POLARIS MINE

POST RECLAMATION MONITORING REPORT

3rd QUARTER 2005

FOR THE

NUNAVUT WATER BOARD

&

INDIAN AND NORTHERN AFFAIRS CANADA

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December 31, 2005

Nunavut Water Board
Box 119
Gjoa Haven, NU
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Attention: Phyllis Beaulieu, Manager of Licensing

Indian and Northern Affairs Canada
P.O. Box 100
Iqaluit, Nunavut
X0A 0H0

Attention: Carl McLean, Manager, Lands Administration

Dear Phyllis and Carl;

Re: Polaris Mine Water Licence NWB1POL0311 – 2005 3rd Quarter Water Licence Report

Please find attached the combined Polaris Mine 2005 3rd Quarter Water Licence Report and the Decommissioning and Reclamation Plan (DRP) Report. I will forward paper copies of this report to your offices as well as a CD containing an electronic version of the report.

During the 3rd Quarter of 2005, the key annual monitoring requirements for the Polaris Mine were undertaken as the site was essentially snow free during July and most of August. A small staff consisting of our environmental consultant's representative (to conduct water quality monitoring), a heavy duty mechanic (to maintain the equipment and the camp) and one (and for a short period, two) local Inuit assistant(s) (employed by Teck Cominco) were on-site continuously during July. In addition, during the last week of July, a Teck Cominco representative and a geotechnical engineer from Gartner Lee Limited conducted a detailed site inspection including the annual geotechnical inspection. At the end of July, crews demobilized from site for the season. Subsequent to the site being vacated, water quality monitoring was continued by personnel who flew to site for 4 to 12 hour long site monitoring events from Resolute Bay. Weather conditions did not permit safe access to the site during late August though until mid September despite numerous attempts. By mid September the site was snow covered and Garrow Creek was frozen preventing further sampling.

The comprehensive monitoring site was completed as required by Water Licence and Decommissioning and Reclamation Plan (DRP) requirements. The attached report includes the following items that were inspected and/or sampled during the 3rd Quarter:

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- Effluent discharge monitoring from Garrow Lake was conducted weekly (as weather permitted). This program included the water quality sampling of the receiving environment (Garrow Bay) and the reference location. The water quality monitoring program also included the environmental effects monitoring program.
- Surveyed the water elevation at Garrow Lake in the spring and at the end of the summer.
- In August (minimum ice conditions), the monitoring of the water column of Garrow Lake was conducted at two locations.
- Monitoring of wind speeds from Resolute during open water periods of Garrow Lake when the site was not occupied.
- Surface water quality samples were taken as required by the Decommissioning and Reclamation Plan approvals of Frustration Lake and surface water flows observed at Little Red Dog Quarry landfill.
- Soil quality sampling of the former Concentrate Storage Building area.
- The annual geotechnical inspection of the site was undertaken in late July. As this was the first year after reclamation activities were completed in 2004, a very detailed inspection of conditions was undertaken to provide comprehensive documentation of site conditions for future reference.
- Installation and monitoring of thermistors at Little Red Dog Quarry landfill and the Operational landfill.
- A detailed topographic survey was completed of the Subsidence Area.

In summary, the primary results of the monitoring indicate that:

- Garrow Lake remains stable as predicted;
- The water quality of the Garrow Creek is excellent with all parameters well below licence limits (including TSS);
- The detailed geotechnical inspection identified that all key areas being monitored are stable including the landfill covers, the remnants of the former Garrow Lake Dam, the Garrow Lake shoreline, the covers over the mine entrances, the marine shoreline adjacent to the former dock, the Frustration Lake jetty, and the subsidence area.

If there are any questions related to this report, please contact me at any time.

Yours truly,

Bruce J. Donald
Reclamation Manager
Environment and Corporate Affairs
Teck Cominco Limited

Enclosure:

- 2005 3rd Quarter Polaris Mine Site Monitoring Data Report

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1. EXECUTIVE SUMMARY IN INUKTITUT

Refer to Appendix 1 for an executive summary of the contents of this report translated into Inuktitut by Susan Salluviniq of Resolute Bay, Nunavut.

2. INTRODUCTION

During the 3rd Quarter of 2005, the key annual monitoring requirements for the Polaris Mine were undertaken as the site is relatively snow free through July and most of August. A small staff re-opened the camp in late June and remained on site through the end of July to facilitate the comprehensive Garrow Lake effluent water quality sampling. The staff on site consisted of:

a. A Gartner Lee Limited representative who was responsible to conduct the effluent water quality monitoring and to manage the camp.
b. A heavy duty mechanic contracted to Teck Cominco to maintain the site mechanical equipment and camp.
c. One or two Inuit assistants from Resolute Bay were employed by Teck Cominco.

During the last week of July, a Teck Cominco representative and a geotechnical engineer from Gartner Lee Limited joined the site staff and conducted a detailed general site inspection, surveyed the subsidence area, and conducted the first post-reclamation annual geotechnical inspection.

At the end of July, the site crew closed the camp for the season. Subsequent site water quality monitoring was continued by personnel who flew to site from Resolute Bay for 4 to 12 hour long site monitoring events. The chartered aircraft was held on site during these monitoring events so that staff would not be stranded at site in case weather conditions deteriorated. Weather conditions (fog and snow storms) did not permit safe access to the site during late August though until mid September despite numerous attempts. By mid September the site was snow covered and Garrow Creek was frozen preventing further sampling.

The comprehensive site monitoring requirements were with few exceptions completed successfully as required by Water Licence and Decommissioning and Reclamation Plan (DRP). This report presents the results of each element of the comprehensive monitoring conducted.

3. WATER QUALITY MONITORING

During the 3rd Quarter, very comprehensive water quality monitoring was undertaken within the water column of Garrow Lake, of Garrow Creek from the "Final Discharge Point" (Garrow Lake effluent), from the receiving environment (Garrow Bay), and from the reference site.

3.1. Garrow Lake Effluent

As required by the Water Licence, the DRP and the Metal Mining Effluent Regulations (MMER) sampling of the Final Discharge Point from Garrow Lake must be conducted whenever effluent is discharging. Appendix 2 presents all of the water quality and environmental effects monitoring data conducted at the Final Discharge Point, in Garrow Bay and from the reference location. The water quality program was overseen by Azimuth Consulting Group Inc. They received all the data and compiled the attached report. Extensive co-ordination with Environment Canada was required during

the program due to the unique difficulties experienced due to the location of the site (due to both weather and the logistics of getting samples to the laboratories within required sample holding times).
All water quality results were compliant with the water quality parameters required by both the Water Licence and the MMER's. Table 1 summarizes the primary parameters of interest for the Garrow Lake effluent and the associated Water Licence regulatory limits.

TABLE 1
GARROW LAKE EFFLUENT - WATER QUALITY MONITORING
PRIMARY SUBSTANCES OF INTEREST

	Concentration - mg/L		
	LEAD	**ZINC**	**TSS**
Water Licence Limits			
Monthly Mean	0.07	0.50	15.00
Maximum Grab	0.14	1.00	30.00
Sample Results from:			
06-Jul-05	0.00017	0.0127	4
13-Jul-05	0.00230	0.0205	3.0
16-Jul-05	0.00042	0.0179	3.0
23-Jul-05	0.00024	0.0325	3.0
30-Jul-05	0.00020	0.0405	3.0
06-Aug-05	0.00047	0.0356	3.0
13-Aug-05	0.00111	0.0310	3.0
24-Aug-05	0.00093	0.0905	4.8
27-Aug-05	0.00076	0.0680	3.7

There were two acute lethality tests conducted on Rainbow Trout and Daphnia magna and all tests were compliant.

3.2. Garrow Lake Water Column

The Water Licence requires that comprehensive sampling of Garrow Lake water column is conducted in two locations (Water Licence Station 262-3 and 262-3a) during the period of maximum melt (August 25, 2005). In recent years, the ice has not melted sufficiently to allow sampling during this period, but in 2005 Garrow Lake cleared sufficiently so that sampling was conducted as required. The results of the sampling are provided in Appendix 3.

In summary the key results from the testing are as expected:

- The structure of Garrow Lake remains stable due to the salinity differences in the water column.
- The concentrations of metals in all layers of the lake (including the surface mixolimnion layer) are as expected (gradually decreasing since cessation of active tailings disposal).
- The general profile of chemistry through the water column remains consistent with previous sampling events.
- The chemistry, density and temperature results between the two sampling locations (262-3 and 262-3a) are comparable continuing to indicate horizontal uniformity within layers of the lake.

This report presents the data from the August sampling event only without review of previous data or data trends (not required under the licence). However, a detailed review of the data and longer term

trends is being prepared and will be presented to regulators in 2006 to support rationalization of sampling requirements.

3.3. Other Surface Waters

Approvals under the DRP require sampling of surface waters in two areas. These were collected during the 3rd Quarter when summer conditions permitted the sampling to occur.

3.3.1. Little Red Dog Quarry Landfill

The design of the Little Red Dog Quarry landfill (LRDQL) cover was gently sloped so that any water from rainfall or water from melting snow would drain from the quarry area through the notch cut in the quarry walls. The DRP approval permitting the placement of metals contaminated soils in LRDQL require that any surface waters are sampled. This is intended to confirm that no metals are being leached from the contaminated soils.

On July 28th, 2005 a small area with water slowly flowing on surface in the notch of LRD Quarry was sampled. It is important to note that almost essentially the entire surface area of the quarry cap showed no evidence of surface water and only a short distance from where the small puddle of surface water was observed (a few metres), the water re-entered the coarse ground surface materials and disappeared.

The laboratory results are provided in Appendix 4. In summary, the metal concentrations were low confirming that there are no concerns with the small amount water flowing from this area. Results were:

- Lead was 0.00103 mg/L,
- Zinc was 0.0657 mg/L,
- TSS was less than detection (<3),
- pH was 7.91.

3.3.2. Frustration Lake

The approval under the DRP to decommission the freshwater system at Frustration Lake required that on an annual basis during the ice free period in the summer, a water sample of the lake is taken adjacent to the jetty that was left in place. The intent of the sample is to monitor TSS as an additional indicator that the jetty is not being eroded at an unacceptable rate. The state of the jetty is also included in the annual geotechnical inspection which is included in Appendix 5 of this report. The geotechnical inspection did not identify an erosion concerns.

The laboratory result of the sample collected on July 28th, 2005 is included in Appendix 4. The sample had a TSS was 4.2 mg/L.

4. PHYSICAL STABILITY OF THE SITE

The physical stability of the site was monitored through a combination of a geotechnical inspection, a detailed topographic survey of the subsidence area, and through survey monitoring of Garrow Lake elevations.

4.1. Subsidence Survey

The annual geotechnical inspection report (included in Appendix 5) discusses visual observations of the subsidence area and includes a large scale plan and sections of the subsidence area survey. The survey was conducted in July 2005. The survey was done by Teck Cominco and drafted by a Teck Cominco drafting contractor. The resulting drawings were then supplied to Gartner Lee Limited to utilize in compiling the geotechnical report.

During reclamation of the Polaris mine site, the majority of the permanent survey control stations were left intact to facilitate surveying subsequent to the reclamation work being completed. These stations were used for control for the 2005 (and previous) surveys. The survey was conducted with a Trimble 5700/5800 Trimark 3 high accuracy GPS system.

4.2. Annual Geotechnical Inspection

While there is little detail in either the Water Licence or the DRP as to the requirements of the annual geotechnical inspection, a comprehensive inspection was conducted over several days by a professional geotechnical engineer who resided on site to facilitate full use of his time on site. The inspection included all of the engineered structures constructed or altered during the reclamation process including:

- The stability of the decommissioned former Garrow Lake dam
- The stability of the covers / seals of the four mine entrances
- The stability of the landfill covers on both the Operational landfill and the Little Red Dog Quarry landfill.
- The stability of the marine foreshore in the area of the decommissioned dock and the adjacent foreshore areas.

In addition, the geotechnical inspection specifically reviewed the following other areas:

- The stability of the Garrow Lake wave break structure (specifically where the only water flows out of Garrow Lake into Garrow Creek) to confirm that the invert of the outlet is stable and that there are no obstructions to flow.
- The subsidence area was visually inspected, and the subsidence survey drawings reviewed to identify if there are any areas that present a potential hazard to wildlife or humans. The geotechnical inspection did not comment on the underlying rock mechanics of the subsidence area.
- The stability of the jetty at Frustration Lake to confirm that unacceptable erosion is not occurring.
- The stability of the shoreline area around Garrow Lake to identify if there is any instability that would result in unacceptable sedimentation in the lake.
- Identify if there is any active erosion occurring in areas where culverts had been removed from roadways.
- General inspection of the site for erosion of site water courses that have been altered by site activities.

The 2005 inspection was comprehensive and the documentation of the inspection was detailed as this was the first summer since completion of the site reclamation activities. The intent was to provide a detailed baseline of information that can be referred to in future geotechnical inspections to identify if there are any significant changes over time.

In summary, the results of the geotechnical inspection were:

- The remnants of the former decommissioned Garrow Lake dam appear stable. There is a small area where geotextile is exposed and should be covered with rip-rap in 2006.
- The covers over the mine entrances are all stable with no concerns noted. In some instances the covers blend into the landscape so well that there was some difficulty in locating them visually.
- Both landfill covers are in excellent condition and there were no concerns noted. The natural slope above the Operation Landfill has a drainage feature that should be monitored.
- The marine foreshore appears stable and no concerns were noted. The shoreline at the water's edge is being actively reshaped by ice action as is expected. Photographic monitoring stations were established to provide a long term visual monitoring system.
- That the outlet of Garrow Lake appears stable and no concerns were identified.
- The subsidence area has no observable significant surface movement. The subsidence survey does not indicate any significant movement. The survey indicates that there may be a small amount of movement in one area but it will take another year or two of monitoring to confirm whether or not it is data noise or actual movement that is observed. There were no safety concerns identified related to the use of this area by the public or wildlife.
- No erosion concerns were identified at the Frustration Lake jetty.
- There were no observable erosion or foreshore instability concerns identified around the perimeter of Garrow Lake. The required measurements of the four erosion pin stations were incorrectly done this year, so the geotechnical inspection report recommends that this be redone in 2006 to definitively confirm that there are no changes occurring.
- No erosion concerns were noted at any of the areas where culverts had been removed from roadways.
- The general inspection for instability or erosion around the site in general recommended that there are two areas on the perimeter of the New Quarry where erosion channels were active and should addressed in 2006.

The complete geotechnical inspection report is included in Appendix 5.

4.3. Garrow Lake Elevations

During the site reclamation, a metal rebar pin was surveyed adjacent to the location that Garrow Creek flows out of Garrow Lake to facilitate survey monitoring of the lake elevations. In 2005 the initial survey in June was difficult to obtain due to ice on the lake. Therefore the accuracy of the June survey is suspect. However, the key elevation data is from the late August survey, which records the minimum water elevation of Garrow Lake for the year. This elevation is controlled by the elevation of the invert of the location where Garrow Creek flows out of Garrow Lake. If the late summer elevation of Garrow Lake is consistent from year to year, it will confirm that the elevation of the invert is not changing (i.e. is not eroding). The elevation surveyed in 2005 will form the basis for on-going monitoring of the invert as this was the first year after completion of site reclamation, so the invert was not influenced by reclamation activities.

TABLE 2

GARROW LAKE ELEVATIONS (Metres)

DATE	Survey Station 352 Elev. (m)	INSTRUMENT HEIGHT	ROD READING	LAKE ELEVATION	Comments
27-Jun-05	1006.52	0.55	1.96	1005.11	
24-Aug-05	1006.52	0.55	2.00	1005.07	Low flow in creek as getting colder

Note: Pre-Dam lake elevation at end of discharge season was reported to be 1005.7m
Survey Station #352 location is -878.338, 3679.594 (local grid)

5. OTHER SITE MONITORING

In addition to monitoring the chemical and physical stability of the site, monitoring of wind speeds at Resolute Bay, monitoring of landfill cover cap temperatures, and monitoring of metals concentrations of soils in the former Concentrate Storage Building were undertaken during the 3rd Quarter of 2005.

5.1. Resolute Bay Wind Monitoring

The Water Licence, and the DRP requires that during open water periods of Garrow Lake wind speeds be monitored at Resolute Bay (when there are no personnel stationed on site at Polaris). The purpose is to identify if there were any wind storm events with sufficient energy to potentially cause mixing of the surface layers of Garrow Lake. If this extremely unlikely event were to occur, then Teck Cominco is required to conduct an additional sampling of the water column of Garrow Lake as soon as practical to identify if there had been mixing of the mixolimnion with the halocline.

Ice on Garrow Lake did not fully dissipate until late August and reformed prior to mid September in 2005. As staff were not continuously on site during August, and only visited the site once in September (on the 15th), wind records for the month of August, and the first two weeks of September were obtained from Environment Canada's weather station at Resolute Bay (Refer to Appendix 6). The data was reviewed to determine if there were any periods where wind speed could potentially have been sufficient to cause significant mixing of the lake.

During the review of the DRP, in response to a question submitted by DFO, Paul Ericson of AXYS Environmental Consultants prepared a letter of response (dated December 14, 2001) which further discussed the potential mixing of the mixolimnion with the halocline due to wind events and the resulting change in zinc concentrations in the mixolimnion. In the letter, he identified that in his original report presented in Volume 2 of the DRP (titled "Garrow Lake Dam – Effect of Removal on Lake Stability and Outflow Water Quality") there was an error in the Y axis units used in Figure 4. Figure 4 graphs the relationship between time duration and wind speed necessary to mix the surface layer of Garrow Lake (mixolimnion layer) with the halocline. The error was that the Y axis of the graph should have been in days not hours. In the last paragraph at the bottom of page 4 of the December 14th, 2001 letter, Mr. Erickson states that using conservative assumptions, it would take an average wind speed of 52 km/hr a duration of 21.6 hours to cause mixing of the 7.5 to 8.5 metre depth of the lake.

In reviewing the wind speed records from Resolute Bay for the period August 1, 2005 to September 15, 2005, there was one period between September 11th and into September 12th, 2005 that for 13 hours, the hourly maximum wind speed averaged 54 km/hr. *It is important to note that the Resolute wind speed records show the maximum wind speed for each hour and not the average wind speed for each hour which would be substantially lower so that the 54 km/hr wind speed used would be a substantial overstatement of the average wind speed.* The 13 hour duration (even if the average speed was 54 km/hr) is still much short of the time required to cause even 1 metre of the halocline to be mixed with the mixolimnion. Additionally, this event occurred two days prior to a site visit at which time Garrow Lake was observed to be snow and ice covered so that the lake water surface would not have been exposed to the September 11th wind event. There were no other wind events during the August 1st to September 15th time period that were near the duration of the September 11th storm.

5.2. Landfill Thermistor Monitoring

Construction of the cap of the LRDQ landfill was one of the last reclamation activities completed in 2004. As a result of this work being completed just before crews demobilized from site, thermistors were not installed until 2005 when personnel were once again stationed on site. They installed thermistors in the LRDQ landfill in June and in late July they were installed in the Operational landfill. At the LRDQ landfill, four thermistors were installed. The thermistors are designed so that they are long to extend from the ground surface through to the base of the landfill. At the Operational landfill, only two thermistors were successfully installed. Prior to constructing the 1.8 metre thick cap on the Operational landfill in 2003/2004, there were thermistors already installed in the landfill. Some of the existing thermistors were stuck in the pipes that extend through the landfill and could not be removed and in other cases; the new thermistors could not be inserted into the existing pipes. Of the four thermistor pipes at the Operational landfill, to date only two thermistors are functioning. Additional attempts to install one more thermistor in this area will be attempted in 2006.

Once the thermistors were installed, they were monitored by personnel station on site. After the site was vacated at the end of July, the data was collected when personnel flew to site to conduct the weekly Garrow Lake effluent sampling. In August the thermistors were not monitored on a weekly basis. Scheduling of the charter plane by Ken Borek Air did not normally allow enough time to get to site in time to complete both the water sampling, and thermistor readings prior to returning to Resolute Bay in time to ship the water samples out on the scheduled flight. The thermistor data collected is reported in Appendix 7.

It is expected that the 2005 temperature data from the LRDQ landfill should be fundamentally different from the Operational landfill data. The Operational landfill contents have been in place for years and are solidly frozen as verified by previous thermistor data. Only the near surface conditions of the Operational landfill are new due to the reshaping of the surface of the landfill and the addition of the 1.8m thick cap. In the case of the LRDQ landfill, all of the fills have been placed there from September 2002 through until completion of the reclamation project in September 2004. The fills in LRDQ were placed both in winter and summer conditions. It will require a period of time for the internal dump temperatures to become uniform, and stabilize, as the permafrost establishes itself into this new fill.

5.2.1. Operational Landfill Thermistor Data

Of all the thermistor data collected in 2005, data from Thermistor #OL-2 (Appendix 7) appears to be as expected. It shows the base of the landfill temperatures ranging between -11.5 to -14.3 degrees C over a month and a half period. Temperatures did not exceed 0^0C at depths greater than 1 metre. There were only three monitoring events for the summer season so more data needs to be collected to be more confident of the data.

Thermistor OL-4 on the other hand showed very different data. At the base of the landfill, temperatures were slightly higher, ranging from -7.5 to -10.1 ^{0}C. However, the minimum elevation that did not exceed 0^0C is indicated to be at about 2.5 m Below Ground Surface (BGS). Above this elevation, the thermistor temperatures appear to be much more sensitive to surface air temperatures. At 1.5m and 1.75m BGS, temperatures were higher than those nearer to ground surface, which does not make sense, especially for the late August and mid September data. The thermistors were installed by placing vegetable oil into the pipe casings along with the thermistors to prevent air flow within the pipes affecting the thermistor readings. This was the method used during mine operations, and the data collected at that time was uniform and indicated the oil was a good installation method.

5.2.2. LRDQ Landfill Thermistor Data

Four thermistors were installed in LRDQ in late June so that more data was collected in 2005 from these thermistors than at the Operational landfill. Temperatures at the base of the landfill were fairly consistent for all thermistors and show that temperatures are in the range of -1.7 to -2.9 ^{0}C. It is apparent that freeze-back of the fill in the LRDQ landfill is only in the early stages of being formed.

The minimum elevations where materials remained below ^{0}C throughout the summer monitoring period were as follows:

Thermistor # LRD-1	5.0 m BGS
Thermistor # LRD-2	2.5 m BGS
Thermistor # LRD-3	3.0 m BGS
Thermistor # LRD-4	3.0 m BGS

In summary, this is the first year of collecting data from the new thermistors from both the LRDQ landfill and the Operational landfill. This preliminary data suggests:

- The Operational landfill was used during mine operations and has been in place for many years. Temperatures of the permafrost in the Operational landfill are much lower (colder) than the more newly placed LRDQ landfill materials. This is not unexpected as establishment of permafrost in the LRDQ landfill is in the early stages of being established.
- Temperature data from 5 of the 6 thermistors indicate that the ground shallower than 2.5m to 5m BGS exceeds 0^0C at some time during the summer. One thermistor (in the Operational landfill) indicated that the maximum depth of thawing in the active layer was a maximum of 1.0m BGS during the same period. The results from 5 of the thermistors indicates that either freeze back of permafrost has not yet stabilized near surface, or that there are technical flaws with the thermistor installations.

For 2006 it is proposed to undertake the following:

- To attempt to install an additional thermistor in the Operational landfill.
- Install data loggers to collect data on a more regular basis and if practical, to collect data for a longer period of time.
- To improve the physical setup of the thermistors at surface to minimize the possibility that data is being influence by thermo-siphoning related to the metal pipes extending above the landfill surface. This would be done by either insulating the exposed pipe sections or by cutting them off even with the ground surface.

5.3. Former Concentrate Storage Building Soil Contamination

During remediation of metals contaminated soils within the footprint of the former Concentrate Storage Building, after excavation of surficial soils was completed, residual concentrates were not recoverable from the fractured bedrock underlying the soils. Considerable effort was expended to recover the maximum quantities of this contamination, but upon completion of remedial efforts a thin veneer of concentrate dusts remained in a portion of the building footprint. Remediation was completed and a minimum 0.5 metre thick cover of local materials was placed over this area as a cover. Questions regarding the potential for this material to migrate to the surface of the cover materials were posed by regulators.

While not required by the Water Licence or the DRP, Teck Cominco intends to take several soil samples annually to demonstrate that the metals concentrations in the soil cover are below remedial objectives and that there are no trends of increasing metals concentrations over time. This was done on August 6th, 2005 by a Gartner Lee Limited representative while onsite for a water sampling event. The laboratory certificate of the sample results is included in Appendix 8. All soil metals concentrations analyzed are substantially below the approved site remedial targets and are as follows:

TABLE 3
FORMER CONCENTRATE STORAGE AREA SOIL SAMPLES
August 6th, 2005 SAMPLING EVENT

Parameter	Remedial Target	ConShed North	ConShed Mid	ConShed South
pH		8.53	8.43	8.53
Lead	2,000	556	1,290	903
Zinc	10,000	1,740	3,770	2,720

Note: Concentrations are in mg/kg

APPENDIX 1

Executive Summary of 2005 3rd Quarter Report

Translated into Inuktitut

1. ᓯᕗᓕᕐᑎᓄᖓᐅᔪᖅ ᓇᐃᓕᒋᐊᓯᒪᔪᖅ ᐅᓂᑳᖅ ᐃᓄᑎᑑᕐᑐᖅ

ᑕᖀᑦ 9ᖑᔪᑦ ᐊᓂᒍᕐᓯᒪᓕᑎᓗᒋᑦ 2005ᒥ, ᑕᐃᑯᐊ ᐊᕐᒍᑕᒫᑦ ᖃᐅᔨᓴᑕᐅᔭᕆᐊᓖᑦ ᒪᓕᑕᐅᔭᕆᐊᖃᑐᑦ ᒪᕈᓕᕿᒥ ᐅᔭᕐᓯᐅᕐᕕᕕᓂᕐᒥ ᑲᔪᓯᑎᑕᐅᓚᐅᑐᑦ ᐊᐳᑎᖁᑐᓚᐅᒪᑦ ᔪᓚᐃᒥ ᐊᒐᓯᐅᓗ ᐃᓚᖓᓂ. ᐅᓄᖏᖢᑎᒃ ᐊᕙᑎᓕᕆᒡᐅᔪᑦ (ᐃᒪᐅ ᖃᓄᐃᓂᖓᓂ ᖃᐅᔨᓴᕐᑏᑦ), ᐊᐅᓚᐅᓯᕆᔨᖃᖢᑎᒃ (ᐅᖁᒪᐅᑐᓂᐅᑎᖏ ᐊᐅᓚᔪᓇᓯᐊᕐᒍᐊᒪᖓᑕ ᐊᒪᓗ ᑕᒫᕐᕕᖓᑦ) ᐊᒪᓗ ᐊᑕᐅᓯᖅ (ᐅᕙᓗᓃᑦ ᕿᓚᒥᐅᔪᕐᒥᒃ, ᒪᕉᒃ) ᓄᓇᓕᒥᐅᑦ ᐃᓄᐃᑦ ᐃᑲᔪᑎ(ᐅᔪᑦ) ᕿᓴᓗᐸᐃᒥ (ᐃᖃᓇᐃᔭᑎᒋᔭᐅᓗᓂᒃ ᑎᒃ ᑲᒥᑯᑯᓄᑦ) ᑕᐃᒪᖓᓕᒫᖅ ᑕᐃᑲᓂᓚᐅᑐᑦ ᒪᕈᓕᕿᒥ ᔪᓚᐃᖑᑎᓗᒍ. ᐊᒪᖢᑲᓂᖅ, ᐱᓇᓱᐊᕈᓯᖓᓂ ᑭᖑᓕᕐᐸᖑᔪᒥ ᔪᓚᐃᒥ, ᑎᒃ ᑲᒥᑯᑯᓂᖓᑐᖅ ᐊᒪᓗ ᐅᔭᕐᓕᕆᓂᒥ ᖃᐅᔨᒪᔨᒪᕆᒃ ᒑᓄ ᓖᑯᓂᖓᕐᑐᖅ ᖃᐅᔨᓴᓚᐅᑐᖅ ᓄᓇᖓᓂ ᐊᒪᓗ ᐊᕐᒍᑕᒫᑦ ᐊᓯᖏᓂ ᖃᐅᔨᓴᓂᐅᖃᑕᕐᑐᓗ. ᓄᖑᐊᓂ ᔪᓚᐃ, ᐃᖃᓇᐃᔭᕐᑏᑦ ᐃᒍᑎᕆᓚᐅᑐᑦ ᓄᓇᓕᒥ ᐊᕐᒍᔪᒧ ᑭᖑᓕᕐᐸᓯᐅᑲᐃᓇᕆᓗᑎᒃ. ᓄᓇ ᑕᐃᓇ ᑭᓱᐃᕈᔭᐅᓚᐅᑎᓗᒍ, ᐃᒪᐅᑉ ᖃᓄᐃᑐᓂᖓ ᖃᐅᔨᓴᑕᐅᓚᐅᒥᔪᖅ ᑲᔪᓰᓇᕐᑐᖅ ᑕᐃᑯᖓᑐᖃᓚᐅᒪᑦ ᐃᖃᓇᐃᔭᕐᑎᑎᓂᒃ ᐃᑲᕐᓂ 4ᒥᑦ 12ᒧᑦ ᑕᑲᓂᖢᑎᒃ ᖃᐅᔨᓴᖃᑕᕐᑎᐅᔪᑦ ᕿᓴᓗᐸᐃᒥᖢᑎᒃ. ᓯᓚᐅ ᖃᓄᐃᑐᓂᖓ ᐊᔪᕐᓇᕐᑎᓯᓚᐅᒪᑦ ᐊᑕᕐᓇᖏᓗᑎᒃ ᑕᐃᑯᖓᕈᓇᐃᓕᐅᒪᓚᐅᒪᑕ ᓄᖑᐊᓂ ᐊᒐᓯᐅᑉ ᕿᑎᐊᓄ ᓯᑎᐱᕆᐅ ᑎᑭᖢᒍ ᐊᒥᓱᐊᑎᕐᖢᑎᒃ ᐅᒃᑐᖃᑕᕐᓗᐊᖢᑎᒃ. ᕿᑎᖓᓂ ᓯᑎᐱᕆᐅᑉ ᐊᐳᑎᑕᖃᓕᓚᐅᒪᑦ ᐊᒪᓗ ᑭᖑᕈᑉ ᑰᖓ ᖁᐊᖑᓕᓚᐅᒪᑦ ᖃᐅᔨᓴᑕᐅᔪᓇᖏᔪᑎᒋᑲᓂᓕᓚᐅᒪᒍ.

ᑕᒪᓇ ᑲᔪᓰᓇᕐᑐᖅ ᑕᐃᓯᒥᖓ ᐱᔭᕆᑕᐅᓚᐅᑐᖅ ᑕᐃᒪᐃᖁᔭᐅᓯᒪᓂᕆᓚᐅᑕᖓ ᐃᒪᒧ ᐱᔪᓇᐅᑎᖓᒍᑦ ᐊᒪᓗ ᐃᒍᑎᑕᐅᓂᖓᑕ ᖃᓄᐃᑐᓂᕙᓂᖓᓄ ᐅᑎᑎᑕᐅᓂᖓᑕ ᐊᕿᓯᒪᓂᖓᑕ ᐱᔭᕆᐊᖃᑎᑕᐅᓂᐅᑉ. ᐅᕙᓂ ᐃᓚᐅᔪᖅ ᑎᑎᕐᓯᒪᔪᖅ ᑐᓴᕈᑎᐅᔪᑦ ᓄᓇᐅᔪᐃᑦ ᖃᐅᔨᓴᑕᐅᓚᐅᑐᑦ ᐊᒪᓗ/ᐅᕙᓗᓃᑦ ᖃᐅᔨᓴᑕᐅᓚᐅᑐᑦ ᐱᖓᔪᕿᓕᑕᖓᓂ ᐅᓂᑲᓕᐊᑎᓂ ᐊᒪᓗ ᓇᐃᓕᒋᐊᓯᒪᔪᑦ ᑭᓱᐃ ᖃᐅᔨᔭᐅᓚᐅᒪᖓᑕ ᐅᒪ ᐊᑕᓂᑐᑦ:

1. ᐃᒪᐅ ᖃᓄᐃᑐᓂᖓ ᑭᐊᕉᑉ ᑕᓯᖓᓂᑦ ᑰᒃᑐᖅ
   ᖃᐅᔨᓴᑕᐅᓂᖓ ᐃᒪᐅ ᐊᓂᕙᓕᐊᔫᑉ ᑭᐊᕉᑉ ᑕᓯᖓᓂᑦ ᐱᓇᓱᐊᕈᓯᑕᒫᑦ ᖃᐅᔨᓴᑕᐅᓚᐅᑐᖅ (ᓯᓚᐅ ᖃᓄᐃᑐᓂᖓ ᒪᓕᖢᒍ ᑰᓂᖓᓂ. ᐃᒪᐃ ᖃᐅᔨᓴᑕᐅᔪᓕᒫᑦ ᑐᖓᓂᓚᐅᑐᑦ ᐃᒪᕐᒧᑦ ᐱᔪᓇᐅᑎᒥᑐᓂ ᐊᒪᓗ ᓴᕙᕐᔭᒃᐃᑦ ᐅᔭᕐᐅᑕᐅᔪᑦ ᑰᓂᖓᑕ ᒪᓕᒐᖏ ᐃᓯᓕᑕᕐᕕᖓᑕ. ᓄᖑᐊᓂ ᐊᒐᓯᐅᑉ ᐊᒪᓗ ᐱᒋᐊᓂᖓᓂ ᓯᑎᐱᕆᐅᑉ ᓯᓚᖓ ᐱᐅᓚᐅᖏᒪᑦ ᕿᑭᑕᕐᒧᕈᓇᓚᐅᖏᑐᒍ ᑭᓯᐊᓂ ᖁᐊᒪᑕ ᓯᑎᐱᕆᒥ.

2. ᐃᒪᐅᑉ ᖃᓄᐃᑐᓂᖓ ᑭᐊᕉᑉ ᑕᓯᖓᓂ
   ᐊᒐᓯᐅᑎᓗᒍ, ᖃᐅᔨᓴᓂᐅᔪᖅ ᐊᐳᒥᖏᑐᓂ ᖁᓕᓇᓂ ᑭᐊᕉᑉ ᑕᓯᖓ ᖃᐅᔨᓴᓚᐅᑐᒍᑦ ᑎᑎᕐᓗᒥᓗ ᖃᓕᓇᖑᓂᖏᑦ ᑕᓯᕐᒥ ᓱᓕ ᐱᐅᓯᕙᓕᐊᔪᖅ ᐊᒪᓗ ᐃᒪᖓ ᐊᐳᐸᓗᑲᓴᖓ ᓯᕗᓕᕐᓂ ᖃᐅᔨᓴᑕᐅᓂᐅᓚᐅᑐᓂ. ᑕᒪᓇ ᖃᐅᔨᓴᓂᐅᔪᖅ ᒪᕈᐃᓂᑦ ᑕᑯᓴᐅᑎᓯᔪᖅ ᑕᒪᓇ ᖁᓕᐊᓇᓂᐅᔪᖅ ᐃᒪᖓ ᑕᓯᐅᑉ ᓱᓕ ᓱᓂᓯᒪᖏᑐᖅ ᐊᓯᐳᕐᐸᓕᐊᖏᑐᖅ. ᑕᒪᓇ ᖃᐅᔨᓴᑕᐅᓂᖓᑕ ᓇᓗᓇᐃᓯᔪᖅ ᓴᕕᕿᔭᐅᓂᖓ ᒥᑭᓕᕙᓕᐊᔪᖅ ᑕᐃᒪᖓᓂ ᐅᔭᕐᓯᐅᓂᖅ ᐊᐅᓚᓂᖃᓚᐅᓯᒪᒪᑦ.

3. ᐃᒪᐅ ᖃᓄᐃᑐᓂᖓ ᐊᓯᖏᓂᑦ ᖃᖓᓂᑐᓂᑦ ᐃᒪᕐᓂᑦ
   ᖃᐅᔨᓴᓂᐅᔪᖅ ᐃᒪᕐᒥ ᑯᕐᔪᒃᑐᕐᒥᑦ ᓄᓇᐅ ᖃᖓᓂ ᐋᐅᐸᕐᑐᖅ ᕿᒥᑯᓘᑉ ᖃᐅᔨᓴᑕᐅᓚᐅᑐᖅ ᓴᕕᕿᔭᒧᑦ ᓱᑯᓇᕐᑐᑦ ᐃᒪᒧᐸᓕᐊᖏᑲᓗᐊᒪᖓᑦ ᖃᐅᔨᓴᕈᑕᐅᓗᓂ. ᑕᐃᑯᐊ ᖃᐅᔨᓴᕈᑕᐅᔪᖅ ᓇᓗᓇᐃᓯᓚᐅᑐᑦ ᑕᒪᕐᒥᒃ ᐊᕿᓂᕐᓴ ᓴᕕᕿᔭᒃᓴᕐᓗ ᐃᒪᕐᒥ ᖁᑎᓂᖅ ᖁᑎᑐᐊᓗᖏᑐᖅ.

   ᐊᒪᓗᑲᓂᖅ, ᐃᒪᒥ ᖃᐅᔨᓴᓂᐅᔪᖅ ᓄᕐᓴᑐᕐᓴᐃᓴᐢ ᑕᓯᖏᓂᑦ ᖃᐅᔨᓴᓚᐅᒥᔪᑦ ᖃᐃᔭᐅᓗᓂᓗ ᖃᒥᑭᑯᑎᓕᐊᖑᓯᒪᔪᖅ ᒪᓕᒧᑦ ᓄᖑᑕᐅᐸᓕᐊᖏᑲᓗᐊᒪᖓᑦ ᓯᑯᖃᕈᓂᕐᓚᑦ. ᖃᐅᔨᓴᕈᑕᐅᔪᕐᓂ ᖃᐅᔨᔭᐅᓚᐅᑐᖅ ᐊᑎᑐᕐᒥᑐᖅ ᖃᐅᔨᓴᑕᐅᔪᖅ ᓯᕈᓇᕐᑐᖅ (ᐃᒪᐅ ᐱᔪᓇᐅᑎᐅ ᒪᓕᑕᐅᖁᔭᑕ ᑐᖓᓂ).

4. ᓄᓇᓕᓚᓇᖓ ᐊᑕᕐᓇᑐᒥᖏᑲᓗᐊᒪᖓᑦ
   ᓄᓇᓕᓚᓇᖓᑕ ᐊᑕᕐᓇᑐᒥᖏᓂᖓ ᓄᓇᐳᔪᖅ ᖃᐅᔨᓴᑕᐅᓚᐅᑐᖅ ᓄᓇᒥᒃ ᖃᐅᔨᓴᑎᓕᓇᒧᑦ ᑕᐃᓇ ᖃᐅᔨᓴᓚᓇᐊᓗᒃᑐᓂ ᖃᐅᔨᓴᓚᐅᒪᑦ ᐅᑐᓂ ᐊᒥᓱᓂ ᓄᖑᐊᓂ ᔪᓚᐃᒥ (ᐊᐳᑎᖃᕈᓂᕐᓕᒪᑦ). ᐅᑯᓂᖓ ᓄᓇᓂ ᖃᐅᔨᓴᓚᐅᑐᖅ:
   - ᐊᐅᓚᓂᖓ ᐊᒪᓗ ᐊᐅᐸᑐᖅ ᕿᒥᑯᓘᑉ ᒪᒃᑐᑯᕐᑕᐅᕕᖓ ᐅᓕᑕᐅᓯᒪᔪᑦ ᖃᑎᓯᓯᒪᓗᑎᒃ (ᖃᓄᐃᕐᑲᓗᐊᒪᖓᑕ ᐊᒪᓗ ᑎᓱᐊᓕᐊᕐᑲᓗᐊᒪᖓᑕ ᑐᐊᐸᖓ)

- ᓄᓇᖓ ᐃᒍᑎᑕᐅᓂᐅᓚᐅᑐᖅ ᑭᐊᕉᑉ ᑕᓯᖓᑕ ᓯᒥᖓᑕ ᐃᓂᒋᓚᐅᑕᖓ (ᓯᓂᖓ ᐊᒪᓗ ᑰᖓᑕ ᑰᕕᖓ ᓱᓂᐸᓕᐊᖏᑲᓗᐊᒪᖓᑕ).
- ᑭᐊᕈ ᑰᖓᑕ ᑰᕕᖓ ᑯᑲᓗᐊᒪᖓᑦ ᐊᒪᓗ ᓄᖑᑎᕆᕙᓕᐊᖏᑲᓗᐊᒪᖓᑦ ᑯᑐᕐᒥᒃ.
- ᓯᔭᖓ ᑭᐊᕈ ᑖᓯᖓ (ᓱᓂᐸᓕᐊᖏᑲᓗᐊᒪᖓᑦ ᓄᖑᐸᓕᐊᔪᖅᖏᑲᓗᐊᒪᖓᓗ)
- ᓄᓇᐃᑦ ᐅᔭᕋᑕᕐᕕᐅᓚᐅᑐᑦ ᓱᓕ ᓯᒥᒃᓯᒪᒪᒐᓗᐊᒪᖓᑕ (ᓱᓕ ᓯᒥᓯᒪᒪᒐᓗᐊᒪᖓᑕ ᐊᒪᓗ ᖃᖏᑦ ᑲᑕᒐᖏᑲᓗᐊᒪᖓᑕ).
- ᐃᒍᑎᑕᐅᓂᕆᓚᐅᑕᖓ ᑕᕆᐅᒥ ᑐᓚᒃᑕᕐᕕᒃ ᐊᒪᓗ ᖃᓂᒋᔭᖏᑦ ᐅᑎᑎᑕᐅᓂᕆᓚᐅᑕᖓ ᖃᓄᐃᑐᓂᖓᓄ ᓯᔭᖓ (ᓇᒪᖏᑐᕐᒥ ᑎᓲᕐᑐᖅᖏᑲᓗᐊᒪᖓᑦ).
- ᓄᓇᖓᑕ ᖃᖓ ᐅᔭᕋᓯᐅᕕᐅᔪᑦ ᖁᓛᖏᑦ ᖁᓕᓕᕐᓯᒪᓂᐅᔪᕐᓂ ᐅᔭᕋᓯᐅᕕᕕᓂᓂ ᑕᐃᑯᐊ ᑲᑕᕐᐸᓕᐊᖏᑲᓗᐊᒪᖓᑕ.
- ᐊᖁᑏᑦ ᖁᓕᐅᕐᕕᓕᐅᕐᓯᒪᔪᑦ ᐱᕐᑕᐅᓯᒪᔪᑦ ᑕᑯᓴᐅᔪᓚᓇᒥᑦ ᑎᓲᕐᑐᖅᖏᑲᓗᐊᒪᖓᑦ.
- ᐊᓯᖏᑦ ᐊᕿᒋᐊᕐᓯᒪᔪᑦ ᖃᓄᐃᖏᑎᐊᕋᓗᐊᒪᖓᑕ ᐊᒪᓗ ᐊᓯᖏᓂ ᑎᓲᕐᑐᓂ ᐱᑕᖅᖏᒪᖓᑦ.

ᓄᓇᖓᓂ ᖃᐅᔨᓴᕐᑎ ᑐᓂᓯᓚᐅᑐᖅ ᐅᓂᑳᕐᒥ ᐅᖃᓯᒪᔪᕐᒥᒃ ᑭᓱᓕᒫᑦ ᖃᓄᐃᖏᑎᐊᑐᑦ ᐊᒪᓗ ᐃᓱᒫᓗᑎᑕᖅᖏᑐᖅ. ᐅᑯᓂᖓ ᐃᒪᐃᓕᔭᓇᐊᓕᓂ ᐅᖃᐅᓯᖃᓚᐅᑐᖅ:

- ᒥᑭᑐᒐᓗᐊᕐᒥᒃ ᓄᓇᒥ ᐃᒍᑎᕕᐅᔪᕕᓂᕐᒥ ᑭᐊᕉᑉ ᑕᓯᖓᑕ ᓯᒥᖓᓂ ᖃᓗᓇᕐᑕᖅ ᐃᓕᔭᐅᓂᕕᓂᐊ ᐊᑕᒍ ᓴᕿᔮᕐᓕᕐᑐᖅ ᐊᒪᓗ ᐊᓕᑕᐃᓕᔪᑎᖓᓂ ᐃᓕᓯᕕᐅᑲᓂᕆᐊᓕᒃ 2006ᖑᓕᕐᐸᑦ.
- ᒪᕈᐃᖑᓚᐅᑐᑦ ᓄᓇᐃᑦ ᖃᓂᒋᔭᓂ ᓄᑖᖅ ᑐᐊᐸᒃᑕᕕᐅᔪᕐᒥ ᐃᒪᖅ ᑕᐃᑲᓂ ᓄᖑᑎᕙᓕᐊᓂᖓᓂᒃ ᓯᕕᖓᓂᕐᒥ ᐊᕿᑕᐅᒥᐊᑲᓂᓇᐊᖅᑳᕐᑐᖅ 2006ᖑᓕᕐᐸᑦ ᑎᓱᐊᕙᓕᐊᓂᐊ ᓄᖅᑲᓕᕐᖁᓗᒍ.
- ᓯᕕᖓᓂᖓ ᐅᖓᑕᓂᑐᖅ ᒪᓇᐅᔪᖅ ᒪᕐᓗᑰᕐᕕᐅᑉ ᐃᒪᕐᒧᑦ ᑯᕕᐅᒪᑦ ᑕᒪᓇᓗ ᓄᖑᐸᓕᐊᑎᑎᒪᑦ ᐊᕿᑕᐅᓯᒪᔪᕐᒥᒃ. ᑭᓯᐊᓂ ᑕᒪᓇ ᐃᒪᐅ ᑰᓂᖓ ᑕᐃᒪᐃᓕᖓᔪᓴᔭᐅᒪᑦ ᐊᒪᓗ ᑕᒪᓇ ᓴᕿᑎᓯᐸᓕᐊᒪᑦ ᐅᔭᕋᓛᓂᒃ ᑕᒪᑐᒥᖓ ᐊᐅᓚᓯᔪᕐᒥᒃ ᓄᖑᐸᓕᐊᑎᓯᔪᕐᒥᒃ. ᒪᓇ ᓱᓂᑕᐅᖏᐸᑦ ᖃᓄᐃᖏᑐᖅ ᑭᓯᐊᓂ ᐊᕐᒍᑕᓖᑦ ᖃᐅᔨᓴᑕᐅᖃᑕᓇᐊᖅᑳᕐᑐᖅ.

ᐊᒪᓗᑲᓂᖅ, ᑐᑭᓯᓇᓯᓯᒪᑎᐊᑐᖅ ᖃᐅᔨᓴᓂᐅᔪᖅ ᓄᓇᖓᑕ ᖃᖓᓂᒃ ᖃᓕᑎᑕᐅᓯᒪᓂᖓ ᓄᓇᖓ ᑎᑎᕋᑕᐅᓚᐅᑐᖅ ᓇᓗᓇᐃᑕᐅᓯᒪᖁᓗᒍ ᓄᓇᖓ ᐊᕿᒋᐊᑕᐅᓯᒪᓕᓂᕆᔭᖓᓂᒃ. ᑕᒪᓇ ᖃᐅᔨᓴᓂᐅᔪᖅ ᐃᓱᓕᖏᑐᖅ ᑭᓯᐊᓂ ᓄᓇᖓᑕ ᐊᐅᓚᔭᓂᖓ ᒥᑭᓗᐊᒍᑦ ᐊᑕᕐᓇᒫᖔᑦ ᐃᓱᒫᓗᓇᖏᑐᖅ ᐃᓄᓕᒫᓄᖓᔪᓄ ᐃᓱᒪᓗᓕᓇᖏᑐᖅ ᐅᒪᔪᕐᓄᓗᓃᑦ (ᑕᒪᓇ ᐃᓱᒫᓗᓇᑐᑐᐊᖑᒐᓗᐊᖅ). ᖃᐅᔨᓴᓂᐅᖅ ᐊᕋᒍ ᑲᔪᓯᑎᑕᐅᑲᓂᓛᑐᖅ ᐊᒪᓗ ᖃᓄᐃᓂᓴᐅᒪᖔᑦ 2005ᒥ ᖃᐅᔨᓴᓂᒥ ᐅᖃᐅᓯᐅᓛᑐᖅ.

ᖁᓕᕆᓂᖓ ᑭᐊᕈ ᑕᓯᖓ ᖃᐅᔨᓴᑕᐅᓚᐅᑐᖅ ᓄᖑᐊᓂ ᐊᐅᔭᖅ. ᖃᐅᔨᓴᓂᐅᔪᖅ ᑕᓯᐅᑉ ᖁᓕᕆᓂᖓᓂᒃ ᓇᓗᓇᐃᓯᓂᐊᑐᖅ ᖃᓄ ᐊᑐᓂ ᐊᓯᐳᕐᐸᓕᐊᒪᖔᑦ. ᑕᓯᖅ ᐃᒪᑭᓕᕙᓕᐊᒃᐸᑦ ᐊᖁᔪᓂ, ᑕᒪᓇ ᓇᓗᓇᐃᓯᒪᔭᕐᑐᖅ ᐊᑯᓂᖓ ᑭᐊᕉᑉ ᑕᓯᖓᑕ ᐊᒪᓗ ᑭᐊᕉᑉ ᑰᖓᑕ ᐊᑯᓂᖓᓂᑐᖅ ᓄᖑᓕᕐᑐᖅ. ᑕᒪᓇ ᑕᐃᒪᐃᒪᖔᑦ ᖃᐅᔭᓴᕈᑎᓂ ᓴᕿᖏᑐᖅ 2005ᒥ.

5. ᐊᓯᖏᑦ ᓄᓇᐃ ᖃᐅᔨᓴᐅᖏᓇᕐᓂᖏᑦ

ᐃᓇᓱᐊᕐᑎᐅᔪᑦ ᑕᐃᑲᓂ ᓄᓇᒥᑐᓂᒪᑕ ᔪᓚᐃᖑᑎᓗᒍ, ᐊᓄᕆᖓ ᑕᐃᑲᓂ ᖃᐅᔨᓴᑕᐅᓚᐅᑐᖅ ᓯᓚᓂᐊᑎᑯᖏᓂᑦ ᕿᓴᓗᐸᐃᒥᑦ. ᓯᓚᓗᒃᑐᐊᓗᒃᐸᑦ ᐊᓄᕿᑐᐊᓗᓗᓂ ᒪᓕᑐᐊᓗᓕᕐᐸᑦ ᑕᒪᓇ ᐃᖑᓚᓯᒐᔭᕐᒪᑦ ᑭᐊᕉᑉ ᑕᓯᖓᓂ, ᑕᐃᒪ ᑎᒃ ᑲᒥᑯᑯᑦ ᖃᐅᔨᓴᑲᓂᕆᐊᖃᕋᔭᕐᑐᑦ ᑕᓯᕐᒥᒃ ᖃᐅᔨᓇᓱᒃᑐᑎᒃ ᖃᓄᑎᒋ ᐃᖑᓚᕐᑎᒋᓯᒪᓕᒫᖓ. ᓴᖏᓂᕐᐹᖅ ᐊᓄᕆᓂᕕᓂᖓ ᓯᓚᐅ ᖃᐅᔨᓴᓂᖏᑕ ᑎᑎᕋᑕᐅᓯᒪᓂᖏ ᒪᓕᓗᒋᑦ ᐊᒐᓯᒥ ᓯᑎᐱᕆᒥᓗ 2005ᖑᑎᓗᒍ ᓯᑎᐱᕆ 11ᒥᐅᓚᐅᓯᒪᔪᖅ ᑭᓯᐊᓂ ᐊᑯᓂᐅᓚᐅᖏᑐᖅ ᐃᓱᒫᓗᓕᓇᓚᐅᖏᑐᖅ. ᐊᒪᓗ ᑕᐃᓱᒪᓂᐅᑎᓗᒍ ᐊᕐᒍᔭᒥ, ᑭᐊᕈ ᑕᓯᖓ ᖁᐊᖑᓕᓚᐅᑐᖅ ᑕᐃᒪᐃᓂᖓᓄ ᒪᓕᖑᑦ ᓱᓂᑕᓚᐅᖏᑐᖅ.

ᓂᓚᓱᓂᖓ ᐊᑯᓂᖓᓂ ᒪᒃᓗᑯᕕᐱᓃᑦ ᓴᐅᔭᐅᓯᒪᔪᑦ ᑕᐃᒪᖓᓕᒫᖅ ᖃᐅᔨᓴᑕᐅᔪᑦ ᐅᖁᓂᖓᓄ ᓂᓚᓱᓂᖓᓄᓗᓃᑦ ᖃᐅᔨᓴᐅᑎᓄᑦ ᒪᕐᓗᑯᐃ ᐃᓗᐊᓄ ᐊᕿᑕᐅᓯᒪᔪᑦ. ᑕᑯᐊ ᖃᐅᔨᓴᕈᑎᐅᔪᑦ

ᐊᕿᑕᐅᓚᐅᑐᑦ ᔪᓂᒥ ᐊᒪᓗ ᔪᓚᐃ 2005ᖑᑎᓗᒍ ᐊᒪᓗ ᐅᖃᓕᒪᑕᐅᒪᓂᖏᑦ ᓇᓗᓇᐃᓯᔪᑦ ᖁᐊᓇᕐᑑᑉ ᐅᖓᑎᐊᓗᐊᓂᑐᑦ (ᐊᑯᓂ ᐊᕐᒍᓂ ᑕᑯᐊ ᐊᕿᑕᐅᓯᒪᓕᑐᑦ), ᐊᒪᓗ ᐊᐅᐸᑐᖅ ᕿᒥᑯᓘᒥ ᓴᐅᔭᐅᓯᒪᔪᑦ (ᑕᓇ ᓄᑕᕐᒥᒃ ᐃᓗᓕᑕᐅᓯᒪᔪᖅ), ᓱᓕ ᖁᐊᕐᐸᓕᐊᔪᖅ. ᓂᓚᓱᓂᖏᑕ ᖃᐅᔨᓴᑕᐅᓂᖏᑦ ᓴᐅᔭᐅᓯᒪᓕᑎᓗᒋᑦ ᑕᑯᐊ ᒪᕐᓗᑯᕐᕕᐅᓯᒪᔪᑦ ᓂᓚᓱᖏᓂᓴᐅᔪᑦ ᓂᕆᐅᒋᔭᐅᓚᐅᑐᕐᒥᑦ. ᑕᐃᓱᒪᓂᐅᑎᓗᒍ, ᑎᒃ ᑲᒥᑯᑯᑦ ᖃᐅᔨᒪᓚᑕᓚᐅᖏᑐᑦ ᖁᐊᖑᐃᓇᓲᖅ ᑕᐃᑲᓂ ᖁᐊᐸᓕᐊᖏᓂᖓᓄᒪᖔᑦ ᐅᕙᓗᓃᑦ ᑕᐃᑯᐊ ᓂᓚᓱᓂᖓᑕ ᖃᐅᔨᓴᕈᑎᖏᑦ ᐊᕿᑕᐅᓯᐊᓯᒪᖏᒪᖓᑕ. ᑎᒃ ᑲᒥᑯᑯᑦ ᐱᓇᓱᐊᑲᓂᓖᕐᑐᑦ ᖃᐅᔨᓴᕈᑎᒥᒃ ᓂᓚᓱᓂᖓᓂ ᐅᓇᓂᖓᓂᓗᓃᑦ 2006ᖑᓕᕐᐸᑦ ᐊᕿᑕᐅᑎᐊᑲᓂᖁᓗᒍ ᓱᓕᓚᑖᕐᑐᕐᒥᒃ ᐅᖃᓕᒪᑕᐅᖃᑕᖁᓗᒍ.

ᑕᐃᑯᐊ ᐅᔭᕋᓴᔭᖅᑲᕕᐅᓚᐅᑐᑦ ᓯᕐᓗᐊᑦᖃᕕᕕᓃᑦ, ᐅᑎᑎᑕᐅᕙᓕᐊᑎᓗᒍ ᖃᓄᐃᑐᓂᖓᓄᑦ ᑲᖓᕐᓗᑯᐃᑦ ᑕᒪᒥᓕᒫᑎᐊ ᓄᐊᑕᐅᓚᐅᖏᑐᑦ ᓴᓗᒪᕐᑕᐅᓇᑎᒃ. ᖃᖓ ᑐᐊᐸᒃ ᐱᔭᕐᑕᐅᓚᐅᑐᖓᓗᐊᖅ ᑕᐃᓄᖓ ᐱᔭᕈᓇᓂᓕᒫᖓᓄᑦ ᐊᑕᓂᑐᕐᒧᑦ. ᑕᐅᓇ ᐊᑎᖓ ᒪᓂᑐᐊᓗᒪᑦ ᐊᒪᓗ ᓱᕐᓂᖅᑲᐅᓗᓂ, ᐊᒪᓗ ᐃᓚᖓ ᒥᑭᑐᑎᑯᓗᓗᓂ ᑐᐊᐸᖓ ᑕᒪᒃᒥ ᐱᔭᕐᑕᐅᔪᓇᓚᐅᖏᑐᖅ ᐃᖅᐸᓯᐊ. ᐅᒪᔪᐃ ᐊᒪᓗ ᐃᓄᐃᑦ ᑕᒪᑐᒧᖓ ᓱᓂᑕᐅᖁᓇᒥᑦ ᖃᖓᕐᓗᑯᖏᓄᑦ, ᑎᒃ ᑲᒥᑯᑯᑦ 0.5ᒥᑕᒥᒃ ᑐᐊᐸᒥ ᖃᓕᓚᐅᑕᖓᑦ (ᖃᓂᒋᔭᓃᑦ ᑐᐊᐸᑕᕐᓗᑎᒃ) ᖃᐸᓕᑕᐅᓗᓂ ᑕᐅᕙᓇ ᓄᓇᖓ. ᐊᑕᕐᓇᑐᕐᑯᓇᒍ ᖃᖓ ᓄᓇᖓᑕ ᐊᑕᓇᑐᕐᑯᓇᒍ ᐅᒪᔪᕐᓄᑦ ᐃᓄᓄᓗ, 2005ᖑᑎᓗᒍ ᑐᐊᐸᖓᓂᑦ ᖃᐅᔨᓴᑕᐅᔪᖃᓚᐅᑐᖅ ᖃᐅᔨᓗᑎᒃᓗ ᖃᓄᑎᒋ ᓴᕕᕐᔭᒃᓴᕐᑕᖃᒪᖔᑦ. ᑕᒪᕐᒥᓕᒫᑦ ᑕᒪᐃᓂᑦ ᐱᖓᓱᓂᑦ ᖃᐅᔨᓴᑕᐅᕕᐅᔪᓂᑦ ᑕᑯᓴᕈᑎᓯᔪᑦ ᓴᕕᕐᔭᒃᓴᖅ ᒥᑭᓂᓴᐅᔪᖅ ᓴᓗᒪᕐᓴᕐᑕᐅᐸᑦ ᑐᕐᓯᓇᔭᐅᓚᐅᑐᓂᑦ. ᐊᑐᓂ ᐊᕐᒍᑕᒫᑦ ᑕᐃᓇ ᖃᐅᔨᓴᑕᐅᐸᑦ, ᖃᐅᔨᓴᑕᐅᔪᑎᓴᑲᓂᓂᑦ ᐱᖃᑕᓛᑐᑦ ᑕᐅᕙᓇ ᓄᓇᖓ ᖃᓄᐃᖏᑎᐊᕐᓴᓗᐊᒪᖔᑦ.

APPENDIX 2

2005 3rd Quarter

Garrow Lake Effluent Discharge Monitoring

by

Azimuth Consulting Group Inc.

Bruce J. Donald
Reclamation Manager

November 10, 2005

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

Attention: Peter Blackall, Regional Director of Environmental Protection

Dear Peter Blackall;

Re: Polaris Mine 2005 3rd Quarter MMER Report

Please find attached the Metal Mining Effluent Regulation (MMER) Report for Polaris Mine for the 3rd Quarter of 2005. As Polaris is a remote mine and operations on the site have ceased, collection of MMER and Environmental Effects Monitoring (EEM) data for this year was conducted by small field crews stationed onsite for the first part of the season, and then by flying scientists/ technicians to site on a weekly basis for the latter part of the season. Field crews were onsite when flow initiated in Garrow Creek on approximately June 25, 2005. Flow continued through July and August, and Garrow Creek was observed to be frozen on September 13, 2005.

The MMER effluent characterization monitoring, bioassay testing, and environmental effects monitoring were conducted throughout the quarter. Due to the short season of flow, two sets of acute and sublethal toxicity tests were conducted within the quarter on July 16 and August 9, 2005, corresponding to the dates of EEM quarterly water quality monitoring samples collected at effluent, exposure and reference stations. A quarterly effluent sample plus acute and sublethal toxicity samples were also collected on July 6, 2005, but due to fog conditions at the mine, the toxicity samples did not make it to the labs within holding times are were discarded. The effluent sample was analyzed for the MMER and EEM parameters. No exposure or reference samples were collected on July 6, 2005, since Garrow Bay was still ice-covered.

MMER water quality monitoring was conducted on a weekly basis throughout most of the season. Between August 20 – 23 and after August 27, 2005, access to the site was not possible due to weather conditions. Ken Russell and Jenny Ferone were informed of failed sampling attempts and were updated with weather and safety conditions at the site on a regular basis. On September 13, 2005, a quarterly event with acute toxicity testing was planned. However, upon arrival onsite, it was observed that Garrow Creek (final discharge point) was frozen. A chronology of the 2005 sampling season is presented in Appendix I.

There were no exceedances of MMER Schedule 4 Limits for the 2005 season, and there was no acute toxicity in Rainbow trout and *Daphnia* tests. Holding times for nitrate and alkalinity were exceeded in the July 6, 2005 sample due to an oversight by the ALS lab. This situation is explained in a letter from ALS provided in Appendix J, and is not likely to influence the results.

The following information is included in our 2005 3rd Quarter MMER Report:

- Table 1a – Concentrations Of Effluent For MMER Schedule 4 Sampled Weekly
- Table 1b – Monthly Mean Concentrations Of Effluent For MMER Schedule 4
- Table 1c – Mass Loading Of Deleterious Substance For Each Day Sampled
- Table 1d – Mass Loading Per Calendar Month For Each Deleterious Substance
- Table 2 – Results of Acute Lethality Tests and Daphnia Magna Monitoring Tests
- Table 3 – Effluent Characterization Water Quality Results (studies conducted under Part 1, Section 4) (Effluent Characterization) (Table 3, Table 5)
- Table 4 – Water Quality Monitoring in Exposure and Reference Stations (Results of studies conducted under Part 1, Section 7)
- Table 5 – QAQC of Effluent and Water Quality Data

Additional Appendices

- Appendix A – Information specified by Section 8.1 of Reference Method EPS 1/Rm/13: 96 hr acute rainbow trout test
- Appendix B – Information specified by Section 8.1 of Reference Method EPS 1/Rm/14: 72 hr acute *Daphnia magna* test
- Appendix C – 7-d Topsmelt Growth and Survival Sublethal Toxicity Test
- Appendix D – 92-h Echinoderm Fertilization Sublethal Toxicity Test
- Appendix E – 7-d Sublethal Champia (Algae) Sublethal Toxicity Test
- Appendix F – Results of Effluent Characterization, as per Paragraph 15(1)(a)
- Appendix G – Acute Toxicity Testing Reports
- Appendix H – Sublethal Toxicity Testing Reports
- Appendix I – Polaris 2005 Sampling Event Chronology
- Appendix J – Letter from ALS explaining missed holding times of alkalinity and nitrate for July 6,2005 sample

The MMER and EEM data required to be reported in electronic format were submitted electronically through the RISS online system on November 10 2005. In addition to this hardcopy report, an electronic pdf version of this report is being emailed to you (e-mailed November 10, 2005).

If you have any questions regarding the annual report or aspects of the application of the MMER to the Polaris Mine, please feel free to contact me.

Yours truly,

Original signed by B. Donald
Bruce Donald

Attachments: 2005 3rd Quarter Regulatory Data Tables
cc: Randy Baker (Azimuth Consulting Group)
Ken Russell (Environment Canada)
Jenny Ferone (Environment Canada)

Polaris Mine 2005 3rd Quarter MMER Report

Prepared for

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

November 10, 2005

Teck Cominco
Bag 2000
Kimberley, BC, Canada
V1A 3E1

2005 3rd QUARTER MMER REPORT

LOCATION - FINAL DISCHARGE POINT FROM GARROW LAKE (GARROW LAKE DAM SIPHONS)

Table 1a. CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4 SAMPLED WEEKLY

Sample Taken During The Week of	Date Sample Taken	DELETERIOUS SUBSTANCE (mg/L)[1] Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]	pH[1]	Collection Method
3-Jul-05	6-Jul-05	*0.00020*	0.00024	*0.0050*	0.00017	0.00060	0.0127	4	0.0050	7.49	Grab
10-Jul-05	13-Jul-05	*0.00020*	0.00061	*0.0050*	0.00230	0.00088	0.0205	*3.0*	*0.0050*	7.48	Grab
10-Jul-05	16-Jul-05	*0.00020*	0.00042	0.0444	0.00042	0.00081	0.0179	*3.0*	0.0090	7.59	Grab
17-Jul-05	23-Jul-05	*0.00020*	0.00047	*0.0050*	0.00024	0.00105	0.0325	*3.0*	*0.0050*	7.56	Grab
24-Jul-05	30-Jul-05	0.00021	0.00050	*0.0050*	0.00020	0.00141	0.0405	*3.0*	*0.0050*	7.70	Grab
31-Jul-05	6-Aug-05	*0.00020*	0.00052	*0.0050*	0.00047	0.00166	0.0356	*3.0*	*0.0050*	7.65	Grab
7-Aug-05	13-Aug-05	*0.00020*	0.00052	*0.0050*	0.00111	0.00149	0.0310	*3.0*	0.0080	7.79	Grab
14-Aug-05	24-Aug-05[3]	*0.00020*	0.00101	*0.0050*	0.00093	0.00474	0.0905	4.8	0.0090	8.13	Grab
21-Aug-05	27-Aug-05	*0.00020*	0.00079	*0.0050*	0.00076	0.00356	0.0680	3.7	0.0100	7.92	Grab
28-Aug-05	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
4-Sep-05	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
11-Sep-05	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
18-Sep-05	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
25-Sep-05	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L and pH which is in pH units

Note [2] - "nd" refers to no effluent discharge to sample

Note [3] - due to weather conditions samples could not be collected the week of August 14th, two sets were collected the following week.

Concentrations in italicized font are less than the detection limit shown.

Table 1b. MONTHLY MEAN CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4

MONTH OF	MONTHLY MEAN CONCENTRATION[1] OF DELETERIOUS SUBSTANCE[3] Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226
July/04	0.0002	0.00045	0.0129	0.00066	0.00095	0.0248	3	0.0058
August/04	0.0002	0.00071	0.00500	0.00082	0.00286	0.0563	3.6	0.0080
September/04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L

Note [2] - "nd" refers to no effluent discharge to sample

Note[3] - Monthly Mean Concentrations - the MEAN value of the concentrations measured in all water samples collected during each month when a deleterious substance is deposited.

