328	79	220 - 435	*6*	0.89	0.16	0.61 - 1.10
Ninespine stickleback	*11*	34	16	12 - 69								

4.4.19 Lake 33 / Stream E33

Lake 33 is located on the north side of Roberts Lake (Figure 4.20). The lake has a surface area of 6.9 ha. Water depths up to 11 m were recorded in the lake during spot depth measurements. Deep areas (>5 m) were common throughout the lake. Stream E33 passes through a very small channel connecting Lake 33 to Roberts Lake; fish passage was not considered possible at the time of surveys due to very low flows (Figure 4.46). Field surveys were conducted on 27 June and 14 August.

Fish sampling in Lake 33 included gill netting (8.5 h), minnow trapping (16.6 h), and angling (8 rod-h). Seven Arctic char were captured in the lake. These fish had a mean fork length of 301 mm, mean weight of 259 g, and a mean condition factor of 0.89 (Table 4.18).

Backpack electrofishing (381 s) was conducted in Stream E33 from the outflow at Lake 33 to its confluence with Roberts Lake. No fish were captured in the stream. Given the poor connectivity of Lake 33 to Roberts Lake and the apparent small size of Arctic char present, the Arctic char caught in Lake 33 likely form part of the lacustrine Arctic char population.

Figure 4.46 **Stream E33 Looking Upstream towards Lake 33. Low Flows May Prevent Fish Passage into Lake 33.**

Figure 4.47 **Poorly Defined Channel of Stream E35, Looking from Lake 35 towards Roberts Lake.**

Table 4.18 Summary Statistics for Fish in Lake 33, 2006.

Species	Fork Length (mm)				Weight (g)				Condition Factor			
	n	Mean	SD	Range	*n*	Mean	SD	Range	*n*	Mean	SD	Range
Arctic char	*7*	301	43	221 - 350	*7*	259	115	80 - 454	*7*	0.89	0.12	0.74 - 1.06

4.4.20 Lake 35 / Stream E35

Lake 35 is situated on the north side of Roberts Lake and has a surface area of 3.1 ha (Figure 4.20). The lake bottom had an abundance of boulder and cobble substrate with limited gravel in some places. Water depth throughout the lake was very shallow, with a maximum recorded depth of 1.2 m. The outflow from the lake had no defined channel and no flow at the time of survey (14 August; Figure 4.47). There was a steep gradient down to Roberts Lake. Fish passage from Roberts Lake was considered unlikely.

Gill netting could not be carried out in the lake, as the maximum depth in the lake was only 1.2 m. Backpack electrofishing (411 s) was conducted along the lake shoreline. No fish were captured during sampling efforts. Lake 35 was shallow throughout and likely would not provide suitable overwintering habitat for Arctic char or lake trout.

4.4.21 Summary

Several of the small waterbodies connected to Roberts Lake provide additional fish habitat for spawning, rearing, and overwintering. These small lakes and streams provide habitat for both anadromous and lacustrine Arctic char populations depending on the connectivity of the tributary lake to Roberts Lake. Arctic char were captured in six of the 20 lakes sampled and five of the 12 streams sampled.

Future research in the Roberts Lake system is needed to determine the prevalence of anadromous versus resident Arctic char in these small lakes.

4.5 ROBERTS BAY

The catch and size statistics for fish sampled in Roberts Bay are summarized in Appendix C4 and Appendix C6; data from individual fish are presented in Appendix C2. Fyke nets were used to sample fish in Roberts Bay between 10 and 12 July 2006. To differentiate between the catches of east and west bound fish, the Arctic fyke net was composed of two side-by-side traps separated by a lead extending to the shore.

4.5.1 Species Composition and Relative Abundance

The fyke net catch in Roberts Bay included six species that were represented by 106 fish. Arctic flounder was the predominant species in the catch (32%), followed by capelin (30%), lake trout (23%), Arctic char (10%), Greenland cod (3%), and fourhorn sculpin (2%) (Table 4.19).

Directional movement data from the fyke nets in Roberts Bay indicated some differences in fish species moving east and west. The catch of east bound fish (n=62) was comprised mainly of Arctic flounder (39%) and lake trout (33%), followed by capelin (11%), Arctic char (10%) and small numbers of Greenland cod and fourhorn sculpin (Table 4.19). The catch of west bound fish (n=44) was comprised primarily of capelin (57%) and Arctic flounder (22.7%). The remaining 20.5% of the west bound catch consisted of Arctic char and lake trout (Table 4.19).

Table 4.19 Number of Fish Captured in the Fyke Nets in Roberts Bay, 2006.

Fyke net direction	Arctic flounder	Capelin	Lake trout	Arctic char	Greenland cod	Fourhorn sculpin	Total
East Bound	24	7	20	6	3	2	**62**
West Bound	10	25	4	5	0	0	**44**
Total	**34 (32.1%)**	**32 (30.2%)**	**24 (22.6%)**	**11 (10.4%)**	**3 (2.8%)**	**2 (1.9%)**	**106**

4.5.2 Life History Data

Arctic Flounder

Size Distribution

In total, 34 Arctic flounder were captured in Roberts Bay. The mean total length was 202 mm, with the lengths ranging from 140 to 287 mm (Appendix C4). Two general size-classes of Arctic flounder were noted: 50% of captured fish were between 210 and 260 mm, and 41% were between 140 and 180 mm (Figure 4.48).

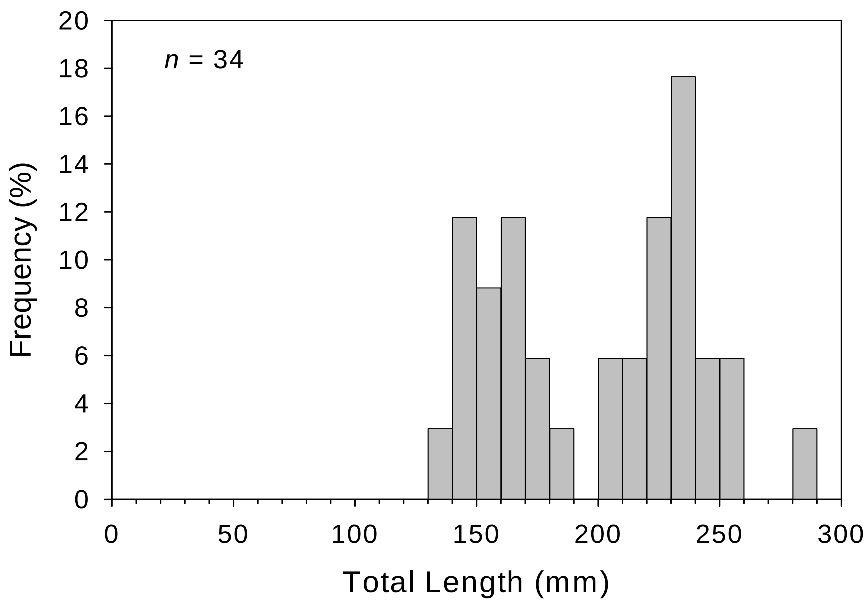


Figure 4.48 Length-frequency Distribution of Arctic Flounder in Roberts Bay, 2006.

Length-Weight Relationship

The length-weight relationship for Arctic flounder captured in Roberts Bay (Figure 4.49) was described by the following equation, where W is weight in grams and L is total length in millimetres:

$$W = 2.404 \times 10^{-5} * L^{2.927} \qquad (n=32, r^2=0.95)$$

The mean condition factor for Arctic flounder in Roberts Bay was 1.60, with condition factors ranging between 1.10 and 2.05 (Appendix C4).

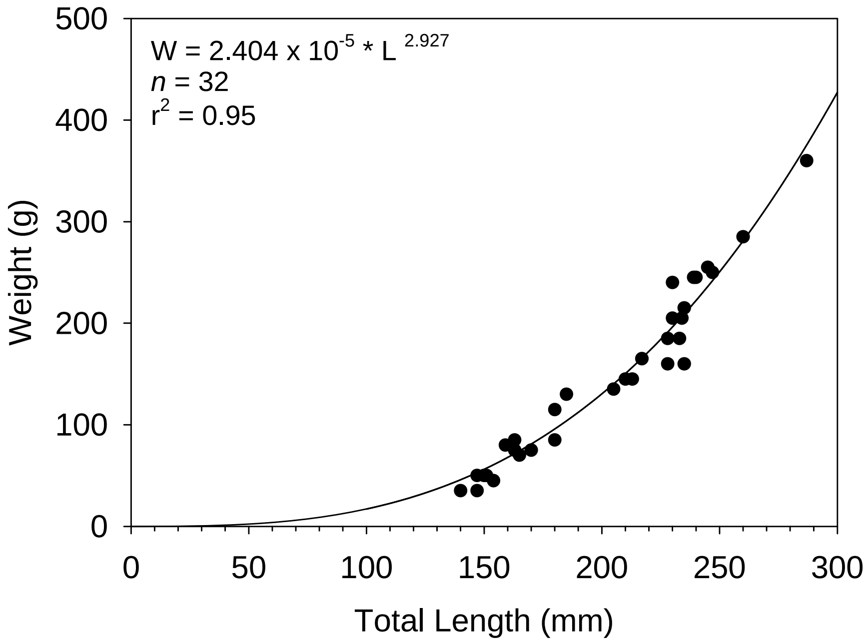


Figure 4.49 Length-weight Relationship of Arctic Flounder in Roberts Bay, 2006.

Lake Trout

Size Distribution

In total, 24 lake trout were captured in Roberts Bay. Captured lake trout were generally large in size and had a mean fork length of 613 mm (Figure 4.50). Fork lengths of individual fish ranged between 460 and 990 mm (Appendix C4).

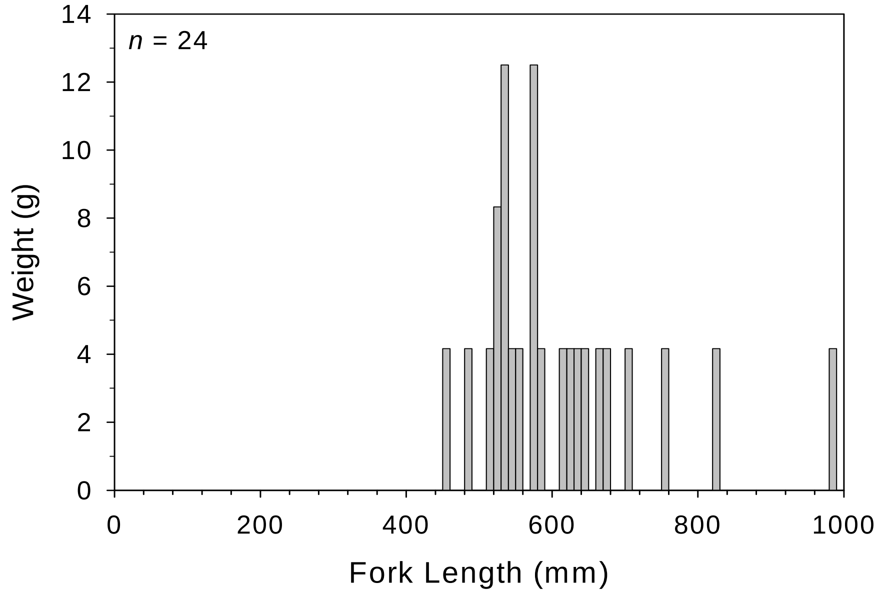


Figure 4.50 Length-frequency Distribution of Lake Trout in Roberts Bay, 2006.

Length-Weight Relationship

The length-weight relationship for lake trout captured in Roberts Bay (Figure 4.51) was described by the following equation, where W is weight in grams and L is fork length in millimetres:

$$W = 5.937 \times 10^{-3} * L^{2.046} \qquad (n=24, r^2=0.90)$$

The mean condition factor for lake trout in Roberts Bay was 1.29, with a range of 0.72 to 1.51 (Appendix C4).

Arctic Char

Eleven Arctic char were captured in Roberts Bay. Fork lengths ranged from 201 to 820 mm, with a mean length of 593 mm. Sample size was too small to calculate length-weight relationship for Arctic char in Roberts Bay. The mean condition factor was 0.95 and the range was 0.68 to 1.30 (Appendix C4).

Capelin

In total, 32 capelin were captured in Roberts Bay. These fish were in near-spawning condition based on external body characteristics and release fo eggs or milt with slight body pressure. The mean fork length was 129 mm and the lengths ranged between 119 and 155 mm. Weight measurements were not obtained for these fish due to the small body sizes.

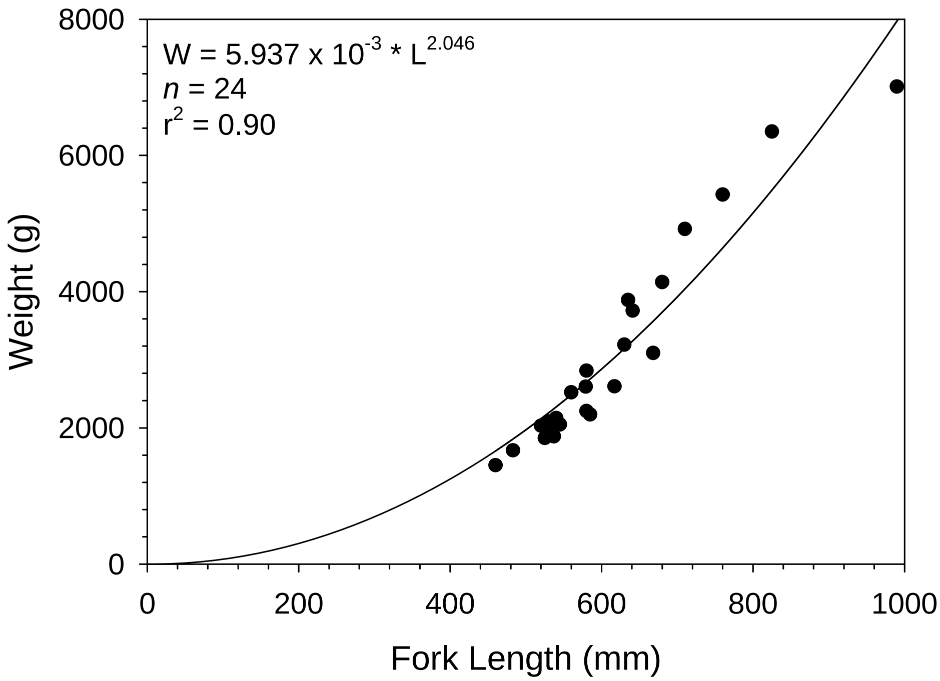


Figure 4.51 Length-weight Relationship of Lake Trout in Roberts Bay, 2006.

Greenland Cod

Three Greenland cod were caught in Roberts Bay. The mean total length was 94 mm and the range was 90 to 97 mm (Appendix C4). No weights were obtained for these fish due to their small size, therefore condition factors could not be calculated.

Fourhorn Sculpin

Two fourhorn sculpin were captured in Roberts Bay. The mean total length was 96 mm and the range was 72 to 119 mm. Weight was only obtained for one of these fish, and the condition factor was calculated to be 1.34 (Appendix C4).

4.6 SUMMARY

In total, 1290 fish representing 11 species were encountered in the Doris North Project area during fisheries surveys conducted in 2006. Fish sampling was conducted in Roberts Lake, Little Roberts Outflow, 20 small lakes in the Roberts Lake drainage, 12 small streams in the Roberts Lake drainage and in the marine environment of Roberts Bay. Overall, the most common fish species captured was ninespine stickleback (46.4%), followed by Arctic char (25.8%), lake trout (11.0%), cisco (7.4%), broad whitefish (4.7%), lake whitefish (3.4%), Arctic flounder (2.6%), capelin (2.5%), Greenland cod (2.3%), fourhorn sculpin (1.6%) (Table 4.20).

Lake Communities

Fish sampling was conducted in Roberts Lake and in 20 small lakes within the Roberts Lake drainage area. A large variety of sampling methods (gill nets, fyke nets, backpack electrofisher, minnow traps, beach seines, and angling) resulted in the combined catch of 859 fish. Ninespine stickleback dominated the small-fish catch in the lakes. Other species captured included Arctic char, lake trout, lake whitefish, broad whitefish, and cisco.

Table 4.20 Summary of Fish Encountered in Lakes and Streams Sampled in the Doris North Project Area, 2006.

Species	Roberts Bay	Roberts Lake	Little Roberts Outflow	Small Lakes in Roberts Lake Drainage	Small Streams in Roberts Lake Drainage	Total
Arctic char	11	34	193	60	35	**333**
Lake trout	24	14	66	26	12	**141**
Lake whitefish		24		20		**46**
Broad whitefish			1	5		**6**
Cisco		59		36		**95**
Ninespine stickleback		270		311	17	**598**
Greenland cod	3					**3**
Capelin	32					**32**
Arctic flounder	34					**34**
Fourhorn sculpin	2					**2**
Total	**106**	**401**	**260**	**458**	**64**	**1290**

Stream Communities

Fish sampling was conducted in Little Roberts Outflow and in 12 small streams that drain into Roberts Lake. A fish fence installed in Little Roberts Outflow between 19 June and 22 July 2006 resulted in the capture of 260 fish that included Arctic char (n=193), lake trout (n=66) and one broad whitefish.

Fish (n=64) were caught in five of the 12 sampled streams that drain into Roberts Lake. Arctic char was the dominant species in these streams; ninespine stickleback and lake trout were also captured.

Marine Communities

A directional Arctic fyke net was used to assess fish movements in Roberts Bay from 10 to 12 July 2006. The east bound fish contributed 58% to the total catch of 106 fish. Arctic char and lake trout were generally represented by large size-classes, whereas Greenland cod, capelin, Arctic flounder, and fourhorn sculpin were small in size.

Arctic Char in Roberts Lake System

Fish sampling at the Little Roberts Outflow fish fence was conducted to quantify Arctic char smolt migration from the Roberts Lake system into the marine environment of Roberts Bay. In total, 178 Arctic char were captured moving downstream; these included 86 smolt-sized fish (between 200 and 350 mm in fork length). The size distribution of Arctic char moving downstream varied considerably with time, with large size-classes (>600 mm in fork length) moving downstream earlier than the smolts and older juveniles. The results of the 2006 Arctic char out-migration study indicated that it was feasible to monitor smolt migration using a fence and trap design, at least during the flow regimes present in late June and July 2006.

Arctic char were captured in six of the 20 lakes and five of the 12 streams sampled in the drainage basin of Roberts Lake. Small lakes and streams with good connection to Roberts Lake appeared to provide habitat for anadromous populations of Arctic char migrating from the marine environment of Roberts Bay. Fish sampling of small lakes with poor connectivity to Roberts Lake yielded small Arctic char with bright spawning coloration. It is likely that these lakes are able to support resident populations of Arctic char. Some of the smaller lakes were too shallow to support overwintering of Arctic char.

Approximately 10.6 km of shoreline was surveyed for Arctic char spawning habitat along the western end of Roberts Lake. Suitable spawning locations (i.e., 3 to 6 m depth with gravel or gravel/cobble substrate) were identified at 54 areas within the surveyed section of the lake. Adult males were observed at four potential spawning sites; however spawning activities were not observed at the time of survey.

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6.0 CLOSURE

We trust the information contained in this report is sufficient for your present needs. Should you have any questions regarding the project, please do not hesitate to contact the undersigned.

Yours truly,

GOLDER ASSOCIATES LTD.

Authors:

Suzanne Earle, M.Sc.,
Aquatic Biologist

Edyta Jasinska, Ph.D
Senior Aquatic Scientist

Report reviewed by:

Gary Ash, M.Sc., P.Biol.
Senior Fisheries Biologist, Principal

Nathan Schmidt, Ph.D., P.Eng
Senior Water Resources Engineer,
Associate

APPENDIX A
HYDROLOGY DATA

DOORIS LAKE OUTFLOW HYDROMETRIC STATION

H71

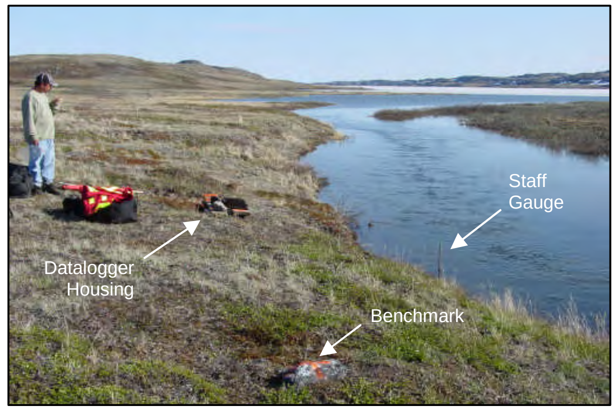
FACTSHEET

LOCATION AND DETAILS

Located on the right downstream bank of Doris Lake outflow, approximately 50 m downstream of the lake.

Operational:	2003 (30 June - 9 September)	2004 (8 June - 11 September)	
	2005 (27 June - 17 September)	2006 (26 June – 8 September)	
Benchmark:	Top of embedded boulder; 22.593 m (geodetic)	Drainage Area:	93.1 km^2
Coordinates:	UTM: 434108 m E, 7559274 m N (NAD27)	Lat/Long:	68°08'30" N, 106°35'14" W
Datalogger:	Optimum Instruments #0948	Transducer:	KPSI #0402786 (5 psi; 15 m)

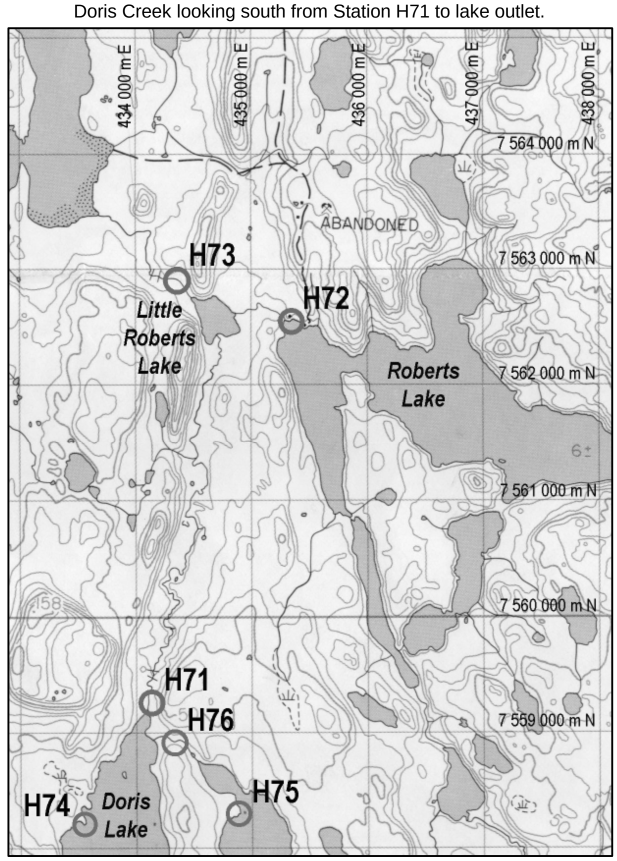
Aerial view of Doris Creek looking north along outlet channel.



Doris Creek looking south from Station H71 to lake outlet.


Station H71 from RDB looking northwest.


Station H71 from RDB looking southeast.



NTS Mapping of Area.

FACT-H71-2006.DOC

ROBERTS LAKE AND OUTFLOW HYDROMETRIC STATION

H72

FACTSHEET

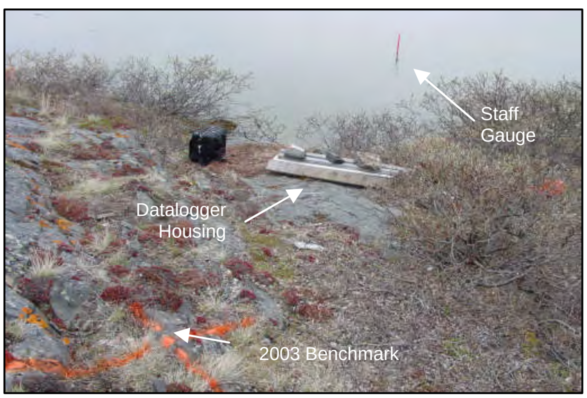
LOCATION AND DETAILS

Located on the right downstream bank of Roberts Lake, approximately 20 m upstream of the lake outlet.

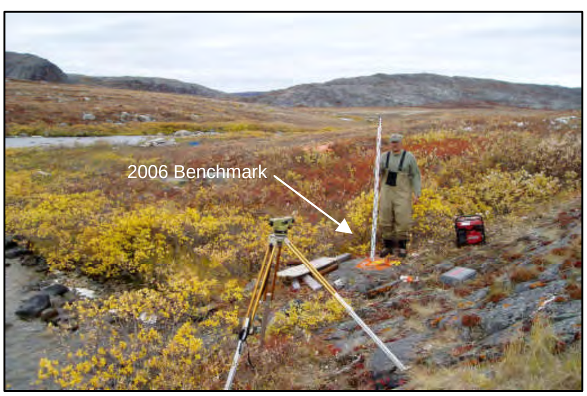
Operational:	2003 (30 June – 9 September)	2004 (9 May – 13 September)	
	2005 (29 June – 17 September)	2006 (29 June – 6 September)	
Benchmark:	Rock bolt in bedrock; 6.958 m (geodetic)	Drainage Area:	97.8 km^2
Coordinates:	UTM: 435310 m E, 7562560 m N (NAD27)	Lat/Long:	68°10'10" N, 106°33'32" W
Datalogger:	Optimum Instruments #0628	Transducer:	KPSI #0202697 (5 psi, 15 m)

Aerial view of Roberts Lake Outlet looking northeast.

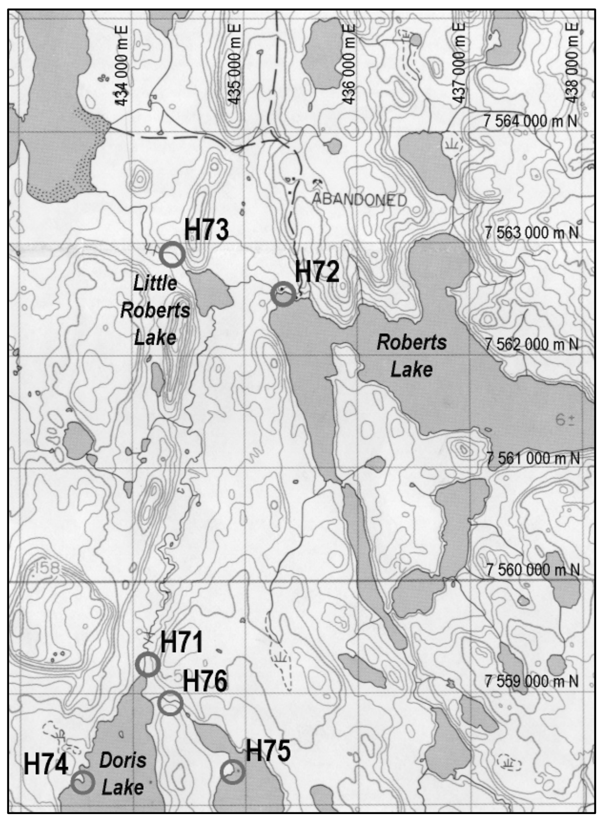

Station H72 from lake looking northwest.



Station H72 from bank looking southeast.



Station H72 from bank looking west at new benchmark.



NTS Mapping of Area.

LITTLE ROBERTS LAKE OUTFLOW HYDROMETRIC STATION

H73

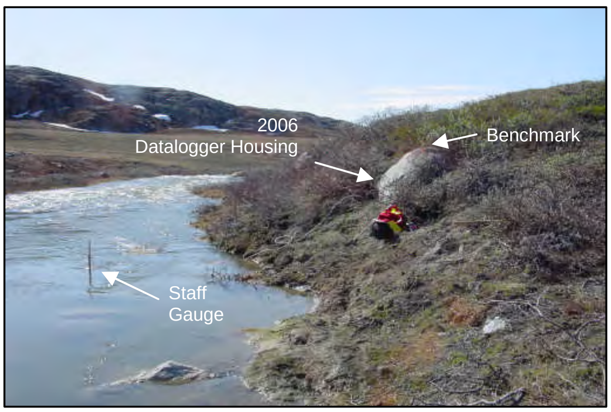
FACTSHEET

LOCATION AND PURPOSE

Located on the Little Roberts Lake outflow, approximately 200 m downstream of the lake.

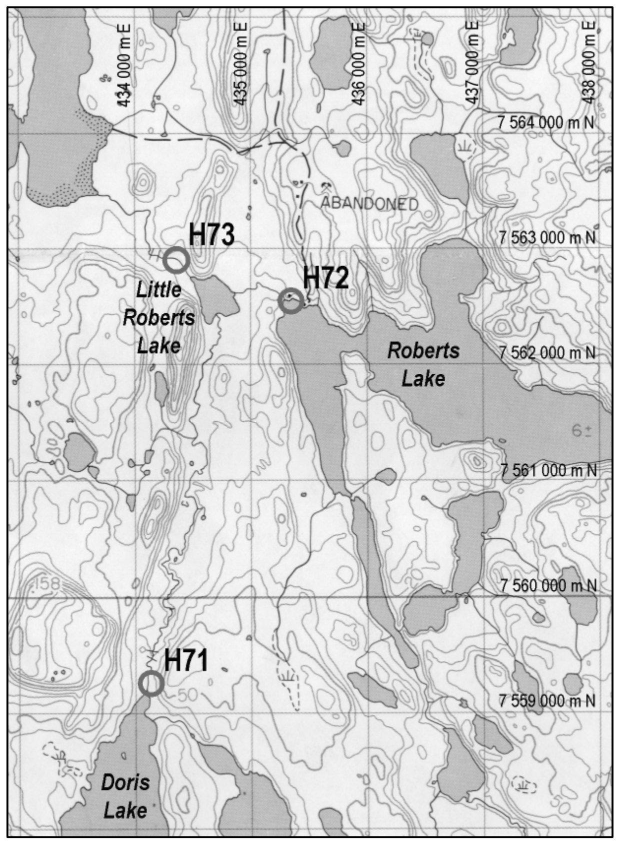
Operational:	2003 (30 June – 9 September)	2004 (6 June – 7 September)	
	2005 (28 June – 17 September)	2006 (30 May – 8 September)	
Benchmark:	Top of embedded boulder; 100.000 m (local)	Drainage Area:	198.9 km^2
Coordinates:	UTM: 434320 m E, 7562920 m N (NAD27)	Lat/Long:	68°10'20" N, 106°34'59" W
Datalogger:	Optimum Instruments #1166	Transducer:	KPSI #0402788 (5 psi, 15 m)

Panoramic view of H73 from LDB looking west.



Station H73 from RDB looking downstream.

Station H73 from bank looking east.



NTS Mapping of Area.

FACT-H73-2006.DOC

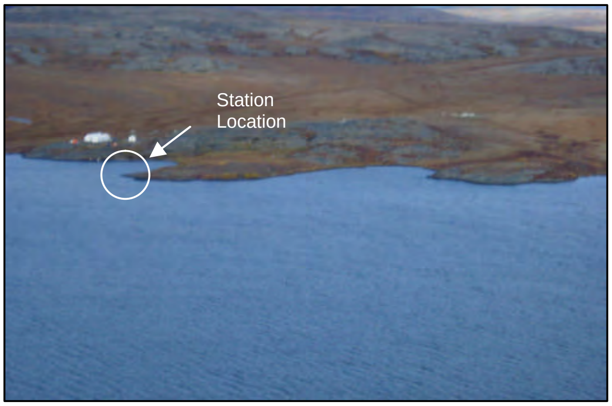
DORIS LAKE
HYDROMETRIC STATION

H74
FACTSHEET

LOCATION AND DETAILS

Located on bedrock outcrop on west shore of Doris Lake.

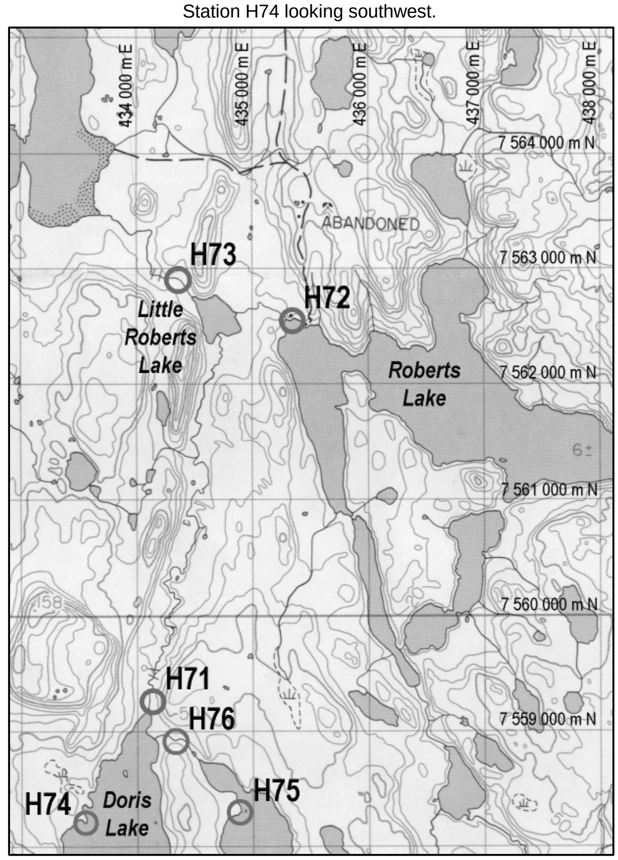
Operational:	2004 (7 May – 10 September) 2006 (1 January – ongoing)	2005 (22 July – 31 December)	
Benchmark:	Rock bolt ; 23.546 m (geodetic)	Drainage Area:	93.1 km^2
Coordinates:	UTM: 434491 m E, 7558256 m N (NAD27)	Lat/Long:	68°07'56" N, 106°34'34" W
Datalogger:	Optimum Instruments #1167	Transducer:	KPSI #0405797 (10 psi, 60 m)
Thermistor:	5 kΩ		



Aerial view of Doris Lake Station H74 looking west.


Station H74 looking southwest.

Station H74 from lake looking northwest.



NTS Mapping of Area.

Station H74 benchmark.

TAIL LAKE
HYDROMETRIC STATION

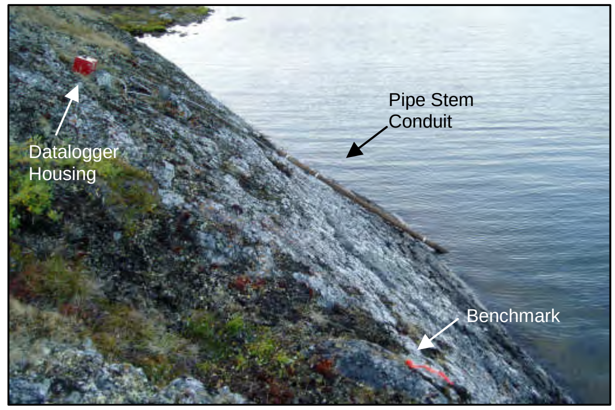
H75
FACTSHEET

LOCATION AND PURPOSE

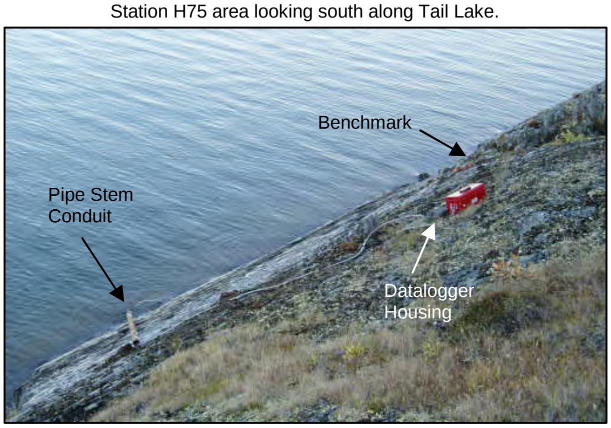
Located on bedrock outcrop on northwest shore of Tail Lake.

Operational:	2004 (8 May – 31 December) 2006 (1 January – ongoing)	2005 (1 January – 31 December)	
Benchmark:	Rock bolt ; 29.339 m (geodetic)	Drainage Area:	4.4 km^2
Coordinates:	UTM: 434896 m E, 7558296 m N (NAD27)	Lat/Long:	68°07'58" N, 106°33'59" W
Datalogger:	Optimum Instruments #0639	Transducer:	KPSI #0405798 (10 psi, 60 m)
Thermistor:	5 kΩ		

Station H75 area looking south along Tail Lake.

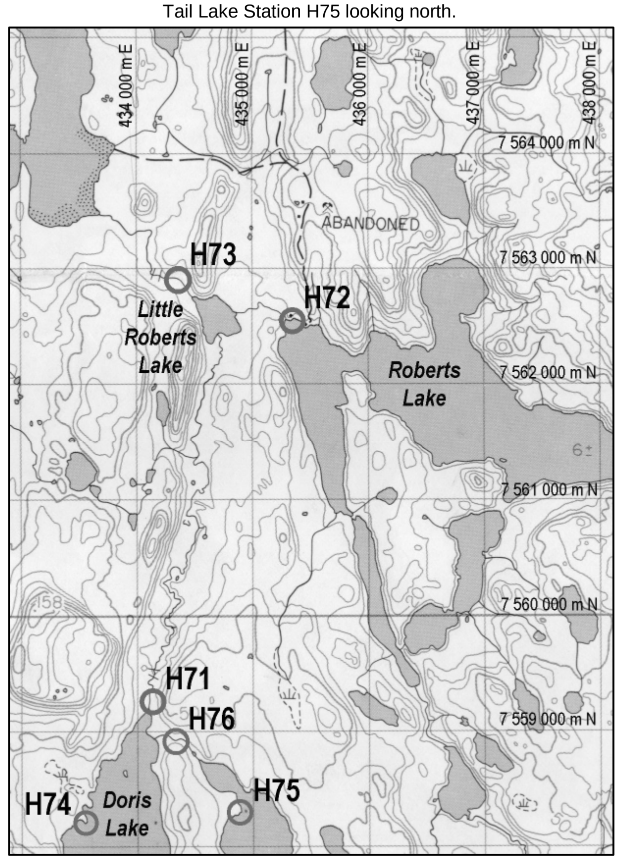


Tail Lake Station H75 looking north.



Tail Lake Station H75 looking east towards water.

Tail Lake Station H75 looking southeast towards water.



NTS Mapping of Area.

FACT-H75-2006.DOC

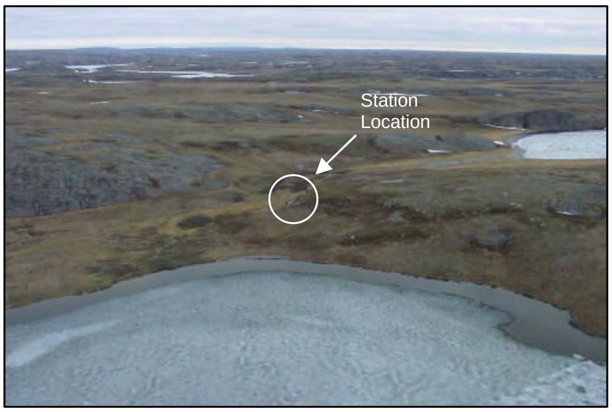
TAIL LAKE OUTFLOW HYDROMETRIC STATION

H76
FACTSHEET

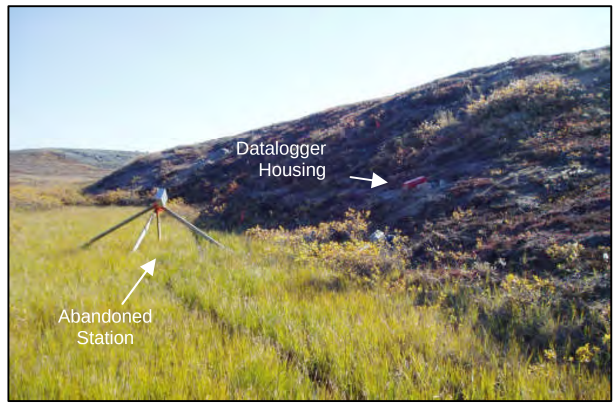
LOCATION AND PURPOSE

Located on the left downstream bank of Tail Lake outflow, approximately 200 m upstream of Doris Lake.

Operational:	2004 (20 June – 11 September) 2006 (26 June – 8 September)	2005 (26 June – 17 September)	
Benchmark:	Top of embedded boulder; 26.301 m (geodetic)	Drainage Area:	4.4 km^2
Coordinates:	UTM: 434270 m E, 7558965 m N (NAD27)	Lat/Long:	68°08’19” N, 106°34’55” W
Datalogger:	Optimum Instruments #0949	Transducer:	KPSI #0402787 (5 psi, 15 m)



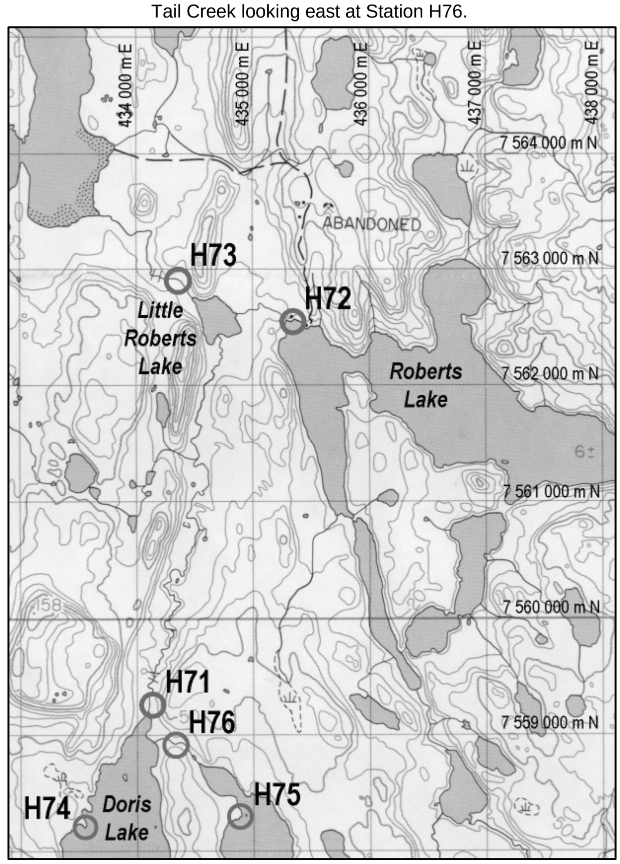
Aerial view of Tail Creek looking upstream from Doris to Tail Lake.



Tail Creek looking east at Station H76.

Station H76 looking west (downstream) during high water.


Station H76 looking east (upstream) during high water.



NTS Mapping of Area.

