APPENDIX 16

INTERTIDAL and SUBTIDAL PHOTOGRAPHIC SURVEY

FORMER DOCK AREA

Azimuth Consulting Group Inc.
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Our File #: TC-03-03

September 27, 2004

Bruce Donald
Teck Cominco Metals
Bag 2000
Kimberley BC V1A 3E1

Dear Mr. Donald:

Re: Intertidal and Subtidal Photographic Survey – Former Dock Area, Polaris Mine

Intertidal Survey – The intertidal beach was visually surveyed during mid-August 2004 and representative photographs taken (Appendix A). There is no evidence of the former dock structure or other infrastructure (concentrate storage shed, machine shops, barge and concentrator). Shorelines have been graded using native cobble and gravel to match the undisturbed intertidal and beach habitat north and south of the former dock. There are no fine sediments (silt/clay) or erosional areas that might contribute sediment to the water column during wind events or ice movement. This area is actively scoured by ice and we observed both ice-free conditions as well as conditions when ice was pushed against the shore. The shoreline withstood and was modified by the ice in the same fashion as shorelines away from the former dock area. Given the coarse grain size of the material and consistent slope and aspect of the remediated beach with the adjacent intertidal shoreline and beach area, we do not expect that the integrity of the remediated area would be compromised in any way.

Subtidal Survey – A Seabed Imagery and Mapping System (SIMS) towed underwater video camera was deployed on August 19, 2004 to record video imagery of the decommissioned dock or wharf area at the Teck Cominco Polaris Mine, Little Cornwallis Island. The objective of the underwater video survey was to document subtidal, marine conditions of the dock area as it relates to fish habitat, in accordance with Section 2.2.3 of the Fisheries and Oceans Canada Fish Habitat Authorization No. 02-HCAA-000-000063. Still photographs (Appendix A) were also taken of the intertidal, foreshore region in the immediate vicinity of the dock to illustrate post-remediation conditions, to compare the former dock area with “native” shoreline north and south of the remediated beach.

This report describes the SIMS imagery depicted on the two DVD videos that accompany this letter and a third DVD depicting subtidal biota from a SCUBA survey.

Figure 1 depicts the location of the former dock cells and shows the SIMS survey tracks relative to the former cells. This figure illustrates the extent of video coverage over the bottom in the vicinity of the former dock, the shoreline north and south of the former dock, and offshore. Video coverage was extended well beyond the former dock to provide sufficient spatial coverage to put the subtidal marine environment near the former dock area in perspective with adjacent habitat.

Five underwater video transects were run in a north – south direction from 200 m to < 20 m offshore up to 300 m north and south of the former dock area. Three more transect were run east – west, perpendicular to shore, over the former dock area to illustrate the transition between subtidal and intertidal habitat. The first three, most offshore transects are depicted on DVD 1. The two innermost transects (four and five) and the perpendicular transects (six to eight) are depicted on DVD 2.

Transect 1 runs south to north, parallel to the shoreline a distance of approximately 200 m offshore of the former shoreline of the dock cells at a depth 30 – 32 m. (Note that the depth transducer did not function properly during the first half of the transect and depth read about 10 m, not 30 m). The seabed is gradually rolling and substrate consists primarily of gravelly sand and shell hash with sporadic rocky outcroppings. There are small reef-like structures that provide abundant habitat complexity and surface area for attached red and brown algae, soft corals, hard corals and corraline algae. Percent cover by biota was at least 80 – 90% in most areas. The hard substrate is also excellent habitat for many macrofauna species such as sea urchin, anemone, crinoids, barnacles and clams (based on abundant shell hash).

Moving northwards, there is a gradual transition to more heterogeneous habitat types consisting of sand dominated areas with scattered cobble and occasional boulder patches (75^{o} 23’ 1649 N 96^{o} 56’ 2581”; Time 3:06) with a return to patchy rocky gravelly sand substrate type (75^{o} 23’ 1758 N 96^{o} 56’ 8703”; Time 4:05). Sand substrates have a lower percent cover by biota (15 – 20%) that consists of anemone, barnacles, clams, crinoids and urchins. It is unusual to see barnacles at the depth recoded here, but may be characteristic of this area. Some anthropogenic debris was also observed, consisting of pieces of wood and metal.

Opposite the former dock area there is a transition to a flat, rough, complex cobble bottom (75^{o} 23’ 2304 N 96^{o} 56’ 0364”; Time 8:15) with a few sand patches. Barnacles and red and brown algae species are attached to the hard bottom. The SIMS survey turned to head back on a southern transect (75^{o} 23’ 3910 N 96^{o} 57’ 3279”; Time 20:00) about 250 m north of the former dock area along Transect 2. At this point the bottom had a uniform, flat slope with coarse gravel, cobble, sand mixture with near complete coverage by algae, barnacles, soft coral and numerous anemone and sea stars.

Transect 2 was conducted from north to south about 125 m offshore at a depth of approximately 19 – 20 m. We attempted to follow this depth contour as much as possible, although several floating icebergs forced the boat to move inshore or offshore to avoid the bergs as necessary (Figure 1). The seabed is relatively flat with uniform coarse cobble/gravel substrate with a few large rocky outcrops. Cover by attached biota is high (70 – 90%) with algae, barnacles, anemone and coralline algae. Abundant shell hash suggests that clams are present in the sediment. Sea stars and anemone are also observed in addition to live sea urchin and abundant sea urchin tests (urchin shell debris).

At 75° 23' 3657 N 96° 57' 1822" (Time 22:42) there was a transition to sandy/silty hummocks and ridges with about 15% rocky/boulder cover habitat. Coarse material (cobble, gravel) is accumulated within the troughs between the sandy ridges, suggesting that the sediment is actively disturbed, probably by propeller action by ships, as this is directly offshore of the former dock. There is less cover by algae, coral and barnacles in these areas and fewer macrofauna.

South of this area moving along the former dock area, substrate and habitat are very mixed alternating between complex, heterogeneous coarse substrate with abundant coverage by algae and macrofauna, to sandy substrates with patches of coarse material, sparse algal coverage and few macrofauna species, except sea urchins (e.g., 75° 23' 3546 N 96° 57' 1407"; Time 22:20). At 75° 23' 3344 N 96° 57' 0724" (Time 24:20) there is a 50 m long sandy ridge about 2 m in height that runs parallel to shore. Troughs contain coarse rock and some debris. This ridge was probably created by ship propeller activity.

Opposite the former dock area, the shoreline naturally becomes shallower, as depth diminishes to about 12 – 15 m at the same distance offshore. At this depth, ambient light conditions are sufficient to support relatively abundant kelp (*Laminaria* sp.) growth over coarse bottom substrates. Sea stars, urchins, anemone, soft coral and some barnacles are also present at these depths, especially in the vicinity of kelp.

Kelp forests provide abundant cover for large, patchy clouds of mysids (*Mysis* sp.) (e.g., (75° 23' 3003 N 96° 57' 2765"; Time 27:40). Mysids and possibly amphipods inhabit spaces among the kelp fronds and were very abundant when present. The relationship between kelp and mysids was also observed from Garrow Bay in 2003 during SCUBA surveys offshore of the mouth of Garrow Creek. A good example of this can be seen on Transect 2 and 3 at 75° 23' 2857 N 96° 56' 9420" (Time 28:21). The bottom consists of a heterogeneous mixture of cobble, gravel and sand with some filamentous red and brown algae, and attached kelp with (30 – 40% cover). Dense clouds of mysids are present within 1 m off of the bottom and concentrated near cover. A sea cucumber was observed, as well as a single fish, possibly an Arctic cod.

Offshore of the former dock area the bottom is distinctly furrowed (75° 23' 2618 N 96° 56' 8944"; Time 29:35) with a mostly sandy bottom (depth 15 m) with scattered cobble, gravel and a few rocks. Cover by biota is only 10%. South of this area there is a transition back to rocky troughs with cobble substrate (75° 23' 2293 N 96° 56' 8095"; Time 31:17) and large, rocky piles of broken rock and cobble and occasional sandy patches with some attached algae and kelp. Mysids, sea stars and anemone are present. Further south, the bottom is flatter, less disturbed and kelp and algal coverage increases as does mysid abundance. At the south end of Transect 2 (11 m depth), there is a transition to soft, sandy/silt bottom with uniform slope and a few drop-offs and ledges with few attached biota such as kelp or anemone. Sea urchins are abundant over the bottom, which may partly explain the lack of kelp.

Transect 3 (75° 23' 1184 N 96° 56' 4447"; Time 37:19) was conducted in a south – north direction in 7 – 13 m of water between 40 m and 80 m offshore, depending on ice conditions. Habitat at the southern end of the transect consists of very coarse, rocky, heterogeneous substrate with a variable, steep slope with kelp cover of about 60%. Mysids are abundant with few anemone and no sea urchins or sea stars observed. Northwards, there is a gradual transition to finer substrates in deeper water becoming more sandy/silty with 20% algae cover, less kelp and few anemone and mysids. Transect 3 overlapped transect 2 at 75° 23'

2490 N 96° 56' 8393"; Time 49:25 (Figure 1) because a small iceberg occurred in the same area as the abundant mysid clouds observed on Transect 2.

Progressing northwards, depth and substrate type varied in much the same fashion as Transect 2, partly because of the spatial overlap and because of the influence of proximity to the former dock area. Nearer the dock area, substrate is more disturbed and contains hummocks and depressions with a mixture of substrate. Sea urchins are common over sandy substrate. Where substrate consists of rock, cobble and gravel, attached biota such as algae and kelp are more abundant as are sea anemone, soft corals, barnacles and sea stars. A good example is at 75° 23' 1645 N 96° 56' 5923" (Time 41:00) (8.6 m), where bottom substrate steeply slopes and consists of coarse rock with abundant attached biota.

There is a gradual transition to sandy/silty substrate and less complex habitat at about 75° 23' 2405 N 96° 56' 8294" (Time 47:40). Biota coverage is sparse with occasional clumps of attached algae and kelp, and relatively flat bottom with small waveforms in the sand. There are patches of abundant kelp cover, however, that support dense clouds of mysids at about 15 m depth. This habitat extends north to 75° 23' 3536 N 96° 57' 0705"; Time 55:00 (15.5 m depth) where there is an abrupt transition to a flat bottom consisting mostly of sand with some gravel/cobble and abundant scattered shell debris and sea anemone, with sparse cover by algae or kelp. Transect 3 ends over a wide slow turn west towards deeper water (18 m) with moderate cover by algae and kelp and very abundant cover and diversity by macrofauna, especially sea anemone.

Transect 4 (DVD 2, Tape 4) runs north – south between 40 and 60 m offshore of the remediated beach in water depths between 8 and 9 m 75° 23' 4048 N 96° 57' 0939"; Time 02:50). The seabed is relatively flat with sandy/silty substrate with occasional boulders, lots of sea urchins and some kelp and coralline algae. Moving south, kelp abundance increases as does density of mysids. At 75° 23' 3724 N 96° 57' 0107" (Time 03:40) there is abundant kelp cover and mysid abundance over the bottom with some sediment accumulation over bottom substrate and on kelp fronds, presumably as a result of remedial activities around the dock cells.

Transect 4 runs along shore parallel to the bottom beneath the steep slope north and south of the approaches to the dock cells (75° 23' 3062 N 96° 56' 9070"; Time 06:04) and at shallow depths within the former dock cells. Directly offshore of the north end of the former dock, slope is very steep and consists of large rock and boulder substrate with abundant kelp cover. Depth increases sharply to 3 m and the video survey continues within the former dock cell (Time 06:56). Substrate consists of sandy/silt with clean patches of gravel/cobble. Walls of the cut off cells are clearly visible, with some sections partially buried by sediment. At this part of Transect 4, the SIMS camera moves inside and outside of the semi-circular cells during the along-shore transit.

At 75° 23' 2416 N 96° 56' 7802" (Time 08:33) the camera drops outside of the south end of the former dock over the steep wall surrounding the cells into deeper water (8 m). Beyond 3 m depth, beneath the ice-scour zone, sediment grain size increases as does cover by biota. South of the former dock, the transect was forced nearer shore by an ice floe and depth diminished to 2 m before a transition to deeper water (75° 23' 1551 N 96° 56' 5150"; Time 12:22) with steep slope, coarse substrate and 70% kelp cover with some mysids and anemone. About 100 m south of the former dock, the SIMS survey turns to continue northwards on Transect 5, only 20 m or less from shore in 1 – 3 m of water (75° 23' 1215 N 96° 56' 3972"; Time 14:00).

Transect 5 is conducted along shore in very shallow (< 2 m) water parallel to and no more than 25 m offshore. Substrate south of the dock cells consists of a heterogeneous mixture of coarse materials dominated by ice-scoured cobble/gravel with a few boulders and no algae or other macrofauna. Some metal and other anthropogenic debris can be seen. Abundant large substrate surrounding the former dock cells prevents any substantive erosion of the shoreline surrounding the cells. Within the cut-off sheet pile walls of the former dock cells, bottom sediment is fine grain, consisting primarily of sandy/silt with occasional gravel patches. The substrate is slightly winnowed by surface waves and does not appear to be actively eroding or contributing sediment to the water column. Depending on ice conditions, this area may be modified by shifting floes of ice pushed ashore by wind-driven currents. However, like the remaining shoreline at this shallow depth, this habitat will not support biota. North of the former dock area (75° 23' 2971N 96° 56' 8512"; Time 22:40), bottom substrate is naturally very coarse and similar to substrate south of the former dock with no attached biota. Transect 5 ends at 26:00. At this point, the SIMS survey was re-located (75° 23' 2198 N 96° 56' 8978"; Time 28:18) to conduct three transects (6, 7 and 8) perpendicular to shore, alternatively moving from deep water (~28 m; again the depth transducer was not functioning properly), onshore and offshore (Figure 1).

Transect 6 moves onshore directly towards the south end of the former dock. Here the bottom consisted of a mixture of rock, cobble and gravel with sparse algae cover with some barnacles and anemone. About 100 m offshore, deep furrows and hummocks are clearly seen on the bottom, due to propeller action (e.g., 75° 23' 2377 N 96° 56' 8333"; Time 29:53). At 50 m offshore, the SIMS survey encountered the vertical face of the dock cell sheet pile that is heavily encrusted with kelp, algae and anemone. Within the dock cell, at a depth of about 3 m, substrate is similar as described on Transect 5 and consists of sandy/silt with gravel patches.

At 75° 23' 2672 N 96° 56' 8083" (Time 32:30) the survey turned north and then offshore (west along **Transect 7**) immediately dropping to 8 m off the west side of the sheet pile. Substrate consists of scattered rock, cobble, and gravel and shell debris. Some anthropogenic material such as metal is observed. With increasing depth, abundance of biota, such as anemone, barnacle, crinoids, sea cucumber and especially mysids increases.

The final onshore **Transect 8** was made at 35:20 towards the north end of the former dock. Similar slope and habitat features (i.e., furrows, substrate, biota) were observed. At 75° 23' 2755 N 96° 56' 8558" (Time 38:34) the SIMS camera approached and moved up the joint between two dock cell walls and moved inside the dock (Figure 1). The survey then turned away from the shore and followed the shoreline south towards the south end of the former dock (75° 23' 2666 N 96° 56'8342"; Time 40:09). The cut off edges of the sheet piles can clearly be seen, demarking the boundary between substrates within and filling the dock cells, from the sheet pile walls and coarse substrates on the outside (west) of the former dock. Note that a small school of juvenile Arctic cod was observed at 40:45, using the inside of the cells as cover.