Table 1c. MASS LOADING OF DELETERIOUS SUBSTANCE FOR EACH DAY SAMPLED

Sample Taken During The Week of	Date Sample Taken	DAILY MASS LOADING OF DELETERIOUS SUBSTANCE (kg/day)[1]								Average Daily Flow Rate (m^3/day)[4]
		Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]	
3-Jul-05	6-Jul-05	0.002	0.002	0.042	0.001	0.005	0.108	34	42,353	8,471
10-Jul-05	13-Jul-05	0.001	0.002	0.018	0.008	0.003	0.075	11	18,178	3,636
10-Jul-05	16-Jul-05	0.001	0.001	0.148	0.001	0.003	0.060	10	30,086	3,343
17-Jul-05	23-Jul-05	0.001	0.003	0.027	0.001	0.006	0.177	16	27,214	5,443
24-Jul-05	30-Jul-05	0.000	0.001	0.011	0.000	0.003	0.092	7	11,299	2,260
31-Jul-05	6-Aug-05	0.001	0.003	0.034	0.003	0.011	0.240	20	33,734	6,747
7-Aug-05	13-Aug-05	0.002	0.006	0.056	0.012	0.017	0.348	34	89,872	11,234
14-Aug-05	24-Aug-05[3]	0.004	0.018	0.089	0.017	0.084	1.604	85	159,501	17,722
21-Aug-05	27-Aug-05	0.003	0.010	0.063	0.010	0.045	0.856	47	125,830	12,583
28-Aug-05	nd[2]	0	0	0	0	0	0	0	0	0
4-Sep-05	nd[2]	0	0	0	0	0	0	0	0	0
11-Sep-05	nd[2]	0	0	0	0	0	0	0	0	0
18-Sep-05	nd[2]	0	0	0	0	0	0	0	0	0
25-Sep-05	nd[2]	0	0	0	0	0	0	0	0	0

Note[1] - Mass Loading is in kilograms per day of the deleterious substance deposited except Radium 226 which is in Bq per day

Note [2] - "nd" refers to no effluent discharge to sample

Note [3] - August 24 data are presented in the week of the August 14th

Note [4] - Discharge for August 6 is an estimate pending verification by Teck Cominco.

Table 1d. MASS LOADING PER CALENDAR MONTH FOR EACH DELETERIOUS SUBSTANCE

CALENDAR MONTH OF	MASS LOADING[1] FOR DELETERIOUS SUBSTANCE (kg/month)[2]								Average Weekly Flow Rate[3] (m^3/week)	Total Monthly Volume[4] (m^3/month)
	Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[2]		
July/04	0.03	0.06	1.53	0.08	0.12	3.16	483.14	800,602	32,412	143,540
August/04	0.07	0.29	1.87	0.32	1.21	23.62	1,438.14	3,169,267	84,501	374,218
September/04	0	0	0	0	0	0	0	0	0	0

Note[1] - Total Mass Loading for Calendar month calculated by multiplying the Average Daily Mass Loading for the Month x # days in the month

Note[2] - Mass loading units are in kg per month except Radium 226, which is in Bq permonth

Note[3] - Average Weekly Flow Rate calculated by multiplying Average Daily Flow Rate x 7 days per week

Note[4] - Total Monthly Volume calculated by multiplying Average Daily Flow Rate for the month x days in month

Table 2

RESULTS OF ACUTE LETHALITY TESTS AND
DAPHNIA MAGNA MONITORING TESTS

Date Sample Collected	Effluent Acutely Lethal to Rainbow Trout (yes or no)	Effluent Acutely Lethal to *Daphnia magna* (yes or no)
16-Jul-05	No	No
6-Aug-05	No	No

Non-compliance Information

If effluent was non-compliant with the aurthorized limits set out in Schedule4, indicate the cause(s) of non-compliance and remedial measures planned or implemented. Also indicate remedial meaures planned or implemented in response to the failure of acute lethality tests.

There were no non-compliant concentrations, and no failed acute lethality toxicity tests during 2005 3rd Quarter for Polaris Mine.

Table 3. 2005 3rd Quarter Polaris Mine Effluent Characterization Results (Part 1, Section 4)

Effluent Characterization from Final Discharge Point - Garrow Lake Former Dam / Syphons
Northing: 75°22'32"
Easting: 96°48'37"

Facility Name:		Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)				
FDP Name:		Garrow Lake Syphons				
Sample ID:		G Creek	G-Creek	G-Creek		
Sampling Date:		6-Jul-05	16-Jul-05	6-Aug-05		
Sample Method:		Grab	Grab	Grab		
Parameter	**Units**				***Detection Limit***	**Methods[1]**
Hardness	mg/L	149	184	375	*0.54 - 5.4*	Calculation - EPA Method 3005A, ICPOES (EPA Method 6010B)[4]
Alkalinity, Total	mg/L	28.1	29.2	52.5	*2.0*	Colourimetry - APHA Method 2320 (potentiometric titration)
Aluminum, Total	mg/L	<0.20	0.0085	<0.20	*0.001 - 0.2*	ICPMS[3]
Cadmium, Total	mg/L	0.000034	0.000044	0.000097	*0.000020*	SPR-IDA[2], ICPMS[3]
Iron, Total	mg/L	0.012	0.043	0.014	*0.010*	SPR-IDA[2], ICPMS[3]
Mercury, Total	mg/L	<0.000010	<0.000010	<0.000010	*0.000010*	Cold Vapour Atomic Florescence Spectrophotometry
Molybdenum, Total	mg/L	<0.0050	<0.0050	<0.0050	*0.0050*	ICPMS[3]
Ammonia Nitrogen	mg/L	0.036	0.037	<0.020	*0.020*	APHA Method 4500-NH3 (selective ion electrode)
Nitrate Nitrogen	mg/L	0.032	<0.050	0.072	*0.025 - 0.050*	APHA Method 4110 (determination of inorganic ions by ion chromatography)
Arsenic, Total	mg/L	<0.00020	<0.00020	<0.00020	*0.00020*	Hydride-Vapour Atomic Absorption Spectrophotometry
Copper, Total	mg/L	0.000240	0.000424	0.000516	*0.000050*	Chelation SPR-IDA[2], ICPMS[3]
Cyanide, Total	mg/L	<0.0050	0.0444	<0.0050	*0.0050*	Colourimetry - APHA Method 4500-CN (cynate hydrolosis using an ammonia selective electrode
Lead, Total	mg/L	0.000166	0.000415	0.000467	*0.000050*	Chelation SPR-IDA[2], ICPMS[3]
Nickel, Total	mg/L	0.000601	0.000807	0.00166	*0.000050*	Chelation SPR-IDA[2], ICPMS[3]
Zinc, Total	mg/L	0.0127	0.0179	0.0356	*0.00050*	Chelation SPR-IDA[2], ICPMS[3]
Total Suspended Solids	mg/L	4.0	<3.0	<3.0	*3.0*	Gravimetry - APHA Method 2540 (filtration through glass fibre filter)
Radium-226 (a)	Bq/L	0.0050	0.009	<0.0050	*0.0050*	Radio Chemistry[5]
pH	pH units	7.49	7.59	7.65	*0.010*	APHA Method 4500-H (pH electrode meter)

Notes:

< = Less than the detection limit indicated.

(a) Results are expressed as Becquerels per litre (Bq/L). This analysis is subcontracted to SRC, Saskatoon.

[1]Original data reports are available upon request

[2]SPR-IDA = Suspended Particulate Resin consisting of immobilized iminodiacetate on a divinyl benzene polymer is used to chelate and preconcentrate metals in seawater (preparation technique).

[3]Instrumental analysis is by ICPMS = Inductively Coupled Mass Spectrometry.

[4]This analysis is carried out using procedures adapted from "StandardMethods for the Examination of Water and Wastewater" 20th Edition 1998, published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the USEPA. The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emissionspectrophotometry ICPOES (EPA Method 6010B).

[5]All radium isotopes in the sample solution are separated by coprecipitation with lead sulfate. The precipitate is redissolved and the radium isotopes are separated by coprecipitation with barium sulfate. The precipitate is filtered and mounted on a stainless steel disk. It is then counted on an alpha spectrometer. The radium 226 alpha energy is distinct and the peak can be clearly identified.

Table 4. 2005 3rd Quarter Polaris Mine Water Quality Monitoring Results (Part 1, Section 7)

Station:		Exposure Area		Reference Area			
Description:		Garrow Bay at Mouth of Garrow Creek Confluence		Garrow Bay ~1km NE of exposure station (confluence with Garrow Creek).			
Northing:		75°22'15"		75°22'40"			
Easting:		96°48'30"		96°47'12"			
Facility Name:		Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)		Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)			
FDP Name:		Garrow Lake Syphons		Garrow Lake Syphons			
Area Name:		Garrow Bay Exposure		Garrow Bay Reference			
Sample ID:		G-BAY	G-Bay (b)	T-BAY REF	Ref		
Sampling Date:		16-Jul-05	6-Aug-05	16-Jul-05	6-Aug-05		
Sample Method:		Grab	Grab	Grab	Grab		
Parameters	**Units**					***Detection Limit***	**Methods[1]**
Hardness	mg/L	215	385	271	840	*0.54-5.4*	Calculation - EPA Method 3005A, ICPOES (EPA Method 6010B)[4]
Alkalinity, Total	mg/L	44.2	63.2	23.0	53.5	*2.0*	Colourimetry - APHA Method 2320 (potentiometric titration)
Aluminum, Total	mg/L	0.0519	<0.10	0.0619	<0.10	*0.001-0.2*	ICPMS[3]
Cadmium, Total	mg/L	0.000051	0.000081	<0.000020	<0.000020	*0.000020*	SPR-IDA[2], ICPMS[3]
Iron, Total	mg/L	0.207	0.015	0.217	0.011	*0.010*	SPR-IDA[2], ICPMS[3]
Mercury, Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	*0.000010*	Cold Vapour Atomic Florescence Spectrophotometry
Molybdenum, Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	*0.0050*	ICPMS[3]
Ammonia Nitrogen	mg/L	0.048	<0.020	<0.020	<0.020	*0.020*	APHA Method 4500-NH3 (selective ion electrode)
Nitrate Nitrogen	mg/L	<0.050	0.092	<0.050	0.0261	*0.025*	APHA Method 4110 (determination of inorganic ions by ion chromatography)
Arsenic, Total	mg/L	<0.00020	<0.00020	0.00050	0.00024	*0.00020*	Hydride-Vapour Atomic Absorption Spectrophotometry
Copper, Total	mg/L	0.000748	0.000608	0.000563	0.000305	*0.000050*	Chelation SPR-IDA[2], ICPMS[3]
Cyanide, Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	*0.0050*	Colourimetry - APHA Method 4500-CN (cynate hydrolosis using an ammonia selective electrode
Lead, Total	mg/L	0.00147	0.000517	0.000690	0.000078	*0.000050*	Chelation SPR-IDA[2], ICPMS[3]
Nickel, Total	mg/L	0.00126	0.00188	0.000554	0.000412	*0.000050*	Chelation SPR-IDA[2], ICPMS[3]
Zinc, Total	mg/L	0.0154	0.0224	0.00323	0.00122	*0.00050*	Chelation SPR-IDA[2], ICPMS[3]
Total Suspended Solids	mg/L	16.7	<3.0	<3.0	<3.0	*3.0*	Gravimetry - APHA Method 2540 (filtration through glass fibre filter)
Radium-226 (a,b)	Bq/L	0.010	n/a	<0.0050	<0.0050	*0.0050*	Radio Chemistry[5]
pH	pH units	7.64	7.96	7.40	7.89	*0.010*	APHA Method 4500-H (pH electrode meter)
Water Temperature[6]	°C	0.2	0.6	-0.1	0.2	*n/a*	Field - Campbell Scientific Hydrolab Model H20, or YSI Meter Model 85
Dissolved Oxygen[6]	mg/L	13.2	11.6	15.2	13.9	*n/a*	Field - Campbell Scientific Hydrolab Model H20, or YSI Meter Model 85

Notes

The Garrow Bay exposure area (mouth of the creek), and Garrow Bay reference area were frozen during the July 6, 2005 sampling event.

< = Less than the detection limit indicated.

(a) Results are expressed as Becquerels per litre (Bq/L). This analysis is subcontracted to SRC, Saskatoon.

(b) n/a for August 6, 2005 sample = not available, the sample was lost during analysis by SRC with no additional sample remaining to repeat the analysis.

[1]Original data reports are available upon request

[2]SPR-IDA = Suspended Particulate Resin consisting of immobilized iminodiacetate on a divinyl benzene polymer is used to chelate and preconcentrate metals in seawater (preparation technique).

[3]Instrumental analysis is by ICPMS = Inductively Coupled Mass Spectrometry.

[4]This analysis is carried out using procedures adapted from "StandardMethods for the Examination of Water and Wastewater" 20th Edition 1998, published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the USEPA. The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emissionspectrophotometry ICPOES (EPA Method 6010B).

[5]All radium isotopes in the sample solution are separated by coprecipitation with lead sulfate. The precipitate is redissolved and the radium isotopes are separated by coprecipitation with barium sulfate. The precipitate is filtered and mounted on a stainless steel disk. It is then counted on an alpha spectrometer. The radium 226 alpha energy is distinct and the peak can be clearly identified.

[6]Temperature and dissolved oxygen data are estimated pending verification by Teck Cominco.

Table 5. 2005 3rd Quarter Polaris Mine QAQC Sample Results[1] Including Field Duplicates, Field Blanks, and Transport Blanks.

Sample Type:		Field Duplicate	Original Sample		Field Duplicate	Original Sample		Field Duplicate	Original Sample	
Sample ID:		Dup	G Creek		DUP	G-Creek		Dup	Ref	
Location:		Garrow Lake Syphons			Garrow Lake Syphons			Garrow Bay Reference		
Description:		Final Discharge Point		RPD[2]	Final Discharge Point		RPD[2]	~1km NE of confluence with Garrow Creek		RPD[2]
Sampling Date:		6-Jul-05		(%)	16-Jul-05		(%)	6-Aug-05		(%)
Parameters	**Parameter Units**									
Hardness	mg/L	140	149	6.0	187	184	1.6	852	840	1.4
Alkalinity, Total	mg/L	28.0	28.1	0.4	29.0	29.2	0.7	53.8	53.5	0.6
Aluminum, Total	mg/L	<0.10	<0.20	n/a	0.0087	0.0085	2.4	<0.10	<0.10	n/a
Cadmium, Total	mg/L	0.000040	0.000034	17.6	0.000049	0.000044	11.4	<0.000020	<0.000020	n/a
Iron, Total	mg/L	0.013	0.012	8.3	0.043	0.043	0.0	0.011	0.011	0.0
Mercury, Total	mg/L	<0.000010	<0.000010	n/a	<0.000010	<0.000010	n/a	<0.000010	<0.000010	n/a
Molybdenum, Total	mg/L	<0.0050	<0.0050	n/a	<0.0050	<0.0050	n/a	<0.0050	<0.0050	n/a
Ammonia Nitrogen	mg/L	0.032	0.036	11.1	0.044	0.037	18.9	<0.020	<0.020	n/a
Nitrate Nitrogen	mg/L	0.028	0.032	12.5	<0.050	<0.050	n/a	0.0348	0.0261	33.3
Arsenic, Total	mg/L	0.00021	<0.00020	n/a	<0.00020	<0.00020	n/a	<0.00020	0.00024	n/a
Copper, Total	mg/L	0.000295	0.000240	22.9	0.000376	0.000424	11.3	0.000321	0.000305	5.2
Cyanide, Total	mg/L	<0.0050	<0.0050	n/a	0.0058	0.0444	86.9	<0.0050	<0.0050	n/a
Lead, Total	mg/L	0.000241	0.000166	45.2	0.000409	0.000415	1.4	0.000062	0.000078	20.5
Nickel, Total	mg/L	0.000673	0.000601	12.0	0.000819	0.000807	1.5	0.000460	0.000412	11.7
Zinc, Total	mg/L	0.0136	0.0127	7.1	0.0185	0.0179	3.4	0.00165	0.00122	35.2
Total Suspended Solids	mg/L	<3.0	4.0	n/a	<3.0	<3.0	n/a	<3.0	<3.0	n/a
Radium-226 (a,b)	Bq/L	<0.0050	0.0050	n/a	<0.0050	0.009	n/a	0.0060	<0.0050	n/a
pH	pH units	7.62	7.49	1.7	7.58	7.59	0.1	7.80	7.89	1.1
Salinity	o/oo	<1.0	<1.0	n/a	<1.0	<1.0	n/a	4.6	4.6	0.0
Calcium, Total	mg/L	16.5	19.1	13.6	21.4	21.1	1.4	58.1	57.6	0.9
Magnesium, Total	mg/L	24.0	24.6	2.4	32.3	31.9	1.3	172	169	1.8

Notes

[1]QAQC samples were collected during each EEM monitoring event. At least one field duplicate and/or one blank sample was collected during each event.

[2]RPD = Relative Percent Difference = [Absolute value (DUP-ORIG)/ORIG]*100%

Cells in grey shading have RPD values >50% for co-located field duplicates

[3]Distilled water from onsite distiller, stored for 1 year in jerry cans onsite.

[4]Commercial distilled water transported to mine site.

QAQC Results

A total of 3 duplicate samples and 5 blank samples were collected during the 2005 EEM program at Polaris mine. All RPD values were less than 50%, with the exception of one measurement of cyanide on July 16, 2005. Cyanide is not used in the process and is typically measured at less than the detection limit. With the exception of the aforementioned cyanide measurement, which is questionable, the data generally indicate good reproducibility between co-located field duplicates (i.e., low measurement and analytical variability).

Blank samples from the on-site distilled water that had been stored indicated relatively high levels of zinc, copper, and lead. This contamination was considered to be a result of the storage procedure and metal leaching from the metal jerry cans that the water was stored in for the year. The transport blanks using commmercial distilled water indicated low concentrations of all paramters (i.e., typically less than, or slightly higher than detection limits), which reveals no background contamination issues with the analysis.

Table 5. 2005 3rd Quarter Polaris Mine QAQC Sample Results[1] Including Field Duplicates, Field Blanks, and Transport Blanks.

Sample Type:		Field Blank	Field Blank	Field Blank	ALS Travel Blank	ALS Travel Blank
Sample ID:						
Location:		n/a	n/a	n/a	n/a	n/a
Description:		Distilled Water[3]	Distilled Water[3]	Distilled Water[3]	Distilled Water[4]	Distilled Water[5]
Sampling Date:		6-Jul-05	16-Jul-05	6-Aug-05	24-Aug-05	24-Aug-05
Parameters	**Parameter Units**					
Hardness	mg/L	3.07	<0.54	0.85	<0.50	<0.50
Alkalinity, Total	mg/L	3.2	<2.0	<2.0	<2.0	<2.0
Aluminum, Total	mg/L	<0.0010	<0.0050	<0.10	<0.0010	<0.0010
Cadmium, Total	mg/L	<0.000050	<0.000020	<0.000050	<0.000020	<0.000050
Iron, Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Mercury, Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum, Total	mg/L	<0.000050	<0.0050	<0.0050	<0.000050	<0.000050
Ammonia Nitrogen	mg/L	<0.020	<0.020	<0.020	-	-
Nitrate Nitrogen	mg/L	<0.0050	<0.0050	<0.0050	-	-
Arsenic, Total	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Copper, Total	mg/L	0.00484	0.00167	0.0244	<0.000050	<0.00010
Cyanide, Total	mg/L	<0.0050	<0.0050	<0.0050	-	-
Lead, Total	mg/L	0.00212	0.00607	0.0445	<0.000050	<0.000050
Nickel, Total	mg/L	<0.00010	<0.000050	<0.00050	<0.000050	<0.00010
Zinc, Total	mg/L	0.0080	0.00440	0.0040	<0.00050	<0.0010
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0
Radium-226 (a,b)	Bq/L	<0.0050	<0.0050	<0.0050	-	-
pH	pH units	6.27	5.59	6.17	5.51	5.53
Salinity	o/oo	<1.0	<1.0	<1.0	<1.0	<1.0
Calcium, Total	mg/L	1.23	0.084	0.341	<0.050	<0.050
Magnesium, Total	mg/L	<0.10	<0.10	<0.10	<0.050	<0.050

POLARIS MINE – 2005 3rd QUARTER MMER REPORT

APPENDIX A

i. Information specified by Section 8.1 of Reference Method EPS 1/Rm/13: 96 hr acute rainbow trout test

APPENDIX B

i. Information specified by Section 8.1 of Reference Method EPS 1/Rm/14: 72 hr acute *Daphnia magna* test

APPENDIX C

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPAW 95-EPA West Coast: 7-day Topsmelt Survival and Growth Tests.

APPENDIX D

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPS 1/Rm/27-EC: 92 hr Echinoderm (sand dollar) Fertilization Test

APPENDIX E

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPA/600/4-91-003, Method 1009.0: Algae (*Champia parvula*) 7-day Sublethal Growth Tests

APPENDIX F

i. Results of Effluent Characterization, as per Paragraph 15(1)(a)

APPENDIX G

ii. Acute toxicity testing laboratory reports

APPENDIX H

i. Sublethal toxicity testing laboratory reports

APPENDIX I

i. Polaris 2005 Sampling Event Chronology

APPENDIX J

i. Letter from ALS explaining missed holding times for July 6, 2005 sample

APPENDIX A

96-h Acute Rainbow Trout Toxicity Test

Section 8.1.1 Effluent

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for monthly acute toxicity testing were collected
   - Test 1: Saturday July 16, 2005 – 0900h
   - Test 2: Saturday August 6, 2005 – 1000h

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method

- Water was collected from at least 15cm below the surface using a water pump with silicon tubing
- Water was collected from the upstream direction
- The pump was flushed with site water for at least one minute prior to sample collection
- 2 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Blake Hamer (Gartner Lee) Test 1
   - Brenda Bolton (Gartner Lee) Test 2

vii. Labeling/coding of sample (Sample IDs)
   - Test 1 – G-Creek_Acute_071605
   - Test 2 – Garrow Creek

viii. Date & time of sample receipt
   - Samples for sublethal toxicity testing were received:
     Test 1 – Tuesday July 19, 2005 – 1045h
     Test 2 – Tuesday August 9, 2005 – 1015h

ix. Temperature upon sample receipt at laboratory
   - Test 1 – 12.7 °C
   - Test 2 – 19.0 °C

Section 8.1.2 Test Facilities and Conditions

i. Test type & method
   - 96-hour Rainbow Trout LC_{50}

ii. Indications of deviations from requirements in Sections 2 to 7 of Method EPS 1/RM/13
   - No deviations from requirements

iii. Name and city of testing laboratory

- EVS Environment Consultants, North Vancouver, BC

iv. Source of test species
   - Sun Valley

v. Percent mortality of fish in stock tank(s)
   - Test 1: 0.1%
   - Test 2: 0.1%

vi. Species of test organism
   - Rainbow Trout (*Oncorhynchus mykiss*)

vii. Date and time for start of definitive test
   - Test 1: July 21, 2005 – 1035h
   - Test 2: August 11, 2005 – 1500h

viii. Person(s) performing the test and verifying the results

- Test 1: Marriah Grey, Robert Harrison, Julianna Kalocai
- Test 2: Anja Fouche, Robert Harrison, Julianna Kalocai

ix. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
- Test 1: pH - 7.3, T - 15.0 °C, DO - 10.4 mg/L, C – 1445 µmhos/cm
- Test 2: pH - 7.4, T - 15.0 °C, DO - 10.1 mg/L, C – 2510 µmhos/cm

x. Confirmation that no adjustment of sample or solution pH occurred
- Test 1: No pH adjustment
- Test 2: No pH adjustment

xi. Indication of aeration of test solutions before introduction of fish
- Test 1: 6.5 ± 1 mL/min/L for 30mins
- Test 2: 6.5 ± 1 mL/min/L for 30mins

xii. Concentrations and volumes tested
- Concentrations (% effluent volume / total volume) tested and total volumes used were:
- Control (0%) - 10 L (test 1&2)
- 6.25% - 10 L (test 1&2)
- 12.5% - 10 L (test 1&2)
- 25% - 10 L (test 1&2)
- 50% - 10 L (test 1&2)
- 100% - 10 L (test 1&2)

xiii. Measurements of dissolved oxygen, pH and temperature

Sample Collection Date	Test Concentration (% v/v)	Temperature (0hr) (°C)	Temperture (48 hr) (°C)	Dissolved Oxygen (0hr) (mg/L)	Dissolved Oxygen (48hr) (mg/L)	pH (0hr) pH units	pH (48hr) pH units	Conductivity (0hr) umhos/cm
Test 1	0 (Control)	15	15	10.1	9.7	7	6.7	37
16-Jul-05	6.25	15	15	10.1	9.5	7.1	6.8	194
	12.5	15	15	10.1	9.8	7.1	6.8	301
	25	15	15	10.1	9.8	7.1	6.8	418
	50	15	15	10.1	9.8	7.2	6.9	775
	100	15	15	10.2	9.8	7.3	7	1445
Test 2	0 (Control)	15	15	10.1	9.3	7	7	40
19-Aug-05	6.25	15	15	10.1	9.4	7	7	323
	12.5	15	15	10.1	9.4	7	7.1	535
	25	15	15	10.1	9.6	7	7.1	827
	50	15	15	10.1	9.6	7.2	7.2	1373
	100	15	15	10.1	9.7	7.4	7.3	2510

xiv. Number of fish added to each test vessel
- 10 fish/ 10 L vessel (Test 1 & 2)

xv. Mean and range of fork length of control fish at end of test
- Test 1: 30 mm (25 – 33)
- Test 2: 31 mm (27 – 35)

xvi. Mean wet weight of individual control fish at end of the test
- Test 1: 0.29 g (0.20 – 0.37)
- Test 2: 0.33 g (0.22 – 0.46)

xvii. Estimated loading density of fish in test solutions
- Test 1: 0.29 g/L
- Test 2: 0.33 g/L

Section 8.1.3 Results

i. Number of mortalities of fish in each test solution
   - Results were the same for Test 1, and Test 2, except where noted
   - Control (0%) - 0
   - 6.25% - 0
   - 12.5% - 0
   - 25% - 0
   - 50% - 0
   - 100% - 0

ii. Number of control fish showing atypical/stressed behaviour
   - None in Test 1 or Test 2

iii. Mean mortality rate in solutions of effluent and control water
   - Results were the same for Test 1 and Test 2
   - Control (0%) - 0%
   - 6.25% - 0%
   - 12.5% - 0%
   - 25% - 0%
   - 50% - 0%
   - 100% - 0%

iv. Estimate of 96-h LC50 in multi-concentration tests
   - Results were the same for Test 1 and Test 2
   - 96hr LC_{50} concentration > 100% effluent

v. Most recent 96-h LC50 for reference toxicity test(s)
   - Reference toxicity tests for Toxicant: SDS
   - Test 1 & 2: (Jul-12-03) 96-h LC_{50} = 24mg/L SDS, 95% CL = 18-32mg/L

vi. Reference toxicant warning limits (mean +/- 2SD)
   - Reference toxicity tests for Toxicant: SDS
   - Test 1 & 2: 96-h LC_{50} = 29 +/- 12 mg/L SDS

APPENDIX B

72-h Acute *Daphnia magna* Toxicity Test

Section 8.1.1 Effluent

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for monthly acute toxicity testing were collected
   - Test 1: Saturday July 16, 2005 – 0900h
   - Test 2: Saturday August 6, 2005 – 1000h

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 2 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Blake Hamer (Gartner Lee) Test 1
   - Brenda Bolton (Gartner Lee) Test 2

vii. Labeling/coding of sample (Sample IDs)
   - Test 1 – G-Creek_Acute_071605
   - Test 2 – Garrow Creek

viii. Date & time of sample receipt
   - Samples for sublethal toxicity testing were received:
     Test 1 – Tuesday July 19, 2005 – 1045h
     Test 2 – Tuesday August 9, 2005 – 1015h

ix. Temperature upon sample receipt at laboratory
   - Test 1 – 12.7 °C
   - Test 2 – 19.0 °C

Section 8.1.2 Test Facilities and Conditions

ii. Test type & method
   - 48-hour *Daphnia magna* LC_{50}

iii. Indications of deviations from requirements in Sections 2 to 7 of Method EPS 1/RM/13
   - No deviations from requirements

iv. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

v. Species of test organism
   - *Daphnia magna*

vi. Date and time for start of definitive test
   - Test 1: July 19, 2005 – 1600h
   - Test 2: August 11, 2005 – 1030h

vii. Person(s) performing the test and verifying the results
   - Test 1: Shiva Behnia, Julianna Kalocai
   - Test 2: Shiva Behnia, Julianna Kalocai

viii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - Test 1: pH - 7.3, T – 21.0 °C, DO - 10.8 mg/L, C – 1566 µmhos/cm
   - Test 2: pH - 7.5, T - 21.0 °C, DO - 10.8 mg/L, C – 2850 µmhos/cm

ix. Confirmation that no adjustment of sample or solution pH occurred
- Test 1: No pH adjustment
- Test 2: No pH adjustment

x. Indication of any adjustment of hardness of effluent sample
- Test 1: No hardness adjustment (initial hardness = 160 mg/L)
- Test 2: No hardness adjustment (initial hardness = 300 mg/L)

xi. Indication of any aeration of sample
- Test 1: 25-50 mL/min/L for 12mins
- Test 2: 25-50 mL/min/L for 15mins

xii. Concentrations and volumes tested
- Concentrations (% effluent volume / total volume) tested and total volumes used for both Test 1 and Test 2 were:
- Control (0%) - 200 mL
- 6.25% - 200 mL
- 12.5% - 200 mL
- 25% - 200 mL
- 50% - 200 mL
- 100% - 200 mL

xiii. Measurements of dissolved oxygen, pH and temperature

Sample Collection Date	Test Concentration (% v/v)	Temperature (0hr) (°C)	Temperture (48 hr) (°C)	Dissolved Oxygen (0hr) (mg/L)	Dissolved Oxygen (48hr) (mg/L)	pH (0hr) pH units	pH (48hr) pH units	Conductivity (0hr) umhos/cm	Hardness (0hr) (mg/L)
Test 1	0 (Control)	20	21	9.1	8.7	7.6	7.6	344	94
16-Jul-05	6.25	20	21	9.1	8.7	7.6	7.6	426	
	12.5	20	21.5	9	8.7	7.6	7.7	505	
	25	20.5	21.5	9	8.7	7.6	7.7	648	
	50	20.5	21	9	8.7	7.4	7.7	954	
	100	21	21.5	8.9	8.7	7.4	7.5	1566	160
Test 2	0 (Control)	20	21	9.1	8.6	7.4	7.6	354	94
19-Aug-05	6.25	20	21	9	8.5	7.4	7.7	505	
	12.5	20.5	21	9	8.5	7.5	7.7	654	
	25	20.5	21	8.9	8.5	7.5	7.7	990	
	50	21	21	8.9	8.5	7.5	7.6	1582	
	100	21	21	8.9	8.5	7.6	7.6	2850	300

xiv. Estimates of time to first brood, average number of neonates per brood, and percent mortality during the seven-day period prior to the test
- Test 1: 8 days to brood, >34 neonates/brood, 0% mortality in 7d prior to test
- Test 2: 7 days to brood, >29 neonates/brood, 0% mortality in 7d prior to test

xv. Number of neonates per test vessel and milliliters of solution per daphnid
- Methods for all tests and dilution series were the same:
- 10 neonates per vessel
- 200 mL of solution per vessel
- 20 mL of solution per daphnid

Section 8.1.3 Results

i. Number of dead and/or immobile daphnids in each test solution including controls
   - Results were the same for Test 1 and Test 2
   - Control (0%) - 0 dead / immobile
   - 6.25% - 0 dead / immobile
   - 12.5% - 0 dead / immobile
   - 25% - 0 dead / immobile
   - 50% - 0 dead / immobile
   - 100% - 0 dead / immobile

ii. For single-concentration test the number of daphnids dead in each of three replicate effluent solutions and in each of three replicate control solutions at end of test. Also report the mean value.
   - Single concentration test was not conducted, dilution series tests were conducted

iii. Estimate of 48-h LC50 and 95% confidence limits in multi-concentration tests, 48-h EC50 for immobilization and 95% confidence limits, indication of statistical method on which results are based.
   - Test 1: 48-h LC_{50} = > 100% effluent
   - Test 2: 48-h LC_{50} = > 100% effluent

iv. Most recent 48-h LC50 for reference toxicant test(s), reference chemical(s), date test initiated, historic geometric mean LC50 and warning limits.
   - Reference toxicity tests for Toxicant: Zinc
   - Test 1: (Jul-19-05) 96-h LC_{50} = 426µg/L Zinc, 95% CL = 362 – 504 µg/L
   - Test 2: (Aug-15-05) 96-h LC_{50} = 481µg/L Zinc, 95% CL = 388 – 597 µg/L

v. Reference toxicant warning limits (mean +/- 2 SD)
   - Reference toxicity tests for Toxicant: Zinc
   - Test 1: 96-h LC_{50} = 445 (+/- 280) µg/L Zinc
   - Test 2: 96-h LC_{50} = 445 (+/- 280) µg/L Zinc

APPENDIX C

7-d Topsmelt Growth and Survival Toxicity Test

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for sublethal toxicity testing were collected:
     Test 1 – Saturday July 16, 2005 – 0900h
     Test 2 – Saturday August 6, 2005 – 1000h

iii. Type of sample
   - Final effluent water from final discharge point

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 3 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Blake Hamer (Gartner Lee) Tests 1
   - Brenda Bolton (Gartner Lee) Test 2

vii. Labeling/coding of sample (Sample IDs)
   - Test 1 – G-Creek_Sublethal_071605
   - Test 2 – Garrow Creek

viii. Date & time of sample receipt
   - Samples for sublethal toxicity testing were received:
     Test 1 – Tuesday July 19, 2005 – 1045h
     Test 2 – Tuesday August 9, 2005 – 1015h

ix. Temperature upon sample receipt at laboratory
   - Test 1 – 12.7 °C
   - Test 2 – 19.0 °C

Test Organisms Imported from External Supplier

i. Species of test organism
   - Topsmelt (*Atherinops affinis*)

ii. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

iii. Source of test species
   - Aquatic Bio Systems (ABS), Fort Collins, Colorado

iv. Date test species acquired on
   - Test 1 – July 19, 2005
   - Test 2 – August 9, 2005

v. Indications of deviations from EC guidance on the importation of test organisms
   - No deviations from EC requirements

vi. Percent mortality of fish in 24-hour period preceding the test
   - Test 1 - <10% mortality in approximately 450 fish upon receipt
   - Test 2 - <10% mortality in approximately 450 fish upon receipt

vii. Age at start of test
   - Test 1 – 10 days post-hatch
   - Test 2 – 10 days post-hatch

viii. Unusual appearance, behaviour, or treatment of larvae before their use in the test
- Nothing unusual noted for any test

ix. Confirmation that larvae are actively feeding and swimbladders are not inflated
- All tests - Larvae actively feeding and swimbladders not inflated

x. Confirmation that temperature change was <3°C and dissolved oxygen was maintained at >6mg/L during transport
- Temperature change was <2°C and dissolved oxygen supersaturated mg/L during transport

xi. Test organism acclimation rate at the testing laboratory
- For both tests: Organisms were received on the day of set-up
- Organisms were received in holding water conditions of DO=supersaturated, pH = 7.3, T = 21°C, salinity = 33ppt
- Organisms were acclimated to EVS water holding conditions of DO = 7.5 mg/L, pH = 7.8, T=20°C salinity = 28-29ppt,
- Acclimation was conducted in the lab on the day of the test by adding lab seawater at approximately 30 min. intervals. The differences between the water quality upon receipt and EVS holding conditions were minor.

Test Facilities and Conditions

i. Test type & method
- 7-day Topsmelt (*Atherinops affinis*) Survival and Growth Toxicity Test
- Static renewal
- Sample water was renewed daily
- Reference Method - EPA/600/R-95/136 (EPAW 95-EPA West Coast)

ii. Dates or test days during test when subsamples or multiple samples were renewed
- Samples were renewed daily for all tests (Test Day 1,2,3,4,5,6)
- Three subsamples were used on days i) 0-1; ii) 2-3; and iii) 4-5-6-7

iii. Indications of deviations from requirements in Sections 11 of Method EPA/600/R-95/136 (EPAW 95-EPA West Coast)
- No deviations from requirements
- Salinity controls were run
- Sample water salinity for
    - Test 1 was 6 ppt
    - Test 2 was 1.0 ppt

iv. Date and time for start of definitive test
- Test 1 Tuesday July 19, 2005 – 1430h
- Test 2 Tuesday August 9, 2005 – 1500h

v. Date for test completion
- Test 1 July 26, 2005
- Test 2 August 16, 2005

vi. Test vessel description
- For all tests was a 600mL beaker

vii. Person(s) performing the test and verifying the results
- Test 1: Testing and overall setup conducted by: Jenny Shao and QA/QC by: Julianna Kalokai
- Test 2: Testing and overall setup conducted by: Jenny Shao and QA/QC by: Julianna Kalokai

viii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
- Test 1: pH 7.7, T 20.0 °C, DO 11.1 mg/L, C 1520 µmhos/cm
- Test 2: pH 7.7, T 20.0 °C, DO 9.8 mg/L, C 2700 µmhos/cm

ix. Confirmation that no adjustment of sample or solution pH occurred
- For both tests, no pH adjustment

x. Indication of aeration of test solutions before introduction of fish
- For both tests, no pre-aeration was conducted, none was required

xi. Indication that EC guidance document for salinity adjustment was followed
- The following was done for all 3 tests:
    - No deviations from EC guidance document on preparation of hypersaline brine (HSB)
    - HSB prepared from natural seawater concentrated to 90ppt (by filtering to at least 10 μm before placing it into the freezer and then freezing/refreezing to remove frozen layer and concentrate salts in the hypersaline brine)
    - No deviations from EC guidance document for salinity adjustment of sample
    - HSB was added to samples to salinity adjust them to ~30ppt
    - For a 200mL volume the concentrations were prepared by adding:
        - Test 1: 143mL of effluent + 57mL of HSB for the highest concentration. This solution was then diluted using natural seawater for the lower test concentrations (i.e., 50% of the highest concentration + 50% of the dilution water, repeated for subsequent dilutions).
        - Test 2: 135mL of effluent + 65mL of HSB for the highest concentration. This solution was then diluted using natural seawater for the lower test concentrations (i.e., 50% of the highest concentration + 50% of the dilution water, repeated for subsequent dilutions).

xii. Type and source of control/dilution water
- For all 3 tests, control/dilution water was UV-sterilized, 0.45μm-filtered natural seawater from the Vancouver Aquarium

xiii. Concentrations and volumes tested:
- Concentrations (% effluent volume / total volume) tested and total volumes used were:
- For Test 1:
    - Control (0%) - 200 mL
    - Salinity Control (0%) - 200 mL
    - 4.5% - 200mL
    - 8.9% - 200mL
    - 17.9% - 200mL
    - 35.7% - 200mL
    - 71.4% - 200mL
- For Test 2:
    - Control (0%) - 200 mL
    - Salinity Control (0%) - 200 mL
    - 4.2% - 200mL
    - 8.4% - 200mL
    - 16.9% - 200mL
    - 33.7% - 200mL
    - 67.4% - 200mL

xiv. Number of replicated per concentration
- For both tests: 5 replicates per concentration

xv. Number of organisms added to each test vessel
- For both tests: 5 fish per vessel

xvi. Manner and rate of exchange of test solutions
- For both tests: Daily renewal

xvii. Measurements of dissolved oxygen, pH and temperature, and salinity for each 24 hr period

- Test 1: See attached photocopied pages 1 and 2 of original laboratory report
- Test 2: See attached photocopied pages 3 and 4 of original laboratory report

Results

i. Number and % of mortalities of fish in each test solution. Note that this data is presented in units of number of SURVIVORS and % MORTLITY. (Data is entered from original handwritten tables in lab reports)

- Test 1: Totals from all 5 replicates are presented:

Concentration		Number of Survivors - Day of Test							% Mortality on the Day of Test						
(% effluent v/v)	Replicate	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Control	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
Brine	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
Control	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
4.5%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	4	0	0	0	0	0	0	20
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
8.9%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	4	0	0	0	0	0	0	20
17.9%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
35.7%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
71.4%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	4	0	0	0	0	0	0	20
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0

- Test 2: Totals from all 5 replicates are presented:

Concentration		Number of Survivors - Day of Test							% Mortality - Day of Test						
(% effluent v/v)	Replicate	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Control	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0

Concentration		Number of Survivors - Day of Test							% Mortality - Day of Test						
(% effluent v/v)	Replicate	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	B	5	5	5	5	5	5	4	0	0	0	0	0	0	20
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	4	0	0	0	0	0	0	20
Brine	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
Control	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	4	0	0	0	0	0	0	20
	E	5	5	4	4	4	4	3	0	0	20	0	0	0	20
4.2%	A	5	5	4	4	4	4	4	0	0	20	0	0	0	20
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	4	4	4	4	4	4	0	20	0	0	0	0	0
	E	5	4	4	4	4	4	4	0	20	0	0	0	0	0
8.4%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	4	0	0	0	0	0	0	20
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
16.9%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	4	4	4	4	4	0	0	20	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	4	4	4	4	3	0	0	20	0	0	0	20
	E	5	5	5	5	5	5	4	0	0	0	0	0	0	20
33.7%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	4	4	4	4	4	0	0	20	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
67.4%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	4	4	4	4	4	4	0	20	0	0	0	0	0
	C	5	5	5	5	5	5	3	0	0	0	0	0	0	40
	D	5	5	5	5	5	5	4	0	0	0	0	0	0	20
	E	5	5	5	5	5	5	4	0	0	0	0	0	0	20

ii. Average dry weight (mg) per original fish in test vessel. No preservation of fish was used. Fish were dried and then weighed.

- Test 1: Mean dry weight (mg) of each replicate and overall means are presented:

Concentration	Replicate					Overall Mean	Standard Deviation
(% effluent v/v)	1	2	3	4	5		
D-Control	0.9600	1.0480	0.7560	1.0100	0.8060	0.9160	0.1284
B-Control	1.0780	1.1300	1.0720	0.9420	0.6900	0.9824	0.1775
4.5	0.7320	0.6840	0.9000	0.5200	1.0080	0.7688	0.1903
8.9	1.0120	1.1320	0.9960	0.5400	0.3960	0.8152	0.3253
17.9	0.9600	1.0280	0.9220	1.2440	0.9020	1.0112	0.1387
35.7	0.8420	1.2900	1.2400	0.9640	0.9900	1.0652	0.1916
71.4	1.2300	0.6620	0.9660	1.1000	0.5680	0.9052	0.2828

- Test 2: Mean dry weight (mg) of each replicate are presented:

Concentration	Replicate						
(% effluent v/v)	1	2	3	4	5	Overall Mean	Standard Deviation
D-Control	0.8000	0.6080	1.0980	0.7760	0.5640	0.7692	0.2105
B-Control	0.8380	1.0760	0.9920	0.8020	0.8620	0.9140	0.1155
4.2	0.8120	0.9280	0.9700	1.0420	0.5720	0.8648	0.1837
8.4	0.8980	0.8560	0.7120	1.0200	1.0200	0.9012	0.1285
16.9	0.9820	0.8880	0.6860	0.5780	0.6420	0.7552	0.1718
33.7	0.7260	0.9700	0.7060	0.6300	0.7240	0.7512	0.1284
67.4	1.0340	0.8380	0.6120	0.8640	0.7040	0.8104	0.1615

iii. Estimate of 7-d LC_{50} (95% CL)

- Test 1: 7-d LC_{50} concentration > 71.4% effluent (highest concentration tested due to dilution for salinity adjustment)
- Test 2: 7-d LC_{50} concentration > 67.4% effluent (highest concentration tested due to dilution for salinity adjustment)
- Quantal statistic methods not applicable

iv. Estimate of 7-d IC_{25} (95% CL) for growth

- Test 1: 7-d IC_{25} concentration > 71.4% effluent (highest concentration tested due to dilution for salinity adjustment)
- Test 2: 7-d IC_{25} concentration > 67.4% effluent (highest concentration tested due to dilution for salinity adjustment)

v. Current reference toxicity tests (95% CL) for 7-d LC_{50} for survival and 7-d IC_{50} for growth

- Test 1 :Reference toxicity tests for Toxicant: Copper
    - Test conducted on July 19, 2005, same day as effluent test
    - Reference toxicant test was conducted on the same batch of externally supplied topsmelt used in the effluent test and under the same experimental conditions as the effluent test
    - 7-d LC_{50} survival = 117 mg/L Cu, 95% CL = 100-136 mg/L
    - 7-d IC_{50} growth = 116 mg/L Cu, 95% CL = 81-156 mg/L
- Test 2 :Reference toxicity tests for Toxicant: Copper
    - Test conducted on August 9, 2005, same day as effluent test
    - Reference toxicant test was conducted on the same batch of externally supplied topsmelt used in the effluent test and under the same experimental conditions as the effluent test
    - 7-d LC_{50} survival = 103 mg/L Cu, 95% CL = 91-118 mg/L
    - 7-d IC_{50} growth = 95 mg/L Cu, 95% CL = 75-127 mg/L

vi. Reference toxicity warning limits (+/- SD) for 7-d LC_{50} for survival and 7-d IC_{50} for growth

- Test 1: Reference toxicity tests for Toxicant: Copper
    - 7-d LC_{50} survival = 133 ± 39mg/L Cu
    - 7-d IC_{50} growth = 132 ± 46mg/L Cu
- Test 2: Reference toxicity tests for Toxicant: Copper
    - 7-d LC_{50} survival = 132 ± 40mg/L Cu,
    - 7-d IC_{50} growth = 133 ± 40mg/L Cu

APPENDIX D

92-h Echinoderm Fertilization Test

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75^{o} 22' 32" N, 97^{o} 48' 37" W.

ii. Date & time of sampling
   - Samples for sublethal toxicity testing were collected:
     Test 1 – Saturday July 16, 2005 – 0900h
     Test 2 – Saturday August 6, 2005 – 1000h

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 4 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Blake Hamer (Gartner Lee) Tests 1
   - Brenda Bolton (Gartner Lee) Test 2

x. Labeling/coding of sample (Sample IDs)
   - Test 1 – G-Creek_Sublethal_071605
   - Test 2 – Garrow Creek

xi. Date & time of sample receipt
   - Samples for sublethal toxicity testing were received:
     Test 1 – Tuesday July 19, 2005 – 1045h
     Test 2 – Tuesday August 9, 2005 – 1015h

xii. Temperature upon sample receipt at laboratory
   - Test 1 – 12.7 °C
   - Test 2 – 19.0 °C

Test Organisms

i. Species of test organism
   - Sandollar Echinoid (*Dendraster excentricus*)

ii. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

iii. Source of test species
   - Westwind Sealab, Victoria BC
   - All adults providing gametes are from the same population and source
   - Gametes are spawned in-house at EVS

iv. Date test species acquired on
   - Test 1: July 19, 2005
   - Test 2: August 9, 2005

v. Holding time and conditions for adults
   - Test 1: Adults received at the testing laboratory the day of the test.
   - Test 2: Adults received at the testing laboratory the day of the test.

vi. Indications of deviations from EC guidance on the importation of test organisms
   - Test 1: No deviations from EC requirements
   - Test 2: No deviations from EC requirements

vii. Weekly percent mortality of adults being held over 7d preceding test

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

- Test 1: <2% per day over the 7 days preceding the test
- Test 2: <2% per day over the 7 days preceding the test

viii. Age of test organisms
- Test 1: < 4 hours after spawning
- Test 3: < 4 hours after spawning

ix. Unusual appearance, behaviour, or treatment of adults or gametes before test start, or anything unusual about the test
- Test 1: Organisms appear healthy, in good condition, nothing unusual about test organisms or test
- Test 2: Organisms appear healthy, in good condition, nothing unusual about test organisms or test

Test Facilities and Conditions

i. Test type & method
- Echinoderm (*Dendraster excentricus*) Fertilization Toxicity Test
- Static
- Reference Method – EPS/1/RM/27 with 1997 amendments

ii. Test duration
- Test 1: 10:10 min (10min sperm + 10min sperm & egg)
- Test 2: 10:10 min (10min sperm + 10min sperm & egg)

iii. Date and time for start of definitive test
- Test 1: Tuesday July 19, 2005 – 1514h
- Test 2: Tuesday August 9, 2005 – 1723h

iv. Test vessel description
- Test 1: 16 x 125mm test tubes
- Test 2: 16 x 125mm test tubes

v. Person(s) performing the test and verifying the results
- Test 1: Testing by Shawn Seguin; QA/QC reviewed by Julianna Kalokai.
- Test 2: Testing by Shawn Seguin; QA/QC reviewed by Julianna Kalokai.

vi. Indication of rate and duration of pre-aeration of test solutions before initiation of test
- Test 1: No pre-aeration
- Test 2: No pre-aeration

vii. Confirmation that no adjustment of sample or solution pH occurred
- Test 1: No pH adjustment
- Test 2: No pH adjustment

viii. Procedure for sample filtration
- Test 1: No sample filtration
- Test 2: No sample filtration

ix. Procedure for preparation of hypersaline brine (HSB) as per EC guidance document on salinity adjustment – July 1997

- Test 1: Hypersaline brine (HSB) was prepared from natural seawater concentrated to 90ppt (by filtering to at least 10 μm before placing it into the freezer and then freezing/refreezing to remove frozen layer and concentrate salts in the hypersaline brine). HSB was added to samples to salinity adjust them to 30ppt. For a 10mL volume the concentrations were prepared by adding 7.28mL of effluent + 2.72mL of HSB for the highest concentration. This solution was diluted using natural seawater for the lower test concentrations (i.e., 50% of the highest concentration + 50% of the dilution water, repeated for subsequent dilutions). No deviations from EC guidance document (July 1997) for salinity adjustment of sample.
- Test 2: Hypersaline brine (HSB) was prepared from natural seawater concentrated to 90ppt (by filtering to at least 10 μm before placing it into the freezer and then freezing/refreezing to remove frozen layer and concentrate salts in the hypersaline brine). HSB was added to samples to salinity adjust them to 30ppt. For a 10mL volume the concentrations were prepared by adding 7.13mL of effluent + 2.87mL of HSB for

the highest concentration. This solution was diluted using natural seawater for the lower test concentrations (i.e., 50% of the highest concentration + 50% of the dilution water, repeated for subsequent dilutions). No deviations from EC guidance document (July 1997) for salinity adjustment of sample.

x. Procedure for salinity adjustment as per EC guidance document on salinity adjustment – July 1997
- No deviations from EC guidance for salinity adjustment
- Test 1: salinity adjusted from 3.0 to 28 ppt
- Test 2: salinity adjusted from 1.0 to 29 ppt

xi. Type and source of control/dilution water
- Test 1: UV-sterilized, 0.45µm-filtered natural seawater from the Vancouver Aquarium
- Test 2: UV-sterilized, 0.45µm-filtered natural seawater from the Vancouver Aquarium

xii. Concentrations and volumes tested
- Test 1: Concentrations (% effluent volume / total volume) tested and total volumes used were:
    - Control (0%) - 10mL
    - Salinity Control (0%) - 10mL
    - 4.6% - 10mL
    - 9.1% - 10mL
    - 18.2% - 10mL
    - 36.4% - 10mL
    - 72.8% - 10mL
- Test 2: Concentrations (% effluent volume / total volume) tested and total volumes used were:
    - Control (0%) - 10mL
    - Salinity Control (0%) - 10mL
    - 4.5% - 10mL
    - 8.9% - 10mL
    - 17.8% - 10mL
    - 35.6% - 10mL
    - 71.3% - 10mL

xiii. Number of replicated per concentration
- Test 1: 4 replicates per treatment concentration
- Test 2: 4 replicates per treatment concentration

xiv. Number of organisms per container
- Test 1: 2000 eggs per vessel (100 counted)
- Test 2: 2000 eggs per vessel (100 counted)

xv. Measurements of pH and dissolved oxygen in sample water before use
- Test 1: pH 8.2, DO 8.5
- Test 3: pH 8.3, DO 8.5

xvi. Measurements of pH, temperature, dissolved oxygen, and salinity during test
- Test 1: pH – 7.9 – 8.3, T - 15.0°C, DO - 8.5mg/L, salinity - 28ppt
- Test 2: pH – 7.5 – 8.4, T - 15.0°C, DO – 7.8 – 8.5mg/L, salinity - 29ppt

Results

i. Number and % of fertilized eggs in each test concentration
- Test 1: (Number is equal to percent since totals were 100)
    - Control (0%): # Fert = 64, 60, 66, 69
    - 4.6%: # Fert = 56, 51, 52, 53
    - 9.1%: # Fert = 39, 37, 37, 36
    - 18.2%: # Fert = 33, 28, 29, 30
    - 36.4%: # Fert = 39, 39, 37, 36

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

- 72.8%: # Fert = 20, 16, 21, 21

- Test 2: (Number is equal to percent since totals were 100)
  - Control (0%): # Fert = 88, 81, 85, 86
  - Salinity Control: # Fert = 91, 86, 85, 87
  - 4.5%: # Fert = 82, 80, 79,78
  - 8.9%: # Fert = 76, 77, 77, 76
  - 17.8%: # Fert = 64, 59, 63, 61
  - 35.6%: # Fert = 50, 54, 54, 53
  - 71.3%: # Fert = 37, 40, 37,35

ii. Estimate of IC_{25} (95% CL) for fertilization success

- Test 1: IC_{25} concentration = 5.2 (4.4 – 6.0)% v/v effluent
- Test 2: IC_{25} concentration = 15.6 (13.6 – 18.3)% v/v effluent
- Quantitative statistic used to generate IC_{25} values was log-linear interpolation (200 resamples) calculated in ToxCalc v5.0.23 (for both Test 1 and Test 2)

iii. Current reference toxicity tests (95% CL) for IC_{50} for fertilization

- Test 1: Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
  - Test conducted on July 19, 2005, same day as effluent test
  - Reference test conducted under same conditions
  - IC_{50} for fertilization = 5.8 mg/L SDS, 95% CL = (5.2 – 6.5)mg/L
- Test 2: Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
  - Test conducted on August 9, 2005, same day as effluent test
  - Reference test conducted under same conditions
  - IC_{50} for fertilization = 3.9 mg/L SDS, 95% CL = (3.6 – 4.1) mg/L

iv. Reference toxicant warning limits (+/- 2SD) for IC_{50} for fertilization

- Test 1: 3.6 +/- 4.4 mg/L SDS
- Test 2: 3.9 +/- 4.3 mg/L SDS

APPENDIX E

7-d Sublethal *Champia* (Algae) Toxicity Test

Reporting Requirements for Reference Method EPA/600/4-91-003, Method 1009.0 (*Champia*)

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for yearly sublethal toxicity testing were collected:
     Test 1 – Saturday July 16, 2005 – 0900h
     Test 2 – Saturday August 6, 2005 – 1000h

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 1 x 4L sample bottles were filled

vi. Name of person submitting samples
   - Blake Hamer (Gartner Lee) Tests 1
   - Brenda Bolton (Gartner Lee) Test 2

vii. Temperature of water upon receipt at lab
   - Test 1: 18°C
   - Test 2: 22°C

xiii. Labeling/coding of sample (Sample IDs)
   - Test 1 – G-Creek Sublethal 071605
   - Test 2 – Garrow Creek

xiv. Date & time of sample receipt
   - Samples for sublethal toxicity testing were received:
     Test 1 – Tuesday July 19, 2005 – 1300h
     Test 2 – Tuesday August 9, 2005 – 0900h

Test Organisms

i. Species of test organism
   - Algae (*Champia parvula*)

ii. Name and city of testing laboratory
   - Test 1: Stantec Consulting Ltd, Guelph Ontario
   - Saskatchewan Research Council [SRC], Saskatoon, SK

iii. Source of test species and health of organisms
   - Test 1
     - Source was Stantec in-house culture
     - Batch number CH05-07
     - Sexually mature male and female branches
     - Females have trichogynes, males have sori with spermatia
     - No organisms exhibiting unusual appearance, behaviour or undergoing unusual treatment were used in the test
   - Test 2
     - Sexually mature male and female branches
     - Obtained from USEPA, Hatfield Marine Science Center, Newport Oregon, 1995
     - Appear in excellent health, nothing unusual

- Females have trichogynes, males have sori with spermatia

iv. Any unusual appearance, behaviour, or treatment of test organisms, before their use in test
- Test 1 and Test 2
  - Nothing unusual about the appearance, behaviour, or treatment of test organisms, before their use in test; everything is normal
  - Nothing unusual about the tests

Test Facilities and Conditions

i. Test type & method
- Test 1:
- Test of Sexual Reproduction using the Red Macroalga *Champia parvula*, EPA-821-R-02-014, October 2002 Method 1009.0, with Canadian adaptations (Environment Canada 1998, 1999)
- Static, non-renewal
- 48-hour exposure, followed by 7 day recovery period for cystocarp development
- Test 2:
- Test of Sexual Reproduction using the Red Macroalga *Champia parvula*, Reference Method - EPA/600/4-91/003, Method 1009.0
- Static, non-renewal
- 2 day exposure, followed by 5-7 day recovery period for cystocarp development

ii. Date and time for start of definitive test
- Test 1: Tuesday July 19, 2005 17:45h
- Test 3: Tuesday August 9, 2005 – time not noted but lab notes state tests started within 72 hrs of collection

xviii. Date for test completion
- Test 1 – July 28, 2005
- Test 2 – August 16, 2005

iii. Test vessel description
- Test 1: 270mL transparent polystyrene cups with polystyrene lids
- Test 2: 270mL transparent polystyrene cups with polystyrene lids

iv. Person(s) performing the test and verifying the results
- Test 1: E. Jonczyk/ K. Johnson
- Tests 2: Mary Moody

v. Indication of pre-aeration of test solutions
- Test 1: No pre-aeration
- Test 2: No pre-aeration

vi. Confirmation that no pH adjustment of sample or solution occurred
- Test 1: No pH adjustment
- Test 2: - No pH adjustment

vii. Indication that EC guidance document for salinity adjustment was followed
- Test 1:
  - No deviations from EC guidance document on preparation of hypersaline brine (Environment Canada Salinity Adjustment Guidance Document, revised Dec. 2001)
  - HSB prepared from natural seawater at 90ppt (by filtering to at least 10 μm before placing it into the freezer and then freezing/refreezing to remove frozen layer and concentrate salts in the hypersaline brine)
  - No deviations from EC guidance document for salinity adjustment of sample
  - Salinity adjustment (for a 1000mL volume): 660mL effluent + 330mL HSB + 10mL test nutrient solution

- Salinity of samples adjusted from 0ppt to 32ppt

- Test 2:
  - No deviations from EC guidance document on preparation of hypersaline brine (May 2001)
  - HSB prepared from natural seawater at 90ppt (by filtering to at least 10 µm before placing it into the freezer and then freezing/refreezing to remove frozen layer and concentrate salts in the hypersaline brine)
  - No deviations from EC guidance document for salinity adjustment of sample
  - Salinity adjustment: 600mL effluent + 260mL HSB + 8.6 ml test nutrient solution

Salinity of samples adjusted from 2ppt to 30ppt

viii. Type and source of control/dilution water

- Test 1:
  - Natural seawater collected from Pointe-du-Chene in Shediac Bay, New Brunswick.
  - No chemicals added.
  - Filtered to 0.45µm prior to use
- Test 2
  - Natural seawater collected at the Pacific Environmental Center, Environment Canada, North Vancouver, BC
  - Filtered to 0.2µm and autoclaved prior to use
  - Salinity adjusted as per EC guidance document to 30ppt with HSB from the same source

ix. Type and quantity of any chemicals added to the control dilution water

- Test 1: No chemicals added to dilution water. 10 mL of test nutrients.
- Test 3: No chemicals added. Test nutrients as described in Test Method USEPA/600/4-91/003, Method 1009.0 were added at concentration of 10mL/L, analytical grade, 8.6 mL added

x. Concentrations and volumes of test solutions

- Concentrations (% effluent volume / total volume) tested and total volumes used were:

- Tests 1:
  - Control (Natural Seawater) (0%) - 100mL
  - Salinity Control Brine (0%) - 100mL
  - 2.1% - 100mL
  - 4.4% - 100mL
  - 8.3% - 100mL
  - 16.5% - 100mL
  - 33% - 100mL
  - 66% - 100mL
- Tests 2:
  - Control (Natural Seawater) (0%) - 100mL, 4.5cm depth
  - Salinity Control Brine (0%) - 100mL, 4.5cm depth
  - 4.38% - 100mL, 4.5cm depth
  - 8.75% - 100mL, 4.5cm depth
  - 17.5% - 100mL, 4.5cm depth
  - 35% - 100mL, 4.5cm depth
  - 70% - 100mL, 4.5cm depth

xi. Number of replicates per concentration

- Tests 1& 2: 3 replicates per concentration

xii. Number of organisms per test chamber

- Tests 1 & 2: 5 female branches + 2 male branches per chamber

Reporting Requirements for Reference Method EPA/600/4-91-003, Method 1009.0 (*Champia*)

xiii. Measurements of pH, temperature, dissolved oxygen, and salinity of sample before use
- Test 1 (unadjusted effluent): pH – 8.0, T – 22.0 °C, DO – 10.2mg/L, salinity - 0ppt
- Test 1 (before use): pH – 8.0, T – 22.5 °C, DO – 7.0mg/L, salinity - 32ppt
- Test 2 (unadjusted sample): pH - 7.75, T – 23.0 °C, DO – 8.6mg/L, salinity - 2ppt
- Test 2 (before use): pH – 8.35, T – 23.0 °C, DO – 7.6mg/L, salinity - 30ppt

xiv. Measurements of pH, temperature, dissolved oxygen, and salinity of test solution and controls at 0hr, 48hr, and the beginning and end of recovery period
- Test 1: See attached photocopied page 5 of original laboratory report
- Test 2: See attached photocopied pages 6 of original laboratory report

Results

i. Number and % mortality of female plants after recovery in each test solution
- Totals from all 3 replicates are presented:
- Test 1:
  - Control (0%): 0 (0%) mortality
  - Salinity Control (0%): 0 (0%) mortality
  - 2.1%: 0 (0%) mortality
  - 4.4%: 0 (0%) mortality
  - 8.3%: 0 (0%) mortality
  - 16.5%: 0 (0%) mortality
  - 33%: 0 (0%) mortality
  - 66%: 0 (0%) mortality
- Test 2:
  - Control (0%): 0 (0%) mortality
  - Salinity Control (0%): 0 (0%) mortality
  - 4.38%: 0 (0%) mortality
  - 8.75%: 0 (0%) mortality
  - 17.5%: 0 (0%) mortality
  - 35%: 0 (0%) mortality
  - 70%: 0 (0%) mortality

ii. Mean number of cystocarps per plant in each replicate of each test concentration
- Test 1: (Replicates are A, B, and C)
  - Control (0%): A) 26.8, B) 27.2, C) 26.4
  - Salinity Control (0%): A) 27.6, B) 27.4, C) 28.4
  - 2.1%: A) 29.4, B) 29.0, C) 30.0
  - 4.4%: A) 26.2, B) 26.8, C) 27.4
  - 8.3%: A) 27.6, B) 27.2, C) 28.0
  - 16.5%: A) 25.4, B) 26.4, C) 26.6
  - 33%: A) 18.4, B) 15.0, C) 18.4
  - 66%: A) 0.4, B) 0.2, C) 0.2
- Test 2: (Replicates are A, B, and C)
  - Control (0%): A) 104.0, B) 74.2, C) 79.6
  - Salinity Control (0%): A) 103.8, B) 84.6, C) 99.0
  - 4.38%: A) 89.8, B) 70.0, C) 82.6
  - 8.75%: A) 86.6, B) 98.4, C) 93.6
  - 17.5%: A) 95.6, B) 94.0, C) 88.4
  - 35%: A) 91.8, B) 88.8, C) 67.2
  - 70%: A) 35.0, B) 36.6, C) 28.4

Reporting Requirements for Reference Method EPA/600/4-91-003, Method 1009.0 (*Champia*)

iii. Estimate of IC_{25} (95% CL) for cystocarp development

- Test 1: IC_{25} concentration = 24.6 (22.2 – 27.2)% effluent v/v
- Quantal statistic method was linear interpolation determined using ToxStat 3.5
- Test 2: IC_{25} concentration = 45.3 (27.5 – 52.4)% effluent v/v
- Quantal statistic method was linear interpolation (200 resamples) determined using ToxCalc v5.0.23

iv. Current reference toxicity tests (95% CL) for IC_{50} for cystocarp development

- Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
  - Test 1: Test conducted on July 19, 2005, same day as effluent test
    - Reference toxicant test was conducted under the same experimental conditions as the effluent test
    - IC_{50} cystocarp development = 0.134 mg/L SDS, 95% CL = (0.123 – 0.143) mg/L
  - Test 2: Test conducted on August 17, 2005, within 30 days of effluent test
    - Reference toxicant test was conducted under the same experimental conditions as the effluent test
    - IC_{50} cystocarp development = 1.31mg/L SDS, 95% CL = (1.20 - 1.41) mg/L

v. Reference toxicant warning limits (+/- 2SD) for IC_{50} for cystocarp development

- Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
- Test 1: 0.155 (0.112 – 0.216) mg/L SDS
- Test 2: 1.41 (1.15 – 1.74) mg/L SDS

Pages 1 to 6 inclusive are included in the hardcopy sent in the mail. This data can also be found in the original lab reports in Appendix H.

APPENDIX F

Results of Effluent Characterization as per Paragraph 15(1)(a)

RESULTS OF EFFLUENT CHARACTERIZATION

AS PER PARAGRAPH 15(1)(a)

Nine MMER effluent samples were collected during the 3nd Quarter of 2005 between July 6, 2005 and August 27, 2005. "Quarterly" EEM samples were collected from the effluent, exposure, and reference stations on July 16, 2005 and August 6, 2005 and analyzed for a wider suite of elements, as per the guidance document. Monthly loadings of metals to Garrow Bay were calculated based on average weekly discharge volumes from Garrow Lake to Garrow Bay via the creek outflow. The August 6, 2005 effluent volume discharge is estimated and will be finalized by Teck Cominco.

Holding times for nitrate and alkalinity were missed during the July 6, 2005 event due to an oversight by the laboratory. The oversight is explained in Appendix I and is not likely to influence results. A quarterly event with toxicity testing was planned for this event; however, due to a delay in shipment because of weather conditions at the mine site, toxicity samples missed holding times and were discarded at the labs. The parameters that missed holding times were "quarterly" parameters, and additional measurements were taken on July 16, 2005, corresponding to acute and sublethal toxicity testing.

Due to the high Arctic, remote location of the mine, travel into or out of the mine site can be hazardous due to weather conditions such as fog and snow. As the mine has ceased operations and little infrastructure exists onsite, sampling this season was conducted by small field crews stationed onsite, or by flying technicians in on a weekly basis to collect the MMER samples. In August and September, several planned MMER sampling attempts did not proceed due to hazardous weather conditions that prevented flights from getting into the mine site or from departing Resolute Bay. MMER samples were collected at the next possible time, and Ken Russell and Jenny Ferone were kept informed of this situation. The 2005 sampling chronology is presented in Appendix I. The last sample was collected on August 27, 2005. After this event, the mine was inaccessible due to weather until September 13, 2005, when Garrow Creek (final discharge point) was frozen with no discharge.

There were no exceedances of any Schedule 4 discharge limits during the quarter.

Water samples for acute and sublethal toxicity testing were collected using a pump system from about 20 m downstream of the historic dam location on Garrow Lake, within the main flow of the creek. Acute Lethality Testing was conducted on samples collected July 16, 2005 and August 6, 2005. There were no adverse effects observed for either the 96-hr Rainbow Trout toxicity test, or the 48-hr *Daphnia magna* toxicity test. LC_{50} values were >100% effluent for both species in all testing events.

Sublethal Toxicity Testing was conducted on samples collected July 16, 2005 and August 6, 2005. As this is considered a marine discharge, marine species were used for sublethal testing following brine adjustment of the brackish effluent (as per EC test protocols). Testing for fish (7-d Topsmelt growth and survival) and invertebrates (Sand dollar) was conducted at EVS Environment Consultants, Vancouver, BC, while algae (48-h *Champia*) testing was undertaken at Stantec Guelph, ON, for the July test, and at the Saskatchewan Research Council, Saskatoon SK, for the August test.

There were no effects observed in the Topsmelt Survival and Growth Test at the highest concentrations tested (>71.4%, and >67.4% effluent v/v).

Sublethal effects were observed for the echinoid and algal species in both tests. In the echinoid *(Dendraster excentricus)* fertilization test,

- the IC_{25}'s were 5.2, and 15.6% v/v, and
- the IC_{50}'s were 13.2, and 55% v/v

In the *Champia parvula* sexual reproduction test

- the IC_{25}'s were 24.6, and 45.3% v/v,
- the IC_{50} was 61.4% v/v in the second test (not reported in the first test).