APPENDIX B
PHYSICAL LIMNOLOGY AND WATER QUALITY DATA

Appendix B1. **Field data collected for Doris North Project water quality sites: conductivity, dissolved oxygen, pH, water temperature and Secchi depth, 2006.**

Waterbody	Date	Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	pH	Water Temperature (°C)	Secchi Depth (m)	Notes
Doris Lake	31-May-06	251	12.4	6.47	1.6	nd	DO/Temp taken 3 m below ice surface
Doris Lake	14-Jul-06	180	12.0	6.91	9.9	2.5	
Doris Lake	11-Aug-06	202	nd	6.00	16.0	2.1	pH probe not calibrating 100%
Doris Lake	13-Sep-06	211	10.9	8.05	8.4	1.5	
Tail Lake	31-May-06	nd	12.3	7.30	3.4	nd	DO/Temp taken 3 m below ice surface
Tail Lake	20-Jul-06	119	10.2	7.32	16.4	6.1	
Tail Lake	12-Aug-06	nd	9.6	nd	15.6	3.8	WTW would not calibrate
Tail Lake	13-Sep-06	140	11.2	7.90	6.8	3.9	
Roberts Lake	30-May-06	nd	15.4	7.61	2.8	nd	DO/Temp taken 3 m below ice surface
Roberts Lake	14-Jul-06	171	11.8	6.65	10.2	1.8	
Roberts Lake	10-Aug-06	197	10.5	6.81	16.7	2.2	
Roberts Lake	11-Sep-06	222	11.6	8.15	9.6	2.7	
Little Roberts Lake	30-May-06	nd	16.1	7.68	1.7	nd	DO/Temp taken 2.5 m below ice surface
Little Roberts Lake	14-Jul-06	191	11.1	6.78	12.8	2.0	
Little Roberts Lake	11-Aug-06	229	10.1	6.68	16.1	1.9	
Little Roberts Lake	13-Sep-06	290	11.2	7.82	5.5	1.6	
Doris Outflow	18-Jun-06	246	12.6	7.42	4.2	nd	
Doris Outflow	24-Jun-06	242	13.2	7.53	5.1	nd	
Doris Outflow	30-Jun-06	269	12.0	7.62	6.2	nd	
Doris Outflow	7-Jul-06	176	11.5	7.27	7.6	nd	
Doris Outflow	13-Jul-06	191	10.7	6.50	11.1	nd	
Doris Outflow	20-Jul-06	211	9.6	7.33	14.7	nd	
Doris Outflow	28-Jul-06	182	10.9	6.20	10.3	nd	
Doris Outflow	4-Aug-06	nd	10.7	7.39	14.7	nd	
Doris Outflow	11-Aug-06	210	10.0	6.16	16.2	nd	
Doris Outflow	18-Aug-06	257	10.2	7.86	14.5	nd	
Doris Outflow	26-Aug-06	259	10.6	7.86	12.1	nd	
Doris Outflow	1-Sep-06	259	11.3	7.95	7.2	nd	
Doris Outflow	9-Sep-06	260	11.4	7.70	8.9	nd	
Doris Outflow (2)	9-Sep-06	251	11.2	7.60	10.1	nd	site below falls
Tail Outflow	18-Jun-06	183	10.0	7.32	6.2	nd	
Tail Outflow	24-Jun-06	162	10.0	7.46	8.6	nd	
Tail Outflow	30-Jun-06	158	7.8	7.52	11.1	nd	
Tail Outflow	7-Jul-06	103	9.1	7.18	8.4	nd	
Tail Outflow	13-Jul-06	121	7.3	nd	13.5	nd	
Tail Outflow	20-Jul-06	nd	7.4	7.33	15.7	nd	erroneous field entry for conductivity
Tail Outflow	28-Jul-06	124	9.2	6.00	9.5	nd	pH probe not calibrating 100%
Tail Outflow	4-Aug-06	158	7.6	6.25	14.6	nd	
Tail Outflow	11-Aug-06	207	7.2	6.01	12.9	nd	
Tail Outflow	18-Aug-06	306	8.0	6.95	11.5	nd	
Tail Outflow	26-Aug-06	355	8.3	6.86	8.1	nd	
Tail Outflow	1-Sep-06	418	8.3	6.93	3.7	nd	
Tail Outflow	9-Sep-06	342	9.4	6.94	5.6	nd	
Roberts Outflow	18-Jun-06	203	12.4	7.53	3.4	nd	
Roberts Outflow	13-Jul-06	174	10.3	7.37	10.7	nd	
Roberts Outflow	10-Aug-06	209	10.0	7.08	17.0	nd	
Roberts Outflow	9-Sep-06	220	10.7	7.85	11.7	nd	
Little Roberts Outflow	18-Jun-06	214	12.4	7.57	4.7	nd	
Little Roberts Outflow	13-Jul-06	191	11.0	6.72	11.7	nd	
Little Roberts Outflow	10-Aug-06	234	10.4	7.43	17.8	nd	
Little Roberts Outflow	9-Sep-06	275	11.9	7.60	13.0	nd	
Roberts Bay	31-May-06	nd	14.0	6.68	0.0	nd	DO/Temp taken 3 m below ice surface
Roberts Bay	20-Jul-06	19680	11.2	6.92	13.5	5.4	
Roberts Bay	12-Aug-06	nd	10.5	6.60	13.1	2.5	conductivity probe not calibrating 100%
Roberts Bay	11-Sep-06	nd	12.0	7.98	8.4	5.2	conductivity probe not calibrating 100%

nd - not determined

Appendix B2. Dissolved oxygen (DO) and water temperature profiles collected for Doris North Project water quality sites, May-September 2006.

DORIS LAKE (13W 0433799E 7558286N NAD27)											
31 May 2006			15 July 2006			11 August 2006			13 September 2006		
Depth (m)	DO (mg/L)	Temp (°C)	Depth (m)	DO (mg/L)	Temp (°C)	Depth (m)	DO (mg/L)	Temp (°C)	Depth (m)	DO (mg/L)	Temp (°C)
0.0	ice	ice	0.0	11.2	15.2	no profiles were collected due to meter malfunction			0.0	11.0	8.2
0.5	ice	ice	0.5	11.7	14.6				1.0	10.9	8.4
1.0	ice	ice	1.0	11.9	13.8				2.0	10.8	8.5
1.5	ice	ice	1.5	12.0	13.3				3.0	10.8	8.5
2.0	ice	ice	2.0	12.2	12.7				4.0	10.8	8.5
2.5	12.4	1.5	2.5	12.2	12.4				5.0	10.8	8.5
3.0	12.4	1.6	3.0	12.4	11.7				6.0	10.8	8.5
3.5	12.4	1.6	3.5	12.4	11.3				7.0	10.8	8.5
4.0	12.4	1.7	4.0	12.5	10.8				8.0	10.8	8.5
4.5	12.4	1.7	4.5	12.5	10.5				9.0	10.8	8.6
5.0	12.4	1.7	5.0	12.6	10.3				10.0	10.8	8.6
5.5	12.5	1.7	5.5	12.7	10.2				11.0	11.2	8.6
6.0	12.5	1.7	6.0	12.5	10.0				12.0	11.2	8.6
6.5	12.5	1.8	6.5	12.6	9.9						
7.0	12.6	1.8	7.0	12.5	9.8						
7.5	12.6	1.8	7.5	12.7	9.7						
8.0	12.6	1.8	8.0	12.7	9.4						
8.5	12.6	1.8	8.5	12.6	9.3						
9.0	12.6	1.8	9.0	12.6	9.2						
9.5	12.6	1.8	9.5	12.3	8.8						
10.0	12.7	1.8	10.0	12.4	8.6						
10.5	12.7	1.8	10.5	12.3	8.5						
11.0	12.8	1.8	11.0	12.3	8.5						
11.5	12.3	1.8	11.5	12.5	8.4						
12.0	11.7	1.7	12.0	12.4	8.4						
12.5	9.5	1.7	12.5	12.5	8.3						
13.0	8.1	1.7	13.0	12.4	8.2						
13.5	6.3	1.7	13.5	11.8	8.1						
14.0	3.8	1.7	14.0	4.8	7.8						

TAIL LAKE (13W 0434987E 7557952N NAD27)											
31 May 2006			20 July 2006			12 August 2006			13 September 2006		
Depth (m)	DO (mg/L)	Temp (°C)	Depth (m)	DO (mg/L)	Temp (°C)	Depth (m)	DO (mg/L)	Temp (°C)	Depth (m)	DO (mg/L)	Temp (°C)
0.0	ice	ice	0.0	9.9	16.9	0.0	9.7	15.3	0.0	11.4	6.5
0.5	ice	ice	0.5	10.2	16.6	0.5	9.7	15.5	0.5	11.2	6.7
1.0	ice	ice	1.0	10.2	16.4	1.0	9.6	15.6	1.0	11.2	6.8
1.5	ice	ice	1.5	10.3	16.2	1.5	9.6	15.7	1.5	11.2	6.8
2.0	12.7	2.7	2.0	10.4	16.0	2.0	9.6	15.8	2.0	11.1	6.8
2.5	12.8	3.2	2.5	10.4	15.9	2.5	9.6	15.9	2.5	11.1	6.8
3.0	12.3	3.4	3.0	10.3	15.7	3.0	9.6	15.9	3.0	11.2	6.8
3.5	11.5	3.6	3.5	10.5	15.6	3.5	9.6	16.0	3.5	11.2	6.9
4.0	11.3	3.7	4.0	10.5	15.5	4.0	9.5	16.0	4.0	11.1	6.8
4.5	10.9	3.7	4.5	10.6	15.4	4.5	9.5	16.0	4.5	11.2	6.8
			5.0	10.6	15.2	5.0	9.6	16.0	5.0	11.2	6.8
			5.5	10.7	15.2	5.5	9.6	16.0	5.5	11.2	6.8
			6.0	10.8	14.7	6.0	9.4	16.0	6.0	11.2	6.8
			6.5	10.8	14.6	6.5	9.2	16.0			

Appendix B2. Dissolved oxygen (DO) and water temperature profiles collected for Doris North Project water quality sites, May-September 2006.

ROBERTS LAKE (13W 0435587E 7562161N NAD 27)											
30 May 2006			14 July 2006			10 August 2006			11 September 2006		
Depth (m)	DO (mg/L)	Temp (°C)	Depth (m)	DO (mg/L)	Temp (°C)	Depth (m)	DO (mg/L)	Temp (°C)	Depth (m)	DO (mg/L)	Temp (°C)
0.0	ice	ice	0.0	11.7	10.2	0.0	10.3	16.9	0.1	11.7	9.7
0.5	ice	ice	0.5	11.7	10.2	0.5	10.3	16.8	0.5	11.6	9.7
1.0	ice	ice	1.0	11.8	10.2	1.0	10.5	16.7	1.0	11.6	9.6
1.5	ice	ice	1.5	11.7	10.2	1.5	10.5	16.7	1.5	11.5	9.5
2.0	ice	ice	2.0	11.7	10.1	2.0	10.5	16.6	2.0	11.5	9.5
2.5	15.1	2.4	2.5	11.7	10.1	2.5	10.5	16.6	2.5	11.5	9.4
3.0	15.4	2.8	3.0	11.7	10.1	3.0	10.6	16.5	3.0	11.5	9.4
3.5	14.1	3.2	3.5	11.8	10.0	3.5	10.6	16.5	3.5	11.4	9.4
4.0	12.3	3.3	4.0	11.8	10.0	4.0	10.6	16.4	4.0	11.4	9.4
4.5	11.4	3.2	4.5	11.8	10.0	4.5	10.6	16.3	4.5	11.5	9.4
5.0	10.8	3.1	5.0	10.2	9.3	5.0	10.9	14.6	5.0	11.4	9.3
5.5	10.0	2.8	5.5	11.4	8.4	5.5	10.6	13.3	5.5	11.5	9.3
						6.0	10.7	12.1	6.0	11.4	9.3
						6.5	10.0	11.6	6.5	11.5	9.3
						7.0	9.0	11.5	7.0	11.5	9.3
						7.3	9.0	11.1			

LITTLE ROBERTS LAKE (13W 434723E 7562724N NAD27)											
30 May 2006			14 July 2006			11 August 2006			13 September 2006		
Depth (m)	DO (mg/L)	Temp (°C)	Depth (m)	DO (mg/L)	Temp (°C)	Depth (m)	DO (mg/L)	Temp (°C)	Depth (m)	DO (mg/L)	Temp (°C)
0.0	ice	ice	0.0	11.0	13.1	0.0	10.1	15.7	0.0	11.2	5.5
0.5	ice	ice	0.5	11.0	12.9	0.5	10.2	16.0	0.5	11.2	5.5
1.0	ice	ice	1.0	11.1	12.8	1.0	10.1	16.1	1.0	11.2	5.5
1.5	ice	ice	1.5	11.1	12.7	1.5	10.0	16.2	1.5	11.2	5.5
2.0	ice	ice	2.0	11.0	12.5	2.0	10.0	16.3	2.0	11.2	5.5
2.5	16.1	1.7	2.5	11.3	12.3	2.5	10.0	16.0			
2.7			3.0	11.4	12.2						
			3.5	11.3	12.1						
			4.0	11.2	12.1						

ROBERTS BAY (13W 433290E 7564019N NAD27)											
31 May 2006			20 July 2006			12 August 2006			13 September 2006		
Depth (m)	DO (mg/L)	Temp (°C)	Depth (m)	DO (mg/L)	Temp (°C)	Depth (m)	DO (mg/L)	Temp (°C)	Depth (m)	DO (mg/L)	Temp (°C)
0.0	ice	ice	0.0	11.0	14.3	0.0	10.8	13.2	0.1	12.0	9.3
0.5	ice	ice	0.5	11.1	13.6	0.5	10.6	13.2	0.5	12.1	8.8
1.0	ice	ice	1.0	11.2	13.5	1.0	10.5	13.1	1.0	12.0	8.4
1.5	ice	ice	1.5	11.0	12.7	1.5	10.6	13.1	1.5	12.2	8.3
2.0	13.8	0.2	2.0	11.5	12.1	2.0	10.6	13.1	2.0	12.1	8.1
2.5	13.8	0.0	2.5	11.9	11.3	2.5	10.6	13.1	2.5	12.1	8.0
3.0	14.0	0.0	3.0	12.1	11.1	3.0	10.6	13.0	3.0	12.1	7.8
3.5	14.4	0.0	3.5	12.2	10.6	3.5	10.6	13.0	3.5	12.3	7.7
3.7	15.3	0.0	4.0	12.1	10.4	4.0	10.6	13.0	4.0	12.3	7.7
			4.5	12.8	9.9	4.5	10.6	13.0	4.5	12.4	7.6
			5.0	12.7	9.7	5.0	10.6	12.9	5.0	12.4	7.5
			5.5	14.7	9.7	5.2	10.6	12.9	5.5	12.9	7.5

Appendix B3. Water quality QA/QC data for the Doris North Project, 2006.

Parameter	Units	MRV	MDL	Fresh Water Guideline[a]	Replicates at Doris Lake (top)				Replicates at Doris Lake (bottom)			
					31-May-06 (under ice)				31/05/2006 (uice)nder			
					Rep1	Rep2	Mean	StDev	Rep1	Rep2	Mean	StDev
Total Metals												
Aluminum (Al)	µg/L	*0.5*	*2*	*5-100*	11.4	8.7	10.04	1.93	19.7	24.1	21.90	3.11
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.0239	0.0173	0.02060	0.00467	0.0178	0.0200	0.01890	0.00156
Arsenic (As)	µg/L	*0.002*	*0.04*	*5*	0.773	0.673	0.7230	0.0707	0.849	0.768	0.8085	0.0573
Barium (Ba)	µg/L	*0.004*	*0.1*		2.90	3.11	3.005	0.148	4.58	4.88	4.730	0.212
Beryllium (Be)	µg/L	*0.003*	*0.01*		<0.003	<0.003	<0.003	-	0.004	0.004	0.0038	0.0004
Bismuth (Bi)	µg/L	*0.001*	*0.01*		<0.001	0.017	-	-	<0.001	0.006	-	-
Boron (B)	µg/L	*0.05*	*0.8*		29.10	28.00	28.550	0.778	32.00	29.00	30.500	2.121
Cadmium (Cd)	µg/L	*0.002*	*0.006*	*0.017*	<0.002	0.014	-	-	<0.002	<0.002	<0.002	-
Calcium (Ca)	mg/L	*0.004*	*0.1*		9.210	8.820	9.015	0.276	9.160	9.040	9.100	0.085
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.207	0.283	0.245	0.054	0.224	0.259	0.242	0.025
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.021	0.020	0.020	0.000	0.039	0.041	0.040	0.001
Copper (Cu)	µg/L	*0.05*	*0.1*	*2*	1.95	1.60	1.775	0.247	1.41	1.52	1.465	0.078
Iron (Fe)	µg/L	*2*	*4*	*300*	20	16	18	3	156	164	160	6
Lead (Pb)	µg/L	*0.001*	*0.006*	*1*	0.109	0.036	0.073	0.052	0.013	0.048	0.031	0.024
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		8.020	7.980	8.000	0.028	7.950	7.950	7.950	0.000
Manganese (Mn)	µg/L	*0.003*	*0.03*		5.56	5.62	5.590	0.042	84.30	83.90	84.100	0.283
Molybdenum (Mo)	µg/L	*0.001*	*0.0080*	*73*	0.126	0.157	0.142	0.022	0.132	0.153	0.143	0.015
Mercury (Hg)	ng/L	*0.6*	*1.2*	*26*	-	-	-	-	-	-	-	-
Nickel (Ni)	µg/L	*0.005*	*0.06*	*25*	0.360	0.364	0.362	0.003	0.389	0.405	0.397	0.011
Potassium (K)	mg/L	*0.002*	*0.005*		2.74	2.94	0.003	0.000	2.89	2.93	0.003	0.000
Selenium (Se)	µg/L	*0.1*	*0.3*	*1.0*	2.3	1.9	2.1	0.3	2.5	2.1	2.3	0.3
Silver (Ag)	µg/L	*0.0005*	*0.005*	*0.1*	<0.0005	0.001	-	-	<0.0005	0.002	-	-
Sodium (Na)	mg/L	*0.002*	*0.006*		36.30	41.20	0.039	0.003	39.10	41.80	0.040	0.002
Strontium (Sr)	µg/L	*0.004*	*0.008*		46.300	48.900	47.600	1.838	49.100	50.800	49.950	1.202
Thallium (Tl)	µg/L	*0.0003*	*0.003*		<0.003	0.003	-	-	<0.003	0.001	-	-
Tin (Sn)	µg/L	*0.03*	*0.07*		12.200	0.556	6.378	8.234	0.296	0.639	0.468	0.243
Uranium (U)	µg/L	*0.0001*	*0.003*		0.029	0.037	0.033	0.006	0.027	0.033	0.030	0.005
Vanadium (V)	µg/L	*0.005*	*0.05*		0.075	0.030	0.052	0.032	0.077	0.050	0.064	0.019
Zinc (Zn)	µg/L	*0.1*	*0.2*	*7.5* [b]	12.50	1.59	7.045	7.715	4.09	5.11	4.600	0.721
Dissolved Metals												
Aluminum (Al)	µg/L	*0.2*	*1*		0.844	0.842	0.843	0.001	2.280	2.400	2.340	0.085
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.022	0.017	0.019	0.004	0.018	0.020	0.019	0.002
Arsenic (As)	µg/L	*0.002*	*0.04*		0.741	0.617	0.679	0.088	0.472	0.726	0.599	0.180
Barium (Ba)	µg/L	*0.004*	*0.1*		2.450	2.560	2.505	0.078	2.710	3.050	2.880	0.240
Beryllium (Be)	µg/L	*0.003*	*0.01*		<0.003	<0.003	<0.003	-	<0.003	0.004	-	-
Boron (B)	µg/L	*0.03*	*0.08*		27.30	25.10	26.200	1.556	31.60	28.50	30.050	2.192
Cadmium (Cd)	µg/L	*0.002*	*0.006*		<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	-
Calcium (Ca)	mg/L	*0.004*	*0.1*		7.96	8.11	8.035	0.106	8.49	8.77	8.630	0.198
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.20	0.27	0.239	0.049	0.22	0.25	0.235	0.023
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.010	0.013	0.0111	0.0021	0.022	0.020	0.0211	0.0015
Copper (Cu)	µg/L	*0.05*	*0.1*		1.66	1.27	1.465	0.276	1.40	1.40	1.400	0.000
Iron (Fe)	µg/L	*2*	*4*		6	5	5	1	51	41	46	7
Lead (Pb)	µg/L	*0.001*	*0.006*		0.009	<0.001	-	-	<0.001	0.002	-	-
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		6.75	7.95	7.350	0.849	7.17	7.02	7.095	0.106
Manganese (Mn)	µg/L	*0.003*	*0.03*		1.070	1.120	1.0950	0.0354	63.200	59.000	61.100	2.970
Molybdenum (Mo)	µg/L	*0.001*	*0.008*		0.116	0.135	0.1255	0.0134	0.115	0.144	0.130	0.021
Nickel (Ni)	µg/L	*0.005*	*0.06*		0.157	0.157	0.1570	0.0000	0.242	0.281	0.262	0.028
Potassium (K)	mg/L	*0.002*	*0.005*		2.56	2.71	0.003	0.000	2.69	2.91	0.003	0.000
Selenium (Se)	µg/L	*0.1*	*0.3*		2.1	1.8	1.95	0.25	1.1	2.0	1.59	0.63
Silver (Ag)	µg/L	*0.0005*	*0.005*		<0.0005	<0.0005	<0.005	-	<0.0005	<0.0005	<0.0005	-
Sodium (Na)	mg/L	*0.002*	*0.006*		34.3	40.1	0.037	0.004	36.9	40.9	0.039	0.003
Strontium (Sr)	µg/L	*0.004*	*0.008*		42.9	45.4	44.15	1.77	46.6	50.4	48.50	2.69
Uranium (U)	µg/L	*0.0001*	*0.003*		0.0104	0.0117	0.01105	0.00092	0.0149	0.0204	0.01765	0.00389
Vanadium (V)	µg/L	*0.005*	*0.05*		0.074	0.028	0.0512	0.0323	0.074	0.050	0.062	0.017
Zinc (Zn)	µg/L	*0.05*	*0.2*		3.33	1.59	2.460	1.230	4.04	3.98	4.010	0.042
Nutrients												
Phosphorus, Total	mg/L	*0.001*	*0.008*		0.026	0.027	0.0265	0.0007	0.027	0.026	0.027	0.001
Ammonia-N	mg/L	*0.001*	*0.02*	*0.572*	0.018	0.005	0.0115	0.0092	0.023	0.018	0.021	0.004
Total Kjeldahl Nitrogen	mg/L	*0.01*	*0.05*		0.53	0.54	0.535	0.007	0.52	0.50	0.51	0.01
Dissolved Organic Carbon	mg/L	*0.2*	*0.6*		5.2	5.6	5.40	0.28	5.6	5.7	5.65	0.07
Carbon Part	mg/L	*0.02*	*0.2*		1.20	1.35	1.275	0.106	0.66	0.67	0.665	0.007
TOC (Calculated)		*0.8*			6.4	7.0	6.68	0.39	6.3	6.4	6.32	0.08
Fluoride (F)	mg/L	*0.01*	*0.04*		0.07	0.07	0.070	0.000	0.06	0.08	0.070	0.014
Sulphide	mg/L	*0.001*	*0.004*		<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-
Total Suspended Solids	mg/L	*1*	*10*		2	2	2	0	<1	<1	<1	-
Routine												
Chloride (Cl)	mg/L	*0.3*	*0.6*		80.8	75.2	78.00	3.96	82.2	82.5	82.35	0.21
Nitrate+Nitrite-N	mg/L	*0.005*	*0.02*		<0.005	0.010	-	-	0.099	0.104	0.102	0.004
Nitrite-N	mg/L	*0.001*	*0.016*	*0.06*	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-
Nitrate-N (calculated)	mg/L	*0.005*		*13*	<0.005	0.010	0.0095	-	0.099	0.104	0.101	0.004
Sulphate (SO4)	mg/L	*3*	*6*		4	4	4	0	4	5	5	1
pH, EC and Alkalinity												
pH (Laboratory)	units	*N/A*	*N/A*	*6.5-9.0*	7.05	7.04	7.05	0.01	6.83	6.85	6.84	0.01
Conductivity (EC)	µS/cm	*0.1*	*2*		317	319	318	1	344	345	345	1
Bicarbonate (HCO_3)	mg/L	*1*	*5*		40	40	40	0	43	43	43	0
Carbonate	mg/L				-	-	-	-	-	-	-	-
Alkalinity, Total	mg$CaCO_3$/L	*1*	*4*		33	33	33	0	35	35	35	0
P- Alkalinity	mg$CaCO_3$/L	*1*	*4*		<1	<1	<1	-	<1	<1	<1	-
Ion Balance												
Ion Balance		*N/A*	*N/A*		1.05	1.02	1.04	0.02	1.03	1.02	1.03	0.01
Anions	meq/L	*N/A*	*N/A*		3.01	2.86	2.94	0.11	3.11	3.13	3.12	0.01
Cations	meq/L	*N/A*	*N/A*		3.15	2.92	3.04	0.16	3.19	3.19	3.19	0.00
TDS (Calculated)	mg/L	*9*			169	159	164	7	174	175	175	1
Hardness, Total	mg$CaCO_3$/L	*0.01*	*0.25*		55.9	52.6	54.25	2.33	55.6	55.0	55.30	0.42
ICP Metals for Routine												
Calcium (Ca)	mg/L	*0.004*	*0.1*		9.180	8.600	8.8900	0.4101	9.140	9.000	9.070	0.099
Potassium (K)	mg/L	*0.1*	*0.1*		3.0	2.9	2.95	0.07	3.1	2.8	2.95	0.21
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		8.00	7.57	7.785	0.304	7.95	7.89	7.920	0.042
Sodium (Na)	mg/L	*0.5*	*1.5*		45.0	41.2	43.10	2.69	46.1	46.3	46.20	0.14
Other												
Color, True	TCU	*1*	*2*		14	12	13	1	10	10	10	0
Cyanide, Total	mg/L	*0.001*	*0.004*		<0.001	0.002	0.0020	-	<0.001	<0.001	<0.001	-
ARC Sample ID					0602745	0602746			0602743	0602747		

Note: MRV = Minimum Reported Value; MDL = Method Detection Limit

[a] CCME (2006), except where noted [b] BCMOE (2006)

shaded cells indicate values that exceed the guidelines

Appendix B3. Water quality QA/QC data for the Doris North Project, 2006.

Parameter	Units	MRV	MDL	Fresh Water Guideline[a]	Replicates at Doris Lake (top) 14-Jul-06				Replicates at Doris Lake (top) 11-Aug-06			
					Rep1	Rep2	Mean	StDev	Rep1	Rep2	Mean	StDev
Total Metals												
Aluminum (Al)	µg/L	*0.5*	*2*	*5-100*	31.2	31.5	31.35	0.21	19.9	21.5	20.70	1.13
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.0116	0.0104	0.01100	0.00085	0.0136	0.0145	0.01405	0.00064
Arsenic (As)	µg/L	*0.002*	*0.04*	*5*	0.420	0.432	0.4260	0.0085	0.527	0.568	0.5475	0.0290
Barium (Ba)	µg/L	*0.004*	*0.1*		2.92	2.94	2.930	0.014	2.62	2.58	2.600	0.028
Beryllium (Be)	µg/L	*0.003*	*0.01*		<0.003	<0.003	<0.003	-	0.004	<0.003	-	-
Bismuth (Bi)	µg/L	*0.001*	*0.01*		0.002	0.001	0.0015	0.0005	0.002	0.002	0.0022	0.0004
Boron (B)	µg/L	*0.05*	*0.8*		20.50	20.70	20.600	0.141	24.60	23.30	23.950	0.919
Cadmium (Cd)	µg/L	*0.002*	*0.006*	*0.017*	0.003	0.004	0.0031	0.0008	<0.002	<0.002	<0.002	-
Calcium (Ca)	mg/L	*0.004*	*0.1*		6.790	6.780	6.785	0.007	6.970	6.880	6.925	0.064
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.225	0.187	0.206	0.027	0.199	0.289	0.244	0.064
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.023	0.027	0.025	0.003	0.027	0.021	0.024	0.004
Copper (Cu)	µg/L	*0.05*	*0.1*	*2*	0.87	0.88	0.876	0.003	1.37	1.61	1.490	0.170
Iron (Fe)	µg/L	*2*	*4*	*300*	68	65	67	3	34	34	34	0
Lead (Pb)	µg/L	*0.001*	*0.006*	*1*	0.052	0.047	0.050	0.003	0.130	0.134	0.132	0.003
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		5.780	5.740	5.760	0.028	6.460	6.400	6.430	0.042
Manganese (Mn)	µg/L	*0.003*	*0.03*		6.72	6.03	6.375	0.488	7.92	7.61	7.765	0.219
Molybdenum (Mo)	µg/L	*0.001*	*0.0080*	*73*	0.116	0.116	0.116	0.000	0.133	0.134	0.134	0.001
Mercury (Hg)	ng/L	*0.6*	*1.2*	*26*	4.600	16.000	10.300	8.061	2.100	<0.6	-	-
Nickel (Ni)	µg/L	*0.005*	*0.06*	*25*	0.602	0.564	0.583	0.027	0.261	0.281	0.271	0.014
Potassium (K)	mg/L	*0.002*	*0.005*		2.22	2.22	0.002	0.000	2.25	2.22	0.002	0.000
Selenium (Se)	µg/L	*0.1*	*0.3*	*1.0*	1.0	1.1	1.0	0.1	1.3	1.2	1.2	0.1
Silver (Ag)	µg/L	*0.0005*	*0.005*	*0.1*	0.002	0.002	0.002	0.000	0.001	0.001	0.001	0.000
Sodium (Na)	mg/L	*0.002*	*0.006*		28.40	28.20	0.028	0.000	33.20	32.50	0.033	0.000
Strontium (Sr)	µg/L	*0.004*	*0.008*		38.400	38.400	38.400	0.000	37.800	38.000	37.900	0.141
Thallium (Tl)	µg/L	*0.0003*	*0.003*		0.013	0.014	0.013	0.000	0.011	0.010	0.010	0.001
Tin (Sn)	µg/L	*0.03*	*0.07*		0.136	0.124	0.130	0.008	0.388	6.200	3.294	4.110
Uranium (U)	µg/L	*0.0001*	*0.003*		0.031	0.032	0.031	0.001	0.034	0.034	0.034	0.000
Vanadium (V)	µg/L	*0.005*	*0.05*		0.086	0.049	0.068	0.026	0.083	0.058	0.071	0.018
Zinc (Zn)	µg/L	*0.1*	*0.2*	*7.5* [b]	0.85	0.99	0.923	0.100	3.63	2.35	2.990	0.905
Dissolved Metals												
Aluminum (Al)	µg/L	*0.2*	*1*		3.370	3.540	3.455	0.120	2.130	2.000	2.065	0.092
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.011	0.010	0.011	0.001	0.014	0.015	0.014	0.001
Arsenic (As)	µg/L	*0.002*	*0.04*		0.375	0.369	0.372	0.004	0.488	0.512	0.500	0.017
Barium (Ba)	µg/L	*0.004*	*0.1*		2.280	2.270	2.275	0.007	2.150	2.140	2.145	0.007
Beryllium (Be)	µg/L	*0.003*	*0.01*		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-
Boron (B)	µg/L	*0.03*	*0.08*		18.90	19.10	19.000	0.141	22.30	22.10	22.200	0.141
Cadmium (Cd)	µg/L	*0.002*	*0.006*		0.002	0.003	0.003	0.000	<0.002	<0.002	<0.002	-
Calcium (Ca)	mg/L	*0.004*	*0.1*		6.15	6.18	6.165	0.021	6.54	6.36	6.450	0.127
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.17	0.15	0.164	0.014	0.42	0.28	0.353	0.099
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.015	0.014	0.0142	0.0006	0.012	0.011	0.0114	0.0006
Copper (Cu)	µg/L	*0.05*	*0.1*		0.69	0.64	0.664	0.035	1.11	1.22	1.165	0.078
Iron (Fe)	µg/L	*2*	*4*		16	13	14	2	3	<2	-	-
Lead (Pb)	µg/L	*0.001*	*0.006*		0.040	0.040	0.040	0.000	0.108	0.116	0.112	0.006
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		5.21	5.35	5.280	0.099	6.09	5.95	6.020	0.099
Manganese (Mn)	µg/L	*0.003*	*0.03*		0.227	0.200	0.2135	0.0191	0.141	0.156	0.149	0.011
Molybdenum (Mo)	µg/L	*0.001*	*0.008*		0.106	0.107	0.1065	0.0007	0.115	0.116	0.116	0.001
Nickel (Ni)	µg/L	*0.005*	*0.06*		0.417	0.512	0.4645	0.0672	0.132	0.114	0.123	0.013
Potassium (K)	mg/L	*0.002*	*0.005*		2.00	2.03	0.002	0.000	2.10	2.06	0.002	0.000
Selenium (Se)	µg/L	*0.1*	*0.3*		0.9	0.8	0.85	0.04	0.8	0.8	0.84	0.01
Silver (Ag)	µg/L	*0.0005*	*0.005*		0.0011	0.0012	0.00115	0.00007	<0.0005	<0.0005	<0.005	-
Sodium (Na)	mg/L	*0.002*	*0.006*		25.7	26.4	0.026	0.000	31.4	30.8	0.031	0.000
Strontium (Sr)	µg/L	*0.004*	*0.008*		35.3	34.7	35.00	0.42	35.9	35.4	35.65	0.35
Uranium (U)	µg/L	*0.0001*	*0.003*		0.0126	0.0145	0.01355	0.00134	0.0230	0.0212	0.02210	0.00127
Vanadium (V)	µg/L	*0.005*	*0.05*		0.010	0.024	0.0172	0.0101	0.074	0.034	0.054	0.028
Zinc (Zn)	µg/L	*0.05*	*0.2*		0.85	0.98	0.918	0.093	1.70	0.74	1.218	0.682
Nutrients												
Phosphorus, Total	mg/L	*0.001*	*0.008*		0.023	0.021	0.0220	0.0014	0.031	0.028	0.030	0.002
Ammonia-N	mg/L	*0.001*	*0.02*	*0.572*	0.005	0.003	0.0040	0.0014	0.008	0.008	0.008	0.000
Total Kjeldahl Nitrogen	mg/L	*0.01*	*0.05*		0.41	0.40	0.405	0.007	0.45	0.43	0.440	0.014
Dissolved Organic Carbon	mg/L	*0.2*	*0.6*		5.2	5.2	5.20	0.00	5.0	4.9	4.95	0.07
Carbon Part	mg/L	*0.02*	*0.2*		1.06	0.82	0.940	0.170	0.80	0.81	0.805	0.007
TOC (Calculated)		*0.8*			6.3	6.0	6.14	0.17	5.8	5.7	5.76	0.06
Fluoride (F)	mg/L	*0.01*	*0.04*		0.05	0.05	0.050	0.000	0.03	0.03	0.030	0.000
Sulphide	mg/L	*0.001*	*0.004*		<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-
Total Suspended Solids	mg/L	*1*	*10*		4	3	4	1	<1	2	-	-
Routine												
Chloride (Cl)	mg/L	*0.3*	*0.6*		60.6	60.3	60.45	0.21	62.2	62.6	62.40	0.28
Nitrate+Nitrite-N	mg/L	*0.005*	*0.02*		0.012	<0.005	-	-	<0.005	<0.005	<0.005	-
Nitrite-N	mg/L	*0.001*	*0.016*	*0.06*	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	-
Nitrate-N (calculated)	mg/L	*0.005*		*13*	0.012	<0.005	-	-	<0.005	<0.005	<0.005	-
Sulphate (SO4)	mg/L	*3*	*6*		<3	<3	<3	-	<3	<3	<3	-
pH, EC and Alkalinity												
pH (Laboratory)	units	*N/A*	*N/A*	*6.5-9.0*	7.67	7.51	7.59	0.11	7.59	7.66	7.63	0.05
Conductivity (EC)	µS/cm	*0.1*	*2*		254	254	254	0	266	266	266	0
Bicarbonate (HCO_3)	mg/L	*1*	*5*		33	32	33	1	33	33	33	0
Carbonate	mg/L				-	-	-	-	-	-	-	-
Alkalinity, Total	mgCaCO$_3$/L	*1*	*4*		27	27	27	0	27	27	27	0
P- Alkalinity	mgCaCO$_3$/L	*1*	*4*		<1	<1	<1	-	<1	<1	<1	-
Ion Balance												
Ion Balance		*N/A*	*N/A*		0.97	0.98	0.98	0.01	0.96	0.98	0.97	0.01
Anions	meq/L	*N/A*	*N/A*		2.3	2.28	2.29	0.01	2.36	2.35	2.36	0.01
Cations	meq/L	*N/A*	*N/A*		2.22	2.23	2.23	0.01	2.28	2.31	2.30	0.02
TDS (Calculated)	mg/L	*9*			125	124	125	1	128	128	128	0
Hardness, Total	mgCaCO$_3$/L	*0.01*	*0.25*		41.6	42.5	42.05	0.64	42.8	43.3	43.05	0.35
ICP Metals for Routine												
Calcium (Ca)	mg/L	*0.004*	*0.1*		6.860	7.030	6.9450	0.1202	7.030	7.070	7.050	0.028
Potassium (K)	mg/L	*0.1*	*0.1*		2.3	2.2	2.25	0.07	2.3	2.3	2.30	0.00
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		5.94	6.06	6.000	0.085	6.13	6.24	6.185	0.078
Sodium (Na)	mg/L	*0.5*	*1.5*		30.6	30.5	30.55	0.07	31.3	31.8	31.55	0.35
Other												
Color, True	TCU	*1*	*2*		12	12	12	0	12	12	12	0
Cyanide, Total	mg/L	*0.001*	*0.004*		<0.001	0.002	-	-	<0.001	<0.001	<0.001	-
ARC Sample ID					0603483	0603484			0604179	0604180		

Note: MRV = Minimum Reported Value; MDL = Method Detection Limit

[a] CCME (2006), except where noted [b] BCMOE (2006)

shaded cells indicate values that exceed the guidelines

Appendix B3. Water quality QA/QC data for the Doris North Project, 2006.

Parameter	Units	MRV	MDL	Fresh Water Guideline[a]	Replicates at Doris Lake (top)				Field Blank Tail Lake		
					13-Sep-06				20-Jul-06	12-Aug-06	13-Sep-06
					Rep1	Rep2	Mean	StDev			
Total Metals											
Aluminum (Al)	µg/L	*0.5*	*2*	*5-100*	51.8	47.0	49.40	3.39	0.9	0.5	<0.5
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.0141	0.0137	0.01390	0.00028	0.0013	0.0006	0.0015
Arsenic (As)	µg/L	*0.002*	*0.04*	*5*	0.580	0.558	0.5690	0.0156	0.010	0.055	0.022
Barium (Ba)	µg/L	*0.004*	*0.1*		2.88	2.83	2.855	0.035	0.014	0.047	0.049
Beryllium (Be)	µg/L	*0.003*	*0.01*		0.008	0.005	0.0068	0.0021	<0.003	<0.003	<0.003
Bismuth (Bi)	µg/L	*0.001*	*0.01*		<0.001	<0.001	<0.001	-	<0.001	0.001	<0.001
Boron (B)	µg/L	*0.05*	*0.8*		23.10	22.10	22.600	0.707	0.50	0.31	0.37
Cadmium (Cd)	µg/L	*0.002*	*0.006*	*0.017*	0.003	<0.002	-	-	<0.002	0.003	<0.002
Calcium (Ca)	mg/L	*0.004*	*0.1*		7.070	7.100	7.085	0.021	<0.004	0.004	<0.004
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.224	0.214	0.219	0.007	0.04	0.06	0.07
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.035	0.032	0.033	0.002	<0.001	0.004	<0.001
Copper (Cu)	µg/L	*0.05*	*0.1*	*2*	1.31	1.29	1.300	0.014	<0.05	0.11	0.05
Iron (Fe)	µg/L	*2*	*4*	*300*	98	90	94	6	<2	<2	<2
Lead (Pb)	µg/L	*0.001*	*0.006*	*1*	0.042	0.044	0.043	0.002	0.008	0.022	0.013
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		6.390	6.420	6.405	0.021	0.0005	0.0010	0.0013
Manganese (Mn)	µg/L	*0.003*	*0.03*		23.80	22.50	23.150	0.919	0.003	0.140	0.041
Molybdenum (Mo)	µg/L	*0.001*	*0.0080*	*73*	0.150	0.159	0.155	0.006	0.004	0.004	0.007
Mercury (Hg)	ng/L	*0.6*	*1.2*	*26*	1.000	<0.6	-	-	<0.6	<0.6	<0.6
Nickel (Ni)	µg/L	*0.005*	*0.06*	*25*	0.345	0.367	0.356	0.016	0.008	0.152	0.018
Potassium (K)	mg/L	*0.002*	*0.005*		2.35	2.36	0.002	0.000	<2	<2	<2
Selenium (Se)	µg/L	*0.1*	*0.3*	*1.0*	1.4	1.5	1.5	0.1	<0.1	<0.1	<0.1
Silver (Ag)	µg/L	*0.0005*	*0.005*	*0.1*	0.002	0.001	0.001	0.001	0.0009	0.0021	0.0018
Sodium (Na)	mg/L	*0.002*	*0.006*		31.90	32.20	0.032	0.000	<2	<2	<2
Strontium (Sr)	µg/L	*0.004*	*0.008*		38.800	38.700	38.750	0.071	0.012	0.020	0.021
Thallium (Tl)	µg/L	*0.0003*	*0.003*		0.012	0.011	0.011	0.000	0.0061	0.0056	0.0053
Tin (Sn)	µg/L	*0.03*	*0.07*		0.150	0.101	0.126	0.035	0.04	<0.03	<0.03
Uranium (U)	µg/L	*0.0001*	*0.003*		0.036	0.031	0.034	0.003	<0.0001	0.0002	0.0002
Vanadium (V)	µg/L	*0.005*	*0.05*		0.081	0.088	0.085	0.005	0.010	0.014	0.011
Zinc (Zn)	µg/L	*0.1*	*0.2*	*7.5* [b]	0.57	1.35	0.960	0.552	0.3	0.4	0.4
Dissolved Metals											
Aluminum (Al)	µg/L	*0.2*	*1*		1.090	1.170	1.130	0.057	<0.2	0.2	<0.2
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.014	0.014	0.014	0.000	0.0013	0.0006	0.0015
Arsenic (As)	µg/L	*0.002*	*0.04*		0.478	0.501	0.490	0.016	0.009	0.053	0.021
Barium (Ba)	µg/L	*0.004*	*0.1*		2.080	2.020	2.050	0.042	0.009	0.012	<0.004
Beryllium (Be)	µg/L	*0.003*	*0.01*		0.004	<0.003	-	-	<0.003	<0.003	<0.003
Boron (B)	µg/L	*0.03*	*0.08*		20.40	20.30	20.350	0.071	0.30	0.20	0.37
Cadmium (Cd)	µg/L	*0.002*	*0.006*		<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
Calcium (Ca)	mg/L	*0.004*	*0.1*		6.76	6.64	6.700	0.085	<0.004	<0.004	<0.004
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.22	0.21	0.214	0.007	0.04	0.06	0.07
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.014	0.010	0.0119	0.0028	<0.001	0.002	<0.001
Copper (Cu)	µg/L	*0.05*	*0.1*		1.23	1.19	1.210	0.028	<0.05	0.10	<0.05
Iron (Fe)	µg/L	*2*	*4*		<2	<2	<2	-	<2	<2	<2
Lead (Pb)	µg/L	*0.001*	*0.006*		0.028	0.026	0.027	0.001	0.008	0.022	0.013
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		5.98	6.00	5.990	0.014	0.0002	0.0010	0.0013
Manganese (Mn)	µg/L	*0.003*	*0.03*		0.133	0.099	0.116	0.024	<0.003	0.067	0.018
Molybdenum (Mo)	µg/L	*0.001*	*0.008*		0.127	0.136	0.132	0.006	0.002	0.004	0.001
Nickel (Ni)	µg/L	*0.005*	*0.06*		0.116	0.092	0.104	0.017	0.007	0.021	0.017
Potassium (K)	mg/L	*0.002*	*0.005*		2.18	2.16	0.002	0.000	<0.002	<0.002	<0.002
Selenium (Se)	µg/L	*0.1*	*0.3*		0.8	0.8	0.78	0.04	<0.1	0.0	<0.1
Silver (Ag)	µg/L	*0.0005*	*0.005*		<0.0005	<0.0005	<0.005	-	0.0008	0.0009	0.0010
Sodium (Na)	mg/L	*0.002*	*0.006*		30.5	30.2	0.030	0.000	<0.002	<0.002	<0.002
Strontium (Sr)	µg/L	*0.004*	*0.008*		37.9	38.4	38.15	0.35	0.012	0.019	0.020
Uranium (U)	µg/L	*0.0001*	*0.003*		0.0124	0.0194	0.01590	0.00495	<0.0001	0.0002	<0.0001
Vanadium (V)	µg/L	*0.005*	*0.05*		0.010	0.010	0.010	0.000	0.010	0.010	0.010
Zinc (Zn)	µg/L	*0.05*	*0.2*		0.56	1.17	0.867	0.429	0.22	0.29	0.24
Nutrients											
Phosphorus, Total	mg/L	*0.001*	*0.008*		0.042	0.030	0.036	0.008	0.008	0.015	0.020
Ammonia-N	mg/L	*0.001*	*0.02*	*0.572*	0.009	0.010	0.010	0.001	0.009	0.003	0.005
Total Kjeldahl Nitrogen	mg/L	*0.01*	*0.05*		0.51	0.52	0.52	0.01	0.02	<0.01	0.02
Dissolved Organic Carbon	mg/L	*0.2*	*0.6*		4.8	5.3	5.05	0.35	0.5	0.3	0.5
Carbon Part	mg/L	*0.02*	*0.2*		1.73	1.76	1.745	0.021	<0.02	0.05	<0.02
TOC (Calculated)		*0.8*			6.5	7.1	6.80	0.37		0.4	
Fluoride (F)	mg/L	*0.01*	*0.04*		0.07	0.07	0.070	0.000	<0.01	<0.01	<0.01
Sulphide	mg/L	*0.001*	*0.004*		0.002	<0.001	-	-	<0.001	<0.001	<0.001
Total Suspended Solids	mg/L	*1*	*10*		3	3	3	0	<1	<1	3
Routine											
Chloride (Cl)	mg/L	*0.3*	*0.6*		62.6	63.3	62.95	0.49	1.3	<0.3	<0.3
Nitrate+Nitrite-N	mg/L	*0.005*	*0.02*		<0.005	<0.005	<0.005	-	<0.005	0.014	<0.005
Nitrite-N	mg/L	*0.001*	*0.016*	*0.06*	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001
Nitrate-N (calculated)	mg/L	*0.005*		*13*	<0.005	<0.005	<0.005	-	<0.005	0.014	<0.005
Sulphate (SO4)	mg/L	*3*	*6*		<3	<3	<3	-	<3	<3	<3
pH, EC and Alkalinity											
pH (Laboratory)	units	*N/A*	*N/A*	*6.5-9.0*	7.68	7.69	7.69	0.01	5.82	5.44	5.49
Conductivity (EC)	µS/cm	*0.1*	*2*		271	271	271	0	1	2	1
Bicarbonate (HCO_3)	mg/L	*1*	*5*		34	34	34	0	2	2	2
Carbonate	mg/L				-	-	-	-			
Alkalinity, Total	mg$CaCO_3$/L	*1*	*4*		28	28	28	0	2	2	2
P- Alkalinity	mg$CaCO_3$/L	*1*	*4*		<1	<1	<1	-	<1	<1	<1
Ion Balance											
Ion Balance		*N/A*	*N/A*		0.95	0.96	0.96	0.01	0.21	0.27	0.27
Anions	meq/L	*N/A*	*N/A*		2.36	2.38	2.37	0.01	0.12	0.08	0.09
Cations	meq/L	*N/A*	*N/A*		2.25	2.29	2.27	0.03	0.02	0.02	0.02
TDS (Calculated)	mg/L	*9*			127	129	128	1	5	4	4
Hardness, Total	mg$CaCO_3$/L	*0.01*	*0.25*		43.5	43.8	43.65	0.21	0.09	<0.01	<0.01
ICP Metals for Routine											
Calcium (Ca)	mg/L	*0.004*	*0.1*		6.990	7.060	7.025	0.049	<0.004	0.005	0.005
Potassium (K)	mg/L	*0.1*	*0.1*		2.3	2.3	2.30	0.00	<0.1	<0.1	<0.1
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		6.32	6.36	6.340	0.028	0.0006	0.0005	0.0000
Sodium (Na)	mg/L	*0.5*	*1.5*		30.5	31.1	30.80	0.42	<0.5	<0.5	<0.5
Other											
Color, True	TCU	*1*	*2*		6	6	6	0	<1	3	<1
Cyanide, Total	mg/L	*0.001*	*0.004*		<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001
ARC Sample ID					0604986	0604983			0603694	0604194	0604981

Note: MRV = Minimum Reported Value; MDL = Method Detection Limit
[a] CCME (2006), except where noted [b] BCMOE (2006)
shaded cells indicate values that exceed the guidelines

Appendix B4. Water quality data for fresh water stations in the Doris North Project, 2006.

