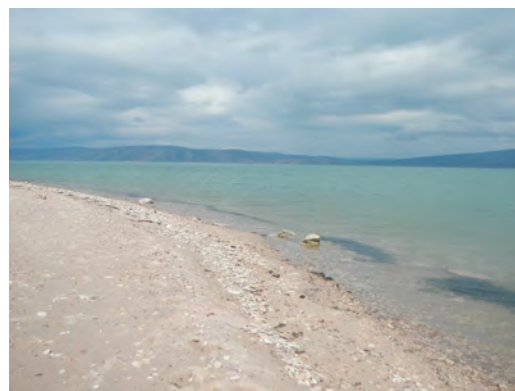
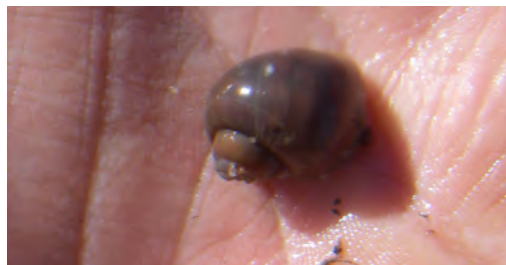
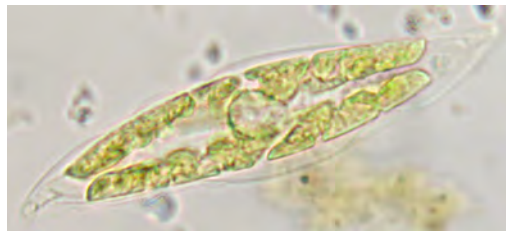


Appendix V7-1A

Back River Project: 2012 Marine Baseline Report

Sabina Gold & Silver Corp.

BACK RIVER PROJECT 2012 Marine Baseline Report



BACK RIVER PROJECT

2012 MARINE BASELINE REPORT

February 2013
Project #833-002-26

Citation:

Rescan. 2013. *Back River Project: 2012 Marine Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd.

Prepared for:



Sabina Gold & Silver Corp.

Prepared by:



Rescan™ Environmental Services Ltd.
Vancouver, British Columbia

Executive Summary

Executive Summary

The Back River Project (the Project) is an exploration gold project owned by Sabina Gold & Silver Corporation (Sabina) located in the West Kitikmeot region of Nunavut. Sabina contracted Rescan Environmental Services (Rescan) in 2012 to conduct a comprehensive baseline program that covered the geographical area of the Goose Property, the George Property, and two potential Marine Laydown Areas (MLA) located on the southern part of Bathurst Inlet.

The 2012 baseline program was designed around potential infrastructure and known deposits at the Goose Property, the George Property, and the MLAs along Bathurst Inlet. It was assumed that access from the MLAs to George and Goose properties would be by winter road, and that access between the George and Goose properties would also be by winter road.

This report presents the results from the marine portion of the 2012 baseline program. Data were collected during the ice-covered (April) and open-water (August) seasons to capture the range of conditions in the marine ecosystem. Under-ice sampling was conducted on a regional scale, measuring the general physical oceanography, water quality, and phytoplankton characteristics at four sites throughout the pelagic waters of southern Bathurst Inlet. The summer campaign (August) focused on the local environments of two potential MLAs: Option 4 MLA near a spit 28 km from the head of the inlet; and Option 6 MLA located 12 km north of the Option 4 MLA and nearly 40 km from the head of Bathurst Inlet. At these MLA options, data were collected on the physical characteristics of the water column, water quality (including dissolved oxygen), sediment quality, phytoplankton, and benthic invertebrates, including data on metal concentrations in bivalve tissue. Sampling was conducted on a grid of 11 sites at the Option 4 MLA and 12 sites at Option 6 MLA.

The marine baseline sampling program showed Bathurst Inlet and the areas proximate to the MLA options to be pristine Arctic coastal environments, with generally clear water, low water column phytoplankton biomass, generally low nutrient and metal concentrations in both the water column and sediments, and abundant and diverse benthic invertebrate communities.

In April, Bathurst Inlet was covered by a solid sea-ice (~1.5 m thick) and the water column had a stable pycnocline around 10 m separating the cold and less saline surface layer from the warmer and saltier deep water. Oxygen concentrations under the ice were generally near-saturation in the surface layer, which was consistent with the very low phytoplankton biomass, with some oxygen depletion in the deep waters to 8 mg/L or below, characteristic of deep fjord systems. The low under-ice phytoplankton densities resulted in high macronutrient (nitrogen and phosphorus) and micronutrient (metals) concentrations in the surface layer due to reduced uptake and several months of re-mineralization. Under-ice conditions created an environment with no wind-driven circulation and limited freshwater inputs leading to very low levels of suspended solids. Under-ice metal concentrations were generally low, with all concentrations below CCME marine water quality guideline levels.

In August, no ice was present in Bathurst Inlet and the sampling at the MLA options showed a more variable environment that was more influenced by wind-driven currents, waves, and riverine and terrestrial runoff. The surface waters were much less saline in summer due to the contribution of the many rivers and streams flowing into the inlet. Sufficient light penetrated the clear waters to permit photosynthesis at the sediment surface in shallow waters and beneath the pycnocline in deeper waters. Near-shore effects from waves and runoff were evident in bulk measures of suspended material and in measurements of nutrient and metal concentrations. The near-shore effects were particularly apparent

in the Option 6 MLA, with its relatively shallow and gentle bathymetry that encouraged wind-driven sediment resuspension and led to naturally higher concentrations of suspended solids, iron, and zinc.

Outside of these near-shore effects, nutrient and metal concentrations were generally low during the summer. Phytoplankton uptake and strong stratification inhibiting deep-water entrainment reduced nutrient concentrations in the surface waters, depleting nitrate to <0.005 mg/L by August from its April concentration of ~0.6 mg/L. Cadmium concentrations were naturally elevated over CCME marine guidelines at both MLA options in the summer, reaching 0.00013 mg/L. No other water quality parameters were greater than the CCME marine guidelines.

The sediments in both MLA options showed a range of composition, from nearly completely sand to primarily composed of silt and clay. Sites in the Option 4 MLA were generally sandier than sites in the Option 6 MLA, which was potentially due to the relatively large peninsula in the Option 6 MLA interfering with currents and water movement. Sediment nutrient and metal concentrations were generally related to composition, with the sandier sediments containing lower nutrient and metal concentrations. Sediment metal concentrations were generally low, but arsenic and copper concentrations were greater than CCME interim sediment quality guidelines at some of the sites composed of finer sediments. Arsenic and copper concentrations were greater than CCME guidelines at mid-shore sites west of the peninsula in the Option 6 MLA. Copper concentrations were also greater than the guidelines at two sites at the southern end of the Option 4 MLA.

The biology of the marine environment was characteristic of coastal Arctic ecosystems. A north-south gradient in phytoplankton biomass was observed, with higher chlorophyll *a* concentrations at the Option 4 MLA near to the head of the Inlet. Phytoplankton biomass was generally low (0.1 to 0.4 µg chlorophyll *a*/L in summer), and the phytoplankton community was likely starved for nitrogen. Perhaps as a result of the low nutrient conditions, the phytoplankton community was dominated by dinoflagellates, many of which are capable of sustaining themselves by vertically migrating to nutrient-rich deep waters or feeding on other plankton or organic matter. Phytoplankton taxonomic diversity was generally greater in August than April.

The benthic invertebrate community varied with composition of the sediments and the water depth. Near-shore environments were dominated by small bivalves, and benthos density was likely enhanced by topographic features protecting the near-shore environment from waves or currents. Motile organisms, such as amphipods, cumaceans (hooded shrimp), and some polychaetes (small segmented worms), were more prevalent in the deeper mid-shore sites. The deeper mid-shore environments had much higher taxonomic richness (~10 to 25 genera/sample) and diversity (~0.6 to 0.8, when bivalves were not dominant) than the near-shore, bivalve-dominated environment. Tissue from bivalves from the near-shore and mid-shore environments were collected and tested for metal concentrations. Metal concentrations in tissue were low, and arsenic and mercury tissue concentrations were lower than the guidelines for human consumption.

Acknowledgements

Acknowledgements

This report was prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd. (Rescan). The 2012 marine fieldwork was conducted by Mike Henry (Ph.D.), Kevin Lesk-Winfield (B. App. Tech. GIS, M.E.Tech.), Fiona Hodge (M.Sc.), Adam Chateauvert (M.Sc.), and Soleil Switzer (M.Sc., R.P.Bio.). Data analysis and report writing was conducted by Benjamin Beall (Ph.D., M.Sc.), David Crawford (Ph.D., M.Sc.), and Mike Henry. This report was reviewed by Mike Henry and Deborah Muggli (Ph.D., M.Sc., R.P.Bio.). The project was managed by Deborah Muggli and co-ordinated by Korina Houghton (B.Sc.).

Extensive support was provided by the Sabina logistics team and camp management, Sabina Environmental Co-ordinators Maria Ballesteros, Merle Keefe, and Darcy Kanayok, as well as Northern Air Support Helicopters and Discovery Expediting.

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BACK RIVER PROJECT

2012 MARINE BASELINE REPORT

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Glossary and Abbreviations

Glossary and Abbreviations

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

Autotroph(ic)	Organism (or an adjective describing an organism) that can synthesize organic compounds using inorganic compounds, usually using light energy (i.e. photosynthesis).
CCME	Canadian Council of Ministers of the Environment
Chl <i>a</i>	Chlorophyll <i>a</i> ; the primary pigment in photosynthetic organisms.
CTD	Oceanographic instrument that measures conductivity, temperature, and depth.
Euphotic Zone Depth	Threshold at which the respiratory requirements of a cell are balanced by the production of organic compounds by photosynthesis.
Heterotroph(ic)	Organism (or an adjective describing an organism) that must consume organic matter from the environment for growth and metabolism.
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
ISQG	Interim Sediment Quality Guideline
Mixotroph(ic)	Organism (or an adjective describing an organism) that uses both autotrophy and heterotrophy to supply the organic matter necessary for growth and metabolism.
MLA	Marine Laydown Area
NTU	Nephelometric Turbidity Unit
PEL	Probable Effects Level
Photosynthesis	The process by which organisms use energy from sunlight to synthesize organic compounds from carbon dioxide and water.
QA/QC	Quality Assurance/Quality Control
Pycnocline	Vertical zone in the water column in which density changes rapidly with depth. Seawater density is a function of salinity and temperature.
Re-mineralization	The transformation of organic matter to inorganic compounds, typically mediated by biological activity.
SE	Standard Error of the Mean
TN	Total Nitrogen
TOC	Total Organic Carbon
TSS	Total Suspended Solids

1. Introduction

1. Introduction

The Back River Project (the Project) is an exploration gold project owned by Sabina Gold & Silver Corporation (Sabina) located in the West Kitikmeot region of Nunavut. Exploration programs were run out of both the Goose and George camps in 2012 (Figure 1-1).

For 2012, Sabina contracted Rescan Environmental Services Ltd. (Rescan) to conduct a comprehensive baseline program that covered the geographical area of the Goose Property, the George Property, and a Marine Laydown Area located on the southern part of Bathurst Inlet. The following components were included in the 2012 baseline program:

- o Meteorology
- o Air Quality and Dust
- o Noise
- o Hydrology and Bathymetry
- o Freshwater Water Quality, Sediment Quality, Aquatic Biology
- o Freshwater Fish and Fish Habitat
- o Marine Water Quality, Sediment Quality, Aquatic Biology
- o Marine Fish and Fish Habitat
- o Wildlife (Terrestrial and Marine)
- o Wildlife DNA Study (Grizzly Bear and Wolverine)
- o Ecosystem Mapping
- o Vegetation and Wetlands (including Rare Plants)
- o Soils and Terrain
- o Country Foods
- o Archaeology
- o Socio-Economics
- o Land Use
- o Metal Leaching/Acid Rock Drainage (ML/ARD)

The 2012 baseline program was designed around potential infrastructure and known deposits at the Goose Property, the George Property, and two potential Marine Laydown Area options along southern Bathurst Inlet. It was assumed that access from the potential Marine Laydown Areas to George and Goose properties would be by winter road, and that access between the George and Goose properties would also be by winter road.

This report presents the results from the 2012 Marine Baseline program conducted in southern Bathurst Inlet. The purpose of 2012 marine program was to collect information on marine water quality, sediment quality, and aquatic biology (phytoplankton, benthic macroinvertebrates, and shellfish) to support the preparation for a future environmental assessment report and to provide the potential baseline information for future monitoring programs in the region should the Project be approved.



Figure 1-1

Chapter 2 of this report presents the methods used during the 2012 Marine Baseline program, and Chapter 3 presents results. Chapter 4 provides a short summary of the results and all raw data are provided in appendices.

2. Methods

2. Methods

2.1 SITE OVERVIEW AND STUDY DESIGN

Bathurst Inlet is a typical fjord system that is long (~165 km), narrow (~2 to 15 km), deep (>300 m), and contains a shallow sill (Figures 2.1-1 and 2.1-4). Bathurst Inlet flows northward into the Coronation Gulf through a system of constrictions, complex bathymetries, and island networks. It can be divided into two major basins that are separated by a long (~20 km), shallow sill (mean depth: 42 m; range: 16 to 63 m) just northeast of Kingaok. The outer inlet is seaward of the sill and is the deeper of the two basins, with maximum depths exceeding 300 m near Omingmaktok, and large sections of this basin are deeper than 100 m. The landward inner basin runs southward from Kingaok to the head of the fjord, and depths are typically between 100 and 150 m, before shoaling to less than 50 m as the inlet approaches the Western River.

The 2012 Marine Baseline Program was carried out in southern Bathurst Inlet during the ice-covered season (April 12) and at two potential Marine Laydown Areas (MLA) in southwestern Bathurst Inlet during the open-water season (July 31 to August 5). The following components were sampled as part of the 2012 marine program:

- o Physical oceanography (temperature, salinity, and water clarity);
- o Water quality (including dissolved oxygen);
- o Sediment quality;
- o Phytoplankton communities (biomass, density, and taxonomy);
- o Benthic macroinvertebrate communities (density and taxonomy); and
- o Shellfish tissue metal content.

The under-ice sampling was conducted in the mid-channel of southern Bathurst Inlet in waters that reached 100 m deep (Figure 2.1-1). Open-water sampling was conducted at the MLA options mid-way down the southernmost basin along the western shore (Figure 2.1-1). Option 4 was the southernmost potential MLA, approximately 12 km from the head of the inlet and 150 km from the entrance to the inlet. Option 6 was 28 km north of Option 4 and was approximately 40 km from the head of Bathurst Inlet and 30 km from the village of Kingaok. The Option 4 MLA was near a small spit, with shallow near-shore waters that quickly exceeded depths of 50 m a few 100 m from shore (Figure 2.1-2 and Plate 2.1-1). The Option 6 MLA was near a small peninsula where the waters quickly fell below 50 m a few 100 m from shore (Figure 2.1-3 and Plate 2.1-2). There was a deeper channel running into shallower waters (<3 m) in the small embayment to the west of the peninsula. Given the freshwater inputs from the Western River at the head of the inlet, the southern section of Bathurst Inlet would be expected to have a positive estuarine circulation where surface flow would move seaward, and a compensating bottom water flow would move landward towards the head of the inlet. There is a sill towards Manning Point that would restrict bottom water flow into the deep waters of southern Bathurst Inlet (Figure 2.1-4).

During the ice-covered season, sampling occurred at four mid-channel sites on April 12, 2012 (Figure 2.1-1). The sites extended from the head of the inlet (BI-1) to the mid-channel area near the Option 6 MLA (BI-4). At each site, information related to the water column structure (salinity and temperature), dissolved oxygen content, water quality, and phytoplankton biomass and taxonomy were collected.



Plate 2.1-1. Aerial view from the northwest of the Option 6 MLA, Back River Project, August 2012.



Plate 2.1-2. Aerial view from the southeast of the Option 4 MLA, Back River Project, July 2012.

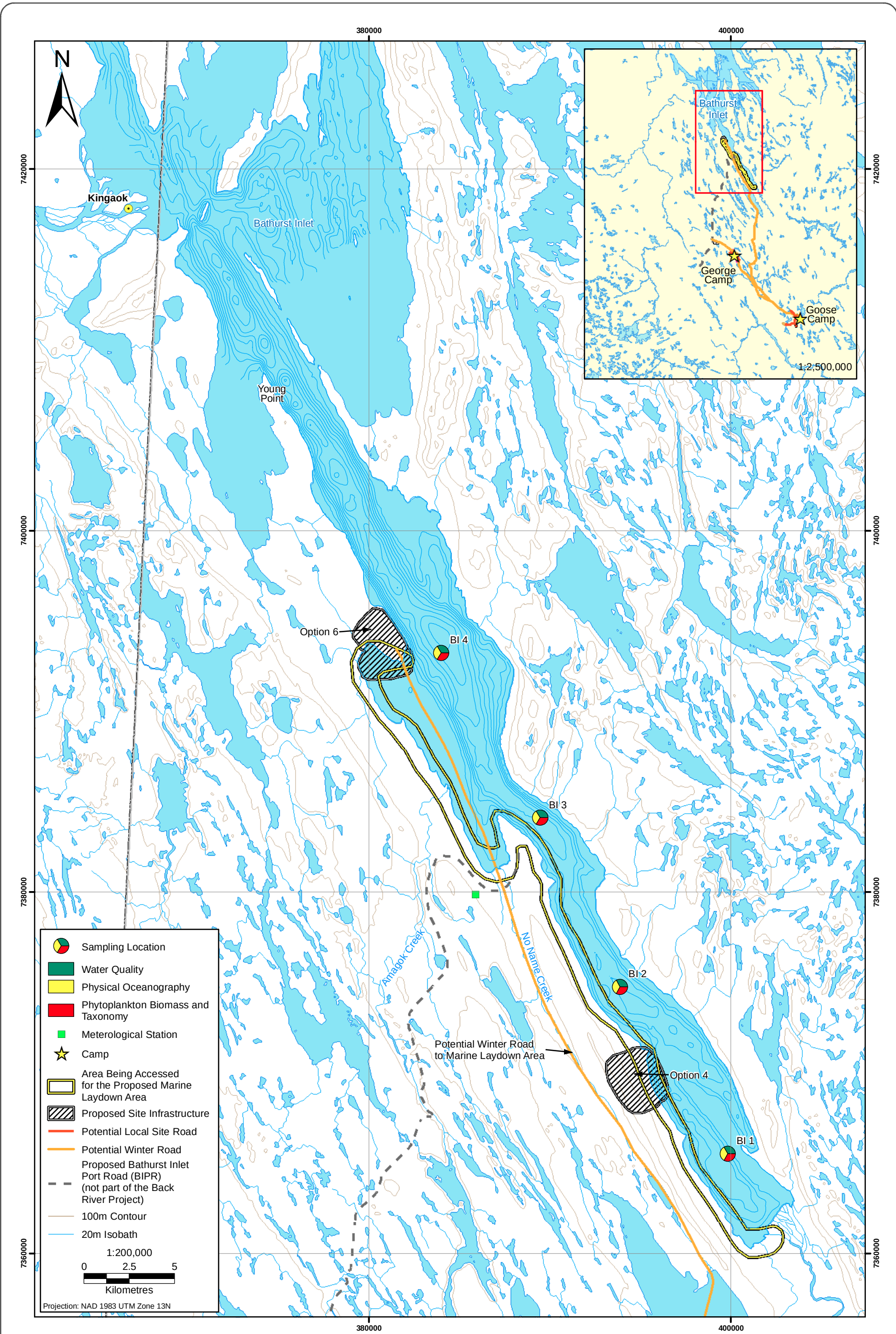


Figure 2.1-1



Under-Ice Marine Sampling Locations, Back River Project, April 2012



Figure 2.1-1

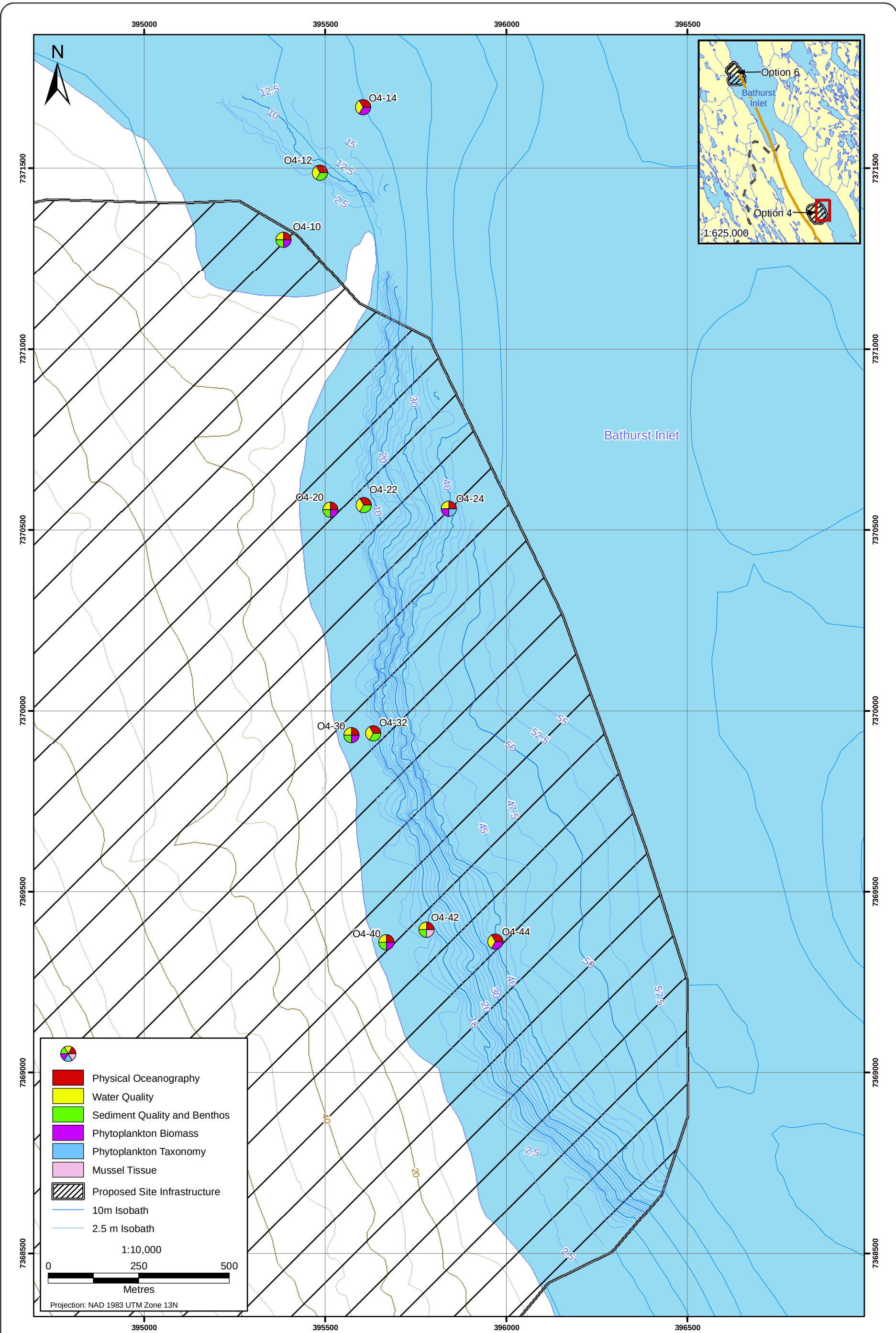


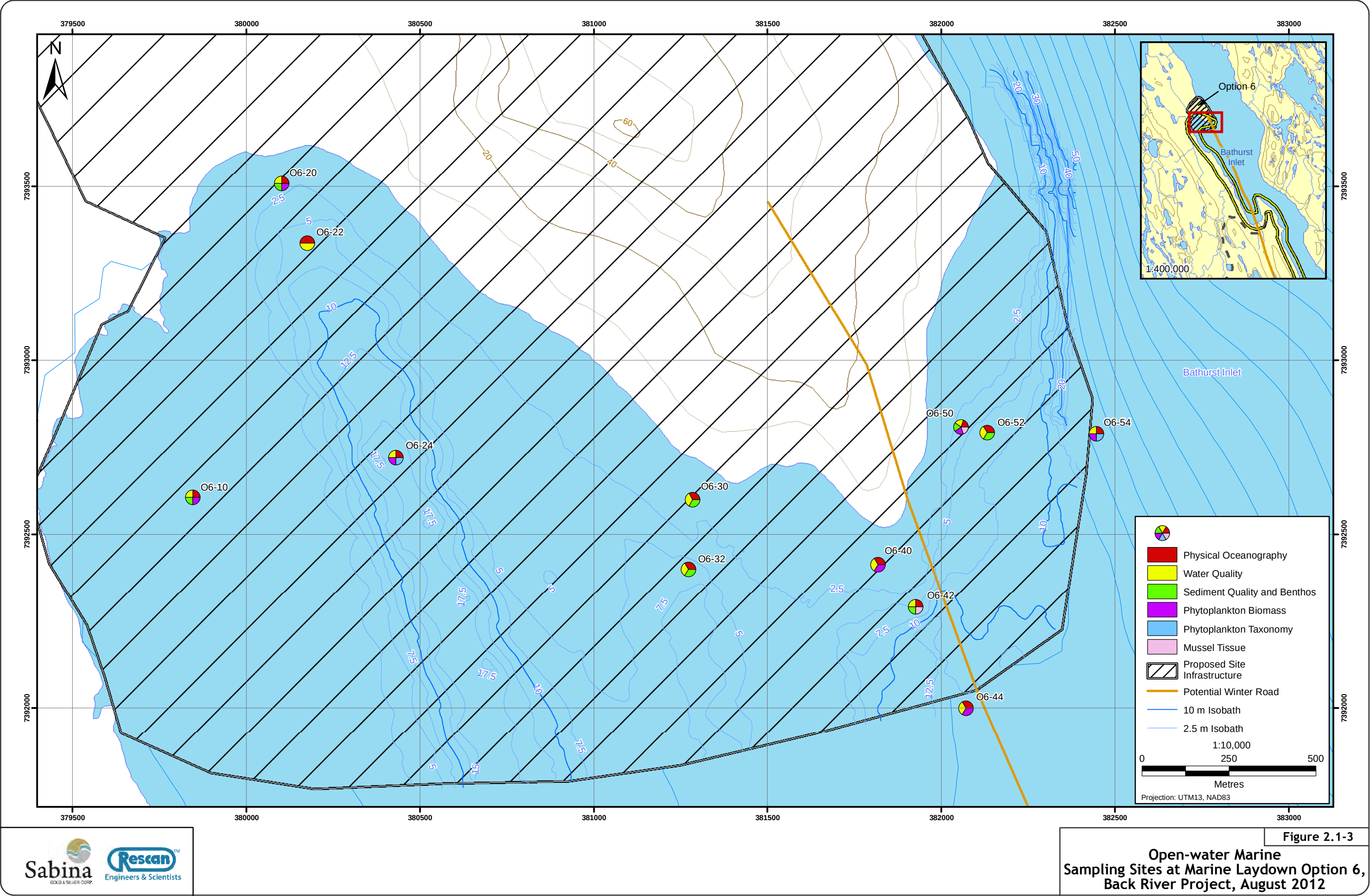
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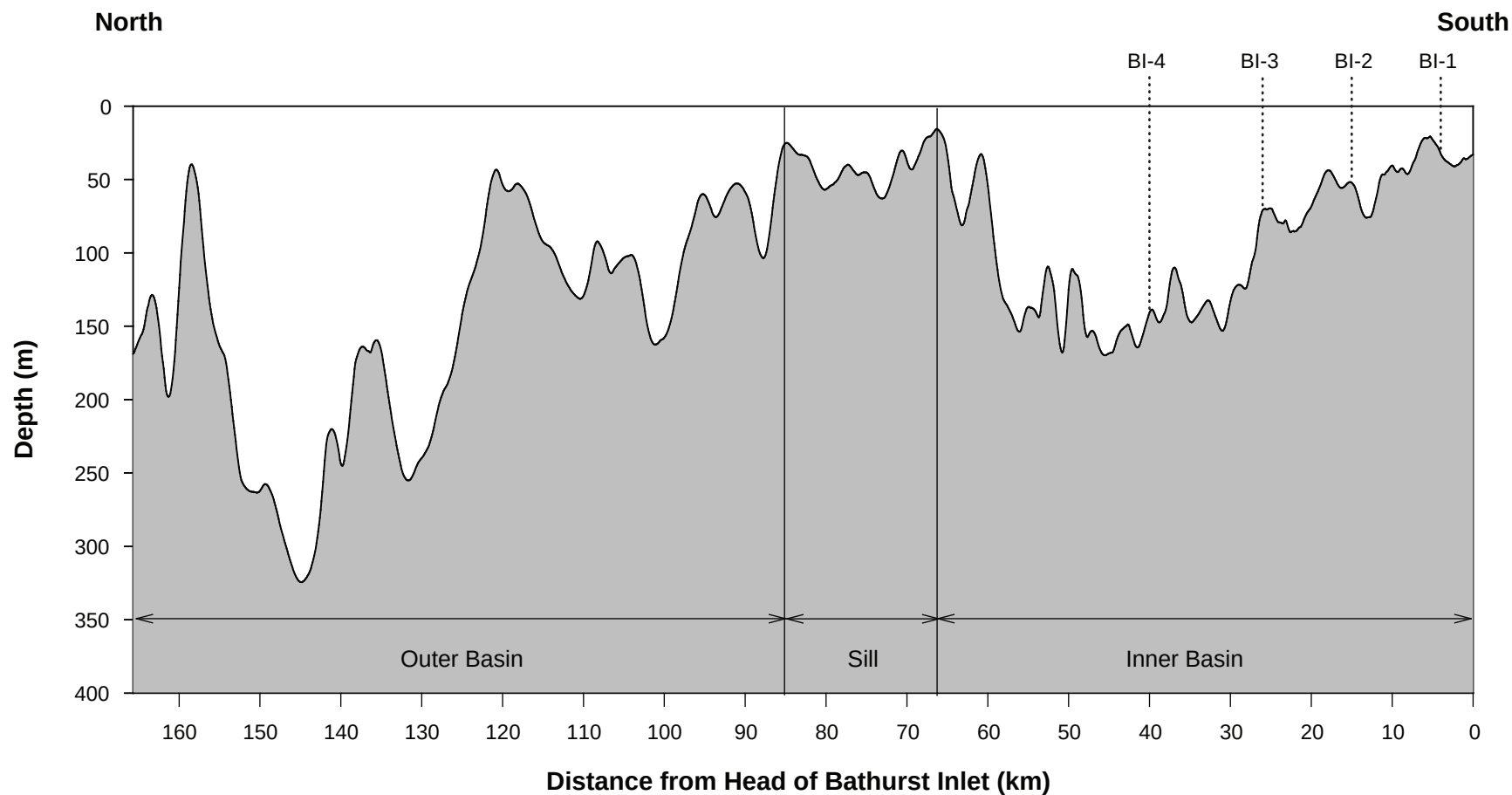


Open-water Marine Sampling Sites at Marine Laydown Option 4,
Back River Project, August 2012

Figure 2.1-2







**Bathymetry of Bathurst Inlet with
BI Sampling Sites, April 2012**

Figure 2.1-4

During the open-water season, sampling grids were established at each MLA option, with several short transects running from the shallow near-shore environment to the immediate deep waters just off shore. Sampling was conducted at each MLA option between July 31 and August 5, 2012. At the Option 4 MLA, a 4-transect grid was established, with three sites per transect (except Transect 2) for a total 11 sites. The transects were on both sides of the spit, and sites moved from the near-shore to the deep-water environment. At the Option 6 MLA, a 5-transect grid was sampled, with most transects consisting of three sampling sites, and totalled 12 sampling sites overall. The grid covered the near-shore, mid-shore, and deep-water environment, and covered both sides of the peninsula. At each MLA option, information related to water column structure (salinity and temperature), dissolved oxygen content, water quality, sediment quality, phytoplankton, benthic macroinvertebrates, and shellfish (tissue metal content) were collected. A brief summary of the marine components sampled during April and August is presented in Table 2.1-1. Table 2.1-2 provides a summary of sampled parameters, replication, sampling dates, and sampling equipment used. Full descriptions are provided in the following text.

Table 2.1-1. Marine Sampling Components and Sampling Schedule, Back River Project, 2012

Sampled Parameters	Ice-covered (Regional)	Open-water (Local)	
		Option 4	Option 6
Physical Oceanography			
Salinity and Temperature	April 12	July 31	July 31
Dissolved Oxygen	April 12	July 31	July 31
Euphotic Zone Depth		August 3	August 1
Water Quality	April 12	August 3	August 1
Sediment Quality		August 4	August 2
Biology			
Phytoplankton Biomass, Density, and Taxonomy	April 12	August 3	August 1
Benthos Density and Taxonomy		August 4	August 2
Shellfish Physical Characteristics and Tissue Metals		August 4	August 3

2.2 PHYSICAL OCEANOGRAPHY AND LIGHT PENETRATION

Physical oceanographic profiles (e.g., salinity, temperature, and dissolved oxygen) were collected at each regional and MLA Option sampling site during the under-ice (April 12) and the open-water season (July 31).

In April, the under-ice water was accessed by drilling a 25-cm diameter hole through the ice. The ice thickness was recorded and a vertical profile of temperature, salinity, and conductivity was collected using an *in situ* conductivity, temperature, and depth probe (CTD; RBR-420) fitted with an optical dissolved oxygen unit. The probe was lowered through the water column to within 1 m of the sea floor. The data logged during this process were immediately transferred to a computer in the field. Data from the downcast were used to derive physical profiles.

During the open-water survey, CTD and dissolved oxygen profiles were collected from the side of an aluminum boat. The logged and recorded data were processed using the same methods in April. However, due to a faulty dissolved oxygen sensor, the dissolved oxygen profiles collected during the open-water survey were not usable.

All dissolved oxygen data was compared to the marine Canadian Council for Ministers of the Environment (CCME) guideline for the protection of aquatic life (CCME 2012a).

Table 2.1-2. Summary of the Marine Baseline Sampling Program, Back River Project, 2012

Monitoring Parameter	Sampling Frequency	Sample Replication and Depths	Sampling Dates/Timing	Sampling Device
Physical Oceanography				
Temperature, salinity, dissolved oxygen profiles, light penetration	2 x	Entire water column; n = 1/site	April (Temperature, Salinity, Dissolved Oxygen), July 31 (Temperature, Salinity, light)	Conductivity-Temperature-Depth (CTD) probe; dissolved oxygen meter; Secchi disk
Water Quality				
Physical, nutrients, metals	2 x	4 depths at deep sites; 1 depth at shallow sites; 20% replication	April, August	2.5 L Niskin (April); 5 L GO-FLO sampling bottle (August)
Sediment Quality				
Physical, particle size, nutrients, metals, total organic carbon	1 x	n = 3/site	August; coincident with benthos survey	Petite Ponar grab
Phytoplankton				
Biomass (chlorophyll <i>a</i>)	2 x	n = 3/site @ 1 m below the surface	April and August; coincident with water quality surveys	2.5 L Niskin (April); 5 L GO-FLO sampling bottle (August)
Density and taxonomy	2 x	n = 1/site at 1 m below the surface at 4 sites (April); n = 3/site at 1 m below the surface at 3 sites (August)	April and August; coincident with water quality surveys	2.5 L Niskin (April); 5 L GO-FLO sampling bottle (August)
Benthic Macroinvertebrates (Benthos)				
Density and taxonomy	1 x	n = 3/site	August; coincident with sediment survey	Petite Ponar grab; 500 µm sieve
Mussels				
Physical characteristics and tissue metals	1 x	n = 10/site; 3 sites	August	Petite Ponar grab

Secchi depths were measured during August to determine the light penetration at each site during the open-water season. A 30-cm white disk was placed over the shaded side of the boat and lowered until it disappeared from sight. It was raised into view and lowered until it disappeared a second time. This was recorded as the Secchi depth (D_s). The 1% ($Z_{1\%}$) euphotic zone depth was computed by first calculating the light extinction coefficient (k) from D_s , and then calculating the euphotic zone depth based on the appropriate light extinction coefficient. The 1% euphotic depth is the depth of the water column where 1% of the surface irradiance reaches. It represents the depth at which the integrated gross water column photosynthetic production is equivalent to the integrated gross water column respiration; thus, there is net photosynthesis above this depth. The 1% euphotic depth is often known as the compensation depth, and was calculated as follows (Parsons et al. 1984):

Light extinction coefficient:

$$k \text{ (m}^{-1}\text{)} = 1.7/D_s$$

Euphotic Depth (1%):

$$Z_{1\%} \text{ (m)} = 4.6/k$$

2.3 WATER QUALITY

Water quality samples were collected in southern Bathurst Inlet on April 12, 2012 during the under-ice season, and at the MLA options on August 1 (Option 6) and August 3 (Option 4) during the open-water season. Depths of water quality sampling were determined based on the water column structure (as determined by the CTD profiles), and whether the sites were deep (> 5 m; several samples per site) or shallow (< 5 m; single sample at 1 m). At the deeper sites, the following four depths were usually sampled based on the vertical stratification present: 1 m below the surface, 4 m above the pycnocline, 4 m below the pycnocline, and at the mid-depth of the deep layer. The pycnocline was defined as the depth zone where the density (i.e., salinity) changed most sharply. Ultimately, the four depths were distributed to best approximate the water column structure as determined by the CTD profiles.

During the under-ice sampling in April, the underlying water was accessed through a hole following the CTD cast. An adapted 2.5 L 'skinny' Niskin bottle was then lowered to the desired depth to collect the water sample. This bottle is designed to 'trip' and collect discrete samples during freezing temperatures. To avoid metal contamination, the tripping mechanism used acid-cleaned silicone tubing within the interior of the bottle. A dual-rope system was used to achieve bottle closure and to ensure the collection of discrete samples.

During the August open-water sampling, all water samples were collected using an acid-washed 5 L GO-FLO sampling device. The GO-FLO was securely attached to a metred cable line and was then lowered to the appropriate sampling depth. It was allowed to equilibrate for one minute, at which time it was triggered closed using a brass messenger. The GO-FLO was then raised and brought into the boat for subsampling.

Subsamples for the various water quality parameters (e.g., physical parameters/major ions, nutrients, and total metals) were drawn from the GO-FLO/Niskin bottles, with the scientist wearing powder-free, nitrile gloves, with care being taken not to bring the bottle or bottle cap into contact with the plastic spigot or other possible sources of contamination. The appropriate preservatives provided by the analytical laboratory (ALS Laboratory Group, Burnaby, British Columbia) were added to the trace-metal clean bottles in the field after collection. Duplicate samples were collected for approximately 20% of the samples during each water quality survey.

After collection and preservation, all samples were kept cold and in the dark while in the field and were refrigerated at camp prior to transport. Samples were transported in coolers with freezer packs on the first flight out of camp to ALS Burnaby for all analyses. The parameters analyzed and applicable detection limits are summarized in Table 2.3-1.

Table 2.3-1. Marine Water Quality Parameters and Realized Detection Limits, Back River Project, 2012

Parameter	Units	Realized Detection Limits	Parameter	Units	Realized Detection Limits
Physical Tests			Anions		
Hardness (as CaCO ₃)	mg/L	4.3	Bromide (Br)	mg/L	5
pH	pH	0.1	Chloride (Cl)	mg/L	50
Alkalinity, Total (as CaCO ₃)	mg/L	2	Fluoride (F)	mg/L	0.75-2
Total Suspended Solids	mg/L	2	Sulphate (SO ₄)	mg/L	50
Turbidity	NTU	0.1			

(continued)

Table 2.3-1. Marine Water Quality Parameters and Realized Detection Limits, Back River Project, 2012 (completed)

Parameter	Units	Realized Detection Limits	Parameter	Units	Realized Detection Limits
Nutrients			Total and Dissolved Metals (cont'd)		
Ammonia (as N)	mg/L	0.005	Lead (Pb)	mg/L	0.0003
Nitrate and Nitrite (as N)	mg/L	0.006	Lithium (Li)	mg/L	0.02
Nitrate (as N)	mg/L	0.006	Magnesium (Mg)	mg/L	1
Nitrite (as N)	mg/L	0.002	Manganese (Mn)	mg/L	0.0002
Orthophosphate	mg/L	0.001	Mercury (Hg)	mg/L	0.00001
Total Phosphorus	mg/L	0.002	Molybdenum (Mo)	mg/L	0.002
Silicate (as SiO ₂)	mg/L	0.5	Nickel (Ni)	mg/L	0.0005
Organic Carbon			Phosphorus (P)	mg/L	1
Total Organic Carbon	mg/L	0.5	Potassium (K)	mg/L	20
Total and Dissolved Metals			Rhenium (Re)	mg/L	0.0005
Aluminum (Al)	mg/L	0.005	Rubidium (Rb)	mg/L	0.005
Antimony (Sb)	mg/L	0.0005	Selenium (Se)	mg/L	0.002
Arsenic (As)	mg/L	0.002	Silicon (Si)	mg/L	0.5
Barium (Ba)	mg/L	0.001	Silver (Ag)	mg/L	0.0001
Beryllium (Be)	mg/L	0.0005	Sodium (Na)	mg/L	20
Bismuth (Bi)	mg/L	0.0005	Strontium (Sr)	mg/L	0.05
Boron (B)	mg/L	0.1	Tellurium (Te)	mg/L	0.0005
Cadmium (Cd)	mg/L	0.00005	Thallium (Tl)	mg/L	0.00005
Calcium (Ca)	mg/L	0.5	Thorium (Th)	mg/L	0.0005
Cesium (Cs)	mg/L	0.0005	Tin (Sn)	mg/L	0.001
Chromium (Cr)	mg/L	0.0005	Titanium (Ti)	mg/L	0.005
Cesium (Cs)	mg/L	0.0005	Tungsten (W)	mg/L	0.001
Chromium (Cr)	mg/L	0.0005	Uranium (U)	mg/L	0.00005
Cobalt (Co)	mg/L	0.00005	Vanadium (V)	mg/L	0.0005
Copper (Cu)	mg/L	0.0005	Yttrium (Y)	mg/L	0.0005
Gallium (Ga)	mg/L	0.0005	Zinc (Zn)	mg/L	0.003
Iron (Fe)	mg/L	0.01	Zirconium (Zr)	mg/L	0.0005

All water quality parameters were screened against the CCME water quality guidelines for the protection of aquatic life (CCME 2012a).

2.4 SEDIMENT QUALITY

Sediment quality samples were collected during the open-water season on August 2 (Option 6) and August 4, 2012 (Option 4). Sediment samples were collected at the more shallow sites at the near-shore and mid-shore stations, and coincided with benthic invertebrate sampling and the collection of mussel samples.

Marine sediment quality samples were collected in triplicate using a Petite Ponar grab sampler, with replicates spaced roughly 20 to 50 m apart. Each sediment sample was carefully transferred onto a white, plastic tray, and the top 2 cm of sediment was scraped into a bowl, homogenized, and then placed into two Whirl-Pak bags: one for grain size, and one for sediment chemistry. All samples were refrigerated (in darkness) until they were shipped on the first available flight out of camp to ALS in Yellowknife, NT where they were forwarded to ALS Burnaby for analysis. The parameters analyzed and applicable detection limits are summarized in Table 2.4-1.

Table 2.4-1. Marine Sediment Quality Parameters and Realized Detection Limits, Back River Project, 2012

Parameter	Units	Realized Detection Limits	Parameter	Units	Realized Detection Limits
Moisture	%	0.1	Metals (cont'd)		
pH	pH	0.1	Chromium (Cr)	mg/kg	0.5
Particle Size			Cobalt (Co)	mg/kg	0.1
% Gravel (>2 mm)	%	0.1	Copper (Cu)	mg/kg	0.5
% Sand (2.0 mm - 0.063 mm)	%	0.1	Iron (Fe)	mg/kg	50
% Silt (0.063 mm - 4 µm)	%	0.1	Lead (Pb)	mg/kg	0.5
% Clay (<4 µm)	%	0.1	Lithium (Li)	mg/kg	5
Nutrients			Magnesium (Mg)	mg/kg	20
Total Nitrogen	%	0.02	Manganese (Mn)	mg/kg	1
Organic Carbon			Mercury (Hg)	mg/kg	0.005
Total Organic Carbon	%	0.1	Molybdenum (Mo)	mg/kg	0.5
Plant Available Nutrients			Nickel (Ni)	mg/kg	0.5
Available Ammonium-N	mg/kg	1-1.6	Phosphorus (P)	mg/kg	50
Available Nitrate-N	mg/kg	2-6	Potassium (K)	mg/kg	100
Available Nitrite-N	mg/kg	0.4-1.2	Selenium (Se)	mg/kg	0.2
Available Phosphate-P	mg/kg	2-4	Silver (Ag)	mg/kg	0.1
Metals			Sodium (Na)	mg/kg	100
Aluminum (Al)	mg/kg	50	Strontium (Sr)	mg/kg	0.5
Antimony (Sb)	mg/kg	0.1	Sulphur (S)	mg/kg	500
Arsenic (As)	mg/kg	0.05	Thallium (Tl)	mg/kg	0.05
Barium (Ba)	mg/kg	0.5	Tin (Sn)	mg/kg	2
Beryllium (Be)	mg/kg	0.2	Titanium (Ti)	mg/kg	1
Bismuth (Bi)	mg/kg	0.2	Uranium (U)	mg/kg	0.05
Cadmium (Cd)	mg/kg	0.05	Vanadium (V)	mg/kg	0.2
Calcium (Ca)	mg/kg	50	Zinc (Zn)	mg/kg	1

All sediment quality parameters were screened against the CCME sediment quality guidelines for the protection of aquatic life (CCME 2012b). The CCME sediment quality guidelines include the interim sediment quality guidelines (ISQGs) and the probable effect levels (PELs). The more conservative ISQGs are levels or concentrations below which adverse biological effects are rarely observed. The higher PEL guidelines correspond to concentrations above which negative biological effects frequently occur.

2.5 PHYTOPLANKTON

Phytoplankton biomass (as chlorophyll *a*) and taxonomy samples were collected during the ice-covered and open-water campaigns. Biomass and taxonomy samples were collected at each of the four sampling sites during April, while biomass samples were collected from the shallow, near-shore sites and the deeper, off-shore sites at both MLA options during August. Taxonomy samples were collected in August at two sites at the Option 6 MLA (O6-24 and O6-54) and at one site at the Option 4 MLA (O4-24). Biomass samples were always collected in triplicate, while single taxonomy samples were collected at each site in April and triplicate taxonomy samples were collected at each sampled site in August.

Samples were collected at 1 m depth at all sites using a 2.5 L Niskin bottle in April, and a 5 L GO-FLO water sampler in August. During April, phytoplankton samples were collected 1 m below the base of the ice layer. All samples were transferred into 1 L plastic bottles and stored in a cool, dark cooler until being

returned to camp later in the day. Once at camp, the biomass samples were filtered onto 0.45 µm filters that were wrapped into aluminum foil, and stored frozen. Chlorophyll samples were hand carried to Vancouver, BC, to ensure they remained frozen and sent to ALS (Burnaby, BC) for analysis.

Taxonomy samples were preserved with Lugol's iodine solution once back at camp. These samples were sent immediately to EcoAnalysts Inc. (Moscow, Idaho, U.S.A.) for enumeration and identification.

2.6 BENTHIC INVERTEBRATES

Benthic invertebrate samples were collected in both MLA options during August. These samples were collected at the near-shore and mid-shore stations, and coincided with the collection of the sediment quality samples.

All samples were collected with a Petite Ponar dredge. Triplicate samples were collected at each site, with each replicate being collected approximately 20 to 50 m apart from one another. The Petite Ponar was carefully set open, lowered gradually onto the sediment using a metred cable line, and triggered closed. Once recovered, each sediment sample was transferred into a 500 µm sieve bucket and rinsed with site-specific water until free of sediments. The material retained within the sieve was then placed into a labelled plastic jar and filled with 10% buffered formalin. All benthos samples were sent to Columbia Science (Courtenay, BC) for enumeration and identification, and community descriptors were calculated as described below. Benthos density was calculated by dividing the total benthos counts by the surface area of the Petite Ponar sampler (0.0225 m²).

Several community descriptors were calculated from the taxonomic results, including benthos density, genera richness, and Simpson's diversity index. Cyclopoid and calanoid copepods were not included in the community metrics as they are generally planktonic. Nematodes and harpacticoid copepods were excluded as they are considered meiofauna (invertebrates between 63 µm and 500 µm) and were not adequately sampled using a 500 µm sieve bucket. Those organisms that could not be identified to at least the family level, and made up less than 2% of the benthos counts in each replicate, were also excluded from the community analysis. The dominant members of the community were resolved taxonomically to the genus level, but gastropods, echinurans, nemertean, ostracods, phoronids, and isopods were only resolved to higher levels. For the purposes of the richness and diversity analyses, the lowest available classification was used, whether it was genus or higher. Taxonomic richness was calculated as the total number of benthic invertebrate taxa present in each replicate sample, and the Simpson's diversity index was calculated as:

$$\text{Simpson's Diversity Index (D)} = 1 - \sum_{i=1}^T p_i^2$$

where T is the number of taxa present (i.e., taxa richness), and p_i is the relative abundance of each taxon calculated as n_i/N , where n_i is the number of individuals in taxon i , and N is the total number of all individuals.

2.7 MUSSELS (MYTILUS TROSSULUS)

Bay mussels (*Mytilus trossulus*) were collected using a Petite Ponar grab sampler. Samples were collected from three sites including the southernmost mid-shore site (O4-42) in Option 4 MLA (August 4), and the mid-shore site south of the peninsula (O6-42) and the near-shore site east of the peninsula (O6-50) in Option 6 MLA (August 3). At each site, the Petite Ponar was lowered over the side of the vessel until it reached the sediment surface. The Petite Ponar was then triggered and hoisted to the surface where the contents were emptied into a plastic wash basin. Any bay mussels present in the sample were transferred into Whirl-Pak bags containing sample water and placed in a cooler.

Following collection, the mussels were transported back to camp where a subset was processed for tissue sampling. Only intact, live specimens were used, as those showing signs of physical damage were discarded. For each of the mussels selected for tissue sampling, physical characteristics including shell length, shell width, shell height, and total wet weight were measured. The tissue of each selected mussel was removed using a scalpel and forceps. The tissue was weighed and transferred into a Whirl-Pak bag. The Whirl-Pak bag was then sealed, labelled, and frozen. Ten mussels were sampled at each site—10 mussels from the Option 4 MLA and 10 mussels from each of the Option 6 MLA sites.

Tissue samples were transferred to ALS in Burnaby, British Columbia where they were analyzed for metals. The parameters and realized detection limits are presented in Table 2.7-1. Tissue concentrations were compared to the Canadian Standards (Maximum Levels) for Various Chemical Contaminants in Foods (Health Canada 2012) and the Canada Food and Drug Regulations (C.R.C., c. 870, B.15.001).

Table 2.7-1. Shellfish Tissue Parameters and Realized Detection Limits, Back River Project, 2012

Parameter	Unit	Realized Detection Limit	Parameter	Unit	Realized Detection Limit
Physical Tests			Metals (cont'd)		
% Moisture	%	0.1	Manganese (Mn)	mg/kg ww	0.004
			Mercury (Hg)	mg/kg ww	0.001
Metals			Molybdenum (Mo)	mg/kg ww	0.004
Aluminum (Al)	mg/kg ww	0.4	Nickel (Ni)	mg/kg ww	0.01
Antimony (Sb)	mg/kg ww	0.002	Phosphorus (P)	mg/kg ww	50
Arsenic (As)	mg/kg ww	0.004	Potassium (K)	mg/kg ww	200
Barium (Ba)	mg/kg ww	0.01	Rhenium (Re)	mg/kg ww	0.002
Beryllium (Be)	mg/kg ww	0.002	Rubidium (Rb)	mg/kg ww	0.01
Bismuth (Bi)	mg/kg ww	0.002-0.017	Selenium (Se)	mg/kg ww	0.02
Boron (B)	mg/kg ww	0.2-4.5	Sodium (Na)	mg/kg ww	200
Cadmium (Cd)	mg/kg ww	0.002	Strontium (Sr)	mg/kg ww	0.01
Calcium (Ca)	mg/kg ww	5	Tellurium (Te)	mg/kg ww	0.004
Cesium (Cs)	mg/kg ww	0.001	Thallium (Tl)	mg/kg ww	0.0004-0.005
Chromium (Cr)	mg/kg ww	0.01	Thorium (Th)	mg/kg ww	0.002
Cobalt (Co)	mg/kg ww	0.004	Tin (Sn)	mg/kg ww	0.004
Copper (Cu)	mg/kg ww	0.01	Titanium (Ti)	mg/kg ww	0.01
Gallium (Ga)	mg/kg ww	0.004	Uranium (U)	mg/kg ww	0.0004
Iron (Fe)	mg/kg ww	0.2	Vanadium (V)	mg/kg ww	0.004
Lead (Pb)	mg/kg ww	0.004	Yttrium (Y)	mg/kg ww	0.002
Lithium (Li)	mg/kg ww	0.02	Zinc (Zn)	mg/kg ww	0.1
Magnesium (Mg)	mg/kg ww	10	Zirconium (Zr)	mg/kg ww	0.04-0.08

ww: wet weight

2.8 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

A quality assurance and quality control (QA/QC) program was incorporated into the design of this study to track samples, account for within site variability, and identify potential sources of contamination from sampling equipment, sample transportation, or sample processing. This included the use of chain of custody forms, replicate samples, and sample blanks.

2.8.1 Water Quality QA/QC

All water quality samples were recorded on chain of custody forms before being sent to ALS laboratories. Replicate samples accounted for approximately 20% of water samples collected during each sampling period. These replicate samples were collected from multiple depths.

Equipment, field, and travel blanks were processed and submitted with the water samples as part of the QA/QC program. These blanks identified potential sources of contamination to the field samples.

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

Field blanks were designed to identify possible contamination from the exposure of the sample to ambient conditions at the sampling site. These were processed in the field by opening the bottles provided by ALS (containing double de-ionized water) and exposing the sample to ambient air for one minute. The bottles were preserved and handled in the same manner as water quality samples.

Travel blanks were designed to identify potential contamination from the transportation of samples from the sampling location to ALS laboratories. These bottles contained double de-ionized water and were provided by ALS. They were never opened in the field, and were returned to ALS with the other water quality samples. The blanks were analyzed for the same parameters as the regular water samples.

2.8.2 Sediment Quality QA/QC

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

2.8.3 Aquatic Biology QA/QC

Chain of custody forms were used for all aquatic biology samples. All samples had replication; triplicate samples were taken for chlorophyll *a* (phytoplankton biomass) and phytoplankton taxonomic analysis (August only), and triplicate samples were collected for benthos. Additional QA/QC measures were used by the benthos taxonomist to ensure consistent and accurate sorting of benthos samples. These procedures are outlined below.

2.8.4 Benthos Sorting QA/QC

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

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

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

3. Results

3. Results

3.1 PHYSICAL OCEANOGRAPHY

Water column profiles of temperature, salinity, and dissolved oxygen were collected at four sites in Bathurst Inlet in winter (BI-1 through BI-4), at 11 sites in the Option 4 MLA in August, and at 12 sites in the Option 6 MLA in August. The complete data from the physical oceanographic profiles are presented in Appendix A.

Light penetration measurements were conducted at all MLA options sites in August.

3.1.1 Under Ice (April)

The water column structure and dissolved oxygen of southern Bathurst Inlet were measured in winter 2012 at a series of four under-ice sites (BI-1 to BI-4; Figure 2.1-1) along the length of the inlet.

3.1.1.1 Water Column Structure

Water column structure in Bathurst Inlet was characterized by a strong pycnocline around 15 m depth, caused primarily by differences in salinity. Temperature profiles beneath the ice were very similar at all sites (Figure 3.1-1), with a cold (~ -1.4 to -1.5°C) surface layer of around 10 m thickness followed by a thermocline at between 10 to 15 m depth, overlying a warmer (~ -0.5 to -0.6°C) deep water layer. The surface water temperatures were near the freezing temperature of seawater (at a salinity of 27) indicating ice thickness may have been increasing during this time. Salinity profiles showed a well-defined halocline coinciding with the thermocline, and slightly lower salinities of ~ 27 in the upper 10 m that increased to ~ 27.8 in deeper water (Figure 3.1-1). The lower surface salinities are indicative of freshwater input from rivers and precipitation during the previous open-water season.

3.1.1.2 Dissolved Oxygen

Site BI-1 toward the head of the inlet was shallower and had slightly lower dissolved oxygen concentrations than at the other sites, both at the surface and at depth (Figure 3.1-1). Below the 15 m pycnocline, dissolved oxygen at site BI-1 (~ 7.5 mg/L) was a little lower than the CCME guideline of 8 mg/L. At sites BI-2 to BI-4, dissolved oxygen was usually above 12 mg/L at the surface, decreasing to around 8 mg/L below 15 m depth. The lower deep-water oxygen levels are typical of fjords where deep-water renewal is infrequent, and organic material accumulates and is re-mineralized by microbes.

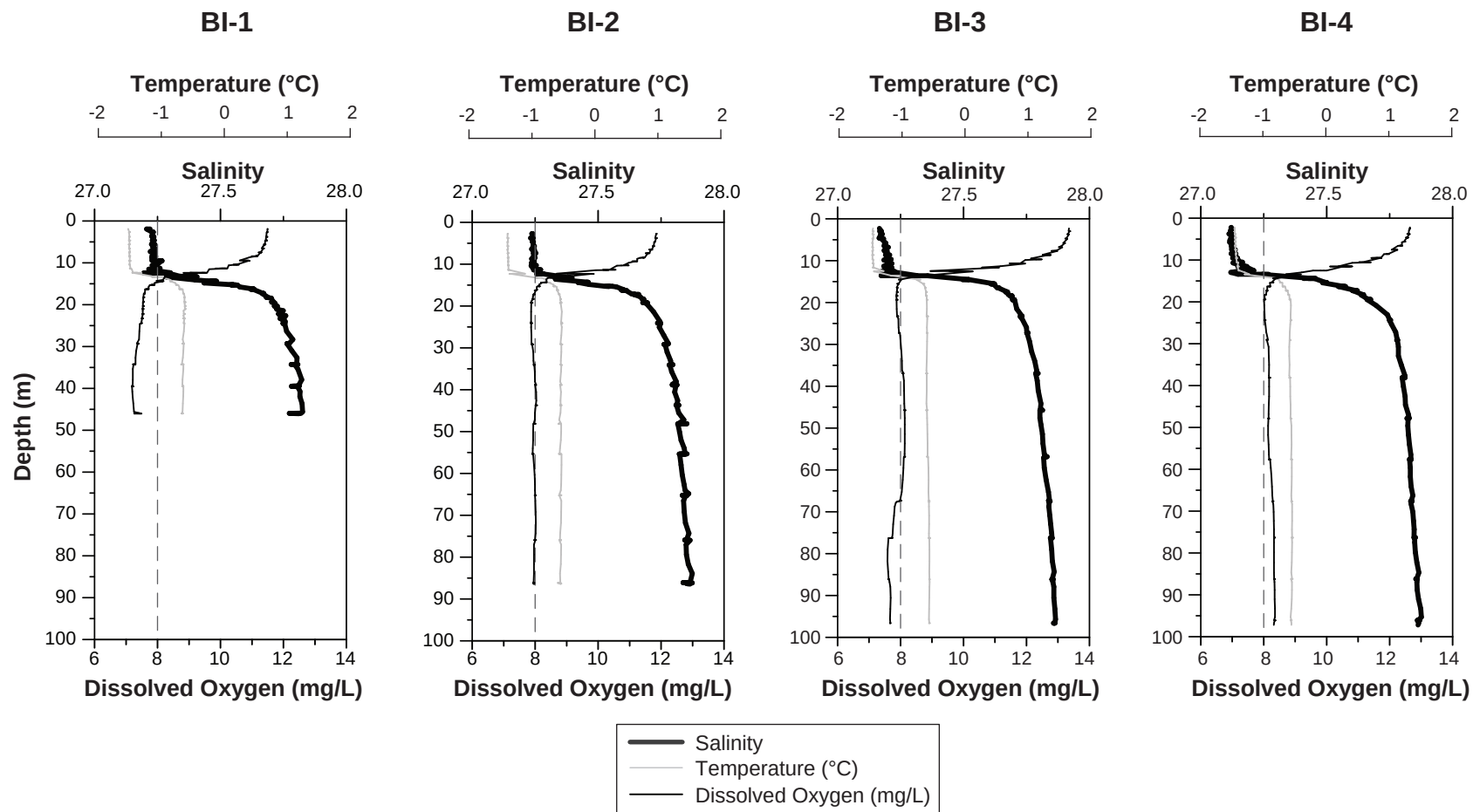
3.1.2 Open Water (August)

In August, the water column was sampled in more detail using finer spatial scale surveys at a number of sites in the Option 4 MLA (Figure 2.1-2) and Option 6 MLA (Figure 2.1-3). These were divided into near-shore, mid-shore, and offshore sites.

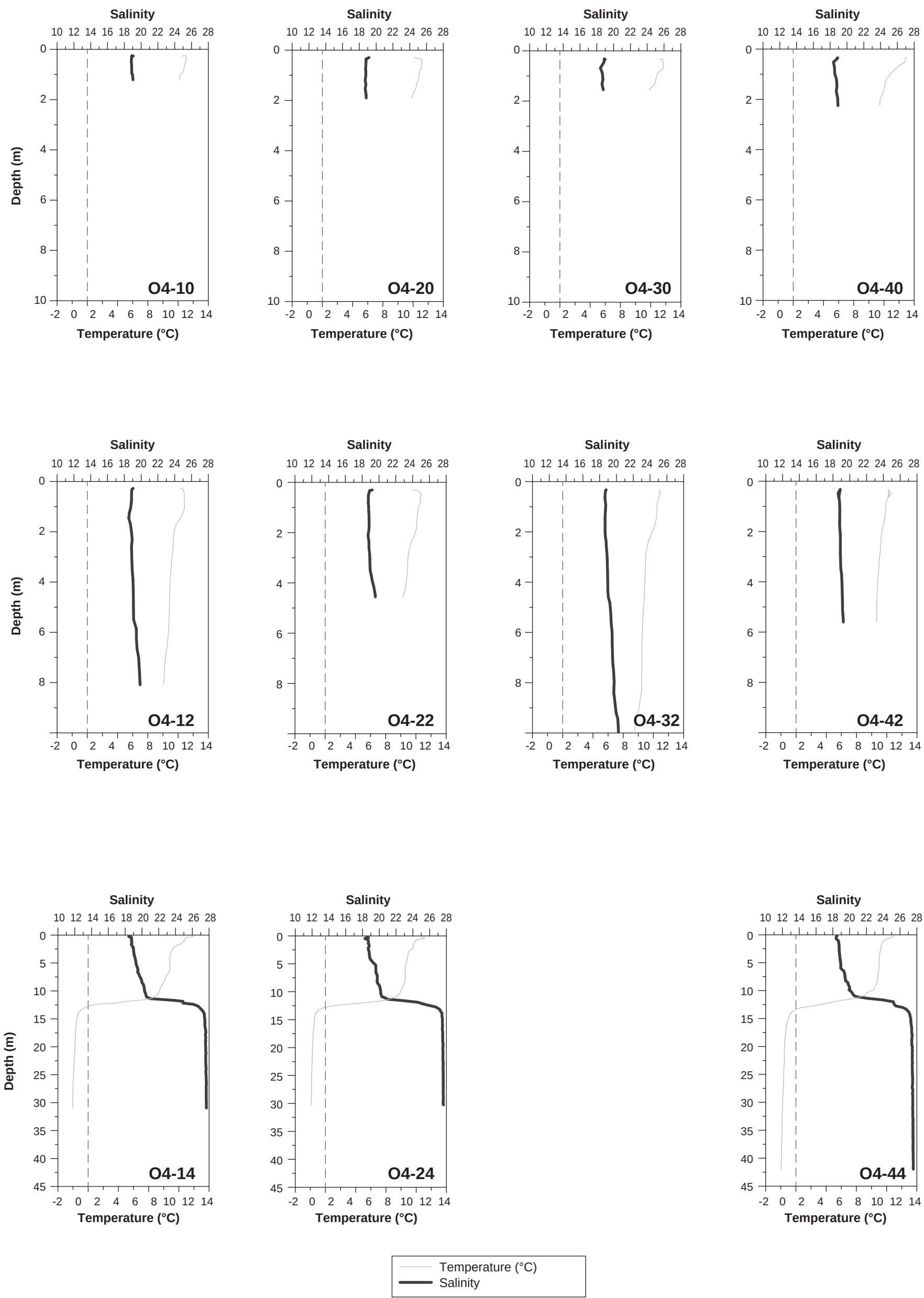
3.1.2.1 Water Column Structure

Option 4 MLA

In the Option 4 MLA, surface temperature was considerably higher and salinity was lower than in the winter BI sites. This resulted from summer warming and ice melt, bringing warmer, fresher water into the surface layer. Temperature and salinity profiles were well mixed and relatively homogenous in all the shallow near-shore sites O4-10, O4-20, O4-30 and O4-40 (Figure 3.1-2).



Note: Vertical dashed lines represent the CCME interim water quality guideline for the minimum concentration of dissolved oxygen in marine and estuarine waters (8.0 mg/L).



Notes: Dashed vertical lines represent the CCME interim water quality guideline for the minimum concentration of dissolved oxygen in marine and estuarine waters (8.0 mg/L).
Note the different scales on y-axis.

Temperature at these sites varied between 10.4 and 13.1°C, and salinity varied only slightly between 18.4 and 19.2 (Figure 3.1-2).

The slightly deeper mid-shore sites were again well mixed, with temperatures at sites O4-12, O4-22, O4-32 and O4-42 varying between 8.8 and 11.5°C (Figure 3.1-2). Near-surface temperatures were slightly cooler than in the shallower sites. Salinity at these sites varied mainly between 18.5 and 19.6, with slightly higher values at depth (up to 20.2) at site O4-32.

The deeper sites (> 30 m depth) further offshore (O4-14, O4-24 and O4-44) had a surface mixed-layer in the upper 10 m showing similar characteristics (Figure 3.1-2) to the shallower sites described above. Temperature in this layer varied between 8.4 and 12.4°C, and salinity varied between 18.3 and 20.5, with a sharp pycnocline between 10 to 15 m depth. The deeper water was relatively homogenous, with cold (-0.4 to 0.4°C) and salty (27.3 to 27.7) characteristics (Figure 3.1-2) similar to deep water in winter (Figure 3.1-1).

Option 6 MLA

In the Option 6 MLA (Figure 3.1-3), the water column structure of the shallow near-shore sites (O6-10, O6-20, O6-30, O6-40 and O6-50) was similar to that of Option 4 MLA, being well mixed with temperature mainly in the range of 10.9 to 12.1°C, and salinity 17.5 to 18.1. At the slightly deeper mid-shore site O6-22, the water column showed slight stratification near the bottom (-5.5 m), with temperature between 9.4 and 11.8°C, and salinity between 17.5 and 19.1.

Deeper sites (O6-24, O6-44 and O6-54) further offshore also showed similar profiles to those in Option 4 MLA, although the water column was shallower in the Option 6 MLA (Figure 3.1-3). The surface mixed-layer of 5 to 10 m thickness was characterized by temperatures of 9.2 to 11.9°C and salinities of 17.5 to 19.6. This was followed by a pycnocline overlying (5.5 m at O6-24 and 10 m at O6-54) water of temperature -0.7 to 0.1°C and salinity 27.2 to 27.6, again characteristic of the inlet deep water. The transects in the embayment west of the peninsula in the Option 6 MLA tended to have thinner mixed layers (~5 m) above the characteristic Bathurst Inlet deep water. South and east of the peninsula, on the other hand, had more variety in the water column structure. Weak and likely transient pycnoclines were observed around 5 m, above a strong pycnocline separating the surface waters from the deep cold and saline water.

3.1.2.2 Dissolved Oxygen

The dissolved oxygen sensor failed during the open-water survey in 2012. Figure 3.1-4 shows the dissolved oxygen profile from two sites located in Bathurst Inlet during August 2010 (Rescan 2012). The 2010 profiles show the characteristic estuarine-like oxygen profiles of high-latitude fjords. The strong pycnocline at a depth of ~12.5 m prohibited mixing and restricted oxygen replenishment of the deep waters in Bathurst Inlet. As a result, re-mineralization of organic matter consumed oxygen and reduced oxygen concentrations to < 7 mg/L. The dissolved oxygen profiles in 2012 were expected to be similar to the ones observed in 2010, since major changes to the water circulation and biogeochemistry of the Inlet would be required to disrupt these natural processes.

3.1.2.3 Light Penetration

Light is required for autotrophic photosynthesis and its availability within the water column is controlled by the amount of incident light, and to a large degree, the concentration of light-absorbing and attenuating organic and inorganic material in the water. An autotrophic organism is capable of growth when the respiratory requirements of the cell are balanced by the production of organic

compounds by photosynthesis. This threshold usually occurs at depths where 0.1 to 1% of the surface irradiance exists, and is often known as the euphotic zone depth or the compensation depth.

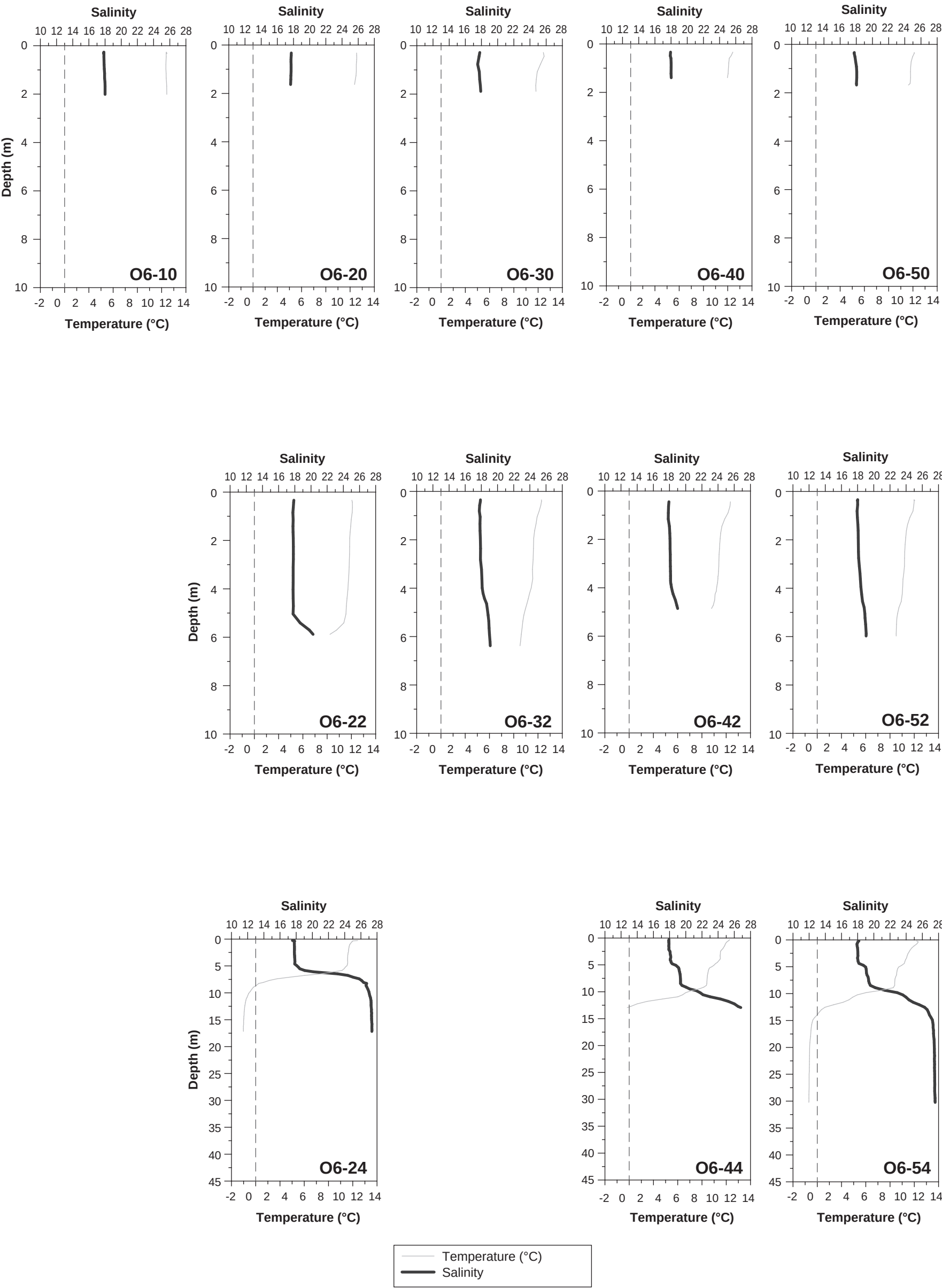
Overall, the waters in Bathurst Inlet were relatively clear allowing light to reach the sediment surface at most near-shore and mid-shore sites in both MLA options (Table 3.1-1). This would permit the growth of photosynthetic benthic microalgae and macroalgae (seaweeds; Plate 3.1-1) in these areas. The mid-shore and deep-water sites in the embayment west of the peninsula in the Option 6 MLA had higher quantities of suspended organic matter, and substantially shallower euphotic zone depths than other mid-shore and deep-water sites. At the deep-water sites (>10 m), the euphotic zone (13.8 to 19.2 m) extended below the pycnocline, providing the surface layer phytoplankton communities with an optimal light regime for photosynthesis. It is also likely the deep light penetration sustained robust phytoplankton communities at and just below the pycnocline where nutrients were more plentiful.

Table 3.1-1. Secchi and Euphotic Zone Depths in MLA options in Bathurst Inlet, Back River Project, August 2012

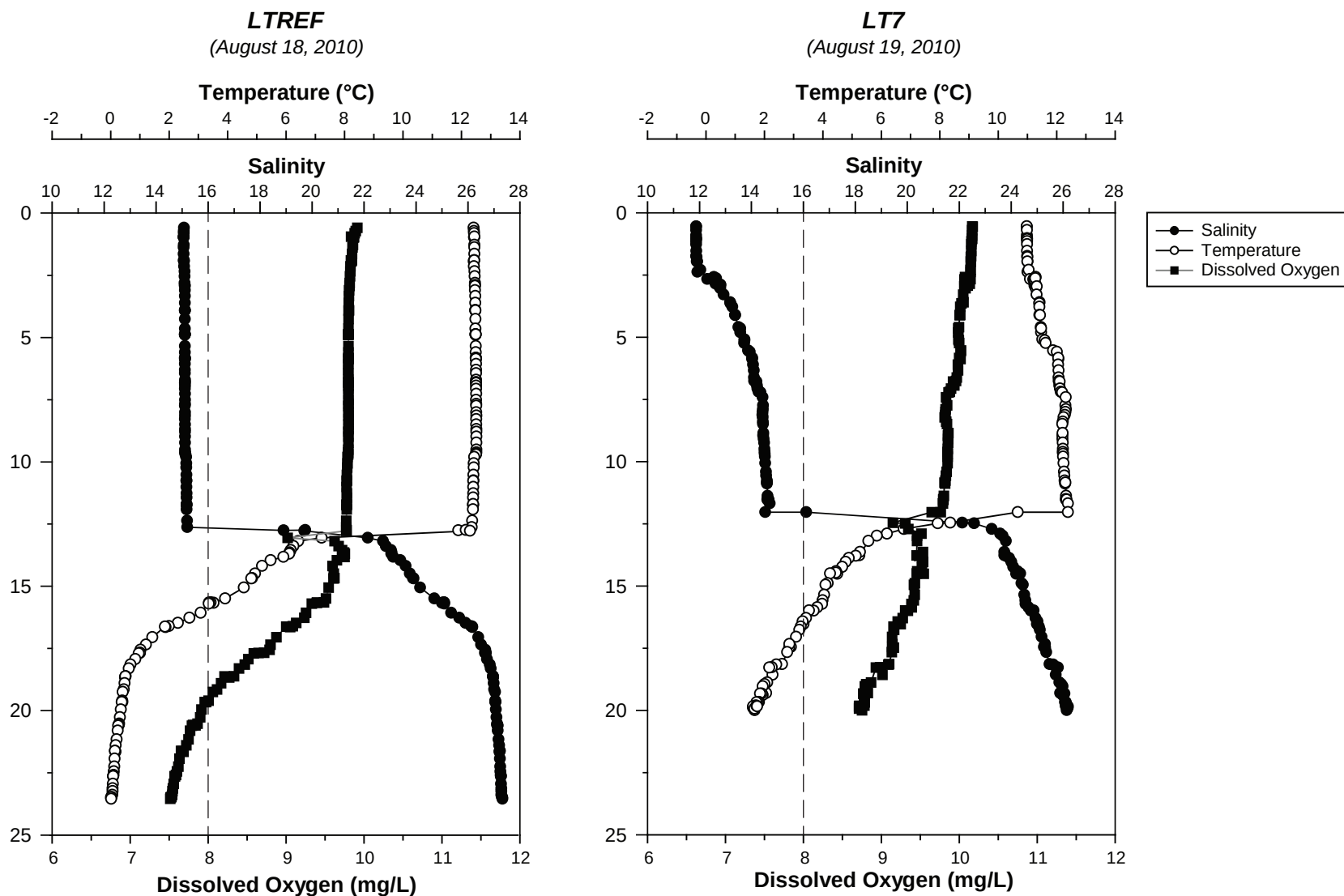
Site	Site Water Depth (m)	Secchi Depth D _s (m)	Euphotic Zone Depth EZD (m)
Option 4 MLA			
O4-10	1.2	bottom	bottom (1.2)
O4-12	8.1	5.5	bottom (14.7)
O4-14	31.0	5.1	13.8
O4-20	1.9	1.4	bottom (3.8)
O4-22	4.6	2.5	bottom (6.6)
O4-24	30.3	5.4	14.6
O4-30	1.8	1.6	bottom (4.3)
O4-32	10.0	3.3	8.8
O4-40	2.2	bottom	bottom (2.2)
O4-42	5.6	bottom	bottom (5.6)
O4-44	42.0	5.4	14.6
Option 6 MLA			
O6-10	2.0	1.4	bottom (3.8)
O6-20	1.6	0.8	bottom (2.2)
O6-22	5.9	1.2	3.2
O6-24	17.2	1.2	3.2
O6-30	1.9	bottom	bottom (1.9)
O6-32	6.4	4.0	bottom (10.8)
O6-40	1.4	bottom	bottom (1.4)
O6-42	4.9	bottom	bottom (4.9)
O6-44	12.9	6.5	bottom (17.6)
O6-50	1.7	bottom	bottom (1.7)
O6-52	6.0	6.0	bottom (16.2)
O6-54	30.2	7.1	19.2

Notes: EZD calculated to the 1% incident light level.

EZD numbers in brackets are the euphotic zone depth predicted from the light extinction coefficient.



Notes: Dashed vertical lines represent the CCME interim water quality guideline for the minimum concentration of dissolved oxygen in marine and estuarine waters (8.0 mg/L).
Note the different scales on y-axis.
* Indicates no data collected for that specific station.



Note: Dashed lines represent the CCME interim guideline for the minimum concentration of dissolved oxygen in marine and estuarine waters (8.0 mg/L).

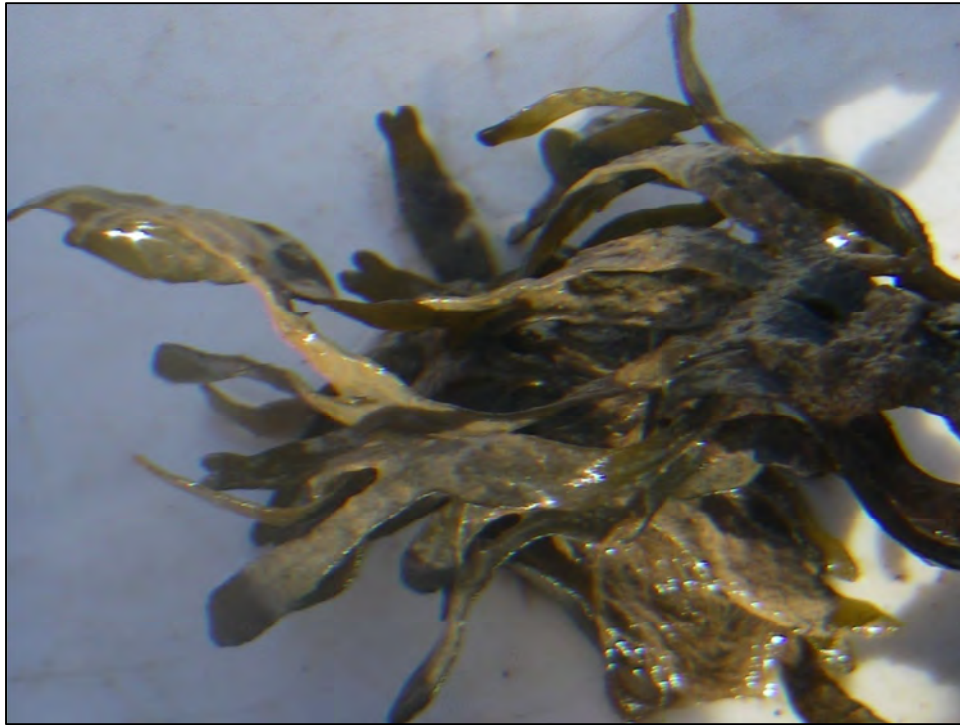


Plate 3.1-1. Macroalgae (Fucus sp.) collected from the sediments in the Option 6 MLA, Back River Project, August 2012.

3.2 WATER QUALITY

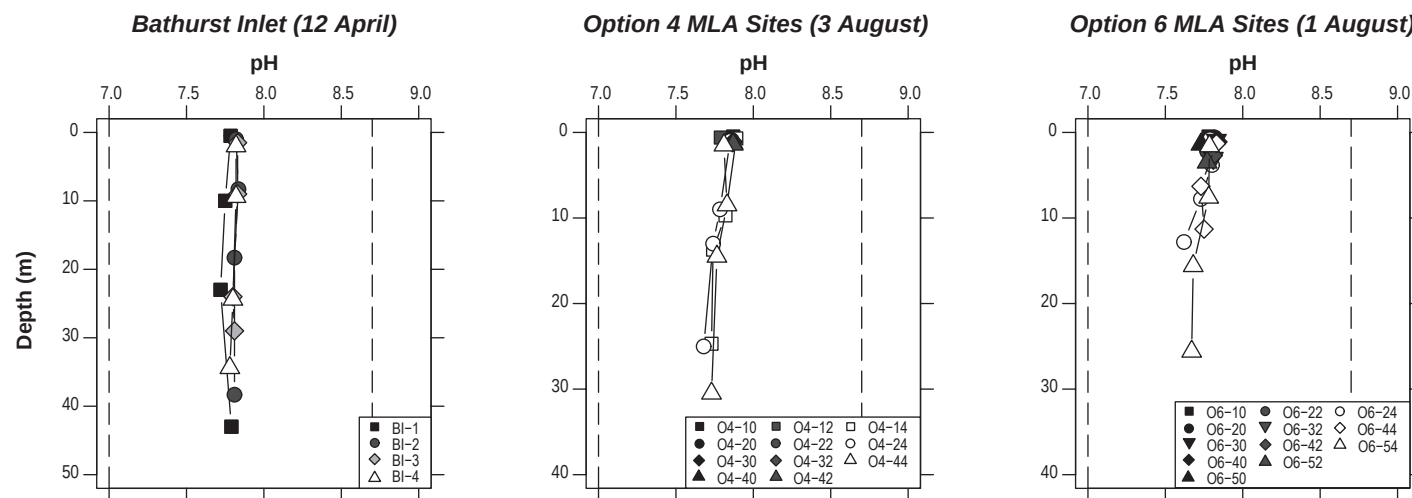
Water quality samples were collected at four sites in southern Bathurst Inlet in April and at 11 sites in Option 4 MLA and 12 sites in Option 6 MLA in August. Profiles of four depths were done at all four April sites (BI-1, BI-2, BI-3, and BI-4). Surface (1 m) samples were collected at the Option MLA sites, except for profiles done at the deep sites in Option 4 MLA (O4-14, O4-24, and O4-44) and Option 6 MLA (O6-24, O6-44, and O6-54). Profiles of water quality parameters are shown in Figures 3.2-1 to 3.2-13 and all raw water quality data and realized detection limits are presented in Appendix B.

3.2.1 pH

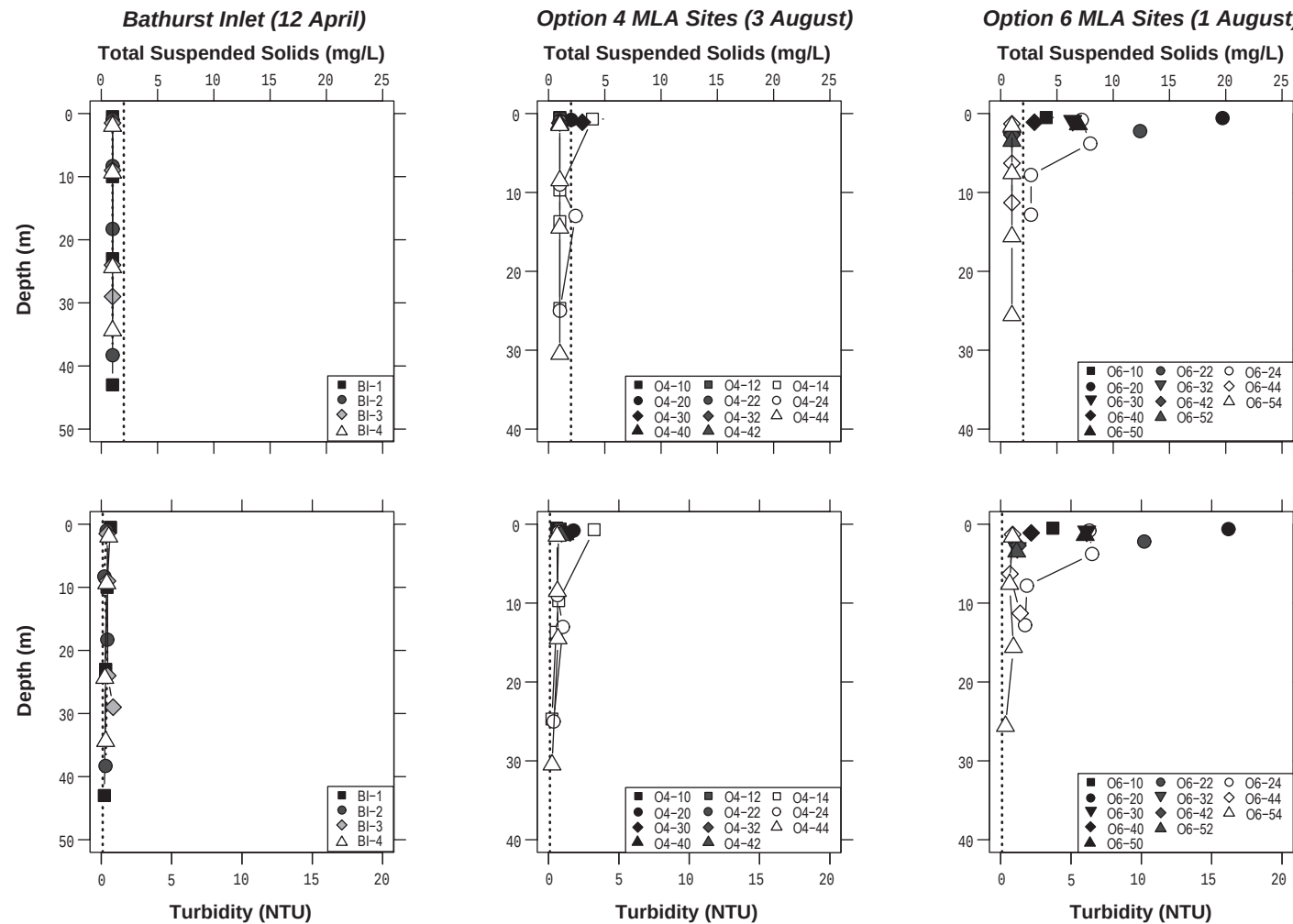
April pH levels were similar within profiles and across the BI sites, averaging around 7.7 pH units (Figure 3.2-1). Surface (<10 m depth) pH values in August were slightly elevated (pH ~7.9) relative to summer deep water and under-ice (April) values, and was probably due to inorganic carbon uptake by photosynthesizing phytoplankton.

3.2.2 Suspended Material

Suspended material concentrations were very low in the under-ice profiles collected in April, with total suspended solids (TSS) values below detection limits and turbidity generally less than 1 NTU (Figure 3.2-2). In August, the Option 4 MLA sites had suspended material observations only slightly higher (~1 mg/L TSS and ~1 NTU) than April values, and the greatest increase seen in the surface samples. Wind-driven resuspension of sediments likely increased both TSS and turbidity values in the August observations. The near-shore site O4-14 had a TSS concentration of nearly 5 mg/L and a turbidity level of 4 NTU, which was higher than mid-shore and deep water observations at other Option 4 sites.



Notes: The error bars represent the standard error of the mean of replicate samples collected at one depth at each site.
 The analytical detection limit for pH was 0.1 units.
 The dashed lines show the range of the interim CCME marine water quality guideline for pH (pH 7.0–8.7).



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
Dotted lines show the analytical detection limits of 2 mg/L for total suspended solids and 0.1 NTU for turbidity.
Values below the analytical limit are plotted at half the detection limit.
Interim CCME guidelines for total suspended solids and turbidity are dependent upon background levels.

Option 6 MLA sites had much higher TSS and turbidity levels than the April and Option 4 MLA observations (Figure 3.2-2). TSS and turbidity reached a maximum of 20 mg/L and 17 NTU in the surface (1 m) waters of O6-20. Wind-driven mixing and resuspension of sediments was the likely source of elevated suspended solids in the Option 6 observations. The bay west of the peninsula in Option 6 has shallow bathymetry and fine sediments (see Section 3.3.1) and the persistent winds in the region combined with these bathymetric and sediment characteristics would promote resuspension.

3.2.3 Nutrients

Overall, nutrient levels were higher in April than in August in Bathurst Inlet, particularly in the surface waters (Figures 3.2-3 to 3.2-5). Nitrate was below detection limits in the mixed layer in all of the MLA option sites in August. The elevated nitrate concentrations reported for O6-10 and O6-20 are artifacts of increased detection limits (0.5 mg/L) due to sample dilution, and the real environmental concentrations were likely much lower. A depth gradient in nitrate was observed at all sites, regardless of season, and was likely caused uptake by phytoplankton in the surface waters and by the re-mineralization of organic matter in the deep waters and sediments.

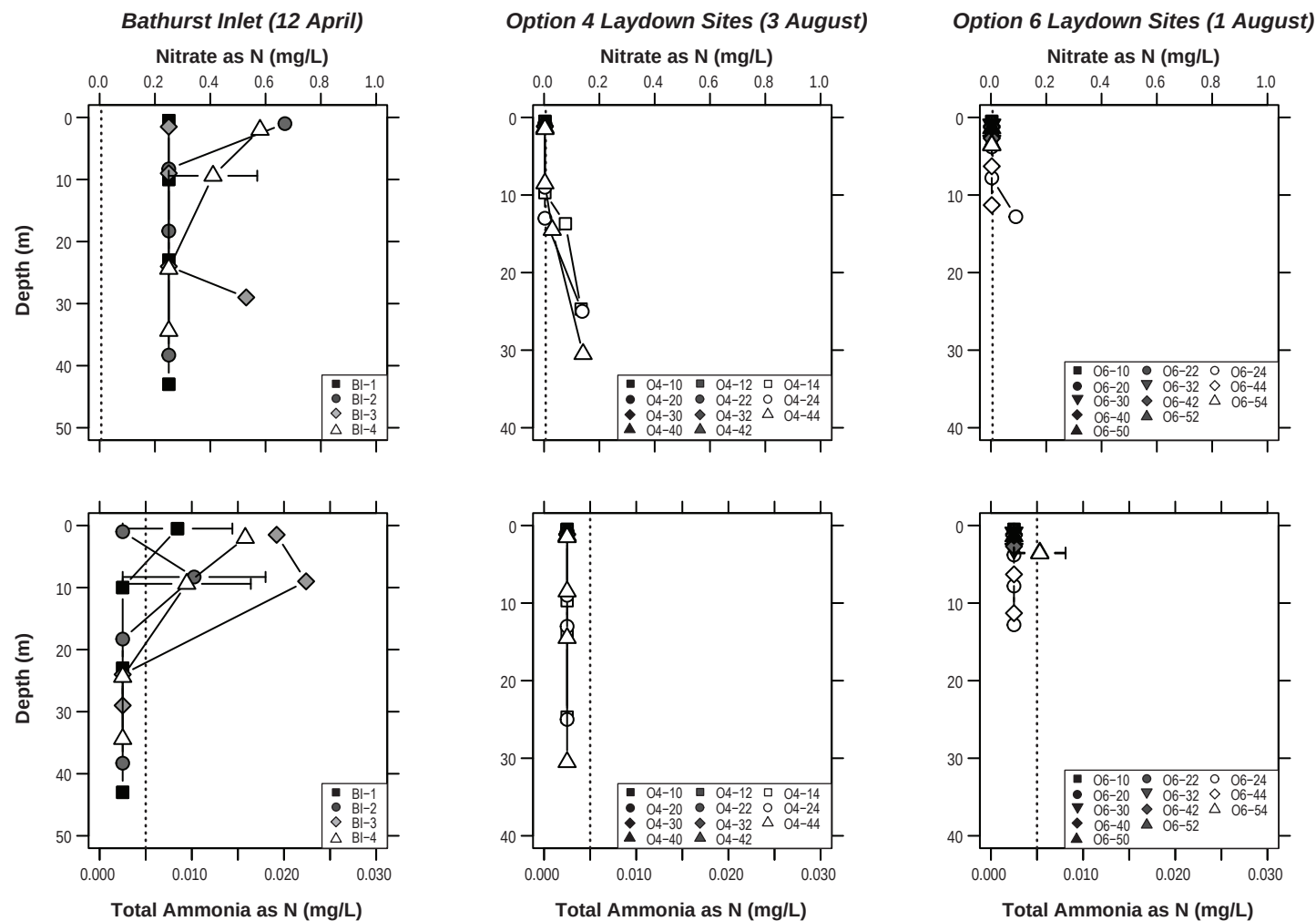
Total ammonia concentrations (mainly existing as ammonium, NH_4^+) were above the detection limits in the under-ice samples in April (Figure 3.2-3), reaching a maximum of 0.022 mg/L at 8.5 m at site BI-3, and were greatest in the surface layer. This elevated ammonium likely resulted from enhanced grazing of phytoplankton by zooplankton at and above the pycnocline, their subsequent excretion (high in nitrogenous compounds), and the re-mineralization of the resulting organic material.