Zinc is the primary contaminant of potential concern (COPC) identified in mine effluent. Concentrations of zinc during 2005 averaged 39 µg/L and ranged between 13 and 91 µg/L, which are well below the MMER effluent limit of 500µg/L. These concentrations are also lower than those measured in 2003, 128µg/L (range 48 – 186µg/L), and in 2004, 72 µg/L (range 35 – 198 µg/L), and show a decreasing pattern over the last three years. Note the CCME guideline for zinc is 30 µg/L and the BC AWQG guidelines are 7.5 and 33 µg/L, for the chronic and acute guidelines, respectively. Concentrations of zinc in Polaris mine effluent were not substantially higher than these guidelines in 2005.

On July 16, 2004 and August 6, 2005, the concentrations of zinc in the effluent were 17.9 and 35.6 µg/L, respectively. The echinoid test endpoints converted into concentrations of zinc results in values of 0.93 and 5.5 µg Zn/L for the IC_{25}'s, and 2.4 and 19.6 µg Zn/L for the IC_{50}. Reference toxicity tests of zinc on *Dendraster* fertilization give mean EC_{50} concentrations of 8.5 – 60 µg Zn/L (Dinnel et al. 1983). The reported range of *Dendratster* EC_{50}'s correspond to the August 6, 2005 IC_{50} of 19.6 µg Zn/L. The IC_{50} zinc concentration in the July 16, 2005 sample is lower than the literature EC_{50}'s and may indicate that other substances in the effluent were contributing to the sublethal effects in this sample. The echinoid test is quite sensitive to zinc, with IC25 (converted) zinc concentrations being less than the BC AWQG chronic guideline of 7.5 µg/L.

Endpoints for the *Champia* test in terms of zinc concentrations were 4.4 and 16.1 µg Zn/L (IC_{25}'s), and 21.9 µg Zn/L (IC_{50} in the August 6, 2005 sample). The reference IC_{25} endpoint for zinc in the *Champia* test performed in-house at SRC, reported in 2003, was 27 µg Zn/L (95% confidence limits 16-42µg/L). This reference concentration is similar to the zinc concentrations corresponding to the IC25 an IC50 in the August 6, 2005 sample. Like the echinoid results, the IC25 converted zinc concentration in the July 16, 2005 sample was lower than reference endpoints and may indicate that other substances in this sample were contributing to toxicity. *Champia* also appears to be sensitive to zinc concentrations between the BC AWQG chronic guideline of 7.5 µg/L and maximum guideline of 33 µg/L.

Given the similarity between zinc concentrations in the effluent samples and the effects concentrations of zinc in reference tests, it is likely that zinc is responsible for the sublethal effects observed in both the *Dendraster* and *Champia* tests.

Reference: Dinnel, P.A., Q.J. Stober, J.M. Link, M.W. Letourneau, W.E. Roberts, S.P. Felton, and R.E. Nakatan. 1983. Methodology and Validation of a Sperm Cell Toxicity Test for Testing Toxic Substances in Marine Waters. Final Report, FRI-UW-8306, Fisheries Research Inst., School of Fisheries, University of Washington, Seattle, WA :208. Source: EPA EcoTox database.

APPENDIX G

Acute Toxicity Testing Laboratory Reports

EVS environment consultants
A member of the Golder group of companies

Golder Associates

Golder Associates Ltd.

195 Pemberton Avenue
North Vancouver, British Columbia, Canada V7P 2R4
Telephone 604-986-4331
Fax 604-662-8548

E/05/0336
04-1424-044

August 17, 2005

Azimuth Consulting Group
218 – 2902 West Broadway
Vancouver, BC V6K 2G8

Attention: Ms. Cheryl Mackintosh

RE: WORK ORDERS: 0500296, 297
TOXICITY TEST RESULTS ON THE SAMPLES COLLECTED JULY 16, 2005

Dear Ms. Mackintosh

We are pleased to provide you with the results of the toxicity tests performed on the effluent sample identified as G-Creek-acute-071605 collected July 16, 2005. The sample was tested with the 48-h *Daphnia magna* and the 96-h rainbow trout LC50 toxicity tests. The tests were performed according to the Environment Canada protocol for conducting acute toxicity tests using *D. magna* (EPS 1/RM/14, Second Edition, 2000) and rainbow trout (EPS 1/RM/13, Second Edition, 2000). An independent EVS/Golder QA/QC review confirmed that all acceptability criteria specified by the protocol were met. The results of these tests are summarized from the appended data and are presented in Table 1.

Should you have any questions or comments regarding this report, please do not hesitate to contact the undersigned at 604-986-4331.

Yours very truly,
EVS ENVIRONMENT CONSULTANTS
A Member of the Golder Group of Companies

for Jennifer Young, B.Sc.
Bioassay Team Leader – Cladoceran Team

Verified By:

QA/QC Committee:
Cathy McPherson, B.Sc.
Julianna Kalocai, M.Sc.

Attachment: Table 1
RH/clz
O:\Data\Final\2004\1424\04-1424-044\LET 0817 2005 Tox Test WO 0500296 297 1.doc

Table 1
Toxicity Test Results

SAMPLE ID	SAMPLE DATE	48h *Daphnia magna* LC50 (95% CL) % (v/v)	96-h Rainbow Trout - LC50 (95% CL) % (v/v)
G-Creek-Acute-071605	July 16, 2005	>100	>100

CL – confidence limits.

EVS ENVIRONMENT CONSULTANTS
48-h *Daphnia magna* TOXICITY TEST DATA SUMMARY

Client: Azimuth
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500297
EVS Analysts: SXB
Test Type: 48h LC50
Test Initiation Date: 19 July 05

SAMPLE INFORMATION

Identification: G-Creek-Acute-071605
Amount Received: 1x2L Subsampled from 1x20L RBT
Date Collected: 16 July 05
Date Received: July 19, 2005
Temperature (°C): 21.0
pH: 7.3 ① 7.4
Dissolved Oxygen (mg/L): 10.8 ① 8.9
Conductivity (µmhos/cm): 1566
Hardness (mg/L as $CaCO_3$): 160
Alkalinity (mg/L as $CaCO_3$): —
Ammonia (mg/L N): —
Chlorine (mg/L Cl): —

pH adjustment details: —
① Pre-aeration rate and duration: 12 min @ 25-50 mL/min/L

DILUTION/CONTROL WATER (initial water quality)

Water Type: moderately Hard water (July13B)
Temperature (°C): 20.0
pH: 7.6
Dissolved Oxygen (mg/L): 9.1
Conductivity (µS/cm): 344
Hardness (mg/L as $CaCO_3$): 94
Alkalinity (mg/L as $CaCO_3$): 64
Other: —

TEST SPECIES INFORMATION

Broodstock Culture ID (in-house culture): 05 July A/B
Age (on Day 0): < 24hr
Days to First Brood: 8
Avg. Young/Brood (after 1st brood): 34
% Mortality in 7 d Before Test: 0
Reference Toxicant: Zinc
Current Reference Toxicant Result
Reference Toxicant Test Date: July 19, 2005
48-h LC50 and 95% CL: 426 (362-504) mg/L Zn
Reference Toxicant Warning Limits (mean ± 2SD) and CV
445 ± 280 mg/L Zn ; CV = 31

TEST CONDITIONS

Temperature Range (°C): 20.0 - 21.0
pH Range: 7.4 - 7.7
Dissolved Oxygen Range (mg/L): ~~5~~ 8.7 - 9.1
Conductivity Range (µS/cm): 344 - 1566
Photoperiod (L:D h): 16:8
No. Organisms/Volume: 10/200ml
Other: —

TEST RESULTS: The 48hr LC50 of G-Creek-Acute-071605 is >100% (V/V).

Data Verified By: [signature]
Date Verified: Aug. 16/05

EVS ENVIRONMENT CONSULTANTS
48-h *Daphnia magna* ACUTE TOXICITY TEST DATA

Client: Azimuth
Sample ID: G-Greek-Acute-071605
EVS Project No.: 04-1424-044
Date Collected: 16 July 05
EVS Work Order No.: 0500297
Test Initiation Date/Time: 19 July 05 @ 16:00
Daphnid Broodstock Batch: 05 July A/B
No. Organisms/Volume: 10/200 ml

Concentration % (v/v)	Number of Survivors (1 to 48 h)					Dissolved Oxygen (mg/L)			Temperature (°C)			pH			Conductivity (µmhos/cm)	
	1	2	4	24	48	0	24	48	0	24	48	0	24	48	0	48
Control				10	10	9.1	8.7	8.7	20.0	21.0	21.0	7.6	7.5	7.6	344	344
6.25				10	10	9.1	8.8	8.7	20.0	21.0	21.0	7.6	7.5	7.6	426	425
12.5				10	10	9.0	8.8	8.7	20.0	21.0	21.5	7.6	7.5	7.7	505	506
25				10	10	9.0	8.7	8.7	20.5	21.0	21.5	7.6	7.5	7.7 SDZ	948	647
50				10	10	~~8.8~~ 9.0	8.7	8.7	20.5	21.0	21.0	7.4	7.5	7.7	958	944
100				10	10	8.9	8.7	8.7	21.0	21.0	21.5	7.4	7.4	7.5	1566	1532
Technician Initials					TL	SXB	SXB	TL	SXB	SXB	TL	SXB	SXB	TL	SXB	TL

Sample Description: clear - colourless
WQ Instruments Used: Temp. Calibrated Hg thermometer pH II-A-020501 DO II-A-011201 Cond. IIA-990901
Comments:

Test Set Up By: SXB Data Verified By: [signature] Date Verified: Aug. 16/05

EVS ENVIRONMENT CONSULTANTS
RAINBOW TROUT ACUTE TOXICITY TEST DATA SUMMARY

Client: Azimuth
EVS Project No.: 04-1424-044 (Golder ~~EVS~~ REA)
EVS Work Order No.: OS00296
EVS Analysts: MJG, REA
Test Type: 96-h LC50
Test Initiation Date: July 21/05 @ 1035

SAMPLE
Identification: G-Creek 071605 Acute
Amount Received: 2 x 20L
Date Collected: July 16/05
Date Received: July 19/05
Other:

DILUTION/CONTROL WATER (initial water quality)
Fresh Water (dechlorinated): ✓
Temperature (°C): 15
pH: 7.0
Dissolved Oxygen (mg/L): 10.1
Conductivity (µS/cm): 37
Hardness (mg/L as $CaCO_3$): 14
Alkalinity (mg/L as $CaCO_3$): 8
Other:

TEST SPECIES INFORMATION
Source: Sun Valley
Collection Date/Batch: 062205
Control Fish Size (mean, SD and range measured at end of test)
Date Measured: July 25/05
Fork Length (mm): 30 ± 3 (25-33)
Wet Weight (g): 0.29 ± 0.07 (0.20-0.37)
Reference Toxicant: SDS
Current Reference Toxicant Result
Reference Toxicant Test Date: July 12/05
Duration of Acclimation (days): 20
96-h LC50 (and 95% CL): 24 (18 and 32)
Reference Toxicant Warning Limits (mean ± 2SD) and CV
29 ± 12 mg/L SDS CV: 21%

TEST CONDITIONS
Dissolved Oxygen Range (mg/L): 9.5-10.2
Temperature Range (°C): 15
pH Range: 6.7-7.3
Conductivity Range (µS/cm): 37-1463
Aeration Provided? (give rate): 6.5 ± 1 mL/min/L
Photoperiod (L:D h): 16:8
No. Organisms/Volume: 10/10L
Loading Density (g/L): 0.29
Acclimation Before Testing (days): 29
Mortality In Previous Week of Acclimation (%): 0.1
Other: ✓

TEST RESULTS The 96-h LC50 is estimated to be > 100% (v/v)

Data Verified By: Ralph K
Date Verified: Aug. 4/05

EVS ENVIRONMENT CONSULTANTS
RAINBOW TROUT ACUTE TOXICITY TEST DATA

WHOLE SAMPLE WATER QUALITY

	Initial	pH Adjustment[1]	After 30-min Pre-aeration
Temp. (°C)	15		15
pH	7.3		7.3
DO (mg/L)	10.4		10.2
Cond. (µS/cm)	1445		1445

1. Document pH adjustment procedure (if used) under "Comments".

Client: Azimuth
Golder ~~EVS~~ Project No.: 04-1424-044
EVS Work Order No.: 05002296
Trout Batch No. and 7-d Acclimation Mortality: 062205/0.5%
No. Fish/Volume: 10/10L
Sample ID: G-Creek 071605 Acute
Date/Time Collected: July 16/05 @ 0900
Test Initiation Date/Time: July 21/05 @ 1035

Total Pre-Aeration Time: 30 min

Concentration % (v/v)	Number of Survivors (1 to 96 hours)							Dissolved Oxygen (mg/L)					Temperature (°C)					pH					Conductivity (µS/cm)	
	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
control				10	10	10	10	10.5	9.8	9.6	9.5	9.7	15	15	15	15	15	7.0	6.8	6.9	7.0	6.7	37	41
6.25				10	10	10	10	10.1	10.0	9.8	9.6	9.5	15	15	15	15	15	7.1	6.9	6.9	6.9	6.8	194	197
12.5				10	10	10	10	10.1	9.9	9.8	9.6	9.8	15	15	15	15	15	7.1	6.9	6.9	6.9	6.8	301	305
25				10	10	10	10	10.1	9.9	9.9	9.6	9.8	15	15	15	15	15	7.1	7.0	7.1	7.0	6.8	418	423
50				10	10	10	10	10.1	9.9	9.8	9.6	9.8	15	15	15	15	15	7.2	7.0	7.1	7.0	6.9	775	784
100				10	10	10	10	10.2	10.0	9.6	9.8	9.8	15	15	15	15	15	7.3	7.1	7.2	7.2	7.0	1445	1463
Technician Initials				RDH	MC	MC	RDH	RDH	RDH	MC	MC	RDH	RDH	RDH	MC	MC	RDH	RDH	RDH	MC	MC	RDH	RDH	RDH

WQ Instruments Used: Temperature calibrated Hg thermometer pH II-A-030302 DO II-A-3 Conductivity II-A-030363
Sample Description: clear
Comments:

Test Set Up By: RDH Data Verified By: [signature] Date Verified: Aug. 4/05

CHAIN-OF-CUSTODY/TEST REQUEST FORM

EVS environment consultants
195 Pemberton Avenue
North Vancouver, BC
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.evsenvironment.com

Please see instructions for completion on back. Shaded areas to be completed by EVS Laboratory upon sample receipt.

Client Name: Teck Cominco
Client Contact Name: Bruce Donald
Ship to: BILL TO AZIMUTH CONSULTING GROUP.
Address: Bag 2000
Kimberley, BC
V1A 3E1
Phone: (250)427-8405
Fax: (250)427-5451
Sampled By: Blake Hamer
Attn: Edmond Canuia
Shipping Date: July 16/05

Collection Date (dd/mmm/yy)	Time (24-h clock)	Sample Identification	1 Type of Each Sample	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G = grab; C = composite	Number of Sample Containers x Volume of Sample Container (i.e., 1 x 20 L)	2 Sample Container Type by Code	Test(s) Requested: 96-hr LC50 Rainbow Trout	48-hr LC50 Daphnia Magna	7-Day Toxicity Test	20 min. Echinoderm Fertilization			3 Notes? (e.g. preserved, saltwater, freshwater, may contain sewage)	Receipt Sample Temp. (°C)	4 Condition/Integrity
For composite sample record date & time starting and ending																
16/07/05	0900	G-Creek_Acute_071605	E		G	2×20	P	X	X					Effluent Water		
16/07/05	0900	G-Creek_Sublethal_071605	E		G	3×20	P			X	X			Effluent Water		

EVS Receipt Check List - SAP
EVS Project #: 04-1424-DQ049
EVS Workorder #: 0500296/7/8/9
Sample Storage Location: 4°C [X] Chemical [ ] Other
Supporting documentation/other information attached if applicable:

1.	Signatures & dates correct?	Y N
2.	Chain-of-custody fully completed?	Y N
3.	Containers arrived in good condition (unbroken)?	Y N
4.	Container labels completed (i.e., dates, ID's)?	Y N
5.	Container labels agreed with custody papers?	Y N
6.	Sample receipt temperature within acceptable range?	Y N
7a.	Sediment testing going to be initiated within 14 days?	Y N
7b.	If no, are samples under Nitrogen? If not, why?	Y N
8.	Chain-of-custody generated upon receipt.	[ ]
9.	Sample containers originate from EVS.	[ ]

PO/Reference No.:
Project Title: Polaris MMER -
Results Needed By: Routine Turn Around.

Comments/Instructions: Bill to: Azimuth Consulting Group. Temp: 12.7°C
Electronic Results, to: Cheryl Mackintosh, Azimuth, cmackintosh@azimuthgroup.ca
Bruce Donald, Teck Cominco, ~~bdonald~~ bruce.donald@teckcominco.com.

A) Released By: Blake Hamer Date: July 16, 2005
Company: GLL Time: 1030
Courier name:
Shipping containers secured by: ~~Tape~~ Straps Lock Other (circle one)
Custody seals used? Yes No

B) Received by: SAP Date: 19 July 05
Company: Golder Time: 10:45
Shipping containers received secure? Yes No
Custody seals intact? Yes No N/A

C) Released By: Date:
Company: Time:
Courier name:
Shipping containers secured by: Tape Straps Lock Other (circle one)
Custody seals used? Yes No

D) Received by: Date:
Company: Time:
Shipping containers received secure? Yes No
Custody seals intact? Yes No N/A

1 Receiving Water (RW); Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
2 Collapsible Carboy (CC); Glass Jar (GJ); Jerry Can (JC); Plastic HDPE (P); Plastic Bucket (PB); Other (Please Specify)
3 Please note any conditions the lab should be aware of for safety and storage concerns
4 Acceptable (A); Unacceptable (U). Please note specifics (e.g., broken, leaking, lid not on) under Comments/Instructions

Revision Date: Sept. 25, 2000

Distribution of copies:
White, yellow, pink - accompany the shipment
Orange - retained by consignor (e.g., shipper)
Yellow - retained by consignee (e.g., receiver)
Pink - for use as needed
White - returned to consignor by consignee

EVS environment consultants
A member of the Golder group of companies

Golder Associates

Golder Associates Ltd.

195 Pemberton Avenue
North Vancouver, British Columbia, Canada V7P 2R4
Telephone 604-986-4331
Fax 604-662-8548

E/05/0341
04-1424-044

August 31, 2005

Azimuth Consulting Group
218 – 2902 West Broadway
Vancouver, BC V6K 2G8

Attention: Ms. Cheryl Mackintosh

RE: WORK ORDERS: 0500334, 335
TOXICITY TEST RESULTS ON THE SAMPLES COLLECTED AUGUST 6, 2005

Dear Ms. Mackintosh

We are pleased to provide you with the results of the toxicity tests performed on the effluent sample identified as Garrow Creek collected August 6, 2005. The sample was tested with the 48-h *Daphnia magna* and the 96-h rainbow trout LC50 toxicity tests. The tests were performed according to the Environment Canada protocol for conducting acute toxicity tests using *D. magna* (EPS 1/RM/14, Second Edition, 2000) and rainbow trout (EPS 1/RM/13, Second Edition, 2000). An independent EVS/Golder QA/QC review confirmed that all acceptability criteria specified by the protocol were met. The results of these tests are summarized from the appended data and are presented in Table 1.

Should you have any questions or comments regarding this report, please do not hesitate to contact the undersigned at 604-986-4331.

Yours very truly,
EVS ENVIRONMENT CONSULTANTS
A Member of the Golder Group of Companies

Jennifer Young, B.Sc.
Bioassay Team Leader – Cladoceran Team

Verified By:

QA/QC Committee:
Cathy McPherson, B.Sc.
Julianna Kalocai, M.Sc.

Attachment: Table 1
RH/clz
O:\Data\Final\2004\1424\04-1424-044\LET 0831 2005 Tox Test 0500334 335 .doc

Table 1
Toxicity Test Results

SAMPLE ID	SAMPLE DATE	48h *Daphnia magna* LC50 (95% CL) % (v/v)	96-h Rainbow Trout - LC50 (95% CL) % (v/v)
Garrow Creek	August 6, 2005	>100	>100

CL – confidence limits.

Toxicity testing was carried out in accordance with applicable test methodologies and/or standards of practice. Our liability is limited solely to the cost of re-testing in the event of non-compliance with such test specifications or standards of practice. Golder/EVS accepts no responsibility or liability for the interpretation or use of these testing results by others, nor for any delay, loss, damage or interruptions of testing, collection, preparation, and delivery of samples or test results resulting from events or circumstances beyond our control.

EVS ENVIRONMENT CONSULTANTS
48-h *Daphnia magna* TOXICITY TEST DATA SUMMARY

Client: Azimuth Consulting Group
EVS Analysts: SXB
EVS Project No.: 04-1424-044
Test Type: 48h LC50
EVS Work Order No.: 0500335
Test Initiation Date: 11 Aug 05

SAMPLE INFORMATION

Identification: Garrow Creek
Amount Received: 5x20L
Date Collected: 06 Aug 05
Date Received: 09 Aug 05
Temperature (°C): 21.0 → 21.0
pH: 7.5 → 7.6
Dissolved Oxygen (mg/L): 10.8 → 8.9
Conductivity (µmhos/cm): 2850
Hardness (mg/L as $CaCO_3$): ~~300~~
Alkalinity (mg/L as $CaCO_3$): —
Ammonia (mg/L N): —
Chlorine (mg/L Cl): —

pH adjustment details: none
Pre-aeration rate and duration: 15 Min @ 25 to 50 ml/L/min

DILUTION/CONTROL WATER (initial water quality)

Water Type: Moderately Hard water (July 30 C)
Temperature (°C): 20.0
pH: 7.4
Dissolved Oxygen (mg/L): 9.1
Conductivity (µS/cm): 354
Hardness (mg/L as $CaCO_3$): ~~300~~ 94
Alkalinity (mg/L as $CaCO_3$): ~~of~~ 70
Other: —

TEST SPECIES INFORMATION

Broodstock Culture ID (in-house culture): 18 July A/B/C
Age (on Day 0): <24hr
Days to First Brood: 7.0
Avg. Young/Brood (after 1st brood): ~~7~~ 29
% Mortality in 7 d Before Test: 0
Reference Toxicant: ZinC
Current Reference Toxicant Result
Reference Toxicant Test Date: Aug 15, 2005
48-h LC50 and 95% CL: 481 (388-597) mg/L Zn
Reference Toxicant Warning Limits (mean ± 2SD) and CV
445 ± 280 mg/L Zn ; CV = 31

TEST CONDITIONS

Temperature Range (°C): 20.0-21.0
pH Range: 7.4-7.7
Dissolved Oxygen Range (mg/L): 8.5-9.1
Conductivity Range (µS/cm): 350-2850
Photoperiod (L:D h): 16:8
No. Organisms/Volume: 10/200ml
Other: —

TEST RESULTS The 48hr LC50 of Garrow Creek is >100% (v)

Data Verified By: Ralph
Date Verified: Aug. 31/05

EVS ENVIRONMENT CONSULTANTS
48-h *Daphnia magna* ACUTE TOXICITY TEST DATA

Client: Azimuth Consulting Group
Sample ID: ~~6 Creek~~ Garrow Creek
EVS Project No.: 04-1424-044
Date Collected: 06 Aug 05
EVS Work Order No.: 0500335
Test Initiation Date/Time: 11 Aug 05 @ 10:30
Daphnid Broodstock Batch: 18 July A/B/C
No. Organisms/Volume: 10/200 ml

Concentration % (v/v)	Number of Survivors (1 to 48 h)					Dissolved Oxygen (mg/L)			Temperature (°C)			pH			Conductivity (µmhos/cm)	
	1	2	4	24	48	0	24	48	0	24	48	0	24	48	0	48
Control				10	10	9.1	8.9	8.6	20.0	21.0	21.0	7.4	7.7	7.6	354	350
6.25				10	10	9.0	8.8	8.5	20.0	21.0	21.0	7.4	7.7	7.7	505	508
12.5				10	10	9.0	8.8	8.5	20.5	21.0	21.0	7.5	7.7	7.7	654	667
25				10	10	8.9	8.8	8.5	20.5	21.0	21.0	7.5	7.7	7.7	990	992
50				10	10	8.9	8.7	8.5	20.5	21.0	21.0	7.5	7.7	7.6	1458	1593
100				10	10	8.9	8.7	8.5	21.0	21.0	21.0	7.6	7.7	7.6	2850	2766
Technician Initials				SXB	SXB	SXB	SXB	SXB	SXB	SXB	SXB	SXB	SXB	SXB	SXB	SXB

Sample Description: clear - colourless
WQ Instruments Used: Temp: Calibrated Hg thermometer pH II-A-020501 DO II-A-011201 Cond. IIA-990901
Comments:

Test Set Up By: SXB Data Verified By: [signature] Date Verified: Aug 31/05

EVS ENVIRONMENT CONSULTANTS
RAINBOW TROUT ACUTE TOXICITY TEST DATA SUMMARY

Client: Azimuth
EVS Project No.: 04-1424-044 (Golder Ref)
EVS Work Order No.: 0500334

EVS Analysts: AXF, RCH
Test Type: 96-h LC50
Test Initiation Date: Aug 11/05 @ 1500

SAMPLE
Identification: Garrow Creek
Amount Received: 5 + 20L
Date Collected: Aug 6/05
Date Received: Aug 9/05
Other: —

DILUTION/CONTROL WATER (initial water quality)
Fresh Water (dechlorinated): ✓
Temperature (°C): 15
pH: 7.0
Dissolved Oxygen (mg/L): 10.1
Conductivity (µS/cm): 40
Hardness (mg/L as $CaCO_3$): 14
Alkalinity (mg/L as $CaCO_3$): 8
Other: —

TEST SPECIES INFORMATION
Source: Sun Valley
Collection Date/Batch: 062205
Control Fish Size (mean, SD and range measured at end of test)
Date Measured: Aug 15/05
Fork Length (mm): 31 ± 3 (27 and 35)
Wet Weight (g): 0.33 ± 0.08 (0.22 and 0.46)
Reference Toxicant: SDS
Current Reference Toxicant Result
Reference Toxicant Test Date: July 12/05
Duration of Acclimation (days): 20
96-h LC50 (and 95% CL): 24 (18 and 32)
Reference Toxicant Warning Limits (mean ± 2SD) and CV
29 ± 12 mg/L SDS CV: 21%

TEST CONDITIONS
Dissolved Oxygen Range (mg/L): 9.0 – 10.1
Temperature Range (°C): 15
pH Range: 6.8 – 7.4
Conductivity Range (µS/cm): 40 – 2850
Aeration Provided? (give rate): 6.5 ± 1 mL/min/L
Photoperiod (L:D h): 16:8
No. Organisms/Volume: 10 / 10L
Loading Density (g/L): 0.33
Acclimation Before Testing (days): 50
Mortality In Previous Week of Acclimation (%): 0.1
Other: —

TEST RESULTS: The 96-h LC50 is estimated to be > 100% (v/v)

Data Verified By: [signature] Date Verified: Aug. 30/05

EVS ENVIRONMENT CONSULTANTS
RAINBOW TROUT ACUTE TOXICITY TEST DATA

WHOLE SAMPLE WATER QUALITY

	Initial	pH Adjustment[1]	After 30-min Pre-aeration
Temp. (°C)	15	/	15
pH	7.4	/	7.4
DO (mg/L)	10.1	/	10.1
Cond. (µS/cm)	2510	/	2510

1. Document pH adjustment procedure (if used) under "Comments".

Total Pre-Aeration Time 30 min

Client ~~EVS~~ Golder Azimuth
~~EVS~~ Project No. 04-1424-044
EVS Work Order No. 0500334
Trout Batch No. and 7-d Acclimation Mortality 062205/0.1%
No. Fish/Volume 10 / 10L
Sample ID Carron Creek
Date/Time Collected Aug 6/05 @ 1100
Test Initiation Date/Time Aug 11/05 @ 1500

Concentration %(v/v)	Number of Survivors (1 to 96 hours)							Dissolved Oxygen (mg/L)					Temperature (°C)					pH					Conductivity (µS/cm)	
	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
control				10	10	10	10	10.1	9.2	~~9.4~~ 9.8	~~10.~~ 10.0 AXF	9.3	15	15	15	15	15	7.0	7.1	6.8	6.9	7.0	40	51
6.25				10	10	10	10	10.1	9.0	10.0	~~10.2~~ 10.0	9.4	15	15	15	15	15	7.0	7.1	6.9	7.0	7.0	323	349
12.5				10	10	10	10	10.1	9.2	10.0	~~10.2~~ 10.0	9.4	15	15	15	15	15	7.0	7.1	6.9	7.1	7.1	535	571
25				10	10	10	10	10.1	9.4	10.0	~~10.2~~ 10.0	9.6	15	15	15	15	15	7.0	7.1	6.9	7.1	7.1	827	864
50				10	10	10	10	10.1	9.4	~~10.4~~ 10.1 AXF	~~10.3~~ 10.1 AXF	9.6	15	15	15	15	15	7.2	7.2	7.0	7.1	7.2	1373	1431
100				10	10	10	10	10.1	9.8	~~10.8~~ 10.1 AXF	~~10.5~~ 10.1 AXF	9.7	15	15	15	15	15	7.4	7.3	7.0	7.1	7.3	2510	2850
Technician Initials				ReH	AXF	AXF	ReH	ReH	ReH	AXF①	AXF①	ReH	ReH	ReH	AXF	AXF	ReH	ReH	ReH	AXF	AXF	ReH	ReH	ReH

WQ Instruments Used: Temperature calibrated Hg thermometre pH II-A-030302 DO II-A-3 Conductivity II-A-030304

Sample Description clear

Comments ① Re-calibrated D.O. meter

Test Set Up By ReH Data Verified By [signature] Date Verified Aug. 30/05

Forms\Lab\Datasheets\Trout\ACUTE.DOC August 26, 2002

CHAIN-OF-CUSTODY / TEST REQUEST FORM

SRS 0743

Client Name: Teck Cominco
Client Contact: Bruce Donald
Address: Box 2000
Kimberley BC
V1A 3G1
Phone: 250-427-5405
Fax: 250-427-2451
Sampled by: B. Patton
Ship to:
Attn: Edmund Canavia

Golder Associates
195 Pemberton Avenue
North Vancouver, B.C.
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.golder.com

Shipping Date: Aug 6/05

1 Collection Date (DD/MMM/YYYY)	1 Time (24-h clock)	Sample Identification	2 Type of Each Sample	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G=grab C=composite	Number of Sample Containers x Volume of Sample Containers (1 x 20L)	3 Sample Container Type by Code	Test(s) Requested: Sublethal toxicity 1					4 Sample Notes (preserved, saltwater, freshwater, may contain sewage...)
06/Aug/05	10:00 am	Garrow Creek	E		G	1x20L		X					Client is actually Azimuth Consulting

PO/Reference No.:
Project Title:
Results Needed By:

Comments/Instructions:

1) Released by: B Patton Date: Aug 6/05
Company: Gartner Lee Ltd. Time: 14:00 hrs
Courier Name:

2) Released by: Date:
Company: Time:
Courier Name:

1) Received by: (SRS) Date: 9 Aug 05
Company: Golder Time: 10:15

1) Received by: Date:
Company: Time:

Shaded area to be completed by Golder Laboratory upon sample receipt.

Golder Project No.: 0500327 / 328 / 334 / 33
Golder Work Order No.: 04-1424-044
Condition Upon Receipt: Good
Receipt Sample Temp. (°C): 19.0

1 For composite effluent or water samples, the sample collection date/time is the **end** of the compositing period.
2 Receiving Water (RW): Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
3 Collapsible Carboy (CC); glass jar (GJ); Jerry Can (JC); Plastic HDPE (P); Other (Please Specify)
4 Please note any conditions the lab should be aware of for safety and storage concerns

Distribution of copies:
White, Yellow – accompany the shipment
Pink – kept by consignor (e.g. shipper)
Yellow – kept by consignee (e.g. receiver)
White – returned to consignor by consignee

Please see instructions for completion on back of form

Revision Date: November 22, 2004

APPENDIX H

Sublethal Toxicity Testing Laboratory Reports

Stantec Consulting Ltd.
11B Nicholas Beaver Road RR3
Guelph ON N1H 6H9
Tel: (519) 763-4412 Fax: (519) 763-4419

stantec.com

Stantec

Work Order : 207782
Sample Number : 13103

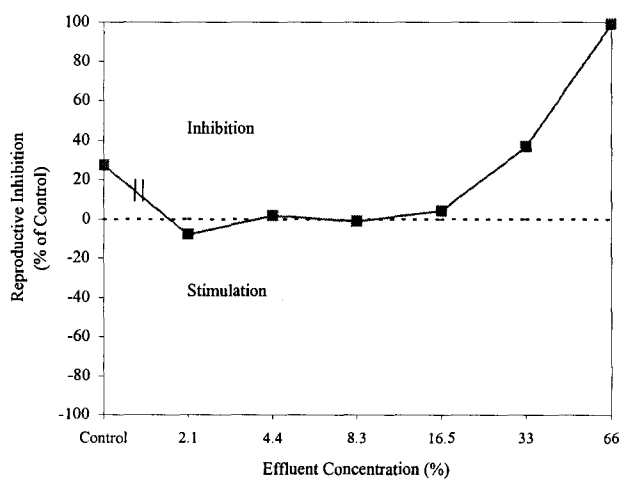
Sample Identification

Company :	Azimuth Consulting Group Inc.		
Location :	Vancouver, BC	Date Collected :	2005-07-16
Substance :	G-Creek Sublethal 071605	Time Collected :	09:00
Sampling Method :	Grab	Date Received :	2005-07-19
Sampled By :	B. Hamer	Time Received :	13:00
Shipped By:	Fed Ex/Rd	Date Tested :	2005-07-19
Temp. on arrival :	18.0°C	Lab Storage:	4±2 °C
Sample Description:	Clear, colourless, odourless.		

Test Results

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Reproduction)	24.6%	22.2-27.2	Linear Interpolation (Toxstat 3.5) b

Champia parvula Reproductive Inhibition



Note: Statistical analyses were performed using pooled control and salt control data.

Work Order Number: 207782
Sample Number: 13103

Test Conditions

Test Organism [a]	:	*Champia parvula*	Test Vessel	:	240 mL polystyrene cup
Organism Batch Number	:	CH05-07	Number of Replicates	:	3
Source	:	Stantec in-house culture	Number of Organisms per Replicate	:	5 females / 2 males
Life Stage [c]	:	Sexually mature	Test Volume (per replicate)	:	100 mL
Mean Organism Mortality	:	0% (7 days prior to testing)	Test Solution Depth	:	5 cm
Salinity Adjustment [d]	:	Yes	Recovery Volume (per replicate)	:	200 mL
pH Adjustment	:	None	Recovery Solution Depth	:	7 cm
Sample Filtration	:	None	Recovery Water Filtered (prior to dilution)	:	Yes (60µm)
Test Aeration (during exposure)	:	None	Date of Test Initiation	:	2005-07-19
Test Aeration (during recovery)	:	Yes (continuous, gentle aeration)	Time of Test Initiation	:	17:45
Photoperiod (h)	:	16 light / 8 dark	Date of Recovery Initiation	:	2005-07-21
Light Intensity	:	1000 - 1600 lux	Date of Test Completion	:	2005-07-28
Test Temperature (°C)	:	23.0 – 26.0	Test Duration	:	48 hours
Control/Dilution Water [e]	:	Natural seawater	Recovery Duration	:	7 days
Test Type	:	Static non-renewal	Analyst(s)	:	EJ/KJ

[a] Test Organism : No organisms exhibiting unusual appearance, behaviour, or undergoing unusual treatment were used in the test. All test organisms were from the same culture.

[c] Life Stage : Test organisms were sexually mature males having sori with spermatia and sexually mature females having trichogynes.

[d] Salinity Adjustment : Salinity adjustment was performed following the procedure for Hypersaline Brine Addition (Environment Canada Salinity Adjustment Guidance Document, revised December 2001).

[e] Control/Dilution Water : Filtered (0.45 µm) natural seawater from Pointe-du-Chene in Shediac Bay, New Brunswick. No chemicals added.

Test Method : Test of Sexual Reproduction using the Red Macroalga *Champia parvula.* EPA-821-R-02-014, October 2002, Method 1009.0, with Canadian adaptations (Environment Canada 1998, 1999).

Comments

Nutrient addition of 10 mls to the 100% salinity adjusted sample, prior to test initiation, reduced the maximum concentration tested from 66.7% to 66%.

Noted Deviation(s): The maximum test temperature of 24.0 °C, as specified by the test method, was exceeded on Day 4 of the recovery period. There were no other unusual conditions or deviations from the test protocol. The results reported relate only to the sample tested.

Reference Toxicant Data

Substance :	Sodium Dodecyl Sulphate (SDS)	Historical Mean IC50 :	0.155 mg/L
Test Date :	2005-07-19	Warning Limits (± 2 SD) :	0.112-0.216
Test Duration :	48 hrs exposure, 7 days recovery	Statistical Method :	Linear Interpolation (Toxstat 3.5)[b]
IC50 Reproduction	0.134 mg/L	Test Conducted By :	E. Jonczyk/K. Johnson
95% Confidence Limits:	0.123-0.143	Organism Batch :	CH05-07

The reference toxicant test was conducted under conditions identical to the test.

References

[b] West, Inc. and D. Gulley. 1996. Toxstat Release 3.5. Western Ecosystems Technology. Cheyenne, WY, U.S.A.

Date: 2005-08-25

Approved By: Project Manager

Work Order : 207782
Sample Number : 13103

Cystocarp Counts

Concentration (%)	Replicate	Plant 1	Plant 2	Plant 3	Plant 4	Plant 5	Replicate Mean	Treatment Mean	Standard Deviation
Control	A	19	27	34	30	24	26.8	26.8	6.98
	B	32	21	36	25	22	27.2		
	C	23	42	29	21	17	26.4		
Salt Control	A	31	26	24	18	39	27.6	27.8	7.94
	B	24	29	32	37	15	27.4		
	C	17	22	28	35	40	28.4		
2.1	A	27	24	37	25	34	29.4	29.5	7.50
	B	33	19	39	28	26	29.0		
	C	24	31	42	16	37	30.0		
4.4	A	11	29	34	22	35	26.2	26.8	8.13
	B	27	24	38	15	30	26.8		
	C	28	31	22	38	18	27.4		
8.3	A	34	30	21	25	28	27.6	27.6	7.14
	B	16	24	32	29	35	27.2		
	C	39	34	25	13	29	28.0		
16.5	A	22	26	23	13	43	25.4	26.1	8.41
	B	29	19	31	29	24	26.4		
	C	15	24	32	41	21	26.6		
33	A	13	17	12	23	27	18.4	17.3	5.55
	B	16	20	15	13	11	15.0		
	C	10	18	26	24	14	18.4		
66	A	0	1	0	1	0	0.4	0.3	0.46
	B	0	0	1	0	0	0.2		
	C	1	0	0	0	0	0.2		

Plant Mortality Data

Exposure Period

	♂ 0 Hours		♀ 0 Hours		♂ 48 Hours		♀ 48 Hours		♀ Test Completion	
Concentration (%)	Number Dead	Mortality (%)	Number Dead	Mortality (%)	Number Dead	Mortality (%)	Number Dead	Mortality (%)	Number Dead	Mortality (%)
Control	0	0	0	0	0	0	0	0	0	0
Salt Control	0	0	0	0	0	0	0	0	0	0
2.1	0	0	0	0	0	0	0	0	0	0
4.4	0	0	0	0	0	0	0	0	0	0
8.3	0	0	0	0	0	0	0	0	0	0
16.5	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0

Test Data Reviewed By: [signature]
Date: 2005-08-11

Work Order : 207782
Sample : 13103

Water Chemistry Data

Initial Water Chemistry (100% Effluent)

	Temperature (°C)	pH	Dissolved Oxygen (mg/L)	O2 Saturation (%)*	Salinity (‰)
Initial Parameters:	22.0	8.0	10.2	122	0
Parameters after Salinity Adjustment [1]:	22.5	8.0	7.0	98	32
Chemistry after Pre-Aeration [1,2]:	-	-	-	-	-

Exposure Period Water Chemistry

0 hours

Date & Time : 2005-07-19 17:45
Analyst(s) : EJ/KJ

Test Conc. (%)	pH	Dissolved Oxygen (mg/L)	O_2 Sat. (%)*	Salinity (‰)	Temperature (°C)
66	7.8	7.8	106	32	22.5
33	7.7	7.3	102	32	22.5
16.5	7.7	7.2	100	32	22.5
8.3	7.7	7.1	100	32	22.5
4.4	7.7	7.3	103	32	22.5
2.1	7.7	7.0	99	32	23.0
Salt Control	7.7	5.9	83	30	24.0
Control	7.7	6.4	91	30	22.0

48 hours

Date & Time : 2005-07-21 16:00
Analyst(s) : KJ

Test Conc. (%)	pH	Dissolved Oxygen (mg/L)	O_2 Sat. (%)*	Salinity (‰)	Temperature (°C)
66	8.8	7.7	99	31	23.0
33	8.9	7.0	98	31	23.0
16.5	8.7	6.9	98	31	23.0
8.3	9.1	6.9	97	31	22.0
4.4	8.7	6.8	96	30	22.5
2.1	8.9	6.6	94	30	22.0
Salt Control	9.0	6.2	91	30	22.0
Control	9.1	6.7	95	30	22.0

Initial Water Chemistry (Recovery Water)

	Temperature (°C)	pH	Dissolved Oxygen (mg/L)	O2 Saturation (%)*	Salinity (‰)
Initial Parameters:	22.0	7.5	6.6	93	30

Recovery Period Water Chemistry

0 hours

Date & Time : 2005-07-21 16:00
Analyst(s) : KJ

Test Conc. (%)	pH	Dissolved Oxygen (mg/L)	O_2 Sat. (%)*	Salinity (‰)	Temperature (°C)
66	7.5	6.6	93	30	22.0
33	7.5	6.6	93	30	22.0
16.5	7.5	6.6	93	30	22.0
8.3	7.5	6.6	93	30	22.0
4.4	7.5	6.6	93	30	22.0
2.1	7.5	6.6	93	30	22.0
Salt Control	7.5	6.6	93	30	22.0
Control	7.5	6.6	93	30	22.0

Test Completion

Date & Time : 2005-07-28 16:00
Analyst(s) : EJ

Test Conc. (%)	pH	Dissolved Oxygen (mg/L)	O_2 Sat. (%)*	Salinity (‰)	Temperature (°C)
66	8.0	7.4	92	30	22.0
33	8.0	7.5	93	30	22.0
16.5	8.0	7.3	91	30	22.0
8.3	8.1	7.4	92	30	22.0
4.4	8.0	7.5	93	30	22.0
2.1	8.0	7.5	93	30	22.0
Salt Control	8.1	7.5	93	30	22.0
Control	7.8	7.6	95	30	22.0

Daily Temperature Monitoring

Date:	2005-07-19	2005-07-20	2005-07-21	2005-07-22	2005-07-23	2005-07-24	2005-07-25	2005-07-26	2005-07-27	2005-07-28
Temp. (°C):	23.0	24.0	24.0	24.0	23.0	24.0	26.0	24.0	23.0	23.0

[1] if applicable
[2] @ <100 bubbles/min
* adjusted for barometric pressure

August 2005

LABORATORY REPORT

Azimuth Consulting Group

POLARIS MINE

ENVIRONMENTAL EFFECTS MONITORING PROGRAM

July 16, 2005 Sample

PREPARED FOR:

Azimuth Consulting Group
Vancouver, BC

PREPARED BY:

EVS environment consultants
A Member of the Golder Group of Companies
North Vancouver, BC

AZIMUTH CONSULTING GROUP

POLARIS MINE ENVIRONMENTAL EFFECTS MONITORING PROGRAM

JULY 16, 2005 SAMPLE

LABORATORY REPORT

Prepared for

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

Prepared by

EVS Environment Consultants (A Member of the Golder Group of Companies)
195 Pemberton Avenue
North Vancouver, BC
Canada V7P 2R4

EVS Project No.

04-1424-044

August 2005

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LIST OF TABLES

1. INTRODUCTION

EVS Environment Consultants (a member of the Golder Group of Companies) conducted sublethal Metal Mining Effluent Regulations (MMER) toxicity testing for Azimuth Consulting Group as part of the Environmental Effects Monitoring (EEM) program for Polaris Mine.

A sample, identified as G Creek-071605, was collected from the Polaris Mine Site on July 16, 2005 in 20-L collapsible polyethylene containers. It was received at the EVS laboratory on July 19, 2005 and was stored in the dark at 4°C prior to test initiation. The sample was evaluated for toxicity using the 7-d topsmelt (*Atherinops affinis*) survival and growth toxicity test and the echinoderm (*Dendraster excentricus*) fertilization toxicity test. Toxicity testing was initiated on the day of initial sample receipt.

This report describes the methods and results of the 7-d topsmelt (*Atherinops affinis*) toxicity test and the echinoderm (*Dendraster excentricus*) fertilization toxicity test. The raw data and statistical analyses are provided in Appendices I and II respectively, and the chain-of-custody form is provided in Appendix III.

2. METHODS

2.1 7-D TOPSMELT (*ATHERINOPS AFFINIS*) SURVIVAL AND GROWTH TOXICITY TEST

A static-renewal 7-d survival and growth toxicity and reference toxicant tests using topsmelt (*A. affinis*) was conducted in accordance with U.S. Environmental Protection Agency (USEPA, 1995). Test conditions and methods are summarized in Table 1.

This 7-day test exposes topsmelt larvae to different concentrations of a given sample. Fish are fed on a daily basis and both survival and growth endpoints are measured at test termination. These observations are assessed in comparison to the pooled negative and brine controls.

2.2 ECHINODERM (*DENDRASTER EXCENTRICUS*) FERTILIZATION TOXICITY TEST

The echinoderm (*Dendraster excentricus*) fertilization toxicity test was conducted in accordance with Environment Canada (1992 with 1997 amendments). Test conditions and methods are summarized in Table 2.

This fertilization test involves exposing echinoderm sperm to a series of test concentrations for ten minutes, echinoderm eggs are then added allowing fertilization to occur for ten minutes. Following the ten minutes exposure time, the eggs are preserved and the number of fertilized and unfertilized eggs in each replicate are counted. These observations are assessed in comparison to the pooled negative and brine controls.

2.3 STATISTICAL ANALYSIS

Statistical analyses for all tests were conducted using the computer software program TOXCALC (version 5.0.23; Tidepool Scientific Software, 1994).

2.4 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

This study followed a comprehensive QA/QC Program to ensure full documentation and minimize possible errors in computation and reporting of results. The following general QA/QC guidelines were applied in this test: use of negative controls, use of positive controls, use of brine controls, replication, instrument calibration, water quality maintenance and

record-keeping, and use of standard operating procedures (SOPs). To ensure data and reporting meet quality standards, all data and statistical analyses were reviewed by a member of our QA/QC Committee prior to reporting the results.

Toxicity testing was carried out in accordance with applicable test methodologies and/or standards of practice. Our liability is limited solely to the cost of re-testing in the event of non-compliance with such test specifications or standards of practice. Golder/EVS accepts no responsibility or liability for the interpretation or use of these testing results by others, or for any delay, loss, damage or interruptions of testing, collection, preparation, and delivery of samples or test results resulting from events or circumstances beyond our control.

Table 1. 7-d Topsmelt (*Atherinops affinis)* survival and growth toxicity test methods

TEST PARAMETER	TEST CONDITION
Test type	Static-renewal
Test duration	7 d
Test chamber	600-mL beaker
Test solution volume	200 mL
Number of replicate chambers per treatment	5
Number of organisms per test chamber	5
Age of test organisms at test initiation	10 d
Food	Newly hatched *Artemia* nauplii (<24 hours old)
Feeding Regime	Fed 0.5 mL/ beaker twice daily of concentrated nauplii suspension (prepared to provide 200 nauplii in 0.5 mL); no feeding at test termination
Sample manipulations (e.g. pre-aeration, pH adjustment, filtration)	Salinity-adjusted
Control/dilution water	UV-sterilized and 0.5μm-filtered natural sea water from Vancouver Aquarium, BC
Dilutions	4.5, 8.9, 17.9, 35.7, 71.4% (v/v)
Renewal of dilutions	Daily
Aeration	None
Water quality parameters and frequency	Temperature, pH, dissolved oxygen, and salinity daily
Temperature	20 ± 1°C
Salinity	30 ± 2 (sample adjusted with hypersaline brine [HSB]. Preparation of HSB and salinity adjustment as per EC guidance document on salinity adjustment –July 1997)
Lighting	Overhead full-spectrum fluorescent lights; 538 – 1076 lux; 16:8 light:dark photoperiod
Reference toxicant	Initiated concurrently with sample using copper to generate LC50 and IC50 values; results compared to lab mean ± 2 SD
Endpoints	Survival and growth (dry weight)
Test validity	≥ 80% mean control survival; ≥ 0.85 mg/fish mean dry weight for surviving control fish
Reference protocol	US EPA (1995), EPA/600/R-95/136

Table 2. Echinoderm (*Dendraster excentricus*) fertilization toxicity test methods

TEST PARAMETER	TEST CONDITION
Test type	Static
Test duration	10:10 min
Test chamber	16 X 125 mm test tubes
Test solution volume	10 mL
Number of replicate chambers per treatment	4
Number of eggs per test chamber	2000
Age of test organisms	< 4 hours after spawning
Sample manipulations (e.g. pre-aeration, pH adjustment, filtration)	Salinity-adjusted
Control/dilution water	UV-sterilized and 0.5μm-filtered natural sea water from Vancouver Aquarium, BC
Dilutions	4.6, 9.1, 18.3, 36.6, 72.8% (v/v)
Renewal of dilutions	None
Aeration	None during testing
Water quality parameters and frequency	Temperature, pH, dissolved oxygen, and salinity
Temperature	15 ± 1°C
Salinity	30 ± 2 (sample adjusted with hypersaline brine [HSB]. Preparation of HSB and salinity adjustment as per EC guidance document on salinity adjustment –July 1997)
Lighting	Ambient laboratory illumination (moderate intensity)
Reference toxicant	Initiated concurrently with test; same test methods as above using SDS to generate an EC50 value; results compared to lab mean ± 2 SD
Endpoint	Fertilization of eggs
Test validity	≥ 50% and ≤ 100% mean control fertilization
Reference protocols	Environment Canada (1992), (EPS/1/RM/27 with 1997 amendments)

3. RESULTS

3.1 7-D TOPSMELT (*ATHERINOPS AFFINIS*) SURVIVAL AND GROWTH TOXICITY TEST

The test results are summarized in Table 1 and the raw statistical analyses are provided in Appendix I.

The highest concentration tested was approximately 71.4% due to salinity adjustment. The mean survival in both the negative and brine controls was 100%. Mean dry weight in the pooled controls was 0.95mg. The negative and brine controls were not significantly different for both the growth and survival endpoints ($p = 0.52$ and $p = 1.00$, respectively).

The *A. affinis* survival and growth toxicity test showed no adverse effects on survival or growth in all tested concentrations relative to the pooled controls ($p \leq 0.05$). For the survival and growth endpoints the NOEC was 71.4, and the LOEC was >71.4% (v/v). The LC50 for survival was >71.4% (v/v). The IC50 and IC25 for growth were both >71.4% (v/v).

3.2 ECHINODERM (*DENDRASTER EXCENTRICUS*) FERTILIZATION TOXICITY TEST

The test results are summarized in Table 2 and the raw statistical analyses are provided in Appendix II.

The highest concentration tested was 72.8% due to salinity adjustment. Mean fertilization in the pooled controls was 66.9%. The negative and brine controls were not significantly different ($p = 0.09$).

The *D. excentricus* fertilization toxicity test exhibited adverse effects on egg fertilization in all test concentrations relative to the pooled controls ($p \leq 0.05$). The NOEC was <4.6 and LOEC was 4.6 % (v/v). The IC50 and IC25 (95% confidence limits) values were 13.2 (10.6 – 17.1) and 5.2 (4.4 – 6.0) % (v/v), respectively.

3.2 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The tests met all passing criteria for test validity as outlined in the respective protocols. Water quality parameters during the test were all within the acceptable range of values. Point estimates for the reference toxicant tests were all within the laboratory mean ± 2 standard deviations, indicating that the tests were within acceptable limits of variability.

Table 3. Summary of results for the 7-d Topsmelt (*Atherinops affinis)* survival and growth toxicity test

TEST CONCENTRATION (% V/V)	SURVIVAL (%)(MEAN ± SD)	GROWTH (DRY WEIGHT MG) (MEAN ± SD)
D-Control	100.0 ± 0.0	0.92 ± 0.13
Brine Control	100.0 ± 0.0	0.98 ± 0.18
Pooled Controls	100.0 ± 0.0	0.95 ± 0.15
4.5	96.0 ± 8.9	0.77 ± 0.19
8.9	96.0 ± 8.9	0.82 ± 0.33
17.9	100.0 ± 0.0	1.01 ± 0.14
35.9	100.0 ± 0.0	1.07 ± 0.19
71.4	96.0 ± 8.9	0.91 ± 0.28
TEST ENDPOINT	**SURVIVAL (% V/V)**	**GROWTH (% V/V)**
NOEC	71.4	71.4
LOEC	>71.4	>71.4
LC50	>71.4	na
IC50	na	>71.4
IC25	na	>71.4

SD – Standard Deviation; na – not applicable.

Table 4. Summary of results for the Echinoderm (*Dendraster excentricus*) fertilization toxicity test

TEST CONCENTRATION (% v/v)	PROPORTION FERTILIZED (%) (MEAN ± SD)
Negative Control	64.8 ± 3.8
Brine Control	69.0 ± 1.8
Pooled Control	66.9 ± 3.6
4.6	53.0 ± 2.2*
9.1	37.2 ± 1.3*
18.2	30.0 ± 2.2*
36.5	23.5 ± 2.9*
72.8	19.5 ± 2.4*
TEST ENDPOINT	**PROPORTION FERTILIZED %(v/v)**
NOEC	<4.6
LOEC	4.6
IC50 (95% CL)	13.2 (10.6 – 17.1)
IC25 (95% CL)	5.2 (4.4 – 6.0)

*Indicates significant difference ($p \leq 0.05$) relative to the pooled controls.
SD – Standard Deviation; CL – Confidence Limits.

4. REFERENCES

Environment Canada. 1992. Biological test method: fertilization of echinoids (sea urchins and sand dollars). Environmental Protection Series, Report EPS 1/RM/27, December 1992. Environment Canada, Conservation and Protection, Ottawa, ON. 68 pp + appendices. Amended November 1997.

EVS (EVS Environment Consultants). 2004. Topsmelt (*Atherinops affinis*) 7-d larval survival and growth test. EVS SOP 1100-5. In: EVS Consultants Laboratory Standard Operating Procedures (SOP) Manual. Volume II: Water Toxicity Tests. EVS Environment Consultants, North Vancouver, BC.

US EPA (U.S. Environmental Protection Agency). 2002. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to marine and estuarine organisms. 3rd edition. US Environmental Protection Agency, Office of Water (4303T). US Environmental Protection Agency, Washington, DC. EPA/821/R-02/014. 464 pp.

US EPA. 1995. Short term methods for estimating the chronic toxicity of effluents and receiving waters to marine and estuarine organisms. 2nd edition. US Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Office of Research and Development, Washington, DC. EPA/600/R-95/136. 563 pp.

Tidepool Scientific Software. 1994. TOXCALC: Comprehensive Toxicity Data Analysis and Database Software, Version 5.0.23. Tidepool Scientific Software, McKinleyville, CA. 80 pp.

APPENDIX I

Raw Data and Statistical Analyses:

Atherinops affinis

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST DATA SUMMARY

Client: Polaris
EVS Project No.: 04-1424-064
EVS Work Order No.: 0500258 298
EVS Analysts: JXS, SXB, MJG, AXF
Test Initiation Date: 19-July-05

Sample	Initial Sample Day 0	Refresh Samples Day 2	Refresh Samples Day 4
Identification	G Creek sublethal 071605	G Creek	G Creek
Amount Received	1 8x20L	1x20L	1x20L
Date Collected	16Jul05	16Jul05	16Jul05
Date Received	19Jul05	19Jul05	19Jul05
Temperature (°C)	20.0	20.0	20.0
pH	7.7 ①→ 8.2	7.8 ①→ 8.2	7.7 ①→ 8.3
DO (mg/L)	11.1 ①→ 7.6	11.0 ①→ 7.6	10.8 ①→ 7.6
Conductivity (µmhos/cm)	1520	1520	1520
Salinity (ppt)	6 ①→ 29	6 ①→ 29	6 ①→ 29
Ammonia (mg/L N)	-	-	-
Chlorine (mg/L Cl)	-	-	-
Other	① After Salinity Adjustment		

DILUTION/CONTROL WATER (initial water quality)

Water Type: Filtered, UV sterilized seawater
Temperature (°C): 20.0
pH: 7.8
Dissolved Oxygen (mg/L): 7.5
Salinity: 28

TEST SPECIES INFORMATION

Source: ABS
Date Received: 19-July-05
Age (on Day 0): 10-d
Reference Toxicant: Cu
Current Reference Toxicant Result (incl. 95% CL)
Reference Toxicant Test Date: 19Jul05
7-d survival LC50: ~~122 (106-140)~~ RS 117 (100-136) µg/L Cu
7-d growth IC50: ~~[illegible] (80-149)~~ 116 (81-156) µg/L Cu
Reference Toxicant Warning Limits (mean ± 2SD) and CV
7-d survival LC50: 133 ± 39 µg/L Cu CV=15%
7-d growth IC50: 132 ± 46 µg/L Cu CV=17%

TEST CONDITIONS

Temperature Range (°C): 20.0 - 21.0
pH Range: 7.7 - 8.3
Dissolved Oxygen Range (mg/L): 6.2 - 7.7
Salinity (ppt): 28 - ~~29~~ 30
Photoperiod (L:D h): 16:8
Aeration Provided?: No
Other: -

TEST RESULTS

Endpoint	Conc. Units	NOEC	LOEC	LC50 (95% CL)	IC50 (95% CL)	IC25 (95% CL)
Survival	% (v/v)	71.4	>71.4	>71.4		
Growth	% (v/v)	71.4	>71.4		>71.4	>71.4

Other: ____

Data Verified By: [signature]
Date Verified: Aug. 22/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA (EEM)

Client: Polaris

EVS Project No.: 04-1424-044

EVS Work Order No.: 0500298

Sample ID: G-Creek Sublethal C71605

Test Initiation Date/Time: 19-July-05/1430

Source/Date Received: ABS/19-July-05

% (v/v) Concentration	Temperature (°C)														
	0	1		2		3		4		5		6		7
D-control	20.0	20.5	20.0	20.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.0
B-control	20.5	20.5	20.5	20.5	20.5	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
4.5	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
8.9	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
~~35.7~~ 17.9	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
~~71.4~~ 35.7	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
71.4	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
Tech. Initials	TJ	SXB	SXB	SXB	SXB	SXB	SXB	MV	MV	MV	MV	MV	MV	TJ

% (v/v) Concentration	pH													
	0	1 old	1 new	2		3		4		5		6		7
D-control	7.8	7.7	7.7	7.7	7.8	7.8	7.9	7.8	7.8	7.8	7.8	7.8	7.9	8.0
B-control	7.9	7.7	8.0	7.7	7.9	7.8	7.9	7.8	7.8	7.8	7.8	7.8	7.9	8.0
4.5	7.9	7.7	8.0	7.7	7.9	7.8	7.9	7.9	7.9	7.8	7.9	7.9	7.9	7.7
8.9	7.9	7.8	8.0	7.7	7.9	7.8	8.0	7.9	7.9	7.8	8.0	7.9	8.0	7.7
17.9	8.0	7.8	8.1	7.7	8.0	7.9	8.0	8.0	8.0	7.9	8.1	8.0	8.1	7.7
35.7	8.1	7.9	8.1	7.8	8.1	7.9	8.1	8.0	8.2	7.9	8.2	8.0	8.2	7.8
71.4	8.2	7.9	8.2	7.8	8.2	7.9	8.3	8.0	8.3	8.0	8.2	8.0	8.3	7.8
Tech. Initials	TJ	SXB	SXB	SXB	SXB	SXB	SXB	MV	MV	MV	MV	MV	MV	TJ

WQ Instruments Used: Temp. Calibrated Hg thermometer pH II-A-030301

Comments: D used II-A-51

Test Set Up By: TJ, SXB Data Verified By: [signature] Date Verified: Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA (EEM)

Client Polaris
Sample ID G-Creek Sublethal C7160S
EVS Project No. 04-1424-044
Test Initiation Date/Time 19-July-05 1430
EVS Work Order No. 0500~~28~~298
Source/Date Received ABS 19-July-05

% (v/v) Concentration	Salinity (ppt)													
	0	1		2		3		4		5		6		7
D-control	28	28	28	28	28	28	28	28	28	28	28	28	28	28
B-control	30	30	30	30	30	30	30	30	30	30	30	30	30	30
4.5	28	28	28	28	28	28	28	28	28	28	28	28	28	28
8.9	28	28	28	28	28	28	28	28	28	28	28	28	28	28
17.9	28	28	28	28	28	28	28	28	28	28	28	28	28	28
35.7	28	28	28	28	28	28	28	28	28	28	28	28	28	28
71.4	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Tech. Initials	TM	SXB	SXB	SXB	SXB	SXB	SXB	SXB	ML	SXB	ML	SXB	ML	TM

% (v/v) Concentration	Dissolved Oxygen (mg/L)													
	0	1		2		3		4		5		6		7
D-control	7.5	6.6	7.5	6.7	7.5	6.5	7.5	6.5	7.7	6.6	7.7	6.6	7.7	6.4
B-control	7.5	6.6	7.5	6.7	7.5	6.5	7.5	6.5	7.7	6.7	7.7	6.6	7.6	6.2
4.5	7.5	6.5	7.5	6.7	7.5	6.5	7.5	6.5	7.7	6.6	7.7	6.5	7.7	6.6
8.9	7.5	6.5	7.5	6.8	7.6	6.6	7.5	6.4	7.6	6.6	7.7	6.6	7.7	6.7
17.9	7.6	6.5	7.5	6.7	7.6	6.7	7.5	6.4	7.6	6.5	7.7	6.6	7.7	6.6
35.7	7.6	6.6	7.5	6.8	7.6	6.6	7.6	6.5	7.6	6.5	7.6	6.6	7.6	6.2
71.4	7.6	6.5	7.5	6.7	7.6	6.6	7.6	6.5	7.6	6.6	7.6	6.6	7.6	6.4
Tech. Initials	TM	SXB	SXB	SXB	SXB	SXB	SXB	ML	ML	ML	ML	ML	ML	TM

WQ Instruments Used: Salinity II-A-030303 DO II-A-14
Comments

Test Set Up By TM. SXB Data Verified By [signature] Date Verified Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client Polaris
EVS Project No. 04-1424-044
EVS Work Order No. 0500 ~~358~~ 398

Sample ID G-Creek Sublethal 071605
Test Species/Batch A affinis / 19-July-05
Test Initiation Date/Time 19-July-05 / 1430h
No. of Organisms/Volume 5 / 200 ml

Concentration % v/v	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
D-control	A	T1	5	5	5	5	5	5	5	
	B	T2	5	5	5	5	5	5	5	
	C	T3	5	5	5	5	5	5	5	
	D	T4	5	5	5	5	5	5	5	
	E	T5	5	5	5	5	5	5	5	
B-control	A	T6	5	5	5	5	5	5	5	
	B	T7	5	5	5	5	5	5	5	
	C	T8	5	5	5	5	5	5	5	
	D	T9	5	5	5	5	5	5	5	
	E	T10	5	5	5	5	5	5	5	
4.5	A	T11	5	5	5	5	5	5	5	
	B	T12	5	5	5	5	5	5	5	
	C	T13	5	5	5	5	5	5	5	
	D	T14	5	5	5	5	5	5	4	
	E	T15	5	5	5	5	5	5	5	
8.9	A	T16	5	5	5	5	5	5	5	
	B	T17	5	5	5	5	5	5	5	
	C	T18	5	5	5	5	5	5	5	
	D	T19	5	5	5	5	5	5	5	
	E	T20	5	5	5	5	5	5	4	
Technician Initials		TM	SKB	SKL	SKB	MML	MML	MM	TM	

Sample Description colorless, clear.
Data Verified By [signature] Date Verified Aug 17/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client Polaris
EVS Project No. 04-1424-044
EVS Work Order No. 0500~~0858~~398

Sample ID G-Creek 071605 Sublethal
Test Species/Batch A. affinis / 19-July-05
Test Initiation Date/Time 19-July-05 / 1430h
No. of Organisms/Volume 5/200ml

% (v/v) Concentration	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
17.9	A	T21	5	5	5	5	5	5	5	
	B	T22	5	5	5	5	5	5	5	
	C	T23	5	5	5	5	5	5	5	
	D	T24	5	5	5	5	5	5	5	
	E	T25	5	5	5	5	5	5	5	
~~35.9~~ RSD 35.7	A	T26	5	5	5	5	5	5	5	
	B	T27	5	5	5	5	5	5	5	
	C	T28	5	5	5	5	5	5	5	
	D	T29	5	5	5	5	5	5	5	
	E	T30	5	5	5	5	5	5	5	
71.4	A	T31	5	5	5	5	5	5	5	
	B	T32	5	5	5	5	5	5	4	
	C	T33	5	5	5	5	5	5	5	
	D	T34	5	5	5	5	5	5	5	
	E	T35	5	5	5	5	5	5	5	
	A									
	B									
	C									
	D									
	E									
Technician Initials		TM	SNB	SNB	SNB	MM	MM	MM	MM	

Sample Description colorless clear.
Data Verified By Gail Fink Date Verified Aug. 18/05

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Polaris

EVS Project No.: 04-1424-044

EVS Work Order No.: 05002[illegible]

Start Date (Day 0): 19-July-05 071605 sublethal

Sample ID: G-Creek

Balance Type/Serial Number: Sartorius / BP-211D

Sample ID (Y/N)	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
D-CTL	A	T1	1237.86	1242.66	5	5		AXF/[illegible]
	B	T2	1223.60	1228.84	5	5		
	C	T3	1234.30	1238.08	5	5		
	D	T4	122157	1226.62	5	5	confirmed 1226.58 mg ✓	
	E	T5	1215.08	1219.11	5	5		
B-CTL	A	T6	1236.55	1241.94	5	5		
	B	T7	1230.84	1236.489	5	5		
	C	T8	1223.70	1229.06	5	5		
	D	T9	1242.73	1247.44	5	5		
	E	T10	1228.47	1231.92	5	5		
4.5	A	T11	1221.11	1224.77	5	5	confirmed 1224.75 mg ✓	
	B	T12	1237.55	1240.97	5	5		
	C	T13	1221.54	1226.04	5	5		
	D	T14	1229.99	1232.59	4	4		
	E	T15	1220.96	1226.00	5	5		

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Ralph K

Date Verified: Aug. 17/05

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Polaris

EVS Project No.: 04-1424-044

EVS Work Order No.: 0500788

Start Date (Day 0): 19-July-05

Sample ID: G-Creek ~~07605~~ 07605 Sublethal 07/605

Balance Type/Serial Number: Sartorius / BP-211D

Sample ID	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
8-9	A	T16	1221.54	1226.60	5	5		AXF 7/20
	B	T17	1235.48	1241.14	5	5		
	C	T18	1237.41	1242.39	5	5		
	D	T19	1236.28	1238.98	5	5	Confirmed 1238.99 mg ✓	
	E	T20	1219.90	1221.88	4	4		
17.9	A	T21	1227.04	1231.84	5	5		
	B	T22	1246.60	1251.74	5	5		
	C	T23	1239.07	1243.68	5	5		
	D	T24	1231.19	1237.41	5	5		
	E	T25	AXF 1229.72	1234.23	5	5		
~~35.9~~ 35.7	A	T26	1230.92	1235.13	5	5	Confirmed 1235.14 mg ✓	
	B	T27	1228.42	1234.87	5	5		
	C	T28	1231.53	1237.73	5	5		
	D	T29	1235.66	1240.48	5	5		
	E	T30	1228.20	1233.15	5	5		

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Ralph K

Date Verified: Aug. 18/05

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client Polaris

EVS Project No. 04-1424-044

EVS Work Order No. 05002838

Start Date (Day 0) 19-July-05

Sample ID G-Creek ~~07/605~~ Sublethal 07/605

Balance Type/Serial Number Sartorius / BP-211D

Sample ID	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
71.4	A	T31	1227.99	1234.14	5	5		AXF 7.7
	B	T32	1230.90	1234.21	4	4		
	C	T33	1234.94	1239.77	5	5		
	D	T34	1230.30	1235.80	5	5		
	E	T35	1232.19	1234.5~~4~~.03	5	5		
	A							
	B							
	C							
	D							
	E							
	A							
	B							
	C							
	D							
	E							

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By Qacji 4

Date Verified Aug. 17/05

Test: LF-Larval Fish Growth and Survival Test | Test ID: 0500298
Species: AA-Atherinops affinis | Protocol: EPAW 95-EPA West Coast
Sample ID: G_CREEK_Sublethal_071605 | Sample Type: EFF2-Industrial
Start Date: 7/19/2005 End Date: 7/26/2005 | Lab ID: BCEVS-EVS Environment Consultants

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	No. Fish Weighed	Total Wgt(mg)	Tare Wgt(mg)
	1	1	D-Control	5							5	5	1237.86	1242.66
	2	2	D-Control	5							5	5	1223.6	1228.84
	3	3	D-Control	5							5	5	1234.3	1238.08
	4	4	D-Control	5							5	5	1221.57	1226.62
	5	5	D-Control	5							5	5	1215.08	1219.11
	6	1	B-Control	5							5	5	1236.55	1241.94
	7	2	B-Control	5							5	5	1230.84	1236.49
	8	3	B-Control	5							5	5	1223.7	1229.06
	9	4	B-Control	5							5	5	1242.73	1247.44
	10	5	B-Control	5							5	5	1228.47	1231.92
	11	1	4.5	5							5	5	1221.11	1224.77
	12	2	4.5	5							5	5	1237.55	1240.97
	13	3	4.5	5							5	5	1221.54	1226.04
	14	4	4.5	5							4	4	1229.99	1232.59
	15	5	4.5	5							5	5	1220.96	1226
	16	1	8.9	5							5	5	1221.54	1226.6
	17	2	8.9	5							5	5	1235.48	1241.14
	18	3	8.9	5							5	5	1237.41	1242.39
	19	4	8.9	5							5	5	1236.28	1238.98
	20	5	8.9	5							4	4	1219.9	1221.88
	21	1	17.9	5							5	5	1227.04	1231.84
	22	2	17.9	5							5	5	1246.6	1251.74
	23	3	17.9	5							5	5	1239.07	1243.68
	24	4	17.9	5							5	5	1231.19	1237.41
	25	5	17.9	5							5	5	1229.72	1234.23
	26	1	35.7	5							5	5	1230.92	1235.13
	27	2	35.7	5							5	5	1228.42	1234.87
	28	3	35.7	5							5	5	1231.53	1237.73
	29	4	35.7	5							5	5	1235.66	1240.48
	30	5	35.7	5							5	5	1228.2	1233.15
	31	1	71.4	5							5	5	1227.99	1234.14
	32	2	71.4	5							4	4	1230.9	1234.21
	33	3	71.4	5							5	5	1234.94	1239.77
	34	4	71.4	5							5	5	1230.3	1235.8
	35	5	71.4	5							5	5	1232.19	1235.03

Comments: Azimuth(Polaris) 04-1424-044

Reviewed by Aug. 18/05

Larval Fish Growth and Survival Test-7-d survival

Start Date:	7/19/2005	Test ID:	500298	Sample ID:	G_CREEK_Sublethal_071605
End Date:	7/26/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth(Polaris) 04-1424-044				

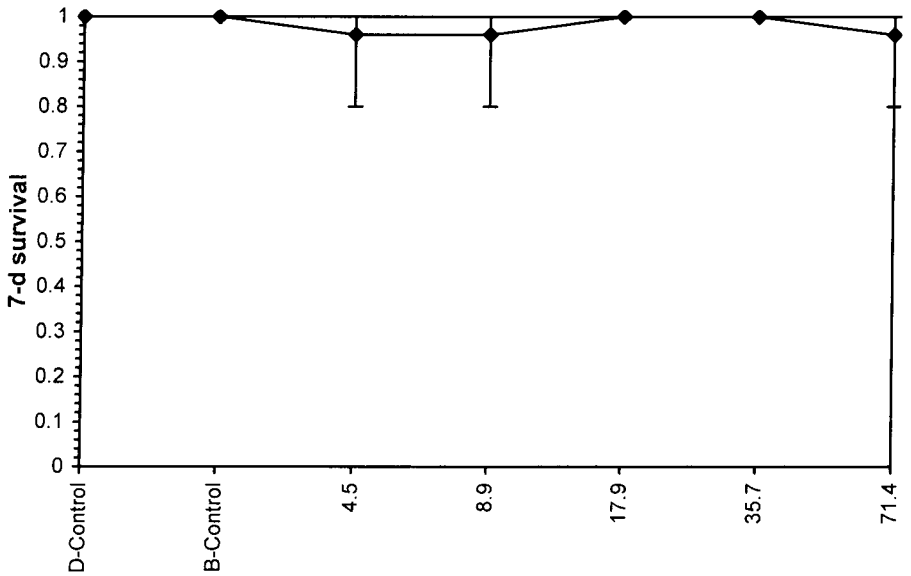
Conc-%	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000
B-Control	1.0000	1.0000	1.0000	1.0000	1.0000
4.5	1.0000	1.0000	1.0000	0.8000	1.0000
8.9	1.0000	1.0000	1.0000	1.0000	0.8000
17.9	1.0000	1.0000	1.0000	1.0000	1.0000
35.7	1.0000	1.0000	1.0000	1.0000	1.0000
71.4	1.0000	0.8000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5		
B-Control	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5		
4.5	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	25.00	16.00
8.9	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	25.00	16.00
17.9	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	27.50	16.00
35.7	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	27.50	16.00
71.4	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	25.00	16.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.59678	0.9	-2.2346	4.3922
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 1.00)	0	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	71.4	>71.4		1.40056

Dose-Response Plot



Statistical comparisons were against the negative control.