Parameter	Units	MRV	MDL	Fresh Water Guideline[a]	Doris Lake							
					31-May-06	31-May-06	14-Jul-06	14-Jul-06	11-Aug-06	11-Aug-06	13-Sep-06	13-Sep-06
					Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom
Total Metals												
Aluminum (Al)	µg/L	*0.5*	*2*	*5-100*	8.7	24.1	31.5	33.1	21.5	19.5	47.0	57.0
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.0173	0.0200	0.0104	0.0133	0.0145	0.0154	0.0137	0.0145
Arsenic (As)	µg/L	*0.002*	*0.04*	*5*	0.673	0.768	0.432	0.447	0.568	0.529	0.558	0.579
Barium (Ba)	µg/L	*0.004*	*0.1*		3.11	4.88	2.94	2.92	2.58	2.76	2.83	2.98
Beryllium (Be)	µg/L	*0.003*	*0.01*		<0.003	0.004	<0.003	<0.003	<0.003	<0.003	0.005	0.004
Bismuth (Bi)	µg/L	*0.001*	*0.01*		0.017	0.006	0.001	<0.001	0.002	0.003	<0.001	<0.001
Boron (B)	µg/L	*0.05*	*0.8*		28.0	29.0	20.7	21.5	23.3	23.3	22.1	22.2
Cadmium (Cd)	µg/L	*0.002*	*0.006*	*0.017*	0.014	<0.002	0.004	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium (Ca)	mg/L	*0.004*	*0.1*		8.82	9.04	6.78	6.67	6.88	6.93	7.10	7.13
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.283	0.259	0.187	0.182	0.289	0.297	0.214	0.230
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.020	0.041	0.027	0.025	0.021	0.026	0.032	0.032
Copper (Cu)	µg/L	*0.05*	*0.1*	*2*	1.60	1.52	0.88	0.98	1.61	1.77	1.29	1.32
Iron (Fe)	µg/L	*2*	*4*	*300*	16	164	65	68	34	42	90	109
Lead (Pb)	µg/L	*0.001*	*0.006*	*1*	0.036	0.048	0.047	0.069	0.134	0.155	0.044	0.046
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		7.98	7.95	5.74	5.76	6.40	6.36	6.42	6.40
Manganese (Mn)	µg/L	*0.003*	*0.03*		5.62	83.90	6.03	6.78	7.61	10.90	22.50	25.70
Molybdenum (Mo)	µg/L	*0.001*	*0.0080*	*73*	0.157	0.153	0.116	0.114	0.134	0.147	0.159	0.151
Mercury (Hg)	ng/L	*0.6*	*1.2*	*26*			16.000	<0.6	<0.6	3.400	<0.6	1.800
Nickel (Ni)	µg/L	*0.005*	*0.06*	*25*	0.364	0.405	0.564	0.597	0.281	0.418	0.367	0.393
Potassium (K)	mg/L	*0.002*	*0.005*		2.94	2.93	2.22	2.19	2.22	2.24	2.36	2.36
Selenium (Se)	µg/L	*0.1*	*0.3*	*1.0*	1.9	2.1	1.1	1.1	1.2	1.2	1.5	1.2
Silver (Ag)	µg/L	*0.0005*	*0.005*	*0.1*	0.001	0.002	0.002	0.002	0.001	0.001	0.001	0.001
Sodium (Na)	mg/L	*0.002*	*0.006*		41.2	41.8	28.2	28.2	32.5	32.4	32.2	32.2
Strontium (Sr)	µg/L	*0.004*	*0.008*		48.9	50.8	38.4	37.8	38.0	38.3	38.7	39.0
Thallium (Tl)	µg/L	*0.0003*	*0.003*		0.003	0.001	0.014	0.013	0.010	0.010	0.011	0.012
Tin (Sn)	µg/L	*0.03*	*0.07*		0.556	0.639	0.124	25.300	6.200	3.780	0.101	0.302
Uranium (U)	µg/L	*0.0001*	*0.003*		0.037	0.033	0.032	0.031	0.034	0.032	0.031	0.034
Vanadium (V)	µg/L	*0.005*	*0.05*		0.030	0.050	0.049	0.081	0.058	0.047	0.088	0.094
Zinc (Zn)	µg/L	*0.1*	*0.2*	*7.5* [b]	1.59	5.11	0.99	2.56	2.35	3.56	1.35	1.27
Dissolved Metals												
Aluminum (Al)	µg/L	*0.2*	*1*		0.84	2.40	3.54	3.45	2.00	1.32	1.17	1.18
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.017	0.020	0.010	0.013	0.015	0.015	0.014	0.015
Arsenic (As)	µg/L	*0.002*	*0.04*		0.617	0.726	0.369	0.385	0.512	0.456	0.501	0.451
Barium (Ba)	µg/L	*0.004*	*0.1*		2.56	3.05	2.27	2.27	2.14	2.24	2.02	2.03
Beryllium (Be)	µg/L	*0.003*	*0.01*		<0.003	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	0.004
Boron (B)	µg/L	*0.03*	*0.08*		25.1	28.5	19.1	19.3	22.1	21.5	20.3	20.1
Cadmium (Cd)	µg/L	*0.002*	*0.006*		<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium (Ca)	mg/L	*0.004*	*0.1*		8.11	8.77	6.18	6.19	6.36	6.28	6.64	6.74
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.27	0.25	0.15	0.18	0.28	0.29	0.21	0.23
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.013	0.020	0.014	0.015	0.011	0.012	0.010	0.010
Copper (Cu)	µg/L	*0.05*	*0.1*		1.27	1.40	0.64	0.70	1.22	1.32	1.19	1.13
Iron (Fe)	µg/L	*2*	*4*		5	41	13	14	<2	3	<2	<2
Lead (Pb)	µg/L	*0.001*	*0.006*		<0.001	0.002	0.040	0.038	0.116	0.121	0.026	0.026
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		7.95	7.02	5.35	5.39	5.95	5.85	6.00	6.04
Manganese (Mn)	µg/L	*0.003*	*0.03*		1.120	59.000	0.200	0.202	0.156	0.183	0.099	0.126
Molybdenum (Mo)	µg/L	*0.001*	*0.008*		0.135	0.144	0.107	0.105	0.116	0.114	0.136	0.131
Nickel (Ni)	µg/L	*0.005*	*0.06*		0.157	0.281	0.512	0.413	0.114	0.159	0.092	0.105
Potassium (K)	mg/L	*0.002*	*0.005*		2.71	2.91	2.03	2.03	2.06	2.04	2.16	2.17
Selenium (Se)	µg/L	*0.1*	*0.3*		1.8	2.0	0.8	0.9	0.8	0.9	0.8	0.8
Silver (Ag)	µg/L	*0.0005*	*0.005*		<0.0005	<0.0005	0.0012	0.0010	<0.0005	<0.0005	<0.0005	<0.0005
Sodium (Na)	mg/L	*0.002*	*0.006*		40.1	40.9	26.4	26.0	30.8	29.6	30.2	30.3
Strontium (Sr)	µg/L	*0.004*	*0.008*		45.4	50.4	34.7	34.6	35.4	36.5	38.4	39.0
Uranium (U)	µg/L	*0.0001*	*0.003*		0.0117	0.0204	0.0145	0.0141	0.0212	0.0162	0.0194	0.0132
Vanadium (V)	µg/L	*0.005*	*0.05*		0.028	0.050	0.024	0.016	0.034	0.039	0.010	0.010
Zinc (Zn)	µg/L	*0.05*	*0.2*		1.59	3.98	0.98	0.86	0.74	1.76	1.17	1.00
Nutrients												
Phosphorus, Total	mg/L	*0.001*	*0.008*		0.027	0.026	0.021	0.022	0.028	0.051	0.030	0.048
Ammonia-N	mg/L	*0.001*	*0.02*	*0.572*	0.005	0.018	0.003	0.007	0.008	0.008	0.010	0.007
Total Kjeldahl Nitrogen	mg/L	*0.01*	*0.05*		0.54	0.50	0.40	0.45	0.43	0.61	0.52	0.48
Dissolved Organic Carbon	mg/L	*0.2*	*0.6*		5.6	5.7	5.2	5.4	4.9	4.9	5.3	5.0
Carbon Part	mg/L	*0.02*	*0.2*		1.35	0.67	0.82	0.92	0.81	1.41	1.76	1.77
TOC (Calculated)		*0.8*			7.0	6.4	6.0	6.3	5.7	6.3	7.1	6.8
Fluoride (F)	mg/L	*0.01*	*0.04*		0.07	0.08	0.05	0.05	0.03	0.03	0.07	0.05
Sulphide	mg/L	*0.001*	*0.004*		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Suspended Solids	mg/L	*1*	*10*		2	<1	3	2	2	3	3	4
Routine												
Chloride (Cl)	mg/L	*0.3*	*0.6*		75.2	82.5	60.3	53.0	62.6	61.6	63.3	63.0
Nitrate+Nitrite-N	mg/L	*0.005*	*0.02*		0.010	0.104	<0.005	<0.005	<0.005	<0.005	<0.005	0.011
Nitrite-N	mg/L	*0.001*	*0.016*	*0.06*	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrate-N (calculated)	mg/L	*0.005*		*13*	0.010	0.104	<0.005	<0.005	<0.005	<0.005	<0.005	0.011
Sulphate (SO4)	mg/L	*3*	*6*		4	5	<3	<3	<3	<3	<3	<3
pH, EC and Alkalinity												
pH (Laboratory)	units	*N/A*	*N/A*	*6.5-9.0*	7.04	6.85	7.51	7.45	7.66	7.30	7.69	7.69
Conductivity (EC)	µS/cm	*0.1*	*2*		319	345	254	252	266	265	271	270
Bicarbonate (HCO_3)	mg/L	*1*	*5*		40	43	32	33	33	33	34	34
Carbonate	mg/L											
Alkalinity, Total	$mgCaCO_3/L$	*1*	*4*		33	35	27	27	27	27	28	28
P- Alkalinity	$mgCaCO_3/L$	*1*	*4*		<1	<1	<1	<1	<1	<1	<1	<1
Ion Balance												
Ion Balance		*N/A*	*N/A*		1.02	1.02	0.98	1.06	0.98	0.97	0.96	0.97
Anions	meq/L	*N/A*	*N/A*		2.86	3.13	2.28	2.07	2.35	2.32	2.38	2.37
Cations	meq/L	*N/A*	*N/A*		2.92	3.19	2.23	2.19	2.31	2.25	2.29	2.3
TDS (Calculated)	mg/L	*9*			159	175	124	116	128	126	129	129
Hardness, Total	$mgCaCO_3/L$	*0.01*	*0.25*		52.6	55.0	42.5	41.5	43.3	42.3	43.8	43.8
ICP Metals for Routine												
Calcium (Ca)	mg/L	*0.004*	*0.1*		8.60	9.00	7.03	6.76	7.07	6.98	7.06	7.04
Potassium (K)	mg/L	*0.1*	*0.1*		2.9	2.8	2.2	2.2	2.3	2.3	2.3	2.3
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		7.57	7.89	6.06	5.97	6.24	6.03	6.36	6.38
Sodium (Na)	mg/L	*0.5*	*1.5*		41.2	46.3	30.5	30.1	31.8	30.9	31.1	31.3
Other												
Color, True	TCU	*1*	*2*		12	10	12	12	12	12	6	<1
Cyanide, Total	mg/L	*0.001*	*0.004*		0.002	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
ARC Sample ID					0602746	0602747	0603484	0603485	0604180	0604178	0604983	0604982

Note: MRV = Minimum Reported Value; MDL = Method Detection Limit

[a] CCME (2006), except where noted [b] BCMOE (2006)

shaded cells indicate values that exceed the guidelines

Appendix B4. Water quality data for fresh water stations in the Doris North Project, 2006.

Parameter	Units	MRV	MDL	Fresh Water Guideline[a]	Tail Lake						
					31-May-06	20-Jul-06	20-Jul-06	12-Aug-06	12-Aug-06	13-Sep-06	13-Sep-06
					Middle	Top	Bottom	Top	Bottom	Top	Bottom
Total Metals											
Aluminum (Al)	µg/L	*0.5*	*2*	*5-100*	19.1	54.9	33.0	40.9	44.2	54.9	58.9
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.0122	0.0220	0.0107	0.0096	0.0094	0.0112	0.0099
Arsenic (As)	µg/L	*0.002*	*0.04*	*5*	0.628	0.241	0.236	0.373	0.347	0.316	0.328
Barium (Ba)	µg/L	*0.004*	*0.1*		2.31	2.09	1.53	1.72	1.71	1.83	1.87
Beryllium (Be)	µg/L	*0.003*	*0.01*		0.005	<0.003	<0.003	<0.003	<0.003	0.004	0.004
Bismuth (Bi)	µg/L	*0.001*	*0.01*		<0.001	0.004	0.005	0.002	0.003	<0.001	<0.001
Boron (B)	µg/L	*0.05*	*0.8*		25.8	17.4	16.2	16.1	15.6	13.9	14.2
Cadmium (Cd)	µg/L	*0.002*	*0.006*	*0.017*	<0.002	0.094	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium (Ca)	mg/L	*0.004*	*0.1*		7.36	5.38	5.38	5.41	5.41	5.57	5.71
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.377	0.288	0.231	0.253	0.237	0.168	0.200
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.031	0.036	0.018	0.024	0.023	0.019	0.022
Copper (Cu)	µg/L	*0.05*	*0.1*	*2*	1.55	1.30	1.26	1.34	1.14	1.07	1.15
Iron (Fe)	µg/L	*2*	*4*	*300*	91	76	51	71	75	82	89
Lead (Pb)	µg/L	*0.001*	*0.006*	*1*	0.031	0.104	0.047	0.105	0.103	0.045	0.052
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		5.79	4.56	4.55	4.67	4.26	4.54	4.62
Manganese (Mn)	µg/L	*0.003*	*0.03*		5.20	3.54	3.46	6.75	7.81	3.68	3.87
Molybdenum (Mo)	µg/L	*0.001*	*0.0080*	*73*	0.127	0.104	0.102	0.118	0.113	0.130	0.148
Mercury (Hg)	ng/L	*0.6*	*1.2*	*26*		<0.6	<0.6	<0.6	<0.6	1.600	<0.6
Nickel (Ni)	µg/L	*0.005*	*0.06*	*25*	0.808	0.484	0.395	0.506	0.456	0.401	0.453
Potassium (K)	mg/L	*0.002*	*0.005*		2.02	1.52	1.50	1.50	1.50	1.48	1.52
Selenium (Se)	µg/L	*0.1*	*0.3*	*1.0*	1.9	0.4	0.4	0.7	0.6	0.6	0.6
Silver (Ag)	µg/L	*0.0005*	*0.005*	*0.1*	<0.0005	0.001	0.001	0.001	0.001	0.001	<0.0005
Sodium (Na)	mg/L	*0.002*	*0.006*		18.2	15.5	15.6	15.9	16.1	15.9	16.4
Strontium (Sr)	µg/L	*0.004*	*0.008*		29.9	22.4	22.3	22.5	22.6	23.0	23.5
Thallium (Tl)	µg/L	*0.0003*	*0.003*		<0.003	0.017	0.020	0.007	0.007	0.013	0.013
Tin (Sn)	µg/L	*0.03*	*0.07*		5.630	0.049	3.990	2.420	0.329	0.918	2.780
Uranium (U)	µg/L	*0.0001*	*0.003*		0.021	0.025	0.023	0.029	0.030	0.031	0.032
Vanadium (V)	µg/L	*0.005*	*0.05*		0.036	0.141	0.092	0.104	0.087	0.049	0.066
Zinc (Zn)	µg/L	*0.1*	*0.2*	*7.5* [b]	8.24	5.07	1.03	4.50	1.10	1.14	1.21
Dissolved Metals											
Aluminum (Al)	µg/L	*0.2*	*1*		9.60	9.25	8.11	10.20	10.20	16.10	16.90
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.012	0.022	0.011	0.010	0.009	0.011	0.010
Arsenic (As)	µg/L	*0.002*	*0.04*		0.445	0.235	0.224	0.368	0.347	0.277	0.298
Barium (Ba)	µg/L	*0.004*	*0.1*		2.00	1.49	1.11	1.18	1.24	1.32	1.36
Beryllium (Be)	µg/L	*0.003*	*0.01*		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Boron (B)	µg/L	*0.03*	*0.08*		25.8	12.3	11.1	13.9	14.1	13.4	14.1
Cadmium (Cd)	µg/L	*0.002*	*0.006*		<0.002	0.061	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium (Ca)	mg/L	*0.004*	*0.1*		6.74	5.03	4.76	4.89	5.02	5.36	5.51
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.36	0.28	0.23	0.21	0.20	0.16	0.20
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.016	0.013	0.009	0.010	0.011	0.009	0.006
Copper (Cu)	µg/L	*0.05*	*0.1*		1.49	1.04	1.02	1.28	0.88	1.07	1.08
Iron (Fe)	µg/L	*2*	*4*		65	17	13	13	13	19	21
Lead (Pb)	µg/L	*0.001*	*0.006*		0.003	0.046	0.047	0.096	0.101	0.045	0.041
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		3.87	4.32	3.98	3.81	3.81	4.31	4.57
Manganese (Mn)	µg/L	*0.003*	*0.03*		1.570	0.280	0.235	0.253	0.233	0.546	0.465
Molybdenum (Mo)	µg/L	*0.001*	*0.008*		0.110	0.104	0.096	0.106	0.103	0.113	0.122
Nickel (Ni)	µg/L	*0.005*	*0.06*		0.804	0.398	0.329	0.372	0.378	0.393	0.393
Potassium (K)	mg/L	*0.002*	*0.005*		1.86	1.43	1.35	1.36	1.40	1.42	1.49
Selenium (Se)	µg/L	*0.1*	*0.3*		1.2	0.4	0.4	0.5	0.4	0.5	0.6
Silver (Ag)	µg/L	*0.0005*	*0.005*		<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Sodium (Na)	mg/L	*0.002*	*0.006*		15.8	14.7	14.1	14.6	14.9	15.5	16.0
Strontium (Sr)	µg/L	*0.004*	*0.008*		29.0	21.2	19.9	20.3	20.9	22.9	22.8
Uranium (U)	µg/L	*0.0001*	*0.003*		0.0151	0.0132	0.0140	0.0135	0.0115	0.0093	0.0093
Vanadium (V)	µg/L	*0.005*	*0.05*		0.035	0.082	0.080	0.028	0.053	0.048	0.026
Zinc (Zn)	µg/L	*0.05*	*0.2*		4.03	2.80	1.03	1.62	1.09	1.07	1.17
Nutrients											
Phosphorus, Total	mg/L	*0.001*	*0.008*		0.021	0.014	0.014	0.021	0.022	0.030	0.019
Ammonia-N	mg/L	*0.001*	*0.02*	*0.572*	0.052	0.079	0.010	0.011	0.008	0.011	0.006
Total Kjeldahl Nitrogen	mg/L	*0.01*	*0.05*		0.63	0.32	0.32	0.30	0.29	0.27	0.28
Dissolved Organic Carbon	mg/L	*0.2*	*0.6*		9.1	5.2	5.0	4.9	5.0	5.2	5.3
Carbon Part	mg/L	*0.02*	*0.2*		0.35	0.13	0.16	0.13	0.16	0.10	0.25
TOC (Calculated)		*0.8*			9.5	5.3	5.2	5.0	5.2	5.3	5.6
Fluoride (F)	mg/L	*0.01*	*0.04*		0.06	0.07	0.07	0.04	0.04	0.08	0.07
Sulphide	mg/L	*0.001*	*0.004*		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Suspended Solids	mg/L	*1*	*10*		<1	<1	<1	<1	<1	<1	<1
Routine											
Chloride (Cl)	mg/L	*0.3*	*0.6*		38.7	28.8	31.4	32.2	29.4	30.3	30.5
Nitrate+Nitrite-N	mg/L	*0.005*	*0.02*		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrite-N	mg/L	*0.001*	*0.016*	*0.06*	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrate-N (calculated)	mg/L	*0.005*		*13*	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Sulphate (SO4)	mg/L	*3*	*6*		4	<3	<3	<3	<3	<3	<3
pH, EC and Alkalinity											
pH (Laboratory)	units	*N/A*	*N/A*	*6.5-9.0*	7.00	7.48	7.47	7.60	7.58	7.60	7.61
Conductivity (EC)	µS/cm	*0.1*	*2*		192	151	151	153	153	160	159
Bicarbonate (HCO_3)	mg/L	*1*	*5*		39	30	30	31	31	32	32
Carbonate	mg/L										
Alkalinity, Total	mgCaCO$_3$/L	*1*	*4*		32	25	25	26	26	27	27
P- Alkalinity	mgCaCO$_3$/L	*1*	*4*		<1	<1	<1	<1	<1	<1	<1
Ion Balance											
Ion Balance		*N/A*	*N/A*		1.02	0.95	0.94	0.91	0.94	0.94	0.93
Anions	meq/L	*N/A*	*N/A*		1.8	1.35	1.43	1.47	1.39	1.43	1.44
Cations	meq/L	*N/A*	*N/A*		1.83	1.29	1.35	1.34	1.3	1.35	1.34
TDS (Calculated)	mg/L	*9*			98	71	75	77	73	75	75
Hardness, Total	mgCaCO$_3$/L	*0.01*	*0.25*		42.1	31.0	30.8	28.8	30.8	32.6	32.0
ICP Metals for Routine											
Calcium (Ca)	mg/L	*0.004*	*0.1*		7.33	5.15	5.16	5.41	5.54	5.57	5.57
Potassium (K)	mg/L	*0.1*	*0.1*		2.2	1.5	1.5	1.6	1.5	1.5	1.5
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		5.79	4.41	4.36	3.72	4.12	4.54	4.40
Sodium (Na)	mg/L	*0.5*	*1.5*		21.3	14.4	15.9	16.6	15.0	15.1	15.2
Other											
Color, True	TCU	*1*	*2*		41	14	14	12	9	6	6
Cyanide, Total	mg/L	*0.001*	*0.004*		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
ARC Sample ID					0602742	0603701	0603700	0604191	0604186	0604985	0604984

Note: MRV = Minimum Reported Value; MDL = Method Detection Limit
[a] CCME (2006), except where noted [b] BCMOE (2006)
shaded cells indicate values that exceed the guidelines

Appendix B4. Water quality data for fresh water stations in the Doris North Project, 2006.

Parameter	Units	MRV	MDL	Fresh Water Guideline[a]	Roberts Lake						
					30-May-06 Middle	14-Jul-06 Top	14-Jul-06 Bottom	10-Aug-06 Top	10-Aug-06 Bottom	11-Sep-06 Top	11-Sep-06 Bottom
Total Metals											
Aluminum (Al)	µg/L	*0.5*	*2*	*5-100*	45.2	130.0	137.0	58.7	65.8	65.0	69.6
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.0160	0.0106	0.0112	0.0134	0.0132	0.0128	0.0157
Arsenic (As)	µg/L	*0.002*	*0.04*	*5*	0.767	0.413	0.420	0.529	0.484	0.381	0.460
Barium (Ba)	µg/L	*0.004*	*0.1*		3.20	3.67	3.75	2.65	3.02	2.77	2.79
Beryllium (Be)	µg/L	*0.003*	*0.01*		0.005	0.004	0.004	0.004	<0.003	<0.003	0.003
Bismuth (Bi)	µg/L	*0.001*	*0.01*		<0.001	0.011	0.005	0.004	0.014	0.010	<0.001
Boron (B)	µg/L	*0.05*	*0.8*		31.0	20.5	20.8	23.9	23.9	26.1	25.6
Cadmium (Cd)	µg/L	*0.002*	*0.006*	*0.017*	0.007	0.010	0.005	<0.002	<0.002	<0.002	<0.002
Calcium (Ca)	mg/L	*0.004*	*0.1*		6.58	5.12	5.08	5.35	5.40	5.62	5.72
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.361	0.370	0.399	0.299	0.325	0.188	0.367
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.043	0.065	0.063	0.033	0.036	0.019	0.028
Copper (Cu)	µg/L	*0.05*	*0.1*	*2*	1.62	1.10	1.06	1.73	1.70	1.67	3.78
Iron (Fe)	µg/L	*2*	*4*	*300*	80	173	171	64	86	50	77
Lead (Pb)	µg/L	*0.001*	*0.006*	*1*	0.017	0.088	0.084	0.128	0.132	0.109	0.088
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		6.83	5.16	5.19	5.92	6.04	5.95	6.34
Manganese (Mn)	µg/L	*0.003*	*0.03*		43.50	9.27	9.14	5.32	6.38	3.82	4.76
Molybdenum (Mo)	µg/L	*0.001*	*0.0080*	*73*	0.202	0.188	0.200	0.185	0.184	0.196	0.176
Mercury (Hg)	ng/L	*0.6*	*1.2*	*26*		5.200	2.100	4.500	9.900	4.000	<0.6
Nickel (Ni)	µg/L	*0.005*	*0.06*	*25*	0.497	0.665	0.664	0.425	0.439	2.780	0.485
Potassium (K)	mg/L	*0.002*	*0.005*		2.47	1.95	1.94	2.01	2.05	2.06	2.14
Selenium (Se)	µg/L	*0.1*	*0.3*	*1.0*	2.1	0.8	0.9	1.2	1.2	0.8	1.1
Silver (Ag)	µg/L	*0.0005*	*0.005*	*0.1*	0.010	0.003	0.002	0.002	0.001	0.002	<0.0005
Sodium (Na)	mg/L	*0.002*	*0.006*		35.5	26.3	27.3	30.5	31.2	30.6	33.7
Strontium (Sr)	µg/L	*0.004*	*0.008*		43.6	36.2	36.3	36.5	36.2	36.8	36.6
Thallium (Tl)	µg/L	*0.0003*	*0.003*		<0.003	0.018	0.017	0.007	0.010	0.018	0.012
Tin (Sn)	µg/L	*0.03*	*0.07*		0.460	0.451	3.430	8.630	2.570	0.955	7.000
Uranium (U)	µg/L	*0.0001*	*0.003*		0.043	0.050	0.049	0.048	0.045	0.043	0.044
Vanadium (V)	µg/L	*0.005*	*0.05*		0.162	0.260	0.277	0.134	0.105	0.112	0.118
Zinc (Zn)	µg/L	*0.1*	*0.2*	*7.5* [b]	2.53	1.19	0.78	1.45	1.83	1.78	2.74
Dissolved Metals											
Aluminum (Al)	µg/L	*0.2*	*1*		5.02	7.80	6.44	3.37	2.24	3.76	3.78
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.015	0.010	0.011	0.013	0.013	0.012	0.016
Arsenic (As)	µg/L	*0.002*	*0.04*		0.499	0.345	0.324	0.448	0.379	0.336	0.380
Barium (Ba)	µg/L	*0.004*	*0.1*		2.37	1.93	1.91	1.88	1.97	2.02	2.03
Beryllium (Be)	µg/L	*0.003*	*0.01*		<0.003	<0.003	0.004	<0.003	<0.003	<0.003	<0.003
Boron (B)	µg/L	*0.03*	*0.08*		28.7	19.4	19.1	22.4	21.5	22.9	23.3
Cadmium (Cd)	µg/L	*0.002*	*0.006*		<0.002	0.010	0.005	<0.002	<0.002	<0.002	<0.002
Calcium (Ca)	mg/L	*0.004*	*0.1*		5.74	4.75	4.69	5.02	4.93	5.32	5.48
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.36	0.17	0.22	0.28	0.22	0.18	0.36
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.019	0.012	0.014	0.010	0.010	0.006	0.008
Copper (Cu)	µg/L	*0.05*	*0.1*		1.32	0.74	1.04	1.29	1.16	1.35	3.06
Iron (Fe)	µg/L	*2*	*4*		28	16	15	3	4	4	4
Lead (Pb)	µg/L	*0.001*	*0.006*		<0.001	0.046	0.045	0.109	0.099	0.036	0.088
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		6.11	4.84	4.80	5.60	5.48	5.56	5.99
Manganese (Mn)	µg/L	*0.003*	*0.03*		30.200	0.267	0.271	0.177	0.168	0.171	0.180
Molybdenum (Mo)	µg/L	*0.001*	*0.008*		0.174	0.174	0.176	0.176	0.174	0.178	0.176
Nickel (Ni)	µg/L	*0.005*	*0.06*		0.394	0.496	0.570	0.306	0.322	0.277	0.309
Potassium (K)	mg/L	*0.002*	*0.005*		2.18	1.74	1.73	1.87	1.86	2.00	2.02
Selenium (Se)	µg/L	*0.1*	*0.3*		2.1	0.7	0.6	0.8	0.7	0.8	0.7
Silver (Ag)	µg/L	*0.0005*	*0.005*		<0.0005	0.0006	0.0012	<0.0005	<0.0005	<0.0005	<0.0005
Sodium (Na)	mg/L	*0.002*	*0.006*		32.1	25.5	24.7	29.0	28.4	28.5	32.1
Strontium (Sr)	µg/L	*0.004*	*0.008*		39.3	33.4	32.7	33.7	33.2	34.6	35.1
Uranium (U)	µg/L	*0.0001*	*0.003*		0.0224	0.0219	0.0243	0.0247	0.0228	0.0225	0.0276
Vanadium (V)	µg/L	*0.005*	*0.05*		0.093	0.024	0.028	0.045	0.021	0.036	0.101
Zinc (Zn)	µg/L	*0.05*	*0.2*		2.46	1.17	0.77	1.42	1.05	1.09	1.17
Nutrients											
Phosphorus, Total	mg/L	*0.001*	*0.008*		0.020	0.020	0.019	0.027	0.038	0.026	0.013
Ammonia-N	mg/L	*0.001*	*0.02*	*0.572*	0.006	0.035	0.006	0.006	0.008	0.007	0.005
Total Kjeldahl Nitrogen	mg/L	*0.01*	*0.05*		0.34	0.34	0.30	0.37	0.40	0.28	0.28
Dissolved Organic Carbon	mg/L	*0.2*	*0.6*		4.9	4.8	4.7	4.1	4.1	4.0	4.3
Carbon Part	mg/L	*0.02*	*0.2*		0.32	0.49	0.41	0.41	0.50	0.45	0.43
TOC (Calculated)		*0.8*			5.2	5.3	5.1	4.5	4.6	4.5	4.7
Fluoride (F)	mg/L	*0.01*	*0.04*		0.05	0.06	0.07	0.03	0.03	0.05	0.05
Sulphide	mg/L	*0.001*	*0.004*		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Suspended Solids	mg/L	*1*	*10*		<1	4	4	<1	2	<1	2
Routine											
Chloride (Cl)	mg/L	*0.3*	*0.6*		69.4	56.5	56.5	57.4	57.3	58.3	71.7
Nitrate+Nitrite-N	mg/L	*0.005*	*0.02*		<0.005	<0.005	<0.005	0.009	<0.005	<0.005	<0.005
Nitrite-N	mg/L	*0.001*	*0.016*	*0.06*	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrate-N (calculated)	mg/L	*0.005*		*13*	<0.005	<0.005	<0.005	0.009	<0.005	<0.005	<0.005
Sulphate (SO4)	mg/L	*3*	*6*		5	4	4	4	4	4	6
pH, EC and Alkalinity											
pH (Laboratory)	units	*N/A*	*N/A*	*6.5-9.0*	7.05	7.16	7.47	7.42	7.30	7.49	7.52
Conductivity (EC)	µS/cm	*0.1*	*2*		285	233	230	244	243	259	270
Bicarbonate (HCO_3)	mg/L	*1*	*5*		31	26	24	26	27	27	27
Carbonate	mg/L										
Alkalinity, Total	mg$CaCO_3$/L	*1*	*4*		25	21	19	22	22	22	22
P- Alkalinity	mg$CaCO_3$/L	*1*	*4*		<1	<1	<1	<1	<1	<1	<1
Ion Balance											
Ion Balance		*N/A*	*N/A*		1.03	0.96	0.96	0.99	0.96	0.95	0.91
Anions	meq/L	*N/A*	*N/A*		2.56	2.1	2.08	2.13	2.14	2.16	2.6
Cations	meq/L	*N/A*	*N/A*		2.65	2.02	1.99	2.1	2.06	2.05	2.36
TDS (Calculated)	mg/L	*9*			144	115	113	117	117	117	141
Hardness, Total	mg$CaCO_3$/L	*0.01*	*0.25*		43.0	35.5	35.0	38.0	37.1	36.8	36.9
ICP Metals for Routine											
Calcium (Ca)	mg/L	*0.004*	*0.1*		6.22	5.31	5.18	5.61	5.51	5.48	5.49
Potassium (K)	mg/L	*0.1*	*0.1*		2.5	2.0	2.0	2.0	2.1	2.0	2.3
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		6.66	5.40	5.35	5.83	5.66	5.62	5.64
Sodium (Na)	mg/L	*0.5*	*1.5*		39.7	29.0	28.4	29.6	29.1	29.0	36.1
Other											
Color, True	TCU	*1*	*2*		14	12	12	9	12	5	8
Cyanide, Total	mg/L	*0.001*	*0.004*		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
ARC Sample ID					0602744	0603480	0603481	0604185	0604183	0604938	0604941

Note: MRV = Minimum Reported Value; MDL = Method Detection Limit

[a] CCME (2006), except where noted [b] BCMOE (2006)

shaded cells indicate values that exceed the guidelines

Appendix B4. Water quality data for fresh water stations in the Doris North Project, 2006.

Parameter	Units	MRV	MDL	Fresh Water Guideline[a]	Little Roberts Lake				Doris Outflow			
					30-May-06 Bottom	14-Jul-06	11-Aug-06	13-Sep-06	18-Jun-06	24-Jun-06	30-Jun-06	7-Jul-06
Total Metals												
Aluminum (Al)	µg/L	*0.5*	*2*	*5-100*	245.0	90.9	48.2	54.5	106.0	78.2	75.1	87.4
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.0201	0.0120	0.0148	0.0146	0.0120	0.0117	0.0126	0.0149
Arsenic (As)	µg/L	*0.002*	*0.04*	*5*	0.431	0.438	0.638	0.568	0.376	0.370	0.420	0.507
Barium (Ba)	µg/L	*0.004*	*0.1*		5.45	3.39	2.85	3.37	3.46	3.10	3.47	3.80
Beryllium (Be)	µg/L	*0.003*	*0.01*		0.007	<0.003	<0.003	<0.003	0.003	0.007	<0.003	0.007
Bismuth (Bi)	µg/L	*0.001*	*0.01*		<0.001	0.004	0.003	0.001	<0.001	0.003	0.002	0.003
Boron (B)	µg/L	*0.05*	*0.8*		15.7	20.8	25.3	24.0	19.5	18.8	21.0	20.8
Cadmium (Cd)	µg/L	*0.002*	*0.006*	*0.017*	<0.002	0.008	<0.002	<0.002	0.002	0.003	<0.002	0.003
Calcium (Ca)	mg/L	*0.004*	*0.1*		5.36	5.93	6.74	8.09	6.35	6.29	6.97	6.93
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.432	0.330	0.354	0.266	0.775	0.278	0.270	0.344
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.133	0.057	0.046	0.045	0.054	0.047	0.044	0.051
Copper (Cu)	µg/L	*0.05*	*0.1*	*2*	1.96	1.10	1.61	1.49	1.30	1.26	1.30	1.53
Iron (Fe)	µg/L	*2*	*4*	*300*	185	140	155	184	125	101	145	141
Lead (Pb)	µg/L	*0.001*	*0.006*	*1*	0.149	0.066	0.142	0.050	0.035	0.086	0.043	0.055
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		3.94	5.51	6.46	7.53	5.84	5.29	5.22	5.50
Manganese (Mn)	µg/L	*0.003*	*0.03*		20.20	9.00	14.30	8.68	13.00	9.86	18.00	15.10
Molybdenum (Mo)	µg/L	*0.001*	*0.0080*	*73*	0.178	0.161	0.175	0.153	0.116	0.105	0.115	0.121
Mercury (Hg)	ng/L	*0.6*	*1.2*	*26*		<0.6	12.000	0.900	<0.6	<0.6	<0.6	<0.6
Nickel (Ni)	µg/L	*0.005*	*0.06*	*25*	0.785	0.656	0.390	0.413	0.850	0.437	0.383	0.531
Potassium (K)	mg/L	*0.002*	*0.005*		1.92	2.07	2.14	2.39	2.20	2.03	2.10	2.28
Selenium (Se)	µg/L	*0.1*	*0.3*	*1.0*	0.6	1.0	1.1	1.5	0.8	0.8	1.0	1.4
Silver (Ag)	µg/L	*0.0005*	*0.005*	*0.1*	0.001	0.003	0.001	0.001	0.001	0.002	0.001	0.001
Sodium (Na)	mg/L	*0.002*	*0.006*		19.3	27.5	33.4	36.8	26.4	26.3	27.9	29.5
Strontium (Sr)	µg/L	*0.004*	*0.008*		29.5	37.8	41.2	48.6	39.0	33.5	36.6	38.2
Thallium (Tl)	µg/L	*0.0003*	*0.003*		<0.003	0.015	0.009	0.012	0.005	0.005	0.005	0.008
Tin (Sn)	µg/L	*0.03*	*0.07*		5.750	0.200	6.940	3.930	<0.03	<0.03	<0.03	<0.03
Uranium (U)	µg/L	*0.0001*	*0.003*		0.041	0.043	0.041	0.034	0.026	0.028	0.030	0.032
Vanadium (V)	µg/L	*0.005*	*0.05*		0.346	0.191	0.153	0.063	0.279	0.627	0.794	0.129
Zinc (Zn)	µg/L	*0.1*	*0.2*	*7.5* [b]	6.77	0.39	2.10	2.50	1.87	5.83	10.10	12.20
Dissolved Metals												
Aluminum (Al)	µg/L	*0.2*	*1*		59.80	5.67	4.33	4.20	15.00	9.47	5.48	5.05
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.020	0.012	0.015	0.015	0.012	0.012	0.012	0.015
Arsenic (As)	µg/L	*0.002*	*0.04*		0.391	0.368	0.530	0.457	0.337	0.300	0.334	0.392
Barium (Ba)	µg/L	*0.004*	*0.1*		2.90	2.09	2.05	2.72	2.24	2.07	2.26	2.18
Beryllium (Be)	µg/L	*0.003*	*0.01*		<0.003	<0.003	<0.003	<0.003	<0.003	0.005	<0.003	<0.003
Boron (B)	µg/L	*0.03*	*0.08*		15.2	19.8	23.7	21.5	17.8	17.2	19.5	16.7
Cadmium (Cd)	µg/L	*0.002*	*0.006*		<0.002	0.008	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium (Ca)	mg/L	*0.004*	*0.1*		5.10	5.49	6.23	7.73	5.81	5.84	6.21	5.89
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.39	0.23	0.33	0.25	0.62	0.23	0.11	0.19
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.028	0.014	0.012	0.014	0.012	0.015	0.011	0.011
Copper (Cu)	µg/L	*0.05*	*0.1*		1.80	0.77	1.23	1.45	1.12	1.05	1.04	1.04
Iron (Fe)	µg/L	*2*	*4*		57	18	11	18	31	15	16	13
Lead (Pb)	µg/L	*0.001*	*0.006*		0.035	0.043	0.117	0.033	0.010	0.012	0.007	0.021
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		3.74	5.16	5.99	7.00	5.38	4.94	4.86	4.68
Manganese (Mn)	µg/L	*0.003*	*0.03*		3.050	0.311	0.178	0.188	4.000	1.410	0.595	0.424
Molybdenum (Mo)	µg/L	*0.001*	*0.008*		0.158	0.152	0.154	0.145	0.107	0.099	0.104	0.106
Nickel (Ni)	µg/L	*0.005*	*0.06*		0.648	0.504	0.281	0.240	0.276	0.252	0.190	0.186
Potassium (K)	mg/L	*0.002*	*0.005*		1.81	1.90	2.00	2.24	1.98	1.86	1.89	1.88
Selenium (Se)	µg/L	*0.1*	*0.3*		0.6	0.8	0.8	0.9	0.8	0.6	0.7	0.9
Silver (Ag)	µg/L	*0.0005*	*0.005*		<0.0005	0.0008	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Sodium (Na)	mg/L	*0.002*	*0.006*		19.2	26.5	31.2	34.7	24.6	24.2	26.2	26.8
Strontium (Sr)	µg/L	*0.004*	*0.008*		28.9	34.5	37.3	47.9	36.3	30.5	33.8	31.0
Uranium (U)	µg/L	*0.0001*	*0.003*		0.0285	0.0209	0.0226	0.0146	0.0167	0.0147	0.0171	0.0135
Vanadium (V)	µg/L	*0.005*	*0.05*		0.121	0.037	0.034	0.010	0.152	0.396	0.451	0.019
Zinc (Zn)	µg/L	*0.05*	*0.2*		12.30	0.39	2.08	2.18	1.87	2.36	1.19	3.09
Nutrients												
Phosphorus, Total	mg/L	*0.001*	*0.008*		0.026	0.018	0.019	0.031	0.019	0.020	0.022	0.022
Ammonia-N	mg/L	*0.001*	*0.02*	*0.572*	0.022	0.004	0.008	0.005	0.008	0.008	0.014	0.015
Total Kjeldahl Nitrogen	mg/L	*0.01*	*0.05*		0.36	0.36	0.40	0.37	0.42	0.42	0.47	0.51
Dissolved Organic Carbon	mg/L	*0.2*	*0.6*		6.6	5.0	4.8	4.9	5.3	4.6	5.0	4.7
Carbon Part	mg/L	*0.02*	*0.2*		0.33	0.47	0.67	0.92	0.94	0.90	1.00	1.22
TOC (Calculated)		*0.8*			6.9	5.5	5.5	5.8	6.2	5.5	6.0	5.9
Fluoride (F)	mg/L	*0.01*	*0.04*		0.04	0.06	0.06	0.05	0.05	0.06	0.05	0.06
Sulphide	mg/L	*0.001*	*0.004*			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Suspended Solids	mg/L	*1*	*10*		2	3	2	<1	2	2	3	3
Routine												
Chloride (Cl)	mg/L	*0.3*	*0.6*		41.2	59.4	63.1	74.2	55.9	54.6	60.6	61.1
Nitrate+Nitrite-N	mg/L	*0.005*	*0.02*		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrite-N	mg/L	*0.001*	*0.016*	*0.06*	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002
Nitrate-N (calculated)	mg/L	*0.005*		*13*	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Sulphate (SO4)	mg/L	*3*	*6*		4	4	<3	5	5	7	<3	<3
pH, EC and Alkalinity												
pH (Laboratory)	units	*N/A*	*N/A*	*6.5-9.0*	6.93	7.13	7.50	7.48	7.08	7.11	7.14	7.10
Conductivity (EC)	µS/cm	*0.1*	*2*		183	240	270	310	223	235	250	265
Bicarbonate (HCO_3)	mg/L	*1*	*5*		27	29	32	32	31	29	33	33
Carbonate	mg/L											
Alkalinity, Total	mg$CaCO_3$/L	*1*	*4*		22	24	26	27	26	24	27	27
P- Alkalinity	mg$CaCO_3$/L	*1*	*4*		<1	<1	<1	<1	<1	<1	<1	<1
Ion Balance												
Ion Balance		*N/A*	*N/A*		0.97	0.95	0.98	0.97	0.91	0.9	0.93	0.96
Anions	meq/L	*N/A*	*N/A*		1.69	2.22	2.37	2.72	2.19	2.15	2.29	2.3
Cations	meq/L	*N/A*	*N/A*		1.64	2.12	2.32	2.63	1.98	1.94	2.12	2.22
TDS (Calculated)	mg/L	*9*			93	121	130	149	117	116	123	126
Hardness, Total	mg$CaCO_3$/L	*0.01*	*0.25*		29.6	38.4	44.0	49.7	36.4	36.2	38.5	38.8
ICP Metals for Routine												
Calcium (Ca)	mg/L	*0.004*	*0.1*		5.34	6.01	7.02	7.90	5.99	6.29	6.96	6.87
Potassium (K)	mg/L	*0.1*	*0.1*		2.0	2.1	2.2	2.4	2.1	2.1	2.2	2.3
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		3.94	5.68	6.43	7.28	5.20	4.97	5.13	5.26
Sodium (Na)	mg/L	*0.5*	*1.5*		22.9	29.9	31.9	36.2	27.6	26.9	29.8	31.9
Other												
Color, True	TCU	*1*	*2*		31	12	12	4	13	15	12	12
Cyanide, Total	mg/L	*0.001*	*0.004*		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
ARC Sample ID					0602740	0603482	0604181	0604980	0602968	0603048	0603136	0603382

Note: MRV = Minimum Reported Value; MDL = Method Detection Limit

[a] CCME (2006), except where noted [b] BCMOE (2006)

shaded cells indicate values that exceed the guidelines

CWQG = Canadian Water Quality Guidelines for Protection of F

Appendix B4. Water quality data for fresh water stations in the Doris North Project, 2006.