Nitrate, total phosphorus, orthophosphate, silicate, and total organic carbon (TOC) all exhibited depth gradients, with macronutrients being lower and TOC slightly higher in surface waters. Vertical gradients were more pronounced in August than in the under-ice samples collected in April, and was likely due to enhanced phytoplankton productivity (contributing to TOC) and nutrient uptake in the summer mixed layer, and enhanced re-mineralization in the deep waters. As noted above, nitrate was completely exhausted in many sites in August, and nitrogen supply was likely limiting to phytoplankton growth. Phosphorus was always above detection limits in the surface waters, but was depleted from ~0.04 mg/L orthophosphate in April to less than 0.02 mg/L in August (Figure 3.2-4). Bioavailable orthophosphate comprised the majority of the total phosphorus pool, which reduces the chances of phosphorus limitation controlling the growth of phytoplankton. Like phosphorus, the concentration of silicate dropped from ~1.2 mg/L in April to ~0.8 mg/L in the Option 4 MLA and ~0.6 mg/L in the Option 6 MLA in August. The larger decrease in silicate at the Option 6 MLA sites may have been due to the increased presence from diatoms, which use silicate to produce their frustules (outer cell walls). This would be consistent with the absence of diatoms from the phytoplankton taxonomy sample collected in the Option 4 MLA in August (Section 3.4).

Surface concentrations of TOC tended to be slightly higher than bottom layer concentrations, and probably resulted from the enhanced inputs of TOC from primary production near the surface and enhanced re-mineralization in and near the sediments (Figure 3.2-5). Sediment resuspension due to wind mixing at near-shore sites would also add benthic TOC to the water column, and may have contributed to the higher TOC concentrations (2.1 mg/L) at the Option 6 MLA than those observed at the Option 4 MLA (1.9 mg/L).

3.2.4 Metals

Bathurst Inlet had measurable concentrations of some metals in both April and August, but in general can be considered a low-metal environment. Arsenic and mercury concentrations were always below their analytical detection limits (Figures 3.2-6 and 3.2-12), and lead concentrations were also below the detection limits, except for one sample in April (BI-4) and one in August (O6-54).



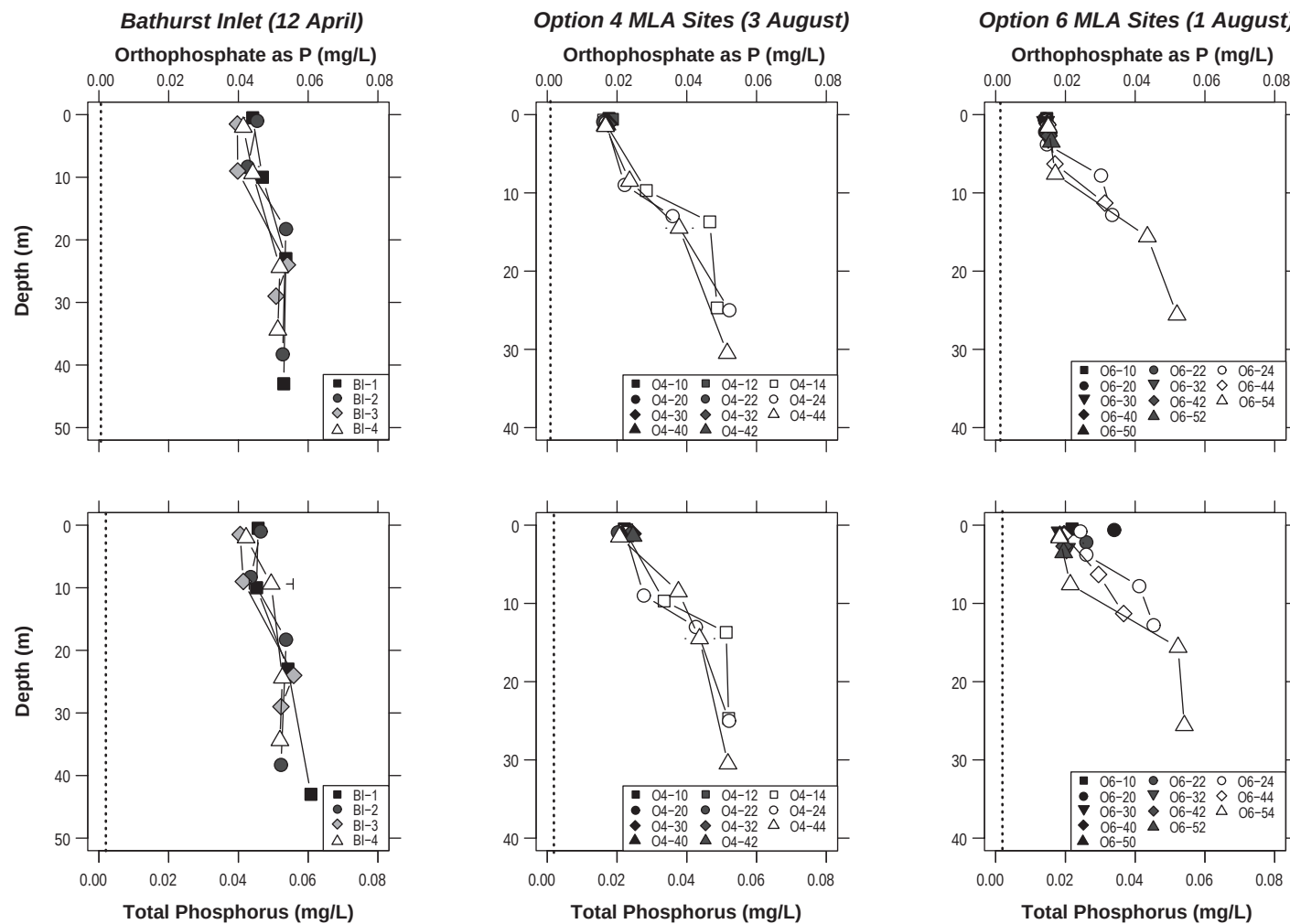
Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.

Dotted lines show the detection limits of 0.006 mg/L for nitrate and 0.005 mg/L for total ammonia. Values below the analytical limit are plotted at half the detection limit.

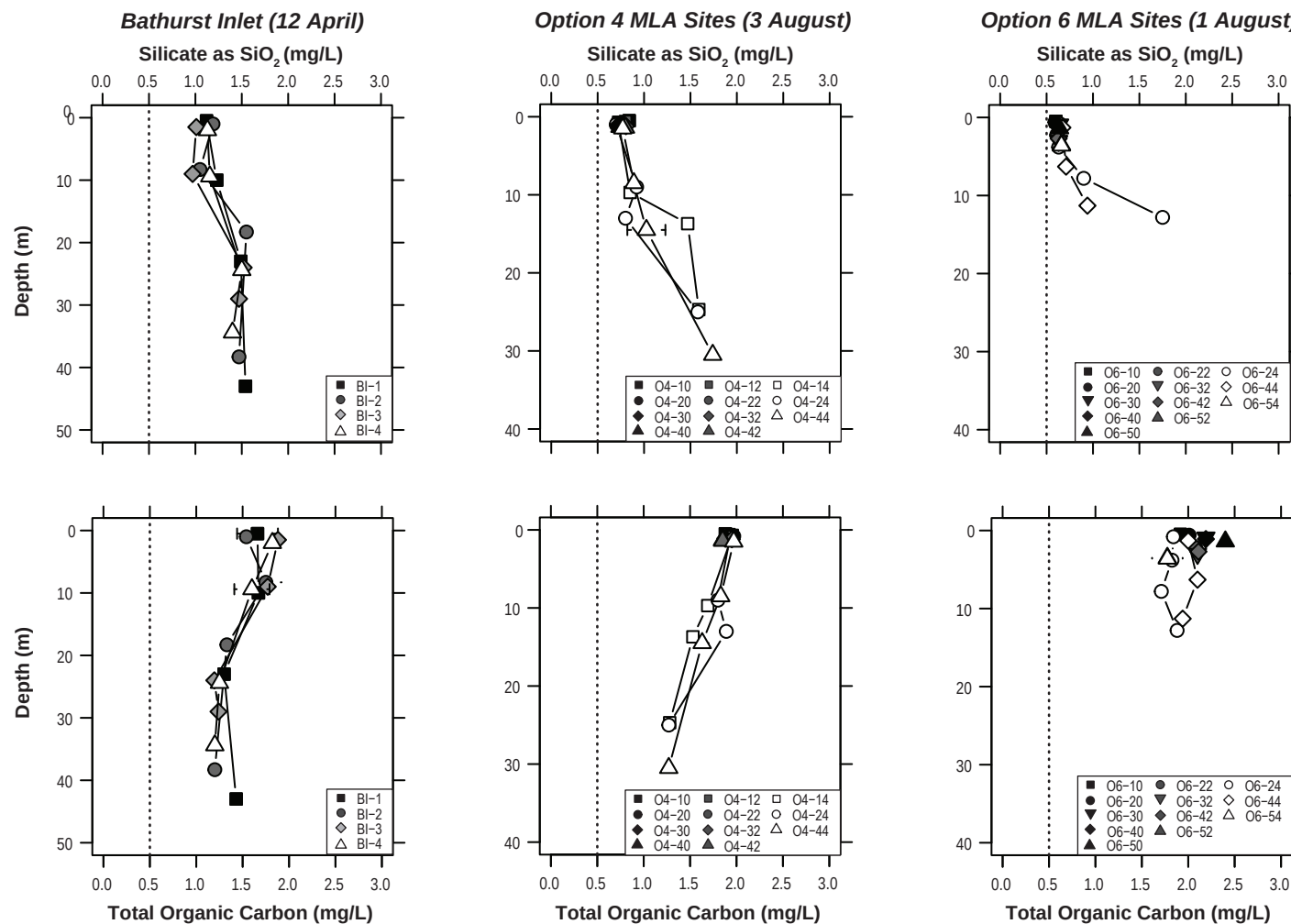
Nitrate concentrations were substantially less than the interim CCME marine water quality guideline for nitrate (3.6 mg/L).

The CCME water quality guidelines for total ammonia depend on temperature and pH;

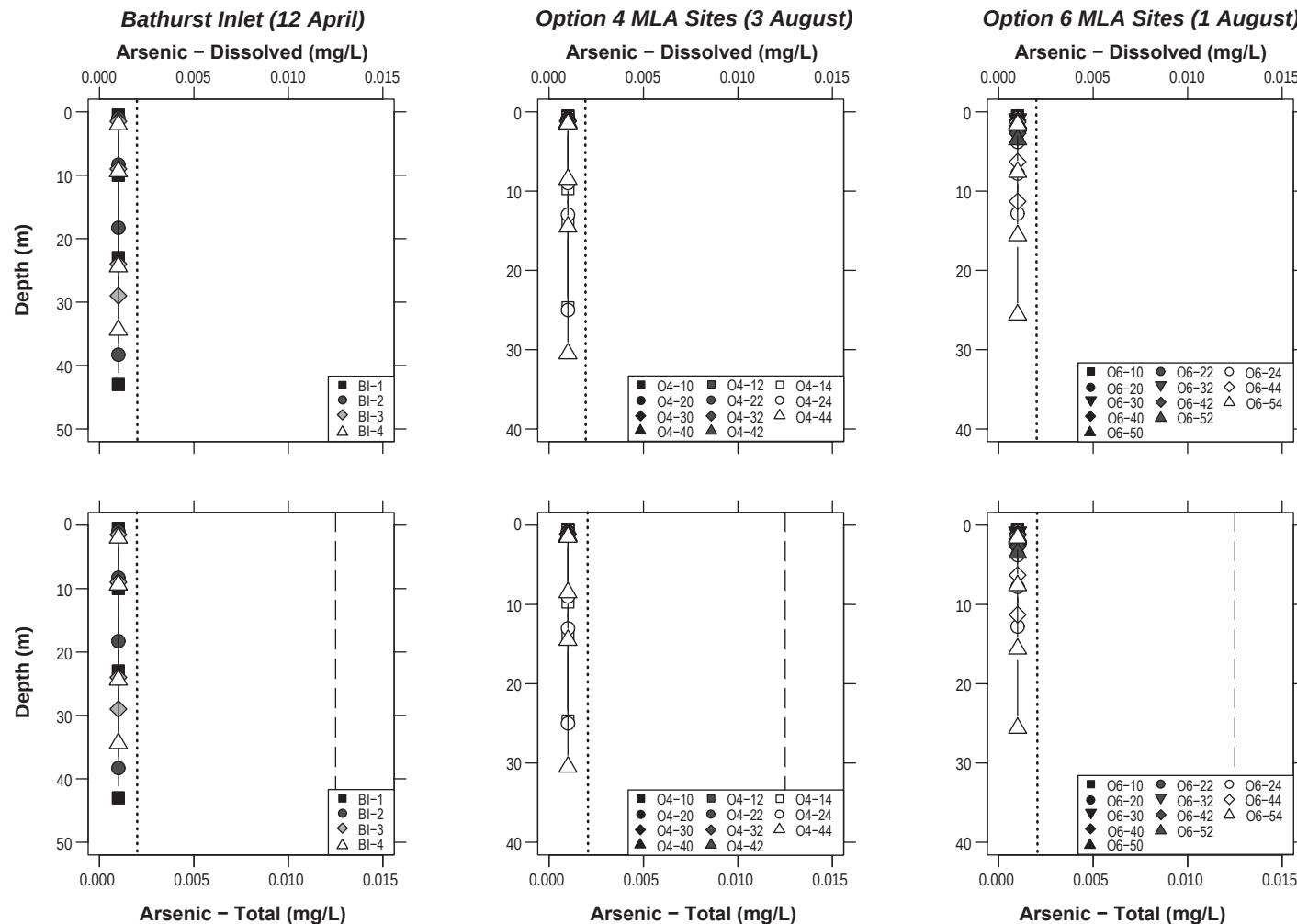
the observed total ammonia concentrations in Bathurst Inlet were substantially less than the lowest guideline of 0.715 mg/L at pH 8.0 and 15°C.



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
 Dotted lines show the analytical detection limits of 0.001 mg/L for orthophosphate and 0.002 mg/L for total phosphorus.
 Values below the analytical limit are plotted at half the detection limit.



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
 Dotted lines show the analytical detection limits of 0.5 mg/L for silicate and 0.5 mg/L for total organic carbon.
 Values below the analytical limit are plotted at half the detection limit.

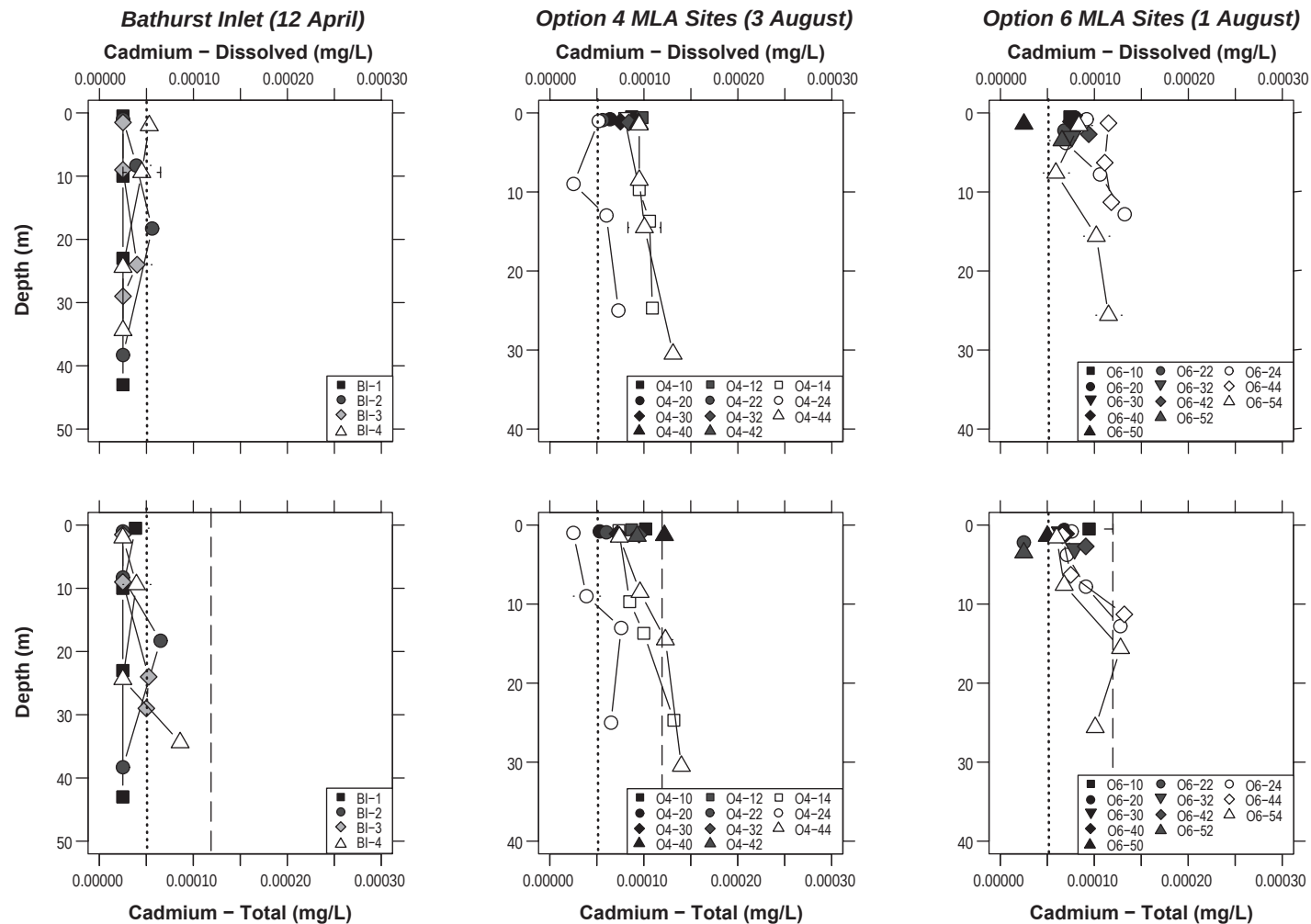


Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.

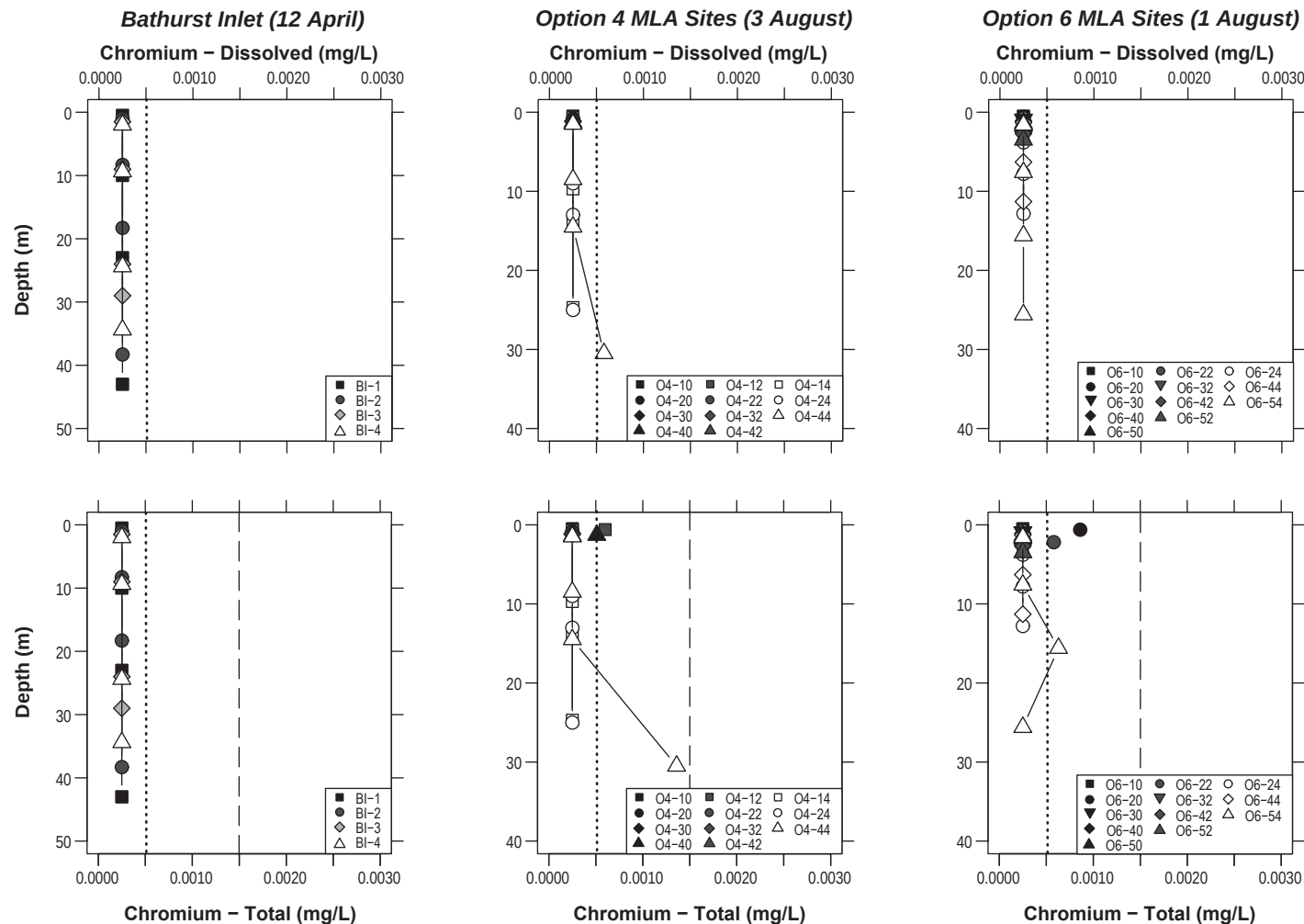
Dotted lines show the analytical detection limits of 0.002 mg/L.

Values below the analytical limit are plotted at half the detection limit.

Dashed lines represent the interim CCME marine water quality guidelines for total arsenic (0.0125 mg/L).



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
Dotted lines show the analytical detection limits of 0.00005 mg/L.
Values below the analytical limit are plotted at half the detection limit.
Dashed lines represent the interim CCME marine water quality guidelines for total cadmium (0.00012 mg/L).



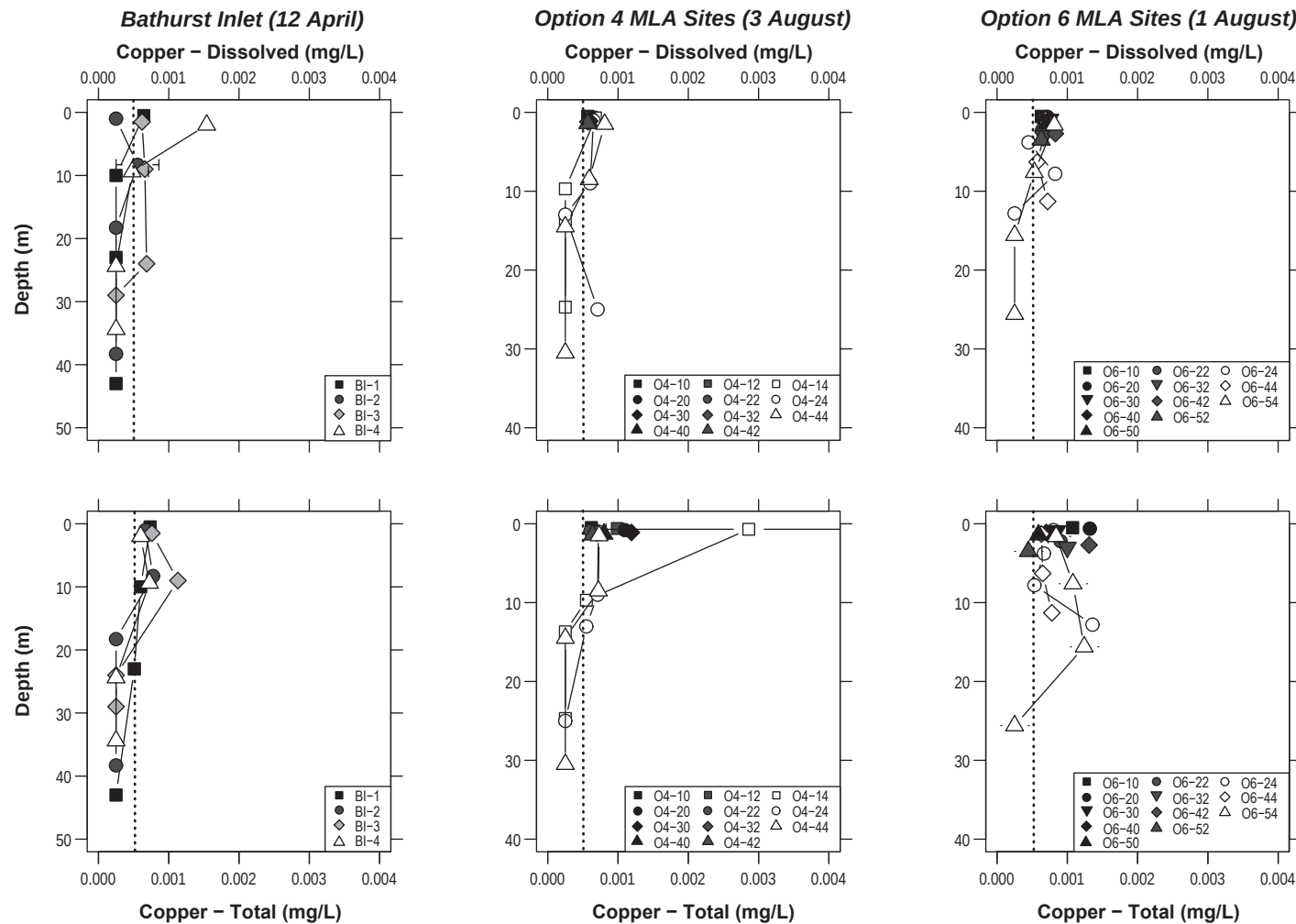
Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.

Dotted lines show the analytical detection limits of 0.0005 mg/L.

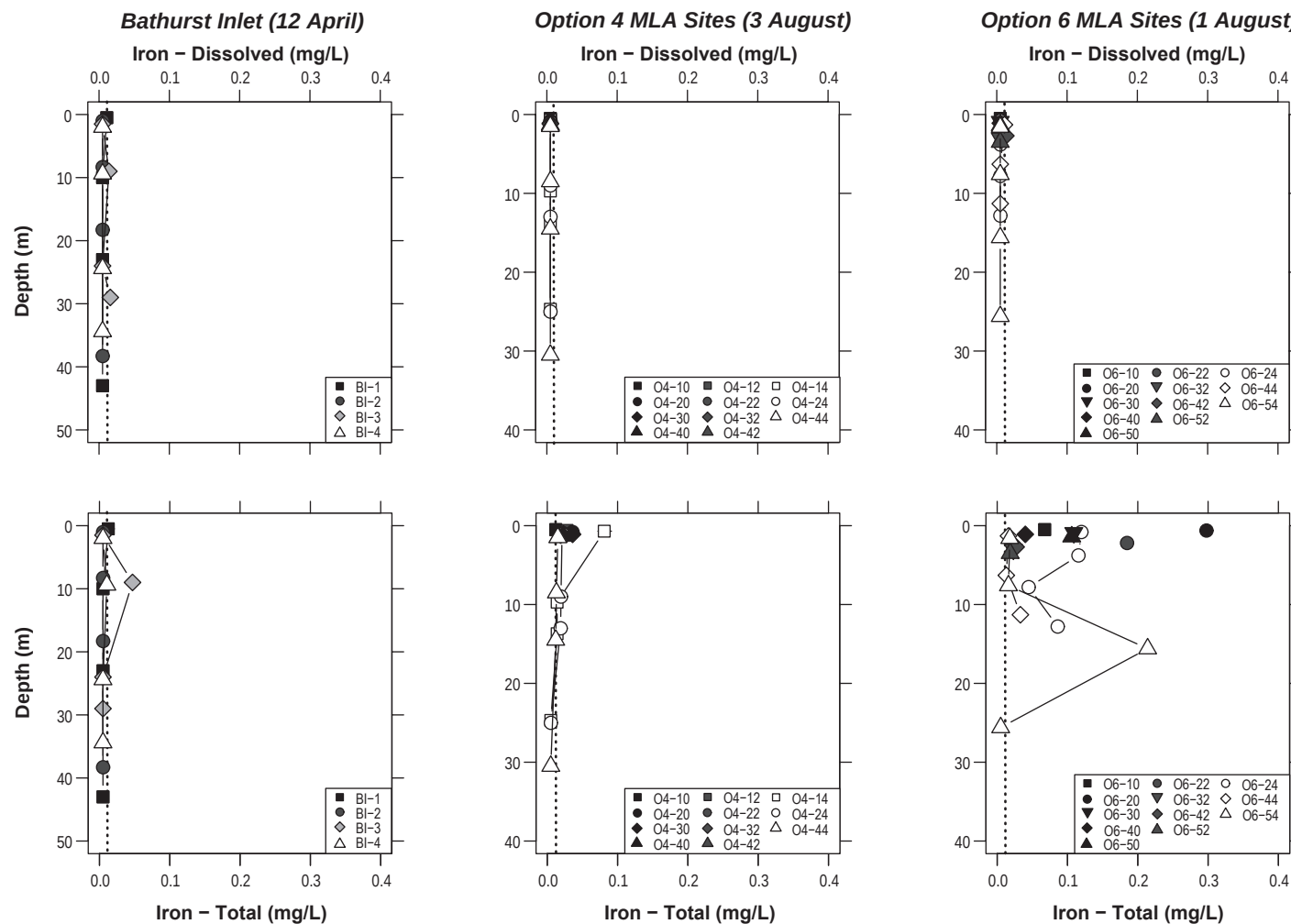
Values below the analytical limit are plotted at half the detection limit.

Dashed lines represent the interim CCME water quality guidelines for total hexavalent chromium (0.0015 mg/L).

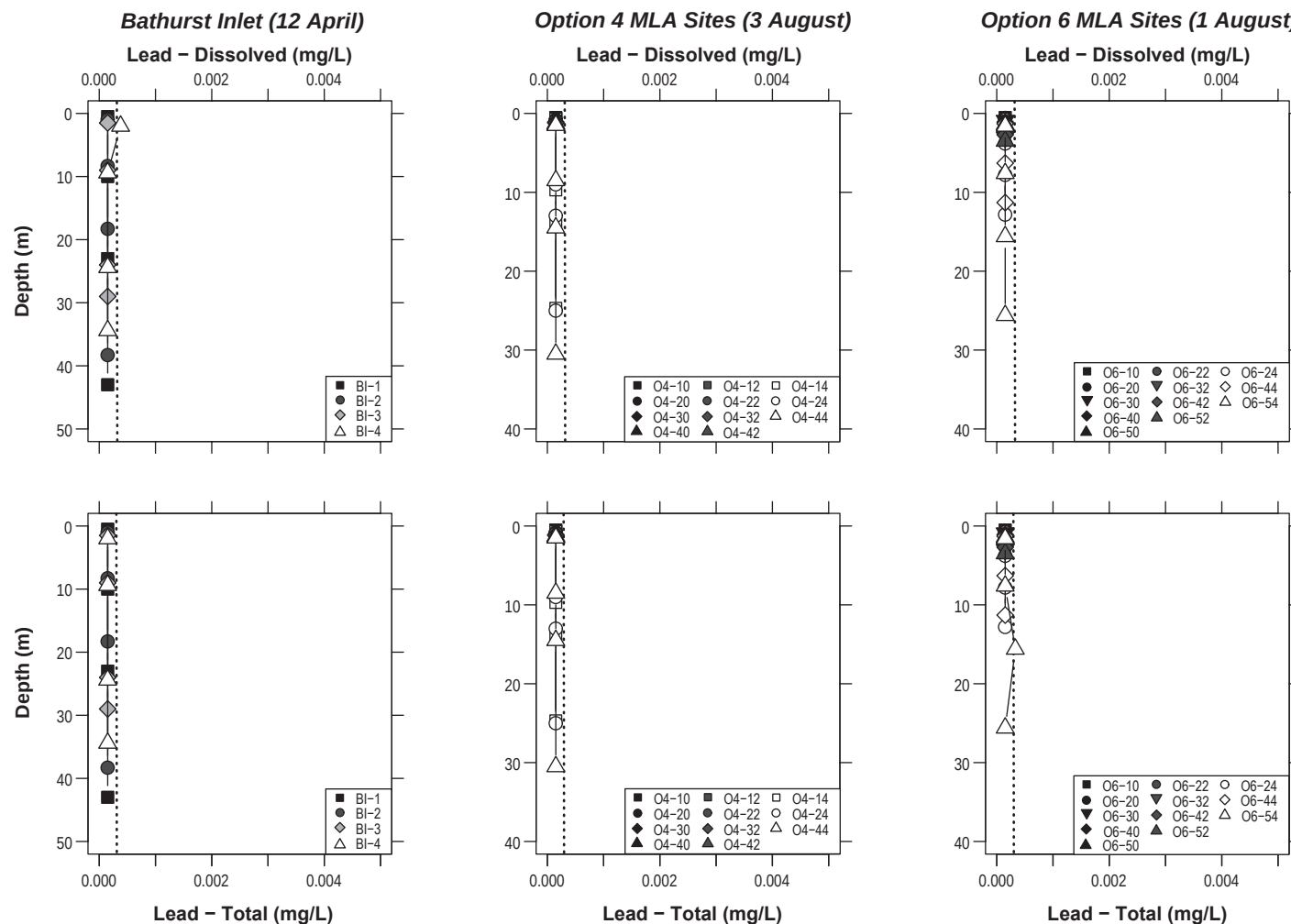
Concentrations were substantially lower than the interim guideline for total trivalent chromium (0.056 mg/L).



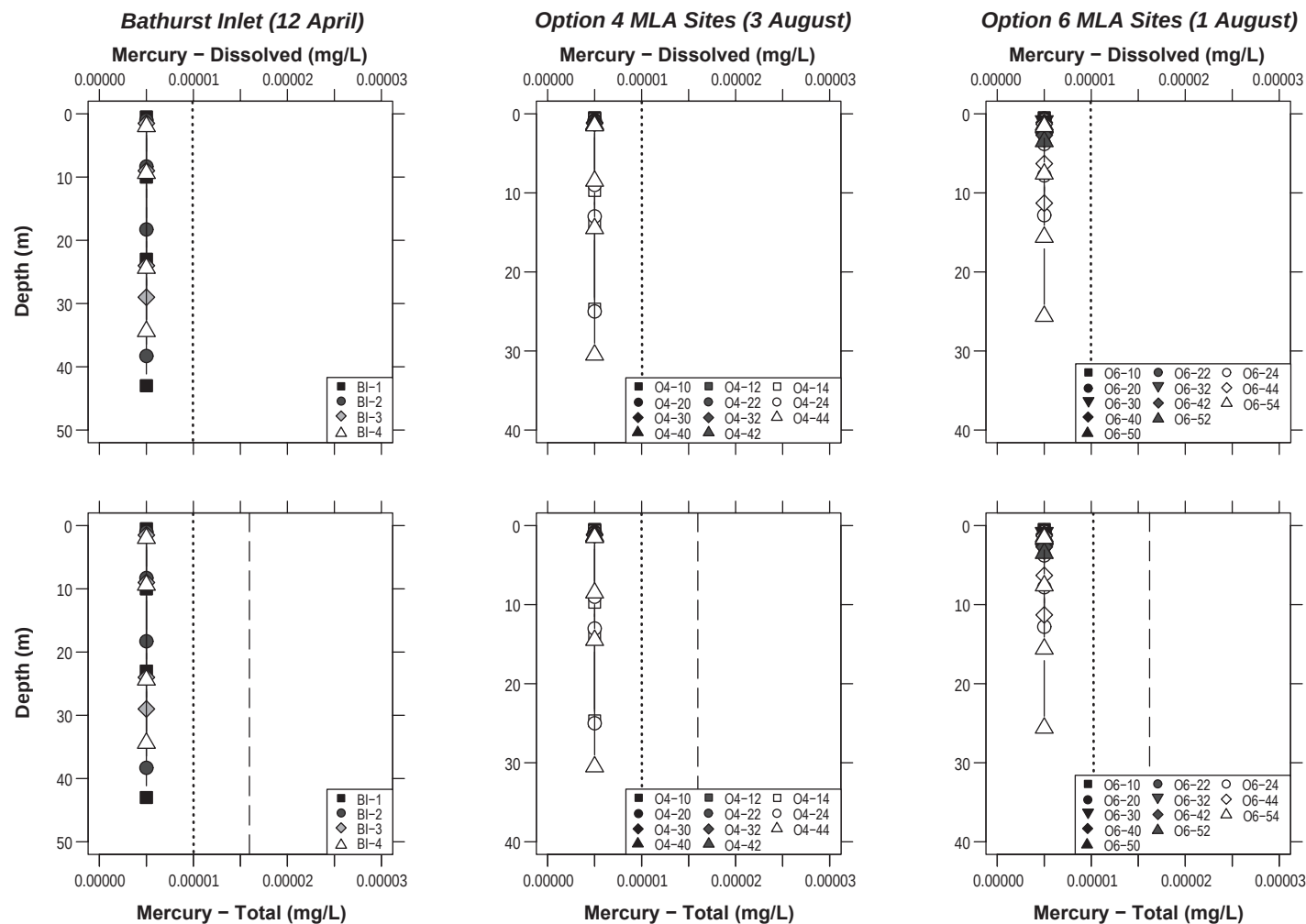
Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
Dotted lines show the analytical detection limits of 0.0005 mg/L.
Values below the analytical limit are plotted at half the detection limit.



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
Dotted lines show the analytical detection limits of 0.01 mg/L.
Values below the analytical limit are plotted at half the detection limit.



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
 Dotted lines show the analytical detection limits of 0.0003 mg/L.
 Values below the analytical limit are plotted at half the detection limit.



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.

Dotted lines show the analytical detection limits of 0.00001 mg/L.

Values below the analytical limit are plotted at half the detection limit.

Dashed lines represent the interim CCME water quality guideline for total inorganic mercury (0.000016 mg/L).

Cadmium concentrations were higher in August in both Option 4 MLA and Option 6 MLA than the concentrations in April (Figure 3.2-7). April cadmium concentrations, in both the dissolved and total phases, were at or below detection limits. The August samples showed consistent depth gradients in both MLAs, with lower concentrations ranging from 0.00005 mg/L to 0.000012 mg/L in the surface layer and from 0.00006 mg/L to 0.00014 mg/L in deep samples. The majority (80 to 100%) of the cadmium resided in the dissolved fraction. Biological uptake or riverine dilution may have been the causes of the decreased surface concentrations of cadmium. Enhanced re-mineralization of organic matter in the summer may also have increased the concentration of cadmium in the deep water.

Chromium concentrations were generally less than the analytical detection limits, except the near-shore samples (O4-12, O4-40, O6-20, and O6-22) and deep-water samples (O4-44 and O6-54) collected in August (Figure 3.2-8). The measurable chromium in these samples was mostly in the particulate fraction, and was likely the result of chromium adsorption to suspended material.

Copper showed a consistent vertical gradient in both April and August samples, with higher concentrations observed near the surface (Figure 3.2-9). Much of the copper was dissolved (mean: 87%), except in the deeper samples from the Option 6 MLA. The anomalously high value from the surface sample at O4-14 was due to a single replicate concentration of 0.0049 mg/L, and was likely due to an elemental spike in the ICP-MS analysis.

Total iron concentrations were much higher at sites in the Option 6 area in August than samples from Option 4 or the April sites (Figure 3.2-10). The iron in the water column was mostly associated with particles and high TSS, with dissolved iron concentrations near or below the analytical detection limits. In the Option 6 MLA, iron concentrations were higher towards the surface of the water column, and in the near shore, reaching 0.3 mg/L at O6-20. The iron was probably associated with the high levels of suspended particles in the shallow waters at this MLA option, likely due to sediment re-suspension.

Lead concentrations were at or below detection limits in all samples from Bathurst Inlet in 2012 (Figure 3.2-11). Similarly, mercury concentrations were below detection limits (Figure 3.2-12). These low environmental metal concentrations are consistent with the undisturbed nature of the Bathurst Inlet ecosystem and the local freshwater inputs and geology (Rescan 2013).

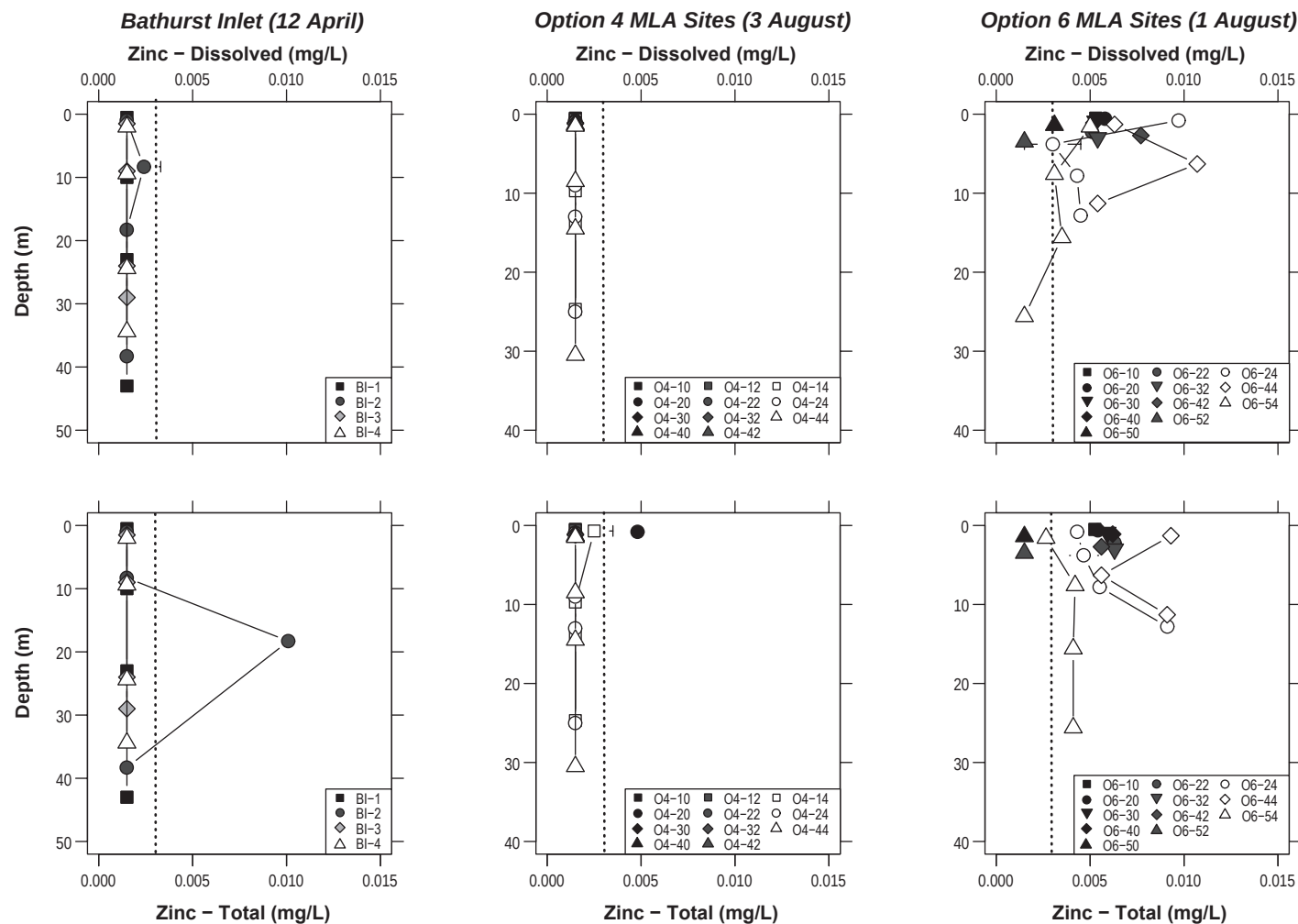
Like iron, zinc concentrations were substantially higher in the Option 6 MLA than in the Option 4 MLA or the April sites, reaching 0.009 mg/L at O6-44 (Figure 3.2-13). Like iron, sediment re-suspension, and to a lesser extent, run off, were the probable sources for the zinc in the Option 6 samples; however, zinc is more likely to stay in the dissolved fraction than iron due to the precipitation chemistry between dissolved iron and hydroxides (Byrne and Kester 1976).

3.2.5 CCME Guidelines

All water quality data collected in Bathurst Inlet were compared to the interim CCME's water quality guidelines (CCME 2012a). All water quality parameters, with the exception of cadmium, were below the guidelines. Total cadmium concentrations were greater than the guideline of 0.00012 mg/L in two deep samples at site O4-44, one deep sample at site O4-14, and one deep sample at each of sites O6-24, O6-44, and O6-54. The water quality parameters indicated Bathurst Inlet to be a pristine Arctic ecosystem.

3.3 SEDIMENT QUALITY

Sediment quality samples were collected from eight sites in both the Option 4 MLA and the Option 6 MLA. Sediments were analyzed for grain size and various physico-chemical parameters. Complete results of the sediment quality analyses are presented in Appendix C.



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.

Dotted lines show the analytical detection limits of 0.003 mg/L.

Values below the analytical limit are plotted at half the detection limit.

3.3.1 Particle Size

The near-shore sites O4-20, O4-30, and O4-40 of the Option 4 MLA were characterized by coarse-grained sediments, with 85 to 87% sand and the rest composed mainly of silt and clay (Figure 3.3-1). A small amount of gravel (7%) was present at site O4-20, while site O4-10 had a finer composition, with a much greater component of silt (32%) and clay (20%). This could have resulted from the small peninsula (just south of the site) influencing local currents and sediment distribution.

The mid-shore sites divided into two groups. Sites O4-12 and O4-22 were similar in composition to most of the near-shore sites, with around 90% sand, 6% silt and 3 to 4% clay (Figure 3.3-1). Further south, sites O4-32 and O4-42 had a finer particle size distribution similar to O4-10, with 37 to 39% sand, 35 to 38% silt, and 25 to 26% clay.

Around the Option 6 MLA, the near-shore sites O6-10 and O6-20 were almost entirely composed of sand (94 to 98%), with very small amounts of silt, clay, and gravel (Figure 3.3-1). Sites O6-30 and O6-50 were also predominantly sand (56 to 64%), but were characterized by greater contributions of silt (16 to 25%), clay (12 to 18%) and gravel (2 to 6%). All of the mid-shore sites (O6-22, O6-32, O6-42, O6-52) had a finer composition (Figure 3.3-1) dominated by silt (49 to 61%) and clay (25 to 42%), with a lesser contribution of sand (4 to 20%) and gravel (0 to 2%).

3.3.2 Nutrients

Levels of available ammonium nitrogen in the sediments of Option 4 MLA and Option 6 MLA near-shore sites were below or around the detection limits of 1.0 to 1.6 mg/kg (Figure 3.3-2). Mid-shore concentrations were several times greater, reaching 8.9 mg/kg at O4-42. Available phosphate levels were higher than detection limits at the near-shore sites (Figure 3.3-2), and again tended to be somewhat higher at the mid-shore sites.

The TOC and total nitrogen (TN) content (Figure 3.3-3) appeared to be related to particle size distribution, with sites having the highest proportion of fines (silt and clay) also tending to have the highest percentage of TOC and TN. Available N, and to a lesser extent available P, also tended to be higher in finer sediments with a higher percentage of organic matter.

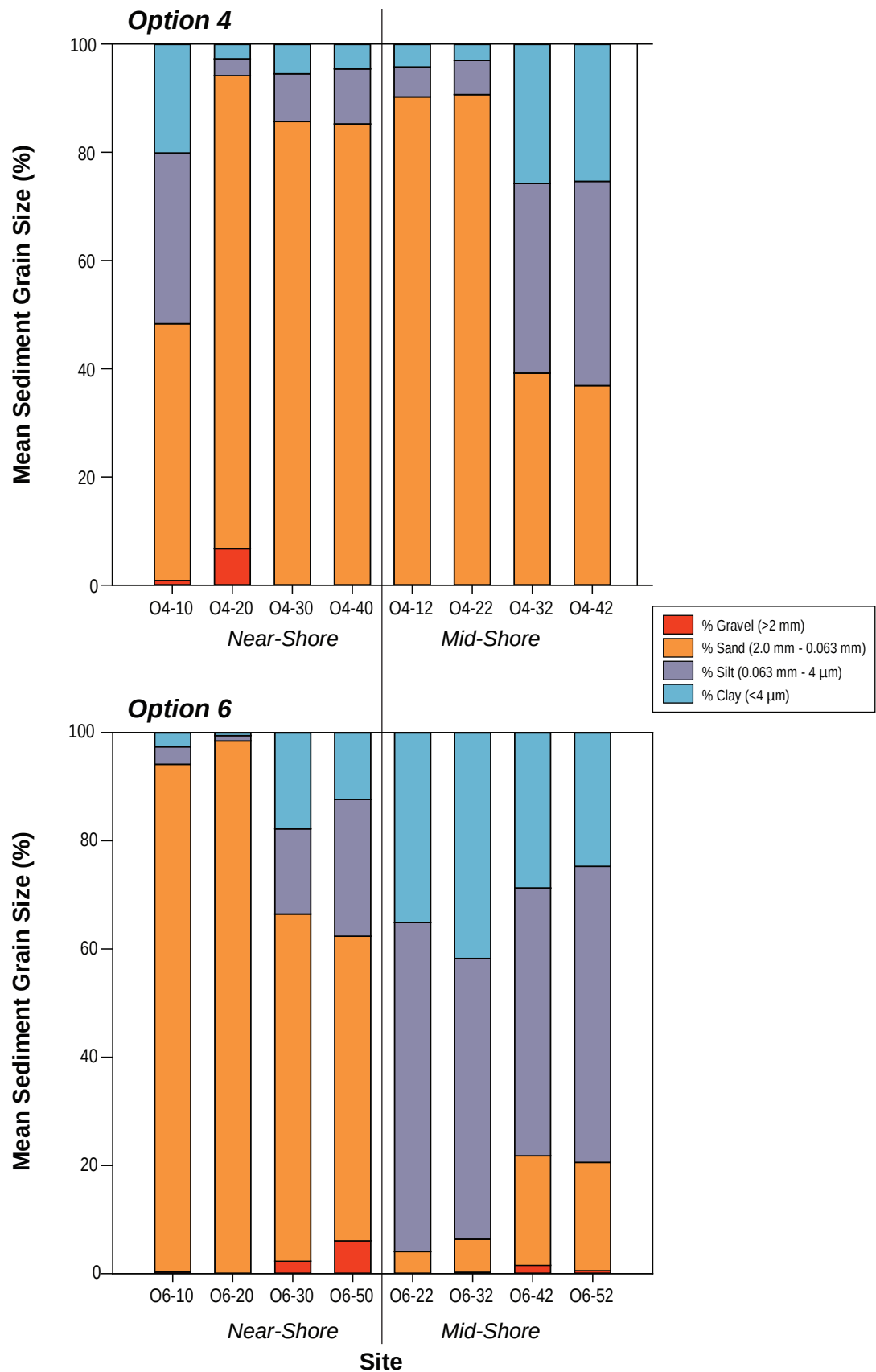
3.3.3 Metals

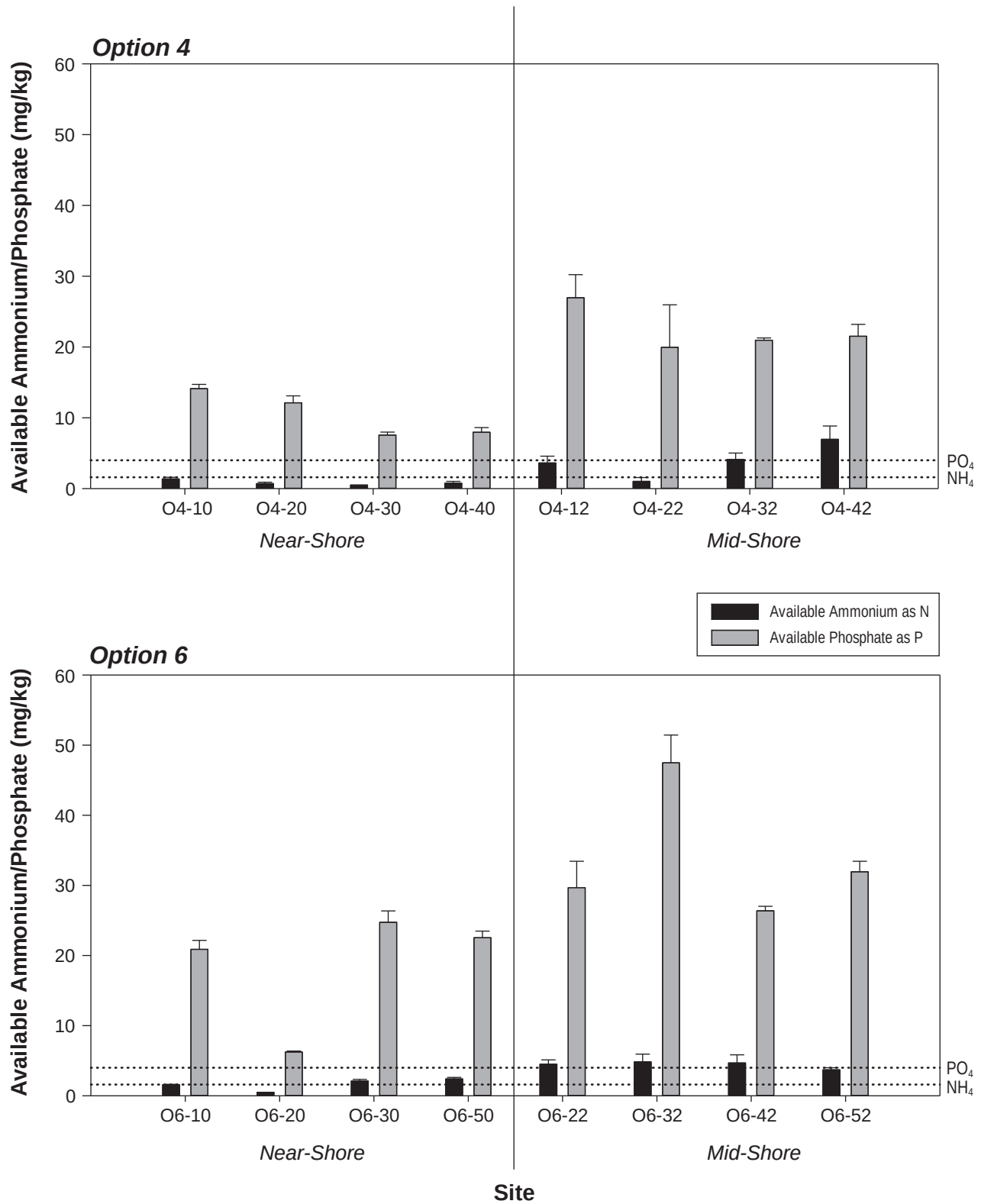
There was a clear pattern between concentrations of most metals and the particle size distribution of the sediments. For arsenic, chromium, copper, lead, and zinc (Figures 3.3-4, 3.3-6, 3.3-7, 3.3-8, 3.3-10), concentrations were higher in sediments with a greater proportion of fines; this is related to the higher surface area and reactive qualities of silts and clays for the adsorption of metals. These finer sediments also contained more organic material as noted above. In the near-shore sites of the Option 4 MLA, concentrations of these metals were elevated at site O4-10. In the mid-shore sites, greater concentrations were observed at sites O4-32 and O4-42. For the Option 6 MLA, higher levels were observed at near-shore sites O6-30 and O6-50, and in the mid-shore at sites O6-22 and O6-32.

Mean concentrations of cadmium and mercury were below or close to detection limits at all sites (Figure 3.3-5 and 3.3-9).

3.3.4 CCME Guidelines

The concentrations of cadmium, chromium, lead, mercury, and zinc were all below CCME ISQG and PEL guidelines at all MLA option sites (Figures 3.3-5, 3.3-6, 3.3-8, 3.3-9, 3.3-10). Generally, the levels of arsenic and copper were also below either the CCM ISQG or PEL guidelines, and no concentrations were higher than the guidelines at any of the near-shore sites (Figures 3.3-4 and 3.3-7).



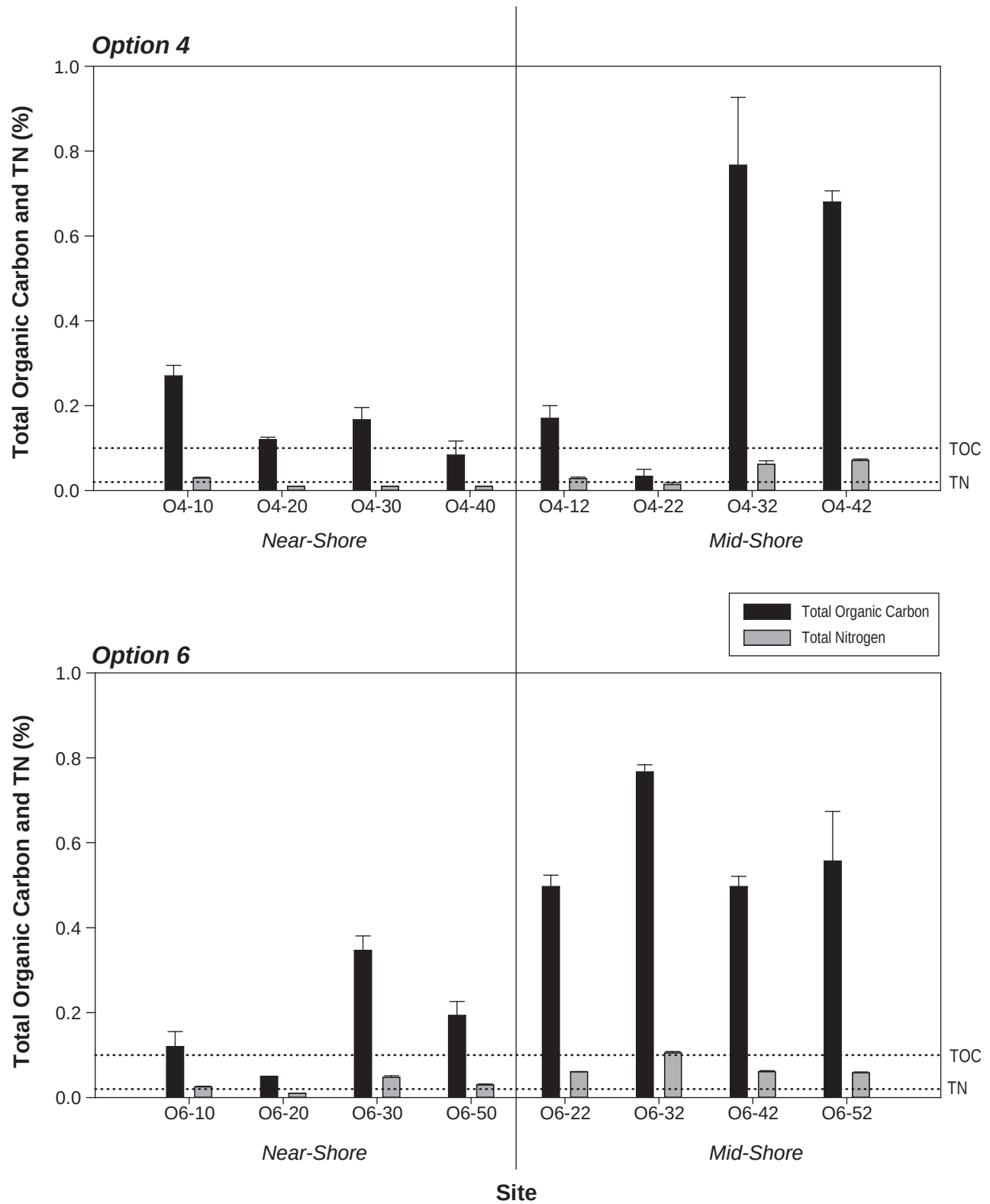


Notes: Error bars represent standard error of the mean of replicates.

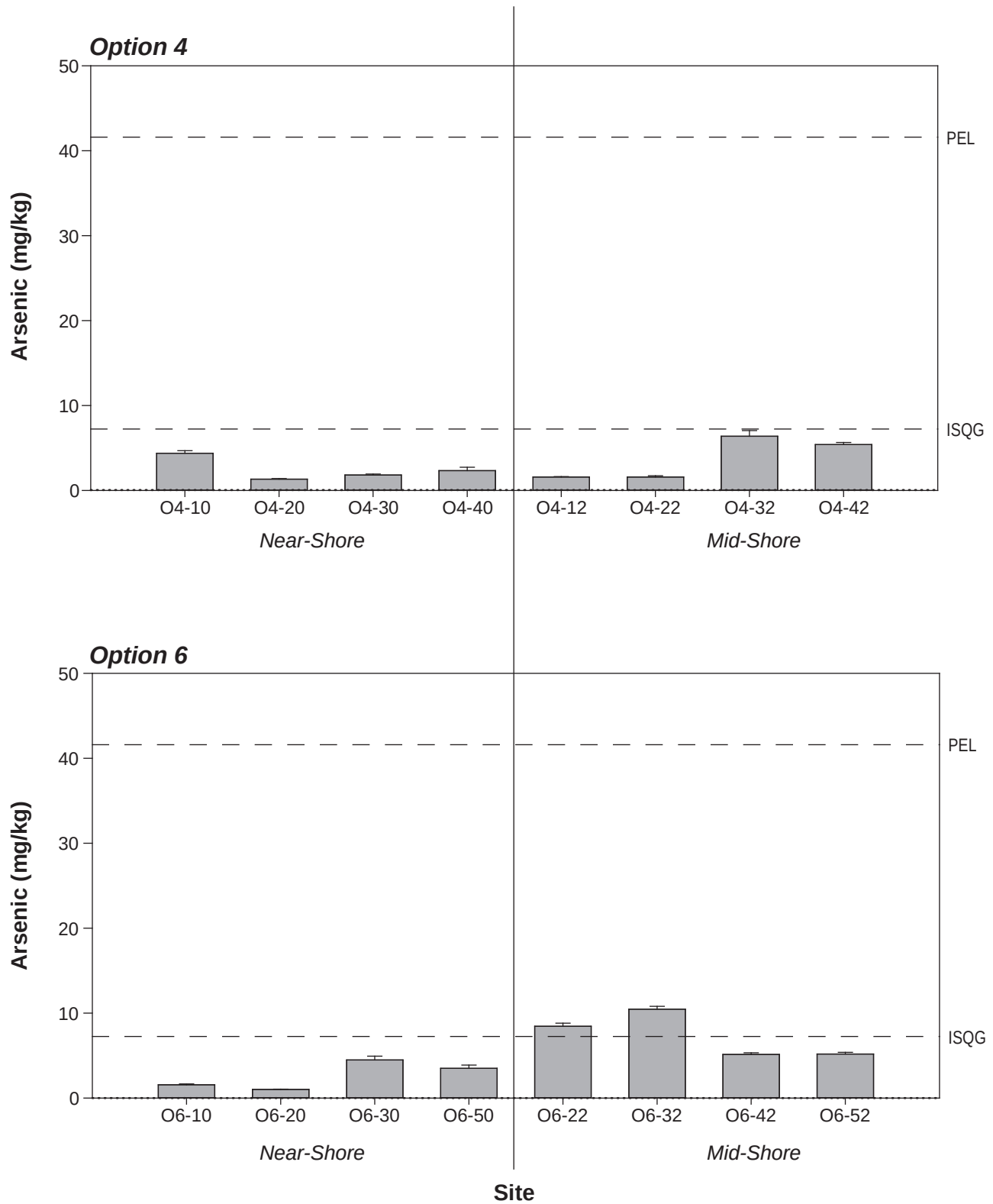
Dotted lines represent analytical detection limit (available ammonium 1.0 - 1.6 mg/kg; available phosphate 2.0 - 4.0 mg/kg).

Values below the detection limit are plotted at half the detection limit.

No samples were collected at O6-40.



Notes: Error bars represent standard error of the mean of replicates.
 Dotted lines represent analytical detection limit (total organic carbon 0.1%; total nitrogen 0.02%).
 Values below the detection limit are plotted at half the detection limit.
 No samples were collected at O6-40.



Notes: Error bars represent standard error of the mean of replicates.

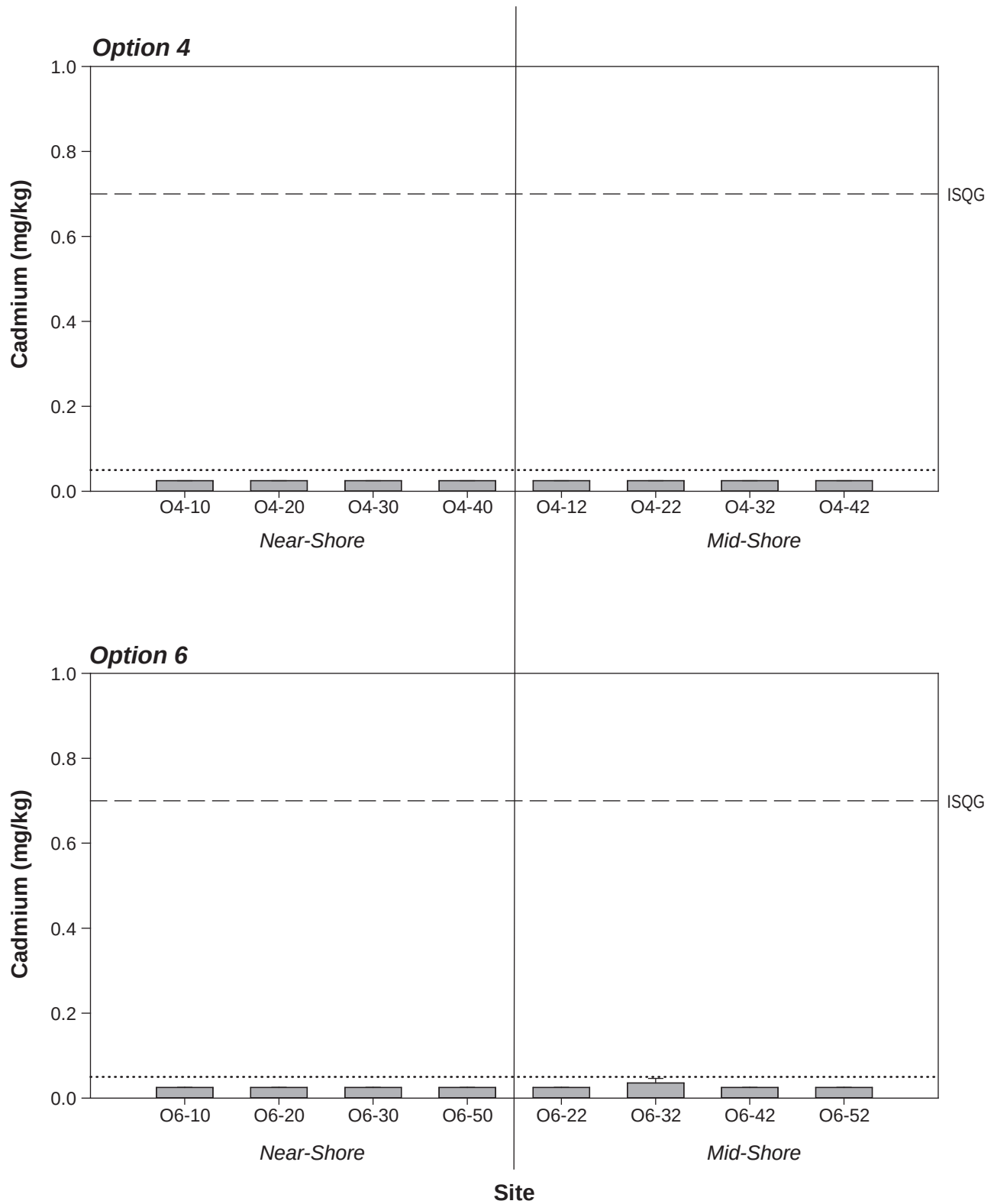
Dotted lines represent analytical detection limit (arsenic 0.05 mg/kg).

Values below the detection limit are plotted at half the detection limit.

Dashed lines represent CCME guidelines; the interim sediment quality guideline for arsenic is 7.24 mg/kg and the probable effect level is 41.6 mg/kg.

No samples were collected at O6-40.

Figure 3.3-4



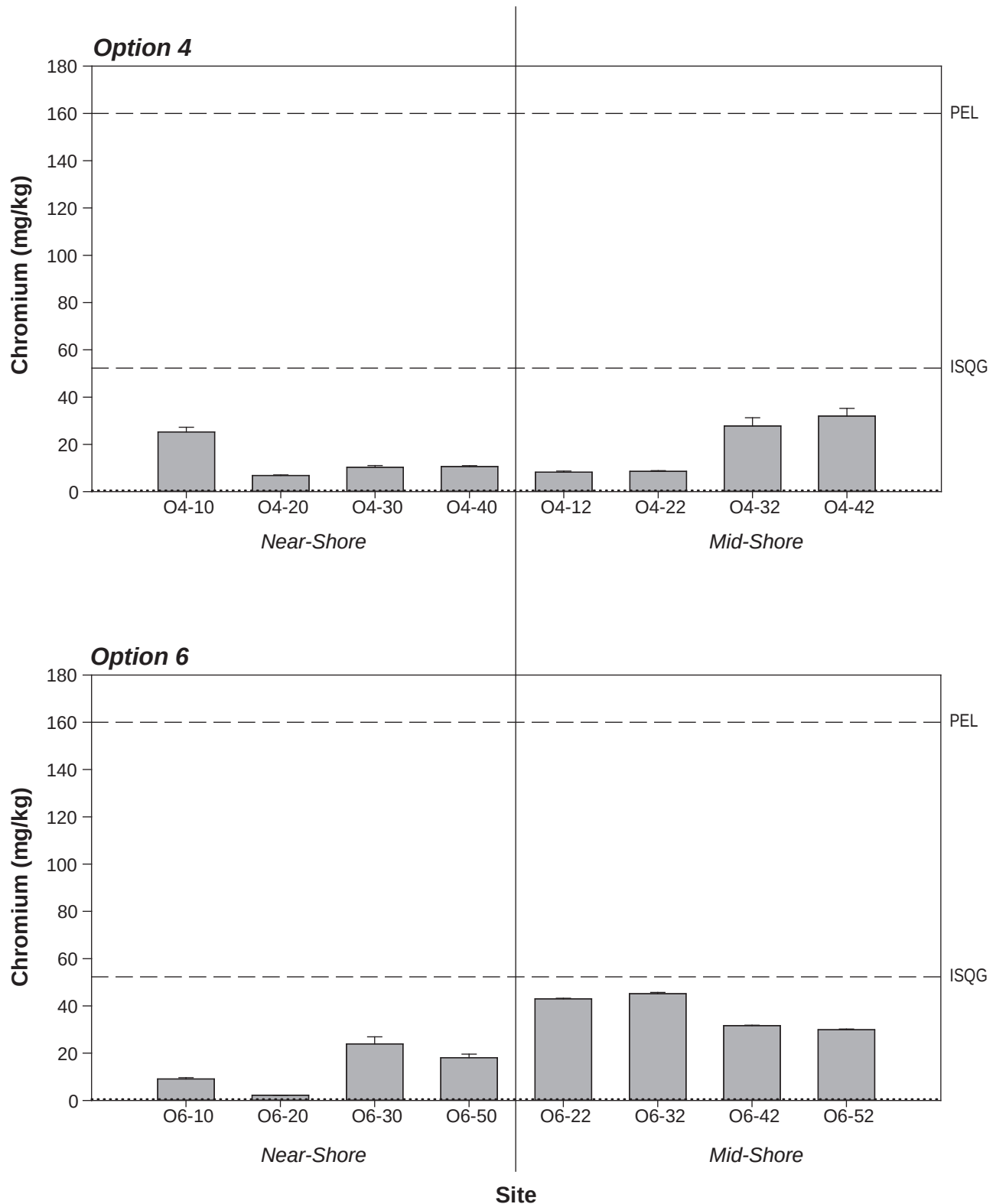
Notes: Error bars represent standard error of the mean of replicates.

Dotted lines represent analytical detection limit (cadmium 0.05 mg/kg).

Values below the detection limit are plotted at half the detection limit.

Dashed lines represent CCME guidelines; the interim sediment quality guideline for cadmium is 0.7 mg/kg and the probable effect level is 4.2 mg/kg.

No samples were collected at O6-40.



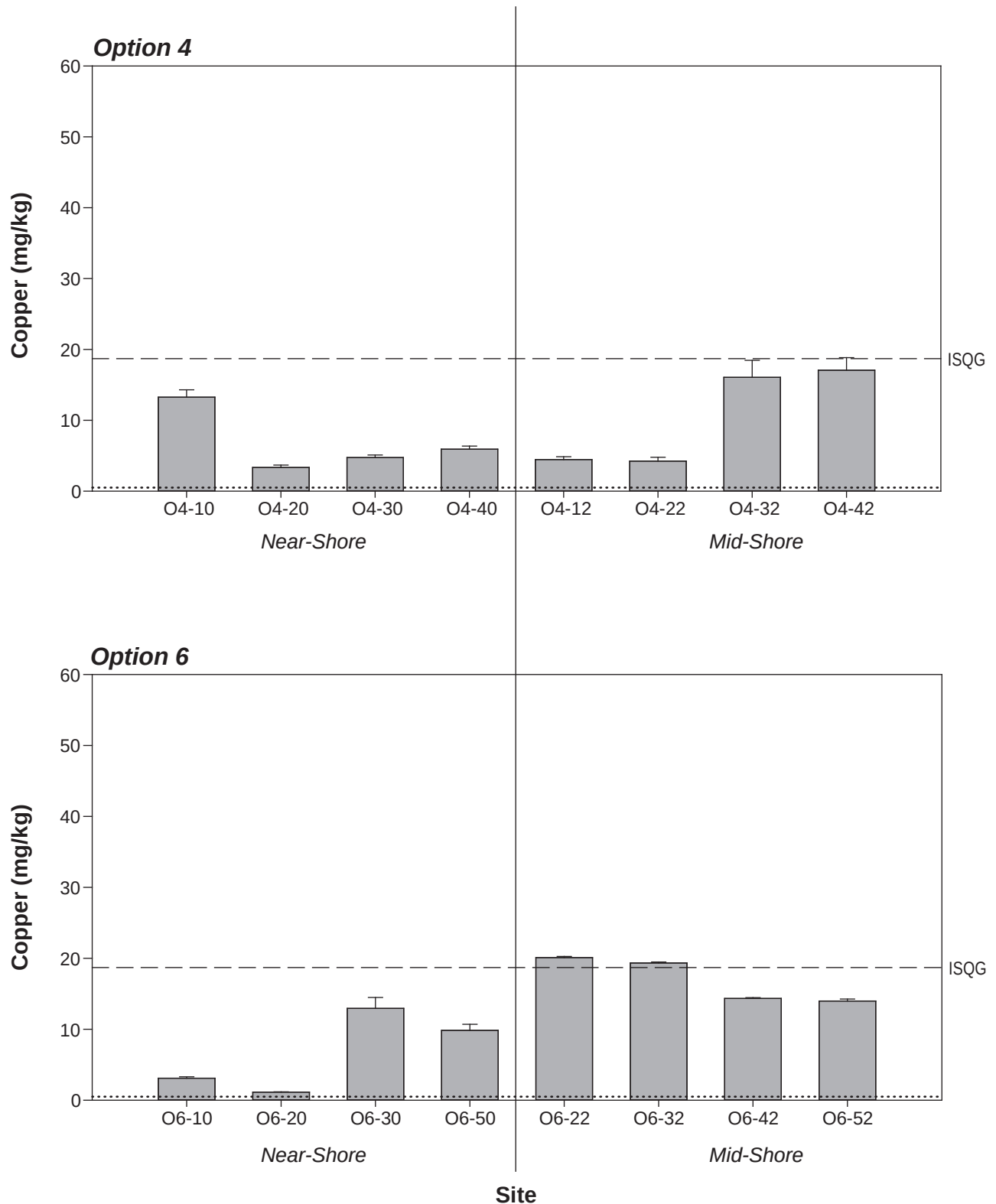
Notes: Error bars represent standard error of the mean of replicates.

Dotted lines represent analytical detection limit (chromium 0.5 mg/kg).

Values below the detection limit are plotted at half the detection limit.

Dashed lines represent CCME guidelines; the interim sediment quality guideline for chromium is 52.3 mg/kg and the probable effect level is 160 mg/kg.

No samples were collected at O6-40.



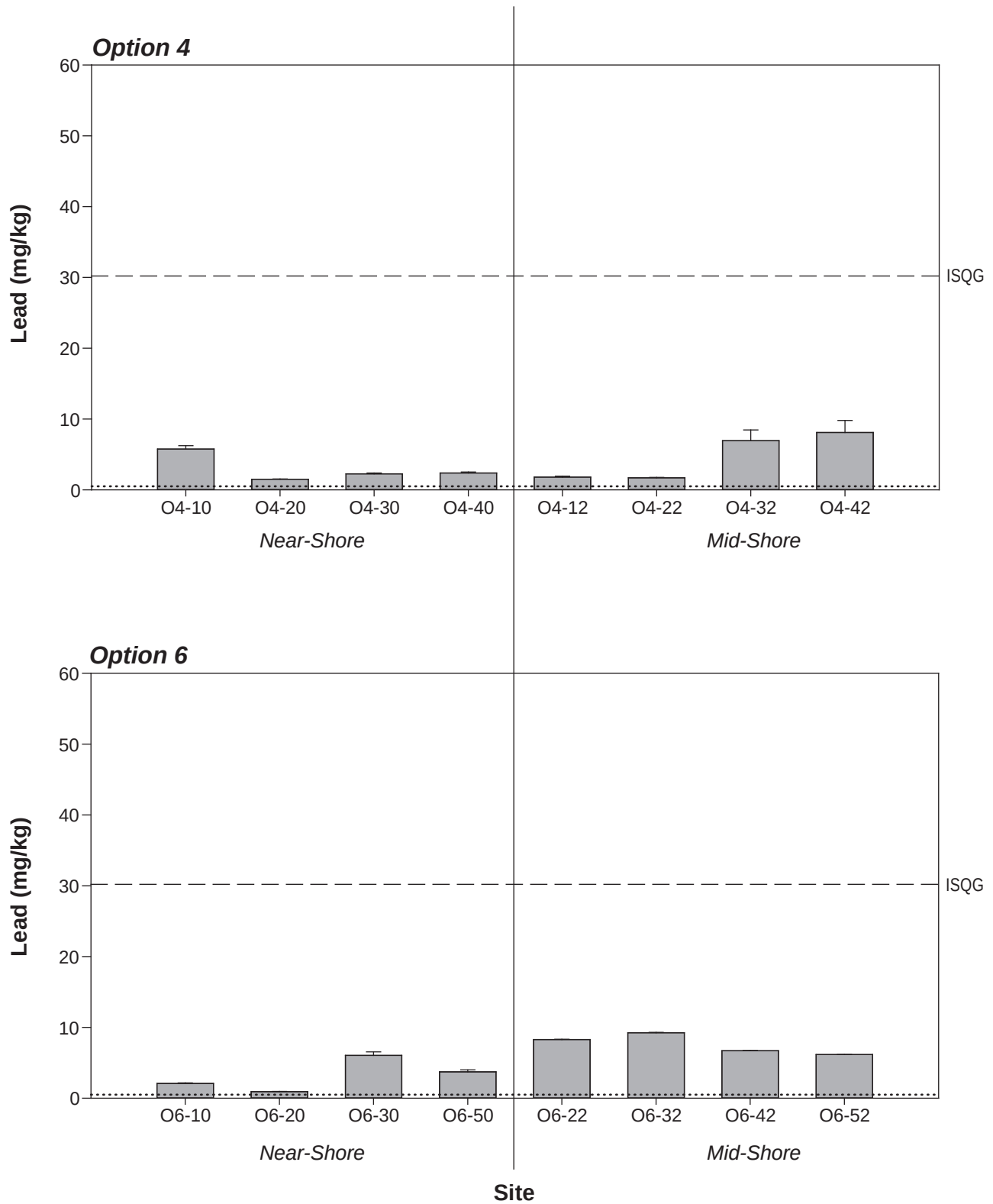
Notes: Error bars represent standard error of the mean of replicates.

Dotted lines represent analytical detection limit (copper 0.5 mg/kg).

Values below the detection limit are plotted at half the detection limit.

Dashed lines represent CCME guidelines; the interim sediment quality guideline for copper is 18.7 mg/kg and the probable effect level is 108 mg/kg.

No samples were collected at O6-40.



Notes: Error bars represent standard error of the mean of replicates.

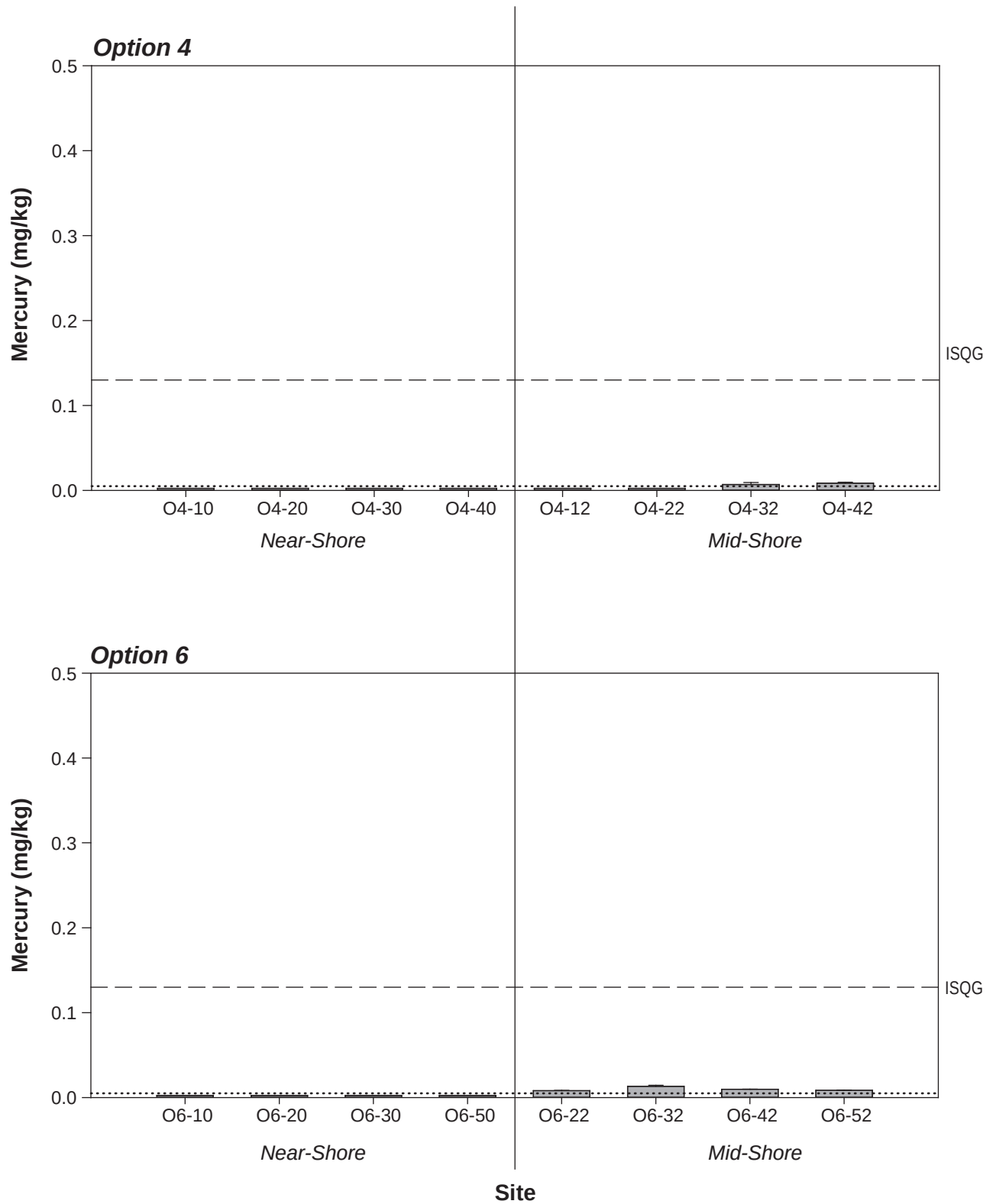
Dotted lines represent analytical detection limit (lead 0.5 mg/kg).

Values below the detection limit are plotted at half the detection limit.

Dashed lines represent CCME guidelines; the interim sediment quality guideline for lead is 30.2 mg/kg and the probable effect level is 112 mg/kg.

No samples were collected at O6-40.

Figure 3.3-8



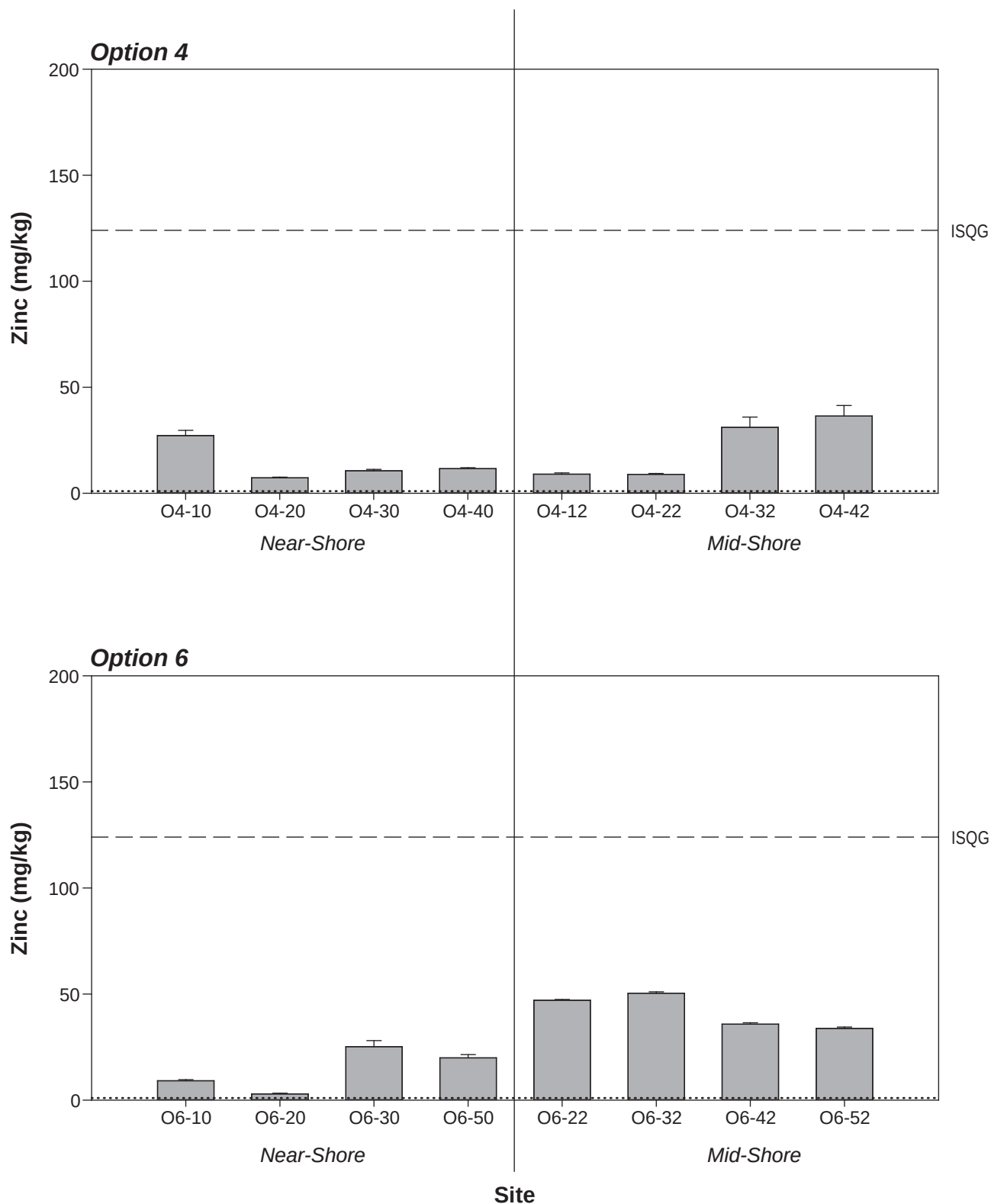
Notes: Error bars represent standard error of the mean of replicates.

Dotted lines represent analytical detection limit (mercury 0.005 mg/kg).

Values below the detection limit are plotted at half the detection limit.

Dashed lines represent CCME guidelines; the interim sediment quality guideline for mercury is 0.13 mg/kg and the probable effect level is 0.7 mg/kg.

No samples were collected at O6-40.



Notes: Error bars represent standard error of the mean of replicates.

Dotted lines represent analytical detection limit (zinc 1.0 mg/kg).

Values below the detection limit are plotted at half the detection limit.

Dashed lines represent CCME guidelines; the interim sediment quality guideline for zinc is 124 mg/kg and the probable effect level is 271 mg/kg.

No samples were collected at O6-40.

Figure 3.3-10

For the Option 6 MLA mid-shore area that was composed of finer sediments, arsenic concentrations were slightly higher than the ISQG level at 25% of sites, and copper was greater at 50% of sites. All three replicates for arsenic were greater than the ISQG guideline at the O6-22 and O6-32 sites. For copper, one replicate at the O4-32 site, two replicates at the O4-42 site, and all replicates at the O6-22 and O6-32 sites were greater than the ISQG guideline.