Larval Fish Growth and Survival Test-7-d survival

Start Date:	7/19/2005	Test ID:	500298	Sample ID:	G_CREEK_Sublethal_071605
End Date:	7/26/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth(Polaris) 04-1424-044				

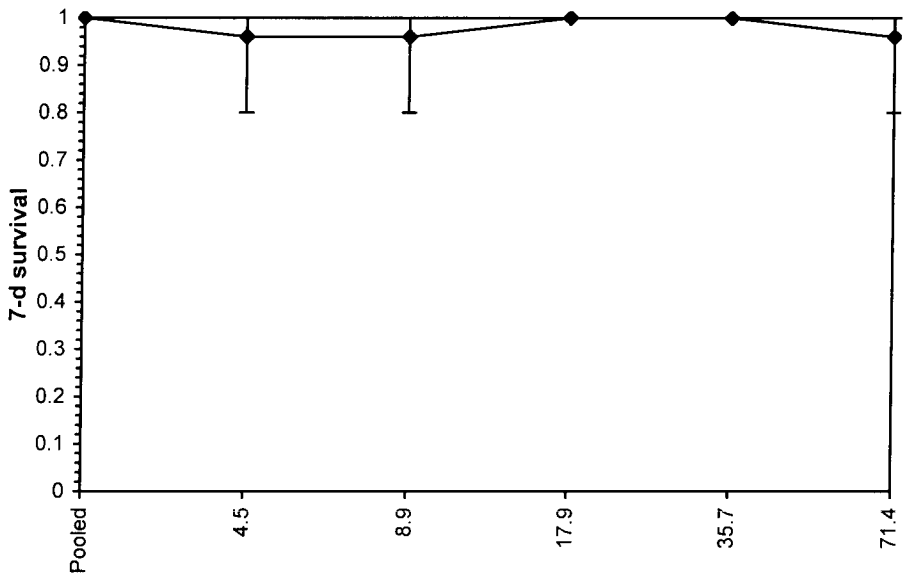
Conc-%	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000
B-Control	1.0000	1.0000	1.0000	1.0000	1.0000
4.5	1.0000	1.0000	1.0000	0.8000	1.0000
8.9	1.0000	1.0000	1.0000	1.0000	0.8000
17.9	1.0000	1.0000	1.0000	1.0000	1.0000
35.7	1.0000	1.0000	1.0000	1.0000	1.0000
71.4	1.0000	0.8000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical
Pooled	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	10		
4.5	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	35.00	21.00
8.9	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	35.00	21.00
17.9	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	40.00	21.00
35.7	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	40.00	21.00
71.4	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	35.00	21.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.58129	0.91	-2.3952	5.50568
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 1.00)	0	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Wilcoxon Rank Sum Test	71.4	>71.4		1.40056

Dose-Response Plot



Statistical comparisons were agianst the pooled controls.

Reviewed by: Aug. 18/05

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	7/19/2005	Test ID:	500298	Sample ID:	G_CREEK_Sublethal_071605
End Date:	7/26/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth(Polaris) 04-1424-044				

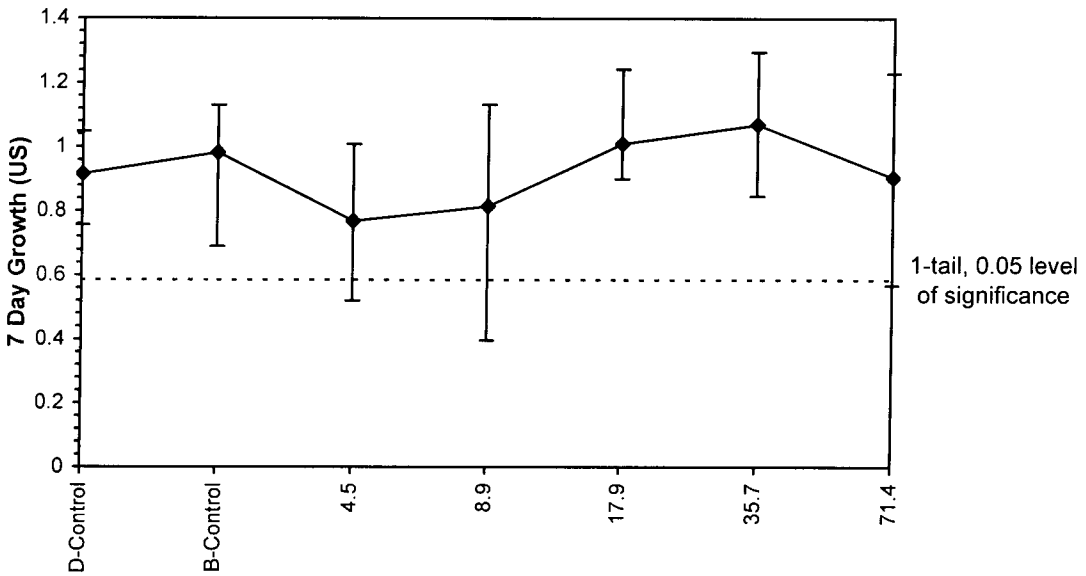
Conc-%	1	2	3	4	5
D-Control	0.9600	1.0480	0.7560	1.0100	0.8060
B-Control	1.0780	1.1300	1.0720	0.9420	0.6900
4.5	0.7320	0.6840	0.9000	0.5200	1.0080
8.9	1.0120	1.1320	0.9960	0.5400	0.3960
17.9	0.9600	1.0280	0.9220	1.2440	0.9020
35.7	0.8420	1.2900	1.2400	0.9640	0.9900
71.4	1.2300	0.6620	0.9660	1.1000	0.5680

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.9160	0.1284	0.9160	0.7560	1.0480	14.012	5			
B-Control	0.9824	0.1775	0.9824	0.6900	1.1300	18.072	5			
4.5	0.7688	0.1903	0.7688	0.5200	1.0080	24.755	5	1.051	2.360	0.3307
8.9	0.8152	0.3253	0.8152	0.3960	1.1320	39.903	5	0.719	2.360	0.3307
17.9	1.0112	0.1387	1.0112	0.9020	1.2440	13.719	5	-0.679	2.360	0.3307
35.7	1.0652	0.1916	1.0652	0.8420	1.2900	17.985	5	-1.065	2.360	0.3307
71.4	0.9052	0.2828	0.9052	0.5680	1.2300	31.246	5	0.077	2.360	0.3307

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96171	0.9	-0.2156	-0.8642
Bartlett's Test indicates equal variances (p = 0.42)	4.97608	15.0863		
The control means are not significantly different (p = 0.52)	0.67773	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	71.4	>71.4		1.40056	0.33065	0.36097	0.06323	0.04907	0.30153	5, 24

Dose-Response Plot



Statistical comparisons were against the negative control.

Reviewed by: Aug. 18/05

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	7/19/2005	Test ID:	500298	Sample ID:	G_CREEK_Sublethal_071605
End Date:	7/26/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth(Polaris) 04-1424-044				

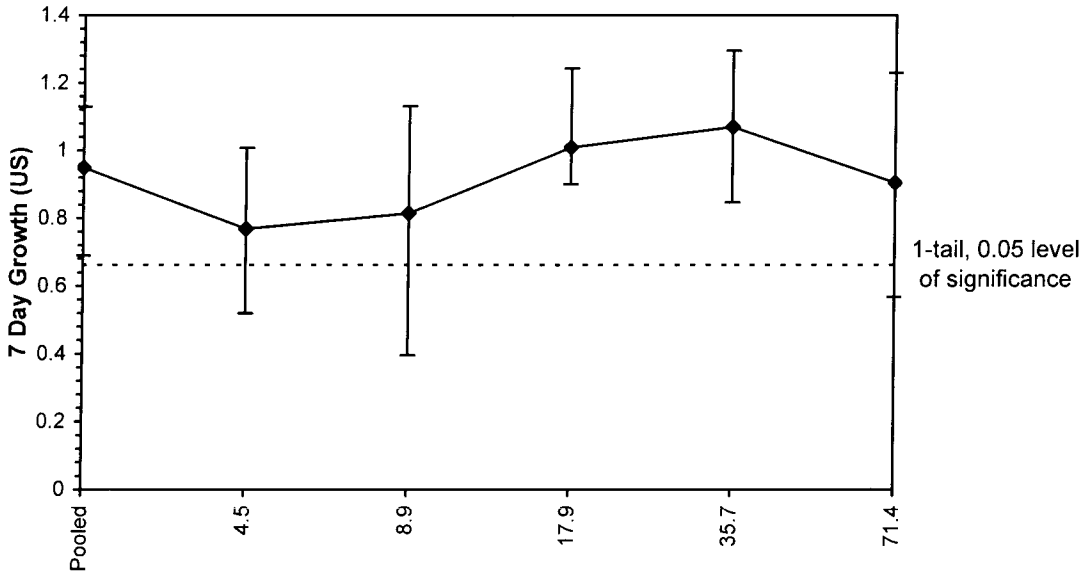
Conc-%	1	2	3	4	5
D-Control	0.9600	1.0480	0.7560	1.0100	0.8060
B-Control	1.0780	1.1300	1.0720	0.9420	0.6900
4.5	0.7320	0.6840	0.9000	0.5200	1.0080
8.9	1.0120	1.1320	0.9960	0.5400	0.3960
17.9	0.9600	1.0280	0.9220	1.2440	0.9020
35.7	0.8420	1.2900	1.2400	0.9640	0.9900
71.4	1.2300	0.6620	0.9660	1.1000	0.5680

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Pooled	0.9492	0.1502	0.9492	0.6900	1.1300	15.822	10			
4.5	0.7688	0.1903	0.7688	0.5200	1.0080	24.755	5	1.547	2.462	0.2871
8.9	0.8152	0.3253	0.8152	0.3960	1.1320	39.903	5	1.149	2.462	0.2871
17.9	1.0112	0.1387	1.0112	0.9020	1.2440	13.719	5	-0.532	2.462	0.2871
35.7	1.0652	0.1916	1.0652	0.8420	1.2900	17.985	5	-0.995	2.462	0.2871
71.4	0.9052	0.2828	0.9052	0.5680	1.2300	31.246	5	0.377	2.462	0.2871

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9613	0.91	-0.2544	-0.8676
Bartlett's Test indicates equal variances (p = 0.38)	5.3243	15.0863		
The control means are not significantly different (p = 0.52)	0.67773	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	71.4	>71.4		1.40056	0.28714	0.30251	0.06509	0.04534	0.24132	5, 29

Dose-Response Plot



Statistical comparisons were against the ~~negative control~~ Pooled controls

Reviewed by Aug-18/05

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST DATA SUMMARY

Client (Polaris) Azimuth

EVS Analysts JXS, SXB, MJG, AXF

EVS Project No. 04-1424-044

EVS Work Order No. ~~05002~~ 0500~~25~~298

Test Initiation Date 19-July-05

Sample	Initial Sample	Refresh Samples	
	Day 0	Day 2	Day 4
Identification	100 mg/L Cu Stock (05-Cu-001)		
Amount ~~Received~~ Prepared	1x1L		
Date ~~Collected~~ Prepared	7 Mar 05		
Date Received	na		
Temperature (°C)	↓		
pH			
DO (mg/L)			
Conductivity (μmhos/cm)			
Salinity (ppt)			
Ammonia (mg/L N)			
Chlorine (mg/L Cl)			
Other	↓		

DILUTION/CONTROL WATER (initial water quality)

Water Type Filtered, UV sterilized seawater

Temperature (°C) 20.0

pH 7.8

Dissolved Oxygen (mg/L) 7.5

Salinity 28

TEST SPECIES INFORMATION

Source ABS

Date Received 19-July-05

Age (on Day 0) 10-d

Reference Toxicant Cu

Current Reference Toxicant Result (incl. 95% CL)

Reference Toxicant Test Date 19 Jul 05

7-d survival LC50 ~~122 (106-140)~~ 117 (100-136) μg/L Cu

7-d growth IC50 ~~112 (80-149)~~ 116 (81-156) μg/L Cu

Reference Toxicant Warning Limits (mean ± 2SD) and CV

7-d survival LC50 133 ± 39 μg/L Cu CV=15%

7-d growth IC50 132 ± 46 μg/L Cu CV=17%

TEST CONDITIONS

Temperature Range (°C) 20.0 - 21.0

pH Range 7.7 - 8.0

Dissolved Oxygen Range (mg/L) ~~6.3~~ 6.2 - 7.7

Salinity (ppt) 28

Photoperiod (L:D h) 16:8

Aeration Provided? No

Other -

TEST RESULTS

Endpoint	Conc. Units	NOEC	LOEC	LC50 (95% CL)	IC50 (95% CL)	IC25 (95% CL)
Survival	μg/L Cu	100	180	117 (100-136) ~~122 (106-140)~~		
Growth		56	100		116 (81-156) ~~112 (80-144)~~	83 (68-114) ~~80 (65-114)~~

Other

Data Verified By [signature]

Date Verified Aug 22/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA (EEM)

Client (Polaris) Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 0500~~258~~ 298 RSD

Sample ID Cu Reference Toxicant
Test Initiation Date/Time 19-July-05/1440h
Source/Date Received ABS/19-July-05

Cu (µg/L) Concentration	Temperature (°C)													
	0	old	1 new	2		3		4		5		6		7
0-control	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
32	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
56	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
100	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
180	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
320	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0 ~~21.0~~	—	—	—	—	—	—
								MG						
Tech. Initials	TH	SxB	SxB	SxB	SxB	SxB	SxB	MG	MG	MG	MG	MG	MG	TH

Cu (µg/L) Concentration	pH													
	0	old	1 new	2		3		4		5		6		7
0-control	7.8	7.7	7.7	7.7	7.8	7.7	7.9	7.8	7.9	7.8	7.8	7.9	7.9	7.9
32	7.8	7.7	7.7	7.7	7.8	7.7	7.9	7.8	7.9	7.8	7.8	7.9	7.9	7.9
56	7.8	7.7	7.8	7.7	7.8	7.7	7.9	7.8	7.9	7.8	7.8	7.9	7.9	7.9
100	7.8	7.7	7.7	7.7	7.8	7.8	7.9	7.8	7.9	7.8	7.8	8.0	7.9	7.9
180	7.8	7.7	7.8	7.7	7.8	7.8	7.9	7.8	7.9	7.8	7.8	8.0	7.9	7.9
320	7.8	7.7	7.8	7.7	7.8	7.8	7.9	7.8	7.9	7.8	7.8	8.0	7.9	7.9
Tech. Initials	TH	SxB	SxB	SxB	SxB	SxB	SxB	MG	MG	MG	MG	MG	MG	TH

WQ Instruments Used: Temp. Calibrated Hg thermometer pH II-A-030301
Comments

Test Set Up By JMS. SxB Data Verified By Qalfish Date Verified Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA (EEM)

Client (Polaris) Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 05072158 2918 RSP

Sample ID Cu Reference Toxicant
Test Initiation Date/Time 19-July-05/1440h
Source/Date Received ABS/19-July-05

Cu (mg/L) Concentration	Salinity (ppt)													
	0	1		2		3		4		5		6		7
0-control	28	28	28	28	28	28	28	28	28	28	28	28	28	28
32	28	28	28	28	28	28	28	28	28	28	28	28	28	28
56	28	28	28	28	28	28	28	28	28	28	28	28	28	28
100	28	28	28	28	28	28	28	28	28	28	28	28	28	28
180	28	28	28	28	28	28	28	28	28	28	28	28	28	28
320	28	28	28	28	28	28	28	28	—	—	—		—	—
Tech. Initials	TJ	SXB	SXB	SXB	SXB	SXB	SXB	SXB	MC	SXB	MC	SXB	MC	SXB

Cu (mg/L) Concentration	Dissolved Oxygen (mg/L)													
	0	1		2		3		4		5		6 MC 7.7		7
0-control	7.5	6.8	7.5	6.7	7.5	6.6	7.5	6.6	7.7	6.5	7.7	6.6	~~7.9~~	6.2
32	7.5	6.5	7.5	6.7	7.5	6.5	7.5	6.6	7.7	6.5	7.7	6.6	7.7	6.3
56	7.5	6.6	7.5	6.8	7.5	6.6	7.5	6.5	7.7	6.5	7.7	6.7	7.7	6.6
100	7.5	6.6	7.5	6.7	7.5	6.6	7.5	6.6	7.7	6.4	7.7	6.7	7.7	6.4
180	7.5	6.6	7.5	6.7	7.5	6.6	7.5	6.6	7.7	6.5	7.7	6.6	7.7 MC	6.6
320	7.5	6.6	7.5	6.7	7.5	6.7	7.5	6.5	~~7.7~~ MC	—	—	—	—	
Tech. Initials	TJ	SXB	SXB	SXB	SXB	SXB	SXB	MC	MC	MC	MC	MC	MC	TJ

WQ Instruments Used: Salinity I-A-050505 DO I-A-0814
Comments

Test Set Up By TJ SXB Data Verified By [signature] Date Verified Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client (Polaris) Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 0589 ~~458~~ 298
RSO

Sample ID Cu Reference Toxicant
Test Species/Batch A. affinis/19-July-05
Test Initiation Date/Time 19-July-05/1440h
No. of Organisms/Volume 5/200mL

Cu (mg/L) Concentration	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
D-control	A	A80	5	5	5	5	5	5	5	
	B	A81	5	5	5	5	5	5	5	
	C	A82	5	5	5	5	5	5	5	
	D	A83	5	5	5	5	5	5	dead 4	
	E	A84	5	5	5	5	5	5	5	
32	A	A85	5	5	5	5	5	5	5	
	B	A86	5	5	5	5	5	5	5	
	C	A87	5	5	5	5	5	5	5	
	D	A88	5	5	5	5	5	5	5	
	E	A89	5	5	5	5	5	5	4	
56	A	A91	5	5	4	4	4	4	4	
	B	A92	5	5	5	5	5	5	5	
	C	A93	5	5	5	5	5	5	5	
	D	A94	5	5	5	5	5	5	5	
	E	A95	5	5	5	5	5	5	5	
100	A	A66	5	3	2	2	2	2	2	
	B	A67	4	1	1	1	1	1	1	
	C	A68	5	4	4	4	4	4	4	
	D	A69	5	4	4	4	4	5	4	
	E	A70	5	5	5	5	5	5	5	
Technician Initials		TM	SXB	SXB	SXB	TM	TM	TM	TM	

Sample Description clear, colorless.
Data Verified By Qalfish Date Verified Aug. 17/05

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client (Polaris) Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 0500~~158~~ 292
150

Sample ID Cu Reference Toxicant
Test Species/Batch A. affinis/19-July-05
Test Initiation Date/Time 19-July-05/1440h
No. of Organisms/Volume 5/200 ml

Cu (mg/L) Concentration	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
180	A		4	3	0	0	0	0 MK	—	
	B	471	5	5	4	4	4	~~3~~ 4	3	
	C		5	3	2	1	0	0	—	
	D		4	2	2	1	0	0	—	
	E	472	5	3	2	2	1	1	1	
320	A		3	2	1	0	0	0	-	
	B		2	2	0	0	0	0	—	
	C		2	2	1	0	0	0	—	
	D		2	2	0	0	0	0	—	
	E		3	2	0	0	0	0	—	
	A									
	B									
	C									
	D									
	E									
	A									
	B									
	C									
	D									
	E									
Technician Initials		TM	SxB	SxB	SxB	MK	MK	MK	TM	

Sample Description clear, colorless
Data Verified By Malfik Date Verified Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Azimuth (Polaris)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500298

Start Date (Day 0): 19-July-05
Sample ID: Cu Reference Toxicant
Balance Type/Serial Number: Sartorius / BP-211D

Sample ID	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
D-CTL	A	A80	1225.71	1231.08	5	5		JxT/TT
	B	A81	1228.66	1232.69	5	5		
	C	A82	1235.20	1239.66	5	5	Confirmed 1239.84 mg ✓	
	D	A83	1233.97	1239.36	~~5~~ 4	~~5~~ 4	1 fish lost when transferring	
	E	A84	1228.91	1234.00	5	5		

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: [signature]
Date Verified: Aug. 18/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Azimuth (Polaris)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500298

Start Date (Day 0): 19-Jul-05
Sample ID: Cu Reference Toxicant
Balance Type/Serial Number: Sartorius/BP-211D

Sample ID	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
32	A	A85	1229.51	1236.23	5	5		AXF/mm
	B	A86	1233.16	1239.24	5	5		
	C	A87	1234.56	1238.84	5	5		
	D	A88	1225.13	1231.48	5	5		
	E	A89	1236.28	1241.25	4	4		
56	A	A91	1245.68	1249.99	4	4		
	B	A92	1222.48	1227.32	5	5		
	C	A93	1240.76	1246.95	5	5		
	D	A94	1233.51	1239.05	5	5		
	E	A95	1239.61	1245.85	5	5		
	A							
	B							
	C							
	D							
	E							

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Ralph

Date Verified: Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Azimuth (Polaris)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500248

Start Date (Day 0): 19-Jul-05
Sample ID: Cu Reference Toxicant
Balance Type/Serial Number: Sartorius/BP-211D

Sample ID mg/L	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
100	A	A66	1227.36	1229.94	2	2		AXF
	B	A67	1237.38	1238.70	1	1		
	C	A68	1224.68	1228.~~49~~ 24	4	4	Confirmed 1228.25 mg ✓	
	D	A69	1232.31	1236.61	4	4		
	E	A70	1244.03	1247.98	5	5		
180	~~A~~ B	A71	1239.12	1241.93	3	3	Confirmed 1241.90 mg ✓	
	~~B~~ E	A72	1214.89	1215.67	1	1		
	~~C~~	~~A73~~	~~1221.50~~					
	~~D~~	~~A74~~	~~1238.30~~					
	~~E~~							
	A							
	B							
	C							
	D							
	E							

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Ralph

Date Verified: Aug. 17/05

Test: LF-Larval Fish Growth and Survival Test
Test ID: RTAACu45
Species: AA-Atherinops affinis
Protocol: EPAW 95-EPA West Coast
Sample ID: REF-Ref Toxicant
Sample Type: CU-Copper
Start Date: 7/19/2005 End Date: 7/26/2005
Lab ID: BCEVS-EVS Environment Consultants

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	No. Fish Weighed	Total Wgt(mg)	Tare Wgt(mg)
	1	1	D-Control	5							5	5	1225.71	1231.08
	2	2	D-Control	5							5	5	1228.66	1232.69
	3	3	D-Control	5							5	5	1235.2	1239.86
	4	4	D-Control	5							5	5	1233.97	1239.36
	5	5	D-Control	5							5	5	1228.91	1234
	6	1	32.0	5							5	5	1229.51	1236.23
	7	2	32.0	5							5	5	1233.16	1239.24
	8	3	32.0	5							5	5	1234.56	1238.84
	9	4	32.0	5							5	5	1225.13	1231.48
	10	5	32.0	5							4	4	1236.28	1241.25
	11	1	56.0	5							4	4	1245.68	1249.99
	12	2	56.0	5							5	5	1222.48	1227.32
	13	3	56.0	5							5	5	1240.76	1246.95
	14	4	56.0	5							5	5	1233.51	1239.05
	15	5	56.0	5							5	5	1239.61	1245.85
	16	1	100.0	5							2	2	1227.36	1229.94
	17	2	100.0	5							1	1	1237.38	1238.7
	18	3	100.0	5							4	4	1224.68	1228.24
	19	4	100.0	5							4	4	1232.31	1236.61
	20	5	100.0	5							5	5	1244.03	1247.98
	21	1	180.0	5							0	0	0	0
	22	2	180.0	5							3	3	1239.12	1241.93
	23	3	180.0	5							0	0	0	0
	24	4	180.0	5							0	0	0	0
	25	5	180.0	5							1	1	1214.89	1215.67
	26	1	320.0	5							0	0	0	0
	27	2	320.0	5							0	0	0	0
	28	3	320.0	5							0	0	0	0
	29	4	320.0	5							0	0	0	0
	30	5	320.0	5							0	0	0	0

Comments: Azimuth Polaris 04-1424-044 (0500298)

Reviewed by: Aug. 22/05

Larval Fish Growth and Survival Test-7-d survival

Start Date:	7/19/2005	Test ID:	RTAACu45	Sample ID:	REF-Ref Toxicant
End Date:	7/26/2005	Lab ID:	BCEVS-EVS Environment C	Sample Type:	CU-Copper
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth Polaris 04-1424-044 (0500298)				

Conc-ug/L	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000
32	1.0000	1.0000	1.0000	1.0000	0.8000
56	0.8000	1.0000	1.0000	1.0000	1.0000
100	0.4000	0.2000	0.8000	0.8000	1.0000
180	0.0000	0.6000	0.0000	0.0000	0.2000
320	0.0000	0.0000	0.0000	0.0000	0.0000

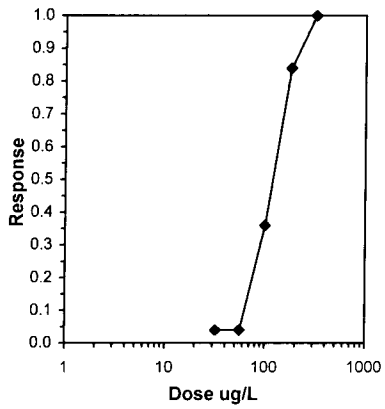
			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-ug/L	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5			0	25
32	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	25.00	17.00	1	25
56	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	25.00	17.00	1	25
100	0.6400	0.3286	0.9416	0.4636	1.3453	38.004	5	17.50	17.00	9	25
*180	0.1600	0.2608	0.4053	0.2255	0.8861	71.039	5	15.00	17.00	21	25
320	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	5			25	25

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.90309	0.888	0.17519	1.66432
Equality of variance cannot be confirmed				

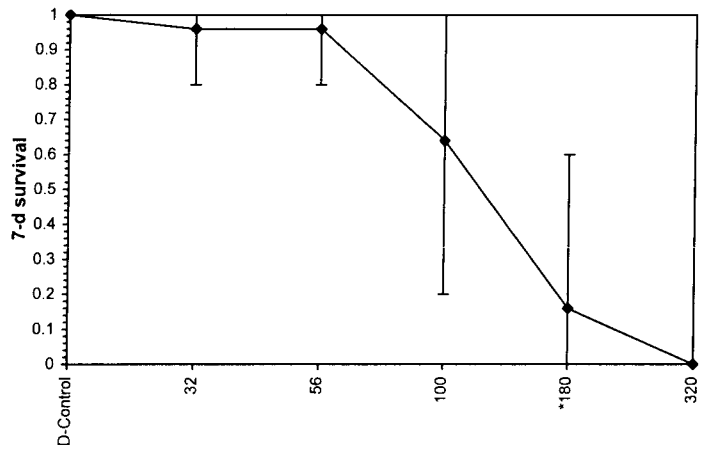
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	180	134.164	

Trimmed Spearman-Karber

Trim Level	EC50	95% CL		
0.0%				
5.0%	116.88	100.05	136.55	
10.0%	116.41	98.86	137.08	
20.0%	117.22	94.25	145.79	
Auto-4.0%	117.04	100.39	136.44	ug/L Cu



Dose-Response Plot



Reviewed by Aug. 22/05

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	7/19/2005	Test ID:	RTAACu45	Sample ID:	REF-Ref Toxicant
End Date:	7/26/2005	Lab ID:	BCEVS-EVS Environment C	Sample Type:	CU-Copper
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth Polaris 04-1424-044 (0500298)				

Conc-ug/L	1	2	3	4	5
D-Control	1.0740	0.8060	0.9320	1.0780	1.0180
32	1.3440	1.2160	0.8560	1.2700	0.9940 ✓
56	0.8620	0.9680	1.2380	1.1080	1.2480
100	0.5160	0.2640 ✓	0.7120	0.8600	0.7900
180	0.0000	0.5620	0.0000	0.0000	0.1560 ✓
320	0.0000	0.0000	0.0000	0.0000	0.0000

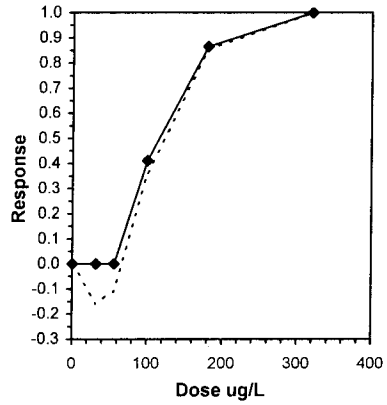
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-ug/L	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.9816	0.1145	0.9816	0.8060	1.0780	11.666	5				1.0675	1.0000
32	1.1360	0.2038	1.1360	0.8560	1.3440	17.943	5	-1.219	2.300	0.2913	1.0675	1.0000
56	1.0848	0.1688	1.0848	0.8620	1.2480	15.557	5	-0.815	2.300	0.2913	1.0675	1.0000
*100	0.6284	0.2409	0.6284	0.2640	0.8600	38.338	5	2.789	2.300	0.2913	0.6284	0.5887
*180	0.1436	0.2435	0.1436	0.0000	0.5620	169.535	5	6.618	2.300	0.2913	0.1436	0.1345
320	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	5				0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9755	0.888	0.077	-0.1953
Bartlett's Test indicates equal variances (p = 0.66)	2.41004	13.2767		

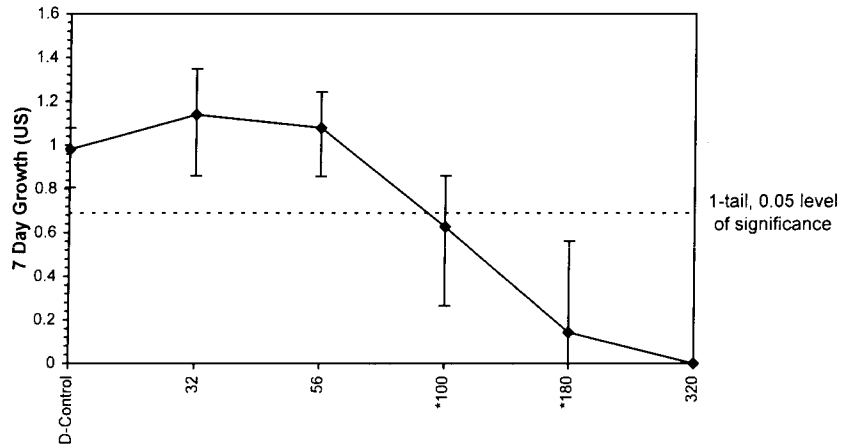
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	56	100	74.8331		0.29126	0.29672	0.85895	0.04009	5.4E-07	4, 20

Linear Interpolation (200 Resamples)

Point	ug/L	SD	95% CL(Exp)		Skew	
IC05	61.35	6.16	30.65	67.13	-1.9529	
IC10	66.70	4.93	43.95	78.27	-0.6852	
IC15	72.05	5.63	55.64	91.09	0.5478	
IC20	77.39	6.77	62.96	102.78	1.0777	
IC25	82.74	7.81	67.65	114.17	0.9592	
IC40	98.79	11.11	78.22	135.91	0.5373	
IC50	115.62	14.64	80.73	156.41	0.6255	ug/L Cu



Dose-Response Plot



Reviewed by Aug 22/05

APPENDIX II

Raw Data and Statistical Analyses:

Dendraster excentricus

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST DATA SUMMARY

Client Azimuth Consulting (Polaris Mine)
EVS Project No. 04-1424-044
EVS Work Order No. 0500299

EVS Analysts SRS
Test Initiation Date 19 July 05

SAMPLE

Identification G-creek sublethal 071605
Amount Received 3x20L
Date Collected 16-Jul-05
Date Received 19-Jul-05
Temperature (°C) 14.0 ① → 15.0
pH 7.5 ① → 8.2
Dissolved Oxygen (mg/L) 11.1 ① → 8.5
Conductivity (µmhos/cm) 1520
Salinity (ppt) 3.0 ① → 28
Ammonia (mg/L N) —
Chlorine (mg/L Cl) —
Other —

① Brine Adjustment

TEST SPECIES

Organism Dendraster excentricus
Source Westcoast Sea Lab
Date Received ~~SDS~~ SRS 19 Jul 05
Reference Toxicant SDS
Current Reference Toxicant Result
Reference Toxicant Test Date 19 Jul 05
IC50 (and 95% CL) 5.8 (5.2 - 6.5) mg/L
Reference Toxicant Warning Limits (mean ± 2SD) and CV
3.6 ± 4.4 mg/L SDS; CV = 60%

DILUTION/CONTROL WATER (initial water quality)

Water Type UV sterilized; 0.45µm filtered SW
Temperature (°C) 15
pH 7.9
Dissolved Oxygen (mg/L) 8.5
Salinity (ppt) 28
Other —

TEST CONDITIONS

Temperature Range (°C) 15.0
pH Range 7.9 - 8.3
Dissolved Oxygen Range (mg/L) ~~7.9~~ SRS 7.9 - 8.5
Salinity Range (ppt) 28
Sperm:Egg Ratio 2000:1
Test Duration 10:10
Other —

TEST RESULTS

Statistical comparisons were against pooled controls
IC_{50}: 13.2 (10.8 - 16.9) % v/v
IC_{25}: 5.2 (4.4 - 6.1) % v/v
NOEC: < 4.6 % v/v
LOEC: 4.6 % v/v

Data Verified By [signature]
Date Verified Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST INITIAL WATER QUALITY

Client: Azimuth (Polaris Mine)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500299
Logbook: Edmonds #13 Pages: 68-71

Test Initiation Date/Time: 19 July 05 / 1514
Test Species: Dendraster excentricus
Source/Date Received: Westmar Seatab / 19 July 05
Test Duration: 10:10

Sample ID G-Creek sublethal 071605	Temperature (°C)	pH	Salinity (ppt)	Dissolved Oxygen (mg/L)	Comments
Control	15	7.9	28	8.5	
Brine Control	15	8.3	28	8.5	
4.6 %v/v	15	8.0	28	8.5	
9.1% v/v	15	8.1	28	8.5	
18.2 ~~SRS~~ ±8.3 %v/v	15	8.1	28	8.5	
36.4 ~~SRS~~ ±6.6 %v/v	15	8.1	28	8.5	
Max (72.8%v)	15	8.2	28	8.5	
Technician Initials	SRS	SRS	SRS	SRS	

WQ Instruments Used: Temp. Calibrated Hg Thermometer pH II-A-030301 Salinity II-A-030304 DO II-A-20

Sample Description: Sample is clear with no odour.

Data Verified By: Qaljf Date Verified: Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST – EGG COUNT (SAMPLES)

Client: Azimuth (Polaris Mine)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500299
Logbook: Echinoid #13 Pages: 68-71

Test Initiation Date/Time: 19 July 05 / 1514
Test Species: Dendraster excentricus
Source/Date Received: 19 July 05 / Westwind Seaclub
Test Duration: 10:10
Sperm:Egg Ratio: 2000:1

Sample ID (%(V/V))	Replicate	Number of Fertilized Eggs	Number of Unfertilized Eggs	Comments	Tech. Initials
Control	A	64	36		SRS
	B	60	40		
	C	66	34		
	D	69	31		
G-Creek Subsurface 071605 4.6	A	56	44		SRS
	B	51	49		
	C	52	48		
	D	53	47		
G-Creek Subsurface 071605 9.1	A	39	61		SRS
	B	37	63		
	C	37	63		
	D	36	64		
G-Creek Subsurface 071605 18.2 SRS	A	33	67		SRS
	B	~~38~~ 28	72		
	C	29	71		
	D	30	70		
G-Creek Subsurface 071605 36.4 SRS	A	20	80		SRS
	B	27	73		
	C	23	77		
	D	24	76		
G-Creek Subsurface 071605 Max (72.8)	A	20	80		SRS
	B	16	84		
	C	21	79		
	D	21	79		

Data Verified By: [signature]
Date Verified: Aug. 17/05

Test: SC-Sperm Cell Fertilization test					Test ID: 0500299		
Species: DE-Dendraster excentricus					Protocol: EPS1/RM/27-EC 92 (Sperm Cell)		
Sample ID: g_creek sublethal 071605					Sample Type: GW-groundwater		
Start Date: 7/19/2004 10:10			End Date: 7/19/2004		Lab ID: BCEVS-EVS Environment Consultants		
Pos	ID	Rep	Group	Total Counted	Number Fertilized	Number Unfertilized	Notes
	1	1	D-Control	100	64	36	
	2	2	D-Control	100	60	40	
	3	3	D-Control	100	66	34	
	4	4	D-Control	100	69	31	
	5	1	B-Control	100	70	30	
	6	2	B-Control	100	68	32	
	7	3	B-Control	100	71	29	
	8	4	B-Control	100	67	33	
	9	1	4.600	100	56	44	
	10	2	4.600	100	51	49	
	11	3	4.600	100	52	48	
	12	4	4.600	100	53	47	
	13	1	9.100	100	39	61	
	14	2	9.100	100	37	63	
	15	3	9.100	100	37	63	
	16	4	9.100	100	36	64	
	17	1	18.200	100	33	67	
	18	2	18.200	100	28	72	
	19	3	18.200	100	29	71	
	20	4	18.200	100	30	70	
	21	1	36.400	100	20	80	
	22	2	36.400	100	27	73	
	23	3	36.400	100	23	77	
	24	4	36.400	100	24	76	
	25	1	72.800	100	20	80	
	26	2	72.800	100	16	84	
	27	3	72.800	100	21	79	
	28	4	72.800	100	21	79	

Comments: Azimuth Consulting Group (Polaris) 04-1424-044 (0500299)

Reviewed by: Aug 19/04

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	7/19/2004 10:10	Test ID:	500299	Sample ID:	g_creek sublethal 071605
End Date:	7/19/2004	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	GW-groundwater
Sample Date:	7/16/2004	Protocol:	EPS1/RM/27-EC 92 (Sperm (	Test Species:	DE-Dendraster excentricus
Comments:	Azimuth Consulting Group (Polaris) 04-1424-044 (0500299)				

Conc-%	1	2	3	4
D-Control	0.6400	0.6000	0.6600	0.6900
B-Control	0.7000	0.6800	0.7100	0.6700
4.6	0.5600	0.5100	0.5200	0.5300
9.1	0.3900	0.3700	0.3700	0.3600
18.2	0.3300	0.2800	0.2900	0.3000
36.4	0.2000	0.2700	0.2300	0.2400
72.8	0.2000	0.1600	0.2100	0.2100

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Pooled	0.6688	0.0356	0.6688	0.6000	0.7100	5.328	8				0.6688	1.0000
*4.6	0.5300	0.0216	0.5300	0.5100	0.5600	4.076	4	8.308	2.508	0.0419	0.5300	0.7925
*9.1	0.3725	0.0126	0.3725	0.3600	0.3900	3.378	4	17.739	2.508	0.0419	0.3725	0.5570
*18.2	0.3000	0.0216	0.3000	0.2800	0.3300	7.201	4	22.080	2.508	0.0419	0.3000	0.4486
*36.4	0.2350	0.0289	0.2350	0.2000	0.2700	12.284	4	25.972	2.508	0.0419	0.2350	0.3514
*72.8	0.1950	0.0238	0.1950	0.1600	0.2100	12.208	4	28.367	2.508	0.0419	0.1950	0.2916

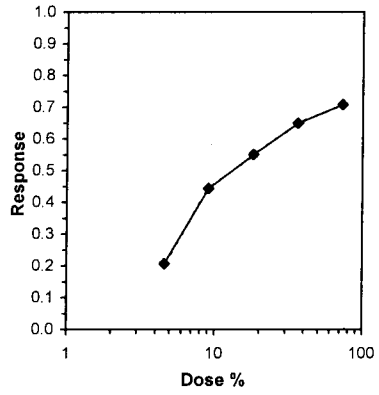
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96577	0.896	-0.6264	0.89125
Bartlett's Test indicates equal variances (p = 0.59)	3.72999	15.0863		
The control means are not significantly different (p = 0.09)	2.02707	2.44691		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	<4.6	4.6			0.04189	0.06264	0.18978	0.00074	1.0E-18	5, 22

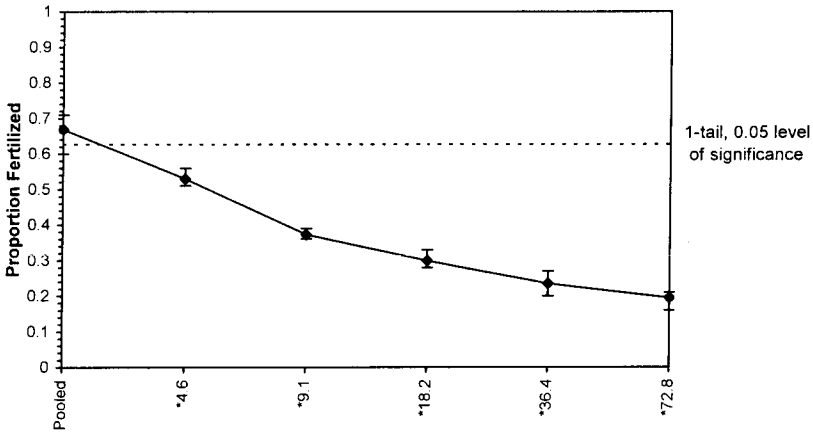
Log-Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew	
IC05*	0.515	0.065	0.376	0.746	1.1707	
IC10*	1.294	0.204	0.886	2.030	1.4723	
IC15*	2.475	0.454	1.574	4.227	1.0928	
IC20*	4.263	0.546	2.495	5.437	-0.5325	
IC25	5.229	0.268	4.417	6.073	-0.2992	
IC40	8.069	0.268	7.197	8.864	-0.1114	
IC50	13.159	1.074	10.756	16.853	0.9349	%v/v

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Note: Statistical comparisons were against pooled controls

Reviewed by:

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	7/19/2004 10:10	Test ID:	500299	Sample ID:	g_creek sublethal 071605
End Date:	7/19/2004	Lab ID:	BCEVS-EVS Environment C	Sample Type:	GW-groundwater
Sample Date:	7/16/2004	Protocol:	EPS1/RM/27-EC 92 (Sperm	Test Species:	DE-Dendraster excentricus
Comments:	Azimuth Consulting Group (Polaris) 04-1424-044 (0500299)				

Conc-%	1	2	3	4
D-Control	0.6400	0.6000	0.6600	0.6900
B-Control	0.7000	0.6800	0.7100	0.6700
4.6	0.5600	0.5100	0.5200	0.5300
9.1	0.3900	0.3700	0.3700	0.3600
18.2	0.3300	0.2800	0.2900	0.3000
36.4	0.2000	0.2700	0.2300	0.2400
72.8	0.2000	0.1600	0.2100	0.2100

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6475	0.0377	0.6475	0.6000	0.6900	5.830	4				0.6475	1.0000
B-Control	0.6900	0.0183	0.6900	0.6700	0.7100	2.646	4					
*4.6	0.5300	0.0216	0.5300	0.5100	0.5600	4.076	4	6.504	2.410	0.0435	0.5300	0.8185
*9.1	0.3725	0.0126	0.3725	0.3600	0.3900	3.378	4	15.222	2.410	0.0435	0.3725	0.5753
*18.2	0.3000	0.0216	0.3000	0.2800	0.3300	7.201	4	19.235	2.410	0.0435	0.3000	0.4633
*36.4	0.2350	0.0289	0.2350	0.2000	0.2700	12.284	4	22.833	2.410	0.0435	0.2350	0.3629
*72.8	0.1950	0.0238	0.1950	0.1600	0.2100	12.208	4	25.047	2.410	0.0435	0.1950	0.3012

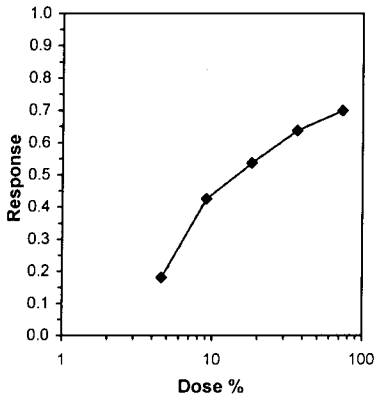
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.98059	0.884	-0.1047	-0.1759
Bartlett's Test indicates equal variances (p = 0.67)	3.19845	15.0863		
The control means are not significantly different (p = 0.09)	2.02707	2.44691		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	<4.6	4.6			0.04354	0.06724	0.12461	0.00065	6.1E-15	5, 18

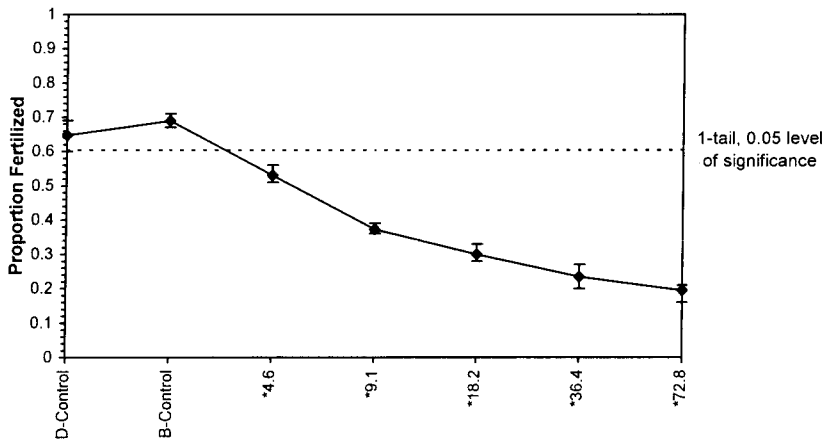
Log-Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew	
IC05*	0.607	0.161	0.394	1.360	2.3644	
IC10*	1.584	0.557	0.927	4.356	2.4779	
IC15*	3.154	0.865	1.634	6.106	0.5417	
IC20	4.857	0.524	3.042	6.173	-0.5720	
IC25	5.612	0.375	4.664	6.952	0.2814	
IC40	8.513	0.444	7.515	10.306	1.0512	
IC50	14.556	1.689	10.887	21.343	0.9377	%v/v

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Note: Statistical comparisons were against the dilution control

Reviewed by

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST DATA SUMMARY

Client: Azimuth Consulting (Polaris Mine)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500299

EVS Analysts: SRS
Test Initiation Date: 19 July 05

SAMPLE

Identification: SDS Reftox Stock Soln #05-3-004
Amount ~~Received~~ Prep'd: 1 x 1L
Date ~~Collected~~ Prep'd: 7-Jun-05
Date Received: N/A
Temperature (°C):
pH:
Dissolved Oxygen (mg/L):
Conductivity (µmhos/cm):
Salinity (ppt):
Ammonia (mg/L N):
Chlorine (mg/L Cl):
Other:

TEST SPECIES

Organism: Dendraster excentricus
Source: Westwind Sealab
Date Received: 19 July 05
Reference Toxicant: SDS
Current Reference Toxicant Result
Reference Toxicant Test Date: 19 July 05
IC50 (and 95% CL): 5.8 (5.2 - 6.5) mg/L SDS
Reference Toxicant Warning Limits (mean ± 2SD) and CV
3.6 ± 4.4 mg/L SDS, CV% = 60

DILUTION/CONTROL WATER (initial water quality)

Water Type: UV sterilized; 0.45 µm filtered SW
Temperature (°C): 15
pH: 7.9
Dissolved Oxygen (mg/L): 8.5
Salinity (ppt): 28
Other: —

TEST CONDITIONS

Temperature Range (°C): 15
pH Range: 7.8 - 7.9
Dissolved Oxygen Range (mg/L): 8.5
Salinity Range (ppt): 28
Sperm:Egg Ratio: 2000:1
Test Duration: 10:10
Other: —

TEST RESULTS

IC50: 5.8 (5.2 - 6.5) mg/L SDS
IC25: 3.0 (2.6 - 3.5) mg/L SDS
NOEC: 1.0 mg/L SDS
LOEC: 1.8 mg/L SDS

Data Verified By: [signature]
Date Verified: Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST INITIAL WATER QUALITY

Client Azimuth (Polaris Mine)
EVS Project No. 04-1424-044
EVS Work Order No. 0500299
Logbook #13 Pages 68-71'

Test Initiation Date/Time 19 July 05 / 1514
Test Species Dendraster excentricus
Source/Date Received Weston Seatab / 19 July 05
Test Duration 10:10

Reftox

Sample ID SDS (mg/L)	Temperature (°C)	pH	Salinity (ppt)	Dissolved Oxygen (mg/L)	Comments
Control	15	7.9	29	8.5	
1.0	15	7.8	28	8.5	
1.8	15	7.8	28	8.5	
3.2	15	7.8	28	8.5	
5.6	15	7.8	28	8.4 8.5	
10.0	15	7.8	28	8.4 8.5	
Technician Initials	SRS	SRS	SRS	SRS	

WQ Instruments Used: Temp. Calibrated Hg Thermometer pH ID-A-030301 Salinity ID-A-080304 DO ID-A-20

Sample Description

Data Verified By [signature] Date Verified Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST – EGG COUNTS (CONTROLS)

Client: Azimuth (Polaris Mine)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0508299
Logbook: #13 Pages: 68-71

Test Initiation Date/Time: 19 Aug 05 / 1514
Test Species: Dendraster excentricus
Test Duration: 10:10
Sperm:Egg Ratio: 2000:1

Concentration SDS (mg/L)	Replicate	No. Fertilized Eggs	No. Unfertilized Eggs	Comments	Tech. Initials
Reference Toxicant					
1.0	A	71	29		SRS
	B	69	31		
	C	71	29		
	D	70	30		
1.8	A	56	44		
	B	60	40		
	C	62	38		
	D	60	40		
3.2	A	~~51~~ 51	~~49~~ 49		
	B	47	53		
	C	51	49		
	D	50	50		
5.6	A	34	66		
	B	37	63		
	C	32	68		
	D	36	64		
10	A	20	80		
	B	21	79		
	C	18	82		
	D	19	81		
Control Seawater					
Brine Control	A	70	30		SRS
	B	68	32		
	C	71	29		
	D	67	33		

Data Verified By: [signature] Date Verified: Aug 17/05

Test: SC-Sperm Cell Fertilization test						Test ID: rtdesds051	
Species: DE-Dendraster excentricus						Protocol: EPS1/RM/27-EC 92 (Sperm Cell)	
Sample ID: REF-Ref Toxicant						Sample Type: SDS-Sodium dodecyl sulfate	
Start Date: 7/19/2005 10:10			End Date: 7/19/2005			Lab ID: BCEVS-EVS Environment Consultants	
Pos	ID	Rep	Group	Total Counted	Number Fertilized	Number Unfertilized	Notes
	1	1	D-Control	100	64	36	
	2	2	D-Control	100	60	40	
	3	3	D-Control	100	66	34	
	4	4	D-Control	100	69	31	
	5	1	1.000	100	71	29	
	6	2	1.000	100	69	31	
	7	3	1.000	100	71	29	
	8	4	1.000	100	70	30	
	9	1	1.800	100	56	44	
	10	2	1.800	100	60	40	
	11	3	1.800	100	62	38	
	12	4	1.800	100	60	40	
	13	1	3.200	100	51	49	
	14	2	3.200	100	47	53	
	15	3	3.200	100	51	49	
	16	4	3.200	100	50	50	
	17	1	5.600	100	34	66	
	18	2	5.600	100	37	63	
	19	3	5.600	100	32	68	
	20	4	5.600	100	36	64	
	21	1	10.000	100	20	80	
	22	2	10.000	100	21	79	
	23	3	10.000	100	18	82	
	24	4	10.000	100	19	81	

Comments: Azimuth Consulting Group 04-1424-044 (0500299)

Reviewed by Aug. 17/05

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	7/19/2005 10:10	Test ID:	rtdesds051	Sample ID:	REF-Ref Toxicant
End Date:	7/19/2005	Lab ID:	BCEVS-EVS Environment C	Sample Type:	SDS-Sodium dodecyl sulfate
Sample Date:		Protocol:	EPS1/RM/27-EC 92 (Sperm	Test Species:	DE-Dendraster excentricus
Comments:	Azimuth Consulting Group 04-1424-044 (0500299)				

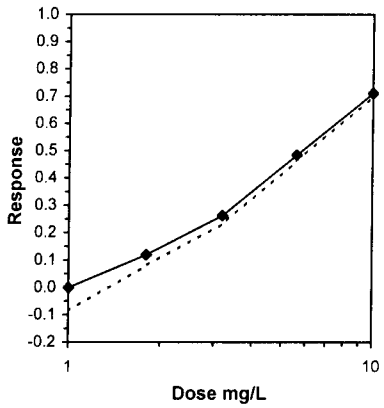
Conc-mg/L	1	2	3	4
D-Control	0.6400	0.6000	0.6600	0.6900
1	0.7100	0.6900	0.7100	0.7000
1.8	0.5600	0.6000	0.6200	0.6000
3.2	0.5100	0.4700	0.5100	0.5000
5.6	0.3400	0.3700	0.3200	0.3600
10	0.2000	0.2100	0.1800	0.1900

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-mg/L	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6475	0.0377	0.6475	0.6000	0.6900	5.830	4				0.6750	1.0000
1	0.7025	0.0096	0.7025	0.6900	0.7100	1.363	4	-3.386	2.410	0.0391	0.6750	1.0000
*1.8	0.5950	0.0252	0.5950	0.5600	0.6200	4.230	4	3.232	2.410	0.0391	0.5950	0.8815
*3.2	0.4975	0.0189	0.4975	0.4700	0.5100	3.805	4	9.234	2.410	0.0391	0.4975	0.7370
*5.6	0.3475	0.0222	0.3475	0.3200	0.3700	6.381	4	18.468	2.410	0.0391	0.3475	0.5148
*10	0.1950	0.0129	0.1950	0.1800	0.2100	6.620	4	27.855	2.410	0.0391	0.1950	0.2889

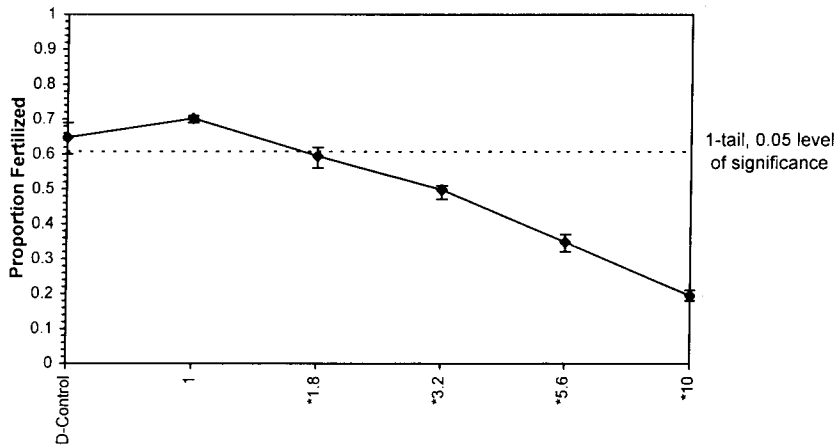
Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.96443		0.884		-0.4619	0.4979
Bartlett's Test indicates equal variances (p = 0.33)					5.80467		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	1	1.8	1.34164		0.03915	0.06046	0.15043	0.00053	1.8E-16	5, 18

Log-Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew	
IC05	1.3050	0.0620	1.1588	1.5675	0.7327	
IC10	1.6566	0.1267	1.3262	2.1192	0.1987	
IC15	2.0587	0.1538	1.5036	2.4959	-0.3268	
IC20	2.5196	0.1504	2.0886	3.0277	-0.0752	
IC25	3.0499	0.1581	2.5656	3.5441	-0.1894	
IC40	4.5501	0.1485	4.0503	5.0634	-0.0472	
IC50	5.8248	0.2258	5.1944	6.4999	-0.1156	mg/L SDS



Dose-Response Plot



Reviewed by: Aug. 17/05

APPENDIX III

Chain-of-Custody Form

CHAIN-OF-CUSTODY/TEST REQUEST FORM

Please see instructions for completion on back. Shaded areas to be completed by EVS Laboratory upon sample receipt.

EVS environment consultants
195 Pemberton Avenue
North Vancouver, BC
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.evsenvironment.com

Client Name: Teck Cominco
Client Contact Name: Bruce Donald
Ship to: BILL TO AZIMUTH CONSULTING GROUP.
Address: Bay 2000 Kimberley BC V1A 3E1
Phone: (250)427-8405
Fax: (250)427-8451
Sampled By: Blake Hamer
Attn: Edmond Canuria
Shipping Date: July 16/05

Collection Date (dd/mmm/yy)	Time (24-h clock)	Sample Identification	1 Type of Each Sample	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G = grab; C = composite	Number of Sample Containers x Volume of Sample Container (i.e., 1 x 20 L)	2 Sample Container Type by Code	Test(s) Requested: 96-hr LC50 Rainbow Trout	48-hr LC50 Daphnia Magna	7-Day Toxicity Test	20 min Echinoderm Fertilization			3 Notes? (e.g. preserved, saltwater, freshwater, may contain sewage)	Receipt Sample Temp. (°C)	4 Condition/Integrity
For composite sample record date & time starting and ending																
16/07/05	0900	C-Creek_Acute_071605	E		G	2x20	P	X	X					Effluent Water		
16/07/05	0900	C-Creek_Sublethal_071605	E		G	3x20	P			X	X			Effluent Water		

EVS Receipt Check List SAP

EVS Project #: 04-1424-0044
EVS Workorder #: 0500296/7/8/9
Sample Storage Location: 4°C (X), Chemical ( ), Other _____
Supporting documentation/other information attached if applicable.

1.	Signatures & dates correct?	Y N
2.	Chain-of-custody fully completed?	Y N
3.	Containers arrived in good condition (unbroken)?	Y N
4.	Container labels completed (i.e., dates, ID's)?	Y N
5.	Container labels agreed with custody papers?	Y N
6.	Sample receipt temperature within acceptable range?	Y N
7a.	Sediment testing going to be initiated within 14 days?	Y N
7b.	If no, are samples under Nitrogen? If not, why?	Y N
8.	Chain-of-custody generated upon receipt.	☐
9.	Sample containers originate from EVS.	☐

PO/Reference No.:
Project Title: Polaris MMER.
Results Needed By: Routine Turn Around.

Comments/Instructions: Bill to: Azimuth Consulting Group.
Electronic Results to: Cheryl Mackintosh, Azimuth, cmackintosh@azimuthgroup.ca
Bruce Donald, Teck Cominco, bruce.donald@teckcominco.com.
Temp: 12.7°C

A) Released By: Blake Hamer Date: July 16, 2005
Company: GLL Time: 1030
Courier name: _____
Shipping containers secured by: ~~Tape~~ Straps Lock Other _____ (circle one)
Custody seals used? Yes No

B) Received by: SAP Date: 19 July 05
Company: Golder Time: 10:45
Shipping containers received secure? (Yes) No
Custody seals intact? (Yes) No N/A

C) Released By: Date:
Company: Time:
Courier name: _____
Shipping containers secured by: Tape Straps Lock Other _____ (circle one)
Custody seals used? Yes No

D) Received by: Date:
Company: Time:
Shipping containers received secure? Yes No
Custody seals intact? Yes No N/A

1 Receiving Water (RW); Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
2 Collapsible Carboy (CC); Glass Jar (GJ); Jerry Can (JC); Plastic HDPE (P); Plastic Bucket (PB); Other (Please Specify)
3 Please note any conditions the lab should be aware of for safety and storage concerns
4 Acceptable (A); Unacceptable (U). Please note specifics (e.g., broken, leaking, lid not on) under Comments/Instructions

Revision Date: Sept. 25, 2000

Distribution of copies:
White, yellow, pink - accompany the shipment
Orange - retained by consignor (e.g., shipper)
Yellow - retained by consignee (e.g., receiver)
Pink - for use as needed
White - returned to consignor by consignee

smart science solutions

Champia parvula Sexual Reproduction Test Results

for Sample E452

for

Azimuth Consulting Group

by

Mary Moody
Environment and Minerals Division
Saskatchewan Research Council

SRC Publication No. 11020-7C05

August 2005

Saskatchewan Research Council
15 Innovation Boulevard, Saskatoon, SK S7N 2X8
Phone: 306-933-5469

Champia parvula Sexual Reproduction Test Quality Assurance Summary

Client	Azimuth Consulting Group	SRC Sample #	E452
File #	MM478	Test Initiation Date	Aug 9/05
Analyst	M. Moody	Test Completion Date	Aug 16/05
Sample Identity/Name	Garrow Creek		

This report is based on the Report Assessment Checklist for EEM Cycle Two: Test of Sexual Reproduction using the Red Macroalga *Champia parvula.* (May 1999)

Test Organisms, Method and Conditions - Species: *Champia parvula,* sexually mature male and female branches, in good health, males having sori with spermatia, females having trichogynes. Method: EPA/600/4-91/003, Method 1009.0, static, non-renewal; 2-day effluent exposure followed by 5 to 7 day recovery period in control medium for cystocarp development. Exposure/Dilution Medium: natural seawater collected at Pacific Environmental Science Centre, Environment Canada, North Vancouver, B.C., filtered to 0.2µm and autoclaved before use, adjusted as necessary to salinity 30 ppt. with hypersaline brine made from the same source water. Test medium is natural seawater enriched with 10 ml/L Test Nutrient Solution. Recovery Medium is natural seawater as above, enriched with 10 ml/L Culture Nutrient Solution (method section 16.10.1.3).