Parameter	Units	MRV	MDL	Fresh Water Guideline[a]	Doris Outflow							
					13-Jul-06	20-Jul-06	28-Jul-06	4-Aug-06	11-Aug-06	18-Aug-06	26-Aug-06	1-Sep-06
Total Metals												
Aluminum (Al)	µg/L	*0.5*	*2*	*5-100*	73.6	64.8	59.9	32.8	41.9	58.6	39.5	146.0
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.0103	0.0123	0.0124	0.0140	0.0143	0.0158	0.0164	0.0126
Arsenic (As)	µg/L	*0.002*	*0.04*	*5*	0.443	0.398	0.427	0.488	0.513	0.628	0.668	0.727
Barium (Ba)	µg/L	*0.004*	*0.1*		3.36	3.13	3.32	2.88	2.89	3.01	2.97	4.80
Beryllium (Be)	µg/L	*0.003*	*0.01*		<0.003	<0.003	0.004	<0.003	<0.003	<0.003	0.003	0.007
Bismuth (Bi)	µg/L	*0.001*	*0.01*		0.002	0.001	0.002	0.005	0.003	0.002	<0.001	<0.001
Boron (B)	µg/L	*0.05*	*0.8*		21.3	23.0	24.4	24.1	23.6	23.6	22.8	22.4
Cadmium (Cd)	µg/L	*0.002*	*0.006*	*0.017*	0.011	0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002
Calcium (Ca)	mg/L	*0.004*	*0.1*		6.88	6.70	7.33	7.11	7.35	8.03	8.13	8.39
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.271	0.248	0.229	0.303	0.305	0.312	0.347	0.485
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.046	0.040	0.051	0.037	0.050	0.062	0.053	0.136
Copper (Cu)	µg/L	*0.05*	*0.1*	*2*	0.98	1.43	1.46	1.44	1.42	1.52	1.50	1.48
Iron (Fe)	µg/L	*2*	*4*	*300*	113	100	117	78	105	116	106	356
Lead (Pb)	µg/L	*0.001*	*0.006*	*1*	0.056	0.053	0.144	0.134	0.130	0.117	0.052	0.096
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		5.90	6.15	6.27	6.29	6.47	6.77	6.05	6.12
Manganese (Mn)	µg/L	*0.003*	*0.03*		10.80	12.30	18.90	16.10	18.10	18.10	19.30	64.20
Molybdenum (Mo)	µg/L	*0.001*	*0.0080*	*73*	0.119	0.148	0.127	0.129	0.133	0.150	0.148	0.154
Mercury (Hg)	ng/L	*0.6*	*1.2*	*26*	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Nickel (Ni)	µg/L	*0.005*	*0.06*	*25*	0.643	0.331	0.586	0.345	0.316	0.449	0.502	0.547
Potassium (K)	mg/L	*0.002*	*0.005*		2.25	2.20	2.35	2.25	2.23	2.37	2.42	2.47
Selenium (Se)	µg/L	*0.1*	*0.3*	*1.0*	1.2	0.8	0.9	1.3	1.1	1.6	1.7	1.6
Silver (Ag)	µg/L	*0.0005*	*0.005*	*0.1*	0.002	0.002	0.005	0.001	0.001	0.002	<0.0005	<0.0005
Sodium (Na)	mg/L	*0.002*	*0.006*		28.1	31.6	30.5	31.8	32.6	33.1	33.6	33.0
Strontium (Sr)	µg/L	*0.004*	*0.008*		38.8	37.0	39.1	39.1	40.8	44.3	42.6	44.6
Thallium (Tl)	µg/L	*0.0003*	*0.003*		0.013	0.012	0.022	0.012	0.013	0.003	<0.003	<0.003
Tin (Sn)	µg/L	*0.03*	*0.07*		0.111	0.124	<0.03	0.035	0.037	0.061	0.032	<0.03
Uranium (U)	µg/L	*0.0001*	*0.003*		0.034	0.033	0.032	0.035	0.037	0.038	0.036	0.041
Vanadium (V)	µg/L	*0.005*	*0.05*		0.147	0.152	0.139	0.116	0.067	0.140	0.093	0.336
Zinc (Zn)	µg/L	*0.1*	*0.2*	*7.5* [b]	1.06	0.99	1.24	1.77	3.57	8.44	1.35	3.10
Dissolved Metals												
Aluminum (Al)	µg/L	*0.2*	*1*		5.59	4.16	3.69	1.47	1.64	2.53	0.91	0.76
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.010	0.011	0.012	0.014	0.014	0.016	0.016	0.012
Arsenic (As)	µg/L	*0.002*	*0.04*		0.403	0.304	0.340	0.442	0.421	0.515	0.402	0.470
Barium (Ba)	µg/L	*0.004*	*0.1*		2.22	2.22	2.12	2.15	2.06	2.12	2.18	2.40
Beryllium (Be)	µg/L	*0.003*	*0.01*		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Boron (B)	µg/L	*0.03*	*0.08*		19.1	20.3	23.6	20.5	20.7	22.2	21.4	21.0
Cadmium (Cd)	µg/L	*0.002*	*0.006*		0.007	0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium (Ca)	mg/L	*0.004*	*0.1*		6.25	6.39	6.53	6.63	6.68	7.25	7.71	7.97
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.27	0.24	0.11	0.30	0.26	0.25	0.35	0.31
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.019	0.011	0.016	0.012	0.013	0.014	0.018	0.017
Copper (Cu)	µg/L	*0.05*	*0.1*		0.73	1.17	1.25	1.11	1.10	1.15	1.15	1.20
Iron (Fe)	µg/L	*2*	*4*		17	7	13	5	4	7	8	5
Lead (Pb)	µg/L	*0.001*	*0.006*		0.039	0.034	0.132	0.115	0.123	0.112	0.041	0.037
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		5.32	5.75	5.66	5.85	5.84	6.14	5.83	5.83
Manganese (Mn)	µg/L	*0.003*	*0.03*		0.332	0.237	0.552	0.162	0.202	0.214	0.305	0.317
Molybdenum (Mo)	µg/L	*0.001*	*0.008*		0.111	0.141	0.122	0.118	0.122	0.131	0.136	0.138
Nickel (Ni)	µg/L	*0.005*	*0.06*		0.466	0.159	0.195	0.162	0.174	0.150	0.131	0.146
Potassium (K)	mg/L	*0.002*	*0.005*		2.02	2.06	2.07	2.06	2.06	2.11	2.27	2.30
Selenium (Se)	µg/L	*0.1*	*0.3*		0.9	0.6	0.5	0.8	0.8	0.8	0.9	1.1
Silver (Ag)	µg/L	*0.0005*	*0.005*		0.0012	<0.0005	0.0045	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Sodium (Na)	mg/L	*0.002*	*0.006*		25.8	29.9	29.0	29.8	29.8	30.4	32.5	32.3
Strontium (Sr)	µg/L	*0.004*	*0.008*		34.8	34.8	34.3	36.4	36.9	40.0	39.7	41.4
Uranium (U)	µg/L	*0.0001*	*0.003*		0.0162	0.0168	0.0221	0.0176	0.0205	0.0178	0.0187	0.0161
Vanadium (V)	µg/L	*0.005*	*0.05*		0.016	0.092	0.034	0.075	0.023	0.046	0.014	0.030
Zinc (Zn)	µg/L	*0.05*	*0.2*		1.05	0.87	1.16	0.84	2.52	1.54	1.26	1.45
Nutrients												
Phosphorus, Total	mg/L	*0.001*	*0.008*		0.026	0.024	0.050	0.045	0.030	0.035	0.036	0.039
Ammonia-N	mg/L	*0.001*	*0.02*	*0.572*	0.015	0.027	0.026	0.013	0.012	0.011	0.019	0.009
Total Kjeldahl Nitrogen	mg/L	*0.01*	*0.05*		0.46	0.47	0.63	0.53	0.47	0.49	0.51	0.52
Dissolved Organic Carbon	mg/L	*0.2*	*0.6*		5.5	5.0	5.2	5.1	5.0	5.2	4.9	3.6
Carbon Part	mg/L	*0.02*	*0.2*		0.69	0.78	1.17	0.85	0.96	1.03	1.22	1.46
TOC (Calculated)		*0.8*			6.2	5.8	6.4	6.0	6.0	6.2	6.1	5.1
Fluoride (F)	mg/L	*0.01*	*0.04*		0.05	0.06	0.05	0.03	0.03	0.04	0.04	0.04
Sulphide	mg/L	*0.001*	*0.004*		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Suspended Solids	mg/L	*1*	*10*		3	3	4	2	2	3	4	3
Routine												
Chloride (Cl)	mg/L	*0.3*	*0.6*		59.8	76.8	62.1	62.4	63.6	65.8	63.8	65.3
Nitrate+Nitrite-N	mg/L	*0.005*	*0.02*		<0.005	<0.005	0.009	<0.005	<0.005	<0.005	0.006	<0.005
Nitrite-N	mg/L	*0.001*	*0.016*	*0.06*	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003
Nitrate-N (calculated)	mg/L	*0.005*		*13*	<0.005	<0.005	0.009	<0.005	<0.005	<0.005	0.006	<0.005
Sulphate (SO4)	mg/L	*3*	*6*		<3	<3	5	<3	<3	<3	<3	<3
pH, EC and Alkalinity												
pH (Laboratory)	units	*N/A*	*N/A*	*6.5-9.0*	6.92	7.41	7.18	7.56	7.60	7.56	7.46	7.49
Conductivity (EC)	µS/cm	*0.1*	*2*		249	276	265	267	271	276	279	284
Bicarbonate (HCO_3)	mg/L	*1*	*5*		30	45	33	33	34	34	34	35
Carbonate	mg/L											
Alkalinity, Total	mg$CaCO_3$/L	*1*	*4*		25	37	27	27	28	28	28	29
P- Alkalinity	mg$CaCO_3$/L	*1*	*4*		<1	<1	<1	<1	<1	<1	<1	<1
Ion Balance												
Ion Balance		*N/A*	*N/A*		0.98	0.87	0.97	0.97	0.97	0.98	0.99	0.99
Anions	meq/L	*N/A*	*N/A*		2.22	2.95	2.4	2.35	2.41	2.46	2.4	2.46
Cations	meq/L	*N/A*	*N/A*		2.19	2.57	2.34	2.28	2.34	2.42	2.37	2.42
TDS (Calculated)	mg/L	*9*			122	156	131	128	131	134	132	134
Hardness, Total	mg$CaCO_3$/L	*0.01*	*0.25*		41.3	37.2	44.2	43.2	44.7	47.5	44.6	45.9
ICP Metals for Routine												
Calcium (Ca)	mg/L	*0.004*	*0.1*		6.78	6.46	7.42	7.17	7.54	8.06	7.84	8.17
Potassium (K)	mg/L	*0.1*	*0.1*		2.2	2.7	2.3	2.3	2.4	2.3	2.3	2.2
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		5.93	5.12	6.24	6.14	6.28	6.64	6.07	6.19
Sodium (Na)	mg/L	*0.5*	*1.5*		30.0	40.4	32.0	31.3	31.8	32.4	32.7	33.3
Other												
Color, True	TCU	*1*	*2*		12	15	8	18	12	16	13	13
Cyanide, Total	mg/L	*0.001*	*0.004*		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
ARC Sample ID					0603486	0603697	0603868	0604175	0604177	0604225	0604649	0604651

Note: MRV = Minimum Reported Value; MDL = Method Detection Limit ·reshwater Life (CCME 2006)

[a] CCME (2006), except where noted [b] BCMOE (2006)

shaded cells indicate values that exceed the guidelines

Appendix B4. Water quality data for fresh water stations in the Doris North Project, 2006.

Parameter	Units	MRV	MDL	Fresh Water Guideline[a]	Doris Outflow		Tail Outflow					
					9-Sep-06	9-Sep-06 Below Falls	18-Jun-06	24-Jun-06	30-Jun-06	7-Jul-06	13-Jul-06	20-Jul-06
Total Metals												
Aluminum (Al)	µg/L	*0.5*	*2*	*5-100*	35.2	35.6	27.6	14.4	21.8	15.1	16.2	28.8
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.0122	0.0140	0.0106	0.0090	0.0080	0.0099	0.0063	0.0084
Arsenic (As)	µg/L	*0.002*	*0.04*	*5*	0.596	0.574	0.243	0.223	0.238	0.258	0.272	0.286
Barium (Ba)	µg/L	*0.004*	*0.1*		2.98	2.89	2.06	1.93	2.19	2.01	2.35	2.70
Beryllium (Be)	µg/L	*0.003*	*0.01*		0.004	<0.003	0.004	0.005	0.007	0.005	<0.003	<0.003
Bismuth (Bi)	µg/L	*0.001*	*0.01*		0.011	0.003	<0.001	0.001	<0.001	0.006	<0.001	<0.001
Boron (B)	µg/L	*0.05*	*0.8*		23.0	22.4	13.4	14.2	14.0	11.8	17.1	16.0
Cadmium (Cd)	µg/L	*0.002*	*0.006*	*0.017*	0.003	<0.002	0.002	0.006	0.002	0.010	<0.002	0.003
Calcium (Ca)	mg/L	*0.004*	*0.1*		8.20	7.66	6.39	6.09	6.07	5.71	6.14	6.36
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.191	0.173	0.649	0.167	0.188	0.220	0.158	0.203
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.060	0.054	0.016	0.017	0.025	0.040	0.047	0.058
Copper (Cu)	µg/L	*0.05*	*0.1*	*2*	1.31	1.35	1.13	0.85	0.84	0.98	0.52	0.88
Iron (Fe)	µg/L	*2*	*4*	*300*	130	107	40	62	85	89	175	358
Lead (Pb)	µg/L	*0.001*	*0.006*	*1*	0.039	0.035	0.025	0.017	0.006	0.034	0.032	0.037
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		7.02	6.78	5.45	4.63	4.24	4.12	4.64	4.98
Manganese (Mn)	µg/L	*0.003*	*0.03*		24.10	24.30	1.24	1.53	2.22	2.02	4.22	6.07
Molybdenum (Mo)	µg/L	*0.001*	*0.0080*	*73*	0.139	0.137	0.101	0.071	0.073	0.073	0.073	0.096
Mercury (Hg)	ng/L	*0.6*	*1.2*	*26*	<0.6	1.200	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Nickel (Ni)	µg/L	*0.005*	*0.06*	*25*	0.388	0.697	0.530	0.459	0.446	0.681	0.709	0.513
Potassium (K)	mg/L	*0.002*	*0.005*		2.43	2.37	1.70	1.43	1.30	1.28	1.29	1.37
Selenium (Se)	µg/L	*0.1*	*0.3*	*1.0*	1.4	1.6	0.4	0.4	0.4	0.5	0.5	0.4
Silver (Ag)	µg/L	*0.0005*	*0.005*	*0.1*	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.002
Sodium (Na)	mg/L	*0.002*	*0.006*		34.1	33.8	16.3	15.0	14.4	14.3	14.1	16.3
Strontium (Sr)	µg/L	*0.004*	*0.008*		44.8	42.6	28.9	24.7	24.5	23.6	27.2	28.5
Thallium (Tl)	µg/L	*0.0003*	*0.003*		0.016	0.013	0.004	0.004	0.006	0.008	0.014	0.013
Tin (Sn)	µg/L	*0.03*	*0.07*		0.036	0.034	<0.03	<0.03	<0.03	<0.03	0.037	0.045
Uranium (U)	µg/L	*0.0001*	*0.003*		0.032	0.033	0.011	0.010	0.010	0.010	0.011	0.013
Vanadium (V)	µg/L	*0.005*	*0.05*		0.045	0.010	0.157	0.300	0.401	0.042	0.054	0.095
Zinc (Zn)	µg/L	*0.1*	*0.2*	*7.5* [b]	0.81	1.47	5.50	5.35	7.28	16.00	0.88	2.07
Dissolved Metals												
Aluminum (Al)	µg/L	*0.2*	*1*		0.98	1.08	5.08	4.25	4.20	3.84	4.55	6.03
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.012	0.014	0.010	0.009	0.008	0.010	0.006	0.008
Arsenic (As)	µg/L	*0.002*	*0.04*		0.456	0.504	0.222	0.215	0.218	0.238	0.248	0.244
Barium (Ba)	µg/L	*0.004*	*0.1*		2.30	2.27	1.82	1.65	1.71	1.62	1.93	2.11
Beryllium (Be)	µg/L	*0.003*	*0.01*		0.003	<0.003	<0.003	0.005	<0.003	0.005	<0.003	<0.003
Boron (B)	µg/L	*0.03*	*0.08*		20.0	21.1	12.6	12.7	11.9	10.9	13.9	14.2
Cadmium (Cd)	µg/L	*0.002*	*0.006*		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003
Calcium (Ca)	mg/L	*0.004*	*0.1*		7.62	7.32	5.87	5.61	5.20	5.22	5.49	5.72
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.18	0.17	0.64	0.15	0.14	0.14	0.16	0.20
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.008	0.008	0.012	0.013	0.012	0.016	0.020	0.019
Copper (Cu)	µg/L	*0.05*	*0.1*		1.14	1.12	0.98	0.79	0.70	0.67	0.31	0.70
Iron (Fe)	µg/L	*2*	*4*		5	4	13	18	17	19	41	56
Lead (Pb)	µg/L	*0.001*	*0.006*		0.028	0.026	0.002	0.008	0.006	0.012	0.032	0.036
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		6.45	6.38	4.86	4.41	3.69	3.77	4.23	4.52
Manganese (Mn)	µg/L	*0.003*	*0.03*		0.117	0.119	0.807	0.789	0.503	1.010	0.939	0.631
Molybdenum (Mo)	µg/L	*0.001*	*0.008*		0.130	0.135	0.089	0.065	0.064	0.058	0.065	0.087
Nickel (Ni)	µg/L	*0.005*	*0.06*		0.144	0.105	0.458	0.402	0.346	0.387	0.682	0.429
Potassium (K)	mg/L	*0.002*	*0.005*		2.21	2.24	1.56	1.35	1.15	1.19	1.17	1.24
Selenium (Se)	µg/L	*0.1*	*0.3*		0.8	0.7	0.4	0.4	0.4	0.5	0.5	0.4
Silver (Ag)	µg/L	*0.0005*	*0.005*		<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	0.0014	0.0007
Sodium (Na)	mg/L	*0.002*	*0.006*		31.3	31.6	15.2	13.9	12.5	13.4	12.7	15.1
Strontium (Sr)	µg/L	*0.004*	*0.008*		41.2	40.4	28.9	22.8	21.5	21.2	24.3	25.6
Uranium (U)	µg/L	*0.0001*	*0.003*		0.0156	0.0136	0.0078	0.0076	0.0065	0.0071	0.0078	0.0085
Vanadium (V)	µg/L	*0.005*	*0.05*		<0.01	<0.01	0.149	0.268	0.332	0.026	0.052	0.073
Zinc (Zn)	µg/L	*0.05*	*0.2*		0.57	0.41	5.43	3.53	3.31	2.99	0.88	0.93
Nutrients												
Phosphorus, Total	mg/L	*0.001*	*0.008*		0.040	0.048	0.008	0.008	0.008	0.006	0.011	0.013
Ammonia-N	mg/L	*0.001*	*0.02*	*0.572*	0.008	0.007	0.104	0.012	0.008	0.006	0.008	0.039
Total Kjeldahl Nitrogen	mg/L	*0.01*	*0.05*		0.50	0.55	0.30	0.30	0.30	0.32	0.31	0.35
Dissolved Organic Carbon	mg/L	*0.2*	*0.6*		5.0	5.0	5.9	5.2	5.4	5.3	5.8	5.7
Carbon Part	mg/L	*0.02*	*0.2*		1.52	1.75	0.10	0.10	0.30	0.23	0.30	0.22
TOC (Calculated)		*0.8*			6.5	6.8	6.0	5.3	5.7	5.5	6.1	5.9
Fluoride (F)	mg/L	*0.01*	*0.04*		0.06	0.06	0.06	0.07	0.05	0.06	0.06	0.07
Sulphide	mg/L	*0.001*	*0.004*		0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Suspended Solids	mg/L	*1*	*10*		3	2	<1	<1	<1	<1	2	<1
Routine												
Chloride (Cl)	mg/L	*0.3*	*0.6*		66.4	65.9	34.7	30.1	27.4	28.8	29.0	32.7
Nitrate+Nitrite-N	mg/L	*0.005*	*0.02*		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007
Nitrite-N	mg/L	*0.001*	*0.016*	*0.06*	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002
Nitrate-N (calculated)	mg/L	*0.005*		*13*	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005
Sulphate (SO4)	mg/L	*3*	*6*		5	<3	<3	6	<3	<3	<3	<3
pH, EC and Alkalinity												
pH (Laboratory)	units	*N/A*	*N/A*	*6.5-9.0*	7.53	6.97	6.99	7.01	6.98	6.95	8.47	7.07
Conductivity (EC)	µS/cm	*0.1*	*2*		287	279	170	159	147	151	151	164
Bicarbonate (HCO_3)	mg/L	*1*	*5*		35	34	36	33	34	31	37	35
Carbonate	mg/L										1	
Alkalinity, Total	mg$CaCO_3$/L	*1*	*4*		29	28	29	27	28	26	33	29
P- Alkalinity	mg$CaCO_3$/L	*1*	*4*		<1	<1	<1	<1	<1	<1	1	<1
Ion Balance												
Ion Balance		*N/A*	*N/A*		0.95	0.95	0.93	0.89	0.93	0.92	0.89	0.98
Anions	meq/L	*N/A*	*N/A*		2.55	2.45	1.61	1.52	1.37	1.37	1.52	1.54
Cations	meq/L	*N/A*	*N/A*		2.44	2.34	1.5	1.35	1.28	1.26	1.35	1.51
TDS (Calculated)	mg/L	*9*			138	132	84	79	72	71	77	82
Hardness, Total	mg$CaCO_3$/L	*0.01*	*0.25*		48.2	46.0	35.0	32.4	31.7	30.3	34.1	35.2
ICP Metals for Routine												
Calcium (Ca)	mg/L	*0.004*	*0.1*		8.08	7.58	6.09	5.98	6.06	5.71	6.11	6.35
Potassium (K)	mg/L	*0.1*	*0.1*		2.3	2.4	1.7	1.5	1.3	1.3	1.3	1.4
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		6.80	6.57	4.80	4.25	4.02	3.89	4.57	4.70
Sodium (Na)	mg/L	*0.5*	*1.5*		32.5	31.3	17.3	15.3	14.1	14.4	14.5	17.7
Other												
Color, True	TCU	*1*	*2*		<1	<1	13	15	12	12	19	15
Cyanide, Total	mg/L	*0.001*	*0.004*		0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
ARC Sample ID					0604976	0604977	0602967	0603049	0603137	0603383	0603487	0603698

Note: MRV = Minimum Reported Value; MDL = Method Detection Limit
[a] CCME (2006), except where noted [b] BCMOE (2006)
shaded cells indicate values that exceed the guidelines

Appendix B4. Water quality data for fresh water stations in the Doris North Project, 2006.

Parameter	Units	MRV	MDL	Fresh Water Guideline[a]	Tail Outflow						
					28-Jul-06	4-Aug-06	11-Aug-06	18-Aug-06	26-Aug-06	1-Sep-06	9-Sep-06
Total Metals											
Aluminum (Al)	µg/L	0.5	2	5-100	12.1	16.8	16.9	16.1	15.0	20.0	65.2
Antimony (Sb)	µg/L	0.0005	0.001		0.0072	0.0094	0.0100	0.0102	0.0087	0.0073	0.0070
Arsenic (As)	µg/L	0.002	0.04	5	0.261	0.402	0.483	0.655	0.741	0.761	0.644
Barium (Ba)	µg/L	0.004	0.1		2.42	3.28	4.50	5.82	6.79	7.94	6.61
Beryllium (Be)	µg/L	0.003	0.01		<0.003	<0.003	<0.003	<0.003	<0.003	0.005	0.007
Bismuth (Bi)	µg/L	0.001	0.01		0.001	0.006	0.004	0.001	<0.001	<0.001	0.002
Boron (B)	µg/L	0.05	0.8		13.5	14.6	14.8	13.9	16.7	13.7	13.3
Cadmium (Cd)	µg/L	0.002	0.006	0.017	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium (Ca)	mg/L	0.004	0.1		6.96	7.99	11.20	13.70	15.70	18.00	13.80
Chromium (Cr)	µg/L	0.03	0.3		0.105	0.267	0.246	0.188	0.282	0.284	0.159
Cobalt (Co)	µg/L	0.001	0.01		0.045	0.073	0.123	0.133	0.160	0.226	0.181
Copper (Cu)	µg/L	0.05	0.1	2	0.62	0.79	0.57	0.58	0.68	0.63	0.71
Iron (Fe)	µg/L	2	4	300	170	301	507	634	853	1150	1070
Lead (Pb)	µg/L	0.001	0.006	1	0.094	0.124	0.132	0.113	0.053	0.048	0.055
Magnesium (Mg)	mg/L	0.0001	0.0005		5.40	5.81	7.93	9.38	11.00	12.50	9.68
Manganese (Mn)	µg/L	0.003	0.03		5.02	9.21	17.10	21.40	28.10	43.40	29.80
Molybdenum (Mo)	µg/L	0.001	0.0080	73	0.069	0.071	0.080	0.055	0.044	0.039	0.056
Mercury (Hg)	ng/L	0.6	1.2	26	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Nickel (Ni)	µg/L	0.005	0.06	25	0.513	0.581	0.660	0.563	0.548	0.550	0.445
Potassium (K)	mg/L	0.002	0.005		1.30	1.33	1.83	1.95	2.10	2.22	2.26
Selenium (Se)	µg/L	0.1	0.3	1.0	0.4	0.7	1.2	1.5	2.0	2.2	1.9
Silver (Ag)	µg/L	0.0005	0.005	0.1	0.004	0.001	0.001	0.001	<0.0005	<0.0005	0.002
Sodium (Na)	mg/L	0.002	0.006		17.9	19.0	25.2	31.8	38.6	44.8	36.5
Strontium (Sr)	µg/L	0.004	0.008		30.8	38.3	54.7	67.6	78.1	91.8	69.1
Thallium (Tl)	µg/L	0.0003	0.003		0.022	0.015	0.011	0.001	<0.003	<0.003	0.012
Tin (Sn)	µg/L	0.03	0.07		<0.03	<0.03	<0.03	0.051	0.052	<0.03	0.047
Uranium (U)	µg/L	0.0001	0.003		0.008	0.011	0.010	0.009	0.010	0.018	0.035
Vanadium (V)	µg/L	0.005	0.05		0.022	0.065	0.051	0.042	0.098	<0.01	<0.01
Zinc (Zn)	µg/L	0.1	0.2	7.5 [b]	4.95	2.64	2.62	11.10	2.96	3.34	1.39
Dissolved Metals											
Aluminum (Al)	µg/L	0.2	1		4.74	5.64	5.94	4.40	3.73	3.75	4.42
Antimony (Sb)	µg/L	0.0005	0.001		0.007	0.009	0.010	0.010	0.009	0.007	0.007
Arsenic (As)	µg/L	0.002	0.04		0.240	0.366	0.391	0.550	0.400	0.454	0.584
Barium (Ba)	µg/L	0.004	0.1		2.08	2.76	3.83	4.96	6.05	7.18	5.42
Beryllium (Be)	µg/L	0.003	0.01		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Boron (B)	µg/L	0.03	0.08		13.1	12.7	13.4	13.3	15.7	12.8	12.8
Cadmium (Cd)	µg/L	0.002	0.006		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium (Ca)	mg/L	0.004	0.1		6.48	7.40	10.30	12.60	14.90	17.20	12.90
Chromium (Cr)	µg/L	0.03	0.3		0.08	0.26	0.24	0.19	0.28	0.28	0.16
Cobalt (Co)	µg/L	0.001	0.01		0.030	0.017	0.023	0.022	0.017	0.095	0.040
Copper (Cu)	µg/L	0.05	0.1		0.58	0.79	0.52	0.41	0.57	0.54	0.50
Iron (Fe)	µg/L	2	4		58	69	118	114	89	123	123
Lead (Pb)	µg/L	0.001	0.006		0.086	0.121	0.126	0.105	0.053	0.040	0.026
Magnesium (Mg)	mg/L	0.0001	0.0005		4.96	5.40	7.36	8.96	10.50	11.90	9.37
Manganese (Mn)	µg/L	0.003	0.03		3.400	0.550	2.930	5.880	1.890	28.900	16.500
Molybdenum (Mo)	µg/L	0.001	0.008		0.069	0.069	0.066	0.045	0.039	0.035	0.043
Nickel (Ni)	µg/L	0.005	0.06		0.468	0.545	0.594	0.469	0.499	0.498	0.402
Potassium (K)	mg/L	0.002	0.005		1.21	1.24	1.65	1.81	2.01	2.10	2.13
Selenium (Se)	µg/L	0.1	0.3		0.3	0.4	0.6	0.8	0.9	1.0	0.9
Silver (Ag)	µg/L	0.0005	0.005		0.0020	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Sodium (Na)	mg/L	0.002	0.006		16.9	17.7	23.5	30.3	36.8	42.8	36.0
Strontium (Sr)	µg/L	0.004	0.008		28.7	35.1	49.6	62.6	73.6	86.1	65.0
Uranium (U)	µg/L	0.0001	0.003		0.0077	0.0069	0.0070	0.0047	0.0068	0.0082	0.0126
Vanadium (V)	µg/L	0.005	0.05		0.010	0.039	0.021	0.021	0.012	0.010	<0.01
Zinc (Zn)	µg/L	0.05	0.2		2.42	2.57	2.39	3.33	2.84	3.07	1.36
Nutrients											
Phosphorus, Total	mg/L	0.001	0.008		0.014	0.021	0.026	0.019	0.006	0.021	0.019
Ammonia-N	mg/L	0.001	0.02	0.572	0.011	0.007	0.009	0.013	0.014	0.010	0.005
Total Kjeldahl Nitrogen	mg/L	0.01	0.05		0.30	0.31	0.34	0.25	0.23	0.21	0.19
Dissolved Organic Carbon	mg/L	0.2	0.6		4.8	5.8	5.7	4.9	4.4	4.9	3.9
Carbon Part	mg/L	0.02	0.2		0.17	0.25	0.32	0.16	0.33	0.38	0.18
TOC (Calculated)		0.8			5.0	6.1	6.0	5.1	4.7	5.3	4.1
Fluoride (F)	mg/L	0.01	0.04		0.06	0.03	0.05	0.04	0.04	0.04	0.05
Sulphide	mg/L	0.001	0.004		0.002	0.002	0.004	0.005	0.006	0.007	0.004
Total Suspended Solids	mg/L	1	10		<1	<1	5	2	<1	3	<1
Routine											
Chloride (Cl)	mg/L	0.3	0.6		37.8	39.9	56.9	77.1	88.3	107.0	89.2
Nitrate+Nitrite-N	mg/L	0.005	0.02		0.007	<0.005	<0.005	<0.005	<0.005	0.029	0.015
Nitrite-N	mg/L	0.001	0.016	0.06	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	0.002
Nitrate-N (calculated)	mg/L	0.005		13	0.007	<0.005	<0.005	<0.005	<0.005	0.026	0.013
Sulphate (SO4)	mg/L	3	6		4	<3	<3	6	4	7	6
pH, EC and Alkalinity											
pH (Laboratory)	units	N/A	N/A	6.5-9.0	6.91	7.22	7.17	7.16	7.18	7.09	7.50
Conductivity (EC)	µS/cm	0.1	2		183	198	268	334	388	449	377
Bicarbonate (HCO_3)	mg/L	1	5		46	39	45	41	41	39	34
Carbonate	mg/L										
Alkalinity, Total	$mgCaCO_3/L$	1	4		38	32	37	34	33	32	28
P- Alkalinity	$mgCaCO_3/L$	1	4		<1	<1	<1	<1	<1	<1	<1
Ion Balance											
Ion Balance		N/A	N/A		0.85	0.96	0.97	0.98	1.02	1.02	0.99
Anions	meq/L	N/A	N/A		1.9	1.81	2.41	2.98	3.24	3.79	3.19
Cations	meq/L	N/A	N/A		1.62	1.73	2.33	2.93	3.3	3.86	3.15
TDS (Calculated)	mg/L	9			97	95	128	161	178	209	174
Hardness, Total	$mgCaCO_3/L$	0.01	0.25		39.6	44.0	59.2	73.3	79.7	92.2	74.6
ICP Metals for Routine											
Calcium (Ca)	mg/L	0.004	0.1		7.55	8.16	11.10	13.80	15.10	17.30	13.60
Potassium (K)	mg/L	0.1	0.1		1.4	1.4	1.9	2.0	2.1	2.2	2.3
Magnesium (Mg)	mg/L	0.0001	0.0005		5.04	5.74	7.65	9.43	10.20	11.90	9.87
Sodium (Na)	mg/L	0.5	1.5		18.3	18.7	25.2	32.6	37.9	45.1	36.8
Other											
Color, True	TCU	1	2		8	17	11	16	13	13	4
Cyanide, Total	mg/L	0.001	0.004		<0.001	<0.001	<0.001	<0.001	0.002	0.002	0.001
ARC Sample ID					0603869	0604174	0604176	0604226	0604648	0604650	0604978

Note: MRV = Minimum Reported Value; MDL = Method Detection Limit

[a] CCME (2006), except where noted [b] BCMOE (2006)

shaded cells indicate values that exceed the guidelines

Appendix B4. Water quality data for fresh water stations in the Doris North Project, 2006.