3.4 PHYTOPLANKTON

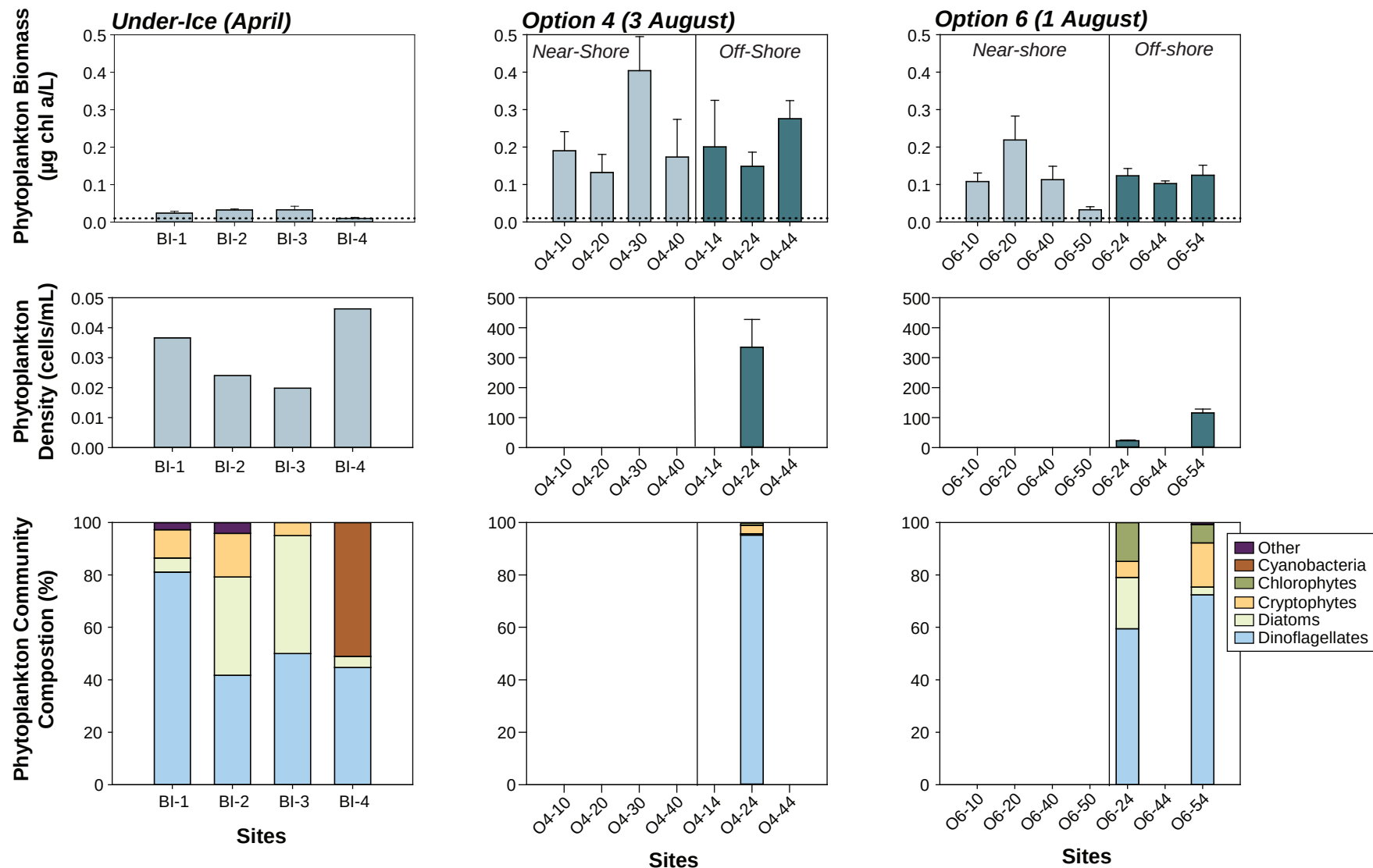
Phytoplankton are free-floating (planktonic) autotrophic organisms important in many aquatic systems as primary producers. They form the base of many aquatic food chains and are important in the cycles of nutrients and organic matter. The biomass of phytoplankton can provide valuable information on the productivity and activity of the aquatic food chain. Phytoplankton biomass was measured at four sites in southern Bathurst Inlet in April 2012, and at seven sites at each of the MLA options in August. Phytoplankton taxonomy samples, which are useful for understanding the processes shaping the phytoplankton community and relationships between the phytoplankton and higher trophic levels, were collected at four sites in Bathurst Inlet in April (BI sites) and three sites in August (one MLA Option 4 site and two sites at Option 6). Phytoplankton biomass (as chlorophyll *a*) results are presented in Appendix D.1 with the phytoplankton taxonomic results provided in Appendix D.2.

3.4.1 Biomass, Density, and Community Composition

Phytoplankton biomass was very low in southern Bathurst Inlet and ranged from nearly undetectable levels $\sim 0.01 \mu\text{g chl } a/\text{L}$ at BI-4 in April to a maximum of $\sim 0.4 \mu\text{g chl } a/\text{L}$ at O4-30 in August (Figure 3.4-1). The phytoplankton biomass in the Option 6 MLA was generally lower than in the Option 4 MLA, and may have indicated a north-south trend. April samples were collected under ice and light attenuation likely inhibited photosynthesis and ultimately the growth of phytoplankton. Long summer days and warmer temperatures were the probable causes of the ~ 10 -fold increase in phytoplankton biomass in the August samples. Although greater than the observations in April, phytoplankton biomass in August was still low for a near-shore environment, and was likely due to the lack of available inorganic nitrogen, such as nitrate or ammonia, in the environment (Figure 3.2-3).

The density of phytoplankton cells was at least 1,000-fold higher in the August samples than the April samples (Figure 3.4-1). This change in cell density between April and August was much greater than the change in chlorophyll *a* concentration, and was probably due to changes in the community composition and the physiological response of the phytoplankton to the different light regimes. Chlorophyll-*a*-rich diatoms were a more significant component of the community in April, while dinoflagellates and other, small and less chlorophyll-rich, flagellates like cryptomonads and chlorophytes were more prevalent in August. This shift in community composition, and the relative chlorophyll quotas, was likely compounded by the change in light conditions; the dim under-ice light environment would induce phytoplankton cells to increase their chlorophyll *a* content.

The phytoplankton community in Bathurst Inlet was dominated by dinoflagellates in both April and August (Figure 3.4-1; Plate 3.4-1), with a minimum of 38% of the community, by cell density, observed in April at BI-2. Diatoms were more prevalent in April samples (BI sites) and the only observation of cyanobacteria (*Merismopedia* sp.) occurred at the more northerly April site (BI-4). Many dinoflagellate taxa are able to vertically migrate to seek out nutrients and are mixotrophic or heterotrophic, which means the cells can also acquire energy from organic matter. The prevalence of dinoflagellates in Bathurst Inlet may be due to the dinoflagellates vertically migrating to the pycnocline or below to gather nitrogen combined with supplementing or replacing the energy from photosynthesis with energy from grazing and organic matter. *Katodinium glaucum* and *Heterocapsa* sp. were dominant taxa and formed up to 79% and 60% (respectively) of the entire community at two of the August sampling sites (Table 3.4-1). *Katodinium* is a heterotrophic taxon, while *Heterocapsa* is photosynthetic, and prevalence of these two taxa point to a mix of metabolisms required for success in Bathurst Inlet in the summer.



Notes: Error bars show the standard error of the mean of replicates from each site.

Dotted lines show the analytical detection limit of $0.01 \mu\text{g/L}$ for chlorophyll a phytoplankton biomass.

Phytoplankton density and community composition samples were only collected at three sites (O4-24, O6-24, and O6-54) in August 2012.



Plate 3.4-1. A dinoflagellate, *Protoperidinium* sp., collected from site BI-1, Back River Project, April 2012.

Table 3.4-1. Dominant Phytoplankton Taxa (% total individuals) in Bathurst Inlet in April (BI Sites) and August (MLA Sites), Back River Project, 2012

Taxon	Site						
	BI-1	BI-2	BI-3	BI-4	O4-24	O6-24	O6-54
Bacillariophyceae (Diatoms)							
<i>Nitzschia</i> sp.			15%			3%	
<i>Fragilaria</i> sp.		25%					
<i>Navicula</i> sp.	5%	13%	25%	4%		9%	1%
<i>Pleurosigma</i> sp.			5%			2%	
Chlorophyceae							
<i>Carteria</i> sp.					3%	13%	7%
Cryptophyceae							
<i>Cryptomonas</i> sp.	3%	8%				3%	
<i>Komma caudata</i>					2%		11%
<i>Teleaulax</i> sp.	8%	8%	5%		2%	3%	6%
Dinophyceae (Dinoflagellates)							
<i>Katodinium glaucum</i>	27%	8%	10%	17%	14%	11%	60%
<i>Gyrodinium</i> sp.	22%	13%	20%	21%	2%	4%	4%
<i>Heterocapsa</i> sp.	14%	4%	10%		79%	19%	5%
<i>Peridinium</i> sp.	3%					23%	3%
<i>Protoperidinium</i> sp.	16%	17%	10%	2%		1%	
Myxophyceae (Cyanobacteria)							
<i>Merismopedia</i> sp.				51%			

3.4.2 Richness and Diversity

Phytoplankton genus richness was similar between the April sites and the southerly Option 4 MLA site in August (~8 genera/sample), and higher at the Option 6 sites in August (~12 genera/sample; Figure 3.4-2). Diversity, measured by Simpson's D, was low at the Option 4 MLA site (0.35) due to the dominance by two genera of dinoflagellates (*Heterocapsa* and *Katodinium*) in the sample. In contrast, phytoplankton diversity was high at the BI and Option 6 MLA sites (~0.6 to 0.8), with the phytoplankton communities being more evenly distributed over a greater community richness.

3.5 BENTHIC INVERTEBRATES

Benthic macroinvertebrates (benthos or macrobenthos) are organisms greater than 500 µm in size living in or on the sediments (i.e., living in the benthic zone). Benthos are ecologically important organisms, serving as food sources for fish and often act to structure and modify the physical and chemical environment of the benthic zone. Because of their close association with the sediment and their limited mobility, benthos are useful indicators of sediment quality and local environmental conditions. Benthos samples were collected from the near-shore and mid-shore environment at each of the MLA (Option 4 and Option 6). Complete results of the benthos taxonomic results are provided in Appendix E.

3.5.1 Density and Community Composition

Benthos density varied ~10-fold across the different sampling sites, with ~50,000 organisms/m² at O4-20 and ~4,000 organisms/m² at O6-50 (Figure 3.5-1). Near-shore sites at the Option 4 MLA option were dominated by small bivalves (Plate 3.5-1), with *Macoma balthica* comprising at least ~90% of the total number of organisms in near-shore samples (Table 3.5-1). The waves and currents in the shallow water of the near-shore sites would likely select for bivalves over more physically-vulnerable taxa. The spit in the Option 4 MLA may offer some physical protection to waves and surface currents in the near-shore, and results in higher bivalve, and overall benthos density at site O4-20. The mid-shore site at the Option 4 MLA had benthos communities with a greater diversity of organisms, and higher densities of mobile organisms like polychaetes, cumaceans (hooded shrimp), and amphipods (Figure 3.5-2).

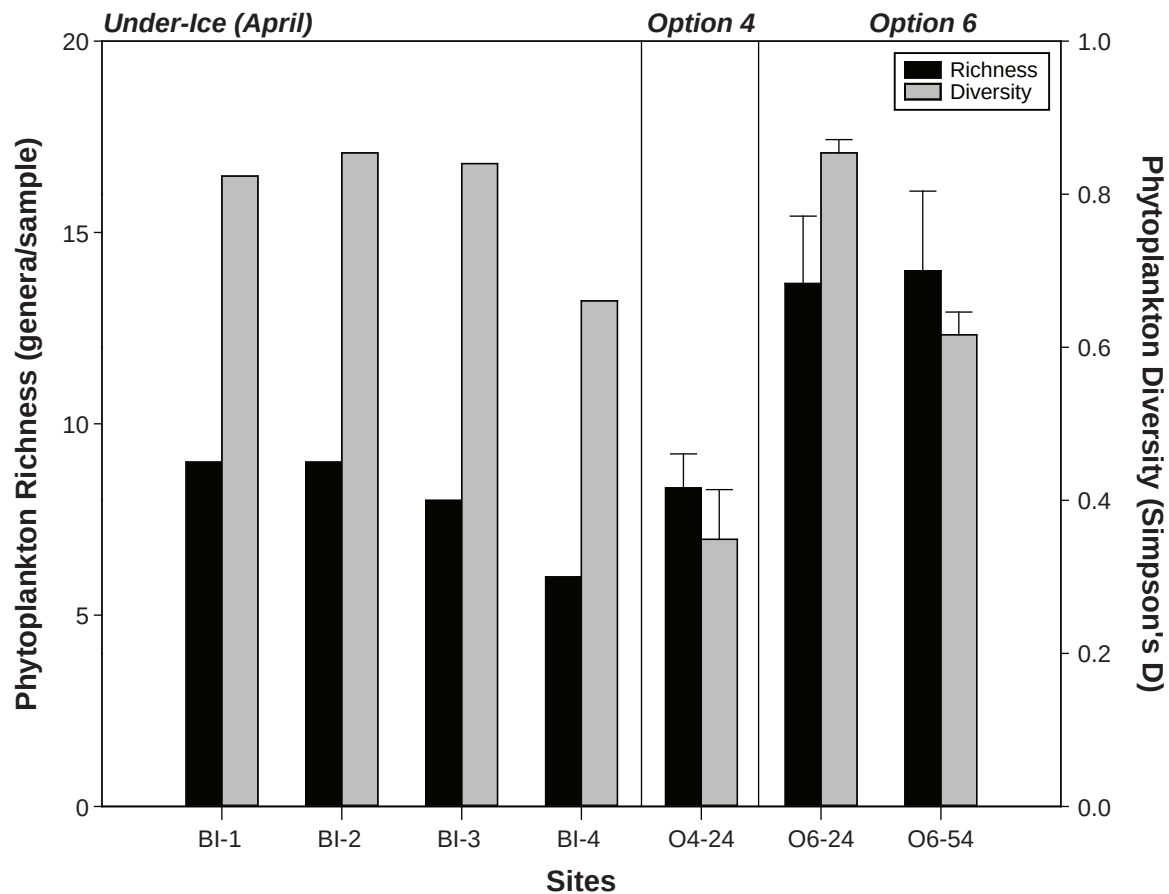
The general pattern in benthos abundance and community composition was similar between the Option 6 and the Option 4 MLAs. Bivalves, primarily *M. balthica*, dominated the near-shore sites, with polychaetes, cumaceans, and amphipods becoming dominant in deeper waters (Table 3.5-2 and Figure 3.5-2). Also, like in the Option 4 MLA, the peninsula in the Option 6 MLA may have been a local feature modifying the currents and waves, and providing some protection to more vulnerable benthos. Overall, the local water movement patterns were likely important factors in shaping the sediment composition at the MLA options and the benthos communities that lived within the substrate.

3.5.2 Richness and Diversity

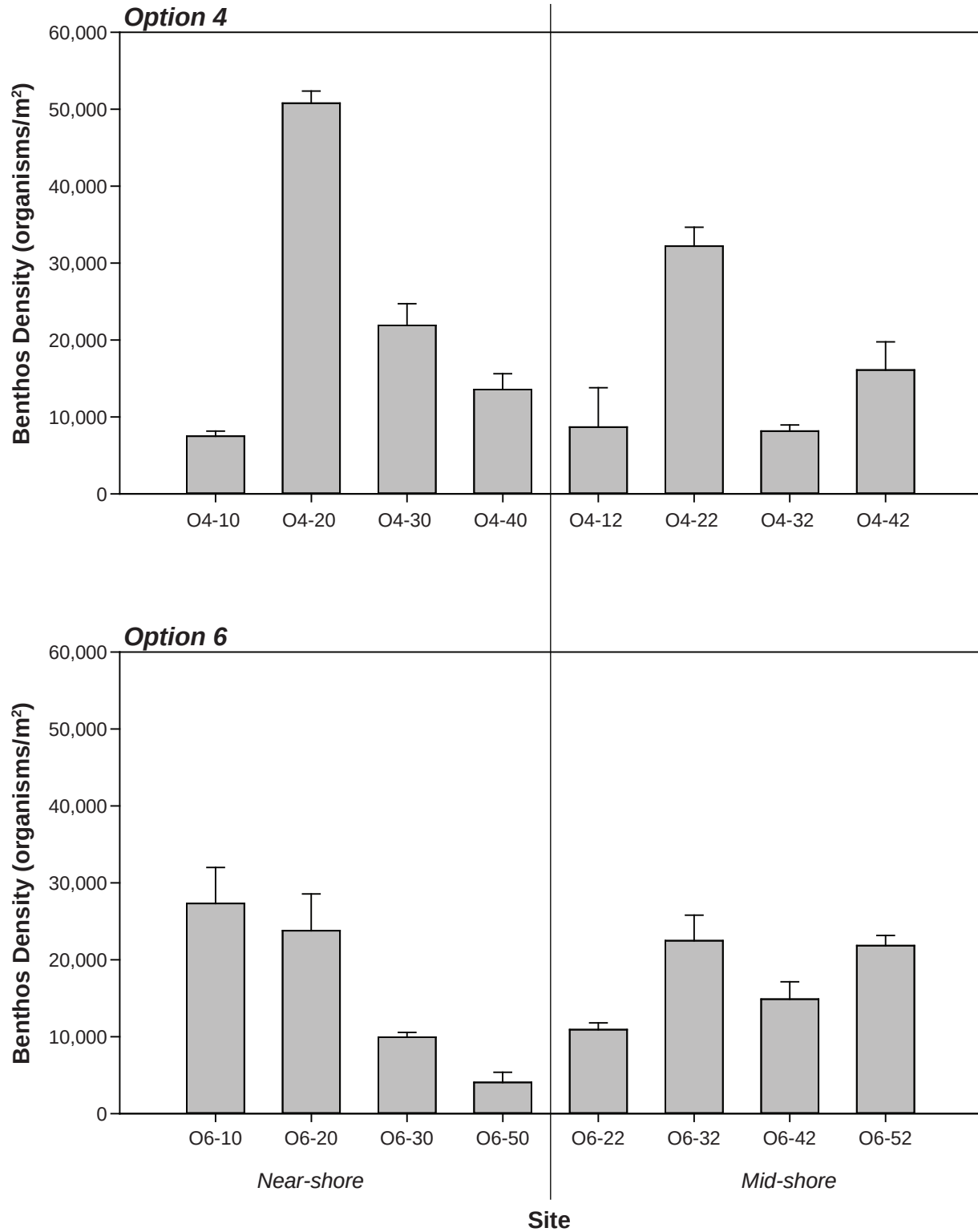
In general, benthos richness and diversity were much lower in the near-shore sites than in the mid-shore sites in the Option 4 MLA (Figure 3.5-3). The sites dominated by bivalves had few other taxa (richness less than ~8) and low indices of diversity (Simpson's D ~0.30 or less). Similarly, the mid-shore sites in the Option 6 MLA also had greater richness and diversity in benthos than the bivalve-dominated near-shore sites. Furthermore, the mid-shore communities in the Option 6 MLA were richer and more diverse (i.e., had more taxa present) than in the Option 4 MLA.

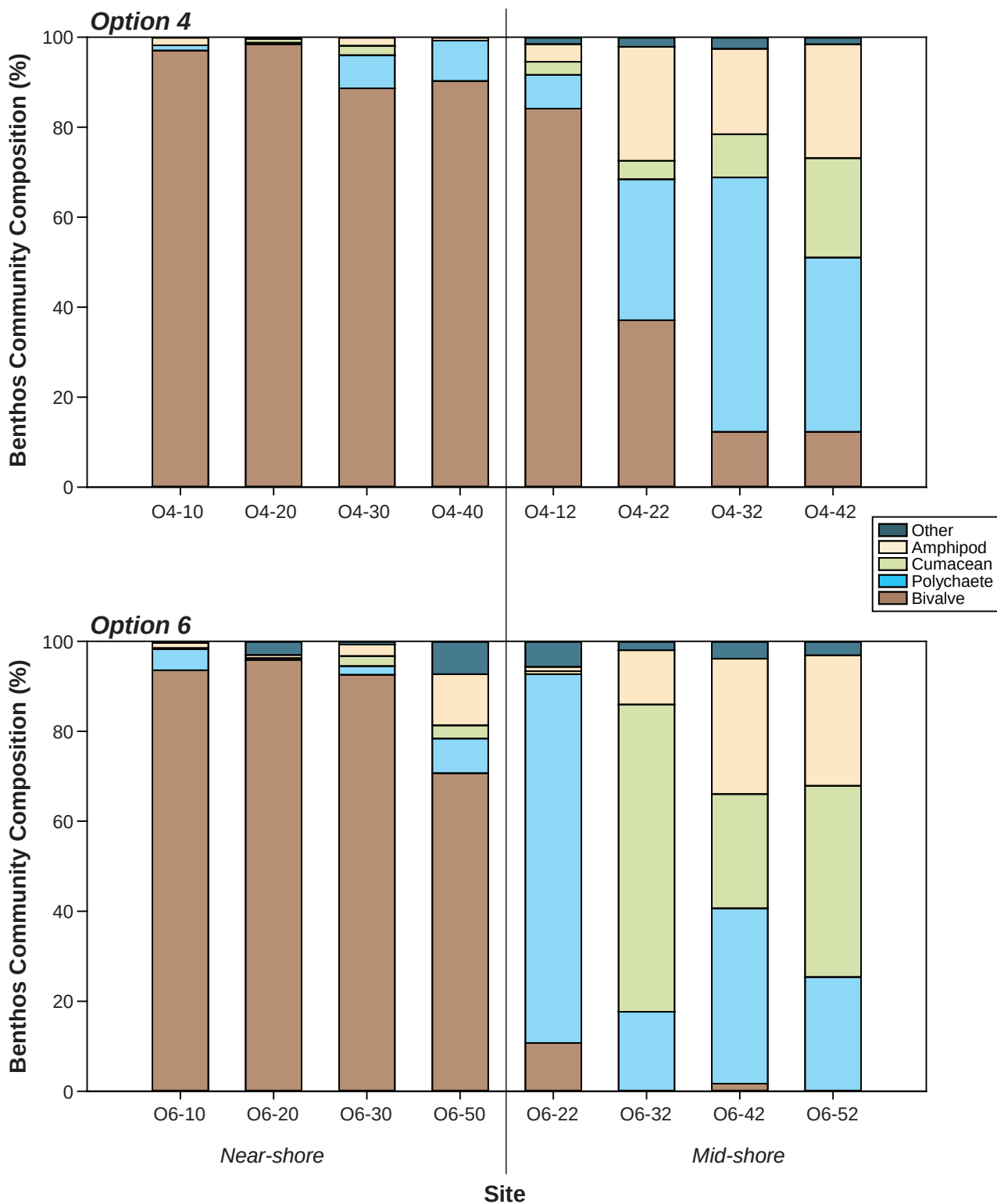
3.6 SHELLFISH

Bay mussels (*Mytilus trossulus*) were collected by Petite Ponar at one site in the Option 4 MLA (O4-42) and two sites in the Option 6 MLA (O6-24 and O6-50) in Bathurst Inlet. Ten mussels were subsampled and their physical characteristics were recorded and reported in Appendix F.1. The flesh was harvested and analyzed for metal content; the complete results are reported in Appendix F.2.



Notes: Error bars represent standard error of the mean of replicates from each site.
 Richness and diversity indices were calculated only for sites sampled for phytoplankton community composition (O4-24, O6-24, and O6-54) in August 2012.





Notes: Gastropods, echinurans, nemertean, ostracods, phoronids, and isopods comprised <5% of the total number of individuals and were pooled into the Other category.
 Values shown are the mean percentage from replicate samples from each site.
 No samples were collected at O6-40.

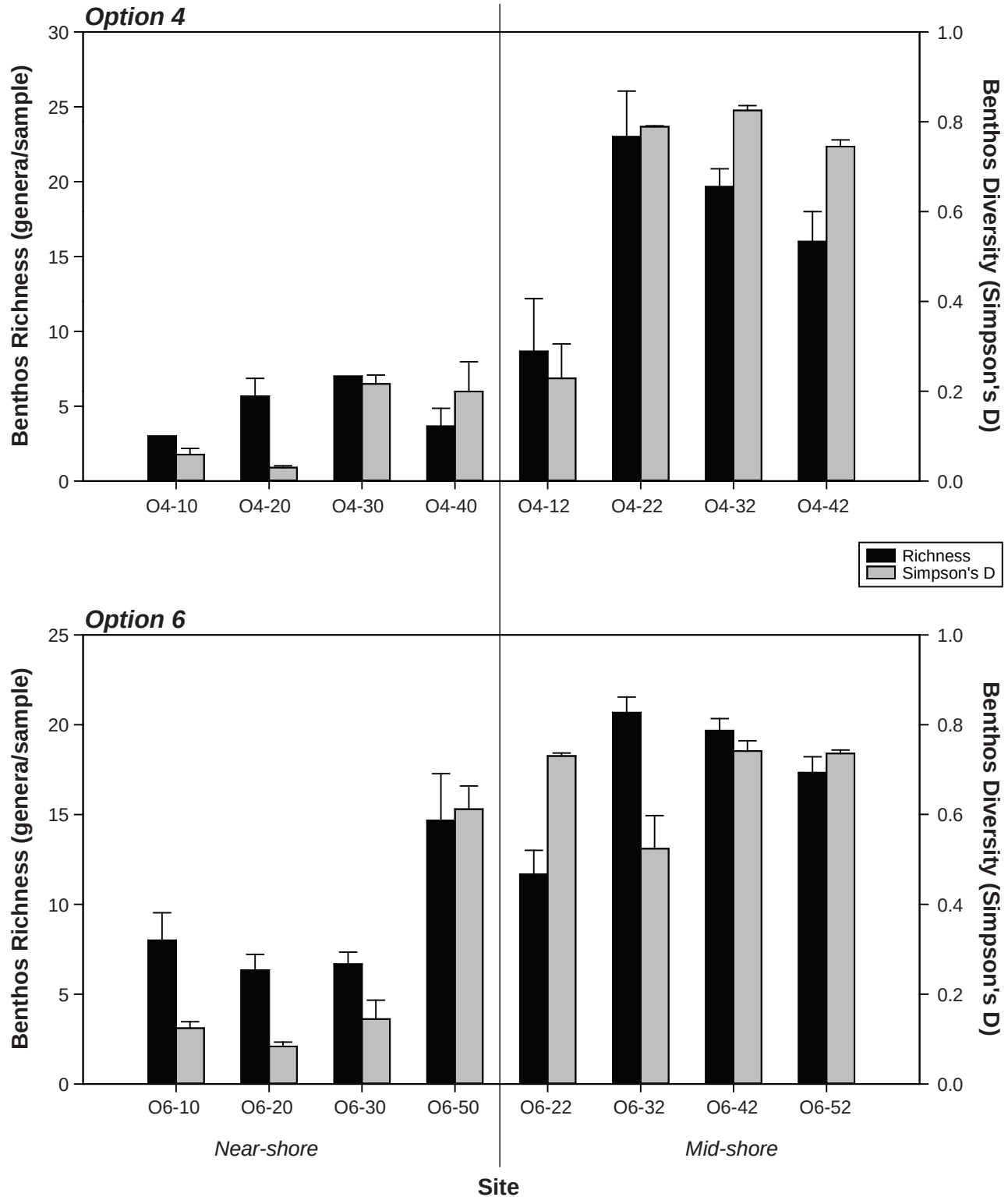




Plate 3.5-1. Bay mussels (*Mytilus trossulus*) collected from the Option 4 MLA, Back River Project, August 2012.

Table 3.5-1. Dominant Benthos Taxa (% total individuals) in Samples from Option 4 MLA, Back River Project, August 2012

Taxon	Site							
	04-10	04-20	04-30	04-40	04-12	04-22	04-32	04-42
Bivalvia								
<i>Macoma balthica</i>	97%	98%	89%	90%	84%	37%	7%	11%
<i>Mytilus trossulus</i>								
Polychaete Errantia								
<i>Nephtys</i> sp.						12%	30%	34%
Polychaete Sedentia								
<i>Aricidea nolani</i>							6%	
<i>Leitoscoloplos</i> sp.								
<i>Prionospio cirrifera</i> Cmplx.						7%	9%	
Cumacea								
<i>Brachydiastylis resima</i>							7%	21%
Amphipoda								
<i>Boeckosimus affinis</i>								
<i>Crassikorophium clarencense</i>								
<i>Pontoporeia femorata</i>						20%	16%	24%
Gastropoda								
<i>Cylinchna alba</i>								

Table 3.5-2. Dominant Benthos Taxa (% total individuals) in Samples from Option 6 MLA, Back River Project, August 2012

Taxon	Site							
	O6-10	O6-20	O6-30	O6-50	O6-22	O6-32	O6-42	O6-52
Bivalvia								
<i>Macoma balthica</i>	94%	96%	93%	63%	11%			
<i>Mytilus trossulus</i>				8%				
Polychaete Errantia								
<i>Nephtys</i> sp.					33%	12%	33%	21%
Polychaete Sedentia								
<i>Aricidea nolani</i>					36%			
<i>Leitoscoloplos</i> sp.					10%			
<i>Prionospio cirrifera</i> Cmplx.								
Cumacea								
<i>Brachydiastylis resima</i>						68%	25%	41%
Amphipoda								
<i>Boeckosimus affinis</i>				5%				
<i>Crassikorophium clarencense</i>						6%		9%
<i>Pontoporeia femorata</i>						5%	25%	19%
Gastropoda								
<i>Cylinchna alba</i>					5%			

3.6.1 Physical Characteristics

A summary of the size and weight of mussels collected during the August campaign is shown in Table 3.6-1. The mussels analyzed from O4-42 were larger (mean length: 58.4 mm; flesh weight: 4.7 g) than those collected at O6-42 (mean length: 47.2 mm; flesh weight: 2.7 g) and O6-50 (mean length: 47.4 mm; flesh weight: 2.9 g).

Table 3.6-1. Physical Characteristics of Bay Mussels (*Mytilus trossulus*) Collected in Bathurst Inlet, MLA sites, Back River Project, August 2012

Site	Length (mm)		Width (mm)		Height (mm)		Total Wet Weight (g)		Flesh Wet Weight (g)	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
O4-42	58.4	1.7	23.5	0.8	16.7	0.9	18.6	1.9	4.7	0.3
O6-42	47.2	1.6	18.5	0.4	14.0	0.8	10.8	1.0	2.7	0.3
O6-50	47.4	2.0	18.8	0.7	13.6	0.9	10.5	1.0	2.9	0.3

Note: 10 mussels were collected from each site.

3.6.2 Tissue Metals

Metal concentrations in mussels were generally similar between the Option 4 MLA site and the two Option 6 MLA sites (Table 3.6-2). The most abundant metals in the mussels were, in order of decreasing concentration, calcium, magnesium, iron, zinc, manganese, arsenic, cadmium, copper, chromium, lead, cobalt, molybdenum, and mercury. Iron and calcium concentrations were higher in mussels from O6-42 than the other sites, even excluding the anomalously high calcium value for Mussel #2 from O6-42. No correlations were observed between tissue metal content and mussel size, tissue weight, or sampling location.

Table 3.6-2. Metal Concentrations in the Bay Mussel (*Mytilus trossulus*) Tissue Collected from Bathurst Inlet Sediments, Back River Project, August 2012

Parameter	04-42					06-42					06-50				
	Minimum	Maximum	Mean	Median	Standard Error	Minimum	Maximum	Mean	Median	Standard Error	Minimum	Maximum	Mean	Median	Standard Error
Arsenic (As)	1.57	2.71	2.24	2.28	0.11	1.69	2.56	2.18	2.24	0.09	1.64	2.86	2.18	2.13	0.12
Cadmium (Cd)	0.96	3.07	1.69	1.70	0.20	1.04	2.90	2.25	2.30	0.19	1.24	3.64	1.93	2.00	0.23
Calcium (Ca)	237	922	377	325	63	263	53,100	6,390	794	5,205	316	1,240	581	541	93
Chromium (Cr)	0.17	0.65	0.31	0.26	0.05	0.26	1.10	0.74	0.82	0.09	0.19	0.73	0.43	0.41	0.06
Cobalt (Co)	0.10	0.25	0.18	0.18	0.02	0.15	0.35	0.27	0.29	0.02	0.15	0.32	0.23	0.23	0.02
Copper (Cu)	1.13	2.49	1.69	1.68	0.14	1.41	2.61	2.01	2.03	0.13	1.64	2.54	1.99	1.94	0.09
Iron (Fe)	42.7	232.0	100.7	80.6	19.3	59.6	370.0	246.9	274.0	33.3	50.0	278.0	142.6	112.0	24.2
Lead (Pb)	0.10	0.39	0.25	0.24	0.03	0.13	0.52	0.35	0.37	0.04	0.18	0.49	0.32	0.32	0.03
Magnesium (Mg)	516	688	602	616	17	561	735	660	672	15	482	660	562	558	18
Manganese (Mn)	1.45	3.31	2.18	1.90	0.23	2.19	5.49	4.38	4.69	0.32	1.24	3.94	2.49	2.26	0.29
Mercury (Hg)	0.010	0.027	0.020	0.020	0.001	0.015	0.029	0.025	0.026	0.001	0.019	0.033	0.024	0.024	0.001
Molybdenum (Mo)	0.06	0.22	0.10	0.08	0.01	0.052	0.198	0.111	0.106	0.013	0.067	0.148	0.097	0.078	0.010
Zinc (Zn)	11.2	25.2	17.7	18.7	1.6	10.6	34.5	16.5	15.7	2.1	12.2	30.7	18.0	16.8	1.7

Note: All units are in mg/kg wet weight.

The concentrations of mercury in mussel tissue from Bathurst Inlet in August 2012 were substantially lower than the 0.5 mg/kg of the Health Canada Standards (Maximum Levels) for Contaminants in Food. The highest recorded mercury concentration was 0.033 mg/kg, measured at a near-shore site next to the peninsula at Option 6 MLA (O6-50). The concentrations of arsenic in mussel tissue were lower than the 3.5 mg/kg tolerance for fish protein of the Food and Drug Regulations. The highest recorded arsenic concentration was 2.86 mg/kg that was measured in mussel tissue, also collected at O6-50 in the Option 6 MLA.

4. Summary

4. Summary

Two marine surveys were conducted as part of the 2012 marine baseline program in Southern Bathurst Inlet. The surveys were designed to capture the greatest seasonal variability of the environmental conditions in Bathurst Inlet—the April sampling for under-ice conditions and the August sampling for open-water conditions. Profiles of temperature, salinity, and dissolved oxygen were collected at all sites to provide information on the structure of the water column in the Marine Laydown options in Southern Bathurst Inlet.

The marine baseline sampling program showed Bathurst Inlet and the areas proximate to the MLA options to be pristine Arctic coastal environments, with generally clear water, low water column phytoplankton biomass, generally low nutrient and metal concentrations in both the water column and sediments, and abundant and diverse benthic invertebrate communities.

In April, Bathurst Inlet was covered by a solid sea-ice (~1.5 m thick) and the water column had a stable pycnocline around 10 m separating the cold and less saline surface layer from the warmer and saltier deep water. Oxygen concentrations under the ice were generally near-saturation in the surface layer, which was consistent with the very low phytoplankton biomass, with some oxygen depletion in the deep waters to 8 mg/L or below, characteristic of deep fjord systems. The low under-ice phytoplankton densities resulted in high macronutrient (nitrogen and phosphorus) and micronutrient (metals) concentrations in the surface layer due to reduced uptake and several months of re-mineralization. Under-ice conditions created an environment with no wind-driven circulation and limited freshwater inputs leading to very low levels of suspended solids. Under-ice metal concentrations were generally low, with all concentrations below CCME marine water quality guideline levels.

In August, no ice was present in Bathurst Inlet and the sampling at the MLA options showed a more variable environment that was more influenced by wind-driven currents, waves, and riverine and terrestrial runoff. The surface waters were much less saline in summer due to the contribution of the many rivers and streams flowing into the inlet. Sufficient light penetrated the clear waters to permit photosynthesis at the sediment surface in shallow waters and beneath the pycnocline in deeper waters. Near-shore effects from waves and runoff were evident in bulk measures of suspended material and in measurements of nutrient and metal concentrations. The near-shore effects were particularly apparent in the Option 6 MLA, with its relatively shallow and gentle bathymetry that encouraged wind-driven sediment resuspension and led to naturally higher concentrations of suspended solids, iron, and zinc.

Outside of these near-shore effects, nutrient and metal concentrations were generally low during the summer. Phytoplankton uptake and strong stratification inhibiting deep-water entrainment reduced nutrient concentrations in the surface waters, depleting nitrate to < 0.005 mg/L by August from its April concentration of ~0.6 mg/L. Cadmium concentrations were naturally elevated over CCME marine guidelines at both MLA options in the summer, reaching 0.00013 mg/L. No other water quality parameters were greater than the CCME marine guidelines.

The sediments in both MLA options showed a range of composition, from nearly completely sand to primarily composed of silt and clay. Sites in the Option 4 MLA were generally sandier than sites in the Option 6 MLA, which was potentially due to the relatively large peninsula in the Option 6 MLA interfering with currents and water movement. Sediment nutrient and metal concentrations were generally related to composition, with the sandier sediments containing lower nutrient and metal concentrations. Sediment metal concentrations were generally low, but arsenic and copper

concentrations were greater than CCME interim sediment quality guidelines at some of the sites composed of finer sediments. Arsenic and copper concentrations were greater than CCME guidelines at mid-shore sites west of the peninsula in the Option 6 MLA. Copper concentrations were also greater than the guidelines at two sites at the southern end of the Option 4 MLA.

The biology of the marine environment was characteristic of coastal Arctic ecosystems. A north-south gradient in phytoplankton biomass was observed, with higher chlorophyll *a* concentrations at the Option 4 MLA near to the head of the Inlet. Phytoplankton biomass was generally low (0.1 to 0.4 µg chlorophyll *a*/L in summer), and the phytoplankton community was likely starved for nitrogen. Perhaps as a result of the low nutrient conditions, the phytoplankton community was dominated by dinoflagellates, many of which are capable of sustaining themselves by vertically migrating to nutrient-rich deep waters or feeding on other plankton or organic matter. Phytoplankton taxonomic diversity was generally greater in August than April.

The benthic invertebrate community varied with composition of the sediments and the water depth. Near-shore environments were dominated by small bivalves, and benthos density was likely enhanced by topographic features protecting the near-shore environment from waves or currents. Motile organisms, such as amphipods, cumaceans (hooded shrimp), and some polychaetes (small segmented worms), were more prevalent in the deeper mid-shore sites. The deeper mid-shore environments had much higher taxonomic richness (~10 to 25 genera/sample) and diversity (~0.6 to 0.8, when bivalves were not dominant) than the near-shore, bivalve-dominated environment. Tissue from bivalves from the near-shore and mid-shore environments were collected and tested for metal concentrations. Metal concentrations in tissue were low, and arsenic and mercury tissue concentrations were lower than the guidelines for human consumption.

A comprehensive summary table of results from all sampled sites in 2012 is provided in Table 4-1.

Table 4-1. Summary of 2012 Marine Baseline Results for Bathurst Inlet Sites, Back River Project, 2012

			Dissolved Oxygen	Water Quality			Sediment Quality	Primary producers	Aquatic Macroinvertebrates
			Seasons and Depths that Exceed CCME Guidelines*	General Description	Nutrient Status	CCME Guideline Exceedances*	CCME Guideline Exceedances*	Phytoplankton	Benthos
Regional (Ice-covered)	BI-1	47	Winter, below pycnocline (15m)	normal seawater pH; low TSS	inorganic nitrogen (NH ₃ and NO ₃) and phosphorus available	none	nc	very low chl <i>a</i> biomass and concentration; moderate richness; high diversity; dominated by dinoflagellates	nc
	BI-2	87	none	normal seawater pH; low TSS	inorganic nitrogen (NH ₃ and NO ₃) and phosphorus available	none	nc	very low chl <i>a</i> biomass and concentration; moderate richness; high diversity; abundant diatoms	nc
	BI-3	97	none	normal seawater pH; low TSS	inorganic nitrogen (NH ₃ and NO ₃) and phosphorus available	none	nc	very low chl <i>a</i> biomass and concentration; moderate richness; high diversity; abundant diatoms	nc
	BI-4	97	none	normal seawater pH; low TSS	inorganic nitrogen (NH ₃ and NO ₃) and phosphorus available	none	nc	very low chl <i>a</i> biomass and concentration; lowest richness and diversity; cyanobacteria	nc
Local (Option 4 MLA)	O4-10	1.2	n/a ¹	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	none	none	low chl <i>a</i> biomass	low density, richness and diversity; dominated by bivalve <i>Macoma balthica</i>
	O4-12	8.1	n/a ¹	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	none	none	nc	low density, richness and diversity; dominated by bivalve <i>M. balthica</i>
	O4-14	31	n/a ¹	normal seawater pH with increase from primary production; increased TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	Cd	nc	low chl <i>a</i> biomass	nc
	O4-20	1.9	n/a ¹	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	none	none	low chl <i>a</i> biomass	highest density; low richness and diversity; dominated by bivalve <i>M. balthica</i>
	O4-22	4.6	n/a ¹	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	none	none	nc	high density, richness and diversity; <i>M. balthica</i> ~40% of community

(continued)

Table 4-1. Summary of 2012 Marine Baseline Results for Bathurst Inlet Sites, Back River Project, 2012 (continued)

			Dissolved Oxygen	Water Quality			Sediment Quality	Primary producers	Aquatic Macroinvertebrates
			Seasons and Depths that Exceed CCME Guidelines*	General Description	Nutrient Status	CCME Guideline Exceedances*	CCME Guideline Exceedances*	Phytoplankton	Benthos
Local (Option 4 MLA) (cont'd)	04-24	30	n/a ¹	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	none	nc	low chl <i>a</i> biomass and cell concentration; moderate richness and diversity; dominated by dinoflagellates	nc
	04-30	1.5	n/a ¹	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	none	none	highest chl <i>a</i> biomass	high density; low richness and diversity; dominated by bivalve <i>M. balthica</i>
	04-32	10	n/a ¹	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	none	Cu	nc	low density; high richness and diversity; motile polychaetes
	04-40	2.2	n/a ¹	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	none	none	low chl <i>a</i> biomass	moderate density; low richness and diversity; dominated by bivalve <i>M. balthica</i>
	04-42	5.6	n/a ¹	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	Cd	Cu	nc	moderate density; high richness and diversity; motile polychaetes
	04-44	42	n/a ¹	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	Cd	nc	low chl <i>a</i> biomass	nc
Local (Option 6 MLA)	06-10	2	n/a ¹	normal seawater pH with increase from primary production; increased TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	none	none	low chl <i>a</i> biomass	high density; low richness and diversity; dominated by bivalve <i>Macoma balthica</i>
	06-20	1.6	n/a ¹	normal seawater pH with increase from primary production; increased TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	none	none	higher chl <i>a</i> biomass	high density; low richness and diversity; dominated by bivalve <i>Macoma balthica</i>
	06-22	20	n/a ¹	normal seawater pH with increase from primary production; increased TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	none	As, Cu	nc	low density; moderate richness; high diversity; motile and sedentary polychaetes

(continued)

Table 4-1. Summary of 2012 Marine Baseline Results for Bathurst Inlet Sites, Back River Project, 2012 (completed)

Site Summer Sampling Max Depth (m)			Dissolved Oxygen	Water Quality			Sediment Quality	Primary producers	Aquatic Macroinvertebrates
			Seasons and Depths that Exceed CCME Guidelines*	General Description	Nutrient Status	CCME Guideline Exceedances*	CCME Guideline Exceedances*	Phytoplankton	Benthos
Local (Option 6 MLA) (cont'd)	06-24	17	n/a ¹	normal seawater pH with increase from primary production; increased TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	Cd	nc	low chl <i>a</i> biomass and very low cell concentration; high richness; moderate diversity; dominated by dinoflagellates	nc
	06-30	1.9	n/a ¹	normal seawater pH with increase from primary production; increased TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	none	none	nc	high density; low richness and diversity; dominated by bivalve <i>M. balthica</i>
	06-32	6.4	n/a ¹	normal seawater pH with increase from primary production; increased TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	none	As, Cu	nc	high density, richness, and diversity; dominated by cumaceans
	06-40	1.4	n/a ¹	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	none	none	low chl <i>a</i> biomass	nc
	06-42	4.9	n/a ¹	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	none	none	nc	high density, richness, and diversity; diverse motile community
	06-44	12.9	n/a ¹	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	Cd	nc	low chl <i>a</i> biomass	nc
	06-50	1.7	n/a ¹	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	none	none	low chl <i>a</i> biomass	low density; high richness and diversity; dominated by bivalve <i>M. balthica</i>
	06-52	6	n/a ¹	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	none	none	nc	high density, richness, and diversity; diverse motile community
	06-54	30	n/a ¹	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH ₃ or NO ₃); phosphate available; nutrient depletion in surface waters	Cd	nc	low chl <i>a</i> biomass and cell concentration; high richness; moderate diversity; dominated by dinoflagellates	nc

nc = not collected

¹ dissolved oxygen sensor failure in open-water sampling

* Parameters which, on average, exceeded CCME guidelines as calculated in tables.

Half the detection limit was substituted for values that were below the detection limit for the calculation of exceedance factors.

References

References

Definitions of the acronyms and abbreviations used in this reference list can be found in the Glossary and Abbreviations section.

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Appendix A.1

Temperature, Salinity, and Dissolved Oxygen Data for
Bathurst Inlet, Back River Project, 2012

Appendix A.1. Temperature, Salinity, and Dissolved Oxygen Data for Bathurst Inlet, Back River Project, 2012

BI-1 12-Apr-12					BI-1 12-Apr-12					BI-1 12-Apr-12					BI-1 12-Apr-12					BI-1 12-Apr-12									
Temperature	Depth	Salinity	Dissolved Oxygen	Dissolved Oxygen Saturation	Temperature	Depth	Salinity	Dissolved Oxygen	Dissolved Oxygen Saturation	Temperature	Depth	Salinity	Dissolved Oxygen	Dissolved Oxygen Saturation	Temperature	Depth	Salinity	Dissolved Oxygen	Dissolved Oxygen Saturation	Temperature	Depth	Salinity	Dissolved Oxygen	Dissolved Oxygen Saturation					
(°C)	(m)		(mg/L)	(%)	(°C)	(m)		(mg/L)	(%)	(°C)	(m)		(mg/L)	(%)	(°C)	(m)		(mg/L)	(%)	(°C)	(m)		(mg/L)	(%)					
-1.47	1.9	27.2	11.50	91.5	-1.44	7.5	27.2	11.29	89.9	-1.40	12.4	27.3	9.44	75.2	-0.65	16.3	27.6	7.70	62.8	-0.57	23.2	27.7	7.50	61.3	-0.60	34.3	27.8	7.27	59.4
-1.47	1.9	27.2	11.50	91.5	-1.44	7.5	27.2	11.30	90.0	-1.32	12.4	27.2	9.03	72.1	-0.62	16.3	27.6	7.65	62.4	-0.57	23.3	27.7	7.50	61.4	-0.60	34.3	27.8	7.25	59.2
-1.47	1.9	27.2	11.49	91.4	-1.45	7.5	27.2	11.28	89.8	-1.35	12.4	27.3	9.13	72.8	-0.62	16.3	27.6	7.64	62.3	-0.58	23.3	27.7	7.51	61.4	-0.59	34.3	27.8	7.23	59.2
-1.46	1.9	27.3	11.48	91.3	-1.45	7.5	27.2	11.26	89.6	-1.40	12.4	27.3	9.47	75.5	-0.61	16.3	27.6	7.62	62.2	-0.59	23.3	27.8	7.52	61.5	-0.59	35.3	27.8	7.21	59.0
-1.45	2.6	27.2	11.49	91.4	-1.45	7.5	27.2	11.28	89.8	-1.39	12.4	27.3	9.51	75.8	-0.62	16.3	27.6	7.65	62.4	-0.59	23.3	27.7	7.52	61.5	-0.61	37.9	27.8	7.21	59.0
-1.45	2.6	27.2	11.47	91.3	-1.45	7.5	27.2	11.29	89.8	-1.40	12.4	27.3	9.39	74.9	-0.60	16.3	27.6	7.60	62.1	-0.58	23.3	27.7	7.51	61.4	-0.61	39.3	27.8	7.21	58.9
-1.45	2.6	27.2	11.47	91.3	-1.45	7.5	27.2	11.27	89.7	-1.39	12.4	27.3	9.54	76.1	-0.59	17.3	27.7	7.60	62.1	-0.58	23.3	27.7	7.51	61.4	-0.59	39.4	27.8	7.19	58.8
-1.45	2.6	27.2	11.48	91.4	-1.44	7.5	27.2	11.30	89.9	-1.40	12.4	27.3	9.33	74.4	-0.59	17.3	27.7	7.60	62.0	-0.57	23.3	27.7	7.50	61.3	-0.60	39.4	27.8	7.21	58.9
-1.45	2.6	27.2	11.48	91.4	-1.45	7.5	27.2	11.25	89.5	-1.37	12.4	27.3	9.21	73.5	-0.59	17.3	27.7	7.58	61.9	-0.60	23.3	27.8	7.52	61.5	-0.60	39.5	27.8	7.21	58.9
-1.45	2.6	27.2	11.48	91.3	-1.45	7.5	27.2	11.21	89.2	-1.26	12.4	27.2	8.82	70.6	-0.59	17.3	27.7	7.59	62.0	-0.58	23.3	27.7	7.51	61.4	-0.61	39.5	27.8	7.20	58.9
-1.45	2.6	27.2	11.48	91.4	-1.45	7.5	27.2	11.27	89.7	-1.38	12.4	27.3	9.27	73.9	-0.58	17.3	27.7	7.57	61.9	-0.57	23.3	27.7	7.51	61.4	-0.60	39.5	27.8	7.21	58.9
-1.45	2.7	27.2	11.48	91.4	-1.45	8.3	27.2	11.18	89.0	-1.09	13.2	27.3	8.72	70.1	-0.59	17.3	27.7	7.59	62.0	-0.58	24.0	27.8	7.49	61.3	-0.60	39.5	27.8	7.20	58.9
-1.46	2.7	27.2	11.47	91.3	-1.45	8.3	27.2	11.17	88.9	-1.09	13.3	27.4	8.71	70.1	-0.59	17.3	27.7	7.59	62.0	-0.58	24.4	27.8	7.49	61.2	-0.60	39.5	27.8	7.21	58.9
-1.45	2.8	27.2	11.46	91.2	-1.45	8.3	27.2	11.15	88.7	-1.09	13.3	27.4	8.68	69.8	-0.58	17.4	27.7	7.56	61.8	-0.58	24.4	27.8	7.49	61.2	-0.60	39.5	27.8	7.20	58.9
-1.45	3.6	27.2	11.45	91.2	-1.45	8.3	27.2	11.16	88.8	-1.09	13.3	27.4	8.65	69.6	-0.57	18.2	27.7	7.55	61.7	-0.58	24.4	27.7	7.48	61.2	-0.61	39.5	27.8	7.20	58.9
-1.45	3.8	27.2	11.47	91.3	-1.45	8.4	27.2	11.13	88.6	-1.08	13.3	27.4	8.60	69.2	-0.57	18.2	27.7	7.56	61.8	-0.58	24.4	27.7	7.47	61.1	-0.60	39.5	27.8	7.20	58.9
-1.46	3.8	27.2	11.45	91.1	-1.45	8.4	27.2	11.17	88.9	-1.09	13.3	27.4	8.62	69.4	-0.58	18.2	27.7	7.56	61.8	-0.58	24.4	27.8	7.48	61.2	-0.61	39.5	27.8	7.20	58.9
-1.45	3.8	27.2	11.47	91.3	-1.45	8.4	27.2	11.11	88.5	-1.07	13.3	27.4	8.54	68.7	-0.57	18.2	27.7	7.56	61.8	-0.58	24.4	27.8	7.46	61.0	-0.60	39.5	27.8	7.20	58.8
-1.45	3.8	27.2	11.46	91.2	-1.45	8.4	27.2	10.99	87.5	-1.08	13.3	27.4	8.57	69.0	-0.57	18.2	27.7	7.56	61.8	-0.58	24.4	27.8	7.47	61.1	-0.60	39.5	27.8	7.20	58.9
-1.45	3.8	27.2	11.46	91.2	-1.44	8.4	27.2	11.10	88.4	-1.07	13.3	27.4	8.49	68.4	-0.57	18.4	27.7	7.54	61.7	-0.57	24.5	27.7	7.46	61.0	-0.60	39.5	27.8	7.20	58.9
-1.45	3.8	27.2	11.47	91.2	-1.45	8.5	27.2	11.04	87.8	-1.04	13.3	27.4	8.35	67.2	-0.57	19.3	27.7	7.54	61.7	-0.57	24.5	27.7	7.45	60.9	-0.60	39.5	27.8	7.20	58.8
-1.45	3.8	27.2	11.46	91.2	-1.44	8.5	27.2	11.09	88.2	-1.08	13.3	27.3	8.43	67.8	-0.57	19.3	27.7	7.54	61.7	-0.58	24.6	27.8	7.44	60.8	-0.59	39.6	27.8	7.19	58.8
-1.45	4.0	27.2	11.44	91.0	-1.44	8.5	27.2	11.10	88.4	-0.93	13.3	27.3	8.23	66.5	-0.57	19.3	27.7	7.54	61.7	-0.58	26.3	27.8	7.42	60.7	-0.59	39.6	27.8	7.19	58.8
-1.45	4.6	27.2	11.44	91.0	-1.45	8.5	27.2	11.07	88.1	-0.80	14.0	27.4	8.17	66.2	-0.57	19.3	27.7	7.54	61.7	-0.60	28.3	27.8	7.41	60.6	-0.59	40.7	27.8	7.20	58.9
-1.45	4.6	27.2	11.45	91.1	-1.45	8.5	27.2	11.06	88.0	-0.77	14.3	27.4	7.97	64.7	-0.56	19.3	27.7	7.54	61.7	-0.58	29.2	27.8	7.35	60.1	-0.59	41.9	27.8	7.21	59.0
-1.44	4.6	27.2	11.45	91.2	-1.44	8.7	27.2	10.92	86.9	-0.80	14.3	27.5	8.13	65.9	-0.57	19.3	27.7	7.54	61.7	-0.61	29.3	27.8	7.40	60.5	-0.60	43.6	27.8	7.23	59.1
-1.45	4.6	27.2	11.45	91.2	-1.44	9.4	27.2	10.61	84.4	-0.80	14.3	27.5	8.18	66.3	-0.56	19.4	27.7	7.54	61.6	-0.60	29.3	27.8	7.39	60.4	-0.60	45.6	27.8	7.25	59.3
-1.46	4.6	27.2	11.42	90.9	-1.44	9.5	27.3	10.89	86.7	-0.80	14.3	27.5	8.11	65.8	-0.56	19.4	27.7	7.54	61.6	-0.60	29.3	27.8	7.40	60.5	-0.61	45.9	27.8	7.42	60.7
-1.45	4.6	27.2	11.45	91.1	-1.45	9.5	27.2	10.77	85.7	-0.79	14.3	27.5	8.09	65.6	-0.57	19.7	27.7	7.53	61.6	-0.59	29.3	27.8	7.39	60.4	-0.61	45.9	27.8	7.31	59.7
-1.45	4.6	27.2	11.45	91.1	-1.44	9.5	27.3	10.90	86.8	-0.80	14.3	27.5	8.12	65.9	-0.56	20.3	27.7	7.53	61.6	-0.60	29.3	27.8	7.40	60.5	-0.61	45.9	27.8	7.36	60.2
-1.45	4.6	27.2	11.45	91.1	-1.45	9.5	27.2	10.71	85.3	-0.80	14.4	27.5	8.14	66.1	-0.57	20.3	27.7	7.53	61.6	-0.60	29.3	27.8	7.38	60.4	-0.61	45.9	27.8	7.38	60.3
-1.45	4.6	27.2	11.44	91.0	-1.43	9.5	27.3	10.92	87.0	-0.80	14.4	27.5	8.18	66.4	-0.56	20.3	27.7	7.53	61.6	-0.60	29.3	27.8	7.40	60.5	-0.61	45.9	27.8	7.33	59.9
-1.45	4.6	27.2	11.44	91.1	-1.44	9.5	27.3	10.86	86.5	-0.80	14.4	27.5	8.19	66.4	-0.56	20.3	27.7	7.53	61.6	-0.59	29.3	27.8	7.37	60.3	-0.61	45.9	27.8	7.29	59.6
-1.45	4.7	27.2	11.44	91.0	-1.43	9.5	27.3	10.93	87.0	-0.78	14.4	27.5	8.03	65.2	-0.56	20.3	27.7	7.54	61.6	-0.59	29.3	27.8	7.38	60.3	-0.62	45.9	27.8	7.44	60.8
-1.45	4.7	27.2	11.45	91.1	-1.44	9.5	27.2	10.82	86.2	-0.80	14.4	27.5	8.17	66.3	-0.57	20.3	27.7	7.54	61.6	-0.58	29.3	27.8	7.36	60.2	-0.61	45.9	27.8	7.40	60.5
-1.45	4.7	27.2	11.42	90.8	-1.45	9.5	27.2	10.80	86.0	-0.80	14.4	27.5	8.15	66.1	-0.57	20.3	27.7	7.54	61.6	-0.59	29.3	27.8	7.37	60.3	-0.61	45.9	27.8	7.35	60.1
-1.44	5.5	27.2	11.41	90.8	-1.43	9.5	27.3	10.91	86.9	-0.79	14.4	27.5	8.07	65.5	-0.57	20.3	27.7	7.53	61.6	-0.58	29.3	27.8	7.36	60.2	-0.61	45.9	27.8	7.32	59.9
-1.46	5.6	27.2	11.38	90.5	-1.44	9.5	27.3	10.85	86.4	-0.80	14.4	27.5	8.16	66.2	-0.57	20.9	27.7	7.53	61.6	-0.58	29.3	27.8	7.36	60.2	-0.61	46.0	27.8	7.47	61.1
-1.45	5.6	27.2	11.40	90.8	-1.44	9.5	27.3	10.87	86.5	-0.72	14.8	27.4	7.91	64.3	-0.57	20.9	27.7	7.52	61.5	-0.59	31.0	27.8	7.32	59.9	-0.61	46.0	27.8	7.32	59.8
-1.45	5.6	27.2	11.41	90.8	-1.44	9.5	27.2	10.84	86.3	-0.71	15.2	27.5	7.90	64.3	-0.57	21.0	27.7	7.53	61.6	-0.60	32.7	27.8	7.30	59.7	-0.61	46.0	27.8	7.46	60.9
-1.44	5.6	27.2	11.42	90.9	-1.44	9.5	27.3	10.88	86.6	-0.70	15.2	27.6	7.87	64.1	-0.57	21.0	27.7	7.53	61.6	-0.61	34.2	27.8	7.30	59.6	-0.61	46.0	27.8	7.26	59.3
-1.45	5.6	27.2	11.41	90.8	-1.45	10.4	27.2	10.50	83.6	-0.70	15.2	27.5	7.84	63.8	-0.57	21.0	27.7	7.53	61.6	-0.59	34.2	27.8	7.22	59.0	-0.62	46.0	27.8	7.28	59.5
-1.46	5.6	27.2	11.40	90.7	-1.44	10.4	27.2	10.56	84.0	-0.70	15.2																		

Appendix A.1. Temperature, Salinity, and Dissolved Oxygen Data for Bathurst Inlet, Back River Project, 2012

BI-2 12-Apr-12					BI-2 12-Apr-12					BI-2 12-Apr-12					BI-2 12-Apr-12					BI-2 12-Apr-12					BI-2 12-Apr-12				
Temperature	Depth	Salinity	Dissolved Oxygen	Dissolved Oxygen Saturation	Temperature	Depth	Salinity	Dissolved Oxygen	Dissolved Oxygen Saturation	Temperature	Depth	Salinity	Dissolved Oxygen	Dissolved Oxygen Saturation	Temperature	Depth	Salinity	Dissolved Oxygen	Dissolved Oxygen Saturation	Temperature	Depth	Salinity	Dissolved Oxygen	Dissolved Oxygen Saturation	Temperature	Depth	Salinity	Dissolved Oxygen	Dissolved Oxygen Saturation
(°C)	(m)		(mg/L)	(%)	(°C)	(m)		(mg/L)	(%)	(°C)	(m)		(mg/L)	(%)	(°C)	(m)		(mg/L)	(%)	(°C)	(m)		(mg/L)	(%)	(°C)	(m)		(mg/L)	(%)
-1.45	1.7	27.1	11.87	94.3	-1.43	9.7	27.2	10.97	87.3	-0.71	15.3	27.5	8.14	66.2	-0.59	24.1	27.7	7.88	64.4	-0.59	34.1	27.8	7.96	65.1	-0.62	48.1	27.8	7.98	65.2
-1.45	1.7	27.1	11.88	94.4	-1.43	10.2	27.2	10.81	86.1	-0.68	15.3	27.6	8.08	65.8	-0.59	24.1	27.7	7.88	64.4	-0.59	34.2	27.8	7.97	65.2	-0.61	48.1	27.8	7.98	65.2
-1.45	1.7	27.1	11.88	94.4	-1.43	10.2	27.2	10.87	86.6	-0.66	15.4	27.6	8.05	65.6	-0.59	24.1	27.7	7.87	64.3	-0.59	35.7	27.8	7.99	65.3	-0.62	48.1	27.8	7.98	65.2
-1.44	1.8	27.2	11.85	94.3	-1.43	10.2	27.2	10.91	86.9	-0.65	16.1	27.6	8.05	65.6	-0.59	24.1	27.7	7.87	64.4	-0.60	38.1	27.8	7.99	65.3	-0.63	48.1	27.8	7.98	65.2
-1.43	2.7	27.2	11.86	94.4	-1.43	10.2	27.3	10.94	87.1	-0.65	16.1	27.6	8.05	65.6	-0.59	24.1	27.7	7.87	64.3	-0.59	38.7	27.8	8.02	65.6	-0.60	48.1	27.8	7.96	65.1
-1.44	2.7	27.2	11.85	94.4	-1.43	10.3	27.3	10.97	87.4	-0.65	16.1	27.6	8.03	65.5	-0.59	24.1	27.7	7.86	64.3	-0.60	38.8	27.8	8.00	65.4	-0.59	48.1	27.8	7.95	65.0
-1.44	2.7	27.2	11.86	94.4	-1.43	10.3	27.2	10.73	85.4	-0.65	16.1	27.6	8.05	65.6	-0.58	24.1	27.7	7.86	64.3	-0.59	38.8	27.8	8.00	65.4	-0.59	48.3	27.8	7.94	64.9
-1.44	2.7	27.2	11.84	94.3	-1.43	10.3	27.2	10.60	84.4	-0.65	16.2	27.6	8.02	65.4	-0.58	24.1	27.7	7.86	64.3	-0.60	38.8	27.8	8.00	65.4	-0.59	50.1	27.8	7.94	64.9
-1.44	3.7	27.2	11.81	94.0	-1.43	11.3	27.2	10.37	82.6	-0.65	16.2	27.6	8.03	65.4	-0.59	24.1	27.7	7.87	64.3	-0.60	38.8	27.8	8.00	65.4	-0.59	52.0	27.8	7.93	64.9
-1.44	3.7	27.2	11.83	94.2	-1.42	11.3	27.3	10.49	83.6	-0.65	16.2	27.6	8.03	65.5	-0.58	24.1	27.7	7.86	64.3	-0.61	38.8	27.8	8.00	65.4	-0.61	54.0	27.8	7.92	64.8
-1.43	3.7	27.2	11.84	94.3	-1.42	11.3	27.3	10.55	84.1	-0.64	16.3	27.6	7.98	65.1	-0.58	24.1	27.7	7.86	64.3	-0.60	38.8	27.8	8.00	65.4	-0.61	55.3	27.8	7.92	64.7
-1.43	3.7	27.2	11.84	94.3	-1.42	11.3	27.3	10.52	83.8	-0.64	16.3	27.6	8.00	65.2	-0.59	24.1	27.7	7.87	64.3	-0.59	38.8	27.8	8.00	65.4	-0.62	55.3	27.8	7.92	64.8
-1.44	3.7	27.2	11.83	94.2	-1.43	11.3	27.3	10.44	83.1	-0.65	16.3	27.6	8.01	65.3	-0.58	24.1	27.7	7.86	64.3	-0.59	38.8	27.8	8.01	65.5	-0.61	55.3	27.8	7.92	64.7
-1.44	3.7	27.2	11.84	94.3	-1.43	11.3	27.2	10.15	80.9	-0.65	16.3	27.6	8.02	65.4	-0.59	24.1	27.7	7.86	64.3	-0.59	38.8	27.8	8.00	65.4	-0.62	55.3	27.8	7.92	64.7
-1.43	3.7	27.2	11.84	94.3	-1.43	11.4	27.3	10.25	81.7	-0.63	17.1	27.6	7.97	65.1	-0.59	24.1	27.7	7.86	64.3	-0.60	38.8	27.8	8.00	65.4	-0.61	55.3	27.8	7.92	64.7
-1.43	4.6	27.2	11.81	94.0	-1.42	11.4	27.3	10.33	82.3	-0.62	17.1	27.6	7.97	65.1	-0.58	24.1	27.7	7.86	64.3	-0.60	38.8	27.8	8.00	65.4	-0.62	55.3	27.9	7.92	64.8
-1.44	4.6	27.2	11.81	94.0	-1.40	11.4	27.2	9.92	79.1	-0.62	17.2	27.6	7.97	65.0	-0.59	24.1	27.7	7.87	64.4	-0.61	38.8	27.8	8.00	65.4	-0.62	55.3	27.8	7.93	64.8
-1.44	4.7	27.2	11.80	93.9	-1.16	12.3	27.0	8.68	69.5	-0.62	17.2	27.6	7.95	64.9	-0.59	24.1	27.7	7.87	64.4	-0.61	38.8	27.8	8.00	65.4	-0.62	55.3	27.8	7.92	64.8
-1.44	4.7	27.2	11.79	93.8	-1.35	12.3	27.2	9.03	72.1	-0.62	17.2	27.6	7.96	65.0	-0.59	24.1	27.7	7.87	64.3	-0.60	38.8	27.8	8.00	65.4	-0.60	55.3	27.8	7.91	64.7
-1.44	4.7	27.2	11.78	93.8	-1.39	12.3	27.3	9.22	73.5	-0.62	17.2	27.7	7.96	65.0	-0.59	24.1	27.7	7.87	64.4	-0.59	38.8	27.8	8.01	65.5	-0.61	55.3	27.8	7.93	64.8
-1.44	5.5	27.2	11.77	93.7	-1.39	12.3	27.3	9.32	74.3	-0.62	17.2	27.7	7.97	65.0	-0.58	25.0	27.7	7.87	64.3	-0.60	38.8	27.8	8.00	65.4	-0.61	55.3	27.8	7.92	64.7
-1.44	5.6	27.2	11.75	93.6	-1.41	12.3	27.3	9.47	75.5	-0.61	17.2	27.6	7.94	64.8	-0.59	27.0	27.8	7.88	64.4	-0.59	40.5	27.8	8.03	65.7	-0.60	55.3	27.8	7.91	64.7
-1.44	5.7	27.2	11.73	93.4	-1.37	12.3	27.3	9.86	78.7	-0.61	17.7	27.7	7.93	64.7	-0.60	29.0	27.8	7.88	64.4	-0.60	42.6	27.8	8.03	65.7	-0.61	55.3	27.8	7.91	64.7
-1.44	5.7	27.2	11.76	93.6	-1.39	12.3	27.3	9.72	77.5	-0.60	18.3	27.7	7.92	64.7	-0.60	29.1	27.8	7.89	64.5	-0.60	43.6	27.8	8.02	65.6	-0.60	55.3	27.8	7.91	64.7
-1.44	5.7	27.2	11.76	93.7	-1.37	12.3	27.3	9.82	78.4	-0.60	18.3	27.7	7.91	64.6	-0.60	29.1	27.8	7.89	64.5	-0.59	43.6	27.8	8.02	65.6	-0.61	55.3	27.8	7.91	64.7
-1.43	6.4	27.2	11.71	93.2	-1.40	12.3	27.3	9.61	76.6	-0.60	18.3	27.7	7.92	64.7	-0.59	29.1	27.8	7.89	64.5	-0.59	43.6	27.8	8.02	65.5	-0.58	55.3	27.8	7.92	64.8
-1.44	6.5	27.2	1																										

Appendix A.1. Temperature, Salinity, and Dissolved Oxygen Data for Bathurst Inlet, Back River Project, 2012

BI-2 12-Apr-12					BI-3 12-Apr-12					BI-3 12-Apr-12					BI-3 12-Apr-12					BI-3 12-Apr-12					BI-3 12-Apr-12				
Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)
-0.59	71.8	27.8	8.02	65.6	-1.46	1.9	27.0	13.40	106.5	-1.43	9.8	27.2	11.96	95.2	-0.58	19.3	27.7	7.88	64.4	-0.58	36.9	27.8	8.07	66.0	-0.55	76.2	27.9	7.73	63.3
-0.60	74.3	27.9	8.01	65.5	-1.46	1.9	27.0	13.41	106.5	-1.44	10.6	27.2	11.80	94.0	-0.58	19.3	27.7	7.88	64.4	-0.59	36.9	27.8	8.07	66.0	-0.55	76.2	27.8	7.75	63.4
-0.61	75.9	27.9	7.99	65.4	-1.46	1.9	27.0	13.40	106.4	-1.44	10.6	27.2	11.47	91.3	-0.58	19.3	27.7	7.87	64.4	-0.59	36.9	27.8	8.07	66.0	-0.55	76.2	27.8	7.71	63.2
-0.61	75.9	27.9	8.01	65.5	-1.46	1.9	27.0	13.41	106.5	-1.44	10.6	27.2	11.66	92.8	-0.58	19.3	27.7	7.88	64.4	-0.59	36.9	27.8	8.07	66.0	-0.55	76.2	27.8	7.72	63.2
-0.61	75.9	27.9	8.00	65.4	-1.45	1.9	27.1	13.38	106.3	-1.44	10.6	27.2	11.76	93.6	-0.58	19.3	27.7	7.87	64.4	-0.58	37.0	27.8	8.08	66.1	-0.55	76.2	27.8	7.72	63.2
-0.61	75.9	27.9	8.01	65.5	-1.46	1.9	27.1	13.38	106.4	-1.43	10.6	27.2	11.87	94.5	-0.58	19.3	27.7	7.88	64.4	-0.58	38.7	27.8	8.11	66.3	-0.55	76.2	27.8	7.71	63.1
-0.61	75.9	27.8	8.00	65.4	-1.44	2.2	27.2	13.35	106.2	-1.43	10.6	27.2	11.92	94.9	-0.58	19.3	27.7	7.88	64.4	-0.58	41.1	27.8	8.12	66.4	-0.55	76.2	27.9	7.73	63.3
-0.61	75.9	27.9	7.99	65.3	-1.44	2.9	27.2	13.34	106.2	-1.43	10.7	27.2	11.96	95.2	-0.58	19.3	27.7	7.88	64.4	-0.59	44.1	27.8	8.12	66.4	-0.55	76.2	27.8	7.70	63.0
-0.60	75.9	27.8	7.98	65.3	-1.44	2.9	27.2	13.37	106.3	-1.43	11.3	27.2	11.18	89.0	-0.58	19.4	27.7	7.88	64.4	-0.58	45.7	27.8	8.13	66.5	-0.54	76.3	27.8	7.69	62.9
-0.59	75.9	27.8	7.98	65.2	-1.43	2.9	27.2	13.37	106.4	-1.44	11.6	27.2	10.59	84.3	-0.58	21.5	27.7	7.88	64.4	-0.59	45.7	27.8	8.13	66.5	-0.54	76.3	27.8	7.66	62.7
-0.59	75.9	27.8	7.97	65.2	-1.43	2.9	27.2	13.37	106.4	-1.44	11.6	27.2	10.87	86.5	-0.59	23.2	27.7	7.89	64.5	-0.59	45.7	27.8	8.13	66.5	-0.54	76.3	27.8	7.62	62.4
-0.60	75.9	27.8	8.00	65.4	-1.44	2.9	27.2	13.37	106.4	-1.44	11.6	27.2	11.00	87.5	-0.58	23.2	27.7	7.89	64.5	-0.59	45.7	27.8	8.12	66.4	-0.54	79.0	27.9	7.59	62.2
-0.61	75.9	27.8	8.00	65.4	-1.44	2.9	27.2	13.37	106.4	-1.42	11.6	27.2	11.13	88.6	-0.58	23.2	27.7	7.90	64.6	-0.59	45.7	27.8	8.13	66.5	-0.54	81.8	27.9	7.59	62.2
-0.60	75.9	27.9	7.99	65.3	-1.43	2.9	27.2	13.37	106.4	-1.43	11.6	27.2	11.08	88.2	-0.58	23.2	27.7	7.89	64.5	-0.58	45.7	27.8	8.13	66.5	-0.54	84.3	27.9	7.61	62.3
-0.61	75.9	27.8	8.01	65.5	-1.45	3.6	27.2	13.32	106.0	-1.27	12.5	27.1	8.95	71.5	-0.58	23.2	27.7	7.89	64.5	-0.59	45.7	27.8	8.13	66.5	-0.54	86.1	27.9	7.62	62.4
-0.61	75.9	27.8	8.01	65.5	-1.44	3.6	27.2	13.33	106.0	-1.41	12.5	27.2	10.16	80.9	-0.58	23.2	27.7	7.90	64.6	-0.58	45.7	27.8	8.13	66.5	-0.54	86.1	27.9	7.62	62.4
-0.59	75.9	27.8	7.97	65.2	-1.44	3.7	27.2	13.34	106.2	-1.40	12.5	27.2	9.56	76.2	-0.58	23.2	27.7	7.89	64.5	-0.58	45.7	27.8	8.13	66.5	-0.54	86.1	27.9	7.63	62.5
-0.62	75.9	27.9	8.01	65.4	-1.44	3.7	27.2	13.34	106.1	-1.42	12.5	27.2	10.06	80.1	-0.58	23.2	27.7	7.90	64.6	-0.58	45.7	27.8	8.13	66.5	-0.54	86.1	27.9	7.62	62.4
-0.59	77.0	27.8	7.96	65.1	-1.45	3.7	27.2	13.30	105.8	-1.42	12.5	27.2	9.86	78.6	-0.58	23.2	27.7	7.90	64.6	-0.58	45.7	27.8	8.13	66.5	-0.54	86.1	27.9	7.63	62.5
-0.59	79.4	27.9	7.96	65.1	-1.43	3.7	27.2	13.34	106.2	-1.42	12.5	27.2	10.00	79.6	-0.58	23.2	27.7	7.90	64.6	-0.59	45.7	27.8	8.13	66.5	-0.54	86.1	27.9	7.61	62.3
-0.59	81.6	27.9	7.96	65.1	-1.43	3.7	27.2	13.35	106.2	-1.42	12.5	27.2	10.29	82.0	-0.58	23.3	27.7	7.89	64.5	-0.58	45.7	27.8	8.13	66.5	-0.54	86.1	27.9	7.61	62.4
-0.61	83.9	27.9	7.96	65.1	-1.43	4.6	27.2	13.28	105.7	-1.15	13.5	27.3	8.76	70.3	-0.58	23.3	27.7	7.90	64.6	-0.58	47.6	27.8	8.13	66.5	-0.54	86.1	27.9	7.61	62.3
-0.60	86.0	27.9	7.95	65.0	-1.45	4.7	27.2	13.23	105.3	-1.00	13.5	27.2	8.09	65.1	-0.58	23.3	27.7	7.89	64.5	-0.57	49.2	27.8	8.14	66.6	-0.54	86.1	27.9	7.62	62.4
-0.61	86.1	27.8	7.94	64.9	-1.45	4.8	27.2	13.27	105.6	-1.15	13.6	27.3	8.43	67.6	-0.58	23.3	27.7	7.89	64.5	-0.57	51.4	27.8	8.14	66.6	-0.54	86.1	27.9	7.64	62.6
-0.61	86.1	27.9	7.95	65.0	-1.44	4.8	27.2	13.28	105.7	-1.13	13.6	27.4	8.60	69.1	-0.58	23.3	27.7	7.90	64.6	-0.57	53.6	27.8	8.13	66.6	-0.54	86.8	27.9	7.65	62.7
-0.60	86.1	27.8	7.94	64.9	-1.44	4.8	27.2	13.29	105.8	-0.72	14.5	27.5	7.99	65.0	-0.58	23.3	27.7	7.89	64.5	-0.57	56.1	27.8	8.13	66.5	-0.54	87.9	27.9	7.68	62.9
-0.60	86.1	27.8	7.94	64.9	-1.43	4.8	27.2	13.3																					

Appendix A.1. Temperature, Salinity, and Dissolved Oxygen Data for Bathurst Inlet, Back River Project, 2012

BI-4 12-Apr-12					BI-4 12-Apr-12					BI-4 12-Apr-12					BI-4 12-Apr-12					BI-4 12-Apr-12					BI-4 12-Apr-12				
Temperature	Depth	Salinity	Dissolved Oxygen	Dissolved Oxygen Saturation	Temperature	Depth	Salinity	Dissolved Oxygen	Dissolved Oxygen Saturation	Temperature	Depth	Salinity	Dissolved Oxygen	Dissolved Oxygen Saturation	Temperature	Depth	Salinity	Dissolved Oxygen	Dissolved Oxygen Saturation	Temperature	Depth	Salinity	Dissolved Oxygen	Dissolved Oxygen Saturation	Temperature	Depth	Salinity	Dissolved Oxygen	Dissolved Oxygen Saturation
(°C)	(m)		(mg/L)	(%)	(°C)	(m)		(mg/L)	(%)	(°C)	(m)		(mg/L)	(%)	(°C)	(m)		(mg/L)	(%)	(°C)	(m)		(mg/L)	(%)	(°C)	(m)		(mg/L)	(%)
-1.48	1.4	27.1	12.68	100.7	-1.45	6.6	27.1	12.41	98.7	-0.82	14.4	27.4	8.43	68.3	-0.58	24.4	27.8	8.03	65.7	-0.56	57.6	27.8	8.17	66.9	-0.57	96.0	27.9	8.35	68.4
-1.47	1.4	27.1	12.69	100.8	-1.45	6.6	27.1	12.34	98.1	-0.78	14.4	27.5	8.35	67.7	-0.57	24.4	27.8	8.03	65.7	-0.56	57.6	27.8	8.17	66.9	-0.57	96.1	27.9	8.36	68.4
-1.47	1.4	27.2	12.68	100.8	-1.45	6.6	27.1	12.38	98.4	-0.78	14.4	27.4	8.41	68.3	-0.57	24.4	27.7	8.03	65.7	-0.56	57.6	27.8	8.17	66.9	-0.56	96.1	27.9	8.35	68.3
-1.48	1.4	27.2	12.67	100.7	-1.45	6.6	27.1	12.39	98.5	-0.75	14.4	27.4	8.29	67.4	-0.58	25.4	27.8	8.06	65.9	-0.56	57.6	27.8	8.17	66.9	-0.56	96.1	27.9	8.35	68.3
-1.47	1.4	27.1	12.70	100.9	-1.45	6.6	27.1	12.27	97.5	-0.78	14.4	27.5	8.38	68.0	-0.58	27.2	27.8	8.08	66.1	-0.55	57.7	27.8	8.21	67.2	-0.56	96.1	27.9	8.34	68.3
-1.47	1.4	27.2	12.68	100.8	-1.45	7.5	27.1	12.06	95.9	-0.73	15.3	27.5	8.26	67.1	-0.59	29.0	27.8	8.14	66.5	-0.55	59.6	27.8	8.23	67.3	-0.57	96.1	27.9	8.35	68.4
-1.47	1.5	27.2	12.66	100.6	-1.45	7.5	27.1	12.18	96.9	-0.74	15.3	27.5	8.29	67.3	-0.59	29.0	27.8	8.10	66.2	-0.55	61.7	27.8	8.25	67.5	-0.57	96.1	27.9	8.35	68.4
-1.46	2.2	27.1	12.65	100.5	-1.45	7.5	27.1	12.13	96.5	-0.74	15.3	27.5	8.31	67.5	-0.59	29.1	27.8	8.12	66.4	-0.56	64.1	27.8	8.27	67.7	-0.56	96.8	27.9	8.33	68.2
-1.46	2.3	27.1	12.64	100.5	-1.45	7.6	27.1	12.24	97.4	-0.74	15.3	27.5	8.30	67.5	-0.59	29.1	27.8	8.09	66.2	-0.56	66.3	27.8	8.28	67.8	-0.56	97.2	27.9	8.32	68.1
-1.46	2.5	27.1	12.65	100.5	-1.45	7.6	27.1	12.21	97.1	-0.74	15.3	27.5	8.31	67.5	-0.59	29.1	27.8	8.12	66.4	-0.55	67.6	27.8	8.29	67.9					
-1.46	2.5	27.1	12.64	100.5	-1.45	7.6	27.1	12.23	97.2	-0.70	15.4	27.5	8.20	66.7	-0.59	29.1	27.8	8.10	66.2	-0.56	67.6	27.8	8.29	67.8					
-1.46	2.5	27.1	12.65	100.5	-1.45	7.6	27.1	12.25	97.4	-0.70	16.3	27.6	8.21	66.8	-0.59	29.1	27.8	8.10	66.3	-0.55	67.6	27.8	8.29	67.9					
-1.46	2.5	27.1	12.65	100.5	-1.44	8.4	27.1	11.98	95.3	-0.70	16.3	27.6	8.21	66.9	-0.59	29.1	27.8	8.11	66.3	-0.56	67.6	27.8	8.29	67.8					
-1.46	2.6	27.1	12.63	100.4	-1.45	8.6	27.1	11.93	94.9	-0.69	16.3	27.6	8.19	66.7	-0.59	29.1	27.8	8.11	66.3	-0.56	67.6	27.8	8.28	67.8					
-1.46	3.0	27.1	12.62	100.3	-1.45	8.6	27.1	11.89	94.6	-0.70	16.3	27.6	8.21	66.8	-0.59	30.7	27.8	8.16	66.7	-0.56	67.6	27.8	8.28	67.8					
-1.46	3.7	27.1	12.60	100.2	-1.44	8.6	27.1	11.99	95.4	-0.70	16.3	27.6	8.20	66.7	-0.59	32.9	27.8	8.16	66.7	-0.55	67.6	27.8	8.29	67.9					
-1.45	3.7	27.1	12.56	99.9	-1.44	8.6	27.1	11.97	95.2	-0.69	16.3	27.6	8.18	66.6	-0.59	35.0	27.8	8.17	66.8	-0.56	67.6	27.8	8.29	67.8					
-1.46	3.8	27.1	12.60	100.2	-1.44	8.6	27.1	11.94	95.0	-0.69	16.3	27.6	8.17	66.5	-0.59	37.6	27.8	8.17	66.8	-0.56	67.6	27.8	8.28	67.8					
-1.46	3.8	27.1	12.58	100.0	-1.44	8.6	27.1	11.82	94.0	-0.69	16.3	27.6	8.18	66.6	-0.58	38.1	27.8	8.17	66.9	-0.56	67.6	27.8	8.28	67.8					
-1.45	3.8	27.1	12.62	100.4	-1.43	9.4	27.1	11.74	93.4	-0.68	16.3	27.5	8.15	66.4	-0.58	38.1	27.8	8.17	66.9	-0.55	67.6	27.8	8.30	67.9					
-1.46	3.8	27.1	12.62	100.3	-1.42	9.5	27.1	11.42	90.9	-0.66	16.3	27.5	8.12	66.1	-0.58	38.1	27.8	8.17	66.8	-0.56	67.6	27.8	8.28	67.8					
-1.45	3.8	27.1	12.63	100.4	-1.44	9.5	27.1	11.63	92.5	-0.64	17.3	27.6	8.12	66.2	-0.58	38.1	27.8	8.17	66.8	-0.56	67.6	27.8	8.28	67.8					
-1.46	3.8	27.1	12.62	100.3	-1.44	9.5	27.1	11.57	92.0	-0.62	17.3	27.6	8.08	65.9	-0.59	38.1	27.8	8.17	66.8	-0.56	67.6	27.8	8.28	67.8					
-1.45	3.8	27.1	12.62	100.4	-1.43	9.5	27.1	11.71	93.2	-0.64	17.3	27.6	8.11	66.2	-0.59	38.1	27.8	8.17	66.9	-0.55	68.3	27.8	8.31	68.0					
-1.46	3.8	27.1	12.60	100.2	-1.43	9.5	27.1	11.74	93.4	-0.65	17.3	27.6	8.12	66.2	-0.59	38.1	27.8	8.18	66.9	-0.55	70.2	27.8	8.32	68.1					
-1.46	3.8	27.1	12.60	100.1	-1.44	9.5	27.1	11.67	92.8	-0.62	17.3	27.6	8.10	66.1	-0.59	38.1	27.8	8.17	66.8	-0.55	72.3	27.8	8.32	68.2					
-1.46	3.9	27.1	12.60	100.2	-1.44	9.5	27.1	11.69	93.0	-0.65	17.3	27.6	8.12	66.3	-0.58	38.1	27.8	8.17	66.8	-0.55	74.4	27.8	8.33	68.2					
-1.46	3.9	27.1	12.60	100.2	-1.43	10.5	27.2	11.15	88.7	-0.64	17.3	27.6	8.12	66.2	-0.58	38.1	27.8	8.17	66.9	-0.55	7								

Appendix A.2

Temperature, Salinity, and Dissolved Oxygen Data for the
Option 4 Marine Laydown Area, Back River Project, 2012

Appendix A.2. Temperature, Salinity, and Dissolved Oxygen Data for the Option 4 Marine Laydown Area, Back River Project, 2012

O4-10 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.24	0.3	19.1
11.55	0.3	18.9
11.62	0.3	18.9
11.65	0.3	18.9
11.66	0.4	18.9
11.65	0.4	18.8
11.57	0.5	18.8
11.49	0.6	18.9
11.39	0.8	18.9
11.23	1.0	18.9
11.08	1.0	19.0
10.99	1.1	19.0
10.94	1.2	19.0

O4-12 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.06	0.3	19.1
11.36	0.3	18.9
11.44	0.5	18.9
11.46	0.8	18.8
11.49	1.0	18.8
11.33	1.2	18.6
11.05	1.5	18.5
10.61	1.7	18.7
10.36	2.0	18.9
10.30	2.3	18.9
10.27	2.6	18.9
10.15	3.0	18.9
10.05	3.5	18.9
9.96	3.9	19.0
9.91	4.4	19.1
9.89	4.8	19.1
9.87	5.2	19.1
9.85	5.5	19.1
9.80	5.9	19.4
9.72	6.3	19.4
9.60	6.6	19.5
9.45	7.0	19.7
9.34	7.5	19.8
9.29	8.0	19.9
9.25	8.1	19.9

O4-14 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
12.42	0.3	18.4
11.79	0.4	18.7
11.63	0.4	18.7
11.56	0.4	18.8
11.51	0.6	18.8
11.41	0.8	18.8
11.34	1.1	18.8

O4-14 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.13	1.4	18.8
10.91	1.7	18.7
10.57	1.9	18.8
10.34	2.2	18.9
10.20	2.2	19.0
10.14	2.5	19.0
10.04	2.8	19.0
9.95	3.1	19.0
9.91	3.4	19.1
9.87	3.7	19.1
9.84	3.9	19.2
9.83	4.2	19.2
9.84	4.4	19.2
9.84	4.5	19.2
9.84	4.7	19.3
9.83	4.9	19.3
9.84	5.2	19.3
9.85	5.4	19.4
9.87	5.7	19.4
9.88	5.9	19.5
9.86	6.2	19.5
9.85	6.4	19.5
9.78	6.6	19.5
9.64	6.9	19.6
9.47	7.4	19.7
9.35	7.7	19.9
9.26	8.2	20.0
9.19	8.5	20.0
9.06	8.8	20.2
8.99	9.0	20.2
8.87	9.3	20.3
8.81	9.7	20.3
8.77	10.0	20.3
8.67	10.2	20.4
8.53	10.6	20.5
8.37	10.9	20.5
8.18	11.1	20.6
7.88	11.4	21.0
6.58	11.7	23.8
5.25	11.9	24.9
3.95	12.2	24.9
2.08	12.4	26.1
1.24	12.7	26.7
0.71	13.1	26.9
0.42	13.5	27.2
0.22	13.8	27.3
0.14	14.1	27.4
0.07	14.6	27.4
0.02	14.9	27.5
-0.02	15.2	27.5
-0.06	15.6	27.5
-0.09	16.2	27.5
-0.11	16.6	27.5
-0.13	16.9	27.6
-0.14	17.2	27.6
-0.15	17.4	27.6
-0.14	17.8	27.5
-0.16	18.1	27.6

Appendix A.2. Temperature, Salinity, and Dissolved Oxygen Data for the Option 4 Marine Laydown Area, Back River Project, 2012

O4-14 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
-0.15	18.5	27.6
-0.17	18.8	27.6
-0.18	19.0	27.6
-0.18	19.3	27.6
-0.19	19.6	27.6
-0.19	19.9	27.6
-0.21	20.3	27.6
-0.21	20.7	27.6
-0.23	21.0	27.6
-0.24	21.3	27.6
-0.27	21.8	27.6
-0.29	22.2	27.6
-0.28	22.6	27.6
-0.30	23.1	27.6
-0.32	23.6	27.6
-0.33	24.0	27.7
-0.33	24.4	27.6
-0.35	24.8	27.6
-0.35	25.1	27.6
-0.38	25.5	27.7
-0.38	25.8	27.6
-0.39	26.1	27.7
-0.40	26.4	27.7
-0.40	26.8	27.7
-0.41	27.1	27.7
-0.41	27.5	27.7
-0.41	27.8	27.7
-0.42	28.3	27.7
-0.43	28.8	27.7
-0.43	29.5	27.7
-0.44	30.1	27.7
-0.44	30.7	27.7
-0.44	31.0	27.7

O4-20 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
10.89	0.3	19.2
11.51	0.3	18.9
11.63	0.3	18.8
11.66	0.4	18.8
11.69	0.4	18.8
11.71	0.4	18.8
11.72	0.4	18.8
11.72	0.5	18.8
11.73	0.6	18.8
11.61	0.8	18.7
11.47	0.8	18.8
11.41	1.0	18.8
11.35	1.2	18.7
11.16	1.4	18.8
11.09	1.5	18.7
10.91	1.6	18.7
10.75	1.8	18.8
10.68	1.9	18.8

O4-22 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
10.37	0.3	19.2
11.06	0.3	18.9
11.27	0.4	18.8
11.36	0.5	18.7
11.27	0.5	18.7
11.27	0.7	18.7
11.25	0.8	18.7
11.10	1.0	18.8
11.00	1.1	18.8
10.93	1.3	18.8
10.91	1.5	18.8
10.88	1.6	18.8
10.85	1.8	18.8
10.63	2.1	18.7
10.31	2.4	18.8
10.14	2.6	18.8
9.99	2.8	18.9
9.94	3.1	18.9
9.92	3.3	18.9
9.89	3.5	18.9
9.84	3.7	19.1
9.79	3.9	19.2
9.73	4.1	19.4
9.57	4.4	19.5
9.49	4.5	19.5
9.43	4.6	19.6

O4-24 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.37	0.3	18.7
11.56	0.3	18.6
11.64	0.3	18.6
11.64	0.5	18.3
10.92	0.7	18.6
10.72	0.9	18.7
10.66	1.1	18.7
10.59	1.4	18.7
10.49	1.6	18.8
10.50	1.9	18.8
10.47	2.2	18.7
10.26	2.5	18.7
10.07	2.7	18.8
9.99	2.9	18.8
9.95	3.2	18.8
9.92	3.4	18.8
9.88	3.7	18.8
9.84	4.0	18.9
9.82	4.1	18.9
9.82	4.3	19.0
9.82	4.5	19.1
9.76	4.8	19.3
9.70	5.0	19.4
9.64	5.3	19.6
9.64	5.5	19.6

Appendix A.2. Temperature, Salinity, and Dissolved Oxygen Data for the Option 4 Marine Laydown Area, Back River Project, 2012

O4-24 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
9.64	5.8	19.6
9.64	6.1	19.6
9.64	6.3	19.6
9.63	6.6	19.6
9.62	6.8	19.7
9.63	7.0	19.7
9.66	7.3	19.8
9.66	7.6	19.8
9.64	7.9	19.8
9.61	8.2	19.7
9.54	8.5	19.8
9.43	8.8	20.0
9.35	9.1	20.1
9.30	9.4	20.1
9.23	9.7	20.1
9.13	10.0	20.2
9.04	10.3	20.2
8.88	10.6	20.2
8.68	10.9	20.3
8.33	11.1	20.7
7.92	11.3	20.9
7.19	11.6	23.1
5.80	11.9	24.6
4.19	12.1	25.1
2.40	12.4	25.8
1.23	12.7	26.7
0.75	13.0	27.0
0.47	13.3	27.2
0.30	13.6	27.3
0.17	13.8	27.5
0.11	14.1	27.5
0.06	14.5	27.5
0.03	14.8	27.5
0.00	15.0	27.5
0.00	15.3	27.5
0.00	15.5	27.5
0.00	15.8	27.5
-0.01	16.1	27.5
-0.02	16.4	27.5
-0.04	16.7	27.5
-0.08	16.9	27.5
-0.10	17.3	27.5
-0.10	17.6	27.5
-0.12	17.8	27.6
-0.12	18.2	27.5
-0.14	18.5	27.6
-0.15	18.8	27.5
-0.16	19.1	27.6
-0.18	19.3	27.6
-0.17	19.6	27.6
-0.18	19.9	27.6
-0.19	20.3	27.6
-0.19	20.6	27.6
-0.20	20.8	27.6
-0.20	21.1	27.6
-0.20	21.4	27.6
-0.20	21.7	27.6
-0.21	22.0	27.6
-0.22	22.3	27.6

O4-24 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
-0.22	22.6	27.6
-0.24	23.0	27.6
-0.24	23.3	27.6
-0.25	23.7	27.6
-0.25	24.1	27.6
-0.26	24.5	27.6
-0.27	24.8	27.6
-0.27	25.2	27.6
-0.28	25.5	27.6
-0.28	25.9	27.6
-0.29	26.2	27.6
-0.29	26.5	27.6
-0.29	26.9	27.6
-0.28	27.2	27.6
-0.27	27.7	27.6
-0.29	28.0	27.6
-0.29	28.4	27.6
-0.30	28.7	27.6
-0.30	29.1	27.6
-0.31	29.4	27.6
-0.31	29.8	27.6
-0.34	30.2	27.6
-0.36	30.3	27.7

O4-30 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.78	0.3	19.0
12.06	0.3	18.9
12.15	0.4	18.9
12.15	0.7	18.4
11.56	0.9	18.7
11.36	1.1	18.7
11.26	1.3	18.6
10.82	1.5	18.7
10.67	1.5	18.8

O4-32 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.37	0.3	18.8
11.49	0.4	18.7
11.53	0.4	18.7
11.35	0.7	18.6
11.19	0.9	18.7
11.19	1.2	18.7
11.13	1.4	18.7
10.98	1.7	18.7
10.75	1.9	18.6
10.51	2.2	18.7
10.28	2.4	18.8
10.14	2.6	18.8

Appendix A.2. Temperature, Salinity, and Dissolved Oxygen Data for the Option 4 Marine Laydown Area, Back River Project, 2012