Reference Toxicant Test - Method: EPA/600/4-91/003, Method 1009.0, static, non-renewal; 2-day toxicant exposure followed by 5 to 7 day recovery period in control medium for cystocarp development. Test conditions: performed under same experimental conditions as effluent sample. Compound: sodium dodecyl sulphate mg/L

Date of test: Aug 17/05	Historic value, warning limits ±2SD
IC_{50} (95 % CL) mg/L 1.31 (1.20 - 1.41)	1.41 (1.15 - 1.74)

Quality Control Data - There was no unusual appearance or treatment of test organisms before their use in the test. There was nothing unusual about the test, no deviation from the test method or problems encountered. No control mortality was observed in any control solution during observation periods. Sample was tested within 72 hours of collection. The mean number of cystocarps per plant counted in this test must be >10 to be acceptable. Data for this test is as follows.

natural seawater controls	85.9
brine controls	95.8
pooled control cystocarp count*	90.9

* this number used in calculation of IC values as required in EC guidance document on salinity adjustment, July 1997

Toxicity Test Results

IC_{25} (95 % CL) %v/v	45.3 (27.5 - 52.4)
Signature	M. Moody
Date	Aug 24/05

Saskatchewan Research Council
15 Innovation Boulevard, Saskatoon, SK S7N 2X8
Phone: 306-933-5469

Test Data Summary

SAMPLE

				SRC#	E452
Identification/Name	Garrow Creek			Analyst	Mary Moody
Date/Time Received	Aug 9/05@ 0900	Date Collected	Aug 6/05	Temperature Upon Receipt (°C)	22 with ice packs
Test Initiation Date	Aug 9/05	Test Completion Date	Aug 16/05		

ORGANISM INFORMATION

Species	*Champia parvula*	Appearance/Health of *Champia*	excellent
Source	sexually mature male and female branches, obtained from USEPA, Hatfield Marine Science Center, Newport, Oregon, 1995		
Females, Presence of Trichogynes	yes	Males, Presence of Sori with Spermatia	yes

TEST CONDITIONS

Test Method	USEPA/600/4-91/003, Method 1009.0	Dilution water	Natural seawater from Pacific Environmental Science Centre, North Vancouver B.C.
Test Type	static, non-renewal; 2 day effluent exposure followed by 5-7 day recovery period in control medium for cystocarp development		
Test Vessels (Exposure & Recovery)	270 ml transparent polystyrene cups, transparent polystyrene lids		
Exposure Volume / Depth	100 ml / 4.5 cm	Recovery Volume / Depth	200 ml / 7.3 cm
Replicates/Conc.	3	No. of organisms (female/male)	5/2
Number and Concentrations of Test Solutions (%v/v)	Controls: (two) natural sea water, brine Tests: 70, 35, 17.5, 8.75, 4.38		
Chemicals added to control/dilution water	Test Nutrients as described in method cited at 10 ml/L, analytical grade		

Sample Treatment

D.O. on unadjusted sample salinity adjustment (mg/L)	8.6	D.O. after salinity adjustment (mg/L)	7.7		
Aeration (duration/rate)	none	Filtration	none	pH Adjustment	none
Salinity Adjustment*	600 mL effluent + 260 mL hypersaline brine + 8.6 mL test nutrient solution				
Hypersaline Brine for Salinity Adjustment*	Prepared from natural seawater, at 90 ppt salinity				

* *as per EC guidance document on salinity adjustment, May 2001*

Exposure Period (48 h) and Recovery Period (5-7 days)

Temperature, pH, D.O. and Salinity of test solutions and controls on following page

Photoperiod (L:D h)	16:8	Agitation of tests and controls during exposure	gentle rotary shaking

Recovery Medium: natural sea water containing 10 ml/L Culture Nutrients (section 16.10.1.3 of cited method)

Aeration during recovery: gentle aeration supplied

TOXICITY TEST RESULTS

IC_{25} (%v/v) (95% CL)	45.3 (27.5 - 52.4)	IC_{50} (%v/v), (95% CL)	61.4 (50.4 - 66.6)
Mean control cystocarps/female (pooled natural sea water and brine controls)			90.9

Submitted By: Mary Moody **Date:** Aug 24/05

Saskatchewan Research Council
15 Innovation Boulevard, Saskatoon, SK S7N 2X8
Phone: 306-933-5469

Water Quality Data

Sample Identification/Name Garrow Creek SRC# E452

INITIAL WATER QUALITY	UNADJUSTED SAMPLE at test start, without salinity adjustment	TEST MEDIUM	RECOVERY MEDIUM
Temperature (°C)	23	23	23
Dissolved Oxygen (mg/L)	8.6	7.6	7.8
pH	7.75	8.35	8.10
Salinity (ppt):	2	30	30

Sample Description clear colourless liquid Length of Recovery Period (days) 5

Water Quality Data during Exposure Period (0, 48 hr) and Recovery Period (0 and end)

Concentration % (v/v)	Temperature (°C)				Dissolved Oxygen (mg/L)				pH				Salinity (ppt)			
	exposure		recovery		exposure		recovery		exposure		recovery		exposure		recovery	
	0	48	0	end	0	48	0	end	0	48	0	end	0	48	0	end
Control-NSW*	23	23	23	23	7.6	7.8	7.8	7.9	8.34	8.37	8.10	7.98	30	30	30	30
Control-brine	23	23	23	23	7.8	7.8	7.8	7.8	8.11	8.59	8.10	8.01	30	30	30	30
A 70	23	23	23	23	7.7	7.8	7.8	7.9	8.05	8.54	8.10	8.03	30	30	30	30
C 17.5	23	23	23	23	7.8	7.8	7.8	7.9	8.29	8.64	8.10	8.67	30	30	30	30
E 4.38	23	23	23	23	7.6	7.8	7.8	7.9	8.34	8.47	8.10	8.05	30	30	30	30

RECOVERY PERIOD - TEMPERATURE MONITORING (initial daily entries)

Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
23	23	23	23	23	23		

Comments

pH before salt addition: 7.75, after salt addition 8.12

*NSW natural sea water

technology is our business

Saskatchewan Research Council
15 Innovation Boulevard, Saskatoon, SK S7N 2X8
Phone: 306-933-5469

Test Data

Sample Identification Garrow Creek E452

Concentration % (v/v) #		Rep	Mortality #	Mortality %	Individual Plant Cystocarp Counts 1	2	3	4	5	mean	SD*	Comments
Control, Natural Sea Water		A	0	0	130	80	119	96	95	104.0	20.1	Mean and SD 85.9, 23.8 Healthy red colour, normal growth
		B	0	0	63	86	60	60	102	74.2	19.0	
		C	0	0	95	106	54	54	89	79.6	24.2	
Control, brine		A	0	0	96	98	129	106	90	103.8	15.2	Mean and SD 95.8, 15.3 Healthy red colour, normal growth
		B	0	0	75	74	103	91	80	84.6	12.3	
		C	0	0	97	96	104	118	80	99.0	13.8	
E	4.38	A	0	0	105	60	81	103	100	89.8	19.2	Mean and SD 80.8, 17.4 Healthy red colour, normal growth
		B	0	0	88	53	65	84	60	70.0	15.3	
		C	0	0	103	75	85	64	86	82.6	14.5	
D	8.75	A	0	0	110	88	75	72	88	86.6	15.0	Mean and SD 92.9, 22.9 Healthy red colour, normal growth
		B	0	0	109	127	75	71	110	98.4	24.3	
		C	0	0	82	50	124	121	91	93.6	30.5	
C	17.5	A	0	0	100	138	92	71	77	95.6	24.6	Mean and SD 92.7, 19.1 Healthy red colour, normal growth
		B	0	0	107	107	65	100	91	94.0	17.5	
		C	0	0	99	101	63	94	85	88.4	15.5	
B	35	A	0	0	82	67	118	115	77	91.8	23.2	Mean and SD 82.6, 24.2 Healthy red colour, normal growth
		B	0	0	67	88	76	138	75	88.8	28.5	
		C	0	0	55	75	58	57	91	67.2	15.5	
A	70	A	0	0	35	27	40	37	36	35.0	4.8	Mean and SD 33.3, 8.3 Healthy red colour, normal growth
		B	0	0	44	41	18	40	40	36.6	10.5	
		C	0	0	22	41	23	25	31	28.4	7.9	

* Standard Deviation

Submitted by: C. McNeely Date: Aug 24/05

Algal Reproduction Test-Reproduction

Start Date:	8/9/2005	Test ID:	CP478IM	Sample ID:	E452
End Date:	8/16/2005	Lab ID:	SRC-Saskatchewan Researc	Sample Type:	effluent
Sample Date:	8/6/2005	Protocol:	EPA MARINE	Test Species:	CP-Champia parvula
Comments:	Azimuth, Garrow Creek				

Conc-%	1	2	3
control NSW	104.0	74.2	79.6
control salt	103.8	84.6	99.0
4.38	89.8	70.0	82.6
8.75	86.6	98.4	93.6
17.5	95.6	94.0	88.4
35	91.8	88.8	67.2
70	35.0	36.6	28.4

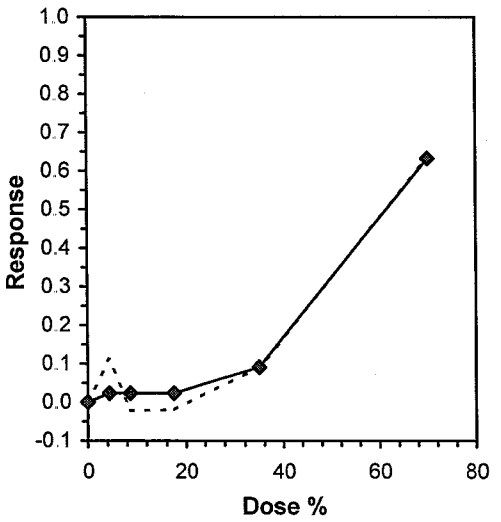
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Pooled	90.867	1.0000	90.867	74.200	104.000	14.348	6				90.867	1.0000
4.38	80.800	0.8892	80.800	70.000	89.800	12.403	3	1.401	2.602	18.693	88.778	0.9770
8.75	92.867	1.0220	92.867	86.600	98.400	6.390	3	-0.278	2.602	18.693	88.778	0.9770
17.5	92.667	1.0198	92.667	88.400	95.600	4.080	3	-0.251	2.602	18.693	88.778	0.9770
35	82.600	0.9090	82.600	67.200	91.800	16.248	3	1.151	2.602	18.693	82.600	0.9090
*70	33.333	0.3668	33.333	28.400	36.600	13.040	3	8.010	2.602	18.693	33.333	0.3668

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95534	0.873	-0.382	-0.7392
Bartlett's Test indicates equal variances (p = 0.41)	5.05585	15.0863		
The control means are not significantly different (p = 0.41)	0.91096	2.77645		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test Treatments vs Pooled Controls	35	70	49.4975	2.85714	18.6933	0.20572	1647.03	103.188	1.5E-05	5, 15

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	24.453	14.175	0.000	46.034	-0.2407
IC10	35.583	10.745	0.000	44.063	-1.3971
IC15	38.810	6.323	10.646	46.832	-1.1329
IC20	42.038	5.167	19.403	49.607	-1.0896
IC25	45.266	4.472	27.509	52.378	-1.0088
IC40	54.949	3.252	41.542	60.787	-1.0203
IC50	61.404	2.558	50.439	66.550	-0.9526



SRC

CHAIN-OF-CUSTODY / TEST REQUEST FORM

№ 0744

Golder Associates
195 Pemberton Avenue
North Vancouver, B.C.
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.golder.com

Client Name Bruce Donald
Address Box 2000
Kimberly BC
V1A 3E1

Client Contact Bruce Donald
Phone 250-427-8405
Fax 250-427-8451
Sampled by E Bolton

Ship to SRC
15 Innovation Boulevard
Saskatoon SK S7N 2X8
Attn. Mary Moody

Shipping Date Aug 6/05

Collection Date (DD/MMM/YYYY) [1]	Time (24-h clock) [1]	Sample Identification	Type of Each Sample [2]	Material Safety Data Sheet Attached? (✔)	Sample Collection Method G=grab C=composite	Number of Sample Containers x Volume of Sample Containers (1 x 20L)	Sample Container Type by Code [3]	Test(s) Requested: Sublethal [illegible]					Sample Notes (preserved, saltwater, freshwater, may contain sewage...) [4]
06/08/05	10:00	Borrow Creek	E		G	2x2L							
		received Aug 9/05 2x2L at 22°C with ice packs											

PO/Reference No.
Project Title
Results Needed By

Comments/Instructions

1) Released by: E Bolton Date: Aug 6/05
Company: Gartner Lee Time: 14:00 hrs
Courier Name:

2) Released by: Date:
Company: Time:
Courier Name:

1) Received by: M Moody Date: Aug 9/05
Company: SRC Time: 0900

Received by: Date:
Company: Time:

Shaded area to be completed by Golder Laboratory upon sample receipt.
Golder Project No.
Golder Work Order No.
Condition Upon Receipt
Receipt Sample Temp. (C)

1 For composite effluent or water samples, the sample collection date/time is the **end** of the compositing period.
2 Receiving Water (RW): Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
3 Collapsible Carboy (CC); glass jar (GJ); Jerry Can (JC); Plastic HDPE (P); Other (Please Specify)
4 Please note any conditions the lab should be aware of for safety and storage concerns

Distribution of copies: White, Yellow — accompany the shipment
Pink — kept by consignor (e.g. shipper)
Yellow — kept by consignee (e.g. receiver)
White — returned to consignor by consignee

Please see instructions for completion on back of form

6/6 MM

Revision Date: November 22, 2004

September 2005

LABORATORY REPORT

Azimuth Consulting Group

POLARIS MINE

ENVIRONMENTAL EFFECTS MONITORING PROGRAM

August 6, 2005 Sample

PREPARED FOR:

Azimuth Consulting Group
Vancouver, BC

PREPARED BY:

EVS environment consultants
A Member of the Golder Group of Companies
North Vancouver, BC

AZIMUTH CONSULTING GROUP

POLARIS MINE ENVIRONMENTAL EFFECTS MONITORING PROGRAM

AUGUST 6, 2005 SAMPLE

LABORATORY REPORT

Prepared for

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

Prepared by

EVS Environment Consultants (A Member of the Golder Group of Companies)
195 Pemberton Avenue
North Vancouver, BC
Canada V7P 2R4

EVS Project No.

04-1424-044

September 2005

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GLOSSARY

Control	A treatment in an investigation or study that duplicates all the conditions and factors that might affect the results of the investigation, except the specific condition that is being studied. In an aquatic toxicity test, the control must duplicate all the conditions of the exposure treatment(s), but must contain no test substance. The control is used to determine the absence of measurable toxicity due to basic test conditions (e.g., quality of the dilution water, health of test organisms, or effects due to handling of test organisms). (Environment Canada, 1998)
Dilution water	Water used to dilute the test material in an aquatic toxicity test in order to prepare either different concentrations of a test chemical or different percentages of an effluent for the various test treatments. The water (negative) control in a test is prepared with dilution water only. (Rand, 1995)
Effluent	Any liquid waste (e.g., industrial, municipal) discharged to the aquatic environment. (Environment Canada, 1998)
Endpoint	The reaction of the organisms to show the effect which is intended to mark completion of the test, and also the measurement(s) or value(s) derived, that characterize the results of the test (e.g., IC*p*). (Environment Canada, 1998)
IC*p*	The inhibiting concentration for a (specified) percent effect. It represents a point estimate of the concentration of test substance that is estimated to cause a designated percent impairment in a quantitative biological function such as the size attained by fish during a growth period. This term should be used for any toxicological test which measures a quantitative effect or change in rate, such as growth, reproduction, or respiration. (Environment Canada, 1998)
LC50	The median lethal concentration, i.e., the concentration of substance in water estimated to be lethal to 50% of the test organisms. The LC50 and its 95% confidence limits are usually derived by statistical analysis of mortalities in several test concentrations, after a fixed period of exposure. The duration of exposure must be specified (e.g., 96-h LC50). (Environment Canada, 1998)

LOEC	The lowest-observed-effect-concentration. This is the lowest concentration of a test substance to which organisms are exposed, that causes adverse effects on the organism which are detected by the observer and are statistically significant. For example, the LOEC might be the lowest test concentration at which growth of fish was decreased significantly from that of the control groups. LOEC is generally reserved for adverse sublethal effects but can also be used for mortality, which might sometimes be the most sensitive effect observed. (Environment Canada, 1998)
NOEC	The no-observed-effect-concentration. This is the highest concentration of a test substance or material to which organisms are exposed, that does not cause any observed and statistically significant adverse effects on the organism. For example, the NOEC might be the highest test concentration at which growth was not decreased significantly from that of the control groups. NOEC customarily refers to adverse sublethal effects, and to the most sensitive effect unless otherwise specified. (Environment Canada, 1998)
Percentage (%)	A concentration expressed in parts per hundred parts. One percentage represents one unit or part of substance (e.g., effluent, elutriate, leachate or receiving water) diluted with water or medium to a total of 100 parts. Depending on the test substance, concentrations can be prepared on a weight-per-weight, weight-per-volume, or volume-per-volume basis, and are expressed as the percentage of test substance in the final sediment mixture or solution. (Environment Canada, 1999b)
Quality assurance (QA)	A program organized and designed to provide accurate and precise results. Included are selection of proper technical methods; tests, or laboratory procedures; sample collection and preservation; selection of limits; evaluation of data; quality control; and qualifications and training of personnel. (Rand, 1995)
Quality control (QC)	Specific actions required to provide information for the quality assurance program. Included are standardization, calibration, replicates, and control and check samples suitable for statistical estimates of confidence of the data. (Rand, 1995)

Reference toxicant	A standard chemical used to measure the sensitivity of the test organisms to establish confidence in the toxicity data obtained for a test substance. In most instances, a toxicity test with a reference toxicant is performed to assess the sensitivity of the organisms at the time the test substance is evaluated, and to determine the precision of results obtained by the laboratory for that chemical. (Environment Canada, 1999b)
Significant difference	A quantitative determination of the probability that two measurements of the same parameter are different, given the variability of the measurements.

1. INTRODUCTION

EVS Environment Consultants (a member of the Golder Group of Companies) conducted sublethal Metal Mining Effluent Regulations (MMER) toxicity testing for Azimuth Consulting Group as part of the Environmental Effects Monitoring (EEM) program for Polaris Mine.

A sample, identified as Garrow Creek, was collected from the Polaris Mine Site on August 6, 2005 in 20-L collapsible polyethylene containers. It was received at the EVS laboratory on August 9, 2005 and was stored in the dark at 4°C prior to test initiation. The sample was evaluated for toxicity using the 7-d topsmelt (*Atherinops affinis*) survival and growth toxicity test and the echinoderm (*Dendraster excentricus*) fertilization toxicity test. Toxicity testing was initiated on the day of initial sample receipt.

This report describes the methods and results of the 7-d topsmelt (*Atherinops affinis*) toxicity test and the echinoderm (*Dendraster excentricus*) fertilization toxicity test. The raw data and statistical analyses are provided in Appendices I and II respectively, and the chain-of-custody form is provided in Appendix III.

2. METHODS

2.1 7-D TOPSMELT (*ATHERINOPS AFFINIS*) SURVIVAL AND GROWTH TOXICITY TEST

A static-renewal 7-d survival and growth toxicity and reference toxicant tests using topsmelt (*A. affinis*) was conducted in accordance with U.S. Environmental Protection Agency (USEPA, 1995). Test conditions and methods are summarized in Table 1.

This 7-day test exposes topsmelt larvae to different concentrations of a given sample. Fish are fed on a daily basis and both survival and growth endpoints are measured at test termination. These observations are assessed in comparison to the pooled negative and brine controls.

2.2 ECHINODERM (*DENDRASTER EXCENTRICUS*) FERTILIZATION TOXICITY TEST

The echinoderm (*Dendraster excentricus*) fertilization toxicity test was conducted in accordance with Environment Canada (1992 with 1997 amendments). Test conditions and methods are summarized in Table 2.

This fertilization test involves exposing echinoderm sperm to a series of test concentrations for ten minutes, echinoderm eggs are then added allowing fertilization to occur for ten minutes. Following the ten minutes exposure time, the eggs are preserved and the number of fertilized and unfertilized eggs in each replicate are counted. These observations are assessed in comparison to the pooled negative and brine controls.

2.3 STATISTICAL ANALYSIS

Statistical analyses for all tests were conducted using the computer software program TOXCALC (version 5.0.23; Tidepool Scientific Software, 1994).

2.4 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

This study followed a comprehensive QA/QC Program to ensure full documentation and minimize possible errors in computation and reporting of results. The following general QA/QC guidelines were applied in this test: use of negative controls, use of positive controls, use of brine controls, replication, instrument calibration, water quality maintenance and

record-keeping, and use of standard operating procedures (SOPs). To ensure data and reporting meet quality standards, all data and statistical analyses were reviewed by a member of our QA/QC Committee prior to reporting the results.

Toxicity testing was carried out in accordance with applicable test methodologies and/or standards of practice. Our liability is limited solely to the cost of re-testing in the event of non-compliance with such test specifications or standards of practice. Golder/EVS accepts no responsibility or liability for the interpretation or use of these testing results by others, or for any delay, loss, damage or interruptions of testing, collection, preparation, and delivery of samples or test results resulting from events or circumstances beyond our control.

Table 1. 7-d Topsmelt (*Atherinops affinis)* survival and growth toxicity test methods

TEST PARAMETER	TEST CONDITION
Test type	Static-renewal
Test duration	7 d
Test chamber	600-mL beaker
Test solution volume	200 mL
Number of replicate chambers per treatment	5
Number of organisms per test chamber	5
Age of test organisms at test initiation	10 d
Food	Newly hatched *Artemia* nauplii (<24 hours old)
Feeding Regime	Fed 0.5 mL/ beaker twice daily of concentrated nauplii suspension (prepared to provide 200 nauplii in 0.5 mL); no feeding at test termination
Sample manipulations (e.g. pre-aeration, pH adjustment, filtration)	Salinity-adjusted
Control/dilution water	UV-sterilized and 0.5μm-filtered natural sea water from Vancouver Aquarium, BC
Dilutions	4.2, 8.4, 16.9, 33.7, 67.4% (v/v)
Renewal of dilutions	Daily
Aeration	None
Water quality parameters and frequency	Temperature, pH, dissolved oxygen, and salinity daily
Temperature	20 ± 1°C
Salinity	30 ± 2 (sample adjusted with hypersaline brine [HSB]. Preparation of HSB and salinity adjustment as per EC guidance document on salinity adjustment –July 1997)
Lighting	Overhead full-spectrum fluorescent lights; 538 – 1076 lux; 16:8 light:dark photoperiod
Reference toxicant	Initiated concurrently with sample using copper to generate LC50 and IC50 values; results compared to lab mean ± 2 SD
Endpoints	Survival and growth (dry weight)
Test validity	≥ 80% mean control survival; ≥ 0.85 mg/fish mean dry weight for surviving control fish
Reference protocol	US EPA (1995), EPA/600/R-95/136

Table 2. Echinoderm (*Dendraster excentricus*) fertilization toxicity test methods

TEST PARAMETER	TEST CONDITION
Test type	Static
Test duration	10:10 min
Test chamber	16 X 125 mm test tubes
Test solution volume	10 mL
Number of replicate chambers per treatment	4
Number of eggs per test chamber	2000
Age of test organisms	< 4 hours after spawning
Sample manipulations (e.g. pre-aeration, pH adjustment, filtration)	Salinity-adjusted
Control/dilution water	UV-sterilized and 0.5μm-filtered natural sea water from Vancouver Aquarium, BC
Dilutions	4.5, 8.9, 17.8, 35.6, 71.3% (v/v)
Renewal of dilutions	None
Aeration	None during testing
Water quality parameters and frequency	Temperature, pH, dissolved oxygen, and salinity
Temperature	15 ± 1°C
Salinity	30 ± 2 (sample adjusted with hypersaline brine [HSB]. Preparation of HSB and salinity adjustment as per EC guidance document on salinity adjustment –July 1997)
Lighting	Ambient laboratory illumination (moderate intensity)
Reference toxicant	Initiated concurrently with test; same test methods as above using SDS to generate an EC50 value; results compared to lab mean ± 2 SD
Endpoint	Fertilization of eggs
Test validity	≥ 50% and ≤ 100% mean control fertilization
Reference protocols	Environment Canada (1992), (EPS/1/RM/27 with 1997 amendments)

3. RESULTS

3.1 7-D TOPSMELT (*ATHERINOPS AFFINIS*) SURVIVAL AND GROWTH TOXICITY TEST

The test results are summarized in Table 3 and the raw statistical analyses are provided in Appendix I.

The highest concentration tested was approximately 67.4% due to salinity adjustment. The mean survival for the negative and brine controls was 92 and 88%, respectively. Mean dry weight in the pooled controls was 0.86mg. The negative and brine controls were not significantly different for both the growth and survival endpoints (p = 0.40 and p = 0.70, respectively).

The *A. affinis* survival and growth toxicity test showed no adverse effects on survival or growth in all tested concentrations relative to the pooled controls ($p \leq 0.05$). For the survival and growth endpoints, the NOEC was 67.4, and the LOEC was >67.4% (v/v). The LC50 for survival was >67.4% (v/v). The IC50 and IC25 for growth were both >67.4% (v/v).

3.2 ECHINODERM (*DENDRASTER EXCENTRICUS*) FERTILIZATION TOXICITY TEST

The test results are summarized in Table 4 and the raw statistical analyses are provided in Appendix II.

The highest concentration tested was 71.3% due to salinity adjustment. Mean fertilization in the pooled controls was 86%. The negative and brine controls were not significantly different (p =0.30).

The *D. excentricus* fertilization toxicity test exhibited adverse effects on egg fertilization in all test concentrations relative to the pooled controls ($p \leq 0.05$). The NOEC was <4.5 and LOEC was 4.5% (v/v). The IC50 and IC25 (95% confidence limits) values were 55.0 (49.2 – 61.1) and 15.6 (13.6 – 18.3) % (v/v), respectively.

3.2 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The tests met all passing criteria for test validity as outlined in the respective protocols. Water quality parameters during the test were all within the acceptable range of values. Point estimates for the reference toxicant tests were all within the laboratory mean ± 2 standard deviations, indicating that the tests were within acceptable limits of variability.

Table 3. Summary of results for the 7-d Topsmelt (*Atherinops affinis)* survival and growth toxicity test

TEST CONCENTRATION (% v/v)	SURVIVAL (%)(MEAN ± SD)	GROWTH (DRY WEIGHT MG) (MEAN ± SD)
Negative Control	92.0 ± 11.0	0.81 ± 0.24
Brine Control	88.0 ± 17.9	0.91 ± 0.12
Pooled Controls	90.0 ± 11.0	0.86 ± 0.18
4.2	88.0 ± 11.0	0.86 ± 0.18
8.4	96.0 ± 8.9	0.90 ± 0.13
16.9	80.0 ± 14.1	0.76 ± 0.17
33.7	92.0 ± 11.0	0.75 ± 0.13
67.4	80.0 ± 14.1	0.81 ± 0.16
TEST ENDPOINT	**SURVIVAL (% v/v)**	**GROWTH (% v/v)**
NOEC	67.4	67.4
LOEC	>67.4	>67.4
LC50	>67.4	na
IC50	na	>67.4
IC25	na	>67.4

SD – Standard Deviation; na – not applicable.

Table 4. Summary of results for the Echinoderm (*Dendraster excentricus)* fertilization toxicity test

TEST CONCENTRATION (% v/v)	PROPORTION FERTILIZED (%) (MEAN ± SD)
Negative Control	85.0 ± 2.9
Brine Control	87.2 ± 2.6
Pooled Controls	86.1 ± 2.8
4.5	79.8 ± 1.7*
8.9	76.5 ± 0.6*
17.8	61.8 ± 2.2*
35.6	52.8 ± 1.9*
71.3	37.2 ± 2.1*
TEST ENDPOINT	**PROPORTION FERTILIZED %(v/v)**
NOEC	<4.5
LOEC	4.5
IC50 (95% CL)	55.0 (49.2 – 61.1)
IC25 (95% CL)	15.6 (13.6– 18.3)

*Indicates significant difference ($p \leq 0.05$) relative to the pooled controls.
SD – Standard Deviation; CL – Confidence Limits.

4. REFERENCES

Environment Canada. 1992. Biological test method: fertilization of echinoids (sea urchins and sand dollars). Environmental Protection Series, Report EPS 1/RM/27, December 1992. Environment Canada, Conservation and Protection, Ottawa, ON. 68 pp + appendices. Amended November 1997.

US EPA. 1995. Short term methods for estimating the chronic toxicity of effluents and receiving waters to marine and estuarine organisms. 2nd edition. US Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Office of Research and Development, Washington, DC. EPA/600/R-95/136. 563 pp.

Tidepool Scientific Software. 1994. TOXCALC: Comprehensive Toxicity Data Analysis and Database Software, Version 5.0.23. Tidepool Scientific Software, McKinleyville, CA. 80 pp.

APPENDIX I

Raw Data and Statistical Analyses:

Atherinops affinis

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST DATA SUMMARY

Client Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 0500327

EVS Analysts MJG SxB JxS RSO
Test Initiation Date 9 Aug 05

Sample	Initial Sample	Refresh Samples	
	Day 0	Day 2	Day 4
Identification	Garrow Creek	Garrow Creek	Garrow Creek
Amount Received	5 x 20L	5 x 20L	5 x 20L
Date Collected	6-Aug-05	6 Aug 05	6 Aug 05
Date Received	9-Aug-05	9 Aug 05	9 Aug 05
Temperature (°C)	20.0	20.0	20.0
pH	7.7 ① → 8.3	7.8 ① → 8.4	7.9 ① → 8.4
DO (mg/L)	9.8 ① → 7.6	10.0 ① → 7.6	10.5 ① → 7.6
Conductivity (µmhos/cm)	-	-	-
Salinity (ppt)	1.0 ① → 30.0	1.0 ① → 30.0	1.0 ① → 30.0
Ammonia (mg/L N)	-	-	
Chlorine (mg/L Cl)	-	-	
Other	① After salinity adjustment	① After salinity adjustment	① After salinity adjustment

DILUTION/CONTROL WATER (initial water quality)
Water Type unsterilized filtered SW
Temperature (°C) 20.0
pH 7.9
Dissolved Oxygen (mg/L) 7.7
Salinity 29

TEST SPECIES INFORMATION
Source ABS Inc.
Date Received 9-Aug-05
Age (on Day 0) 10 days
Reference Toxicant Cu
Current Reference Toxicant Result (incl. 95% CL)
Reference Toxicant Test Date 9 Aug 05
7-d survival LC50 103 (91-118) ~~103 (88-124)~~ mg/L Cu
7-d growth IC50 95 ~~(75-125)~~ (76-127) mg/L Cu
Reference Toxicant Warning Limits (mean ± 2SD) and CV
7-d survival LC50 132 ± 40 mg/L Cu CV=15%
7-d growth IC50 133 ± 40 mg/L Cu CV=15%

TEST CONDITIONS
Temperature Range (°C) 20.0 - 21.0
pH Range 7.7 ~~7.9~~ - 8.4
Dissolved Oxygen Range (mg/L) 6.4-7.7
Salinity (ppt) 28-31
Photoperiod (L:D h) 16:8
Aeration Provided? None
Other -

TEST RESULTS

Endpoint	Conc. Units	NOEC	LOEC	LC50 (95% CL)	IC50 (95% CL)	IC25 (95% CL)
Survival	% (v/v)	67.4	>67.4	>67.4		
Growth		67.4	~~>67.4~~ >67.4		>67.4	>67.4

Other

Data Verified By Qualfish
Date Verified Sept 1/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA

Client Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 0500327

Sample ID G. Creek (Garrow Creek)
Test Initiation Date/Time 9 Aug 05 / 1500h
Source/Date Received ABS Inc / 9 Aug 05

Concentration % (v/v)	Temperature (°C)													
	0	1		2		3		4		5		6		7
D-Control	20.0	20.5	20.0	20.0	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	21.0
B-Control	20.0	20.5	20.0	20.0	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5
4.2	20.0	20.5	20.0	20.0	20.0	20.0	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0
8.4	20.0	20.5	20.0	20.0	20.0	20.0	20.0	20.5	20.0	20.5	20.0	20.5	20.0	21.0
16.9	20.0	20.5	20.0	20.0	20.0	20.0	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0
33.7	20.0	20.5	20.0	20.0	20.0	20.0	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0
67.4	20.0	20.5	20.0	20.0	20.0	20.0	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0
Tech. Initials	SxB	SxB	SxB	VL	VL	SxB	SRJ	SxB	SxB	SxB	SxB	TM	TM	TM

Concentration % (v/v)	pH													
	0	old / New		2		3		4		5		6		7
D-Control	7.9	7.9	8.0	7.9	7.9	7.7	7.9	7.7	8.0 SxB 8.0	7.8	7.9	8.0	7.9	8.0
B-Control	8.0	7.9	8.1	8.0	8.0	7.7	7.9	7.7	7.9 SxB	7.8	7.9	8.0	7.9	7.9
4.2	8.0	7.9	8.2	7.9	8.1	7.7	8.0	7.7	8.1	7.8	8.0	8.0	7.9	7.9
8.4	8.0	8.0	8.2	7.9	8.1	7.8	8.0	7.8	8.1	7.8	8.0	8.0	8.0	8.0
16.9	8.1	8.0	8.3	8.0	8.2	7.9	8.1	7.8	8.2	7.9	8.1	8.1	8.0	8.0
33.7	8.1	8.0	8.3	8.1	8.3	8.1	8.1	7.9	8.3	7.9	8.2	8.2	8.1	8.1
67.4	8.3	8.1	8.4	8.1	8.4	8.1	8.2	8.0	8.4	8.0	8.3	8.4	8.1	8.1
Tech. Initials	SxB	SxB	SxB	VL	VL	SxB	SRJ	SxB	SxB	SxB	SxB	TM	TM	TM

WQ Instruments Used: Temp. Calibrated Hg Thermometer pH 030302

Comments

Test Set Up By SxB Data Verified By [signature] Date Verified Aug. 31/05

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA

Client Azimuth

EVS Project No. C4-1424-044

EVS Work Order No. 0500327

Sample ID C. Creek Control Creek

Test Initiation Date/Time 9 Aug 05 / 1500

Source/Date Received ABS Inc. / 9 Aug 05

Concentration % (v/v)	Salinity (ppt)													
	0	1		2		3		4		5		6 D		7
D-Control	29	29	29	29	29	30	30	30	30	31	30	28	28	29
B-Control	30	30	30	30	30	30	30	31	30	30	30	30	30	30
4.2	30	31	30	30	30	30	30	30	30	30	30	30	28	29
8.4	30	30	30	30	30	30	30	30	30	30	30	30	28	29
16.9	30	30	30	30	30	30	30	30	30	30	30	30	28	29
33.7	30	31	30	30	30	31	30	30	30	30	30	30	28	29
67.4	30	30	30	30	30	31	30	31	30	31	30	30	29	30
Tech. Initials	SxB	SxB	SxB	MJG	MJG	SxB	SxB	SxB	SxB	SxB	SxB	TT	TT	TT

Concentration % (v/v)	Dissolved Oxygen (mg/L)													
	0	1		2		3		4		5		6		7
D-Control	7.7	6.7	7.7	6.6	7.6	6.6	7.6	6.6	7.6	6.7	7.6	6.4	7.5	6.4
B-Control	7.6	6.6	7.6	6.4	7.6	6.6	7.6	6.6	7.6	6.7	7.6	6.6	7.5	6.6
4.2	7.6	6.7	7.6	6.4	7.6	6.4	7.6	6.5	7.6	6.5	7.6	6.6	7.5	6.6
8.4	7.6	6.7	7.6	6.5	7.6	6.7	7.6	6.6	7.6	6.6	7.6	6.4	7.5	6.4
16.9	7.7	6.6	7.6	6.4	7.6	6.5	7.6	6.5	7.6	6.6	7.6	6.5	7.5	6.6
33.7	7.6	6.6	7.6	6.8	7.6	6.8	7.6	6.6	7.6	6.5	7.6	6.5	7.5	6.6
67.4	7.6	6.7	7.6	6.6	7.6	6.6	7.6	6.7	7.6	6.7	7.6	6.4	7.6	6.4
Tech. Initials	SxB	SxB	SxB	MJG	MJG	SxB	SxB	SxB	SxB	SxB	SxB	TT	TT	TT

WQ Instruments Used: Salinity ~~II~~ III (Acc) II C3 DO II-A-20

Comments (1) meet II-14-030306

Test Set Up By SxB Data Verified By Qa/QC Date Verified Aug 31/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 0500327

Sample ID G-Creek (Perran Creek)
Test Species/Batch Atherinops affinis, Petaluma
Test Initiation Date/Time 9 Aug 05 1500
No. of Organisms/Volume 5 / 200 mL

Concentration % (v/v)	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
D.CTL	A	1T	5	5	5	5	5	5	5	
	B	2T	5	5	5	5	5	5	4	
	C	3T	5	5	5	5	5	5	5	
	D	4T	5	5	5	5	5	5	5	
	E	5T	5	5	5	5	5	5	4	
B-CTL	A	6T	5	5	5	5	5	5	5	
	B	7T	5	5	5	5	5	5	5	
	C	8T	5	5	5	5	5	5	5	
	D	9T	5	5	5	5	5	5	4	
	E	10T	5	5	4 ①	4	4	4	3	
4.2	A	11T	5	4	SXB 4	4	4	4	4	
	B	12T	5	5	5	5	5	5	5	
	C	13T	5	5	5	5	5	5	5	
	D	14T	5	4	SXB 4	4	4	4	4	
	E	15T	5	4 ①	4 SXB	4	4	4	4	① No Body
8.4	A	16T	5	5	5	5	5	5	5	
	B	17T	5	5	5	5	5	5	5	
	C	18T	5	5	5	5	5	5	4	
	D	19T	5	5	5	5	5	5	5	
	E	20T	5	5	5	5	5	5	5	
Technician Initials		SXB	SXB	ML	SXB	SXB	SXB	JH	SXB	

Sample Description light brown, no smell
Data Verified By [signature] Date Verified Aug 31/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client: Azimuth
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500327

Sample ID: Garrow Creek
Test Species/Batch: Atherinops affinis
Test Initiation Date/Time: 9 Aug 05 1500
No. of Organisms/Volume: 5/200mL

Concentration % (v/v)	Rep.	Pan No.	Number of Survivors – Day of Test 1	2	3	4	5	6	7	Comments
16.9	A	21 T	5	5	5	5	5	5	5	① No dead body - ~~Technician~~ EVS
	B	22	5	5	4	4	4	4	4	
	C	23	5	5	5	5	5	5	4	
	D	24	5	5	①4	4	4	4	3	
	E	25	5	5	5	5	5	5	4	
33.7	A	26	5	5	5	5	5	5	5	
	B	27	5	5	~~5~~5	4	4	4	4	
	C	28	5	5	5	5	5	5	5	
	D	~~29~~	5	5	4	4	4	*	4	
	E	30	5	5	5	5	5	5	5	
67.4	A	31	5	5	5	5	5	5	5	
	B	32	5	4	4	4	4	4	4	
	C	33	5	5	5	5	5	5	~~4~~3	
	D	34	5	5	5	5	5	5	4	
	E	35	~~5~~4	5	5	5	5	5	4	
	A									
	B									
	C									
	D									
	E									
Technician Initials		~~SXB~~	SXB	ML	SXB	SXB	SXB	MS	SXB	

Sample Description: clear - colourless
Data Verified By: Qualified
Date Verified: Aug 31/05

EVS ENVIRONMENT CONSULTANTS

Larval Fish Toxicity Tests - Dry Weight Data

CLIENT:	Azimuth	TEST TYPE:	7-d Survival and Growth
PROJECT #	04-1424-044	TEST SPECIES:	*Atherinops affinis*
WORK ORDER #:	0500327	TEST INITIATION DATE:	9-Aug-05
BALANCE TYPE:	Sartorius BP211D		

Pan No.	Rep	Sample ID: Garrow Creek % (v/v)	Survival At Start	Number of Survivors	Number Weighed	Pan weight (mg)	Final Weight (mg) Pan + Biomass	Tech'n Initials	Comments
T-1	A	Control	5	5	4	1218.92	1222.92	RSD	Fish lost in transfer.
T-2	B		5	4	4	1231.52	1234.56	RSD	
T-3	C		5	5	5	1229.15	1234.64	RSD	
T-4	D		5	5	5	1235.47	1239.35	RSD	
T-5	E		5	4	4	1241.65	1244.47	RSD	
T-6	A	Brine Control	5	5	5	1217.25	1221.44	RSD	
T-7	B		5	5	5	1229.47	1234.85	RSD	
T-8	C		5	5	5	1233	1237.96	RSD	
T-9	D		5	4	4	1236.48	1240.49	RSD	
T-10	E		5	3	3	1237.67	1241.98	RSD	
T-11	A	4.2	5	4	4	1236.79	1240.85	RSD	
T-12	B		5	5	5	1221.62	1226.26	RSD	
T-13	C		5	5	5	1236.85	1241.7	RSD	
T-14	D		5	4	4	1231.67	1236.88	RSD	
T-15	E		5	4	4	1227.6	1230.46	RSD	
T-16	A	8.4	5	5	5	1232.12	1236.61	RSD	
T-17	B		5	5	5	1221.55	1225.83	RSD	
T-18	C		5	4	4	1226.4	1229.96	RSD	
T-19	D		5	5	5	1224.88	1229.98	RSD	
T-20	E		5	5	5	1228.72	1233.82	RSD	
T-21	A	16.9	5	5	5	1226.33	1231.24	RSD	
T-22	B		5	4	4	1227.45	1231.89	RSD	
T-23	C		5	4	4	1223.67	1227.1	RSD	
T-24	D		5	3	3	1228.16	1231.05	RSD	
T-25	E		5	4	4	1218.71	1221.92	RSD	
T-26	A	33.7	5	5	5	1229.33	1232.96	RSD	
T-27	B		5	4	4	1223.13	1227.98	RSD	
T-28	C		5	5	5	1222.55	1226.08	RSD	
T-29	D		5	4	4	1231.12	1234.27	RSD	
T-30	E		5	5	5	1230.86	1234.48	RSD	
T-31	A	67.4	5	5	5	1234.04	1239.21	RSD	
T-32	B		5	4	4	1236.02	1240.21	RSD	
T-33	C		5	3	3	1229.02	1232.08	RSD	
T-34	D		5	4	4	1231.66	1235.98	RSD	
T-35	E		5	4	4	1231.22	1234.74	RSD	
T-16	(d)						1236.52 ✓	RSD	
T-21	(d)						1231.16 ✓	RSD	
T-35	(d)						1234.81 ✓	RSD	

(d) - duplicate; pan reweighed after being placed in the oven and desiccated a second time.

Aug. 31/05

Test: LF-Larval Fish Growth and Survival Test
Species: AA-Atherinops affinis
Sample ID: Garrow_Creek
Start Date: 8/9/2005 End Date: 8/16/2005

Test ID: 0500327
Protocol: EPAW 95-EPA West Coast
Sample Type: EFF2-Industrial
Lab ID: BCEVS-EVS Environment Consultants

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	No. Fish Weighed	Total Wgt(mg)	Tare Wgt(mg)
	1	1	D-Control	5							5	4	1218.92	1222.92
	2	2	D-Control	5							4	4	1231.52	1234.56
	3	3	D-Control	5							5	5	1229.15	1234.64
	4	4	D-Control	5							5	5	1235.47	1239.35
	5	5	D-Control	5							4	4	1241.65	1244.47
	6	1	B-Control	5							5	5	1217.25	1221.44
	7	2	B-Control	5							5	5	1229.47	1234.85
	8	3	B-Control	5							5	5	1233	1237.96
	9	4	B-Control	5							4	4	1236.48	1240.49
	10	5	B-Control	5							3	3	1237.67	1241.98
	11	1	4.2	5							4	4	1236.79	1240.85
	12	2	4.2	5							5	5	1221.62	1226.26
	13	3	4.2	5							5	5	1236.85	1241.7
	14	4	4.2	5							4	4	1231.67	1236.88
	15	5	4.2	5							4	4	1227.6	1230.46
	16	1	8.4	5							5	5	1232.12	1236.61
	17	2	8.4	5							5	5	1221.55	1225.83
	18	3	8.4	5							4	4	1226.4	1229.96
	19	4	8.4	5							5	5	1224.88	1229.98
	20	5	8.4	5							5	5	1228.72	1233.82
	21	1	16.9	5							5	5	1226.33	1231.24
	22	2	16.9	5							4	4	1227.45	1231.89
	23	3	16.9	5							4	4	1223.67	1227.1
	24	4	16.9	5							3	3	1228.16	1231.05
	25	5	16.9	5							4	4	1218.71	1221.92
	26	1	33.7	5							5	5	1229.33	1232.96
	27	2	33.7	5							4	4	1223.13	1227.98
	28	3	33.7	5							5	5	1222.55	1226.08
	29	4	33.7	5							4	4	1231.12	1234.27
	30	5	33.7	5							5	5	1230.86	1234.48
	31	1	67.4	5							5	5	1234.04	1239.21
	32	2	67.4	5							4	4	1236.02	1240.21
	33	3	67.4	5							3	3	1229.02	1232.08
	34	4	67.4	5							4	4	1231.66	1235.98
	35	5	67.4	5							4	4	1231.22	1234.74

Comments: Azimuth - Polaris 04-1424-044

Reviewed by: Aug 31/05

Larval Fish Growth and Survival Test-7-d survival

Start Date:	8/9/2005	Test ID:	500327	Sample ID:	Garrow_Creek
End Date:	8/16/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth - Polaris 04-1424-044				

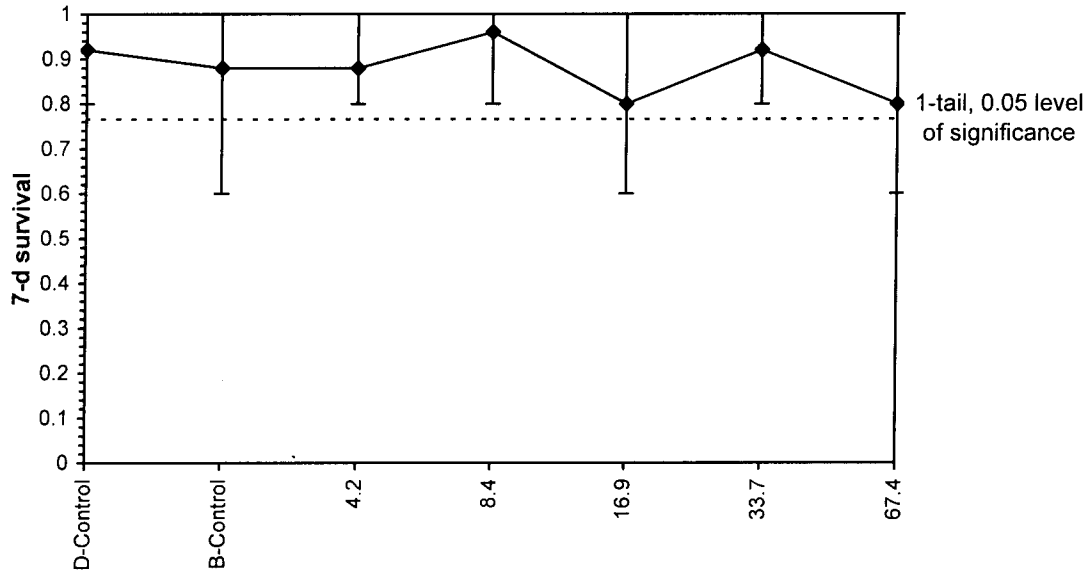
Conc-%	1	2	3	4	5
D-Control	1.0000	0.8000	1.0000	1.0000	0.8000
B-Control	1.0000	1.0000	1.0000	0.8000	0.6000
4.2	0.8000	1.0000	1.0000	0.8000	0.8000
8.4	1.0000	1.0000	0.8000	1.0000	1.0000
16.9	1.0000	0.8000	0.8000	0.6000	0.8000
33.7	1.0000	0.8000	1.0000	0.8000	1.0000
67.4	1.0000	0.8000	0.6000	0.8000	0.8000

			Transform: Arcsin Square Root					1-Tailed		
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.9200	0.1095	1.2500	1.1071	1.3453	10.434	5			
B-Control	0.8800	0.1789	1.2058	0.8861	1.3453	17.113	5			
4.2	0.8800	0.1095	1.2024	1.1071	1.3453	10.848	5	0.544	2.360	0.2068
8.4	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	-0.544	2.360	0.2068
16.9	0.8000	0.1414	1.1106	0.8861	1.3453	14.625	5	1.592	2.360	0.2068
33.7	0.9200	0.1095	1.2500	1.1071	1.3453	10.434	5	0.000	2.360	0.2068
67.4	0.8000	0.1414	1.1106	0.8861	1.3453	14.625	5	1.592	2.360	0.2068

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94769	0.9	-0.1197	-0.6919
Bartlett's Test indicates equal variances (p = 0.97)	0.91421	15.0863		
The control means are not significantly different (p = 0.70)	0.405	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	67.4	>67.4		1.48368	0.154	0.171	0.03047	0.01919	0.20149	5, 24

Dose-Response Plot



Statistical analysis performed with the negative control.

Reviewed by: Aug 31/05

Larval Fish Growth and Survival Test-7-d survival

Start Date:	8/9/2005	Test ID:	500327	Sample ID:	Garrow_Creek
End Date:	8/16/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth - Polaris 04-1424-044				

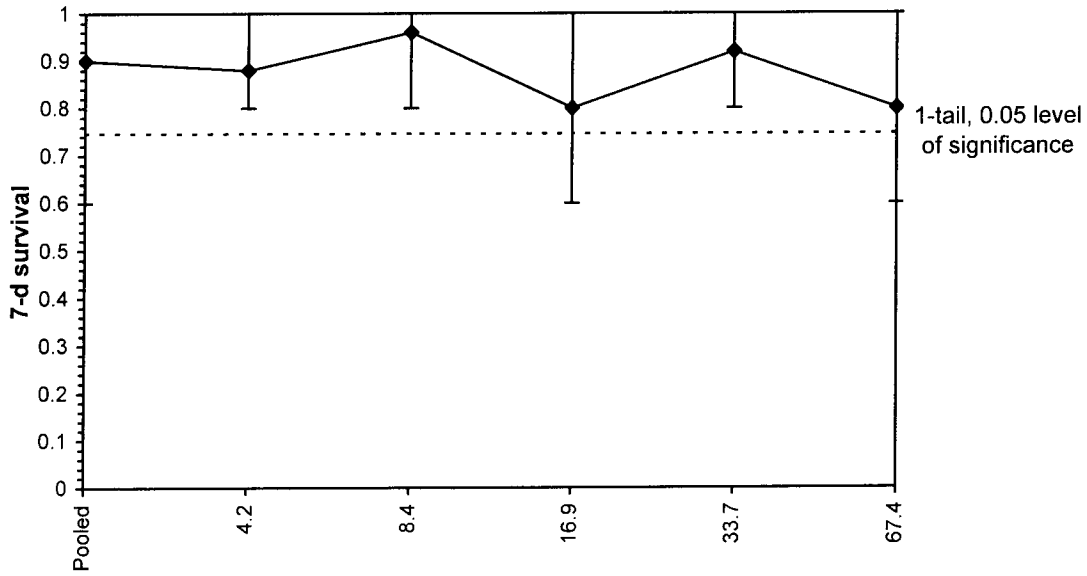
Conc-%	1	2	3	4	5
D-Control	1.0000	0.8000	1.0000	1.0000	0.8000
B-Control	1.0000	1.0000	1.0000	0.8000	0.6000
4.2	0.8000	1.0000	1.0000	0.8000	0.8000
8.4	1.0000	1.0000	0.8000	1.0000	1.0000
16.9	1.0000	0.8000	0.8000	0.6000	0.8000
33.7	1.0000	0.8000	1.0000	0.8000	1.0000
67.4	1.0000	0.8000	0.6000	0.8000	0.8000

			Transform: Arcsin Square Root					1-Tailed		
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Pooled	0.9000	0.1414	1.2279	0.8861	1.3453	13.389	10			
4.2	0.8800	0.1095	1.2024	1.1071	1.3453	10.848	5	0.315	2.462	0.1997
8.4	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	-0.860	2.462	0.1997
16.9	0.8000	0.1414	1.1106	0.8861	1.3453	14.625	5	1.447	2.462	0.1997
33.7	0.9200	0.1095	1.2500	1.1071	1.3453	10.434	5	-0.273	2.462	0.1997
67.4	0.8000	0.1414	1.1106	0.8861	1.3453	14.625	5	1.447	2.462	0.1997

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95136	0.91	-0.4731	-0.265
Bartlett's Test indicates equal variances (p = 0.95)	1.19442	15.0863		
The control means are not significantly different (p = 0.70)	0.405	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	67.4	>67.4		1.48368	0.15355	0.17312	0.0295	0.02192	0.27347	5, 29

Dose-Response Plot



Statistical analysis performed with pooled controls.

Reviewed by: Aug 31/05

Larval Fish Growth and Survival Test-7 Day Growth (CND)

Start Date:	8/9/2005	Test ID:	500327	Sample ID:	GARROW_CREEK
End Date:	8/16/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth - Polaris 04-1424-044				

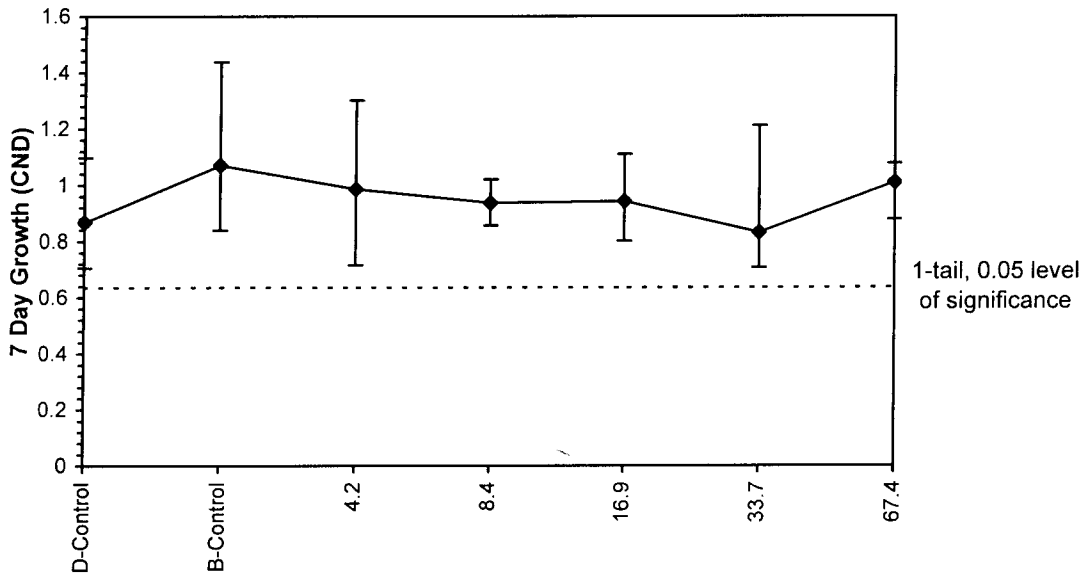
Conc-%	1	2	3	4	5
D-Control	1.0000	0.7600	1.0980	0.7760	0.7050
B-Control	0.8380	1.0760	0.9920	1.0025	1.4367
4.2	1.0150	0.9280	0.9700	1.3025	0.7150
8.4	0.8980	0.8560	0.8900	1.0200	1.0200
16.9	0.9820	1.1100	0.8575	0.9633	0.8025
33.7	0.7260	1.2125	0.7060	0.7875	0.7240
67.4	1.0340	1.0475	1.0200	1.0800	0.8800

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.8678	0.1710	0.8678	0.7050	1.0980	19.710	5			
B-Control	1.0690	0.2230	1.0690	0.8380	1.4367	20.861	5			
4.2	0.9861	0.2110	0.9861	0.7150	1.3025	21.397	5	-1.198	2.360	0.2331
8.4	0.9368	0.0776	0.9368	0.8560	1.0200	8.280	5	-0.699	2.360	0.2331
16.9	0.9431	0.1192	0.9431	0.8025	1.1100	12.644	5	-0.762	2.360	0.2331
33.7	0.8312	0.2154	0.8312	0.7060	1.2125	25.910	5	0.371	2.360	0.2331
67.4	1.0123	0.0772	1.0123	0.8800	1.0800	7.629	5	-1.463	2.360	0.2331

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94085	0.9	0.90895	1.11753
Bartlett's Test indicates equal variances (p = 0.22)	7.00651	15.0863		
The control means are not significantly different (p = 0.15)	1.60103	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	67.4	>67.4		1.48368	0.23312	0.26863	0.02377	0.02439	0.45333	5, 24

Dose-Response Plot



Statistical analysis performed on negative control using Canadian method to assess test validity criteria.

Reviewed by: Aug-31/05

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	8/9/2005	Test ID:	500327	Sample ID:	GARROW_CRE
End Date:	8/16/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth - Polaris 04-1424-044				

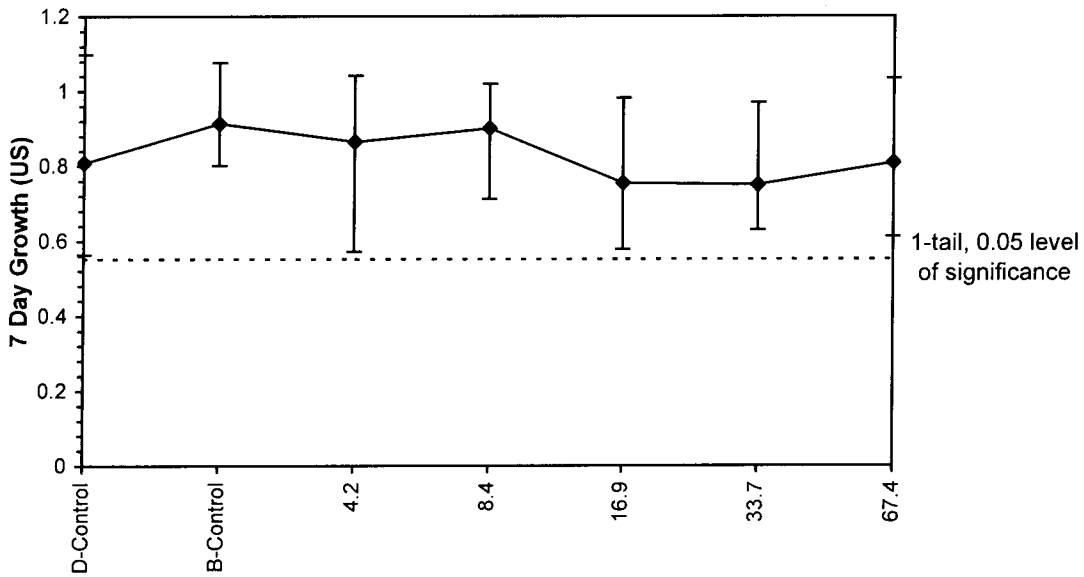
Conc-%	1	2	3	4	5
D-Control	1.0000	0.6080	1.0980	0.7760	0.5640
B-Control	0.8380	1.0760	0.9920	0.8020	0.8620
4.2	0.8120	0.9280	0.9700	1.0420	0.5720
8.4	0.8980	0.8560	0.7120	1.0200	1.0200
16.9	0.9820	0.8880	0.6860	0.5780	0.6420
33.7	0.7260	0.9700	0.7060	0.6300	0.7240
67.4	1.0340	0.8380	0.6120	0.8640	0.7040

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.8092	0.2353	0.8092	0.5640	1.0980	29.082	5			
B-Control	0.9140	0.1155	0.9140	0.8020	1.0760	12.636	5			
4.2	0.8648	0.1837	0.8648	0.5720	1.0420	21.242	5	-0.511	2.360	0.2569
8.4	0.9012	0.1285	0.9012	0.7120	1.0200	14.262	5	-0.845	2.360	0.2569
16.9	0.7552	0.1718	0.7552	0.5780	0.9820	22.750	5	0.496	2.360	0.2569
33.7	0.7512	0.1284	0.7512	0.6300	0.9700	17.097	5	0.533	2.360	0.2569
67.4	0.8104	0.1615	0.8104	0.6120	1.0340	19.927	5	-0.011	2.360	0.2569

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96877	0.9	0.03752	-0.9001
Bartlett's Test indicates equal variances (p = 0.85)	1.98489	15.0863		
The control means are not significantly different (p = 0.40)	0.89395	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	67.4	>67.4		1.48368	0.25689	0.31747	0.01761	0.02962	0.70433	5, 24

Dose-Response Plot



Statistical analysis performed with D-control

Reviewed by: Sept 1/05

Larval Fish Growth and Survival Test-7 Day Growth (US)					
Start Date:	8/9/2005	Test ID:	500327	Sample ID:	GARROW_CRE
End Date:	8/16/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth - Polaris 04-1424-044				

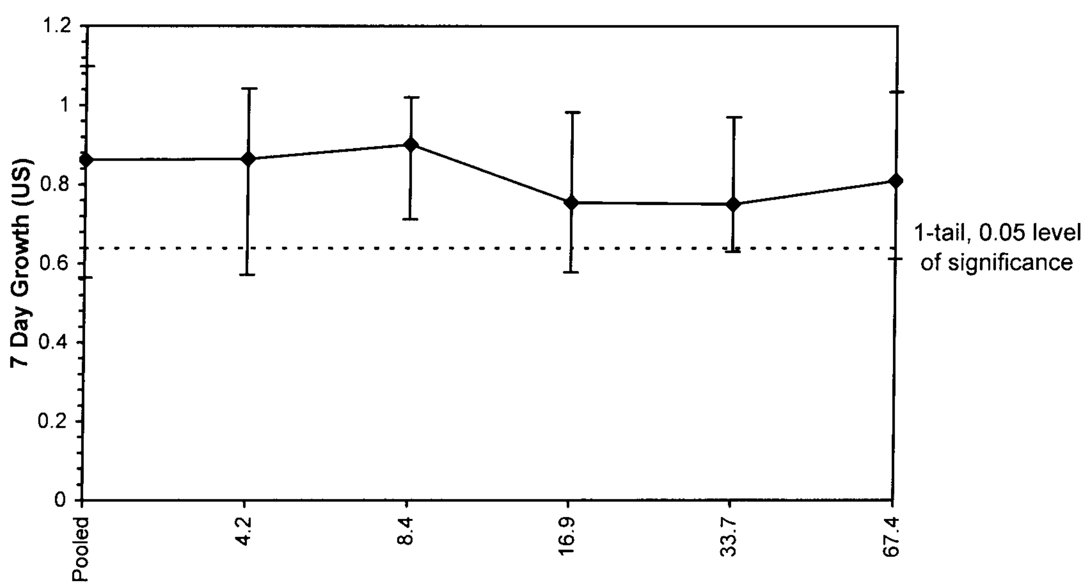
Conc-%	1	2	3	4	5
D-Control	1.0000	0.6080	1.0980	0.7760	0.5640
B-Control	0.8380	1.0760	0.9920	0.8020	0.8620
4.2	0.8120	0.9280	0.9700	1.0420	0.5720
8.4	0.8980	0.8560	0.7120	1.0200	1.0200
16.9	0.9820	0.8880	0.6860	0.5780	0.6420
33.7	0.7260	0.9700	0.7060	0.6300	0.7240
67.4	1.0340	0.8380	0.6120	0.8640	0.7040

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Pooled	0.8616	0.1833	0.8616	0.5640	1.0980	21.272	10			
4.2	0.8648	0.1837	0.8648	0.5720	1.0420	21.242	5	-0.035	2.462	0.2228
8.4	0.9012	0.1285	0.9012	0.7120	1.0200	14.262	5	-0.438	2.462	0.2228
16.9	0.7552	0.1718	0.7552	0.5780	0.9820	22.750	5	1.176	2.462	0.2228
33.7	0.7512	0.1284	0.7512	0.6300	0.9700	17.097	5	1.220	2.462	0.2228
67.4	0.8104	0.1615	0.8104	0.6120	1.0340	19.927	5	0.566	2.462	0.2228

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95378	0.91	-0.1738	-0.7645
Bartlett's Test indicates equal variances (p = 0.96)	1.08676	15.0863		
The control means are not significantly different (p = 0.40)	0.89395	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	67.4	>67.4		1.48368	0.22282	0.25861	0.02046	0.0273	0.59313	5, 29

Dose-Response Plot



Statistical analysis performed with pooled controls.