The SIMS survey on DVD 2 ended at the south end of the former dock at 75° 23' 2420 N 96° 56' 7477" (Time 42:34).

SCUBA Dive Video

In addition to the SIMS towed underwater video imagery, the SCUBA team filmed a single onshore transect beginning approximately 100 m offshore in 23 m of water towards the dock cells, focusing on macrofauna species. Many more species are clearly observed from the SCUBA survey video because of the attention to detail that cannot be achieved with SIMS.

Imagery of the SCUBA video begins directly offshore of the dock within the disturbed, furrowed habitat that consists of a mixture of substrate (cobble, gravel, sand, silt), shell debris, anthropogenic debris and attached macrofauna. Abundant species include urchins, anemone, barnacles, and soft coral and coralline algae.

There is reasonably abundant hard substrate that supports good abundance and diversity of macrofauna. Notable macrofauna filmed by the camera crew include the following organisms:

- A large basket star (02:04).
- Soft coral and nudibranch (3:03).
- Nudibranch and coralline algae with barnacles feeding in the background (18 m depth).
- Shrimp and northern red anemone (4:15).
- Sea star vs. sea star (4:43).
- Sea spider (Pycnogonidia) and softshell clams (5:15).
- Hummock and trench habitat (7:40) with abundant red algae, kelp and mysids (8:20); nudibranch and barnacles.

At 11:00, 10 – 20 m offshore of the dock cells in 8 – 10 m of water bottom is flat with sandy/silt substrate, sparse algal coverage and relatively abundant mysid population. The vertical wall of the dock cell is encountered at 12:40 and appears to support an abundant and diverse invertebrate community. There is excellent coverage by red and brown algae, kelp, barnacles and tunicates.

Inside the former dock cells, substrate consists of sandy/silt with gravel patches. Mysids can be observed within the dock cells. The video acquired using SCUBA substantiates and supports the SIMS survey and provides additional, fine-scale imagery of resident biota.

Summary

Subtidal Survey – The SIMS survey was conducted along a series of transects, parallel and perpendicular to shore, extending directly north/south and east/west of the remediated dock and adjacent habitat.

Subtidal marine habitat surrounding the former dock area is heterogeneous, consisting primarily of coarse substrate dominated by cobble/gravel with occasional boulders, interspersed by smaller grain-size sandy/silt patches. Bottom slope is gradual and shallow and there is no evidence of extensive disturbance by ice. At deep depths (>18 m), biota consisted of sparse algae cover, barnacles and other macrofauna especially anemone, crinoids and sea cucumber. At depths shallower than 18 m, large blade kelp becomes increasingly abundant and in many locations, supports dense aggregations of mysids and possibly amphipods. Sea anemone, crinoids, sea urchin, barnacles and sea stars are also abundant. In sandy habitats, sea urchins dominate macrofauna taxa. Directly offshore (50 – 75 m) of the former dock, deep (~2 m) furrows and hummocks with a heterogeneous mixture

of sand, cobble and gravel are observed. These furrows are presumably created by the propeller action of more than 20 years of docking by ships in this area. Furrows are not observed at similar distances offshore north and south of the former dock.

Within 20 – 30 m of the former dock cells, the base of which is in 8 – 12 m of water, bottom substrate consists of boulder and rock and slopes steeply upwards to meet the vertical sheet piles. The rocky slope provides excellent habitat for attached biota, especially algae and kelp, which provide abundant cover for other fauna, especially mysids. Amphipods, anemone and a few fish were observed. The sheet piles themselves also provide good habitat for algae and kelp and are heavily encrusted by macrofauna.

Within the dock cells themselves, water depth is about 3 m and bottom substrate consists primarily of fine grain sandy/silt with occasional patches of gravel and cobble. There is no evidence of biota at such shallow depths, which is consistent with habitat north and south of the dock cells because ice-scour prevents colonization by biota. The fine sediments show signs of winnowing from wave action. Remedial activities appear to have dispersed some fine sediment that has settled on habitat around the dock area.

Intertidal Habitat – The intertidal habitat directly onshore of the former dock and north and south of the dock consists of coarse gravel/cobble. Shoreline features in the immediate vicinity of the former dock are indistinguishable from adjacent shorelines and appear stable and non-erosional and will be shaped by ice (see Photos). The coarse material along shore, adjacent to the fine sediments within the dock cells will likely move offshore with ice movements and ice rafting, gradually covering the fine sediments and further eliminating these as a sediment source.

Sincerely,

Azimuth Consulting Group Inc.

Randy Baker, M.Sc., R.P.Bio.

cc:

Legend

Features

- SIMS Route
- Transect Direction
- Former Dockcell
- Former Structures

Details

- Geogrpahic Coordinate System (Lat, Long)
- Polaris Mine Coordinate System
- Coast Line
- 1m Contour Line
- 0.5m Contour Line

300 E
400 E
500 E
600 E
75° 23.4' N
1700 N
1600 N
75° 23.3' N
1500 N
96° 57.25' W
1400 N
75° 23.2' N
1300 N
96° 57.0' W
1200 N
75° 23.1' N
96° 56.75' W
1100 N
96° 56.5' W

Transect 1
Transect 2
Transect 3
Transect 4
Transect 5

Inset 1

C R O Z I E R S T R A I T

0 25 50 100 150 m
Plotted at 1:2500

SHORELINE ELEV. 998.7 m
WEST OF SHORELINE
SURVEYED 19 AUGUST 2004
19:00h – 20:00h

Inset 1

0 10 20 40m
Plotted at 1:1000

Transect 8
Transect 7
Transect 6
End of Survey

PREPARED BY:

AZIMUTH

Azimuth Consulting Group Inc.
218-2902 West Broadway
Vancouver BC, V6K 2G8

DRAWN BY:	CHECK BY:	DATE:	PROJECT No:
BT	RB	10/12/2004 1:30 PM	TC-03-03

PROJECT: Polaris Mine

TITLE:

SIMS Survey
Transect Lines

CLIENT: Teck Cominco

Figure 1

Appendix A – Photo 1: South of former dock cells looking west from hill.

Appendix A – Photo 2: South end of foreshore area of former dock area looking west from hill.

Appendix A – Photo 3: North end of former dock area, looking west from hill.

Appendix A – Photo 4: North of former dock area, looking west from hill.

Appendix A – Photo 5: Foreshore area of south end of former dock showing remediated shoreline.

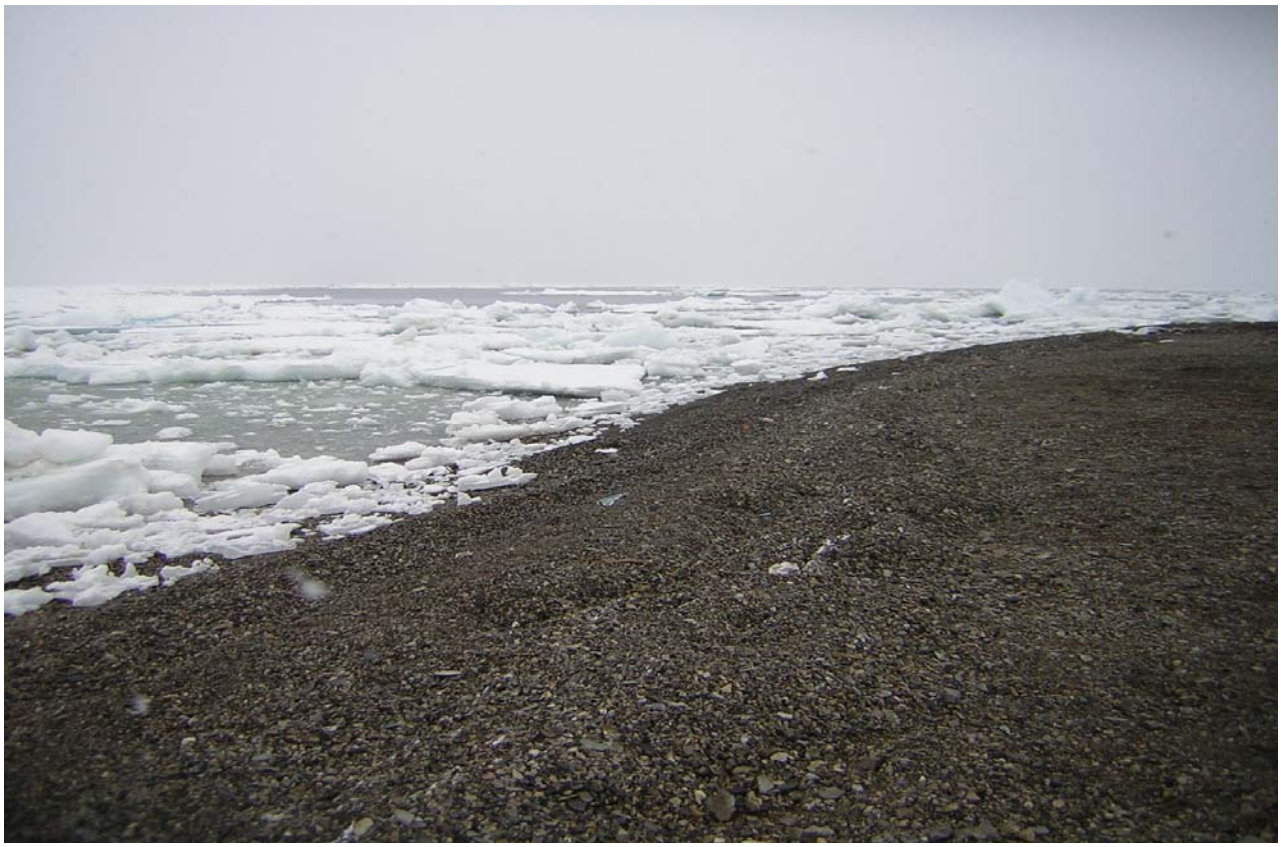
Appendix A – Photo 6: Foreshore area of former dock area, looking north.

Appendix A – Photo 7: Immediate foreshore area of former dock, looking north.

Appendix A – Photo 8: Foreshore of former dock, showing remediated shoreline features and ice cover.

Appendix A – Photo 9: Northern boundary of former dock area foreshore.

Appendix A – Photo 10: Foreshore area just north of former dock showing ice-scoured shoreline.



APPENDIX 17

MISCELLANEOUS WATER AND SOILS SAMPLES

COLLECTED FROM THE SITE

ALS Environmental

CHEMICAL ANALYSIS REPORT

Date:	October 22, 2004
ALS File No.	U7585
Report On:	TC-03-03 Soil Analysis
Report To:	**Azimuth Consulting Group Inc.** 218 - 2902 West Broadway Vancouver, BC V6K 2G8
Attention:	**Mr. Patrick Allard**
Received:	September 1, 2004

ALS ENVIRONMENTAL
per:

Andre Langlais, M.Sc. - Project Chemist
Frederick Chen, B.Sc. - Section Coordinator

ALS CANADA LTD.
1988 Triumph Street, Vancouver, BC Canada V5L 1K5
Phone: 604-253-4188 Fax: 604-253-6700 Website: www.alsenviro.com

File No. U7585

RESULTS OF ANALYSIS - Sediment/Soil

Sample ID				G Lake	G Bay-int
Sample Date				04-08-26	04-08-26
ALS ID				*1*	*2*
Physical Tests					
pH				7.97	
Total Metals					
Antimony	T-Sb			<10	<20
Arsenic	T-As			11.0	<10
Barium	T-Ba			984	711
Beryllium	T-Be			0.59	<1.0
Cadmium	T-Cd			3.01	<1.0
Chromium	T-Cr			18.6	15.1
Cobalt	T-Co			4.7	<4.0
Copper	T-Cu			28.1	15.1
Lead	T-Pb			71	<100
Mercury	T-Hg			0.070	<0.050
Molybdenum	T-Mo			<4.0	<8.0
Nickel	T-Ni			32.2	20
Selenium	T-Se			<2.0	<4.0
Silver	T-Ag			<2.0	<4.0
Tin	T-Sn			<5.0	<10
Vanadium	T-V			59.3	57.2
Zinc	T-Zn			1160	101
Organic Parameters					
Total Organic Carbon		C		4.61	
Particle Size					
Gravel	(>2.00mm)		(%)	<0.10	0.80
Sand	(2.00mm - 0.063mm)		(%)	2.30	48.1
Silt	(0.063mm - 4um)		(%)	71.7	40.1
Clay	(<4um)		(%)	26.0	11.0

Results are expressed as milligrams per dry kilogram except where noted.
< = Less than the detection limit indicated.
Total Organic Carbon results are expressed as percent, dry weight basis.

File No. U7585

Appendix 1 - METHODOLOGY

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

pH in Soil

This analysis is carried out in accordance with procedures described in "Soil Sampling and Methods of Analysis" (CSSS). The procedure involves mixing the air-dried sample with deionized/distilled water. The pH of the solution is then measured using a standard pH probe. A one to two ratio of sediment to water is used for mineral soils and a one to ten ratio is used for highly organic soils.

Metals in Sediment/Soil

This analysis is carried out using procedures from CSR Analytical Method 8 "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, Lands and Parks, 26 June 2001, and procedures adapted from "Test Methods for Evaluating Solid Waste", SW-846 Method 3050B or Method 3051, United States Environmental Protection Agency (EPA). The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve, and a representative subsample of the dry material is weighed. The sample is then digested at 90 degrees Celsius for 2 hours by either hotplate or block digester using a 1:1 ratio of concentrated nitric and hydrochloric acids. Instrumental analysis is by atomic absorption/fluorescence spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

Recommended Holding Time:

Sample:	6 months (Hg = 28 days)
Extract:	6 months (Hg = 28 days, Sb & Sn = 7 days)
Reference:	BCMELP

For more detail see ALS Environmental "Collection & Sampling Guide"

Total Carbon, Total Organic Carbon and Inorganic Carbon in Sediment/Soil

This analysis is carried out in accordance with U.S. EPA Method 9060A (Publ. # SW-846 3rd ed., Washington, DC 20460). Total Carbon is determined by high temperature oxidation of carbon to carbon dioxide which is then measured by means of a nondispersive infrared analyzer. Inorganic Carbon is determined by reaction with phosphoric acid to convert all carbonates to carbon dioxide which is also measured by means of a nondispersive infrared analyzer. Total Organic Carbon is determined as the difference between Total and Inorganic Carbons.

Recommended Holding Time:

Appendix 1 - METHODOLOGY - Continued

Sample: 14 days
Reference: Puget
For more detail see ASL "Collection & Sampling Guide"

Particle Size Distribution in Sediment/Soil

This analysis is carried out using a method adapted for Fisheries and Environment Canada, Ottawa, described in Walton, 1978. The procedure involves oven-drying and sample pre-treatment to remove organics, prior to using standard sieves for the sand and silt fractions and the pipette method for the clay fraction.

Laboratory Location: Pacific Soil Analysis Inc., Richmond (Subcontract)

Results contained within this report relate only to the samples as submitted.