O4-32 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
10.04	2.8	18.9
9.99	3.1	18.9
9.96	3.3	18.9
9.94	3.6	18.9
9.91	3.8	19.0
9.88	4.0	19.0
9.86	4.4	19.0
9.83	4.6	19.0
9.81	4.8	19.2
9.73	5.1	19.3
9.69	5.3	19.3
9.67	5.6	19.4
9.64	5.7	19.4
9.63	6.0	19.5
9.61	6.2	19.5
9.59	6.4	19.5
9.59	6.6	19.5
9.58	6.8	19.5
9.59	7.0	19.5
9.59	7.3	19.6
9.57	7.5	19.7
9.56	7.7	19.7
9.56	8.0	19.7
9.56	8.2	19.7
9.53	8.4	19.7
9.44	8.6	19.8
9.35	8.9	19.8
9.18	9.2	20.0
9.00	9.4	20.2
8.87	9.7	20.2
8.82	10.0	20.2

O4-42 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.35	0.5	18.6
10.93	0.6	18.7
10.99	0.3	18.9
11.14	0.4	18.7
11.08	0.5	18.7
11.04	0.5	18.7
10.91	0.7	18.7
10.78	0.8	18.8
10.71	1.0	18.8
10.69	1.2	18.8
10.64	1.3	18.8
10.57	1.5	18.8
10.49	1.7	18.8
10.35	1.9	18.8
10.24	2.1	18.9
10.19	2.3	18.9
10.14	2.6	18.9
10.10	2.9	18.9
10.03	3.0	18.9
10.00	3.3	18.9
9.97	3.5	18.9
9.91	3.7	19.0
9.83	4.0	19.1
9.81	4.3	19.1
9.78	4.5	19.1
9.76	4.7	19.1
9.75	4.9	19.1
9.75	5.1	19.1
9.75	5.3	19.2
9.74	5.5	19.2
9.71	5.6	19.2

O4-40 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
13.06	0.3	18.9
13.09	0.4	18.9
13.11	0.4	18.8
13.11	0.4	18.8
13.01	0.5	18.4
12.18	0.7	18.5
11.49	1.0	18.6
11.10	1.2	18.7
10.95	1.3	18.8
10.86	1.5	18.8
10.80	1.7	18.7
10.56	1.9	18.8
10.42	2.0	18.9
10.38	2.1	18.9
10.36	2.2	18.9

O4-44 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.57	0.2	18.5
11.41	0.4	18.4
10.95	0.7	18.4
10.60	1.0	18.6
10.43	1.2	18.7
10.33	1.4	18.7
10.28	1.7	18.7
10.23	1.9	18.7
10.21	2.3	18.8
10.15	2.6	18.8
10.13	3.0	18.8
10.11	3.2	18.8
10.07	3.4	18.8
10.04	3.8	18.8
10.03	4.1	18.8
10.02	4.4	18.9
10.01	4.4	18.9
10.00	4.7	18.9
10.00	4.9	18.9
10.00	5.1	18.9

Appendix A.2. Temperature, Salinity, and Dissolved Oxygen Data for the Option 4 Marine Laydown Area, Back River Project, 2012

O4-44 31-Jul-12			O4-44 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity	Temperature (°C)	Depth (m)	Salinity
10.00	5.3	19.0	-0.02	22.9	27.5
10.03	5.5	19.0	-0.03	23.2	27.4
10.03	5.7	18.9	-0.05	23.5	27.5
10.02	6.0	18.9	-0.06	23.8	27.5
9.99	6.3	19.1	-0.07	24.2	27.5
9.94	6.5	19.3	-0.08	24.5	27.5
9.91	6.8	19.4	-0.09	24.8	27.5
9.89	7.1	19.4	-0.09	25.1	27.5
9.88	7.3	19.4	-0.09	25.4	27.5
9.87	7.5	19.5	-0.09	25.7	27.5
9.86	7.7	19.5	-0.10	26.0	27.5
9.85	8.0	19.5	-0.11	26.4	27.5
9.83	8.2	19.5	-0.11	26.6	27.5
9.75	8.6	19.8	-0.10	27.0	27.5
9.75	8.8	19.8	-0.11	27.3	27.5
9.58	9.2	19.9	-0.13	27.6	27.5
9.51	9.6	20.0	-0.15	27.9	27.5
9.41	9.9	19.9	-0.16	28.2	27.5
8.98	10.1	20.2	-0.16	28.4	27.5
8.69	10.5	20.3	-0.17	28.8	27.5
8.51	10.8	20.5	-0.19	29.1	27.5
8.10	11.1	20.8	-0.19	29.4	27.5
7.39	11.4	22.2	-0.19	29.8	27.5
6.33	11.7	24.0	-0.20	30.2	27.5
5.22	12.0	25.2	-0.20	30.5	27.5
4.20	12.4	25.3	-0.21	30.8	27.5
3.03	12.7	25.5	-0.21	31.2	27.5
1.85	13.0	26.3	-0.22	31.5	27.5
1.30	13.3	26.7	-0.23	31.9	27.5
0.97	13.6	26.9	-0.24	32.2	27.5
0.71	13.9	27.1	-0.25	32.6	27.5
0.54	14.3	27.2	-0.26	33.0	27.6
0.46	14.6	27.2	-0.26	33.4	27.6
0.42	15.0	27.3	-0.26	33.8	27.5
0.34	15.4	27.3	-0.27	34.1	27.5
0.30	15.7	27.3	-0.28	34.4	27.6
0.26	16.0	27.3	-0.28	34.7	27.6
0.22	16.3	27.3	-0.27	35.0	27.6
0.17	16.5	27.4	-0.27	35.4	27.5
0.15	16.8	27.4	-0.28	35.7	27.6
0.13	17.0	27.4	-0.27	36.0	27.5
0.13	17.5	27.4	-0.29	36.4	27.6
0.11	17.8	27.4	-0.29	36.7	27.6
0.07	18.0	27.5	-0.29	37.0	27.6
0.06	18.4	27.4	-0.30	37.3	27.6
0.05	18.8	27.4	-0.30	37.7	27.5
0.04	19.1	27.4	-0.30	38.0	27.6
0.04	19.4	27.4	-0.31	38.4	27.6
0.01	19.7	27.4	-0.32	38.7	27.6
-0.01	20.0	27.5	-0.33	39.0	27.6
-0.01	20.3	27.5	-0.32	39.4	27.6
-0.03	20.6	27.5	-0.33	39.8	27.6
-0.02	20.9	27.5	-0.34	40.1	27.6
-0.02	21.1	27.4	-0.34	40.5	27.6
-0.02	21.4	27.5	-0.34	40.8	27.6
-0.03	21.7	27.5	-0.35	41.2	27.6
-0.02	22.0	27.5	-0.35	41.7	27.6
-0.02	22.3	27.5	-0.36	41.9	27.6
-0.01	22.6	27.5	-0.36	42.0	27.6

Appendix A.3

Temperature, Salinity, and Dissolved Oxygen Data for the
Option 6 Marine Laydown Area, Back River Project, 2012

Appendix A.3. Temperature, Salinity, and Dissolved Oxygen Data for the Option 6 Marine Laydown Area, Back River Project, 2012

O6-10 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
12.11	0.3	17.7
11.93	0.3	17.8
11.87	0.3	17.8
11.86	0.3	17.8
11.85	0.3	17.8
11.84	0.3	17.8
11.83	0.3	17.9
11.83	0.5	17.9
11.80	0.6	17.9
11.80	0.8	17.9
11.80	1.0	17.9
11.81	1.1	17.9
11.83	1.3	17.9
11.86	1.5	18.0
11.89	1.7	18.0
11.89	2.0	18.0

O6-20 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
12.04	0.3	17.7
12.05	0.4	17.7
12.06	0.5	17.7
12.05	0.6	17.7
12.03	0.7	17.7
12.01	0.8	17.7
12.01	0.9	17.7
12.01	1.1	17.7
11.98	1.3	17.7
11.90	1.4	17.7
11.82	1.6	17.6

O6-22 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.39	0.3	17.9
11.44	0.4	17.9
11.45	0.6	17.8
11.41	0.8	17.8
11.30	1.1	17.8
11.26	1.4	17.8
11.19	1.7	17.8
11.15	1.9	17.8
11.14	2.3	17.8
11.12	2.6	17.8
11.11	2.8	17.8
11.09	3.1	17.8
11.04	3.4	17.8
10.99	3.7	17.8

O6-22 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
10.95	4.0	17.8
10.85	4.4	17.8
10.77	4.7	17.8
10.73	5.0	17.8
10.49	5.4	18.7
9.69	5.7	19.8
8.97	5.9	20.3

O6-24 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.87	0.3	17.5
11.44	0.3	17.7
11.35	0.3	17.8
11.31	0.3	17.8
11.28	0.4	17.8
11.28	0.4	17.8
11.23	0.5	17.8
11.13	0.7	17.8
11.06	0.9	17.8
11.00	1.0	17.8
10.96	1.2	17.8
10.94	1.4	17.8
10.91	1.6	17.8
10.89	1.8	17.8
10.88	1.9	17.8
10.86	2.2	17.8
10.85	2.4	17.8
10.82	2.6	17.8
10.79	2.8	17.8
10.78	3.1	17.8
10.77	3.3	17.8
10.76	3.5	17.8
10.76	3.8	17.8
10.76	4.0	17.8
10.77	4.2	17.8
10.77	4.4	17.8
10.75	4.6	17.8
10.70	4.9	18.1
10.52	5.2	18.3
10.38	5.5	18.4
10.14	5.8	19.0
9.22	6.1	20.2
7.84	6.5	23.1
6.05	6.8	24.4
4.34	7.1	25.0
3.00	7.4	25.8
2.16	7.7	26.1
1.49	8.1	26.3
1.00	8.2	26.7
0.70	8.6	26.6
0.41	9.0	26.8
0.21	9.4	26.9
0.04	9.8	27.0
-0.11	10.1	27.0

Appendix A.3. Temperature, Salinity, and Dissolved Oxygen Data for the Option 6 Marine Laydown Area, Back River Project, 2012

O6-24 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
-0.22	10.5	27.1
-0.30	10.9	27.2
-0.38	11.1	27.2
-0.43	11.4	27.2
-0.47	11.8	27.3
-0.50	12.1	27.3
-0.54	12.4	27.3
-0.57	12.8	27.3
-0.58	13.1	27.3
-0.60	13.5	27.3
-0.62	13.8	27.3
-0.62	14.1	27.3
-0.64	14.4	27.3
-0.65	14.8	27.3
-0.67	15.1	27.3
-0.67	15.5	27.4
-0.68	15.8	27.4
-0.69	16.2	27.4
-0.69	16.6	27.4
-0.69	16.9	27.4
-0.70	17.2	27.4

O6-30 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.91	0.3	17.8
12.00	0.4	17.7
11.59	0.8	17.5
11.25	1.1	17.7
11.14	1.4	17.8
11.09	1.6	17.9
11.10	1.9	17.9

O6-32 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.72	0.3	17.9
11.72	0.4	17.9
11.65	0.6	17.8
11.46	0.8	17.8
11.24	1.1	17.9
11.12	1.3	17.8
10.96	1.6	17.8
10.87	1.9	17.9
10.84	2.4	17.9
10.81	2.8	17.9
10.73	3.2	18.0
10.76	3.6	18.1
10.59	4.0	18.1
10.41	4.2	18.2
10.27	4.4	18.4
10.13	4.6	18.6
9.95	4.9	18.7

O6-32 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
9.79	5.1	18.8
9.67	5.4	18.9
9.59	5.6	19.0
9.51	5.9	19.0
9.42	6.2	19.1
9.37	6.4	19.1

O6-40 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.91	0.3	17.9
11.72	0.5	17.9
11.51	0.6	18.0
11.45	0.8	18.0
11.42	1.0	18.0
11.38	1.2	18.0
11.31	1.4	18.0

O6-42 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.81	0.4	17.9
11.76	0.6	17.9
11.54	0.9	17.8
11.18	1.2	17.8
10.87	1.5	18.0
10.73	1.7	18.0
10.67	2.0	18.1
10.64	2.2	18.1
10.61	2.4	18.1
10.56	2.6	18.1
10.54	2.9	18.1
10.53	3.1	18.1
10.50	3.3	18.1
10.46	3.5	18.1
10.44	3.5	18.1
10.43	3.6	18.1
10.41	3.7	18.1
10.38	3.8	18.1
10.34	3.9	18.2
10.31	4.0	18.2
10.25	4.1	18.3
10.12	4.3	18.4
10.06	4.5	18.7
9.92	4.7	18.9
9.73	4.9	19.0

Appendix A.3. Temperature, Salinity, and Dissolved Oxygen Data for the Option 6 Marine Laydown Area, Back River Project, 2012

O6-44 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.71	0.3	17.9
11.62	0.5	17.9
11.47	0.6	17.9
11.36	0.8	17.9
11.27	1.0	17.9
11.21	1.3	17.9
11.13	1.5	17.9
11.04	1.8	17.9
10.96	2.0	17.9
10.84	2.2	17.9
10.73	2.4	18.0
10.70	2.6	18.1
10.70	2.8	18.1
10.69	3.1	18.1
10.67	3.3	18.1
10.68	3.5	18.1
10.69	3.7	18.1
10.68	3.9	18.1
10.59	4.1	18.1
10.47	4.3	18.2
10.37	4.5	18.2
10.14	4.8	18.3
9.97	5.1	18.8
9.76	5.3	19.0
9.53	5.5	19.1
9.44	5.7	19.2
9.39	6.0	19.2
9.35	6.2	19.2
9.33	6.5	19.3
9.30	6.7	19.3
9.27	7.0	19.3
9.26	7.2	19.3
9.24	7.5	19.3
9.23	7.8	19.3
9.21	8.1	19.4
9.20	8.5	19.4
9.16	8.8	19.5
8.88	9.1	20.0
8.34	9.5	20.5
6.55	10.6	22.1
6.01	10.9	23.0
4.32	11.4	24.3
2.65	11.8	25.3
1.55	12.2	26.0
0.83	12.7	26.5
0.46	12.9	26.8

O6-50 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
9.75	0.3	19.1
11.47	0.3	17.8
11.49	0.4	17.7
11.49	0.4	17.7
11.30	0.5	17.8
11.15	0.7	17.9
11.09	0.9	18.0
11.07	1.1	18.1
11.08	1.4	18.1
11.03	1.6	18.0
10.85	1.7	18.0

O6-52 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.32	0.3	18.0
11.38	0.4	18.0
11.30	0.4	18.0
11.32	0.4	18.0
11.34	0.4	18.0
11.30	0.5	18.0
11.20	0.8	17.9
10.85	1.1	18.0
10.60	1.4	18.0
10.47	1.6	18.1
10.40	1.9	18.1
10.34	2.2	18.1
10.30	2.5	18.1
10.28	2.8	18.1
10.26	3.1	18.2
10.18	3.4	18.3
10.10	3.6	18.3
10.07	3.9	18.4
10.01	4.2	18.5
9.91	4.5	18.6
9.65	4.8	18.8
9.51	5.1	18.9
9.43	5.2	18.9
9.38	5.5	19.0
9.36	5.9	19.1
9.35	6.0	19.1

Appendix A.3. Temperature, Salinity, and Dissolved Oxygen Data for the Option 6 Marine Laydown Area, Back River Project, 2012

O6-54 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.59	0.2	18.1
11.75	0.3	18.0
11.73	0.5	18.0
11.60	0.8	17.9
11.31	1.1	17.9
11.07	1.5	18.0
10.88	1.9	18.0
10.75	2.3	18.0
10.64	2.6	18.0
10.55	3.0	18.0
10.49	3.4	18.0
10.38	3.7	18.0
10.31	4.0	18.1
10.24	4.4	18.2
9.95	4.7	18.7
9.61	5.1	19.0
9.49	5.4	19.1
9.44	5.8	19.1
9.41	6.2	19.1
9.39	6.5	19.1
9.29	6.9	19.3
9.22	7.3	19.3
9.19	7.7	19.4
9.18	8.0	19.4
9.19	8.5	19.6
9.03	8.9	20.2
7.68	9.4	21.4
6.02	9.8	22.9
5.07	10.2	23.6
4.56	10.7	24.0
4.16	11.2	24.3
3.49	11.6	24.9
2.47	12.1	25.6
1.53	12.5	26.3
1.13	13.0	26.6
0.87	13.5	26.8
0.67	14.0	26.9
0.38	14.5	27.1
0.19	14.9	27.2
0.11	15.3	27.3
0.05	15.8	27.3
0.01	16.3	27.3
-0.02	16.8	27.4
-0.04	17.4	27.4
-0.06	18.0	27.4
-0.11	18.5	27.5
-0.14	19.1	27.5
-0.16	19.7	27.5
-0.17	20.3	27.5
-0.17	20.9	27.5
-0.19	21.6	27.5
-0.18	22.1	27.5
-0.19	22.6	27.5
-0.19	23.2	27.5
-0.20	23.8	27.5
-0.20	24.4	27.5
-0.22	25.0	27.5
-0.22	25.6	27.5
-0.22	26.2	27.5

O6-54 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
-0.22	26.9	27.5
-0.23	27.5	27.5
-0.23	28.1	27.5
-0.24	28.8	27.6
-0.25	29.4	27.6
-0.25	30.0	27.6
-0.25	30.2	27.6

Appendix B

Raw Marine Water Quality Data, Back River Project, 2012

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				BI-1					BI-2					BI-3				
Sample ID				BI-1 (SF)	BI-1 SF rep2	BI-1 (AP)	BI-1 (BP)	BI-1 (DP)	BI-2 (SF)	BI-2 (AP) rep 1	BI-2 (AP) rep 2	BI-2 (BP)	BI-2 (DP)	BI-3 (SF)	BI-3 (AP)	BI-3 (BP) rep 1	BI-3 (BP) rep 2	BI-3 (DP)
Replicate				1	2	1	1	1	1	2	1	1	1	1	1	1	2	1
Date Sampled		CCME Guidelines for the Protection of Aquatic Life ^a	Realised Detection Limits	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12
Depth Sampled (m)				1	1	10.5	23.5	43.5	1	8.3	8.3	18.3	38.3	1	8.5	23.5	23.5	28.5
ALS Sample ID	Units			L1134477-1	L1134477-21	L1134477-2	L1134477-3	L1134477-4	L1134477-5	L1134477-6	L1134477-20	L1134477-7	L1134477-8	L1134477-9	L1134477-10	L1134477-11	L1134477-19	L1134477-12
Physical Tests																		
Hardness (as CaCO ₃)	mg/L		4.3	5040	4840	5070	5130	5160	5100	5120	4930	5160	5220	5070	5080	5190	4970	5170
pH	pH Units	7.0-8.7	0.1	7.74	7.83	7.75	7.72	7.79	7.82	7.83	7.84	7.81	7.81	7.83	7.83	7.79	7.81	7.81
Alkalinity, Bicarbonate (as CaCO ₃)	mg/L		2.0	120	117	118	119	118	121	120	123	120	115	123	120	118	120	117
Alkalinity, Carbonate (as CaCO ₃)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO ₃)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO ₃)	mg/L		2.0	120	117	118	119	118	121	120	123	120	115	123	120	118	120	117
Total Suspended Solids	mg/L	c	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Turbidity	mg/L	c	0.1	0.48	0.82	0.41	0.31	0.22	0.40	0.19	0.21	0.43	0.31	0.42	0.44	0.44	0.47	0.84
Major Anions																		
Bromide (Br)	mg/L		5	54.4	57.6	55.8	55.5	56.5	56.6	56.5	64.2	56.6	53.9	55.2	52.4	55.7	57.7	57.4
Chloride (Cl)	mg/L		50	15600	15400	15300	15600	15700	15600	15400	14900	15900	15800	15500	15600	15900	16800	16300
Fluoride (F)	mg/L		0.75 - 2.00	<2.0	1.04	<2.0	<2.0	<2.0	<2.0	<2.0	1.01	<2.0	<2.0	<2.0	<2.0	<2.0	1.06	<2.0
Sulphate (SO ₄)	mg/L		50	2220	2200	2170	2210	2240	2220	2200	2110	2260	2240	2200	2210	2270	2390	2350
Nutrients																		
Ammonia, Total (as N)	mg/L		0.005	<0.0050	0.0144	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0180	<0.0050	<0.0050	0.0192	0.0224	<0.0050	<0.0050	<0.0050
Nitrate and Nitrite (as N)	mg/L		0.006	0.138	0.105	0.138	0.182	0.190	0.127	0.126	0.0899	0.173	0.169	0.0896	0.0875	0.171	0.171	0.159
Nitrate (as N)	mg/L	3.612 ^b	0.006	0.138	0.0979	0.138	0.182	0.190	0.124	0.122	0.0828	0.173	0.169	0.0819	0.0799	0.171	0.171	0.159
Nitrite (as N)	mg/L		0.002	<0.0020	0.0072	<0.0020	<0.0020	<0.0020	0.0035	0.0039	0.0071	<0.0020	<0.0020	0.0077	0.0076	<0.0020	<0.0020	<0.0020
Orthophosphate (as P)	mg/L		0.001	0.0466	0.0416	0.0469	0.0536	0.0530	0.0454	0.0457	0.0397	0.0536	0.0527	0.0397	0.0398	0.0543	0.0538	0.0508
Total Phosphorus (P)	mg/L		0.002	0.0467	0.0446	0.0452	0.0542	0.0608	0.0464	0.0451	0.0420	0.0537	0.0522	0.0405	0.0414	0.0555	0.0562	0.0522
Silicate (as SiO ₂)	mg/L		0.5	1.12	1.12	1.23	1.49	1.54	1.19	1.15	0.95	1.55	1.47	1.01	0.97	1.57	1.47	1.47
Organic Carbon																		
Total Organic Carbon	mg/L		0.5	1.44	1.88	1.67	1.30	1.43	1.54	1.59	1.91	1.33	1.20	1.88	1.77	1.20	1.19	1.24
Total Metals																		
Aluminum (Al)	mg/L		0.005	0.0188	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0055	<0.0050
Antimony (Sb)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic (As)	mg/L	0.0125 ^b	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L		0.001	0.0121	0.0125	0.0121	0.0119	0.0116	0.0120	0.0123	0.0127	0.0114	0.0114	0.0129	0.0128	0.0111	0.0112	0.0114
Beryllium (Be)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.1	3.51	3.73	3.58	3.66	3.81	3.63	3.65	3.76	3.73	3.82	3.78	3.78	3.77	3.86	3.89
Cadmium (Cd)	mg/L	0.00012	0.00005	<0.000050	0.000052	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000065	<0.000050	<0.000050	<0.000050	0.000051	0.000054	0.000050
Calcium (Ca)	mg/L		0.5	328	306	325	328	326	323	329	304	328	328	321	322	328	313	325
Cesium (Cs)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chromium (Cr)	mg/L	Cr(VI): 0.0015; Cr(III): 0.056 ^b	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)	mg/L		0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000122	<0.000050	<0.000050	<0.000050
Copper (Cu)	mg/L		0.0005	0.00074	0.00073	0.00060	0.00051	<0.00050	0.00067	0.00076	0.00079	<0.00050	<0.00050	0.00076	0.00113	<0.00050	<0.00050	<0.00050
Gallium (Ga)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)	mg/L		0.01	<0.010	0.020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.047	<0.010	<0.010	<0.010
Lead (Pb)	mg/L		0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L		0.02	0.144	0.150	0.146	0.151	0.154	0.148	0.149	0.152	0.152	0.154	0.152	0.151	0.155	0.155	0.158
Magnesium (Mg)	mg/L		1	1020	987	1020	1040	1040	1020	1040	983	1040	1050	1030	1030	1040	1010	1040
Manganese (Mn)	mg/L		0.0002	0.00232	0.00273	0.00215	0.00295	0.00801	0.00150	0.00171	0.00250	0.00151	0.00170	0.00271	0.00288	0.00093	0.00133	0.00122
Mercury (Hg)	mg/L	Inorganic Hg: 0.000016 ^b	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.002	0.0086	0.0087	0.0090	0.0087	0.0092	0.0089	0.0087	0.0089	0.0088	0.0091	0.0087	0.0096	0.0089	0.0091	0.0093
Nickel (Ni)	mg/L		0.0005	0.00075	0.00091	0.00089	0.00062	0.00057	0.00083	0.00084	0.00082	0.00108	0.00058	0.00087	0.00098	0.00073	0.00065	0.00061
Phosphorus (P)	mg/L		1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location			BI-1					BI-2					BI-3				
Sample ID			BI-1 (SF)	BI-1 SF rep2	BI-1 (AP)	BI-1 (BP)	BI-1 (DP)	BI-2 (SF)	BI-2 (AP) rep 1	BI-2 (AP) rep 2	BI-2 (BP)	BI-2 (DP)	BI-3 (SF)	BI-3 (AP)	BI-3 (BP) rep 1	BI-3 (BP) rep 2	BI-3 (DP)
Replicate			1	2	1	1	1	1	2	1	1	1	1	1	1	2	1
Date Sampled		CCME Guidelines for the Protection of Aquatic Life ^a	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12
Depth Sampled (m)		Realised Detection Limits	1	1	10.5	23.5	43.5	1	8.3	8.3	18.3	38.3	1	8.5	23.5	23.5	28.5
ALS Sample ID	Units		L1134477-1	L1134477-21	L1134477-2	L1134477-3	L1134477-4	L1134477-5	L1134477-6	L1134477-20	L1134477-7	L1134477-8	L1134477-9	L1134477-10	L1134477-11	L1134477-19	L1134477-12
Potassium (K)	mg/L	20	311	299	308	314	316	309	313	294	318	318	311	309	319	300	313
Rhenium (Re)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Rubidium (Rb)	mg/L	0.005	0.0904	0.0921	0.0914	0.0936	0.0944	0.0906	0.0904	0.0926	0.0939	0.0939	0.0922	0.0925	0.0941	0.0944	0.0949
Selenium (Se)	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L	0.5	0.75	0.63	0.73	0.89	0.92	0.65	0.66	0.52	0.88	0.88	0.58	0.58	0.87	0.82	0.82
Silver (Ag)	mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)	mg/L	20	8830	8470	8750	8930	9000	8770	8940	8330	9010	9070	8820	8750	9040	8500	8840
Strontium (Sr)	mg/L	0.05	5.88	5.70	5.83	5.94	5.98	5.85	5.94	5.58	6.01	6.05	5.90	5.87	6.05	5.69	5.94
Tellurium (Te)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thorium (Th)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Tin (Sn)	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Titanium (Ti)	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0061	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten (W)	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Uranium (U)	mg/L	0.00005	0.00243	0.00246	0.00249	0.00251	0.00251	0.00248	0.00241	0.00246	0.00252	0.00248	0.00248	0.00249	0.00252	0.00248	0.00255
Vanadium (V)	mg/L	0.0005	0.00067	0.00061	0.00070	0.00067	0.00073	0.00070	0.00074	0.00066	0.00069	0.00070	0.00063	0.00080	0.00074	0.00068	0.00073
Yttrium (Y)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)	mg/L	0.003	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0101	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals																	
Aluminum (Al)	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0069	<0.0050	<0.0050	<0.0050
Antimony (Sb)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic (As)	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L	0.001	0.0127	0.0125	0.0121	0.0117	0.0116	0.0127	0.0118	0.0128	0.0112	0.0113	0.0128	0.0128	0.0111	0.0115	0.0113
Beryllium (Be)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L	0.1	3.53	3.73	3.57	3.72	3.74	3.67	3.71	3.80	3.84	3.77	3.68	3.79	3.78	3.91	3.87
Cadmium (Cd)	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000054	0.000056	<0.000050	<0.000050	<0.000050	<0.000050	0.000055	<0.000050
Calcium (Ca)	mg/L	0.5	326	306	331	333	330	328	330	313	331	333	324	324	333	314	331
Cesium (Cs)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chromium (Cr)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000052	0.000052	<0.000050	<0.000050	<0.000050
Copper (Cu)	mg/L	0.0005	0.00059	0.00070	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00086	<0.00050	<0.00050	0.00062	0.00066	0.00062	0.00075	<0.00050
Gallium (Ga)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)	mg/L	0.01	0.017	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.014	<0.010	<0.010	0.016
Lead (Pb)	mg/L	0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L	0.02	0.148	0.149	0.145	0.153	0.155	0.147	0.151	0.152	0.156	0.154	0.151	0.155	0.152	0.155	0.155
Magnesium (Mg)	mg/L	1	1030	990	1030	1040	1050	1040	1040	1010	1050	1060	1030	1040	1060	1020	1050
Manganese (Mn)	mg/L	0.0002	0.00215	0.00264	0.00193	0.00065	0.00155	0.00103	0.00104	0.00217	0.00041	0.00041	0.00306	0.00222	0.00059	0.00039	0.00041
Mercury (Hg)	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L	0.002	0.0090	0.0088	0.0090	0.0093	0.0091	0.0088	0.0088	0.0091	0.0091	0.0090	0.0096	0.0092	0.0091	0.0093	0.0094
Nickel (Ni)	mg/L	0.0005	0.00106	0.00081	0.00086	0.00077	0.00068	0.00075	0.00089	0.00080	0.00074	0.00064	0.00094	0.00111	0.00080	0.00073	0.00069
Phosphorus (P)	mg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Potassium (K)	mg/L	20	312	292	313	319	316	314	315	299	314	319	314	314	321	305	318
Rhenium (Re)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Rubidium (Rb)	mg/L	0.005	0.0924	0.0929	0.0916	0.0931	0.0943	0.0912	0.0922	0.0935	0.0943	0.0938	0.0923	0.0922	0.0940	0.0951	0.0942
Selenium (Se)	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L	0.5	0.73	0.60	0.73	0.89	0.91	0.65	0.70	0.55	0.89	0.87	0.54	0.57	0.89	0.83	0.88

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location			BI-1					BI-2					BI-3					
Sample ID			BI-1 (SF)	BI-1 SF rep2	BI-1 (AP)	BI-1 (BP)	BI-1 (DP)	BI-2 (SF)	BI-2 (AP) rep 1	BI-2 (AP) rep 2	BI-2 (BP)	BI-2 (DP)	BI-3 (SF)	BI-3 (AP)	BI-3 (BP) rep 1	BI-3 (BP) rep 2	BI-3 (DP)	
Replicate			1	2	1	1	1	1	2	1	1	1	1	1	1	2	1	
Date Sampled			12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	
Depth Sampled (m)			1	1	10.5	23.5	43.5	1	8.3	8.3	18.3	38.3	1	8.5	23.5	23.5	28.5	
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life ^a	Realised Detection Limits	L1134477-1	L1134477-21	L1134477-2	L1134477-3	L1134477-4	L1134477-5	L1134477-6	L1134477-20	L1134477-7	L1134477-8	L1134477-9	L1134477-10	L1134477-11	L1134477-19	L1134477-12
Silver (Ag)	mg/L		0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)	mg/L		20	8880	8310	8930	9040	8970	8960	8960	8500	8960	9090	8900	8890	9110	8620	8960
Strontium (Sr)	mg/L		0.05	5.93	5.58	5.95	6.04	5.97	5.94	5.99	5.71	5.97	6.06	5.95	5.96	6.10	5.79	6.02
Tellurium (Te)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)	mg/L		0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thorium (Th)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Tin (Sn)	mg/L		0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Titanium (Ti)	mg/L		0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten (W)	mg/L		0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Uranium (U)	mg/L		0.00005	0.00252	0.00248	0.00246	0.00259	0.00253	0.00251	0.00252	0.00250	0.00256	0.00253	0.00255	0.00252	0.00249	0.00252	0.00256
Vanadium (V)	mg/L		0.0005	0.00082	0.00058	0.00073	0.00073	0.00068	0.00070	0.00063	0.00063	0.00077	0.00075	0.00079	0.00070	0.00065	0.00075	0.00082
Yttrium (Y)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)	mg/L		0.003	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0033	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

Notes:

Shaded cells indicate concentration was above CCME water quality guideline for the protection of aquatic life (CCME 2012)

^a Canadian water quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012.

^b Interim guideline.

^c Dependent on background levels

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				BI-4					04-10	04-12	04-14					04-20	04-22
Sample ID				BI-4 (SF)	BI-4 (AP) rep 1	BI-4 (AP) rep 2	BI-4 (BP)	BI-4 (DP)	04-10-1 REP 1	04-12-1	04-14-SF1 1M	04-14-SF2 1M	04-14-AP 10M	04-14-BP 14M	04-14-DP 25M	04-20-1 1M	04-22-1 1M
Replicate				1	1	2	1	1	1	1	1	2	1	1	1	1	1
Date Sampled		CCME Guidelines for the Protection of Aquatic Life ^a	Realised Detection Limits	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
Depth Sampled (m)				1	8.4	8.4	23.4	33.4	1	1	1	1	10	14	25	1	1
ALS Sample ID	Units			L1134477-13	L1134477-14	L1134477-18	L1134477-15	L1134477-16	L1190279-6	L1190279-8	L1190279-1	L1190279-2	L1190279-3	L1190279-4	L1190279-5	L1190204-7	L1190204-6
Physical Tests																	
Hardness (as CaCO ₃)	mg/L		4.3	5110	5060	4900	5100	5140	3500	3470	3330	3350	4240	4910	4890	3440	3420
pH	pH Units	7.0-8.7	0.1	7.82	7.82	7.82	7.80	7.78	7.87	7.79	7.89	7.89	7.82	7.74	7.73	7.85	7.86
Alkalinity, Bicarbonate (as CaCO ₃)	mg/L		2.0	121	121	120	119	119	98.7	100	95.3	91.8	110	121	120	94.5	93.0
Alkalinity, Carbonate (as CaCO ₃)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO ₃)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO ₃)	mg/L		2.0	121	121	120	119	119	98.7	100	95.3	91.8	110	121	120	94.5	93.0
Total Suspended Solids	mg/L	c	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	4.8	3.0	<2.0	<2.0	<2.0	2.0	<2.0
Turbidity	mg/L	c	0.1	0.53	0.47	0.31	0.25	0.31	0.57	0.83	3.51	2.97	0.72	0.54	0.24	1.78	1.02
Major Anions																	
Bromide (Br)	mg/L		5	54.9	54.5	54.6	55.3	57.5	45.1	45.0	43.2	42.3	52.3	60.9	61.1	42.7	41.7
Chloride (Cl)	mg/L		50	15300	15500	15700	15900	15900	10900	11000	10500	10500	13000	15400	15300	10600	10500
Fluoride (F)	mg/L		0.75 - 2.00	<2.0	<2.0	1.05	<2.0	1.02	0.82	0.79	0.85	0.96	1.00	1.08	1.08	0.79	0.80
Sulphate (SO ₄)	mg/L		50	2170	2210	2240	2250	2270	1540	1560	1490	1490	1840	2170	2170	1500	1480
Nutrients																	
Ammonia, Total (as N)	mg/L		0.005	0.0158	0.0164	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate and Nitrite (as N)	mg/L		0.006	0.107	0.108	0.136	0.159	0.154	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	0.0796	0.134	<0.0060	<0.0060
Nitrate (as N)	mg/L	3.612 ^b	0.006	0.58	0.57	0.136	0.159	0.154	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	0.0772	0.134	<0.0060	<0.0060
Nitrite (as N)	mg/L		0.002	<0.10	<0.10	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0024	<0.0020	<0.0020	<0.0020
Orthophosphate (as P)	mg/L		0.001	0.0414	0.0418	0.0464	0.0519	0.0513	0.0177	0.0187	0.0160	0.0163	0.0284	0.0466	0.0487	0.0168	0.0160
Total Phosphorus (P)	mg/L		0.002	0.0422	0.0431	0.0557	0.0526	0.0519	0.0221	0.0228	0.0227	0.0218	0.0335	0.0513	0.0520	0.0226	0.0203
Silicate (as SiO ₂)	mg/L		0.5	1.13	1.10	1.21	1.50	1.40	0.84	0.80	0.73	0.72	0.85	1.47	1.59	0.71	0.75
Organic Carbon																	
Total Organic Carbon	mg/L		0.5	1.82	1.79	1.41	1.25	1.20	1.88	1.92	2.02	1.89	1.69	1.53	1.28	1.97	1.90
Total Metals																	
Aluminum (Al)	mg/L		0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0125	0.0189	0.0575	0.0530	0.0095	0.0135	<0.0050	0.0266	0.0144
Antimony (Sb)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic (As)	mg/L	0.0125 ^b	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L		0.001	0.0123	0.0126	0.0120	0.0111	0.0110	0.0103	0.0095	0.0108	0.0109	0.0102	0.0108	0.0113	0.0109	0.0109
Beryllium (Be)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.1	3.73	3.76	3.83	3.83	3.81	3.39	3.53	3.08	3.16	3.99	4.40	4.97	2.87	2.78
Cadmium (Cd)	mg/L	0.00012	0.00005	<0.000050	<0.000050	0.000054	<0.000050	0.000086	0.000102	0.000087	0.000070	0.000077	0.000085	0.000100	0.000132	0.000053	0.000060
Calcium (Ca)	mg/L		0.5	320	323	298	321	325	225	227	216	220	291	329	334	222	219
Cesium (Cs)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chromium (Cr)	mg/L	Cr(VI): 0.0015; Cr(III): 0.056 ^b	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00060	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)	mg/L		0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000052	0.000086	0.000086	<0.000050	<0.000050	<0.000050	0.000066	<0.000050
Copper (Cu)	mg/L		0.0005	0.00060	0.00081	0.00064	<0.00050	<0.00050	0.00062	0.00099	0.00489	0.00083	0.00055	<0.00050	<0.00050	0.00110	0.00061
Gallium (Ga)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)	mg/L		0.01	<0.010	<0.010	0.016	<0.010	<0.010	0.012	0.028	0.090	0.072	0.014	0.014	<0.010	0.036	0.022
Lead (Pb)	mg/L		0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L		0.02	0.151	0.152	0.154	0.154	0.156	0.131	0.134	0.122	0.124	0.159	0.182	0.202	0.113	0.109
Magnesium (Mg)	mg/L		1	1020	1030	962	1040	1040	700	709	675	674	851	990	988	691	684
Manganese (Mn)	mg/L		0.0002	0.00282	0.00285	0.00211	0.00123	0.00088	0.00162	0.00197	0.00291	0.00272	0.00201	0.00269	0.00262	0.00227	0.00180
Mercury (Hg)	mg/L	Inorganic Hg: 0.000016 ^b	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.002	0.0086	0.0089	0.0091	0.0089	0.0091	0.0067	0.0071	0.0064	0.0064	0.0077	0.0094	0.0099	0.0068	0.0063
Nickel (Ni)	mg/L		0.0005	0.00073	0.00091	0.00111	0.00054	0.00064	0.00079	0.00092	0.00085	0.00077	0.00072	0.00076	0.00073	0.00237	0.00075
Phosphorus (P)	mg/L		1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location			BI-4					04-10	04-12	04-14					04-20	04-22
Sample ID			BI-4 (SF)	BI-4 (AP) rep 1	BI-4 (AP) rep 2	BI-4 (BP)	BI-4 (DP)	04-10-1 REP 1	04-12-1	04-14-SF1 1M	04-14-SF2 1M	04-14-AP 10M	04-14-BP 14M	04-14-DP 25M	04-20-1 1M	04-22-1 1M
Replicate			1	1	2	1	1	1	1	1	2	1	1	1	1	1
Date Sampled		CCME Guidelines for the Protection of Aquatic Life ^a	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
Depth Sampled (m)		Realised Detection Limits	1	8.4	8.4	23.4	33.4	1	1	1	1	10	14	25	1	1
ALS Sample ID	Units		L1134477-13	L1134477-14	L1134477-18	L1134477-15	L1134477-16	L1190279-6	L1190279-8	L1190279-1	L1190279-2	L1190279-3	L1190279-4	L1190279-5	L1190204-7	L1190204-6
Potassium (K)	mg/L	20	309	309	292	313	318	216	221	212	214	271	310	314	218	218
Rhenium (Re)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Rubidium (Rb)	mg/L	0.005	0.0907	0.0924	0.0934	0.0943	0.0956	0.0695	0.0699	0.0656	0.0674	0.0834	0.0971	0.103	0.0650	0.0633
Selenium (Se)	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L	0.5	0.62	0.63	0.63	0.89	0.80	<0.50	<0.50	0.66	0.50	0.50	0.84	0.92	<0.50	<0.50
Silver (Ag)	mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)	mg/L	20	8730	8760	8230	8860	8940	5820	5960	5730	5770	7590	8730	8750	5940	5910
Strontium (Sr)	mg/L	0.05	5.88	5.87	5.54	5.94	6.01	4.06	4.18	4.02	4.05	5.07	5.81	5.84	4.16	4.12
Tellurium (Te)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thorium (Th)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Tin (Sn)	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Titanium (Ti)	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten (W)	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Uranium (U)	mg/L	0.00005	0.00253	0.00246	0.00245	0.00256	0.00251	0.00153	0.00160	0.00164	0.00160	0.00197	0.00220	0.00222	0.00174	0.00176
Vanadium (V)	mg/L	0.0005	0.00069	0.00065	0.00069	0.00067	0.00075	0.00051	0.00060	0.00064	0.00057	0.00059	0.00066	0.00070	0.00056	<0.00050
Yttrium (Y)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)	mg/L	0.003	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0035	<0.0030	<0.0030	<0.0030	<0.0030	0.0048	<0.0030
Zirconium (Zr)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals																
Aluminum (Al)	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	0.0056	0.0072	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Antimony (Sb)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic (As)	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L	0.001	0.0128	0.0128	0.0119	0.0115	0.0111	0.0108	0.0107	0.0110	0.0100	0.0107	0.0110	0.0108	0.0110	0.0107
Beryllium (Be)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L	0.1	3.77	3.85	3.87	3.94	3.84	3.52	3.74	3.20	3.21	4.25	4.75	4.88	2.97	2.85
Cadmium (Cd)	mg/L	0.00005	0.000053	0.000065	<0.000050	<0.000050	<0.000050	0.000087	0.000098	0.000086	0.000073	0.000095	0.000106	0.000109	0.000064	0.000056
Calcium (Ca)	mg/L	0.5	328	324	310	326	325	229	225	217	219	292	332	333	225	224
Cesium (Cs)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chromium (Cr)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000056	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Copper (Cu)	mg/L	0.0005	0.00154	0.00071	<0.00050	<0.00050	<0.00050	0.00057	0.00062	0.00072	0.00064	<0.00050	<0.00050	<0.00050	0.00062	0.00061
Gallium (Ga)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)	mg/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)	mg/L	0.0003	0.00038	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L	0.02	0.155	0.153	0.157	0.157	0.155	0.139	0.144	0.128	0.123	0.165	0.186	0.194	0.113	0.111
Magnesium (Mg)	mg/L	1	1040	1030	1000	1040	1050	711	706	676	682	853	991	985	700	694
Manganese (Mn)	mg/L	0.0002	0.00271	0.00271	0.00183	0.00048	0.00032	0.00139	0.00139	0.00141	0.00123	0.00110	0.00132	0.00092	0.00127	0.00095
Mercury (Hg)	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L	0.002	0.0089	0.0092	0.0091	0.0093	0.0090	0.0070	0.0070	0.0068	0.0067	0.0086	0.0093	0.0099	0.0063	0.0063
Nickel (Ni)	mg/L	0.0005	0.00113	0.00107	0.00069	0.00072	0.00067	0.00077	0.00082	0.00076	0.00079	0.00076	0.00087	0.00061	0.00083	0.00086
Phosphorus (P)	mg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Potassium (K)	mg/L	20	313	311	301	317	317	222	219	213	214	269	312	307	222	220
Rhenium (Re)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Rubidium (Rb)	mg/L	0.005	0.0925	0.0933	0.0939	0.0971	0.0951	0.0707	0.0739	0.0695	0.0642	0.0874	0.0979	0.104	0.0669	0.0640
Selenium (Se)	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L	0.5	0.60	0.63	0.72	0.86	0.81	<0.50	0.50	<0.50	<0.50	<0.50	0.80	0.86	<0.50	<0.50

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location			BI-4					04-10	04-12	04-14					04-20	04-22	
Sample ID			BI-4 (SF)	BI-4 (AP) rep 1	BI-4 (AP) rep 2	BI-4 (BP)	BI-4 (DP)	04-10-1 REP 1	04-12-1	04-14-SF1 1M	04-14-SF2 1M	04-14-AP 10M	04-14-BP 14M	04-14-DP 25M	04-20-1 1M	04-22-1 1M	
Replicate			1	1	2	1	1	1	1	1	2	1	1	1	1	1	
Date Sampled			12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	
Depth Sampled (m)			1	8.4	8.4	23.4	33.4	1	1	1	1	10	14	25	1	1	
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life ^a	Realised Detection Limits	L1134477-13	L1134477-14	L1134477-18	L1134477-15	L1134477-16	L1190279-6	L1190279-8	L1190279-1	L1190279-2	L1190279-3	L1190279-4	L1190279-5	L1190204-7	L1190204-6
Silver (Ag)	mg/L		0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)	mg/L		20	8840	8780	8560	8940	8920	5960	5900	5730	5780	7680	8720	8530	6030	5990
Strontium (Sr)	mg/L		0.05	5.94	5.89	5.73	6.02	6.00	4.17	4.12	4.02	4.03	5.11	5.81	5.69	4.23	4.21
Tellurium (Te)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)	mg/L		0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thorium (Th)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Tin (Sn)	mg/L		0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Titanium (Ti)	mg/L		0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten (W)	mg/L		0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Uranium (U)	mg/L		0.00005	0.00250	0.00252	0.00251	0.00252	0.00251	0.00154	0.00166	0.00167	0.00165	0.00200	0.00223	0.00221	0.00183	0.00178
Vanadium (V)	mg/L		0.0005	0.00068	0.00069	0.00059	0.00079	0.00080	<0.00050	<0.00050	<0.00050	<0.00050	0.00057	0.00062	0.00068	<0.00050	<0.00050
Yttrium (Y)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)	mg/L		0.003	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

Notes:

Shaded cells indicate concentration was above CCME water quality guideline for the protection of aquatic life (CCME 2012)

^a Canadian water quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012.

^b Interim guideline.

^c Dependent on background levels

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				04-24					04-30	04-32		04-40	04-42	04-44					
Sample ID				04-24-AP1 9M	04-24-AP2 9M	04-24-SF 1M	04-24-BP 13M	04-24-DP 25M	04-30-1	04-32-1	04-32-2	04-40-1 1M	04-42-1 1M	04-44-SF 1M	04-44-AP 8M	04-44-BP1 14M	04-44-BP2 14M	04-44-DP 30M	
Replicate				1	2	1	1	1	1	1	2	1	1	1	1	1	2	1	
Date Sampled				3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	
Depth Sampled (m)				9	9	1	13	25	1	1	1	1	1	1	8	14	14	30	
ALS Sample ID		Units	CCME Guidelines for the Protection of Aquatic Life ^a	Realised Detection Limits	L1190204-1	L1190204-2	L1190204-3	L1190204-4	L1190204-5	L1190274-1	L1190279-9	L1190274-2	L1190237-6	L1190237-7	L1190237-1	L1190237-2	L1190237-3	L1190237-4	L1190237-5
Physical Tests																			
Hardness (as CaCO ₃)	mg/L			4.3	3770	3740	3410	4630	4960	3460	3440	3410	3360	3520	3350	3760	4700	4800	4950
pH	pH Units	7.0-8.7		0.1	7.78	7.79	7.85	7.74	7.68	7.87	7.85	7.88	7.87	7.87	7.81	7.83	7.79	7.74	7.73
Alkalinity, Bicarbonate (as CaCO ₃)	mg/L			2.0	105	103	96.1	116	119	96.1	97.5	92.0	92.3	96.2	93.0	101	116	118	119
Alkalinity, Carbonate (as CaCO ₃)	mg/L			2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO ₃)	mg/L			2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO ₃)	mg/L			2.0	105	103	96.1	116	119	96.1	97.5	92.0	92.3	96.2	93.0	101	116	118	119
Total Suspended Solids	mg/L	c		2.0	<2.0	<2.0	<2.0	2.4	<2.0	3.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Turbidity	mg/L	c		0.1	0.62	0.64	0.71	1.03	0.36	1.54	1.15	0.71	1.16	0.88	0.61	0.63	0.68	0.67	0.25
Major Anions																			
Bromide (Br)	mg/L			5	48.4	46.2	41.3	57.4	61.8	42.2	43.5	43.8	41.8	41.4	42.4	49.7	59.3	59.3	61.7
Chloride (Cl)	mg/L			50	11800	11600	10600	14800	15800	10600	10900	10800	10500	10600	10800	12300	14800	15100	15700
Fluoride (F)	mg/L			0.75 - 2.00	1.01	0.96	0.82	1.01	1.06	0.94	0.78	0.96	0.82	0.82	0.78	1.00	1.10	1.05	1.08
Sulphate (SO ₄)	mg/L			50	1670	1650	1500	2090	2240	1510	1540	1530	1480	1480	1520	1740	2090	2130	2220
Nutrients																			
Ammonia, Total (as N)	mg/L			0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate and Nitrite (as N)	mg/L			0.006	<0.0060	<0.0060	<0.0060	<0.0060	0.138	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	0.0071	0.0583	0.141
Nitrate (as N)	mg/L	3.612 ^b		0.006	<0.0060	<0.0060	<0.0060	<0.0060	0.138	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	0.0562	0.141
Nitrite (as N)	mg/L			0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	0.0021	<0.0020
Orthophosphate (as P)	mg/L			0.001	0.0223	0.0221	0.0168	0.0359	0.0522	0.0177	0.0170	0.0179	0.0171	0.0166	0.0167	0.0236	0.0340	0.0416	0.0516
Total Phosphorus (P)	mg/L			0.002	0.0277	0.0277	0.0224	0.0426	0.0521	0.0246	0.0234	0.0238	0.0215	0.0246	0.0207	0.0376	0.0395	0.0478	0.0518
Silicate (as SiO ₂)	mg/L			0.5	0.91	0.93	0.70	0.80	1.58	0.72	0.82	0.79	0.74	0.80	0.77	0.89	0.82	1.23	1.74
Organic Carbon																			
Total Organic Carbon	mg/L			0.5	1.82	1.78	1.93	1.89	1.27	1.88	2.01	1.89	1.85	1.85	1.97	1.83	1.69	1.57	1.27
Total Metals																			
Aluminum (Al)	mg/L			0.005	0.0131	0.0111	0.0136	0.0104	0.0072	0.0272	0.0148	0.0134	0.0180	0.0126	0.0183	0.0082	0.0076	0.0084	<0.0050
Antimony (Sb)	mg/L			0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic (As)	mg/L	0.0125 ^b		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L			0.001	0.0112	0.0112	0.0108	0.0121	0.0118	0.0101	0.0101	0.0105	0.0105	0.0098	0.0102	0.0104	0.0116	0.0121	0.0108
Beryllium (Be)	mg/L			0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)	mg/L			0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L			0.1	2.88	2.95	2.73	3.72	4.07	2.90	3.45	3.09	3.50	3.37	3.06	3.46	4.30	4.62	4.74
Cadmium (Cd)	mg/L	0.00012		0.00005	<0.000050	0.000053	<0.000050	0.000076	0.000065	0.000072	0.000093	0.000097	0.000122	0.000093	0.000074	0.000096	0.000116	0.000130	0.000140
Calcium (Ca)	mg/L			0.5	235	241	218	301	331	219	218	219	218	221	218	244	313	328	336
Cesium (Cs)	mg/L			0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chromium (Cr)	mg/L	Cr(VI): 0.0015; Cr(III): 0.056 ^b		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00051	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00136
Cobalt (Co)	mg/L			0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000057	<0.000050	<0.000050	0.000053	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Copper (Cu)	mg/L			0.0005	0.00073	0.00069	0.00072	0.00055	<0.00050	0.00119	0.00071	0.00069	0.00080	0.00064	0.00073	0.00072	<0.00050	<0.00050	<0.00050
Gallium (Ga)	mg/L			0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)	mg/L			0.01	0.021	0.018	0.021	0.019	<0.010	0.036	0.020	0.018	0.023	0.016	0.015	0.013	0.012	0.012	<0.010
Lead (Pb)	mg/L			0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L			0.02	0.114	0.117	0.106	0.150	0.164	0.116	0.130	0.128	0.135	0.129	0.122	0.136	0.170	0.187	0.189
Magnesium (Mg)	mg/L			1	754	759	679	906	988	695	687	686	686	686	687	760	938	966	996
Manganese (Mn)	mg/L			0.0002	0.00216	0.00218	0.00197	0.00256	0.00322	0.00213	0.00183	0.00177	0.00193	0.00165	0.00175	0.00196	0.00203	0.00271	0.00355
Mercury (Hg)	mg/L	Inorganic Hg: 0.000016 ^b		0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L			0.002	0.0065	0.0066													

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location			04-24					04-30	04-32		04-40	04-42	04-44				
Sample ID			04-24-AP1 9M	04-24-AP2 9M	04-24-SF 1M	04-24-BP 13M	04-24-DP 25M	04-30-1	04-32-1	04-32-2	04-40-1 1M	04-42-1 1M	04-44-SF 1M	04-44-AP 8M	04-44-BP1 14M	04-44-BP2 14M	04-44-DP 30M
Replicate			1	2	1	1	1	1	1	2	1	1	1	1	1	2	1
Date Sampled	CCME Guidelines for the Protection of Aquatic Life ^a		3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
Depth Sampled (m)	Realised Detection Limits		9	9	1	13	25	1	1	1	1	1	1	8	14	14	30
ALS Sample ID	Units		L1190204-1	L1190204-2	L1190204-3	L1190204-4	L1190204-5	L1190274-1	L1190279-9	L1190274-2	L1190237-6	L1190237-7	L1190237-1	L1190237-2	L1190237-3	L1190237-4	L1190237-5
Potassium (K)	mg/L	20	229	236	214	285	315	216	212	212	211	213	213	239	295	305	315
Rhenium (Re)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Rubidium (Rb)	mg/L	0.005	0.0687	0.0687	0.0636	0.0874	0.0948	0.0635	0.0705	0.0680	0.0713	0.0678	0.0674	0.0724	0.0904	0.0978	0.0968
Selenium (Se)	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L	0.5	0.52	0.53	<0.50	0.57	0.90	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.75	0.92
Silver (Ag)	mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)	mg/L	20	6380	6490	5890	8130	8950	5830	5710	5800	5740	5810	5730	6420	8340	8540	8860
Strontium (Sr)	mg/L	0.05	4.45	4.52	4.11	5.42	5.96	4.07	4.00	4.07	4.04	4.10	4.00	4.51	5.58	5.71	5.94
Tellurium (Te)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thorium (Th)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Tin (Sn)	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Titanium (Ti)	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten (W)	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Uranium (U)	mg/L	0.00005	0.00195	0.00199	0.00176	0.00234	0.00253	0.00163	0.00155	0.00155	0.00160	0.00154	0.00157	0.00174	0.00219	0.00213	0.00222
Vanadium (V)	mg/L	0.0005	0.00054	0.00050	0.00051	0.00062	0.00071	0.00054	<0.00050	0.00051	<0.00050	<0.00050	<0.00050	0.00053	0.00065	0.00064	0.00146
Yttrium (Y)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)	mg/L	0.003	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals																	
Aluminum (Al)	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0052	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Antimony (Sb)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic (As)	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L	0.001	0.0112	0.0113	0.0107	0.0119	0.0119	0.0106	0.0108	0.0108	0.0105	0.0105	0.0104	0.0109	0.0108	0.0121	0.0109
Beryllium (Be)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L	0.1	2.96	2.99	2.73	3.73	4.09	2.88	3.66	3.18	3.28	3.38	3.21	3.59	4.35	3.44	4.82
Cadmium (Cd)	mg/L	0.00005	<0.000050	<0.000050	0.000052	0.000060	0.000073	0.000075	0.000083	0.000085	0.000094	0.000095	0.000095	0.000095	0.000118	0.000083	0.000131
Calcium (Ca)	mg/L	0.5	242	238	218	311	335	226	222	222	217	229	218	244	319	324	337
Cesium (Cs)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chromium (Cr)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00058
Cobalt (Co)	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Copper (Cu)	mg/L	0.0005	0.00065	0.00056	0.00065	<0.00050	0.00071	0.00060	0.00057	0.00057	0.00059	0.00057	0.00081	0.00059	<0.00050	<0.00050	<0.00050
Gallium (Ga)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)	mg/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)	mg/L	0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L	0.02	0.118	0.120	0.110	0.150	0.167	0.117	0.138	0.126	0.133	0.132	0.121	0.143	0.180	0.135	0.195
Magnesium (Mg)	mg/L	1	767	764	695	935	1000	703	701	694	683	717	680	764	947	970	997
Manganese (Mn)	mg/L	0.0002	0.00084	0.00113	0.00128	0.00134	0.00100	0.00126	0.00108	0.00110	0.00123	0.00107	0.00120	0.00092	0.00148	0.00170	0.00198
Mercury (Hg)	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L	0.002	0.0066	0.0069	0.0061	0.0084	0.0092	0.0064	0.0071	0.0066	0.0066	0.0064	0.0065	0.0072	0.0092	0.0086	0.0096
Nickel (Ni)	mg/L	0.0005	0.00103	0.00089	0.00073	0.00072	0.00070	0.00076	0.00097	0.00085	0.00094	0.00088	0.00084	0.00078	0.00065	0.00084	0.00054
Phosphorus (P)	mg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Potassium (K)	mg/L	20	239	231	214	294	319	222	216	216	210	220	213	239	298	307	316
Rhenium (Re)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Rubidium (Rb)	mg/L	0.005	0.0695	0.0699	0.0637	0.0874	0.0949	0.0663	0.0697	0.0670	0.0701	0.0692	0.0660	0.0755	0.0952	0.0850	0.101
Selenium (Se)	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L	0.5	0.55	<0.50	<0.50	<0.50	0.91	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	0.66	0.90

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location			04-24					04-30	04-32		04-40	04-42	04-44				
Sample ID			04-24-AP1 9M	04-24-AP2 9M	04-24-SF 1M	04-24-BP 13M	04-24-DP 25M	04-30-1	04-32-1	04-32-2	04-40-1 1M	04-42-1 1M	04-44-SF 1M	04-44-AP 8M	04-44-BP1 14M	04-44-BP2 14M	04-44-DP 30M
Replicate			1	2	1	1	1	1	1	2	1	1	1	1	1	2	1
Date Sampled			3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
Depth Sampled (m)			9	9	1	13	25	1	1	1	1	1	1	8	14	14	30
ALS Sample ID	Units		L1190204-1	L1190204-2	L1190204-3	L1190204-4	L1190204-5	L1190274-1	L1190279-9	L1190274-2	L1190237-6	L1190237-7	L1190237-1	L1190237-2	L1190237-3	L1190237-4	L1190237-5
Silver (Ag)	mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)	mg/L	20	6900	6400	5890	8330	9010	6020	5800	5860	5730	6020	5720	6440	8510	8620	8940
Strontium (Sr)	mg/L	0.05	4.58	4.46	4.13	5.58	5.99	4.21	4.06	4.11	4.04	4.24	4.01	4.53	5.69	5.77	5.97
Tellurium (Te)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000058	<0.000050
Thorium (Th)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Tin (Sn)	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Titanium (Ti)	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten (W)	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Uranium (U)	mg/L	0.00005	0.00199	0.00204	0.00182	0.00244	0.00260	0.00166	0.00151	0.00167	0.00170	0.00156	0.00157	0.00176	0.00215	0.00256	0.00249
Vanadium (V)	mg/L	0.0005	0.00052	<0.00050	<0.00050	0.00062	0.00074	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00064	0.00066	0.00069
Yttrium (Y)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)	mg/L	0.003	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00057	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

Notes:

Shaded cells indicate concentration was above CCME water quality guideline for the protection of aquatic life (CCME 2012)

^a Canadian water quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012.

^b Interim guideline.

^c Dependent on background levels

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				06-10		06-20	06-22	06-24					06-30	06-32	06-40	06-42
Sample ID				06-10-1 1M	06-10-2 1M	06-20-1	06-22 2.5M	06-24-SF 1M	06-24-AP1 4M	06-24-AP2 4M	06-24-BP 8M	06-24-DP 13M	06-30 1M	06-32 3M	06-40-1 1M	06-42 2.5M
Replicate				1	2	1	1	1	1	2	1	1	1	1	1	1
Date Sampled		CCME Guidelines for the Protection of Aquatic Life ^a	Realised Detection Limits	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12
Depth Sampled (m)				1	1	1	2.5	1	4	4	8	13	1	3	1	2.5
ALS Sample ID	Units			L1189353-3	L1189353-4	L1189353-29	L1189350-1	L1189346-1	L1189346-2	L1189346-3	L1189346-4	L1189346-5	L1189350-3	L1189350-2	L1189350-4	L1189350-5
Physical Tests																
Hardness (as CaCO ₃)	mg/L		4.3	3200	3090	3060	3030	3190	3220	3220	4880	5050	3270	3140	3270	3080
pH	pH Units	7.0-8.7	0.1	7.76	7.80	7.82	7.77	7.79	7.80	7.80	7.73	7.62	7.83	7.81	7.84	7.81
Alkalinity, Bicarbonate (as CaCO ₃)	mg/L		2.0	92.7	97.4	91.8	90.2	91.6	90.6	92.3	120	123	87.6	87.6	90.6	87.6
Alkalinity, Carbonate (as CaCO ₃)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO ₃)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO ₃)	mg/L		2.0	92.7	97.4	91.8	90.2	91.6	90.6	92.3	120	123	87.6	87.6	90.6	87.6
Total Suspended Solids	mg/L	c	2.0	4.6	3.5	19.7	12.4	7.2	8.3	7.6	2.7	2.7	6.4	<2.0	3.0	<2.0
Turbidity	mg/L	c	0.1	3.77	3.65	16.2	10.2	6.31	6.45	6.55	1.87	1.74	6.12	1.18	2.17	1.23
Major Anions																
Bromide (Br)	mg/L		5	38.9	39.2	38.4	38.6	37.6	37.6	37.1	57.7	62.5	38.0	38.9	37.9	39.6
Chloride (Cl)	mg/L		50	10100	10300	10100	10200	9990	10200	10200	15400	16700	10200	10300	10200	10300
Fluoride (F)	mg/L		0.75 - 2.00	0.80	0.79	0.78	0.76	<0.75	0.82	0.77	0.98	1.01	0.79	0.78	0.85	0.84
Sulphate (SO ₄)	mg/L		50	1410	1450	1430	1440	1400	1420	1440	2180	2370	1430	1450	1420	1440
Nutrients																
Ammonia, Total (as N)	mg/L		0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate and Nitrite (as N)	mg/L		0.006	<0.0060	<0.0060	<0.0060	<0.51	<0.0060	<0.0060	<0.0060	0.0067	0.101	<0.51	<0.51	<0.51	<0.51
Nitrate (as N)	mg/L	3.612 ^b	0.006	<0.50	<0.50	<0.50	<0.0060	<0.0060	<0.0060	<0.0060	<0.0063	0.0901	<0.0060	<0.0060	<0.0060	<0.0060
Nitrite (as N)	mg/L		0.002	<0.10	<0.10	<0.10	<0.0020	<0.0020	<0.0020	<0.0020	0.0058	0.0111	<0.0020	<0.0020	<0.0020	<0.0020
Orthophosphate (as P)	mg/L		0.001	0.0143	0.0150	0.0140	0.0142	0.0145	0.0148	0.0145	0.0302	0.0334	0.0143	0.0151	0.0147	0.0153
Total Phosphorus (P)	mg/L		0.002	0.0220	0.0218	0.0340	0.0260	0.0243	0.0264	0.0255	0.0412	0.0453	0.0185	0.0203	0.0196	0.0196
Silicate (as SiO ₂)	mg/L		0.5	0.61	0.59	0.59	0.61	0.64	0.62	0.64	0.90	1.75	0.64	0.63	0.62	0.63
Organic Carbon																
Total Organic Carbon	mg/L		0.5	1.92	1.91	2.01	2.08	1.84	1.85	1.80	1.71	1.88	2.19	2.10	2.19	2.11
Total Metals																
Aluminum (Al)	mg/L		0.005	0.0487	0.0493	0.239	0.187	0.0798	0.0980	0.0950	0.0225	0.0255	0.0856	0.0218	0.0373	0.0167
Antimony (Sb)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic (As)	mg/L	0.0125 ^b	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L		0.001	0.0111	0.0103	0.0121	0.0115	0.0107	0.0108	0.0112	0.0132	0.0140	0.0108	0.0105	0.0103	0.0101
Beryllium (Be)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.1	2.81	2.75	2.62	2.65	2.63	2.65	2.72	3.93	4.30	2.72	2.77	2.72	2.67
Cadmium (Cd)	mg/L	0.00012	0.00005	0.000120	0.000069	0.000068	<0.000050	0.000076	0.000068	0.000074	0.000091	0.000128	0.000064	0.000079	0.000070	0.000091
Calcium (Ca)	mg/L		0.5	204	204	200	203	218	210	222	335	330	220	199	212	203
Cesium (Cs)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chromium (Cr)	mg/L	Cr(VI): 0.0015; Cr(III): 0.056 ^b	0.0005	<0.00050	<0.00050	0.00086	0.00058	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)	mg/L		0.00005	0.000079	0.000089	0.000227	0.000137	0.000107	0.000095	0.000102	0.000074	0.000109	0.000102	<0.000050	0.000053	0.000078
Copper (Cu)	mg/L		0.0005	0.00126	0.00089	0.00132	0.00090	0.00080	0.00068	0.00065	0.00053	0.00136	0.00085	0.00100	0.00070	0.00131
Gallium (Ga)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)	mg/L		0.01	0.072	0.063	0.298	0.185	0.120	0.113	0.118	0.045	0.086	0.109	0.023	0.040	0.027
Lead (Pb)	mg/L		0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L		0.02	0.113	0.105	0.102	0.107	0.105	0.107	0.109	0.157	0.171	0.105	0.109	0.107	0.108
Magnesium (Mg)	mg/L		1	623	624	612	629	656	641	675	997	995	685	630	668	653
Manganese (Mn)	mg/L		0.0002	0.00353	0.00292	0.00570	0.00413	0.00340	0.00323	0.00317	0.00281	0.00589	0.00324	0.00225	0.00243	0.00323
Mercury (Hg)	mg/L	Inorganic Hg: 0.000016 ^b	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.002	0.0062	0.0061	0.0058	0.0060	0.0064	0.0058	0.0061	0.0086	0.0094	0.0058	0.0062	0.0062	0.0060
Nickel (Ni)	mg/L		0.0005	0.00099	0.00104	0.00136	0.00103	0.00105	0.00090	0.00104	0.00083	0.00183	0.00105	0.00093	0.00094	0.00091
Phosphorus (P)	mg/L		1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location			06-10		06-20	06-22	06-24					06-30	06-32	06-40	06-42	
Sample ID			06-10-1 1M	06-10-2 1M	06-20-1	06-22 2.5M	06-24-SF 1M	06-24-AP1 4M	06-24-AP2 4M	06-24-BP 8M	06-24-DP 13M	06-30 1M	06-32 3M	06-40-1 1M	06-42 2.5M	
Replicate			1	2	1	1	1	1	2	1	1	1	1	1	1	
Date Sampled			1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	
Depth Sampled (m)			1	1	1	2.5	1	4	4	8	13	1	3	1	2.5	
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life ^a	Realised Detection Limits	L1189353-3	L1189353-4	L1189353-29	L1189350-1	L1189346-1	L1189346-2	L1189346-3	L1189346-4	L1189346-5	L1189350-3	L1189350-2	L1189350-4	L1189350-5
Potassium (K)	mg/L		20	184	189	181	192	202	194	203	312	304	208	193	200	195
Rhenium (Re)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Rubidium (Rb)	mg/L		0.005	0.0636	0.0607	0.0602	0.0618	0.0602	0.0613	0.0602	0.0885	0.0954	0.0604	0.0624	0.0608	0.0608
Selenium (Se)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L		0.5	0.54	<0.50	1.45	0.90	0.74	0.60	0.73	0.59	1.08	1.08	<0.50	0.65	<0.50
Silver (Ag)	mg/L		0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)	mg/L		20	5210	5350	5170	5320	5790	5550	5840	9150	9020	5620	5340	5420	5370
Strontium (Sr)	mg/L		0.05	3.65	3.74	3.61	3.72	3.97	3.80	4.01	6.04	5.94	3.97	3.74	3.85	3.73
Tellurium (Te)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)	mg/L		0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000057	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thorium (Th)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Tin (Sn)	mg/L		0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Titanium (Ti)	mg/L		0.005	<0.0050	<0.0050	0.0116	0.0074	0.0120	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten (W)	mg/L		0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Uranium (U)	mg/L		0.00005	0.00155	0.00152	0.00162	0.00161	0.00159	0.00158	0.00163	0.00221	0.00226	0.00153	0.00160	0.00157	0.00161
Vanadium (V)	mg/L		0.0005	0.00060	0.00059	0.00117	0.00082	0.00069	0.00070	0.00068	0.00060	<0.00050	0.00065	<0.00050	0.00052	<0.00050
Yttrium (Y)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)	mg/L		0.003	0.0054	0.0051	0.0054	0.0063	0.0043	0.0054	0.0039	0.0055	0.0091	0.0059	0.0063	0.0062	0.0056
Zirconium (Zr)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	0.00064	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals																
Aluminum (Al)	mg/L		0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Antimony (Sb)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic (As)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L		0.001	0.0106	0.0105	0.0111	0.0106	0.0108	0.0104	0.0103	0.0119	0.0138	0.0103	0.0101	0.0105	0.0101
Beryllium (Be)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.1	2.79	2.91	2.73	2.78	2.81	2.76	2.77	4.04	4.23	2.75	2.69	2.82	2.75
Cadmium (Cd)	mg/L		0.00005	0.000077	0.000071	0.000079	0.000068	0.000092	0.000076	0.000063	0.000106	0.000132	0.000078	0.000076	0.000075	0.000094
Calcium (Ca)	mg/L		0.5	205	209	200	195	216	212	214	329	340	215	203	215	200
Cesium (Cs)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chromium (Cr)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)	mg/L		0.00005	<0.000050	<0.000050	0.000053	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000088	0.000053	<0.000050	<0.000050	<0.000050
Copper (Cu)	mg/L		0.0005	0.00068	0.00058	0.00072	0.00064	0.00068	0.00064	<0.00050	0.00083	<0.00050	0.00075	0.00066	0.00066	0.00083
Gallium (Ga)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)	mg/L		0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013
Lead (Pb)	mg/L		0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L		0.02	0.108	0.110	0.108	0.105	0.116	0.109	0.109	0.159	0.167	0.109	0.105	0.105	0.108
Magnesium (Mg)	mg/L		1	652	624	623	618	643	654	652	987	1020	663	638	665	627
Manganese (Mn)	mg/L		0.0002	0.00124	0.00100	0.00128	0.00078	0.00103	0.00081	0.00085	0.00224	0.00497	0.00124	0.00089	0.00109	0.00117
Mercury (Hg)	mg/L		0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.002	0.0060	0.0064	0.0065	0.0060	0.0066	0.0060	0.0062	0.0088	0.0092	0.0062	0.0058	0.0061	0.0059
Nickel (Ni)	mg/L		0.0005	0.00102	0.00098	0.00094	0.00092	0.00086	0.00086	0.00083	0.00089	0.00107	0.00084	0.00097	0.00090	0.00124
Phosphorus (P)	mg/L		1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Potassium (K)	mg/L		20	196	199	187	180	196	196	199	303	318	204	195	205	194
Rhenium (Re)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Rubidium (Rb)	mg/L		0.005	0.0613	0.0633	0.0621	0.0602	0.0639	0.0614	0.0631	0.0893	0.0970	0.0607	0.0602	0.0618	0.0619
Selenium (Se)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L		0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.						

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location			06-10		06-20	06-22	06-24					06-30	06-32	06-40	06-42
Sample ID			06-10-1 1M	06-10-2 1M	06-20-1	06-22 2.5M	06-24-SF 1M	06-24-AP1 4M	06-24-AP2 4M	06-24-BP 8M	06-24-DP 13M	06-30 1M	06-32 3M	06-40-1 1M	06-42 2.5M
Replicate			1	2	1	1	1	1	2	1	1	1	1	1	1
Date Sampled			1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12
Depth Sampled (m)			1	1	1	2.5	1	4	4	8	13	1	3	1	2.5
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life ^a Realised Detection Limits	L1189353-3	L1189353-4	L1189353-29	L1189350-1	L1189346-1	L1189346-2	L1189346-3	L1189346-4	L1189346-5	L1189350-3	L1189350-2	L1189350-4	L1189350-5
Silver (Ag)	mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)	mg/L	20	5520	5630	5290	5020	5670	5620	5660	8980	9360	5510	5400	5570	5320
Strontium (Sr)	mg/L	0.05	3.88	3.96	3.71	3.49	3.89	3.86	3.88	5.92	6.15	3.92	3.76	3.95	3.71
Tellurium (Te)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thorium (Th)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Tin (Sn)	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Titanium (Ti)	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten (W)	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Uranium (U)	mg/L	0.00005	0.00165	0.00162	0.00160	0.00160	0.00160	0.00169	0.00167	0.00242	0.00245	0.00159	0.00154	0.00158	0.00163
Vanadium (V)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00058	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Yttrium (Y)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)	mg/L	0.003	0.0053	0.0053	0.0058	0.0051	0.0097	0.0045	<0.0030	0.0043	0.0045	0.0053	0.0054	0.0052	0.0077
Zirconium (Zr)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

Notes:

Shaded cells indicate concentration was above CCME water quality guideline for the protection of aquatic life (CCME 2012)

^a Canadian water quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012.

^b Interim guideline.

^c Dependent on background levels

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				06-44			06-50	06-52		06-54				
Sample ID				06-44-SF 1M	06-44-AP 6M	06-44-DP 11M	06-50-1	06-52-1 3M	06-52-2 3M	06-54-SF1 1M	06-54-SF2 1M	06-54-AP 7M	06-54-BP 15M	06-54-DP 25M
Replicate				1	1	1	1	1	2	1	2	1	1	1
Date Sampled				1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12
Depth Sampled (m)				1	6	11	1	3	3	1	1	7	15	25
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life ^a	Realised Detection Limits	L1189350-6	L1189350-7	L1189350-8	L1189342-1	L1189342-2	L1189342-3	L1189342-4	L1189342-5	L1189342-6	L1189342-7	L1189342-8
Physical Tests														
Hardness (as CaCO ₃)	mg/L		4.3	3170	3400	4300	3090	3140	3120	3120	3160	3310	4870	5010
pH	pH Units	7.0-8.7	0.1	7.83	7.73	7.75	7.73	7.78	7.76	7.78	7.79	7.78	7.68	7.67
Alkalinity, Bicarbonate (as CaCO ₃)	mg/L		2.0	94.1	97.2	114	89.6	91.7	92.2	88.4	90.5	95.9	118	121
Alkalinity, Carbonate (as CaCO ₃)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO ₃)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO ₃)	mg/L		2.0	94.1	97.2	114	89.6	91.7	92.2	88.4	90.5	95.9	118	121
Total Suspended Solids	mg/L	c	2.0	<2.0	<2.0	<2.0	6.9	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Turbidity	mg/L	c	0.1	0.85	0.66	1.39	6.01	1.10	1.18	0.88	0.80	0.64	0.91	0.34
Major Anions														
Bromide (Br)	mg/L		5	39.6	40.4	53.8	38.9	37.6	40.1	39.4	39.5	41.5	59.5	59.8
Chloride (Cl)	mg/L		50	10300	11000	14300	9900	9890	10400	10600	10500	10800	15300	15700
Fluoride (F)	mg/L		0.75 - 2.00	0.81	0.85	1.03	0.84	0.89	0.77	0.77	<0.75	0.76	0.99	1.03
Sulphate (SO ₄)	mg/L		50	1440	1540	2020	1380	1380	1470	1500	1490	1510	2170	2230
Nutrients														
Ammonia, Total (as N)	mg/L		0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0081	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate and Nitrite (as N)	mg/L		0.006	<0.51	<0.51	<0.51	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	0.0481	0.152
Nitrate (as N)	mg/L	3.612 ^b	0.006	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	0.0447	0.152
Nitrite (as N)	mg/L		0.002	<0.0020	<0.0020	0.0039	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0034	<0.0020
Orthophosphate (as P)	mg/L		0.001	0.0150	0.0170	0.0313	0.0149	0.0161	0.0158	0.0149	0.0153	0.0171	0.0435	0.0520
Total Phosphorus (P)	mg/L		0.002	0.0196	0.0295	0.0367	0.0184	0.0199	0.0191	0.0180	0.0187	0.0214	0.0523	0.0541
Silicate (as SiO ₂)	mg/L		0.5	0.67	0.71	0.94	0.64	0.66	0.66	0.62	0.66	0.71	1.30	1.51
Organic Carbon														
Total Organic Carbon	mg/L		0.5	2.00	2.10	1.94	2.40	1.94	1.61	1.88	1.81	1.69	1.57	1.04
Total Metals														
Aluminum (Al)	mg/L		0.005	0.0114	0.0078	0.0203	0.0990	0.0228	0.0109	0.0128	0.0495	0.0105	0.0172	<0.0050
Antimony (Sb)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic (As)	mg/L	0.0125 ^b	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L		0.001	0.0098	0.0105	0.0117	0.0104	0.0098	0.0102	0.0103	0.0103	0.0102	0.0118	0.0112
Beryllium (Be)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.1	2.67	2.92	3.77	2.52	2.64	2.69	2.60	2.62	2.89	4.04	4.17
Cadmium (Cd)	mg/L	0.00012	0.00005	0.000066	0.000075	0.000132	0.000050	<0.000050	<0.000050	0.000065	0.000055	0.000068	0.000128	0.000101
Calcium (Ca)	mg/L		0.5	200	219	279	201	205	206	194	201	217	308	330
Cesium (Cs)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chromium (Cr)	mg/L	Cr(VI): 0.0015; Cr(III): 0.056 ^b	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00063	<0.00050
Cobalt (Co)	mg/L		0.00005	<0.000050	<0.000050	0.000053	0.000092	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Copper (Cu)	mg/L		0.0005	0.00063	0.00065	0.00078	0.00059	0.00064	<0.00050	0.00085	0.00083	0.00108	0.00124	<0.00050
Gallium (Ga)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)	mg/L		0.01	0.016	0.013	0.033	0.106	0.020	0.017	0.019	0.017	0.016	0.214	<0.010
Lead (Pb)	mg/L		0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	0.00033	<0.00030
Lithium (Li)	mg/L		0.02	0.102	0.113	0.147	0.099	0.105	0.106	0.104	0.104	0.115	0.163	0.164
Magnesium (Mg)	mg/L		1	615	691	886	624	634	636	608	618	676	976	1020
Manganese (Mn)	mg/L		0.0002	0.00206	0.00187	0.00228	0.00320	0.00210	0.00222	0.00219	0.00203	0.00236	0.00227	0.00175
Mercury (Hg)	mg/L	Inorganic Hg: 0.000016 ^b	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.002	0.0059	0.0063	0.0084	0.0056	0.0059	0.0060	0.0064	0.0059	0.0064	0.0090	0.0093
Nickel (Ni)	mg/L		0.0005	0.00097	0.00090	0.00116	0.00090	0.00084	0.00080	0.00116	0.00092	0.00098	0.00100	0.00070
Phosphorus (P)	mg/L		1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location			06-44			06-50	06-52		06-54				
Sample ID			06-44-SF 1M	06-44-AP 6M	06-44-DP 11M	06-50-1	06-52-1 3M	06-52-2 3M	06-54-SF1 1M	06-54-SF2 1M	06-54-AP 7M	06-54-BP 15M	06-54-DP 25M
Replicate			1	1	1	1	1	2	1	2	1	1	1
Date Sampled		CCME Guidelines for the Protection of Aquatic Life ^a	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12
Depth Sampled (m)		Realised Detection Limits	1	6	11	1	3	3	1	1	7	15	25
ALS Sample ID	Units		L1189350-6	L1189350-7	L1189350-8	L1189342-1	L1189342-2	L1189342-3	L1189342-4	L1189342-5	L1189342-6	L1189342-7	L1189342-8
Potassium (K)	mg/L	20	191	211	266	187	190	192	174	185	204	301	313
Rhenium (Re)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Rubidium (Rb)	mg/L	0.005	0.0604	0.0655	0.0848	0.0575	0.0598	0.0607	0.0596	0.0604	0.0651	0.0923	0.0940
Selenium (Se)	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L	0.5	<0.50	<0.50	0.60	0.68	<0.50	<0.50	<0.50	<0.50	<0.50	0.71	0.92
Silver (Ag)	mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)	mg/L	20	5240	5790	7410	5250	5310	5310	4820	5070	5510	8220	8870
Strontium (Sr)	mg/L	0.05	3.63	3.99	5.08	3.68	3.73	3.71	3.37	3.54	3.88	5.64	6.07
Tellurium (Te)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)	mg/L	0.00005	<0.000050	<0.000050	<0.000050	0.000069	0.000072	0.000073	0.000061	0.000054	0.000057	0.000052	<0.000050
Thorium (Th)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Tin (Sn)	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Titanium (Ti)	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten (W)	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Uranium (U)	mg/L	0.00005	0.00157	0.00163	0.00210	0.00156	0.00172	0.00170	0.00165	0.00157	0.00173	0.00242	0.00238
Vanadium (V)	mg/L	0.0005	<0.00050	<0.00050	0.00063	0.00073	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00071	0.00071
Yttrium (Y)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)	mg/L	0.003	0.0093	0.0056	0.0091	<0.0030	<0.0030	<0.0030	0.0038	<0.0030	0.0042	0.0041	0.0041
Zirconium (Zr)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals													
Aluminum (Al)	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0067	<0.0050	<0.0050	<0.0050	<0.0050
Antimony (Sb)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic (As)	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L	0.001	0.0104	0.0103	0.0113	0.0102	0.0101	0.0099	0.0111	0.0104	0.0102	0.0120	0.0113
Beryllium (Be)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L	0.1	2.77	2.93	3.67	2.62	2.71	2.64	2.74	2.72	2.86	4.24	4.31
Cadmium (Cd)	mg/L	0.00005	0.000115	0.000111	0.000118	<0.000050	0.000052	0.000079	0.000088	0.000079	0.000059	0.000102	0.000115
Calcium (Ca)	mg/L	0.5	204	220	287	205	208	205	200	206	217	315	326
Cesium (Cs)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chromium (Cr)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000070	<0.000050	<0.000050	<0.000050	<0.000050
Copper (Cu)	mg/L	0.0005	0.00072	0.00057	0.00072	0.00071	0.00067	0.00059	0.00076	0.00087	0.00053	<0.00050	<0.00050
Gallium (Ga)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)	mg/L	0.01	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)	mg/L	0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L	0.02	0.109	0.112	0.147	0.106	0.108	0.105	0.106	0.108	0.114	0.165	0.171
Magnesium (Mg)	mg/L	1	646	693	869	625	637	634	635	641	673	991	1020
Manganese (Mn)	mg/L	0.0002	0.00119	0.00115	0.00110	0.00098	0.00106	0.00110	0.00152	0.00125	0.00126	0.00112	0.00064
Mercury (Hg)	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L	0.002	0.0063	0.0064	0.0084	0.0059	0.0061	0.0061	0.0061	0.0061	0.0064	0.0094	0.0095
Nickel (Ni)	mg/L	0.0005	0.00112	0.00107	0.00090	0.00082	0.00085	0.00070	0.00135	0.00130	0.00101	0.00087	0.00082
Phosphorus (P)	mg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Potassium (K)	mg/L	20	194	217	273	187	193	191	187	191	207	308	309
Rhenium (Re)	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Rubidium (Rb)	mg/L	0.005	0.0624	0.0655	0.0834	0.0596	0.0610	0.0597	0.0617	0.0618	0.0634	0.0958	0.0970
Selenium (Se)	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.65	0.96

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location			06-44			06-50	06-52		06-54					
Sample ID			06-44-SF 1M	06-44-AP 6M	06-44-DP 11M	06-50-1	06-52-1 3M	06-52-2 3M	06-54-SF1 1M	06-54-SF2 1M	06-54-AP 7M	06-54-BP 15M	06-54-DP 25M	
Replicate			1	1	1	1	1	2	1	2	1	1	1	
Date Sampled			1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	
Depth Sampled (m)			1	6	11	1	3	3	1	1	7	15	25	
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life ^a	Realised Detection Limits	L1189350-6	L1189350-7	L1189350-8	L1189342-1	L1189342-2	L1189342-3	L1189342-4	L1189342-5	L1189342-6	L1189342-7	L1189342-8
Silver (Ag)	mg/L		0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)	mg/L		20	5340	5910	7640	5240	5360	5280	5120	5180	5550	8390	8760
Strontium (Sr)	mg/L		0.05	3.68	4.07	5.25	3.68	3.75	3.71	3.59	3.65	3.93	5.79	5.97
Tellurium (Te)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)	mg/L		0.00005	<0.000050	<0.000050	<0.000050	0.000069	0.000069	0.000064	0.000060	0.000051	0.000052	0.000050	<0.000050
Thorium (Th)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Tin (Sn)	mg/L		0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Titanium (Ti)	mg/L		0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten (W)	mg/L		0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Uranium (U)	mg/L		0.00005	0.00169	0.00177	0.00225	0.00163	0.00170	0.00159	0.00163	0.00163	0.00176	0.00239	0.00249
Vanadium (V)	mg/L		0.0005	<0.00050	<0.00050	0.00055	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00061	0.00068
Yttrium (Y)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)	mg/L		0.003	0.0063	0.0107	0.0054	0.0031	<0.0030	<0.0030	0.0085	<0.0030	0.0031	0.0035	<0.0030
Zirconium (Zr)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

Notes:

Shaded cells indicate concentration was above CCME water quality guideline for the protection of aquatic life (CCME 2012)

^a Canadian water quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012.

^b Interim guideline.

^c Dependent on background levels

Appendix C

Raw Marine Sediment Quality Data, Back River
Project, 2012

Appendix C. Raw Marine Sediment Quality Data, Back River Project, 2012

Location				04-10			04-12			04-20			04-22					
Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life ^a		Realized Detection Limits	04-10 REP 1	04-10 REP 2	04-10 REP 3	04-12 REP 1	04-12 REP 2	04-12 REP 3	04-20 REP 1	04-20 REP 2	04-20 REP 3	04-22 REP 1	04-22 REP 2	04-22 REP 3		
Replicate					1	2	3	1	2	3	1	2	3	1	2	3		
Date Sampled					4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	
Depth Sampled (m)				1.2	1.2	1.2	8.1	8.1	8.1	1.9	1.9	1.9	4.6	4.6	4.6			
ALS Sample ID		ISQG ^b	PEL ^c	L1190180-25	L1190180-26	L1190180-27	L1190180-28	L1190180-29	L1190180-30	L1190180-31	L1190180-32	L1190180-33	L1190180-34	L1190180-35	L1190180-36			
Physical Tests																		
Moisture	%																	
pH (1:2 soil:water)	pH			0.10	7.18	7.03	7.23	7.93	7.77	7.22	8.05	7.85	8.08	7.62	8.02	7.66		
Particle Size																		
% Gravel (>2 mm)	%			0.10	1.62	<0.10	0.12	<0.10	<0.10	<0.10	10.1	4.96	5.22	<0.10	<0.10	0.11		
% Sand (2.0 mm - 0.063 mm)	%			0.10	57.7	41.4	43.3	87.9	92.1	90.7	84.0	89.1	89.1	91.6	92.4	87.7		
% Silt (0.063 mm - 4 µm)	%			0.10	25.4	35.5	33.7	6.67	4.30	5.57	3.17	3.05	3.12	5.68	5.05	8.26		
% Clay (<4 µm)	%			0.10	15.3	23.2	22.8	5.40	3.59	3.69	2.77	2.91	2.54	2.77	2.59	3.98		
Texture	-			-	Sandy loam	Loam	Loam	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand		
Carbon and Nitrogen																		
Total Organic Carbon	%			0.10	0.22	0.29	0.30	0.23	0.14	0.14	0.13	0.11	0.12	<0.10	<0.10	0.15		
Total Nitrogen	%			0.020	0.027	0.029	0.033	0.035	0.025	0.025	<0.020	<0.020	<0.020	<0.020	<0.020	0.023		
Plant Available Nutrients																		
Available Ammonium (as N)				1.0 - 1.6	1.8	1.3	1.0	3.6	5.3	2.0	1.1	<1.0	<1.0	<1.0	<1.0	2.1		
Nitrate+Nitrite (as N)	mg/kg			2.0 - 6.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0		
Nitrate (as N)	mg/kg			2.0 - 6.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0		
Nitrite (as N)	mg/kg			0.4 - 1.2	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40		
Available Phosphate (as P)	mg/kg			2.0 - 4.0	13.3	13.8	15.3	27.2	32.5	21.2	10.2	12.9	13.3	15.8	12.3	31.8		
Metals																		
Aluminum (Al)	mg/kg	7.24	41.6	50	7720	10100	10400	3300	2800	3290	2740	2550	2430	3050	2770	3350		
Antimony (Sb)	mg/kg			0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	
Arsenic (As)	mg/kg			0.050	3.77	4.65	4.73	1.68	1.47	1.60	1.48	1.30	1.24	1.54	1.36	1.88		
Barium (Ba)	mg/kg			0.50	46.9	57.7	57.4	14.3	10.3	16.9	11.5	11.2	9.92	19.6	18.1	19.9		
Beryllium (Be)	mg/kg			0.20	0.33	0.43	0.45	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	
Bismuth (Bi)	mg/kg	0.7	4.2	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20		
Cadmium (Cd)	mg/kg			0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		
Calcium (Ca)	mg/kg			50	3190	2740	3350	967	636	897	1030	752	1000	1190	1220	1150		
Chromium (Cr)	mg/kg			52.3	160	0.50	21.3	26.8	27.7	8.89	7.36	8.53	7.36	6.79	6.44	8.50	8.04	9.23
Cobalt (Co)	mg/kg			0.10	4.57	5.78	6.06	2.05	1.72	2.11	1.94	1.84	1.75	2.03	1.86	2.22		
Copper (Cu)	mg/kg	18.7	108	0.50	11.3	13.7	14.8	4.42	3.82	5.17	3.94	3.32	2.81	4.12	3.39	5.23		
Iron (Fe)	mg/kg	30.2	112	50	12600	15000	15400	5550	4770	5400	4860	4520	4280	5550	5650	6040		
Lead (Pb)	mg/kg			0.50	4.80	6.22	6.26	1.97	1.53	1.93	1.56	1.54	1.43	1.70	1.60	1.83		
Lithium (Li)	mg/kg			5.0	14.2	19.3	19.8	7.0	5.9	7.1	5.7	5.3	5.1	6.3	5.7	7.1		
Magnesium (Mg)	mg/kg			20	4910	6370	6670	2430	2140	2300	2100	1870	1860	2210	2020	2440		
Manganese (Mn)	mg/kg			1.0	103	126	136	47.0	38.9	46.4	45.7	40.4	40.0	50.2	47.9	53.4		
Mercury (Hg)	mg/kg	0.13	0.70	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		
Molybdenum (Mo)	mg/kg			0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50		
Nickel (Ni)	mg/kg			0.50	11.6	15.2	15.5	5.49	4.89	5.13	4.57	4.16	4.14	4.68	4.39	5.23		
Phosphorus (P)	mg/kg			50	444	551	561	243	229	257	193	181	176	304	314	327		
Potassium (K)	mg/kg			100	2050	2720	2800	830	620	840	610	610	550	670	580	800		
Selenium (Se)	mg/kg			0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20		
Silver (Ag)	mg/kg			0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10		
Sodium (Na)	mg/kg			100	2790	2920	3940	2120	1390	1230	1310	1160	1270	1630	1300	1820		
Strontium (Sr)	mg/kg			0.50	40.2	42.1	46.7	14.1	10.7	13.0	12.9	11.8	12.0	13.1	12.2	13.8		
Sulphur (S)	mg/kg			500	1100	900	1000	700	<500	600	500	<500	<500	<500	<500	600		
Thallium (Tl)	mg/kg			0.050	0.075	0.102	0.107	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		
Tin (Sn)	mg/kg			2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0		
Titanium (Ti)	mg/kg			1.0	379	455	459	118	93.6	142	110	118	97.6	179	176	166		
Uranium (U)	mg/kg			0.050	0.838	1.14	1.09	0.339	0.345	0.379	0.298	0.317	0.377	0.444	0.396	0.374		
Vanadium (V)	mg/kg			0.20	26.8	32.4	32.6	9.90	8.11	10.9	8.63	8.40	7.98	11.5	12.3	11.7		
Zinc (Zn)	mg/kg	124	271	1.0	22.2	29.1	30.3	10.0	8.0	9.1	7.9	7.2	6.7	8.9	8.3	9.7		

Notes:

Shaded cells indicate values that exceed CCME guidelines.