 ToxCalc v5.0.23 Reviewed by: [signature] Sept 1/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST DATA SUMMARY

Client Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 0500327

EVS Analysts SxB MJG JxS RS
Test Initiation Date 9 Aug 05

Sample	Initial Sample	Refresh Samples	
	Day 0	Day 2	Day 4
Identification	100mg/L Cu Stock (05Cu001)		
Amount ~~Received~~ Prepared	1X1L		
Date ~~Collected~~ Prepared	1-Mar-05		
Date Received	na		
Temperature (°C)			
pH			
DO (mg/L)			
Conductivity (µmhos/cm)			
Salinity (ppt)			
Ammonia (mg/L N)			
Chlorine (mg/L Cl)			
Other			

DILUTION/CONTROL WATER (initial water quality)
Water Type UV sterilized filtered SW
Temperature (°C) 20.0
pH 7.9
Dissolved Oxygen (mg/L) 7.7
Salinity 29

TEST CONDITIONS
Temperature Range (°C) 20.0 - 20.5
pH Range 7.8 - 8.0
Dissolved Oxygen Range (mg/L) 6.4 - 7.7
Salinity (ppt) 28 - 31
Photoperiod (L:D h) 16:8
Aeration Provided? None
Other -

TEST SPECIES INFORMATION
Source ABS Inc
Date Received 9 Aug 05
Age (on Day 0) 10 days
Reference Toxicant Cu
Current Reference Toxicant Result (incl. 95% CL)
Reference Toxicant Test Date 9 Aug 05
7-d survival LC50 ~~107 (88-129)~~ 103 (91-118) mg/L Cu
7-d growth IC50 ~~95 (75-125)~~ 76-127 mg/L Cu
Reference Toxicant Warning Limits (mean ± 2SD) and CV
7-d survival LC50 132 ± 40 mg/L Cu CV=15%
7-d growth IC50 133 ± 40 mg/L Cu CV=15%

TEST RESULTS

Endpoint	Conc. Units	NOEC	LOEC	LC50 (95% CL)	IC50 (95% CL)	IC25 (95% CL)
Survival	mg/L Cu	56	100	~~107 (88-129)~~ 103 (91-118)		
Growth		~~32~~ 56	~~32~~ 100		~~95 (75-125)~~ 76-127	~~64 (7-91)~~ 71 (11-91)

Other

Data Verified By [signature] Date Verified Sept. 1/05

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA (EEM)

Client Azimuth

EVS Project No. 04-1424-044

EVS Work Order No. C500327

Sample ID Cu Reftox

Test Initiation Date/Time 9 Aug 05 1500

Source/Date Received ABS Inc. / 9 Aug 05

Concentration mg/L Cu	Temperature (°C)													
	0	1 old	1 new	2		3		4		5		6		7
CTL	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.5	20.0	20.5
32	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.5	20.0	20.5
56	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.5	20.0	20.5
100	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.5
180	20.0	20.0	20.0	20.0	20.0	20.0	20.0	~~20.0~~	~~20.0~~	20.0	20.0			
320	20.0	20.0	20.0	20.0	20.0									
Tech. Initials	SxB	SxB	SxB	MTL	MTL	SRS	SRS	SxB	SxB	SxB	SxB	TM	TM	TM

Concentration mg/L Cu	pH													
	0	1		2		3		4		5		6		7
CTL	7.9	7.9	8.0	7.9	7.9	7.8	7.9	7.8	8.0	7.9	7.9	7.9	8.0	7.9
32	7.9	8.0	8.0	7.9	7.9	7.8	7.9	~~7.8~~ 7.9	7.9	7.9	7.9	7.9	8.0	8.0
56	7.9	7.9	8.0	8.0	7.9	7.8	7.9	~~7.8~~ 7.9	8.0	7.9	7.9	8.0	8.0	8.0
100	7.9	7.9	8.0	8.0	7.9	7.8	7.9	7.8	8.0	7.9	7.9	8.0	8.0	8.0
180	7.9	7.8	8.0	~~7.9~~ 7.9	7.9	7.8	7.9	~~7.8~~	~~8.0~~	~~7.9~~	~~7.9~~			
320	7.9	7.9	8.0	~~7.9~~	7.9									
				MTL										
Tech. Initials	SxB	SxB	SxB	MTL	MTL	SRS	SRS	SxB	SxB	SxB	SxB	TM	TM	TM

WQ Instruments Used: Temp. Calibrated Ag Thermometer pH 030302

Comments

Test Set Up By SxB Data Verified By [signature] Date Verified Aug 31/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA (EEM)

Client Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 0500327

Sample ID Cu Reftox
Test Initiation Date/Time 9 Aug -05 / 1500
Source/Date Received ABS In 9 Aug 05

Concentration mg/L Cu	Salinity (ppt)													
	0	1		2		3		4		5		6 D		7
CTL	29	29	29	29	29	30	30	31	30	30	30	30	28	29
32	29	29	29	29	29	30	30	30	30	30	30	29	28	29
56	29	29	29	29	29	30	30	30	30	30	30	29	28	29
100	29	29	29	29	29	30	30	30	30	30	30	29	28	29
180	29	29	29	29	29	~~30~~	30	~~30~~	~~30~~	~~30~~	~~30~~			
320	29	29	29	29	29									
Tech. Initials	SXB	SXB	SXB	MC	MC	SRS	SRS	SXB	SXB	SXB	SXB	TH	TH	TH

Concentration mg/L Cu	Dissolved Oxygen (mg/L)													
	0	1		2		3		4		5		6		7
CTL	7.7	6.8	7.7	6.6	7.6	6.8	7.6	6.6	7.6	6.7	7.6	6.6	~~7.6~~ 7.5	6.6
32	7.7	6.9	7.7	6.5	7.6	6.9	7.6	6.7	7.6	6.9	7.6	6.4	7.5	6.6
56	7.7	6.8	7.7	6.7	7.6	7.0	7.6	6.8	7.6	6.9	7.6	6.6	7.5	6.4
100	7.7	6.8	7.7	6.6	7.6	7.0	7.6	6.9	7.6	7.0	7.6	6.6	7.5	6.4
180	7.7	6.9	7.7	6.5	7.6	7.1	7.6	~~6.9~~	~~7.6~~	~~7.0~~				
320	7.7	6.8	7.7	6.5	7.6	X								
Tech. Initials	SXB	SXB	SXB	MC	MC	SRS	SRS	SXB	SXB	SXB	SXB	TH	TH	TH

WQ Instruments Used: Salinity II-C-3 DO II-A-20
Comments Dosed II-A-050506

Test Set Up By SXB Data Verified By Qualified Date Verified Aug 31/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client: Azimuth
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500327

Sample ID: cu_Lefton
Test Species/Batch: Atherinops affinis
Test Initiation Date/Time: 9 Aug 05 1500
No. of Organisms/Volume: 5/200mL

Concentration mg/L Cu	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
CTL	A	36 T	5	5	5	5	5	5	5	
	B	37	5	5	5	5	5	5	5	
	C	38	5	5	5	5	5	5	5	
	D	39	5	5	4	4	4	4	4	
	E	40	5	5	5	5	5	5	5	
32	A	41	5	5	5	5	5	5	5	
	B	42	5	5	5	5	5	5	4	① one fish stuck on wall while feeding – technician error.
	C	43	5	5	4	4	4	4	4	
	D	44	5	5	①4	4	4	4	4	
	E	45	5	5	4	4	4	3①	3	
56	A	46	5	5	5	5	5	5	5	
	B	47	5	5	5	5	5	5	5	
	C	48	5	5	5	5	5	5	5	
	D	49	5	5	5	5	5	5	5	
	E	50	5	5	5	5	5	5	5	
100	A	51	5	3	3	3	3	3	3	
	B	52	5	~~3~~ 2	2	2	2	2	2	
	C	53	5	4	3	3	3	3	3	
	D	54	5	4	4	4	3	3	3	
	E	55	5	3	2	2	2	2	2	
Technician Initials		SXB	SXB	MH	SXB	SXB	SXB	TM	SXB	

Sample Description: clear colourless
Data Verified By: [signature]
Date Verified: Aug 31/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client: Azimuth
EVS Project No.: 041424049
EVS Work Order No.: 0500327

Sample ID: Cu Reftox
Test Species/Batch: Atherinops affinis
Test Initiation Date/Time: 9 Aug 05 / 1500
No. of Organisms/Volume: 5 / 200mL

Concentration mg/L Cu	Rep.	Pan No.	Number of Survivors – Day of Test 1	2	3	4	5	6	7	Comments
18	A	56	3	2	2	2	2	2	1	
	B		4	0	0	-	-	-	-	
	C		5	0	0	-	-	-	-	
	D		4	1	0	-	-	-	-	
	E		2	0	0	-	-	-	-	
32	A		SXB 0	0	0	-	-	-	-	
	B		2	0	0	-	-	-	-	
	C		SXB 0	0	0	-	-	-	-	
	D		SXB 0	0	0	-	-	-	-	
	E		1	0	0	-	-	-	-	
	A									
	B									
	C									
	D									
	E									
	A									
	B									
	C									
	D									
	E									
Technician Initials		SXB	SXB	MV	SXB	SXB	SXB	TM	SXB	

Sample Description: clear - colourless
Data Verified By: Qacfq
Date Verified: Aug 31/05

EVS ENVIRONMENT CONSULTANTS

Larval Fish Toxicity Tests - Dry Weight Data

CLIENT: Azimuth
PROJECT #: 04-1424-044
WORK ORDER #: 0500327
BALANCE TYPE: Sartorius BP211D

TEST TYPE: 7-d Survival and Growth
TEST SPECIES: *Atherinops affinis*
TEST INITIATION DATE: 9-Aug-05

Pan No.	Rep	Sample ID: Cu ug/L	Survival At Start	Number of Survivors	Number Weighed	Pan weight (mg)	Final Weight (mg) Pan + Biomass	Tech'n Initials	Comments
T-36	A	Control	5	5	5	1227.73	1231.65	RSD	
T-37	B		5	5	5	1237.69	1243.76	RSD	
T-38	C		5	5	5	1233.73	1238.72	RSD	
T-39	D		5	4	4	1228.92	1231.78	RSD	
T-40	E		5	5	5	1227.75	1233.44	RSD	
T-41	A	32	5	5	5	1231.67	1236.17	RSD	
T-42	B		5	4	4	1224.44	1228.26	RSD	
T-43	C		5	4	4	1238.77	1241.92	RSD	
T-44	D		4	4	4	1227	1230.34	RSD	Tech error --fish killed during testing.
T-45	E		4	3	3	1236.71	1239.86	RSD	Tech error - fish killed during testing.
T-46	A	56	5	5	5	1230.75	1234.97	RSD	
T-47	B		5	5	5	1220.44	1224.77	RSD	
T-48	C		5	5	5	1226.91	1231.88	RSD	
T-49	D		5	5	5	1227.66	1232.44	RSD	
T-50	E		5	5	5	1233.65	1238.33	RSD	
T-51	A	100	5	3	3	1063.07	1065.92	RSD	
T-52	B		5	2	2	1070.3	1071.8	RSD	
T-53	C		5	3	3	1061.53	1063.78	RSD	
T-54	D		5	3	3	1059.1	1061.99	RSD	
T-55	E		5	2	2	1037.82	1038.91	RSD	
T-56	A	180	5	1	1	1044.2	1044.67	RSD	
T-57	B		5	0	0	1036.78	0	RSD	
T-58	C		5	0	0	1044.68	0	RSD	
T-59	D		5	0	0	1044.41	0	RSD	
T-60	E		5	0	0	1045.27	0	RSD	
T-61	A	320	5	0	0	0	0	RSD	
T-62	B		5	0	0	0	0	RSD	
T-63	C		5	0	0	0	0	RSD	
T-64	D		5	0	0	0	0	RSD	
T-65	E		5	0	0	0	0	RSD	
T-36	(d)						1231.53 ✓	RSD	
T-50	(d)						1238.37 ✓	RSD	
T-51	(d)						1065.88 ✓	RSD	

(d) - duplicate; pan reweighed after being placed in the oven and desiccated a second time.

QA/QC review: Ralph 4
Sept. 1/05

Test: LF-Larval Fish Growth and Survival Test												Test ID: rtaacu46		
Species: AA-Atherinops affinis												Protocol: EPAW 95-EPA West Coast		
Sample ID: REF-Ref Toxicant												Sample Type: CU-Copper		
Start Date: 8/9/2005			End Date: 8/16/2005									Lab ID: BCEVS-EVS Environment Consultants		
Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	No. Fish Weighed	Total Wgt(mg)	Tare Wgt(mg)
	1	1	D-Control	5							5	5	1227.73	1231.65
	2	2	D-Control	5							5	5	1237.69	1243.76
	3	3	D-Control	5							5	5	1233.73	1238.72
	4	4	D-Control	5							4	4	1228.92	1231.78
	5	5	D-Control	5							5	5	1227.75	1233.44
	6	1	32.0	5							5	5	1231.67	1236.17
	7	2	32.0	5							4	4	1224.44	1228.26
	8	3	32.0	5							4	4	1238.77	1241.92
	9	4	32.0	4							4	4	1227	1230.34
	10	5	32.0	4							3	3	1236.71	1239.86
	11	1	56.0	5							5	5	1230.75	1234.97
	12	2	56.0	5							5	5	1220.44	1224.77
	13	3	56.0	5							5	5	1226.91	1231.88
	14	4	56.0	5							5	5	1227.66	1232.44
	15	5	56.0	5							5	5	1233.65	1238.33
	16	1	100.0	5							3	3	1063.07	1065.92
	17	2	100.0	5							2	2	1070.3	1071.8
	18	3	100.0	5							3	3	1061.53	1063.78
	19	4	100.0	5							3	3	1059.1	1061.99
	20	5	100.0	5							2	2	1037.82	1038.91
	21	1	180.0	5							1	1	1044.2	1044.67
	22	2	180.0	5							0	0	1036.78	0
	23	3	180.0	5							0	0	1044.68	0
	24	4	180.0	5							0	0	1044.41	0
	25	5	180.0	5							0	0	1045.27	0
	26	1	320.0	5							0	0	0	0
	27	2	320.0	5							0	0	0	0
	28	3	320.0	5							0	0	0	0
	29	4	320.0	5							0	0	0	0
	30	5	320.0	5							0	0	0	0

Comments: Azimuth - Polaris 04-1424-044

Reviewed by Aug 31/05

Larval Fish Growth and Survival Test-7-d survival

Start Date:	8/9/2005	Test ID:	rtaacu46	Sample ID:	REF-Ref Toxicant
End Date:	8/16/2005	Lab ID:	BCEVS-EVS Environment C	Sample Type:	CU-Copper
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth - Polaris 04-1424-044				

Conc-ug/L	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	0.8000	1.0000
32	1.0000	0.8000	0.8000	1.0000	0.7500
56	1.0000	1.0000	1.0000	1.0000	1.0000
100	0.6000	0.4000	0.6000	0.6000	0.4000
180	0.2000	0.0000	0.0000	0.0000	0.0000
320	0.0000	0.0000	0.0000	0.0000	0.0000

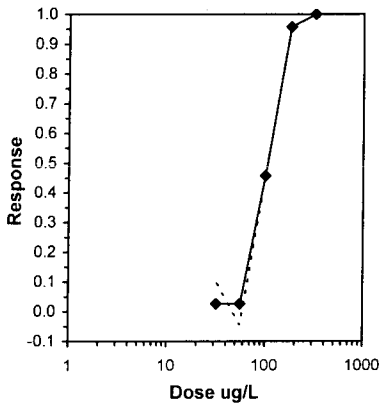
			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-ug/L	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5			1	25
32	0.8700	0.1204	1.1850	1.0472	1.3453	11.519	5	20.00	17.00	3	23
56	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	30.00	17.00	0	25
*100	0.5200	0.1095	0.8055	0.6847	0.8861	13.691	5	15.00	17.00	12	25
*180	0.0400	0.0894	0.2731	0.2255	0.4636	38.990	5	15.00	17.00	24	25
320	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	5			25	25

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.98032	0.888	0.05175	-0.2912
Equality of variance cannot be confirmed				

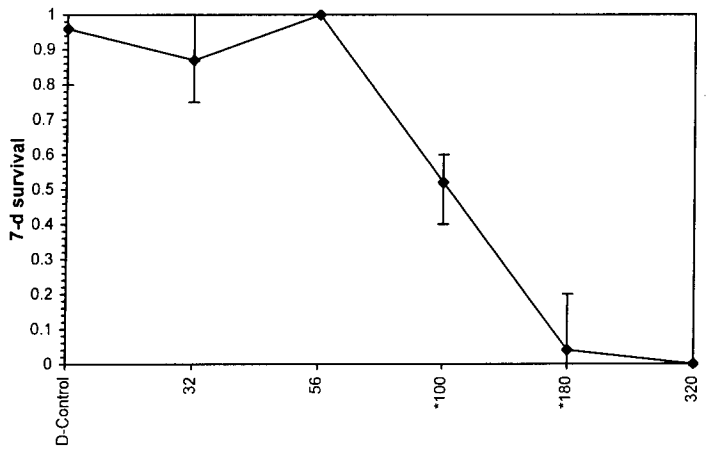
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	56	100	74.8331	

Trimmed Spearman-Karber

Trim Level	EC50	95% CL		
0.0%				
5.0%	103.41	90.52	118.14	
10.0%	103.63	89.27	120.30	
20.0%	104.05	85.12	127.20	
Auto-2.6%	103.48	90.82	117.90	ug/L Cu



Dose-Response Plot



Reviewed by [signature] Aug-31/05

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	8/9/2005	Test ID:	rtaacu46	Sample ID:	REF-Ref Toxicant
End Date:	8/16/2005	Lab ID:	BCEVS-EVS Environment C	Sample Type:	CU-Copper
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth - Polaris 04-1424-044				

Conc-ug/L	1	2	3	4	5
D-Control	0.7840	1.2140	0.9980	0.5720	1.1380
32	0.9000	0.7640	0.6300	0.8350	0.7875
56	0.8440	0.8660	0.9940	0.9560	0.9360
100	0.5700	0.3000	0.4500	0.5780	0.2180
180	0.0940	0.0000	0.0000	0.0000	0.0000
320	0.0000	0.0000	0.0000	0.0000	0.0000

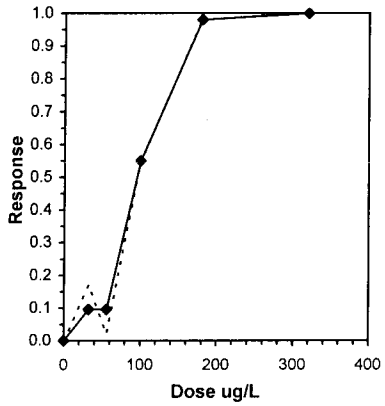
			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-ug/L	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	0.9412	0.2633	0.9412	0.5720	1.2140	27.979	5			0.9412	1.0000
32	0.7833	0.1002	0.7833	0.6300	0.9000	12.796	5	23.00	17.00	0.8512	0.9044
56	0.9192	0.0627	0.9192	0.8440	0.9940	6.819	5	25.00	17.00	0.8512	0.9044
*100	0.4232	0.1609	0.4232	0.2180	0.5780	38.013	5	16.00	17.00	0.4232	0.4496
*180	0.0188	0.0420	0.0188	0.0000	0.0940	223.607	5	15.00	17.00	0.0188	0.0200
320	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	5			0.0000	0.0000

Auxiliary Tests				Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)				0.96904	0.888	-0.5637	1.29994
Bartlett's Test indicates unequal variances (p = 8.40E-03)				13.6784	13.2767		
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**			
Steel's Many-One Rank Test	56	100	74.8331				

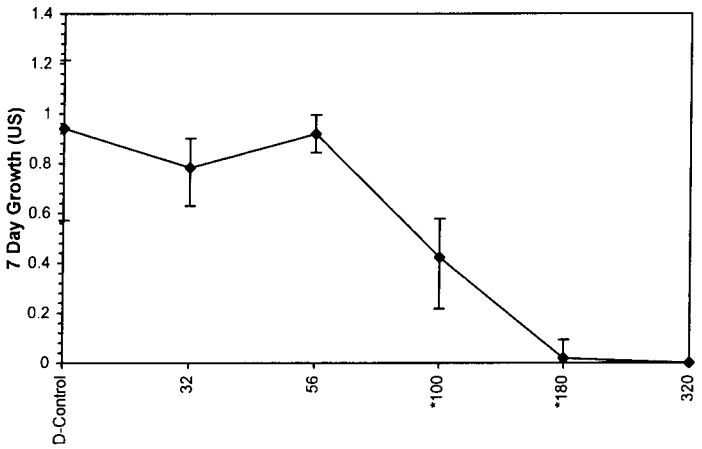
Linear Interpolation (200 Resamples)

Point	ug/L	SD	95% CL(Exp)		Skew	
IC05*	16.742	22.428	0.966	84.151	0.6591	
IC10	56.429	21.864	0.000	72.829	0.0540	
IC15	61.266	19.804	0.000	78.932	-0.6284	
IC20	66.103	16.425	4.297	85.035	-1.1939	
IC25	70.941	10.605	11.216	91.139	-1.6164	
IC40	85.453	7.896	65.694	112.047	0.4556	
IC50	95.128	8.949	75.508	127.164	0.6374	ug/L Cu

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Reviewed by Aug. 31/05

APPENDIX II

Raw Data and Statistical Analyses:

Dendraster excentricus

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST DATA SUMMARY

Client: Azimuth Consulting (Pebble Mine)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500328

EVS Analysts: SRS, JAP
Test Initiation Date: 09 Aug 05

SAMPLE

Identification: Garrow Creek
Amount Received: 5x20L
Date Collected: 06 Aug 05
Date Received: 09 Aug 05
Temperature (°C): 16 @ → 15
pH: 7.3 @ → 8.3
Dissolved Oxygen (mg/L): 10.0 @ → 8.5
Conductivity (µmhos/cm): 2700
Salinity (ppt): 1.0 @ → 29.0
Ammonia (mg/L N): —
Chlorine (mg/L Cl): —
Other: —

@ Brine Adjustment

TEST SPECIES

Organism: Dendraster excentricus
Source: Westwind Sealab
Date Received: 09 Aug 05
Reference Toxicant: SDS
Current Reference Toxicant Result
Reference Toxicant Test Date: 09 Aug 05
IC50 (and 95% CL): 3.9 (3.6-4.1) mg/L SDS
Reference Toxicant Warning Limits (mean ± 2SD) and CV
3.9 ± 4.3 mg/L SDS, CV = 55%

DILUTION/CONTROL WATER (initial water quality)

Water Type: UV sterilized, 0.5µm filtered SW
Temperature (°C): 15
pH: 8.0
Dissolved Oxygen (mg/L): 8.5
Salinity (ppt): 29
Other: —

TEST CONDITIONS

Temperature Range (°C): 15
pH Range: 7.8 → ~~8.04~~ 8.2 ~~8.3~~ 8.4
Dissolved Oxygen Range (mg/L): ~~7.81~~ 7.8 → 8.5
Salinity Range (ppt): 29
Sperm:Egg Ratio: 2000:1
Test Duration: 10:10
Other: —

TEST RESULTS

IC 50: 55.0 (49.2 - 61.1) % v/v
IC 25: 15.6 (13.6 - 18.3) % v/v
NOEC: < 4.5 % v/v
LOEC: 4.5 % v/v
Statistical comparisons were against pooled controls

Data Verified By: [signature]
Date Verified: Aug. 31/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST INITIAL WATER QUALITY

Client Azimuth Consulting (Polaris Mine)
EVS Project No. 04-1424-04
EVS Work Order No. 0500328
Logbook Echinoid #13 Pages 71-74

Test Initiation Date/Time 9Aug05 / 1723
Test Species Dendraster excentricus
Source/Date Received Westwind Seafds / 9 Aug 05
Test Duration 10:10

Sample ID %(v/v)	Temperature (°C)	pH	Salinity (ppt)	Dissolved Oxygen (mg/L)	Comments
Garrow Creek - Max	15	8.3	29	8.5	
Garrow Creek - 36	15	8.1	29	8.4	
Garrow Creek - 18	15	7.9	29	8.4	
Garrow Creek - 9	15	7.9	29	8.4	
Garrow Creek - 4.5	15	7.8	29	8.4	
Cntl	15	8.0	29	8.5	
Brine Cntl	15	8.4	29	7.8	
Technician Initials	SRS/JAP	SRS/JAP	SRS/JAP	SRS/JAP	

WQ Instruments Used: Temp. Calibrated Hg thermometer pH II-A-51 Salinity II-A-030303 DO II-A-20

Sample Description Clear with no odour

Data Verified By [signature] Date Verified Aug-31/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST – EGG COUNT (SAMPLES)

Client: Azimuth Consulting (Polaris Mine)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500328
Logbook: Echinoid Pages: 71-74

Test Initiation Date/Time: 09 Aug 05 / 1723
Test Species: Dendraster excentricus
Source/Date Received: Westward Sealab / 09 Aug 05
Test Duration: 10:10
Sperm:Egg Ratio: 2000:1

Sample ID	Replicate	Number of Fertilized Eggs	Number of Unfertilized Eggs	Comments	Tech. Initials
Control	A	88	12		SRS
	B	81	19		
	C	85	15		
	D	86	14		
Brine Control	A	91	9		
	B	86	14		
	C	85	15		
	D	87	13		
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				

Data Verified By: Ralph
Date Verified: Aug 31/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST – EGG COUNT (SAMPLES)

Client: Azimuth Consulting (Polaris Mine)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500328
Logbook: Echinoid Pages: 71-74

Test Initiation Date/Time: 09 Aug 05 / 1723
Test Species: Dendraster excentricus
Source/Date Received: Westwind Sealab / 09 Aug 05
Test Duration: 10:10
Sperm:Egg Ratio: 2000:1

Sample ID % (v/v) Garrow Creek	Replicate	Number of Fertilized Eggs	Number of Unfertilized Eggs	Comments	Tech. Initials
Max 71.3%	A	37	63		SRS
	B	40	60		↓
	C	37	63		
	D	35	65		
35.6 ~~36%~~ RD	A	50	50		
	B	54	46		
	C	54	46		
	D	53	47		
17.8 ~~18%~~ RD	A	64	36		
	B	59	41		
	C	63	37		
	D	61	39		
8.9%	A	76	24		
	B	77	23		
	C	77	23		
	D	76	24		
4.5%	A	82	18		
	B	80	20		
	C	79	21		
	D	78	22		↓
	A				
	B				
	C				
	D				

Data Verified By: [signature] Date Verified: Aug 31/05

Test: SC-Sperm Cell Fertilization test
Species: DE-Dendraster excentricus
Sample ID: Garrow Creek
Start Date: 8/9/2004 10:10 End Date: 8/9/2004

Test ID: 0500328
Protocol: EPS1/RM/27-EC 92 (Sperm Cell)
Sample Type: ~~GW-groundwater~~ Effluent
Lab ID: BCEVS-EVS Environment Consultants

Pos	ID	Rep	Group	Total Counted	Number Fertilized	Number Unfertilized	Notes
	1	1	D-Control	100	88	12	
	2	2	D-Control	100	81	19	
	3	3	D-Control	100	85	15	
	4	4	D-Control	100	86	14	
	5	1	B-Control	100	91	9	
	6	2	B-Control	100	86	14	
	7	3	B-Control	100	85	15	
	8	4	B-Control	100	87	13	
	9	1	4.500	100	78	22	
	10	2	4.500	100	79	21	
	11	3	4.500	100	80	20	
	12	4	4.500	100	82	18	
	13	1	8.900	100	76	24	
	14	2	8.900	100	77	23	
	15	3	8.900	100	77	23	
	16	4	8.900	100	76	24	
	17	1	17.800	100	61	39	
	18	2	17.800	100	63	37	
	19	3	17.800	100	59	41	
	20	4	17.800	100	64	36	
	21	1	35.600	100	53	47	
	22	2	35.600	100	54	46	
	23	3	35.600	100	54	46	
	24	4	35.600	100	50	50	
	25	1	71.300	100	35	65	
	26	2	71.300	100	37	63	
	27	3	71.300	100	40	60	
	28	4	71.300	100	37	63	

Comments: Azimuth Consulting Group (Polaris Mine) 04-1424-044 (0500328)

Reviewed by: Aug-31/05

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	8/9/2004 10:10	Test ID:	500328	Sample ID:	Garrow Creek
End Date:	8/9/2004	Lab ID:	BCEVS-EVS Environment C	Sample Type:	~~GW-groundwater~~ Effluent
Sample Date:	8/6/2004	Protocol:	EPS1/RM/27-EC 92 (Sperm	Test Species:	DE-Dendraster excentricus
Comments:	Azimuth Consulting Group (Polaris Mine) 04-1424-044 (0500328)				

Conc-%	1	2	3	4
D-Control	0.8800	0.8100	0.8500	0.8600
B-Control	0.9100	0.8600	0.8500	0.8700
4.5	0.7800	0.7900	0.8000	0.8200
8.9	0.7600	0.7700	0.7700	0.7600
17.8	0.6100	0.6300	0.5900	0.6400
35.6	0.5300	0.5400	0.5400	0.5000
71.3	0.3500	0.3700	0.4000	0.3700

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.8500	0.0294	0.8500	0.8100	0.8800	3.463	4				0.8500	1.0000
B-Control	0.8725	0.0263	0.8725	0.8500	0.9100	3.014	4					
*4.5	0.7975	0.0171	0.7975	0.7800	0.8200	2.141	4	3.662	2.410	0.0346	0.7975	0.9382
*8.9	0.7650	0.0058	0.7650	0.7600	0.7700	0.755	4	5.929	2.410	0.0346	0.7650	0.9000
*17.8	0.6175	0.0222	0.6175	0.5900	0.6400	3.591	4	16.217	2.410	0.0346	0.6175	0.7265
*35.6	0.5275	0.0189	0.5275	0.5000	0.5400	3.589	4	22.494	2.410	0.0346	0.5275	0.6206
*71.3	0.3725	0.0206	0.3725	0.3500	0.4000	5.534	4	33.305	2.410	0.0346	0.3725	0.4382

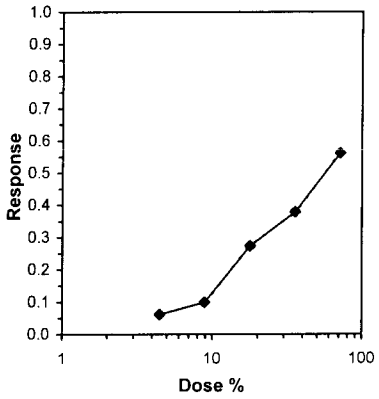
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96944	0.884	-0.376	-0.1401
Bartlett's Test indicates equal variances (p = 0.37)	5.40444	15.0863		
The control means are not significantly different (p = 0.30)	1.13994	2.44691		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	<4.5	4.5			0.03455	0.04065	0.13432	0.00041	5.3E-17	5, 18

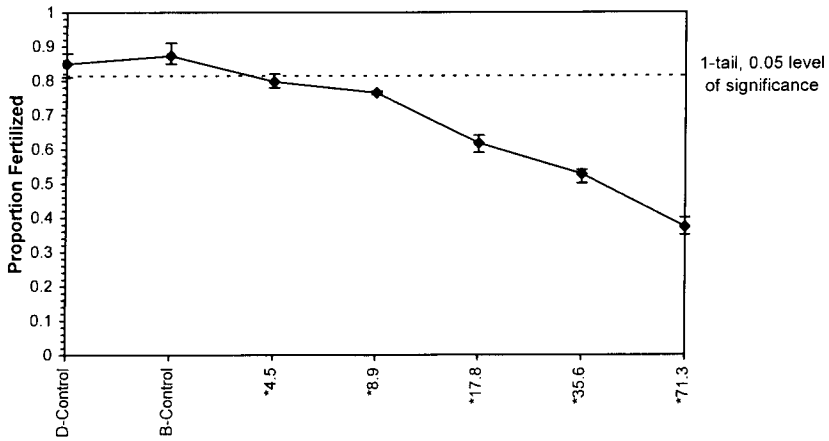
Log-Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05*	2.975	1.400	0.565	7.600	0.6911
IC10	8.900	1.288	3.027	10.418	-0.8297
IC15	10.909	0.614	9.311	12.929	0.4646
IC20	13.326	0.777	11.427	15.949	0.5340
IC25	16.234	1.070	13.604	20.191	0.7205
IC40	38.524	1.817	32.550	43.489	-0.4616
IC50	56.411	2.378	49.614	64.710	0.5505

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Note: statistical comparisons are against dilution control

Reviewed by: Aug 31/05

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	8/9/2004 10:10	Test ID:	500328	Sample ID:	Garrow Creek
End Date:	8/9/2004	Lab ID:	BCEVS-EVS Environment C	Sample Type:	~~GW-groundwater~~ Effluent
Sample Date:	8/6/2004	Protocol:	EPS1/RM/27-EC 92 (Sperm	Test Species:	DE-Dendraster excentricus
Comments:	Azimuth Consulting Group (Polaris Mine) 04-1424-044 (0500328)				

Conc-%	1	2	3	4
D-Control	0.8800	0.8100	0.8500	0.8600
B-Control	0.9100	0.8600	0.8500	0.8700
4.5	0.7800	0.7900	0.8000	0.8200
8.9	0.7600	0.7700	0.7700	0.7600
17.8	0.6100	0.6300	0.5900	0.6400
35.6	0.5300	0.5400	0.5400	0.5000
71.3	0.3500	0.3700	0.4000	0.3700

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Pooled	0.8613	0.0285	0.8613	0.8100	0.9100	3.310	8				0.8613	1.0000
*4.5	0.7975	0.0171	0.7975	0.7800	0.8200	2.141	4	4.768	2.508	0.0335	0.7975	0.9260
*8.9	0.7650	0.0058	0.7650	0.7600	0.7700	0.755	4	7.199	2.508	0.0335	0.7650	0.8882
*17.8	0.6175	0.0222	0.6175	0.5900	0.6400	3.591	4	18.231	2.508	0.0335	0.6175	0.7170
*35.6	0.5275	0.0189	0.5275	0.5000	0.5400	3.589	4	24.962	2.508	0.0335	0.5275	0.6125
*71.3	0.3725	0.0206	0.3725	0.3500	0.4000	5.534	4	36.555	2.508	0.0335	0.3725	0.4325

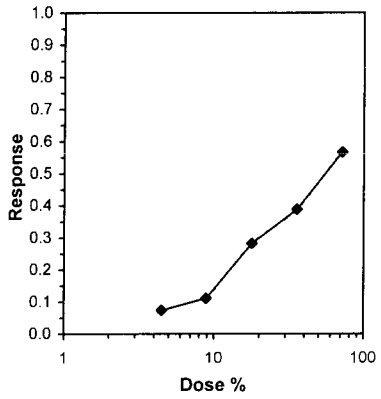
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97972	0.896	-0.1255	1.3485
Bartlett's Test indicates equal variances (p = 0.30)	6.1116	15.0863		
The control means are not significantly different (p = 0.30)	1.13994	2.44691		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	<4.5	4.5			0.03354	0.03894	0.16656	0.00048	3.5E-20	5, 22

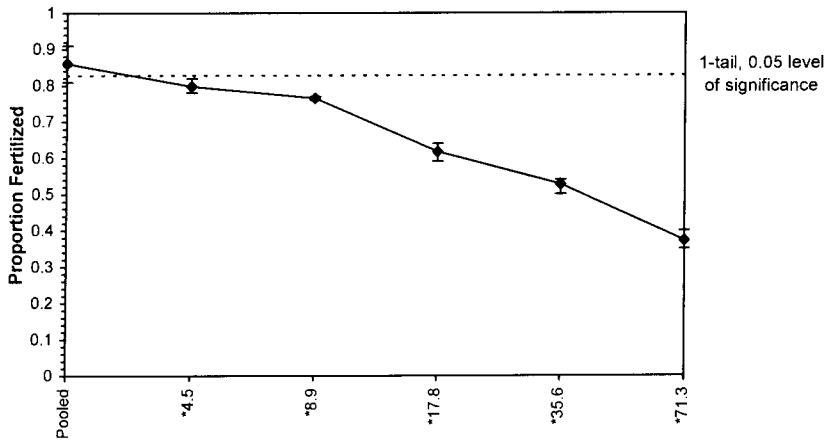
Log-Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew	
IC05*	2.163	0.950	0.835	6.375	1.2352	
IC10	7.243	1.368	2.765	10.506	-0.2796	
IC15	10.424	0.446	9.200	11.908	0.1462	
IC20	12.777	0.574	11.163	14.753	0.1484	
IC25	15.613	0.797	13.605	18.305	0.1477	
IC40	37.370	1.848	30.582	42.085	-0.6715	
IC50	55.010	2.043	49.176	61.090	0.1372	%v/v

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Note: statistical comparisons are against pooled controls

Reviewed by: Aug 31/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST DATA SUMMARY

Client: Azimuth Consulting (Pebble Mine)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500328

EVS Analysts: SRS, JAP
Test Initiation Date: 09 Aug 05

SAMPLE

Identification: SDS Reftox Soln #05-5-009
Amount ~~Received~~ Prep'd: 1L
Date ~~Collected~~ Prep'd: 05 Aug 05
Date Received: —
Temperature (°C): —
pH: —
Dissolved Oxygen (mg/L): —
Conductivity (µmhos/cm): —
Salinity (ppt): —
Ammonia (mg/L N): —
Chlorine (mg/L Cl): —
Other: —

TEST SPECIES

Organism: Dendraster excentricus
Source: Westwind Sealab
Date Received: 09 Aug 05
Reference Toxicant: SDS
Current Reference Toxicant Result
Reference Toxicant Test Date: 09 Aug 05
IC50 (and 95% CL): 3.9 (3.6 - 4.1) mg/L SDS
Reference Toxicant Warning Limits (mean ± 2SD) and CV
3.9 ± 4.3 mg/L SDS; CV = 55%

DILUTION/CONTROL WATER (initial water quality)

Water Type: UV sterilized, 0.5µm filtered SW
Temperature (°C): 15
pH: 8.0
Dissolved Oxygen (mg/L): 8.5
Salinity (ppt): 29
Other: —

TEST CONDITIONS

Temperature Range (°C): 15
pH Range: 7.8 - 8.0
Dissolved Oxygen Range (mg/L): 8.4 - 8.5
Salinity Range (ppt): 29
Sperm:Egg Ratio: 2000:1
Test Duration: 10:10
Other: —

TEST RESULTS

IC 50: 3.9 (3.6-4.1) mg/L SDS
IC 25: 2.3 (2.2-2.4) mg/L SDS
NOEC: 1.0 mg/L SDS
LOEC: 1.8 mg/L SDS

Data Verified By: [signature]
Date Verified: Aug 31/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST INITIAL WATER QUALITY

Client Azimuth Consulting (Polaris Mine)
EVS Project No. 04-1424-8044
EVS Work Order No. 0500328
Logbook Echinoid #13 Pages 71-74

Test Initiation Date/Time 9 Aug 05 / 1723
Test Species Dendraster excentricus
Source/Date Received Westwind Seclab / 9 Aug 05
Test Duration 10:16

Reftox

Sample ID SDS (mg/L)	Temperature (°C)	pH	Salinity (ppt)	Dissolved Oxygen (mg/L)	Comments
Cnt1	15	8.0	29	8.5	
1.0	15	7.8	29	8.4	
1.8	15	7.8	29	8.4	
3.2	15	7.8	29	8.4	
5.6	15	7.9	29	8.4	
10.0	15	7.9	29	8.4	
Technician Initials	SRS/JAP	SRS/JAP	SRS/JAP	SRS/JAP	

WQ Instruments Used: Temp. Calibrated Hg thermometer pH II-A-57 Salinity II-A-030303 DO II-A-20

Sample Description

Data Verified By Ralph K Date Verified Aug 31/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST – EGG COUNTS (CONTROLS)

Client: Azimuth Consulting (Polaris Mine) Test Initiation Date/Time: 09/Aug/05 / 1723
EVS Project No.: 04-1424-044 Test Species: Dendraster excentricus
EVS Work Order No.: 0500328 Test Duration: 10:10
Logbook: Echinoid Pages: 71-74 Sperm:Egg Ratio: 2000:1
Reftox

Concentration 5 DS (mg/L)	Replicate	No. Fertilized Eggs	No. Unfertilized Eggs	Comments	Tech. Initials
Reference Toxicant					
1.0	A	88	12		SRS
	B	84	16		
	C	89	11		
	D	87	13		
1.8	A	75	25		
	B	~~74~~ SRS 73	27		
	C	~~72~~ SRS 74	26		
	D	73	27		
3.2	A	49	51		
	B	52	48		
	C	53	47		
	D	49	51		
5.6	A	26	74		
	B	28	72		
	C	26	74		
	D	27	73		
10.0	A	16	84		
	B	11	89		
	C	14	86		
	D	15	85		
Control Seawater					
Cntl	A	88	12		SRS
	B	81	19		
	C	85	15		
	D	86	14		

Data Verified By: Ralph Ky Date Verified: Aug 31/05

Test: SC-Sperm Cell Fertilization test						Test ID: rtdesds052	
Species: DE-Dendraster excentricus						Protocol: EPS1/RM/27-EC 92 (Sperm Cell)	
Sample ID: REF-Ref Toxicant						Sample Type: SDS-Sodium dodecyl sulfate	
Start Date: 8/9/2005 10:10			End Date: 8/9/2005			Lab ID: BCEVS-EVS Environment Consultants	
Pos	ID	Rep	Group	Total Counted	Number Fertilized	Number Unfertilized	Notes
	1	1	D-Control	100	88	12	
	2	2	D-Control	100	81	19	
	3	3	D-Control	100	85	15	
	4	4	D-Control	100	86	14	
	5	1	1.000	100	88	12	
	6	2	1.000	100	84	16	
	7	3	1.000	100	89	11	
	8	4	1.000	100	87	13	
	9	1	1.800	100	75	25	
	10	2	1.800	100	73	27	
	11	3	1.800	100	74	26	
	12	4	1.800	100	73	27	
	13	1	3.200	100	49	51	
	14	2	3.200	100	52	48	
	15	3	3.200	100	53	47	
	16	4	3.200	100	49	51	
	17	1	5.600	100	26	74	
	18	2	5.600	100	28	72	
	19	3	5.600	100	26	74	
	20	4	5.600	100	27	73	
	21	1	10.000	100	16	84	
	22	2	10.000	100	11	89	
	23	3	10.000	100	14	86	
	24	4	10.000	100	15	85	

Comments: Azimuth Consulting Group 04-1424-044 (0500328)

Reviewed by: Aug 31/05

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	8/9/2005 10:10	Test ID:	rtdesds052	Sample ID:	REF-Ref Toxicant
End Date:	8/9/2005	Lab ID:	BCEVS-EVS Environment C	Sample Type:	SDS-Sodium dodecyl sulfate
Sample Date:		Protocol:	EPS1/RM/27-EC 92 (Sperm	Test Species:	DE-Dendraster excentricus
Comments:	Azimuth Consulting Group 04-1424-044 (0500328)				

Conc-mg/L	1	2	3	4
D-Control	0.8800	0.8100	0.8500	0.8600
1	0.8800	0.8400	0.8900	0.8700
1.8	0.7500	0.7300	0.7400	0.7300
3.2	0.4900	0.5200	0.5300	0.4900
5.6	0.2600	0.2800	0.2600	0.2700
10	0.1600	0.1100	0.1400	0.1500

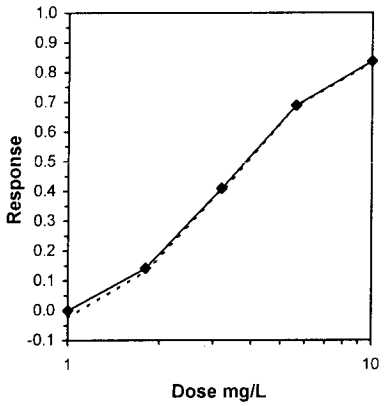
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-mg/L	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.8500	0.0294	0.8500	0.8100	0.8800	3.463	4				0.8600	1.0000
1	0.8700	0.0216	0.8700	0.8400	0.8900	2.483	4	-1.412	2.410	0.0341	0.8600	1.0000
*1.8	0.7375	0.0096	0.7375	0.7300	0.7500	1.298	4	7.941	2.410	0.0341	0.7375	0.8576
*3.2	0.5075	0.0206	0.5075	0.4900	0.5300	4.062	4	24.176	2.410	0.0341	0.5075	0.5901
*5.6	0.2675	0.0096	0.2675	0.2600	0.2800	3.579	4	41.118	2.410	0.0341	0.2675	0.3110
*10	0.1400	0.0216	0.1400	0.1100	0.1600	15.430	4	50.118	2.410	0.0341	0.1400	0.1628

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.95791		0.884		-0.5718	-0.0762
Bartlett's Test indicates equal variances (p = 0.43)					4.8475		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	1	1.8	1.34164		0.03414	0.04017	0.38111	0.0004	3.8E-21	5, 18

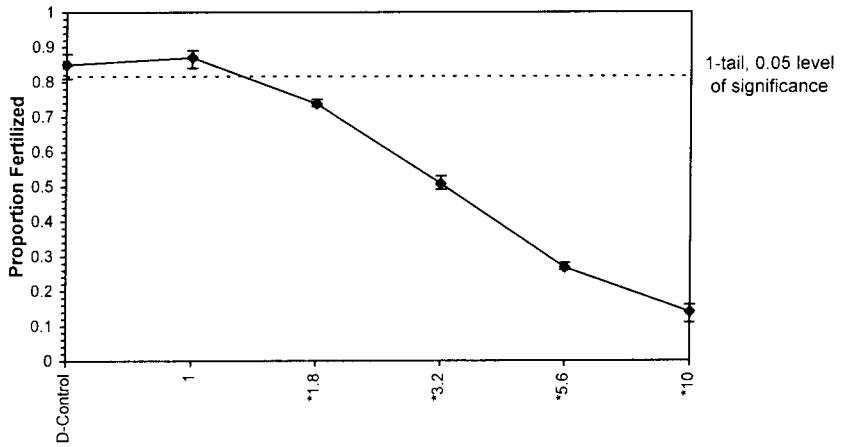
Log-Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05	1.2507	0.0219	1.1728	1.3194	0.2839
IC10	1.5329	0.0430	1.4377	1.6889	1.2146
IC15	1.8323	0.0408	1.7124	1.9570	0.2306
IC20	2.0553	0.0391	1.9513	2.1828	0.4191
IC25	2.2959	0.0426	2.1872	2.4359	0.3093
IC40	3.1375	0.0735	2.9274	3.3760	0.1213
IC50	3.8600	0.0706	3.6272	4.0719	-0.0638

mg/L SDS



Dose-Response Plot



Reviewed by: Aug 31 05

APPENDIX III

Chain-of-Custody Form

CHAIN-OF-CUSTODY / TEST REQUEST FORM

0743

Client Name: Teck Cominco
Address: Box 2000, Kimberley BC, V1A 3E1
Client Contact: Bruce Donald
Phone: 250-427-5405
Fax: 250-427-8451
Sampled by: B Bolton
Ship to:
Attn.: Edmund Canonia
Shipping Date: Aug 6/05

Golder Associates
195 Pemberton Avenue
North Vancouver, B.C.
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.golder.com

1 Collection Date (DD/MMM/YYYY)	1 Time (24-h clock)	Sample Identification	2 Type of Each Sample	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G=grab C=composite	Number of Sample Containers x Volume of Sample Containers (1 x 20L)	3 Sample Container Type by Code	Test(s) Requested: Sublethal toxicity					4 Sample Notes (preserved, saltwater, freshwater, may contain sewage...)
06/Aug/05	10:00 am	Garrow Creek	E		G	1 x 20L		X					Client is actually Azimuth Consulting

PO/Reference No.:
Project Title:
Results Needed By:

Comments/Instructions:

1) Released by: B Bolton Date: Aug 6/05
Company: Gartner Lee Ltd. Time: 14:00 hrs
Courier Name:

2) Released by: Date:
Company: Time:
Courier Name:

1) Received by: (SRS) Date: 9 Aug 05
Company: Golder Time: 10:15

1) Received by: Date:
Company: Time:

Shaded area to be completed by Golder Laboratory upon sample receipt.

Golder Project No.: 0500327 / 328 / 334 / 335
Golder Work Order No.: 04-1424-044
Condition Upon Receipt: Good
Receipt Sample Temp. (°C): 19.0

1 For composite effluent or water samples, the sample collection date/time is the **end** of the compositing period.
2 Receiving Water (RW): Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
3 Collapsible Carboy (CC); glass jar (GJ); Jerry Can (JC); Plastic HDPE (P); Other (Please Specify)
4 Please note any conditions the lab should be aware of for safety and storage concerns

Distribution of copies: White, Yellow — accompany the shipment
Pink — kept by consignor (e.g. shipper)
Yellow — kept by consignee (e.g. receiver)
White — returned to consignor by consignee

Please see instructions for completion on back of form

Revision Date: November 22, 2004

CHAIN-OF-CUSTODY / TEST REQUEST FORM

No. 0742

Client Name: Teck Cominco
Client Contact: Bruce Donald
Ship to:
Address: Box 2000
Kimberly, BC
V1A 3E1
Phone: 250-427-8405
Fax: 250-427-8451
Sampled by: B Bolton
Attn: Edmund Camacia

Golder Associates
195 Pemberton Avenue
North Vancouver, B.C.
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.golder.com

Shipping Date: Aug 6/05

1 Collection Date (DD/MMM/YYYY)	1 Time (24-h clock)	Sample Identification	2 Type of Each Sample	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G=grab C=composite	Number of Sample Containers x Volume of Sample Containers (1 x 20L)	3 Sample Container Type by Code	Test(s) Requested: Sub-lethal toxicity	Test(s) Requested	Test(s) Requested	Test(s) Requested	Test(s) Requested	4 Sample Notes (preserved, saltwater, freshwater, may contain sewage...)
06/Aug/05	10:00 am	Garrow Creek	E		G	2x20L	P	X					Client is actually Azimuth consulting

PO/Reference No.:
Project Title:
Results Needed By:

Comments/Instructions:

1) Released by: B Bolton Date: Aug 6/05
Company: Gartner Lee Ltd Time: 14 hrs
Courier Name:

2) Released by: Date:
Company: Time:
Courier Name:

1) Received by: (SRS) Date: 9 Aug 05
Company: Golder Time: 10:15

1) Received by: Date:
Company: Time:

Shaded area to be completed by Golder Laboratory upon sample receipt

Golder Project No.: 0500327 /328/334/335
Golder Work Order No.: 04-1924-044
Condition Upon Receipt: Good
Receipt Sample Temp. (°C): 19.0

1 For composite effluent or water samples, the sample collection date/time is the **end** of the compositing period.
2 Receiving Water (RW): Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
3 Collapsible Carboy (CC); glass jar (GJ); Jerry Can (JC); Plastic HDPE (P); Other (Please Specify)
4 Please note any conditions the lab should be aware of for safety and storage concerns

Distribution of copies: White, Yellow – accompany the shipment
Pink – kept by consignor (e.g. shipper)
Yellow – kept by consignee (e.g. receiver)
White – returned to consignor by consignee

Please see instructions for completion on back of form

Revision Date: November 22, 2004

CHAIN-OF-CUSTODY / TEST REQUEST FORM

10 0741

Golder Associates
195 Pemberton Avenue
North Vancouver, B.C.
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.golder.com

Client Name: Teck Cominco
Address: Box 2000, Kimberly, BC V1A 3E1
Client Contact: Bruce Donald
Phone: 250-427-8405
Fax: 250-427-8451
Sampled by: B Bolton
Ship to:
Attn.: Edmund Camaria
Shipping Date: Aug 6/05

1 Collection Date (DD/MMM/YYYY)	1 Time (24-h clock)	Sample Identification	2 Type of Each Sample	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G=grab C=composite	Number of Sample Containers x Volume of Sample Containers (1 x 20L)	3 Sample Container Type by Code	Test(s) Requested: Acute toxicity					4 Sample Notes (preserved, saltwater, freshwater, may contain sewage...)
06/Aug/05	10:00	Garrow Creek	20L		G	2x20L	P	X					Client is actually Azimuth consulting

PO/Reference No.:
Project Title:
Results Needed By:

Comments/Instructions:

1) Released by: Brenda Bolton Date: Aug 6/05
Company: Gartner Lee Time: 14:00 hrs
Courier Name:

2) Released by: Date:
Company: Time:
Courier Name:

1) Received by: (SRS) Date: 9 Aug 05
Company: Golder Time: 10:15

1) Received by: Date:
Company: Time:

Shaded area to be completed by Golder laboratory upon sample receipt.

Golder Project No.: 0500327 / 328/334/335
Golder Work Order No.: 04-1429-044
Condition Upon Receipt: Good
Receipt Sample Temp. (°C): 19.0

1 For composite effluent or water samples, the sample collection date/time is the **end** of the compositing period.
2 Receiving Water (RW): Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
3 Collapsible Carboy (CC); glass jar (GJ); Jerry Can (JC); Plastic HDPE (P); Other (Please Specify)
4 Please note any conditions the lab should be aware of for safety and storage concerns

Distribution of copies:
White, Yellow – accompany the shipment
Pink – kept by consignor (e.g. shipper)
Yellow – kept by consignee (e.g. receiver)
White – returned to consignor by consignee

Please see instructions for completion on back of form

Revision Date: November 22, 2004

APPENDIX I

Polaris 2005 Sampling Event Chronology

Appendix I - Polaris 2005 Sampling and Event Chronology

Becasue mine activities at the Polaris Mine Site ceased during the 2005 season, collection of the MMER and EEM data was conducted by small field crews stationed on-site for limited time periods (early season) and then by flying technicians into the site on a weekly basis in the latter part of the season. Because of the remote location of the high Arctic mine site and the unpredictable weather conditions, sample shipping and transport issues typically arise throughout the season. This season there were several flight attempts into the mine site during the latter part of the season that were unsuccessful due to hazardous weather conditions. The following is a chronology of the 2005 MMER/EEM sampling program, including sample attempts that were prevented due to weather conditions and/or shipping difficulties.

Date	Event Type	Observation/ Comments
Sat. Jun-25-05	-	Flow initiated in Garrow Creek
Wed. Jun-29-05	Monthly/Quarterly	FDP accessible; exposure (Garrow Bay) and reference (Garrow Bay) stations were ice covered precluding sample collection; no exceedances of MMER Schedule 4 limits; T-Hg, alkalinity and nitrate were analyzed after holding times due to an oversight by the ALS lab; a letter explaining this oversight was included in the 2nd quarter report. The EVS and Stantech labs were not able to accommodate a toxicity testing program for this event, as samples would have arrived during a statutory holiday (i.e., Friday July 1, 2005)
Wed. Jul-06-05	Monthly/Quarterly Failed attempt for collecting toxicity samples	FDP accessible; exposure (Garrow Bay) and reference (Garrow Bay) stations were ice covered precluding sample collection; no exceedances of MMER Schedule 4 limits; alkalinity and nitrate were analyzed after holding time due to an oversight by the ALS lab; a letter explaining this oversight is included in the 3nd quarter report Samples for toxicity testing were collected. However, due to fog conditions at the mine site, the flight into and out of the mine site was delayed and missed the connecting flight out of Resolute Bay. Toxicity samples missed holding times and were discarded by the labs, or stopped en-route.
Wed. Jul-13-05	Weekly	A weekly sample was collected as the program schedule was adjusted to Saturday collections to enable sample delivery to the labs earlier in the week (i.e., Tuesday). Although this shipping schedule adds an extra day in transit, if there are no weather delays, then samples should arrive at the labs within the holding time for all toxicity tests.
Sat. Jul-16-05	Monthly/Quarterly Acute Toxicity Sublethal Toxicity	All effluent and water quality monitoring stations were accessible for sample collection. Samples arrived at the labs on Tuesday July 19, 2005 within holding times for all tests. No exceedances of Schedule 4 limits. No acute toxicity.
Sat. Jul-23-05	Weekly	No exceedances of Schedule 4 limits.
Sat. Jul-23-05	Weekly	No exceedances of Schedule 4 limits.
Sat. Jul-23-05	Weekly	No exceedances of Schedule 4 limits.
Sat. Aug-06-05	Monthly/Quarterly Acute Toxicity Sublethal Toxicity	All effluent and water quality monitoring stations were accessible for sample collection. Samples arrived at the labs on Tuesday August 9, 2005 within holding times for all tests. No exceedances of Schedule 4 limits. No acute toxicity.
Sat. Aug-13-05	Weekly	No exceedances of Schedule 4 limits.
Sat. Aug-20-05	Failed attempt for Weekly sample	Flight to Polaris Mine site from Resolute was attempted but did not land due to thick fog and therefore unsafe landing conditions. Jenny Ferone and Ken Russell were notified of this and the following failed attempts on August 29, 2005.
Sun. Aug-21-05	Failed attempt for Weekly sample	Flight to Polaris Mine site from Resolute was attempted but did not land due to thick fog and therefore unsafe landing conditions. Jenny Ferone and Ken Russell were notified of this and the following failed attempts on August 29, 2005.
Mon. Aug-22-05	Failed attempt for Weekly sample	Fog conditions from satellite photos indicated weather was the same or worse than the previous 2 days. No flight attempted over to site due to unsafe landing conditions. Jenny Ferone and Ken Russell were notified of this and the following failed attempts on August 29, 2005.
Tue. Aug-23-05	Failed attempt for Weekly sample	Fog conditions from satellite photos indicated weather was the same or worse than the previous 3 days. No flight attempted over to site due to unsafe landing conditions. Jenny Ferone and Ken Russell were notified of this and the following failed attempts on August 29, 2005.
Wed. Aug-24-05	Weekly	The sample attempt made on Wed August 24, 2005, was successful, following the failed attempts since the previous Saturday. No exceedances of Schedule 4 limits.
Sat. Aug-27-05	Weekly	No exceedances of Schedule 4 limits.

Date	Event Type	Observation/ Comments
Wed. Aug-31-05	Failed attempt for Weekly sample	An attempt to fly into Polaris was made. However, due to fog conditions at the mine site, and the plane was unable to land. Ken Russell and Jenny Ferone were notified of this failed attempt on September 1, 2005.
Sat. Sep-03-05	Failed attempt for Weekly sample	Thick fog and poor visibility prevented the plane from leaving Resolute. Ken Russell and Jenny Ferone were notified of this failed attempt on September 6, 2005.
Wed. Sep-07-05	Failed attempt for Weekly sample	The planned flight into Polaris was cancelled by the pilot due to snow conditions (5-10cm) in Resolute and potentially unsafe conditions for landing at the mine site. Ken Russell and Jenny Ferone were notified of this failed attempt on September 7, 2005.
Sat. Sep-10-05	Failed attempt for Weekly sample	A monthly chemistry plus acute toxicity testing event was planned. However, due to blowing snow conditions, it was deemed by the pilot too hazardous to land an aircraft at the mine site. Ken Russell (Environment Canada) was informed on September 13, 2005.
Tue. Sep-13-05	-	A monthly chemistry plus acute toxicity testing event was planned. However, upon arrival at the mine site, the creek was found to be frozen. Ken Russell was informed on September 13, 2005

APPENDIX J

Letter from ALS explaining missed holding times for July 6, 2005 sample

ALS Environmental

August 5, 2005

Mr. Bruce Donald
Teck Cominco
Bag 2000
Kimberley, BC V1A 3E1

Dear Mr. Donald,

RE: Concerns Regarding Analytical Service

This is in response to email correspondence dated July 29, 2005 through August 3, 2005 expressing concerns over the services provided by ALS Environmental on some Teck Cominco / Azimuth Consulting Group submissions from late June and early July. The examples noted in the emails and the overall concerns over the service provided are taken very seriously by ALS Environmental, and this response letter will hopefully help to address the concerns that were expressed.

In order to provide some clarity and to help resolve the various items of concerns, the following are some of the details that relate to the individual concerns expressed in the emails.

1) missed analyses for samples submitted,
2) missed holding times for Nitrate, Mercury, Alkalinity.

Details of Expressed Concerns

Missed Analysis / Missed Holding Times for Samples Submitted for 2 Submissions:

Polaris MMER (ALS W1416) analysed for pH, Salinity, Total Cyanide, Ammonia, Total Suspended Solids, Radium 226 and total metals
Date / Time Received: Monday, July 11, 2005 @ 10:10 am.
Date / Time Reported: Monday, July 25, 2005 @ 2:23 pm for all but the Radium 226 via email
Wednesday, July 27, 2005 @ 2:42 pm for all analysis via email

Polaris MMER (ALS W1458) analysed for pH, Salinity, Total Cyanide, Ammonia, Total Suspended Solids, Radium 226 and total metals including Mercury
Date / Time Received: Tuesday, July 12, 2005 @ 9:30 am.
Date / Reported: Monday, July 25, 2005 @ 2:23 pm for all but the Radium 226 via email
Wednesday, July 27, 2005 @ 2:42 pm for all analysis via email.

On July 28, 2005, Cheryl Mackintosh of Azimuth Consulting Group called Leanne Harris and expressed concern over the fact that the Mercury analysis for W1416 was missing. Upon investigation, it was

discovered that the Mercury was missed at the time of receipt; although it was indicated on the chain of custody. The Mercury analysis for this sample was completed at Ms. Mackintosh's request, but it should be noted that it was one day past the recommended holding time of 28 days for Mercury analysis in water.

On July 29, 2005, Ms. Mackintosh emailed Ms. Harris to inquire about the missing analysis of Nitrate and Alkalinity on the two above referenced submissions. The 48 hour recommended holding time for Nitrate had been exceeded prior to receipt of the samples, but the analysis was carried out as per request. The 14 day holding time for Alkalinity had been exceeded by the time the analysis was completed.

Ms. Mackintosh indicated in subsequent email correspondence that these samples had been identified in an email as MMER monthly samples; which meant that they should have been analysed for a fuller suite of analyses. ALS missed the analysis requests and in future will work toward improved communication internally to prevent a similar situation from occurring again.

The results for the Mercury and Alkalinity analysis with holding time exceedences were compared to other routine monitoring results. Historically, the samples compare well with previous submissions analysed within the holding times. Future submissions will be analysed within the appropriate holding times for Mercury and Alkalinity as long as the samples are received with sufficient time to do the analysis. For the Nitrate analysis, with the very short holding time of 48 hours, these samples will not be able to reach a lab within the holding time due to the remote nature of the site. The recommended holding time for these analyses is usually based on studies done with chemically active samples (such as waste waters or discharge samples), which chemically change over short periods of time. While there is no way to tell exactly how these samples are changing over time (without doing a detailed study that incorporates time studies), in general clean water samples from groundwater or surface water sources usually don't have a large amount of chemical activity.

Hopefully, this letter has summarized and addressed the concerns that have been raised. Most of the issue relates to communication. Increased effort in ensuring that there is excellent communication between our staff and the client, as well as thorough communication internally, helps to yield a successful project.

Thank you for bringing this matter to our attention as it helps us to assess our operation and continuously adjust and improve. Please feel free to contact either of the undersigned if you would like to discuss the matter further.

Sincerely,

Joyce Chow, B. Sc.
Branch Manager

Heather Ross-Easton, B.Sc.
Client Services Representative

cc: Cheryl Mackintosh, Azimuth Consulting Group Inc.
Patrick Allard, Azimuth Consulting Group Inc.
Randy Baker, Azimuth Consulting Group Inc.

APPENDIX 3

Garrow Lake Water Column

Minimum Ice Conditions

Monitoring Event Data

POLARIS MINE - GARROW LAKE SAMPLING - AUGUST 25, 2005

Garrow Lake Center - Station 262-3 DATA

Physical Tests	GLC-0m	GLC-1.5m	GLC-2m	GLC-3m	GLC-4m	GLC-5m	GLC-6m	GLC-7m	GLC-8m	GLC-9m	GLC-10m	GLC-11m	GLC-12m	GLC-13m
Conductivity (uS/cm)	7150	7100	7130	7390	12100	13000	13300	13400	13400	24700	67900	84600	85200	85300
Hardness	858	867	838	898	1470	1540	1580	1600	1700	2850	9300	11800	12300	12400
pH	8.04	8.06	8.08	7.72	8.18	8.22	8.22	8.22	8.22	8.02	7.81	7.84	7.84	7.83
Salinity o/oo	4.2	4.2	4.2	4.4	7.5	8.1	8.3	8.3	8.3	16.2	50.1	64.6	65.2	65.3
Total Suspended Solids	<3.0	3.0	<3.0	<3.0	3.0	7.7	5.0	4.3	5.0	7.0	34.3	44.3	37.0	61.0
Sulphide	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Alkalinity (CaCO3)	90.1	90.2	90.1	94.8	139	98.6	159	156	158	167	279	404	412	421
Total Metals														
Aluminum	<0.030	<0.030	<0.030	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.050	<0.10	<0.10	<0.10	<0.10
Arsenic	<0.00020	<0.00020	<0.00020	<0.00020	0.00034	<0.00020	<0.00020	0.00022	<0.00020	0.00119	<0.00020	0.00045	0.00030	0.00041
Cadmium	0.000311	0.000315	0.000324	0.000310	0.000553	0.000608	0.000599	0.000663	0.000630	0.00125	0.00248	0.000045	0.000041	0.000051
Calcium	80.0	81.0	77.3	84.0	136	141	146	147	157	225	622	778	808	810
Copper	0.000784	0.000756	0.000777	0.000737	0.00111	0.00120	0.00119	0.00125	0.00116	0.00153	0.00401	0.00138	0.000954	0.00109
Iron	<0.010	<0.010	0.012	<0.010	0.011	<0.010	<0.010	0.011	<0.010	<0.010	0.012	0.114	0.137	0.146
Lead	0.000349	0.000334	0.000355	0.000320	0.000311	0.000283	0.000226	0.000312	0.000189	0.000186	0.000382	0.000810	0.000872	0.00113
Magnesium	160	162	157	167	275	289	296	300	318	556	1880	2390	2490	2510
Mercury	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum	0.0016	0.0014	0.0016	0.0016	0.0026	0.0028	0.0028	0.0027	0.0031	0.0069	<0.0050	0.0065	0.0068	0.0068
Nickel	0.00225	0.00228	0.00237	0.00235	0.00366	0.00406	0.00402	0.00421	0.00403	0.00526	0.00912	0.00945	0.00847	0.00860
Zinc	0.130	0.131	0.136	0.134	0.243	0.267	0.265	0.284	0.271	0.552	1.25	0.151	0.104	0.105

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

< = Less than the detection limit indicated.

POLARIS MINE - GARROW LAKE SAMPLING - AUGUST 25, 2005

Garrow Lake Center - Station 262-3 DATA

Physical Tests	GLC-14m	GLC-15m	GLC-16m	GLC-17m	GLC-18m	GLC-19m	GLC-20m	GLC-22m	GLC-30m	GLC-40m	Travel Blank
Conductivity (uS/cm)	85500	85100	85300	85500	85100	85500	85700	85700	85600	86700	2.8
Hardness	13100	12300	12600	12500	12400	13300	13100	12900	14100	14400	<0.50
pH	7.82	7.83	7.82	7.82	7.83	7.83	7.81	7.83	7.82	7.78	5.53
Salinity o/oo	65.4	65.1	65.3	65.4	65.1	65.4	65.6	65.6	65.5	66.5	<1.0
Total Suspended Solids	27.7	31.7	62.3	69.7	47.7	49.0	60.3	45.7	41.7	50.3	<3.0
Sulphide	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.82	<0.020
Alkalinity (CaCO3)	420	431	419	428	432	433	431	430	420	406	<2.0
Total Metals											
Aluminum	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.0010
Arsenic	0.00048	0.00041	0.00035	<0.00020	0.00053	0.00046	0.00040	<0.00020	<0.00020	<0.00020	<0.00020
Cadmium	0.000022	0.000029	0.000031	0.000030	0.000033	0.000030	0.000033	0.000064	0.000069	0.000039	<0.000050
Calcium	861	803	823	816	815	868	851	835	912	915	<0.050
Copper	0.000644	0.000727	0.000645	0.000674	0.000682	0.000716	0.000755	0.000784	0.000652	0.000410	<0.00010
Iron	0.118	0.270	0.282	0.270	0.272	0.273	0.257	0.247	0.351	0.271	<0.010
Lead	0.000591	0.000816	0.000901	0.000861	0.000925	0.000919	0.000903	0.00413	0.00946	0.00523	<0.000050
Magnesium	2650	2490	2570	2550	2530	2700	2660	2620	2860	2930	<0.050
Mercury	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum	0.0075	0.0074	0.0072	0.0072	0.0064	0.0071	0.0072	0.0062	<0.0050	<0.0050	<0.000050
Nickel	0.00829	0.00794	0.00762	0.00794	0.00785	0.00801	0.00730	0.00676	0.00423	0.00119	<0.00010
Zinc	0.0457	0.0565	0.0556	0.0409	0.0435	0.0425	0.0413	0.0468	0.0404	0.0235	<0.0010

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

< = Less than the detection limit indicated.

POLARIS MINE - GARROW LAKE SAMPLING - AUGUST 25, 2005

Garrow Lake South - Station 262-3a DATA

Physical Tests	GLS-0m	GLS-1m	GLS-1.5m	GLS-2m	GLS-3m	GLS-4m	GLS-5m	GLS-6m	GLS-7m	GLS-8m	GLS-9m	GLS-10m	GLS-11m	GLS-12m	GLS-13m
Conductivity (uS/cm)	7080	7110	7100	7120	7170	11000	12800	13200	13400	13700	25100	65300	77100	77400	85200
Hardness	817	837	812	837	800	1320	1530	1640	1600	1730	3320	10100	12900	12300	12800
pH	8.03	8.10	8.10	8.10	8.10	8.23	8.14	8.15	8.14	8.14	7.85	7.71	7.74	7.76	7.78
Salinity o/oo	4.2	4.2	4.2	4.2	4.2	6.7	7.9	8.2	8.3	8.5	16.5	47.9	58.0	58.3	65.2
Total Suspended Solids	5.7	3.7	3.0	5.0	<3.0	4.3	3.7	7.7	<3.0	8.3	8.1	10.0	23.5	21.5	24.1
Sulphide	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Alkalinity (CaCO3)	78.8	90.1	90.8	89.6	91.0	133	150	155	155	159	168	267	371	410	409
Total Metals															
Aluminum	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10
Arsenic	<0.00020	<0.00020	<0.00020	<0.00020	0.00023	0.00028	<0.00020	0.00020	0.00107	0.00098	<0.00020	0.00033	0.00047	<0.00020	0.00033
Cadmium	0.000269	0.000280	0.000263	0.000275	0.000290	0.000454	0.000553	0.000586	0.000619	0.000626	0.00136	0.00238	0.000058	0.000045	0.000055
Calcium	77.3	77.9	75.9	78.0	74.8	120	140	149	147	158	256	683	860	818	846
Copper	0.000861	0.000958	0.000819	0.000782	0.000788	0.000967	0.00113	0.00110	0.00119	0.00119	0.00175	0.00409	0.00167	0.00185	0.00180
Iron	0.023	0.025	0.021	0.022	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	0.012	0.012	0.075	0.117	0.142
Lead	0.000599	0.000456	0.000433	0.000435	0.000409	0.000311	0.000307	0.000281	0.000235	0.000204	0.000195	0.000430	0.000963	0.00107	0.00129
Magnesium	152	156	151	156	149	247	287	308	300	324	651	2050	2610	2500	2600
Mercury	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.0028	0.0025	0.0027	<0.0050	0.0051	0.0075	0.0079	0.0068
Nickel	0.00234	0.00230	0.00213	0.00220	0.00234	0.00328	0.00396	0.00404	0.00405	0.00437	0.00577	0.00884	0.00930	0.00912	0.00854
Zinc	0.113	0.112	0.104	0.109	0.115	0.176	0.219	0.230	0.240	0.253	0.574	1.09	0.146	0.0944	0.0888

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

< = Less than the detection limit indicated.