End of Report

ALS Environmental

CHEMICAL ANALYSIS REPORT

Date:	September 29, 2004
ALS File No.	U8363
Report On:	Polaris/ TC-03-03 Water Analysis
Report To:	**Azimuth Consulting Group Inc.** 218 - 2902 West Broadway Vancouver, BC V6K 2G8
Attention:	**Mr. Randy Baker**
Received:	September 20, 2004

ALS ENVIRONMENTAL
per:

Leanne Harris, B.Sc. - Project Chemist
Andre Langlais, M.Sc. - Project Chemist

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File No. U8363

RESULTS OF ANALYSIS - Water

Sample ID	F-FRUST-TSS-12200
Sample Date	04-09-03
Sample Time	17:00
ALS ID	*1*
Physical Tests	
Total Suspended Solids	3.3

Results are expressed as milligrams per litre except where noted.

File No. U8363

Appendix 1 - METHODOLOGY

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

Solids in Water

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) and total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius, TSS is determined by drying the filter at 104 degrees celsius. Total solids are determined by evaporating a sample to dryness at 104 degrees celsius. Fixed and volatile solids are determined by igniting a dried sample residue at 550 degrees celsius.

Recommended Holding Time:
Sample: 7 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Results contained within this report relate only to the samples as submitted.

End of Report

APPENDIX 18

GARROW LAKE STRATIGRAPHY MONITORING

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS

MID-WINTER SAMPLING EVENT - JANUARY 26, 2004

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL Mid- 3m	<0.00020	<0.00020	0.00057	0.000075	0.00117	<0.010	0.00395	0.00903	<0.000010	<0.0050	0.00373	<0.010	0.236
GL Mid- 4m	0.00024	0.00024	0.000492	0.000064	0.000924	<0.010	0.00193	0.00831	-	<0.0050	0.00319	<0.010	0.197
GL Mid- 5m	<0.00020	<0.00020	0.000513	0.000069	0.00119	<0.010	0.00173	0.00833	-	<0.0050	0.00353	<0.010	0.209
GL Mid- 6m	0.00027	<0.00020	0.000591	0.000069	0.00162	0.018	0.0152	0.00858	-	<0.0050	0.00346	<0.010	0.207
GL Mid- 7m	0.00036	0.00029	0.000493	0.000061	0.000976	<0.010	0.000794	0.00819	-	<0.0050	0.00341	<0.010	0.197
GL Mid- 8m	0.00024	<0.00020	0.00048	0.00006	0.000983	<0.010	0.000447	0.00806	-	<0.0050	0.0033	<0.010	0.189
GL Mid- 9m	0.00027	<0.00020	0.00194	0.000098	0.00191	<0.010	0.000667	0.0199	-	<0.0050	0.0064	<0.010	0.702
GL Mid- 10m	0.00051	0.00039	0.00231	0.000265	0.00351	<0.010	0.00151	0.0753	<0.000010	<0.0050	0.0082	<0.010	0.932
GL Mid- 11m	0.00097	0.0004	0.00021	0.000816	0.00177	0.082	0.00246	0.0961	-	0.006	0.00821	<0.010	0.279
GL Mid- 12m	0.00094	0.00055	0.000217	0.000712	0.00315	0.108	0.0071	0.0944	-	0.0072	0.00862	<0.010	0.27
GL Mid- 13m	0.00096	0.0007	0.00021	0.000518	0.00297	0.095	0.0117	0.0827	-	0.0066	0.00826	<0.010	0.251
GL Mid- 14m	0.00105	0.00035	0.000143	0.000452	0.00273	0.104	0.00534	0.0827	-	0.0066	0.00875	<0.010	0.229
GL Mid- 15m	0.00095	0.0008	0.000094	0.00039	0.00165	0.186	0.00347	0.0825	-	0.0068	0.00847	<0.010	0.256
GL Mid- 16m	0.00081	0.00069	0.000082	0.000402	0.00143	0.211	0.00255	0.0857	-	0.0073	0.00896	<0.010	0.265
GL Mid- 17m	0.00092	0.00061	0.000086	0.000403	0.0014	0.214	0.00284	0.0848	-	0.0068	0.00893	<0.010	0.267
GL Mid- 18m	0.00078	0.00074	0.000084	0.000415	0.00151	0.225	0.003	0.086	-	0.0064	0.00922	<0.010	0.275
GL Mid- 19m	0.00084	0.00083	0.0001	0.000387	0.00144	0.217	0.00308	0.0832	-	0.0071	0.00879	<0.010	0.266
GL Mid- 20m	0.00082	0.00086	0.000081	0.000383	0.00151	0.219	0.00308	0.0844	-	0.0063	0.00866	<0.010	0.26
GL Mid- 22m	0.00087	0.00082	0.00009	0.000428	0.00167	0.236	0.0051	0.0881	-	0.0068	0.00968	<0.010	0.26
GL Mid- 30m	0.00024	0.00034	0.000076	0.00035	0.000844	0.333	0.00317	0.0861	-	0.0059	0.00862	<0.010	0.0514
GL Mid- 40m	0.00028	<0.00020	0.000552	0.00008	0.00127	0.014	0.00558	0.00966	-	<0.0050	0.00361	<0.010	0.234

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

Due to Ice can not sample the top 2 metres

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS

MAXIMUM ICE THICKNESS SAMPLING EVENT - MAY 3, 2004

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL Mid- 3m	<0.00020	0.00026	0.000638	0.000066	0.00112	0.012	0.00318	0.0103	<0.000010	<0.0050	0.00362	<0.010	0.234
GL Mid- 4m	<0.00020	<0.00020	0.000741	0.000073	0.00125	0.026	0.0135	0.0112	-	<0.0050	0.00382	<0.010	0.227
GL Mid- 5m	<0.00020	<0.00020	0.000608	0.000078	0.00102	0.01	0.00144	0.00975	-	<0.0050	0.00378	<0.010	0.247
GL Mid- 6m	<0.00020	<0.00020	0.000617	0.000066	0.00102	<0.010	0.00168	0.00957	-	<0.0050	0.00385	<0.010	0.229
GL Mid- 7m	<0.00020	0.00027	0.0006	0.000064	0.000985	0.039	0.0015	0.00969	-	<0.0050	0.00357	<0.010	0.227
GL Mid- 8m	<0.00020	<0.00020	0.000641	0.000071	0.000969	0.023	0.000926	0.00956	-	<0.0050	0.00363	<0.010	0.231
GL Mid- 9m	<0.00020	0.00028	0.00255	0.000153	0.00225	<0.010	0.0012	0.0209	-	<0.0050	0.00706	<0.010	0.816
GL Mid- 10m	0.00049	0.00039	0.00217	0.000386	0.00329	<0.010	0.00456	0.0898	0.000012	<0.0050	0.00735	<0.010	0.764
GL Mid- 11m	0.00087	0.0005	0.000261	0.00092	0.00163	0.136	0.00481	0.107	-	<0.0050	0.0083	<0.010	0.315
GL Mid- 12m	0.00096	0.00046	0.000207	0.000751	0.00218	0.173	0.00682	0.0971	-	<0.0050	0.00821	<0.010	0.262
GL Mid- 13m	0.00093	0.00044	0.000199	0.000614	0.00248	0.17	0.00861	0.0884	-	0.005	0.00831	<0.010	0.234
GL Mid- 14m	0.00068	0.00072	0.000151	0.00046	0.00193	0.203	0.00645	0.0878	-	0.0062	0.00854	<0.010	0.211
GL Mid- 15m	0.0006	0.00061	0.000078	0.000433	0.0012	0.27	0.00247	0.0903	-	0.0052	0.00914	<0.010	0.211
GL MId- 16m	0.00074	0.0006	0.000079	0.000431	0.0012	0.257	0.00279	0.0876	-	<0.0050	0.00875	<0.010	0.201
GL Mid- 17m	0.00064	0.00065	0.000075	0.000416	0.00127	0.25	0.00338	0.086	-	0.0053	0.00878	<0.010	0.193
GL Mid- 18m	0.0006	0.00059	0.000074	0.000428	0.00113	0.257	0.00269	0.0855	-	0.005	0.00887	<0.010	0.204
GL Mid- 19m	0.00074	0.0006	0.000074	0.000424	0.00113	0.267	0.00241	0.0852	-	<0.0050	0.00897	<0.010	0.202
GL Mid- 20m	0.00067	0.00067	0.000072	0.000415	0.0011	0.252	0.00244	0.0833	-	<0.0050	0.00873	<0.010	0.197
GL Mid- 22m	0.0007	0.00061	0.000081	0.000431	0.00113	0.258	0.00235	0.0862	-	<0.0050	0.00887	<0.010	0.199
GL Mid- 30m	<0.00020	0.00039	0.000082	0.000381	0.00103	0.382	0.00902	0.0841	-	<0.0050	0.00781	<0.010	0.117
GL Mid- 40m	<0.00020	<0.00020	0.000034	0.000129	0.00135	0.486	0.00124	0.0473	-	<0.0050	0.000892	<0.010	0.0301

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

Due to ice can not sample the top two metres

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS

MINIMUM ICE THICKNESS SAMPLING EVENT - 2004

NOT ABLE TO DO AS ICE DID NOT LEAVE LAKE, COULD NOT SAFELY ACCESS SAMPLING LOCATION

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL Mid- 3m													
GL Mid- 4m													
GL Mid- 5m													
GL Mid- 6m													
GL Mid- 7m													
GL Mid- 8m													
GL Mid- 9m													
GL Mid- 10m													
GL Mid- 11m													
GL Mid- 12m													
GL Mid- 13m													
GL Mid- 14m													
GL Mid- 15m													
GL Mid- 16m													
GL Mid- 17m													
GL Mid- 18m													
GL Mid- 19m													
GL Mid- 20m													
GL Mid- 22m													
GL Mid- 30m													
GL Mid- 40m													

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

GARROW LAKE - STATION 262-3 Continued
MID WINTER SAMPLING EVENT - JANUARY 26, 2004

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL Mid- 3m	-	7.2	<3.0	<0.0050
GL Mid- 4m	<0.020	7.4	<3.0	-
GL Mid- 5m	-	7.5	4	-
GL Mid- 6m	-	7.6	4.7	-
GL Mid- 7m	-	7.6	<3.0	-
GL Mid- 8m	<0.020	7.6	<3.0	-
GL Mid- 9m	-	24.4	7.1	-
GL Mid- 10m	-	49.6	4.7	0.0092
GL Mid- 11m	-	61.5	8.7	-
GL Mid- 12m	<0.020	61.8	5.8	-
GL Mid- 13m	-	59.2	18	-
GL Mid- 14m	-	62	20.7	-
GL Mid- 15m	-	62	21.3	-
GL Mid- 16m	<0.020	61.8	18.7	-
GL Mid- 17m	-	61.9	20.8	-
GL Mid- 18m	-	62	24.7	-
GL Mid- 19m	-	61.2	20.7	-
GL Mid- 20m	<0.020	62	26	-
GL Mid- 22m	-	62.2	36	-
GL Mid- 30m	-	62.6	24	-
GL Mid- 40m	0.021	7.3	7.3	-

Footnotes:

1. Data for TSS is believed to be incorrect. Believe that the laboratory did not rinse the salt off the filter paper. This will overstate TSS values.
2. Data for Density for GL Mid-40m is incorrect for

as this number is physically impossible.

GARROW LAKE - STATION 262-3 Continued
MAXIMUM ICE THICKNESS SAMPLING EVENT - MAY 3, 2004

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL Mid- 3m	-	8.1	3	<0.0050
GL Mid- 4m	-	8.2	<3.0	-
GL Mid- 5m	-	8.3	<3.0	-
GL Mid- 6m	-	8.2	6.3	-
GL Mid- 7m	-	8.2	4.3	-
GL Mid- 8m	-	8.1	5.7	-
GL Mid- 9m	-	24.5	9.7	-
GL Mid- 10m	<0.020	55	23	0.0098
GL Mid- 11m	-	62.4	20.3	-
GL Mid- 12m	-	63.1	17.6	-
GL Mid- 13m	-	62.8	25.7	-
GL Mid- 14m	0.03	63.3	5.3	-
GL Mid- 15m	-	63.6	20.3	-
GL Mid- 16m	-	63.7	22.3	-
GL Mid- 17m	0.027	63.8	21.7	-
GL Mid- 18m	-	64.2	19.7	-
GL Mid- 19m	-	64.2	20.3	-
GL Mid- 20m	0.022	63.7	31	-
GL Mid- 22m	-	63.5	38.3	-
GL Mid- 30m	-	63.5	23	-
GL Mid- 40m	0.034	64.1	26.3	-

Footnotes:

Data for TSS is believed to be incorrect. Believe that the laboratory did not rinse the salt off the filter paper. This will overstate TSS values.

GARROW LAKE - STATION 262-3 Continued
MINIMUM ICE THICKNESS SAMPLING EVENT - 2004
COULD NOT SAFELY ACCESS SAMPLING LOCATION

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL Mid- 3m				
GL Mid- 4m				
GL Mid- 5m				
GL Mid- 6m				
GL Mid- 7m				
GL Mid- 8m				
GL Mid- 9m				
GL Mid- 10m				
GL Mid- 11m				
GL Mid- 12m				
GL Mid- 13m				
GL Mid- 14m				
GL Mid- 15m				
GL Mid- 16m				
GL Mid- 17m				
GL Mid- 18m				
GL Mid- 19m				
GL Mid- 20m				
GL Mid- 22m				
GL Mid- 30m				
GL Mid- 40m				

Footnotes:

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS

MID-WINTER SAMPLING EVENT - JANUARY 27, 2004

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL South- 3m	0.00021	<0.00020	0.000526	0.000077	0.00108	<0.010	0.000943	0.00927	<0.000010	<0.0050	0.00366	<0.010	0.223
GL South- 4m	0.0003	<0.00020	0.000531	0.000068	0.000966	<0.010	0.00232	0.00935	-	<0.0050	0.00358	<0.010	0.211
GL South- 5m	<0.00020	<0.00020	0.000537	0.000074	0.000936	<0.010	0.000361	0.00913	-	<0.0050	0.00367	<0.010	0.223
GL South- 6m	0.00028	<0.00020	0.000518	0.000066	0.000932	<0.010	0.000483	0.00924	-	<0.0050	0.00336	<0.010	0.202
GL South- 7m	0.00025	<0.00020	0.000522	0.000067	0.000916	<0.010	0.000325	0.00906	-	<0.0050	0.00361	<0.010	0.208
GL South- 8m	0.00026	<0.00020	0.000531	0.000075	0.000884	<0.010	0.000414	0.00935	-	<0.0050	0.00375	<0.010	0.223
GL South- 9m	0.00032	<0.00020	0.00267	0.000113	0.00277	<0.010	0.000715	0.0231	-	<0.0050	0.0084	<0.010	1
GL South- 10m	0.00085	0.00054	0.000491	0.000854	0.00238	0.011	0.00145	0.13	0.000011	0.0062	0.00802	<0.010	0.423
GL South- 11m	0.00093	0.00034	0.000216	0.000865	0.00184	0.123	0.00216	0.111	-	0.0063	0.00876	<0.010	0.308
GL South- 12m	0.00098	0.00044	0.000216	0.000724	0.00283	0.13	0.00639	0.102	-	0.0079	0.00873	<0.010	0.297
GL South- 13m	0.00107	0.0003	0.000191	0.000543	0.00318	0.114	0.00737	0.0967	-	0.0076	0.00812	<0.010	0.238
GL South- 14m	0.00102	0.00056	0.000158	0.000503	0.0027	0.115	0.00602	0.0953	-	0.0074	0.00879	<0.010	0.241
GL South- 15m	0.00086	0.00068	0.000106	0.000436	0.00193	0.199	0.00347	0.0865	-	0.0061	0.00916	<0.010	0.261
GL South- 16m	0.00086	0.00079	0.000092	0.000412	0.00167	0.232	0.00265	0.0948	-	0.0059	0.00912	<0.010	0.27
GL South- 17m	0.00087	0.00088	0.000089	0.000399	0.00158	0.232	0.00261	0.0945	-	0.0078	0.00914	<0.010	0.272
GL South- 18m	0.00068	0.00053	0.000101	0.000377	0.00168	0.228	0.00267	0.0928	-	0.0067	0.0089	<0.010	0.265
GL South- 19m	0.00093	0.00071	0.000084	0.000394	0.00162	0.233	0.00287	0.0944	-	0.0071	0.00917	<0.010	0.263
GL South- 20m	0.00072	0.00059	0.000084	0.000409	0.00157	0.229	0.00283	0.0937	-	0.0074	0.00924	<0.010	0.266
GL South- 22m	0.00082	0.00078	0.000083	0.000417	0.00159	0.23	0.0027	0.0932	-	0.0071	0.00939	<0.010	0.267
GL South- 30m	0.00036	0.00025	0.000071	0.000362	0.000929	0.31	0.00258	0.0948	-	0.0076	0.00879	<0.010	0.076
GL South- 40m	0.00036	0.00044	0.000083	0.000375	0.00117	0.307	0.00261	0.0964	-	0.0059	0.00923	<0.010	0.0747

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

Due to ice can not sample the top two metres

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS

MAXIMUM ICE THICKNESS SAMPLING EVENT - MAY 3, 2004

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL South- 3m	<0.00020	<0.00020	0.000598	0.000066	0.00108	<0.010	0.000571	0.00965	<0.000010	<0.0050	0.00379	<0.010	0.232
GL South- 4m	<0.00020	<0.00020	0.000615	0.000112	0.000963	<0.010	0.000322	0.00994	-	<0.0050	0.00375	<0.010	0.23
GL South- 5m	<0.00020	<0.00020	0.000636	0.000076	0.00105	0.011	0.000517	0.0103	-	<0.0050	0.00404	<0.010	0.25
GL South- 6m	<0.00020	<0.00020	0.000628	0.000137	0.00104	<0.010	0.000226	0.00971	-	<0.0050	0.00398	<0.010	0.24
GL South- 7m	<0.00020	<0.00020	0.000668	0.000081	0.00127	0.025	0.00289	0.0106	-	<0.0050	0.00409	<0.010	0.252
GL South- 8m	<0.00020	0.00027	0.000628	0.000123	0.00125	0.012	0.000423	0.00983	-	<0.0050	0.00397	<0.010	0.228
GL South- 9m	<0.00020	<0.00020	0.00256	0.000151	0.00231	<0.010	0.000956	0.0238	-	<0.0050	0.00761	<0.010	0.916
GL South- 10m	0.0007	0.00034	0.000983	0.00076	0.00272	0.011	0.00288	0.114	<0.000010	<0.0050	0.00789	<0.010	0.496
GL South- 11m	0.00092	0.00046	0.000246	0.000887	0.00171	0.17	0.0034	0.103	-	<0.0050	0.00858	<0.010	0.3
GL South- 12m	0.00088	0.00035	0.000171	0.00079	0.00213	0.179	0.00384	0.0977	-	<0.0050	0.00894	<0.010	0.283
GL South- 13m	0.00095	0.00035	0.000205	0.000682	0.00255	0.153	0.00627	0.0905	-	0.0058	0.00867	<0.010	0.25
GL South- 14m	0.00081	0.00044	0.000114	0.000485	0.0019	0.198	0.0041	0.0811	-	<0.0050	0.00842	<0.010	0.203
GL South- 15m	0.00067	0.00052	0.000083	0.000402	0.00127	0.245	0.0021	0.0832	-	0.0056	0.00886	<0.010	0.211
GL South- 16m	0.0006	0.00047	0.000083	0.000369	0.00112	0.228	0.00272	0.0785	-	0.005	0.00821	<0.010	0.193
GL South- 17m	0.00074	0.00028	0.000067	0.000423	0.0011	0.214	0.00192	0.0792	-	0.0058	0.00816	<0.010	0.198
GL South- 18m	0.00072	0.00047	0.000074	0.000395	0.00105	0.207	0.00233	0.0845	-	<0.0050	0.00854	<0.010	0.198
GL South- 19m	0.00064	0.0004	0.000071	0.000395	0.00118	0.239	0.00201	0.0832	-	<0.0050	0.00903	<0.010	0.201
GL South- 20m	0.00072	0.00051	0.000074	0.000442	0.00119	0.241	0.00193	0.0834	-	<0.0050	0.00891	<0.010	0.206

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

Due to ice can not sample the top two metres

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS

MINIMUM ICE THICKNESS SAMPLING EVENT - 2004

NOT ABLE TO DO AS ICE DID NOT LEAVE LAKE, COULD NOT SAFELY ACCESS SAMPLING LOCATION

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL South- 3m													
GL South- 4m													
GL South- 5m													
GL South- 6m													
GL South- 7m													
GL South- 8m													
GL South- 9m													
GL South- 10m													
GL South- 11m													
GL South- 12m													
GL South- 13m													
GL South- 14m													
GL South- 15m													
GL South- 16m													
GL South- 17m													
GL South- 18m													
GL South- 19m													
GL South- 20m													
GL South- 22m													
GL South- 30m													
GL South- 40m													

Footnotes: Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

GARROW LAKE - STATION 262-3A Continued
MID WINTER SAMPLING EVENT - JANUARY 27, 2004

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL South- 3m	-	7.7	3.3	<0.0050
GL South- 4m	<0.020	7.7	<3.0	-
GL South- 5m	-	7.7	<3.0	-
GL South- 6m	-	7.7	3.3	-
GL South- 7m	-	7.7	<3.0	-
GL South- 8m	<0.020	7.6	<3.0	-
GL South- 9m	-	34.1	5.8	-
GL South- 10m	-	55.9	26.7	0.0098
GL South- 11m	-	62	31.3	-
GL South- 12m	<0.020	62.7	30	-
GL South- 13m	-	62.8	21.3	-
GL South- 14m	-	62.9	33.3	-
GL South- 15m	-	62.6	34	-
GL South- 16m	<0.020	62.7	41.3	-
GL South- 17m	-	61.5	33.3	-
GL South- 18m	-	61	40	-
GL South- 19m	-	62.3	15.3	-
GL South- 20m	<0.020	63	9.1	-
GL South- 22m	-	63.4	17.8	-
GL South- 30m	-	60.6	26	-
GL South- 40m	<0.020	61.7	38	-

Footnotes: Data for TSS is believed to be incorrect. Believe that the laboratory did not rinse the salt off the filter paper. This will overstate TSS values.

GARROW LAKE - STATION 262-3A Continued
MAXIMUM ICE THICNESS SAMPLING EVENT - MAY 3, 2004

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL South- 3m	-	8.2	<3.0	<0.0050
GL South- 4m	-	8.2	<3.0	-
GL South- 5m	-	8.1	<3.0	-
GL South- 6m	-	8.1	<3.0	-
GL South- 7m	-	8.1	<3.0	-
GL South- 8m	-	8.2	<3.0	-
GL South- 9m	-	32.9	7	-
GL South- 10m	<0.020	58.7	23.7	0.0172
GL South- 11m	-	63	35	-
GL South- 12m	-	63.5	25	-
GL South- 13m	-	63.6	16.3	-
GL South- 14m	0.044	63.6	27	-
GL South- 15m	-	11.4	11.4	-
GL South- 16m	-	28.7	28.7	-
GL South- 17m	0.026	27.4	27.4	-
GL South- 18m	-	16.7	16.7	-
GL South- 19m	-	17.4	17.4	-
GL South- 20m	0.025	20.1	20.1	-

Footnotes:

Data for TSS is believed to be incorrect. Believe that the laboratory did not rinse the salt off the filter paper. This will overstate TSS values.

GARROW LAKE - STATION 262-3A Continued
MINIMUM ICE THICNESS SAMPLING EVENT - 2004
COULD NOT SAFELY ACCESS SAMPLING LOCATION

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL South- 3m				
GL South- 4m				
GL South- 5m				
GL South- 6m				
GL South- 7m				
GL South- 8m				
GL South- 9m				
GL South- 10m				
GL South- 11m				
GL South- 12m				
GL South- 13m				
GL South- 14m				
GL South- 15m				
GL South- 16m				
GL South- 17m				
GL South- 18m				
GL South- 19m				
GL South- 20m				
GL South- 22m				
GL South- 30m				
GL South- 40m				

Footnotes:

GARROW LAKE MONITORING - STATION 262 - 3 (MID LAKE)

	MID WINTER 26-Jan-04				MAXIMUM ICE THICKNESS 03-May-04				MINIMUM ICE THICKNESS Unable to Sample Due to Ice Conditions			
Depth (m)	Temp (C)	pH	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)	Temp (C)	pH	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)	Temp (C)	pH	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)
0	-	-	-	-	-	-	-		-	-	-	-
1	-	-	-	-	-	-	-		-	-	-	-
1.5	-	-	-	-	-	-	-		-	-	-	-
2	-	-	-	-	-	-	-		-	-	-	-
3	-0.37	7.7	8.29	14.4								
4	0.38	7.7	9.95	14.09	GLL to supply data - tests were							
5	0.98	7.7	10.87	13.59	conducted as required							
6	1.3	7.7	10.89	13.55								
7	1.85	7.7	10.9	13.05								
8	2.03	7.7	10.9	12.92								
9	2.32	7.7	10.93	12.83								
10	2.49	7.5	10.9	12.74								
11	3.2	7	10.94	11.8								
12	4.03	6.8	12.91	10								
13	5.08	6.8	41.8	6.75								
14	6.59	6.8	63.3	7.18								
15	8.45	6.8	78.5	3.03								
16	8.7	6.8	80.7	2.32								
17	8.8	6.8	81.3	1.86								
18	8.89	6.8	81.4	1.66								
19	8.89	6.8	81.7	1.3								
20	9.05	6.8	82	0.97								
21	9.12	6.8	82.1	0.71								
22	9.12	6.8	82.1	0.62								
23	9.12	6.8	82.1	0.53								
24	9.12	6.8	82.2	0.45								
25	9.12	6.8	82.1	0.4								
26	9.12	6.8	82.1	0.35								
27	9.12	6.7	82.2	0.32								
28	9.12	6.7	82.2	0.28								
29	9.12	6.7	82.2	0.25								
30	9.12	6.7	82.1	0.23								
31	9.12	6.7	82.2	0.21								
32	9.12	6.7	82.2	0.19								
33	9.12	6.7	82.2	0.17								
34	9.12	6.7	82.2	0.15								
35	9.12	6.6	82.2	0.13								
36	9.12	6.6	82.2	0.12								
37	9.12	6.6	82.2	0.11								
38	9.13	6.6	82.5	0.11								
39	9.16	6.6	82.5	0.11								
40	9.25	6.6	83.9	0.1								

GARROW LAKE MONITORING - STATION 262 - 3A (NEAR OUTLET)

	MID WINTER 27-Jan-04				MAXIMUM ICE THICKNESS 03-May-04				MINIMUM ICE THICKNESS Unable to Sample Due to Ice Conditions			
Depth (m)	Temp (C)	pH	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)	Temp (C)	pH	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)	Temp (C)	pH	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)
0	-	-	-	-	-	-	-		-	-	-	-
1	-	-	-	-	-	-	-		-	-	-	-
1.5	-	-	-	-	-	-	-		-	-	-	-
2	-	-	-	-	-	-	-		-	-	-	-
3	-0.3	8.36	12.4	19.2	GLL to supply data - tests were							
4	2.8	8.35	12.5	18.0	conducted as required							
5	3.3	8.34	12.4	17.5								
6	3.3	8.34	12.4	17.5								
7	3.3	8.34	12.5	17.4								
8	3.3	8.32	12.5	16.3								
9	4.1	8.26	13.0	12.4								
10	5.4	7.9	28.1	6.1								
11	6.8	7.56	76.1	0.1								
12	7.8	7.5	80.4	0.1								
13	8.0	7.5	80.6	0.1								
14	8.2	7.49	80.8	0.1								
15	8.3	7.5	80.7	0.1								
16	8.3	7.49	80.7	0.1								
17	8.3	7.49	80.8	0.1								
18	8.3	7.49	80.8	0.1								
19	8.3	7.49	80.8	0.1								
20	8.3	7.48	80.8	0.1								
21	8.3	7.48	80.8	0.1								
22	8.3	7.48	80.8	0.1								
23	8.3	7.48	80.8	0.1								
24	8.3	7.48	80.8	0.1								
25	8.3	7.48	80.9	0.1								
26	8.3	7.47	80.9	0.1								
27	8.4	7.47	80.9	0.1								
28	8.4	7.46	80.9	0.1								
29	8.4	7.46	80.8	0.1								
30	8.4	7.44	80.9	0.1								
31	8.4	7.43	80.9	0.1								
32	8.4	7.43	80.9	0.1								
33	8.4	7.43	80.9	0.1								
34	8.4	7.42	80.9	0.1								
35	8.4	7.41	80.8	0.1								

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS

MID-WINTER SAMPLING EVENT - JANUARY 26, 2004

	Total Metals Detection Limits (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL Mid- 3m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	0.00001	0.005	0.00005	0.01	0.0005
GL Mid- 4m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 5m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 6m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 7m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 8m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 9m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 10m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	0.00001	0.005	0.00005	0.01	0.0005
GL Mid- 11m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 12m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 13m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 14m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 15m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 16m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 17m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 18m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 19m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 20m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 22m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 30m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 40m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

Due to Ice can not sample the top 2 metres

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS

MAXIMUM ICE THICKNESS SAMPLING EVENT - MAY 3, 2004

	Total Metals Detection Limits (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL Mid- 3m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	0.00001	0.005	0.00005	0.01	0.0005
GL Mid- 4m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 5m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 6m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 7m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 8m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 9m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 10m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	0.00001	0.005	0.00005	0.01	0.0005
GL Mid- 11m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 12m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 13m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 14m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 15m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL MId- 16m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 17m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 18m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 19m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 20m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 22m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 30m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 40m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