^a Canadian sediment quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012

^b ISQG = Interim Sediment Quality Guideline

^c PEL = Probable Effects Level

Appendix C. Raw Marine Sediment Quality Data, Back River Project, 2012

Location				04-30			04-32			04-40			04-42			
Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life ^a		Realized Detection Limits	04-30 REP 1	04-30 REP 2	04-30 REP 3	04-32 REP 1	04-32 REP 2	04-32 REP 3	04-40 REP 1	04-40 REP 2	04-40 REP 3	04-42 REP 1	04-42 REP 2	04-42 REP 3
Replicate					1	2	3	1	2	3	1	2	3	1	2	3
Date Sampled					4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12
Depth Sampled (m)					1.5	1.5	1.5	10.0	10.0	10.0	2.2	2.2	2.2	5.6	5.6	5.6
ALS Sample ID		ISQG ^b	PEL ^c		L1190180-37	L1190180-38	L1190180-39	L1190180-40	L1190180-41	L1190180-42	L1190180-43	L1190180-44	L1190180-45	L1190180-46	L1190180-47	L1190180-48
Physical Tests																
Moisture	%															
pH (1:2 soil:water)	pH			0.10	7.62	7.49	7.67	7.69	7.62	7.30	7.53	7.52	7.67	7.74	7.53	7.68
Particle Size																
% Gravel (>2 mm)	%			0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
% Sand (2.0 mm - 0.063 mm)	%			0.10	87.0	84.6	85.4	60.2	28.8	28.6	85.5	86.3	83.9	28.3	33.9	48.5
% Silt (0.063 mm - 4 µm)	%			0.10	8.22	9.58	8.79	25.4	39.6	40.2	10.0	9.15	11.4	40.4	39.2	33.6
% Clay (<4 µm)	%			0.10	4.80	5.84	5.81	14.4	31.6	31.1	4.42	4.54	4.79	31.4	27.0	18.0
Texture	-			-	Sand / Loamy sand	Loamy sand	Loamy sand	Sandy loam	Clay loam	Clay loam	Loamy sand	Sand / Loamy sand	Loamy sand	Clay loam	Loam	Loam / Sandy loam
Carbon and Nitrogen																
Total Organic Carbon	%			0.10	0.12	0.22	0.16	0.47	1.02	0.81	0.15	<0.10	<0.10	0.64	0.73	0.67
Total Nitrogen	%			0.020	<0.020	<0.020	<0.020	0.045	0.074	0.066	<0.020	<0.020	<0.020	0.067	0.078	0.068
Plant Available Nutrients																
Available Ammonium (as N)				1.0 - 1.6	<1.0	<1.0	<1.0	5.8	2.7	3.9	<1.0	<1.0	1.3	3.2	8.9	8.8
Nitrate+Nitrite (as N)	mg/kg			2.0 - 6.0	<2.0	<2.0	<2.0	<2.0	<4.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Nitrate (as N)	mg/kg			2.0 - 6.0	<2.0	<2.0	<2.0	<2.0	<4.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Nitrite (as N)	mg/kg			0.4 - 1.2	<0.40	<0.40	<0.40	<0.40	<0.80	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Available Phosphate (as P)	mg/kg			2.0 - 4.0	7.2	8.4	7.1	20.7	21.6	20.6	9.3	7.2	7.4	18.4	24.1	22.1
Metals																
Aluminum (Al)	mg/kg			50	3420	3680	4080	6780	11700	11500	3560	3570	3840	12600	11500	8880
Antimony (Sb)	mg/kg			0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.11	<0.10	<0.10	<0.10	0.11	<0.10	<0.10
Arsenic (As)	mg/kg	7.24	41.6	0.050	1.58	1.90	1.97	5.06	6.93	7.18	2.06	1.83	3.12	5.26	5.91	5.05
Barium (Ba)	mg/kg			0.50	13.6	17.0	19.8	39.8	62.5	68.1	15.6	15.8	18.5	76.8	68.1	50.9
Beryllium (Be)	mg/kg			0.20	<0.20	<0.20	<0.20	0.31	0.55	0.50	<0.20	<0.20	<0.20	0.57	0.55	0.41
Bismuth (Bi)	mg/kg			0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.21	<0.20	<0.20
Cadmium (Cd)	mg/kg	0.7	4.2	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Calcium (Ca)	mg/kg			50	934	1220	1120	2460	4540	2810	1170	1170	1170	3690	2880	2490
Chromium (Cr)	mg/kg	52.3	160	0.50	8.98	10.8	11.3	20.8	31.2	31.4	10.3	10.2	11.4	36.4	34.0	25.6
Cobalt (Co)	mg/kg			0.10	2.25	2.53	2.72	4.96	7.05	7.14	2.66	2.62	3.07	7.81	7.30	5.47
Copper (Cu)	mg/kg	18.7	108	0.50	4.02	5.18	5.04	11.3	17.9	19.0	5.13	6.01	6.66	18.8	18.9	13.5
Iron (Fe)	mg/kg			50	6110	7280	7690	12300	17800	17900	7660	7300	8150	19200	18200	14600
Lead (Pb)	mg/kg	30.2	112	0.50	2.00	2.48	2.30	4.27	7.04	9.53	2.32	2.21	2.65	11.3	7.56	5.49
Lithium (Li)	mg/kg			5.0	6.9	7.3	8.0	13.2	22.3	22.3	7.2	7.1	7.6	24.6	22.7	17.3
Magnesium (Mg)	mg/kg			20	2240	2490	2710	5020	7680	7720	2440	2410	2610	8480	8060	6030
Manganese (Mn)	mg/kg			1.0	50.1	55.7	61.4	120	162	167	64.6	64.1	73.4	179	163	128
Mercury (Hg)	mg/kg	0.13	0.70	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0094	0.0095	<0.0050	<0.0050	<0.0050	0.0104	0.0089	0.0063
Molybdenum (Mo)	mg/kg			0.50	<0.50	<0.50	<0.50	0.60	0.68	0.77	<0.50	<0.50	<0.50	0.94	0.71	0.56
Nickel (Ni)	mg/kg			0.50	5.42	6.03	6.64	11.7	18.0	18.1	5.97	5.94	6.63	20.9	19.2	13.8
Phosphorus (P)	mg/kg			50	220	246	249	537	710	722	272	287	278	680	734	579
Potassium (K)	mg/kg			100	710	850	950	1880	3290	3240	790	760	860	3670	3490	2550
Selenium (Se)	mg/kg			0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver (Ag)	mg/kg			0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg			100	1230	1400	1310	3410	5240	5580	1160	940	990	6060	6360	4120
Strontium (Sr)	mg/kg			0.50	15.2	16.7	16.6	30.1	62.5	49.4	14.3	14.0	15.3	54.0	48.3	38.6
Sulphur (S)	mg/kg			500	<500	<500	<500	700	1000	900	<500	<500	<500	1100	1100	1100
Thallium (Tl)	mg/kg			0.050	<0.050	<0.050	<0.050	0.072	0.116	0.116	<0.050	<0.050	<0.050	0.127	0.116	0.090
Tin (Sn)	mg/kg			2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	mg/kg			1.0	150	205	208	324	491	476	205	195	234	514	491	424
Uranium (U)	mg/kg			0.050	0.352	0.505	0.436	0.715	1.18	1.20	0.435	0.427	0.487	1.26	1.21	0.932
Vanadium (V)	mg/kg			0.20	10.8	14.3	14.0	23.0	35.1	35.2	15.8	15.3	17.0	38.0	36.5	28.6
Zinc (Zn)	mg/kg	124	271	1.0	9.4	10.8	11.7	21.4	34.4	37.4	11.2	11.0	12.6	44.1	38.1	27.0

Notes:

Shaded cells indicate values that exceed CCME guidelines.

^a Canadian sediment quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012

^b ISQG = Interim Sediment Quality Guideline

^c PEL = Probable Effects Level

Appendix C. Raw Marine Sediment Quality Data, Back River Project, 2012

Location				06-10			06-20			06-22			06-30				
Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life ^a		Realized Detection Limits	06-10-1	06-10-2	06-10-3	06-20-1	06-20-2	06-20-3	06-22-1	06-22-2	06-22-3	06-30-1	06-30-2	06-30-3	
Replicate					1	2	3	1	2	3	1	2	3	1	2	3	
Date Sampled					2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12
Depth Sampled (m)					2.0	2.0	2.0	1.6	1.6	1.6	5.9	5.9	5.9	1.9	1.9	1.9	
ALS Sample ID		ISQG ^b	PEL ^c		L1189353-5	L1189353-6	L1189353-7	L1189353-8	L1189353-9	L1189353-10	L1189353-11	L1189353-12	L1189353-13	L1189353-14	L1189353-15	L1189353-16	
Physical Tests																	
Moisture	%				18.7	19.1	20.5	20.7	20.1	21.0	48.8	44.3	44.2	29.8	32.7	24.3	
pH (1:2 soil:water)	pH			0.10	7.20	7.17	7.34	7.27	7.24	7.26	7.26	7.35	7.26	7.34	7.48	7.56	
Particle Size																	
% Gravel (>2 mm)	%			0.10	0.50	<0.10	0.14	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	3.71	2.53	0.70	
% Sand (2.0 mm - 0.063 mm)	%			0.10	92.4	94.5	94.4	98.4	98.4	98.4	4.45	4.07	3.69	56.6	60.9	74.9	
% Silt (0.063 mm - 4 µm)	%			0.10	4.04	2.80	2.99	1.09	1.04	0.93	61.3	60.8	60.3	18.8	17.4	11.0	
% Clay (<4 µm)	%			0.10	3.02	2.66	2.51	0.52	0.60	0.64	34.3	35.2	36.0	20.9	19.2	13.4	
Texture	-			-	Sand	Sand	Sand	Sand	Sand	Sand	Silty clay loam	Silty clay loam	Silty clay loam	Sandy loam / Sandy clay loam	Sandy loam	Sandy loam	
Carbon and Nitrogen																	
Total Organic Carbon	%			0.10	<0.10	0.15	0.16	<0.10	<0.10	<0.10	0.55	0.47	0.47	0.37	0.39	0.28	
Total Nitrogen	%			0.020	0.023	0.026	0.027	<0.020	<0.020	<0.020	0.060	0.060	0.062	0.050	0.052	0.040	
Plant Available Nutrients																	
Available Ammonium (as N)				1.0 - 1.6	1.5	1.5	1.7	<1.0	<1.0	<1.0	5.0	3.3	5.2	2.5	2.1	1.7	
Nitrate+Nitrite (as N)	mg/kg			2.0 - 6.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<6.0	<6.0	<4.0	<4.0	<4.0	<4.0	
Nitrate (as N)	mg/kg			2.0 - 6.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<6.0	<6.0	<4.0	<4.0	<4.0	<4.0	
Nitrite (as N)	mg/kg			0.4 - 1.2	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<1.2	<1.2	<0.80	<0.80	<0.80	<0.80	
Available Phosphate (as P)	mg/kg			2.0 - 4.0	18.3	22.2	22.1	6.5	6.0	6.2	36.9	24.2	27.9	21.5	26.4	26.3	
Metals																	
Aluminum (Al)	mg/kg	7.24	41.6	50	3970	3550	3530	1020	1020	1010	16200	15800	15600	9140	9250	6620	
Antimony (Sb)	mg/kg			0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.13	0.14	0.14	0.11	0.11	0.10
Arsenic (As)	mg/kg			0.050	1.73	1.55	1.42	1.07	0.965	0.966	8.33	7.89	9.13	5.05	4.78	3.58	
Barium (Ba)	mg/kg			0.50	12.9	8.98	10.0	6.61	6.27	5.34	80.4	78.8	79.3	51.4	55.6	34.4	
Beryllium (Be)	mg/kg	0.7	4.2	0.20	0.21	<0.20	<0.20	<0.20	<0.20	<0.20	0.68	0.66	0.62	0.39	0.40	0.30	
Bismuth (Bi)	mg/kg			0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.25	0.24	0.26	<0.20	<0.20	<0.20	
Cadmium (Cd)	mg/kg			0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	
Calcium (Ca)	mg/kg			50	1030	830	840	490	376	422	3910	3930	3880	1970	2000	1410	
Chromium (Cr)	mg/kg	52.3	160	0.50	10.2	8.56	8.43	2.24	2.13	2.19	43.2	42.5	43.2	27.8	25.9	18.1	
Cobalt (Co)	mg/kg			0.10	3.09	2.75	2.75	0.66	0.64	0.65	9.07	9.15	9.13	7.40	6.74	5.09	
Copper (Cu)	mg/kg	18.7	108	0.50	3.47	2.91	2.90	1.23	1.09	1.05	19.9	20.0	20.4	14.9	14.0	9.90	
Iron (Fe)	mg/kg			50	6770	5890	5820	1830	1810	1770	24200	23700	24700	15000	14800	10700	
Lead (Pb)	mg/kg	30.2	112	0.50	2.20	2.01	2.03	0.97	0.90	0.86	8.37	8.20	8.23	6.45	6.60	5.04	
Lithium (Li)	mg/kg			5.0	8.7	7.8	7.7	<5.0	<5.0	<5.0	30.7	30.3	30.5	19.0	18.4	12.9	
Magnesium (Mg)	mg/kg	0.13	0.70	20	3320	2960	2940	788	783	786	10400	10100	10300	5810	5720	4140	
Manganese (Mn)	mg/kg			1.0	50.3	46.2	43.3	12.5	12.5	12.2	206	204	206	156	163	110	
Mercury (Hg)	mg/kg			0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0083	0.0076	0.0085	<0.0050	<0.0050	<0.0050	
Molybdenum (Mo)	mg/kg			0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.90	0.79	0.97	0.68	0.52	<0.50	
Nickel (Ni)	mg/kg			0.50	6.93	6.21	6.07	1.50	1.40	1.49	23.6	23.7	23.8	16.6	15.3	10.9	
Phosphorus (P)	mg/kg			50	294	260	254	153	131	150	846	819	867	488	501	374	
Potassium (K)	mg/kg			100	810	670	660	310	320	330	4560	4280	4060	2580	2720	1840	
Selenium (Se)	mg/kg			0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	
Silver (Ag)	mg/kg			0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	
Sodium (Na)	mg/kg			100	1790	1600	1740	1350	1340	1490	6120	5430	6280	2380	2290	1440	
Strontium (Sr)	mg/kg			0.50	9.05	7.40	7.33	9.35	10.3	11.5	52.8	50.4	49.5	29.5	35.4	25.9	
Sulphur (S)	mg/kg			500	700	800	700	700	500	600	1700	1800	1800	1000	800	600	
Thallium (Tl)	mg/kg			0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.149	0.148	0.148	0.094	0.095	0.063	
Tin (Sn)	mg/kg			2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
Titanium (Ti)	mg/kg			1.0	155	128	126	35.5	35.2	33.5	731	693	669	413	413	315	
Uranium (U)	mg/kg			0.050	0.606	0.526	0.515	0.297	0.255	0.282	1.46	1.44	1.44	1.02	0.972	0.748	
Vanadium (V)	mg/kg			0.20	9.78	8.51	8.46	2.42	2.43	2.28	46.4	45.7	46.3	29.7	29.9	21.8	
Zinc (Zn)	mg/kg	124	271	1.0	10.1	8.7	8.6	3.6	2.7	2.4	46.7	46.7	47.8	28.7	27.3	19.6	

Notes:

Shaded cells indicate values that exceed CCME guidelines.

^a Canadian sediment quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012

^b ISQG = Interim Sediment Quality Guideline

^c PEL = Probable Effects Level

Appendix C. Raw Marine Sediment Quality Data, Back River Project, 2012

Location				06-32			06-42			06-50			06-52			
Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life ^a		Realized Detection Limits	06-32-1	06-32-2	06-32-3	06-42-1	06-42-2	06-42-3	06-50-1	06-50-2	06-50-3	06-52-1	06-52-2	06-52-3
Replicate					1	2	3	1	2	3	1	2	3	1	2	3
Date Sampled					2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12
Depth Sampled (m)					6.4	6.4	6.4	4.9	4.9	4.9	1.7	1.7	1.7	6.0	6.0	6.0
ALS Sample ID		ISQG ^b	PEL ^c		L1189353-17	L1189353-18	L1189353-19	L1189353-20	L1189353-21	L1189353-22	L1189353-23	L1189353-24	L1189353-25	L1189353-26	L1189353-27	L1189353-28
Physical Tests																
Moisture	%				58.5	54.2	56.9	43.4	48.0	47.4	30.3	23.4	26.6	42.1	42.7	51.1
pH (1:2 soil:water)	pH			0.10	7.27	7.10	7.52	7.48	7.67	7.39	7.68	7.76	7.65	7.41	7.38	7.57
Particle Size																
% Gravel (>2 mm)	%			0.10	<0.10	0.42	0.14	0.36	2.70	<0.10	1.30	2.51	14.4	0.16	0.95	<0.10
% Sand (2.0 mm - 0.063 mm)	%			0.10	5.66	6.04	6.52	19.6	19.2	21.9	56.2	66.4	46.2	18.9	19.9	21.2
% Silt (0.063 mm - 4 µm)	%			0.10	53.8	52.3	49.6	50.8	49.1	48.5	29.4	20.7	25.8	55.3	54.6	54.2
% Clay (<4 µm)	%			0.10	40.5	41.3	43.7	29.2	29.1	29.5	13.1	10.4	13.6	25.6	24.6	24.6
Texture	-			-	Silty clay loam	Silty clay loam	Silty clay loam	Silt loam	Silt loam / Clay loam	Loam / Clay loam	Sandy loam	Sandy loam	Sandy loam	Silt loam	Silt loam	Silt loam
Carbon and Nitrogen																
Total Organic Carbon	%			0.10	0.75	0.75	0.80	0.53	0.45	0.51	0.24	0.13	0.21	0.42	0.46	0.79
Total Nitrogen	%			0.020	0.099	0.110	0.106	0.057	0.061	0.065	0.028	0.034	0.027	0.054	0.058	0.062
Plant Available Nutrients																
Available Ammonium (as N)				1.0 - 1.6	3.4	7.0	4.1	3.7	3.3	7.0	2.3	2.8	2.1	3.7	3.2	4.2
Nitrate+Nitrite (as N)	mg/kg			2.0 - 6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<4.0	<2.0	<4.0	<4.0	<4.0	<4.0	<4.0
Nitrate (as N)	mg/kg			2.0 - 6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<4.0	<2.0	<4.0	<4.0	<4.0	<4.0	<4.0
Nitrite (as N)	mg/kg			0.4 - 1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<0.80	<0.40	<0.80	<0.80	<0.80	<0.80	<0.80
Available Phosphate (as P)	mg/kg			2.0 - 4.0	39.6	52.1	50.7	25.3	26.3	27.5	21.7	21.5	24.4	29.3	34.5	32.0
Metals																
Aluminum (Al)	mg/kg			50	17700	16900	17000	12100	11700	12200	6560	5590	6710	11500	11300	11500
Antimony (Sb)	mg/kg			0.10	0.18	0.17	0.17	0.13	0.13	0.13	<0.10	<0.10	<0.10	0.13	0.12	0.11
Arsenic (As)	mg/kg	7.24	41.6	0.050	11.1	10.3	9.99	4.73	5.37	5.28	3.67	2.73	4.06	5.20	5.51	4.83
Barium (Ba)	mg/kg			0.50	84.6	82.7	83.6	62.1	62.4	65.5	36.4	32.1	39.6	59.5	59.4	59.4
Beryllium (Be)	mg/kg			0.20	0.78	0.77	0.76	0.52	0.53	0.54	0.27	0.23	0.29	0.49	0.48	0.51
Bismuth (Bi)	mg/kg			0.20	0.28	0.30	0.27	0.21	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	<0.20
Cadmium (Cd)	mg/kg	0.7	4.2	0.050	0.057	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Calcium (Ca)	mg/kg			50	5360	3850	4130	3520	4790	3820	2950	3780	4080	3330	3460	3810
Chromium (Cr)	mg/kg	52.3	160	0.50	45.9	44.1	45.4	31.3	31.8	31.9	18.7	15.2	20.3	30.5	29.6	29.7
Cobalt (Co)	mg/kg			0.10	10.4	9.74	10.2	6.83	7.00	7.03	4.60	3.88	4.84	6.57	6.75	6.52
Copper (Cu)	mg/kg	18.7	108	0.50	19.6	19.1	19.3	14.5	14.1	14.4	10.2	8.18	11.1	14.5	13.9	13.5
Iron (Fe)	mg/kg			50	26600	25300	25800	17100	17400	17500	10900	9090	11300	16900	17000	16700
Lead (Pb)	mg/kg	30.2	112	0.50	9.35	9.19	9.15	6.71	6.64	6.73	4.03	3.19	3.94	6.18	6.13	6.14
Lithium (Li)	mg/kg			5.0	33.7	32.9	33.1	22.8	22.2	23.2	12.1	10.4	12.1	21.2	20.8	21.3
Magnesium (Mg)	mg/kg			20	11000	10500	10500	7660	7750	7800	4870	4060	4920	7620	7440	7400
Manganese (Mn)	mg/kg			1.0	288	244	263	163	172	178	112	89.8	115	167	167	162
Mercury (Hg)	mg/kg	0.13	0.70	0.0050	0.0127	0.0156	0.0112	0.0100	0.0096	0.0095	<0.0050	<0.0050	<0.0050	0.0086	0.0079	0.0087
Molybdenum (Mo)	mg/kg			0.50	1.14	1.03	0.95	0.72	0.70	0.75	<0.50	<0.50	<0.50	0.69	0.68	0.68
Nickel (Ni)	mg/kg			0.50	25.3	24.4	24.5	17.6	17.5	17.4	10.6	9.04	11.4	16.7	16.7	16.5
Phosphorus (P)	mg/kg			50	1080	1030	1000	647	661	665	447	364	446	657	671	612
Potassium (K)	mg/kg			100	4770	4940	4410	3090	2990	3150	1690	1390	1790	3050	2960	2980
Selenium (Se)	mg/kg			0.20	0.24	0.23	0.21	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver (Ag)	mg/kg			0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg			100	8130	7640	6110	4570	4600	5320	2490	1810	2410	4830	4500	4620
Strontium (Sr)	mg/kg			0.50	72.8	69.2	60.4	42.2	44.3	43.9	24.1	27.3	32.9	39.5	39.6	40.5
Sulphur (S)	mg/kg			500	1100	800	1500	800	1000	1000	700	1200	800	1300	700	900
Thallium (Tl)	mg/kg			0.050	0.153	0.149	0.150	0.105	0.104	0.111	0.062	<0.050	0.059	0.105	0.104	0.100
Tin (Sn)	mg/kg			2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	mg/kg			1.0	713	690	679	514	480	506	363	291	382	538	532	522
Uranium (U)	mg/kg			0.050	1.52	1.52	1.54	1.28	1.18	1.18	0.726	0.618	0.693	1.28	1.12	1.16
Vanadium (V)	mg/kg			0.20	49.9	47.7	48.1	34.6	34.5	34.6	21.1	17.1	22.1	34.5	33.6	33.3
Zinc (Zn)	mg/kg	124	271	1.0	51.2	49.2	50.8	35.0	35.3	37.1	20.5	17.0	22.2	35.0	33.5	32.9

Notes:

Shaded cells indicate values that exceed CCME guidelines.

^a Canadian sediment quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012

^b ISQG = Interim Sediment Quality Guideline

^c PEL = Probable Effects Level

Appendix D.1

**Marine Phytoplankton Biomass Data, Back River
Project, 2012**

Appendix D.1. Marine Phytoplankton Biomass Data, Back River Project, 2012

Site	Date Sampled	Replicate	ALS Sample ID	Phytoplankton Biomass ($\mu\text{g chl } a / \text{L}$)	Mean	SE
BI-1	12-Apr-12	1	L1135621-1	0.03	0.02	0.00
		2	L1135621-2	0.03		
		3	L1135621-3	0.02		
BI-2	12-Apr-12	1	L1135621-4	0.03	0.03	0.00
		2	L1135621-5	0.04		
		3	L1135621-6	0.03		
BI-3	12-Apr-12	1	L1135621-7	0.04	0.03	0.01
		2	L1135621-8	0.01		
		3	L1135621-9	0.05		
BI-4	12-Apr-12	1	L1135621-10	0.01	0.01	0.00
		2	L1135621-11	<0.01		
		3	L1135621-12	0.01		
04-10	3-Aug-12	1	L1207378-22	0.09	0.19	0.05
		2	L1207378-23	0.27		
		3	L1207378-24	0.21		
04-20	3-Aug-12	1	L1207378-25	0.12	0.13	0.05
		2	L1207378-26	0.05		
		3	L1207378-27	0.22		
04-24	03-AUG-12	1	L1207378-28	0.09	0.15	0.04
		2	L1207378-29	0.22		
		3	L1207378-30	0.14		
04-30	3-Aug-12	1	L1207378-31	0.24	0.40	0.09
		2	L1207378-32	0.42		
		3	L1207378-33	0.55		
04-14	3-Aug-12	1	L1207378-34	0.05	0.20	0.12
		2	L1207378-35	0.11		
		3	L1207378-36	0.45		
04-40	3-Aug-12	1	L1207378-37	0.09	0.17	0.10
		2	L1207378-38	0.05		
		3	L1207378-39	0.37		
04-44	3-Aug-12	1	L1207378-40	0.27	0.28	0.05
		2	L1207378-41	0.20		
		3	L1207378-42	0.36		
06-10	1-Aug-12	1	L1207378-1	0.15	0.11	0.02
		2	L1207378-2	0.11		
		3	L1207378-3	0.07		
06-20	1-Aug-12	1	L1207378-4	0.35	0.22	0.06
		2	L1207378-5	0.15		
		3	L1207378-6	0.16		
06-24	1-Aug-12	1	L1207378-7	0.14	0.12	0.02
		2	L1207378-8	0.14		
		3	L1207378-9	0.08		
06-40	1-Aug-12	1	L1207378-10	0.07	0.11	0.04
		2	L1207378-11	0.19		
		3	L1207378-12	0.08		
06-44	1-Aug-12	1	L1207378-13	0.10	0.10	0.01
		2	L1207378-14	0.10		
		3	L1207378-15	0.12		
06-50	1-Aug-12	1	L1207378-16	0.03	0.03	0.01
		2	L1207378-17	0.02		
		3	L1207378-18	0.05		
06-54	1-Aug-12	1	L1207378-19	0.09	0.13	0.03
		2	L1207378-20	0.11		
		3	L1207378-21	0.18		

Appendix D.2

Marine Phytoplankton Taxonomy Data, Back River
Project, 2012

Appendix D.2. Marine Phytoplankton Taxonomy Data, Back River Project, 2012

Taxonomic Identification				Location	BI-1	BI-2	BI-3	BI-4	04-24				
				Replicate	1	1	1	1	1	2	3		
				Collection Date	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	
				EcoAnalysts Sample ID	6135.1-1	6135.1-2	6135.1-3	6135.1-4	6135.2-1	6135.2-2	6135.2-2_DUP	6135.2-3	
Lab Duplicate				No	No	No	No	No	No	No	Yes	No	
Class	Order	Family	Genus	Final Designation	Units								
Bacillariophyceae	Centrales	Stephanodiscaceae	Cyclotella	Cyclotella sp.	cells/L								
	Pennales	Achnanthaceae	Achnanthes	Achnanthes sp.	cells/L								
		Bacillariaceae	Nitzschia	Nitzschia sp.	cells/L			3.0			1463.8	700.1	1277.9
		Fragilariaceae	Fragilaria	Fragilaria sp.	cells/L		6.0						
			Synedra	Synedra sp.	cells/L					1257.9			
		Mastogloiaceae	Mastogloia	Mastogloia sp.	cells/L								
		Naviculaceae	Navicula	Navicula sp.	cells/L	2.0	3.0	5.0	2.0	1257.9			
		Pinnulariaceae	Pinnularia	Pinnularia sp.	cells/L								
		Pleurosigmataceae	Pleurosigma	Pleurosigma sp.	cells/L			1.0					
		Rhoicospheniaceae	Rhoicosphenia	Rhoicosphenia sp.	cells/L								
		Rhopalodiaceae	Epithemia	Epithemia sp.	cells/L								
		Surirellaceae	Surirella	Surirella sp.	cells/L								
Chlorophyceae	Chlorococcales	Hydrodictyceae	Pediastrum	Pediastrum tetras	cells/L								
	Volvocales	Chlamydomonadaceae	Carteria	Carteria sp.	cells/L				10063.5		700.1		
Chrysophyceae	Prymnesiales	Prymnesiaceae	Chrysochromulina	Chrysochromulina sp.	cells/L								
Cryptophyceae	Cryptomonadales	Cryptomonadaceae	Cryptomonas	Cryptomonas sp.	cells/L	1.0	2.0						
			Komma	Komma caudata	cells/L				5031.7	5123.2	1400.1	5111.6	
	Pyrenomonadales	Geminigeraceae	Teleaulax	Teleaulax sp.	cells/L	3.0	2.0	1.0	11321.4	1463.8	2100.2	5111.6	
Dictyochophyceae	Dictyochales	Dictyochaceae	Dictyocha	Dictyocha sp.	cells/L	1.0							
	Pedinellales	Pedinellaceae	Pseudopedinella	Pseudopedinella sp.	cells/L				1257.9				
Dinophyceae	Dinophysales	Amphisoleniaceae	Dinophysis	Dinophysis sp.	cells/L				1257.9	731.9	1400.1		
	Gonyaulacales	Goniodomataceae	Alexandrium	Alexandrium sp.	cells/L			2.0					
	Gymnodiniales	Gymnodiniaceae	Katodinium	Katodinium glaucum	cells/L	9.9	2.0	2.0	7.9	88055.5	19029.1	23102.3	46004.5
		Gymnodiniaceae	Gyrodinium	Gyrodinium sp.	cells/L	7.9	3.0	4.0	9.9	2515.9	5123.2	5600.6	8945.3
		Polykrikaceae	Polykrikos	Polykrikos sp.	cells/L								
	Peridinales	Heterocapsaceae	Heterocapsa	Heterocapsa sp.	cells/L	5.0	1.0	2.0		264166.6	190291.5	176417.4	327143.3
		Oxytoxaceae	Ceratium	Ceratium sp.	cells/L								
		Peridiniaceae	Peridinium	Peridinium sp.	cells/L	1.0					731.9	2800.3	1277.9
Protoperidiniaceae		Protoperidinium	Protoperidinium sp.	cells/L	5.9	4.0	2.0	1.0					
	Prorocentrales	Prorocentraceae	Prorocentrum	Prorocentrum minimum	cells/L								
Euglenophyceae	Eutreptiales	Eutreptiaceae	Eutreptiella	Eutreptiella sp.	cells/L		1.0						
Myxophyceae	Chroococcales	Merismopediaceae	Merismopedia	Merismopedia sp.	cells/L			23.6					
Grand Total					cells/L	36.6	24.0	19.8	46.3	386186.5	223958.4	214221.1	394872.2

Note: Taxonomic analysis by EcoAnalysts

Appendix D.2. Marine Phytoplankton Taxonomy Data, Back River Project, 2012

Taxonomic Identification				Location		06-24			06-54		
				Replicate		1	2	3	1	2	3
				Collection Date		1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12
				EcoAnalysts Sample ID		6135.2-4	6135.2-5	6135.2-6	6135.2-7	6135.2-8	6135.2-9
				Lab Duplicate		No	No	No	No	No	No
Class	Order	Family	Genus	Final Designation	Units						
Bacillariophyceae	Centrales	Stephanodiscaceae	Cyclotella	Cyclotella sp.	cells/L	657.2			454.8	314.5	
	Pennales	Achnanthaceae	Achnanthes	Achnanthes sp.	cells/L				629.0		
		Bacillariaceae	Nitzschia	Nitzschia sp.	cells/L	665.4	583.4	985.8	728.6	314.5	
		Fragilariaceae	Fragilaria	Fragilaria sp.	cells/L						
			Synedra	Synedra sp.	cells/L	332.7	875.1	985.8	1819.4	1092.9	1257.9
		Mastogloiaceae	Mastogloia	Mastogloia sp.	cells/L	291.7					
		Naviculaceae	Navicula	Navicula sp.	cells/L	2328.7	1750.2	1971.6	909.7	1092.9	629.0
		Pinnulariaceae	Pinnularia	Pinnularia sp.	cells/L	665.4			328.6		
		Pleurosigmataceae	Pleurosigma	Pleurosigma sp.	cells/L				657.2	454.8	
		Rhoicospheniaceae	Rhoicosphenia	Rhoicosphenia sp.	cells/L	332.7					
		Rhopalodiaceae	Epithemia	Epithemia sp.	cells/L				314.5		
		Surirellaceae	Surirella	Surirella sp.	cells/L	328.6					
Chlorophyceae	Chlorococcales	Hydrodictyceae	Pediastrum	Pediastrum tetras	cells/L	1314.4					
	Volvocales	Chlamydomonadaceae	Carteria	Carteria sp.	cells/L	1330.7	2917.0	5257.7	9096.9	6557.2	8176.6
Chrysophyceae	Prymnesiales	Prymnesiaceae	Chrysochromulina	Chrysochromulina sp.	cells/L				364.3	314.5	
Cryptophyceae	Cryptomonadales	Cryptomonadaceae	Cryptomonas	Cryptomonas sp.	cells/L	1330.7	291.7	328.6	454.8		
			Komma	Komma caudata	cells/L				18193.9	11657.3	7862.1
	Pyrenomonadales	Geminigeraceae	Teleaulax	Teleaulax sp.	cells/L	665.4	583.4	985.8	9551.8	5828.6	6604.2
Dictyochophyceae	Dictyochales	Dictyochaceae	Dictyocha	Dictyocha sp.	cells/L						
	Pedinellales	Pedinellaceae	Pseudopedinella	Pseudopedinella sp.	cells/L				1257.9		
Dinophyceae	Dinophysales	Amphisoleniaceae	Dinophysis	Dinophysis sp.	cells/L	328.6					
	Gonyaulacales	Goniodomataceae	Alexandrium	Alexandrium sp.	cells/L						
	Gymnodiniales	Gymnodiniaceae	Katodinium	Katodinium glaucum	cells/L	2661.4	2625.3	2300.2	83691.9	70672.1	53462.3
		Gymnodiniaceae	Gyrodinium	Gyrodinium sp.	cells/L	665.4	583.4	1971.6	3638.8	5100.0	3773.8
		Polykrikaceae	Polykrikos	Polykrikos sp.	cells/L				629.0		
	Peridinales	Heterocapsaceae	Heterocapsa	Heterocapsa sp.	cells/L	5322.8	3792.0	3943.2	8187.2	3642.9	5975.2
		Oxytoxaceae	Ceratium	Ceratium sp.	cells/L	332.7					
		Peridiniaceae	Peridinium	Peridinium sp.	cells/L	5322.8	5833.9	4600.5	3638.8	3278.6	4717.3
Proto-peridiniaceae		Protoperidinium	Protoperidinium sp.	cells/L	328.6			454.8			
	Prorocentrales	Prorocentraceae	Prorocentrum	Prorocentrum minimum	cells/L				314.5		
Euglenophyceae	Eutreptiales	Eutreptiaceae	Eutreptiella	Eutreptiella sp.	cells/L				314.5		
Myxophyceae	Chroococcales	Merismopediaceae	Merismopedia	Merismopedia sp.	cells/L						
Grand Total					cells/L	21956.7	20127.0	27274.1	140547.7	110015.4	96861.1

Note: Taxonomic analysis by EcoAnalysts

Appendix E

Marine Benthos Taxonomy Data, Back River Project, 2012

Appendix E. Marine Benthos Taxonomy Data, Back River Project, 2012

Taxonomic Identification						Location Replicate Collection Date Area sampled (m ²) Units	04-10			04-12			04-20			04-22		
							1	2	3	1	2	3	1	2	3	1	2	3
							3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225
Major Taxa	Class	Order	Family	Final Designation	Age Class													
NEMERTEA																		
	Anopla	undetermined	undetermined	<i>Anopla</i> sp. indet.	adult	individuals/m ²						88.9					44.4	355.6
	Anopla	undetermined	undetermined	<i>Anopla</i> sp. indet.	juvenile	individuals/m ²						44.4						
	Anopla	Heteronemertea	Lineidae	<i>Cerebratulus</i> sp.	adult	individuals/m ²												
	Anopla	Heteronemertea	Lineidae	<i>Cerebratulus</i> sp.	juvenile	individuals/m ²												
	undetermined	undetermined	undetermined	<i>Nemertea</i> sp. indet.	adult	individuals/m ²											44.4	
	undetermined	undetermined	undetermined	<i>Nemertea</i> sp. indet.	juvenile	individuals/m ²											88.9	
ECHIURA																		
	undetermined	Xenopneusta	Urechidae	<i>Urechis</i> sp.	adult	individuals/m ²						133.3	88.9				44.4	
	undetermined	Xenopneusta	Urechidae	<i>Urechis</i> sp.	juvenile	individuals/m ²						88.9		133.3		88.9		177.8
ANNELIDA																		
Polychaeta Errantia																		
	Polychaeta	Aciculata	Phyllodocidae	<i>Eteone longa</i>	adult	individuals/m ²					88.9	177.8				933.3	622.2	400.0
	Polychaeta	Aciculata	Phyllodocidae	<i>Eteone longa</i>	juvenile	individuals/m ²										88.9	44.4	
	Polychaeta	Aciculata	Phyllodocidae	<i>Eteone</i> nr. <i>pacifica</i>	adult	individuals/m ²												
	Polychaeta	Aciculata	Phyllodocidae	<i>Eteone</i> sp.	adult	individuals/m ²												
	Polychaeta	Aciculata	Polynoidae	<i>Gattyana</i> sp.	adult	individuals/m ²												
	Polychaeta	Aciculata	Polynoidae	<i>Harmothoe imbricata</i> Cmplx.	adult	individuals/m ²												
	Polychaeta	Aciculata	Polynoidae	<i>Hesperonoe</i> sp indet.	adult	individuals/m ²												
	Polychaeta	Aciculata	Lumbrineridae	<i>Lumbrineris</i> sp.	adult	individuals/m ²												
	Polychaeta	Aciculata	Polynoidae	<i>Melaenis loveni</i>	adult	individuals/m ²											44.4	
	Polychaeta	Aciculata	Hesionidae	<i>Micropodarke</i> sp.	adult	individuals/m ²											88.9	
	Polychaeta	Aciculata	Hesionidae	<i>Micropodarke</i> sp.	juvenile	individuals/m ²												
	Polychaeta	Aciculata	Nephtyidae	<i>Nephtys cornuta</i>	adult	individuals/m ²												
	Polychaeta	Aciculata	Nephtyidae	<i>Nephtys</i> sp.	adult	individuals/m ²				88.9		800.0		44.4	88.9	1600.0	5822.2	3333.3
	Polychaeta	Aciculata	Nephtyidae	<i>Nephtys</i> sp.	juvenile	individuals/m ²						88.9				133.3	444.4	577.8
	Polychaeta	Aciculata	Pholoidae	<i>Pholoe</i> sp.	juvenile	individuals/m ²											44.4	
	Polychaeta	Aciculata	Polynoidae	<i>Polynoidae</i> Indet.	adult	individuals/m ²												
Polychaeta Sedentaria																		
	Polychaeta	Canalipalpata	Ampharetidae	<i>Ampharete</i> sp.	adult	individuals/m ²				88.9								
	Polychaeta	Canalipalpata	Cirratulidae	<i>Aphelochaeta</i> sp.	adult	individuals/m ²												
	Polychaeta	undetermined	Paraonidae	<i>Aricidea nolani</i>	adult	individuals/m ²												
	Polychaeta	undetermined	Paraonidae	<i>Aricidea nolani</i>	juvenile	individuals/m ²												
	Polychaeta	Canalipalpata	Ampharetidae	<i>Asabellides</i> sp.	adult	individuals/m ²												
	Polychaeta	undetermined	Capitellidae	<i>Capitella capitata</i> Cmplx.	adult	individuals/m ²												44.4
	Polychaeta	undetermined	Capitellidae	<i>Capitella capitata</i> Cmplx.	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Cirratulidae	<i>Chaetozone setosa</i>	adult	individuals/m ²						133.3				1066.7	533.3	
	Polychaeta	Canalipalpata	Cirratulidae	<i>Chaetozone setosa</i>	juvenile	individuals/m ²										844.4	488.9	
	Polychaeta	Canalipalpata	Cirratulidae	<i>Cirratulidae</i> sp. indet	adult	individuals/m ²											44.4	
	Polychaeta	undetermined	Maldanidae	<i>Clymenura</i> nr <i>polaris</i>	adult	individuals/m ²												
	Polychaeta	undetermined	Cossuridae	<i>Cossura</i> sp.	adult	individuals/m ²												
	Polychaeta	undetermined	Maldanidae	<i>Euclymeninae</i> Indet.	adult	individuals/m ²												
	Polychaeta	undetermined	Capitellidae	<i>Heteromastus</i> sp.	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Laonice</i> sp.	juvenile	individuals/m ²												
	Polychaeta	Canalipalpata	Sabellidae	<i>Laonome kroyeri</i>	adult	individuals/m ²											44.4	177.8
	Polychaeta	undetermined	Orbiniidae	<i>Leitoscoloplos</i> sp.	adult	individuals/m ²												
	Polychaeta	undetermined	Orbiniidae	<i>Leitoscoloplos</i> sp.	juvenile	individuals/m ²												
	Polychaeta	undetermined	Paraonidae	<i>Levinsenia gracilis</i>	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Marenzelleria arctia</i>	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Marenzelleria wireni</i>	adult	individuals/m ²			44.4	88.9				88.9		977.8	266.7	44.4
	Polychaeta	Canalipalpata	Spionidae	<i>Marenzelleria wireni</i>	juvenile	individuals/m ²											44.4	
	Polychaeta	undetermined	Capitellidae	<i>Mediomastus</i> sp.	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Pectinariidae	<i>Pectinaria granulata</i>	adult	individuals/m ²						88.9				44.4		177.8
	Polychaeta	Canalipalpata	Pectinariidae	<i>Pectinaria granulata</i>	adult	individuals/m ²				88.9		177.8				88.9	355.6	444.4
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio (Minuspio) multibranchiata</i>	adult	individuals/m ²										177.8		
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio cirrifera</i> Cmplx.	adult	individuals/m ²				44.4						2177.8	2488.9	2444.4
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio cirrifera</i> Cmplx.	juvenile	individuals/m ²						88.9					44.4	
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio</i> sp.	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio</i> sp.	juvenile	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Pygospio elegans</i>	adult	individuals/m ²								44.4	88.9	44.4	44.4	88.9
	Polychaeta	Canalipalpata	Spionidae	<i>Spio filicornis</i>	adult	individuals/m ²										311.1	488.9	711.1
	Polychaeta	Canalipalpata	Spionidae	<i>Spio filicornis</i>	juvenile	individuals/m ²										44.4	44.4	

Appendix E. Marine Benthos Taxonomy Data, Back River Project, 2012

Taxonomic Identification						Location Replicate Collection Date Area sampled (m ²) Units	04-10			04-12			04-20			04-22		
							1	2	3	1	2	3	1	2	3	1	2	3
							3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225
Major Taxa	Class	Order	Family	Final Designation	Age Class													
	Polychaeta	Canalipalpata	Trichobranchidae	<i>Terebellides</i> sp.	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Trichobranchidae	<i>Terebellides</i> sp.	juvenile	individuals/m ²												
ARTHROPODA																		
Amphipoda	Malacostraca	Amphipoda	Atylidae	<i>Atylidae</i> sp. indet.	adult	individuals/m ²												
	Malacostraca	Amphipoda	Calliopiidae	<i>Apherusa glacialis</i>	adult	individuals/m ²											44.4	
	Malacostraca	Amphipoda	Lysianassidae	<i>Boeckosimus affinis</i>	adult	individuals/m ²							88.9			44.4	44.4	
	Malacostraca	Amphipoda	Lysianassidae	<i>Boeckosimus affinis</i>	juvenile	individuals/m ²												
	Malacostraca	Amphipoda	Corophiidae	<i>Crassikorophium clarencense</i>	adult	individuals/m ²												
	Malacostraca	Amphipoda	Corophiidae	<i>Crassikorophium clarencense</i>	juvenile	individuals/m ²												
	Malacostraca	Amphipoda	Gsmmaracanthidae	<i>Gammaracanthus loricatus</i>	adult	individuals/m ²												
	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus</i> sp.	adult	individuals/m ²	44.4		44.4									
	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus wilkitzkii</i>	adult	individuals/m ²												
	Malacostraca	Amphipoda	Ampeliscidae	<i>Haploops nr. laevis</i>	adult	individuals/m ²												
	Malacostraca	Amphipoda	Ampeliscidae	<i>Haploops nr. laevis</i>	juvenile	individuals/m ²												
	Malacostraca	Amphipoda	Gammaridae	<i>Lagunogammarus setosus</i>	adult	individuals/m ²				44.4					44.4			
	Malacostraca	Amphipoda	Gammaridae	<i>Lagunogammarus setosus</i>	juvenile	individuals/m ²						44.4						
	Malacostraca	Amphipoda	Oedicerotidae	<i>Monoculodes</i> sp.	adult	individuals/m ²	266.7	44.4		88.9		222.2				400.0	844.4	933.3
	Malacostraca	Amphipoda	Oedicerotidae	<i>Monoculodes</i> sp.	juvenile	individuals/m ²										488.9	1066.7	1111.1
	Malacostraca	Amphipoda	Oedicerotidae	<i>Oedicerotidae</i> sp. indet.	adult	individuals/m ²												
	Malacostraca	Amphipoda	Oedicerotidae	<i>Oedicerotidae</i> sp. indet.	juvenile	individuals/m ²												
	Malacostraca	Amphipoda	Uristidae	<i>Onisimus</i> sp.	adult	individuals/m ²				44.4					133.3			
	Malacostraca	Amphipoda	Uristidae	<i>Onisimus</i> sp.	juvenile	individuals/m ²				44.4								
	Malacostraca	Amphipoda	Oedicerotidae	<i>Paroediceros lynceus</i>	adult	individuals/m ²												88.9
	Malacostraca	Amphipoda	Pontoporeiidae	<i>Pontoporeia femorata</i>	adult	individuals/m ²				133.3		133.3				1111.1	755.6	1333.3
	Malacostraca	Amphipoda	Pontoporeiidae	<i>Pontoporeia femorata</i>	adult	individuals/m ²				88.9		177.8		44.4		3777.8	3600.0	8666.7
	Malacostraca	Amphipoda	Calliopiidae	<i>Weyprechtia pinguis</i>	adult	individuals/m ²											88.9	88.9
Copepoda	Maxillopoda	Harpacticoida	undetermined	Harpacticoida sp indet	adult	individuals/m ²											88.9	44.4
Ostracoda	Ostracoda	undetermined	undetermined	Ostracoda sp indet.	adult	individuals/m ²												88.9
Cumacea	Malacostraca	Cumacea	Diastylidae	<i>Brachydiastylis resima</i>	adult	individuals/m ²											88.9	44.4
	Malacostraca	Cumacea	Diastylidae	<i>Brachydiastylis resima</i>	juvenile	individuals/m ²												
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis rathkei</i>	adult	individuals/m ²				44.4		311.1	444.4	444.4	88.9	533.3	266.7	800.0
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis rathkei</i>	juvenile	individuals/m ²						400.0		311.1	44.4	266.7	533.3	1422.2
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis</i> sp.	adult	individuals/m ²												
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis</i> sp.	juvenile	individuals/m ²												
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis sulcata</i>	adult	individuals/m ²												
	Malacostraca	Cumacea	Diastylidae	<i>Leptostylis</i> sp.	adult	individuals/m ²												
	Malacostraca	Isopoda	Munnidae	<i>Munna</i> sp.	adult	individuals/m ²												
	Malacostraca	Isopoda	Chaetiliidae	<i>Saduria entomon</i>	adult	individuals/m ²												
MOLLUSCA																		
Gastropoda	Gastropoda	Cephalaspidea	Cylichnidae	<i>Cylichna alba</i>	adult	individuals/m ²						44.4				44.4	311.1	133.3
	Gastropoda	Cephalaspidea	Cylichnidae	<i>Cylichna alba</i>	juvenile	individuals/m ²										44.4	266.7	44.4
Bivalvia	Gastropoda	Neotaenioglossa	Naticidae	<i>Cryptonatica affinis</i>	adult	individuals/m ²												
	Gastropoda	Neotaenioglossa	Naticidae	<i>Cryptonatica affinis</i>	juvenile	individuals/m ²										88.9	88.9	88.9
	Bivalvia	Veneroida	Astartidae	<i>Astarte borealis</i>	adult	individuals/m ²												
	Bivalvia	Veneroida	Tellinidae	<i>Macoma balthica</i>	adult	individuals/m ²	5822.2	4266.7	4711.1	3333.3	1600.0	4266.7	9155.6	9422.2	13955.6	6355.6	6755.6	6933.3
	Bivalvia	Veneroida	Tellinidae	<i>Macoma balthica</i>	juvenile	individuals/m ²	1822.2	3955.6	1288.9	933.3	533.3	11155.6	39911.1	38444.4	39155.6	4711.1	6088.9	4711.1
	Bivalvia	Myoida	Myidae	<i>Mya</i> sp.	juvenile	individuals/m ²												
	Bivalvia	Mytiloida	Mytilidae	<i>Mytilus trossulus</i>	adult	individuals/m ²												
	Bivalvia	Mytiloida	Mytilidae	<i>Mytilus trossulus</i>	juvenile	individuals/m ²											133.3	88.9
	Bivalvia	Nuculoida	Yoldiidae	<i>Portlandia arctica</i>	adult	individuals/m ²												88.9
PHORONIDA																		
	undetermined	undetermined	undetermined	<i>Phoronida</i> sp indet.		individuals/m ²												
TOTAL						individuals/m ²	7955.6	8311.1	6133.3	5066.7	2222.2	18666.7	49644.4	48800.0	53822.2	26488.9	33288.9	35688.9
Miscellaneous (excluded from data analysis)																		
	Insecta	Diptera	Chironomidae	Chironomidae larvae (Insecta)	larvae	individuals/m ²												
	Clitellata	Undetermined	Undetermined	Oligochaeta sp. indet.	adult	individuals/m ²						44.4						
	Undetermined	Undetermined	Undetermined	Unidentified fish eggs	egg	individuals/m ²						44.4			222.2	1600.0	1511.1	
	Undetermined	Undetermined	Undetermined	Unidentified fish larvae	egg	individuals/m ²							44.4	44.4	133.3			

Note: Taxonomic analysis by COLUMBIA SCIENCE

Appendix E. Marine Benthos Taxonomy Data, Back River Project, 2012

Taxonomic Identification						Location Replicate Collection Date Area sampled (m ²) Units	04-30			04-32			04-40			04-42		
							1	2	3	1	2	3	1	2	3	1	2	3
							3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225	3-Aug-12 0.0225
Major Taxa	Class	Order	Family	Final Designation	Age Class													
NEMERTEA																		
	Anopla	undetermined	undetermined	<i>Anopla</i> sp. indet.	adult	individuals/m ²				44.4								
	Anopla	undetermined	undetermined	<i>Anopla</i> sp. indet.	juvenile	individuals/m ²												
	Anopla	Heteronemertea	Lineidae	<i>Cerebratulus</i> sp.	adult	individuals/m ²				44.4								
	Anopla	Heteronemertea	Lineidae	<i>Cerebratulus</i> sp.	juvenile	individuals/m ²												
	undetermined	undetermined	undetermined	<i>Nemertea</i> sp. indet.	adult	individuals/m ²				44.4								
	undetermined	undetermined	undetermined	<i>Nemertea</i> sp. indet.	juvenile	individuals/m ²												
ECHIURA																		
	undetermined	Xenopneusta	Urechidae	<i>Urechis</i> sp.	adult	individuals/m ²												
	undetermined	Xenopneusta	Urechidae	<i>Urechis</i> sp.	juvenile	individuals/m ²												
ANNELIDA																		
Polychaeta Errantia												355.6						
	Polychaeta	Aciculata	Phyllodocidae	<i>Eteone longa</i>	adult	individuals/m ²												
	Polychaeta	Aciculata	Phyllodocidae	<i>Eteone longa</i>	juvenile	individuals/m ²												
	Polychaeta	Aciculata	Phyllodocidae	<i>Eteone nr. pacifica</i>	adult	individuals/m ²												
	Polychaeta	Aciculata	Phyllodocidae	<i>Eteone</i> sp.	adult	individuals/m ²				44.4								
	Polychaeta	Aciculata	Polynoidae	<i>Gattyana</i> sp.	adult	individuals/m ²												
	Polychaeta	Aciculata	Polynoidae	<i>Harmothoe imbricata</i> Cmplx.	adult	individuals/m ²												
	Polychaeta	Aciculata	Polynoidae	<i>Hesperonoe</i> sp indet.	adult	individuals/m ²										44.4		
	Polychaeta	Aciculata	Lumbrineridae	<i>Lumbrineris</i> sp.	adult	individuals/m ²					44.4							
	Polychaeta	Aciculata	Polynoidae	<i>Melaenis loveni</i>	adult	individuals/m ²				133.3	44.4					266.7	88.9	
	Polychaeta	Aciculata	Hesionidae	<i>Micropodarke</i> sp.	adult	individuals/m ²				44.4						44.4		
	Polychaeta	Aciculata	Hesionidae	<i>Micropodarke</i> sp.	juvenile	individuals/m ²												
	Polychaeta	Aciculata	Nephtyidae	<i>Nephtys cornuta</i>	adult	individuals/m ²												
	Polychaeta	Aciculata	Nephtyidae	<i>Nephtys</i> sp.	adult	individuals/m ²				2844.4	2400.0	1688.9				3155.6	4577.8	7688.9
	Polychaeta	Aciculata	Nephtyidae	<i>Nephtys</i> sp.	juvenile	individuals/m ²				222.2	88.9	88.9				311.1		533.3
	Polychaeta	Aciculata	Pholoidae	<i>Pholoe</i> sp.	juvenile	individuals/m ²												
	Polychaeta	Aciculata	Polynoidae	<i>Polynoidae</i> Indet.	adult	individuals/m ²												
Polychaeta Sedentaria																		
	Polychaeta	Canalipalpata	Ampharetidae	<i>Ampharete</i> sp.	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Cirratulidae	<i>Aphelochaeta</i> sp.	adult	individuals/m ²					133.3	44.4						
	Polychaeta	undetermined	Paraonidae	<i>Aricidea nolani</i>	adult	individuals/m ²				711.1	622.2	88.9						
	Polychaeta	undetermined	Paraonidae	<i>Aricidea nolani</i>	juvenile	individuals/m ²												
	Polychaeta	Canalipalpata	Ampharetidae	<i>Asabellides</i> sp.	adult	individuals/m ²												
	Polychaeta	undetermined	Capitellidae	<i>Capitella capitata</i> Cmplx.	adult	individuals/m ²												
	Polychaeta	undetermined	Capitellidae	<i>Capitella capitata</i> Cmplx.	adult	individuals/m ²												88.9
	Polychaeta	Canalipalpata	Cirratulidae	<i>Chaetozone setosa</i>	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Cirratulidae	<i>Chaetozone setosa</i>	juvenile	individuals/m ²												
	Polychaeta	Canalipalpata	Cirratulidae	<i>Cirratulidae</i> sp. indet	adult	individuals/m ²												
	Polychaeta	undetermined	Maldanidae	<i>Clymenura nr polaris</i>	adult	individuals/m ²				44.4	133.3							88.9
	Polychaeta	undetermined	Cossuridae	<i>Cossura</i> sp.	adult	individuals/m ²												
	Polychaeta	undetermined	Maldanidae	<i>Euclymeninae</i> Indet.	adult	individuals/m ²												
	Polychaeta	undetermined	Capitellidae	<i>Heteromastus</i> sp.	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Laonice</i> sp.	juvenile	individuals/m ²											44.4	
	Polychaeta	Canalipalpata	Sabellidae	<i>Laonome kroyeri</i>	adult	individuals/m ²				44.4	88.9					44.4		
	Polychaeta	undetermined	Orbiniidae	<i>Leitoscoloplos</i> sp.	adult	individuals/m ²				177.8	266.7						44.4	
	Polychaeta	undetermined	Orbiniidae	<i>Leitoscoloplos</i> sp.	juvenile	individuals/m ²				88.9	44.4							
	Polychaeta	undetermined	Paraonidae	<i>Levinsonia gracilis</i>	adult	individuals/m ²							44.4					
	Polychaeta	Canalipalpata	Spionidae	<i>Marenzelleria arctia</i>	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Marenzelleria wireni</i>	adult	individuals/m ²	711.1	977.8	711.1	311.1		133.3	400.0	888.9	400.0			
	Polychaeta	Canalipalpata	Spionidae	<i>Marenzelleria wireni</i>	juvenile	individuals/m ²									44.4			
	Polychaeta	undetermined	Capitellidae	<i>Mediomastus</i> sp.	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Pectinariidae	<i>Pectinaria granulata</i>	adult	individuals/m ²				133.3	44.4					44.4	133.3	177.8
	Polychaeta	Canalipalpata	Pectinariidae	<i>Pectinaria granulata</i>	adult	individuals/m ²										44.4		133.3
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio (Minuspio) multibranchiata</i>	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio cirrifera</i> Cmplx.	adult	individuals/m ²				711.1	800.0	444.4				222.2	133.3	88.9
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio cirrifera</i> Cmplx.	juvenile	individuals/m ²											44.4	
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio</i> sp.	adult	individuals/m ²											44.4	
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio</i> sp.	juvenile	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Pygospio elegans</i>	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Spio filicornis</i>	adult	individuals/m ²										444.4	177.8	
	Polychaeta	Canalipalpata	Spionidae	<i>Spio filicornis</i>	juvenile	individuals/m ²	44.4											

Appendix E. Marine Benthos Taxonomy Data, Back River Project, 2012

Taxonomic Identification						Location	04-30			04-32			04-40			04-42			
						Replicate	1	2	3	1	2	3	1	2	3	1	2	3	
																			Collection Date
						Area sampled (m²)	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225		
Major Taxa	Class	Order	Family	Final Designation	Age Class	Units													
	Polychaeta	Canalipalpata	Trichobranchidae	<i>Terebellides</i> sp.	adult	individuals/m²													
	Polychaeta	Canalipalpata	Trichobranchidae	<i>Terebellides</i> sp.	juvenile	individuals/m²													
ARTHROPODA																			
Amphipoda	Malacostraca	Amphipoda	Atylidae	<i>Atylidae</i> sp. indet.	adult	individuals/m²										133.3			
	Malacostraca	Amphipoda	Calliopidae	<i>Apherusa glacialis</i>	adult	individuals/m²				44.4	88.9								
	Malacostraca	Amphipoda	Lysianassidae	<i>Boeckosimus affinis</i>	adult	individuals/m²					44.4				177.8	44.4	88.9		
	Malacostraca	Amphipoda	Lysianassidae	<i>Boeckosimus affinis</i>	juvenile	individuals/m²													
	Malacostraca	Amphipoda	Corophiidae	<i>Crassikorophium clarencense</i>	adult	individuals/m²													
	Malacostraca	Amphipoda	Corophiidae	<i>Crassikorophium clarencense</i>	juvenile	individuals/m²													
	Malacostraca	Amphipoda	Gsmmaracanthidae	<i>Gammaracanthus loricatus</i>	adult	individuals/m²													
	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus</i> sp.	adult	individuals/m²													
	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus wilkitzkii</i>	adult	individuals/m²										44.4			
	Malacostraca	Amphipoda	Ampeliscidae	<i>Haploops nr. laevis</i>	adult	individuals/m²													
	Malacostraca	Amphipoda	Ampeliscidae	<i>Haploops nr. laevis</i>	juvenile	individuals/m²													
	Malacostraca	Amphipoda	Gammaridae	<i>Lagunogammarus setosus</i>	adult	individuals/m²			44.4				44.4						
	Malacostraca	Amphipoda	Gammaridae	<i>Lagunogammarus setosus</i>	juvenile	individuals/m²					44.4								
	Malacostraca	Amphipoda	Oedicerotidae	<i>Monoculodes</i> sp.	adult	individuals/m²				177.8		44.4	88.9				133.3		
	Malacostraca	Amphipoda	Oedicerotidae	<i>Monoculodes</i> sp.	juvenile	individuals/m²							88.9						
	Malacostraca	Amphipoda	Oedicerotidae	<i>Oedicerotidae</i> sp. indet.	adult	individuals/m²		44.4	44.4	44.4									
	Malacostraca	Amphipoda	Oedicerotidae	<i>Oedicerotidae</i> sp. indet.	juvenile	individuals/m²													
	Malacostraca	Amphipoda	Uristidae	<i>Onisimus</i> sp.	adult	individuals/m²		222.2	355.6	222.2				44.4	222.2				
	Malacostraca	Amphipoda	Uristidae	<i>Onisimus</i> sp.	juvenile	individuals/m²								44.4					
	Malacostraca	Amphipoda	Oedicerotidae	<i>Paroediceros lynceus</i>	adult	individuals/m²					44.4					88.9			
Malacostraca	Amphipoda	Pontoporeiidae	<i>Pontoporeia femorata</i>	adult	individuals/m²		44.4	44.4	44.4	622.2	88.9	400.0		1644.4	1644.4	3111.1			
Malacostraca	Amphipoda	Pontoporeiidae	<i>Pontoporeia femorata</i>	adult	individuals/m²			44.4		444.4	177.8	2222.2		844.4	1022.2	3155.6			
Malacostraca	Amphipoda	Calliopidae	<i>Weyprechtia pinguis</i>	adult	individuals/m²										88.9				
Copepoda	Maxillopoda	Harpacticoida	undetermined	Harpacticoida sp indet	adult	individuals/m²													
Ostracoda	Ostracoda	undetermined	undetermined	Ostracoda sp indet.	adult	individuals/m²						44.4							
Cumacea	Malacostraca	Cumacea	Diastylidae	<i>Brachydiastylis resima</i>	adult	individuals/m²				755.6	622.2			533.3	2311.1	6266.7			
	Malacostraca	Cumacea	Diastylidae	<i>Brachydiastylis resima</i>	juvenile	individuals/m²				266.7	44.4			44.4	355.6	711.1			
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis rathkei</i>	adult	individuals/m²	266.7	177.8	355.6			266.7		266.7	133.3	44.4			
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis rathkei</i>	juvenile	individuals/m²	222.2	133.3	222.2			355.6							
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis</i> sp.	adult	individuals/m²													
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis</i> sp.	juvenile	individuals/m²													
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis sulcata</i>	adult	individuals/m²													
	Malacostraca	Cumacea	Diastylidae	<i>Leptostylis</i> sp.	adult	individuals/m²				44.4									
	Isopoda	Malacostraca	Isopoda	Munnidae	<i>Munna</i> sp.	adult	individuals/m²												
	Malacostraca	Isopoda	Chaetiliidae	<i>Saduria entomon</i>	adult	individuals/m²													
MOLLUSCA																			
Gastropoda	Gastropoda	Cephalaspidea	Cylichnidae	<i>Cylichna alba</i>	adult	individuals/m²				266.7	88.9	44.4		44.4	222.2	311.1			
	Gastropoda	Cephalaspidea	Cylichnidae	<i>Cylichna alba</i>	juvenile	individuals/m²				44.4					44.4	133.3			
	Gastropoda	Neotaenioglossa	Naticidae	<i>Cryptonatica affinis</i>	adult	individuals/m²													
Bivalvia	Gastropoda	Neotaenioglossa	Naticidae	<i>Cryptonatica affinis</i>	juvenile	individuals/m²													
	Bivalvia	Veneroida	Astartidae	<i>Astarte borealis</i>	adult	individuals/m²													
	Bivalvia	Veneroida	Tellinidae	<i>Macoma balthica</i>	adult	individuals/m²				88.9		1022.2		5022.2	4177.8	4088.9	2444.4	488.9	488.9
	Bivalvia	Veneroida	Tellinidae	<i>Macoma balthica</i>	juvenile	individuals/m²	7155.6	9511.1	4533.3					9822.2	3511.1	10133.3	2000.0	44.4	
	Bivalvia	Myoida	Myidae	<i>Mya</i> sp.	juvenile	individuals/m²	11511.1	14933.3	10622.2										
	Bivalvia	Mytiloida	Mytilidae	<i>Mytilus trossulus</i>	adult	individuals/m²													
	Bivalvia	Mytiloida	Mytilidae	<i>Mytilus trossulus</i>	adult	individuals/m²				177.8		44.4							
	Bivalvia	Mytiloida	Mytilidae	<i>Mytilus trossulus</i>	juvenile	individuals/m²						88.9			222.2	44.4	44.4		
	Bivalvia	Nuculoida	Yoldiidae	<i>Portlandia arctica</i>	adult	individuals/m²				400.0	622.2	44.4				88.9	88.9		
PHORONIDA																			
	undetermined	undetermined	undetermined	<i>Phoronida</i> sp indet.		individuals/m²													
TOTAL						individuals/m²	20222.2	26222.2	16888.9	8933.3	6622.2	8533.3	15644.4	8577.8	14755.6	12800.0	12088.9	23422.2	
Miscellaneous (excluded from data analysis)																			
	Insecta	Diptera	Chironomidae	Chironomidae larvae (Insecta)	larvae	individuals/m²													
	Clitellata	Undetermined	Undetermined	Oligochaeta sp. indet.	adult	individuals/m²		44.4				44.4		88.9	88.9				
	Undetermined	Undetermined	Undetermined	Unidentified fish eggs	egg	individuals/m²													
	Undetermined	Undetermined	Undetermined	Unidentified fish larvae	egg	individuals/m²													

Note: Taxonomic analysis by COLUMBIA SCIENCE

Appendix E. Marine Benthos Taxonomy Data, Back River Project, 2012

Taxonomic Identification						Location Replicate Collection Date Area sampled (m ²) Units	06-10			06-20			06-22			06-30		
							1	2	3	1	2	3	1	2	3	1	2	3
							1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225
Major Taxa	Class	Order	Family	Final Designation	Age Class													
NEMERTEA	Anopla	undetermined	undetermined	<i>Anopla</i> sp. indet.	adult	individuals/m ²							88.9					
	Anopla	undetermined	undetermined	<i>Anopla</i> sp. indet.	juvenile	individuals/m ²												
	Anopla	Heteronemertea	Lineidae	<i>Cerebratulus</i> sp.	adult	individuals/m ²												
	Anopla	Heteronemertea	Lineidae	<i>Cerebratulus</i> sp.	juvenile	individuals/m ²												
	undetermined	undetermined	undetermined	<i>Nemertea</i> sp. indet.	adult	individuals/m ²							44.4		44.4			
	undetermined	undetermined	undetermined	<i>Nemertea</i> sp. indet.	juvenile	individuals/m ²												
ECHIURA	undetermined	Xenopneusta	Urechidae	<i>Urechis</i> sp.	adult	individuals/m ²												
	undetermined	Xenopneusta	Urechidae	<i>Urechis</i> sp.	juvenile	individuals/m ²	44.4		222.2	888.9	577.8	577.8				88.9	88.9	
ANNELIDA																		
Polychaeta Errantia	Polychaeta	Aciculata	Phyllodocidae	<i>Eteone longa</i>	adult	individuals/m ²												
	Polychaeta	Aciculata	Phyllodocidae	<i>Eteone longa</i>	juvenile	individuals/m ²										44.4		
	Polychaeta	Aciculata	Phyllodocidae	<i>Eteone nr. pacifica</i>	adult	individuals/m ²								44.4				
	Polychaeta	Aciculata	Phyllodocidae	<i>Eteone</i> sp.	adult	individuals/m ²			44.4			88.9						
	Polychaeta	Aciculata	Polynoidae	<i>Gattyana</i> sp.	adult	individuals/m ²												
	Polychaeta	Aciculata	Polynoidae	<i>Harmothoe imbricata</i> Cmplx.	adult	individuals/m ²									44.4			
	Polychaeta	Aciculata	Polynoidae	<i>Hesperonoe</i> sp indet.	adult	individuals/m ²												
	Polychaeta	Aciculata	Lumbrineridae	<i>Lumbrineris</i> sp.	adult	individuals/m ²												
	Polychaeta	Aciculata	Polynoidae	<i>Melaenis loveni</i>	adult	individuals/m ²												
	Polychaeta	Aciculata	Hesionidae	<i>Micropodarke</i> sp.	adult	individuals/m ²												
	Polychaeta	Aciculata	Hesionidae	<i>Micropodarke</i> sp.	juvenile	individuals/m ²												
	Polychaeta	Aciculata	Nephtyidae	<i>Nephtys cornuta</i>	adult	individuals/m ²												
	Polychaeta	Aciculata	Nephtyidae	<i>Nephtys</i> sp.	adult	individuals/m ²	44.4		44.4				3866.7	3466.7	3466.7	44.4		
	Polychaeta	Aciculata	Nephtyidae	<i>Nephtys</i> sp.	juvenile	individuals/m ²									44.4			
	Polychaeta	Aciculata	Pholoidae	<i>Pholoe</i> sp.	juvenile	individuals/m ²												
	Polychaeta	Aciculata	Polynoidae	<i>Polynoidae</i> Indet.	adult	individuals/m ²												
Polychaeta Sedentaria	Polychaeta	Canalipalpata	Ampharetidae	<i>Ampharete</i> sp.	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Cirratulidae	<i>Aphelocheata</i> sp.	adult	individuals/m ²												
	Polychaeta	undetermined	Paraonidae	<i>Aricidea nolani</i>	adult	individuals/m ²	88.9						4577.8	3866.7	2444.4			
	Polychaeta	undetermined	Paraonidae	<i>Aricidea nolani</i>	juvenile	individuals/m ²	44.4						311.1	533.3	222.2			
	Polychaeta	Canalipalpata	Ampharetidae	<i>Asabellides</i> sp.	adult	individuals/m ²							44.4					
	Polychaeta	undetermined	Capitellidae	<i>Capitella capitata</i> Cmplx.	adult	individuals/m ²									44.4			
	Polychaeta	undetermined	Capitellidae	<i>Capitella capitata</i> Cmplx.	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Cirratulidae	<i>Chaetozone setosa</i>	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Cirratulidae	<i>Chaetozone setosa</i>	juvenile	individuals/m ²												
	Polychaeta	Canalipalpata	Cirratulidae	<i>Cirratulidae</i> sp. indet	adult	individuals/m ²												
	Polychaeta	undetermined	Maldanidae	<i>Clymenura nr polaris</i>	adult	individuals/m ²												
	Polychaeta	undetermined	Cossuridae	<i>Cossura</i> sp.	adult	individuals/m ²												
	Polychaeta	undetermined	Maldanidae	<i>Euclymeninae</i> Indet.	adult	individuals/m ²												
	Polychaeta	undetermined	Capitellidae	<i>Heteromastus</i> sp.	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Laonice</i> sp.	juvenile	individuals/m ²												
	Polychaeta	Canalipalpata	Sabellidae	<i>Laonome kroyeri</i>	adult	individuals/m ²												
	Polychaeta	undetermined	Orbiniidae	<i>Leitoscoloplos</i> sp.	adult	individuals/m ²							533.3	800.0	666.7			
	Polychaeta	undetermined	Orbiniidae	<i>Leitoscoloplos</i> sp.	juvenile	individuals/m ²							222.2	577.8	355.6			
	Polychaeta	undetermined	Paraonidae	<i>Levinsenia gracilis</i>	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Marenzelleria arctia</i>	adult	individuals/m ²											44.4	
	Polychaeta	Canalipalpata	Spionidae	<i>Marenzelleria wireni</i>	adult	individuals/m ²	533.3	444.4	488.9		88.9		44.4	133.3			44.4	44.4
	Polychaeta	Canalipalpata	Spionidae	<i>Marenzelleria wireni</i>	juvenile	individuals/m ²	88.9		177.8									
	Polychaeta	undetermined	Capitellidae	<i>Mediomastus</i> sp.	adult	individuals/m ²							88.9		133.3			
	Polychaeta	Canalipalpata	Pectinariidae	<i>Pectinaria granulata</i>	adult	individuals/m ²									44.4			
	Polychaeta	Canalipalpata	Pectinariidae	<i>Pectinaria granulata</i>	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio (Minuspio) multibranchiata</i>	adult	individuals/m ²											44.4	
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio cirrifera</i> Cmplx.	adult	individuals/m ²									44.4		88.9	
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio cirrifera</i> Cmplx.	juvenile	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio</i> sp.	adult	individuals/m ²								44.4				
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio</i> sp.	juvenile	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Pygospio elegans</i>	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Spio filicornis</i>	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Spio filicornis</i>	juvenile	individuals/m ²												

Appendix E. Marine Benthos Taxonomy Data, Back River Project, 2012

Taxonomic Identification						Location Replicate Collection Date Area sampled (m ²) Units	06-10			06-20			06-22			06-30		
							1	2	3	1	2	3	1	2	3	1	2	3
							1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225
Major Taxa	Class	Order	Family	Final Designation	Age Class													
	Polychaeta	Canalipalpata	Trichobranchidae	<i>Terebellides</i> sp.	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Trichobranchidae	<i>Terebellides</i> sp.	juvenile	individuals/m ²												
ARTHROPODA																		
Amphipoda	Malacostraca	Amphipoda	Atylidae	<i>Atylidae</i> sp. indet.	adult	individuals/m ²												
	Malacostraca	Amphipoda	Calliopiidae	<i>Apherusa glacialis</i>	adult	individuals/m ²												
	Malacostraca	Amphipoda	Lysianassidae	<i>Boeckosimus affinis</i>	adult	individuals/m ²			88.9	44.4	44.4					44.4		44.4
	Malacostraca	Amphipoda	Lysianassidae	<i>Boeckosimus affinis</i>	juvenile	individuals/m ²					44.4	44.4						
	Malacostraca	Amphipoda	Corophiidae	<i>Crassikorophium clarencense</i>	adult	individuals/m ²							44.4				44.4	
	Malacostraca	Amphipoda	Corophiidae	<i>Crassikorophium clarencense</i>	juvenile	individuals/m ²												
	Malacostraca	Amphipoda	Gsmmaracanthidae	<i>Gsmmaracanthus loricatus</i>	adult	individuals/m ²	44.4											
	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus</i> sp.	adult	individuals/m ²												
	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus wilkitzkii</i>	adult	individuals/m ²												
	Malacostraca	Amphipoda	Ampeliscidae	<i>Haploops nr. laevis</i>	adult	individuals/m ²												
	Malacostraca	Amphipoda	Ampeliscidae	<i>Haploops nr. laevis</i>	juvenile	individuals/m ²												
	Malacostraca	Amphipoda	Gammaridae	<i>Lagunogammarus setosus</i>	adult	individuals/m ²	88.9		44.4		88.9					400.0		222.2
	Malacostraca	Amphipoda	Gammaridae	<i>Lagunogammarus setosus</i>	juvenile	individuals/m ²												
	Malacostraca	Amphipoda	Oedicerotidae	<i>Monoculodes</i> sp.	adult	individuals/m ²												
	Malacostraca	Amphipoda	Oedicerotidae	<i>Monoculodes</i> sp.	juvenile	individuals/m ²												
	Malacostraca	Amphipoda	Oedicerotidae	<i>Oedicerotidae</i> sp. indet.	adult	individuals/m ²	88.9	133.3	177.8	133.3	44.4	44.4			44.4			
	Malacostraca	Amphipoda	Oedicerotidae	<i>Oedicerotidae</i> sp. indet.	juvenile	individuals/m ²	44.4											
	Malacostraca	Amphipoda	Uristidae	<i>Onisimus</i> sp.	adult	individuals/m ²												
	Malacostraca	Amphipoda	Uristidae	<i>Onisimus</i> sp.	juvenile	individuals/m ²												
	Malacostraca	Amphipoda	Oedicerotidae	<i>Paroediceros lynceus</i>	adult	individuals/m ²												
	Malacostraca	Amphipoda	Pontoporeiidae	<i>Pontoporeia femorata</i>	adult	individuals/m ²			222.2						133.3			
	Malacostraca	Amphipoda	Pontoporeiidae	<i>Pontoporeia femorata</i>	adult	individuals/m ²									88.9			
	Malacostraca	Amphipoda	Calliopiidae	<i>Weyprechtia pinguis</i>	adult	individuals/m ²												
Copepoda	Maxillopoda	Harpacticoida	undetermined	Harpacticoida sp indet	adult	individuals/m ²												
Ostracoda	Ostracoda	undetermined	undetermined	Ostracoda sp indet.	adult	individuals/m ²					44.4	44.4						
Cumacea	Malacostraca	Cumacea	Diastylidae	<i>Brachydiastylis resima</i>	adult	individuals/m ²							88.9		44.4			
	Malacostraca	Cumacea	Diastylidae	<i>Brachydiastylis resima</i>	juvenile	individuals/m ²							88.9					
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis rathkei</i>	adult	individuals/m ²										44.4	400.0	133.3
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis rathkei</i>	juvenile	individuals/m ²			133.3									88.9
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis</i> sp.	adult	individuals/m ²		88.9										
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis</i> sp.	juvenile	individuals/m ²												
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis sulcata</i>	adult	individuals/m ²												
	Malacostraca	Cumacea	Diastylidae	<i>Leptostylis</i> sp.	adult	individuals/m ²												
	Malacostraca	Isopoda	Munnidae	<i>Munna</i> sp.	adult	individuals/m ²												
Isopoda	Malacostraca	Isopoda	Chaetiliidae	<i>Saduria entomon</i>	adult	individuals/m ²												
MOLLUSCA																		
Gastropoda	Gastropoda	Cephalaspidea	Cylichnidae	<i>Cylichna alba</i>	adult	individuals/m ²	44.4						488.9	400.0	355.6			
	Gastropoda	Cephalaspidea	Cylichnidae	<i>Cylichna alba</i>	juvenile	individuals/m ²						44.4	311.1	44.4	88.9			
	Gastropoda	Neotaenioglossa	Naticidae	<i>Cryptonatica affinis</i>	adult	individuals/m ²												
Bivalvia	Gastropoda	Neotaenioglossa	Naticidae	<i>Cryptonatica affinis</i>	juvenile	individuals/m ²												44.4
	Bivalvia	Veneroida	Astartidae	<i>Astarte borealis</i>	adult	individuals/m ²												
	Bivalvia	Veneroida	Tellinidae	<i>Macoma balthica</i>	adult	individuals/m ²	8311.1	5244.4	7333.3	11511.1	9022.2	8133.3	977.8	1066.7	1066.7	4488.9	3377.8	5422.2
	Bivalvia	Veneroida	Tellinidae	<i>Macoma balthica</i>	juvenile	individuals/m ²	12711.1	16044.4	26977.8	20488.9	10444.4	8755.6	88.9	177.8	88.9	4711.1	4488.9	5066.7
	Bivalvia	Myoida	Myidae	<i>Mya</i> sp.	juvenile	individuals/m ²							44.4					
	Bivalvia	Mytiloida	Mytilidae	<i>Mytilus trossulus</i>	adult	individuals/m ²												
	Bivalvia	Mytiloida	Mytilidae	<i>Mytilus trossulus</i>	juvenile	individuals/m ²					44.4							
	Bivalvia	Nuculoida	Yoldiidae	<i>Portlandia arctica</i>	adult	individuals/m ²												
PHORONIDA																		
	undetermined	undetermined	undetermined	<i>Phoronida</i> sp indet.		individuals/m ²												
TOTAL						individuals/m ²	22177.8	22000.0	36000.0	33066.7	20444.4	17644.4	12088.9	11244.4	9244.4	9600.0	8888.9	11066.7
Miscellaneous (excluded from data analysis)																		
	Insecta	Diptera	Chironomidae	Chironomidae larvae (Insecta)	larvae	individuals/m ²		444.4	533.3									
	Clitellata	Undetermined	Undetermined	Oligochaeta sp. indet.	adult	individuals/m ²			177.8									
	Undetermined	Undetermined	Undetermined	Unidentified fish eggs	egg	individuals/m ²			533.3									
	Undetermined	Undetermined	Undetermined	Unidentified fish larvae	egg	individuals/m ²			88.9									

Note: Taxonomic analysis by COLUMBIA SCIENCE

Appendix E. Marine Benthos Taxonomy Data, Back River Project, 2012

Taxonomic Identification						Location Replicate Collection Date Area sampled (m ²) Units	06-32			06-42			06-50			06-52		
							1	2	3	1	2	3	1	2	3	1	2	3
							1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	2-Aug-12 0.0225	2-Aug-12 0.0225	2-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225
Major Taxa	Class	Order	Family	Final Designation	Age Class													
NEMERTEA	Anopla	undetermined	undetermined	<i>Anopla</i> sp. indet.	adult	individuals/m ²	400.0	177.8		177.8	88.9		44.4			88.9	44.4	
	Anopla	undetermined	undetermined	<i>Anopla</i> sp. indet.	juvenile	individuals/m ²												
	Anopla	Heteronemertea	Lineidae	<i>Cerebratulus</i> sp.	adult	individuals/m ²												
	Anopla	Heteronemertea	Lineidae	<i>Cerebratulus</i> sp.	juvenile	individuals/m ²										44.4		
	undetermined	undetermined	undetermined	<i>Nemertea</i> sp. indet.	adult	individuals/m ²	44.4				44.4						44.4	
	undetermined	undetermined	undetermined	<i>Nemertea</i> sp. indet.	juvenile	individuals/m ²												
ECHIURA	undetermined	Xenopneusta	Urechidae	<i>Urechis</i> sp.	adult	individuals/m ²							133.3					
	undetermined	Xenopneusta	Urechidae	<i>Urechis</i> sp.	juvenile	individuals/m ²							133.3					
ANNELIDA																		
Polychaeta Errantia	Polychaeta	Aciculata	Phyllodocidae	<i>Eteone longa</i>	adult	individuals/m ²												
	Polychaeta	Aciculata	Phyllodocidae	<i>Eteone longa</i>	juvenile	individuals/m ²												
	Polychaeta	Aciculata	Phyllodocidae	<i>Eteone</i> nr. <i>pacifica</i>	adult	individuals/m ²												
	Polychaeta	Aciculata	Phyllodocidae	<i>Eteone</i> sp.	adult	individuals/m ²												
	Polychaeta	Aciculata	Polynoidae	<i>Gattyana</i> sp.	adult	individuals/m ²				44.4	88.9	44.4	44.4	44.4				
	Polychaeta	Aciculata	Polynoidae	<i>Harmothoe imbricata</i> Cmplx.	adult	individuals/m ²	44.4	44.4	88.9	88.9								88.9
	Polychaeta	Aciculata	Polynoidae	<i>Hesperonoe</i> sp indet.	adult	individuals/m ²												
	Polychaeta	Aciculata	Lumbrineridae	<i>Lumbrineris</i> sp.	adult	individuals/m ²												
	Polychaeta	Aciculata	Polynoidae	<i>Melaenis loveni</i>	adult	individuals/m ²												
	Polychaeta	Aciculata	Hesionidae	<i>Micropodarke</i> sp.	adult	individuals/m ²	133.3			44.4		44.4				177.8	133.3	44.4
	Polychaeta	Aciculata	Hesionidae	<i>Micropodarke</i> sp.	juvenile	individuals/m ²										44.4		
	Polychaeta	Aciculata	Nephtyidae	<i>Nephtys cornuta</i>	adult	individuals/m ²	222.2											
	Polychaeta	Aciculata	Nephtyidae	<i>Nephtys</i> sp.	adult	individuals/m ²	2000.0	2577.8	2933.3	4577.8	5644.4	3955.6	44.4			4133.3	5111.1	3866.7
	Polychaeta	Aciculata	Nephtyidae	<i>Nephtys</i> sp.	juvenile	individuals/m ²	355.6	266.7	133.3	311.1		88.9				311.1	133.3	311.1
	Polychaeta	Aciculata	Pholoidae	<i>Pholoe</i> sp.	juvenile	individuals/m ²												
	Polychaeta	Aciculata	Polynoidae	<i>Polynoidae</i> Indet.	adult	individuals/m ²											44.4	
Polychaeta Sedentaria	Polychaeta	Canalipalpata	Ampharetidae	<i>Ampharete</i> sp.	adult	individuals/m ²			44.4									
	Polychaeta	Canalipalpata	Cirratulidae	<i>Aphelochaeta</i> sp.	adult	individuals/m ²								44.4				
	Polychaeta	undetermined	Paraonidae	<i>Aricidea nolani</i>	adult	individuals/m ²	133.3	44.4	44.4									
	Polychaeta	undetermined	Paraonidae	<i>Aricidea nolani</i>	juvenile	individuals/m ²												
	Polychaeta	Canalipalpata	Ampharetidae	<i>Asabellides</i> sp.	adult	individuals/m ²												
	Polychaeta	undetermined	Capitellidae	<i>Capitella capitata</i> Cmplx.	adult	individuals/m ²												
	Polychaeta	undetermined	Capitellidae	<i>Capitella capitata</i> Cmplx.	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Cirratulidae	<i>Chaetozone setosa</i>	adult	individuals/m ²							88.9					
	Polychaeta	Canalipalpata	Cirratulidae	<i>Chaetozone setosa</i>	juvenile	individuals/m ²												
	Polychaeta	Canalipalpata	Cirratulidae	<i>Cirratulidae</i> sp. indet	adult	individuals/m ²												
	Polychaeta	undetermined	Maldanidae	<i>Clymenura</i> nr <i>polaris</i>	adult	individuals/m ²	133.3	444.4	177.8		488.9	222.2				44.4	222.2	355.6
	Polychaeta	undetermined	Cossuridae	<i>Cossura</i> sp.	adult	individuals/m ²	44.4			44.4								
	Polychaeta	undetermined	Maldanidae	<i>Euclymeninae</i> Indet.	adult	individuals/m ²										44.4		
	Polychaeta	undetermined	Capitellidae	<i>Heteromastus</i> sp.	adult	individuals/m ²										44.4		
	Polychaeta	Canalipalpata	Spionidae	<i>Laonice</i> sp.	juvenile	individuals/m ²												
	Polychaeta	Canalipalpata	Sabellidae	<i>Laonome kroyeri</i>	adult	individuals/m ²	177.8	133.3	133.3		88.9					44.4	44.4	
	Polychaeta	undetermined	Orbiniidae	<i>Leitoscoloplos</i> sp.	adult	individuals/m ²	177.8	177.8	133.3									
	Polychaeta	undetermined	Orbiniidae	<i>Leitoscoloplos</i> sp.	juvenile	individuals/m ²	44.4											
	Polychaeta	undetermined	Paraonidae	<i>Levinsenia gracilis</i>	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Marenzelleria arctia</i>	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Marenzelleria wireni</i>	adult	individuals/m ²				177.8		44.4		44.4	44.4			
	Polychaeta	Canalipalpata	Spionidae	<i>Marenzelleria wireni</i>	juvenile	individuals/m ²												
	Polychaeta	undetermined	Capitellidae	<i>Mediomastus</i> sp.	adult	individuals/m ²			44.4	44.4			44.4					
	Polychaeta	Canalipalpata	Pectinariidae	<i>Pectinaria granulata</i>	adult	individuals/m ²		44.4			88.9	133.3						
	Polychaeta	Canalipalpata	Pectinariidae	<i>Pectinaria granulata</i>	adult	individuals/m ²										44.4		
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio (Minuspio) multibranchiata</i>	adult	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio cirrifera</i> Cmplx.	adult	individuals/m ²	88.9	44.4	88.9							44.4		
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio cirrifera</i> Cmplx.	juvenile	individuals/m ²												
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio</i> sp.	adult	individuals/m ²	44.4											
	Polychaeta	Canalipalpata	Spionidae	<i>Prionospio</i> sp.	juvenile	individuals/m ²				44.4								
	Polychaeta	Canalipalpata	Spionidae	<i>Pygospio elegans</i>	adult	individuals/m ²							88.9	133.3	88.9	133.3	133.3	44.4
	Polychaeta	Canalipalpata	Spionidae	<i>Spio filicornis</i>	adult	individuals/m ²					800.0							88.9
	Polychaeta	Canalipalpata	Spionidae	<i>Spio filicornis</i>	juvenile	individuals/m ²												

Appendix E. Marine Benthos Taxonomy Data, Back River Project, 2012

Taxonomic Identification						Location Replicate Collection Date Area sampled (m ²) Units	06-32			06-42			06-50			06-52		
							1	2	3	1	2	3	1	2	3	1	2	3
							1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	2-Aug-12 0.0225	2-Aug-12 0.0225	2-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225	1-Aug-12 0.0225
Major Taxa	Class	Order	Family	Final Designation	Age Class													
	Polychaeta	Canalipalpata	Trichobranchidae	<i>Terebellides</i> sp.	adult	individuals/m ²	177.8	177.8	133.3				44.4	44.4		355.6	222.2	400.0
	Polychaeta	Canalipalpata	Trichobranchidae	<i>Terebellides</i> sp.	juvenile	individuals/m ²			133.3	44.4								
ARTHROPODA																		
Amphipoda	Malacostraca	Amphipoda	Atylidae	<i>Atylidae</i> sp. indet.	adult	individuals/m ²												
	Malacostraca	Amphipoda	Calliopiidae	<i>Apherusa glacialis</i>	adult	individuals/m ²												
	Malacostraca	Amphipoda	Lysianassidae	<i>Boeckosimus affinis</i>	adult	individuals/m ²	44.4	44.4	88.9	88.9	222.2	177.8	177.8	177.8	222.2	44.4		44.4
	Malacostraca	Amphipoda	Lysianassidae	<i>Boeckosimus affinis</i>	juvenile	individuals/m ²				88.9								
	Malacostraca	Amphipoda	Corophiidae	<i>Crassikorophium clarencense</i>	adult	individuals/m ²	933.3	311.1	666.7	44.4	44.4	177.8				488.9	1200.0	622.2
	Malacostraca	Amphipoda	Corophiidae	<i>Crassikorophium clarencense</i>	juvenile	individuals/m ²	666.7	933.3	533.3	44.4	88.9	177.8				577.8	1288.9	1644.4
	Malacostraca	Amphipoda	Gsmmaracanthidae	<i>Gammaracanthus loricatus</i>	adult	individuals/m ²				133.3			44.4					44.4
	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus</i> sp.	adult	individuals/m ²												
	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus wilkitzkii</i>	adult	individuals/m ²												
	Malacostraca	Amphipoda	Ampeliscidae	<i>Haploops nr. laevis</i>	adult	individuals/m ²				311.1	44.4	88.9				44.4		222.2
	Malacostraca	Amphipoda	Ampeliscidae	<i>Haploops nr. laevis</i>	juvenile	individuals/m ²				133.3								
	Malacostraca	Amphipoda	Gammaridae	<i>Lagunogammarus setosus</i>	adult	individuals/m ²							222.2	88.9	44.4			
	Malacostraca	Amphipoda	Gammaridae	<i>Lagunogammarus setosus</i>	juvenile	individuals/m ²												
	Malacostraca	Amphipoda	Oedicerotidae	<i>Monoculodes</i> sp.	adult	individuals/m ²												
	Malacostraca	Amphipoda	Oedicerotidae	<i>Monoculodes</i> sp.	juvenile	individuals/m ²												
	Malacostraca	Amphipoda	Oedicerotidae	<i>Oedicerotidae</i> sp. indet.	adult	individuals/m ²	88.9		88.9	44.4	44.4	311.1				222.2	44.4	222.2
	Malacostraca	Amphipoda	Oedicerotidae	<i>Oedicerotidae</i> sp. indet.	juvenile	individuals/m ²												
	Malacostraca	Amphipoda	Uristidae	<i>Onisimus</i> sp.	adult	individuals/m ²												
	Malacostraca	Amphipoda	Uristidae	<i>Onisimus</i> sp.	juvenile	individuals/m ²												
	Malacostraca	Amphipoda	Oedicerotidae	<i>Paroediceros lynceus</i>	adult	individuals/m ²							44.4			44.4		
	Malacostraca	Amphipoda	Pontoporeiidae	<i>Pontoporeia femorata</i>	adult	individuals/m ²	666.7	266.7	1022.2	1200.0	1777.8	1333.3	133.3	133.3	44.4	2266.7	1733.3	2044.4
	Malacostraca	Amphipoda	Pontoporeiidae	<i>Pontoporeia femorata</i>	adult	individuals/m ²	622.2	577.8	488.9	3511.1	1377.8	1911.1		44.4		1066.7	2044.4	3066.7
	Malacostraca	Amphipoda	Calliopiidae	<i>Weyprechtia pinguis</i>	adult	individuals/m ²	44.4		44.4	44.4								
Copepoda	Maxillopoda	Harpacticoida	undetermined	Harpacticoida sp indet	adult	individuals/m ²												
Ostracoda	Ostracoda	undetermined	undetermined	Ostracoda sp indet.	adult	individuals/m ²					44.4	88.9	88.9	44.4				
Cumacea	Malacostraca	Cumacea	Diastylidae	<i>Brachydiastylis resima</i>	adult	individuals/m ²	8355.6	15155.6	18444.4	1244.4	7333.3	2488.9				7866.7	8177.8	9022.2
	Malacostraca	Cumacea	Diastylidae	<i>Brachydiastylis resima</i>	juvenile	individuals/m ²	533.3	1244.4	2266.7	44.4	133.3					622.2	533.3	933.3
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis rathkei</i>	adult	individuals/m ²						88.9	133.3	88.9	44.4	88.9	88.9	311.1
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis rathkei</i>	juvenile	individuals/m ²							44.4	44.4				
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis</i> sp.	adult	individuals/m ²												88.9
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis</i> sp.	juvenile	individuals/m ²												88.9
	Malacostraca	Cumacea	Diastylidae	<i>Diastylis sulcata</i>	adult	individuals/m ²			44.4									
	Malacostraca	Cumacea	Diastylidae	<i>Leptostylis</i> sp.	adult	individuals/m ²												
Isopoda	Malacostraca	Isopoda	Munnidae	<i>Munna</i> sp.	adult	individuals/m ²	44.4											
	Malacostraca	Isopoda	Chaetiliidae	<i>Saduria entomon</i>	adult	individuals/m ²					44.4							
MOLLUSCA																		
Gastropoda	Gastropoda	Cephalaspidea	Cylichnidae	<i>Cylichna alba</i>	adult	individuals/m ²	133.3	44.4	133.3	133.3	222.2	44.4	88.9	44.4		88.9	222.2	44.4
	Gastropoda	Cephalaspidea	Cylichnidae	<i>Cylichna alba</i>	juvenile	individuals/m ²	44.4				400.0	266.7				533.3	577.8	311.1
	Gastropoda	Neotaenioglossa	Naticidae	<i>Cryptonatica affinis</i>	adult	individuals/m ²	44.4					88.9	88.9	44.4	88.9			
	Gastropoda	Neotaenioglossa	Naticidae	<i>Cryptonatica affinis</i>	juvenile	individuals/m ²		44.4	44.4	44.4	44.4		44.4	44.4				
Bivalvia	Bivalvia	Veneroida	Astartidae	<i>Astarte borealis</i>	adult	individuals/m ²												
	Bivalvia	Veneroida	Tellinidae	<i>Macoma balthica</i>	adult	individuals/m ²							4400.0	1555.6	1022.2			
	Bivalvia	Veneroida	Tellinidae	<i>Macoma balthica</i>	juvenile	individuals/m ²							177.8	222.2	266.7			
	Bivalvia	Myoida	Myidae	<i>Mya</i> sp.	juvenile	individuals/m ²												
	Bivalvia	Mytiloida	Mytilidae	<i>Mytilus trossulus</i>	adult	individuals/m ²						488.9	355.6	177.8	177.8			
	Bivalvia	Mytiloida	Mytilidae	<i>Mytilus trossulus</i>	juvenile	individuals/m ²				88.9	44.4	44.4	44.4	88.9	88.9			
	Bivalvia	Nuculoida	Yoldiidae	<i>Portlandia arctica</i>	adult	individuals/m ²		44.4			88.9							
PHORONIDA																		
	undetermined	undetermined	undetermined	<i>Phoronida</i> sp indet.		individuals/m ²	88.9	44.4	44.4									44.4
TOTAL						individuals/m ²	16533.3	22888.9	28000.0	12577.8	19377.8	12444.4	6622.2	3244.4	2177.8	19377.8	22133.3	23955.6
Miscellaneous (excluded from data analysis)																		
	Insecta	Diptera	Chironomidae	Chironomidae larvae (Insecta)	larvae	individuals/m ²												
	Clitellata	Undetermined	Undetermined	Oligochaeta sp. indet.	adult	individuals/m ²												
	Undetermined	Undetermined	Undetermined	Unidentified fish eggs	egg	individuals/m ²												
	Undetermined	Undetermined	Undetermined	Unidentified fish larvae	egg	individuals/m ²												