POLARIS MINE - GARROW LAKE SAMPLING - AUGUST 25, 2005

Garrow Lake South - Station 262-3a DATA

Physical Tests	GLS-14m	GLS-15m	GLS-16m	GLS-17m	GLS-18m	GLS-19m	GLS-20m
Conductivity (uS/cm)	78000	77900	77700	77600	77600	77600	77500
Hardness	12600	13200	12400	12600	12600	12600	12500
pH	7.76	7.74	7.74	7.75	7.74	7.75	7.74
Salinity o/oo	58.8	58.7	58.5	58.4	58.4	58.4	58.4
Total Suspended Solids	13.5	24.8	14.1	16.1	7.5	11.5	16.1
Sulphide	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Alkalinity (CaCO3)	413	415	403	409	421	427	426
Total Metals							
Aluminum	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Arsenic	0.00060	0.00031	0.00044	0.00070	0.00033	0.00025	0.00036
Cadmium	0.000025	0.000034	0.000034	0.000036	0.000033	0.000032	0.000032
Calcium	833	871	823	834	832	833	826
Copper	0.00179	0.00106	0.00103	0.00101	0.000976	0.000984	0.000833
Iron	0.100	0.241	0.292	0.278	0.258	0.278	0.231
Lead	0.000805	0.00106	0.000972	0.000916	0.000870	0.000905	0.000801
Magnesium	2560	2670	2520	2560	2550	2560	2530
Mercury	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum	0.0069	0.0073	0.0060	0.0070	0.0064	0.0071	0.0055
Nickel	0.00843	0.00717	0.00747	0.00706	0.00700	0.00711	0.00631
Zinc	0.0300	0.0370	0.0398	0.0383	0.0372	0.0417	0.0354

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

< = Less than the detection limit indicated.

POLARIS MINE - GARROW LAKE SAMPLING - AUGUST 25, 2005

Garrow Lake Center - Station 262-3 DETECTION LIMITS

Physical Tests	GLC-0m	GLC-1.5m	GLC-2m	GLC-3m	GLC-4m	GLC-5m	GLC-6m	GLC-7m	GLC-8m	GLC-9m	GLC-10m	GLC-11m	GLC-12m	GLC-13m
Conductivity (uS/cm)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Hardness	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	33	33	33	33	33
pH	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Salinity o/oo	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Suspended Solids	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Sulphide	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Alkalinity (CaCO3)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Total Metals														
Aluminum	0.030	0.030	0.030	0.020	0.020	0.020	0.020	0.020	0.020	0.050	0.10	0.10	0.10	0.10
Arsenic	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020
Cadmium	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020
Calcium	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	5.0	5.0	5.0	5.0	5.0
Copper	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Iron	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Lead	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Magnesium	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	5.0	5.0	5.0	5.0	5.0
Mercury	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Molybdenum	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0050	0.0050	0.0050	0.0050	0.0050
Nickel	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Zinc	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050

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

POLARIS MINE - GARROW LAKE SAMPLING - AUGUST 25, 2005

Garrow Lake Center - Station 262-3 DETECTION LIMITS

Physical Tests	GLC-14m	GLC-15m	GLC-16m	GLC-17m	GLC-18m	GLC-19m	GLC-20m	GLC-22m	GLC-30m	GLC-40m	Travel Blank
Conductivity (uS/cm)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Hardness	33	33	33	33	33	33	33	33	33	33	0.50
pH	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Salinity o/oo	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Suspended Solids	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Sulphide	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.20	
Alkalinity (CaCO3)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Total Metals											
Aluminum	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.0010
Arsenic	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020
Cadmium	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000050
Calcium	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	0.050
Copper	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.00010
Iron	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Lead	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Magnesium	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	0.050
Mercury	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Molybdenum	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.000050
Nickel	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.00010
Zinc	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.0010

Footnotes: essed as milligrams per litre except where noted.

POLARIS MINE - GARROW LAKE SAMPLING - AUGUST 25, 2005

Garrow Lake South - Station 262-3a DETECTION LIMITS

Physical Tests	GLS-0m	GLS-1m	GLS-1.5m	GLS-2m	GLS-3m	GLS-4m	GLS-5m	GLS-6m	GLS-7m	GLS-8m	GLS-9m	GLS-10m	GLS-11m	GLS-12m	GLS-13m
Conductivity (uS/cm)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Hardness	17	17	17	17	17	17	17	17	17	17	33	33	33	33	33
pH	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Salinity (o/oo)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Suspended Solids	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Sulphide	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Alkalinity (CaCO3)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Total Metals															
Aluminum	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.10	0.10	0.10	0.10	0.10
Arsenic	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020
Cadmium	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020
Calcium	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	5.0	5.0	5.0	5.0	5.0
Copper	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Iron	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Lead	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Magnesium	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	5.0	5.0	5.0	5.0	5.0
Mercury	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Molybdenum	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0050	0.0050	0.0050	0.0050	0.0050
Nickel	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Zinc	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050

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

POLARIS MINE - GARROW LAKE SAMPLING - AUGUST 25, 2005

Garrow Lake South - Station 262-3a DETECTION LIMITS

Physical Tests	GLS-14m	GLS-15m	GLS-16m	GLS-17m	GLS-18m	GLS-19m	GLS-20m	Travel Blank
Conductivity (uS/cm)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Hardness	33	33	33	33	33	33	33	0.50
pH	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Salinity (o/oo)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Suspended Solids	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Sulphide	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Alkalinity (CaCO3)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Total Metals								
Aluminum	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.0010
Arsenic	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020
Cadmium	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020
Calcium	5.0	5.0	5.0	5.0	5.0	5.0	5.0	0.050
Copper	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Iron	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Lead	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Magnesium	5.0	5.0	5.0	5.0	5.0	5.0	5.0	0.050
Mercury	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Molybdenum	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.000050
Nickel	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Zinc	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050

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

POLARIS MINE - GARROW LAKE SAMPLING - AUGUST 25, 2005

	DUPLICATE DATA					DUPLICATE DETECTION LIMITS				
Physical Tests	**GLS-6Am**	**GLS-20Am**	**GLC-9Am**	**GLC-20Am**	**GL-BLANK**	**GLS-6am**	**GLS-20Am**	**GLC-9Am**	**GLC-20Am**	**GL-BLANK**
Conductivity (uS/cm)	13400	85700	22400	86000	-	2.0	2.0	2.0	2.0	-
Hardness	1750	12500	3260	12400	-	17	33	33	33	-
pH	8.25	7.84	8.10	7.84	-	0.010	0.010	0.010	0.010	-
Salinity o/oo	8.3	65.6	14.6	65.9	-	1.0	1.0	1.0	1.0	-
Total Suspended Solids	<3.0	52.3	3.7	42.3	-	3.0	3.0	3.0	3.0	-
Sulphide	<0.020	<0.020	<0.020	<0.020	-	0.020	0.020	0.020	0.020	-
Alkalinity (CaCO3)	158	426	159	426	-	2.0	2.0	2.0	2.0	-
Total Metals										
Aluminum	<0.050	<0.10	<0.10	<0.10	<0.0010	0.050	0.10	0.10	0.10	0.0010
Arsenic	0.00027	0.00052	<0.00020	0.00039	<0.00020	0.00020	0.00020	0.00020	0.00020	0.00020
Cadmium	0.000582	0.000029	0.00138	0.000029	<0.000050	0.000020	0.000020	0.000020	0.000020	0.000050
Calcium	157	805	248	799	<0.050	2.5	5.0	5.0	5.0	0.050
Copper	0.00126	0.000802	0.00167	0.000609	<0.00010	0.000050	0.000050	0.000050	0.000050	0.00010
Iron	0.013	0.228	<0.010	0.220	<0.010	0.010	0.010	0.010	0.010	0.010
Lead	0.000278	0.000800	0.000191	0.000775	0.000110	0.000050	0.000050	0.000050	0.000050	0.000050
Magnesium	330	2560	640	2530	0.051	2.5	5.0	5.0	5.0	0.050
Mercury	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Molybdenum	0.0029	0.0066	<0.0050	0.0060	<0.000050	0.0025	0.0050	0.0050	0.0050	0.000050
Nickel	0.00439	0.00618	0.00610	0.00628	<0.00010	0.000050	0.000050	0.000050	0.000050	0.00010
Zinc	0.240	0.0361	0.588	0.0348	0.0014	0.00050	0.00050	0.00050	0.00050	0.0010

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

< = Less than the detection limit indicated.

POLARIS MINE - GARROW LAKE SAMPLING - AUGUST 25, 2005

REPLICATE QA/QC

Physical Tests	GLC-20Am	GLC-20Am	RPD %
Conductivity (uS/cm)	86000	85700	0.349
Hardness	12400	13200	6.25
pH	7.84	7.85	0.127
Salinity o/oo	65.9	65.9	0
Total Suspended Solids	42.3	47.7	12
Sulphide	<0.020	<0.020	0
Alkalinity (CaCO3)	426	421	1.18
Total Metals			
Aluminum	<0.10	<0.10	0
Arsenic	0.00039	0.00044	12
Cadmium	0.000029	0.000034	15.9
Calcium	799	838	4.76
Copper	0.000609	0.000654	7.13
Iron	0.220	0.236	7.02
Lead	0.000775	0.000820	5.64
Magnesium	2530	2690	6.13
Mercury	<0.000010	<0.000010	0
Molybdenum	0.0060	0.0070	15.4
Nickel	0.00628	0.00705	11.6
Zinc	0.0348	0.0386	10.4

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

GARROW LAKE MONITORING HYDROLAB DATA - AUGUST 25, 2005

Depth (m)	TEMPERATURE (0C)		CONDUCTIVITY (mS/cm)		pH		DO (mg/l)	
	Centre 262-3	South 262-3a	Centre 262-3	South 262-3a	Centre 262-3	South 262-3a	Centre 262-3	South 262-3a
0	3.63	3.55	5.45	5.41	9.13	8.29	13.54	13.39
1	3.62	3.55	5.45	5.43	9.13	8.31	13.32	13.35
1.5	3.60	3.50	5.46	5.43	9.13	8.33	13.24	13.30
2	3.57	3.52	5.47	5.43	9.13	8.34	13.21	13.28
3	3.53	3.43	5.46	4.59	9.13	8.35	13.20	15.32
4	4.13	4.43	8.36	9.37	8.90	8.18	17.38	17.65
5	4.75	4.73	9.83	9.96	8.93	8.20	18.03	18.56
6	4.78	4.71	10.10	10.16	8.90	8.24	18.44	18.63
7	4.68	4.68	10.23	10.34	8.92	8.25	18.56	18.14
8	5.05	5.08	11.37	11.62	8.81	8.19	14.10	14.78
9	6.48	6.42	33.80	33.10	8.11	7.55	1.11	2.75
9.5	7.25	7.00	51.00	44.70	7.89	7.36	0.85	1.13
10	7.86	7.92	58.90	60.50	7.87	7.35	0.57	1.57
10.5	8.19	8.19	62.20	63.10	7.91	7.53	0.84	1.78
11	8.24	8.25	63.00	63.40	7.94	7.65	1.02	1.50
12	8.22	8.25	63.80	63.90	7.96	7.74	0.17	0.28
13	8.07	8.07	64.20	64.20	7.96	7.79	0.14	0.18
14	7.92	7.94	64.30	64.30	7.97	7.81	0.14	0.17
15	7.83	7.86	64.30	64.30	7.98	7.82	0.13	0.16
16	7.76	7.78	64.30	64.20	7.99	7.90	0.12	0.15
17	7.73	7.74	64.40	64.20	8.00	7.91	0.13	0.14
18	7.70	7.71	64.40	64.30	8.00	7.92	0.13	0.12
19	7.68	7.70	64.40	64.30	8.00	7.93	0.13	0.12
20	7.68	7.68	64.40	64.30	8.01	7.94	0.13	0.13
21	7.66	7.66	64.40	64.30	8.01	7.94	0.12	0.13
22	7.66	7.66	64.30	64.30	8.01	7.94	0.12	0.12
23	7.68		64.30		8.01		0.12	
24	7.66		64.30		8.01		0.12	
25	7.68		64.30		8.01		0.12	
26	7.66		64.40		8.01		0.12	
27	7.66		64.40		8.01		0.12	
28	7.66		64.40		8.01		0.13	
29	7.71		64.50		8.00		0.11	
30	7.73		64.50		7.99		0.12	
31	7.76		64.60		7.97		0.11	
32	7.77		64.70		7.97		0.12	
33	7.82		64.80		7.95		0.11	
34	7.87		64.90		7.94		0.12	
35	7.92		65.00		7.93		0.13	
36	8.00		65.10		7.91		0.12	
37	8.15		65.10		7.89		0.13	
38	8.22		65.30		7.87		0.14	
39	8.27		65.40		7.86		0.13	
40	8.30		65.50		7.85		0.14	

APPENDIX 4

Monitoring of Other

Site Surface Waters

ALS Environmental

CHEMICAL ANALYSIS REPORT

Date:	August 29, 2005
ALS File No.	W2679
Report On:	Polaris Weekly MMER Water Analysis
Report To:	**Azimuth Consulting Group Inc.** 218 - 2902 West Broadway Vancouver, BC V6K 2G8
Attention:	**Ms. Cheryl Mackintosh**
Received:	August 9, 2005

ALS ENVIRONMENTAL
per:

Leanne Harris, B.Sc. - Project Chemist
Heather A. Ross-Easton, B.Sc. - Project Chemist

File No. W2679

REMARKS

Radium 226 was subcontracted to SRC.

A Campbell Brothers Limited Company

File No. W2679

RESULTS OF ANALYSIS - Seawater

Sample ID		G-Creek	LRD-SW	F-Lake
Sample Date		05-07-30	05-07-28	05-07-28
Sample Time		08:30	15:00	22:00
ALS ID		*1*	*2*	*3*
Physical Tests				
pH		7.70	7.91	-
Salinity	o/oo	1.5	-	-
Total Suspended Solids		<3.0	<3.0	4.2
Cyanides				
Total Cyanide	CN	<0.0050	-	-
Total Metals				
Aluminum	T-Al	<0.20	-	-
Arsenic	T-As	0.00021	-	-
Cadmium	T-Cd	0.000098	-	-
Copper	T-Cu	0.000496	-	-
Iron	T-Fe	0.014	-	-
Lead	T-Pb	0.000202	0.00103	-
Mercury	T-Hg	<0.000050	-	-
Molybdenum	T-Mo	<0.0050	-	-
Nickel	T-Ni	0.00141	-	-
Zinc	T-Zn	0.0405	0.0657	-
Radiological Parameters				
Radium-226		<0.0050	-	-

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

A Campbell Brothers Limited Company

File No. W2679

Appendix 1 - METHODOLOGY

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

pH in Water

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

Recommended Holding Time:
Sample: 2 hours
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Conventional Parameters in Water

These analyses are carried out in accordance with procedures described in "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). Further details are available on request.

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"

Cyanide Species in Water

This analysis is carried out using procedures adapted from APHA Method 4500-CN "Cyanide". Total or strong acid dissociable (SAD) cyanide and weak acid dissociable (WAD) cyanide are determined by sample distillation and analysis using the chloramine-T colourimetric method. Cyanate is determined by the cyanate hydrolysis method using an ammonia selective electrode. Thiocyanate is determined by the ferric nitrate colourimetric method.

Recommended Holding Time:

A Campbell Brothers Limited Company

Sample: 14 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Metals in Seawater

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis of the seawater is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:
Sample: 6 months
Reference: Puget
For more detail see ALS Environmental "Collection & Sampling Guide"

Trace Metals in Seawater by SPR-IDA Chelation

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995, and with procedures adapted from Cetac Technologies Incorporated. A suspended particulate resin (SPR), consisting of immobilized iminodiacetate (IDA) on a divinylbenzene polymer, is used to chelate and preconcentrate metals in seawater. Instrumental analysis is by inductively coupled plasma mass spectrometry (ICPMS) and/or routine atomic absorption spectrophotometry techniques (EPA 7000 series).

Recommended Holding Time:
Sample/Extract: 6 months
Reference: Puget
For more detail see ALS Environmental "Collection & Sampling Guide"

Mercury in Seawater

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedure involves a cold-oxidation of the acidified seawater sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

Recommended Holding Time:

A Campbell Brothers Limited Company

Appendix 1 - METHODOLOGY - Continued

Sample:	28 days
Reference:	Puget

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

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

This Chemical Analysis Report shall only be reproduced in full, except with thewritten approval of ALS Environmental.

End of Report

A Campbell Brothers Limited Company

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

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

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. 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.

A Campbell Brothers Limited Company

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.

This Chemical Analysis Report shall only be reproduced in full, except with the written approval of ALS Environmental.

End of Report

A Campbell Brothers Limited Company

APPENDIX 5

Annual Geotechnical Inspection Report

by

Gartner Lee Limited

Report on Post-closure Geotechnical Inspection for Polaris Mine Site in 2005

Prepared for
TeckCominco Ltd

Submitted by
Gartner Lee Limited

December 2005

Gartner Lee

Report on Post-closure Geotechnical Inspection for Polaris Mine Site in 2005

Prepared for
Teck Cominco Limited

December 2005

Reference: **GLL 50508**

Distribution:
10 Teck Cominco Limited
2 Gartner Lee Limited

Gartner Lee

Gartner Lee Limited

December 15, 2005

Mr. Bruce Donald. P.Eng.
Environmental Manager, Polaris Mine,
Teck Cominco Ltd
Bag 2000
Kimberley, BC V1A 3E1

Dear Mr. Donald:

Re: GLL 50508 – Polaris Mine Site –Report on Post-closure Geotechnical Inspection in 2005

Gartner Lee is pleased to present our report on geotechnical inspections conducted at the Polaris Mine Site in July 2005. This report includes eight sections covering Garrow Lake, Little Red Dog Quarry, the Operational Landfill, the dock site shoreline, Frustration Lake water intake and access road, the North Quarry, various portals, and the subsidence area.

This report presents my observations, conclusions and recommendations. Additional related information on field measurements conducted during the summer 2005 season is reported separately.

If you have any questions please contact the undersigned.

Yours very truly,
GARTNER LEE LIMITED

Alistair Kent, P.Eng.
Senior Geotechnical Engineer

AHK:gc

(50508_Geotech_Insp_Report_Final_16Dec05.doc)

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Executive Summary

In July 2005, Alistair Kent, P.Eng., of Gartner Lee Limited accompanied Mr. Bruce Donald to the Polaris mine site. The visit was conducted in generally good weather conditions, affording excellent visibility and coverage of all areas across the mine site.

With few exceptions, the condition of the overall site is good, with no signs of major instability or erosion being observed that pose threats to human health or wildlife. In several areas, erosion was observed in limited areas, which should continue to be monitored. The report includes recommendations for remedial erosion control measures at a limited number of locations, which should be considered and planned for implementation when practical in the coming year.

1. Introduction

Between July 26 and 30, 2005, Alistair Kent, senior geotechnical engineer and practice area leader of Gartner Lee Limited (GLL), visited the Polaris mine site, accompanied by Mr. Bruce Donald, Environmental Manager, Teck Cominco Limited (TCL). The purpose of the visit was primarily to conduct the required annual geotechnical site inspection.

The detailed results of the inspection are presented in an annotated photographic record, which is contained in the eight appendices to this report. A summary of site conditions and its history are presented in section 2, followed by key observations, conclusions and recommendations.

The Polaris mine site, which was decommissioned during 2003 and 2004, is located on Little Cornwallis Island, at 75 deg 23'North, 96 deg 57' West, some 120 km northwest of Resolute, Nunavut. The overall layout of the Polaris site, based on surveys conducted during the closure period, is shown on Figures 1 and 2.

The information in the report is intended to provide a detailed baseline of data to facilitate comparisons of data in future annual inspections.

The site was sub-divided into a number of common areas to facilitate the organized inspection of the site:

- Area 1 - Garrow Lake, Creek and Dam;
- Area 2 - Frustration Lake Jetty and Access Road;
- Area 3 - New Quarry Area;
- Area 4 - Subsidence Area;
- Area 5 - Operational Landfill;
- Area 6 - Little Red Dog (LRD) Quarry Landfill;
- Area 7 - Mine Portals; and
- Area 8 - Marine Foreshore Adjacent to Former Dock.

This inspection was conducted in accordance with requirements under Section H (6) of the Water Licence and under the requirements of the Decommissioning and Reclamation Plan approvals.

2. Site Conditions and History

The Polaris mine site was operated between 1981 and 2002, and decommissioning activities took place in 2003 and 2004. The site facilities comprised an underground mine, concentrator plant, concentrate shed, dock, airstrip, tailings impoundment, water intake on Frustration Lake, various site access roads, a limestone quarry for mine backfilling, a shale quarry, and various items of infrastructure such as fuel storage, camp, warehousing etc. Upon completion of decommissioning and reclamation activities all structures had been demolished, soils contaminated by metals and hydrocarbons had been excavated and disposed of. At this time only the airstrip and a small portable camp and workshop and container storage remains, located adjacent to Loon Lake. Access roads between Garrow Lake, Frustration Lake and in the immediate vicinity of the previously active mining operations remain. The layout of the site is shown in Figure 1.

The shoreline and slope in the vicinity of the main plant and concentrate storage and ship-loading activities, on the west side of the island now comprise relatively gentle uniform slopes, which have been regraded as part of decommissioning. These slopes are interrupted by sloping roads and ramps. The area in the immediate vicinity of the original dock structure is almost flat. The shoreline has now been restored to a consistent gently sloping platform. Portals for the conveyor, the main access, and the original exploration portal, located on the slopes immediately adjacent to this area have been sealed, backfilled and re-graded to match the surrounding slopes.

A small pad originally used to support the fuel tank farm is present at the south end of this area, and measures approximately 100 m by 50 m. It has fill sideslopes inclined at the angle of repose for rockfill, which have a vertical height of approximately 10 m. This area has not been re-sloped, and we understand that Teck Cominco Limited (TCL) intends to conduct this work in 2006.

The Little Red Dog quarry, located at the northwest end of the airstrip was backfilled partially with demolition debris and metals contaminated soils and subsequently capped with rockfill. The remnant quarry walls above the level of the capping layer are benched and serve to catch ravelling material as the slopes gradually weather. Safety berms extend around the pit perimeter, and additional safety measures in the form of a ditch and a high berm exist at the end of the airstrip. Thermistors have been installed through the cap layer and within the underlying landfill material.

The Operational Landfill, located at the south end of the former facility area, has been capped and re-sloped. During operations thermistors had been installed in the landfill at four locations. During the site visit, attempts to replace the thermistors were made with thermistors designed to monitor the new cap. Difficulties were encountered removing the existing thermistors so that only two of the four installations were successfully replaced.

East of the airstrip, the main features of disturbance are the Subsidence Area and the New Quarry. The subsidence area is located over top of underground mine workings and experienced significant deformations during mine operations. Subsequently, the area has been regraded and the magnitude of subsidence has been decreasing since the cessation of mining. Detailed survey measurements across this area are being collected annually and a brief review of current conditions of this area are included in this report. Specialist geotechnical comment is also being provided in a separate report.

The New Quarry area measures some 800 m by 400 m and was partially reclaimed by regrading stripped materials and resloping quarry faces. Much of the floor of the New Quarry remains as exposed shale bedrock.

A network of access roads has been decommissioned (but are still functional) across the project area. As part of the decommissioning all culverts (with the exception of one) have been removed and drainage crossings re-opened. The access roads are important access for ongoing monitoring activities, and are in good condition.

A short causeway, approximately 100 m long and 10 m wide, which supported the project water supply intake, remains at Frustration Lake, some 4.5 km from the main project site.

At Garrow Lake, the former site of submerged tailings deposition, both the main impoundment dam and the wave break embankment structure were breached and reclaimed. The central part of the main dam was removed and replaced with a rip-rap lined channel. The perimeter of Garrow Lake, previously flooded during mining operations by several metres, has now been returned to its former location. Measurements and observations of the condition of the perimeter beach have been conducted since the dams were breached. Now that Garrow Lake has been restored to its original elevation, the perimeter of the lakeshore is in its former location as well. Observations and monitoring of the re-emerging shoreline were undertaken while the lake was being lowered to monitor for any signs of instability of the newly exposed shoreline. Observations of this area continued during 2005.

3. Approach to Site Inspection

The primary purpose of the geotechnical site inspection is to assess site-wide conditions for evidence of instability or erosion that may be potentially hazardous to either humans or wildlife. The visual inspections documented in this report are supplemented by other information including survey measurements, and thermistor records. As the inspection is primarily visual, this report is largely presented as a series of annotated photographs with their locations established using GPS. These locations are shown on Figures 1 and 2, and it is intended that on-going annual inspections conducted

during the post-closure monitoring period will record visual observations from the same locations. Where significant erosional activities have been observed, measurements of depth and width have been recorded at specific locations, facilitating accurate monitoring of the potential rate of progression in subsequent years. This will allow decisions as to whether to intervene or to allow nature to takes its course. Table 1 lists all observation waypoints for use in future annual inspections.

4. Key Observations and Conclusions

4.1 Area 1 – Garrow Lake, Creek and Dam

Garrow Lake

The perimeter beach was inspected, and no evidence of significant instability or erosion has been detected or observed. No significant trend in erosion has been detected through the erosion pin monitoring. As the water levels have been lowered for the past two years, the shorelines have been exposed to normal cycles of summer and winter seasons. Monitoring of erosion pins was conducted in 2003 and 2004, showing little or not trend for loss of soil. Unfortunately, due to a misunderstanding, no measurements were taken in 2005 to confirm this conclusion. Although the inspection in 2005 indicates that the perimeter beach is stable and largely free of erosion, it is recommended that erosion measurement be continued for one more year, and conducted together with the annual visual inspection. Routine monitoring of suspended sediment levels will continue as part of the effluent water quality monitoring program.

Garrow Lake Wave break Structure

The condition of the breached outlet of Garrow Lake was inspected and appears to be stable. Ongoing measurements of lake level each summer after lake ice has thawed should be continued to provide conclusive evidence that the invert of the breach section remains stable.

Garrow Dam

The sideslopes of the breach excavated through the main dam structure are in good condition, free of erosion or signs of major instability. Minor localised slumping was observed and should continue to be checked in subsequent annual inspections. A localised section of the invert of the breach channel has a section of exposed filter fabric that should be covered with rip-rap. While the integrity of the adjacent rip-rap has not so far been affected, remedial measures should be planned and implemented as soon as is practical in 2006.

4.2 Area 2 – Frustration Lake Jetty and Access Road

The embankment forming the intake jetty at Frustration Lake was observed to be in good condition, and no evidence of erosion or significant instability was found. Minor settlement at the end of the embankment should continue to be observed, but is expected to be the result of localised thaw of buried snow or ice.

The access road is generally in good condition, with only localised erosion at drainage crossings. No excessive recent transport of material was detected.

4.3 Area 3 – New Quarry Area

The perimeter sideslopes of the new Quarry are interspersed by several drainages and erosion features. Otherwise the slopes and floor or the quarry area appear to be stable and pose no hazard to human health or wildlife. These features are the result of small drainages exploiting the loose nature of stripped overburden soils. The consequences of these active erosion features are minor as a result of the effect of drainage dispersing across the floor of the quarry and allow sediment to be deposited. However, remedial erosion control measures are recommended at two locations in order to minimise the effort required to stablilize them. Delays in executing repairs, although not resulting in any site hazards, will only result in more work being required in the future.

4.4 Area 4 – Subsidence Area

This area was inspected in detail during the site visit. A detailed topographic survey was conducted by TCL. Inspection of the subsidence area detected one noticeable crack about 30 m long, a few cm wide and minor ponding of water. The results of surveying across the area in 2005, when compared to survey results in 2004, indicate that there have been no significant changes. At most, settlement of approximately 0.3 m was detected in one cross-section in the central part of the subsidence area.. The overall area continues to be safe for humans and wildlife. An assessment of subsurface conditions is being prepared in a separate report by a specialist underground mining consultant.

4.5 Area 5 – Operational Landfill

The Operational Landfill was inspected and found to be in excellent condition. No signs of instability were observed. The results of monitoring thermistors are reported separately by TCL. Erosion and minor seepage in a localised portion of the slope above the operational landfill was observed, but is not expected

to adversely impact the performance of the landfill. Minor ingress of seepage water may in fact promote formation of a less pervious zone at the base of the cap zone. However, the area should continue to be monitored annually for any signs of frost heave. It is possible that drainage may need to be enhanced along the back edge of the landfill by excavation of a shallow ditch grading to one end or the other of the landfill.

4.6 Area 6 – Little Red Dog (LRD) Quarry Landfill

The surface capping of the LRD Quarry Landfill was inspected and found to be free of any signs of instability or settlement. Seepage exiting the mouth of the quarry comes to surface over a short distance, then re-infiltrates into the surrounding slopes below. The seepage was running clear and water quality testing by TCL (reported separately) shows it to be free of metals. The sideslopes of the quarry above the cap do not exhibit signs of instability, and safety berms along the quarry perimeter are in good condition.

4.7 Area 7 – Mine Portals

The Polaris Mine was an underground mining operation. There were four portals used to access the mine and/or to convey ore out of the mine. As part of the mine decommissioning and reclamation activities, the portals were sealed to prevent the public from accessing the underground mine workings.

The objectives of the annual geotechnical inspection were to look for evidence of any settlement, erosion of the mine seals, or instability at the four portal areas, which might present a risk to human health or wildlife. As shown in the following photographs, all of the portals are in good condition, free of signs of instability or erosion.

4.8 Area 8 – Marine Foreshore Adjacent to Former Dock

The shoreline adjacent to and along the former dock structure was inspected and surveyed. No signs of instability or erosion were observed that would signify loss of overall integrity of the shoreline or slope above. Some ongoing localised changes of the shoreline are expected to continue (due to ice action), and a system of observations and survey transects from consistent positions is now in place.

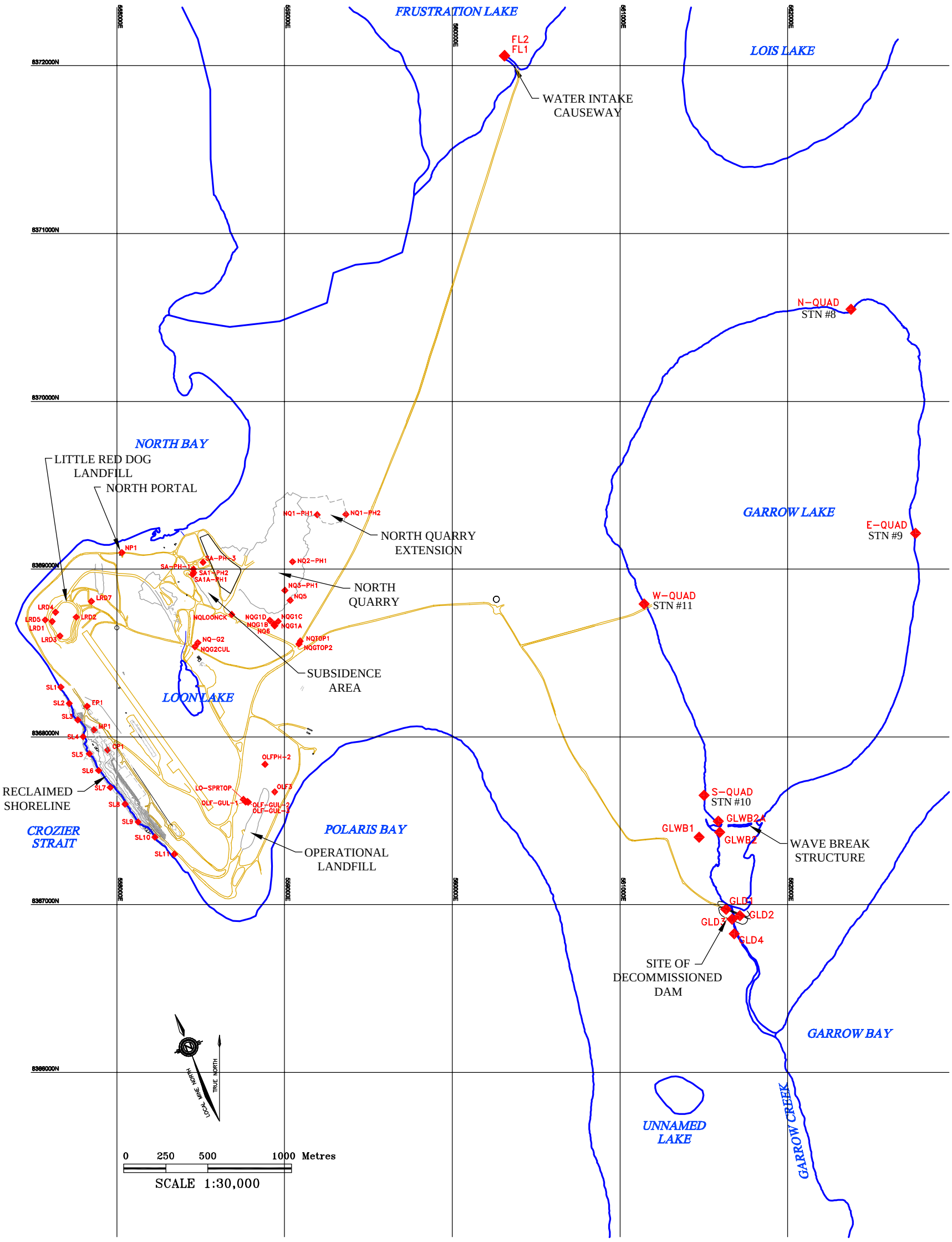
5. Recommendations

The annual geotechnical inspection conducted in July 2005 identified a limited number of relatively minor erosion features that either require ongoing monitoring or remedial action in the coming summer season. These locations are:

- Garrow Lake Dam outlet channel – requires restoration of rip-rip at the downstream outlet; and
- New Quarry Area – requires erosion control measures in two gullies on the southern perimeter.

Monitoring should continue to be conducted of all areas of surface disturbance by the geotechnical engineer in the coming year. Although monitoring of the erosion pins around the perimeter of Garrow Lake have not shown any significant change in the 2003 and 2004 one final check is recommended as part of the annual geotechnical inspection in 2006. Water quality measurements, and survey checking of the level of the lake after spring thaw should be continued.

Figures

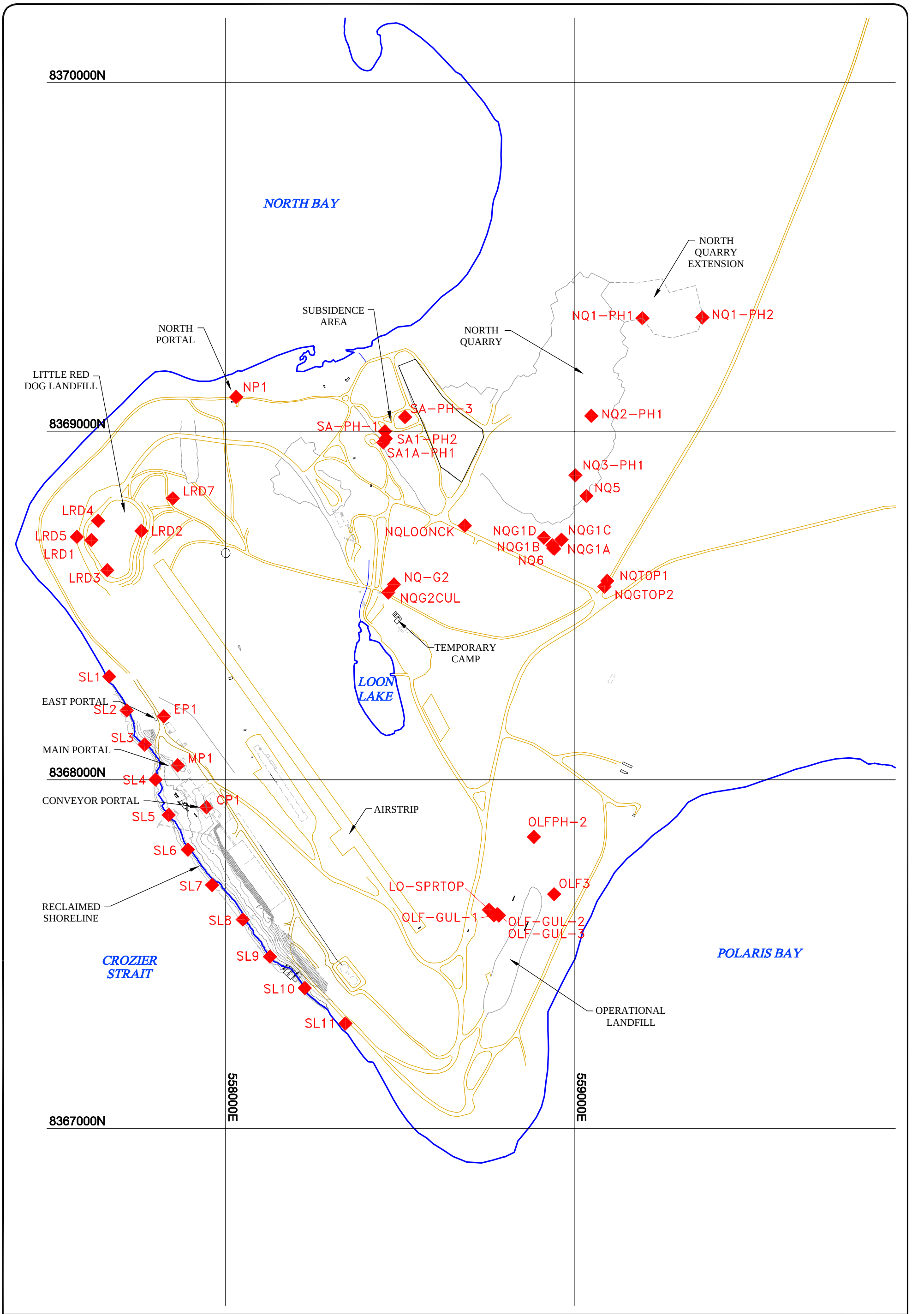


LEGEND:

ROADS

SL11 WAYPOINT – FIELD INSPECTION POINTS, SUMMER 2005 (GLL)

PROJECTION: UTM 83–14	Project: Polaris Mine Location: Nunavut Client: Teck Cominco Limited
REVIEWED BY: DL/AL PREPARED BY: PW/NT DATE ISSUED: NOVEMBER, 2005 PROJECT NUMBER: 50–508 FILE NAME: 50508–1B–01.dwg REVISION: 0	**POLARIS MINE** **2005 GEOTECHNICAL SITE INSPECTION**
teckcominco	Gartner Lee Figure No. 1



LEGEND:

ROADS

SL11 — WAYPOINT – FIELD INSPECTION POINTS, SUMMER 2005 (GLL)

0 50 100 200 300 400 500 Metres

SCALE 1:10,000

PROJECTION: UTM 83–14	Project: Polaris Mine Location: Nunavut Client: Teck Cominco Ltd.
REVIEWED BY: DL/AL	**POLARIS MINE 2005 GEOTECHNICAL INSPECTION - DETAIL OF MINE AREA**
PREPARED BY: PW/NT	
DATE ISSUED: NOVEMBER, 2005	
PROJECT NUMBER: 50–508	
FILE NAME: 50508–1B–01.dwg	
REVISION: 0	Figure No. 2

teckcominco — Gartner Lee

Tables

Table 1. Polaris Geotechnical Inspection
List of Waypoints

AREA	Location	Waypoint	Northing	Easting
1	Station 9	E-QUAD	8,370,547	562,380
1	Dam	GLD1	8,366,973	561,633
1	Dam	GLD2	8,366,935	561,717
1	Dam	GLD3	8,366,914	561,670
1	Dam	GLD4	8,366,827	561,683
1	Wave Break Dam	GLWB1	8,367,402	561,472
1	Wave Break Dam	GLWB2	8,367,433	561,596
1	Wave Break Dam	GLWB2A	8,367,497	561,587
1	Station 8	N-QUAD	8,370,550	562,378
1	Station 10	S-QUAD	8,367,652	561,502
1	Station 11	W-QUAD	8,368,792	561,144
2	Frustration Lk intake	FL1	8,372,061	560,313
2	Frustration Lk intake	FL2	8,372,061	560,312
3	New Quarry	NQG1A	8,368,663	558,943
3	New Quarry	NQG1B	8,368,673	558,937
3	New Quarry	NQG1C	8,368,689	558,964
3	New Quarry	NQG1D	8,368,695	558,913
3	New Quarry	NQ-G2	8,368,561	558,484
3	New Quarry	NQG2CUL	8,368,538	558,467
3	New Quarry	NQGTOP2	8,368,554	559,087
3	New Quarry	NQLOONCK	8,368,730	558,686
3	New Quarry	NQT0P1	8,368,571	559,095
3	New Quarry	NQ1 PH1	8,369,324	559,195
3	New Quarry	NQ1 PH2	8,369,326	559,367
3	New Quarry	NQ2 PH1	8,369,044	559,049
3	New Quarry	NQ3 PH1	8,368,874	559,003
3	New Quarry	NQ5	8,368,814	559,035
3	New Quarry	NQ6	8,368,665	558,940
4	Subsidence Area	SA PH 1	8,369,000	558,457
4	Subsidence Area	SA PH 1	8,369,000	558,457
4	Subsidence Area	SA1 PH2	8,368,979	558,459
4	Subsidence Area	SA1 PH3	8,369,257	559,145
4	Subsidence Area	SA1A PH1	8,368,968	558,452
5	Operational Landfill	LO SPRTOP	8,367,627	558,755
5	Operational Landfill	OLF GUL 1	8,367,611	558,769
5	Operational Landfill	OLF GUL 2	8,367,615	558,780
5	Operational Landfill	OLF GUL 3	8,367,611	558,784
5	Operational Landfill	OLF3	8,367,672	558,942
5	Operational Landfill	OLFPH 2	8,367,836	558,884
6	Little Red Dog Quarry	LRD1	8,368,688	557,616
6	Little Red Dog Quarry	LRD2	8,368,714	557,759
6	Little Red Dog Quarry	LRD3	8,368,602	557,662
6	Little Red Dog Quarry	LRD4	8,368,744	557,635
6	Little Red Dog Quarry	LRD5	8,368,697	557,575
6	Little Red Dog Quarry	LRD6	8,368,690	557,620
6	Little Red Dog Quarry	LRD7	8,368,808	557,850
7	Conveyor Portal	CP1	8,367,922	557,946
7	Exploration Portal	EP1	8,368,183	557,824
7	Main Portal	MP1	8,368,042	557,864
7	North Portal	NP1	8,369,099	558,031
8	Shoreline	SL1	8,368,297	557,667
8	Shoreline	SL10	8,367,403	558,228
8	Shoreline	SL11	8,367,301	558,344
8	Shoreline	SL2	8,368,199	557,717
8	Shoreline	SL3	8,368,102	557,769
8	Shoreline	SL4	8,368,001	557,800
8	Shoreline	SL5	8,367,900	557,838
8	Shoreline	SL6	8,367,800	557,893
8	Shoreline	SL7	8,367,699	557,962
8	Shoreline	SL8	8,367,600	558,050
8	Shoreline	SL9	8,367,493	558,128

Appendices

Appendix A

Area 1 - Garrow Lake, Creek and Dam

Appendix A – AREA 1 – GARROW LAKE, CREEK AND DAM

Background

Decommissioning of Garrow Lake and Garrow Creek was accomplished by lowering the surface of the lake approximately two metres back to its original elevation. After the lake was lowered, the central portion of the dam (located approximately 0.5 km downstream from the former outlet of the lake) was removed. This now allows the lake to discharge naturally for approximately a 10 to 12 week period each summer through the original creek channel. The geotechnical inspection objectives are to assess the stability of the foreshore areas around Garrow lake, the outlet channel of Garrow Lake (i.e., in the area of the wavebreak structure), and the stability of the creek channel and creek slopes in the area of the former dam.

Area 1A – Shoreline Area of Garrow Lake

Decommissioning of the Garrow Dam involved lowering the level of Garrow Lake, exposing shoreline features that were previously submerged during operations. During the process of lowering the lake to its original level, erosion monitoring pins were established at four points evenly distributed around the perimeter of the lake, as shown on Figure 1. The monitoring was conducted to assess stability and erosion as drainage occurs and as the permafrost aggrades back into previously submerged shoreline materials. This monitoring was conducted to ensure that no sediments were being introduced into the lake as result of potential instability of shoreline features. Monitoring in 2003 & 2004 did not identify any stability concerns. The results of the erosion monitoring program are as follows:

	Station 8 Quadrant	Station 9 Quadrant	Station 10 Quadrant	Station 11 Quadrant
July 2003	56.5	45	61.5	50
Aug 2003	56.5	45	61.5	50
Sept 2003	56.5	44	61	50
June 2004	Snow prevented measurement			
July 2004	57.0	n.a.	17.5	50.7
Aug 2004	56.5	45.1	61.5	50.7
Sept 2004	Snow prevented measurement			
June 2005	No measurements available – mostly snow covered			
July 2005	See photographs – no measurements taken due to misunderstanding			
Sept 2005	Snow prevented measurement			

Table of distances in cm from top of pin to ground surface measured along side of pin.

It had been proposed to continue the previously established erosion pin monitoring program for 2005, and then to discontinue the monitoring if no issues are identified, and if recommended by the geotechnical

engineer conducting the 2005 inspection. Due to a misunderstanding no measurements along the side of the monitoring pins were taken at the erosion pins during July and August 2005. The results of the erosion pin measurements, as presented in the table above for 2003 and 2004, and the visual observations documented in various photographs in this and previous reports, indicate that the beach around Garrow Lake is stable and subject to only minor erosion where natural drainages cross. No evidence of mass erosion or instability has been detected. It is apparent that after two years of the lake level being drawn down and the beach re-exposed no adverse effects are occurring. Detailed monitoring by means of erosion pins therefore no longer seems to be justified. However, as a precaution measurements will be taken in 2006 during a snow free period.

In the event that significant erosion does occur in future, this is likely to increase TSS levels that would be identified in the normal weekly sampling of Garrow Lake. Thus, in addition to annual visual inspection, there will still be ongoing monitoring of potential adverse affects on the shoreline.

The following photographs show beach conditions observed in June 2005:

West Quadrant Pin at Station 11 – no measurement is available and the remainder of the shoreline remained snow or ice covered.

View looking north from the West Quadrant Pin at Station 11.

South Quadrant beach at Pin 10 on July 21 2005 – distance to shoreline is 16.4 m.

West Quadrant Pin at Station 11 on July 17 2005 – distance to shoreline is 10.3 m.

North Quadrant Pin at Station 8 on July 18 2005 – distance to shoreline is 30.4 m.

East Quadrant Pin at Station 9 on July 17 2005 – distance to shoreline is 26.7 m.

The following photographs were taken during the July 2005 geotechnical site inspection:

View south from south quadrant pin – Station 10.

View north at south quadrant pin at Station 10.

Small drainage which is in the process of forming a stable channel within silty sands and gravels adjacent to the Pin at South Quadrant Station 10.

Shoreline peg viewed from erosion pin at West Quadrant Station 11.

View north at West Quadrant (Station 11) – shoreline appears generally stable with only occasional erosion of small drainages in the lower part of the beach.

West Quadrant (Station 11) – view south.

View west at North Quadrant Pin at Station 8 – sediments become more coarse and less subject to minor erosion proceeding north and east from the west quadrant.

View east at North Quadrant Pin – Station 8.

View of shoreline at North Quadrant Pin – Station 8.

View south at East Quadrant Pin at Station 9 – sediments exposed are coarser than on west shore and less prone to localized erosion.

View north at East Quadrant Pin – Station 9.

View from pin at East Quadrant (Station 9) where beach has become steeper proceeding southwards along eastern shore, with coarser angular rock fragments.

Area 1B - Wave Break Structure

Garrow Creek is the only flow out of Garrow Lake and therefore controls the elevation of the lake. During operations, a wavebreak structure, consisting of a rockfill embankment approximately 5 m wide and 1 m high, was constructed along the southern edge of Garrow Lake at the entrance to Garrow Creek, as shown on Figure 1. During decommissioning, the wavebreak structure in the channel of Garrow Creek was excavated over a width of approximately 15 m to ensure flow out of the lake was not impeded. The remainder of the wavebreak structure was partially removed for aesthetic purposes.

The annual inspection of the Garrow Creek channel in the area of the wavebreak structure for signs of erosion was conducted. Visual appearances suggest the outflow channel is functioning well, with uniform flow over a width of approximately 15 m, as is illustrated in the following photographs. As per requirements in the Water Licence, annual surveying of the minimum lake elevation is being conducted to provide confirmation that the elevation of the invert of the lake outlet channel is remaining constant, and that the invert of the outlet channel is not being eroded.

In the spring of 2005 an elevation of the water level was taken at the beginning of the discharge season, but due to the presence of water on top of the ice, it is not clear if this actually represents the lake level.

By the time the ice had cleared sufficiently to properly measure the water surface, the lake had been discharging for several weeks, so a reading at this time would not have been representative of the maximum elevation of the lake. Presented below is the proposed chart to track the annual minimum lake elevation upon completion of discharge each year (late August). A reference pin was placed at the shoreline adjacent to the breach in the wave break structure. The results of surveys conducted in June and August 2005 are presented in the following table.

Garrow Lake Elevations (metres)

Date	Survey Station 352 Elev. (m)	Instrument Height	Rod Reading	Lake Elevation	Comments
27-Jun-05	1006.52	0.55	1.96	1005.11	
24-Aug-05	1006.52	0.55	2.00	1005.07	Flow in creek ceased within two weeks after this measurement

Note: Pre-Dam lake elevation at end of discharge season was reported to be 1,005.7 m.
Survey Station #352 location is -878.338, 3679.594 (local grid).

Panoramic view of Garrow Lake at left and wave break structure in the centre from waypoint GLWB1 on the access road on the western valley side slope.

View eastward from waypoint GLWB1 of the channel and drained valley downstream of the wave break structure.

Wider panoramic view from waypoint GLWB1 of valley downstream of wave break structure.

View from waypoint GLWB1.

View north and east from waypoint GLWB2 looks upstream at outlet channel with wave break structure extending to the right. Material in channel is gravel sized and flow is only slightly turbid. Water quality sampling indicates that turbidity levels downstream at the main dam were low, evidenced by TSS measurements of 3 mg/l, at or below detection, on July 24 and July 31st 2005.

View from waypoint GLWB2a looks downstream from a point in the middle of the outlet channel.

View from waypoint GLWB2a looks eastward across outlet channel illustrating uniform flow.

View from waypoint GLWB2a looking west along shoreline, with short remnant section of wavebreak structure in the foreground. Note coarse rock fragments in channel and clarity of shallow flowing water.

AREA 3C - Inspection of the Slopes in the area of the former Garrow Dam

Decommissioning of the Garrow Lake dam was accomplished by removing the centre portion of the dam, which allowed Garrow Creek to resume flowing in its original channel. The decommissioned dam was stabilized by construction of a rip-rap lined channel. The annual inspection focused on assessing the stability and integrity of the reclaimed side slopes of the remaining embankment structure on either abutment and of the associated rip-rap channel in between.

View of the west side of the dam breach from east abutment from waypoint GLD2, showing inlet at right, and rip-rapped channel which is generally in good condition. Opposite side slope, inclined at approximately 12 degrees, appears stable. A minor crack and slight slumping was observed at the left (southern) end of the side slope, about 4 m from the top of the rip-rap, over a length of about 10 m horizontally, and should be watched in subsequent inspections.

View of east side of dam breach from west abutment from waypoint GLD1. Both breach side slopes are inclined at approximately 12 degrees and are generally in good condition.

View northwards at waypoint GLD3, looking upstream along creek channel, showing rip-rap lining, which is in good condition. Flow is moderately uniform across channel, with high clarity.

View from 30 m downstream of waypoint GLD3 at a point where channel gradient increases. Filter fabric underlying the rip-rap material has been exposed over a width of 3 to 4 m and over a length of about 10m. Remedial action to replace rip-rap is recommended. The integrity of surrounding rip-rap does not appear to have been affected.

View looking upstream from waypoint GLD4 of overall breached dam and rip-rapped channel.

View looking downstream from waypoint GLD4 of lower end of outlet channel.

Appendix B

Area 2 - Frustration Lake Jetty and Access Road

Appendix B – AREA 2 – FRUSTRATION LAKE JETTY AND ACCESS ROAD

Decommissioning of the freshwater supply system at Frustration Lake included leaving the jetty largely intact, so as not to remove fish habitat. The primary aspect to be monitored is to confirm that during the open water season no excessive erosion of the jetty embankment is occurring and causing significant sediment generation, which could harm fish habitat. At the time of the inspection on July 28th the lake was ice free in the immediate vicinity of the embankment, except along part of the northern side. Additionally, the road accessing the lake area was inspected to ensure that run-off alongside the road and in drainage channels is not resulting in abnormal erosion of the surrounding land.

As illustrated in the following series of photographs of the intake jetty and the access road, there is no evidence of instability or erosion. The minor settlement and erosion features evident should continue to be observed and reviewed in subsequent annual geotechnical inspections.

Area 2A – Frustration Lake Jetty

No signs of abnormal erosion were observed. A small step in the crest was observed, as shown in the following photographs, having a vertical displacement of about 0.3 m, across a width of 2m, immediately behind the end of the causeway. This did not appear to be a new feature or to correspond with any evident heave of the sideslopes. While this feature should be inspected in following years, it does not appear to be an erosional feature, and may be the result of thaw of buried snow or ice. No remedial measures are required at this time.

View from waypoint FL1 looking towards shoreline – note slight subsidence in foreground.

View from waypoint FL1 looking across end of causeway – note slight subsidence in foreground.

View from waypoint FL2 looking across northern end of causeway – note slight subsidence in foreground, with vertical separation of about 0.3 m over a width of 2 m possibly from melting of snow/ice buried within the fill.

View from waypoint FL2 looking towards shoreline along west side of causeway. No sign of deformation observed along this side.

Area 2B – Frustration Lake Access Road

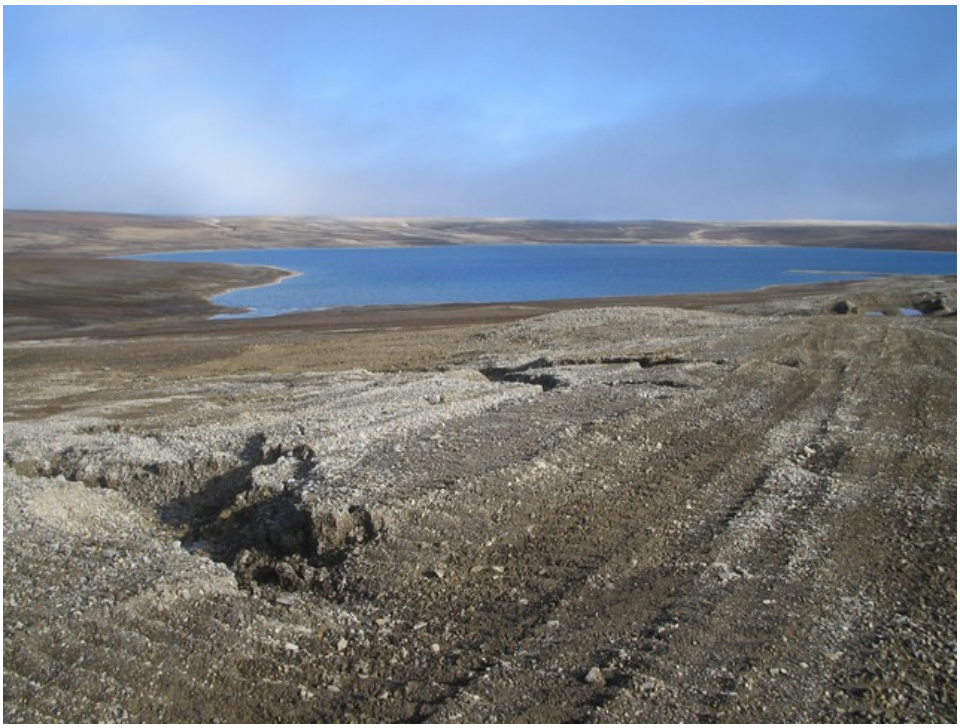
View of segment of road to Frustration Lake looking southwest towards mine site from the highest point of topography. Roadway and sideslope are in good condition, free of significant erosion features.

View to the southwest looking towards topographic high point showing approximately the middle one-third of the access road to Frustration Lake. This section is in good condition.

View to southwest looking up gently sloping section approximately 800 m from the water intake causeway. Roadway is in good condition, with only minor erosion of loose material at drainage crossing.

View northeast from a point about 800 m distant from intake causeway, showing good condition of roadway.

View northeast from about a point 600 m distant from intake causeway, showing a typical drainage swale.



Closer view of minor erosion gully at a point approximately 600 m distant from causeway. There appears to be sufficient coarse fraction so that self-armouring will occur in due course.

A drainage swale at about 500 m distance from intake causeway is in good condition.

Access roadway general view to the northeast at about 300 m distance from intake causeway, which is in good condition.

Appendix C

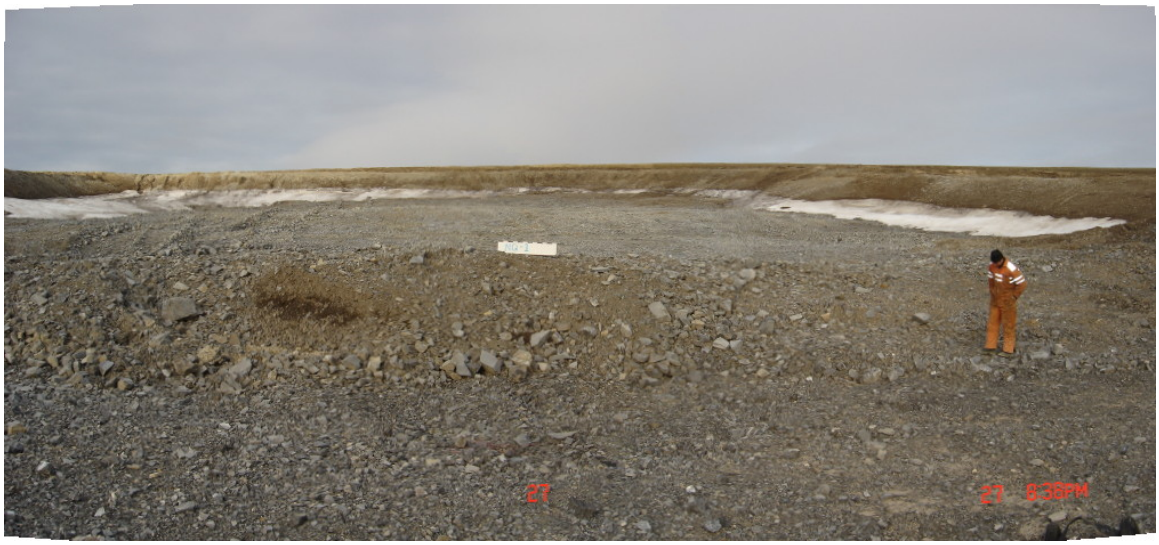
Area 3 - New Quarry Area

Appendix C – AREA 3 – NEW QUARRY AREA

The New Quarry area was a surface quarry where shale was excavated for road maintenance and other uses. At closure the pit walls were re-sloped for public safety and to improve the visual aesthetics.

The annual geotechnical inspection was carried out to assess perimeter slopes for instability or erosion, which might have an impact on human or wildlife safety.

The New Quarry is an area of approximately 800 m by 400 m. During reclamation, an area at the eastern corner was extended to provide material for closure. The floor of the quarry slopes gently and exposes bedrock. The perimeter sideslopes expose rock with a thin veneer of surficial soils, up to about 1 m thick.



View looking east up slope into extension of New Quarry, from waypoint NQ1 PH1, shows stable sideslopes.

Panoramic view looking west down slope into extension of New Quarry, from waypoint NQ1 PH2, shows area of disturbed soil, which appears to be stable.

View looking up west sideslope of New Quarry Extension, where stripped organic surficial soil has been spread. Occasional cracks but no signs of mass movement presenting any hazard to humans or wildlife.

The following photographs show the slopes around the perimeter of the older main part of the new Quarry.

Isolated erosion gully at waypoint NQ2 PH1.

Close-up view of erosion gully at waypoint NQ2 PH1, showing relatively small width, and apparent tendency to be self-armouring.

An isolated erosion gully at waypoint NQ3 PH1.

Area above waypoint NQ5 view looking northeast across area of disturbed surficial soil bordering edge of quarry sideslope. Illustrates typical pattern of surficial deformation caused by seasonal thaw of disturbed surficial soils. This poses no threat to humans or wildlife.

From waypoint NQ5 view west showing stable erosion free nature of surficial soils draped over the top edge of the new Quarry perimeter.

View to northwest at waypoint NQGTOP1 of a thaw/erosion gully on slope between road to Frustration Lake and the new Quarry area. This feature extends down to the top of the fan shown in photographs taken from waypoint NQ6 (see below).

View to northwest from waypoint NQGTOP2 of second thaw/erosion gully adjacent and parallel to the one shown above at waypoint NQGTOP1.

View at waypoint NQ 6 northeast across natural slopes to west of new Quarry area. Thawing and erosive processes have during the life of the project appear to have resulted in two parallel gullies and erosion of surficial weathered rock which has formed a fan as shown. The following photographs show more details of gully that has been eroded in the loosened disturbed materials deposited around the perimeter of the quarry area.

View northwest looking down gully at waypoint NQ6. This appears to be a gradual yet active erosive process, possibly as a result of intermittent storm runoff transporting coarse material from fan upslope, shown in photograph above. This area should continue to be monitored. See measurements of gully size noted in following photographs at known GPS locations to facilitate future comparison of rate of erosion. Localised erosion control measures, likely best implemented by manual labour, to protect surrounding tundra, should be planned for implemented as soon as is practical in 2006.

Photo shows gully through loosened materials around edge of new Quarry, down slope of waypoint NQ6. Following show more detailed measurements and photographs in the vicinity of waypoint NQ6, but labeled at NQG1.

At waypoint NQG1A depth of erosion gully is 72 cm. Signboard has top bars at 10 cm intervals.

At waypoint NQG1B, depth of gully is 1.4 m, and width is 5.6m at base.

At waypoint NQG1C, depth of gully is 51 cm, and width at base is 3.1 m.

At waypoint NQG1D, depth of gully is 52 cm, and width at base is 3.2 m.

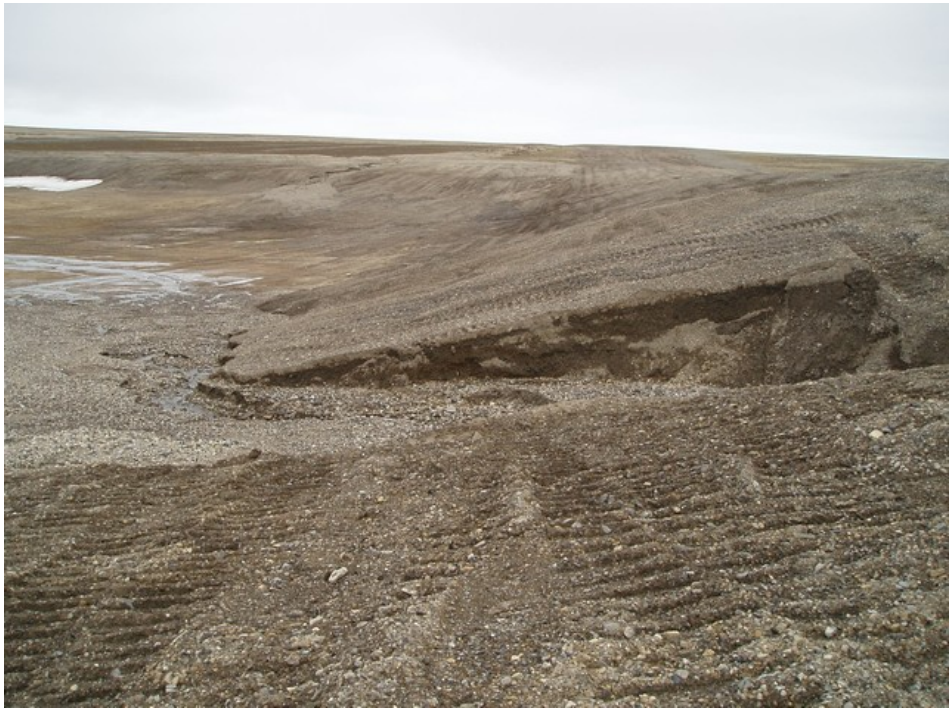
Photo looking west and upstream at waypoint NQG2 shows where drainage from Loon Lake crosses through fill material around the perimeter of the New Quarry area.

Photo looking downstream from waypoint NQG2CUL, where there is an existing collapsing culvert. While channel appears to self-armouring, the culvert should be removed and sideslopes flattened.

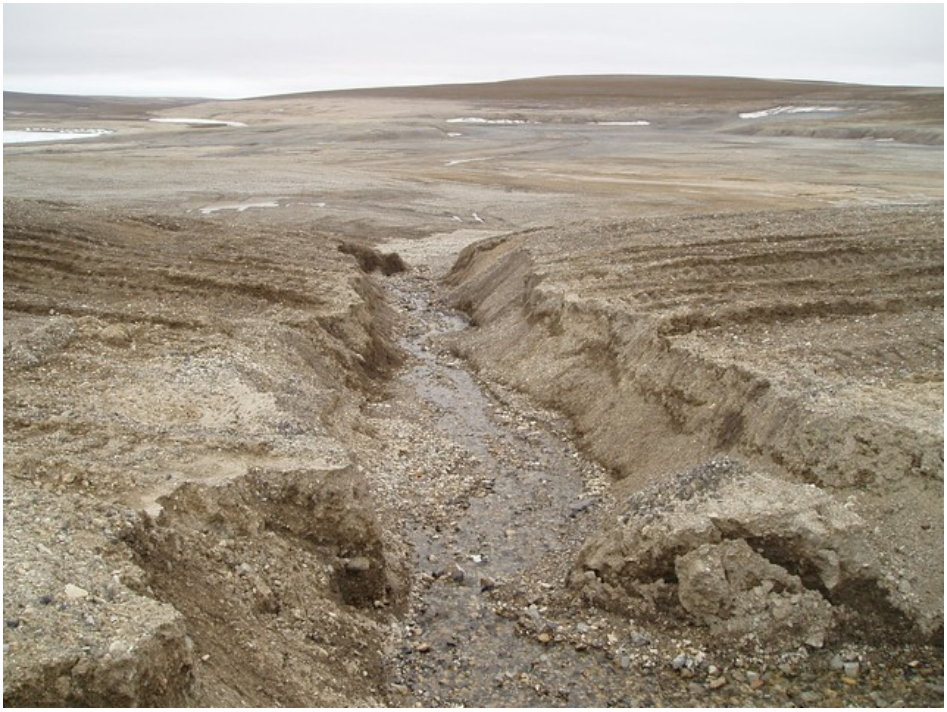
Photo looking upstream from waypoint NQG2CUL.

The following photographs show an area of erosion in the floor of the New Quarry in the vicinity of waypoint NQLOONLK, as located on Figure 1. Although this erosion feature is locally significant, its consequences overall are not. Transported sediment is being deposited across the floor of the new Quarry, as is evident in the photograph below. It is recommended that stabilisation measures be planned and executed as soon as is reasonably practical in 2006, so as to prevent further deepening or widening of the erosion gully

Debris fanning across floor of New Quarry.



View adjacent and immediately to west of view shown above showing significant erosional down cutting of what appears to be quarry strippings of silty sand and gravels.



View upstream of view above. Erosional down cutting of loose silty sand and gravel can be expected to continue if coarse material is not placed here.

View further upstream of above view, at point where drainage channel changes direction and becomes steeper and more active erosion is occurring.

View upstream from view shown above where channel is steepening and deepening.

Further upstream, where drainage is ponding behind stripping fill slope. Downstream of this point (behind the photographer) the channel begins to downcut and steepen.

View to the west shows drainage which has formed a meandering pond across the upper and western part of the New Quarry area.

View eastwards from waypoint NQLOONCK of erosion gully at waypoint NQ6.

Appendix D

Area 4 - Subsidence Area

Appendix D – AREA 4 – SUBSIDENCE AREA

Background

This area overlies a section of underground mine workings that has subsided more aggressively than elsewhere above the mine workings. Concerns related to the physical safety of the public and for wildlife traveling across the land surface in this area are the primary aspect that requires regular monitoring. As part of the annual geotechnical inspection the following tasks were carried out:

- Review of the annual topographic subsidence survey conducted by TCL, comparing the results to the previous survey in 2004; and
- Visual inspection of the area to identify any features that may be of concern related to public and wildlife safety.