Due to ice can not sample the top two metres

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS

MINIMUM ICE THICKNESS SAMPLING EVENT - 2004

NOT ABLE TO DO AS ICE DID NOT LEAVE LAKE, COULD NOT SAFELY ACCESS SAMPLING LOCATION

	Total Metals Detection Limits (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL Mid- 3m													
GL Mid- 4m													
GL Mid- 5m													
GL Mid- 6m													
GL Mid- 7m													
GL Mid- 8m													
GL Mid- 9m													
GL Mid- 10m													
GL Mid- 11m													
GL Mid- 12m													
GL Mid- 13m													
GL Mid- 14m													
GL Mid- 15m													
GL Mid- 16m													
GL Mid- 17m													
GL Mid- 18m													
GL Mid- 19m													
GL Mid- 20m													
GL Mid- 22m													
GL Mid- 30m													
GL Mid- 40m													

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

GARROW LAKE - STATION 262-3 Continued
MID WINTER SAMPLING EVENT - JANUARY 26, 2004

	Detection Limits			
	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL Mid- 3m	-			
GL Mid- 4m	0.02			
GL Mid- 5m	-			
GL Mid- 6m	-			
GL Mid- 7m	-			
GL Mid- 8m	0.02			
GL Mid- 9m	-			
GL Mid- 10m	-			
GL Mid- 11m	-			
GL Mid- 12m	0.02			
GL Mid- 13m	-			
GL Mid- 14m	-			
GL Mid- 15m	-			
GL Mid- 16m	0.02			
GL Mid- 17m	-			
GL Mid- 18m	-			
GL Mid- 19m	-			
GL Mid- 20m	0.02			
GL Mid- 22m	-			
GL Mid- 30m	-			
GL Mid- 40m	0.02			

Footnotes:

GARROW LAKE - STATION 262-3 Continued
MAXIMUM ICE THICKNESS SAMPLING EVENT - MAY 3, 2004

	Detection Limits			
	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL Mid- 3m	-	1	3	
GL Mid- 4m	0.02	1	3	
GL Mid- 5m	-	1	3	
GL Mid- 6m	-	1	3	
GL Mid- 7m	-	1	3	
GL Mid- 8m	0.02	1	3	
GL Mid- 9m	-	1	3	
GL Mid- 10m	-	1	3	
GL Mid- 11m	-	1	3	
GL Mid- 12m	0.02	1	3	
GL Mid- 13m	-	1	3	
GL Mid- 14m	-	1	3	
GL Mid- 15m	-	1	3	
GL MId- 16m	0.02	1	3	
GL Mid- 17m	-	1	3	
GL Mid- 18m	-	1	3	
GL Mid- 19m	-	1	3	
GL Mid- 20m	0.02	1	3	
GL Mid- 22m	-			
GL Mid- 30m	-			
GL Mid- 40m	0.02			

Footnotes:

GARROW LAKE - STATION 262-3 Continued
MINIMUM ICE THICKNESS SAMPLING EVENT - 2004
COULD NOT SAFELY ACCESS SAMPLING LOCATION

	Detection Limits			
	Inorganic Parameters	**Physical Tests**		**Cyanides**
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL Mid- 3m				
GL Mid- 4m				
GL Mid- 5m				
GL Mid- 6m				
GL Mid- 7m				
GL Mid- 8m				
GL Mid- 9m				
GL Mid- 10m				
GL Mid- 11m				
GL Mid- 12m				
GL Mid- 13m				
GL Mid- 14m				
GL Mid- 15m				
GL Mid- 16m				
GL Mid- 17m				
GL Mid- 18m				
GL Mid- 19m				
GL Mid- 20m				
GL Mid- 22m				
GL Mid- 30m				
GL Mid- 40m				

Footnotes:

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS

MID-WINTER SAMPLING EVENT - JANUARY 27, 2004

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL South- 3m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	0.00001	0.005	0.00005	0.01	0.0005
GL South- 4m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 5m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 6m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 7m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 8m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 9m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 10m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	0.00001	0.005	0.00005	0.01	0.0005
GL South- 11m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 12m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 13m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 14m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 15m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 16m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 17m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 18m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 19m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 20m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 22m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 30m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 40m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

Due to ice can not sample the top two metres

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS

MAXIMUM ICE THICKNESS SAMPLING EVENT - MAY 3, 2004

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL South- 3m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	0.00001	0.005	0.00005	0.01	0.0005
GL South- 4m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 5m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 6m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 7m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 8m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 9m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 10m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	0.00001	0.005	0.00005	0.01	0.0005
GL South- 11m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 12m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 13m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 14m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 15m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 16m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 17m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 18m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 19m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 20m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

Due to ice can not sample the top two metres

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS

MINIMUM ICE THICKNESS SAMPLING EVENT - 2004

NOT ABLE TO DO AS ICE DID NOT LEAVE LAKE, COULD NOT SAFELY ACCESS SAMPLING LOCATION

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL South- 3m													
GL South- 4m													
GL South- 5m													
GL South- 6m													
GL South- 7m													
GL South- 8m													
GL South- 9m													
GL South- 10m													
GL South- 11m													
GL South- 12m													
GL South- 13m													
GL South- 14m													
GL South- 15m													
GL South- 16m													
GL South- 17m													
GL South- 18m													
GL South- 19m													
GL South- 20m													
GL South- 22m													
GL South- 30m													
GL South- 40m													

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

GARROW LAKE - STATION 262-3A Continued
MID WINTER SAMPLING EVENT - JANUARY 27, 2004

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL South- 3m	-			
GL South- 4m	0.02			
GL South- 5m	-			
GL South- 6m	-			
GL South- 7m	-			
GL South- 8m	0.02			
GL South- 9m	-			
GL South- 10m	-			
GL South- 11m	-			
GL South- 12m	0.02			
GL South- 13m	-			
GL South- 14m	-			
GL South- 15m	-			
GL South- 16m	0.02			
GL South- 17m	-			
GL South- 18m	-			
GL South- 19m	-			
GL South- 20m	0.02			
GL South- 22m	-			
GL South- 30m	-			
GL South- 40m	0.02			

Footnotes:

GARROW LAKE - STATION 262-3A Continued
MAXIMUM ICE THICNESS SAMPLING EVENT - MAY 3, 2004

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL South- 3m	-	-	-	0.005
GL South- 4m	-	-	-	-
GL South- 5m	-	-	-	-
GL South- 6m	-	-	-	-
GL South- 7m	-	-	-	-
GL South- 8m	-	-	-	-
GL South- 9m	-	-	-	-
GL South- 10m	0.02	-	-	0.005
GL South- 11m	-	-	-	-
GL South- 12m	-	-	-	-
GL South- 13m	-	-	-	-
GL South- 14m	0.02	-	-	-
GL South- 15m	-	1	3	-
GL South- 16m	-	1	3	-
GL South- 17m	0.02	1	3	-
GL South- 18m	-	1	3	-
GL South- 19m	-	1	3	-
GL South- 20m	0.02	1	3	-

Footnotes:

GARROW LAKE - STATION 262-3A Continued
MINIMUM ICE THICNESS SAMPLING EVENT - 2004
COULD NOT SAFELY ACCESS SAMPLING LOCATION

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL South- 3m				
GL South- 4m				
GL South- 5m				
GL South- 6m				
GL South- 7m				
GL South- 8m				
GL South- 9m				
GL South- 10m				
GL South- 11m				
GL South- 12m				
GL South- 13m				
GL South- 14m				
GL South- 15m				
GL South- 16m				
GL South- 17m				
GL South- 18m				
GL South- 19m				
GL South- 20m				
GL South- 22m				
GL South- 30m				
GL South- 40m				

Footnotes:

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS
MID WINTER SAMPLING EVENT - JANUARY 26, 2004
DUPLICATE RESULTS

Project	Polaris SNP Saline Water Analysis (Garrow Lake)
Report to	Gartner Lee Ltd.
ALS File No.	T9117
Date Received	30/01/2004
Date:	20/02/2004

Sample ID		**GL Mid- 7m**	**GL Mid- 7m**	**RPD %**	**GL Mid- 16m**	**GL Mid- 16m**	**RPD %**
Date Sampled		26/01/2004	QC# 373743		26/01/2004	QC# 373744	
Time Sampled							
ALS Sample ID		5			14		
Nature		Water			Water		
Total Metals							
Arsenic	T-As	0.00029	<0.00020	36.7	0.00069	0.00089	25.3
Cadmium	T-Cd	0.000493	0.000492	0.203	0.000082	0.000085	3.59
Cobalt	T-Co	0.000061	0.000062	1.63	0.000402	0.000415	3.18
Copper	T-Cu	0.000976	0.000944	3.33	0.00143	0.00145	1.39
Iron	T-Fe	<0.010	<0.010	0	0.211	0.223	5.53
Lead	T-Pb	0.000794	0.000689	14.2	0.00255	0.00254	0.393
Manganese	T-Mn	0.00819	0.00807	1.48	0.0857	0.0876	2.19
Molybdenum	T-Mo	<0.0050	<0.0050	0	0.0073	0.0069	5.63
Nickel	T-Ni	0.00341	0.00315	7.93	0.00896	0.00919	2.53
Uranium	T-U	<0.010	<0.010	0	<0.010	<0.010	0
Zinc	T-Zn	0.197	0.188	4.68	0.265	0.271	2.24
Inorganic Parameters							
Sulphide	S	-	-	-	<0.020	<0.020	0

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS
MAXIMUM ICE THICKNESS SAMPLING EVENT - MAY 3, 2004
DUPLICATE RESULTS

Project	40137 Saline Water Analysis Garrow SNP (Polaris)
Report to	Gartner Lee Ltd.
ALS File No.	U3258
Date Received	07/05/2004
Date:	21/05/2004

Sample ID		**GL Mid- 6m**	**GL Mid- 6m**	**RPD %**	**GL Mid- 12m**	**GL Mid- 12m**	**RPD %**
Date Sampled		03/05/2004	QC# 385669		03/05/2004	QC# 385670	
Time Sampled							
ALS Sample ID		4			10		
Nature		Water			Water		
Total Metals							
Antimony	T-Sb	<0.00020	<0.00020	0	0.00096	0.00105	8.96
Arsenic	T-As	<0.00020	0.00023	14	0.00046	0.00046	0
Cadmium	T-Cd	0.000617	0.000636	3.03	0.000207	0.00024	14.8
Cobalt	T-Co	0.000066	0.00007	5.88	0.000751	0.000814	8.05
Copper	T-Cu	0.00102	0.00102	0	0.00218	0.00242	10.4
Iron	T-Fe	<0.010	0.01	0	0.173	0.195	12
Lead	T-Pb	0.00168	0.00138	19.6	0.00682	0.00783	13.8
Manganese	T-Mn	0.00957	0.00968	1.14	0.0971	0.112	14.3
Molybdenum	T-Mo	<0.0050	<0.0050	0	<0.0050	0.0064	24.6
Nickel	T-Ni	0.00385	0.00383	0.521	0.00821	0.009	9.18
Uranium	T-U	<0.010	<0.010	0	<0.010	<0.010	0
Zinc	T-Zn	0.229	0.233	1.73	0.262	0.28	6.64

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS
MINIMUM ICE THICKNESS SAMPLING EVENT - NOT SAMPLED
DUPLICATE RESULTS

Project	
Report to	
ALS File No.	
Date Received	
Date:	

Sample ID		**RPD %**	**RPD %**
Date Sampled			
Time Sampled			
ALS Sample ID			
Nature			
Total Metals			
Antimony	T-Sb		
Arsenic	T-As		
Cadmium	T-Cd		
Cobalt	T-Co		
Copper	T-Cu		
Iron	T-Fe		
Lead	T-Pb		
Manganese	T-Mn		
Molybdenum	T-Mo		
Nickel	T-Ni		
Uranium	T-U		
Zinc	T-Zn		

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS
MID WINTER SAMPLING EVENT - JANUARY 26, 2004
DUPLICATE RESULTS

Project	Polaris SNP Saline Water Analysis (Garrow Lake)
Report to	Gartner Lee Ltd.
ALS File No.	T9118
Date Received	30/01/2004
Date:	20/02/2004

Sample ID	**GL South- 7m**	**GL South- 7m**	**RPD %**	**GL South- 16m**	**GL South- 16m**	**RPD %**
Date Sampled	27/01/2004	QC# 373745		27/01/2004	QC# 373746	
Time Sampled						
ALS Sample ID	5			14		
Nature	Water			Water		
Total Metals						
Arsenic T-As	<0.00020	<0.00020	0	0.00079	0.00073	7.89
Cadmium T-Cd	0.000522	0.000562	7.38	0.000092	0.000088	4.44
Cobalt T-Co	0.000067	0.000076	12.6	0.000412	0.000396	3.96
Copper T-Cu	0.000916	0.000896	2.21	0.00167	0.00161	3.66
Iron T-Fe	<0.010	<0.010	0	0.232	0.229	1.3
Lead T-Pb	0.000325	0.000173	61	0.00265	0.00263	0.758
Manganese T-Mn	0.00906	0.0093	2.61	0.0948	0.094	0.847
Molybdenum T-Mo	<0.0050	<0.0050	0	0.0059	0.0072	19.8
Nickel T-Ni	0.00361	0.00372	3	0.00912	0.00907	0.55
Uranium T-U	<0.010	<0.010	0	<0.010	<0.010	0
Zinc T-Zn	0.208	0.231	10.5	0.27	0.265	1.87
Inorganic Parameters						
Sulphide S	-	-	-	<0.020	<0.020	0

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS
MAXIMUM ICE THICKNESS SAMPLING EVENT - MAY 3, 2004
DUPLICATE RESULTS

Project	40137 Saline Water Analysis Garrow SNP (Polaris)
Report to	Gartner Lee Ltd.
ALS File No.	U3253
Date Received	07/05/2004
Date:	21/05/2004

Sample ID	**GL South- 4m**	**GL South- 4m**	**RPD %**	**GL South- 15m**	**GL South- 15m**	**RPD %**
Date Sampled	03/05/2004	QC# 385637		03/05/2004	QC# 385638	
Time Sampled						
ALS Sample ID	2			13		
Nature	Water			Water		
Physical Tests						
Salinity o/oo	-	-	-	64.4	64.3	0.155
Total Metals						
Antimony T-Sb	<0.00020	<0.00020	0	0.00067	0.00077	13.9
Arsenic T-As	<0.00020	<0.00020	0	0.00052	0.00065	22.2
Cadmium T-Cd	0.000615	0.00061	0.816	0.000083	0.000082	1.21
Cobalt T-Co	0.000112	0.000075	39.6	0.000402	0.000451	11.5
Copper T-Cu	0.000963	0.00106	9.59	0.00127	0.0012	5.67
Iron T-Fe	<0.010	<0.010	0	0.245	0.235	4.17
Lead T-Pb	0.000322	0.000329	2.15	0.0021	0.00214	1.89
Manganese T-Mn	0.00994	0.01	0.602	0.0832	0.0804	3.42
Molybdenum T-Mo	<0.0050	<0.0050	0	0.0056	0.0056	0
Nickel T-Ni	0.00375	0.004	6.45	0.00886	0.00847	4.5
Uranium T-U	<0.010	<0.010	0	<0.010	<0.010	0
Zinc T-Zn	0.23	0.247	7.13	0.211	0.201	4.85

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS
MINIMUM ICE THICKNESS SAMPLING EVENT - NOT SAMPLED
DUPLICATE RESULTS

Project	
Report to	
ALS File No.	
Date Received	
Date:	

Sample ID	**RPD %**	**RPD %**
Date Sampled		
Time Sampled		
ALS Sample ID		
Nature		
Total Metals		
Antimony T-Sb		
Arsenic T-As		
Cadmium T-Cd		
Cobalt T-Co		
Copper T-Cu		
Iron T-Fe		
Lead T-Pb		
Manganese T-Mn		
Molybdenum T-Mo		
Nickel T-Ni		
Uranium T-U		
Zinc T-Zn		

APPENDIX 19

CORRESPONDENCE BETWEEN

TECK COMINCO AND ENVIRONMENT CANADA

REGARDING THE APPLICATION OF THE

METAL MINING EFFLUENT REGULATIONS

Azimuth Consulting Group Inc.
218-2902 West Broadway
Vancouver, BC V6K 2G8

Phone: 604-730-1220
Fax: 604-739-8511

Our File #: TC-03-03

March 29, 2004

Sidney F. Bruinsma
Enforcement/Emergencies Officer, Nunavut
Northern Division, Environmental Protection Branch
Environment Canada
Box 1870, Iqaluit
Nunavut X0A 0H0

Dear Mr. Bruinsma:

Re: Polaris Mine EEM – Missed Sublethal Toxicity Test Sampling Event

Further to our recent discussion, we are pleased to document the issues and circumstances surrounding the missed 2003 sampling event for sublethal toxicity testing (SLTT) of effluent at Teck Cominco's Polaris Mine.