Note: Taxonomic analysis by COLUMBIA SCIENCE

Appendix F.1

Raw Data for Physical Characteristics for the Bay Mussel
(*Mytilus trossulus*), Back River Project, 2012

Appendix F.1. Raw Data for Physical Characteristics for the Bay Mussel (*Mytilus trossulus*), Back River Project, 2012

O6-42 rep	Length (mm)	Width (mm)	Height (mm)	Wet Weight	
				Total (g)	Flesh (g)
1	55	20	17	17.1	4.4
2	55	20	15	14.8	3.4
3	49	20	14	12.8	2.5
4	50	19	19	10.4	3.1
5	45	17	15	9.9	2.1
6	46	18	12	9.4	2.2
7	46	17	14	8.7	2.2
8	44	18	11	8.8	2.6
9	41	18	11	7.9	1.9
10	41	18	12	8.4	2.1
Mean	47.2	18.5	14.0	10.8	2.7
SE	1.6	0.4	0.8	1.0	0.3

O6-42 rep	Length (mm)	Width (mm)	Height (mm)	Wet Weight	
				Total (g)	Flesh (g)
1	62	22	20	18.4	4.9
2	53	21	13	11.2	4.0
3	47	19	12	9.8	2.1
4	47	20	15	12.5	3.2
5	47	19	14	9.5	3.0
6	47	18	14	10.5	2.2
7	45	19	14	10.6	2.6
8	45	18	13	9.3	3.3
9	40	14	10	6.1	1.7
10	41	18	11	7.6	2.4
Mean	47.4	18.8	13.6	10.5	2.9
SE	2.0	0.7	0.9	1.0	0.3

O6-50 rep	Length (mm)	Width (mm)	Height (mm)	Wet Weight	
				Total (g)	Flesh (g)
1	72	28	23	34.0	7.0
2	57	23	16	16.6	5.1
3	58	24	17	19.2	4.3
4	58	23	14	14.7	3.7
5	59	23	17	19.3	5.7
6	61	28	16	18.4	4.3
7	54	22	19	18.7	4.4
8	59	23	18	19.9	4.2
9	53	20	14	13.1	4.8
10	53	21	13	11.9	3.2
Mean	58.4	23.5	16.7	18.6	4.7
SE	1.7	0.8	0.9	1.9	0.3

Appendix F.2

Raw Total Metal Data for the Bay Mussel
(*Mytilus trossulus*), Back River Project, 2012

Appendix F.2. Raw Total Metal Data for the Bay Mussel (*Mytilus trossulus*), Back River Project, 2012

Location			O4-42										O6-42									
Replicate	Realised Detection Limits ^a	Units	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Sample ID			O4-42-1	O4-42-2	O4-42-3	O4-42-4	O4-42-5	O4-42-6	O4-42-7	O4-42-8	O4-42-9	O4-42-10	O6-42-1	O6-42-2	O6-42-3	O6-42-4	O6-42-5	O6-42-6	O6-42-7	O6-42-8	O6-42-9	O6-42-10
Date Sampled			4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
ALS Sample ID			L1207467-1	L1207467-2	L1207467-3	L1207467-4	L1207467-5	L1207467-6	L1207467-7	L1207467-8	L1207467-9	L1207467-10	L1207456-1	L1207456-2	L1207456-3	L1207456-4	L1207456-5	L1207456-6	L1207456-7	L1207456-8	L1207456-9	L1207456-10
Physical Tests																						
% Moisture	0.1	%	84.4	83.2	78.4	80.5	81.7	80.7	77.0	77.3	78.8	78.8	81.5	69.6	80.3	81.4	75.6	78.2	78.6	75.8	76.6	76.9
Total Metals																						
Aluminum (Al)	0.4	mg/kg wet weight	19.8	12.8	156	37.3	29.4	260	42.1	81.2	21.0	195	158	59.7	255	54.6	484	447	425	397	430	325
Antimony (Sb)	0.002	mg/kg wet weight	<0.0020	<0.0020	0.0036	0.0024	<0.0020	0.0020	0.0029	0.0025	<0.0020	0.0024	<0.0020	0.0029	0.0027	<0.0020	0.0021	0.0027	0.0035	0.0023	0.0028	0.0030
Arsenic (As)	0.004	mg/kg wet weight	2.17	1.57	2.50	2.27	2.28	2.65	2.71	2.35	2.06	1.85	1.69	2.25	2.43	1.70	2.56	2.19	2.33	2.22	2.29	2.18
Barium (Ba)	0.01	mg/kg wet weight	0.191	0.146	0.755	0.227	0.166	1.25	0.221	0.370	0.193	0.858	0.722	1.21	1.21	0.287	2.34	2.13	1.90	1.74	2.02	1.66
Beryllium (Be)	0.002	mg/kg wet weight	<0.0020	<0.0020	0.0084	0.0025	<0.0020	0.0128	0.0031	0.0043	0.0024	0.0095	0.0081	0.0051	0.0114	0.0028	0.0215	0.0197	0.0211	0.0185	0.0200	0.0153
Bismuth (Bi)	0.002 - 0.017	mg/kg wet weight	0.0238	<0.0060	0.0978	<0.0070	<0.017	<0.011	0.0398	<0.0080	<0.0050	<0.0080	<0.0060	<0.011	<0.011	0.0397	0.0388	<0.015	0.0244	<0.010	<0.014	<0.012
Boron (B)	0.2 - 4.5	mg/kg wet weight	<3.1	<3.0	<3.7	<3.2	4.85	<4.4	8.12	4.95	<3.6	7.58	<4.0	<3.8	<4.2	<3.6	<4.5	4.20	6.97	4.24	4.60	4.28
Cadmium (Cd)	0.002	mg/kg wet weight	2.10	1.89	1.03	1.65	0.963	3.07	1.63	1.75	1.83	0.970	2.90	2.85	2.05	1.75	2.65	1.04	2.43	1.89	2.16	2.78
Calcium (Ca)	5	mg/kg wet weight	378	284	377	309	257	374	290	237	922	341	263	53100	1320	1440	4610	902	359	682	535	685
Cesium (Cs)	0.001	mg/kg wet weight	0.0026	0.0023	0.0127	0.0042	0.0039	0.0197	0.0044	0.0068	0.0033	0.0150	0.0136	0.0056	0.0206	0.0060	0.0405	0.0341	0.0339	0.0317	0.0344	0.0256
Chromium (Cr)	0.01	mg/kg wet weight	0.279	0.175	0.385	0.252	0.174	0.645	0.257	0.263	0.233	0.430	0.457	0.386	0.761	0.257	1.10	0.997	0.861	0.848	0.897	0.797
Cobalt (Co)	0.004	mg/kg wet weight	0.102	0.118	0.239	0.228	0.173	0.247	0.187	0.173	0.142	0.209	0.214	0.219	0.282	0.145	0.315	0.280	0.350	0.301	0.307	0.294
Copper (Cu)	0.01	mg/kg wet weight	1.13	1.32	2.17	1.60	1.32	2.49	1.90	1.75	1.29	1.95	1.41	1.56	1.86	1.59	2.21	2.32	2.08	1.97	2.61	2.48
Gallium (Ga)	0.004	mg/kg wet weight	0.0052	<0.0040	0.0500	0.0112	0.0089	0.0754	0.0108	0.0218	0.0051	0.0587	0.0479	0.0165	0.0778	0.0167	0.154	0.135	0.134	0.128	0.129	0.0999
Iron (Fe)	0.2	mg/kg wet weight	90.5	42.7	160	62.4	73.9	232	58.6	87.3	49.8	150	137	137	216	59.6	370	336	334	292	331	256
Lead (Pb)	0.004	mg/kg wet weight	0.103	0.393	0.176	0.305	0.169	0.287	0.214	0.251	0.355	0.227	0.419	0.326	0.224	0.125	0.440	0.289	0.417	0.474	0.297	0.520
Lithium (Li)	0.02	mg/kg wet weight	0.108	0.082	0.288	0.104	0.111	0.455	0.111	0.157	0.112	0.348	0.255	0.142	0.390	0.128	0.774	0.644	0.632	0.582	0.671	0.491
Magnesium (Mg)	10	mg/kg wet weight	638	624	627	586	558	688	516	537	634	607	619	638	735	561	698	663	641	681	688	680
Manganese (Mn)	0.004	mg/kg wet weight	1.87	1.77	3.17	1.95	1.45	3.31	1.76	1.93	1.49	3.08	3.31	5.49	3.80	2.19	5.22	4.80	4.77	4.60	5.28	4.38
Mercury (Hg)	0.001	mg/kg wet weight	0.0200	0.0198	0.0182	0.0243	0.0100	0.0267	0.0235	0.0181	0.0219	0.0163	0.0255	0.0285	0.0256	0.0147	0.0279	0.0231	0.0255	0.0227	0.0252	0.0291
Molybdenum (Mo)	0.004	mg/kg wet weight	0.0834	0.0603	0.101	0.0935	0.0848	0.123	0.0727	0.0749	0.0784	0.220	0.0523	0.112	0.198	0.0795	0.118	0.0994	0.0957	0.0838	0.131	0.136
Nickel (Ni)	0.01	mg/kg wet weight	0.403	0.343	0.572	0.619	0.435	0.616	0.419	0.428	0.397	0.545	0.412	0.564	0.884	0.359	0.872	0.908	0.817	0.790	0.798	0.773
Phosphorus (P)	50	mg/kg wet weight	1310	1500	1810	1890	2320	1610	2000	2130	2250	1920	1740	1630	1820	1830	2290	1970	1770	2050	1940	1790
Potassium (K)	200	mg/kg wet weight	1550	1710	1790	2040	2000	1770	2030	2100	2190	2000	1810	1700	1990	1790	1970	1840	1960	1960	2090	1860
Rhenium (Re)	0.002	mg/kg wet weight	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium (Rb)	0.01	mg/kg wet weight	0.633	0.656	0.999	0.826	0.913	1.14	0.891	1.00	0.871	1.11	1.01	0.769	1.16	0.936	1.78	1.48	1.55	1.49	1.67	1.30
Selenium (Se)	0.02	mg/kg wet weight	0.745	0.946	1.19	1.22	1.04	1.33	1.09	1.18	1.01	1.32	0.655	0.829	1.05	0.922	1.11	1.06	0.926	1.09	1.23	1.15
Sodium (Na)	200	mg/kg wet weight	4120	3960	3510	3360	3300	3710	2960	2900	3590	3200	3260	3080	3960	3270	2620	2840	2780	2980	3150	3350
Strontium (Sr)	0.01	mg/kg wet weight	5.36	4.12	4.55	3.87	3.93	4.87	3.97	2.99	11.9	4.34	3.58	219	15.0	7.20	17.1	11.3	4.68	8.00	7.27	8.05
Tellurium (Te)	0.004	mg/kg wet weight	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium (Tl)	0.0004 - 0.005	mg/kg wet weight	<0.00060	<0.00060	<0.0028	<0.0016	<0.0012	<0.0036	<0.0020	<0.0016	<0.0012	<0.0030	<0.0020	<0.0016	<0.0030	<0.0012	<0.0050	0.00464	0.00422	0.00430	0.00487	<0.0036
Thorium (Th)	0.002	mg/kg wet weight	0.0095	0.0095	0.0868	0.0263	0.0175	0.131	0.0426	0.0788	0.0180	0.0853	0.0513	0.0507	0.0938	0.0255	0.205	0.181	0.212	0.152	0.252	0.162
Tin (Sn)	0.004	mg/kg wet weight	0.0175	0.103	0.0239	0.0803	0.0573	0.0072	0.0298	0.0051	<0.0040	0.0109	0.0049	0.113	<0.0040	<0.0040	0.0287	0.0133	0.181	0.0085	0.0648	0.0186
Titanium (Ti)	0.01	mg/kg wet weight	0.497	0.361	4.85	1.15	0.852	5.36	0.916	2.22	0.617	5.34	5.47	2.07	6.87	1.75	13.9	11.8	12.0	10.5	12.4	8.60
Uranium (U)	0.0004	mg/kg wet weight	0.0537	0.0292	0.0598	0.0515	0.0643	0.0813	0.0384	0.0416	0.0646	0.0928	0.0486	0.0873	0.161	0.0468	0.127	0.0865	0.0935	0.0703	0.0757	0.0903
Vanadium (V)	0.004	mg/kg wet weight	0.0812	0.0537	0.311	0.120	0.103	0.457	0.103	0.187	0.0747	0.467	0.315	0.250	0.582	0.146	0.885	0.793	0.779	0.699	0.779	0.596
Yttrium (Y)	0.002	mg/kg wet weight	0.136	0.0574	0.159	0.0906	0.0622	0.239	0.0695	0.0894	0.0669	0.114	0.0957	0.146	0.160	0.0506	0.294	0.232	0.247	0.179	0.249	0.200
Zinc (Zn)	0.1	mg/kg wet weight	11.2	12.3	25.2	23.4	12.6	13.5	22.2	18.0	19.3	19.7	11.0	10.6	14.3	12.4	16.7	16.2	15.9	34.5	15.4	18.4
Zirconium (Zr)	0.04 - 0.08	mg/kg wet weight	<0.040	<0.080	0.222	0.088	0.062	0.379	0.100	0.282	0.047	0.333	0.156	0.146	0.191	0.071	0.562	0.404	0.651	0.328	0.672	0.395

Appendix F.2. Raw Total Metal Data for the Bay Mussel (*Mytilus trossulus*), Back River Project, 2012

Location			O6-50									
Replicate	Realised Detection Limits ^a	Units	1	2	3	4	5	6	7	8	9	10
Sample ID			O6-50-1	O6-50-2	O6-50-3	O6-50-4	O6-50-5	O6-50-6	O6-50-7	O6-50-8	O6-50-9	O6-50-10
Date Sampled			3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
ALS Sample ID			L1207468-1	L1207468-2	L1207468-3	L1207468-4	L1207468-5	L1207468-6	L1207468-7	L1207468-8	L1207468-9	L1207468-10
Physical Tests												
% Moisture	0.1	%	77.8	79.6	77.7	77.2	79.9	80.6	76.6	76.9	74.9	78.6
Total Metals												
Aluminum (Al)	0.4	mg/kg wet weight	204	339	60.8	34.7	52.9	84.7	244	130	238	86.9
Antimony (Sb)	0.002	mg/kg wet weight	0.0025	<0.0020	0.0027	<0.0020	0.0034	0.0024	<0.0020	0.0022	0.0025	<0.0020
Arsenic (As)	0.004	mg/kg wet weight	2.86	1.74	2.05	2.29	1.64	2.07	2.47	2.50	2.18	1.96
Barium (Ba)	0.01	mg/kg wet weight	1.11	1.41	0.396	0.200	0.310	0.496	1.16	0.637	1.14	0.390
Beryllium (Be)	0.002	mg/kg wet weight	0.0103	0.0151	0.0041	0.0032	0.0032	0.0047	0.0116	0.0070	0.0104	0.0043
Bismuth (Bi)	0.002 - 0.017	mg/kg wet weight	<0.014	<0.0070	<0.0090	<0.0090	0.0415	<0.013	<0.012	<0.010	<0.012	<0.0080
Boron (B)	0.2 - 4.5	mg/kg wet weight	<3.6	<3.6	<3.3	<2.7	<3.0	<3.0	<3.2	<3.1	<3.7	<2.6
Cadmium (Cd)	0.002	mg/kg wet weight	3.64	2.00	1.34	2.00	1.36	2.05	2.23	2.09	1.34	1.24
Calcium (Ca)	5	mg/kg wet weight	563	519	563	316	392	936	563	379	1240	339
Cesium (Cs)	0.001	mg/kg wet weight	0.0157	0.0267	0.0061	0.0042	0.0056	0.0073	0.0199	0.0103	0.0187	0.0078
Chromium (Cr)	0.01	mg/kg wet weight	0.638	0.731	0.232	0.190	0.310	0.415	0.553	0.399	0.529	0.334
Cobalt (Co)	0.004	mg/kg wet weight	0.323	0.254	0.217	0.146	0.163	0.251	0.292	0.241	0.222	0.167
Copper (Cu)	0.01	mg/kg wet weight	2.36	1.79	2.10	1.97	1.88	1.90	2.01	1.72	2.54	1.64
Gallium (Ga)	0.004	mg/kg wet weight	0.0618	0.110	0.0165	0.0106	0.0148	0.0236	0.0800	0.0387	0.0687	0.0255
Iron (Fe)	0.2	mg/kg wet weight	221	278	81.9	50.0	75.8	101	210	123	191	94.2
Lead (Pb)	0.004	mg/kg wet weight	0.357	0.491	0.178	0.268	0.304	0.339	0.475	0.327	0.273	0.232
Lithium (Li)	0.02	mg/kg wet weight	0.334	0.527	0.128	0.103	0.134	0.184	0.393	0.235	0.371	0.175
Magnesium (Mg)	10	mg/kg wet weight	660	634	528	549	498	541	572	588	566	482
Manganese (Mn)	0.004	mg/kg wet weight	3.03	3.94	1.38	1.24	2.00	2.21	3.37	2.30	3.47	1.94
Mercury (Hg)	0.001	mg/kg wet weight	0.0327	0.0200	0.0236	0.0243	0.0190	0.0274	0.0306	0.0249	0.0192	0.0216
Molybdenum (Mo)	0.004	mg/kg wet weight	0.120	0.0752	0.110	0.0757	0.0788	0.148	0.0667	0.0764	0.147	0.0703
Nickel (Ni)	0.01	mg/kg wet weight	0.658	0.567	0.435	0.325	0.386	0.751	0.597	0.583	0.614	0.358
Phosphorus (P)	50	mg/kg wet weight	1990	1780	1970	2720	1920	1700	2570	2470	2160	2280
Potassium (K)	200	mg/kg wet weight	1760	1770	2220	1830	1780	1480	2150	1820	2160	1810
Rhenium (Re)	0.002	mg/kg wet weight	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium (Rb)	0.01	mg/kg wet weight	1.05	1.26	0.994	0.745	0.816	0.708	1.34	0.943	1.25	0.862
Selenium (Se)	0.02	mg/kg wet weight	1.06	0.978	1.06	0.914	1.00	0.796	0.996	0.906	1.17	1.11
Sodium (Na)	200	mg/kg wet weight	3440	2780	2860	2730	2530	2990	2420	3070	2630	2330
Strontium (Sr)	0.01	mg/kg wet weight	6.04	4.62	6.12	3.55	4.29	6.27	5.80	4.03	14.0	3.91
Tellurium (Te)	0.004	mg/kg wet weight	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium (Tl)	0.0004 - 0.005	mg/kg wet weight	<0.0030	<0.0032	<0.0028	<0.0012	<0.0012	<0.0020	<0.0030	<0.0020	<0.0036	<0.0016
Thorium (Th)	0.002	mg/kg wet weight	0.117	0.114	0.0640	0.0375	0.0246	0.0641	0.104	0.0685	0.123	0.0415
Tin (Sn)	0.004	mg/kg wet weight	0.0567	0.0124	0.0099	0.119	0.0232	0.0395	0.0459	0.0109	0.0070	0.0854
Titanium (Ti)	0.01	mg/kg wet weight	6.68	8.06	1.70	1.15	1.80	2.47	7.55	4.09	7.00	2.94
Uranium (U)	0.0004	mg/kg wet weight	0.105	0.0466	0.0592	0.0479	0.0336	0.0878	0.0768	0.0697	0.0660	0.0487
Vanadium (V)	0.004	mg/kg wet weight	0.437	0.639	0.153	0.107	0.131	0.249	0.483	0.276	0.494	0.192
Yttrium (Y)	0.002	mg/kg wet weight	0.264	0.164	0.0873	0.0788	0.0533	0.102	0.161	0.119	0.144	0.0810
Zinc (Zn)	0.1	mg/kg wet weight	16.3	18.5	30.7	13.3	15.6	17.2	20.5	15.2	20.2	12.2
Zirconium (Zr)	0.04 - 0.08	mg/kg wet weight	0.337	0.359	0.186	0.117	0.080	0.141	0.336	0.257	0.395	0.072

Appendix V7-2A

**Back River Project: Preliminary Desalination Assessment
at the Marine Laydown Area, Bathurst Inlet, NU**

Memorandum



DATE: June 25, 2013

TO: Matthew Pickard, Director, Environment & Community Relations
Max Brownhill, Manager Environmental Approvals
Elizabeth Sherlock, Environment Manager
Sabina Gold & Silver Corporation

FROM: Philippe Benoit, M.Sc., Michael Henry, Ph.D., Deborah Muggli, Ph.D., M.Sc., R.P.Bio

SUBJECT: Back River Project: Preliminary Desalination Assessment at the Marine Laydown Area, Bathurst Inlet, NU

1. Introduction

The temporary Marine Laydown Area (MLA) in Bathurst Inlet will require potable water for times when the camp is open. The closest lakes have been found to be too shallow to be used as a potable water source, especially during the winter when the MLA camp will be mainly operational.

As such, Sabina is investigating the possibility of using a desalination plant to produce potable water for the camp.

Seawater would be drawn from Bathurst Inlet and filtered through a desalination plant. The salt extracted during the desalination would be dissolved in the excess seawater used in the process and then released back to Bathurst Inlet as a brine solution.

Sabina requested that Rescan do a quick evaluation to determine if there were any fatal flaws from an environmental point of view if desalination were chosen as the preferred option for providing potable water to the MLA. Introducing hyper-saline brine to a marine environment could adversely affect resident marine life. For the purposes of this evaluation, it was assumed that if discharging brine to Bathurst Inlet did not result in changes to salinity greater than the CCME salinity guideline for the protection of marine life (+/- 10%), then as a first screening, no adverse effects would be expected to resident marine life.

This memo presents a possible discharge scenario that could result in no adverse environmental effects to the marine receiving environment in Bathurst Inlet.

2. Overview of Concept

The general concept investigated entailed discharging the brine into the surface water (but below the maximum thickness of ice) at 4-5 m depth, away from the shoreline.

A key aspect would be to discharge the brine via a floating raft or other structure so that the brine is not in direct contact with the seabed floor.

Once the brine is discharged to surface waters, it would naturally sink, thereby diluting itself, so by the time it reached any potentially-sensitive habitat on the seabed floor, it would be within the CCME salinity guidelines for the protection of marine life (natural salinity plus or minus 10% (CCME 2013)).

To investigate this concept, the model that is being set up for the marine fuel spill modelling work (MIKE3 3D hydrodynamic model by DHI (2010)) was modified to simulate the brine discharge to Bathurst Inlet. While this is a preliminary analysis and the model is not currently set up specifically for brine, it was used for speed of time and to provide a high-level screening for the use of a desalination plant.

3. Background Information-Existing Environment

The proposed MLA is on the western shore of southern Bathurst Inlet at approximately 66°40.69' N and 107°43.59' W. The site consists of a long cobble/sand beach, with a shoreline generally following a 120-125° WSW heading. The water shelf extends orthogonally from the shore at a steep slope of approximately 20% 240 m offshore to depths below 50 m. Beyond this distance, the seabed slopes more gently to depths below 150 m in the main inlet channel.

Numerous detailed studies of the region have been conducted by Rescan Environmental Services Ltd.; recent studies in 2012 (Rescan 2012b; Rescan 2013) collected physical oceanographic water column data (i.e. vertical profiles of temperature, salinity and dissolved oxygen) and the first available high-quality water current velocities at several sampling stations within southern Bathurst Inlet. This dataset was assembled specifically to monitor the areas of interest for a marine shipping route and marine built-in infrastructure within the southern portion of the inlet.

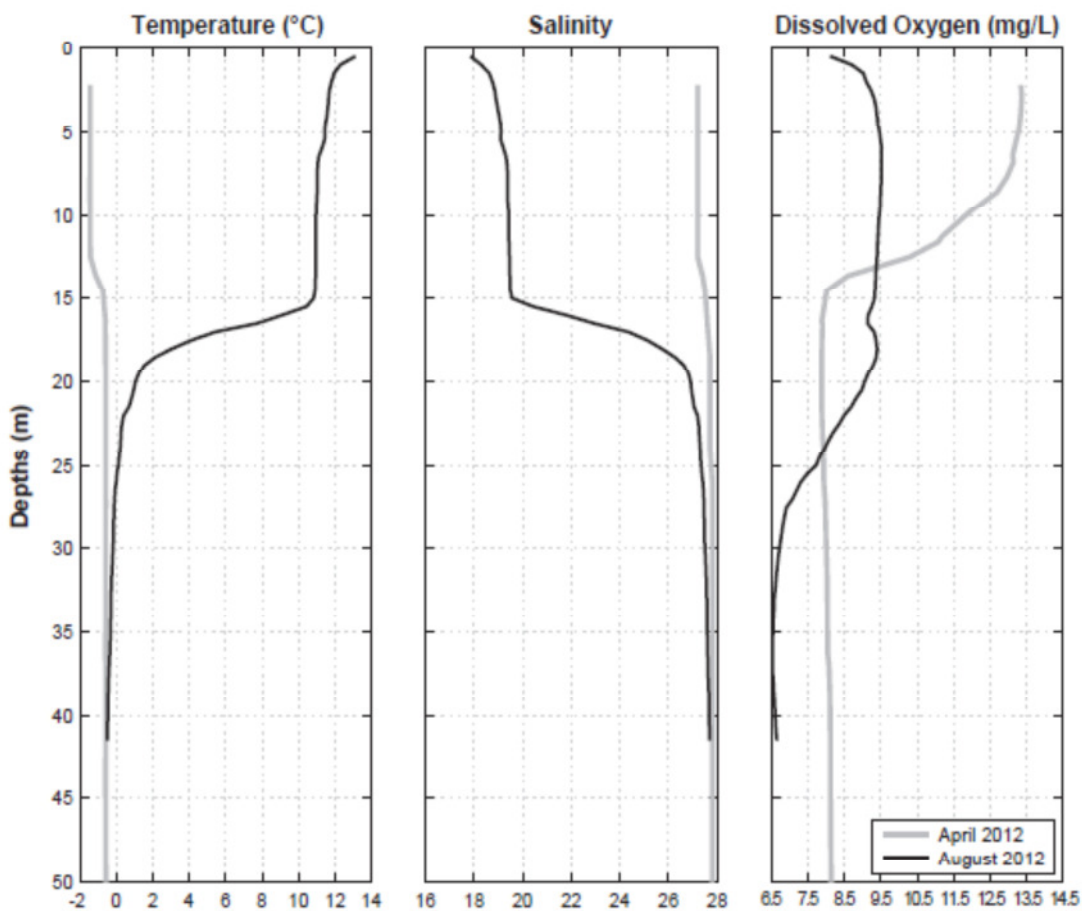
All water column observations showed a strongly stratified two-layered pycnocline structure with a 15 to 20 m warm, fresh and oxygenated top layer above a colder, saltier and less oxygenated bottom layer. The differences between winter and summer profiles are illustrated in Figure 1. This figure shows the water column structure data collected in April and August 2012 at stations near the proposed BIPR port station that is approximately 19 km southwest of the MLA. Winter thermohaline profiles generally approximated a two-layered vertically stratified system comprised of a cold (~-1.5°C), less saline (26-27) upper layer of approximately 10 to 20 m depth overlaying a slightly warmer (~-0.5°C) and denser bottom layer of higher salinity (> 27). The surface salinity in the inlet was found to be highly dependent on the seasonal riverine inputs and the contribution of brine inputs from surface ice formation. The winter upper mixed layer was found to be highly oxygenated within the inlet (> 13 mg/L; 94 to > 100% saturation) compared to the bottom waters that had lower dissolved oxygen concentrations and lower saturation levels (< 9 mg/L; ~60% saturation). The lack of wind-driven mixing due to the ice cover was the most important factor in maintaining the water column stratification.

In the summer season, the thermohaline structure of the water column was again a two-layered profile for all stations in Bathurst Inlet, with a sharp ~3 to 4 m thick pycnocline present at roughly 15 to 20 m depth that separated a warmer (10-13°C), fresher (salinity 17.8-19.5) upper layer from a cold (1 to -0.5°C) and salty (salinity 26.9-27.7) oceanic bottom layer. The dissolved oxygen concentrations in the surface layer (> 9 mg/L) were much lower than values recorded in winter; however, they still resulted in large oxygen saturations (95 to 99%) due to the warmer surface temperatures. The deep water layer harboured much lower oxygen concentrations (< 7.5 mg/L), with a minimum observed of 6.53 mg/L (53.6% saturation). This dissolved oxygen deficiency resulted from a combination of deep-water and sediment organic matter oxidation, and the mid-column stratification limiting mixing between both top and bottom water layers.

Measured water current velocities and directions were heavily influenced by their surrounded bathymetry, but generally a two-layered flow structure was observed, with significant variability

recorded in both current speeds and directions at all times. Average velocities in southern Bathurst Inlet were less than 10 cm/s in the bottom layer, while in the top layer they ranged from 20 to 60 cm/s with maximum recorded magnitudes up to nearly 150 cm/s during strong wind events. Maximum surface significant wave heights were estimated at roughly 2 m height for the study region. The vast majority of currents were linked to wind-driven forcing, while calculated tidal currents were generally almost negligible.

Figure 1. Profiles of Temperature, Salinity and Dissolved Oxygen in Bathurst Inlet Near the BIPR Proposed Port Site for Winter (April 2012) and Summer (August 2012) Conditions.



4. Desalination

As stated in the frozen Project Description document written by Sabina, the total water supply volumes needed are anticipated to be approximately 50 m³/day: 30 m³/day for domestic uses and 20 m³/day for additional miscellaneous industrial purposes.

There are multiple types of desalination processes (for review, please see Hamed (2005) and Fritzmann et al. 2007)); however, the typical plant needs 3 kg of seawater to produce 1 kg of freshwater. The extracted salt is dissolved in the extra 2 kg of seawater, which is then returned to the natural environment. For the Back River MLA development, freshwater supply needed during construction and operations is estimated at roughly 50 m³ per day; thus, 150 m³ of Bathurst Inlet waters will need to be taken each day near the MLA site to produce the required 50 m³ water supply, and approximately 100 m³ of brine will need to be discharged in the vicinity of the MLA.

Brine concentrations of salinity can be estimated by looking at the water column thermohaline profiles as discussed in section 3. Assuming both the extraction and release of seawater will occur in the top ~ 5 m of the water column, then the yearly range of 17.8 to 27.1 surface layer salinity will yield brines of salinity 26.7 to 40.65.

5. Modelling Description

Rescan is currently conducting marine fuel spill modelling using the MIKE3 3D hydrodynamic model by DHI (2010). The model being developed is specifically designed to quantify the movement of oil slicks on Bathurst Inlet's surface layer; the model focuses on the top 10 m of the water column and uses a large modelling grid (i.e. 100 to 200 m grid size) to complete a large amount of simulation in a limited amount of time. Although such a setting is not optimal for the study of small-scale mass balance and density currents potentially resulting from the desalination process at the MLA, it is a useful tool to explore the first order effects of the brine release on the salinity near the MLA.

6. Results

The hydrodynamic model was run for 28-day simulations using the Bathurst Inlet physical oceanographic data (i.e., winds, currents, temperature, salinity, etc...) as recorded by Rescan (2012b). Two major scenarios were explored: summer and winter conditions (Figures 2 & 3). The ejected brine from the desalination process was released at a shallow location (~ 5 m depth) near the approximate MLA location (marked by a black diamond). In all simulations, the brine discharge was enhanced by approximately 1,000 times compared to the volumes required in the Project Description. This augmentation was required to get a realistic salinity difference signature within the model grid, as the model grid size (200 m for the results presented here) is almost 3 orders of magnitude greater than the probable discharge pipe diameter size (i.e., likely 25 to 50 cm); the model was designed to effectively monitor the discharge of millions of litres of oil along the coastline (not the small volume required for brine discharge). By significantly increasing the brine discharge volumes, it allows the results presented in this memo to be considered as conservative 'upper bounds' limits to the effects of desalination on the salinity content, since the realistic discharge amount will likely have a much lesser impact.

Figure 2. Summer Simulation Result

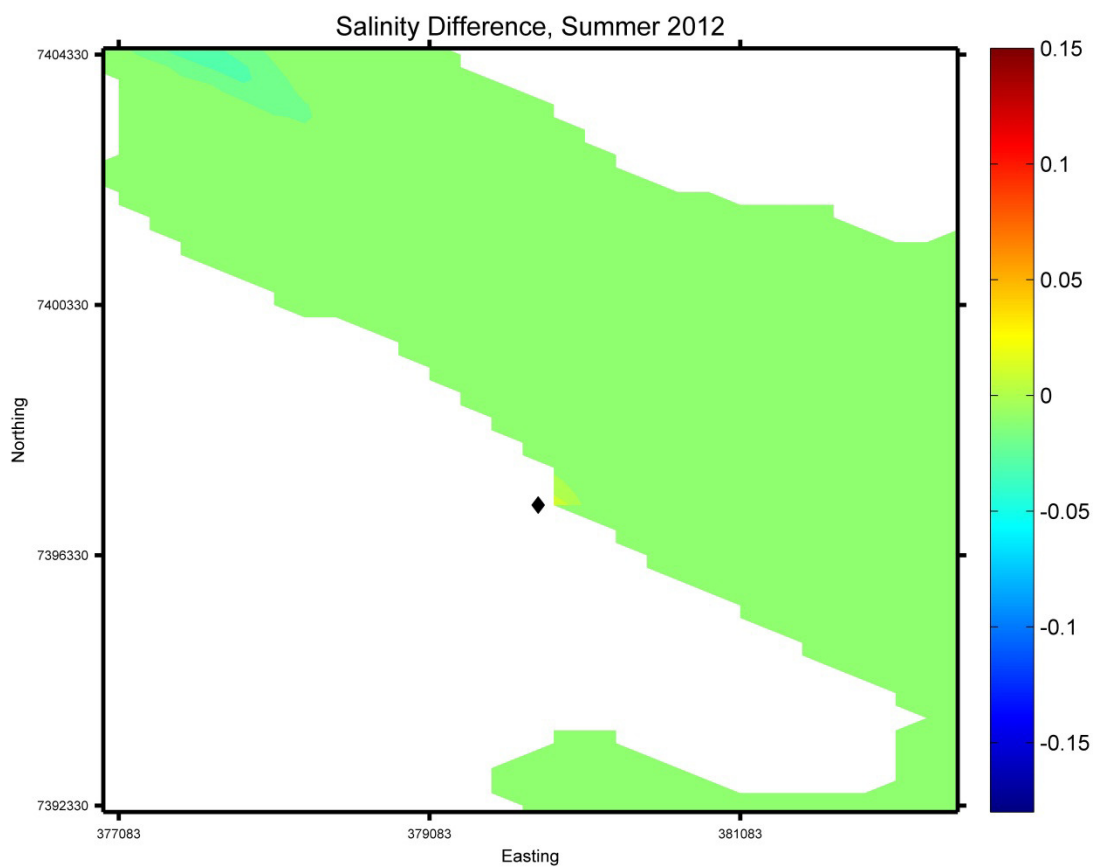
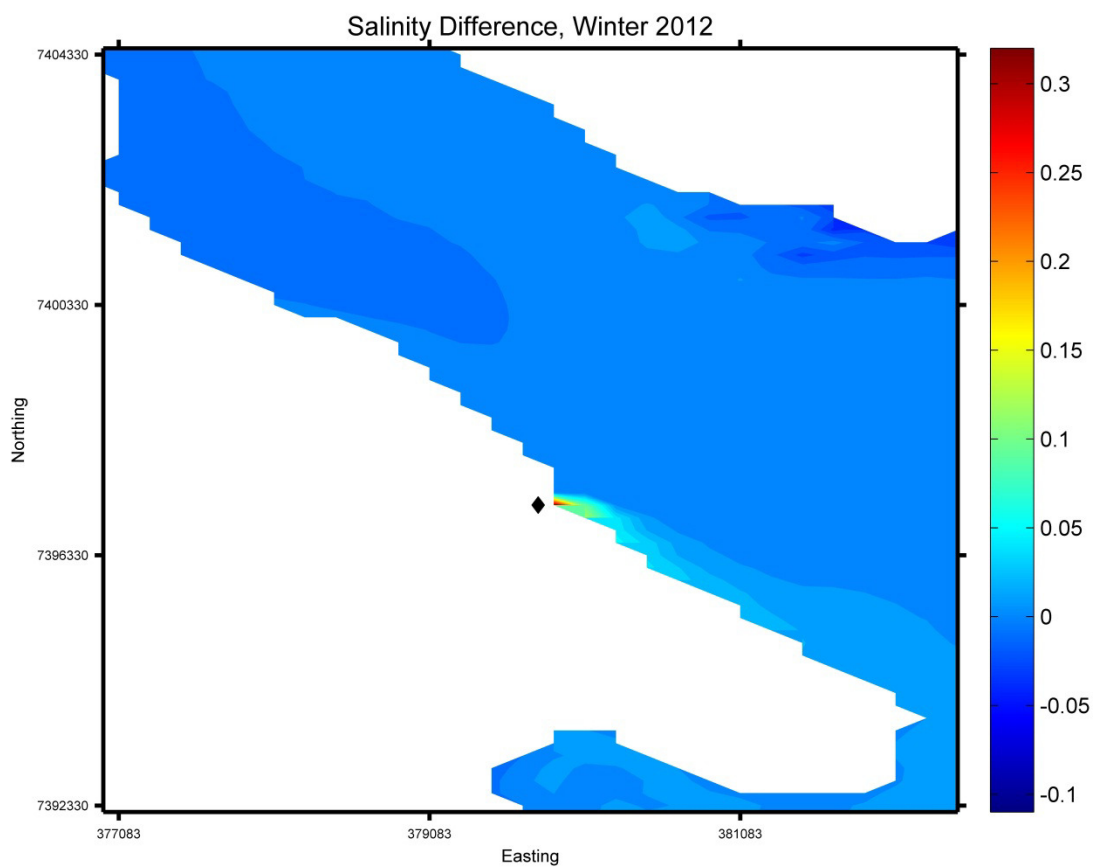


Figure 3. Winter Simulation Result



Summer Conditions

The summer simulation was the most straightforward, as the model already reproduces quite well the surface layer of the inlet as recorded by Rescan (2012b). Figure 2 shows the results of the salinity difference between the baseline condition and brine discharge simulations after 28 days of model time. It is readily apparent that the differences are negligible between both simulations; only a 0.03 increase is recorded in the vicinity of the discharge source, the rest is readily mixed within the inlet resulting in changes of ~ 0.0001 salinity, which are barely detectable. The strong wind-driven surface currents present in the open-water season quickly dissipate any salinity input from the desalination process.

Winter Conditions

The winter simulations required some more finesse to execute properly. The major difficulty lied in reproducing the ice-covered conditions within the inlet, as the model used for the oil spill calculations was not explicitly designed to handle sub-zero atmospheric conditions. Furthermore, under-ice physical oceanographic characteristics are not well known yet for Bathurst Inlet; winter currents measurements will only become available in September 2013. However, a few modifications were done to the model to realistically reproduce under-ice conditions similar to those measured in Roberts Bay, which is in southeastern Melville Sound to the northeast of Bathurst inlet (Rescan 2012a). Thus, the 28-day winter simulations were done with the following modifications from the summer simulations: no winds, no heat exchange, starting temperatures were set at 1°C , starting salinity was set at 25 and freshwater discharges were set to zero. The baseline winter simulation resulted in average surface currents of ~ 5 cm/s, which were comparable to those measured in Roberts Bay.

Figure 3 shows the result in salinity difference between the baseline condition and brine discharge simulations after 28 days of model time. The salinity signature is clearly noticeable at the discharge location, with a maximum increase of 0.321 salinity recorded near the discharge source. This was slightly more than 1% of the base salinity input. The salinity plume rapidly dispersed along the shore south of the MLA; the salinity increase decreased to 0.15 within 200 m of the discharge source, and down to 0.05-0.1 within ~ 1 km of the MLA. Given that salinity remains well within $<10\%$ of the initial winter baseline simulation throughout the model domain, the desalination discharge is assumed to have little to no effect on the marine ecology in the vicinity of the MLA shoreline as the changes would be well within the CCME salinity guideline for the protection of marine life (natural salinity plus or minus 10% (CCME 2013)).

7. Conclusions

First order calculations using a hydrodynamic numerical model of Bathurst Inlet were used to quantify the potential effects of desalination on the surface water salinity near the MLA. Despite the many simplifying assumptions made during model construction, the simulations were able to reasonably reproduce brine discharge signatures near the MLA, albeit those resulting from extreme discharge cases due to the limitations imposed by the modelling grid size. Even with imposed large discharges, the salinity signature was almost negligible in summer simulations, and was well contained within 10% of the standard salinity baseline in winter simulations. The major reason for this rapid dispersal of salinity at the MLA was likely due to the shoreline conditions found at the site: the steep shelf and close proximity to the deep main channel result in constant circulation of waters between the shore and mid-channel locations, even when the surface currents reach their minimum during winter. Thus, the brine is unlikely to reach a location where it could accumulate in the benthic zone and reach levels outside of the protective CCME guideline concentrations. The desalination requirements for the MLA

are also relatively small compared to the natural range of salinity imposed by freshwater discharges to Bathurst Inlet; the Amagok river near the MLA can have discharges of up to $4.3 \times 10^6 \text{ m}^3/\text{d}$ (see Rescan 2012b), which is several thousand times the brine discharge amounts ($50 \text{ m}^3/\text{d}$). Larger rivers will have discharge volumes ten to a hundred times greater during peak season, resulting in persisting surface water salinity variations of $\sim 2\text{-}3$, much more radical changes than those occurring from the desalination.

References

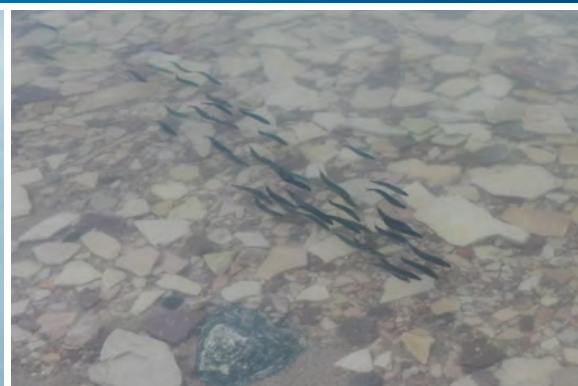
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Appendix V7-4A

Back River Project: 2012 Marine Fish and Fish Habitat Baseline Report

Sabina Gold & Silver Corp.

BACK RIVER PROJECT 2012 Marine Fish and Fish Habitat Baseline Report



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December 2012

BACK RIVER PROJECT

2012 MARINE FISH AND FISH HABITAT BASELINE REPORT

December 2012
Project #833-002-27

Citation:

Rescan. 2012. *Back River Project: 2012 Marine Fish and Fish Habitat Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd.

Prepared for:



Sabina Gold & Silver Corp.

Prepared by:



Rescan™ Environmental Services Ltd.
Vancouver, British Columbia

Executive Summary

Executive Summary

The Back River Project is an exploration gold project owned by Sabina Gold and Silver Corporation located in the West Kitikmeot region of Nunavut. The 2012 Marine Fish and Fish Habitat baseline program collected data in the marine environment associated with the proposed Marine Laydown Areas Option 4 and Option 6.

The objectives of the program were to characterize the fish community, to obtain general information regarding intertidal and nearshore marine habitat extent and quality, and to identify and assess the quality of any freshwater fish habitat that was present in both of the potential in Marine Laydown Areas.

The intertidal marine habitat was described by delineating units of similar habitat and the identifying homogenous zones within those units. The nearshore marine habitat was examined through hydroacoustic and underwater video surveys. The marine fish community was sampled through the use of gillnets, minnow traps, crab traps, longlines and beach seines. The quality and quantity of freshwater fish habitat in the Marine Laydown Areas was assessed through an observational survey.

At Marine Laydown Area Option 4, two intertidal habitat units were identified, with a total of six intertidal habitat zones identified within the units. Sand and small gravels were the primary intertidal substrate types. Substrate in the nearshore marine habitat ranged from soft mud to cobble, with fine sediments dominating. No freshwater habitat was identified in the adjacent on-land areas. Eleven fish species were identified: Arctic cisco, Arctic flounder, broad whitefish, capelin, fourhorn sculpin, lake trout, ninespine stickleback, Pacific herring, rainbow smelt, saffron cod, and starry flounder.

Three intertidal habitat units were identified at Marine Laydown Area Option 6, with a combined total of five intertidal habitat zones. While fine sediment, including sand and gravel, was the primary substrate type, cobble and boulder substrates were found in one habitat unit. Clean rock and gravel was found in very shallow sections of the nearshore marine area, but deeper nearshore habitat was entirely fine sediment or larger substrate types covered in a layer of fine sediment. No freshwater fish habitat was identified in the area. The eleven fish species identified in Option 6 were: Arctic cisco, Arctic flounder, broad whitefish, capelin, fourhorn sculpin, ninespine stickleback, Pacific herring, rainbow smelt, saffron cod, slender eelblenny, and starry flounder.

An aerial survey of capelin spawning habitat was conducted in both potential Marine Laydown Areas and the surrounding shoreline. Capelin spawning schools were observed in July in most of the surveyed area along the western shore of Bathurst Inlet. Schools were observed in the Option 6 area and along the majority of the shoreline surveyed from south of the Option 4 area to the peninsula between the two Option areas.

With the exception of lake trout and slender eelblenny, all fish species were found in both areas. Many of the species found in the area are associated with brackish environments or anadromous life histories, which suggests a strong freshwater influence in the ecosystem. Multiple life stages were recorded at both sites, including rearing juvenile fish and spawning adult capelin. No SARA-listed species or other species of special conservation concern were captured.

Acknowledgements

Acknowledgements

This report was produced for Sabina Gold and Silver Corp. (Sabina) by Rescan Environmental Services Ltd. Fieldwork was conducted by Kyla Warren (M.Sc.), Brock Stables (M.Sc.), Eric Demers (Ph.D., R.P.Bio), and Dana Haggarty (M.Sc.). Rescan staff were assisted in the field by Ryan Kamookak, Dennis Qirqqut, and Jonah (assistants provided by Sabina). This report was prepared by Kyla Warren and reviewed by Dana Haggarty (M.Sc.), Kirsten Seymour (M.Sc., R.P.Bio.), and Deborah Muggli (Ph.D., M.Sc., R.P.Bio.). The Back River project baseline program was managed by Deborah Muggli, with project coordination assistance from Korina Houghton (B.Sc.).

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BACK RIVER PROJECT

2012 MARINE FISH AND FISH HABITAT

BASELINE REPORT

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1. Introduction

1. Introduction

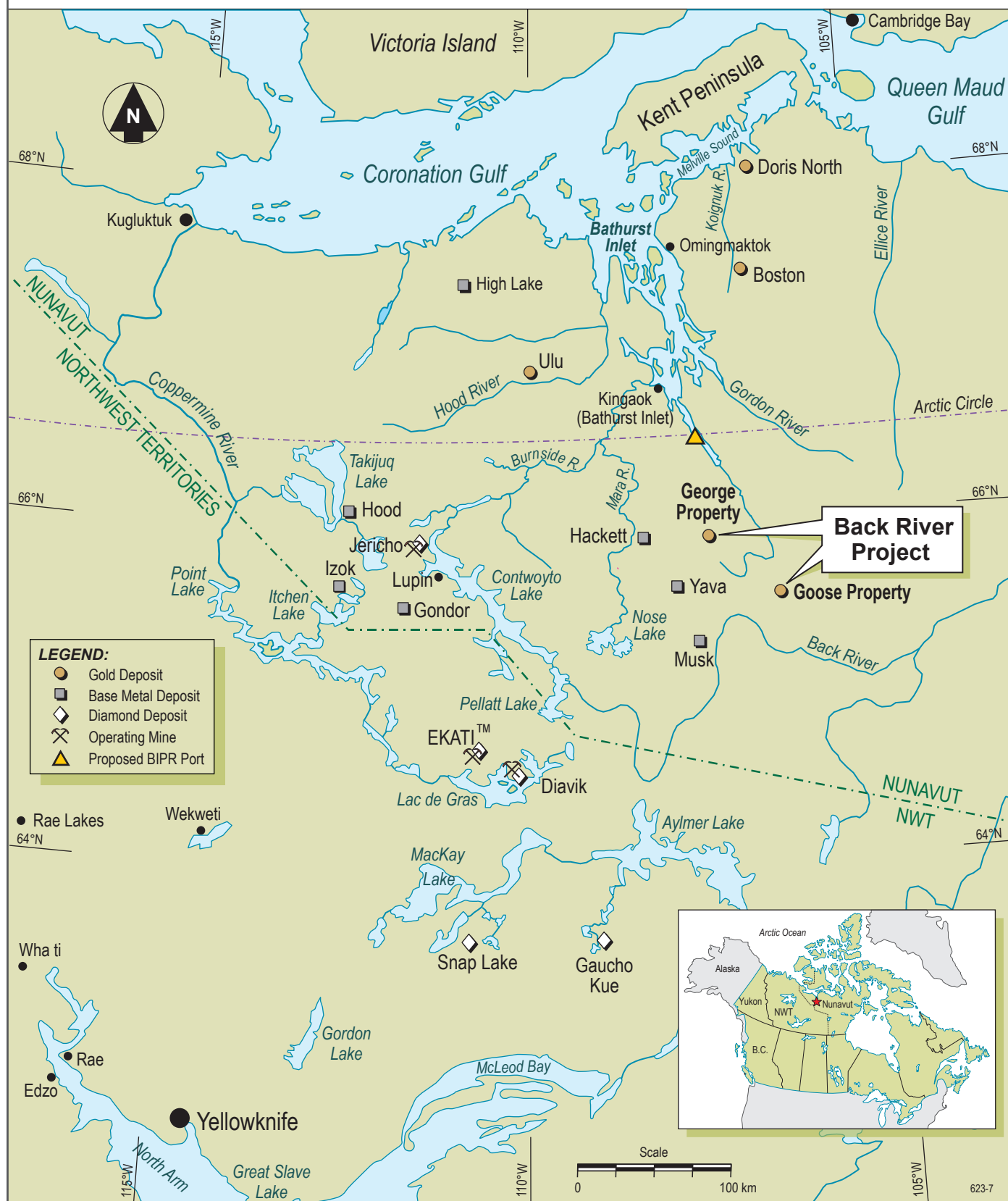
The Back River Project (the Project) is an exploration gold project owned by Sabina Gold and Silver Corporation (Sabina) located in the West Kitikmeot region of Nunavut. Exploration programs were run out of both the Goose and George camps in 2012 (Figure 1-1).

For 2012, Sabina contracted Rescan Environmental Services (Rescan) to conduct a comprehensive baseline program that covered the geographical area of the Goose Property, the George Property, and a Marine Laydown Area located on the southern part of Bathurst Inlet. The following components were included in the 2012 baseline program:

- o Meteorology
- o Air Quality & Dust
- o Noise
- o Hydrology and Bathymetry
- o Freshwater Water Quality, Sediment Quality, Aquatic Biology
- o Freshwater Fish and Fish Habitat
- o Marine Water Quality, Sediment Quality, Aquatic Biology
- o Marine Fish and Fish Habitat
- o Wildlife (Terrestrial and Marine)
- o Wildlife DNA Study (Grizzly Bear and Wolverine)
- o Ecosystem Mapping
- o Vegetation and Wetlands (including Rare Plants)
- o Soils and Terrain
- o Country Foods
- o Archaeology
- o Socio-Economics
- o Land Use
- o Metal Leaching/Acid Rock Drainage (ML/ARD)

The 2012 baseline program was designed around potential infrastructure and known deposits at the Goose Property, the George Property, and the Marine Laydown Area. It was assumed that access from the Marine Laydown Area to George and Goose properties would be by winter road, and that access between the George and Goose properties would also be by winter road.

This report presents the results from the Marine Fish and Fish Habitat portion of the 2012 baseline program.



The purpose of the 2012 baseline program was to characterize the fish community and available fish habitat in marine areas associated with potential future development. The specific objectives addressed by the 2012 baseline study are:

- o to characterize the fish community in potential Marine Laydown Areas Option 4 and Option 6, including identification of fish species, population attributes, relative abundance, and other relevant biological information;
- o to obtain general information regarding intertidal habitat extent and quality in potential Marine Laydown Areas Option 4 and Option 6;
- o to use hydroacoustic and underwater video surveys to obtain information regarding subtidal marine habitat quality and quantity near potential Marine Laydown Area infrastructure in Option 4 and Option 6; and
- o to identify and assess the quality of freshwater fish habitat in potential Marine Laydown Areas Option 4 and Option 6.

The Marine Fish and Fish Habitat baseline program characterized fish communities and fish habitat in two specific areas within the potential Marine Laydown Area; Option 4 and Option 6. At each area, intertidal and nearshore habitat was assessed through a combination of detailed habitat surveys, identification of habitat units and hydroacoustic and underwater video habitat surveys. Aerial surveys were used to identify spawning areas for capelin in the region. Freshwater habitat in both Option 4 and Option 6 areas was assessed on foot and through aerial surveys.

The nearshore fish community was sampled with gillnets, minnow traps, crab traps, beach seines and longlines at both Option 4 and Option 6 areas. Species composition, relative abundance, catch-per-unit-effort, and aspects of fish biology and health were also characterized as part of the program.

Chapter 2 of this report presents the methods, and Chapter 3 of this report presents the results. All raw data collected are included as appendices to this report. A brief summary is provided in Chapter 4.

2. Methods

2. Methods

2.1 STUDY AREA

Bathurst Inlet is a large, deep inlet southeast of Coronation Gulf in the territory of Nunavut. The Western River discharges into the head of the inlet and the Mara River enters on the eastern side of the inlet.

Figure 2.1-1 presents the location of the potential Marine Laydown Area relative to the potential infrastructure at Goose and George Properties. For 2012, two areas were identified within the overall potential area. These areas were identified as Option 4 and Option 6 (Figure 2.1-2).

Figure 2.1-2 presents the areas where marine fish habitat was characterized, the areas where marine fish communities were characterized, and the on-land areas where fish habitat was examined.

2.2 FIELD METHODOLOGY

2.2.1 Marine Fish Habitat

Intertidal

Travel to site and aerial surveys were conducted in a Eurocopter AStar helicopter.

Figure 2.1-2 shows the area where marine habitat characteristics were surveyed. The intertidal fish habitat was surveyed on foot and by boat from July 14 - 16 (Option 4) and July 16 - 19 (Option 6). The crew of two, including one biologist, surveyed the study area and identified habitat units based on physical shoreline characteristics (substrate type, cover extent, cover type, vegetation type, and shoreline slope). The boundaries of each habitat unit were delineated based on these characteristics and the overall substrate composition of the units identified by recording the proportion of sand, gravel, cobble, boulder and rock in each.

More detailed intertidal habitat surveys were completed by two crew members, including one biologist, at low tide at two locations per site (Figure 2.2-1 and Figure 2.2-2). The survey transect began at 1 m below the low water line and ran perpendicular to the waterline to the high water mark, identified by the presence of rooted vegetation. The detailed intertidal habitat survey identified zones of homogenous habitat based on dominant substrate and cover types. The length of each zone within the transects were measured with a surveyor's tape. The total transect length was also measured. The zones were characterized with a visual estimation of the percent composition of sand, gravel, cobble, boulder, and bedrock substrate. The type and amount of cover within each zone was recorded, as were any other pertinent habitat characteristics.

Nearshore

Nearshore habitat was characterized using hydroacoustic surveys and underwater video sampling in the areas shown in Figure 2.1-2. A 4.2 m and a 4.9 m boat were used for all marine work, equipped with a 25 hp Johnson or a 25 hp Mercury outboard engine. Both boats were equipped with 25 hp engines, and driven by an experienced boat driver. All crew wore floater suits and boats were equipped with basic boat safety kits including paddles, rope, a flashlight and spare engine parts. The crew made regular safety check-ins while on site.

Hydroacoustic surveys were completed by two experienced biologists. One biologist operated the equipment while the second drove the boat and operated a handheld GPS recording continuous positional data. Underwater video sampling required three crew members. One crew member drove the boat and operated a handheld GPS, a second operated the camera, and a third stabilized the video equipment.

Acoustic data were collected using a BioSonics DTX scientific echo sounder with a downward looking transducer. The survey was conducted along transects in the nearshore area between depths of approximately 1 m and 40 m, with greater effort in areas of particular interest. The specifications for the acoustic collection equipment are presented in Table 2.2-1. Option 6 was surveyed between July 13 and 18. Option 4 was surveyed between July 18 and 19.

Table 2.2-1. Acoustic System Specifications for Collection of Bathymetric and Bottom Type Data at Bathurst Inlet Port Options 4 and 6 in July 2012

Category	Variable	Value
Echo sounder	Type	BioSonics DTX
Transducer	Type	BioSonics split-beam
	Sound frequency	201 kHz
	Nominal beam angle	6.7°
	Depth of transducer face	0.40 m
Settings	Pulse width	0.4 msec
	Transmit power level	low (-10.3 dB)
	Data collection threshold	-100 dB
	Minimum data range	0.5 m
	Time varied threshold	40 log R
	Ping rate	5 pps
DGPS	Type	WAAS-differential ¹
	Datum	NAD83
Other	Transecting speed	1.4-1.9 m/sec

¹ A WAAS satellite signal was received during sampling with typical nominal position accuracy of 2 to 3 m.

The substrate composition was then determined from the ratio of first and second bottom echo energy according to the RoxAnn method (Chivers, Emerson and Burns 1990). This widely used method uses the ratio of first and second bottom echo energy to distinguish bottom types. Energy from the first echo (E1) represents substrate roughness, while energy from the second echo (E2) represents hardness, and x-y plots of these variables are used to characterize substrate types through cluster analysis. Because E1 and E2 can vary from ping to ping, even at a single location with a homogeneous bottom type, VBT estimates bottom type by averaging values from groups of contiguous pings (reports).

In this study, VBT reports were 14 pings long (4-5 m along transect at our transecting speed). Other processing settings for VBT appear in Appendix 1. This technique was not applicable where the range from the transducer to the bottom was less than 1.0 m in this case, and, in general, VBT is not reliable on slopes that exceeded 20° (J. Burczynski, BioSonics, personal communication August 9, 2009). Data with range < 1.0 m were not classified (sediment type = “unknown”). Data where slopes exceeded 20° were classified; however, areas with these conditions were marked as questionable on the sediment type maps.

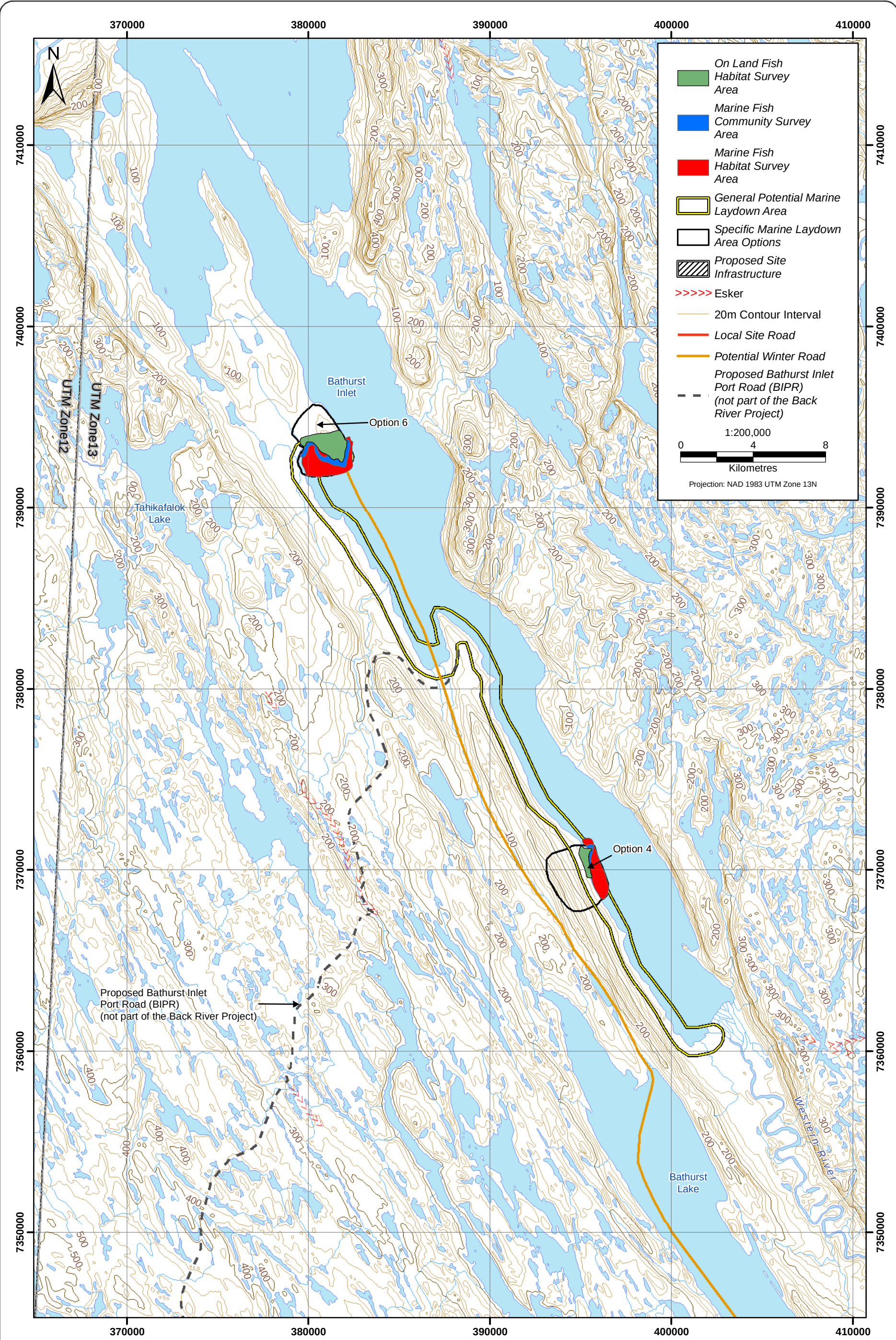


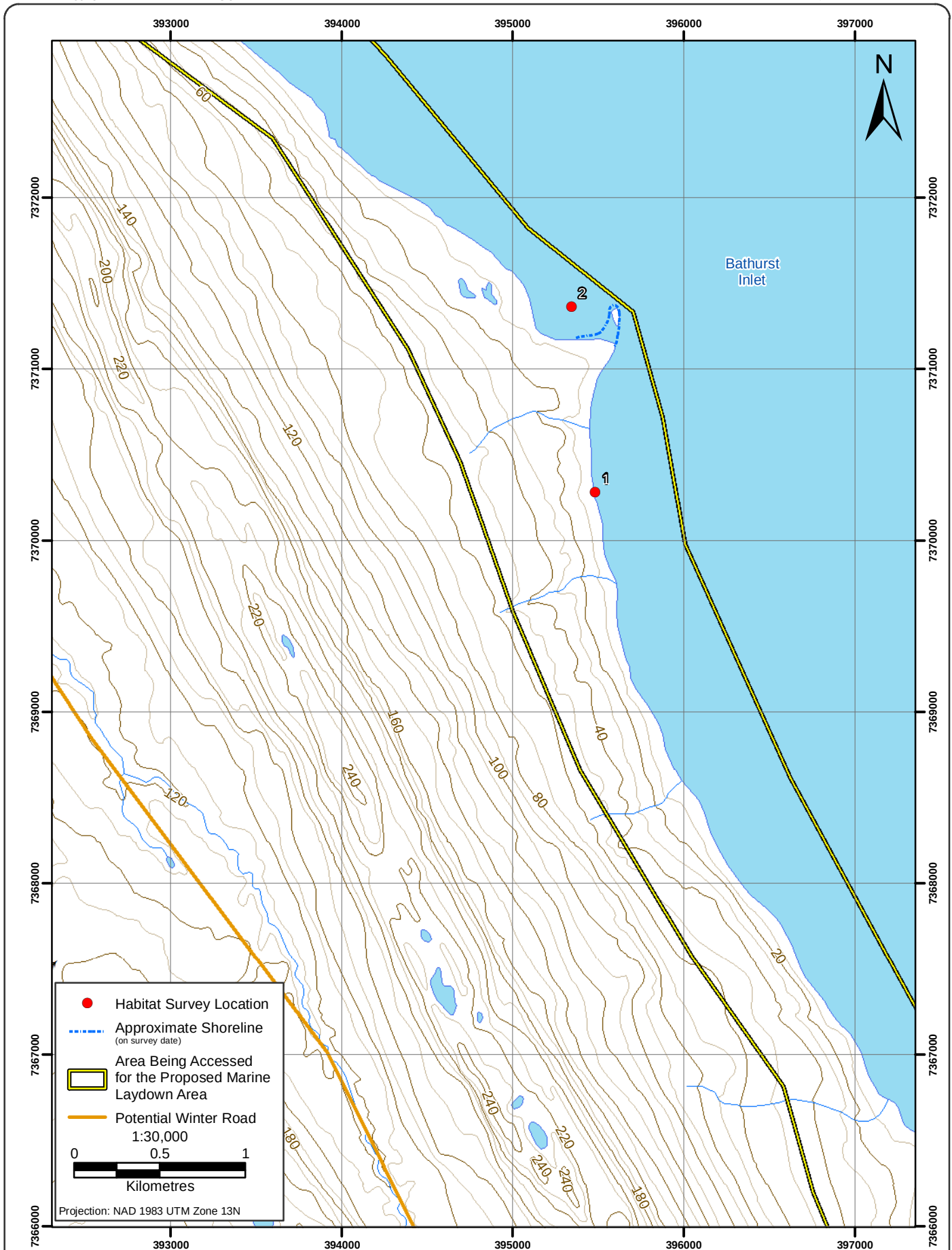
Figure 2.1-2



Marine Fish and Fish Habitat Sampling Locations,
Back River Project, 2012

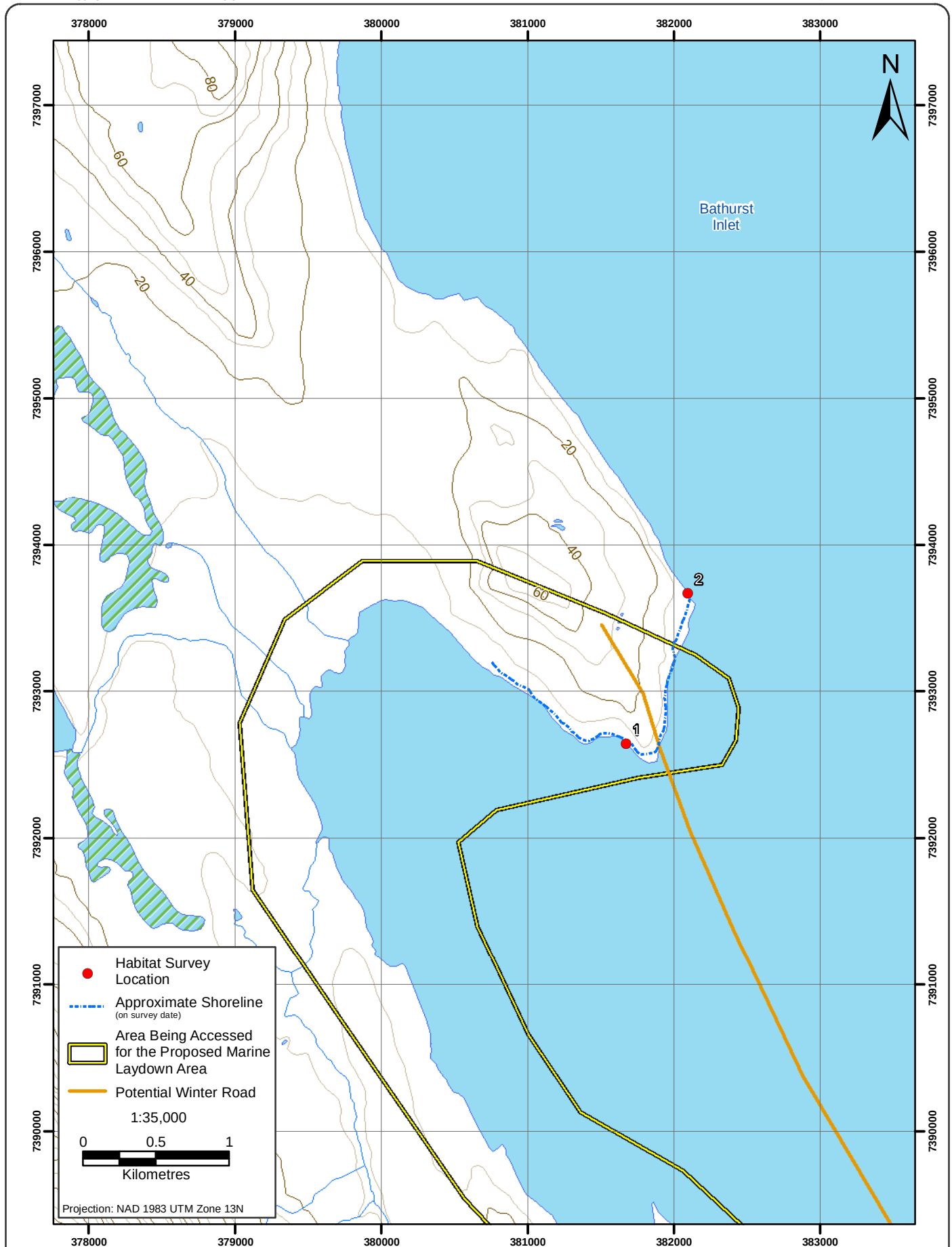
Figure 2.1-2





Detailed Intertidal Habitat Survey Locations,
Option 4, 2012

Figure 2.2-1



Detailed Intertidal Habitat Survey Locations,
Option 6, 2012

Figure 2.2-2

The substrate classification scheme used for this analysis was developed from data collected in previous studies which had sediments similar to Options 4 and 6. This scheme grouped sediments into four categories: very soft fines, mud, sand-gravel, and cobble-boulder. It should be recognized that this scheme is a simplification of the actual situation, since a continuum of substrates from soft fines to bedrock undoubtedly occurred throughout the many and varied habitats within the study areas.

Additional observations of substrate were made with a Splashcam Deltavision underwater video camera used in representative sampling sites within the surveyed areas (Figure 2.2-3 and Figure 2.2-4). Underwater sampling sites in Option 4 were visited on July 21, and sites in Option 6 were visited on July 22. Sampling sites were selected based on a preliminary analysis of the hydroacoustic data with the objective of sampling a range of substrate types. An underwater video camera equipped with a weight, probe and external light was lowered to the substrate. The camera gathered images from about 50-100 cm above the substrate, covering several meters of substrate at each site. The images were recorded onto a Sony VRD-MC6 DVD recorder. Substrate type was assessed through observation of the substrate appearance and the interaction between the substrate and the weight and probe (e.g., the probe penetration depth). Additional information such as the presence of mussels or other sea life was recorded as well.

2.2.2 Marine Fish Community

The marine fish community of the Marine Laydown Options was assessed using a suite of gear chosen to sample a variety of habitats, fish body sizes, and habitat use patterns. A variety of sampling gear was used to try and capture the greatest diversity of fish species. Sampling gear included gillnets, minnow traps, beach seines, crab traps and longlines. Option 4 was surveyed from July 14 - 17, July 22, and August 11 - 13. Option 6 was surveyed July 17-21 and August 7-9. Poor weather often limited available sampling days and areas and resulted in modifications to sampling methodology by preventing retrieval of traps or requiring sampling gear to be set only in more sheltered sections of the site.

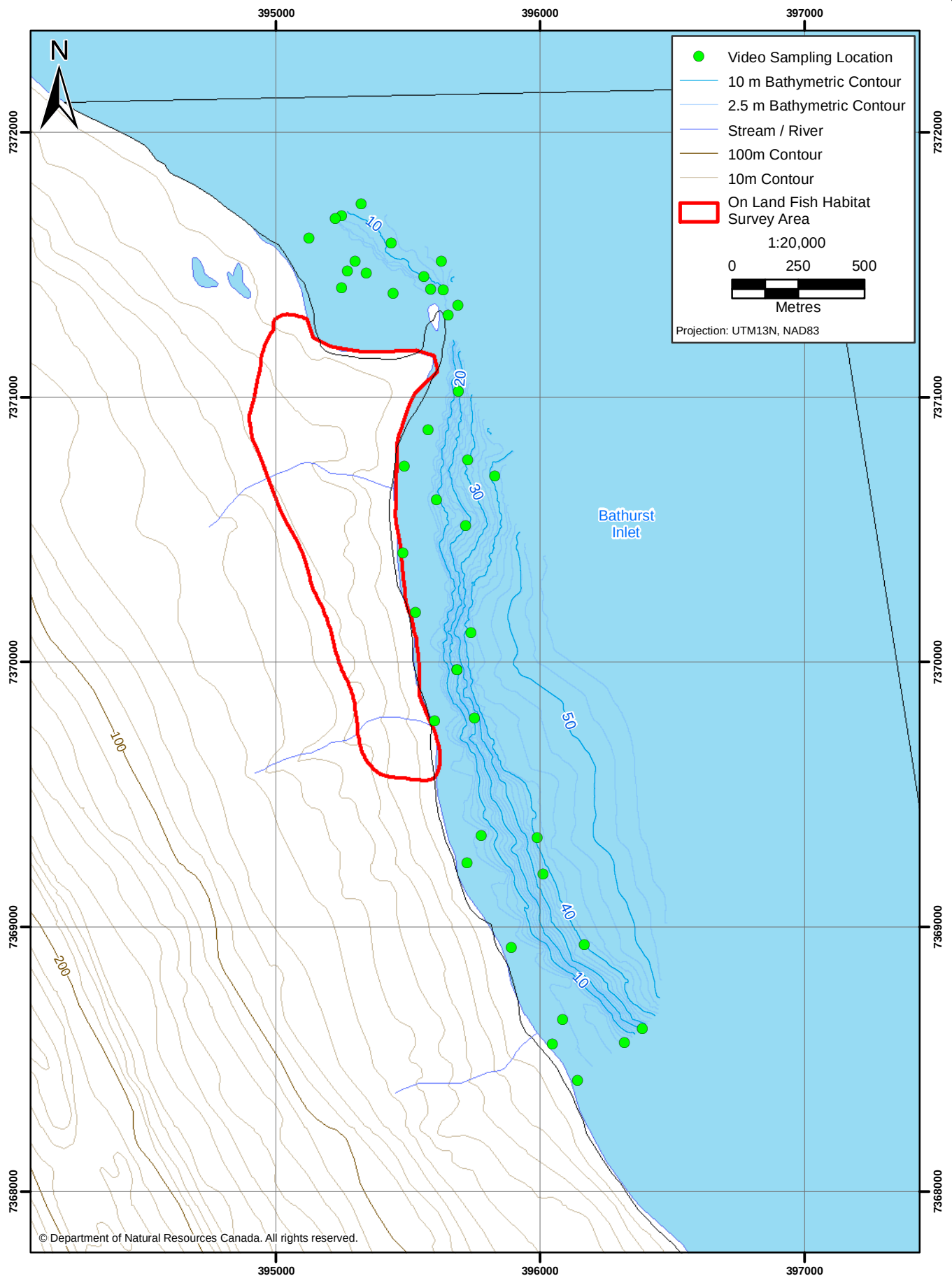
Beach seines and some minnow traps were set and operated from shore while gillnets, longlines, crab traps and some minnow traps required the use of 4.3 and 4.9 m aluminum boats each equipped with a 25 hp Johnson or a 25 hp Mercury outboard engine. The location of the gear set was recorded using a handheld GPS. For longer equipment types, such as gillnets, the location of each end recorded. Gear set locations are shown in Figure 2.2-5 and Figure 2.2-6.

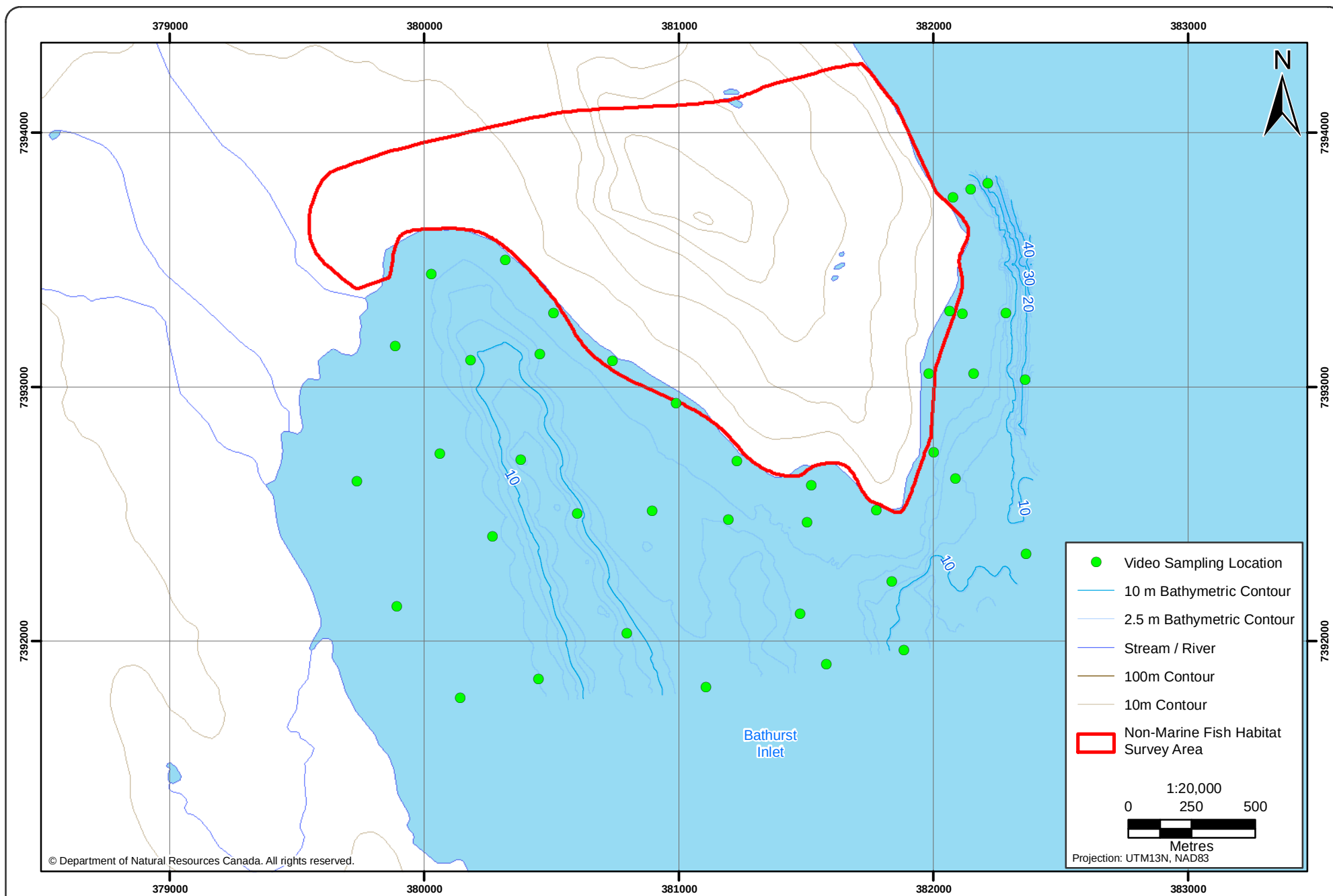
Captured fish were held in buckets or large water-filled containers. Fish were identified to species. Fork length was measured to the nearest millimeter on measuring boards and each fish was then weighed to the nearest 0.1 g (for fish < 200 g in weight) or to the nearest 1 g (for fish > 200 g in weight). Any external parasites or injuries on a fish were recorded. The captured fish were then released alive. No lethal sampling was conducted for this project. However, any incidental mortalities were dissected to determine sex and maturity and to examine the fish for internal parasites.

2.2.2.1 Sampling Gear

Minnow Traps

Minnow traps were comprised of two 6.3 mm metal mesh cylinders measuring 23 cm by 42 cm with 2 cm tapered openings. Minnow traps were set at 1.5 m to 5 m depths to capture small fish near the substrate. Traps were baited with canned fish or commercial crab and prawn bait and set from shore or from a boat. Minnow traps were generally left overnight and retrieved the next morning, however occasionally worsening weather prevented retrieval until the next day.





**Video Sampling Locations for Marine
Nearshore Habitat Assessment, Option 6, 2012**

Figure 2.2-4

Beach Seines

Beach seines were nets operated from shore. They captured fish with small to medium body sizes inhabiting the intertidal and near subtidal areas.

The beach seines used were 8 m by 1.2 m in size and were composed of 3.1 mm mesh. When operating the beach seines, one crew member held an end of the net at the shoreline while the other end was walked out to chest depth and then perpendicularly to the shore. The beach seine was then pulled around in a semi-circle until the crew member reached the shore, keeping the upper edge of the net above the water and allowing the weighted leadline on the bottom of the net to drag over the substrate. The beach seine was then pulled to shore, capturing any fish in the area covered by the net. The total surface area covered by each net set was approximately 50 m².

Crab Traps

Crab traps were set at depths of 5-20 m from a boat and were used to sample mid-size to large-bodied fish and large benthic invertebrates in demersal habitats. The crab traps used were fixed-wall, circular metal traps made of 5 cm mesh with two 6.3 cm by 4 cm openings. They were baited with commercial crab and prawn bait or raw fish and set overnight.

Longlines

Longlines were set at 5-10 m depths and targeted large demersal and benthic fish. Each longline was 30 m long and comprised of a weighted line with 20 hooks per line attached in pairs at 3 m intervals. All hooks were on a 2 m long leader lines. The eight leaders were set with a 21 mm circle hook and a 20 mm J-hook at the end. The hooks were baited with pieces of raw fish. Buoys were attached to 10 m lines at either end of the longline.

Longlines were originally set for a 1.5 h duration but the set time was increased in response to very low catch rates. Longlines were set both parallel and perpendicular to the shore.

Gillnets

Gillnets of varying mesh sizes were used for the fish community sampling. Gillnets captured fish in demersal or pelagic habitats in mid-depth to deep water areas by entangling them. Gillnets were deployed in gangs comprised of panels of multiple mesh sizes, allowing for the capture of small to large bodied fish. Each gang was comprised of six panels of 1.3 cm, 2.5 cm, 3.8 cm, 5.1 cm, 6.4 cm, 7.6 cm and 8.9 cm monofilament mesh, alternating small and large mesh sizes. Each panel was 15.2 m long and 2.4 m deep, with a leadline on the lower edge and buoys on the upper edge to keep the gillnet vertical in the water. The total fishing area for a gillnet gang was 218.9 m².

Floating gangs sampled fish near the surface of the water while sinking gangs were equipped with a heavier leadline and fewer floats and rested on the substrate. Gangs were set both parallel and perpendicular to the shore. Gillnets were initially set for approximately 60 minutes but subsequent set times were modified in response to catch rates.

2.2.3 Spawning Surveys

The July sampling trip was timed to coincide with the capelin spawning season. Capelin spawn in intertidal and shallow subtidal areas along spawning beaches, and have been reported in Bathurst Inlet periodically since 1833 (Richardson 1833). As they are shallow water spawners that spawn in large congregations, they are readily visible from the shore and the air. Spawning surveys within the study areas were conducted by foot on July 18 and 19. The crew walked the shoreline identifying areas in which capelin schools were congregated.

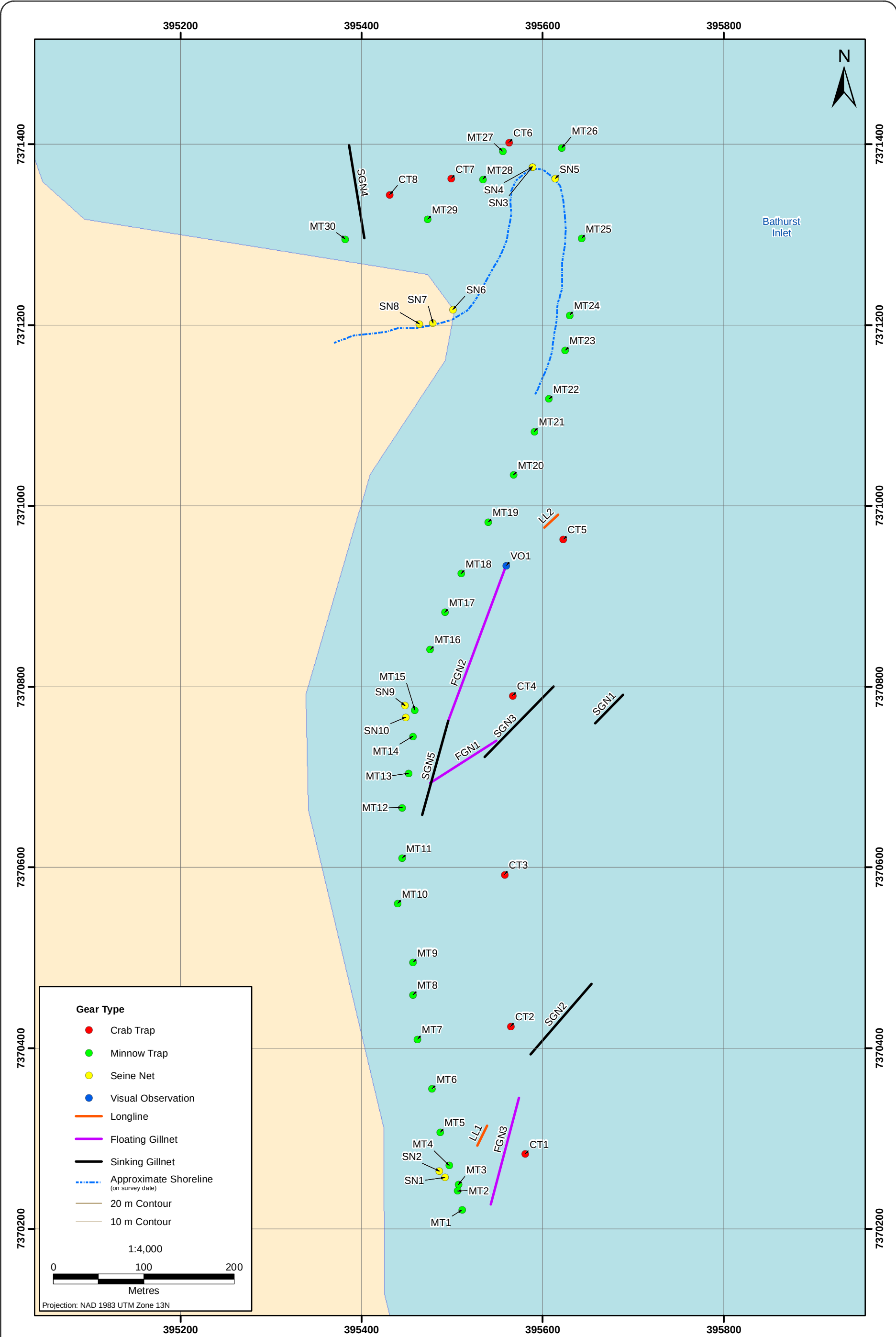


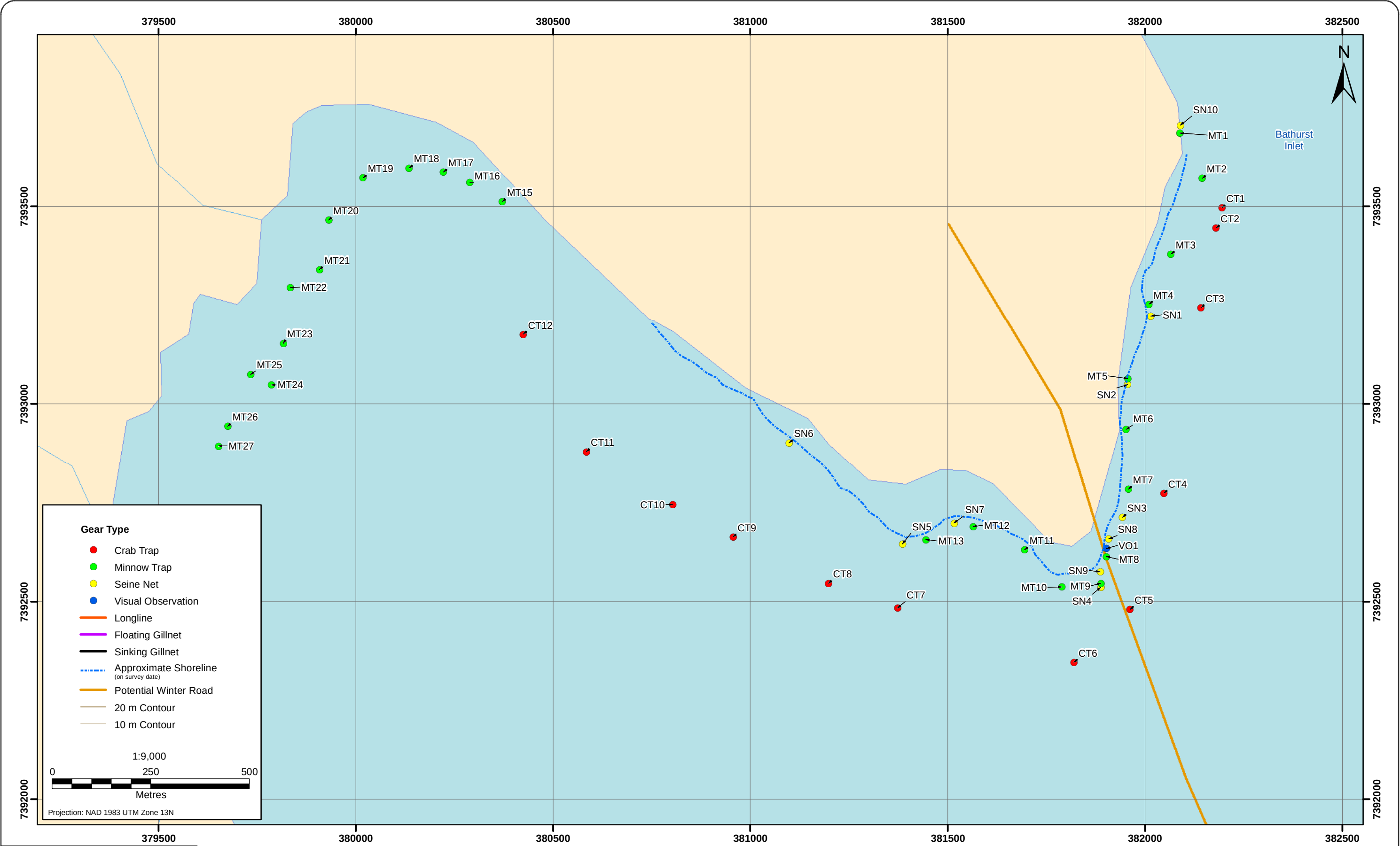
Figure 2.2-5



Sampling Gear Set Locations in Option 4, Back River Project, 2012

Figure 2.2-5





An aerial spawning survey was conducted on July 21 using a Eurocopter AStar helicopter and surveyed a section of the eastern shoreline of Bathurst inlet from south of Option 4 to north of Option 6 (Figure 2.2-7). The section was surveyed from a helicopter flying slowly at low elevation. Spawning capelin schools in shallow water were readily identified using these methods. Areas in which large schools of capelin were observed were marked with a handheld GPS, and areas in which capelin schools were absent were recorded.