Parameter	Units	MRV	MDL	Fresh Water Guideline[a]	Roberts Outflow				Little Roberts Outflow			
					18-Jun-06	13-Jul-06	10-Aug-06	9-Sep-06	18-Jun-06	13-Jul-06	10-Aug-06	9-Sep-06
Total Metals												
Aluminum (Al)	µg/L	*0.5*	*2*	*5-100*	383.0	228.0	77.5	56.6	379.0	98.2	49.1	53.6
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.0112	0.0117	0.0133	0.0134	0.0130	0.0105	0.0134	0.0127
Arsenic (As)	µg/L	*0.002*	*0.04*	*5*	0.374	0.507	0.515	0.480	0.380	0.466	0.633	0.659
Barium (Ba)	µg/L	*0.004*	*0.1*		6.20	4.71	2.79	2.76	6.32	3.51	2.69	3.15
Beryllium (Be)	µg/L	*0.003*	*0.01*		0.013	0.005	<0.003	<0.003	0.013	0.004	<0.003	<0.003
Bismuth (Bi)	µg/L	*0.001*	*0.01*		0.001	<0.001	0.006	<0.001	0.002	<0.001	0.002	0.002
Boron (B)	µg/L	*0.05*	*0.8*		18.0	22.9	24.9	24.4	17.2	22.9	25.7	26.6
Cadmium (Cd)	µg/L	*0.002*	*0.006*	*0.017*	0.003	0.012	<0.002	<0.002	0.002	0.003	<0.002	0.002
Calcium (Ca)	mg/L	*0.004*	*0.1*		4.22	5.13	5.45	5.46	4.91	6.22	6.78	7.86
Chromium (Cr)	µg/L	*0.03*	*0.3*		1.090	0.443	0.329	0.239	1.050	0.272	0.354	0.287
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.128	0.091	0.043	0.039	0.124	0.057	0.049	0.044
Copper (Cu)	µg/L	*0.05*	*0.1*	*2*	1.43	1.29	1.60	1.68	1.52	1.09	1.51	1.45
Iron (Fe)	µg/L	*2*	*4*	*300*	313	250	97	87	318	151	140	155
Lead (Pb)	µg/L	*0.001*	*0.006*	*1*	0.108	0.118	0.139	0.055	0.110	0.067	0.142	0.046
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		4.90	5.46	6.05	5.47	5.11	5.89	6.57	7.18
Manganese (Mn)	µg/L	*0.003*	*0.03*		12.30	12.00	7.89	10.30	11.80	8.46	12.40	9.24
Molybdenum (Mo)	µg/L	*0.001*	*0.0080*	*73*	0.152	0.193	0.194	0.193	0.139	0.153	0.177	0.168
Mercury (Hg)	ng/L	*0.6*	*1.2*	*26*	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	8.500
Nickel (Ni)	µg/L	*0.005*	*0.06*	*25*	0.701	0.726	0.478	0.471	0.734	0.649	0.398	0.431
Potassium (K)	mg/L	*0.002*	*0.005*		1.81	1.99	2.06	1.90	1.96	2.14	2.17	2.34
Selenium (Se)	µg/L	*0.1*	*0.3*	*1.0*	0.6	1.1	1.2	1.2	0.6	1.0	1.3	1.9
Silver (Ag)	µg/L	*0.0005*	*0.005*	*0.1*	0.002	0.002	0.001	0.001	0.002	0.002	<0.0005	0.002
Sodium (Na)	mg/L	*0.002*	*0.006*		21.7	27.2	31.3	28.6	23.2	27.7	33.9	36.7
Strontium (Sr)	µg/L	*0.004*	*0.008*		33.0	36.8	36.2	37.2	34.9	38.7	41.0	48.5
Thallium (Tl)	µg/L	*0.0003*	*0.003*		0.007	0.014	0.008	0.012	0.008	0.013	0.009	0.014
Tin (Sn)	µg/L	*0.03*	*0.07*		<0.03	0.047	0.048	0.050	<0.03	0.041	0.075	0.030
Uranium (U)	µg/L	*0.0001*	*0.003*		0.048	0.055	0.049	0.073	0.043	0.041	0.044	0.041
Vanadium (V)	µg/L	*0.005*	*0.05*		0.678	0.385	0.147	0.050	0.699	0.173	0.137	0.062
Zinc (Zn)	µg/L	*0.1*	*0.2*	*7.5* [b]	2.13	2.97	7.37	5.58	6.54	1.57	2.58	1.21
Dissolved Metals												
Aluminum (Al)	µg/L	*0.2*	*1*		37.10	9.54	3.21	3.11	37.60	5.27	3.60	4.16
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.011	0.011	0.013	0.013	0.012	0.011	0.013	0.013
Arsenic (As)	µg/L	*0.002*	*0.04*		0.312	0.364	0.437	0.449	0.313	0.376	0.523	0.584
Barium (Ba)	µg/L	*0.004*	*0.1*		2.11	1.96	1.79	2.05	2.32	2.13	1.92	2.32
Beryllium (Be)	µg/L	*0.003*	*0.01*		0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Boron (B)	µg/L	*0.03*	*0.08*		17.6	21.1	22.2	24.4	16.4	20.6	23.4	23.9
Cadmium (Cd)	µg/L	*0.002*	*0.006*		0.003	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002
Calcium (Ca)	mg/L	*0.004*	*0.1*		3.95	4.78	5.00	5.38	4.55	5.75	6.17	7.52
Chromium (Cr)	µg/L	*0.03*	*0.3*		0.67	0.20	0.26	0.24	0.70	0.15	0.28	0.28
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.013	0.011	0.009	0.005	0.017	0.015	0.013	0.012
Copper (Cu)	µg/L	*0.05*	*0.1*		1.16	0.78	1.26	1.16	1.29	0.76	1.14	1.24
Iron (Fe)	µg/L	*2*	*4*		33	16	4	<2	47	16	6	19
Lead (Pb)	µg/L	*0.001*	*0.006*		0.019	0.036	0.108	0.027	0.025	0.040	0.118	0.032
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		4.70	5.13	5.53	5.41	4.78	5.38	6.03	6.89
Manganese (Mn)	µg/L	*0.003*	*0.03*		3.800	0.261	0.178	0.148	3.390	0.347	0.179	0.182
Molybdenum (Mo)	µg/L	*0.001*	*0.008*		0.141	0.168	0.176	0.190	0.121	0.139	0.162	0.165
Nickel (Ni)	µg/L	*0.005*	*0.06*		0.371	0.480	0.471	0.303	0.368	0.484	0.259	0.278
Potassium (K)	mg/L	*0.002*	*0.005*		1.62	1.79	1.87	1.86	1.72	1.96	1.96	2.16
Selenium (Se)	µg/L	*0.1*	*0.3*		0.6	0.8	0.9	0.8	0.5	1.0	0.9	1.1
Silver (Ag)	µg/L	*0.0005*	*0.005*		0.0006	0.0008	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005
Sodium (Na)	mg/L	*0.002*	*0.006*		20.0	25.7	28.8	28.4	21.5	25.9	31.1	35.1
Strontium (Sr)	µg/L	*0.004*	*0.008*		30.6	33.0	33.0	37.1	31.7	35.6	37.6	47.7
Uranium (U)	µg/L	*0.0001*	*0.003*		0.0245	0.0222	0.0273	0.0239	0.0219	0.0217	0.0214	0.0215
Vanadium (V)	µg/L	*0.005*	*0.05*		0.182	0.010	0.021	0.034	0.225	0.025	0.025	0.033
Zinc (Zn)	µg/L	*0.05*	*0.2*		2.06	2.96	2.25	0.85	5.29	1.51	1.16	1.17
Nutrients												
Phosphorus, Total	mg/L	*0.001*	*0.008*		0.017	0.020	0.025	0.033	0.018	0.019	0.029	0.035
Ammonia-N	mg/L	*0.001*	*0.02*	*0.572*	0.009	0.009	0.012	0.015	0.003	0.004	0.008	0.008
Total Kjeldahl Nitrogen	mg/L	*0.01*	*0.05*		0.28	0.30	0.32	0.29	0.35	0.34	0.40	0.38
Dissolved Organic Carbon	mg/L	*0.2*	*0.6*		4.2	4.3	4.1	4.3	4.9	4.9	4.8	4.8
Carbon Part	mg/L	*0.02*	*0.2*		0.37	0.54	0.44	0.32	0.66	0.35	0.57	0.78
TOC (Calculated)		*0.8*			4.6	4.8	4.5	4.6	5.6	5.3	5.4	5.6
Fluoride (F)	mg/L	*0.01*	*0.04*		0.04	0.08	0.03	0.05	0.04	0.05	0.04	0.06
Sulphide	mg/L	*0.001*	*0.004*		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Suspended Solids	mg/L	*1*	*10*		3	5	2	1	5	3	<1	2
Routine												
Chloride (Cl)	mg/L	*0.3*	*0.6*		46.2	56.3	58.0	58.3	48.4	59.2	63.2	72.7
Nitrate+Nitrite-N	mg/L	*0.005*	*0.02*		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrite-N	mg/L	*0.001*	*0.016*	*0.06*	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrate-N (calculated)	mg/L	*0.005*		*13*	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Sulphate (SO4)	mg/L	*3*	*6*		5	<3	<3	6	8	<3	<3	7
pH, EC and Alkalinity												
pH (Laboratory)	units	*N/A*	*N/A*	*6.5-9.0*	6.98	7.48	7.43	7.43	7.07	7.92	7.46	7.65
Conductivity (EC)	µS/cm	*0.1*	*2*		183	230	246	249	194	246	270	310
Bicarbonate (HCO_3)	mg/L	*1*	*5*		21	26	26	27	24	27	32	32
Carbonate	mg/L											
Alkalinity, Total	mg$CaCO_3$/L	*1*	*4*		17	21	22	22	20	22	26	27
P- Alkalinity	mg$CaCO_3$/L	*1*	*4*		<1	<1	<1	<1	<1	<1	<1	<1
Ion Balance												
Ion Balance		*N/A*	*N/A*		0.92	0.96	0.98	0.91	0.89	0.99	0.99	0.95
Anions	meq/L	*N/A*	*N/A*		1.76	2.06	2.11	2.21	1.92	2.15	2.38	2.72
Cations	meq/L	*N/A*	*N/A*		1.62	1.98	2.07	2.02	1.72	2.13	2.34	2.6
TDS (Calculated)	mg/L	*9*			95	112	116	119	103	118	130	148
Hardness, Total	mg$CaCO_3$/L	*0.01*	*0.25*		28.6	35.2	36.9	36.2	30.9	38.9	42.9	49.2
ICP Metals for Routine												
Calcium (Ca)	mg/L	*0.004*	*0.1*		4.13	5.18	5.46	5.46	4.78	6.19	6.87	7.86
Potassium (K)	mg/L	*0.1*	*0.1*		1.7	1.9	2.0	2.0	1.6	2.1	2.3	2.3
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		4.44	5.41	5.65	5.47	4.61	5.69	6.26	7.18
Sodium (Na)	mg/L	*0.5*	*1.5*		23.1	28.2	29.4	28.7	24.3	29.8	32.8	35.7
Other												
Color, True	TCU	*1*	*2*		16	12	9	<1	16	12	12	7
Cyanide, Total	mg/L	*0.001*	*0.004*		<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
ARC Sample ID					0602969	0603488	0604184	0604975	0602970	0603489	0604182	0604960

Note: MRV = Minimum Reported Value; MDL = Method Detection Limit
[a] CCME (2006), except where noted [b] BCMOE (2006)
shaded cells indicate values that exceed the guidelines

Appendix B5. Water quality data for marine station in the Doris North Project, 2006.

Parameter	Units	MRV	MDL	Marine Guideline[a]	Roberts Bay						
					31-May-06 Middle	20-Jul-06 Top	20-Jul-06 Bottom	12-Aug-06 Top	12-Aug-06 Bottom	11-Sep-06 Top	11-Sep-06 Bottom
Total Metals											
Aluminum (Al)	µg/L	*0.5*	*2*		82.1	34.5	9.2	50.9	48.3	33.7	30.8
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.1110	0.0876	0.0782	0.1340	0.1210	0.1690	0.1420
Arsenic (As)	µg/L	*0.002*	*0.04*	*12.5*	15.2	13.3	11.4	25.6	27.2	23.7	21.6
Barium (Ba)	µg/L	*0.004*	*0.1*		8.76	6.60	5.86	7.87	7.81	5.08	5.16
Beryllium (Be)	µg/L	*0.003*	*0.01*		0.038	0.057	0.009	0.030	0.030	0.062	0.060
Bismuth (Bi)	µg/L	*0.001*	*0.01*		0.014	0.010	0.006	0.045	0.054	0.020	0.095
Boron (B)	µg/L	*0.05*	*0.8*		1770	2610	2530	2700	2730	3180	3060
Cadmium (Cd)	µg/L	*0.002*	*0.006*	*0.120*	0.038	0.026	0.023	0.061	0.052	0.096	0.088
Calcium (Ca)	mg/L	*0.004*	*0.1*		175	180	175	229	232	281	284
Chromium (Cr)	µg/L	*0.03*	*0.3*		1.550	1.050	1.250	12.100	12.000	19.500	18.900
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.585	0.319	0.261	0.265	0.282	0.081	0.490
Copper (Cu)	µg/L	*0.05*	*0.1*	*2-3* [b]	2.91	3.70	3.57	4.53	4.24	7.47	10.30
Iron (Fe)	µg/L	*2*	*4*		149	155	71	210	196	349	385
Lead (Pb)	µg/L	*0.001*	*0.006*		0.085	0.061	0.040	0.224	0.221	0.367	0.454
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		581	583	563	728	752	939	924
Manganese (Mn)	µg/L	*0.003*	*0.03*		20.30	2.97	1.78	5.76	5.60	4.94	5.03
Molybdenum (Mo)	µg/L	*0.001*	*0.0080*		4.620	4.660	4.470	6.220	6.290	7.530	7.860
Mercury (Hg)	ng/L	*0.6*	*1.2*	*16*		<0.6	<0.6	<0.6	16.0	1.4	10.0
Nickel (Ni)	µg/L	*0.005*	*0.06*		0.216	1.550	1.930	1.350	1.740	6.500	9.820
Potassium (K)	mg/L	*0.002*	*0.005*		175	182	190	218	224	275	400
Selenium (Se)	µg/L	*0.1*	*0.3*	*2* [b]	1.1	1.1	1.0	1.3	1.3	1.5	1.4
Silver (Ag)	µg/L	*0.0005*	*0.005*		0.010	0.007	0.006	0.010	0.010	0.039	0.010
Sodium (Na)	mg/L	*0.002*	*0.006*		5340	5590	5390	6130	6090	7840	7770
Strontium (Sr)	µg/L	*0.004*	*0.008*		3080	3200	3120	4400	4470	5310	5270
Thallium (Tl)	µg/L	*0.0003*	*0.003*		<0.003	0.040	0.035	0.003	0.003	0.006	0.006
Tin (Sn)	µg/L	*0.03*	*0.07*		3.070	6.900	1.480	3.460	5.760	0.600	0.848
Uranium (U)	µg/L	*0.0001*	*0.003*		1.230	1.150	1.100	1.840	1.880	2.100	2.140
Vanadium (V)	µg/L	*0.005*	*0.05*		1.500	1.910	1.590	6.310	7.600	1.080	0.960
Zinc (Zn)	µg/L	*0.1*	*0.2*	*10* [b]	4.22	5.60	5.44	6.85	8.92	11.10	16.20
Dissolved Metals											
Aluminum (Al)	µg/L	*0.2*	*1*		4.17	1.38	0.75	2.80	5.22	4.00	4.00
Antimony (Sb)	µg/L	*0.0005*	*0.001*		0.102	0.084	0.075	0.104	0.109	0.162	0.139
Arsenic (As)	µg/L	*0.002*	*0.04*		12.2	11.1	8.4	20.9	21.1	22.7	21.6
Barium (Ba)	µg/L	*0.004*	*0.1*		6.83	6.00	5.82	6.93	6.90	2.04	2.98
Beryllium (Be)	µg/L	*0.003*	*0.01*		0.021	0.029	0.008	0.030	0.030	0.060	0.060
Boron (B)	µg/L	*0.03*	*0.08*		1,760	2,420	2,360	2,530	2,520	2,810	2,900
Cadmium (Cd)	µg/L	*0.002*	*0.006*		0.034	0.022	0.022	0.060	0.051	0.077	0.075
Calcium (Ca)	mg/L	*0.004*	*0.1*		175	165	161	218	221	270	270
Chromium (Cr)	µg/L	*0.03*	*0.3*		1.51	1.04	1.23	10.20	9.25	5.98	7.38
Cobalt (Co)	µg/L	*0.001*	*0.01*		0.579	0.318	0.255	0.205	0.156	0.020	0.020
Copper (Cu)	µg/L	*0.05*	*0.1*		2.45	3.15	3.38	4.47	3.62	4.95	5.92
Iron (Fe)	µg/L	*2*	*4*		3	82	70	122	63	45	137
Lead (Pb)	µg/L	*0.001*	*0.006*		0.006	0.016	0.016	0.212	0.169	0.302	0.322
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		581	536	520	699	691	887	875
Manganese (Mn)	µg/L	*0.003*	*0.03*		15.900	1.640	1.120	2.710	2.880	3.990	3.570
Molybdenum (Mo)	µg/L	*0.001*	*0.008*		4.350	4.260	4.250	5.870	6.140	6.920	6.920
Nickel (Ni)	µg/L	*0.005*	*0.06*		0.190	1.030	1.170	0.530	0.930	0.100	0.260
Potassium (K)	mg/L	*0.002*	*0.005*		168	173	172	212	208	256	400
Selenium (Se)	µg/L	*0.1*	*0.3*		1.0	1.0	0.9	1.2	1.2	1.5	1.4
Silver (Ag)	µg/L	*0.0005*	*0.005*		0.0092	0.0063	0.0049	0.0094	0.0103	0.0159	0.0100
Sodium (Na)	mg/L	*0.002*	*0.006*		4880	5180	5020	5690	5810	7290	7320
Strontium (Sr)	µg/L	*0.004*	*0.008*		3070	2900	2860	4190	4220	5040	4970
Uranium (U)	µg/L	*0.0001*	*0.003*		1.1900	1.0100	1.0100	1.6800	1.7400	1.9900	2.0200
Vanadium (V)	µg/L	*0.005*	*0.05*		0.850	1.250	1.240	5.970	6.490	0.620	0.720
Zinc (Zn)	µg/L	*0.05*	*0.2*		3.09	5.47	5.37	6.82	4.34	7.64	7.93
Nutrients											
Phosphorus, Total	mg/L	*0.001*	*0.008*		0.024	0.022	0.024	0.041	0.038	0.029	0.035
Ammonia-N	mg/L	*0.001*	*0.02*		0.016	0.020	0.004	0.008	0.011	0.007	0.007
Total Kjeldahl Nitrogen	mg/L	*0.01*	*0.05*		0.13	0.09	0.08	0.10	0.10	0.06	0.08
Dissolved Organic Carbon	mg/L	*0.2*	*0.6*		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Carbon Part	mg/L	*0.02*	*0.2*		0.30	<0.02	<0.02	0.06	0.07	0.06	0.09
TOC (Calculated)		*0.8*			0.3			0.1	0.1	0.1	0.1
Fluoride (F)	mg/L	*0.01*	*0.04*		0.62	0.41	0.44	0.45	0.46	0.54	0.54
Sulphide	mg/L	*0.001*	*0.004*		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Suspended Solids	mg/L	*1*	*10*		6	3	<1	4	<1	2	<1
Routine											
Chloride (Cl)	mg/L	*0.3*	*0.6*		13400	8230	9610	10900	10900	13100	13700
Nitrate+Nitrite-N	mg/L	*0.005*	*0.02*		<0.005	<0.005	0.011	<0.005	<0.005	<0.005	<0.005
Nitrite-N	mg/L	*0.001*	*0.016*		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrate-N (calculated)	mg/L	*0.005*		*16*	<0.005	<0.005	0.011	<0.005	<0.005	<0.005	<0.005
Sulphate (SO4)	mg/L	*3*	*6*		1750	1120	1260	1450	1440	1710	1710
pH, EC and Alkalinity											
pH (Laboratory)	units	*N/A*	*N/A*	*7.0-8.7*	7.74	7.86	7.88	7.89	7.87	7.90	7.93
Conductivity (EC)	µS/cm	*0.1*	*2*		34800	26200	27100	30800	30900	36400	36700
Bicarbonate (HCO_3)	mg/L	*1*	*5*		106	75	77	89	89	104	105
Carbonate	mg/L										
Alkalinity, Total	$mgCaCO_3/L$	*1*	*4*		87	62	63	73	73	86	86
P- Alkalinity	$mgCaCO_3/L$	*1*	*4*		<1	<1	<1	<1	<1	<1	<1
Ion Balance											
Ion Balance		*N/A*	*N/A*		0.97	1	0.92	0.96	0.97	1.05	0.99
Anions	meq/L	*N/A*	*N/A*		416	256	298	340	338	406	423
Cations	meq/L	*N/A*	*N/A*		405	256	276	327	328	424	418
TDS (Calculated)	mg/L	*9*			24100	14800	16800	19400	19300	23800	24300
Hardness, Total	$mgCaCO_3/L$	*0.01*	*0.25*		2750	2870	2780	3440	3520	4490	4550
ICP Metals for Routine											
Calcium (Ca)	mg/L	*0.004*	*0.1*		161	189	180	233	241	285	291
Potassium (K)	mg/L	*0.1*	*0.1*		257	166	193	215	209	256	274
Magnesium (Mg)	mg/L	*0.0001*	*0.0005*		570	582	566	694	710	917	928
Sodium (Na)	mg/L	*0.5*	*1.5*		7900	4480	4950	5800	5810	7540	7360
Other											
Color, True	TCU	*1*	*2*		<1	<1	<1	<1	<1	<1	<1
Cyanide, Total	mg/L	*0.001*	*0.004*		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
ARC Sample ID					0602741	0603695	0603696	0604189	0604187	0604936	0604937

Note: MRV = Minimum Reported Value; MDL = Method Detection Limit

[a] CCME (2006), except where noted [b] BCMOE (2006)

shaded cells indicate values that equall or exceed the guidelines

Appendix B6. Chlorophyll 'a' and phaeophytin concentrations in Doris North Project waterbodies, 2006.

Waterbody	Date Sampled	Chlorophyll 'a' (mg/m^3)		Phaeophytin (mg/m^3)		Chlorophyll 'a' : Phaeophytin Ratio
		Average	Standard Deviation	Average	Standard Deviation	
Roberts Lake	11-Sep-06	7.2	1.7	4.0	0.4	1.8
Little Roberts Lake	13-Sep-06	8.3	1.7	5.0	1.5	1.7
Doris Lake	13-Sep-06	15.3	1.6	5.1	1.6	3.0
Tail Lake	13-Sep-06	2.8	0.9	2.3	1.0	1.2
Roberts Bay	11-Sep-06	0.7	0.5	0.4	0.4	1.6

NOTES:

Chlorophyll 'a' is the dominant type of chlorophyll in the algae most commonly found in surface waters. Phaeophytin is a breakdown product of chlorophyll and the ratio of chlorophyll to phaeophytin provides information of the health of the algal population. During rapid growth, the proportion of phaeophytin is low. During periods of decline, such as those that follow prolonged cloudy weather or exposure of the algae to toxic substances, the proportion of phaeophytin is high.

No guidelines have been proposed in Canada for water quality criterion for Chlorophyll 'a'; however, a guideline of 100 ug/L has been proposed for streams in British Columbia.

APPENDIX C
FISH DATA

Appendix C1. Data for individual fish captured at the fish fence in Little Roberts Outflow, 2006

Sample Number	Species	Fork Length (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Moving	Location	Ageing Structures	Age (years)	Capture Code	Year Tagged	Comments
1	LKTR	451	950	1.04	U	B-036	FF	19-Jun-06	D/S	Little Roberts Outflow			R	2000	
2	LKTR	766	4470	0.99	U	G-4614	AN	19-Jun-06	D/S	Little Roberts Outflow					
3	ARCH	731	3375	0.86	U	G-4615	AN	20-Jun-06	D/S	Little Roberts Outflow					
4	LKTR	500	1645	1.32	U	G-4616	AN	20-Jun-06	D/S	Little Roberts Outflow					
5	LKTR	446	925	1.04	U	G-4016	FF	20-Jun-06	D/S	Little Roberts Outflow			R	2004	
6	LKTR	813	6135	1.14	U	G-4617	AN	20-Jun-06	D/S	Little Roberts Outflow					
7	LKTR	416	640	0.89	U	G-3308	AN	21-Jun-06	D/S	Little Roberts Outflow			R	2003	
8	ARCH	341	360	0.91	M	G-4234	FF	22-Jun-06	D/S	Little Roberts Outflow	OT	6	R	2004	dead in trap; analyzed for Strontium
9	ARCH	779	4865	1.03	M	G-4618	FF	23-Jun-06	D/S	Little Roberts Outflow					kype developing
10	ARCH	651	2410	0.87	U	G-4619	FF	23-Jun-06	D/S	Little Roberts Outflow					
11	ARCH	819	3810	0.69	M	G-4620	AN	23-Jun-06	D/S	Little Roberts Outflow					kype developing
12	ARCH	686	2485	0.77	U	G-4621	AN	23-Jun-06	D/S	Little Roberts Outflow					
13	ARCH	760	4430	1.01	M	G-4622	AN	23-Jun-06	D/S	Little Roberts Outflow					
14	ARCH	579	1320	0.68	U	G-4452	AN	23-Jun-06	D/S	Little Roberts Outflow			R	2005	
15	ARCH	727	2810	0.73	U	G-4623	AN	23-Jun-06	D/S	Little Roberts Outflow					
16	ARCH	815	4755	0.88	U	G-4624	AN	23-Jun-06	D/S	Little Roberts Outflow					
17	ARCH	772	4210	0.92	M	G-4629	FF	23-Jun-06	D/S	Little Roberts Outflow					
18	ARCH	768	3845	0.85	U	G-4306	FF	23-Jun-06	D/S	Little Roberts Outflow			R	2005	
19	ARCH	653			U	G-4626	AN	23-Jun-06	D/S	Little Roberts Outflow					weight of 4125 g not used in calculations
20	LKTR	882	7505	1.09	U	G-4343	AN	23-Jun-06	D/S	Little Roberts Outflow			R	2005	
21	LKTR	812	5555	1.04	U	G-4206	AN	23-Jun-06	D/S	Little Roberts Outflow			R	2004	
22	LKTR	645	3260	1.21	U	G-4261	AN	23-Jun-06	D/S	Little Roberts Outflow			R	2005	
23	LKTR	520	1330	0.95	U	G-4627	AN	23-Jun-06	D/S	Little Roberts Outflow					
24	LKTR	638	2725	1.05	U	G-4064	FF	23-Jun-06	D/S	Little Roberts Outflow			R	2004	
25	ARCH	690	2835	0.86	U	G-4628	AN	24-Jun-06	D/S	Little Roberts Outflow					
26	ARCH	773	3435	0.74	U	G-4629	AN	24-Jun-06	D/S	Little Roberts Outflow					
27	ARCH	764	4570	1.02	M	G-4630	AN	24-Jun-06	D/S	Little Roberts Outflow					
28	ARCH	703	2560	0.74	U	G-4631	AN	25-Jun-06	D/S	Little Roberts Outflow					
29	ARCH	676	2755	0.89	U	G-4632	AN	25-Jun-06	D/S	Little Roberts Outflow					
30	ARCH	753	3990	0.93	U	G-4634	AN	25-Jun-06	U/S	Little Roberts Outflow					
31	ARCH	691	2385	0.72	U	G-4635	AN	25-Jun-06	D/S	Little Roberts Outflow					
32	ARCH	631	2205	0.88	U	G-4637	AN	25-Jun-06	U/S	Little Roberts Outflow					
33	ARCH	108	10	0.79	U		FF	25-Jun-06	D/S	Little Roberts Outflow					
34	ARCH	823	3735	0.67	U	G-4638	FF	25-Jun-06	D/S	Little Roberts Outflow					
35	ARCH	688	2005	0.62	U	G-4315	AN	25-Jun-06	D/S	Little Roberts Outflow			R	2005	
36	LKTR	627	2715	1.10	U	G-4633	AN	25-Jun-06	U/S	Little Roberts Outflow					
37	LKTR	814	5915	1.10	U	G-4636	AN	25-Jun-06	U/S	Little Roberts Outflow					
38	ARCH	663	2930	1.01	U	G-4639	FF	26-Jun-06	D/S	Little Roberts Outflow					
39	ARCH	692	2910	0.88	U	G-4640	AN	26-Jun-06	D/S	Little Roberts Outflow					
40	ARCH	626	1930	0.79	U	G-4641	FF	26-Jun-06	D/S	Little Roberts Outflow					
41	LKTR	508	1585	1.21	U	G-4283	AN	26-Jun-06	D/S	Little Roberts Outflow			R	2005	
42	LKTR	654	1355	0.48	U	G-4642	AN	26-Jun-06	D/S	Little Roberts Outflow					
43	ARCH	738	2785	0.69	U	G-4643	FF	27-Jun-06	D/S	Little Roberts Outflow					
44	ARCH	375	455	0.86	U	G-4578	FF	27-Jun-06	D/S	Little Roberts Outflow			R	2005	
45	ARCH	645			U	G-4644	FF	27-Jun-06	D/S	Little Roberts Outflow					escaped before weight measured
46	ARCH	480	1000	0.90	U	G-4645	AN	27-Jun-06	D/S	Little Roberts Outflow					
47	ARCH	430	695	0.87	U	G-4126	AN	27-Jun-06	D/S	Little Roberts Outflow			R	2004	
48	ARCH	506	1220	0.94	U	G-4378	AN	27-Jun-06	D/S	Little Roberts Outflow			R	2005	
49	ARCH	605	1895	0.86	U	G-3226	AN	27-Jun-06	D/S	Little Roberts Outflow			R	2003	
50	ARCH	619	2120	0.89	U	G-4647	FF	27-Jun-06	D/S	Little Roberts Outflow					
51	LKTR	636	2595	1.01	U	G-4064	AN	27-Jun-06	U/S	Little Roberts Outflow			R	2004	
52	LKTR	718	3785	1.02	U	G-4646	AN	27-Jun-06	U/S	Little Roberts Outflow					
53	LKTR	473	1035	0.98	U	G-4500	AN	27-Jun-06	D/S	Little Roberts Outflow			R	2005	
54	ARCH	583	1740	0.88	U	G-4663	FF	28-Jun-06	D/S	Little Roberts Outflow					

Appendix C1. Data for individual fish captured at the fish fence in Little Roberts Outflow, 2006

Sample Number	Species	Fork Length (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Moving	Location	Ageing Structures	Age (years)	Capture Code	Year Tagged	Comments
55	ARCH	488	975	0.84	U	G-4331	FF	28-Jun-06	D/S	Little Roberts Outflow			R	2005	
56	ARCH	480	975	0.88	U	G-4664	FF	28-Jun-06	D/S	Little Roberts Outflow					
57	ARCH	424	735	0.96	U	G-4134	FF	28-Jun-06	D/S	Little Roberts Outflow			R	2004	
58	ARCH	358	445	0.97	U	G-4502	FF	28-Jun-06	D/S	Little Roberts Outflow			R	2005	
59	ARCH	384	485	0.86	U	G-4665	FF	28-Jun-06	D/S	Little Roberts Outflow					
60	ARCH	357	370	0.81	U		FF	28-Jun-06	D/S	Little Roberts Outflow					
61	ARCH	342	350	0.87	U		FF	28-Jun-06	D/S	Little Roberts Outflow	FR	3			
62	ARCH	741	3600	0.88	M	G-4666	FF	28-Jun-06	D/S	Little Roberts Outflow					
63	ARCH	268	180	0.94	U		FF	28-Jun-06	D/S	Little Roberts Outflow	FR	3			
64	LKTR	823	6175	1.11	U	G-4667	AN	28-Jun-06	U/S	Little Roberts Outflow					
65	ARCH	817	5140	0.94	U	G-4668	DN	29-Jun-06	U/S	Little Roberts Outflow					
66	ARCH	825	4955	0.88	M	G-4669	DN	29-Jun-06	U/S	Little Roberts Outflow					
67	ARCH	755	3885	0.90	U	G-3274	FF	29-Jun-06	D/S	Little Roberts Outflow			R	2004	
68	ARCH	671	2430	0.80	U	G-4670	FF	29-Jun-06	D/S	Little Roberts Outflow					
69	ARCH	480	1015	0.92	U	G-4671	FF	29-Jun-06	D/S	Little Roberts Outflow					
70	ARCH	772	3855	0.84	M	G-4672	FF	29-Jun-06	D/S	Little Roberts Outflow					
71	ARCH	441	830	0.97	U	G-4542	FF	29-Jun-06	D/S	Little Roberts Outflow			R	2005	
72	ARCH	620	1780	0.75	U	G-4673	FF	29-Jun-06	D/S	Little Roberts Outflow					
73	ARCH	377	480	0.90	U	G-4674	FF	29-Jun-06	D/S	Little Roberts Outflow					
74	ARCH	625	2155	0.88	M	G-4327	FF	29-Jun-06	D/S	Little Roberts Outflow			R	2005	
75	ARCH	534	1590	1.04	U	G-4675	FF	29-Jun-06	D/S	Little Roberts Outflow					
76	ARCH	660	2745	0.95	M	G-4287	FF	29-Jun-06	D/S	Little Roberts Outflow			R	2005	
77	ARCH	694	2610	0.78	M	G-4008	FF	29-Jun-06	D/S	Little Roberts Outflow			R	2004	
78	ARCH	457			M	G-4676	FF	29-Jun-06	D/S	Little Roberts Outflow					
79	ARCH	239	105	0.77	U		FF	29-Jun-06	D/S	Little Roberts Outflow					
80	ARCH	525	1365	0.94	U	G-4677	FF	29-Jun-06	D/S	Little Roberts Outflow					
81	ARCH	664	2255	0.77	M	G-4678	FF	29-Jun-06	D/S	Little Roberts Outflow					
82	ARCH	347	385	0.92	U		FF	29-Jun-06	D/S	Little Roberts Outflow					
83	LKTR	833	5535	0.96	U	G-4084	DN	29-Jun-06	U/S	Little Roberts Outflow			R	2004	
84	ARCH	520	1290	0.92	U	W-2220	FF	30-Jun-06	D/S	Little Roberts Outflow			R	2002	
85	ARCH	604	1715	0.78	U	G-3183	FF	30-Jun-06	D/S	Little Roberts Outflow			R	2003	
86	ARCH	353	410	0.93	U	G-4600	FF	30-Jun-06	D/S	Little Roberts Outflow			R	2005	
87	ARCH	372	495	0.96	U	G-4410	FF	30-Jun-06	D/S	Little Roberts Outflow			R	2005	
88	ARCH	322	275	0.82	U	G-4562	FF	30-Jun-06	D/S	Little Roberts Outflow	SC		R	2005	
89	ARCH	366	445	0.91	U	G-4200	FF	30-Jun-06	D/S	Little Roberts Outflow			R	2004	
90	ARCH	411	565	0.81	U	G-4679	FF	30-Jun-06	D/S	Little Roberts Outflow					
91	ARCH	317	295	0.93	U		FF	30-Jun-06	D/S	Little Roberts Outflow	FR	3			
92	ARCH	355	310	0.69	U		FF	30-Jun-06	D/S	Little Roberts Outflow					
93	ARCH	316	270	0.86	U		FF	30-Jun-06	D/S	Little Roberts Outflow					
94	ARCH	267	165	0.87	U		FF	30-Jun-06	D/S	Little Roberts Outflow	FR	4			
95	ARCH	270	170	0.86	U		FF	30-Jun-06	D/S	Little Roberts Outflow					
96	ARCH	270	165	0.84	U		FF	30-Jun-06	D/S	Little Roberts Outflow					
97	ARCH	369	410	0.82	U		FF	30-Jun-06	D/S	Little Roberts Outflow					
98	LKTR	623	2215	0.92	U	G-4684	AN	30-Jun-06	D/S	Little Roberts Outflow					
99	LKTR	800	5340	1.04	U	G-4685	AN	30-Jun-06	U/S	Little Roberts Outflow					
100	LKTR	793	5275	1.06	U	G-4686	AN	30-Jun-06	U/S	Little Roberts Outflow					
101	LKTR	874	7015	1.05	U	G-4343	AN	30-Jun-06	U/S	Little Roberts Outflow			R	2005	
102	LKTR	605	2070	0.93	U	G-4181	AN	30-Jun-06	U/S	Little Roberts Outflow			R	2004	
103	ARCH	845	5510	0.91	M	G-4687	FF	01-Jul-06	D/S	Little Roberts Outflow					
104	ARCH	625	2125	0.87	U	G-4688	FF	01-Jul-06	D/S	Little Roberts Outflow					
105	ARCH	352	410	0.94	U	G-4237	FF	01-Jul-06	D/S	Little Roberts Outflow			R	2004	
106	ARCH	631	2395	0.95	M	G-4406	FF	01-Jul-06	D/S	Little Roberts Outflow			R	2005	
107	ARCH	408	615	0.91	U	G-4409	FF	01-Jul-06	D/S	Little Roberts Outflow			R	2005	
108	ARCH	345	390	0.95	U	G-4462	FF	01-Jul-06	D/S	Little Roberts Outflow			R	2005	

Appendix C1. Data for individual fish captured at the fish fence in Little Roberts Outflow, 2006

Sample Number	Species	Fork Length (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Moving	Location	Ageing Structures	Age (years)	Capture Code	Year Tagged	Comments
109	ARCH	370	435	0.86	U	G-4236	FF	01-Jul-06	D/S	Little Roberts Outflow			R	2004	
110	ARCH	301	205	0.75	U	G-4549	FF	01-Jul-06	D/S	Little Roberts Outflow			R	2005	
111	ARCH	371	475	0.93	U	G-4689	FF	01-Jul-06	D/S	Little Roberts Outflow					
112	ARCH	355	400	0.89	U	G-4690	FF	01-Jul-06	D/S	Little Roberts Outflow					
113	ARCH	341	355	0.90	U	G-4691	FF	01-Jul-06	D/S	Little Roberts Outflow					
114	ARCH	361	445	0.95	U	G-4692	FF	01-Jul-06	D/S	Little Roberts Outflow					
115	ARCH	336	325	0.86	U	G-4693	FF	01-Jul-06	D/S	Little Roberts Outflow					
116	ARCH	295	225	0.88	U		FF	01-Jul-06	D/S	Little Roberts Outflow					
117	ARCH	300	240	0.89	U		FF	01-Jul-06	D/S	Little Roberts Outflow					
118	ARCH	260	145	0.82	U		FF	01-Jul-06	D/S	Little Roberts Outflow					
119	ARCH	267	175	0.92	U		FF	01-Jul-06	D/S	Little Roberts Outflow					
120	ARCH	284	215	0.94	U		FF	01-Jul-06	D/S	Little Roberts Outflow					
121	ARCH	291	195	0.79	U		FF	01-Jul-06	D/S	Little Roberts Outflow					
122	ARCH	289	190	0.79	U		FF	01-Jul-06	D/S	Little Roberts Outflow					
123	ARCH	273	165	0.81	U		FF	01-Jul-06	D/S	Little Roberts Outflow					
124	ARCH	651	2215	0.80	U	G-3167	FF	01-Jul-06	D/S	Little Roberts Outflow			R	2003	
125	ARCH	409	595	0.87	U	G-4503	FF	01-Jul-06	D/S	Little Roberts Outflow			R	2005	
126	ARCH	280	170	0.77	U		FF	01-Jul-06	D/S	Little Roberts Outflow					
127	ARCH	269	165	0.85	U		FF	01-Jul-06	D/S	Little Roberts Outflow	FR	5			
128	ARCH	248	135	0.89	U		FF	01-Jul-06	D/S	Little Roberts Outflow	FR	3			
129	ARCH	347	340	0.81	U	G-4537	FF	01-Jul-06	D/S	Little Roberts Outflow			R	2005	
130	ARCH	262			U		FF	01-Jul-06	D/S	Little Roberts Outflow	FR, OT	3			dead in vexar, partial body
131	ARCH	334	350	0.94	U		FF	01-Jul-06	D/S	Little Roberts Outflow	FR, OT	6			in stomach of LKTR; analyzed for Strontium
132	LKTR	778	4810	1.02	U	G-4614	AN	01-Jul-06	U/S	Little Roberts Outflow			R	2005	
133	LKTR	830	6375	1.11	U	G-4694	AN	01-Jul-06	U/S	Little Roberts Outflow					
134	LKTR	801	5320	1.04	U	G-4695	AN	01-Jul-06	U/S	Little Roberts Outflow					
135	LKTR	795	5565	1.11	U	G-4330	AN	01-Jul-06	U/S	Little Roberts Outflow			R	2005	
136	LKTR	824	5625	1.01	U	G-4184	AN	02-Jul-06	U/S	Little Roberts Outflow			R	2004	
137	LKTR	794	5545	1.11	U	G-4696	AN	02-Jul-06	U/S	Little Roberts Outflow					
138	LKTR	717	4025	1.09	U	G-4697	AN	02-Jul-06	U/S	Little Roberts Outflow					
139	LKTR	779	5695	1.20	U	G-4698	AN	02-Jul-06	U/S	Little Roberts Outflow					
140	LKTR	867	6565	1.01	U	G-4699	AN	02-Jul-06	U/S	Little Roberts Outflow					
141	LKTR	821	6215	1.12	U	G-4700	AN	03-Jul-06	U/S	Little Roberts Outflow					
142	ARCH	899	5005	0.69	U	G-4701	AN	04-Jul-06	U/S	Little Roberts Outflow	FR, OT	11			perished
143	ARCH	350	355	0.83	U		FF	04-Jul-06	D/S	Little Roberts Outflow					
144	ARCH	407	615	0.91	U	G-4199	FF	04-Jul-06	D/S	Little Roberts Outflow			R	2004	
145	ARCH	281	190	0.86	U		FF	04-Jul-06	D/S	Little Roberts Outflow					
146	ARCH	303	225	0.81	U		FF	04-Jul-06	D/S	Little Roberts Outflow					
147	ARCH	253	140	0.86	U		FF	04-Jul-06	D/S	Little Roberts Outflow					
148	ARCH	834	5415	0.93	U	G-4703	AN	04-Jul-06	U/S	Little Roberts Outflow					
149	ARCH	652	2435	0.88	U	G-4704	FF	04-Jul-06	D/S	Little Roberts Outflow					
150	ARCH	674	3710	1.21	U	G-4705	AN	04-Jul-06	U/S	Little Roberts Outflow					
151	LKTR	719	4190	1.13	U	G-4702	AN	04-Jul-06	U/S	Little Roberts Outflow					
152	ARCH	649	1665	0.61	U	G-4706	FF	05-Jul-06	D/S	Little Roberts Outflow					
153	ARCH	375	460	0.87	U	G-4561	FF	05-Jul-06	D/S	Little Roberts Outflow			R	2004	
154	ARCH	277	180	0.85	U		FF	05-Jul-06	D/S	Little Roberts Outflow					
155	ARCH	330	300	0.83	U		FF	05-Jul-06	D/S	Little Roberts Outflow					
156	ARCH	284	195	0.85	U		FF	05-Jul-06	D/S	Little Roberts Outflow					
157	ARCH	299	215	0.80	U		FF	05-Jul-06	D/S	Little Roberts Outflow					
158	ARCH	291	185	0.75	U		FF	05-Jul-06	D/S	Little Roberts Outflow					
159	ARCH	282	190	0.85	U		FF	05-Jul-06	D/S	Little Roberts Outflow					
160	ARCH	268	170	0.88	U		FF	05-Jul-06	D/S	Little Roberts Outflow					
161	ARCH	258	155	0.90	U		FF	05-Jul-06	D/S	Little Roberts Outflow					
162	ARCH	248	130	0.85	U		FF	05-Jul-06	D/S	Little Roberts Outflow					

Appendix C1. Data for individual fish captured at the fish fence in Little Roberts Outflow, 2006

Sample Number	Species	Fork Length (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Moving	Location	Ageing Structures	Age (years)	Capture Code	Year Tagged	Comments
163	ARCH	251	140	0.89	U		FF	05-Jul-06	D/S	Little Roberts Outflow	FR	2			
164	ARCH	284	185	0.81	U		FF	05-Jul-06	D/S	Little Roberts Outflow					
165	ARCH	618	1575	0.67	U	G-4093	FF	06-Jul-06	D/S	Little Roberts Outflow			R	2004	
166	ARCH	766	4065	0.90	M	G-4708	AN	06-Jul-06	U/S	Little Roberts Outflow					
167	ARCH	261	185	1.04	U		FF	06-Jul-06	D/S	Little Roberts Outflow	FR, OT				dead in trap
168	ARCH	763	4295	0.97	M	G-4710	AN	06-Jul-06	U/S	Little Roberts Outflow					
169	ARCH	843	5895	0.98	U	G-4713	AN	06-Jul-06	U/S	Little Roberts Outflow					
170	BRWH	545	2000	1.24	U	G-4707	AN	06-Jul-06	U/S	Little Roberts Outflow					
171	LKTR	812	5205	0.97	U	G-4206	DN	06-Jul-06	U/S	Little Roberts Outflow			R	2004	
172	LKTR	770	5345	1.17	U	G-4709	AN	06-Jul-06	U/S	Little Roberts Outflow					
173	ARCH	401	540	0.84	U	G-4714	FF	07-Jul-06	D/S	Little Roberts Outflow					
174	ARCH	221	80	0.74	U		FF	07-Jul-06	D/S	Little Roberts Outflow					
175	ARCH	261	145	0.82	U		FF	07-Jul-06	D/S	Little Roberts Outflow					
176	ARCH	552	1415	0.84	U	G-4715	FF	07-Jul-06	D/S	Little Roberts Outflow					
177	ARCH	734	4480	1.13	U	G-4717	AN	07-Jul-06	U/S	Little Roberts Outflow					
178	ARCH	625	2085	0.85	U	G-4637	FF	07-Jul-06	D/S	Little Roberts Outflow			R	2005	
179	ARCH	668	2855	0.96	U	G-4718	FF	07-Jul-06	D/S	Little Roberts Outflow					
180	ARCH	339	305	0.78	U	G-4580	FF	07-Jul-06	D/S	Little Roberts Outflow			R	2005	
181	ARCH	346	375	0.91	U	G-4481	FF	07-Jul-06	D/S	Little Roberts Outflow			R	2005	
182	ARCH	314	255	0.82	U	G-4719	FF	07-Jul-06	D/S	Little Roberts Outflow					
183	ARCH	243	135	0.94	U		FF	07-Jul-06	D/S	Little Roberts Outflow					
184	ARCH	239	130	0.95	U		FF	07-Jul-06	D/S	Little Roberts Outflow					
185	ARCH	284	190	0.83	U		FF	07-Jul-06	D/S	Little Roberts Outflow					
186	ARCH	269	160	0.82	U		FF	07-Jul-06	D/S	Little Roberts Outflow					
187	ARCH	254	145	0.88	U		FF	07-Jul-06	D/S	Little Roberts Outflow					
188	ARCH	260	150	0.85	U		FF	08-Jul-06	D/S	Little Roberts Outflow	FR, OT	3			adipose collected, dead in trap
189	LKTR	795	5225	1.04	U	G-4389	AN	08-Jul-06	U/S	Little Roberts Outflow			R	2005	
190	ARCH	374	425	0.81	U	G-4403	FF	09-Jul-06	D/S	Little Roberts Outflow			R	2005	
191	ARCH	363	440	0.92	U	G-4193	FF	09-Jul-06	D/S	Little Roberts Outflow			R	2004	
192	ARCH	317	280	0.88	U	G-4602	FF	09-Jul-06	D/S	Little Roberts Outflow			R	2005	
193	ARCH	487			U	G-4720	FF	09-Jul-06	D/S	Little Roberts Outflow					weight of 545 g not used in calculations
194	ARCH	271	175	0.88	U		FF	09-Jul-06	D/S	Little Roberts Outflow					
195	ARCH	317	265	0.83	U		FF	09-Jul-06	D/S	Little Roberts Outflow					
196	ARCH	314	270	0.87	U		FF	09-Jul-06	D/S	Little Roberts Outflow					
197	ARCH	305	250	0.88	U		FF	09-Jul-06	D/S	Little Roberts Outflow					
198	ARCH	303	240	0.86	U		FF	09-Jul-06	D/S	Little Roberts Outflow					
199	ARCH	650	2035	0.74	U	G-4722	AN	09-Jul-06	D/S	Little Roberts Outflow					
200	LKTR	715	5875	1.61	U	G-4721	AN	09-Jul-06	U/S	Little Roberts Outflow					
201	ARCH	688	2515	0.77	F		AN	12-Jul-06	U/S	Little Roberts Outflow					
202	ARCH	719	2605	0.70	F	G-4723	FF	13-Jul-06	D/S	Little Roberts Outflow					moving d/s, photos, genetics
203	ARCH	295	200	0.78	U		FF	13-Jul-06	D/S	Little Roberts Outflow					moving d/s, photos, genetics
204	ARCH	382	495	0.89	U		FF	13-Jul-06	D/S	Little Roberts Outflow					moving d/s, photos, genetics
205	ARCH	270	160	0.81	U		FF	13-Jul-06	D/S	Little Roberts Outflow					moving d/s, photos, no genetics
206	ARCH	582	1730	0.88	U	G-4377	FF	13-Jul-06	D/S	Little Roberts Outflow			R	2005	moving d/s, photos, genetics
207	ARCH	280	130	0.59	U		FF	13-Jul-06	D/S	Little Roberts Outflow					moving d/s, photos, genetics
208	ARCH	294	170	0.67	U		FF	13-Jul-06	D/S	Little Roberts Outflow					erosion of top caudal, moving d/s, genetics, photos
209	LKTR	600	2910	1.35	U	G-4724	DN	13-Jul-06	U/S	Little Roberts Outflow					moving u/s, photos, dorsal eroded,
210	LKTR	900	8110	1.11	U	G-4597	DN	13-Jul-06	U/S	Little Roberts Outflow			R	2005	moving u/s, photos
211	ARCH	742	4130	1.01	M	G-4725	FF	14-Jul-06	D/S	Little Roberts Outflow					moving d/s, photos, genetics
212	LKTR	690	3430	1.04	U	G-4726	DN	14-Jul-06	U/S	Little Roberts Outflow					moving u/s, no genetics
213	ARCH	670	3325	1.11	F	G-4728	DN	15-Jul-06	U/S	Little Roberts Outflow					moving u/s, photos, genetic
214	ARCH	279	185	0.85	U		FF	15-Jul-06	D/S	Little Roberts Outflow					moving d/s, photos, genetics
215	ARCH	345	360	0.88	U		FF	15-Jul-06	D/S	Little Roberts Outflow					moving d/s, photos, genetics
216	ARCH	294	255	1.00	U		FF	15-Jul-06	D/S	Little Roberts Outflow					moving d/s, photos, genetics, bite marks