First, Azimuth Consulting Group (Azimuth) takes full responsibility for the missed sampling event, which resulted from an oversight on our part. Our staff have considerable experience conducting environmental effects monitoring (EEM) programs under the Pulp and Paper Effluent Regulations (PPER), which have been in place for some years. We understand the importance of the SLTT as an EEM investigative tool and would not knowingly miss a sampling event. The oversight comes from our interpretation of the new Metal Mining Effluent Regulations (MMER) and how they apply to the Polaris Mine, which has a unique discharge situation (i.e., limited to approximately 60 days per calendar year). Under both the PPER and MMER, two sampling events are required for the SLTT. However, if the discharge period is less than 120 days, the PPER require only one sampling event. We mistakenly assumed that these terms would also apply to the MMER, which provide less detail pertaining to the requirements of this test than the PPER. This issue was compounded by the unique discharge characteristics and receiving environment of the Polaris Mine, which make the MMER more difficult to interpret and apply compared to mines discharging under more usual conditions.

We became aware of the missed SLTT event during a December 2003 workshop intended to present results of 2003 reconnaissance studies carried out at the mine and to seek feedback from the Technical Advisory Committee (TAP) on our proposed study design for the Polaris Mine. Following our presentation, Ms. Sandra Blenkinsopp pointed out that two sampling events were indeed required under MMER. She then indicated that Environment Canada would contact us to further discuss the implications of this matter.

We agree that the missed SLTT event is unfortunate and will ensure that this test is carried out twice during the 2004 and 2005 discharge periods.

Please do not hesitate to contact us if you have any questions or require further clarification.

Sincerely,
Azimuth Consulting Group Inc.

Patrick Allard, M.Sc., R.P.Bio.

cc: Randy Baker (Azimuth)
Bruce Donald (Teck Cominco)

Environment Canada
Environmental Protection Branch
Prairie and Northern Region
Northern Division
P.O. Box 1870 Iqaluit, Nunavut
X0A 0H0

PROTECTED

Occurrence File: 4408-2004-03-11-003

27 April 2004

WITHOUT PREJUDICE

Mr. David Thompson
Deputy Chairman and CEO
Teck Cominco Metals Ltd.
Suite 600 – 200 Burrard Street
Vancouver, British Columbia
V6C 3L9

and

Mr. John Knapp
Manager of Operations
Teck Cominco Metals Ltd.
Polaris Mine Operation
Polaris, Little Cornwallis Island, Nunavut
X0A 0Y0

RE: ***FISHERIES ACT;***
Metal Mining Effluent Regulations, Environmental Effects Monitoring
Part 1, Section 6(1)

The purpose of this correspondence is to remind Teck Cominco Metals Ltd. and John Knapp, in his capacity as Manager of Operations, Polaris Mine, in the Territory of Nunavut, of their obligations under the Environmental Effects Monitoring provisions of the Metal Mining Effluent Regulations of the *Fisheries Act*. It relates to a report of February 24, 2004 by Azimuth Consulting Group Ltd., acting as an agent for Teck Cominco Metals Ltd. and its officers. This correspondence sets out in writing the circumstances surrounding a failure to collect the appropriate samples as outlined within the regulations to wit: Part 1, Section 6, Environmental Effects Monitoring Studies of the Metal Mining Effluent Regulations.

../1

On 24 February 2004, Azimuth Consulting Group Ltd. had discussions with Environment Canada's Prairie and Northern Region, Senior Environmental Effects Monitoring Coordinator, Sandra Blenkinsopp. It was at this time that the deficiency in sampling was noted by Environment Canada. Azimuth Consulting Group acting as a contractor for Teck Cominco Metals Ltd. stated it had only collected a single sample for Sub-lethal Toxicity Testing (SLTT) contrary to the regulation requirements which required two samples to be collected.

Subsequently this matter was reported to the enforcement section of the Environmental Protection Branch of Environment Canada on the same day. Once I was notified I contacted Mr. Patrick Allard of Azimuth Consulting Group Ltd. requesting information on the circumstances surrounding this failure to meet the requirements of the Fisheries Act. Mr. Allard provided a letter to Environment Canada outlining the issues pertaining to the oversight by Azimuth Consulting Group Ltd. This letter was later also forwarded with the revised Polaris Mine - 2003 ANNUAL Metal Mining Effluent Regulations Summary Report dated March 31, 2004 and sent to Mr. Peter Blackall, Regional Director of Environmental Protection.

Environment Canada recognizes through these correspondences that Teck Cominco Metals Ltd. has taken measures to correct the aforementioned situation. Accordingly, a formal Warning Letter will not be issued in these circumstances.

This correspondence is intended to bring this matter to your attention in order for you to take necessary action to prevent a repeat of the circumstances described herein. In conclusion no further enforcement action is being considered or deemed warranted at this time. Environment Canada will be closing our file on this incident.

If you have any questions or require clarification, please contact the undersigned at (867) 975-4644.

Sidney Frank Bruinsma
Fisheries Act Inspector

cc: Craig Broome – Head of Enforcement Environmental Protection
Prairie and Northern Region, Environment Canada

../2

Bruce J. Donald
Reclamation Manager

April 27, 2004

Prairie & Northern Region
Environment Canada
Room 200, 4999 98th Ave.
Edmonton, AB T6B 2X3

Attention: Peter Blackall, Regional Director of Environmental Protection

Dear Sir;

Re: Polaris Mine – Alteration of System at Final Discharge Point at Garrow Dam

As required under Section 10(2) of the Metal Mining Effluent Regulations, please be advised that the siphons at Garrow Lake dam will not be used for discharging effluent this summer. As part of our decommissioning and closure activities, the dam is being partially decommissioned with a channel constructed through the decommissioned portion of the dam. Flow through the dam will be via the original creek channel starting with this year's effluent discharge season. Sampling of the effluent will be continued from the same location as in previous years so that a change in the location of the Final Discharge Point is not being contemplated.

Yours truly,

Original signed by B. Donald

Bruce Donald

cc:
Walter Kuit (Teck Cominco Limited)
Bob Hutchinson (Teck Cominco Limited)
Trevor Feduniak (Teck Cominco Limited)
Joe Dahoy (Cascade Mgmt)
Randy Baker (Azimuth Consulting Group)

Polaris Mine EEM - Outline of Study Design for Biological Monitoring Studies

Highlights:

- Program builds on 1) results of historical studies covering pre-mining and operational periods; 2) findings of 2003 reconnaissance studies (i.e., field effluent plume delineation, underwater video survey, fish survey, and sediment survey); 3) theoretical effluent plume modeling; and 4) considerable feedback obtained during consultations with the Technical Advisory Panel (TAP) as part of two workshops (April and December 2003) and follow-up discussions.

- Approach consists of a Control/Impact design focusing on one high exposure area (i.e., aquatic receiving environment that is nearest to the mouth of Garrow Creek and that contains an appropriate habitat type with sufficient geographic area to accommodate the necessary number of replicate stations; Environment Canada, 2002) and one reference area. Both areas are located in Garrow Bay, approximately 1 km apart (see attached figure).

- Our rationale for targeting one high exposure area, rather than multiple near-field and far-field exposure areas, follows guidance from Environment Canada (2002) and reflects findings of the 2003 reconnaissance studies which clearly indicated the lack of an exposure gradient between the mouth of Garrow Creek and the reference area.

- The field program is planned from August 11th - 25th 2004, when the likelihood of safe access to Garrow Bay for sampling is optimal.

- Standard and accepted QAQC procedures will be used throughout the program.

- The proposed study design is optimistic. While every attempt will be made to achieve the goals of the program, field conditions and safety issues may require us to focus on a few priority study components. As discussed with members of the TAP, all clam, benthos, and sediment collections will be diver-assisted, so local weather and ice conditions will dictate level of effort. We propose the following priorities and would appreciate feeback from the TAP: 1) fish survey and tissue analyses; 2) supporting environmental variables (water and sediment quality surveys); 3) SIMS survey (faster to accomplish and provides semi-quantitative basis for evaluating any gross impacts to marine communities); and 4) benthic invertebrate community survey (time intensive given replication required to achieve statistically sound assessment).

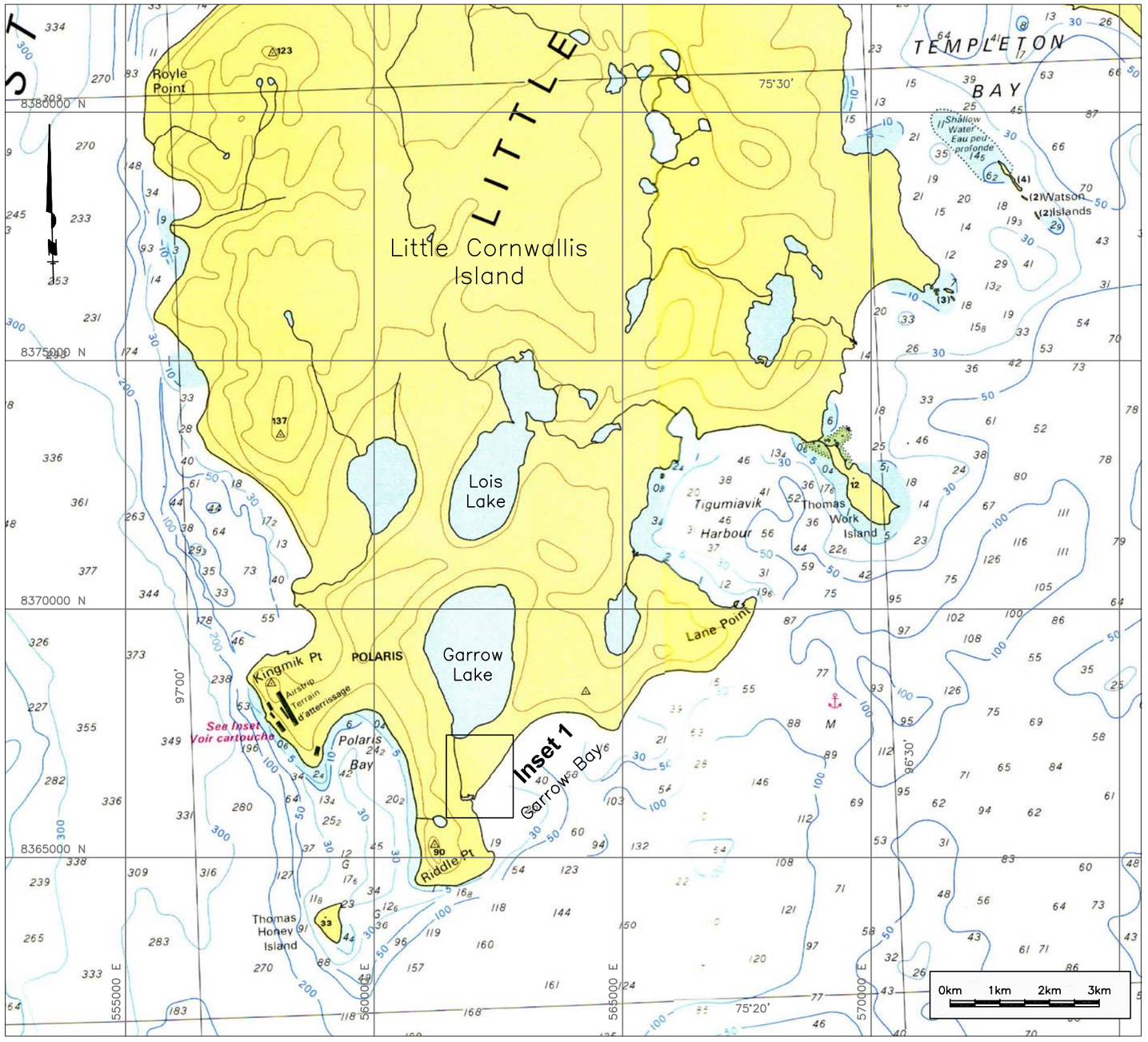
Study Component	Sampling Areas	Sample Size and Replication		Mesurement Endpoints	Sampling Method
Fish Survey and Tissue Analyses - Species selected: softshell clam (*Mya truncata*)	**Garrow Bay high exposure area**: located in the area closest to the mouth of Garrow Creek where sufficient clams can be collected (approx. 6 - 8 m depth)	- Target of 40 clams[1]	- Individual clams	- Length - Width - Whole animal wet weight - Shell weight - Soft tissue fresh weight - Gonad fresh weight - Sex - Condition index - Gonadosomatic index[2]	- Diver-assisted sampling; collection of individuals by hand, only intact clams will be retained
			- 4 soft tissue composites of 10 undepurated clams	- Tissue chemistry: moisture and lipid content, suite of metals	
	Garrow Bay reference area: located approximately 1 km to the northeast, upstream of the predominant current direction (approx. 6 - 8 m depth)	- Target of 40 clams[1]	- Individual clams	Same as high exposure area	Same as high exposure area
			- 4 soft tissue composites of 10 undepurated clams	Same as high exposure area	
Benthic Invertebrate Community Survey	**Garrow Bay high exposure area**: located in the area closest to the mouth of Garrow Creek where benthic communities can be sampled (approx. 6 - 8 m depth)	- 5 replicate stations (approx. 10 m x 10 m each and separated by approx. 50 m)	- 5 x 1L subsamples per station	- Total invertebrate density - Taxon richness - Simpson's diversity index - Bray-Curtis index - Evenness - Taxon density - Taxon proportions - Taxon presence/absence	- Diver-assisted sampling; upper 10 cm of sediment will be collected for each subsample using a 1L plastic container - All 5 x 1L subsamples for a given station will be physically pooled prior to processing - Processing will be performed using a 1 mm mesh size - Identifications will be performed to the lowest practicable taxonomic level
	Garrow Bay reference area: located approximately 1 km to the northeast, upstream of the predominant current direction (approx. 6 - 8 m depth)	- 5 replicate stations (approx. 10 m x 10 m each and separated by approx. 50 m)	- 5 x 1L subsamples per station	Same as high exposure area	Same as high exposure area