2.2.4 Non-Marine Fish Habitat

The potential Marine Laydown Area locations (Figure 2.1-2) were surveyed on foot by a crew of two, including one biologist, and aurally using a Eurocopter AStar helicopter to assess potential freshwater fish habitat. Surveys were undertaken on July 13-16 and August 11-12 (Option 4) and July 17-19 and August 7-9 (Option 6).

2.3 DATA ANALYSIS

Fish communities were characterized using species presence and absence, species catch-per-unit-effort (CPUE), species length-frequency distributions, fish condition, and weight-length regressions. Data gathered from Option 4 and from Option 6 were analyzed separately.

Fish condition is a measure of fish health that relates body weight to body length. Condition was calculated as:

$$K = \text{weight (g)} \times 10^5 / \text{length (mm)}^3$$

Minnow trap and crab trap CPUE were calculated as:

$$\text{CPUE} = (\text{number of fish captured}) / (24 \text{ h})$$

Gillnet CPUE was calculated as:

$$\text{CPUE} = (\text{number of fish captured}) / (100 \text{ m}^2 \text{ of net area}) / (1 \text{ h})$$

Longline CPUE was calculated as:

$$\text{CPUE} = (\text{number of fish captured}) / (\text{no. of pairs of hooks}) / (24 \text{ h})$$

Beach seine CPUE was calculated as:

$$\text{CPUE} = (\text{number of fish captured}) / (100 \text{ m}^2 \text{ of net area})$$

As CPUE is highly dependent on sampling gear type, the CPUE for each gear type was summarized separately. Where there were less than ten sets of a particular gear type, CPUE data was bootstrapped to obtain more precise summary statistics.

Length-frequency distributions and weight-length linear regressions provided information on the population structure in each watershed. Linear regressions assume a normally distributed dataset, so the regression residuals were visually assessed for normality. Non-normally distributed data were normalized using natural log transformations. Small data sets may not accurately represent the larger population and therefore length-frequency distributions and weight-length linear regressions were not carried out when fewer than 15 individuals of a species were captured.

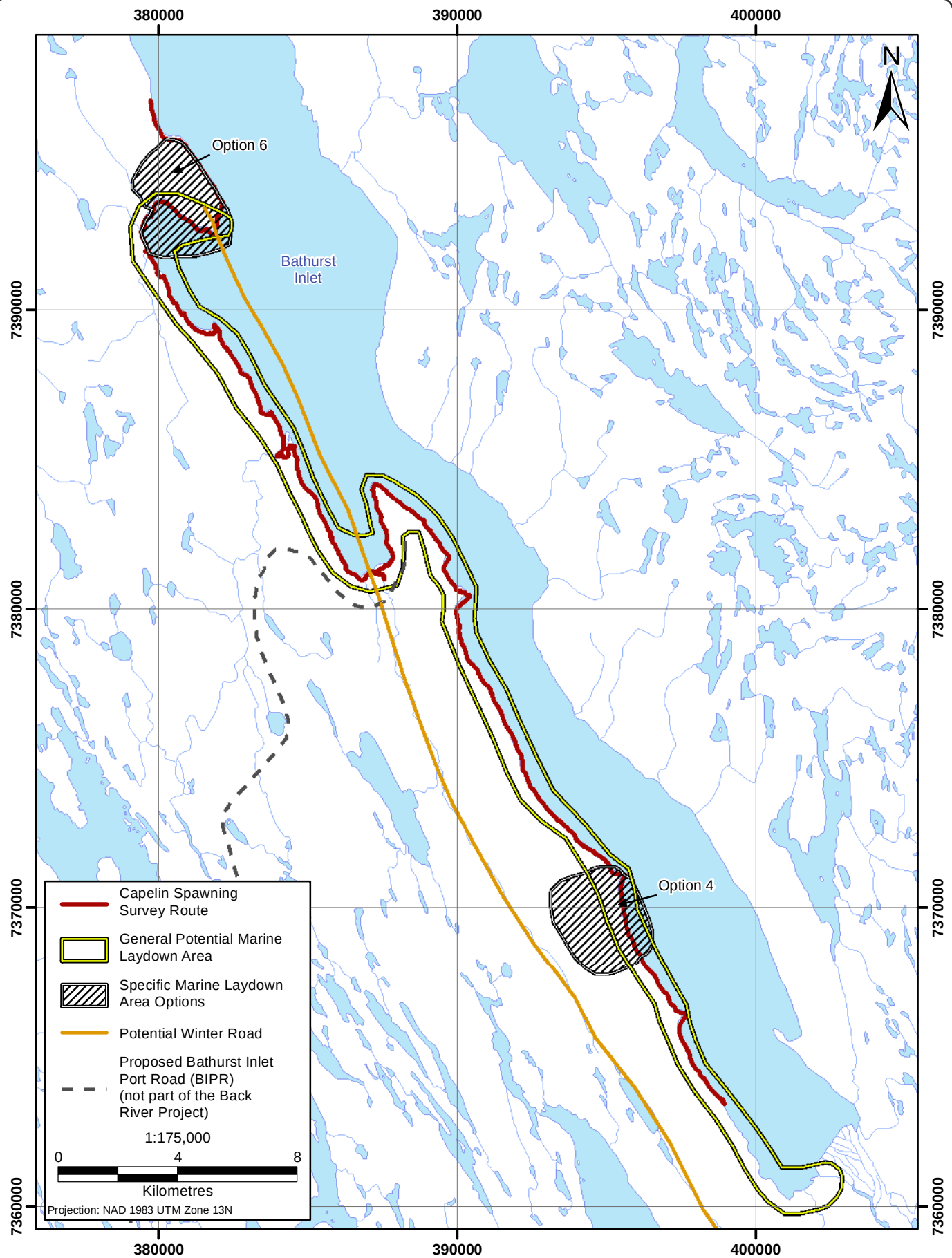


Figure 2.2-7

Outliers were identified using Studentized residual statistics on species-specific weight-length regressions of transformed data. Individuals with a Studentized residual score of greater than 4 (meaning more than four times the standard deviation outside the overall regression) were removed from further length and weight analyses. A score of 4 was chosen as an appropriate threshold for removal since 99.99% of individuals within a normally distributed population will fall within this range. Measurements falling outside these limits were considered to be most likely a result of measuring or transcription errors and not an accurate reflection of the true population.

All statistical analyses were performed using SYSTAT 11 (SYSTAT 2004) or R 2.13.2 (R Development Core Team 2011). The α for all statistical tests was set to 0.05.

2.4 QUALITY ASSURANCE/QUALITY CONTROL

All scales were calibrated with calibration weights prior to the initial trip. The same scales were used for all measurements and all trips to ensure consistency between measurements. While in the office, all data was inspected to identify potential transcription errors.

The hydroacoustic equipment and methodology used in this study can be inaccurate on slopes $> 20^\circ$. Areas with slopes in excess of this gradient were identified through analysis of depth measurements taken as part of the survey and these areas were flagged as potentially inaccurate in analyses. The video sampling observations provided an additional quality check for hydroacoustic substrate classification. Video sampling sites were located along the hydroacoustic transects and were used to compare the estimated classification with observed substrate types.

Validation of the VBT Classification Scheme

Accuracy of the classification scheme was tested by comparing acoustic and video observations at seven specific locations where acoustic and video data were both available from previous sampling (Table 2.4-1). For each location, the known (from video) and estimated (from VBT) percentage of each substrate type were compared.

Acoustic and video classifications of substrates agreed closely for these reference locations. Known soft fines (mud or silt) were always classified by VBT as such (Table 2.4-1). Sand was categorized as sand-gravel 92% of the time and as mud 8% of the time. Gravel and cobble was classified as either sand-gravel or cobble-boulder 97% of the time, and as mud 3% of the time. Cobble and boulder was classified as such 77-100% of the time, and as sand-gravel 0-23% of the time.

Table 2.4-1. Test Results for Acoustic Classification Data of Settings Used at Bathurst Inlet Port Options 4 and 6, 2012

Location	Video Classification	Total Number of VBT Reports	Acoustic Classification from E1/E2							
			Number of Reports				Percentage of Reports			
			Very Soft Fines (1)	Mud (2)	Sand - Gravel (3)	Cobble - Boulder (4)	Very Soft Fines (1)	Mud (2)	Sand - Gravel (3)	Cobble - Boulder (4)
A	Fines	9	9	0	0	0	100%	0%	0%	0%
B	Fines	40	19	21	0	0	48%	53%	0%	0%
B	Gravel and cobble	36	0	1	26	9	0%	3%	72%	25%
A	Cobble and boulders	13	0	0	3	10	0%	0%	23%	77%
C	Mud or silt	19	0	19	0	0	0%	100%	0%	0%
C	Sand	36	0	3	33	0	0%	8%	92%	0%
C	Cobble & boulders	6	0	0	0	6	0%	0%	0%	100%

3. Results and Discussion

3. Results and Discussion

3.1 MARINE FISH HABITAT

3.1.1 Option 4 Area

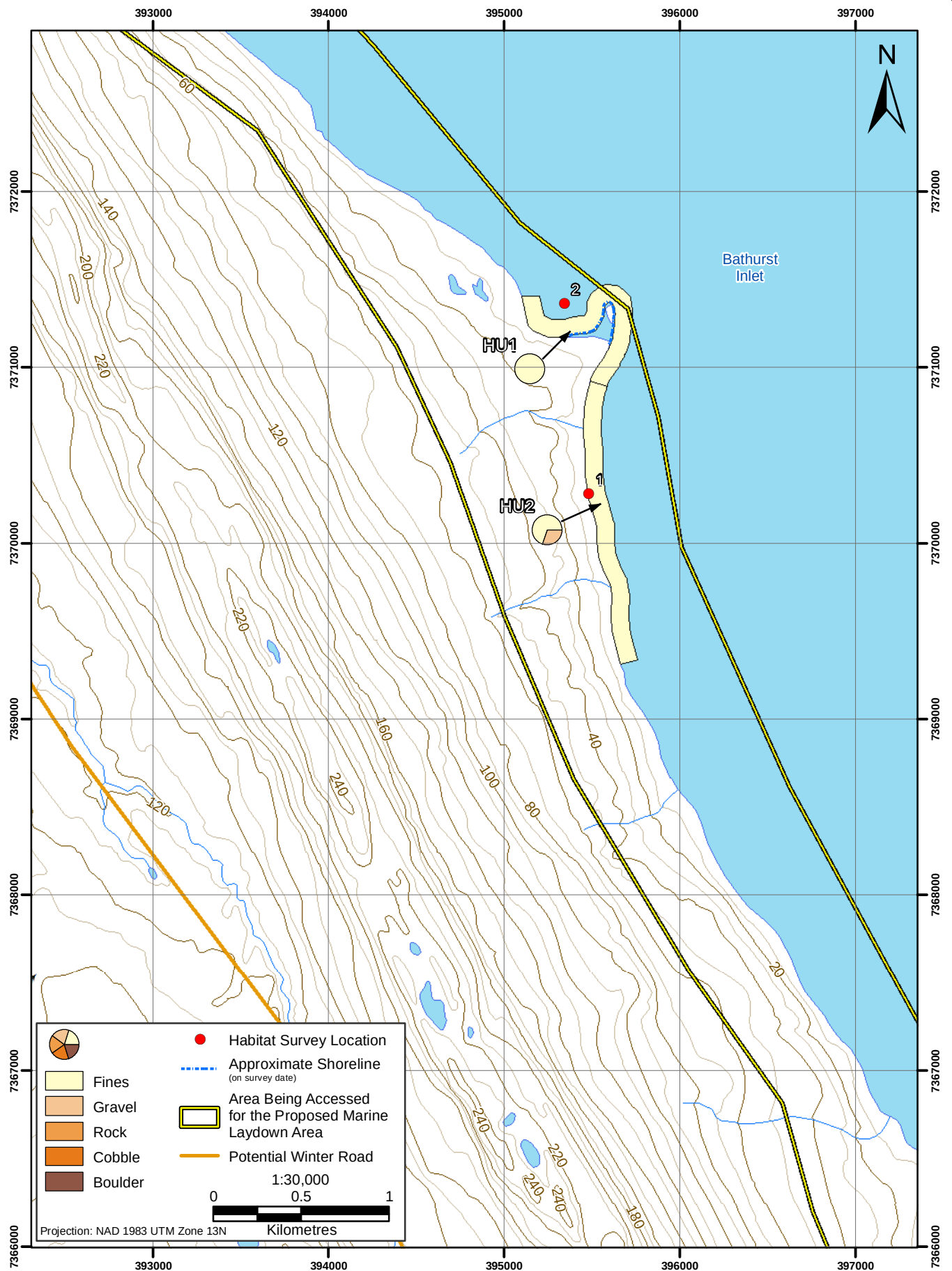
3.1.1.1 Intertidal Habitat

Option 4 contained two habitat units (Figure 3.1-1; Appendix 3.1-1). Both habitat units were dominated by fine substrates and differed only in the relative proportions of gravel and fine sediment. Habitat Unit 1 (4HU1) primarily covered a long spit of land extending out into the inlet and the gradually sloping beach in the shallow bay north of the spit (Plate 3.1-1). Habitat Unit 2 (4HU2) contained more gravel and coarser sand and was found on the south side of the spit (Plate 3.1-2). The intertidal area in 4HU2 was more steeply sloped than 4HU1 and ended at a sparsely vegetated steep clay bank that showed signs of instability due to erosion at the base. In contrast, the high water mark at 4HU1 was indicated by low vegetation and grasses which thickly covered the sand substrate. Cobble, boulder and bedrock were largely absent from the intertidal region of Option 4.



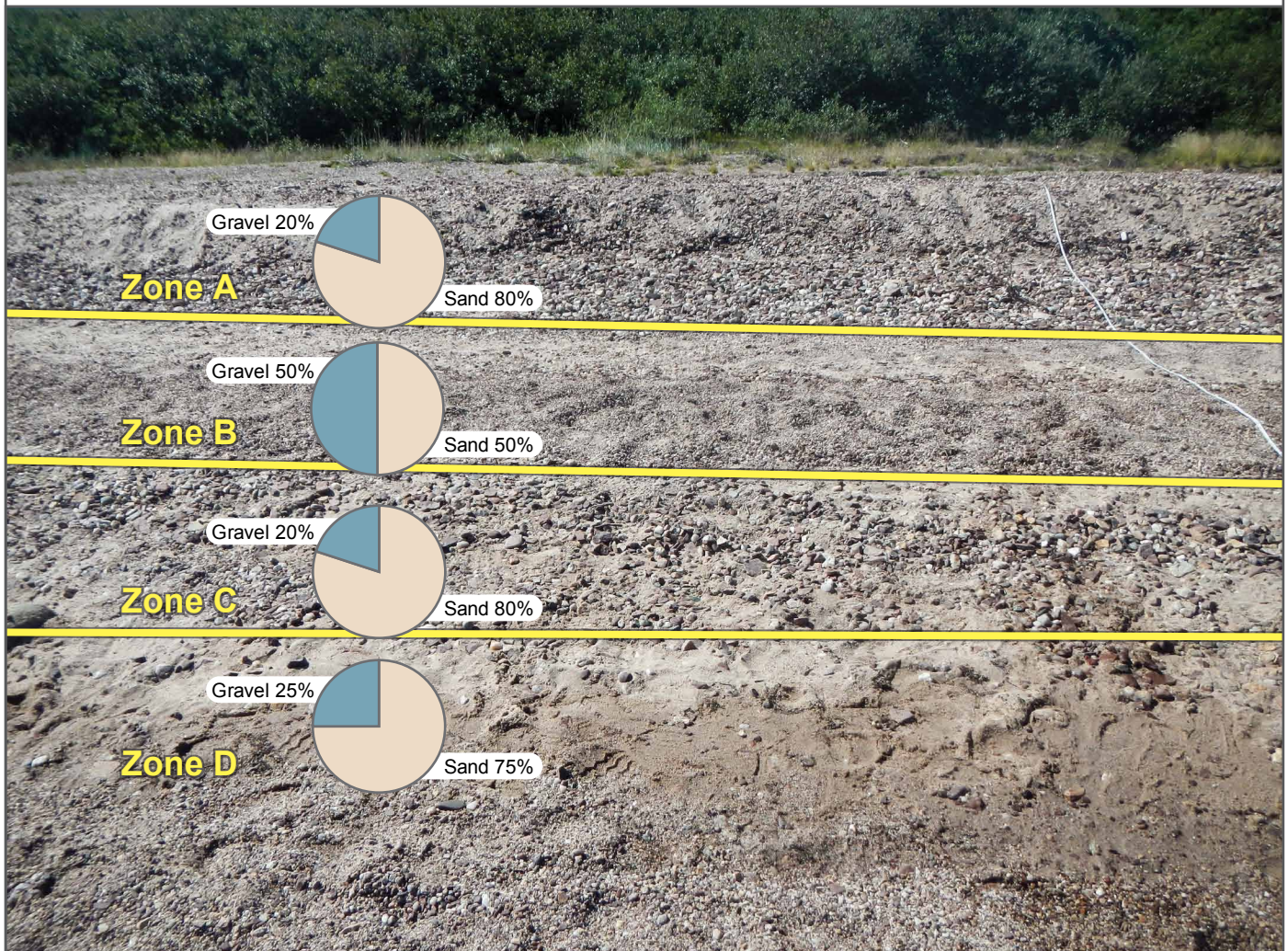
Plate 3.1-1. Habitat Unit 1 of Option 4 was located along the point and in the bay north of the point (photo taken looking north). August 16, 2012.

Two detailed habitat assessments were completed along transects in Option 4. One transect was located in each of the habitat units (Figure 3.1-1). Transect 1 (4TR1) was located in 4HU2. Four zones were identified in the 15.7 m transect, all consisting of varying proportions of sand and gravel (Figure 3.1-2). No cover was observed in 4TR1. Only two zones were identified in Transect 2 (4TR2). The total transect length was shorter (13.5 m) but as with 4TR1, all zones were predominately sand and gravel substrate with no observed cover (Figure 3.1-3).



**Habitat Units and Intertidal Habitat Survey Locations,
Option 4, Back River Project, 2012**

Figure 3.1-1



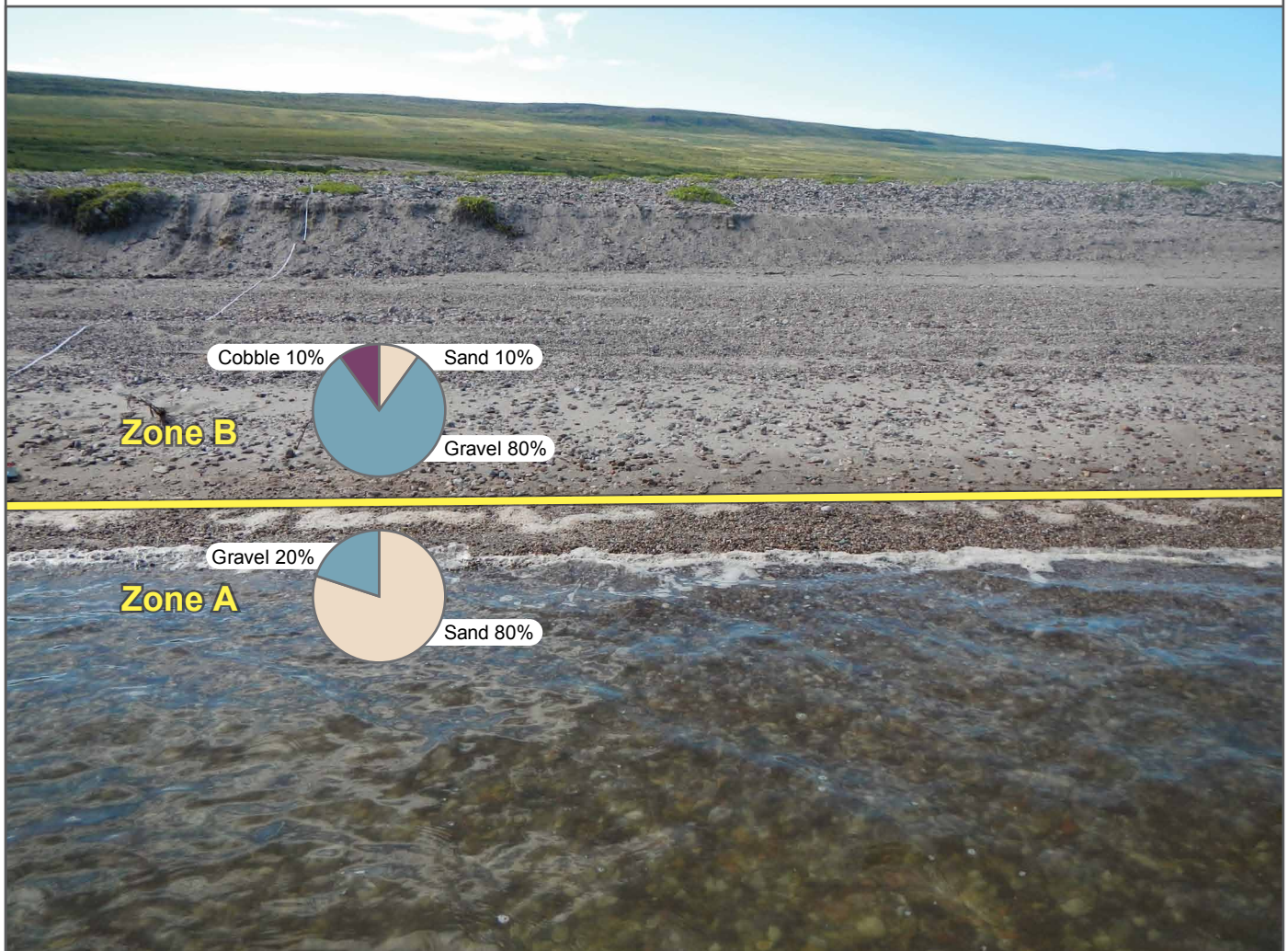




Plate 3.1-2. Habitat Unit 2 of Option 4 contained fines and gravels. July 14, 2012.

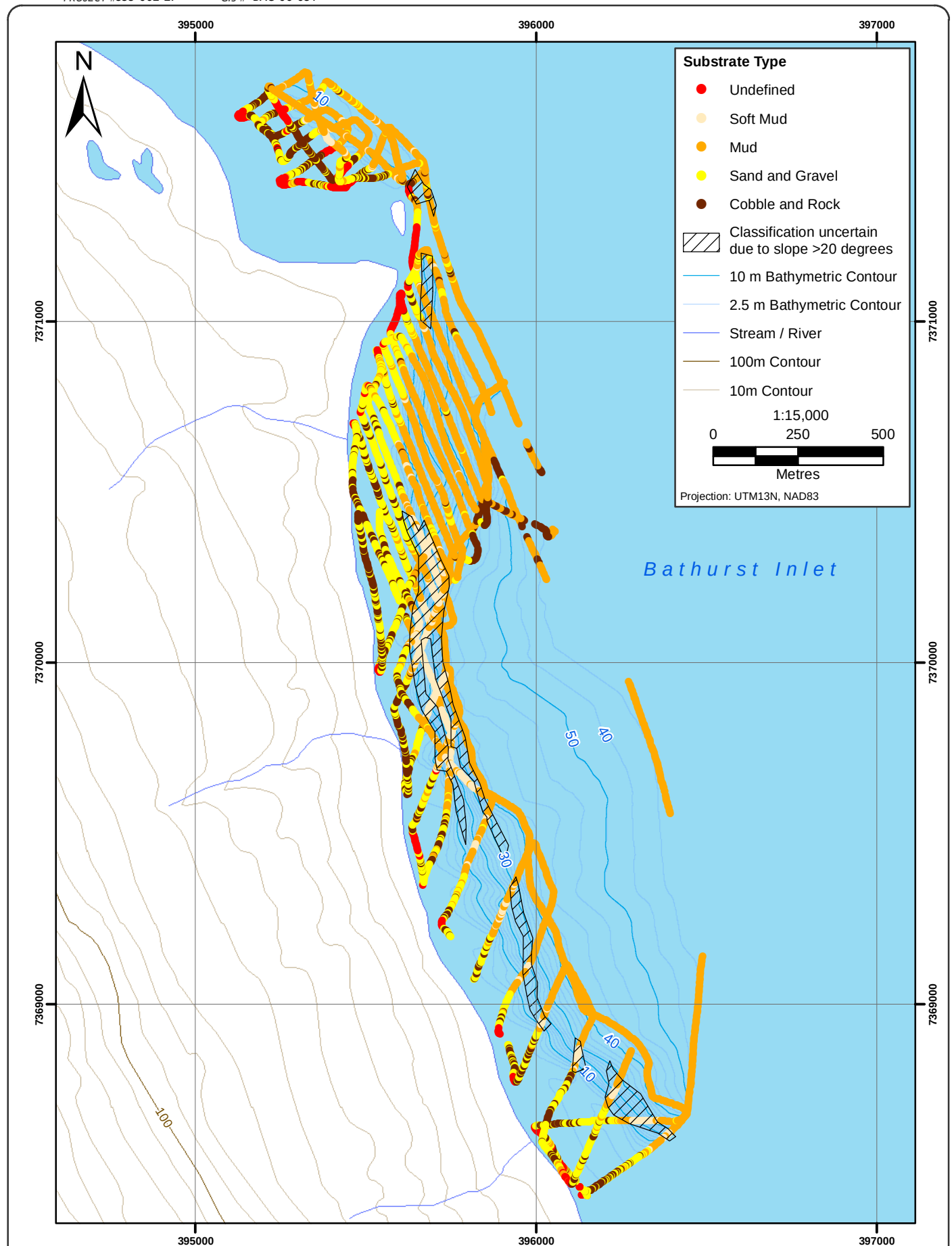
3.1.1.2 Nearshore

Acoustic classifications by VBT at Option 4 ranged from soft mud to cobble and larger rock (Figure 3.1-4). No boulder substrate was observed in the video survey. In most parts of this area, mud predominated below the 4 m depth contour, and was uncommon at shallower depths. Sandy and rocky substrates were mostly restricted to water less than 4 m deep, and were predominant in the shallows. In some places near the point sand and rocky substrate occurred at depths of 10 to 35 m and rocky patches occurred between 40 and 55 m in one area south of the point.

The video surveys provided more detailed information about the composition and characteristics of the nearshore habitat (Figure 3.1-5). At Option 4, the transition from fines to gravel and larger rock was often sudden and substrate types often occurred in patches, often of 1 m or less. Soft, fine substrates (soft mud, firm mud/fine sand) predominated, and even where coarser ones occurred they were usually heavily embedded with fines (Plate 3.1-3 and Plate 3.1-4). Clean gravel was observed only near shore in the proximity of the point at Option 4 (Plate 3.1-5). At a number of locations the surface of the seabed was fine sediment with rocky substrate only a few centimeters beneath. Rocky substrates (gravel, cobble, and boulder) were observed mainly near shore at depths less than 3 m, however, they were found up to 22 m deep along the steep drop-off at Option 4.

At both port options, rocky substrates in shallow water were nearly always heavily covered with algae (Plate 3.1-6). Mussels were rare at Option 4, and live mussels were confirmed at only one location (Plate 3.1-7). Possible sightings of live mussels or empty shells occurred at three other Option 4 locations. No other identifiable marine life was observed.

Sediments may have been classified by VBT as softer than they actually were (e.g., as mud rather than sand or rock), on slopes steeper than 20°. This occurred all along the southern end of Option 4, at a steep drop off between 10 m and 40 m water depths. The category “soft mud” was mainly restricted to these areas and may be an inaccurate classification. However, the available video data did indicate that fine sediment was extremely prevalent throughout the study area, and where rocky substrate was observed it was often covered with fines.



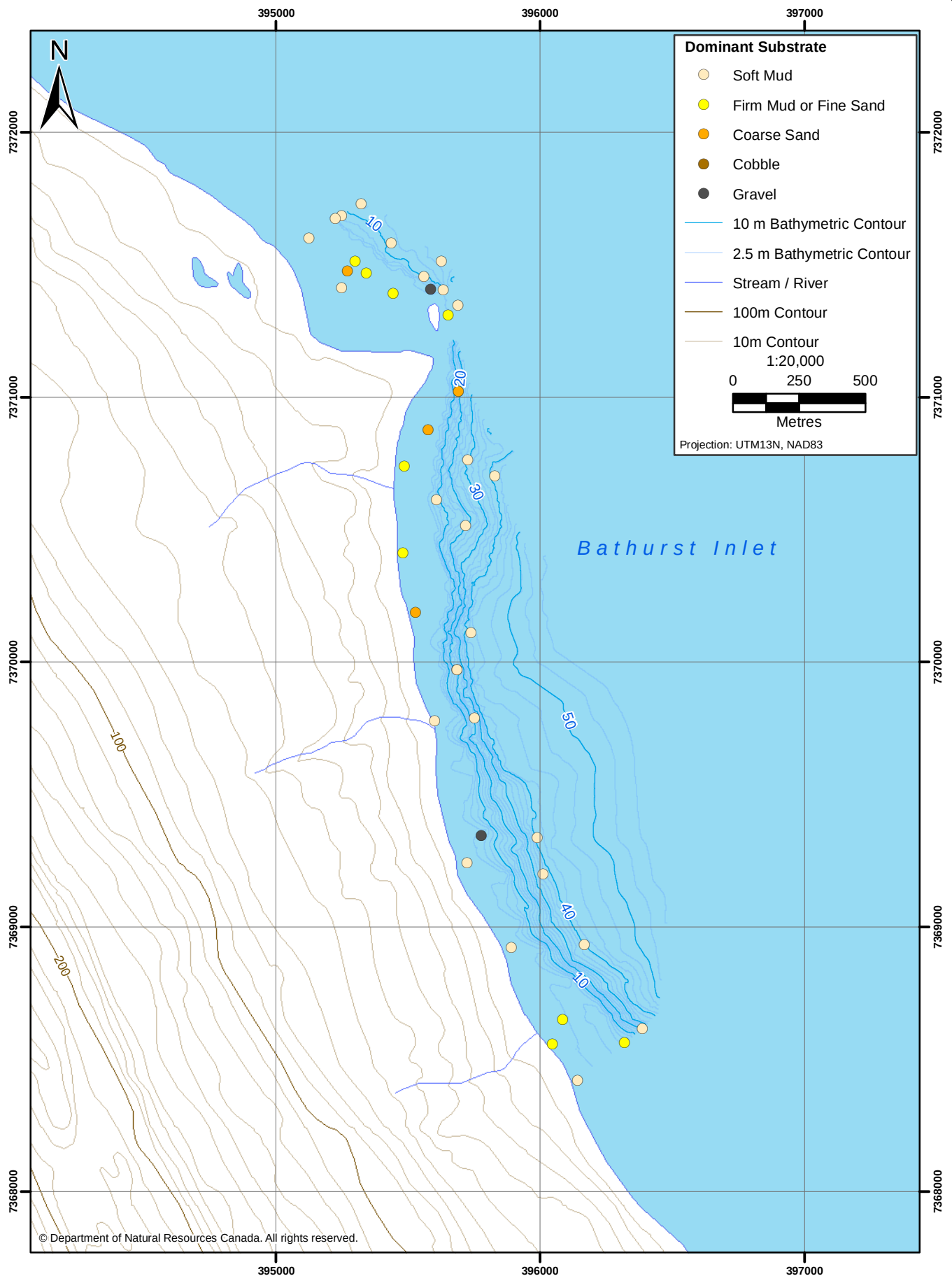


Figure 3.1-5



Plate 3.1-3. Soft mud at Option 4, Location 27.



Plate 3.1-4. Firm mud or soft sand at Option 4, Location 2.



Plate 3.1-5. Clean sand and gravel at Option 4, Location 38.



Plate 3.1-6. Silt and algae covered cobble and gravel at Option 4, Location 15.



Plate 3.1-7. Fines covering rocky substrate with a small cluster of mussels at Option 4, Location 18.

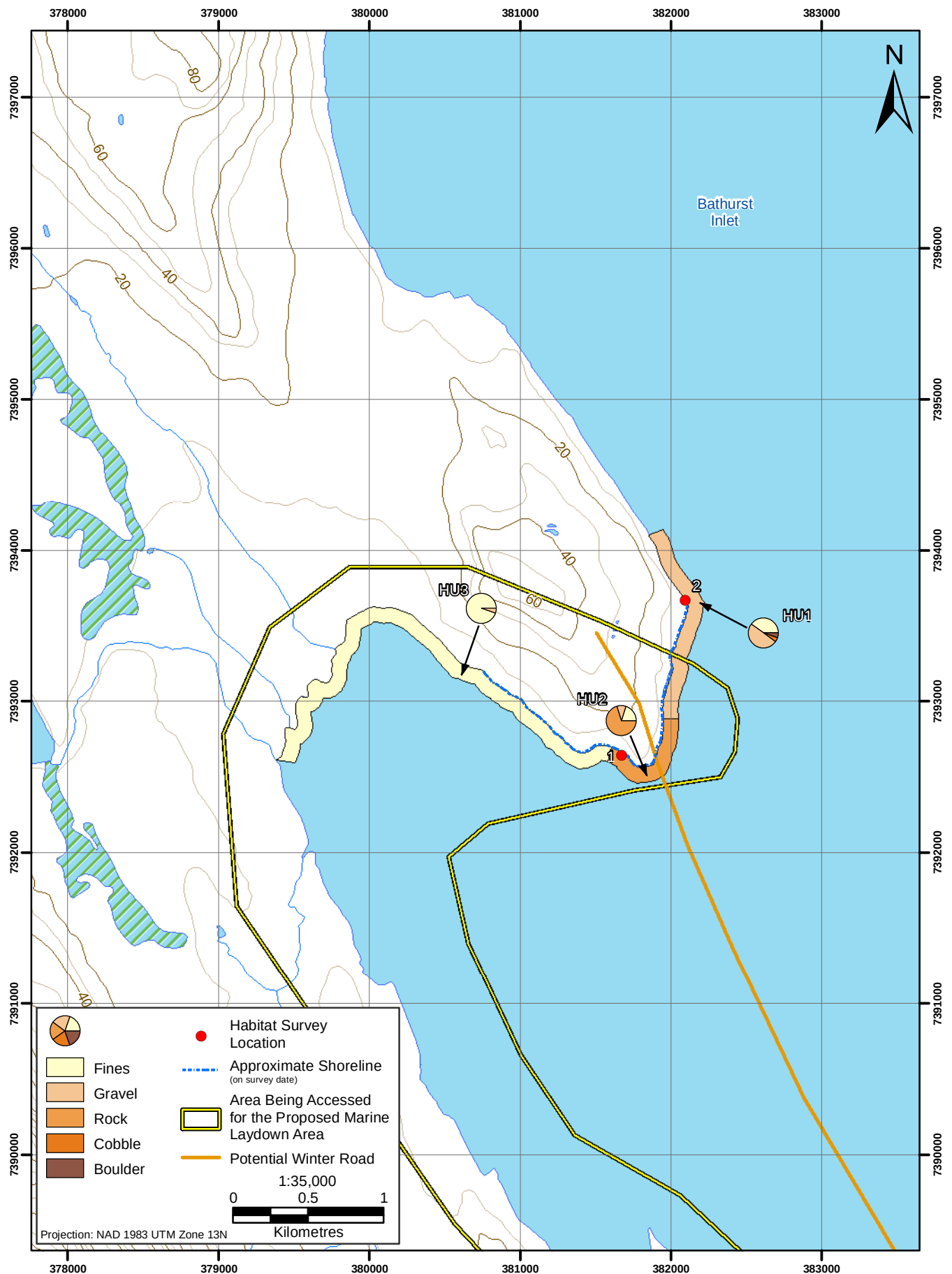
Classifications by VBT generally matched video observations quite closely. Considering that substrate types were often patchy and the video and acoustic sampling locations often did not match precisely, agreement would not be expected in all cases.

3.1.2 Option 6 Area

3.1.2.1 Intertidal

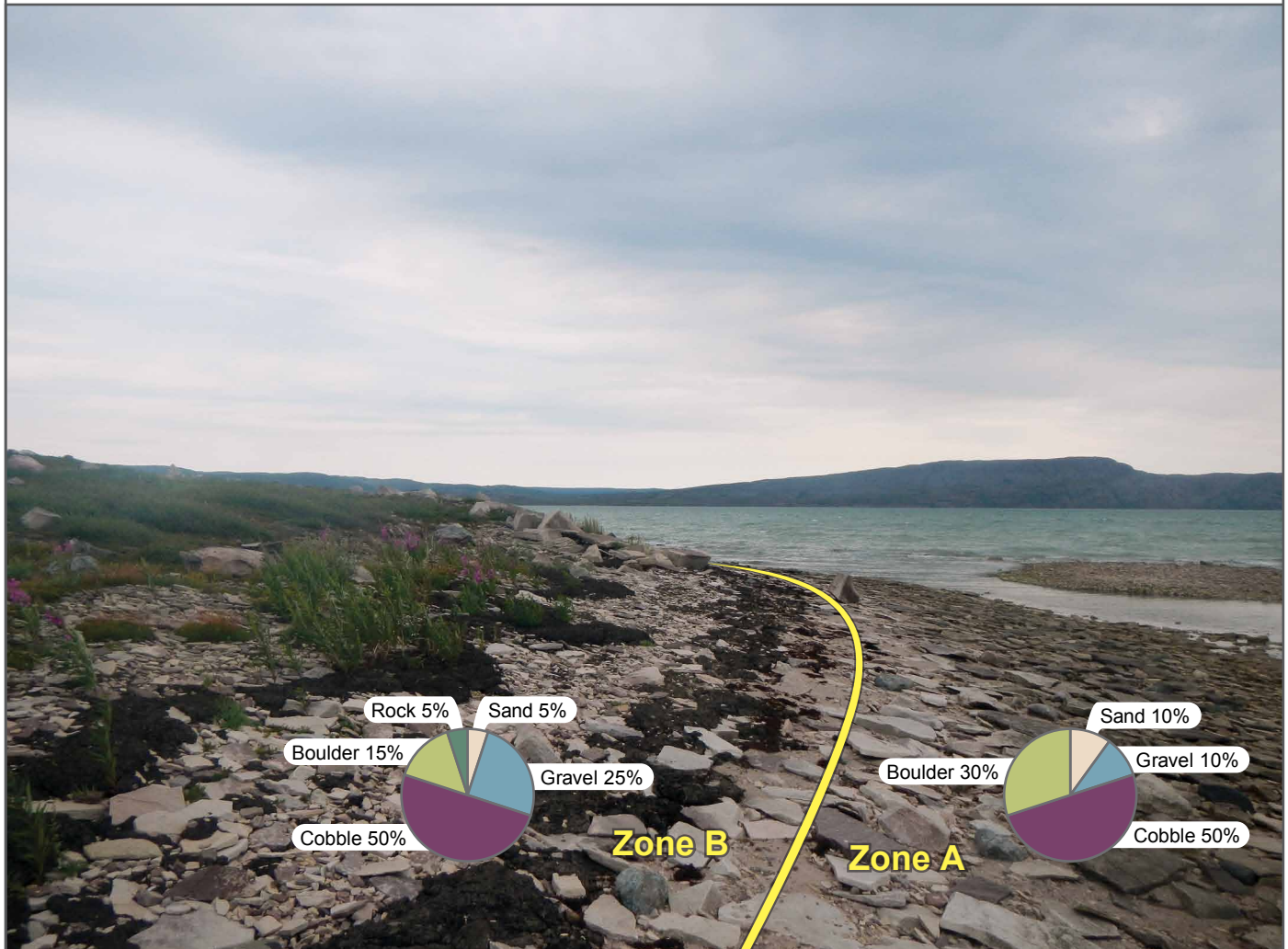
The three habitat units identified in Option 6 contained more varied substrate types than the habitat units in Option 4 (Figure 3.1-5). Habitat Unit 1 (6HU1) was mixed gravel and fines with sporadic boulder cover (Plate 3.1-8). Habitat Unit 2 (6HU2) was primarily composed of outcroppings of bedrock and flat slabs of boulder and cobble that had broken off from these outcroppings interposed with sand (Plate 3.1-9). Habitat Unit 3 (6HU3) was located in the bay created to the south of the promontory and was gradually sloped and almost entirely composed of fines. The substrate in 6HU3 was in the form of a shallow layer of sand and gravel overlaying a thick layer of soft clay/mud.

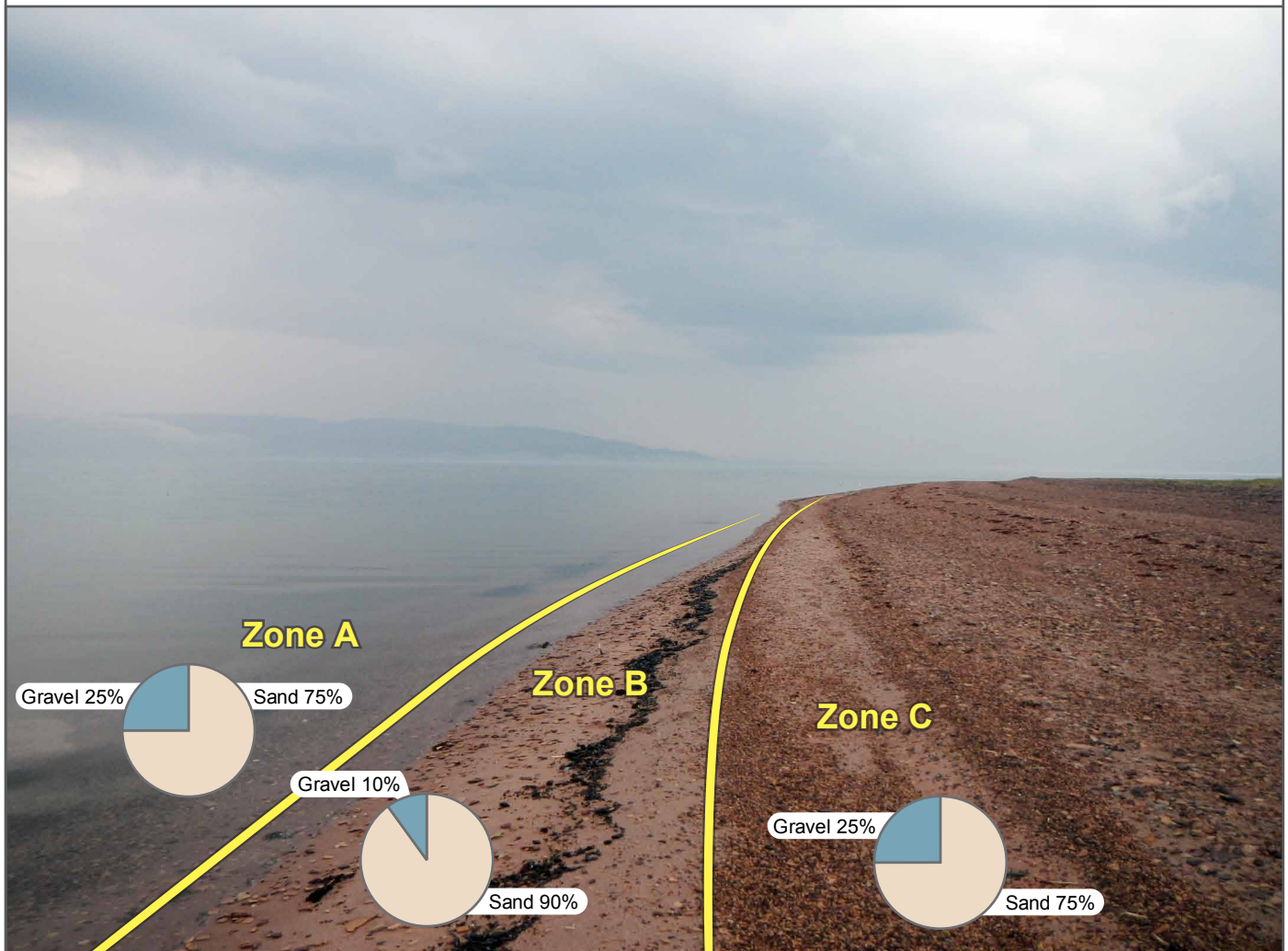
The intertidal habitat at Option 6 was wider with Transect 1 (6TR1) and Transect 2 (6TR2) measured at 18.5 m and 20.6 m, respectively. Zone A in 6TR1 was a wide band of cobble and boulder substrate (Figure 3.1-6). Zone B of 6TR1 was narrower and contained more gravel than boulder substrates and contained cover in the form of mats of macroalgae (Figure 3.1-7). 6TR2 contained three zones of varying proportions of sand and gravel with no observed cover (Figure 3.1-8).



**Habitat Units and Intertidal Habitat Survey Locations,
Option 6, Back River Project, 2012**

Figure 3.1-6





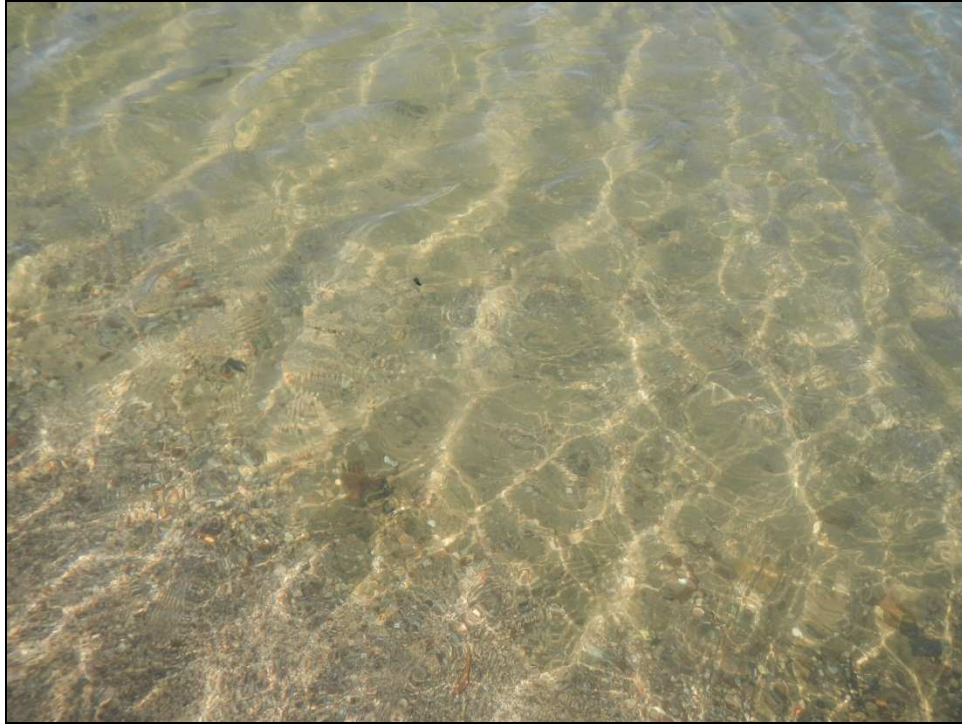


Plate 3.1-8. Mixed gravel and fine sediments at Option 6, Habitat Unit 1. July 15, 2012.



Plate 3.1-9. Bedrock and large substrate were dominant in Habitat Unit 2 of Option 6. July 17, 2012.

3.1.2.2 Nearshore

Acoustic classifications at Option 6 ranged from soft mud to cobble and larger rock (Figure 3.1-9). Boulders were only observed at a single location. Substrates at Option 6 tended to be extremely patchy. Although mud often predominated at depths below 4 m and coarser substrates (sand and rock) often predominated in shallower areas, there were many exceptions to this rule and large rocks and fines were common in small patches outside their typical depths. Cobble and larger rock were especially abundant surrounding the point in water shallower than 4 m. In the north end of the bay, mud was common to depths as shallow as 2 m in some transects.

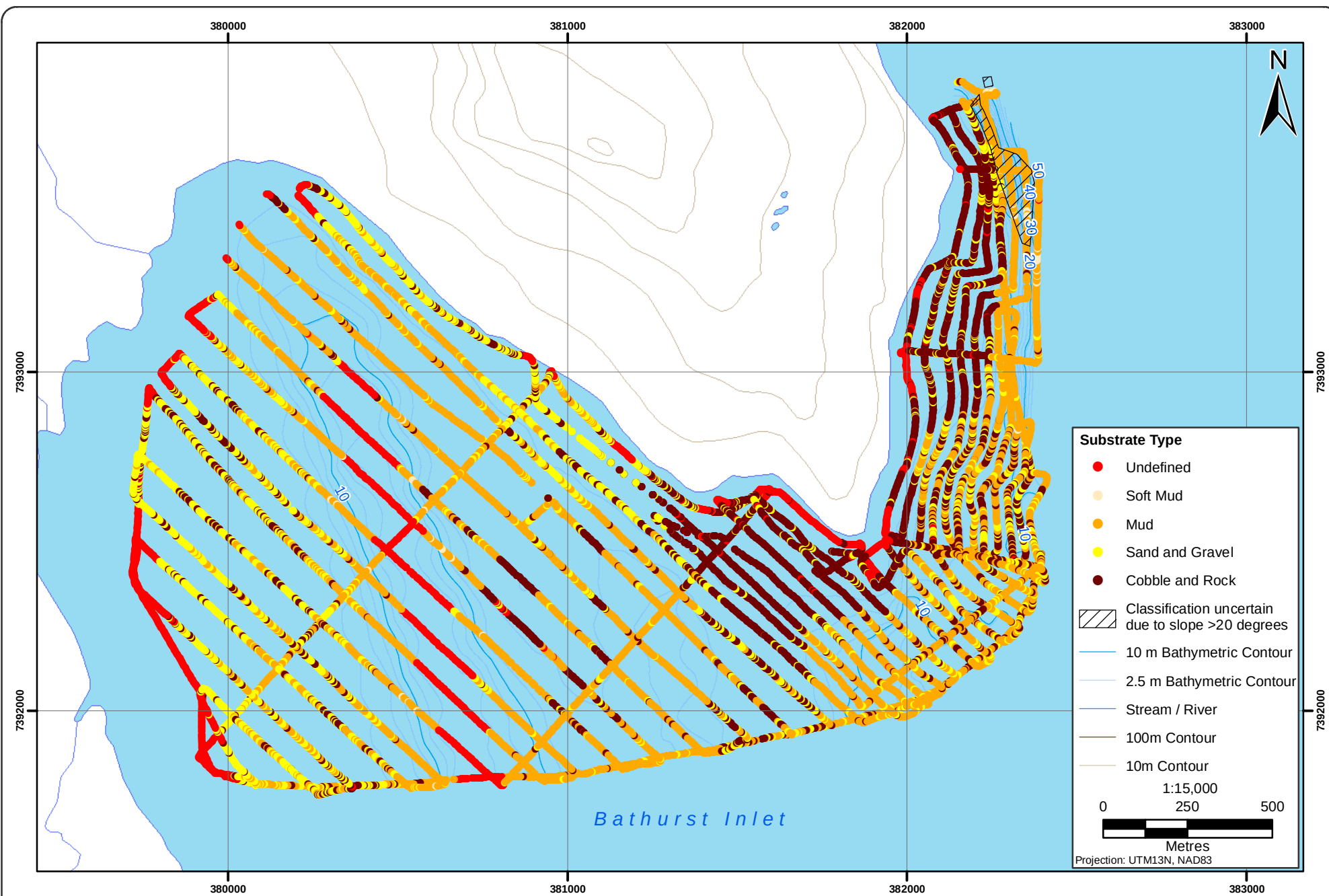
The video surveys provided more detailed information about the composition and characteristics of the nearshore habitat (Figure 3.1-10). As in Option 4, the transition from fines to gravel and larger rock was often sudden and substrate types often occurred in patches. Soft, fine substrates (soft mud, firm mud/fine sand) predominated, and although gravel and cobble were found in several locations, where they occurred they were heavily embedded with fines and algae and no clean coarse substrate was observed. At a number of locations the surface of the seabed was fine sediment with rocky substrate only a few centimeters beneath. Rocky substrates (gravel, cobble, and boulder) were only found very close to shore and not found deeper than 2 m.

Rocky substrates in shallow water were nearly always heavily covered with algae. Mussels were seen at seven locations at Option 6 where they sometimes occurred in large clusters (Plate 3.1-10). Live mussels were only found within the fairly narrow depth range of 1.9 to 6.0 m. No other identifiable marine life was observed.



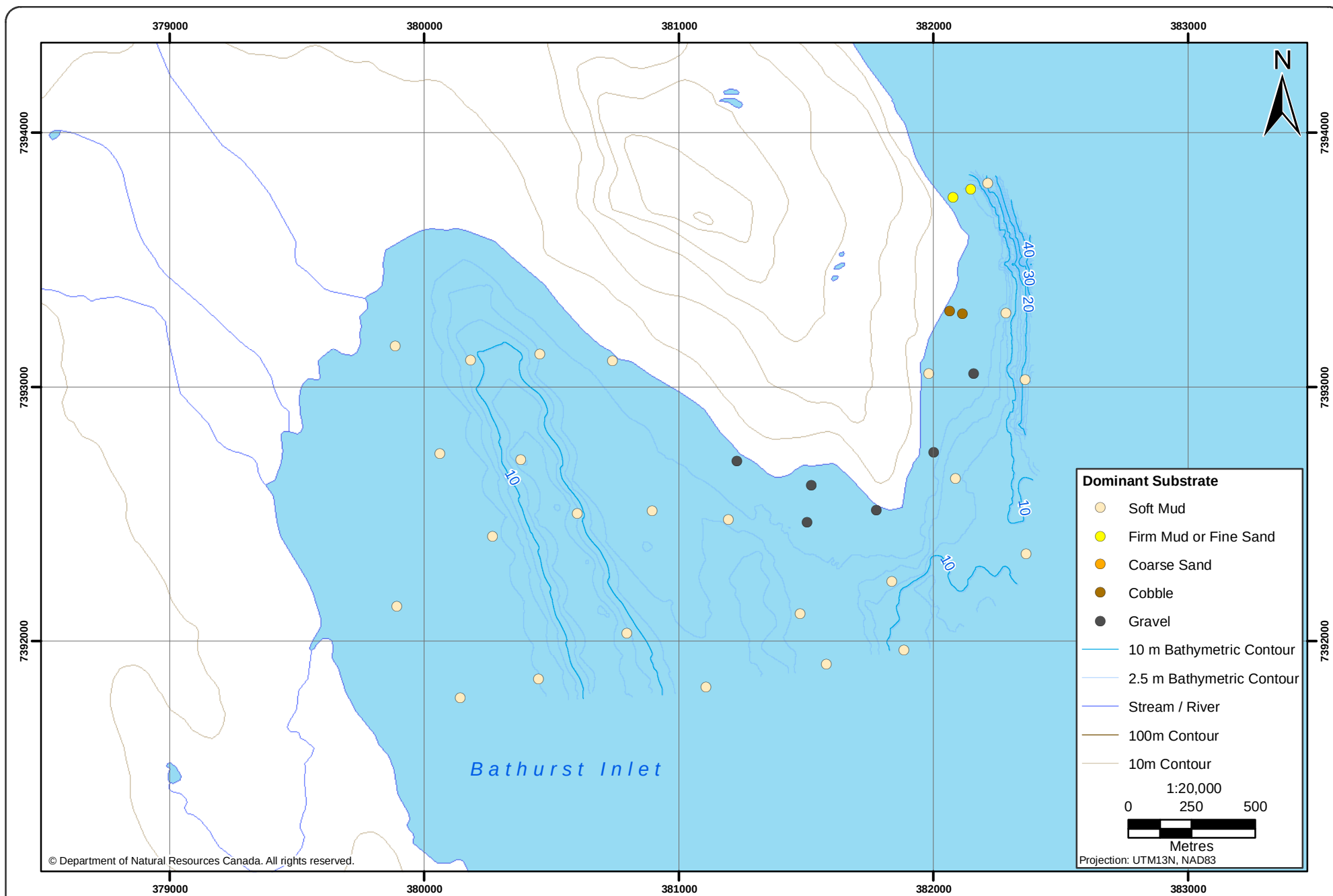
Plate 3.1-10. Mussel beds at Option 6, Location 18.

Sediments may have been classified by VBT as softer than they actually were (e.g., as mud rather than sand or rock), on slopes steeper than 20°. This only occurred in the north corner of the site, where water depths dropped rapidly from 10 m to 50 m. The category “soft mud” almost entirely restricted to this area and may be an inaccurate classification, despite the prevalence of harder mud elsewhere in the site.



Hydroacoustic Estimates of Substrate
Composition, Option 6, 2012

Figure 3.1-9



Although classifications by VBT generally matched video observations quite closely, a notable exception occurred in the trough in the middle of the bay at Option 6 where VBT suggested that the substrate was cobble and larger rock. In this area the first and second bottom echo amplitudes were often unusually large, frequently exceeding the range specified for rock in the classification scheme. In contrast, the single video sample from this area indicated mud, as would be typical at a depth > 15 m in a bay, however murky conditions did not allow a detailed view of the bottom. Based on the uniqueness of acoustic characteristics and the scarcity of ground truth data, the type of substrate occurring in this part of Option 6 is uncertain.

3.2 MARINE FISH COMMUNITY

A total of 58 minnow traps, 20 crab traps, 14 gillnet sets, 4 longline sets, and 20 beach seine sets were used to sample the fish community at the two sites. Details on net and trap sets can be found in Appendix 3.2-1.

Of the 19 fish species previously reported in southern Bathurst Inlet (Richardson 1833; Senate of Canada 1888; Walters 1955; Ellis 1962, Stewart et al. 1993, Rescan Environmental Services 2008), 11 were captured during 2012 sampling (Table 3.2-1). Additionally, seven slender eelblennies (*Lumpenus fabricii*), which have not previously been recorded in Bathurst Inlet, were captured at Option 6. Of those not captured, the Bering wolffish and the sockeye salmon are likely to be extremely rare in Bathurst Inlet. Only three Bering wolffish specimens have been captured in Canada, most recently in 1991 (COSEWIC 2002). Sockeye salmon are even more sporadically observed. Their recorded presence in southern Bathurst Inlet is due to a single observation in 1965 which was more likely to be a group of individuals that strayed outside the normal geographic range than a resident population (Stewart et al. 1993). Arctic char and Arctic cod were previously reported as common (McGowan, Low, and Pike 1993; Stewart et al. 1993) but were not captured.

Table 3.2-1. Previously Reported and 2012 Captured Fish Species in Bathurst Inlet

Species Historically Reported in Bathurst Inlet		Number Captured in 2012	
Common Name	Scientific Name	Option 4	Option 6
Arctic char	<i>Salvelinus alpinus</i>	0	0
Arctic cisco	<i>Coregonus autumnalis</i>	2	14
Arctic cod	<i>Arctogadus glacialis</i>	0	0
Arctic flounder	<i>Liopsetta glacialis</i>	3	5
Bering wolffish	<i>Anarrhichas lepturus</i>	0	0
Broad whitefish	<i>Coregonus nasus</i>	5	2
Capelin	<i>Mallotus villosus</i>	40	148
Fourhorn sculpin	<i>Myoxocephalus quadricornis</i>	78	19
Lake trout	<i>Salvelinus namaycush</i>	1	0
Least cisco	<i>Coregonus sardinella</i>	0	0
Ninespine stickleback	<i>Pungitius pungitius</i>	1	1
Ogac	<i>Gadus ogac</i>	0	0
Pacific herring	<i>Clupea pallasii</i>	41	75

(continued)

Table 3.2-1. Previously Reported and 2012 Captured Fish Species in Bathurst Inlet Sites (completed)

Species Historically Reported in Bathurst Inlet		Number Captured in 2012	
Common Name	Scientific Name	Option 4	Option 6
Prickleback species	Family <i>Stichaeidae</i>	0	0
Rainbow smelt	<i>Osmerus mordax</i>	1	12
Round whitefish	<i>Prosopium cylindraceum</i>	0	0
Saffron cod	<i>Eleginus gracilis</i>	2	46
Sockeye salmon	<i>Oncorhynchus nerka</i>	0	0
Starry flounder	<i>Platichthys stellatus</i>	10	3
Species not Previously Reported			
Slender eelblenny*	<i>Lumpenus fabricii</i>	0	7

* Slender eelblenny belong to Family Stichaeidae and may be the prickleback species previously reported in Richardson (1833).

With the exception of the slender eelblennies and the lake trout (observed but not captured at Option 4), all species were found at both sites.

The following sections provide details of the life history and habitat requirements of the individual species that were captured during the 2012 marine fish community sampling.

3.2.1 Arctic Cisco

Arctic cisco are anadromous salmonids with circumpolar distribution (Evans, Reist, and Minns 2002). They smoltify at a young age and spend much of adult lives in marine or brackish habitats, although they return to freshwater and estuaries to spawn and overwinter (Table 3.2-2). Juvenile Arctic cisco use primarily nearshore, shallow, brackish habitats and when adult Arctic cisco move offshore, they primarily stay within 6 m of the surface.

Table 3.2-2. Arctic Cisco Life History Timing, Habitat Preference and Distribution within the Study Area

Arctic Cisco Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
N/A			N/A	Nearshore, shallow brackish	Unknown	Nearshore, offshore, near surface	Option 4, Option 6	N/A	

N/A = not known to occur in marine or brackish environments; Distrib = distribution

Arctic cisco were captured in both sampling sites (Plate 3.2-1). They were only captured in gillnets, primarily floating gillnets but also along the top edges of sinking gillnets. Arctic cisco were in general some of the largest fish captured, but the capture of a small (123 mm) Arctic cisco at Option 6 shows that younger individuals are present as well.



Plate 3.2-1. Arctic cisco captured at Option 6. August 9, 2012.

3.2.2 Arctic Flounder

Arctic flounder, like most flatfish, are demersal and prefer shallow depths on mud bottoms (Rescan 2008; Table 3.2-3). The species prefers areas with small sheltered embayments and is often found in brackish water and may even enter rivers (Wiswar and Frugé 2006). Arctic flounder are captured in nearshore fisheries throughout the summer (Ellis 1962).

Table 3.2-3. Arctic Flounder Life History Timing, Habitat Preference and Distribution within the Study Area

Arctic Flounder Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
Jan-June	Shallow coastal areas	Unknown	N/A	Nearshore, shallow brackish	Unknown	Nearshore, offshore, near surface	Option 4, Option 6	N/A	

N/A = not known to occur in marine or brackish environments; Distrib = distribution

The Arctic flounder were captured in multiple gear types, including gillnets, beach seines and crab traps (Plate 3.2-2). All gear types in which Arctic flounder were caught sample benthic habitat, and confirm the use of benthic habitat in the sampling sites. Both Option 4 and Option 6 contain a relatively sheltered, shallow bay (on the north side of Option 4 and the southeast side of Option 6) with large amounts of sand and mud substrate. Most of the Arctic flounder captured at the site were from these bays.



Plate 3.2-2. Arctic flounder captured at Option 6. August 9, 2012.

3.2.3 Broad Whitefish

Broad whitefish are most commonly considered a freshwater species, but do occur anadromously. All broad whitefish spend the winters overwintering and spawning in rivers under ice cover (Evans, Reist, and Minns 2002; Table 3.2-4). Anadromous broad whitefish move to estuaries or brackish areas as adults to feed (Percy 1975). In coastal habitats they associate with both pelagic and benthic habitats and food types (Rescan 2008).

Table 3.2-4. Broad Whitefish Life History Timing, Habitat Preference and Distribution within the Study Area

Broad Whitefish Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
N/A			N/A	Freshwater or estuaries	N/A	Estuaries, brackish, pelagic and benthic	Option 4, Option 6	Freshwater or estuaries	N/A

N/A = not known to occur in marine or brackish environments; Distrib = distribution

Broad whitefish were the largest and heaviest fish captured in both sites. They were not common at either site and were captured in both floating and sinking gillnets.

3.2.4 Capelin

Capelin spend the majority of their adult lives in offshore marine habitat and are only generally found in nearshore areas as spawning adults or rearing larval capelin (Table 3.2-5; Jarvela and Thorsteinson 1999). Capelin spawning habitat requirements are fairly specific given their specialized spawning behaviour. In general, capelin spawning habitat must have coarse sand or fine gravel substrate (Arimitsu et al. 2008) and be exposed to wave action.

Table 3.2-5. Capelin Life History Timing, Habitat Preference and Distribution within the Study Area

Capelin Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
Mid July to late August	Sand and gravel beaches with strong wave action	Option 4, Option 6	15 days after spawning	Midwater in estuaries and offshore	Unknown	Offshore	Not in study area	Offshore	Not in study area

Distrib = distribution

All capelin captured during sampling were adults from spawning schools (Plate 3.2-3). For a more detailed description of their habitat use in Bathurst Inlet, please see Section 3.4.



Plate 3.2-3. Capelin in beach seine at Option 6. July 17, 2012.

3.2.5 Fourhorn Sculpin

Fourhorn sculpin are tolerant of a wide range of salinities and occur in freshwater, brackish water and marine areas throughout the Arctic, although they appear to mostly avoid high salinity areas (Walters 1955; Percy 1975). In areas in which they are found, they can comprise a large proportion of the total fish community (Wiswar and Frugé 2006; Rescan 2008). Fourhorn sculpin are almost entirely nearshore in distribution, and in their larval stage are associated with very shallow inshore areas (Jarvela and Thorsteinson 1999; Table 3.2-6).

Table 3.2-6. Fourhorn Sculpin Life History Timing, Habitat Preference and Distribution within the Study Area

Fourhorn Sculpin Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
Mid-winter	Benthic, nearshore, gravel substrate	Unknown	3 months after spawning	Very shallow, nearshore	Sheltered bays in Option 4 and Option 6	Freshwater, brackish, nearshore, benthic	Option 4 and Option 6	Nearshore, lakes	Unknown

Distrib = distribution

Large adult fourhorn sculpin were captured in gillnets in Option 6. Smaller adults were captured in minnow traps in both sites (Plate 3.2-4). Larval fourhorn sculpin were captured in beach seines in both sampling areas but were extremely abundant in the shallow sheltered bay on the north end of Option 4. The lifestage distribution of fourhorn sculpin between the two sites suggests that Option 4 provides high quality rearing habitat for small fourhorn sculpin, but that adult fourhorn sculpin prefer the habitat found at Option 6.



Plate 3.2-4. Small adult fourhorn sculpin captured in a minnow trap at Option 4. July 15, 2012.

3.2.6 Lake Trout

Lake trout are primarily a freshwater species, but have been known to enter brackish water as adults, most likely to feed on marine fish (Walters 1955; Table 3.2-7). Lake trout spawn and rear in freshwater lakes and their use of marine habitat is infrequent (Evans, Reist, and Minns 2002).

Table 3.2-7. Lake Trout Life History Timing, Habitat Preference and Distribution within the Study Area

Lake Trout Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing			Adult Rearing		Overwintering
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
N/A			N/A	N/A			Freshwater, brackish	Option 6	N/A

N/A = not known to occur in marine or brackish environments; Distrib = distribution

The single lake trout observed at Option 6 was feeding on a herring held in a gillnet. It may have moved into Bathurst inlet from one of the rivers feeding into the inlet in order to feed on the abundance of food fish presented by the spawning capelin.

3.2.7 Ninespine Stickleback

Ninespine stickleback are found in freshwater, brackish and nearshore coastal areas (Table 3.2-8). They have a noted presence for sheltered, shallow areas in both freshwater and marine habitats (Evans, Reist, and Minns 2002). Ninespine stickleback spawn in freshwater or brackish areas and are only found in marine habitat as adults.

Table 3.2-8. Ninespine Stickleback Life History Timing, Habitat Preference and Distribution within the Study Area

Ninespine Stickleback Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing			Adult Rearing		Overwintering
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
N/A			N/A	N/A			Brackish, shallow, sheltered	Sheltered bays at Option 4 and Option 6	N/A

N/A = not known to occur in marine or brackish environments; Distrib = distribution

Ninespine stickleback were captured in a seine net in the sheltered bay of Option 4 and in a minnow trap in a shallow area of the sheltered bay of Option 6 (Plate 3.2-5). Both sampling locations provide the shallow areas with low wave action that are preferred by ninespine stickleback.

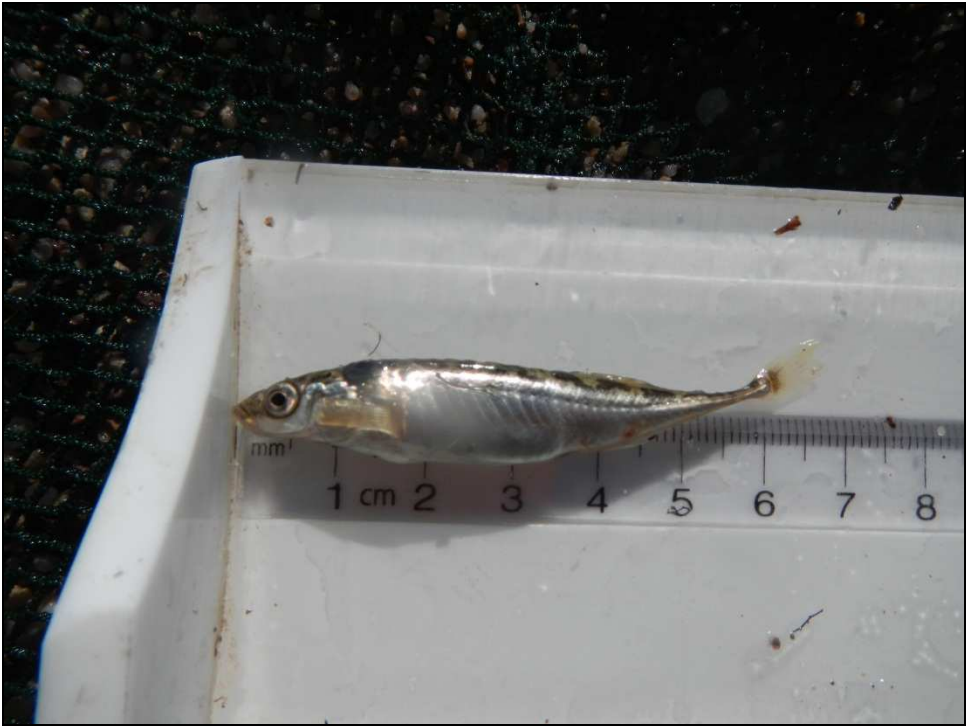


Plate 3.2-5. Ninespine stickleback captured in Option 4. July 15, 2012.

3.2.8 Pacific Herring

Pacific herring are present in marine and brackish coastal areas throughout the Pacific and parts of the Arctic (Lassuy and Moran 1989; Table 3.2-9). Pacific herring move to brackish areas in shallow bays, river mouths and other low-salinity areas during their spring spawning period (Percy 1975). The spawning occurs in the intertidal or subtidal zones of regularly-used spawning grounds (Lassuy and Moran 1989). Herring eggs must be fixed to a surface, which is usually macroalgae but can also include clean rocks or other objects (Hart 1973). Newly-hatched larval Pacific herring remain in nearshore habitat but migrate offshore as older juveniles and adults. Adult Pacific herring prefer depths of 100-200 m.

Table 3.2-9. Pacific Herring Life History Timing, Habitat Preference and Distribution within the Study Area

Pacific Herring Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
June-Sept	Protected nearshore brackish areas, clean substrate or algae	Unknown	July	Nearshore	Unknown	Offshore	Option 4, Option 6	Offshore	Unknown

Distrib = distribution

The Pacific herring captured at Option 4 and Option 6 were all adult fish and were primarily captured in gillnets in 5-10 m of water (Plate 3.2-6). However, adult Pacific herring were also observed in < 1 m

of water at the edges of capelin schools. Herring are primarily planktonic feeders (Lassuy and Moran 1989) but do not exclusively feed on plankton as adults (Percy 1975). While adult capelin are of similar size to adult Pacific herring and are unlikely to be a food source, the herring may be feeding on capelin eggs during the capelin spawning activities. Herring require macroalgae or a clean substrate for spawning, features that are almost entirely absent from both Option 4 and Option 6. It is unlikely that herring spawn in either site. Although no juvenile or larval herring were captured, Bathurst Inlet may be appropriate for herring juvenile rearing.



Plate 3.2-6. Pacific herring captured in a gillnet at Option 6. August 9, 2012.

3.2.9 Rainbow Smelt

Rainbow smelt exhibit anadromous or entirely freshwater life histories and spawn only in rivers (Evans, Reist, and Minns 2002). Downstream movement to lakes or estuaries occurs almost immediately after emergence (Table 3.2-10). Anadromous rainbow smelt rear in an estuary before moving to more saline areas as adults. Adult rainbow smelt are associated with coastal habitats and do not move offshore (Walters 1955). They congregate in pelagic schools in midwater areas (Evans, Reist, and Minns 2002).

Table 3.2-10. Rainbow Smelt Life History Timing, Habitat Preference and Distribution within the Study Area

Rainbow Smelt Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
	N/A		N/A	Estuary	Unknown	Coastal, pelagic midwater	Option 4, Option 6	Nearshore, close to spawning river	Unknown

N/A = not known to occur in marine or brackish environments; Distrib = distribution

Rainbow smelt were captured in low numbers in sinking gillnets in the shallow bays of both sampling locations and were not found in any deeper net sets (Plate 3.2-7). All incidental mortalities were determined to be males of varying maturity.



Plate 3.2-7. Rainbow smelt captured at Option 6. August 9, 2012.

3.2.10 Saffron Cod

Saffron cod are widely distributed in marine and brackish areas of the Arctic (Walters 1955; Jarvela and Thorsteinson 1999). Juvenile saffron cod rear in nearshore nursery areas, but many adult saffron cod move to offshore areas (Table 3.2-11). Saffron cod are associated with demersal and benthic habitats (Rescan 2008).

Table 3.2-11. Saffron Cod Life History Timing, Habitat Preference and Distribution within the Study Area

Saffron Cod Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
Feb - March	Nearshore, under ice, clean sand or pebble substrate	Unknown	April - June	Nearshore, shallow (< 25 m)	Unknown	Nearshore occasionally offshore, marine or brackish	Option 4, Option 6	Marine or brackish	Unknown

Distrib = distribution

Only two saffron cod were captured at Option 4, but they were a commonly captured species in Option 6. One saffron cod was observed chasing spawning capelin, and therefore the large numbers of

saffron cod in Option 6 could be related to the capelin spawning schools. Capelin are an important source of food for cod (Walters 1955; Vandeperre and Methven 2007).

3.2.11 Slender Eelblenny

In contrast to many species captured in the study sites, slender eelblenny prefer areas of moderate to high salinity (Ponton, Gagné, and Fortier 1993). Slender eelblenny are benthic and usually associated with mid- to shallow-water areas on sand, mud, or rock substrate (Table 3.2-12).

Table 3.2-12. Slender Eelblenny Life History Timing, Habitat Preference and Distribution within the Study Area

Slender Eelblenny Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
Early to mid-winter	Offshore	Unknown	Unknown	Nearshore	Unknown	Subtidal to deep water, mud, sand and rock substrates	Option 6	Offshore	Unknown

Distrib = distribution

Slender eelblenny were not captured in Option 4 and were only captured in Option 6 in a sinking gillnet set over the sand and mud substrate in the bay (Plate 3.2-8).



Plate 3.2-8. Slender eelblenny captured in Option 6. August 9, 2012.

3.2.12 Starry Flounder

Starry flounder are found in marine and freshwater environments, but are usually associated with brackish areas (Walters 1955). Starry flounder are pelagic as juveniles but as adults are primarily benthic (Percy 1975). Adult starry flounder can be found from shallow to deep water, but are usually associated with soft substrates such as sand or mud (Table 3.2-13).

Table 3.2-13. Starry Flounder Life History Timing, Habitat Preference and Distribution within the Study Area

Slender Eelblenny Specific Life History									
Spawning			Juvenile Emergence /Hatch	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
Spring, when water temps. approach 11°C	Shallow nearshore	Unknown	Five days after spawning	Estuaries, rivers, shallow nearshore	Option 4	Shallow to mid-water, sand and mud substrate, low salinity	Option 4, Option 6	Deep water up to 300 m	Unknown

Distrib = distribution

Starry flounder were captured in sinking gillnets and beach seines at both Option 4 and Option 6, and in crab traps at Option 4. The majority of starry flounder individuals captured in these studies were captured in Option 4. Adults were found throughout the site (Plate 3.2-9) and very small juvenile starry flounder were captured in beach seines in the bay at the north end of the site (Plate 3.2-10). The mud substrate found at both sites is consistent with starry flounder habitat preferences.



Plate 3.2-9. Adult Starry flounder captured in a crab trap in Option 4. August 12, 2012.

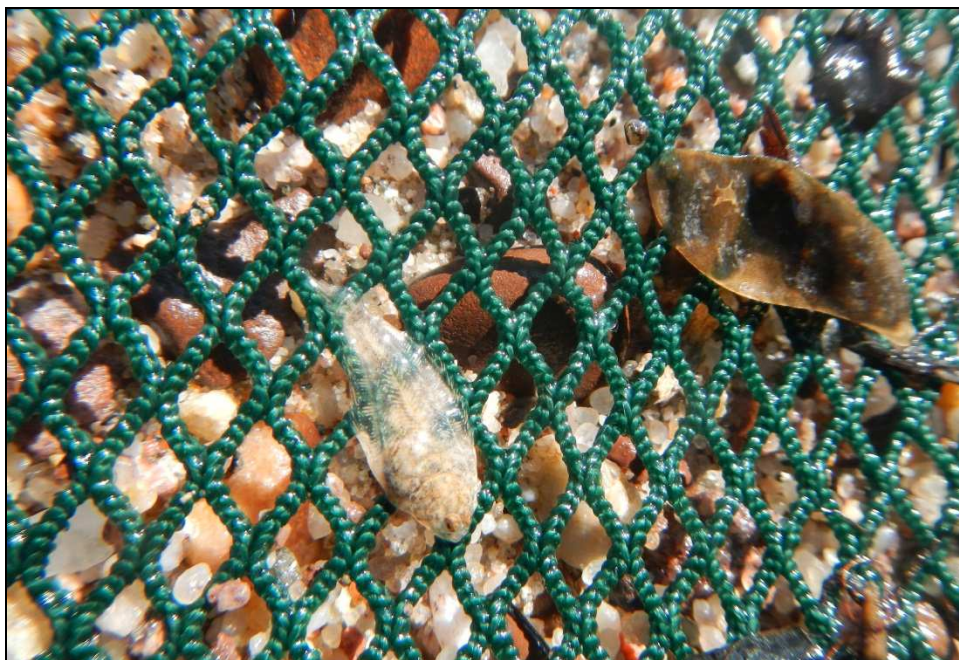


Plate 3.2-10. Juvenile starry flounder captured in a beach seine in Option 4. July 15, 2012.

3.2.13 Option 4

Most fish species captured in Option 4 were captured in gillnets, suggesting mid- to deep-water habitat use and benthic or demersal vertical distribution (Table 3.2-14). Lake trout were not captured, but a lake trout was observed feeding on a Pacific herring caught in a floating gillnet and is confirmed to be present at site.

Fourhorn sculpin and ninespine stickleback were not captured in gillnets in Option 4, but were captured using beach seines (Table 3.2-15). Beach seines, which sample shallow water, were the primary capture method for both these species, suggesting that they primarily use intertidal and near subtidal habitats.

Minnow traps (Table 3.2-16) and long lines (Table 3.2-17) caught very few fish in Option 4. A single fourhorn sculpin was captured in a minnow trap and no fish were captured via longline in Option 4. As they sample similar habitat to gillnets and beach seines, the low CPUE of these types of sampling gear seems more likely to be related to the efficacy of the gear type, rather than habitat use patterns.

Catch and CPUE data separated by set are reported in Appendix 3.2-2.

3.2.14 Option 6

As in Option 4, gillnets captured the greatest variety of fish species at Option 6 (Table 3.2-18). Pacific herring, saffron cod, fourhorn sculpin and Arctic cisco had the highest CPUE in gillnet sampling. Arctic cisco, broad whitefish, Pacific herring, rainbow smelt and slender eelblenny were not captured by any other sampling methodology and saffron cod were only captured in gillnets and longlines (Table 3.2-19). Of the sampling gear types used, only gillnets and long lines sample mid-water pelagic habitats, so species only captured using these gear types may not be found in the shallow and benthic habitats targeted by the other gear types.

Table 3.2-14. Gillnet Standard and Bootstrap CPUE Summary Statistics, Option 4, 2012

Site	Option 4									
Species	Standard CPUE (fish/100 m ² of gillnet/h)						Bootstrap CPUE (fish/100 m ² of gillnet/h)			
	n	Mean	SD	SE	Lower CI	Upper CI	Mean	SD	Lower CI	Upper CI
Arctic cisco	8	0.12	0.23	0.08	0.00	0.50	0.13	0.08	0.00	0.31
Arctic flounder	8	0.20	0.36	0.13	0.00	0.80	0.20	0.12	0.00	0.49
Broad whitefish	8	0.30	0.58	0.20	0.00	1.39	0.30	0.19	0.00	0.72
Capelin	8	2.28	6.46	2.28	0.00	15.07	2.32	2.12	0.00	6.85
Fourhorn sculpin	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lake trout	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nine spine stickleback	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pacific herring	8	4.06	8.28	2.93	0.00	20.66	4.09	2.71	0.38	10.14
Rainbow smelt	8	0.06	0.16	0.06	0.00	0.38	0.06	0.05	0.00	0.17
Saffron cod	8	0.12	0.22	0.08	0.00	0.49	0.12	0.07	0.00	0.29
Slender eelblenny	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Starry flounder	8	0.12	0.22	0.08	0.00	0.49	0.12	0.07	0.00	0.29
Total	8	7.26	9.74	3.44	0.21	24.22	7.28	3.22	1.75	14.19

CPUE = catch-per-unit-effort (fish/100 m² of gillnet/h); n = sample size (number of net sets); SE = standard error of the mean; SD = standard deviation of the mean; CI = confidence interval (95%)

Table 3.2-15. Beach Seine Standard and Bootstrap CPUE Summary Statistics, Option 4, 2012

Site	Option 4									
Species	Standard CPUE (fish/m ² of area seined/h)						Bootstrap CPUE (fish/m ² of area seined/h)			
	n	Mean	SD	SE	Lower CI	Upper CI	Mean	SD	Lower CI	Upper CI
Arctic cisco	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arctic flounder	10	0.20	0.63	0.20	0.00	1.54	0.20	0.19	0.00	0.60
Broad whitefish	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Capelin	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fourhorn sculpin	10	15.32	19.61	6.20	0.00	56.07	15.41	5.90	5.57	28.06
Lake trout	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nine spine stickleback	10	0.20	0.63	0.20	0.00	1.54	0.20	0.19	0.00	0.60
Pacific herring	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rainbow smelt	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Saffron cod	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slender eelblenny	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Starry flounder	10	0.80	1.68	0.53	0.00	3.98	0.80	0.50	0.00	1.99
Total	10	16.52	19.99	6.32	0.00	56.96	16.44	5.95	6.17	29.25

CPUE = catch-per-unit-effort (fish/m² of area seined/h); n = sample size (number of net sets); SE = standard error of the mean; SD = standard deviation of the mean; CI = confidence interval (95%)

Table 3.2-16. Crab Trap and Minnow Trap Standard CPUE Summary Statistics, Option 4, 2012

Site	Option 4														
	Standard CPUE (fish/trap/24h)						Bootstrap CPUE (fish/trap/24h)					Crab Trap Bootstrap CPUE (fish/trap/24h)			
Species	n	Mean	SD	SE	Lower CI	Upper CI	n	Mean	SD	Lower CI	Upper CI	Mean	SD	Lower CI	Upper CI
Arctic cisco	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arctic flounder	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Broad whitefish	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Capelin	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fourhorn sculpin	30	0.00	0.01	0.00	0.00	0.01	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lake trout	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nine spine stickleback	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pacific herring	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rainbow smelt	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Saffron cod	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slender eelblenny	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Starry flounder	30	0.00	0.00	0.00	0.00	0.00	8	0.03	0.04	0.01	0.00	0.10	0.03	0.01	0.01
Total	30	0.00	0.01	0.00	0.00	0.01	8	0.03	0.04	0.01	0.00	0.10	0.03	0.01	0.01

CPUE = catch-per-unit-effort (fish/trap/24h); n = sample size (number of trap sets); SE = standard error of the mean; SD = standard deviation of the mean; CI = confidence interval (95%)

Table 3.2-17. Long Line Standard and Bootstrap CPUE Summary Statistics, Option 4, 2012

Site	Option 4					
Species	Standard CPUE (fish/number of pairs of hooks/h)					
	n	Mean	SD	SE	Lower CI	Upper CI
Arctic cisco	8	0.12	0.23	0.08	0.00	0.50
Arctic flounder	8	0.20	0.36	0.13	0.00	0.80
Broad whitefish	8	0.30	0.58	0.20	0.00	1.39
Capelin	8	2.28	6.46	2.28	0.00	15.07
Fourhorn sculpin	8	0.00	0.00	0.00	0.00	0.00
Lake trout	8	0.00	0.00	0.00	0.00	0.00
Nine spine stickleback	8	0.00	0.00	0.00	0.00	0.00
Pacific herring	8	4.06	8.28	2.93	0.00	20.66
Rainbow smelt	8	0.06	0.16	0.06	0.00	0.38
Saffron cod	8	0.12	0.22	0.08	0.00	0.49
Slender eelblenny	8	0.00	0.00	0.00	0.00	0.00
Starry flounder	8	0.12	0.22	0.08	0.00	0.49
Total	8	7.26	9.74	3.44	0.21	24.22

CPUE = catch-per-unit-effort (fish/number of pairs of hooks/h); n = sample size (number of line sets); SE = standard error of the mean; SD = standard deviation of the mean; CI = confidence interval (95%)

Table 3.2-18. Gillnet Standard and Bootstrap CPUE Summary Statistics, Option 6, 2012

Site	Option 6									
Species	Standard CPUE (fish/100 m ² of gillnet/h)						Bootstrap CPUE (fish/100 m ² of gillnet/h)			
	n	Mean	SD	SE	Lower CI	Upper CI	Mean	SD	Lower CI	Upper CI
Arctic cisco	6	1.37	1.41	0.58	0.04	3.50	1.36	0.53	0.41	2.44
Arctic flounder	6	0.10	0.25	0.10	0.00	0.54	0.10	0.09	0.00	0.31
Broad whitefish	6	0.07	0.17	0.07	0.00	0.36	0.07	0.06	0.00	0.21
Capelin	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fourhorn sculpin	6	1.98	4.85	1.98	0.00	10.39	2.00	1.81	0.00	5.94
Lake trout	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nine spine stickleback	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pacific herring	6	4.49	6.60	2.70	0.00	15.02	4.47	2.47	0.30	9.67
Rainbow smelt	6	0.48	0.91	0.37	0.00	2.06	0.48	0.34	0.00	1.23
Saffron cod	6	4.45	10.36	4.23	0.00	22.50	4.42	3.86	0.03	12.94
Slender eelblenny	6	0.24	0.59	0.24	0.00	1.26	0.24	0.22	0.00	0.72
Starry flounder	6	0.30	0.75	0.30	0.00	1.60	0.30	0.28	0.00	0.91
Total	6	13.63	16.77	6.85	0.11	40.77	13.60	6.32	3.27	26.87

CPUE = catch-per-unit-effort (fish/100 m² of gillnet/h); n = sample size (number of net sets); SE = standard error of the mean; SD = standard deviation of the mean; CI = confidence interval (95%)

Table 3.2-19. Long Line Standard and Bootstrap CPUE Summary Statistics, Option 6, 2012

Site	Option 6										
Species	Standard CPUE (fish/number of pairs of hooks/h)						Bootstrap CPUE (fish/number of pairs of hooks/h)				
	n	Mean	SD	SE	Lower CI	Upper CI	n	Mean	SD	Lower CI	Upper CI
Arctic cisco	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Arctic flounder	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Broad whitefish	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Capelin	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Fourhorn sculpin	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.01	0.00	0.00
Lake trout	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Nine spine stickleback	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Pacific herring	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Rainbow smelt	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Saffron cod	2	0.01	0.02	0.01	0.00	0.03	30	0.00	0.00	0.00	0.00
Slender eelblenny	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Starry flounder	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Total	2	0.01	0.02	0.01	0.00	0.03	30	0.00	0.01	0.00	0.00

CPUE = catch-per-unit-effort (fish/number of pairs of hooks/h); n = sample size (number of line sets); SE = standard error of the mean; SD = standard deviation of the mean; CI = confidence interval (95%)

Capelin and ninespine stickleback were the only species not captured in gillnets. Both were captured primarily by beach seines, with capelin being far more abundant than ninespine sticklebacks, although capelin were only caught during the spawning season in July (Table 3.2-20). Arctic flounder and fourhorn sculpin were the other species captured by beach seines. These species, plus the Pacific herring observed among capelin schools but not captured, were found to be the primary fish species in the shallow subtidal and intertidal zones. Minnow traps, located in a similar area, captured an additional fourhorn sculpin (Table 3.2-21).

One Arctic cisco captured in a gillnet gang at Option 6 showed marks identified as recent lamprey bites. Arctic lamprey are the only lamprey species in the region and the likely cause of the bite marks. While the presence of lamprey bites on a fish in Option 6 implies lamprey are found in the general area, it is impossible to tell whether the Arctic cisco was bitten while in Option 6 or if the lamprey reside elsewhere and the Arctic cisco had recently emigrated to Option 6.

Longlines, minnow traps, and crab traps only captured a limited number of fish and fish species, supporting the similar findings in Option 4. One saffron cod was captured on a longline hook and fourhorn sculpin, ninespine stickleback and Arctic flounder were the only species captured in the traps in low numbers. Despite low CPUE, the species captured using these methods are representative of the species captured in the same habitat types using other gear methodology and provide support to those findings. Incidentally, no crabs or other non-fish organisms were caught in the crab traps.

Table 3.2-20. Beach Seine Standard and Bootstrap CPUE Summary Statistics, Option 6, 2012

Site	Option 6									
Species	Standard CPUE (fish/m ² of area seined/h)						Bootstrap CPUE (fish/m ² of area seined/h)			
	n	Mean	SD	SE	Lower CI	Upper CI	Mean	SD	Lower CI	Upper CI
Arctic cisco	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arctic flounder	10	0.20	0.63	0.20	0.00	1.54	0.20	0.19	0.00	0.60
Broad whitefish	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Capelin	10	29.45	62.79	19.86	0.00	158.21	29.39	18.80	0.00	71.64
Fourhorn sculpin	10	2.19	4.54	1.44	0.00	12.14	2.17	1.36	0.00	5.17
Lake trout	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nine spine stickleback	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pacific herring	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rainbow smelt	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Saffron cod	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slender eelblenny	10	0.20	0.63	0.20	0.00	1.54	0.20	0.19	0.00	0.60
Starry flounder	10	32.04	65.19	20.62	0.00	161.79	32.41	19.52	0.80	76.62
Total	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CPUE = catch-per-unit-effort (fish/m² of area seined/h); n = sample size (number of line sets); SE = standard error of the mean; SD = standard deviation of the mean; CI = confidence interval (95%)

Table 3.2-21. Crab Trap and Minnow Trap Standard CPUE Summary Statistics, Option 6, 2012

Site	Option 6									
Species	Standard CPUE (fish/trap/24h)						Bootstrap CPUE (fish/trap/24h)			
	n	Mean	SD	SE	Lower CI	Upper CI	Mean	SD	Lower CI	Upper CI
Arctic cisco	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Arctic flounder	12	0.08	0.27	0.08	0.00	0.68	30	0.00	0.00	0.00
Broad whitefish	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Capelin	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Fourhorn sculpin	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.01	0.00
Lake trout	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Nine spine stickleback	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Pacific herring	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Rainbow smelt	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Saffron cod	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Slender eelblenny	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Starry flounder	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Total	12	0.08	0.27	0.08	0.00	0.68	30	0.00	0.01	0.00

CPUE = catch-per-unit-effort (fish/trap/24h); n = sample size (number of line sets); SE = standard error of the mean; SD = standard deviation of the mean; CI = confidence interval (95%)

3.3 BIOLOGY

3.3.1 Option 4

A summary of the length, weight and condition (K) of fish captured in Option 4 is presented in Table 3.3-1. Data from individual fish is presented in Appendix 3.3-1. Where less than 15 individuals of a species were captured, no further analysis of the data was possible. This was the case for Arctic cisco, Arctic flounder, broad whitefish, ninespine stickleback, rainbow smelt, saffron cod and starry flounder. Lake trout were only observed and not captured, and were not included in any of the biological data analyses.

Sufficient data were available for capelin, fourhorn sculpin and Pacific herring to allow for the analysis of the weight-length relationship using regression analysis and to allow for length-frequency distributions to be created.