Appendix C1. Data for individual fish captured at the fish fence in Little Roberts Outflow, 2006

Sample Number	Species	Fork Length (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Moving	Location	Ageing Structures	Age (years)	Capture Code	Year Tagged	Comments
217	ARCH	302	240	0.87	U		FF	15-Jul-06	D/S	Little Roberts Outflow					moving d/s, photos, genetics
218	ARCH	266	155	0.82	U		FF	15-Jul-06	D/S	Little Roberts Outflow					moving d/s, no photos, no genetics
219	ARCH	263	140	0.77	U		FF	15-Jul-06	D/S	Little Roberts Outflow					moving d/s, no photos, no genetics
220	ARCH	874	8065	1.21	M	G-4730	DN	15-Jul-06	U/S	Little Roberts Outflow					moving u/s, photos, genetics
221	LKTR						AN	19-Jul-06	U/S	Little Roberts Outflow					moved by Matthew Kawei without processing
222	LKTR						AN	19-Jul-06	U/S	Little Roberts Outflow					moved by Matthew Kawei without processing
223	LKTR						AN	19-Jul-06	U/S	Little Roberts Outflow					moved by Matthew Kawei without processing
224	LKTR						AN	19-Jul-06	U/S	Little Roberts Outflow					moved by Matthew Kawei without processing
225	LKTR						AN	19-Jul-06	U/S	Little Roberts Outflow					moved by Matthew Kawei without processing
226	LKTR						AN	19-Jul-06	U/S	Little Roberts Outflow					moved by Matthew Kawei without processing
227	LKTR						AN	19-Jul-06	U/S	Little Roberts Outflow					moved by Matthew Kawei without processing
228	LKTR						AN	19-Jul-06	U/S	Little Roberts Outflow					moved by Matthew Kawei without processing
229	LKTR						AN	19-Jul-06	U/S	Little Roberts Outflow					moved by Matthew Kawei without processing
230	LKTR						AN	19-Jul-06	U/S	Little Roberts Outflow					moved by Matthew Kawei without processing
231	LKTR						AN	19-Jul-06	U/S	Little Roberts Outflow					moved by Matthew Kawei without processing
232	LKTR						AN	19-Jul-06	U/S	Little Roberts Outflow					moved by Matthew Kawei without processing
233	LKTR						AN	19-Jul-06	U/S	Little Roberts Outflow					moved by Matthew Kawei without processing
234	LKTR						AN	19-Jul-06	U/S	Little Roberts Outflow					moved by Matthew Kawei without processing
235	LKTR						AN	19-Jul-06	U/S	Little Roberts Outflow					moved by Matthew Kawei without processing
236	LKTR						AN	19-Jul-06	U/S	Little Roberts Outflow					moved by Matthew Kawei without processing
237	LKTR	886	6640	0.95	U	G-3499	DN	20-Jul-06	U/S	Little Roberts Outflow			R	2005	lesions, injury to L operculum, no genetics
238	LKTR	850	5825	0.95	U		DN	20-Jul-06	U/S	Little Roberts Outflow					injured right eye and operc, caudual haemorhaging
239	ARCH	266	165	0.88	U		BS	21-Jul-06	D/S	Little Roberts Outflow					moving d/s, genetics, photos
240	ARCH	285	190	0.82	U		BS	21-Jul-06	D/S	Little Roberts Outflow					moving d/s, genetics, photos
241	ARCH	862	5845	0.91	M	G-4849	DN	21-Jul-06	U/S	Little Roberts Outflow					lesions both sides, dorsal injury, jaw wound,
242	ARCH	345	390	0.95	U	G-4847	BS	21-Jul-06	D/S	Little Roberts Outflow					moving d/s, photos, genetics
243	ARCH	344	285	0.70	U	G-4845	BS	21-Jul-06	D/S	Little Roberts Outflow					bite marks on caudal peduncle
244	ARCH	384			U		BS	21-Jul-06	D/S	Little Roberts Outflow					moving d/s, photos, genetics, bite marks
245	ARCH	270	160	0.81	U		BS	21-Jul-06	D/S	Little Roberts Outflow					moving d/s, photos, genetics
246	ARCH	245	140	0.95	U		BS	21-Jul-06	D/S	Little Roberts Outflow					moving d/s, photos, genetics
247	ARCH	287	200	0.85	U		BS	21-Jul-06	D/S	Little Roberts Outflow					moving d/s, photos, genetics
248	ARCH	272	165	0.82	U		BS	21-Jul-06	D/S	Little Roberts Outflow					moving d/s, photos, genetics
249	ARCH	330	285	0.79	U		BS	21-Jul-06	D/S	Little Roberts Outflow					moving d/s, no photos, no genetics
250	ARCH	330	210	0.58	U		BS	21-Jul-06	D/S	Little Roberts Outflow					moving d/s, no photos, no genetics
251	ARCH	265	180	0.97	U		BS	21-Jul-06	D/S	Little Roberts Outflow					moving d/s, no photos, no genetics
252	ARCH	263	150	0.82	U		BS	21-Jul-06	D/S	Little Roberts Outflow					moving d/s, no photos, no genetics
253	ARCH	290	220	0.90	U		BS	21-Jul-06	D/S	Little Roberts Outflow					moving d/s, no photos, no genetics
254	ARCH	495	1030	0.85	U	G-4842	BS	21-Jul-06	D/S	Little Roberts Outflow					moving d/s, lesion L side
255	LKTR	850	6790	1.11	U	G-4185	DN	21-Jul-06	U/S	Little Roberts Outflow			R	2004	moving u/s, lesion R pec, genetics, photos
256	LKTR	740	5150	1.27	U	G-4848	DN	21-Jul-06	U/S	Little Roberts Outflow					
257	LKTR	785	5030	1.04	U	G-4443	DN	21-Jul-06	U/S	Little Roberts Outflow			R	2005	frayed dorsal, ripped R mandible
258	LKTR	805	6190	1.19	U	G-4844	DN	21-Jul-06	U/S	Little Roberts Outflow					moving u/s, no photos, no genetics
259	LKTR	855	7380	1.18	U	G-4258	DN	21-Jul-06	U/S	Little Roberts Outflow			R	2005	moving u/s, R pec fin lesion
260	ARCH	341	360	0.91			FF	22-Jul-06	D/S	Little Roberts Outflow	SC, OT	15			

CODES:

Species:
ARCH Arctic char
LKTR Lake trout
BRWH Broad whitefish

Sex:
F Female
M Male
U Unknown

Ageing Structures:
SC Scales
FR Fin rays
OT Otoliths

Tag Colour:
B Blue
G Green
W White
Y Yellow

Condition Factor = Weight [in g] X 10^5/ (FL [in mm])^3

Capture Codes: R = re-capture

Capture Method:
FF Fish fence
AN Angling
BS Beach seine
DN Dip net

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
1	ARCH	401	520	0.81			AN	22-Jun-06	L32AN-01	Lake 32				photo
2	ARCH	391	685	1.15			AN	22-Jun-06	L32AN-01	Lake 32				
3	ARCH	396	555	0.89			AN	22-Jun-06	L32AN-01	Lake 32				
4	LKTR	512	1880	1.40			AN	22-Jun-06	L32AN-01	Lake 32				photo
5	ARCH	53					EF	22-Jun-06	E32EF-01	Stream E32				photo
6	LKTR	384	695	1.23			AN	26-Jun-06	L32AN-02	Lake 32				
7	LKTR	391	755	1.26			AN	26-Jun-06	L32AN-02	Lake 32				
8	LKTR	399	685	1.08			AN	26-Jun-06	L32AN-02	Lake 32				
9	LKTR	376	630	1.19			AN	26-Jun-06	L32AN-02	Lake 32				
10	LKTR	348	555	1.32			AN	26-Jun-06	L32AN-02	Lake 32				
11	LKTR	325	440	1.28			AN	26-Jun-06	L32AN-02	Lake 32				
12	LKTR	364	635	1.32			AN	26-Jun-06	L32AN-02	Lake 32				
13	ARCH	401	640	0.99			GN	26-Jun-06	L32GN-01	Lake 32				
14	ARCH	356	395	0.88			GN	26-Jun-06	L32GN-01	Lake 32				
15	ARCH	385	570	1.00			GN	26-Jun-06	L32GN-01	Lake 32				
16	ARCH	368	545	1.09			GN	26-Jun-06	L32GN-01	Lake 32				
17	ARCH	363	505	1.06			GN	26-Jun-06	L32GN-01	Lake 32				
18	ARCH	390	520	0.88			GN	26-Jun-06	L32GN-01	Lake 32				
19	ARCH	373	485	0.93			GN	26-Jun-06	L32GN-01	Lake 32				
20	ARCH	361	440	0.94			GN	26-Jun-06	L32GN-01	Lake 32				
21	ARCH	414	645	0.91			GN	26-Jun-06	L32GN-01	Lake 32				
22	ARCH	344	415	1.02			GN	26-Jun-06	L32GN-01	Lake 32				
23	ARCH	407	535	0.79			GN	26-Jun-06	L32GN-01	Lake 32				
24	ARCH	394	405	0.66			GN	26-Jun-06	L32GN-01	Lake 32				
25	ARCH	415	640	0.90			GN	26-Jun-06	L32GN-01	Lake 32	FR			FR-Pel
26	ARCH	311	295	0.98			GN	26-Jun-06	L32GN-01	Lake 32	FR			FR-Pel
27	ARCH	411	670	0.97			GN	26-Jun-06	L32GN-01	Lake 32	FR, OT			FR-Pel and OT, dead in GN - male?
28	LKTR	420	730	0.99			GN	26-Jun-06	L32GN-01	Lake 32				
29	LKTR	374	630	1.20			GN	26-Jun-06	L32GN-01	Lake 32				
30	ARCH	316	305	0.97			GN	27-Jun-06	L33GN-02	Lake 33	FR			FR-Pel
31	ARCH	335	280	0.74			GN	27-Jun-06	L33GN-02	Lake 33	FR			FR-Pel
32	ARCH	221	80	0.74			GN	27-Jun-06	L33GN-03	Lake 33	FR			FR-Pel
33	ARCH	275	180	0.87			GN	27-Jun-06	L33GN-03	Lake 33				photo
34	NNST						EF	28-Jun-06	E12EF-01	Stream E12				
35	NNST						EF	28-Jun-06	E12EF-01	Stream E12				
36	NNST						EF	28-Jun-06	E12EF-01	Stream E12				
37	NNST						EF	28-Jun-06	E12EF-01	Stream E12				
38	NNST						EF	28-Jun-06	E12EF-01	Stream E12				
39	NNST						EF	28-Jun-06	E12EF-01	Stream E12				
40	NNST						EF	28-Jun-06	E12EF-01	Stream E12				
41	NNST						EF	28-Jun-06	E12EF-01	Stream E12				
42	NNST						MT	28-Jun-06	L12MT-03	Lake 12				
43	NNST						MT	28-Jun-06	L12MT-03	Lake 12				
44	LKTR	380	630	1.15			AN	29-Jun-06	L10AN-01	Lake 10				
45	LKTR	372	545	1.06			AN	29-Jun-06	L10AN-01	Lake 10				
46	LKTR	421	955	1.28			AN	29-Jun-06	L10AN-01	Lake 10				
47	LKTR	408	910	1.34			AN	29-Jun-06	L10AN-01	Lake 10				
48	LKTR	381	755	1.37			AN	29-Jun-06	L10AN-01	Lake 10				

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
49	LKTR	389	730	1.24			AN	29-Jun-06	L10AN-01	Lake 10				
50	LKTR	420	920	1.24			AN	29-Jun-06	L10AN-01	Lake 10				
51	LKTR	489	935	0.80			AN	29-Jun-06	L10AN-01	Lake 10				
52	ARCH	107					EF	29-Jun-06	E10EF-01	Stream E10				photo
53	ARCH	61					EF	29-Jun-06	E10EF-01	Stream E10				photo
54	ARCH	58					EF	29-Jun-06	E10EF-01	Stream E10				
55	ARCH	53					EF	29-Jun-06	E10EF-01	Stream E10				
56	ARCH	59					EF	29-Jun-06	E10EF-01	Stream E10				
57	ARCH	62					EF	29-Jun-06	E10EF-01	Stream E10				
58	ARCH	55					EF	29-Jun-06	E10EF-01	Stream E10				
59	ARCH	55					EF	29-Jun-06	E10EF-01	Stream E10				
60	ARCH	98					EF	29-Jun-06	E10EF-01	Stream E10				
61	ARCH	102					EF	29-Jun-06	E10EF-01	Stream E10				
62	ARCH	107					EF	29-Jun-06	E10EF-01	Stream E10				
63	ARCH	98					EF	29-Jun-06	E10EF-01	Stream E10				
64	ARCH	103					EF	29-Jun-06	E10EF-01	Stream E10				photos
65	ARCH	104					EF	29-Jun-06	E10EF-01	Stream E10				
66	ARCH	142					EF	29-Jun-06	E10EF-01	Stream E10				photos
67	ARCH	158					EF	29-Jun-06	E10EF-01	Stream E10				
68	ARCH	142					EF	29-Jun-06	E10EF-01	Stream E10				in small P2, photos
69	ARCH	138					EF	29-Jun-06	E10EF-01	Stream E10				
70	ARCH	402	665	1.02			GN	29-Jun-06	L10GN-01	Lake 10				
71	ARCH	494	1205	1.00			GN	29-Jun-06	L10GN-01	Lake 10	FR			FR-PEL
72	ARCH	445	960	1.09			GN	29-Jun-06	L10GN-01	Lake 10	FR			FR-PEL
73	LKTR	346	510	1.23			GN	29-Jun-06	L10GN-01	Lake 10				
74	ARCH	21					EF	04-Jul-06	E14EF	Stream E14				
75	ARCH	20					EF	04-Jul-06	E14EF	Stream E14				
76	ARCH	71					EF	04-Jul-06	E14EF	Stream E14				
77	ARCH	70					EF	04-Jul-06	E14EF	Stream E14				
78	ARCH	73					EF	04-Jul-06	E14EF	Stream E14				
79	ARCH	96					EF	04-Jul-06	E14EF	Stream E14				
80	ARCH	67					EF	04-Jul-06	E14EF	Stream E14				
81	ARCH	117					EF	04-Jul-06	E14EF	Stream E14				
82	ARCH	506	1595	1.23			GN	05-Jul-06	L06AGN-02	Lake 06a	FR			FR - released alive
83	ARCH	458	1105	1.15	F		GN	05-Jul-06	L06AGN-02	Lake 06a	FR, OT			FR - dead in net
84	ARCH	67					EF	06-Jul-06	E13EF	Stream E13				in Bo/Gr section, photo
85	ARCH	68					EF	06-Jul-06	E13EF	Stream E13				
86	NNST	58					EF	06-Jul-06	E13EF	Stream E13				
87	NNST	63					EF	06-Jul-06	E13EF	Stream E13				
88	ARCH	343	310	0.77			AN	06-Jul-06	L13AN-01	Lake 13	FR			FR-PEL
89	ARCH	261	155	0.87			AN	06-Jul-06	L13AN-01	Lake 13				
90	ARCH	246	95	0.64			GN	06-Jul-06	L13GN-01	Lake 13				
91	ARCH	224	75	0.67			GN	06-Jul-06	L13GN-01	Lake 13				
92	ARCH	304	140	0.50			GN	06-Jul-06	L13GN-01	Lake 13				
93	ARCH	214	85	0.87			GN	06-Jul-06	L13GN-01	Lake 13				
94	ARCH	226	95	0.82			GN	06-Jul-06	L13GN-01	Lake 13				
95	ARCH	234	95	0.74			GN	06-Jul-06	L13GN-01	Lake 13				
96	ARCH	211	90	0.96			GN	06-Jul-06	L13GN-01	Lake 13				

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
97	ARCH	274	175	0.85			GN	06-Jul-06	L13GN-01	Lake 13				
98	ARCH	210	80	0.86			GN	06-Jul-06	L13GN-01	Lake 13	FR			FR-PEL
99	ARCH	225	85	0.75			GN	06-Jul-06	L13GN-01	Lake 13				
100	ARCH	238	105	0.78	M		GN	06-Jul-06	L13GN-01	Lake 13	FR, OT			FR, OT, Dead in net
101	ARCH	216	90	0.89			FN	10-Jul-06	RBFNEB	Roberts Bay				Sea-run
102	ARCH	730	4190	1.08			FN	10-Jul-06	RBFNEB	Roberts Bay				Sea-run
103	ARCH	795	6023	1.20			FN	10-Jul-06	RBFNEB	Roberts Bay				Sea-run
104	ARFL	180	115	1.97			FN	10-Jul-06	RBFNEB	Roberts Bay				
105	ARFL	228	160	1.35			FN	10-Jul-06	RBFNEB	Roberts Bay				
106	ARFL	210	145	1.57			FN	10-Jul-06	RBFNEB	Roberts Bay				
107	ARFL	245	255	1.73			FN	10-Jul-06	RBFNEB	Roberts Bay				
108	ARFL	235	215	1.66			FN	10-Jul-06	RBFNEB	Roberts Bay				
109	ARFL	170	75	1.53			FN	10-Jul-06	RBFNEB	Roberts Bay				
110	ARFL	234	205	1.60			FN	10-Jul-06	RBFNEB	Roberts Bay				
111	ARFL	213	145	1.50			FN	10-Jul-06	RBFNEB	Roberts Bay				
112	ARFL	247	250	1.66			FN	10-Jul-06	RBFNEB	Roberts Bay				
113	ARFL	154	45	1.23			FN	10-Jul-06	RBFNEB	Roberts Bay				
114	ARFL	163	85	1.96			FN	10-Jul-06	RBFNEB	Roberts Bay				
115	ARFL	147	35	1.10			FN	10-Jul-06	RBFNEB	Roberts Bay				
116	ARFL	163	75	1.73			FN	10-Jul-06	RBFNEB	Roberts Bay				
117	ARFL	159	80	1.99			FN	10-Jul-06	RBFNEB	Roberts Bay				
118	ARFL	147	50	1.57			FN	10-Jul-06	RBFNEB	Roberts Bay				
119	ARFL	239	245	1.79			FN	10-Jul-06	RBFNEB	Roberts Bay				
120	ARFL	217	165	1.61			FN	10-Jul-06	RBFNEB	Roberts Bay				
121	ARFL	205	135	1.57			FN	10-Jul-06	RBFNEB	Roberts Bay				
122	ARFL	287	360	1.52			FN	10-Jul-06	RBFNEB	Roberts Bay				
123	ARFL	240	245	1.77			FN	10-Jul-06	RBFNEB	Roberts Bay				
124	ARFL	185	130	2.05			FN	10-Jul-06	RBFNEB	Roberts Bay				
125	ARFL	146					FN	10-Jul-06	RBFNEB	Roberts Bay				eliminated likely erroneous weight of 75 g
126	CAPE	126					FN	10-Jul-06	RBFNEB	Roberts Bay				no "fur"
127	CAPE	153					FN	10-Jul-06	RBFNEB	Roberts Bay				no "fur"
128	CAPE	123					FN	10-Jul-06	RBFNEB	Roberts Bay				no "fur"
129	CAPE	122					FN	10-Jul-06	RBFNEB	Roberts Bay				no "fur"
130	CAPE	121					FN	10-Jul-06	RBFNEB	Roberts Bay				no "fur"
131	CAPE	134					FN	10-Jul-06	RBFNEB	Roberts Bay				no "fur"
132	CAPE	125					FN	10-Jul-06	RBFNEB	Roberts Bay				no "fur"
133	FHSC	119					FN	10-Jul-06	RBFNEB	Roberts Bay				
134	GRCD	97					FN	10-Jul-06	RBFNEB	Roberts Bay				
135	GRCD	94					FN	10-Jul-06	RBFNEB	Roberts Bay				
136	GRCD	90					FN	10-Jul-06	RBFNEB	Roberts Bay				
137	LKTR	520	2030	1.44			FN	10-Jul-06	RBFNEB	Roberts Bay		R	2004	Sea-run
138	LKTR	825	6350	1.13			FN	10-Jul-06	RBFNEB	Roberts Bay				Sea-run
139	LKTR	540	2145	1.36			FN	10-Jul-06	RBFNEB	Roberts Bay				Sea-run
140	LKTR	579	2605	1.34			FN	10-Jul-06	RBFNEB	Roberts Bay				Sea-run
141	LKTR	635	3875	1.51			FN	10-Jul-06	RBFNEB	Roberts Bay				Sea-run
142	ARCH	695	3155	0.94			FN	10-Jul-06	RBFNWB	Roberts Bay				Sea-run
143	ARCH	820	4360	0.79			FN	10-Jul-06	RBFNWB	Roberts Bay				Sea-run
144	ARCH	795	3775	0.75	M		FN	10-Jul-06	RBFNWB	Roberts Bay				Sea-run

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
145	ARCH	780	6192	1.30	M		FN	10-Jul-06	RBFNWB	Roberts Bay				Sea-run
146	ARFL	230	205	1.68			FN	10-Jul-06	RBFNWB	Roberts Bay				
147	ARFL	260	285	1.62			FN	10-Jul-06	RBFNWB	Roberts Bay				
148	ARFL	230	240	1.97			FN	10-Jul-06	RBFNWB	Roberts Bay				
149	CAPE	155					FN	10-Jul-06	RBFNWB	Roberts Bay				
150	CAPE	135					FN	10-Jul-06	RBFNWB	Roberts Bay				
151	CAPE	132					FN	10-Jul-06	RBFNWB	Roberts Bay				
152	LKTR	533	1960	1.29	M		FN	10-Jul-06	RBFNWB	Roberts Bay				Sea-run
153	LKTR	580	2840	1.46			FN	10-Jul-06	RBFNWB	Roberts Bay				Sea-run
154	ARCH	605	2440	1.10			FN	11-Jul-06	RBFNEB	Roberts Bay				Genetics collected, photo
155	ARCH	240	110	0.80			FN	11-Jul-06	RBFNEB	Roberts Bay				genetics, photo
156	ARCH	201	55	0.68			FN	11-Jul-06	RBFNEB	Roberts Bay				genetics, photos, otoliths
157	ARFL	233	185	1.46			FN	11-Jul-06	RBFNEB	Roberts Bay				
158	ARFL	228	185	1.56			FN	11-Jul-06	RBFNEB	Roberts Bay				
159	LKTR	545	2050	1.27			FN	11-Jul-06	RBFNEB	Roberts Bay				Sea-run, genetics, photos
160	LKTR	617	2610	1.11			FN	11-Jul-06	RBFNEB	Roberts Bay		R	2006	Sea-run, genetics, photos,
161	LKTR	710	4920	1.37			FN	11-Jul-06	RBFNEB	Roberts Bay				Sea-run, genetics, photos
162	LKTR	580	2245	1.15			FN	11-Jul-06	RBFNEB	Roberts Bay				Sea-run, genetics, photos
163	LKTR	537	1875	1.21			FN	11-Jul-06	RBFNEB	Roberts Bay				Sea-run, genetics, photos
164	LKTR	483	1670	1.48			FN	11-Jul-06	RBFNEB	Roberts Bay				
165	LKTR	641	3720	1.41			FN	11-Jul-06	RBFNEB	Roberts Bay				Photos
166	ARCH	644	2465	0.92			FN	11-Jul-06	RBFNWB	Roberts Bay				Sea-run, genetics, photos
167	ARFL	165	70	1.56	M		FN	11-Jul-06	RBFNWB	Roberts Bay				
168	ARFL	151	50	1.45	M		FN	11-Jul-06	RBFNWB	Roberts Bay				
169	CAPE	129			M		FN	11-Jul-06	RBFNWB	Roberts Bay				
170	CAPE	127			M		FN	11-Jul-06	RBFNWB	Roberts Bay				
171	CAPE	132			M		FN	11-Jul-06	RBFNWB	Roberts Bay				
172	CAPE	151			M		FN	11-Jul-06	RBFNWB	Roberts Bay				
173	CAPE	130			F		FN	11-Jul-06	RBFNWB	Roberts Bay				
174	CAPE	124			F		FN	11-Jul-06	RBFNWB	Roberts Bay				
175	CAPE	122			F		FN	11-Jul-06	RBFNWB	Roberts Bay				
176	CAPE	127			F		FN	11-Jul-06	RBFNWB	Roberts Bay				
177	CAPE	132			F		FN	11-Jul-06	RBFNWB	Roberts Bay				
178	CAPE	130			F		FN	11-Jul-06	RBFNWB	Roberts Bay				
179	CAPE	129			F		FN	11-Jul-06	RBFNWB	Roberts Bay				
180	CAPE	119			F		FN	11-Jul-06	RBFNWB	Roberts Bay				
181	CAPE	124			F		FN	11-Jul-06	RBFNWB	Roberts Bay				
182	CAPE	124			F		FN	11-Jul-06	RBFNWB	Roberts Bay				
183	CAPE	126			F		FN	11-Jul-06	RBFNWB	Roberts Bay				
184	CAPE	121			F		FN	11-Jul-06	RBFNWB	Roberts Bay				
185	CAPE	131			F		FN	11-Jul-06	RBFNWB	Roberts Bay				
186	CAPE	134			F		FN	11-Jul-06	RBFNWB	Roberts Bay				
187	CAPE	127			F		FN	11-Jul-06	RBFNWB	Roberts Bay				
188	CAPE	122			F		FN	11-Jul-06	RBFNWB	Roberts Bay				
189	LKTR	760	5425	1.24			FN	11-Jul-06	RBFNWB	Roberts Bay				Sea-run, genetics, photos
190	LKTR	530	2095	1.41			FN	11-Jul-06	RBFNWB	Roberts Bay				Sea-run, genetics, photos
191	FHSC	72	5	1.34			FN	12-Jul-06	RBFNEB	Roberts Bay				
192	LKTR	680	4140	1.32			FN	12-Jul-06	RBFNEB	Roberts Bay				genetics, photos

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
193	LKTR	525	1850	1.28			FN	12-Jul-06	RBFNEB	Roberts Bay				genetics, photos
194	LKTR	585	2195	1.10			FN	12-Jul-06	RBFNEB	Roberts Bay				genetics, photos
195	LKTR	990	7010	0.72			FN	12-Jul-06	RBFNEB	Roberts Bay				genetics, photos
196	LKTR	630	3220	1.29			FN	12-Jul-06	RBFNEB	Roberts Bay				photos
197	LKTR	668	3100	1.04			FN	12-Jul-06	RBFNEB	Roberts Bay				photos
198	LKTR	460	1450	1.49			FN	12-Jul-06	RBFNEB	Roberts Bay				photos
199	LKTR	560	2520	1.43			FN	12-Jul-06	RBFNEB	Roberts Bay				photos
200	ARFL	235	160	1.23			FN	12-Jul-06	RBFNWB	Roberts Bay				
201	ARFL	252					FN	12-Jul-06	RBFNWB	Roberts Bay				eliminated likely erroneous weight of 150 g
202	ARFL	150	50	1.48			FN	12-Jul-06	RBFNWB	Roberts Bay				
203	ARFL	180	85	1.46			FN	12-Jul-06	RBFNWB	Roberts Bay				
204	ARFL	140	35	1.28			FN	12-Jul-06	RBFNWB	Roberts Bay				
205	CAPE	120					FN	12-Jul-06	RBFNWB	Roberts Bay				
206	CAPE	130					FN	12-Jul-06	RBFNWB	Roberts Bay				
207	ARCH	670	3317	1.10	F		GN	08-Aug-06	RLGN-01	Roberts Lake				photos, genetics, kept gonads
208	LKTR	262	212	1.18	M		GN	08-Aug-06	RLGN-01	Roberts Lake				
209	LKTR	312	354	1.17	F		GN	08-Aug-06	RLGN-01	Roberts Lake				photos, genetics
210	LKWH	381	767	1.39	F		GN	08-Aug-06	RLGN-01	Roberts Lake				kept gonads
211	LKWH	379			M		GN	08-Aug-06	RLGN-01	Roberts Lake				
212	LKWH	413	1029	1.46	F		GN	08-Aug-06	RLGN-01	Roberts Lake				kept gonads
213	LKWH	531	2077	1.39	M		GN	08-Aug-06	RLGN-01	Roberts Lake				
214	LKTR	606	3172	1.43	M		GN	08-Aug-06	RLGN-02	Roberts Lake				photos, genetics
215	LKWH	496	2014	1.65	F		GN	08-Aug-06	RLGN-02	Roberts Lake				gonads
216	LKWH	410	1010	1.47	F		GN	08-Aug-06	RLGN-02	Roberts Lake				gonads
217	LKTR	728	4938	1.28	M	4685	GN	08-Aug-06	RLGN-03	Roberts Lake		R	2006	photos, genetics, gonads
218	LKWH	430	1099	1.38	F		GN	08-Aug-06	RLGN-03	Roberts Lake				gonads
219	NNST	60					EF	09-Aug-06	L31AEF-01	Lake 31a				
220	NNST	62					EF	09-Aug-06	L31AEF-01	Lake 31a				
221	NNST	49					EF	09-Aug-06	L31AEF-01	Lake 31a				
222	NNST	65					EF	09-Aug-06	L31AEF-01	Lake 31a				
223	NNST	40					EF	09-Aug-06	L31AEF-01	Lake 31a				
224	NNST	45					EF	09-Aug-06	L31AEF-01	Lake 31a				
225	NNST	39					EF	09-Aug-06	L31AEF-01	Lake 31a				
226	NNST	55					EF	09-Aug-06	L31AEF-01	Lake 31a				
227	NNST	56					EF	09-Aug-06	L31AEF-01	Lake 31a				
228	NNST	49					EF	09-Aug-06	L31AEF-01	Lake 31a				
229	NNST	50					EF	09-Aug-06	L31AEF-01	Lake 31a				
230	NNST	45					EF	09-Aug-06	L31AEF-01	Lake 31a				
231	NNST	60					EF	09-Aug-06	L31AEF-01	Lake 31a				
232	NNST	38					EF	09-Aug-06	L31AEF-01	Lake 31a				
233	NNST	45					EF	09-Aug-06	L31AEF-01	Lake 31a				
234	NNST	46					EF	09-Aug-06	L31AEF-01	Lake 31a				
235	NNST	40					EF	09-Aug-06	L31AEF-01	Lake 31a				
236	NNST	50					EF	09-Aug-06	L31AEF-01	Lake 31a				
237	NNST	60					EF	09-Aug-06	L31AEF-01	Lake 31a				
238	NNST	38					EF	09-Aug-06	L31AEF-01	Lake 31a				
239	NNST	35					EF	09-Aug-06	L31AEF-01	Lake 31a				
240	NNST	56					EF	09-Aug-06	L31AEF-01	Lake 31a				

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
241	NNST	55					EF	09-Aug-06	L31AEF-01	Lake 31a				
242	NNST	23					BS	09-Aug-06	L31BBS-01	Lake 31b				
243	NNST	33					BS	09-Aug-06	L31BBS-01	Lake 31b				
244	NNST	75					BS	09-Aug-06	L31BBS-01	Lake 31b				
245	NNST	48					BS	09-Aug-06	L31BBS-01	Lake 31b				
246	NNST	54					BS	09-Aug-06	L31BBS-01	Lake 31b				
247	NNST	32					BS	09-Aug-06	L31BBS-01	Lake 31b				
248	NNST	28					BS	09-Aug-06	L31BBS-01	Lake 31b				
249	NNST	19					BS	09-Aug-06	L31BBS-01	Lake 31b				
250	NNST	37					BS	09-Aug-06	L31BBS-01	Lake 31b				
251	NNST	32					BS	09-Aug-06	L31BBS-01	Lake 31b				
252	NNST	40					BS	09-Aug-06	L31BBS-01	Lake 31b				
253	NNST	41					BS	09-Aug-06	L31BBS-01	Lake 31b				
254	NNST	43					BS	09-Aug-06	L31BBS-01	Lake 31b				
255	NNST	52					BS	09-Aug-06	L31BBS-01	Lake 31b				
256	NNST	56					BS	09-Aug-06	L31BBS-01	Lake 31b				
257	NNST	44					BS	09-Aug-06	L31BBS-01	Lake 31b				
258	NNST	37					BS	09-Aug-06	L31BBS-01	Lake 31b				
259	NNST	30					BS	09-Aug-06	L31BBS-01	Lake 31b				
260	NNST	44					BS	09-Aug-06	L31BBS-01	Lake 31b				
261	NNST	37					BS	09-Aug-06	L31BBS-01	Lake 31b				
262	NNST	51					BS	09-Aug-06	L31BBS-01	Lake 31b				
263	NNST	30					BS	09-Aug-06	L31BBS-01	Lake 31b				
264	NNST	36					BS	09-Aug-06	L31BBS-01	Lake 31b				
265	NNST	31					BS	09-Aug-06	L31BBS-01	Lake 31b				
266	NNST	33					BS	09-Aug-06	L31BBS-01	Lake 31b				
267	NNST	30					BS	09-Aug-06	L31BBS-01	Lake 31b				
268	NNST	30					BS	09-Aug-06	L31BBS-01	Lake 31b				
269	NNST	39					BS	09-Aug-06	L31BBS-01	Lake 31b				
270	NNST	37					BS	09-Aug-06	L31BBS-01	Lake 31b				
271	NNST	56					BS	09-Aug-06	L31BBS-01	Lake 31b				
272	NNST	55					BS	09-Aug-06	L31BBS-01	Lake 31b				
273	NNST	48					BS	09-Aug-06	L31BBS-01	Lake 31b				
274	NNST	44					BS	09-Aug-06	L31BBS-01	Lake 31b				
275	NNST	52					BS	09-Aug-06	L31BBS-01	Lake 31b				
276	NNST	36					BS	09-Aug-06	L31BBS-01	Lake 31b				
277	NNST	89					BS	09-Aug-06	L31BBS-01	Lake 31b				
278	NNST	53					BS	09-Aug-06	L31BBS-01	Lake 31b				
279	NNST	36					BS	09-Aug-06	L31BBS-01	Lake 31b				
280	NNST	34					BS	09-Aug-06	L31BBS-01	Lake 31b				
281	NNST	45					BS	09-Aug-06	L31BBS-01	Lake 31b				
282	NNST	47					BS	09-Aug-06	L31BBS-01	Lake 31b				
283	NNST	54					BS	09-Aug-06	L31BBS-01	Lake 31b				
284	NNST	29					BS	09-Aug-06	L31BBS-01	Lake 31b				
285	NNST	30					BS	09-Aug-06	L31BBS-01	Lake 31b				
286	NNST	34					BS	09-Aug-06	L31BBS-01	Lake 31b				
287	NNST	31					BS	09-Aug-06	L31BBS-01	Lake 31b				
288	NNST	61					BS	09-Aug-06	L31BBS-01	Lake 31b				

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
289	NNST	60					BS	09-Aug-06	L31BBS-01	Lake 31b				
290	NNST	47					BS	09-Aug-06	L31BBS-01	Lake 31b				
291	NNST	37					BS	09-Aug-06	L31BBS-01	Lake 31b				
292	NNST	33					BS	09-Aug-06	L31BBS-01	Lake 31b				
293	NNST	37					BS	09-Aug-06	L31BBS-01	Lake 31b				
294	NNST	39					BS	09-Aug-06	L31BBS-01	Lake 31b				
295	NNST	35					BS	09-Aug-06	L31BBS-01	Lake 31b				
296	NNST	60					BS	09-Aug-06	L31BBS-01	Lake 31b				
297	NNST	50					BS	09-Aug-06	L31BBS-01	Lake 31b				
298	NNST	45					BS	09-Aug-06	L31BBS-01	Lake 31b				
299	NNST	38					BS	09-Aug-06	L31BBS-01	Lake 31b				
300	NNST	34					BS	09-Aug-06	L31BBS-01	Lake 31b				
301	NNST	47					BS	09-Aug-06	L31BBS-01	Lake 31b				
302	NNST	27					BS	09-Aug-06	L31BBS-01	Lake 31b				
303	NNST	28					BS	09-Aug-06	L31BBS-01	Lake 31b				
304	NNST	30					BS	09-Aug-06	L31BBS-01	Lake 31b				
305	NNST	29					BS	09-Aug-06	L31BBS-01	Lake 31b				
306	NNST	25					BS	09-Aug-06	L31BBS-01	Lake 31b				
307	NNST	46					BS	09-Aug-06	L31BBS-01	Lake 31b				
308	NNST	40					BS	09-Aug-06	L31BBS-01	Lake 31b				
309	NNST	30					BS	09-Aug-06	L31BBS-01	Lake 31b				
310	NNST	29					BS	09-Aug-06	L31BBS-01	Lake 31b				
311	NNST	43					BS	09-Aug-06	L31BBS-01	Lake 31b				
312	NNST	33					BS	09-Aug-06	L31BBS-01	Lake 31b				
313	NNST	42					BS	09-Aug-06	L31BBS-01	Lake 31b				
314	NNST	48					BS	09-Aug-06	L31BBS-01	Lake 31b				
315	NNST	31					BS	09-Aug-06	L31BBS-01	Lake 31b				
316	NNST	33					BS	09-Aug-06	L31BBS-01	Lake 31b				
317	NNST	34					BS	09-Aug-06	L31BBS-01	Lake 31b				
318	NNST	48					BS	09-Aug-06	L31BBS-01	Lake 31b				
319	NNST	40					BS	09-Aug-06	L31BBS-01	Lake 31b				
320	NNST	40					BS	09-Aug-06	L31BBS-01	Lake 31b				
321	NNST	35					BS	09-Aug-06	L31BBS-01	Lake 31b				
322	NNST	15					BS	09-Aug-06	L31BBS-01	Lake 31b				
323	NNST	21					BS	09-Aug-06	L31BBS-01	Lake 31b				
324	NNST	18					BS	09-Aug-06	L31BBS-01	Lake 31b				
325	NNST	23					BS	09-Aug-06	L31BBS-01	Lake 31b				
326	NNST	27					BS	09-Aug-06	L31BBS-01	Lake 31b				
327	NNST	30					BS	09-Aug-06	L31BBS-01	Lake 31b				
328	NNST	28					BS	09-Aug-06	L31BBS-01	Lake 31b				
329	ARCH	374	621	1.19	M		FN	09-Aug-06	RLFN-01	Roberts Lake				fyke net at outflow, genetics
330	ARCH	175	44	0.82			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
331	ARCH	102	10	0.94			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
332	ARCH	93	6	0.75			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
333	ARCH	82	4	0.73			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
334	ARCH	83	4	0.70			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
335	ARCH	56					FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
336	ARCH	147	20	0.63			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
337	CISC	134	12	0.50			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
338	CISC	89	4	0.57			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
339	CISC	91	4	0.53			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
340	CISC	89	4	0.57			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
341	CISC	89	4	0.57			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
342	CISC	85	4	0.65			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
343	CISC	81					FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
344	CISC	84	4	0.67			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
345	CISC	88	4	0.59			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
346	CISC	88	6	0.88			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
347	CISC	88	6	0.88			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
348	CISC	82	4	0.73			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
349	CISC	91	6	0.80			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
350	CISC	76					FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
351	CISC	83	4	0.70			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
352	CISC	84					FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
353	CISC	90					FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
354	CISC	85	4	0.65			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
355	CISC	89	4	0.57			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
356	CISC	93	8	0.99			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
357	CISC	84					FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
358	CISC	89	4	0.57			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
359	CISC	91	4	0.53			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
360	CISC	91	6	0.80			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
361	CISC	87					FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
362	CISC	80					FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
363	CISC	89	6	0.85			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
364	CISC	88	4	0.59			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
365	CISC	84	6	1.01			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
366	CISC	49					FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
367	LKTR	149	24	0.73			FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
368	LKWH	610	2910	1.28	F		FN	09-Aug-06	RLFN-01	Roberts Lake				
369	NNST	56					FN	09-Aug-06	RLFN-01	Roberts Lake				
370	NNST	44					FN	09-Aug-06	RLFN-01	Roberts Lake				
371	NNST	43					FN	09-Aug-06	RLFN-01	Roberts Lake				
372	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
373	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				
374	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
375	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				
376	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
377	NNST	44					FN	09-Aug-06	RLFN-01	Roberts Lake				
378	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
379	NNST	63					FN	09-Aug-06	RLFN-01	Roberts Lake				
380	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				
381	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
382	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
383	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
384	NNST	56					FN	09-Aug-06	RLFN-01	Roberts Lake				