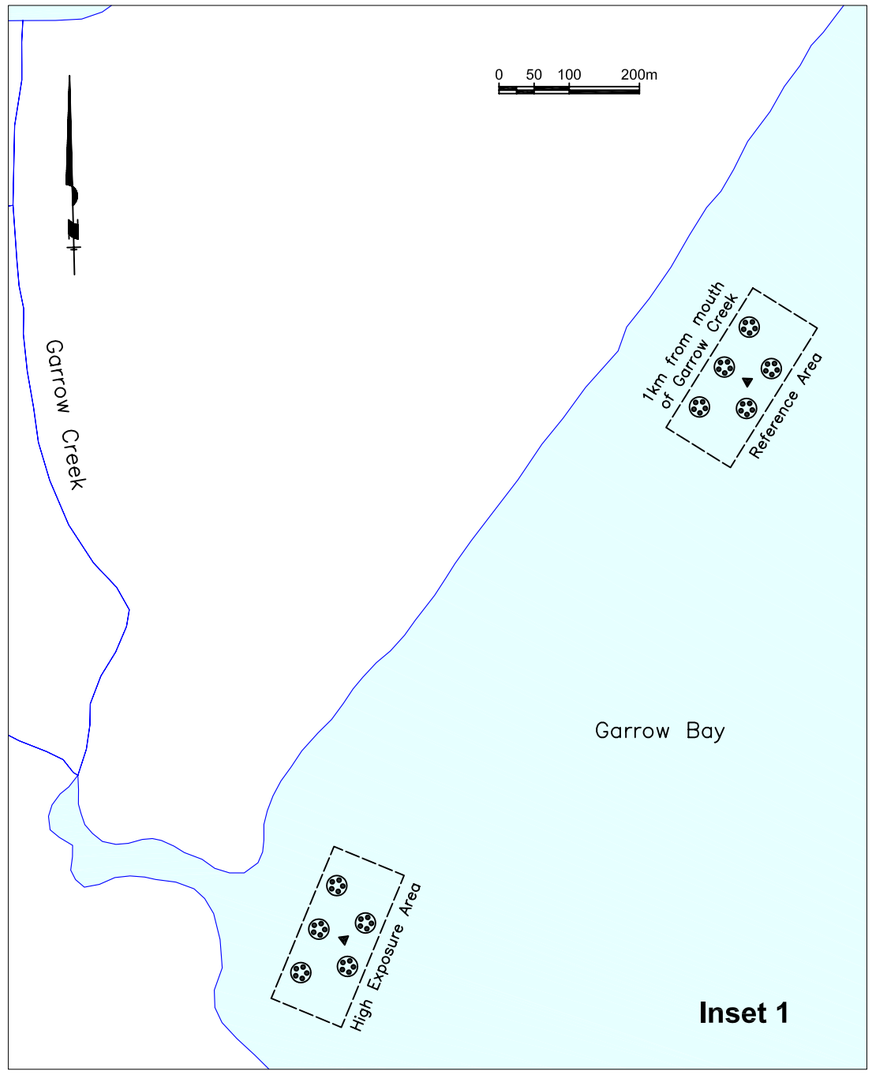
Polaris Mine EEM - Outline of Study Design for Biological Monitoring Studies

Study Component	Sampling Areas	Sample Size and Replication		Mesurement Endpoints	Sampling Method
Supporting Environmental Variables					
- Water quality monitoring	**Garrow Bay high exposure area**: location matching fish and benthic survey sampling area	- 5 replicate stations for field measurements (matching benthic replicate stations)	- Measurements made at 1 m depth intervals	- Field measurements: DO, pH, temperature, salinity, transparency and water depth	- Calibrated YSI meter, pH probe, and depthmeter will be used for all field measurements - Surface water samples will be collected directly into sample containers; all 5 subsamples for a given sampling area will be composited prior to analysis - Subsurface sampling will be conducted using divers; care will be taken not to disturb sediments during sampling; all 5 subsamples for a given sampling area will be composited prior to analysis - Timing of sampling will match routine MMER effluent characterization as well as EEM effluent and water quality monitoring
		- 1 composite surface sample for laboratory analysis	- 5 subsamples matching benthic replicate stations	- Laboratory analyses: pH, temperature, DO, hardness, alkalinity, Al, As, Cd, Cu, cyanide, Fe, Hg, Pb, Mo, Ni, Zn, TSS, ammonia, nitrate, radium 226	
		- 1 composite subsurface sample for laboratory analysis (0.25 m from bottom)	- 5 subsamples matching benthic replicate stations		
	Garrow Bay reference area: location matching fish and benthic survey sampling area	- 5 replicate stations for field measurements (matching benthic replicate stations)	- Measurements made at 1 m depth intervals	Same as high exposure area	Same as high exposure area
		- 1 composite surface sample for laboratory analysis	- 5 subsamples matching benthic replicate stations		
		- 1 composite subsurface sample for laboratory analysis (0.25 m from bottom)	- 5 subsamples matching benthic replicate stations		
- Sediment quality monitoring	**Garrow Bay high exposure area**: location matching fish and benthic survey sampling area	- 5 replicate stations (matching benthic replicate stations)	- 5 subsamples (matching benthic subsamples) per station	- Sediment chemistry: TOC, grain size, suite of metals	- Diver-assisted sampling; upper 10 cm of sediment will be collected for each subsample using a 1L plastic container - All 5 subsamples for a given station will be composited prior to analysis
	Garrow Bay reference area: location matching fish and benthic survey sampling area	- 5 replicate stations (matching benthic replicate stations)	- 5 subsamples (matching benthic subsamples) per station	Same as high exposure area	Same as high exposure area
Additional Studies - Seabed Imaging and Mapping System (SIMS)	**Garrow Bay high exposure area** and **Garrow Bay reference area**	- Numerous georeferenced tracklines within each area	- Continuous imagery	- Seabed classification maps including: substrate type, vegetation type and cover, distribution and relative abundance of macrofauna	- Towed underwater camera (SIMS) providing semi-quantitative survey of physical and biological features of the seabed

[1] During the 2003 reconnaissance studies, a total of 29 clams were collected by divers; access to Garrow Bay for diving was limited to 3 out of 14 field days due to harsh weather conditions (e.g., presence of ice flows, strong winds, blizzard). Every effort will be made during the 2004 field program to meet the mininum EEM requirement of 40 individuals per sampling area; however, the total sample size may be limited by field conditions. In addition, the inherent difficulty in identifying clam sexes in the field may result in a departure from the requirement for 20 males and 20 females.

[2] The gonadosomatic index will be determined under the supervision of Sylvie St-Jean, National Water Research Institute. The sample size will be assessed once field work is completed.





Sampling area for fish survey and benthic invertebrate community survey

Replicate station - benthos, sediment, water (field measurements)

Subsample - benthos, sediment

Surface and subsurface composite sample - water (laboratory analysis); note that subsamples will be taken from each benthic replicate station (see above)

Inset data and surrounding creeks digitized from Map 1 Sampling Sites 1980 *prepared by B.C. Research January 1978*

Other data from Crozier Strait And/Et Pullen Strait 7935 *corrected 2003-03-28 published by the Canadian Hydrographic Service*

AZIMUTH

Azimuth Consulting Group Inc.
218-2902 West Broadway
Vancouver BC, V6K 2G8

DRAWN BY:	CHK. BY:	PROJECT No:
BT	PA	TC-03-03
	DATE: 3/6/2004 1:04 PM	

PROJECT: Polaris

TITLE:

Polairs Mine EEM
Study Design for Biological Studies

CLIENT: Teck Cominco

Figure 1

Review of Polaris Mine EEM
Study Design Outline for Biological Monitoring Studies

Highlights Section
The benthic survey component should be given the 3rd priority rather than the 4th priority. The benthic survey is a main EEM component. If time becomes an issue, the TAP recommends that sediment and water quality sample collection be reduced as indicated in the comments below.

Fish Survey and Tissue Analysis
Gonad dry weight and animal height should be added to the list of measured endpoints.

Benthic Invertebrate Community Survey
The MMER TGD recommends that in marine systems, a stacked set of 1.0 and 0.5 mm screens be used in the field with the 0.5 mm samples being archived and processed only if appropriate.

Benthic Supporting Environmental Variables (Chapter 5 of TGD)
Please see Table 5-7 of the MM TGD for the recommended supporting explanatory variables to be measured at each station in marine/estuarine benthic invertebrate habitats. In addition to the parameters listed in your outline, this table also recommends that dissolved oxygen near the bottom, sediment Eh (redox) and sediment total sulfides, as well as substratum characteristics be measured at each benthic station.

If time is limiting, the TAP recommends that **one sediment sample be collected per station** at the same time as the benthic invertebrate sampling.

Water Quality Monitoring during biological field work (Chapter 6 of MM TGD)
If time is limiting, the TAP recommends that the water quality sample collection work be done within each fish and benthic invertebrate sampling **area at one representative station** (pg 6-5, MM TGD).

Field Measurement of Water Quality Parameters - Please note that when water depth is greater than 4m, the standard water quality parameters measurable in the field should be taken throughout the water column at one to five metre intervals depending on total depth (pg. 6-9 MM TGD). The TAP recommends that the interval at which measurements are taken be less than every meter in the upper portion of the water column, in order to pick up where the freshwater lens is, etc. It is also recommended that conductivity be added to the list of standard field measurements.

Collection of Water Samples for Laboratory Analyses - The water collected for laboratory analyses of water quality should be collected at 2 depth intervals: the subsurface and near bottom (pg. 6-10 MM TGD), as described in your outline.

FINAL MEETING MINUTES

ENVIRONMENTAL EFFECTS MONITORING
STUDY DESIGN MEETING
POLARIS MINE (TECK COMINCO) & TECHNICAL ADVISORY PANEL
Tuesday, December 16, 2003
1:00 p.m to 5:00 pm.

Bev Burns Boardroom, Environment Canada, Edmonton

Attendees:

Bruce Donald	Teck Cominco, Cranbrook
John Knapp	Teck Cominco
Randy Baker	Azimuth Consulting Group Inc., Vancouver
Patrick Allard	Azimuth Consulting Group, Inc., Vancouver
Dionne Filiatrault	Nunavut Water Board, Gjoa Haven
Chris Baron	F&O Canada, Winnipeg
Meighan Wilson	Indian and Northern Affairs, Yellowknife
Stephen Harbicht	Environment Canada, Yellowknife
Sandra Blenkinsopp	Environment Canada, Edmonton
Jenny Ferone	Environment Canada, Edmonton
Paula Siwik	Environment Canada, Edmonton

1. Attendees introduced themselves.

2. No additional items were added to the agenda.

3. Review of the objective: To discuss the findings of the August 2003 reconnaissance studies, and to incorporate these findings into a revised EEM study, scheduled for August 2004.

4. Results of the August 2003 field reconnaissance studies on water chemistry, toxicity testing, plume delineation & modeling, sediment chemistry, benthos, and fish were presented by Randy Baker and Patrick Allard. Their presentation is appended (a hard copy will be sent with the final version of the minutes). An underwater video clip was also viewed. Information from the video presentation and slide presentation is appended at the end of the minutes.

5. General Discussion on Study Design Key Components

Adult Fish Survey

- Given that fin fish were found to be very rare in Garrow Bay, clams will be used in lieu of fin fish.
- The sampling design for collecting clams was discussed, given the limitations on the divers (2 dives per day, approximately 30 -35 minutes per dive). If discrete sampling stations are used similar to a benthic invertebrate sampling design with 5 stations, the divers will only be able to collect about 5 clams per station. Further discussion is needed to confirm if 20 - 25 clams, for example, are sufficient given the variability in a natural population. Another option is to collect clams on a per area basis.
- The range of EEM endpoints found in the MMER EEM Technical Guidance for caged bivalves should be measured on the wild clams, e.g. length, width, etc. (Note: The information is found in the Alternative Monitoring Chapter - Chapter 12).
- The exposure area clams should be collected along the first depth contour where clams are exposed to the effluent from Garrow Creek. This would probably be at the 5 to 6 m depth. Note: Steve Harbicht wants to see solid baseline data from this area in the event that Garrow Lake has a release in the future.
- The reference area will be in the subtidal area to the north of the mouth of Garrow Creek. The reference area clams will be collected along the same depth contour as the exposure area clams to remove the effect of depth. Note that results from the reconnaissance work indicated that metal levels in clams and sediment in this area as well as in the exposure area were similar to background concentrations measured in Tigumiavik Harbour.
- Exposure will be assessed by conducting soft tissue analyses for a suite of metals.

Action Item: Sandra Blenkinsopp to collect information on wild clam sample size. Done - Sandra spoke with Dr. Sylvie St.-Jean en route to the EEM Science Symposium. Dr. St.-Jean suggested a minimum of 40 clams of each sex per area, which usually requires a field collection of about 120 clams.

Action Item: Sandra Blenkinsopp will send Sylvie St.-Jean's contact information to Patrick so that he can get the current information on reproductive endpoints, which are under development. Done. Patrick and Sylvie have discussed the study. Patrick indicated that it was agreed that while 40 clams of each sex per study area would be ideal, it is unlikely that such a large sample size can be achieved due to sampling limitations in Garrow Bay (e.g., diver-assisted, ice flows, weather conditions, etc). Rather, it was agreed that 40 clams total per study area will be targeted. While 20 males and 20 females are recommended for the fish survey, it was acknowledged that difficulties in sexing clams in the field may result in departures from this target ratio.

Benthic Invertebrate Community Survey

- Grabs from the surface will not work because the sediments are too hard.
- Could use diver-assisted cores or quadrats
  - Cores – subsurface too hard
  - Quadrats – difficult because of kelp beds
- Could do a combination – SIMS and diver assisted cores or through-ice cores.
- Benthic stations (5 per area) will be located along a depth contour (approx. 6 m) to remove effect of depth, using same areas as clam survey.
- Patrick suggested divers could use a 1L wide-mouth jar, and drag it at a consistent depth and in a consistent manner until full. Used this method at Burrard Inlet.
- TAP suggested increasing subsamples per station and using a smaller volume. Could possibly do 2 to 3 subsamples per 500 mL jar.
- Use of amphipods briefly discussed (& subsequently discarded).
- Unlikely to have enough time to collect samples from a far-field site. (Note to TAP: a far-field benthic site is not required for an initial MMER EEM survey.)
- SIMS will be back-up, used in same area.

Sediment Collection

- Grabs will not work because the sediments are too hard (see benthic above).
- Steve Harbicht asked about the sediment chemistry with respect to the digest, etc.

Action Item: Sandra Blenkinsopp to confirm if sediment is to be collected per station. Done - Sediment sampling is to be done at each benthic station.

Action Item: Sandra Blenkinsopp to check sediment chemistry guidance for marine environments to determine recommended digestion process for EEM. Status: In Progress.

Effluent and Water Quality Monitoring

- The effluent and water quality monitoring, which includes effluent sublethal toxicity testing, must continue for the full 3 year period until the mine receives recognized closed mine status
- Two effluent samples must be collected for sublethal toxicity testing per year. The mine indicated that it had only collected one in 2003 in 9 weeks of discharge.