The relationship between length and weight of fourhorn sculpin was significant (GLM, $F_{1,31} = 11.92$, $P = 0.002$; Figure 3.3-1). The r^2 , however, suggested that the length of the sculpin only explained 25% of the variance in weight. The length-frequency data provides an explanation for the low r^2 as it illustrates how almost all fourhorn sculpin captured were from a very narrow length range (Figure 3.3-2), preventing an accurate analysis of the weight-length relationship. All fourhorn sculpin but one were small juvenile fish and only a single adult fourhorn sculpin was captured. Option 4 appears to be used primarily as rearing habitat for juvenile fish and may not have a large adult population. Fourhorn sculpin in marine Arctic environments regularly migrate throughout the seasonal and life cycles (Craig 1984). Older fourhorn sculpin may migrate out of Option 4 to elsewhere in Bathurst Inlet.

Length and weight were also significantly related for capelin (GLM, $F_{1,28} = 50.00$, $P < 0.001$; Figure 3.3-3) and Pacific herring. As all capelin captured were males in spawning schools, they can be assumed to be mature adult capelin of three to four years of age, explaining the unimodal and narrow length-frequency distribution (Figure 3.3-4). The range of capelin lengths (121 mm - 160 mm) and weights (12 g - 33 g) recorded at Option 4 are comparable to those recorded in other areas (Vandeperre and Methven 2007).

The Pacific herring also showed significant weight-length relationship (GLM, $F_{1,26} = 727.68$, $P < 0.001$; Figure 3.3-5) unimodal length distribution (Figure 3.3-5) and had an average length of 200 mm. The maximum length of 219 mm reflects a small-bodied population compared to other Arctic Pacific herring populations in which a reported 83% of fish were greater than 240 mm in length (Percy 1975).

3.3.2 Option 6

Summaries of the length, weight and condition (K) of fish captured in Option 4 are reported in Table 3.3-2. For Arctic cisco, Arctic flounder, broad whitefish, ninespine stickleback, slender eelblenny and starry flounder, no further data analysis was possible due to small sample size. The biological characteristics of captured capelin, fourhorn sculpin, Pacific herring and saffron cod were analyzed further.

Capelin length and weight were significantly related (GLM, $F_{1,34} = 146.93$, $P < 0.001$; Figure 3.3-3). Capelin captured in Option 6 were likely all spawning adults and were similar in length (Figure 3.3-4). The average length for capelin in Option 6 was 137 mm, and the range in lengths was similar to that seen in Option 4 and elsewhere (Vandeperre and Methven 2007).

Table 3.3-1. Fork Length, Weight and Condition Summary Statistics, Option 4, 2012

Species	Fork Length (mm)						Weight (g)						Condition (K)					
	n	Mean	SD	SE	Min	Max	n	Mean	SD	SE	Min	Max	n	Mean	SD	SE	Min	Max
Arctic cisco	2	284	47.4	33.5	250	317	2	259.9	124.6	88.1	171.8	348.0	2	1.10	0.00	0.00	1.09	1.10
Arctic flounder	3	136	141.1	81.5	25	295	2	215.4	293.7	207.7	7.7	423.0	2	1.37	0.39	0.28	1.09	1.65
Broad whitefish	5	441	58.4	26.1	367	516	5	1174.0	444.5	198.8	698.0	1664.0	5	1.33	0.14	0.06	1.15	1.48
Capelin	31	140	8.6	1.6	121	160	30	21.3	4.8	0.9	12.0	33.0	30	0.76	0.11	0.02	0.60	0.98
Fourhorn sculpin	39	28	12.0	1.9	20	100	33	75.7	14.1	2.6	27.3	101.6	33	0.94	0.07	0.01	0.84	1.27
Ninespine stickleback	1	66	-	-	-	-	1	1.9	-	-	-	-	1	0.66	-	-	-	-
Pacific herring	29	200	13.5	2.5	145	219	29	75.7	14.1	2.6	27.3	101.6	29	0.94	0.07	0.01	0.84	1.27
Rainbow smelt	1	169	-	-	-	-	1	40.0	-	-	-	-	1	0.83	-	-	-	-
Saffron cod	2	358	75.0	53.0	305	411	2	445.5	301.9	213.5	232.0	659.0	2	0.88	0.09	0.07	0.82	0.95
Starry flounder	10	207	163.4	51.7	14	462	7	446.3	397.5	150.3	14.3	1163.0	7	1.30	0.16	0.06	1.02	1.51

Dash indicates not applicable

n = sample size

SE = standard error of the mean

SD = standard deviation of the mean

Table 3.3-2. Fork Length, Weight and Condition Summary Statistics, Option 6, 2012

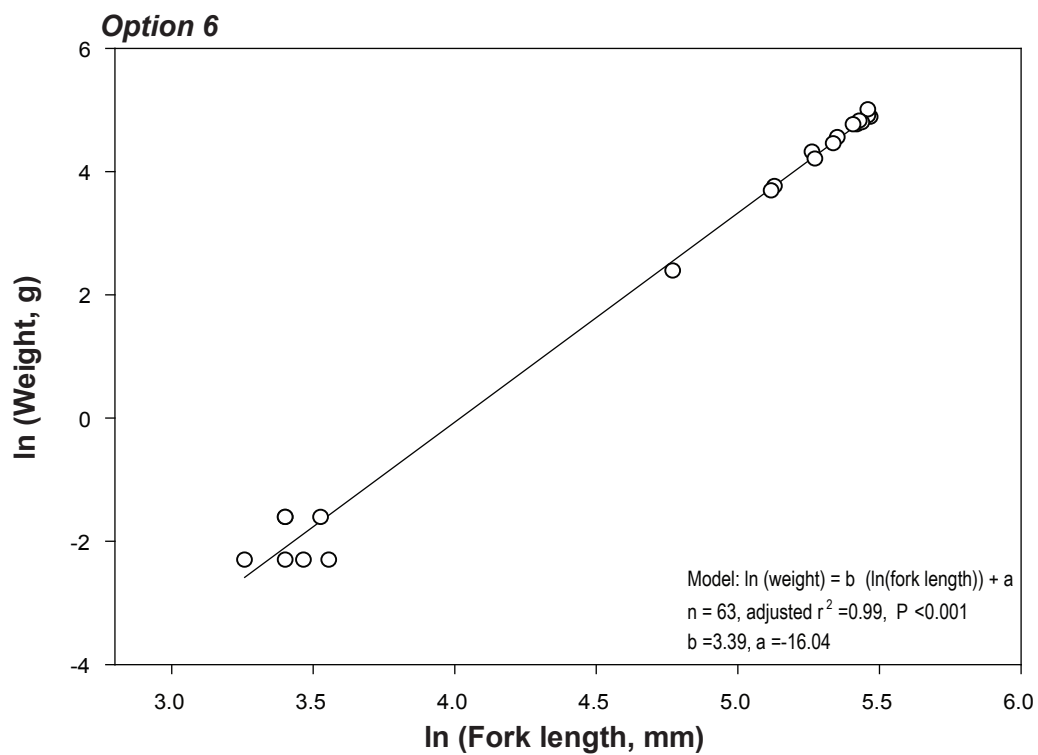
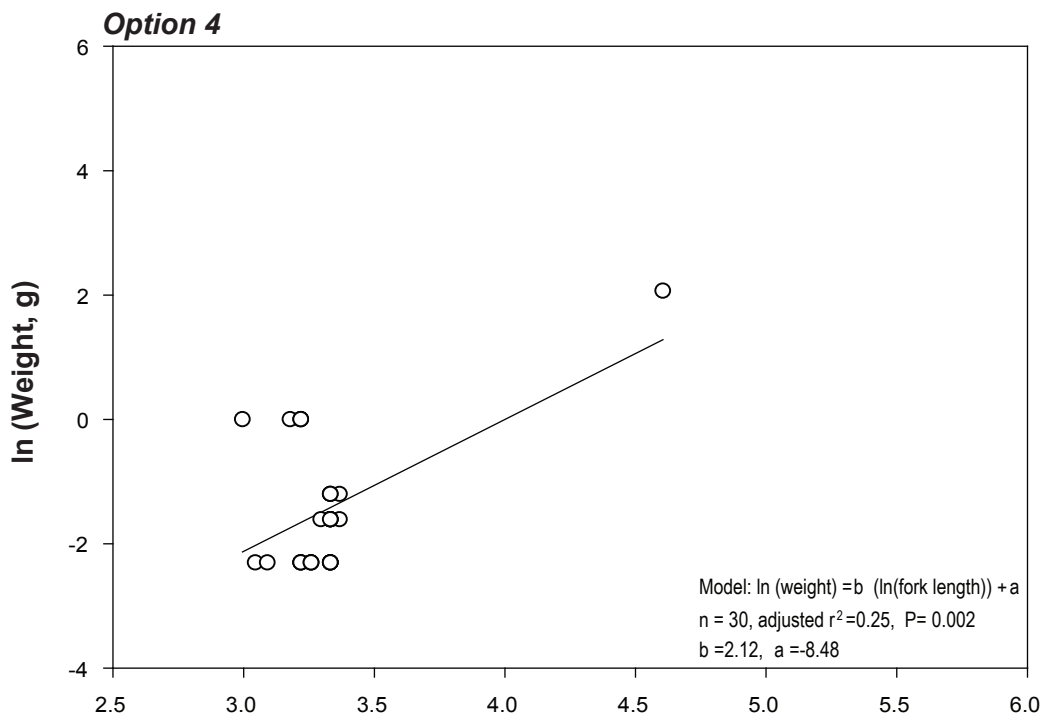
Species	Fork Length (mm)						Weight (g)						Condition (K)					
	n	Mean	SD	SE	Min	Max	n	Mean	SD	SE	Min	Max	n	Mean	SD	SE	Min	Max
Arctic cisco	13	286	79.0	21.9	123	364	13	357.3	219.4	60.9	18.4	633.0	13	1.23	0.31	0.09	0.95	2.15
Arctic flounder	5	157	77.1	34.5	78	286	5	97.6	155.1	69.4	5.7	374.0	5	1.35	0.15	0.07	1.20	1.60
Broad whitefish	4	408	49.0	24.5	367	466	4	823.3	210.3	105.1	608.0	1073.0	4	1.21	0.15	0.07	1.06	1.41
Capelin	37	137	9.2	1.5	122	163	47	18.4	5.0	0.7	11.6	28.0	36	0.65	0.08	0.01	0.56	0.92
Fourhorn sculpin	25	128	93.0	18.6	25	237	22	60.0	56.1	12.0	0.1	149.0	24	0.71	0.37	0.08	0.00	1.15
Ninespine stickleback	1	60	-	-	-	-	1	1.3	-	-	-	-	1	0.60	-	-	-	-
Pacific herring	59	189	30.0	3.9	92	255	59	68.8	23.0	3.0	12.9	135.0	60	1.17	1.33	0.17	0.68	9.12
Rainbow smelt	13	230	52.7	14.6	169	298	13	95.7	79.1	21.9	21.9	225.0	13	0.68	0.21	0.06	0.09	0.91
Saffron cod	33	313	69.4	12.1	122	458	33	269.2	117.6	20.5	63.0	659.0	33	0.99	0.70	0.12	0.36	3.47
Slender eelblenny	7	175	20.9	7.9	135	203	7	16.0	4.2	1.6	12.0	24.0	7	0.33	0.20	0.07	0.23	0.77
Starry flounder	3	269	71.0	41.0	198	340	3	238.1	135.7	78.4	106.0	377.2	3	1.17	0.20	0.12	0.96	1.37

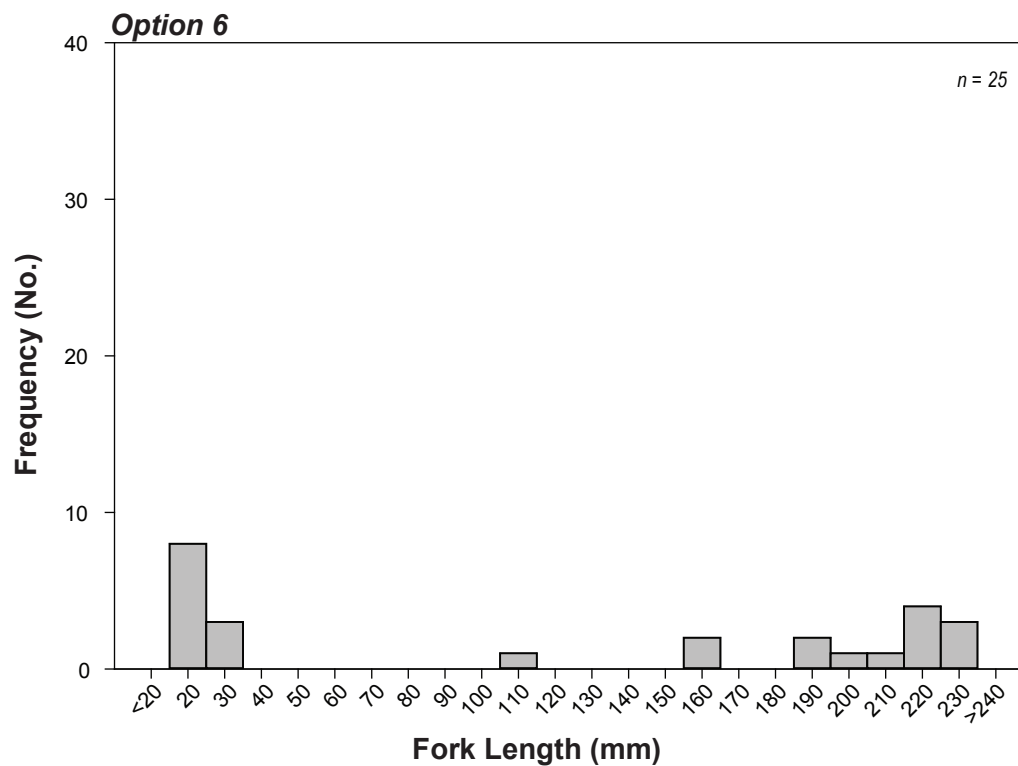
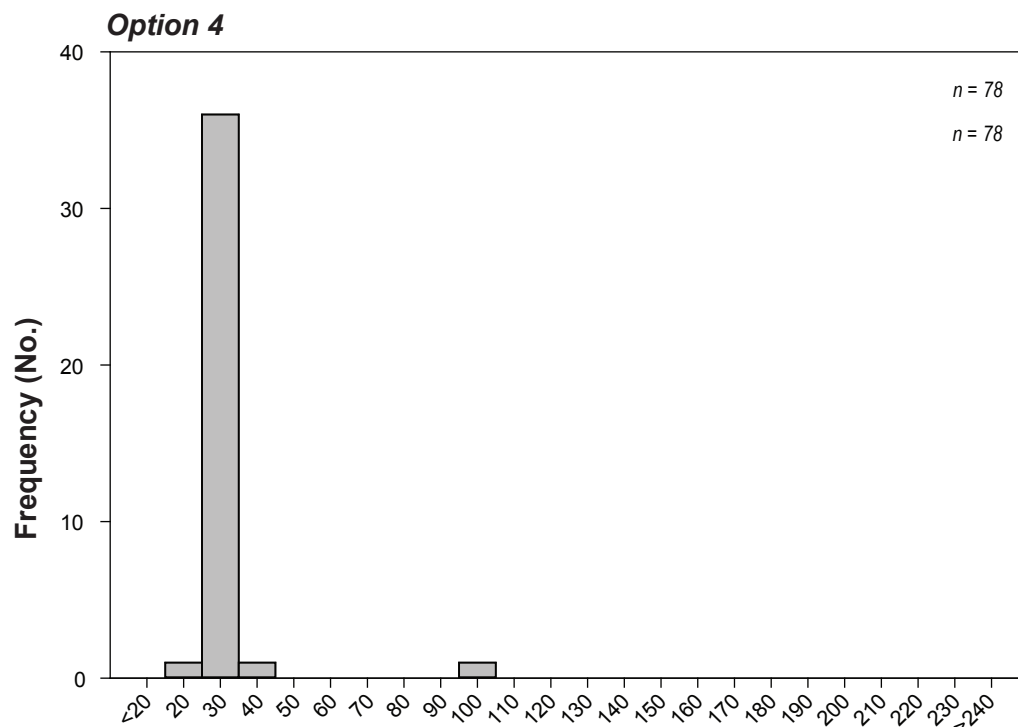
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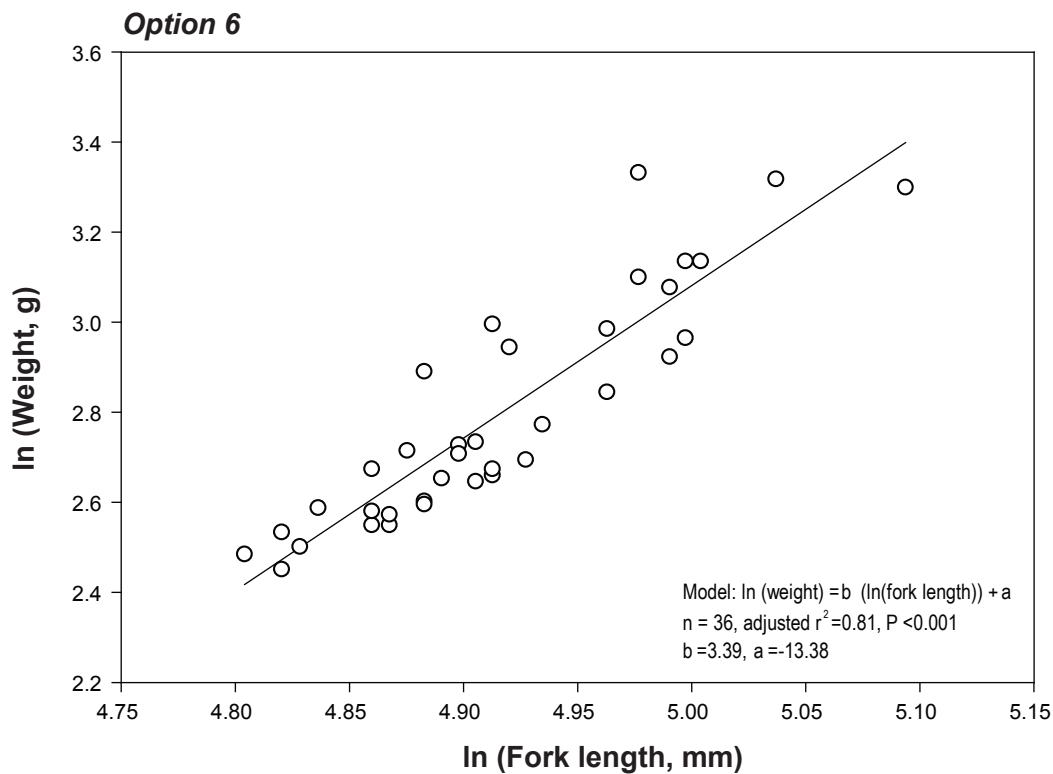
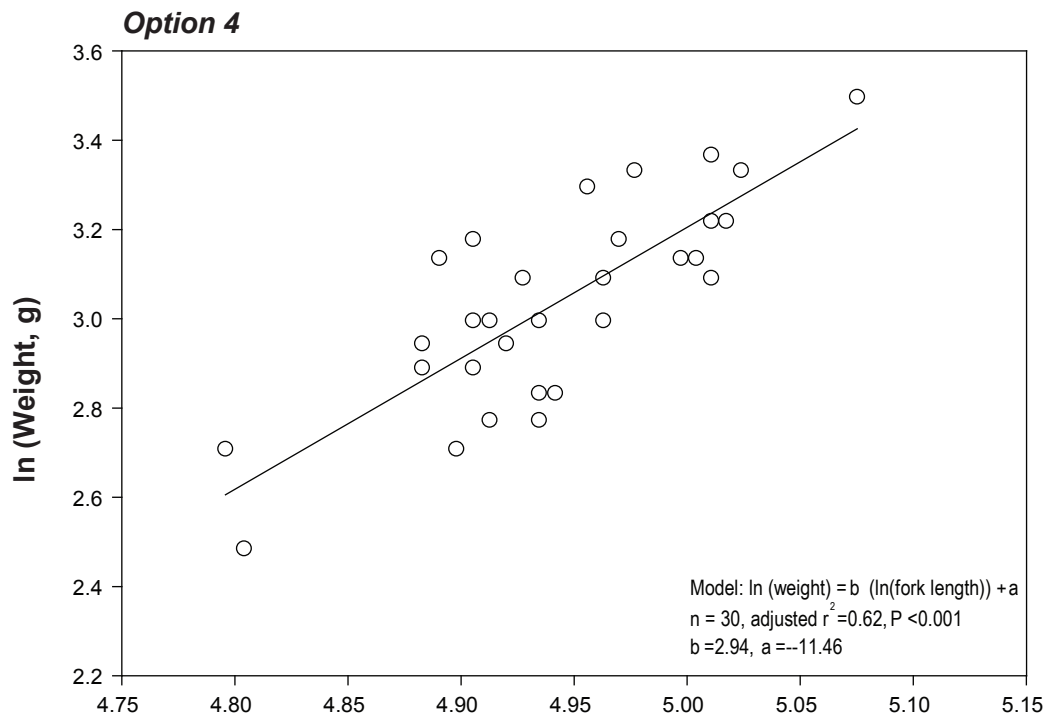
n = sample size

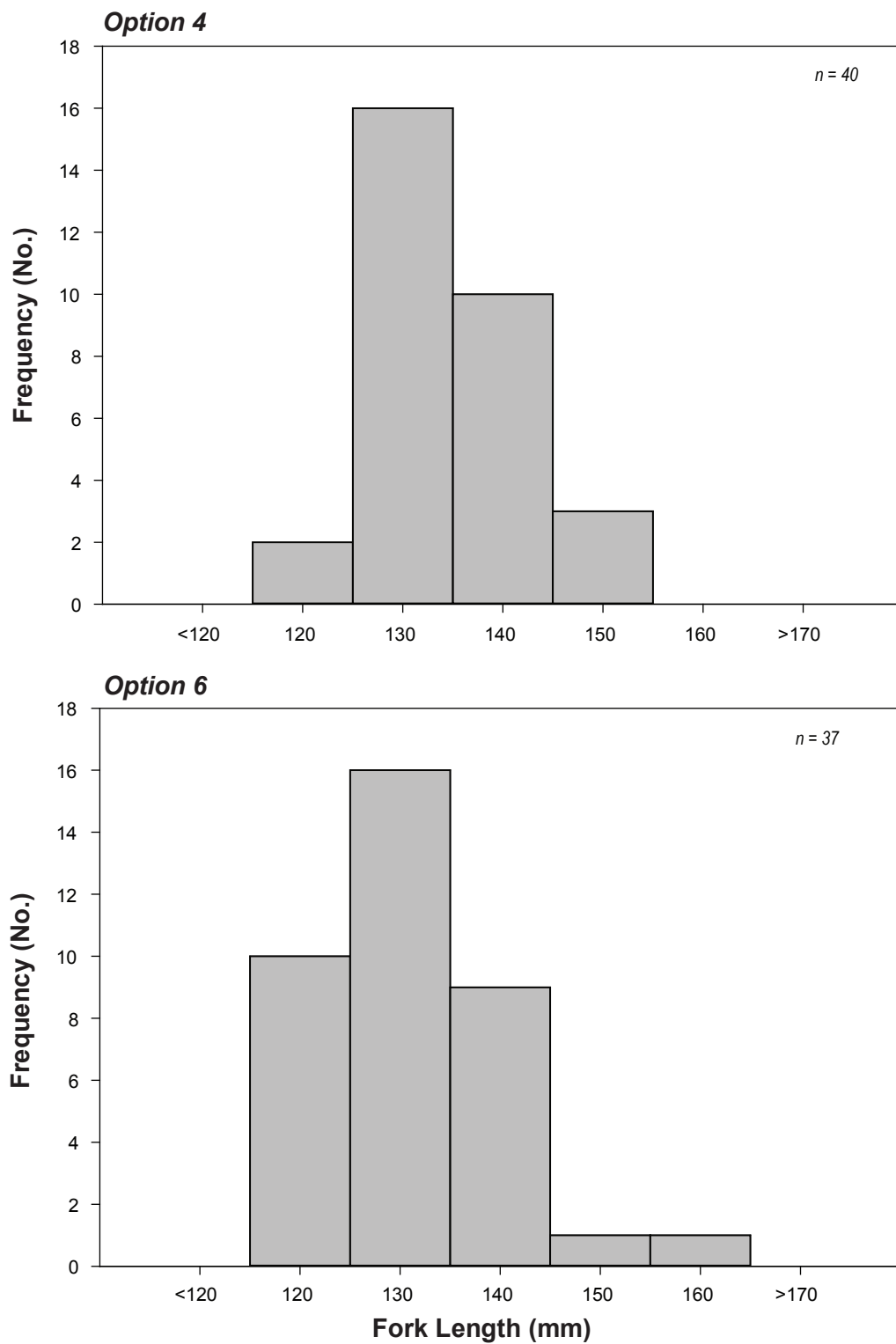
SE = standard error of the mean

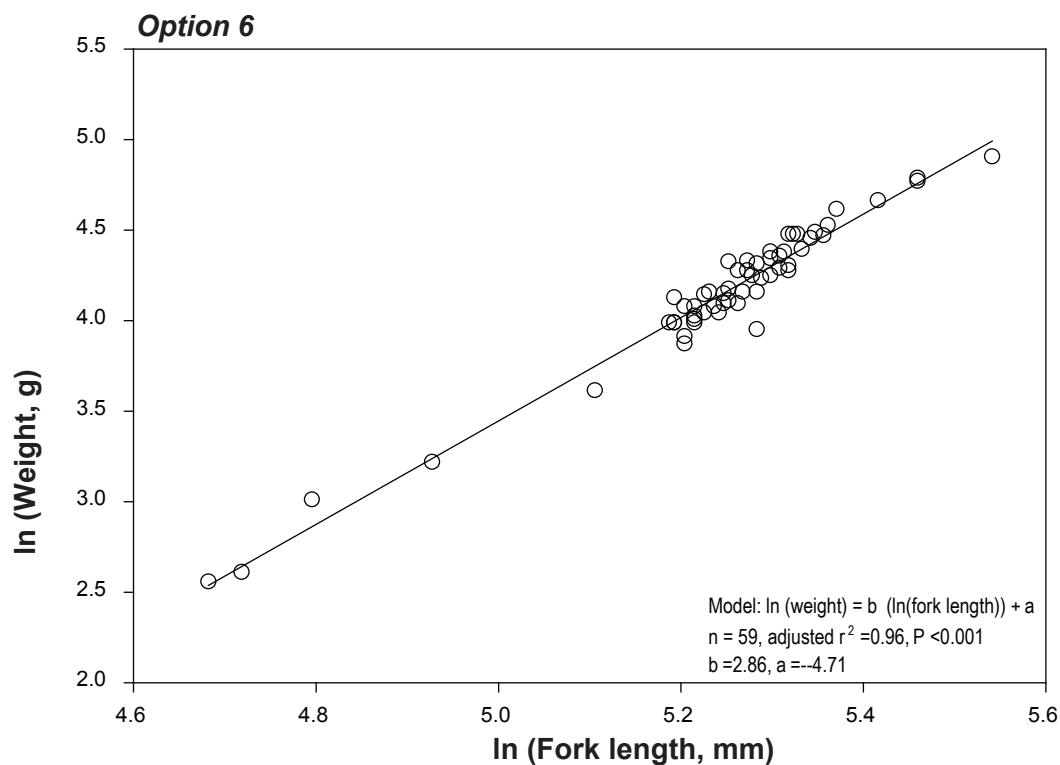
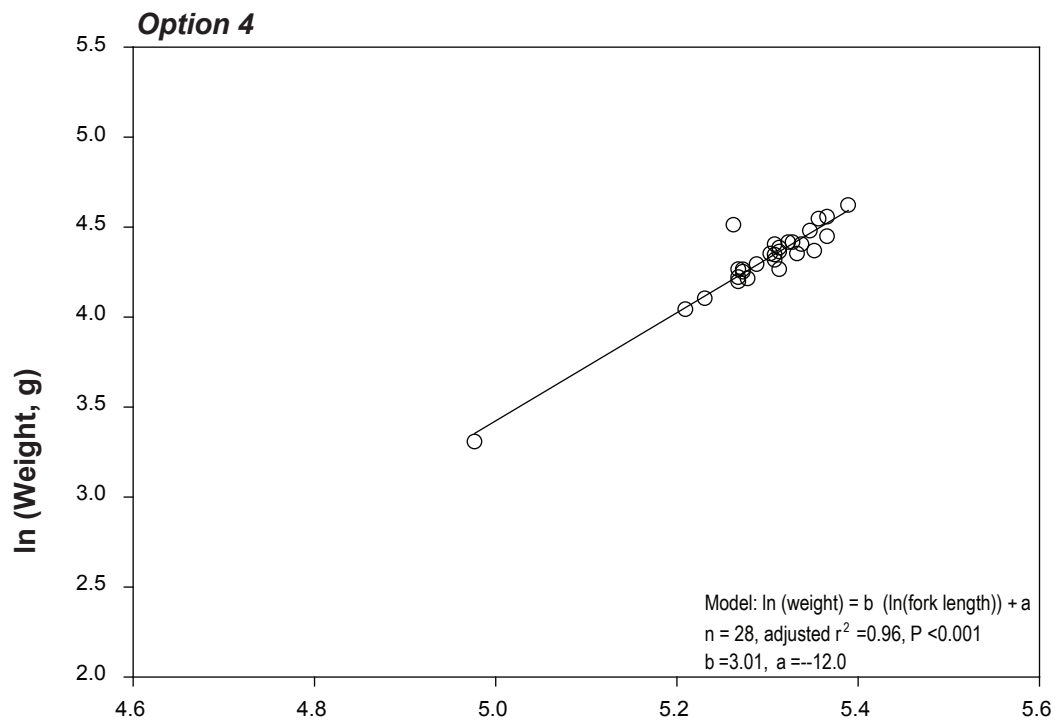
SD = standard deviation of the mean











The relationship between fourhorn sculpin length and weight was statistically significant (GLM, $F_{1,19} = 2719.70$, $P < 0.001$; Figure 3.3-1). In contrast to Option 4, the captured fish represented a range of sizes from 25 mm to 237 mm (Figure 3.3-2). The length-frequency distribution showed two modes: one comprised of small juveniles and centered on the 20-30 mm range, and a second of adults centered on the 220-230 mm range. A few individuals of intermediate sizes were captured as well. The mode comprised of larger adult sculpin was similar to modes reported for other populations (Percy 1975).

The weight-length relationship for Pacific herring was statistically significant (GLM, $F_{1,55} = 1483.62$, $P < 0.001$; Figure 3.3-5). The length frequency distribution shows one predominate mode around the average length of 189 mm (Figure 3.3-6). There was also an additional second smaller grouping of individuals in the 90-130 mm range. As with the Pacific herring captured in Option 4, those captured at Option 6 may be smaller than populations studied elsewhere in the Arctic (Percy 1975).

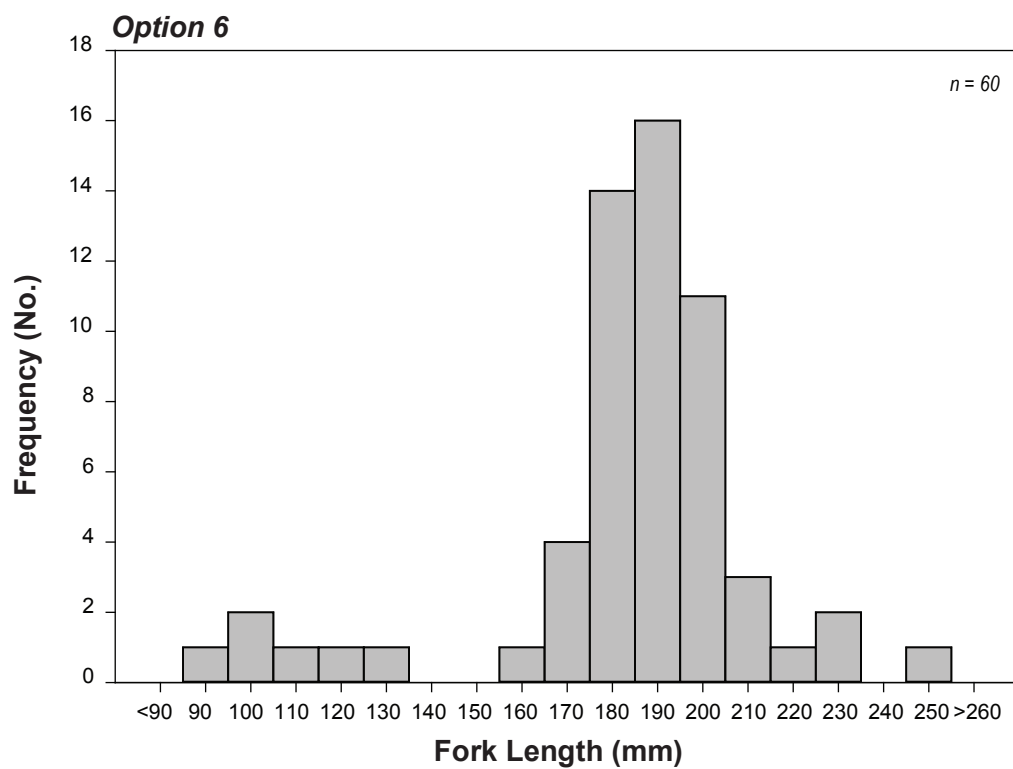
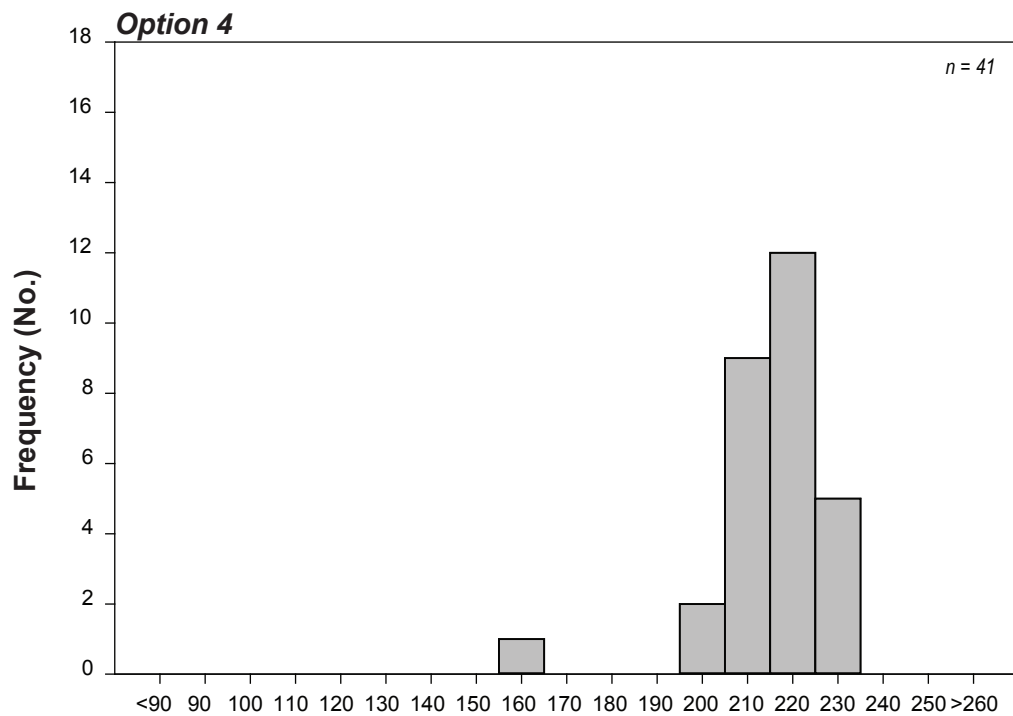
Saffron cod length and weight were significantly related (GLM, $F_{1,30} = 106.11$, $P < 0.001$; Figure 3.3-7). The length distribution of saffron cod in Option 6 was unimodal and represented a wide range of sizes (Figure 3.3-8). The mode of the frequency distribution was similar to the mode of adult saffron cod captured in the Mackenzie Delta (Percy 1975) but very few small young fish were captured, despite small saffron cod providing the majority of the catch in similar sampling conducted in the Beaufort Sea (Wiswar and Frugé 2006). Saffron cod in Option 6 were observed preying on the spawning capelin and may have been following the capelin schools. This may explain both their relative abundance near the Option 6 capelin schools and the prevalence of large fish able to capture and eat adult capelin. Alternately, salinity differences between the Beaufort Sea and Bathurst Inlet could be responsible for the lack of juvenile saffron cod.

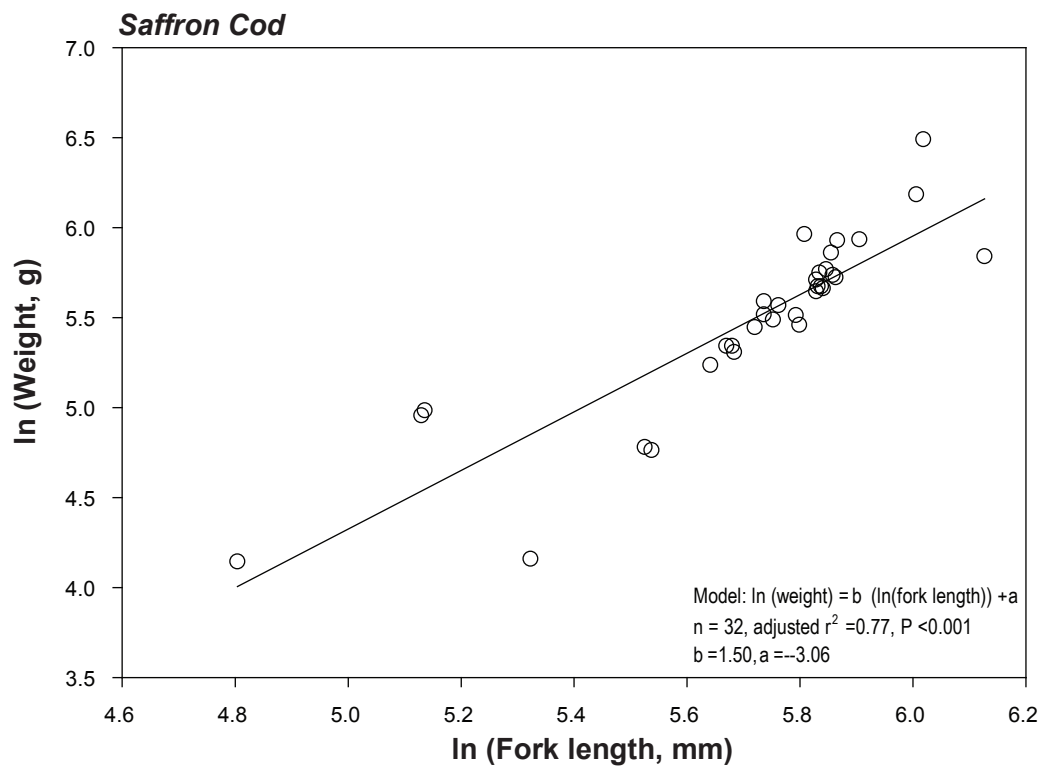
3.4 SPAWNING

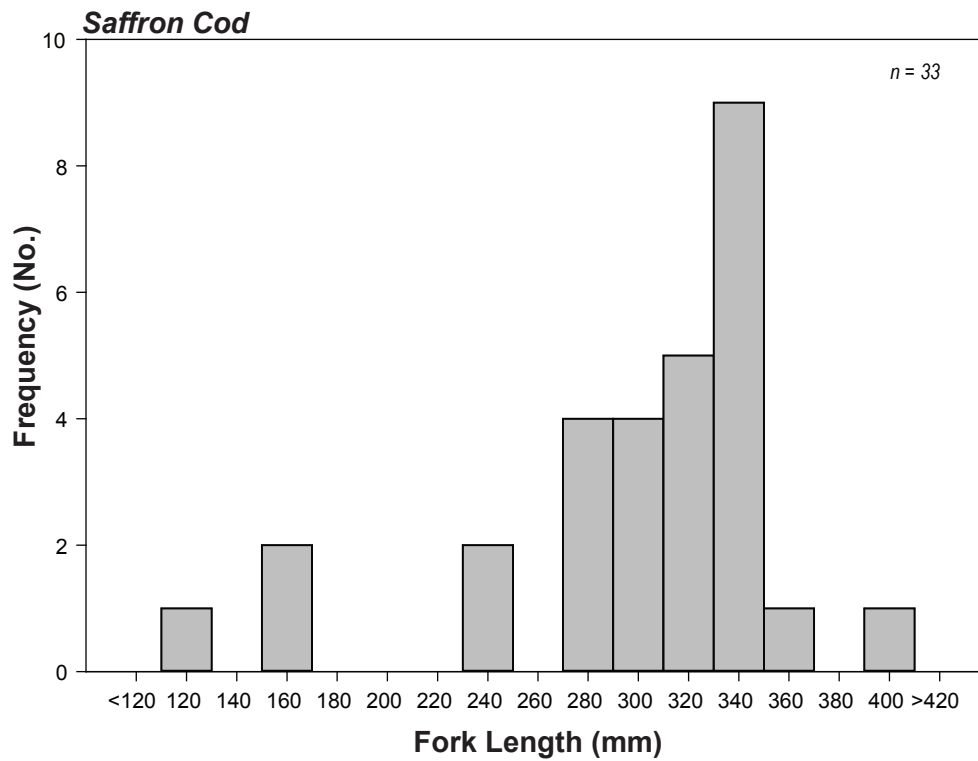
Capelin spawn in large schools that cluster annually on suitable spawning areas (Vandeperre and Methven 2007). In general, capelin spawn in the intertidal zone by “rolling” on beaches and depositing eggs in the interstitial zones of the intertidal substrate. Spawning generally occurs on beaches with sand or fine gravel substrate (Arimitsu et al. 2008). However, in some areas spawning is subtidal and may take place on substrates up to 280 m deep and a given population may vary between intertidal and subtidal spawning between years (Walters 1955). Hydroacoustic surveys of the nearshore environment at Option 4 and Option 6 showed very little loose sand or small gravel below 5-10 m of depths. The mud substrates that predominate in the subtidal areas are unsuitable for capelin spawning and it is unlikely that any spawning takes place outside of the intertidal and near subtidal regions.

The capelin spawning period in Bathurst Inlet occurs in late July (Richardson 1833). On July 15, large schools of fish believed to be capelin were observed on the hydroacoustic echograms at Option 6. On July 18, large schools of capelin were observed in the intertidal and near subtidal zone of the north end of Option 6 stretching for over 1 km north (Plate 3.4-1). Over the following three to four days, the schools extended their range south and capelin were observed in Option 4. On July 21, the schools appeared to be holding over certain beaches and an aerial spawning survey was undertaken.

The survey area and spawning areas identified during the aerial survey are shown in Figure 3.4-1. Capelin spawning schools were observed over much of the survey area, but while the schools observed on the southern end of the survey area were primarily small and widely spaced, schools observed in Option 6 area were thickly clustered and covered more area (Plate 3.4-2).







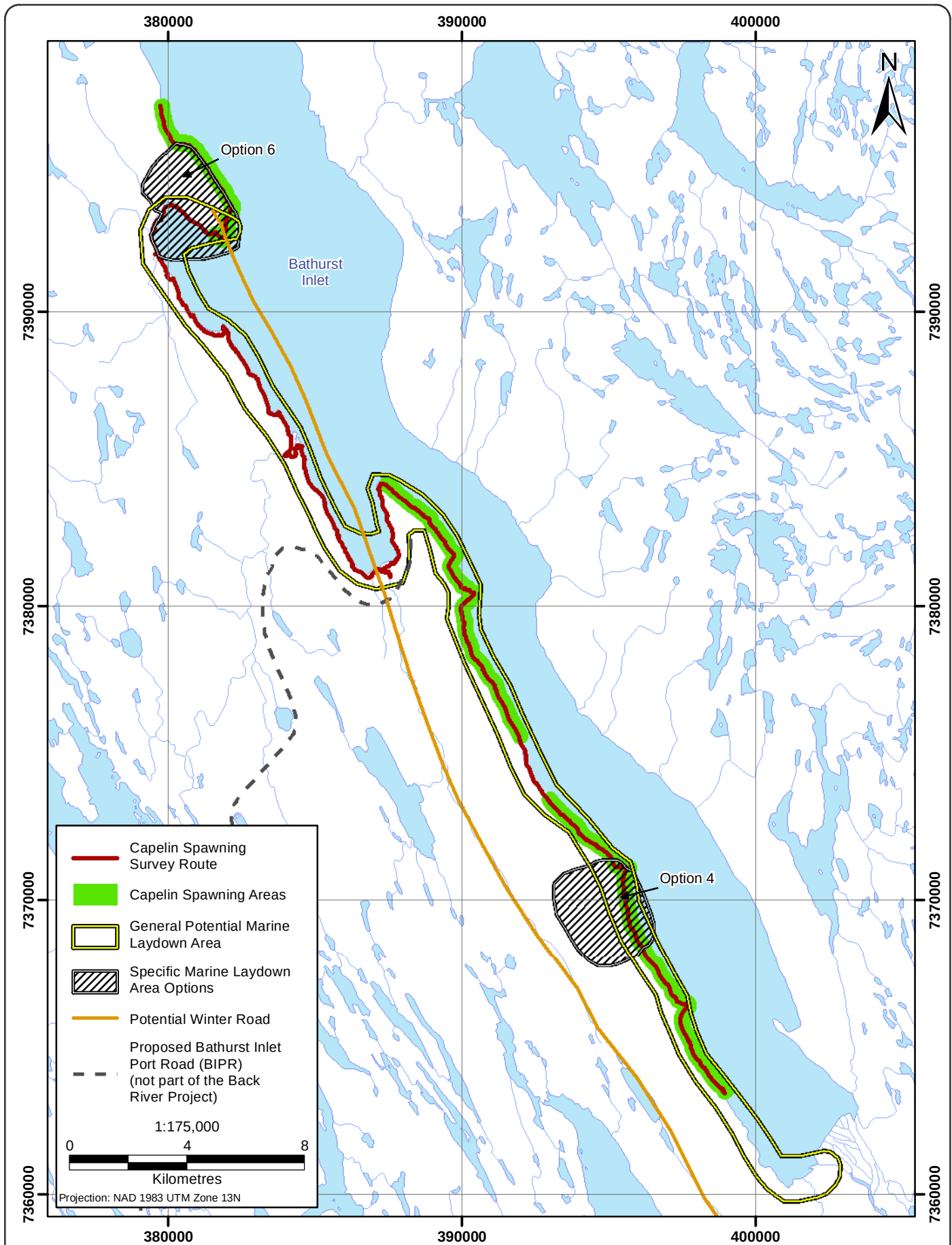


Figure 3.4-1



Plate 3.4-1. Capelin holding prior to spawning at Option 6. July 18, 2012.

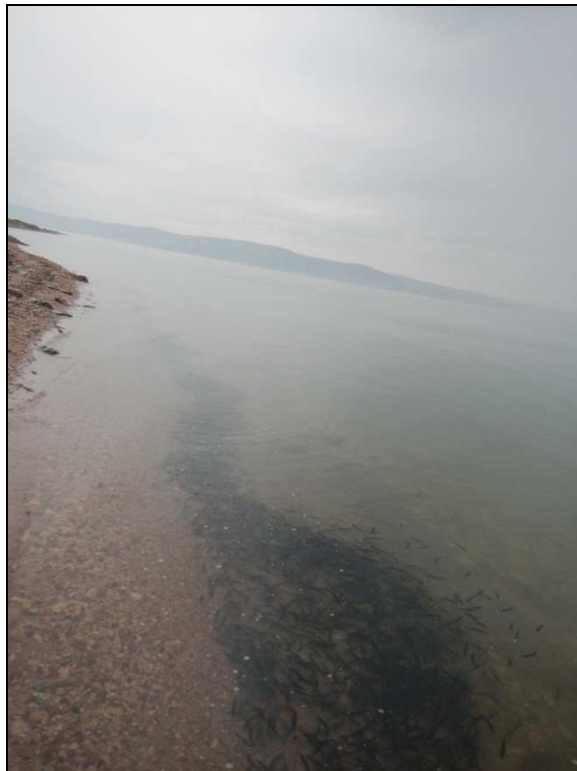


Plate 3.4-2. Capelin schools in Option 6 contained thousands of individuals and covered large sections of beach. July 18, 2012.

3.5 NON-MARINE FISH HABITAT

No potential freshwater fish habitat was found at either site. Both areas were largely dry with no ponds or potential overwintering areas that might support a fish population. Several small channels were found but were dry, partially dry, or otherwise inappropriate for fish habitat and no further surveys were considered necessary.

4. Summary

4. Summary

At Marine Laydown Area Option 4, two intertidal habitat units were identified, with a total of six intertidal habitat zones identified within the units. Sand and small gravels were the primary intertidal substrate types. Substrate in the nearshore marine habitat ranged from soft mud to cobble, with fine sediments dominating. No freshwater habitat was identified in the adjacent on-land areas. Eleven fish species were identified: Arctic cisco, Arctic flounder, broad whitefish, capelin, fourhorn sculpin, lake trout, ninespine stickleback, Pacific herring, rainbow smelt, saffron cod, and starry flounder.

Three intertidal habitat units were identified at Marine Laydown Area Option 6, with a combined total of five intertidal habitat zones. While fine sediment, including sand and gravel, was the primary substrate type, cobble and boulder substrates were found in one habitat unit. Clean rock and gravel was found in very shallow sections of the nearshore marine area, but deeper nearshore habitat was entirely fine sediment or larger substrate types covered in a layer of fine sediment. No freshwater fish habitat was identified in the area. The eleven fish species identified in Option 6 were: Arctic cisco, Arctic flounder, broad whitefish, capelin, fourhorn sculpin, ninespine stickleback, Pacific herring, rainbow smelt, saffron cod, slender eelblenny, and starry flounder.

An aerial survey of capelin spawning habitat was conducted in both potential Marine Laydown Areas and the surrounding shoreline. Capelin spawning schools were observed in July in most of the surveyed area along the western shore of Bathurst Inlet. Schools were observed in the Option 6 area and along the majority of the shoreline surveyed from south of the Option 4 area to the peninsula between the two Option areas.

With the exception of lake trout and slender eelblenny, all fish species were found in both areas. Many of the species found in the area are associated with brackish environments or anadromous life histories, which suggests a strong freshwater influence in the ecosystem. Multiple life stages were recorded at both sites, including rearing juvenile fish and spawning adult capelin. No SARA-listed species or other species of special conservation concern were captured.

References

References

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Appendix 3.1-1

Detailed Intertidal Habitat Surveys, Back River Project,
2012

Appendix 3.1-1. Detailed Intertidal Habitat Surveys, Back River Project, 2012

Option	Transect	Zone	Length (m)	Substrate					Cover	
				Sand %	Gravel %	Cobble %	Boulder %	Rock %	Type	Amount
4	1	A	6.0	80	20	0	0	0	None	N/A
4	1	B	1.2	50	50	0	0	0	None	N/A
4	1	C	3.5	80	80	0	0	0	None	N/A
4	1	D	5.0	75	75	0	0	0	None	N/A
4	2	A	3.5	10	80	10	0	0	None	N/A
4	2	B	9.0	80	20	0	0	0	Algae	Moderate
6	1	A	15.2	10	10	50	30	0	None	N/A
6	1	B	3.3	5	25	50	15	5	None	N/A
6	2	A	1.1	25	75	0	0	0	None	N/A
6	2	B	2.8	90	10	0	0	0	None	N/A
6	2	C	16.7	75	25	0	0	0	None	N/A

N/A = not applicable

Appendix 3.2-1

Sampling Gear Set Data, Back River Project, 2012

Appendix 3.2-1. Sampling Gear Set Data, Back River Project, 2012

Site	Gear	#	Date Set	Time Set	Date Removed	Time Removed	Easting	Northing
Option 4	CT	1	11-Aug-12	16:06	12-Aug	10:32	395581	7370283
Option 4	CT	2	11-Aug-12	16:10	12-Aug	10:35	395565	7370424
Option 4	CT	3	11-Aug-12	16:13	12-Aug	10:40	395558	7370592
Option 4	CT	4	11-Aug-12	16:17	12-Aug	10:46	395567	7370790
Option 4	CT	5	11-Aug-12	16:20	12-Aug	10:49	395623	7370963
Option 4	CT	6	11-Aug-12	16:25	12-Aug	10:52	395563	7371402
Option 4	CT	7	11-Aug-12	16:27	12-Aug	10:57	395499	7371362
Option 4	CT	8	11-Aug-12	16:28	12-Aug	11:01	395431	7371344
Option 6	CT	1	8-Aug-12	17:00	9-Aug	10:43	382195	7393496
Option 6	CT	2	8-Aug-12	17:01	9-Aug	11:45	382180	7393445
Option 6	CT	3	8-Aug-12	17:04	9-Aug	11:46	382142	7393243
Option 6	CT	4	8-Aug-12	17:06	9-Aug	10:50	382048	7392774
Option 6	CT	5	8-Aug-12	17:18	9-Aug	11:00	381962	7392480
Option 6	CT	6	8-Aug-12	17:20	9-Aug	11:40	381820	7392346
Option 6	CT	7	8-Aug-12	17:25	9-Aug	11:15	381373	7392483
Option 6	CT	8	8-Aug-12	17:30	9-Aug	11:25	381198	7392546
Option 6	CT	9	9-Aug-12	10:55	11-Aug	9:15	380956	7392663
Option 6	CT	10	9-Aug-12	10:59	11-Aug	9:18	380803	7392745
Option 6	CT	11	9-Aug-12	10:58	11-Aug	9:19	380584	7392879
Option 6	CT	12	9-Aug-12	11:00	11-Aug	9:22	380424	7393176
Option 4	FGN	1	11-Aug-12	14:43	11-Aug	15:38	395549	7370740
Option 4	FGN	2	12-Aug-12	11:05	12-Aug	12:05	395560	7370934
Option 4	FGN	3	12-Aug-12	13:25	12-Aug	14:10	395574	7370345
Option 6	FGN	1	8-Aug-12	15:00	8-Aug	15:45	380584	7393053
Option 6	FGN	2	9-Aug-12	11:36	9-Aug	12:30	380282	7393265
Option 6	FGN	3	9-Aug-12	13:15	9-Aug	14:15	380897	7392856
Option 4	LL	1	15-Jul-12	13:05	16-Jul	14:45	395528	7370292
Option 4	LL	2	22-Jul-12	13:15	22-Jul	16:05	395617	7370990
Option 6	LL	1	19-Jul-12	13:18	19-Jul	15:30	380436	7393436
Option 6	LL	2	21-Jul-12	11:50	21-Jul	15:11	382099	7392985
Option 4	MT	1	14-Jul-12	15:10	15-Jul	9:50	395511	7370221
Option 4	MT	2	14-Jul-12	15:13	15-Jul	9:51	395506	7370242
Option 4	MT	3	14-Jul-12	15:15	15-Jul	9:52	395507	7370249
Option 4	MT	4	14-Jul-12	15:18	15-Jul	9:53	395497	7370270
Option 4	MT	5	14-Jul-12	15:21	15-Jul	9:58	395487	7370307
Option 4	MT	6	14-Jul-12	15:25	15-Jul	10:10	395478	7370355
Option 4	MT	7	14-Jul-12	15:28	15-Jul	10:13	395462	7370410
Option 4	MT	8	14-Jul-12	15:30	15-Jul	10:15	395457	7370459
Option 4	MT	9	14-Jul-12	15:33	15-Jul	10:20	395457	7370495
Option 4	MT	10	14-Jul-12	15:37	15-Jul	10:27	395440	7370560
Option 4	MT	11	14-Jul-12	15:39	15-Jul	10:31	395445	7370610
Option 4	MT	12	14-Jul-12	15:40	15-Jul	10:40	395445	7370666
Option 4	MT	13	14-Jul-12	15:45	15-Jul	10:42	395452	7370704
Option 4	MT	14	14-Jul-12	15:48	15-Jul	10:43	395457	7370745

Appendix 3.2-1. Sampling Gear Set Data, Back River Project, 2012

Site	Gear	#	Date Set	Time Set	Date Removed	Time Removed	Easting	Northing
Option 4	MT	15	14-Jul-12	15:50	15-Jul	10:45	395459	7370774
Option 4	MT	16	15-Jul-12	11:03	16-Jul	9:35	395476	7370841
Option 4	MT	17	15-Jul-12	11:05	16-Jul	9:38	395492	7370882
Option 4	MT	18	15-Jul-12	11:08	16-Jul	9:41	395510	7370925
Option 4	MT	19	15-Jul-12	11:10	16-Jul	9:44	395540	7370982
Option 4	MT	20	15-Jul-12	11:13	16-Jul	9:46	395568	7371034
Option 4	MT	21	15-Jul-12	11:15	16-Jul	9:50	395591	7371082
Option 4	MT	22	15-Jul-12	11:17	16-Jul	9:55	395607	7371118
Option 4	MT	23	15-Jul-12	11:18	16-Jul	9:59	395625	7371172
Option 4	MT	24	15-Jul-12	11:21	16-Jul	10:05	395630	7371211
Option 4	MT	25	15-Jul-12	11:24	16-Jul	10:07	395643	7371296
Option 4	MT	26	15-Jul-12	11:27	16-Jul	10:08	395621	7371396
Option 4	MT	27	15-Jul-12	11:30	16-Jul	10:15	395556	7371392
Option 4	MT	28	15-Jul-12	11:32	16-Jul	10:18	395534	7371361
Option 4	MT	29	15-Jul-12	11:34	16-Jul	10:20	395473	7371317
Option 4	MT	30	15-Jul-12	11:36	16-Jul	10:22	395382	7371295
Option 6	MT	1	18-Jul-12	14:20	19-Jul	14:40	382089	7393685
Option 6	MT	2	18-Jul-12	14:10	19-Jul	14:41	382145	7393571
Option 6	MT	3	18-Jul-12	14:05	19-Jul	14:51	382066	7393379
Option 6	MT	4	18-Jul-12	14:00	19-Jul	14:53	382010	7393252
Option 6	MT	5	18-Jul-12	13:56	19-Jul	14:00	381957	7393064
Option 6	MT	6	18-Jul-12	13:50	19-Jul	14:02	381952	7392935
Option 6	MT	7	18-Jul-12	13:45	19-Jul	14:25	381958	7392784
Option 6	MT	8	18-Jul-12	14:32	19-Jul	14:11	381902	7392614
Option 6	MT	9	18-Jul-12	14:38	19-Jul	14:12	381888	7392546
Option 6	MT	10	18-Jul-12	14:43	19-Jul	14:13	381789	7392537
Option 6	MT	11	18-Jul-12	14:49	19-Jul	14:15	381695	7392631
Option 6	MT	12	18-Jul-12	14:52	19-Jul	14:17	381564	7392689
Option 6	MT	13	18-Jul-12	14:56	19-Jul	14:18	381445	7392656
Option 6	MT	14	18-Jul-12	14:58	19-Jul	14:20	-	-
Option 6	MT	15	19-Jul-12	14:58	21-Jul	10:44	380371	7393512
Option 6	MT	16	19-Jul-12	15:01	21-Jul	10:47	380289	7393561
Option 6	MT	17	19-Jul-12	15:06	21-Jul	10:52	380222	7393587
Option 6	MT	18	19-Jul-12	15:09	21-Jul	10:55	380135	7393597
Option 6	MT	19	19-Jul-12	15:12	21-Jul	10:59	380018	7393572
Option 6	MT	20	19-Jul-12	15:14	21-Jul	11:02	379931	7393465
Option 6	MT	21	19-Jul-12	15:17	21-Jul	11:04	379908	7393340
Option 6	MT	22	19-Jul-12	15:18	21-Jul	11:18	379834	7393294
Option 6	MT	23	19-Jul-12	15:20	21-Jul	11:22	379816	7393153
Option 6	MT	24	19-Jul-12	15:23	21-Jul	11:25	379786	7393048
Option 6	MT	25	19-Jul-12	15:25	21-Jul	11:28	379733	7393074
Option 6	MT	26	19-Jul-12	15:08	21-Jul	11:35	379675	7392943
Option 6	MT	27	19-Jul-12	15:31	21-Jul	11:38	379652	7392893
Option 6	MT	28	19-Jul-12	15:32	21-Jul	11:40	393506	7372949

Appendix 3.2-1. Sampling Gear Set Data, Back River Project, 2012

Site	Gear	#	Date Set	Time Set	Date Removed	Time Removed	Easting	Northing
Option 4	SGN	1	22-Jul-12	12:30	22-Jul	12:55	395689	7370791
Option 4	SGN	2	22-Jul-12	13:30	22-Jul	14:25	395654	7370471
Option 4	SGN	3	22-Jul-12	14:45	22-Jul	15:45	395536	7370722
Option 4	SGN	4	11-Aug-12	14:52	11-Aug	15:28	395386	7371399
Option 4	SGN	5	12-Aug-12	11:16	12-Aug	11:50	395496	7370762
Option 6	SGN	1	21-Jul-12	13:10	21-Jul	13:55	382059	7392898
Option 6	SGN	2	21-Jul-12	16:05	21-Jul	16:35	382200	7393037
Option 6	SGN	3	9-Aug-12	12:12	9-Aug	13:45	380183	7392750
Option 4	BS	1	14-Jul-12	16:10	14-Jul	-	395492	7370257
Option 4	BS	2	15-Jul-12	12:30	15-Jul	-	395486	7370264
Option 4	BS	3	15-Jul-12	13:35	16-Jul	-	395589	7371375
Option 4	BS	4	15-Jul-12	13:45	15-Jul	-	395589	7371375
Option 4	BS	5	15-Jul-12	14:00	15-Jul	-	395614	7371362
Option 4	BS	6	15-Jul-12	14:40	15-Jul	-	395501	7371217
Option 4	BS	7	15-Jul-12	15:00	15-Jul	-	395479	7371202
Option 4	BS	8	15-Jul-12	15:15	15-Jul	-	395464	7371201
Option 4	BS	9	15-Jul-12	15:45	15-Jul	-	395448	7370779
Option 4	BS	10	15-Jul-12	15:55	15-Jul	-	395449	7370766
Option 6	BS	1	17-Jul-12	10:20	17-Jul	-	382015	7393222
Option 6	BS	2	17-Jul-12	10:40	17-Jul	-	381956	7393049
Option 6	BS	3	17-Jul-12	10:55	17-Jul	-	381943	7392713
Option 6	BS	4	17-Jul-12	11:10	17-Jul	-	381888	7392536
Option 6	BS	5	17-Jul-12	11:25	17-Jul	-	381385	7392646
Option 6	BS	6	17-Jul-12	11:40	17-Jul	-	381098	7392901
Option 6	BS	7	18-Jul-12	12:00	18-Jul	-	381516	7392698
Option 6	BS	8	18-Jul-12	13:00	18-Jul	-	381908	7392658
Option 6	BS	9	18-Jul-12	13:30	18-Jul	-	381887	7392575
Option 6	BS	10	18-Jul-12	13:40	18-Jul	-	381956	7393685
Option 4	VO	1	12-Aug-12	12:00	-	-	395560	7370934
Option 6	VO	1	18-Jul-12	12:30	-	-	381902	7392634

Dash indicates not applicable

BS = Beach Seine

CT = Crab Trap

FGN = Floating Gillnet

LL = Longline

MT = Minnow Trap

SGN = Sinking Gillnet

VO = Visual Observation

Appendix 3.2-2

Summary of Effort and Catch, Back River Project, 2012

Appendix 3.2-2a. Crab Trap Effort and Catch, Back River Project, 2012

Appendix 3.2-2b. Beach Seine Effort and Catch, Back River Project, 2012

Appendix 3.2-2c. Longline Effort and Catch, Back River Project, 2012

Appendix 3.2-2d. Minnow Trap Effort and Catch, Back River Project, 2012

Appendix 3.2-2e. Gillnet Effort and Catch, Back River Project, 2012

Appendix 3.2-2a. Crab Trap Effort and Catch, Back River Project, 2012

Site	#	Soak Time (h)	Catch (No. fish)													Catch-Per-Unit-Effort (No./24 h)												
			Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR	Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR
Option 4	1	18.43	1	0	0	0	0	1	0	0	0	0	0	0	0	0.05	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	2	18.42	2	0	0	0	0	2	0	0	0	0	0	0	0	0.11	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	3	18.45	1	0	0	0	0	1	0	0	0	0	0	0	0	0.05	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	4	18.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	5	18.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	6	18.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	7	18.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	8	19.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	1	17.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	2	18.73	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	3	18.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	4	17.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	5	17.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	6	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	7	17.83	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	8	17.92	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	9	25.67	1	1	0	0	0	0	0	0	0	0	0	0	0	0.94	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	10	25.65	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	11	25.68	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	12	25.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AC = Arctic cisco

AF = Arctic flounder

BW = Broad whitefish

CP = Capelin

FHS = Fourhorn sculpin

LKTR = Lake trout

NSS = Nine spine stickleback

SC = Saffron cod

PH = Pacific herring

SF = Starry flounder

SEB = Slender eelblenny

RS = Rainbow smelt

SC = Saffron cod

Appendix 3.2-2b. Beach Seine Effort and Catch, Back River Project, 2012

Site	#	Catch (No. fish)													Catch-Per-Unit-Effort (No./100 ² of net area)												
		Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR	Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR
Option 4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	2	3	0	0	0	0	0	0	3	0	0	0	0	0	5.97	0.00	0.00	0.00	0.00	0.00	0.00	5.97	0.00	0.00	0.00	0.00	0.00
Option 4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	4	11	1	0	0	0	0	0	10	0	0	0	0	0	21.89	1.99	0.00	0.00	0.00	0.00	0.00	19.90	0.00	0.00	0.00	0.00	0.00
Option 4	5	8	0	0	0	0	0	0	8	0	0	0	0	0	15.92	0.00	0.00	0.00	0.00	0.00	0.00	15.92	0.00	0.00	0.00	0.00	0.00
Option 4	6	32	0	0	0	0	0	0	32	0	0	0	0	0	63.68	0.00	0.00	0.00	0.00	0.00	0.00	63.68	0.00	0.00	0.00	0.00	0.00
Option 4	7	17	0	0	0	0	2	0	15	0	0	0	0	0	33.83	0.00	0.00	0.00	0.00	3.98	0.00	29.85	0.00	0.00	0.00	0.00	0.00
Option 4	8	9	0	0	0	0	2	0	6	0	0	0	1	0	17.91	0.00	0.00	0.00	0.00	3.98	0.00	11.94	0.00	0.00	0.00	1.99	0.00
Option 4	9	3	0	0	0	0	0	0	3	0	0	0	0	0	5.97	0.00	0.00	0.00	0.00	0.00	0.00	5.97	0.00	0.00	0.00	0.00	0.00
Option 4	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	1	84	0	0	0	0	0	0	0	0	84	0	0	0	167.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	167.16	0.00	0.00	0.00
Option 6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	5	3	0	0	0	0	0	0	3	0	0	0	0	0	5.97	0.00	0.00	0.00	0.00	0.00	0.00	5.97	0.00	0.00	0.00	0.00	0.00
Option 6	6	1	0	0	0	0	0	0	1	0	0	0	0	0	1.99	0.00	0.00	0.00	0.00	0.00	0.00	1.99	0.00	0.00	0.00	0.00	0.00
Option 6	7	72	1	0	0	0	0	0	7	0	64	0	0	0	143.28	1.99	0.00	0.00	0.00	0.00	0.00	13.93	0.00	127.36	0.00	0.00	0.00
Option 6	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	9	1	0	0	0	0	1	0	0	0	0	0	0	0	1.99	0.00	0.00	0.00	0.00	1.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AC = Arctic cisco

AF = Arctic flounder

BW = Broad whitefish

CP = Capelin

FHS = Fourhorn sculpin

LKTR = Lake trout

NSS = Nine spine stickleback

SC = Saffron cod

PH = Pacific herring

SF = Starry flounder

SEB = Slender eelblenny

RS = Rainbow smelt

SC = Saffron cod

Appendix 3.2-2c. Longline Effort and Catch, Back River Project, 2012

Site	#	Soak Time (h)	Catch (No. fish)												Catch-Per-Unit-Effort (No. of fish/No. of pairs of hooks/24 h)												
			Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR	Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS
Option 4	1	1.67	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	2	2.83	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	1	3.53	1	0	0	0	0	0	0	0	1	0	0	0	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
Option 6	2	6.02	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AC = Arctic cisco

AF = Arctic flounder

BW = Broad whitefish

CP = Capelin

FHS = Fourhorn sculpin

LKTR = Lake trout

NSS = Nine spine stickleback

SC = Saffron cod

PH = Pacific herring

SF = Starry flounder

SEB = Slender eelblenny

RS = Rainbow smelt

SC = Saffron cod

Appendix 3.2-2d. Minnow Trap Effort and Catch, Back River Project, 2012

Site	#	Soak Time (h)	Catch (No. fish)												Catch-Per-Unit-Effort (No./24 h)												
			Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR	Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS
Option 4	1	18.67	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	2	18.63	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	3	18.62	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	4	18.58	1	0	0	0	0	0	0	1	0	0	0	0	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00
Option 4	5	18.62	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	6	19.42	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	7	19.42	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	8	19.42	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	9	19.45	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	10	19.50	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	11	19.53	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	12	19.67	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	13	19.62	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	14	19.58	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	15	19.58	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	16	21.20	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	17	25.22	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	18	25.22	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	19	25.23	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	20	25.22	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	21	25.25	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	22	25.30	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	23	25.35	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	24	26.07	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	25	26.05	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	26	26.02	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	27	26.08	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	28	26.10	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	29	26.10	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4	30	26.10	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 6	1	24.33	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 6	2	24.52	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 6	3	24.77	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 6	4	24.88	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 6	5	24.73	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 6	6	24.87	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 6	7	25.33	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Appendix 3.2-2d. Minnow Trap Effort and Catch, Back River Project, 2012

Site	#	Soak Time (h)	Catch (No. fish)													Catch-Per-Unit-Effort (No./24 h)												
			Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR	Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR
Option 6	8	23.65	1	0	0	0	0	0	0	1	0	0	0	0	0	1.01	0.00	0.00	0.00	0.00	0.00	0.00	1.01	0.00	0.00	0.00	0.00	0.00
Option 6	9	23.57	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	10	23.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	11	23.43	1	0	0	0	0	0	0	1	0	0	0	0	0	1.02	0.00	0.00	0.00	0.00	0.00	0.00	1.02	0.00	0.00	0.00	0.00	0.00
Option 6	12	23.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	13	23.37	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	14	23.37	1	0	0	0	0	0	0	0	0	0	0	1	0	1.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.03	0.00
Option 6	15	43.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	16	42.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	17	42.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	18	42.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	19	42.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	20	43.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	21	43.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	22	43.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	23	43.37	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	24	43.37	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	25	43.38	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	26	43.78	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	27	43.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	28	43.47	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AC = Arctic cisco

AF = Arctic flounder

BW = Broad whitefish

CP = Capelin

FHS = Fourhorn sculpin

LKTR = Lake trout

NSS = Nine spine stickleback

SC = Saffron cod

PH = Pacific herring

SF = Starry flounder

SEB = Slender eelblenny

RS = Rainbow smelt

SC = Saffron cod

Appendix 3.2-2e. Gillnet Effort and Catch, Back River Project, 2012

Site	#	Net Type	Soak Time (h)	Catch (No. fish)												Catch-Per-Unit-Effort (No./100m²/h)													
				Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR	Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR
Option 4	1	Floating	0.92	4	0	0	3	1	0	0	0	0	0	0	0	0	1.99	0.00	0.00	1.49	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	2	Floating	0.57	31	1	30	0	0	0	0	0	0	0	0	0	0	24.99	0.81	24.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	3	Floating	0.75	2	0	2	0	0	0	0	0	0	0	0	0	0	1.22	0.00	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	1	Sinking	0.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	2	Sinking	0.92	3	0	0	0	1	1	0	0	1	0	0	0	0	1.49	0.00	0.00	0.00	0.50	0.50	0.00	0.00	0.50	0.00	0.00	0.00	0.00
Option 4	3	Sinking	1.00	45	0	0	2	0	1	0	0	1	40	1	0	0	20.56	0.00	0.00	0.91	0.00	0.46	0.00	0.00	0.46	18.27	0.46	0.00	0.00
Option 4	4	Sinking	0.60	5	1	4	0	0	0	0	0	0	0	0	0	0	3.81	0.76	3.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	5	Sinking	0.57	5	0	5	0	0	0	0	0	0	0	0	0	0	4.03	0.00	4.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	1	Floating	0.75	5	0	2	0	2	0	0	0	0	0	1	0	0	3.05	0.00	1.22	0.00	1.22	0.00	0.00	0.00	0.00	0.00	0.61	0.00	0.00
Option 6	2	Floating	1.57	3	0	2	0	1	0	0	0	0	0	0	0	0	0.87	0.00	0.58	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	3	Floating	1.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	1	Sinking	17.07	72	0	26	0	4	0	0	0	42	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	2	Sinking	17.70	21	0	0	0	4	2	0	13	1	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	3	Sinking	18.33	72	3	45	2	3	0	7	0	1	0	11	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AC = Arctic cisco

AF = Arctic flounder

BW = Broad whitefish

CP = Capelin

FHS = Fourhorn sculpin

LKTR = Lake trout

NSS = Nine spine stickleback

SC = Saffron cod

PH = Pacific herring

SF = Starry flounder

SEB = Slender eelblenny

RS = Rainbow smelt

SC = Saffron cod

Appendix 3.3-1

Summary of Biological Data

Appendix 3.3-1a. Biological Data from Fish Captured in Option 4, 2012

Appendix 3.3-1b. Biological Data from Fish Captured in Option 6, 2012

Appendix 3.3-1a. Biological Data from Fish Captured in Option 4, 2012

Method	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
SGN	2	AC	317	348.0	1.09	-	-	-
FGN	1	AC	250	171.8	1.10	-	-	-
BS	4	AF	25	-	-	-	-	-
SGN	4	AF	89	7.7	1.09	-	-	-
FGN	2	AF	295	423.0	1.65	-	-	-
SGN	3	BW	367	698.0	1.41	-	-	-
SGN	3	BW	430	914.0	1.15	-	-	-
FGN	1	BW	411	961.0	1.38	-	-	-
FGN	1	BW	516	1664.0	1.21	-	-	-
FGN	1	BW	480	1633.0	1.48	-	-	-
SGN	3	CP	133	-	-	-	-	-
SGN	3	CP	136	20.0	0.80	-	-	-
SGN	3	CP	122	12.0	0.66	-	-	-
SGN	3	CP	132	18.0	0.78	M	-	-
SGN	3	CP	148	23.0	0.71	M	-	-
SGN	3	CP	134	15.0	0.62	M	-	-
SGN	3	CP	139	16.0	0.60	M	-	-
SGN	3	CP	149	23.0	0.70	M	-	-
SGN	3	CP	137	19.0	0.74	M	-	-
SGN	3	CP	145	28.0	0.92	M	-	-
SGN	3	CP	139	17.0	0.63	M	-	-
SGN	3	CP	152	28.0	0.80	M	-	-
SGN	3	CP	142	27.0	0.94	M	-	-
SGN	3	CP	140	17.0	0.62	M	-	-
SGN	3	CP	135	20.0	0.81	M	-	-
SGN	3	CP	135	18.0	0.73	M	-	-
SGN	3	CP	138	22.0	0.84	M	-	-
SGN	3	CP	150	25.0	0.74	M	-	-
SGN	3	CP	160	33.0	0.81	M	-	-
SGN	3	CP	144	24.0	0.80	M	-	-
SGN	3	CP	139	20.0	0.74	M	-	-
SGN	3	CP	143	22.0	0.75	M	-	-
SGN	3	CP	121	15.0	0.85	M	-	-
SGN	3	CP	136	16.0	0.64	M	-	-
SGN	3	CP	150	22.0	0.65	M	-	-
SGN	3	CP	132	19.0	0.83	M	-	-
SGN	3	CP	151	25.0	0.73	M	-	-
SGN	3	CP	143	20.0	0.68	M	-	-
SGN	3	CP	135	24.0	0.98	M	-	-
SGN	3	CP	150	29.0	0.86	M	-	-
SGN	3	CP	133	23.0	0.98	M	-	-
SGN	3	CP	-	-	-	-	-	-
SGN	3	CP	-	-	-	-	-	-
SGN	3	CP	-	-	-	-	-	-
SGN	3	CP	-	-	-	-	-	-
SGN	3	CP	-	-	-	-	-	-
SGN	3	CP	-	-	-	-	-	-
SGN	3	CP	-	-	-	-	-	-
SGN	3	CP	-	-	-	-	-	-
SGN	3	CP	-	-	-	-	-	-

Appendix 3.3-1a. Biological Data from Fish Captured in Option 4, 2012

Method	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
SGN	3	CP	-	-	-	-	-	-
SGN	3	CP	-	-	-	-	-	-
MT	4	FHS	100	7.9	0.79	-	-	-
BS	2	FHS	28	0.3	1.37	-	-	-
BS	2	FHS	28	0.2	0.91	-	-	-
BS	2	FHS	28	0.2	0.91	-	-	-
BS	4	FHS	25	0.1	0.64	-	-	-
BS	4	FHS	25	0.1	0.64	-	-	-
BS	4	FHS	28	0.1	0.46	-	-	-
BS	4	FHS	28	0.2	0.91	-	-	-
BS	4	FHS	28	0.2	0.91	-	-	-
BS	4	FHS	28	0.1	0.46	-	-	-
BS	4	FHS	29	0.3	1.23	-	-	-
BS	4	FHS	28	0.2	0.91	-	-	-
BS	4	FHS	28	0.3	1.37	-	-	-
BS	4	FHS	29	0.2	0.82	-	-	-
BS	5	FHS	25	0.0	0.00	-	-	-
BS	5	FHS	24	0.0	0.00	-	-	-
BS	5	FHS	28	0.2	0.91	-	-	-
BS	5	FHS	28	0.2	0.91	-	-	-
BS	5	FHS	26	0.1	0.57	-	-	-
BS	5	FHS	28	0.1	0.46	-	-	-
BS	5	FHS	25	0.1	0.64	-	-	-
BS	5	FHS	26	0.1	0.57	-	-	-
BS	6	FHS	28	0.1	0.46	-	-	-
BS	6	FHS	28	0.2	0.91	-	-	-
BS	6	FHS	20	0.0	0.00	-	-	-
BS	6	FHS	25	0.0	0.00	-	-	-
BS	6	FHS	26	0.1	0.57	-	-	-
BS	6	FHS	25	0.0	0.00	-	-	-
BS	6	FHS	28	0.3	1.37	-	-	-
BS	6	FHS	21	0.1	1.08	-	-	-
BS	6	FHS	22	0.1	0.94	-	-	-
BS	6	FHS	27	0.2	1.02	-	-	-
BS	6	FHS	28	0.2	0.91	-	-	-
BS	6	FHS	32	-	-	-	-	-
BS	6	FHS	29	-	-	-	-	-
BS	6	FHS	28	-	-	-	-	-
BS	6	FHS	26	-	-	-	-	-
BS	6	FHS	23	-	-	-	-	-
BS	6	FHS	24	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-

Appendix 3.3-1a. Biological Data from Fish Captured in Option 4, 2012

Method	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	8	FHS	-	-	-	-	-	-
BS	8	FHS	-	-	-	-	-	-
BS	8	FHS	-	-	-	-	-	-
BS	8	FHS	-	-	-	-	-	-
BS	8	FHS	-	-	-	-	-	-
BS	8	FHS	-	-	-	-	-	-
BS	9	FHS	-	-	-	-	-	-
BS	9	FHS	-	-	-	-	-	-
BS	9	FHS	-	-	-	-	-	-
VO	1	LKTR	-	-	-	-	-	-
BS	8	NSS	66	1.9	0.66	-	-	-
SGN	4	PH	211	78.9	0.84	-	-	-
SGN	4	PH	145	27.3	0.90	-	-	-
SGN	4	PH	203	71.2	0.85	-	-	-
SGN	4	PH	196	67.6	0.90	-	-	photo 6905
SGN	5	PH	202	81.8	0.99	-	-	-
SGN	5	PH	214	85.5	0.87	-	-	-
SGN	5	PH	201	77.6	0.96	-	-	-
SGN	5	PH	207	77.6	0.87	-	-	-
SGN	5	PH	212	94.2	0.99	-	-	-
FGN	2	PH	206	82.7	0.95	-	-	-
FGN	2	PH	194	68.1	0.93	-	-	-
FGN	2	PH	210	88.2	0.95	-	-	-
FGN	2	PH	203	80.2	0.96	-	-	-
FGN	2	PH	202	77.1	0.94	-	-	-

Appendix 3.3-1a. Biological Data from Fish Captured in Option 4, 2012

Method	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
FGN	2	PH	198	73.2	0.94	-	-	-
FGN	2	PH	202	74.9	0.91	-	-	-
FGN	2	PH	195	71.1	0.96	-	-	-
FGN	2	PH	208	81.8	0.91	-	-	-
FGN	2	PH	194	66.5	0.91	-	-	-
FGN	2	PH	214	95.3	0.97	-	-	-
FGN	2	PH	203	78.5	0.94	-	-	-
FGN	2	PH	187	60.5	0.93	-	-	-
FGN	2	PH	194	71.2	0.98	-	-	-
FGN	2	PH	193	91.1	1.27	-	-	-
FGN	2	PH	192	61.7	0.87	-	-	-
FGN	2	PH	205	82.7	0.96	-	-	-
FGN	2	PH	219	101.6	0.97	-	-	-
FGN	2	PH	195	70.2	0.95	-	-	-
FGN	2	PH	183	57.0	0.93	-	-	-
FGN	3	PH	-	-	-	-	-	-
FGN	3	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
SGN	3	RS	169	40.0	0.83	-	-	-
SGN	2	SC	305	232.0	0.82	-	-	-
SGN	3	SC	411	659.0	0.95	-	-	-
BS	7	SF	112	14.3	1.02	-	-	-
BS	7	SF	14	-	-	-	-	-
BS	8	SF	14	-	-	-	-	-
BS	8	SF	16	-	-	-	-	-
SGN	2	SF	198	106.0	1.37	-	-	-
SGN	3	SF	225	151.0	1.33	-	-	-
CT	1	SF	334	561.0	1.51	-	-	-
CT	2	SF	462	1163.0	1.18	-	-	photo 6906
CT	2	SF	357	608.0	1.34	-	-	-
CT	3	SF	334	521.0	1.40	-	-	-

Dash indicates data unavailable

BS = Beach Seine

AC = Arctic cisco

SC = Saffron cod

M = Mature

CT = Crab trap

AF = Arctic flounder

PH = Pacific herring

IM = Immature

FGN = Floating gillnet

BW = Broad whitefish

SF = Starry flounder

LL = Longline

CP = Capelin

SEB = Slender eelblenny

MT = Minnow trap

FHS = Fourhorn sculpin

RS = Rainbow smelt

SGN = Sinking gillnet

LKTR = Lake trout

SC = Saffron cod

VO = Visual Observation

NSS = Ninespine stickleback

Appendix 3.3-1b. Biological Data from Fish Captured in Option 6, 2012

[illegible]

Appendix 3.3-1b. Biological Data from Fish Captured in Option 6, 2012

MT	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	7	CP	147	18.6	0.59	-	-	-

Appendix 3.3-1b. Biological Data from Fish Captured in Option 6, 2012

[illegible]

Appendix 3.3-1b. Biological Data from Fish Captured in Option 6, 2012

MT	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
SGN	3	CP	133	-	-	-	-	-
SGN	3	CP	136	20.0	0.80	-	-	-
SGN	3	CP	122	12.0	0.66	-	-	-
SGN	3	CP	132	18.0	0.78	-	-	-
SGN	3	CP	148	23.0	0.71	-	-	-
SGN	3	CP	134	15.0	0.62	-	-	-
SGN	3	CP	139	16.0	0.60	-	-	-
SGN	3	CP	149	23.0	0.70	-	-	-
SGN	3	CP	137	19.0	0.74	-	-	-
SGN	3	CP	145	28.0	0.92	-	-	-
BS	5	FHS	25	-	-	-	-	-
BS	5	FHS	25	-	-	-	-	-
BS	5	FHS	25	-	-	-	-	-
BS	6	FHS	-	7.0	-	-	-	-
BS	7	FHS	34	0.2	0.51	-	-	-
BS	7	FHS	26	0.1	0.57	-	-	-
BS	7	FHS	30	0.2	0.74	-	-	-
BS	7	FHS	25	-	-	-	-	-
BS	7	FHS	30	0.1	0.37	-	-	-
BS	7	FHS	32	0.1	0.31	-	-	-
BS	7	FHS	30	0.2	0.74	-	-	-
MT	8	FHS	118	10.9	0.66	-	-	-
MT	11	FHS	35	0.1	0.23	-	-	-
SGN	2	FHS	169	-	-	-	-	-
SGN	2	FHS	211	95.0	1.01	-	-	-
SGN	2	FHS	208	86.0	0.96	-	-	-
SGN	2	FHS	237	132.0	0.99	-	-	-
SGN	2	FHS	235	135.0	1.04	-	-	-
SGN	2	FHS	226	117.0	1.01	-	-	-
SGN	2	FHS	235	149.0	1.15	-	-	-
SGN	2	FHS	167	40.0	0.86	-	-	-
SGN	2	FHS	230	121.0	0.99	-	-	-
SGN	2	FHS	228	124.0	1.05	-	-	-
SGN	2	FHS	193	75.0	1.04	-	-	-
SGN	2	FHS	223	117.0	1.06	-	-	-
SGN	2	FHS	195	67.0	0.90	-	-	-
MT	14	NSS	60	1.3	0.60	-	-	-
SGN	1	PH	92	71.0	9.12	-	-	-
SGN	1	PH	235	120.0	0.92	-	-	-
SGN	1	PH	-	-	-	-	-	-
SGN	1	PH	187	64.0	0.98	-	-	-
SGN	1	PH	235	118.0	0.91	-	-	-
SGN	1	PH	182	48.0	0.80	-	-	-

Appendix 3.3-1b. Biological Data from Fish Captured in Option 6, 2012

MT	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
SGN	1	PH	182	50.0	0.83	-	-	-
SGN	1	PH	225	106.0	0.93	-	-	-
SGN	1	PH	186	63.0	0.98	-	-	-
SGN	1	PH	209	86.0	0.94	-	-	-
SGN	1	PH	184	56.0	0.90	-	-	-
SGN	1	PH	197	64.0	0.84	-	-	-
SGN	1	PH	180	62.0	1.06	-	-	-
SGN	1	PH	184	55.0	0.88	-	-	-
SGN	1	PH	193	60.0	0.83	-	-	-
SGN	1	PH	182	59.0	0.98	-	-	-
SGN	1	PH	186	57.0	0.89	-	-	-
SGN	1	PH	180	54.0	0.93	-	-	-
SGN	1	PH	189	57.0	0.84	-	-	-
SGN	1	PH	191	65.0	0.93	-	-	-
SGN	1	PH	190	60.0	0.87	-	-	-
SGN	1	PH	191	61.0	0.88	-	-	-
SGN	1	PH	179	54.0	0.94	-	-	-
SGN	1	PH	255	135.0	0.81	-	-	-
SGN	1	PH	184	54.0	0.87	-	-	-
SGN	1	PH	180	54.0	0.93	-	-	-
FGN	1	PH	112	13.6	0.97	-	-	-
FGN	1	PH	108	12.9	1.02	-	-	-
FGN	2	PH	165	37.1	0.83	-	-	photo 6892
FGN	2	PH	197	74.8	0.98	-	-	-
SGN	3	PH	196	70.0	0.93	F	IM	-
SGN	3	PH	203	79.8	0.95	F	IM	-
SGN	3	PH	206	88.0	1.01	F	IM	-
SGN	3	PH	212	87.3	0.92	F	IM	-
SGN	3	PH	200	79.9	1.00	F	IM	-
SGN	3	PH	213	92.4	0.96	M	IM	-
SGN	3	PH	191	75.6	1.08	M	IM	-
SGN	3	PH	190	63.4	0.92	M	IM	-
SGN	3	PH	195	76.0	1.02	F	IM	-
SGN	3	PH	207	81.0	0.91	F	IM	-
SGN	3	PH	184	59.0	0.95	F	IM	-
SGN	3	PH	188	59.0	0.89	F	IM	-
SGN	3	PH	197	52.0	0.68	M	IM	-
SGN	3	PH	202	78.0	0.95	F	IM	-
SGN	3	PH	202	73.0	0.89	F	IM	-
SGN	3	PH	200	77.0	0.96	F	IM	-
SGN	3	PH	204	74.0	0.87	F	IM	-
SGN	3	PH	200	70.0	0.88	F	IM	photo 6896
SGN	3	PH	121	20.3	1.15	M	IM	-
SGN	3	PH	204	72.0	0.85	F	IM	-
SGN	3	PH	198	69.0	0.89	F	IM	-
SGN	3	PH	204	88.0	1.04	M	IM	-
SGN	3	PH	195	72.0	0.97	F	IM	-
SGN	3	PH	193	72.0	1.00	F	IM	-
SGN	3	PH	205	88.0	1.02	M	IM	-
SGN	3	PH	210	89.0	0.96	F	IM	-
SGN	3	PH	215	101.0	1.02	M	IM	-
SGN	3	PH	138	25.0	0.95	F	IM	-
SGN	3	PH	109	93.0	7.18	M	IM	-

Appendix 3.3-1b. Biological Data from Fish Captured in Option 6, 2012

MT	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
SGN	3	PH	194	64.0	0.88	M	IM	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	RS	169	40.0	0.83	-	-	-
FGN	1	RS	184	39.1	0.63	-	-	-
SGN	3	RS	293	21.9	0.09	M	M	photo 6898
SGN	3	RS	235	100.0	0.77	M	M	-
SGN	3	RS	182	36.0	0.60	-	IM	-
SGN	3	RS	296	206.0	0.79	M	M	-
SGN	3	RS	284	209.0	0.91	M	M	-
SGN	3	RS	298	225.0	0.85	M	M	-
SGN	3	RS	197	48.0	0.63	M	IM	-
SGN	3	RS	175	37.0	0.69	-	IM	-
SGN	3	RS	282	183.0	0.82	M	M	-
SGN	3	RS	185	34.0	0.54	-	IM	-
SGN	3	RS	210	65.0	0.70	M	IM	-
LL	1	SC	330	235.0	0.65	-	-	-
SGN	1	SC	406	485.0	0.72	-	-	-
SGN	1	SC	349	351.0	0.83	-	-	-
SGN	1	SC	318	262.0	0.81	-	-	-
SGN	1	SC	350	310.0	0.72	-	-	-
SGN	1	SC	340	302.0	0.77	-	-	-
SGN	1	SC	290	209.0	0.86	-	-	-
SGN	1	SC	341	291.0	0.73	-	-	-
SGN	1	SC	294	202.0	0.79	-	-	-
SGN	1	SC	293	209.0	0.83	-	-	-
SGN	1	SC	310	268.0	0.90	-	-	-
SGN	1	SC	367	378.0	0.76	-	-	-
SGN	1	SC	346	320.0	0.77	-	-	-
SGN	1	SC	328	248.0	0.70	-	-	-
SGN	1	SC	169	142.0	2.94	-	-	-
SGN	1	SC	170	146.0	2.97	-	-	-
SGN	1	SC	342	314.0	0.78	-	-	-
SGN	1	SC	353	376.0	0.85	-	-	-
SGN	1	SC	343	291.0	0.72	-	-	-
SGN	1	SC	254	117.0	0.71	-	-	-
SGN	1	SC	352	306.0	0.70	-	-	-
SGN	1	SC	315	242.0	0.77	-	-	-
SGN	1	SC	333	389.0	1.05	-	-	-
SGN	1	SC	310	249.0	0.84	-	-	-

Appendix 3.3-1b. Biological Data from Fish Captured in Option 6, 2012

MT	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
SGN	1	SC	458	344.0	0.36	-	-	-
SGN	1	SC	282	188.0	0.84	-	-	-
SGN	1	SC	344	288.0	0.71	-	-	-
SGN	1	SC	340	283.0	0.72	-	-	-
SGN	1	SC	251	119.0	0.75	-	-	-
SGN	1	SC	122	63.0	3.47	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	2	SC	305	232.0	0.82	-	-	-
SGN	3	SC	411	659.0	0.95	-	-	-
VO	1	SC	-	-	-	-	-	-
SGN	1	SC	205	64.0	0.74	-	-	-
SGN	1	SEB	203	24.0	0.29	-	-	photo 6893
SGN	1	SEB	188	15.0	0.23	-	-	-
SGN	1	SEB	177	14.0	0.25	-	-	-
SGN	1	SEB	135	19.0	0.77	-	-	-
SGN	1	SEB	170	13.0	0.26	-	-	-
SGN	1	SEB	181	15.0	0.25	-	-	-
SGN	1	SEB	173	12.0	0.23	-	-	-
BS	9	SF	340	377.2	0.96	-	-	-
SGN	2	SF	270	231.0	1.17	-	-	-
SGN	2	SF	198	106.0	1.37	-	-	-

Dash indicates data unavailable

BS = Beach Seine

CT = Crab trap

FGN = Floating gillnet

LL = Longline

MT = Minnow trap

SGN = Sinking gillnet

VO = Visual Observation

AC = Arctic cisco

AF = Arctic flounder

BW = Broad whitefish

CP = Capelin

FHS = Fourhorn sculpin

LKTR = Lake trout

NSS = Ninespine stickleback

SC = Saffron cod

PH = Pacific herring

SF = Starry flounder

SEB = Slender eelblenny

RS = Rainbow smelt

SC = Saffron cod

M = Mature

IM = Immature