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
385	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
386	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				
387	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
388	NNST	56					FN	09-Aug-06	RLFN-01	Roberts Lake				
389	NNST	57					FN	09-Aug-06	RLFN-01	Roberts Lake				
390	NNST	39					FN	09-Aug-06	RLFN-01	Roberts Lake				
391	NNST	60					FN	09-Aug-06	RLFN-01	Roberts Lake				
392	NNST	45					FN	09-Aug-06	RLFN-01	Roberts Lake				
393	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
394	NNST	57					FN	09-Aug-06	RLFN-01	Roberts Lake				
395	NNST	45					FN	09-Aug-06	RLFN-01	Roberts Lake				
396	NNST	60					FN	09-Aug-06	RLFN-01	Roberts Lake				
397	NNST	56					FN	09-Aug-06	RLFN-01	Roberts Lake				
398	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
399	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
400	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
401	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
402	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
403	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
404	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
405	NNST	53					FN	09-Aug-06	RLFN-01	Roberts Lake				
406	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
407	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
408	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
409	NNST	56					FN	09-Aug-06	RLFN-01	Roberts Lake				
410	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
411	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
412	NNST	59					FN	09-Aug-06	RLFN-01	Roberts Lake				
413	NNST	67					FN	09-Aug-06	RLFN-01	Roberts Lake				
414	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				
415	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
416	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
417	NNST	53					FN	09-Aug-06	RLFN-01	Roberts Lake				
418	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
419	NNST	41					FN	09-Aug-06	RLFN-01	Roberts Lake				
420	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
421	NNST	45					FN	09-Aug-06	RLFN-01	Roberts Lake				
422	NNST	39					FN	09-Aug-06	RLFN-01	Roberts Lake				
423	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				
424	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
425	NNST	57					FN	09-Aug-06	RLFN-01	Roberts Lake				
426	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
427	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
428	NNST	58					FN	09-Aug-06	RLFN-01	Roberts Lake				
429	NNST	56					FN	09-Aug-06	RLFN-01	Roberts Lake				
430	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
431	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
432	NNST	53					FN	09-Aug-06	RLFN-01	Roberts Lake				

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
433	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
434	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
435	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
436	NNST	56					FN	09-Aug-06	RLFN-01	Roberts Lake				
437	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
438	NNST	42					FN	09-Aug-06	RLFN-01	Roberts Lake				
439	NNST	41					FN	09-Aug-06	RLFN-01	Roberts Lake				
440	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
441	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
442	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
443	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
444	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
445	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
446	NNST	44					FN	09-Aug-06	RLFN-01	Roberts Lake				
447	NNST	53					FN	09-Aug-06	RLFN-01	Roberts Lake				
448	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
449	NNST	58					FN	09-Aug-06	RLFN-01	Roberts Lake				
450	NNST	45					FN	09-Aug-06	RLFN-01	Roberts Lake				
451	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
452	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
453	NNST	56					FN	09-Aug-06	RLFN-01	Roberts Lake				
454	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
455	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
456	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
457	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
458	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
459	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
460	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
461	NNST	48					FN	09-Aug-06	RLFN-01	Roberts Lake				
462	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
463	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
464	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
465	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
466	NNST	58					FN	09-Aug-06	RLFN-01	Roberts Lake				
467	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				
468	NNST	44					FN	09-Aug-06	RLFN-01	Roberts Lake				
469	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
470	NNST	56					FN	09-Aug-06	RLFN-01	Roberts Lake				
471	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				
472	NNST	61					FN	09-Aug-06	RLFN-01	Roberts Lake				
473	NNST	40					FN	09-Aug-06	RLFN-01	Roberts Lake				
474	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
475	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				
476	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
477	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
478	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
479	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
480	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
481	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
482	NNST	61					FN	09-Aug-06	RLFN-01	Roberts Lake				
483	NNST	43					FN	09-Aug-06	RLFN-01	Roberts Lake				
484	NNST	57					FN	09-Aug-06	RLFN-01	Roberts Lake				
485	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
486	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
487	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
488	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
489	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
490	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
491	NNST	41					FN	09-Aug-06	RLFN-01	Roberts Lake				
492	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
493	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
494	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
495	NNST	48					FN	09-Aug-06	RLFN-01	Roberts Lake				
496	NNST	48					FN	09-Aug-06	RLFN-01	Roberts Lake				
497	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
498	NNST	56					FN	09-Aug-06	RLFN-01	Roberts Lake				
499	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
500	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
501	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
502	NNST	42					FN	09-Aug-06	RLFN-01	Roberts Lake				
503	NNST						FN	09-Aug-06	RLFN-01	Roberts Lake				
504	NNST						FN	09-Aug-06	RLFN-01	Roberts Lake				
505	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
506	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
507	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
508	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
509	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
510	NNST	53					FN	09-Aug-06	RLFN-01	Roberts Lake				
511	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
512	NNST	39					FN	09-Aug-06	RLFN-01	Roberts Lake				
513	NNST	42					FN	09-Aug-06	RLFN-01	Roberts Lake				
514	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
515	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
516	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
517	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
518	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
519	NNST	61					FN	09-Aug-06	RLFN-01	Roberts Lake				
520	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
521	NNST	45					FN	09-Aug-06	RLFN-01	Roberts Lake				
522	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
523	NNST	60					FN	09-Aug-06	RLFN-01	Roberts Lake				
524	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
525	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
526	NNST	48					FN	09-Aug-06	RLFN-01	Roberts Lake				
527	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				
528	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
529	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
530	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
531	NNST	45					FN	09-Aug-06	RLFN-01	Roberts Lake				
532	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
533	NNST	45					FN	09-Aug-06	RLFN-01	Roberts Lake				
534	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
535	NNST	56					FN	09-Aug-06	RLFN-01	Roberts Lake				
536	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
537	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
538	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
539	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
540	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				
541	NNST	48					FN	09-Aug-06	RLFN-01	Roberts Lake				
542	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
543	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
544	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
545	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
546	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				
547	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
548	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
549	NNST	42					FN	09-Aug-06	RLFN-01	Roberts Lake				
550	NNST	59					FN	09-Aug-06	RLFN-01	Roberts Lake				
551	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
552	NNST	48					FN	09-Aug-06	RLFN-01	Roberts Lake				
553	NNST	65					FN	09-Aug-06	RLFN-01	Roberts Lake				
554	NNST	48					FN	09-Aug-06	RLFN-01	Roberts Lake				
555	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
556	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
557	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
558	NNST	58					FN	09-Aug-06	RLFN-01	Roberts Lake				
559	NNST	40					FN	09-Aug-06	RLFN-01	Roberts Lake				
560	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
561	NNST	48					FN	09-Aug-06	RLFN-01	Roberts Lake				
562	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
563	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
564	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
565	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
566	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
567	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
568	NNST	60					FN	09-Aug-06	RLFN-01	Roberts Lake				
569	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				
570	NNST	40					FN	09-Aug-06	RLFN-01	Roberts Lake				
571	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
572	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
573	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
574	NNST	48					FN	09-Aug-06	RLFN-01	Roberts Lake				
575	NNST	53					FN	09-Aug-06	RLFN-01	Roberts Lake				
576	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
577	NNST	56					FN	09-Aug-06	RLFN-01	Roberts Lake				
578	NNST	69					FN	09-Aug-06	RLFN-01	Roberts Lake				
579	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				
580	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
581	NNST	37					FN	09-Aug-06	RLFN-01	Roberts Lake				
582	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
583	NNST	60					FN	09-Aug-06	RLFN-01	Roberts Lake				
584	NNST	57					FN	09-Aug-06	RLFN-01	Roberts Lake				
585	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
586	NNST	62					FN	09-Aug-06	RLFN-01	Roberts Lake				
587	NNST	40					FN	09-Aug-06	RLFN-01	Roberts Lake				
588	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
589	NNST	44					FN	09-Aug-06	RLFN-01	Roberts Lake				
590	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
591	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
592	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
593	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
594	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
595	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
596	NNST	48					FN	09-Aug-06	RLFN-01	Roberts Lake				
597	NNST	59					FN	09-Aug-06	RLFN-01	Roberts Lake				
598	NNST	48					FN	09-Aug-06	RLFN-01	Roberts Lake				
599	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
600	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
601	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
602	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
603	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
604	NNST	43					FN	09-Aug-06	RLFN-01	Roberts Lake				
605	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
606	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
607	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
608	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
609	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				
610	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				
611	NNST	43					FN	09-Aug-06	RLFN-01	Roberts Lake				
612	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
613	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
614	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
615	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
616	NNST	45					FN	09-Aug-06	RLFN-01	Roberts Lake				
617	NNST	41					FN	09-Aug-06	RLFN-01	Roberts Lake				
618	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
619	NNST	47					FN	09-Aug-06	RLFN-01	Roberts Lake				
620	NNST	49					FN	09-Aug-06	RLFN-01	Roberts Lake				
621	NNST	54					FN	09-Aug-06	RLFN-01	Roberts Lake				
622	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
623	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
624	NNST	44					FN	09-Aug-06	RLFN-01	Roberts Lake				

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
625	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
626	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
627	NNST	48					FN	09-Aug-06	RLFN-01	Roberts Lake				
628	NNST	46					FN	09-Aug-06	RLFN-01	Roberts Lake				
629	NNST	44					FN	09-Aug-06	RLFN-01	Roberts Lake				
630	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
631	NNST	40					FN	09-Aug-06	RLFN-01	Roberts Lake				
632	NNST	52					FN	09-Aug-06	RLFN-01	Roberts Lake				
633	NNST	51					FN	09-Aug-06	RLFN-01	Roberts Lake				
634	NNST	50					FN	09-Aug-06	RLFN-01	Roberts Lake				
635	NNST	36					FN	09-Aug-06	RLFN-01	Roberts Lake				
636	NNST	45					FN	09-Aug-06	RLFN-01	Roberts Lake				
637	NNST	55					FN	09-Aug-06	RLFN-01	Roberts Lake				
638	NNST	61					FN	09-Aug-06	RLFN-01	Roberts Lake				Frozen whole
639	LKWH	306	294	1.03	F		GN	09-Aug-06	RLGN-04	Roberts Lake				
640	LKWH	251	206	1.30	F		GN	09-Aug-06	RLGN-04	Roberts Lake				
641	LKWH						GN	09-Aug-06	RLGN-04	Roberts Lake				
642	NNST	52					EF	10-Aug-06	L06BEF	Lake 06b				
643	NNST	53					EF	10-Aug-06	L06BEF	Lake 06b				
644	NNST	45					EF	10-Aug-06	L06BEF	Lake 06b				
645	NNST	39					EF	10-Aug-06	L06BEF	Lake 06b				
646	NNST	62					EF	10-Aug-06	L06BEF	Lake 06b				
647	NNST	47					EF	10-Aug-06	L06BEF	Lake 06b				
648	NNST	63					EF	10-Aug-06	L06BEF	Lake 06b				
649	NNST	40					EF	10-Aug-06	L06BEF	Lake 06b				
650	NNST	54					EF	10-Aug-06	L06BEF	Lake 06b				
651	NNST	52					EF	10-Aug-06	L06BEF	Lake 06b				
652	NNST	59					EF	10-Aug-06	L06BEF	Lake 06b				
653	NNST	55					EF	10-Aug-06	L06BEF	Lake 06b				
654	NNST	53					EF	10-Aug-06	L06BEF	Lake 06b				
655	NNST	45					EF	10-Aug-06	L06BEF	Lake 06b				
656	NNST	46					EF	10-Aug-06	L06BEF	Lake 06b				
657	NNST	61					EF	10-Aug-06	L06BEF	Lake 06b				
658	NNST	53					EF	10-Aug-06	L06BEF	Lake 06b				
659	NNST	60					EF	10-Aug-06	L06BEF	Lake 06b				
660	NNST	59					EF	10-Aug-06	L06BEF	Lake 06b				
661	NNST	56					EF	10-Aug-06	L06BEF	Lake 06b				
662	NNST	49					EF	10-Aug-06	L06BEF	Lake 06b				
663	NNST	53					EF	10-Aug-06	L06BEF	Lake 06b				
664	NNST	55					EF	10-Aug-06	L06BEF	Lake 06b				
665	NNST	34					EF	10-Aug-06	L06BEF	Lake 06b				
666	NNST	52					EF	10-Aug-06	L06BEF	Lake 06b				
667	NNST	56					EF	10-Aug-06	L06BEF	Lake 06b				
668	NNST	46					EF	10-Aug-06	L06BEF	Lake 06b				
669	NNST	50					EF	10-Aug-06	L06BEF	Lake 06b				
670	NNST	56					EF	10-Aug-06	L06BEF	Lake 06b				
671	NNST	42					EF	10-Aug-06	L06BEF	Lake 06b				
672	NNST	49					EF	10-Aug-06	L06BEF	Lake 06b				

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
673	NNST	45					EF	10-Aug-06	L06BEF	Lake 06b				
674	NNST	53					EF	10-Aug-06	L06BEF	Lake 06b				
675	NNST	44					EF	10-Aug-06	L06BEF	Lake 06b				
676	NNST	58					EF	10-Aug-06	L06BEF	Lake 06b				
677	NNST	39					EF	10-Aug-06	L06BEF	Lake 06b				
678	NNST	40					EF	10-Aug-06	L06BEF	Lake 06b				
679	NNST	51					EF	10-Aug-06	L06BEF	Lake 06b				
680	NNST	40					EF	10-Aug-06	L06BEF	Lake 06b				
681	NNST	61					EF	10-Aug-06	L06BEF	Lake 06b				
682	NNST	41					EF	10-Aug-06	L06BEF	Lake 06b				
683	NNST	58					EF	10-Aug-06	L06BEF	Lake 06b				
684	NNST	42					EF	10-Aug-06	L06BEF	Lake 06b				
685	NNST	37					EF	10-Aug-06	L06BEF	Lake 06b				
686	NNST	56					EF	10-Aug-06	L06BEF	Lake 06b				
687	NNST	36					EF	10-Aug-06	L06BEF	Lake 06b				
688	NNST	51					EF	10-Aug-06	L06BEF	Lake 06b				
689	NNST	61					EF	10-Aug-06	L06BEF	Lake 06b				
690	NNST	35					EF	10-Aug-06	L06BEF	Lake 06b				
691	NNST	46					EF	10-Aug-06	L06BEF	Lake 06b				
692	NNST	53					EF	10-Aug-06	L06BEF	Lake 06b				
693	NNST	54					EF	10-Aug-06	L06BEF	Lake 06b				
694	NNST	52					EF	10-Aug-06	L06BEF	Lake 06b				
695	NNST	45					EF	10-Aug-06	L06BEF	Lake 06b				
696	NNST	53					EF	10-Aug-06	L06BEF	Lake 06b				
697	NNST	35					EF	10-Aug-06	L06BEF	Lake 06b				
698	NNST	40					EF	10-Aug-06	L06BEF	Lake 06b				
699	NNST	35					EF	10-Aug-06	L06BEF	Lake 06b				
700	NNST	41					EF	10-Aug-06	L06BEF	Lake 06b				
701	NNST	35					EF	10-Aug-06	L06BEF	Lake 06b				
702	NNST	47					EF	10-Aug-06	L06BEF	Lake 06b				
703	NNST	56					EF	10-Aug-06	L06BEF	Lake 06b				
704	NNST	50					EF	10-Aug-06	L06BEF	Lake 06b				
705	NNST	40					EF	10-Aug-06	L06BEF	Lake 06b				
706	NNST	40					EF	10-Aug-06	L06BEF	Lake 06b				
707	NNST	43					EF	10-Aug-06	L06BEF	Lake 06b				
708	NNST	37					EF	10-Aug-06	L06BEF	Lake 06b				
709	NNST	55					EF	10-Aug-06	L06BEF	Lake 06b				
710	NNST	45					EF	10-Aug-06	L06BEF	Lake 06b				
711	NNST	52					EF	10-Aug-06	L06BEF	Lake 06b				
712	NNST	40					EF	10-Aug-06	L06BEF	Lake 06b				
713	NNST	42					EF	10-Aug-06	L06BEF	Lake 06b				
714	NNST	57					EF	10-Aug-06	L06BEF	Lake 06b				
715	NNST	40					EF	10-Aug-06	L06BEF	Lake 06b				
716	NNST	51					EF	10-Aug-06	L06BEF	Lake 06b				
717	NNST	52					EF	10-Aug-06	L06BEF	Lake 06b				
718	NNST	57					EF	10-Aug-06	L06BEF	Lake 06b				
719	NNST	47					EF	10-Aug-06	L06BEF	Lake 06b				
720	NNST	47					EF	10-Aug-06	L06BEF	Lake 06b				

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
721	NNST	36					EF	10-Aug-06	L06BEF	Lake 06b				
722	NNST	39					EF	10-Aug-06	L06BEF	Lake 06b				
723	NNST	38					EF	10-Aug-06	L06BEF	Lake 06b				
724	NNST	35					EF	10-Aug-06	L06BEF	Lake 06b				
725	NNST	39					EF	10-Aug-06	L06BEF	Lake 06b				
726	NNST	40					EF	10-Aug-06	L06BEF	Lake 06b				
727	NNST	36					EF	10-Aug-06	L06BEF	Lake 06b				
728	NNST	40					EF	10-Aug-06	L06BEF	Lake 06b				
729	NNST	40					EF	10-Aug-06	L06BEF	Lake 06b				
730	NNST	40					EF	10-Aug-06	L06BEF	Lake 06b				
731	NNST	32					EF	10-Aug-06	L06BEF	Lake 06b				
732	NNST	37					EF	10-Aug-06	L06BEF	Lake 06b				
733	NNST	40					EF	10-Aug-06	L06BEF	Lake 06b				
734	NNST	36					EF	10-Aug-06	L06BEF	Lake 06b				
735	NNST	54					EF	10-Aug-06	L32AEF	Lake 32a				
736	NNST	69					EF	10-Aug-06	L32AEF	Lake 32a				
737	NNST	28					EF	10-Aug-06	L32AEF	Lake 32a				
738	NNST	24					EF	10-Aug-06	L32AEF	Lake 32a				
739	NNST	49					EF	10-Aug-06	L32AEF	Lake 32a				
740	NNST	27					EF	10-Aug-06	L32AEF	Lake 32a				
741	NNST	32					EF	10-Aug-06	L32AEF	Lake 32a				
742	NNST	29					EF	10-Aug-06	L32AEF	Lake 32a				
743	NNST	27					EF	10-Aug-06	L32AEF	Lake 32a				
744	NNST	24					EF	10-Aug-06	L32AEF	Lake 32a				
745	NNST	12					EF	10-Aug-06	L32AEF	Lake 32a				
746	ARCH	316	275	0.87			GN	10-Aug-06	L32AGN-01	Lake 32a				
747	ARCH	338	350	0.91			GN	10-Aug-06	L32AGN-01	Lake 32a				
748	ARCH	349	390	0.92			GN	10-Aug-06	L32AGN-02	Lake 32a				
749	ARCH	317	300	0.94	F		GN	10-Aug-06	L32AGN-02	Lake 32a				
750	ARCH	330	220	0.61	F		GN	10-Aug-06	L32AGN-02	Lake 32a				
751	ARCH	341	435	1.10	F		GN	10-Aug-06	L32AGN-02	Lake 32a				
752	ARCH						GN	10-Aug-06	L32AGN-02	Lake 32a				Fish escaped when pulling net
753	ARCH						GN	10-Aug-06	L32AGN-02	Lake 32a				Fish escaped when pulling net
754	ARCH	392	682	1.13	M	G-4381	FN	10-Aug-06	RLFN-01	Roberts Lake		R	2005	Recap G-4381, genetics
755	ARCH	286	269	1.15	F		FN	10-Aug-06	RLFN-01	Roberts Lake				
756	ARCH	166	49	1.07	F		FN	10-Aug-06	RLFN-01	Roberts Lake				
757	CISC	45					FN	10-Aug-06	RLFN-01	Roberts Lake				Frozen whole
758	CISC	40					FN	10-Aug-06	RLFN-01	Roberts Lake				Frozen whole
759	CISC	83	6	1.05			FN	10-Aug-06	RLFN-01	Roberts Lake				Frozen whole
760	CISC	41					FN	10-Aug-06	RLFN-01	Roberts Lake				Frozen whole
761	CISC	82					FN	10-Aug-06	RLFN-01	Roberts Lake				Frozen whole
762	CISC	80					FN	10-Aug-06	RLFN-01	Roberts Lake				Frozen whole
763	ARCH	174	60	1.14			EF	12-Aug-06	E04EF-01	Stream E04				photo
764	ARCH	186	60	0.93			EF	12-Aug-06	E04EF-01	Stream E04				
765	ARCH	134	30	1.25			EF	12-Aug-06	E04EF-01	Stream E04				
766	ARCH	114	20	1.35			EF	12-Aug-06	E04EF-01	Stream E04				
767	ARCH	138	35	1.33			EF	12-Aug-06	E04EF-01	Stream E04				
768	ARCH	101	5	0.49			EF	12-Aug-06	E04EF-01	Stream E04				

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
769	LKTR	436	785	0.95		4321	EF	12-Aug-06	E04EF-01	Stream E04		R	2005	
770	LKTR	266	240	1.28			EF	12-Aug-06	E04EF-01	Stream E04		R		
771	LKTR	243	230	1.60			EF	12-Aug-06	E04EF-01	Stream E04				
772	LKTR	149	35	1.06			EF	12-Aug-06	E04EF-01	Stream E04				
773	LKTR	105	15	1.30			EF	12-Aug-06	E04EF-01	Stream E04				
774	LKTR	96	10	1.13			EF	12-Aug-06	E04EF-01	Stream E04				
775	LKTR	89	5	0.71			EF	12-Aug-06	E04EF-01	Stream E04				
776	LKTR	59					EF	12-Aug-06	E04EF-01	Stream E04				
777	LKTR	109	10	0.77			EF	12-Aug-06	E04EF-01	Stream E04				
778	LKTR	86	10	1.57			EF	12-Aug-06	E04EF-01	Stream E04				
779	LKTR	114	15	1.01			EF	12-Aug-06	E04EF-01	Stream E04				
780	LKTR	88	5	0.73			EF	12-Aug-06	E04EF-01	Stream E04				
781	NNST	30					EF	12-Aug-06	E04EF-01	Stream E04				
782	NNST	20					EF	12-Aug-06	E04EF-01	Stream E04				
783	NNST	35					EF	12-Aug-06	E04EF-01	Stream E04				
784	NNST	35					EF	12-Aug-06	E04EF-01	Stream E04				
785	NNST	68					EF	12-Aug-06	E04EF-01	Stream E04				
786	NNST	52					EF	12-Aug-06	E04EF-01	Stream E04				
787	NNST	21					EF	12-Aug-06	E04EF-01	Stream E04				
788	NNST	22					EF	12-Aug-06	E04EF-01	Stream E04				
789	NNST	51					EF	12-Aug-06	E04EF-01	Stream E04				
790	NNST	20					EF	12-Aug-06	E04EF-01	Stream E04				
791	NNST	35					EF	12-Aug-06	E04EF-01	Stream E04				
792	NNST	37					EF	12-Aug-06	E04EF-01	Stream E04				
793	NNST	40					EF	12-Aug-06	E04EF-01	Stream E04				
794	NNST	50					EF	12-Aug-06	E04EF-01	Stream E04				
795	NNST	52					EF	12-Aug-06	E04EF-01	Stream E04				
796	BRWH	303	340	1.22			GN	12-Aug-06	L04GN-01	Lake 04	SC			
797	BRWH	368	705	1.41			GN	12-Aug-06	L04GN-01	Lake 04				
798	BRWH	398	880	1.40			GN	12-Aug-06	L04GN-01	Lake 04				
799	BRWH	300	365	1.35			GN	12-Aug-06	L04GN-01	Lake 04				
800	BRWH	339	465	1.19			GN	12-Aug-06	L04GN-01	Lake 04				
801	CISC	194	65	0.89			GN	12-Aug-06	L04GN-01	Lake 04				
802	CISC	248	200	1.31			GN	12-Aug-06	L04GN-01	Lake 04				
803	CISC	211	85	0.90			GN	12-Aug-06	L04GN-01	Lake 04				
804	CISC	216	75	0.74			GN	12-Aug-06	L04GN-01	Lake 04				
805	CISC	206	100	1.14			GN	12-Aug-06	L04GN-01	Lake 04				
806	CISC	156	35	0.92			GN	12-Aug-06	L04GN-01	Lake 04				
807	CISC	164	40	0.91			GN	12-Aug-06	L04GN-01	Lake 04				
808	LKTR	304	290	1.03			GN	12-Aug-06	L04GN-01	Lake 04	SC			
809	LKTR	270	220	1.12			GN	12-Aug-06	L04GN-01	Lake 04				
810	LKTR	350	415	0.97			GN	12-Aug-06	L04GN-01	Lake 04	FR, OT			
811	LKWH	378	685	1.27			GN	12-Aug-06	L04GN-01	Lake 04				
812	LKWH	245	175	1.19			GN	12-Aug-06	L04GN-01	Lake 04				
813	LKWH	299	345	1.29			GN	12-Aug-06	L04GN-01	Lake 04				
814	LKWH	290	305	1.25			GN	12-Aug-06	L04GN-01	Lake 04				
815	LKWH	370	700	1.38			GN	12-Aug-06	L04GN-01	Lake 04				
816	LKWH	321	435	1.32			GN	12-Aug-06	L04GN-01	Lake 04				

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
817	LKWH	306	370	1.29			GN	12-Aug-06	L04GN-01	Lake 04				
818	LKWH	339	495	1.27			GN	12-Aug-06	L04GN-01	Lake 04				
819	LKWH	304	370	1.32			GN	12-Aug-06	L04GN-01	Lake 04				
820	LKWH	206					GN	12-Aug-06	L04GN-01	Lake 04				eliminated likely erroneous weight of 220 g
821	CISC	119	20	1.19			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
822	CISC	204	80	0.94			GN	12-Aug-06	L04GN-02	Lake 04	SC			up to 40% may be least cisco from GN#2
823	CISC	211	90	0.96			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
824	CISC	219	75	0.71			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
825	CISC	181	65	1.10			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
826	CISC	203	85	1.02			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
827	CISC	241	185	1.32			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
828	CISC	192	85	1.20			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
829	CISC	155	35	0.94			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
830	CISC	209	60	0.66			GN	12-Aug-06	L04GN-02	Lake 04	SC			up to 40% may be least cisco from GN#2
831	CISC	159	40	1.00			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
832	CISC	205	80	0.93			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
833	CISC	195	75	1.01			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
834	CISC	197	70	0.92			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
835	CISC	146	30	0.96			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
836	CISC	158	40	1.01			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
837	CISC	191	75	1.08			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
838	CISC	162	75	1.76			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
839	CISC	219	100	0.95			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
840	CISC	212	101	1.06			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
841	CISC	206	85	0.97			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
842	CISC	191	80	1.15			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
843	CISC	163	60	1.39			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
844	CISC	200	90	1.13			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
845	CISC	224	115	1.02			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
846	CISC	172	45	0.88			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
847	CISC	173	45	0.87			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
848	CISC	240	155	1.12			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
849	CISC	194	65	0.89			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
850	LKWH	274	275	1.34			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
851	LKWH	281	290	1.31			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
852	LKWH	286	265	1.13			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
853	LKWH	356	560	1.24			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
854	LKWH	316	380	1.20			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
855	LKWH	285	290	1.25			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
856	LKWH	306	385	1.34			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
857	LKWH	360	655	1.40			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
858	LKWH	285	280	1.21			GN	12-Aug-06	L04GN-02	Lake 04	SC			up to 40% may be least cisco from GN#2
859	LKWH	300	360	1.33			GN	12-Aug-06	L04GN-02	Lake 04				up to 40% may be least cisco from GN#2
860	NNST						OB	12-Aug-06	L04GN-02	Lake 04				unknown number observed along shore
861	NNST	20					BS	12-Aug-06	L06DBS-01	Lake 06d				
862	NNST	33					BS	12-Aug-06	L06DBS-01	Lake 06d				
863	NNST	40					BS	12-Aug-06	L06DBS-01	Lake 06d				
864	NNST	51					BS	12-Aug-06	L06DBS-02	Lake 06d				

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
865	NNST	22					BS	12-Aug-06	L06DBS-02	Lake 06d				
866	NNST	21					BS	12-Aug-06	L06DBS-02	Lake 06d				
867	NNST	22					BS	12-Aug-06	L06DBS-02	Lake 06d				
868	NNST	53					BS	12-Aug-06	L06DBS-02	Lake 06d				
869	NNST	51					BS	12-Aug-06	L06DBS-02	Lake 06d				
870	NNST	45					BS	12-Aug-06	L06DBS-02	Lake 06d				
871	NNST	45					BS	12-Aug-06	L06DBS-02	Lake 06d				
872	NNST	52					BS	12-Aug-06	L06DBS-02	Lake 06d				
873	NNST	61					BS	12-Aug-06	L06DBS-02	Lake 06d				
874	NNST	41					BS	12-Aug-06	L06DBS-02	Lake 06d				
875	NNST	51					BS	12-Aug-06	L06DBS-02	Lake 06d				
876	NNST	47					BS	12-Aug-06	L06DBS-02	Lake 06d				
877	NNST	45					BS	12-Aug-06	L06DBS-02	Lake 06d				
878	NNST	42					BS	12-Aug-06	L06DBS-02	Lake 06d				
879	NNST	40					BS	12-Aug-06	L06DBS-02	Lake 06d				
880	NNST	49					BS	12-Aug-06	L06DBS-02	Lake 06d				
881	NNST	44					BS	12-Aug-06	L06DBS-02	Lake 06d				
882	NNST	37					BS	12-Aug-06	L06DBS-02	Lake 06d				
883	NNST	48					BS	12-Aug-06	L06DBS-02	Lake 06d				
884	NNST	30					BS	12-Aug-06	L06DBS-02	Lake 06d				
885	NNST	51					BS	12-Aug-06	L06DBS-02	Lake 06d				
886	NNST	40					BS	12-Aug-06	L06DBS-02	Lake 06d				
887	NNST	36					BS	12-Aug-06	L06DBS-02	Lake 06d				
888	NNST	27					BS	12-Aug-06	L06DBS-02	Lake 06d				
889	NNST	26					BS	12-Aug-06	L06DBS-02	Lake 06d				
890	NNST	22					BS	12-Aug-06	L06DBS-02	Lake 06d				
891	NNST	19					BS	12-Aug-06	L06DBS-02	Lake 06d				
892	NNST	27					BS	12-Aug-06	L06DBS-02	Lake 06d				
893	NNST	41					BS	12-Aug-06	L06DBS-02	Lake 06d				
894	NNST	52					BS	12-Aug-06	L06DBS-02	Lake 06d				
895	NNST	41					BS	12-Aug-06	L06DBS-02	Lake 06d				
896	NNST	46					BS	12-Aug-06	L06DBS-02	Lake 06d				
897	NNST	46					BS	12-Aug-06	L06DBS-02	Lake 06d				
898	NNST	48					BS	12-Aug-06	L06DBS-02	Lake 06d				
899	NNST	36					BS	12-Aug-06	L06DBS-02	Lake 06d				
900	NNST	30					BS	12-Aug-06	L06DBS-02	Lake 06d				
901	NNST	40					BS	12-Aug-06	L06DBS-02	Lake 06d				
902	NNST	63					BS	12-Aug-06	L06DBS-02	Lake 06d				
903	NNST	36					BS	12-Aug-06	L06DBS-02	Lake 06d				
904	NNST	39					BS	12-Aug-06	L06DBS-02	Lake 06d				
905	NNST	26					BS	12-Aug-06	L06DBS-02	Lake 06d				
906	NNST	35					BS	12-Aug-06	L06DBS-02	Lake 06d				
907	NNST	47					BS	12-Aug-06	L06DBS-02	Lake 06d				
908	NNST	28					BS	12-Aug-06	L06DBS-02	Lake 06d				
909	NNST	20					BS	12-Aug-06	L06DBS-02	Lake 06d				
910	NNST	41					BS	12-Aug-06	L06DBS-02	Lake 06d				
911	NNST	41					BS	12-Aug-06	L06DBS-02	Lake 06d				
912	NNST	50					BS	12-Aug-06	L06DBS-02	Lake 06d				

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
913	NNST	45					BS	12-Aug-06	L06DBS-02	Lake 06d				
914	NNST	44					BS	12-Aug-06	L06DBS-02	Lake 06d				
915	NNST	37					BS	12-Aug-06	L06DBS-02	Lake 06d				
916	NNST	35					BS	12-Aug-06	L06DBS-02	Lake 06d				
917	NNST	52					BS	12-Aug-06	L06DBS-02	Lake 06d				
918	NNST	24					BS	12-Aug-06	L06DBS-02	Lake 06d				
919	NNST	20					BS	12-Aug-06	L06DBS-02	Lake 06d				
920	NNST	33					BS	12-Aug-06	L06DBS-02	Lake 06d				
921	NNST	39					BS	12-Aug-06	L06DBS-02	Lake 06d				
922	NNST	20					BS	12-Aug-06	L06DBS-02	Lake 06d				
923	NNST	21					BS	12-Aug-06	L06DBS-02	Lake 06d				
924	NNST	25					BS	12-Aug-06	L06DBS-02	Lake 06d				
925	NNST	24					BS	12-Aug-06	L06DBS-02	Lake 06d				
926	NNST	30					BS	12-Aug-06	L06DBS-02	Lake 06d				
927	NNST	31					BS	12-Aug-06	L06DBS-02	Lake 06d				
928	NNST	38					BS	12-Aug-06	L06DBS-02	Lake 06d				
929	NNST	27					BS	12-Aug-06	L06DBS-02	Lake 06d				
930	NNST	28					BS	12-Aug-06	L06DBS-02	Lake 06d				
931	NNST	31					BS	12-Aug-06	L06DBS-02	Lake 06d				
932	NNST	55					EF	13-Aug-06	L06DEF-01	Lake 06d				
933	NNST	58					EF	13-Aug-06	L06DEF-01	Lake 06d				
934	NNST	51					EF	13-Aug-06	L06DEF-01	Lake 06d				
935	NNST	65					EF	13-Aug-06	L06DEF-01	Lake 06d				
936	NNST	62					EF	13-Aug-06	L06DEF-01	Lake 06d				
937	NNST	45					EF	13-Aug-06	L06DEF-01	Lake 06d				
938	NNST	53					EF	13-Aug-06	L06DEF-01	Lake 06d				
939	NNST	56					EF	13-Aug-06	L06DEF-01	Lake 06d				
940	NNST	58					EF	13-Aug-06	L06DEF-01	Lake 06d				
941	NNST	44					EF	13-Aug-06	L06DEF-01	Lake 06d				
942	NNST	61					EF	13-Aug-06	L06DEF-01	Lake 06d				
943	NNST	45					EF	13-Aug-06	L06DEF-01	Lake 06d				
944	NNST	50					EF	13-Aug-06	L06DEF-01	Lake 06d				
945	NNST	25					EF	13-Aug-06	L06DEF-01	Lake 06d				
946	NNST	37					EF	13-Aug-06	L06DEF-01	Lake 06d				
947	ARCH	257	159	0.94	F		GN	13-Aug-06	L13GN-02	Lake 13				Lake M, Rob Lk Inflow, genetics
948	ARCH	202	70	0.85	F		GN	13-Aug-06	L13GN-02	Lake 13				Lake M, Rob Lk Inflow, genetics
949	ARCH	239	114	0.84	M		GN	13-Aug-06	L13GN-03	Lake 13				Lake M, Rob Lk Inflow, genetics
950	ARCH	272	159	0.79	M		GN	13-Aug-06	L13GN-03	Lake 13				Lake M, Rob Lk Inflow, genetics
951	ARCH	298	248	0.94			GN	14-Aug-06	L13GN-04	Lake 33				Fish kept for tissue
952	ARCH	311	267	0.89			GN	14-Aug-06	L13GN-04	Lake 33				Fish kept for tissue
953	ARCH	350	454	1.06			GN	14-Aug-06	L13GN-05	Lake 33				Fish kept for tissue
954	LKWH						GN	09-Aug-06	RLGN-04	Roberts Lake				
955	LKWH						GN	25-Aug-06	RLGN-08	Roberts Lake				
956	LKWH						GN	25-Aug-06	RLGN-08	Roberts Lake				
957	LKWH						GN	25-Aug-06	RLGN-08	Roberts Lake				
958	CISC	284	287	1.25	M		GN	25-Aug-06	RLGN-08	Roberts Lake				
959	CISC	340	543	1.38	F		GN	25-Aug-06	RLGN-08	Roberts Lake				
960	CISC	345	463	1.13	M		GN	26-Aug-06	RLGN-10	Roberts Lake				processed in camp

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
961	LKTR	500	1296	1.04	F		GN	26-Aug-06	RLGN-10	Roberts Lake				processed in camp, kept gonads
962	LKTR	383	531	0.95	F		GN	26-Aug-06	RLGN-10	Roberts Lake				processed in camp, kept gonads
963	LKWH	546	2693	1.65	M		GN	26-Aug-06	RLGN-10	Roberts Lake				processed in camp, kept gonads
964	CISC	335	419	1.11	M		GN	26-Aug-06	RLGN-12	Roberts Lake				processed in camp
965	CISC	310	335	1.12	F		GN	26-Aug-06	RLGN-12	Roberts Lake				processed in camp
966	LKTR	380	555	1.01	F		GN	26-Aug-06	RLGN-12	Roberts Lake				processed in camp, resting, 1 OT
967	LKTR	330	440	1.22	M		GN	26-Aug-06	RLGN-13	Roberts Lake				processed in camp
968	LKWH						GN	26-Aug-06	RLGN-11	Roberts Lake				
969	LKWH						GN	26-Aug-06	RLGN-11	Roberts Lake				
970	LKWH						GN	26-Aug-06	RLGN-13	Roberts Lake				
971	LKWH						GN	26-Aug-06	RLGN-13	Roberts Lake				
972	LKTR						GN	26-Aug-06	RLGN-14	Roberts Lake				
973	LKWH						GN	26-Aug-06	RLGN-14	Roberts Lake				
974	LKWH						GN	26-Aug-06	RLGN-14	Roberts Lake				
975	LKWH						GN	26-Aug-06	RLGN-14	Roberts Lake				
976	LKWH						GN	26-Aug-06	RLGN-14	Roberts Lake				
977	ARCH	640	3272	1.25	F		EF	27-Aug-06	RLEF-01	Roberts Lake				processed at lake, genetics, photos
978	ARCH	228	131	1.11	M		FN	27-Aug-06	RLFN-02	Roberts Lake				processed at lake, photos
979	ARCH	96	9	1.02			FN	27-Aug-06	RLFN-02	Roberts Lake				Frozen whole
980	ARCH	110	12	0.90			FN	27-Aug-06	RLFN-02	Roberts Lake				Frozen whole
981	ARCH	101	9	0.87			FN	27-Aug-06	RLFN-02	Roberts Lake				Frozen whole
982	ARCH	120	13	0.75			FN	27-Aug-06	RLFN-02	Roberts Lake				Frozen whole
983	ARCH	66	3	1.04			FN	27-Aug-06	RLFN-02	Roberts Lake				Frozen whole
984	ARCH						FN	27-Aug-06	RLFN-02	Roberts Lake				
985	ARCH	600	2759	1.28	F		EF	28-Aug-06	RLEF-02	Roberts Lake				processed at lake, genetics
986	ARCH	483	1342	1.19	F	G-4101	EF	28-Aug-06	RLEF-02	Roberts Lake		R	2004	processed at lake, genetics, photos, rob out,
987	ARCH	400	709	1.11	F		EF	28-Aug-06	RLEF-02	Roberts Lake				processed at lake, genetics, photos
988	ARCH	460	1077	1.11	F	G-4609	EF	28-Aug-06	RLEF-02	Roberts Lake		R	2005	processed at lake
989	ARCH	379	564	1.04	F		EF	28-Aug-06	RLEF-02	Roberts Lake				processed at lake, genetics, photos
990	ARCH	274	243	1.18	F		EF	28-Aug-06	RLEF-02	Roberts Lake				processed at lake, photos
991	LKTR	430	1049	1.32	F		EF	28-Aug-06	RLEF-02	Roberts Lake		R		processed at lake, wound from missing tag
992	ARCH	59					FN	28-Aug-06	RLFN-02	Roberts Lake				
993	ARCH	201	80	0.99			FN	28-Aug-06	RLFN-02	Roberts Lake				
994	ARCH	245	151	1.03			FN	28-Aug-06	RLFN-02	Roberts Lake				
995	ARCH	130	23	1.05			FN	28-Aug-06	RLFN-02	Roberts Lake				leeches
996	ARCH	193	66	0.92			FN	28-Aug-06	RLFN-02	Roberts Lake				
997	ARCH	140	26	0.95			FN	28-Aug-06	RLFN-02	Roberts Lake				
998	ARCH	139	25	0.93			FN	28-Aug-06	RLFN-02	Roberts Lake				
999	LKTR	180	55	0.94			FN	28-Aug-06	RLFN-02	Roberts Lake				
1000	ARCH	105					FN	29-Aug-06	RLFN-02	Roberts Lake				eliminated likely erroneous weight of 25 g
1001	CISC	365	482	0.99	F		GN	29-Aug-06	RLGN-15	Roberts Lake				
1002	CISC	336	482	1.27	M		GN	29-Aug-06	RLGN-15	Roberts Lake				
1003	CISC	310	384	1.29	F		GN	29-Aug-06	RLGN-15	Roberts Lake				
1004	CISC	325	372	1.08	M		GN	29-Aug-06	RLGN-15	Roberts Lake				
1005	CISC	319	295	0.91	F		GN	29-Aug-06	RLGN-15	Roberts Lake				
1006	CISC	321	342	1.03	M		GN	29-Aug-06	RLGN-15	Roberts Lake				
1007	CISC	218	96	0.93	F		GN	29-Aug-06	RLGN-15	Roberts Lake				
1008	CISC						GN	29-Aug-06	RLGN-15	Roberts Lake				

Appendix C2. Data for individual fish captured in the Doris North Project area, 2006.