Action Item: Sandra Blenkinsopp to follow up with Patrick Allard. Done. The 2004 and 2005 monitoring events will include two samples for sublethal toxicity testing.

Timing of Survey

- Survey will be conducted approximately Aug 10 – 25th, 2004.

- Based on experience during the field reconnaissance survey last year, ½ of days up there might be working days.
- Field support for divers was discussed. A lot of the infrastructure will be gone and the medical facility will be decommissioned by August. Sandra Blenkinsopp suggested that it may be better to sample in May through an ice platform when more infrastructure was present at the site. Bruce Donald indicated that effluent wouldn't be flowing in May. Sandra Blenkinsopp has discussed this site with the National EEM Office, and the National EEM Office indicated that the effluent would not have to be flowing during sampling at this site. The consultants decided to work in August. They want to concentrate on open water sampling.
- If due to inclement weather or other difficulties the survey can't be completed, Patrick asked what happens, and the following summarizes the discussion:
    - Sandra Blenkinsopp indicated that the consultants should keep in touch with her or the Authorization Officer (AO) during the field work so that the TAP can be informed if weather is causing a problem, etc., Weather problems, communications with EC, etc., should be documented by the consultants for use in writing up the interpretive report. **Human safety is of primary importance.**
    - Sandra indicated that two weeks is an acceptable level of effort to attempt to achieve the objectives of the field survey.
    - Fall-back position – Combine 2 years of data.
    - Jenny Ferone suggested prioritizing elements of study, e.g. collect clam biological endpoints first.
    - Seabed Imaging and Mapping System (SIMS – see below) will be a backup, since it will be done in the same area. There is value in having both – cores and visual.
- First weekend of September in 2004 – sea-lift. Everybody and everything goes.

Seabed Imaging and Mapping System (SIMS) – The consultants indicated that there is a F&O requirement for SIMS to be done at the dock site now that the dock structure has been removed. Ten to 15 m intervals parallel to shore will be done, followed by tows perpendicular to shore, and then oblique tows. Abundance, and presence / absence will be noted, as well as depth. Drop camera, magnify and do quadrat survey. This is a semi-quantitative method.

6. Steps Forward
    - Sandra Blenkinsopp to distribute minutes
    - Azimuth to finalize study design. Anticipate a 2 to 3 month turn-around time.
    - Randy will make a copy of the video for EC (Received by Edm Office January 7, 2004).

Video and Slide Presentation

Notes from video presentation:

- Video taken first weeks of August 2003
- Thin layer of sand/silt over cobble and gravel
- One fish; Clouds of amphipods (mysids)
- Starting at mouth of creek and moving out
- Ice scour area – rocky, no kelp
- Lot of cobble and gravel and attached kelp typical of 5 to 8 metres depth, 150 – 200 m offshore
- Stark difference in kelp/benthic community abundance between scoured intertidal and subtidal area
- Maximum depth sampled approximately 8 m. Floats were set for the collection of clams at approximately 8 m.
- Clams in softer sediments as well as between larger substrates
- Looking for clams as near to shore as possible, looking for siphons that stick out of the sand. Suspended material hung in water column
- Collected paired sediment and clam tissue samples
- Sediments collected by hand into jar prior to clam collection
- Clams (*Mya truncata*), 17 - 50 g wet body weight, approx. 4 size classes (17-19, 32, 40, & 50 g)
- Dragged a zooplankton net in shallows and collected specimens. Made a representative zooplankton collection.
- Water temperature was -0.5 to -1 ^{o}C water temp, 0 ^{o}C at surface
- 30 to 35 minutes per dive

Slide 4 - Garrow Lake Effluent Characterization

- Collected water samples weekly
- Early in the year the freshwater ice melt causes a drop in salinity
- Garrow Lake is siphoned over the dam then flows by gravity.
- Garrow Creek typical discharge was 0.1 to 0.2 m^3/s. Spring flow generally 1.5 to 2 m^3/s.
- Flow rates are higher this year because more siphons were on line.
- Approximately 20 cm remains to get lake down to level. The dam will be opened for this.
- Garrow Lake sampling performed for Fisheries & Oceans Canada in August 2003: Captured 19 sculpins, sacrificed 11; Zooplankton
- Garrow Lake top 9 or 10 m was brackish water; 2 ppt down to 7 or 8 ppt. Transition zone at 10 or 11m when salinity went from 10 to 60 ppt. Pretty well uniform at 60 ppt to bottom. Temperature inversion – about 8^{o}C at bottom.

Slide 6 – 2003 Effluent Chemistry Data

- BC Aquatic Water Quality Guidelines are marine limits based on toxicity to algae with a 2 fold safety factor

Slide 7 – Contaminants of Potential Concern

- Concentration of Zinc – low initially at ice melt and then increases
- Bruce Donald indicated that in the future Zinc concentrations should be lower, since only meltwater should be drawing down.
- High Pb, reason not known. Could have been due to new siphons.

Slide 8 – Effluent Characterization - Sublethal Toxicity Testing
- Didn't miss any holding times for getting samples to the toxicity lab in Vancouver.
- Acute Lethality Tests – included salinity controls
- SLTT – 72% v/v highest effluent concentration tested; used sea salts
- Randy Baker asked if other mines are doing the salinity adjustment. Sandra B indicated that for marine tests the standard protocol is to adjust salinity.
- Note: Only one effluent collection for SLTT was done. The mine discharged for approximately 9 weeks.

Slides 10 & 11 – Effluent Characterization - Sublethal Toxicity Testing
- Think Zinc was the cause of the toxicity. Paired samples - one for toxicity and one for chemistry.
- Arctic amphipods used by Peter Chapman were collected from discharge environment. Temperature known to affect toxicity. The higher the temperature, the higher the toxicity.

Slide 12 to 13 - Reconnaissance Studies in Garrow Bay
- 16' boat, rifle, communications – radio to mine
- Plume Delineation was done using a boat and chest-waders

Slide 14 to 20 – Plume Delineation
- Chest waders and boat survey, working from outside in
- Field measurements taken of temperature, salinity and zinc concentration
- Samples collected at surface (top 30 cm) and subsurface (10 cm off bottom)
- Effluent was 40 cm 'thick' at mouth of Garrow Creek and decreased to 10 to 20 cm 'thick' 200 m offshore
- At about 25 to 26 ppt salinity, Zinc was down to 0.05 mg/L (detection limit)
- Negative regression between zinc concentration and salinity
- Ice present in bay really accelerates mixing process as plume moves around and under ice blocks.

Slide 21 Modeling - Frick *et al.* 2003 EPA visual plumes software
- Wind and current influences mixing.
- No ice involved in model
- In the future, discharge will be approximately 1/5 to 1/10 of what it was in 2003

Slide 27 – 2003 Reconnaissance Design

- Had planned to use Tigumiavik Harbour as a reference area, but access was too difficult.
- Reference was moved to approximately 500 m north of Garrow Creek mouth, based on results of plume delineation.
- Water Quality Monitoring as well as sediment and clam tissue data indicate background conditions.

Slide 28
- Previous surveys, clams collected under ice but tried to get clams from closer to the creek mouth this time using divers. Intertidal area devoid of life except for amphipods.
- 2 reference areas, one for intertidal and one for sub-tidal, access limited.
- Plume moved both ways, went far enough away north/south to be out of the plume. Also suspected a back eddy but wind a bigger issue.
- Three exposure stations sampled & 1 reference– were limited by divers and clams.

Slide 30
- Prawn trap was baited with cat food. Worked very well in Garrow Lake when baited with cat food. Tried in marine environment – amphipods ate cat food. Was crushed by ice on second night.
- Clams – composited 3 to 4 clams per size category and analyzed composite.

Slide 31
- N=3 means 3 composite samples each comprised of 3 to 4 clams
- Metal suite on body tissue
  - Intended to depurate but not enough clams
  - Pulled them out, put them in bags, scrubbed them in lab, pulled siphon and cleaned as best as could
  - Results include everything: siphon, sediment, gut contents, etc.
- No relationship between size and metal concentration

Slide 32 – Historical Metals Concentrations in Clam Tissue
- Fallis' historical clam data was on depurated clams. Sample size is number of composites in all cases except for BC research who analyzed individual clams.

Slide 34 – Sediment Survey
- Unable to collect sediment with standard Ponar grab
- Recovered kelp on gravel most times in spaces allowed for water movement
- Rate of failure consistent between near-field, far-field and ref area

Slide 35 – Metal Concentrations in Sediment 2003
- Intertidal concentrations higher than sub-tidal concentrations.

- Did analysis on 2mm (sand) fraction and down. In both subtidal and tidal targeted fine sediments.
- Note: likely the first metals data for intertidal sediment collected at this site.

Four options raised for discussion:

- conduct an EEM compliant study design
  - consultants don't think this can be done
- conduct a limited field study using alternative tools
  - diver assisted clams and sediment
    - underwater imagery (SIMS)
    - F&O Canada requires SIMS for intertidal areas by barge
- No further biological monitoring
  - Continue effluent and water quality monitoring
- Other?

Donald Bruce KIMB

From: Donald Bruce KIMB
Sent: August 18, 2004 3:59 PM
To: 'Blenkinsopp,Sandra [Edm]'
Cc: 'Beth Power'
Subject: Polaris EEM Program Update

I just got a call from Randy Baker via the satellite phone from site. The phone system at site is not demolished (and thus no email either) along with the Accommodation Building (so the crews are now living in Sea Containers and Trailers in the temporary camp). The satellite phones do not have good connections and the signal is often distorted. The connection breaks off frequently so they need to call back two or more times to accomplish a 5 minute call.

The 3 Azimuth scientists and the two divers they contracted are on site now. They arrived August 14th as planned. They have all their gear mobilized including the sampling equipment and bottles. We have left a rental compressor on site for the divers (they have to fill their bottles on site as can't ship them full on the airlines). They have set up a tent for shelter by the bay (for the divers) and we have assigned them access to quads for transportation as well as two boats. We purchased one of the boats specifically the EEM program and flew it in during the winter so that they would have a second boat as a safety back up. The winds in Garrow Bay can get fairly strong so we need to be able reach them incase they run into trouble in the first boat. Last year we used an older boat as the backup but it is not adequate for safety and we should have had something more reliable last year. They have the SIMS gear on site with them as well, so are ready to do the video survey.

Randy asked that I pass on to you that they are currently waiting for the ice to free up in Garrow Bay. Last year the ice was off the bay at this time. Randy is concerned that the ice may not leave the bay this year. As we committed, we are having them remain on site for two weeks incase the ice is just a bit later leaving this year. We mutually agreed with Environment Canada that a two week period was as an acceptable level of effort. Hopefully we get a strong wind that frees the ice so we can complete the planned work program.

For your information, we collected our monthly water samples from Garrow Creek yesterday as well as the sub-acute samples. However, it was foggy today so the plane from Resolute was unable to come into site but it didn't really matter as it doesn't look like the commercial flights could make it into Resolute today either. There is a slim chance the weather may change and the plane will try later today but it is a slim chance. Will try to sample again if it looks like the flight can get in tomorrow. If there isn't a flight tomorrow, then we'll try again next Tuesday.

Randy will try to give you a call in a few days to update you directly.
I am in contact with the site on a regular basis incase you want to pass any messages onto them.

Regards,
Bruce Donald

Donald Bruce KIMB

From: Blenkinsopp,Sandra [Edm] [Sandra.Blenkinsopp@EC.gc.ca]
Sent: August 18, 2004 4:24 PM
To: Donald Bruce KIMB
Subject: RE: Polaris EEM Program Update

Thanks for the update Bruce!

-----Original Message-----
From: Donald Bruce KIMB [mailto:bruce.donald@teckcominco.com]
Sent: Wednesday, August 18, 2004 3:59 PM
To: Blenkinsopp,Sandra [Edm]
Cc: Beth Power
Subject: Polaris EEM Program Update

I just got a call from Randy Baker via the satellite phone from site. The phone system at site is not demolished (and thus no email either) along with the Accommodation Building (so the crews are now living in Sea Containers and Trailers in the temporary camp). The satellite phones do not have good connections and the signal is often distorted. The connection breaks off frequently so they need to call back two or more times to accomplish a 5 minute call.

The 3 Azimuth scientists and the two divers they contracted are on site now. They arrived August 14th as planned. They have all their gear mobilized including the sampling equipment and bottles. We have left a rental compressor on site for the divers (they have to fill their bottles on site as can't ship them full on the airlines). They have set up a tent for shelter by the bay (for the divers) and we have assigned them access to quads for transportation as well as two boats. We purchased one of the boats specifically the EEM program and flew it in during the winter so that they would have a second boat as a safety back up. The winds in Garrow Bay can get fairly strong so we need to be able reach them incase they run into trouble in the first boat. Last year we used an older boat as the backup but it is not adequate for safety and we should have had something more reliable last year. They have the SIMS gear on site with them as well, so are ready to do the video survey.

Randy asked that I pass on to you that they are currently waiting for the ice to free up in Garrow Bay. Last year the ice was off the bay at this time. Randy is concerned that the ice may not leave the bay this year. As we committed, we are having them remain on site for two weeks incase the ice is just a bit later leaving this year. We mutually agreed with Environment Canada that a two week period was as an acceptable level of effort. Hopefully we get a strong wind that frees the ice so we can complete the planned work program.

For your information, we collected our monthly water samples from Garrow Creek yesterday as well as the sub-acute samples. However, it was foggy today so the plane from Resolute was unable to come into site but it didn't really matter as it doesn't look like the commercial flights could make it into Resolute today either. There is a slim chance the weather may change and the plane will try later today but it is a slim chance. Will try to sample again if it looks like the flight can get in tomorrow. If there isn't a flight tomorrow, then we'll try again next Tuesday.

Randy will try to give you a call in a few days to update you directly.
I am in contact with the site on a regular basis incase you want to pass any messages onto them.

Regards,
Bruce Donald

Donald Bruce KIMB

From: Blenkinsopp,Sandra [Edm] [Sandra.Blenkinsopp@EC.gc.ca]
Sent: August 20, 2004 12:51 PM
To: Donald Bruce KIMB
Subject: RE: Garrow Bay
Attachments: 20082004_IMAGE121.jpg

Hi Bruce

Here is the info that the weather office obtained from the Canadian Ice Service. I have an interpretation of the image from the sea ice service, but it was done on the assumption that Garrow Bay was on the northern end of the island. I have gone back to them for another interpretation.

S

-----Original Message-----
From: Donald Bruce KIMB [mailto:bruce.donald@teckcominco.com]
Sent: Thursday, August 19, 2004 3:32 PM
To: Blenkinsopp,Sandra [Edm]
Subject: RE: Garrow Bay

That would be appreciated. The ice has gone out in the adjacent bay but it always goes out first as it is more exposed and is a slightly different shape.
…bruce

From: Blenkinsopp,Sandra [Edm] [mailto:Sandra.Blenkinsopp@EC.gc.ca]
Sent: August 19, 2004 3:18 PM
To: Donald Bruce KIMB
Subject: Garrow Bay

Hi Bruce

I've spoken with the weather office staff (MSC) in our building and asked them to try to get some detailed info on the ice conditions in the area of Garrow Bay. If I find out anything that looks useful I'll pass it on.

S