Sample Number	Species	Length* (mm)	Weight (g)	Condition Factor	Sex	Tag No.	Capture Method	Date	Site	Waterbody	Ageing Structures	Capture Code	Year Tagged	Comments
1009	LKTR	591	2405	1.17	F		GN	29-Aug-06	RLGN-16	Roberts Lake				
1010	CISC						GN	29-Aug-06	RLGN-16	Roberts Lake				
1011	CISC						GN	29-Aug-06	RLGN-16	Roberts Lake				
1012	CISC						GN	29-Aug-06	RLGN-16	Roberts Lake				
1013	CISC						GN	29-Aug-06	RLGN-16	Roberts Lake				
1014	CISC						GN	29-Aug-06	RLGN-16	Roberts Lake				
1015	CISC						GN	29-Aug-06	RLGN-16	Roberts Lake				
1016	CISC						GN	29-Aug-06	RLGN-16	Roberts Lake				
1017	CISC						GN	29-Aug-06	RLGN-16	Roberts Lake				
1018	CISC						GN	29-Aug-06	RLGN-16	Roberts Lake				
1019	CISC						GN	29-Aug-06	RLGN-16	Roberts Lake				
1020	LKWH						GN	29-Aug-06	RLGN-16	Roberts Lake				
1021	LKWH						GN	29-Aug-06	RLGN-16	Roberts Lake				
1022	LKTR						AN	06-Sep-06	L10AN-02	Lake 10				
1023	LKTR						AN	06-Sep-06	L10AN-02	Lake 10				
1024	ARCH						AN	07-Sep-06	L06AAN-02	Lake 06a				
1025	ARCH	380	588	1.07	M		GN	07-Sep-06	L06AGN-18	Lake 06a				SW Corner of Roberts, photos, genetics
1026	ARCH	499	1245	1.00	F		GN	07-Sep-06	L06AGN-19	Lake 06a				photos, genetics, kept gonads
1027	ARCH	420	764	1.03	F		GN	07-Sep-06	L06AGN-19	Lake 06a				photos, genetics
1028	ARCH	456	1058	1.12	F		GN	07-Sep-06	L06AGN-19	Lake 06a				photos, genetics, maturing
1029	LKTR						GN	07-Sep-06	L10GN-11	Lake 10				
1030	LKTR						GN	07-Sep-06	L10GN-13	Lake 10				

CODES:

Species:
ARCH Arctic char
ARFL Arctic flounder
BRWH Broad whitefish
CAPE Capelin
CISC Cisco
FHSC Fourhorn sculpin
GRCD Greenland cod
LKTR Lake trout
LKWH Lake whitefish
NNST Ninespine stickleback
SFCD Saffron cod

Capture Method:
BS Beach Seine
EF Backpack Electrofishing
FN Fyke Net
MT Minnow Trap
DN Dip Net
AN Angling
OB Observed

Ageing Structures:
SC Scales
FR Fin rays
OT Otoliths

Sex:
F Female
M Male

Condition Factor = Weight [in g] X 10^5/ (FL [in mm])^3

Tag Colour:
B Blue
G Green
W White

Capture Codes:
R Recapture

Length*: Fork Length for CISC, LKWH, LKTR, ARCH, BRWH, CAPE
Total Length for NNST, ARFL, FHSC, SFCD, GRCD

Appendix C3. Water temperature, discharge and fish catch data for fish fence operations in Little Roberts Outflow, 2006

Trap Check		Water Temp (°C)	Water Depth in Trap (m)	Average Daily Discharge (m^3/s)	Set Period (h)	Downstream Trap Catch						Upstream Trap Catch							
						ARCH		LKTR		Total		ARCH		LKTR		BRWH		Total	
Date	Time					n	CPUE	n	CPUE	n	CPUE	n	CPUE	n	CPUE	n	CPUE	n	CPUE
19-Jun-06	9:30	5.3	0.68	3.073	22.5			2	2.13	**2**	**2.13**								
20-Jun-06	11:30	3.3	0.66	2.798	26.0	1	0.92	3	2.77	**4**	**3.69**								
21-Jun-06	12:30	3.6	0.65	2.566	25.0			1	0.96	**1**	**0.96**								
22-Jun-06	10:00	4.2	0.62	2.384	21.5	1	1.12			**1**	**1.12**								
23-Jun-06	8:00	4.4	0.61	2.212	22.0	11	12.00	5	5.45	**16**	**17.45**								
24-Jun-06	14:55	4.3	0.60	2.050	30.9	3	2.33			**3**	**2.33**								
25-Jun-06	8:40	6.1	0.58	1.946	17.7	6	8.11			**6**	**8.11**	2	2.70	2	2.70			**4**	**5.41**
26-Jun-06	8:50	7.6	0.57	1.882	24.2	3	2.98	2	1.99	**5**	**4.97**								
27-Jun-06	17:40	8.7	0.57	1.807	32.8	8	5.85	1	0.73	**9**	**6.58**			2	1.46			**2**	**1.46**
28-Jun-06	16:06	9.1	0.56	1.705	22.4	10	10.70			**10**	**10.70**			1	1.07			**1**	**1.07**
29-Jun-06	8:37	6.1	0.55	1.616	16.5	16	23.25			**16**	**23.25**	2	2.91	1	1.45			**3**	**4.36**
30-Jun-06	11:10	5.5	0.54	1.595	26.6	14	12.66	1	0.90	**15**	**13.56**			4	3.62			**4**	**3.62**
01-Jul-06	15:48	7.1	0.54	1.534	28.6	29	24.31			**29**	**24.31**			4	3.35			**4**	**3.35**
02-Jul-06	8:32	6.1	0.53	1.467	16.7									5	7.17			**5**	**7.17**
03-Jul-06	11:00	6.4	0.53	1.377	26.5									1	0.91			**1**	**0.91**
04-Jul-06	16:25	6.5	0.52	1.304	29.4	6	4.90			**6**	**4.90**	3	2.45	1	0.82			**4**	**3.26**
05-Jul-06	8:50	6.4	0.51	1.221	16.4	13	19.01			**13**	**19.01**								
06-Jul-06	14:25	6.8	0.50	1.147	29.6	2	1.62			**2**	**1.62**	3	2.43	2	1.62	1	0.81	**6**	**4.87**
07-Jul-06	8:52	6.9	0.49	1.085	18.5	14	18.21			**14**	**18.21**	1	1.30					**1**	**1.30**
08-Jul-06	8:40	7.0	0.48	1.022	23.8	1	1.01			**1**	**1.01**			1	1.01			**1**	**1.01**
09-Jul-06	8:40	7.1	0.47	0.977	24.0	10	10.00			**10**	**10.00**			1	1.00			**1**	**1.00**
10-Jul-06		6.9	0.46	0.937															
11-Jul-06		9.8	0.46	0.915															
12-Jul-06	14:30	11.7	0.46	0.889	77.8							1	0.31					**1**	**0.31**
13-Jul-06	11:00	9.9	0.45	0.868	20.5	7	8.20			**7**	**8.20**			2	2.34			**2**	**2.34**
14-Jul-06	12:00	10.3	0.45	0.849	25.0	1	0.96			**1**	**0.96**			1	0.96			**1**	**0.96**
15-Jul-06	9:00	12.7	0.44	0.821	21.0	6	6.86			**6**	**6.86**	2	2.29					**2**	**2.29**
16-Jul-06	11:00	10.7	0.44	0.779	26.0									16	14.77			**16**	**14.77**
17-Jul-06		8.1	0.43	0.738															
18-Jul-06		8.4	0.43	0.727															
19-Jul-06		10.3	0.42	0.737															
20-Jul-06	11:00	10.2	0.43	0.721	96.0									2	0.50			**2**	**0.50**
21-Jul-06	10:00	9.9	0.42	0.693	23.0	15	15.65			**15**	**15.65**	1	1.04	5	5.22			**6**	**6.26**
22-Jul-06	11:00	9.9	0.42	0.699	25.0	1	0.96			**1**	**0.96**								
Total					**816.0**	**178**	**5.24**	**15**	**0.44**	**193**	**5.68**	**15**	**63.42**	**51**	**215.62**	**1**	**0.38**	**67**	**1.97**

NOTES:

n = number of captured fish

CPUE = catch per unit effort (fish/24 h)

Total CPUE = total (n) / total (h) *24

Appendix C4. Length, weight, and condition factor statistics for fish captured in Doris North Project area, 2006.

Waterbody	Species	Fork Length (mm)					Weight (g)					Condition Factor				
		n	**Mean**	SD	Min	Max	*n*	**Mean**	SD	Min	Max	*n*	**Mean**	SD	Min	Max
Little Roberts Outflow	Arctic char	*193*	**459**	196	108	899	*189*	**1348**	1600	10	8065	*189*	**0.86**	0.10	0.58	1.21
	Lake trout	*50*	**729**	130	416	900	*50*	**4536**	2014	640	8110	*50*	**1.07**	0.15	0.48	1.61
	Broad whitefish	*1*	**545**	-	545	545	*1*	**2000**	-	2000	2000	*1*	**1.24**	-	1.24	1.24
Roberts Lake	Arctic char	*33*	**236**	177	56	670	*30*	**518**	949	3	3317	*30*	**1.00**	0.17	0.63	1.28
	Lake trout	*12*	**404**	176	149	728	*12*	**1253**	1512	24	4938	*12*	**1.12**	0.19	0.73	1.43
	Lake whitefish	*11*	**432**	107	251	610	*10*	**1410**	955	206	2910	*10*	**1.40**	0.18	1.03	1.65
	Cisco	*47*	**142**	102	40	365	*35*	**132**	191	4	543	*35*	**0.85**	0.26	0.50	1.38
	Ninespine stickleback	*268*	**50**	5	36	69	-	-	-	-	-	-	-	-	-	-
Lake 04	Lake trout	*3*	**308**	40	270	350	*3*	**308**	99	220	415	*3*	**1.04**	0.08	0.97	1.12
	Lake whitefish	*20*	**305**	42	206	378	*20*	**392**	153	175	700	*20*	**1.34**	0.28	1.13	2.52
	Broad whitefish	*5*	**342**	42	300	398	*5*	**551**	234	340	880	*5*	**1.32**	0.10	1.19	1.41
	Cisco	*36*	**193**	29	119	248	*36*	**78**	39	20	200	*36*	**1.03**	0.20	0.66	1.76
Stream E04	Arctic char	*6*	**141**	33	101	186	*6*	**35**	22	5	60	*6*	**1.08**	0.33	0.49	1.35
	Lake trout	*12*	**153**	109	59	436	*11*	**124**	237	5	785	*11*	**1.10**	0.31	0.71	1.60
	Ninespine stickleback	*15*	**38**	14	20	68	-	-	-	-	-	-	-	-	-	-
Lake 06a	Arctic char	*6*	**453**	48	380	506	*6*	**1059**	356	588	1595	*6*	**1.10**	0.08	1.00	1.23
Lake 06b	Ninespine stickleback	*93*	**47**	8	32	63	-	-	-	-	-	-	-	-	-	-
Lake 06d	Ninespine stickleback	*86*	**40**	12	19	65	-	-	-	-	-	-	-	-	-	-
Lake 10	Arctic char	*3*	**447**	46	402	494	*3*	**943**	270	665	1205	*3*	**1.04**	0.05	1.00	1.09
	Lake trout	*9*	**401**	41	346	489	*9*	**766**	174	510	955	*9*	**1.19**	0.17	0.80	1.37
Stream E10	Arctic char	*18*	**95**	35	53	158	-	-	-	-	-	-	-	-	-	-
Lake 12	Ninespine stickleback	*10*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake 13	Arctic char	*17*	**246**	37	202	343	*17*	**123**	59	70	310	*17*	**0.79**	0.11	0.50	0.96
Stream E13	Arctic char	*2*	**68**	1	67	68	-	-	-	-	-	-	-	-	-	-
	Ninespine stickleback	*2*	**61**	4	58	63	-	-	-	-	-	-	-	-	-	-
Stream E14	Arctic char	*8*	**67**	33	20	117	-	-	-	-	-	-	-	-	-	-
Lake 31a	Ninespine stickleback	*23*	**49**	9	35	65	-	-	-	-	-	-	-	-	-	-
Lake 31b	Ninespine stickleback	*87*	**39**	12	15	89	-	-	-	-	-	-	-	-	-	-
Lake 32	Arctic char	*18*	**382**	28	311	415	*18*	**526**	108	295	685	*18*	**0.94**	0.11	0.66	1.15
	Lake trout	*10*	**389**	51	325	512	*10*	**764**	403	440	1880	*10*	**1.23**	0.12	0.99	1.40
Stream E32	Arctic char	*1*	**53**	-	53	53	-	-	-	-	-	-	-	-	-	-
Lake 32a	Arctic char	*6*	**332**	13	316	349	*6*	**328**	79	220	435	*6*	**0.89**	0.16	0.61	1.10
	Ninespine stickleback	*11*	**34**	16	12	69	-	-	-	-	-	-	-	-	-	-
Lake 33	Arctic char	*7*	**301**	43	221	350	*7*	**259**	115	80	454	*7*	**0.89**	0.12	0.74	1.06
Roberts Bay	Arctic char	*11*	**593**	249	201	820	*11*	**2987**	2221	55	6192	*11*	**0.95**	0.20	0.68	1.30
	Lake trout	*24*	**613**	118	460	990	*24*	**3079**	1509	1450	7010	*24*	**1.29**	0.18	0.72	1.51
	Fourhorn sculpin	*2*	**96**	33	72	119	*1*	**5**	-	5	5	*1*	**1.34**	-	1.34	1.34
	Greenland cod	*3*	**94**	4	90	97	-	-	-	-	-	-	-	-	-	-
	Capelin	*32*	**129**	9	119	155	-	-	-	-	-	-	-	-	-	-
	Arctic flounder	*34*	**202**	41	140	287	*34*	**147**	83	35	360	*34*	**1.61**	0.29	0.94	2.41

Appendix C5. Backpack electrofishing sampling locations, effort, catch and CPUE in the Doris North Project area, 2006.

Waterbody	Site ID	Date	Start UTM (13W)		End UTM (13W)		Sampling Effort		Number of Fish Captured / CPUE (fish/100s)							
									ARCH		LKTR		NNST		Total	
			Easting	Northing	Easting	Northing	(m)	(s)	n	CPUE	n	CPUE	n	CPUE	n	CPUE
Roberts Lake	RLEF-01	27-Aug-06	435224	7562841	435042	7562961	218	88	1	1.14					1	1.14
	RLEF-02	28-Aug-06	435224	7562841	435042	7562961	218	350	6	1.71	1	0.29			7	2.00
	Total							**438**	**7**	**1.60**	**1**	**0.23**			**8**	**1.83**
Stream E04	E04EF-01	12-Aug-06	436410	7559365	436476	7559246	200	420	6	1.43	12	2.86	15	3.57	33	7.86
Lake 05	L05EF-01	11-Aug-06	436861	7559138	436877	7559198	90	469								
Lake 06b	L06BEF-01	10-Aug-06	437777	7560209			70	441					93	21.09	93	21.09
Lake 06c	L06CEF-01	11-Aug-06	439029	7561564	438741	7561868	150	417								
Lake 06d	L06DEF-01	13-Aug-06	435910	7559613			150	620					15	2.42	15	2.42
Lake 07	L07EF-01	02-Jul-06	438490	7561146			900	547								
Stream E07	E07EF-02	02-Jul-06	438548	7561337	438525	7561214	130	232								
Lake 07a	L07AEF-01	01-Jul-06	438472	7560676			1900	969								
Stream E07a	E07EF-01	01-Jul-06	438566	7560839	438611	7560713	140	353								
Stream E09	E09EF-01	30-Jun-06	440992	7559445	439906	7559431		839								
Stream E10	E10EF-01	29-Jun-06	441121	7559624	441344	7558646		1643	18	1.10					18	1.10
Lake 12	L12EF-01	28-Jun-06	441612	7559196			966	645								
Stream E12	E12EF-01	28-Jun-06	441394	7559495	441612	7559196	370	983					8	0.81	8	0.81
Stream E13	E13EF-01	06-Jul-06	439029	7561564	438319	7562811		1740	2	0.11			2	0.11	4	0.23
Stream E14	E14EF-01	04-Jul-06	436761	7563327	436804	7563608	280	676	8	1.18					8	1.18
Lake 31a	L31AEF-01	09-Aug-06	440553	7560887	440489	7560895	150	501					23	4.59	23	4.59
Lake 32a	L32AEF-01	10-Aug-06	439953	7561762	440026	7561718	175	676					11	1.63	11	1.63
Stream E32	E32EF-01	22-Jun-06	440134	7561066	440104	7561002	70	226	1	0.44					1	0.44
Stream E33	L33EF-01	27-Jun-06	440079	7560997	439894	7561228	296	381								
Lake 35	L35EF-01	14-Aug-06	439514	7562076	439452	7562141	200	411								

NOTES:

n = number of captured fish

CPUE = catch per unit effort (fish/100s)

Total CPUE = total (n) / total (s) *100

Appendix C6. Location, effort, catch, and CPUE data for fyke nets in the Doris North Project area, 2006

Water-body	Site ID	UTM (13W) NAD27		Set Date	Set Time	Pull Date	Pull Time	Set Period (h)	Number of Fish Captured/CPUE (fish/24 h)																			
									ARCH		LKTR		LKWH		CISC		FRSC		NNST		GRCD		CAPE		ARFL		Total	
		Easting	Northing						n	CPUE	n	CPUE	n	CPUE	n	CPUE	n	CPUE	n	CPUE	n	CPUE	n	CPUE	n	CPUE	n	CPUE
Roberts Lake	RLFN-01	441118	7559629	09-Aug-06	11:27	10-Aug-06	10:00	49.5	11	5.3	1	0.5	1	0.5	36	17.5			270	130.9							319	154.7
	RLFN-02	441118	7559629	25-Aug-06	10:30	29-Aug-06	10:30	96.0	15	3.8	1	0.3															16	4.0
	Total							**145.5**	**26**	**3.8**	**2**	**0.3**	**1**	**0.2**	**36**	**5.9**			**270**	**44.5**							**335**	**55.3**
Roberts Bay	RBFNEB	432595	7563321	09-Jul-06	16:00	12-Jul-06	10:30	66.5	6	2.2	20	7.2					2	0.7			3	1.1	7	2.5	24	8.7	62	22.4
	RBFNWB	432595	7563321	09-Jul-06	16:00	12-Jul-06	10:30	66.5	5	1.8	4	1.4											25	9.0	10	3.6	44	15.9
	Total							**133.0**	**11**	**2.0**	**24**	**4.3**					**2**	**0.4**			**3**	**0.5**	**32**	**5.8**	**34**	**6.1**	**106**	**19.1**

NOTES:

n = number of captured fish

CPUE = catch per unit effort

Total CPUE = total (n) / total (h) *24

Appendix C7. Gill net set locations, effort, catch, and CPUE in the Doris North Project area, 2006

Water-body	Site ID	Set No.	UTM (13W) NAD27 Easting	UTM (13W) NAD27 Northing	Set Date	Set Time	Pull Date	Pull Time	Min. Water Depth (m)	Max. Water Depth (m)	Set Period (h)	Net Area (m^2)	No. Panels	Net Units[a]	Mesh Sizes (cm)	ARCH n	ARCH CPUE	LKTR n	LKTR CPUE	LKWH n	LKWH CPUE	BRWH n	BRWH CPUE	CISC n	CISC CPUE	Total n	Total CPUE
Roberts Lake	RLGN-01	1	441027	7560063	08-Aug-06	11:37	08-Aug-06	15:00	3.5	6.5	3.4	37.2	2	0.10	3.8, 6.4	1	9.5	2	19.1	4	38.1					**7**	**66.7**
	RLGN-02	2	440632	7560225	08-Aug-06	11:57	08-Aug-06	12:55	3.7	9.0	1.0	37.2	2	0.03	1.9, 2.5			1	33.4	2	66.7					**3**	**100.1**
	RLGN-03	3	440326	7560535	08-Aug-06	13:08	08-Aug-06	15:00	3.9	8.0	1.9	37.2	2	0.06	1.9, 2.5			1	17.3	1	17.3					**2**	**34.6**
	RLGN-04	1	440938	7560062	09-Aug-06	11:13	09-Aug-06	12:50	4.4	6.5	1.6	37.2	2	0.05	1.9, 2.5					4	79.8					**4**	**79.8**
	RLGN-05	2	440645	7560193	09-Aug-06	11:42	09-Aug-06	12:40	3.5	17.7	1.0	37.2	2	0.03	1.9, 2.5												
	RLGN-06	3	440960	7559960	09-Aug-06	14:27	09-Aug-06	16:30	3.0	10.0	2.1	37.2	3	0.10	1.3, 1.9, 2.5												
	RLGN-07	1	438492	7561382	25-Aug-06	13:00	25-Aug-06	14:00	6.7	11.6	1.0	37.2	2	0.03	3.8, 6.4												
	RLGN-08	2	438996	7561252	25-Aug-06	13:25	25-Aug-06	14:10	6.9	10.6	0.8	37.2	2	0.02	1.9, 2.5					3	129.0			2	86.0	**5**	**215.1**
	RLGN-09	3	439084	7561184	25-Aug-06	13:18	25-Aug-06	14:20	13.3	14.5	1.0	37.2	2	0.03	1.9, 3.8												
	RLGN-10	1	440642	7560131	26-Aug-06	10:50	26-Aug-06	11:20			0.5	37.2	2	0.02	1.3, 1.9, 2.5			2	129.0	1	64.5			1	64.5	**4**	**258.1**
	RLGN-11	2	440612	7559930	26-Aug-06	10:58	26-Aug-06	13:20			2.4	37.2	2	0.07	3.8, 6.4					2	27.3					**2**	**27.3**
	RLGN-12	3	441038	7559833	26-Aug-06	11:10	26-Aug-06	13:30			2.3	37.2	2	0.07	1.9, 2.5			1	13.8					2	27.6	**3**	**41.5**
	RLGN-13	4	441017	7559847	26-Aug-06	15:00	26-Aug-06	15:45	1.6	9.4	0.8	37.2	2	0.02	1.9, 3.8			1	43.0	2	86.0					**3**	**129.0**
	RLGN-14	5	441017	7559847	26-Aug-06	15:05	26-Aug-06	16:00	1.1	10.6	0.9	37.2	3	0.04	1.3, 1.9, 2.5			1	23.5	4	93.8					**5**	**117.3**
	RLGN-15	2	439048	7561190	29-Aug-06	11:10	29-Aug-06	12:50	3.0	10.1	1.7	37.2	2	0.05	1.9, 2.5									8	154.8	**8**	**154.8**
	RLGN-16	3	439048	7561190	29-Aug-06	11:18	29-Aug-06	12:30	10.0	15.4	1.2	37.2	3	0.06	1.3, 1.9, 2.5			1	17.9	2	35.8			10	179.2	**13**	**233.0**
	Total										**23.4**			**0.79**		**1**	**1.3**	**10**	**12.7**	**25**	**31.7**			**23**	**29.2**	**59**	**74.8**
Lake 04	L04GN-01	1	436873	7558738	12-Aug-06	10:29	12-Aug-06	11:50	4.3	4.3	1.4	37.2	2	0.04	3.8, 6.4			3	71.7	10	238.9	5	119.47	7	167.3	**25**	**597.4**
	L04GN-02	2	436778	7558914	12-Aug-06	10:32	12-Aug-06	12:30	3.4	3.4	2.0	37.2	2	0.06	1.9, 2.5					10	164.0			29	475.7	**39**	**639.7**
	Total										**3.3**			**0.10**				**3**	**29.2**	**20**	**194.5**	**5**	**48.63**	**36**	**350.1**	**64**	**622.5**
Lake 05	L05GN-01	1	436953	7559121	11-Aug-06	15:03	11-Aug-06	16:15	3.2	3.2	1.2	37.2	2	0.04	3.8, 6.4												
	L05GN-02	2	437077	7558999	11-Aug-06	15:08	11-Aug-06	16:20	5.4	5.4	1.2	37.2	2	0.04	1.9, 2.5												
	L05GN-03	1	436932	7559139	12-Aug-06	8:36	12-Aug-06	9:45	3.6	4.7	1.2	37.2	2	0.04	1.9, 2.5												
	L05GN-04	2	437036	7559070	12-Aug-06	8:41	12-Aug-06	9:50	2.7	4.2	1.1	37.2	2	0.04	3.8, 6.4												
	Total										**4.7**			**0.15**													
Lake 06a	L06AGN-01	1	436866	7560967	05-Jul-06	13:47	05-Jul-06	14:48	2.4	2.9	1.0	37.2	2	0.03	3.8, 6.4												
	L06AGN-02	2	436812	7560768	05-Jul-06	14:52	05-Jul-06	16:45	2.3	2.6	1.9	37.2	2	0.06	3.8, 6.4	2	34.3									**2**	**34.3**
	L06AGN-03	1	436742	7560271	13-Aug-06	10:56	13-Aug-06	11:52	3.0	3.0	0.9	37.2	2	0.03	1.9, 2.5												
	L06AGN-04	2	436810	7561034	13-Aug-06	11:02	13-Aug-06	14:12	2.9	2.9	3.2	37.2	2	0.10	3.8, 6.4												
	L06AGN-05	3	436842	7560862	13-Aug-06	12:06	13-Aug-06	14:17	2.7	3.0	2.2	37.2	2	0.07	1.9, 2.5												
	L06AGN-06	1	436774	7560711	07-Sep-06	14:46	07-Sep-06	16:34	2.3	2.6	1.8	37.2	2	0.06	3.8, 6.4												
	L06AGN-07	2	436840	7560714	07-Sep-06	14:48	07-Sep-06	16:37	2.7	3.1	1.8	37.2	2	0.06	2.5, 5	1	17.8									**1**	**17.8**
	L06AGN-08	3	436850	7561067	07-Sep-06	14:53	07-Sep-06	16:46	3.1	3.1	1.9	37.2	2	0.06	2.5, 3.8	3	51.4									**3**	**51.4**
	Total										**14.7**			**0.46**		**6**	**13.2**									**6**	**13.2**
Lake 06b	L06BGN-01	1	437726	7560344	10-Aug-06	14:40	10-Aug-06	16:30	3.7	6.1	1.8	37.2	2	0.06	3.8, 6.4												
	L06BGN-02	2	437777	7560209	10-Aug-06	14:45	10-Aug-06	16:45	3.9	3.9	2.0	37.2	2	0.06	1.9, 2.5												
	L06BGN-03	1	437696	7560349	11-Aug-06	8:40	11-Aug-06	10:15	6.0	6.0	1.6	37.2	2	0.05	3.8, 6.4												
	L06BGN-04	2	437824	7560182	11-Aug-06	8:44	11-Aug-06	10:20	1.7	3.2	1.6	37.2	2	0.05	1.9, 2.5												
	Total										**7.0**			**0.22**													
Lake 06c	L06CGN-01	1	437333	7559499	11-Aug-06	11:13	11-Aug-06	14:20	4.4	4.4	3.1	37.2	2	0.10	3.8, 6.4												
	L06CGN-02	2	437227	7559648	11-Aug-06	11:18	11-Aug-06	14:16	1.3	2.1	3.0	37.2	2	0.09	1.9, 2.5												
	Total										**6.1**			**0.19**													
Lake 06d	L06DGN-01	1	436134	7559364	12-Aug-06	14:54	12-Aug-06	16:40	3.4	3.4	1.8	37.2	2	0.05	1.9, 2.5												
	L06DGN-02	2	435962	7559467	12-Aug-06	15:06	12-Aug-06	16:50	2.7	2.7	1.7	37.2	2	0.05	3.8, 6.4												
	L06DGN-03	1	436141	7559356	13-Aug-06	8:28	13-Aug-06	9:45	2.8	2.8	1.3	37.2	2	0.04	3.8, 6.4												
	L06DGN-04	2	435991	7559438	13-Aug-06	8:30	13-Aug-06	9:50	3.4	3.4	1.3	37.2	2	0.04	1.9, 2.5												
	Total										**6.1**			**0.19**													
Lake 07	L07GN-01	1	438497	7561058	02-Jul-06	11:31	02-Jul-06	12:31	2.7	3.1	1.0	37.2	2	0.03	3.8, 6.4												
	L07GN-02	2	438519	7560976	02-Jul-06	12:37	02-Jul-06	15:48	2.3	2.9	3.2	37.2	2	0.10	3.8, 6.4												
	Total										**4.2**			**0.13**													
Lake 07a	L07AGN-01	1	438461	7560492	01-Jul-06	11:36	01-Jul-06	12:21	1.9	2.3	0.8	37.2	2	0.02	3.8, 6.4												
	L07AGN-02	2	438431	7560566	01-Jul-06	12:34	01-Jul-06	15:05	2.1	3.9	2.5	37.2	2	0.08	3.8, 6.4												
	Total										**3.3**			**0.10**													
Lake 09	L09GN-01	1	439906	7559431	30-Jun-06	14:11	30-Jun-06	14:56	2.1	3.0	0.8	37.2	2	0.02	3.8, 6.4												
	L09GN-02	2	439710	7559518	30-Jun-06	14:59	01-Jul-06	9:48	2.1	3.1	18.8	37.2	2	0.58	3.8, 6.4												
	Total										**19.6**			**0.61**													

Number of Fish Captured / CPUE (no. fish/net unit)

Appendix C7. Gill net set locations, effort, catch, and CPUE in the Doris North Project area, 2006

Water-body	Site ID	Set No.	UTM (13W) NAD27 Easting	UTM (13W) NAD27 Northing	Set Date	Set Time	Pull Date	Pull Time	Min. Water Depth (m)	Max. Water Depth (m)	Set Period (h)	Net Area (m^2)	No. Panels	Net Units[a]	Mesh Sizes (cm)	ARCH n	ARCH CPUE	LKTR n	LKTR CPUE	LKWH n	LKWH CPUE	BRWH n	BRWH CPUE	CISC n	CISC CPUE	Total n	Total CPUE
Lake 10	L10GN-01	1	440984	7558463	29-Jun-06	12:52	29-Jun-06	13:26	3.1	5.0	0.6	37.2	2	0.02	3.8, 6.4	3	170.8	1	56.9							4	227.7
	L10GN-02	1	441027	7558511	06-Sep-06	10:25	06-Sep-06	11:15	6.8	9.2	0.8	37.2	2	0.03	3.8, 6.4												
	L10GN-03	2	440762	7558571	06-Sep-06	11:28	06-Sep-06	12:10	7.1	7.5	0.7	37.2	2	0.02	2.5, 5												
	L10GN-04	3	441126	7558587	06-Sep-06	12:21	06-Sep-06	13:30	3.5	9.4	1.2	37.2	2	0.04	2.5, 3.8												
	L10GN-05	4	440822	7558366	06-Sep-06	13:35	06-Sep-06	14:40	2.6	3.5	1.1	37.2	2	0.03	1.9, 2.5												
	L10GN-06	5	440822	7558366	06-Sep-06	14:40	06-Sep-06	16:10	2.6	3.5	1.5	37.2	2	0.05	1.9, 2.5												
	L10GN-07	1	440903	7558535	07-Sep-06	9:40	07-Sep-06	10:42	13.4	13.6	1.0	37.2	2	0.03	3.8, 6.4												
	L10GN-08	2	440832	7558530	07-Sep-06	9:49	07-Sep-06	10:58	12.1	13.0	1.1	37.2	2	0.04	2.5, 5												
	L10GN-09	3	440806	7558459	07-Sep-06	10:10	07-Sep-06	11:02	9.1	6.5	0.9	37.2	2	0.03	2.5, 3.8												
	L10GN-10	4	440903	7558535	07-Sep-06	10:50	07-Sep-06	12:05	13.4	13.6	1.2	37.2	2	0.04	3.8, 6.4												
	L10GN-11	5	440832	7558530	07-Sep-06	10:59	07-Sep-06	12:19	12.1	13.0	1.3	37.2	2	0.04	2.5, 5			1	24.2							1	24.2
	L10GN-12	6	440806	7558459	07-Sep-06	11:06	07-Sep-06	12:24	9.1	6.5	1.3	37.2	2	0.04	2.5, 3.8												
	L10GN-13	7	440903	7558535	07-Sep-06	12:12	07-Sep-06	12:52	13.4	13.6	0.7	37.2	2	0.02	3.8, 6.4			1	48.4							1	48.4
	Total										13.4			0.42		3	7.2	3	7.2							6	14.4
Lake 12	L12GN-01	1	441893	7559062	28-Jun-06	9:45	28-Jun-06	10:31	2.3	3.7	0.8	37.2	2	0.02	3.8, 6.4												
	L12GN-02	2	441800	7559072	28-Jun-06	10:37	28-Jun-06	11:29	3.1	5.7	0.9	37.2	2	0.03	3.8, 6.4												
	L12GN-03	3	441697	7559130	28-Jun-06	11:35	28-Jun-06	13:39	3.1	4.2	2.1	37.2	2	0.06	3.8, 6.4												
	Total										3.7			0.11													
Lake 13	L13GN-01	1	438352	7563126	06-Jul-06	9:48	06-Jul-06	10:25	2.5	3.6	0.6	37.2	2	0.02	3.8, 6.4	11	575.4									11	575.4
	L13GN-02	1	438359	7563099	13-Aug-06	14:55	13-Aug-06	16:00	3.7	3.7	1.1	37.2	2	0.03	1.9, 2.5	2	59.6									2	59.6
	L13GN-03	2	438661	7563256	13-Aug-06	15:02	13-Aug-06	15:56	4.5	4.5	0.9	37.2	2	0.03	3.8, 6.4	2	71.7									2	71.7
	Total										2.6			0.08		15	186.1									15	186.1
Lake 14	L14GN-01	1	436745	7563803	04-Jul-06	11:20	04-Jul-06	12:11	2.2	2.6	0.9	37.2	2	0.03	3.8, 6.4												
	L14GN-02	2	436551	7563947	04-Jul-06	12:22	04-Jul-06	14:30	2.4	3.7	2.1	37.2	2	0.07	3.8, 6.4												
	Total										3.0			0.09													
Lake 31b	L31BGN-01	1	440713	7560888	09-Aug-06	9:52	09-Aug-06	16:05	3.0	3.7	6.2	37.2	2	0.19	1.9, 2.5												
	L31BGN-02	2	440889	7560768	09-Aug-06	9:58	09-Aug-06	16:10	3.2	3.2	6.2	37.2	2	0.19	3.8, 6.4												
	Total										12.4			0.38													
Lake 32	L32GN-01	1	440223	7561187	26-Jun-06	12:48	26-Jun-06	13:36			0.8	37.2	2	0.02	3.8, 6.4	15	604.8	2	80.6							17	685.5
	Total										0.8			0.02		15	604.8	2	80.6							17	685.5
Lake 32a	L32AGN-01	1	439996	7561827	10-Aug-06	9:24	10-Aug-06	11:45	2.3	4.2	2.3	37.2	2	0.07	1.9, 2.5	2	27.5									2	27.5
	L32AGN-02	2	440055	7561882	10-Aug-06	9:30	10-Aug-06	11:26	5.1	5.3	1.9	37.2	2	0.06	3.8, 6.4	6	100.1									6	100.1
	Total										4.3			0.13		8	60.2									8	60.2
Lake 33	L33GN-01	1	439753	7561384	27-Jun-06	9:41	27-Jun-06	10:24	2.8	8.3	0.7	37.2	2	0.02	3.8, 6.4												
	L33GN-02	2	439595	7561605	27-Jun-06	10:34	27-Jun-06	11:43	2.2	6.8	1.1	37.2	2	0.04	3.8, 6.4	2	56.1									2	56.1
	L33GN-03	3	439748	7561557	27-Jun-06	12:03	27-Jun-06	13:10	3.7	10.2	1.1	37.2	2	0.03	3.8, 6.4	2	57.8									2	57.8
	L33GN-04	1	439755	7561448	14-Aug-06	10:48	14-Aug-06	11:50	10.9	10.9	1.0	37.2	2	0.03	3.8, 6.4	2	62.4									2	62.4
	L33GN-05	2	439792	7561548	14-Aug-06	10:58	14-Aug-06	12:01	5.1	7.4	1.1	37.2	2	0.03	1.9, 2.5												
	L33GN-06	3	439770	7561374	14-Aug-06	12:09	14-Aug-06	13:06	7.0	7.0	0.9	37.2	2	0.03	3.8, 6.4												
	L33GN-07	4	439719	7561592	14-Aug-06	12:13	14-Aug-06	13:14	5.2	10.7	1.0	37.2	2	0.03	1.9, 2.5												
	L33GN-08	5	439600	7561506	14-Aug-06	13:27	14-Aug-06	14:09	9.7	9.7	0.7	37.2	2	0.02	1.9, 2.5	1	46.1									1	46.1
	L33GN-09	6	439759	7561434	14-Aug-06	13:31	14-Aug-06	14:15	6.7	10.8	0.7	37.2	2	0.02	3.8, 6.4												
	Total										8.5			0.26		7	26.7									7	26.7

Number of Fish Captured / CPUE (no. fish/net unit)

NOTES:

n = number of captured fish

CPUE = fish / Net Unit[a]

[a] one net unit equals 100 m^2 of net set for 24 hours

Total CPUE = total (n) / (100 m^2 * total (h)

Appendix C8. Location, effort, catch, and CPUE data for minnow trap sets in the Doris North Project area, 2006.

Waterbody	Site ID	UTM (13W) NAD27		Set Date	Set Time	Pull Date	Pull Time	Set Period (h)	Water Depth (m)	Number of Fish Captured / CPUE (fish/24 h)	
										NNST	
		Easting	Northing							n	CPUE
Lake 06a	L06AMT-01	436999	7561115	05-Jul	13:34	05-Jul	17:00	3.4	0.4		
	L06AMT-02	436943	7561108	05-Jul	13:36	05-Jul	17:02	3.4	0.4		
	L06AMT-03	436846	7561095	05-Jul	13:39	05-Jul	17:05	3.4	0.4		
	Total							**10.3**			
Lake 07	L07MT-01	438490	7561146	02-Jul	11:21	02-Jul	15:45	4.4	0.4		
	L07MT-02	438546	7561142	02-Jul	11:24	02-Jul	15:43	4.3	0.5		
	L07MT-03	438581	7561099	02-Jul	11:26	02-Jul	15:41	4.2	0.7		
	Total							**13.0**			
Lake 07a	L07AMT-01	438512	7560654	01-Jul	11:27	01-Jul	14:39	3.2	0.4		
	L07AMT-02	438547	7560655	01-Jul	11:29	01-Jul	14:36	3.1	0.5		
	L07AMT-03	438598	7560670	01-Jul	11:33	01-Jul	14:34	3.0	0.4		
	Total							**9.3**			
Lake 10	L10MT-01	441253	7558643	29-Jun	12:41	29-Jun	16:00	3.3	0.5		
	L10MT-02	441215	7558675	29-Jun	12:43	29-Jun	16:00	3.3	0.6		
	L10MT-03	441180	7558597	29-Jun	12:45	29-Jun	16:00	3.2	0.4		
	Total							**9.8**			
Lake 12	L12MT-01	441676	7559192	28-Jun	9:36	28-Jun	13:47	4.2	0.8		
	L12MT-02	441702	7559172	28-Jun	9:38	28-Jun	13:43	4.1	0.4		
	L12MT-03	441653	7559115	28-Jun	9:41	28-Jun	13:45	4.1	1.1	2	11.76
	Total							**12.3**		**2**	**3.89**
Lake 13	L13MT-01	438373	7562891	06-Jul	9:38	06-Jul	13:53	4.3	-		
	L13MT-02	438400	7562934	06-Jul	9:40	06-Jul	13:55	4.2	-		
	L13MT-03	438335	7562951	06-Jul	9:42	06-Jul	13:58	4.3	-		
	Total							**12.8**			
Lake 14	L14MT-01	436769	7563635	04-Jul	11:08	04-Jul	14:17	3.1	0.5		
	L14MT-02	436752	7563663	04-Jul	11:10	04-Jul	14:19	3.1	0.6		
	L14MT-03	436701	7563682	04-Jul	11:12	04-Jul	14:21	3.1	0.4		
	Total							**9.4**			
Lake 32	L32MT-01	440103	7561164	22-Jun	14:32	26-Jun	15:30	97.0	1.4		
	L32MT-02	440108	7561120	22-Jun	14:38	26-Jun	15:26	96.8	0.9		
	L32MT-03	440164	7561071	22-Jun	14:40	26-Jun	16:20	97.7	0.4		
	L32MT-04	440211	7561090	22-Jun	14:44	26-Jun	15:23	96.7	0.4		
	Total							**388.1**			
Lake 33	L33MT-01	439868	7561321	27-Jun	9:20	27-Jun	13:27	4.1	1.2		
	L33MT-02	439841	7561358	27-Jun	9:22	27-Jun	13:31	4.2	1.4		
	L33MT-03	439757	7561341	27-Jun	9:24	27-Jun	13:35	4.2	1.0		
	L33MT-04	439802	7561420	27-Jun	9:27	27-Jun	13:38	4.2	0.8		
	Total							**16.6**			

NOTES:

n = number of captured fish

CPUE = catch per unit effort (fish/24 h)

Total CPUE = total (n) / total (h) *24

Appendix C9. Angling locations, effort, catch and CPUE in the Doris North Project area, 2006.

Waterbody	Site ID	UTM (13W) NAD27		Date	Sampling Effort			Number of Fish Captured / CPUE					
								ARCH		LKTR		Total	
		Easting	Northing		No. of Rods	(h)	Angler-h	n	CPUE	n	CPUE	n	CPUE
Lake 5	L05AN-01	439906	7559431	30-Jun-06	2	3.0	6.0						
Lake 06a	L06AAN-01	436268	7560012	5-Jul-06	2	3.1	6.2						
	L06AAN-02	436268	7560012	7-Sep-06	2	2.5	5.0	1	0.20			1	0.20
	Total				**2**	**5.6**	**11.2**	**1**	**0.09**			**1**	**0.09**
Lake 06d	L06DAN-01	436134	7559364	12-Aug-06	2	0.8	1.5						
Lake 10	L10AN-01	440822	7558366	29-Jun-06	2	1.5	3.0			8	2.67	8	2.67
	L10AN-02	440822	7558366	6-Sep-06	2	4.0	8.0			2	0.25	2	0.25
	Total				**2**	**4.0**	**8.0**			**10**	**1.25**	**10**	**1.25**
Lake 12	L12AN-01	441612	7559196	28-Jun-06	2	4.4	8.8						
Lake 13	L13AN-01	438661	7563256	6-Jul-06	2	1.5	3.0	2	0.67			2	0.67
Lake 31a	L31AAN-01	440531	7560973	9-Aug-06	2	0.6	1.2						
Lake 32	L32AN-01	440134	7561066	22-Jun-06	2	2.0	4.0	3	0.75	1	0.25	4	1.00
	L32AN-02	440134	7561066	26-Jun-06	2	4.2	8.4			7	0.83	7	0.83
	Total				**2**	**6.2**	**12.4**	**3**	**0.24**	**8**	**0.65**	**11**	**0.89**
Lake 32a	L32AAN-01	439996	7561827	10-Aug-06	2	0.4	0.8						
Lake 33	L33AN-01	439894	7561228	27-Jun-06	2	4.0	8.0						

NOTES:

n = number of captured fish
CPUE = catch per unit effort (fish/angler*h)

Appendix C10. Beach seine sampling locations, effort, CPUE in the Doris North Project area, 2006.

Waterbody	Site ID	UTM (13W) NAD27		Date	Effort (m^2)	Number of Fish Captured/CPUE (fish/100m²)	
						NNST	
		Easting	Northing			n	CPUE
Lake 05	L05BS-01	437200	7558933	12-Aug-06	504		
	L05BS-02	437109	7558865	12-Aug-06	504		
	Total				**1008**		
Lake 06c	L06CBS-01	437205	7559582	11-Aug-06	576		
	L06CBS-02	437222	7559643	11-Aug-06	288		
	Total				**864**		
Lake 06d	L06DBS-01	436141	7559356	12-Aug-06	108	3	2.78
	L06DBS-02	436204	7559351	12-Aug-06	216	68	31.48
	Total				**324**	**71**	**21.91**
Lake 31b	L31BBS-01	440623	7560888	09-Aug-06	108	87	80.56
	Total				**108**	**87**	**80.56**

NOTES:

n = number of captured fish

CPUE = catch per unit effort (fish/100m^2)

Total CPUE = total n / effort

Appendix C11. Arctic char spawning survey in Roberts Lake, 11/12 September 2006.

Site Number	UTM (13W) NAD27		Depth (m)	Arctic char observed
	Easting	Northing		
1	436742	7562772	3.6	
2	436932	7563124	3.3	
3	436764	7563302	2.2	
4	435855	7562459	7.1	Yes
5	436196	7562565	3.6	
6	436214	7562543	3.1	
7	436264	7562514	2.5	
8	436288	7562512	3.1	
9	436309	7562516	3.7	
10	436319	7562523	3.8	Yes
11	436327	7562534	2.6	
12	436371	7562557	2.4	
13	436407	7562546	3.2	
14	436418	7562543	3.7	
15	436479	7562515	6.3	
16	436514	7562535	3.4	
17	436534	7562560	3.8	
18	436556	7562633	3.8	
19	436559	7562654	3.9	
20	436552	7562700	2.6	
21	436550	7562732	3.7	
22	436547	7562753	3.6	
23	436530	7562806	3.0	
24	437038	7562327	4.0	
25	437059	7562307	2.8	
26	437126	7562228	3.1	
27	437155	7562206	2.9	
28	437217	7562127	2.9	
29	437219	7562071	2.3	
30	437394	7561367	2.5	
31	437377	7561354	2.4	
32	437170	7561435	3.9	
33	437160	7561454	2.5	
34	437146	7561473	2.0	
35	437145	7561482	2.0	
36	437113	7561586	3.5	
37	437122	7561539	3.3	Yes
38	437013	7561600	3.3	
39	436978	7561593	3.0	
40	436967	7561590	2.7	
41	436893	7561578	4.9	
42	436699	7561561	2.4	
43	436618	7561552	2.0	
44	436509	7561654	4.3	
45	436460	7561679	2.8	
46	436429	7561701	3.0	
47	436365	7561735	3.5	
48	436300	7561902	3.1	
49	436212	7561984	3.1	
50	435365	7562217	3.3	Yes
51	435312	7562361	2.0	
52	435259	7562708	2.0	
53	435772	7562478	2.7	
54	435814	7562471	3.9	