The annual geotechnical inspection presented herein is a pictorial view, interpreted in conjunction with survey data from the past three years. Comments are restricted to a discussion of changes to surface profiles, and whether there are any surface features representing a potential safety hazard to the public or animals. The geotechnical aspects of the causes of subsidence are addressed separately in a report prepared by Golder Associates.

Annual GPS Survey

A GPS survey of the subsidence area was conducted in 2005 by Teck Cominco. Between the 2003 and 2004 annual survey's, as part of site reclamation, some re-contouring of this area occurred. Therefore, the 2004 survey data will be used as the baseline to monitor future potential movements of the area. The survey data is presented as a contour plan of the area and as a series of sections running east-west through the area, spaced at 50-metre intervals north-south. This information is shown on TCL Figure No. PM- 2005-Area 8 – s1, dated December 15 2005. A copy of this figure is included at the end of this appendix. The sections provide the profile of the ground as surveyed in 2005 compared to the profile of the ground as surveyed in 2004. The vertical scale of the sections has been exaggerated by a factor of two to enhance any vertical movements. It is noted that the actual area of subsidence extends to the west of the central roadway, i.e. to the west of mine grid line E 1600. The survey was extended further east to provide a baseline. The following is inferred from inspection of the survey information:

1. Slopes in the general subsidence area are generally gentle and no steeper than 1 vertical in 5 horizontal, and are not considered to present any safety hazard for either the public or wildlife;

2. The degree of variation between profiles for 2005 and 2004 is similar across the subsidence area and across the baseline area further to the east, and provides an indication of the overall level of accuracy of the survey;
3. Inspection of the cross-sections indicates that there are no conclusive discernible changes in the surface profiles between the 2004 and the 2005 survey, which indicates that no significant movement of the land surface has occurred during the last year; and
4. The only possible exception is along Section 2150, where between stations 1490 and 1530, settlement of approximately 0.3 m is discernible – this trend is not apparent in the adjacent cross-sections nor from comparison of the contours.

Surface Cracks and Visual Inspection of the Subsidence Area

There are a number of surface cracks evident across the subsidence area. As part of the annual monitoring program, the extent of these cracks was surveyed to establish a baseline for determining if they are growing in either number or in extent. Outlines of the cracks are presented in TCL Figure No. PM- 2005-Area 8 – s1, dated December 15 2005, included at the end of this appendix.

In 2005, the most prominent crack was photographed, as shown later in this appendix. The other cracks, located across the southern part of the subsidence area were of a minor and almost imperceptible and discontinuous nature. No differential movement across the cracks was observed. Photographs taken in 2005 as shown below from known positions will be a baseline for comparison with photographs in subsequent years, together with detailed survey across the area.

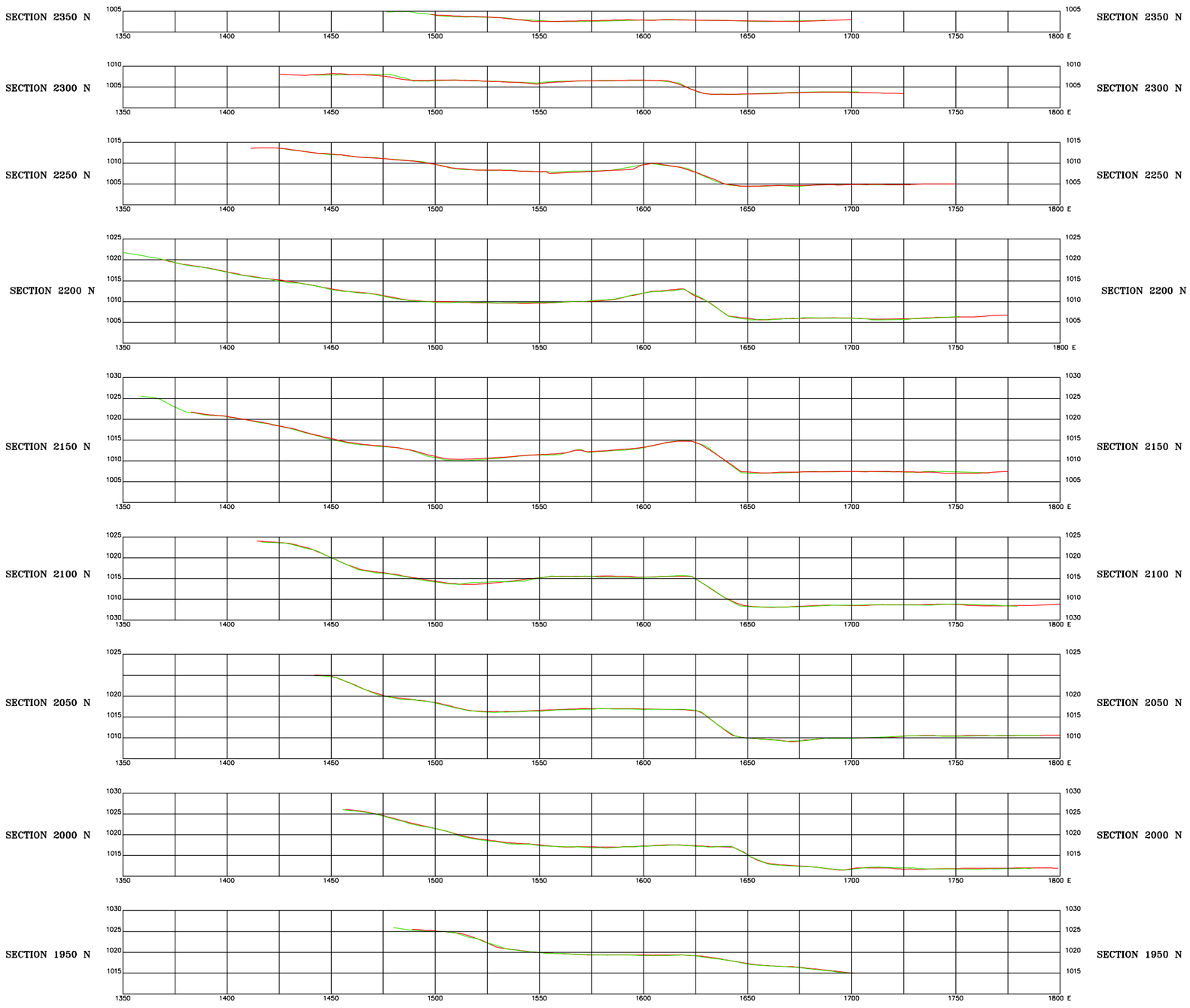
In conclusion, no surface features were observed across the subsidence area that pose a hazard to human health of wildlife.

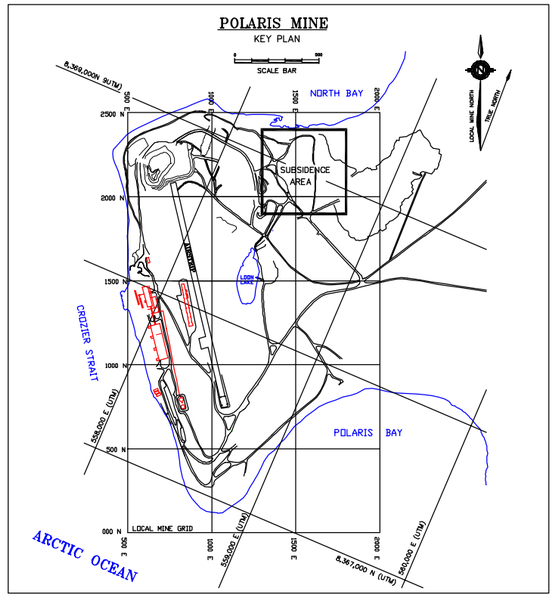
Photo of location SA1 at waypoint SA PH 1, with view looking west. The marker board is positioned adjacent to a tension crack. Other than the ponding in the foreground, this crack is the only distinct feature visible across the entire subsidence area.

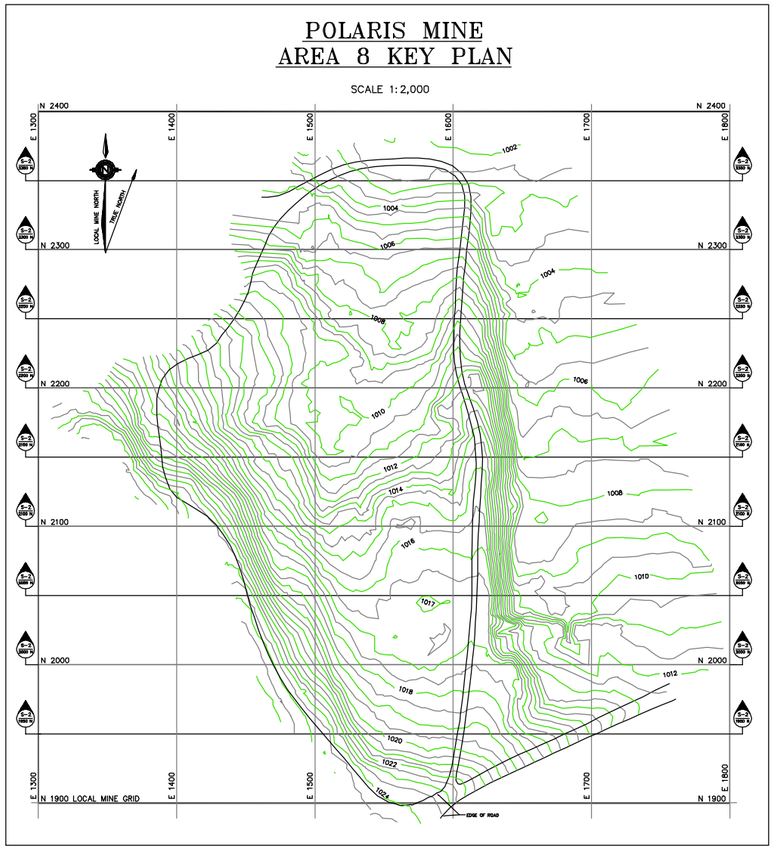
Photo of location SA1 from waypoint SA1 PH2, looking northwest, showing a crack, which is some 30m in length, several cm in width, and no differential displacement. This terrain does not present a hazard to humans or wildlife.

Subsidence Area from waypoint SA PH 3, atop a small road embankment on the eastern margin of the subsidence area.

Photo of Subsidence Area looking west to northwest from location SA PH 3.







No.	REVISION	DATE
5		
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NOTES:
1. DATA COLLECTED JULY, 2005 BY TECK COMINCO REPRESENTATIVE.
2. SECTION CO-ORDINATES AND ELEVATIONS REFER TO LOCAL MINE DATUM.
3. CONTOUR INTERVALS = 0.5 m.

LEGEND:
DENOTES 2004 SURFACE.
DENOTES 2005 SURFACE.

PROJECT:

POLARIS MINE POST CLOSURE
2005 ANNUAL SITE INSPECTION

DRAWING:

PLAN & SECTION VIEWS
SUBSIDENCE - AREA 8

DRAWN BY:
T. M. TECH SERVICES

5-337/SURVEY3

DATE:
DECEMBER 12, 2005

CLIENT:
teckcominco

SCALE: 1:1,000 HORZ.
1:500 VERT.

FIGURE No.
PM 2005 AREA 8

SHEET:
1 OF 1

Appendix E

Area 5 - Operational Landfill

Appendix E – AREA 5 – OPERATIONAL LANDFILL

The primary reclamation objective for the Operational Landfill is to ensure that the contents in the landfill remain permanently encapsulated in permafrost. To confirm this the physical integrity of the cap must be monitored and the thermal regime of the landfill cover caps is monitored through the use of thermistors. The physical integrity of the cap is monitored as part of the geotechnical inspection, and the results of the thermal monitoring program are reported separately by TCL.

The physical integrity of the cover caps and the landfill as a whole were inspected, as shown in the following photographs:

View southwest from waypoint OLFPH2, showing the northeast end slope, which is in good condition.

View southwest along main sideslope of the Operational Landfill from waypoint OLF3, again showing slopes in good condition, free of any erosion or deformation.

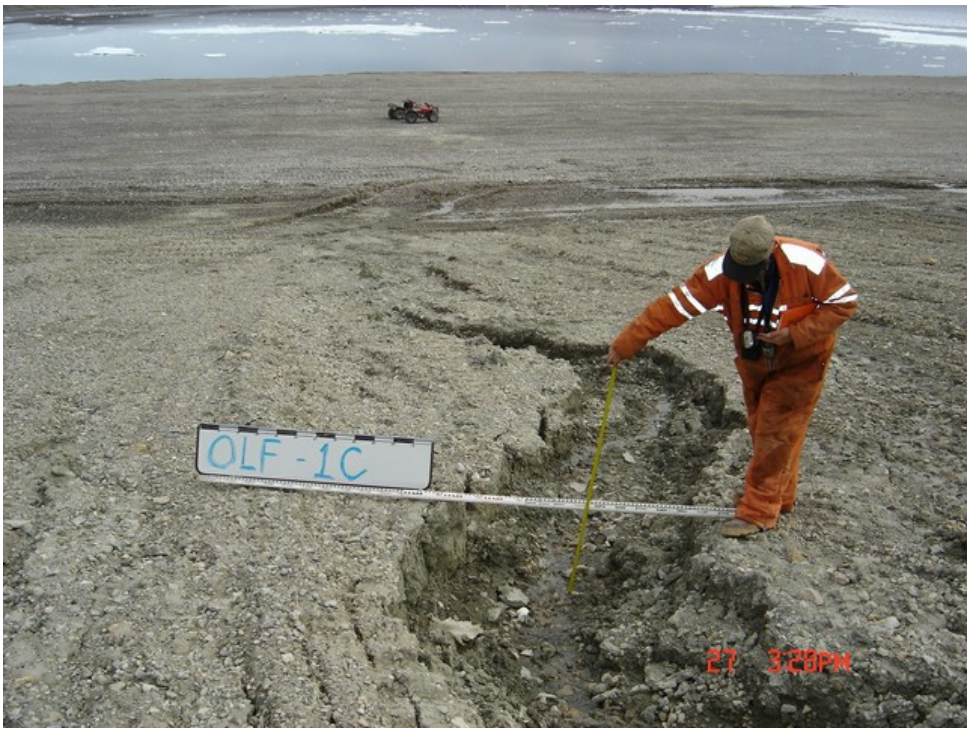
Minor almost imperceptible crack at edge of approach road to northeast end of the operational landfill, viewed from waypoint OLFPH 2. This is not associated with any other signs of settlement of instability in the slope above or below, and poses no hazard to human health or wildlife.

The following photographs show the central part of the slope above the Operational Landfill, which exhibits some moderate erosion activity across a width of some 30 m. This appears to be related to infilling of a natural drainage course, which accumulates shallow groundwater during summer thaw, and which drains towards the slope above the landfill. A small pond has formed as shown in the photograph below at the back, or northern, edge of the landfill. This is a localised feature situated approximately at the mid-point of the northern limit of the landfill. The observed erosion and seepage discharge in the slope above the landfill is not apparently adversely impacting the integrity of the landfill itself. This location is a natural drainage channel and cannot be easily diverted around the landfill. The cap of the operational landfill in this area appears stable and uniform. Annual monitoring of the slope above the landfill is recommended. The following photographs and measurements will facilitate future tracking of the erosion features and effects of seepage flow, if any, on the landfill.

View downslope from waypoint LO SPR TOP. The degree of erosion is not serious and appears to be gradually self-armouring.

Erosion gully at waypoint OLF GUL1 has a depth of 20 cm.

Erosion gully at waypoint OLF GUL2 is 50 cm deep, view upstream.



At waypoint OLF GUL2 looking upstream.

View downslope at waypoint OLF GUL3 - erosion gully is 34 cm deep.

Appendix F

Area 6 – Little Red Dog (LRD) Quarry Landfill

Appendix F – AREA 6 – LITTLE RED DOG (LRD) QUARRY LANDFILL

The primary reclamation objective is to ensure that the contents of the LRD Quarry Landfill remain permanently encapsulated in permafrost.

To confirm this, the annual geotechnical inspection will monitor the physical integrity of the landfill cover cap. Additionally, the temperature profile of the landfill cover cap is being monitored by means of thermistors installed at 4 locations. The purpose of the thermistors is to monitor the establishment of permafrost through the full thickness of the landfill and to verify that the active layer does not extend beneath the base of the cover cap. The thermistors were just installed during the summer of 2005 and were monitored while personnel were on site. The results of monitoring are reported separately by TCL.

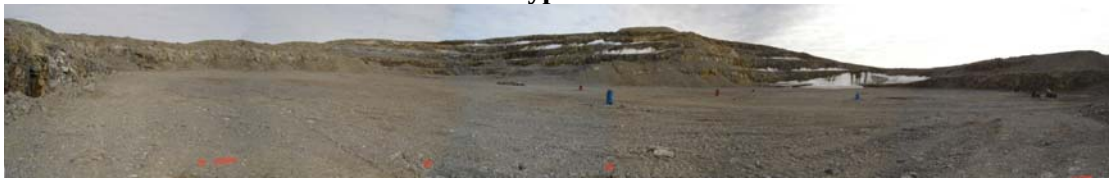
The physical integrity of the cover cap was inspected, together with the condition of the quarry walls. During the site inspection, surface water that was observed flowing from the capping layer at the entrance to the LRD Quarry area was sampled and analyzed for total metals (lead and zinc), as required in the landfill construction approvals, The results of the analyses will be reported by others. No significant metal levels were detected.

The following photographs show panoramic views from several vantage points across the surface of the cap on the LRD landfill. No signs of settlement or instability were observed across the entire area.

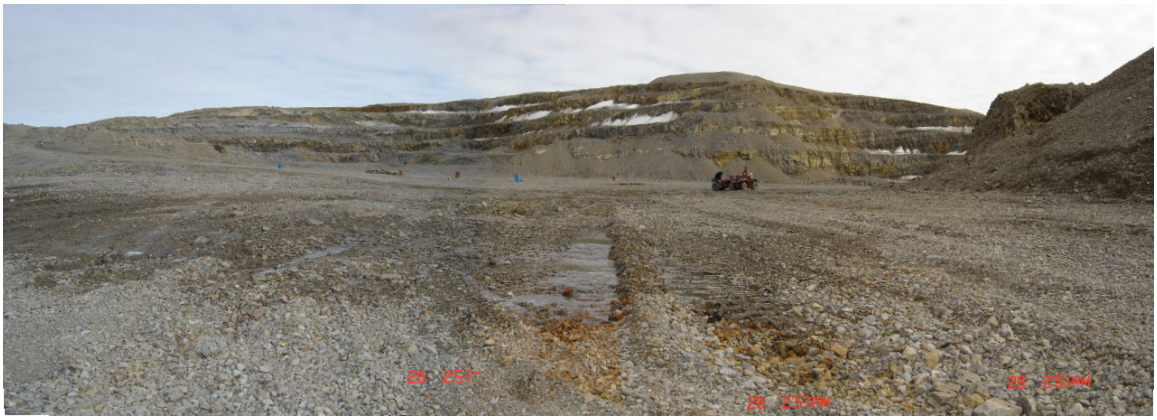
From waypoint LRD1.

From waypoint LRD2.

From waypoint LRD3.



From waypoint LRD4.



View approximately eastwards through the topographic "notch" in the perimeter of the LRD quarry, from waypoint LRD5, where seepage through surficial gravel and rockfill daylights over a distance of some 10m before re-infiltrating. This flow was sampled and was estimate at 1 to 2 litres/sec, exhibiting little to no turbidity. No erosion or instability was observed in the slopes below the notch of the LRD quarry.

View to north from waypoint LRD5 at entrance to LRD quarry landfill. This illustrates perimeter berm about 1.8 m high that borders the top perimeter edge of the LRD quarry sidewalls.

View approximately west from waypoint LRD7 across LRD quarry showing multiple benches of highest part of the quarry sideslopes. No evidence of instability was observed during a tour along the top of the quarry walls. A safety berm is present and is also in good condition.

View of the terrain adjacent to the north end of the airstrip, and of the safety berm around the upper edge of the LRD quarry slopes. The berms are in good condition.

Appendix G

Area 7 - Mine Portals

Appendix G – AREA 7 – MINE PORTALS

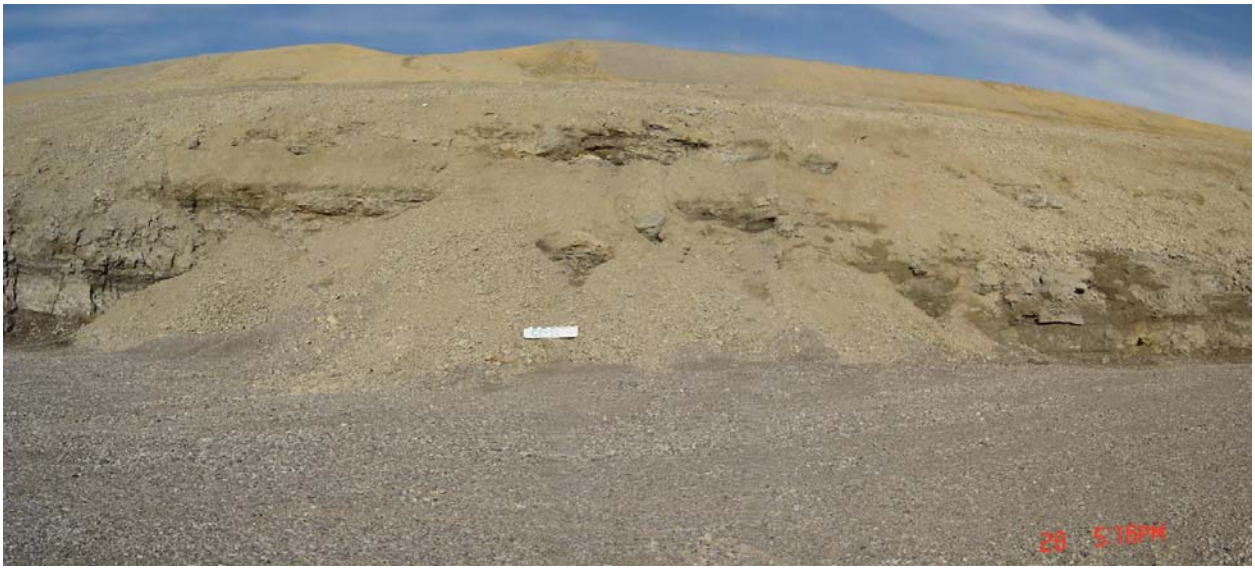
BACKGROUND

The Polaris Mine was an underground mining operation. There were four portals used to access the mine and/or to convey ore out of the mine. As part of the mine decommissioning and reclamation activities, the portals were sealed to prevent the public from accessing the underground mine workings.

The objectives of the annual geotechnical inspection were to look for evidence of any settlement, erosion of the mine seals, or instability at the four portal areas, which might present a risk to human, or wildlife physical safety. As shown in the following photographs, all of the portals are in good condition, free of signs of instability or erosion.

Area 7A - Conveyor Portal

The following photographs document the good condition of the area above and surrounding the Conveyor Portal. No signs of instability or settlement were observed.



Conveyor Portal from waypoint CP1.

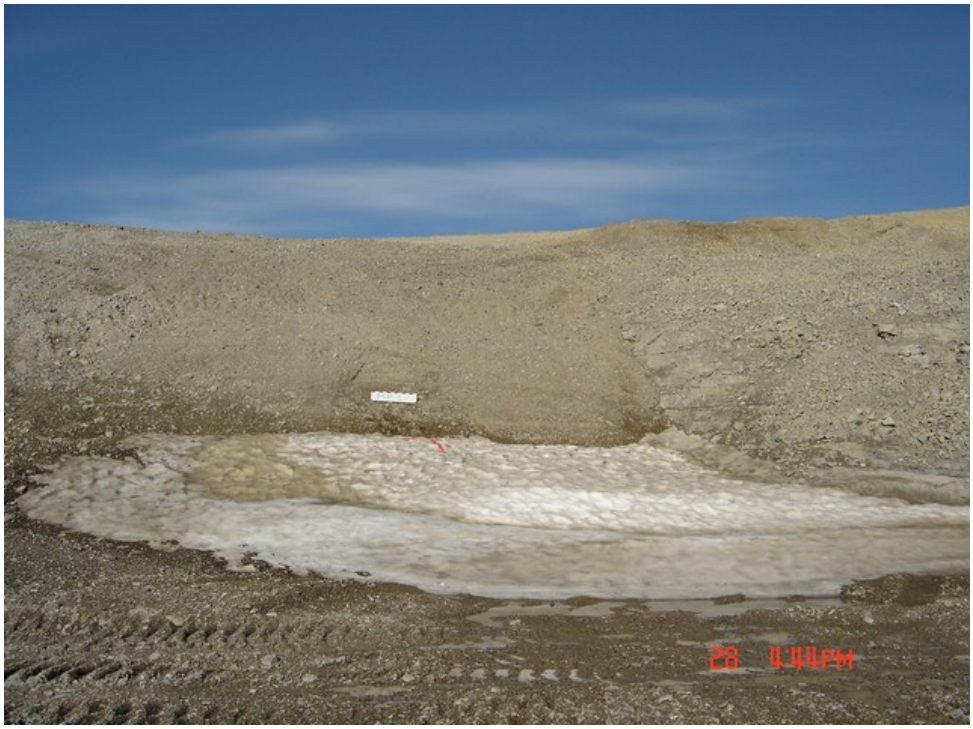
Area 7B - Exploration Portal

The following photographs document the good condition of the area above and surrounding the Exploration Portal. No signs of instability or settlement were observed.

View from waypoint EP1, with no drainage or signs of discharge from vent pipe. Overall slope is approximately 10 degrees and covered in coarse gravel sized rockfill. No signs of instability or hazard to humans or wildlife.

AREA 7C - Main Portal

The following photographs document the good condition of the area above and surrounding the Main Portal. No signs of instability or settlement were observed.

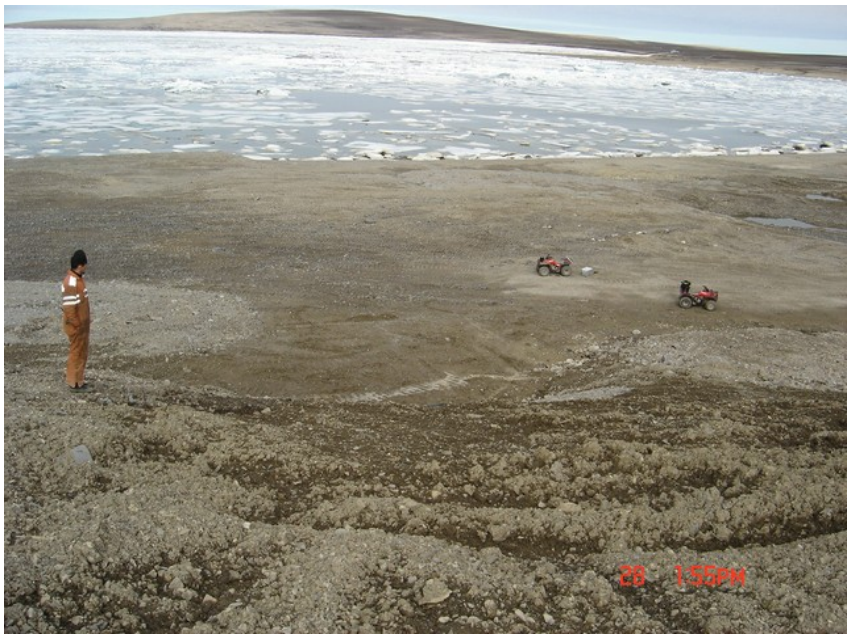


Main Portal from waypoint MP1; no signs of instability or hazards to human or wildlife safety.

Slope above Main Portal area is inclined at about 26 degrees, locally steepening to 35 degrees. Minor slumping was observed, but not considered to present hazard to humans or wildlife.

AREA 7D - North Portal

The following photographs document the good condition of the area above and surrounding the North Portal. No signs of instability or settlement were observed.



North Portal from slope above, which shows no sign of cracks or distress.

North Portal looking west across backfill. This portal accessed a decline and was frozen prior to being backfilled. Thus, the minor drainage along the toe of the cap is considered to be of a surficial nature only.

North Portal from waypoint NP1.

Appendix H

Area 8 - Marine Foreshore Adjacent to Former Dock

Appendix H – AREA 8 – MARINE FORESHORE ADJACENT TO FORMER DOCK

Background

In 2003 and / 2004 the former marine dock cells were removed and the shoreline re-contoured as part of the site's reclamation activities. The marine foreshores both north and south of the former dock were also re-contoured as part of the reclamation process. The objective of the annual geotechnical inspection was to monitor the remediated foreshore and adjacent slopes for signs of abnormal erosion or instability.

The shape and contours of the foreshore are dynamic due to being constantly re-worked by the action of sea ice. Minor ongoing changes to the foreshore topographic features caused by the action of the ice are to be expected. A combination of photographs and surveys has been initiated to monitor conditions. In 2005 a comprehensive set of observation points were set up and photographs taken from each to form a baseline of information for future annual inspections. Additionally, three transects were surveyed in detail to establish a baseline, for comparison of topographic measurements from year to year. The report presents this initial set of observations, which will be compared in future annual inspections. The drawing provided by Teck Cominco, which is included at the end of this appendix, indicates that the slopes along the shoreline are gentle and generally uniform, and are no steeper than 1 vertical in 10 horizontal. The shoreline immediately adjacent to the ocean undulates and is more variable, as shown in the photographs and surveyed sections.

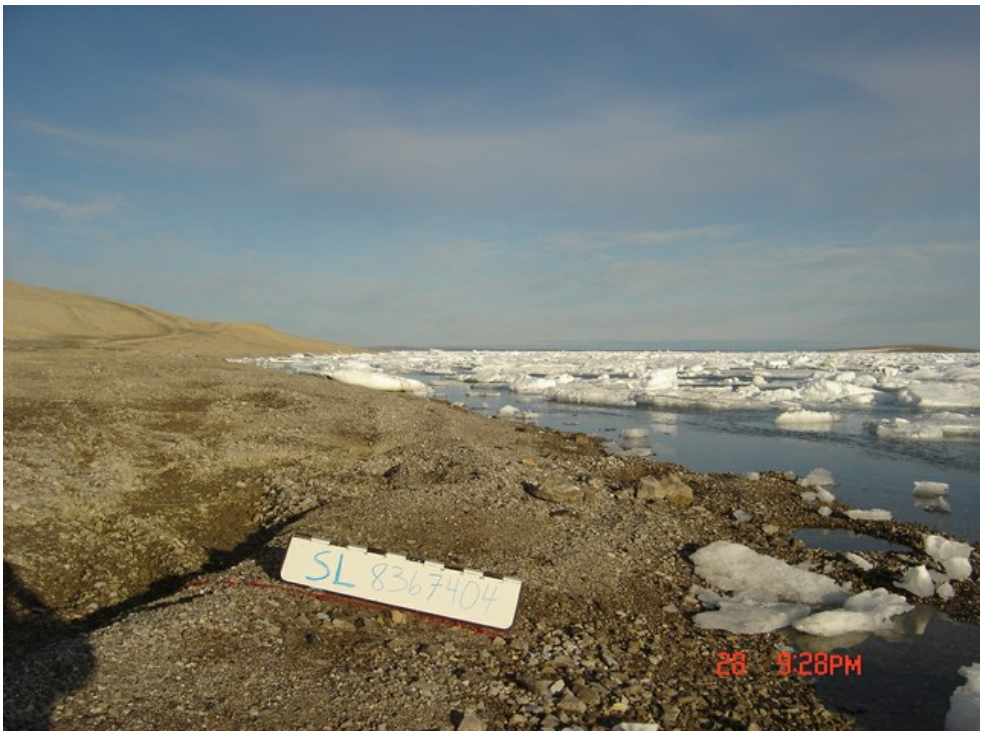
Photographic Monitoring

The following photographs show views along the shoreline and looking east upslope above it from successive points at 100m intervals. The shoreline and adjacent slopes above it are free of signs of settlement, instability or major erosion.

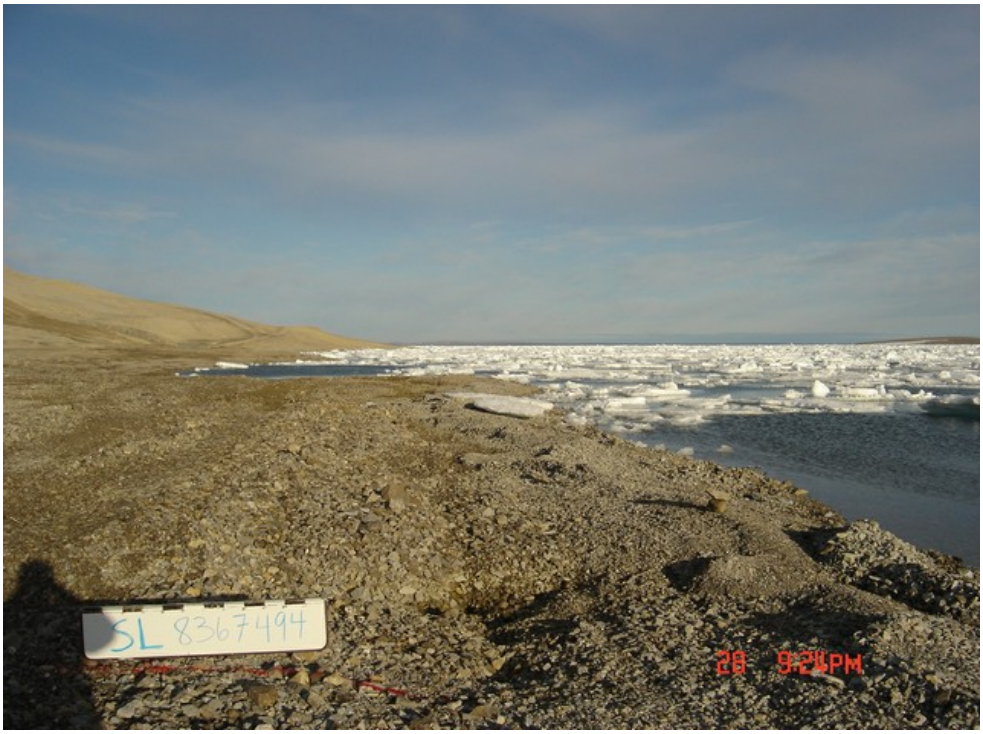
SL-11 North 8 367 300 - View to east.

SL-11 North 8 367 300 view to south.

SL-10 North 8 367 400 view to east.



SL-10 North 8 367 400 view to south.



SL-9 North 8 367 500 view to east.

SL-9 North 8 367 500 view to south.

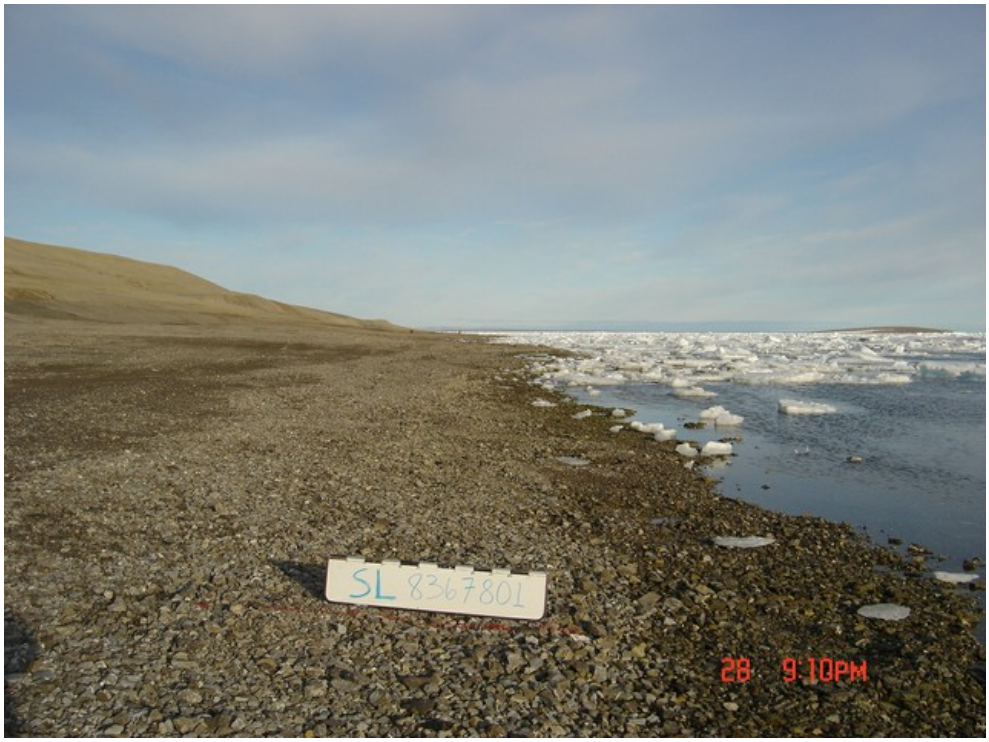
SL-8 North 8 367 600 view to east.

SL-8 North 8 367 600 view to south.

SL-7 North 8 367 700 view to east.

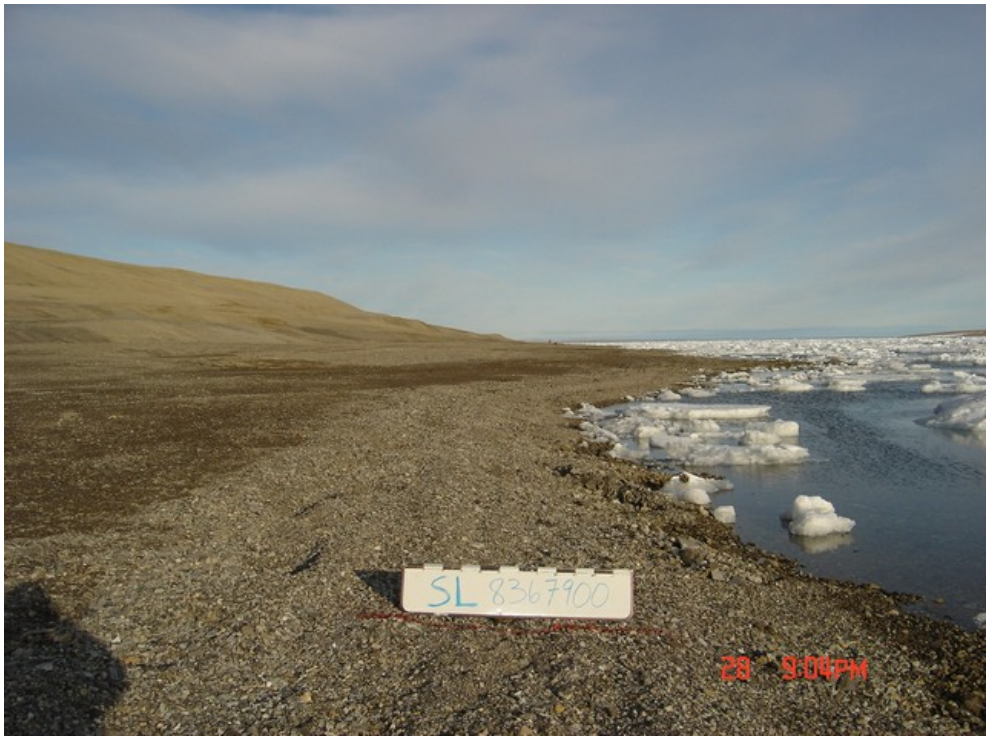
SL-7 North 8 367 700 view to south.

SL-6 North 8 367 800 view to east.



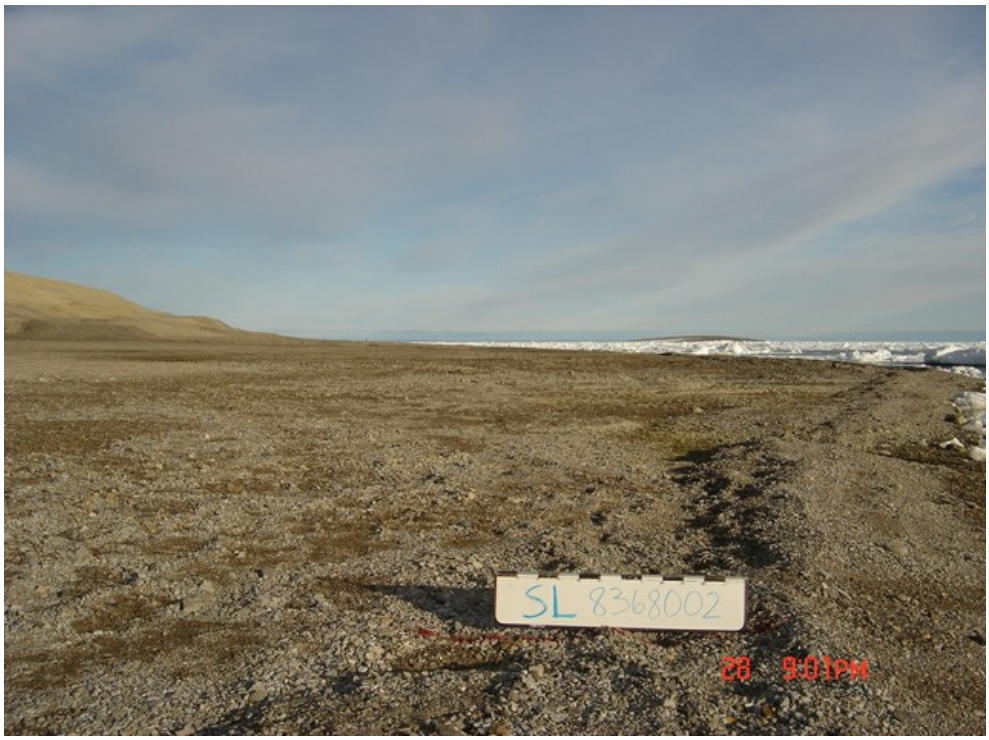
SL-6 North 8 367 800 view to south.

SL-5 North 8 367 900 view to east.



SL-5 North 8 367 900 view to south.

SL-4 North 8 368 000 view to east.



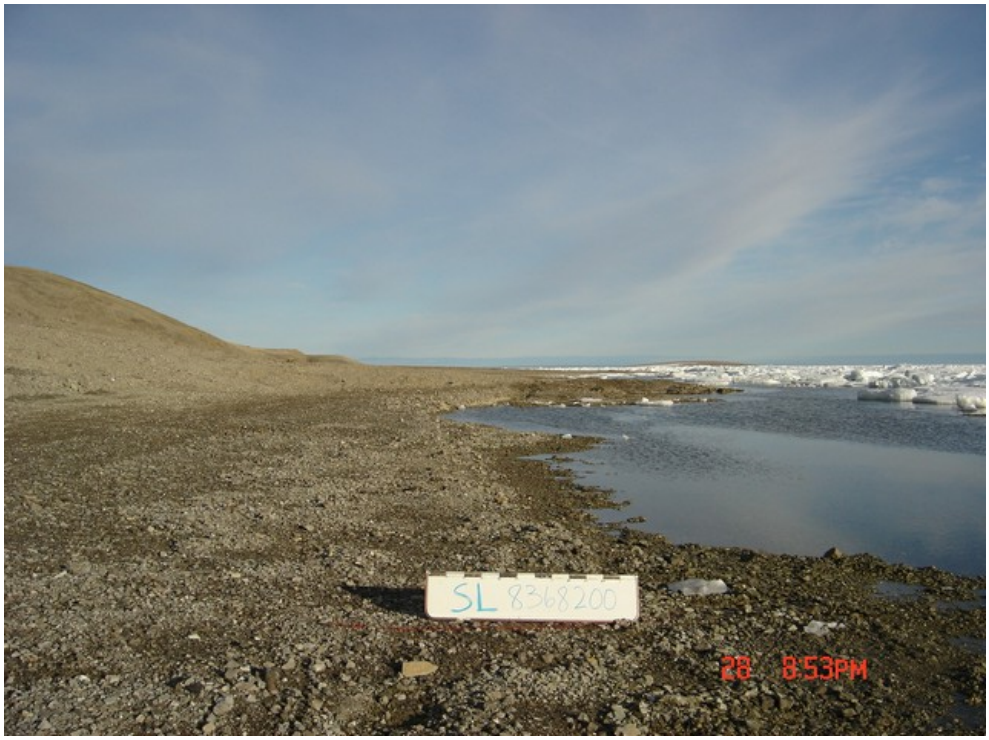
SL-4 North 8 368 000 view to south.

SL-4 North 8 368 000 view to south.

SL-3 North 8 368 100 view to east.

SL-3 North 8 368 100 view to south.

SL-2 North 8 368 200 view to east.



SL-2 North 8 368 200 view to south.

SL-1 North 8 368 300 view to south.

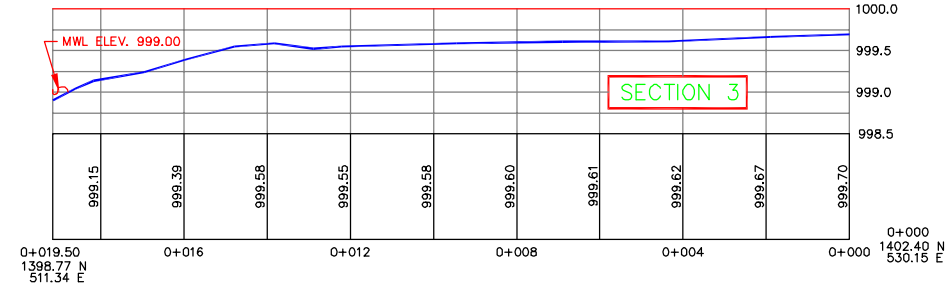
Surveyed Transects

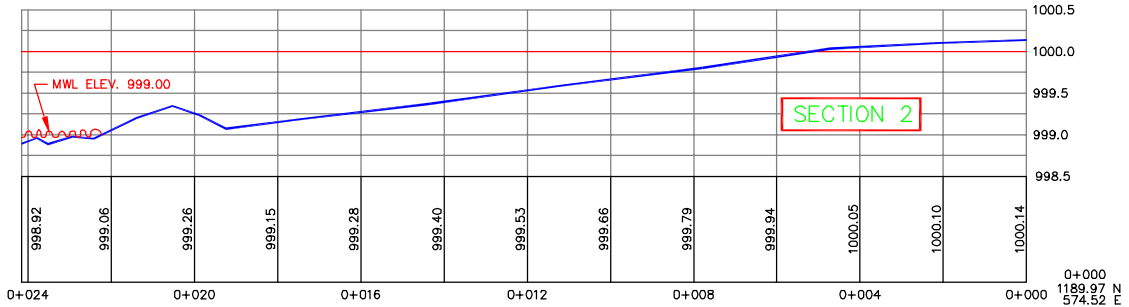
Presented in the drawing provided by Teck Cominco on the following page are the cross sections of the three transects surveyed. The transects ending at the ocean will either be extended or shortened from year to year depending on where the tide is at the time the survey is conducted. However, over a number of years, comparisons of these transects will give an indication of the changes to the foreshore topography.

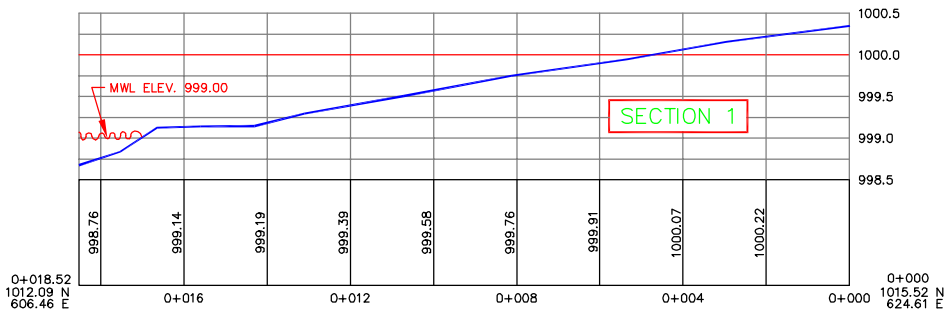
Section 1 is located at the point where the shoreline intersects UTM gridline N 8,367,500 and waypoint SL-9. The overall slope behind the shoreline is gently sloping at approximately 1 Vertical in 11 horizontal.

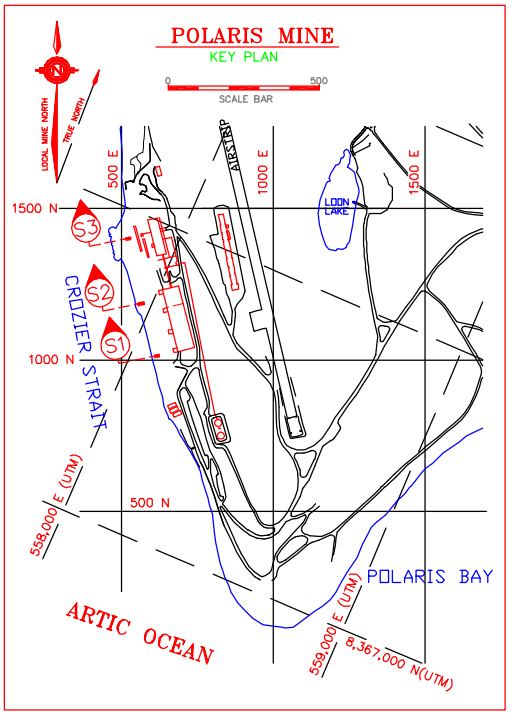
Section 2 is located at the point where the shoreline intersects UTM gridline N 8,367,750, between waypoints SL-6 and SL-7. The overall slope behind the shoreline is gently sloping at approximately 1 Vertical in 15 horizontal, and the slight undulation at the immediate shoreline is reflected in the photographs.

Section 3 is located at the point where the shoreline intersects UTM gridline N 8,367,900 and waypoint SL-5. The overall slope behind the shoreline is almost flat, with a gentle slope at the immediate shoreline, as shown in the photograph.









No.	REVISION	DATE	BY
5			
4			
3			
2			
1			

NOTE:
1. DATA COLLECTED JULY, 2005 BY TECK COMINCO REPRESENTATIVE.
2. SECTION CO-ORDINATES AND ELEVATIONS REFER TO LOCAL MINE DATUM.

PROJECT:
POLARIS MINE POST CLOSURE 2005 ANNUAL SITE INSPECTION

DRAWING:
MARINE FORESHORE SECTIONS

TM TECH SERVICES
CRANBROOK B.C.
(250)489-1855

DRAWN BY: T. MELNICK
5-337 SXS
DATE: DEC. 6/05
FIGURE No. PM 2005 AREA 4
CLIENT: teckcominco
SCALE: 1:100 Horz. 1:50 Vert.
SHEET: 1 OF 1

APPENDIX 6

Wind Speed Monitoring Data

from

Resolute Bay, Nunavut

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
1-Aug-05	0:00	15
1-Aug-05	1:00	11
1-Aug-05	2:00	9
1-Aug-05	3:00	13
1-Aug-05	4:00	17
1-Aug-05	5:00	9
1-Aug-05	6:00	13
1-Aug-05	7:00	19
1-Aug-05	8:00	26
1-Aug-05	9:00	19
1-Aug-05	10:00	17
1-Aug-05	11:00	9
1-Aug-05	12:00	7
1-Aug-05	13:00	9
1-Aug-05	14:00	6
1-Aug-05	15:00	4
1-Aug-05	16:00	6
1-Aug-05	17:00	0
1-Aug-05	18:00	0
1-Aug-05	19:00	2
1-Aug-05	20:00	2
1-Aug-05	21:00	0
1-Aug-05	22:00	0
1-Aug-05	23:00	4
2-Aug-05	0:00	4
2-Aug-05	1:00	4
2-Aug-05	2:00	0
2-Aug-05	3:00	4
2-Aug-05	4:00	6
2-Aug-05	5:00	4
2-Aug-05	6:00	6
2-Aug-05	7:00	0
2-Aug-05	8:00	6
2-Aug-05	9:00	11
2-Aug-05	10:00	11
2-Aug-05	11:00	7
2-Aug-05	12:00	9
2-Aug-05	13:00	7
2-Aug-05	14:00	6
2-Aug-05	15:00	6
2-Aug-05	16:00	6
2-Aug-05	17:00	7
2-Aug-05	18:00	6
2-Aug-05	19:00	9
2-Aug-05	20:00	17
2-Aug-05	21:00	7
2-Aug-05	22:00	11
2-Aug-05	23:00	11
3-Aug-05	0:00	17
3-Aug-05	1:00	7
3-Aug-05	2:00	17
3-Aug-05	3:00	20
3-Aug-05	4:00	19
3-Aug-05	5:00	26
3-Aug-05	6:00	24
3-Aug-05	7:00	37
3-Aug-05	8:00	28
3-Aug-05	9:00	17
3-Aug-05	10:00	33
3-Aug-05	11:00	28
3-Aug-05	12:00	32
3-Aug-05	13:00	37
3-Aug-05	14:00	37
3-Aug-05	15:00	37
3-Aug-05	16:00	37
3-Aug-05	17:00	33
3-Aug-05	18:00	30
3-Aug-05	19:00	30
3-Aug-05	20:00	30
3-Aug-05	21:00	26
3-Aug-05	22:00	26
3-Aug-05	23:00	37
4-Aug-05	0:00	37
4-Aug-05	1:00	33

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
4-Aug-05	2:00	28
4-Aug-05	3:00	33
4-Aug-05	4:00	32
4-Aug-05	5:00	24
4-Aug-05	6:00	35
4-Aug-05	8:00	37
4-Aug-05	9:00	37
4-Aug-05	10:00	28
4-Aug-05	11:00	28
4-Aug-05	12:00	28
4-Aug-05	13:00	28
4-Aug-05	14:00	37
4-Aug-05	15:00	35
4-Aug-05	16:00	37
4-Aug-05	17:00	35
4-Aug-05	18:00	35
4-Aug-05	19:00	44
4-Aug-05	20:00	35
4-Aug-05	21:00	41
4-Aug-05	22:00	37
4-Aug-05	23:00	43
5-Aug-05	0:00	41
5-Aug-05	1:00	43
5-Aug-05	2:00	39
5-Aug-05	3:00	43
5-Aug-05	4:00	41
5-Aug-05	5:00	43
5-Aug-05	6:00	43
5-Aug-05	7:00	43
5-Aug-05	8:00	28
5-Aug-05	9:00	32
5-Aug-05	10:00	28
5-Aug-05	11:00	28
5-Aug-05	12:00	28
5-Aug-05	13:00	37
5-Aug-05	14:00	35
5-Aug-05	15:00	28
5-Aug-05	16:00	39
5-Aug-05	17:00	26
5-Aug-05	18:00	28
5-Aug-05	19:00	28
5-Aug-05	20:00	28
5-Aug-05	21:00	11
5-Aug-05	22:00	24
5-Aug-05	23:00	32
6-Aug-05	0:00	32
6-Aug-05	1:00	33
6-Aug-05	2:00	39
6-Aug-05	3:00	43
6-Aug-05	4:00	32
6-Aug-05	5:00	24
6-Aug-05	6:00	13
6-Aug-05	7:00	15
6-Aug-05	8:00	11
6-Aug-05	9:00	7
6-Aug-05	10:00	15
6-Aug-05	11:00	26
6-Aug-05	12:00	28
6-Aug-05	13:00	28
6-Aug-05	14:00	28
6-Aug-05	15:00	26
6-Aug-05	16:00	35
6-Aug-05	17:00	37
6-Aug-05	18:00	35
6-Aug-05	19:00	32
6-Aug-05	20:00	33
6-Aug-05	21:00	26
6-Aug-05	22:00	15
6-Aug-05	23:00	24
7-Aug-05	0:00	19
7-Aug-05	1:00	19
7-Aug-05	2:00	20
7-Aug-05	3:00	19
7-Aug-05	4:00	17

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
7-Aug-05	5:00	26
7-Aug-05	6:00	17
7-Aug-05	7:00	22
7-Aug-05	8:00	28
7-Aug-05	9:00	26
7-Aug-05	10:00	32
7-Aug-05	11:00	28
7-Aug-05	12:00	28
7-Aug-05	13:00	26
7-Aug-05	14:00	20
7-Aug-05	15:00	30
7-Aug-05	16:00	28
7-Aug-05	17:00	24
7-Aug-05	18:00	30
7-Aug-05	19:00	22
7-Aug-05	20:00	30
7-Aug-05	21:00	26
7-Aug-05	22:00	28
7-Aug-05	23:00	26
8-Aug-05	0:00	30
8-Aug-05	1:00	33
8-Aug-05	2:00	30
8-Aug-05	3:00	30
8-Aug-05	4:00	28
8-Aug-05	5:00	30
8-Aug-05	6:00	26
8-Aug-05	7:00	0
8-Aug-05	8:00	7
8-Aug-05	9:00	15
8-Aug-05	10:00	19
8-Aug-05	11:00	13
8-Aug-05	12:00	15
8-Aug-05	13:00	9
8-Aug-05	14:00	9
8-Aug-05	15:00	2
8-Aug-05	16:00	2
8-Aug-05	17:00	0
8-Aug-05	18:00	6
8-Aug-05	19:00	11
8-Aug-05	20:00	11
8-Aug-05	21:00	6
8-Aug-05	22:00	6
8-Aug-05	23:00	17
9-Aug-05	0:00	20
9-Aug-05	1:00	22
9-Aug-05	2:00	20
9-Aug-05	3:00	6
9-Aug-05	4:00	0
9-Aug-05	5:00	0
9-Aug-05	6:00	4
9-Aug-05	7:00	0
9-Aug-05	8:00	6
9-Aug-05	9:00	6
9-Aug-05	10:00	6
9-Aug-05	11:00	0
9-Aug-05	12:00	7
9-Aug-05	13:00	6
9-Aug-05	15:00	4
9-Aug-05	16:00	2
9-Aug-05	17:00	4
9-Aug-05	18:00	7
9-Aug-05	19:00	7
9-Aug-05	20:00	2
9-Aug-05	21:00	11
9-Aug-05	22:00	13
9-Aug-05	23:00	7
10-Aug-05	0:00	2
10-Aug-05	1:00	0
10-Aug-05	2:00	0
10-Aug-05	3:00	2
10-Aug-05	4:00	2
10-Aug-05	5:00	0
10-Aug-05	6:00	7
10-Aug-05	7:00	0

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
10-Aug-05	8:00	2
10-Aug-05	9:00	4
10-Aug-05	10:00	6
10-Aug-05	11:00	6
10-Aug-05	12:00	4
10-Aug-05	13:00	7
10-Aug-05	14:00	7
10-Aug-05	15:00	0
10-Aug-05	16:00	6
10-Aug-05	17:00	9
10-Aug-05	18:00	6
10-Aug-05	19:00	6
10-Aug-05	20:00	0
10-Aug-05	21:00	0
10-Aug-05	22:00	0
10-Aug-05	23:00	6
11-Aug-05	0:00	7
11-Aug-05	1:00	4
11-Aug-05	2:00	0
11-Aug-05	3:00	4
11-Aug-05	4:00	4
11-Aug-05	5:00	0
11-Aug-05	6:00	9
11-Aug-05	7:00	7
11-Aug-05	8:00	9
11-Aug-05	9:00	20
11-Aug-05	10:00	13
11-Aug-05	11:00	15
11-Aug-05	12:00	17
11-Aug-05	13:00	13
11-Aug-05	14:00	22
11-Aug-05	15:00	22
11-Aug-05	16:00	26
11-Aug-05	17:00	24
11-Aug-05	18:00	22
11-Aug-05	19:00	26
11-Aug-05	20:00	20
11-Aug-05	21:00	19
11-Aug-05	22:00	19
11-Aug-05	23:00	20
12-Aug-05	0:00	30
12-Aug-05	1:00	33
12-Aug-05	2:00	37
12-Aug-05	3:00	17
12-Aug-05	4:00	19
12-Aug-05	5:00	17
12-Aug-05	6:00	15
12-Aug-05	7:00	32
12-Aug-05	8:00	32
12-Aug-05	9:00	28
12-Aug-05	10:00	15
12-Aug-05	11:00	20
12-Aug-05	12:00	17
12-Aug-05	13:00	13
12-Aug-05	14:00	15
12-Aug-05	15:00	9
12-Aug-05	16:00	4
12-Aug-05	17:00	6
12-Aug-05	18:00	7
12-Aug-05	19:00	0
12-Aug-05	20:00	6
12-Aug-05	21:00	7
12-Aug-05	22:00	4
12-Aug-05	23:00	0
13-Aug-05	0:00	6
13-Aug-05	1:00	0
13-Aug-05	2:00	7
13-Aug-05	3:00	6
13-Aug-05	4:00	9
13-Aug-05	5:00	7
13-Aug-05	6:00	9
13-Aug-05	7:00	9
13-Aug-05	8:00	2
13-Aug-05	9:00	2

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
13-Aug-05	10:00	11
13-Aug-05	11:00	24
13-Aug-05	12:00	30
13-Aug-05	13:00	28
13-Aug-05	14:00	15
13-Aug-05	15:00	28
13-Aug-05	16:00	30
13-Aug-05	17:00	19
13-Aug-05	18:00	30
13-Aug-05	19:00	22
13-Aug-05	20:00	26
13-Aug-05	21:00	24
13-Aug-05	22:00	30
13-Aug-05	23:00	24
14-Aug-05	0:00	24
14-Aug-05	1:00	24
14-Aug-05	2:00	22
14-Aug-05	3:00	24
14-Aug-05	4:00	32
14-Aug-05	5:00	30
14-Aug-05	6:00	32
14-Aug-05	7:00	20
14-Aug-05	8:00	32
14-Aug-05	9:00	28
14-Aug-05	10:00	35
14-Aug-05	11:00	33
14-Aug-05	12:00	37
14-Aug-05	13:00	32
14-Aug-05	14:00	28
14-Aug-05	15:00	32
14-Aug-05	16:00	30
14-Aug-05	17:00	33
14-Aug-05	18:00	22
14-Aug-05	19:00	39
14-Aug-05	20:00	20
14-Aug-05	21:00	37
14-Aug-05	22:00	32
14-Aug-05	23:00	32
15-Aug-05	0:00	33
15-Aug-05	1:00	32
15-Aug-05	2:00	26
15-Aug-05	3:00	32
15-Aug-05	4:00	26
15-Aug-05	5:00	28
15-Aug-05	6:00	26
15-Aug-05	7:00	33
15-Aug-05	8:00	30
15-Aug-05	9:00	32
15-Aug-05	10:00	28
15-Aug-05	11:00	32
15-Aug-05	12:00	28
15-Aug-05	13:00	26
15-Aug-05	14:00	30
15-Aug-05	15:00	26
15-Aug-05	16:00	20
15-Aug-05	17:00	24
15-Aug-05	18:00	26
15-Aug-05	19:00	20
15-Aug-05	20:00	22
15-Aug-05	21:00	22
15-Aug-05	22:00	20
15-Aug-05	23:00	17
16-Aug-05	0:00	11
16-Aug-05	1:00	17
16-Aug-05	2:00	20
16-Aug-05	3:00	13
16-Aug-05	4:00	13
16-Aug-05	5:00	20
16-Aug-05	6:00	20
16-Aug-05	7:00	13
16-Aug-05	8:00	13
16-Aug-05	9:00	15
16-Aug-05	10:00	13
16-Aug-05	11:00	17

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
16-Aug-05	12:00	13
16-Aug-05	13:00	17
16-Aug-05	14:00	13
16-Aug-05	15:00	15
16-Aug-05	16:00	11
16-Aug-05	17:00	11
16-Aug-05	18:00	9
16-Aug-05	19:00	9
16-Aug-05	20:00	9
16-Aug-05	21:00	7
16-Aug-05	22:00	4
16-Aug-05	23:00	6
17-Aug-05	0:00	6
17-Aug-05	1:00	6
17-Aug-05	2:00	6
17-Aug-05	3:00	4
17-Aug-05	4:00	2
17-Aug-05	5:00	0
17-Aug-05	6:00	0
17-Aug-05	7:00	4
17-Aug-05	8:00	0
17-Aug-05	9:00	0
17-Aug-05	10:00	4
17-Aug-05	11:00	6
17-Aug-05	12:00	4
17-Aug-05	13:00	4
17-Aug-05	14:00	7
17-Aug-05	15:00	7
17-Aug-05	16:00	7
17-Aug-05	17:00	7
17-Aug-05	18:00	7
17-Aug-05	19:00	0
17-Aug-05	20:00	4
17-Aug-05	21:00	13
17-Aug-05	22:00	19
17-Aug-05	23:00	19
18-Aug-05	0:00	19
18-Aug-05	1:00	13
18-Aug-05	2:00	17
18-Aug-05	3:00	17
18-Aug-05	4:00	22
18-Aug-05	5:00	24
18-Aug-05	6:00	20
18-Aug-05	7:00	11
18-Aug-05	8:00	17
18-Aug-05	9:00	24
18-Aug-05	10:00	24
18-Aug-05	11:00	30
18-Aug-05	12:00	33
18-Aug-05	13:00	33
18-Aug-05	14:00	28
18-Aug-05	15:00	32
18-Aug-05	16:00	32
18-Aug-05	17:00	33
18-Aug-05	18:00	33
18-Aug-05	19:00	26
18-Aug-05	20:00	30
18-Aug-05	21:00	39
18-Aug-05	22:00	24
18-Aug-05	23:00	26
19-Aug-05	0:00	30
19-Aug-05	1:00	24
19-Aug-05	2:00	22
19-Aug-05	3:00	15
19-Aug-05	4:00	24
19-Aug-05	5:00	24
19-Aug-05	6:00	15
19-Aug-05	7:00	17
19-Aug-05	8:00	15
19-Aug-05	9:00	19
19-Aug-05	10:00	22
19-Aug-05	11:00	24
19-Aug-05	12:00	15
19-Aug-05	13:00	19

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
19-Aug-05	14:00	22
19-Aug-05	17:00	22
19-Aug-05	18:00	22
19-Aug-05	19:00	24
19-Aug-05	20:00	15
19-Aug-05	21:00	20
19-Aug-05	22:00	19
19-Aug-05	23:00	19
20-Aug-05	0:00	15
20-Aug-05	1:00	11
20-Aug-05	2:00	9
20-Aug-05	3:00	9
20-Aug-05	4:00	9
20-Aug-05	5:00	15
20-Aug-05	6:00	11
20-Aug-05	7:00	19
20-Aug-05	8:00	17
20-Aug-05	9:00	13
20-Aug-05	10:00	19
20-Aug-05	11:00	13
20-Aug-05	12:00	15
20-Aug-05	14:00	13
20-Aug-05	15:00	7
20-Aug-05	16:00	9
20-Aug-05	17:00	0
20-Aug-05	18:00	0
20-Aug-05	19:00	9
20-Aug-05	20:00	9
20-Aug-05	21:00	13
20-Aug-05	22:00	11
20-Aug-05	23:00	11
21-Aug-05	0:00	11
21-Aug-05	1:00	7
21-Aug-05	2:00	13
21-Aug-05	3:00	20
21-Aug-05	4:00	24
21-Aug-05	5:00	24
21-Aug-05	6:00	28
21-Aug-05	7:00	24
21-Aug-05	8:00	26
21-Aug-05	9:00	33
21-Aug-05	10:00	33
21-Aug-05	11:00	33
21-Aug-05	12:00	33
21-Aug-05	13:00	35
21-Aug-05	14:00	37
21-Aug-05	15:00	37
21-Aug-05	16:00	35
21-Aug-05	17:00	30
21-Aug-05	18:00	28
21-Aug-05	19:00	30
21-Aug-05	20:00	26
21-Aug-05	21:00	19
21-Aug-05	22:00	28
21-Aug-05	23:00	22
22-Aug-05	0:00	26
22-Aug-05	1:00	26
22-Aug-05	2:00	24
22-Aug-05	3:00	24
22-Aug-05	4:00	26
22-Aug-05	5:00	35
22-Aug-05	6:00	28
22-Aug-05	7:00	37
22-Aug-05	8:00	43
22-Aug-05	9:00	43
22-Aug-05	10:00	43
22-Aug-05	11:00	43
22-Aug-05	12:00	43
22-Aug-05	13:00	44
22-Aug-05	14:00	44
22-Aug-05	15:00	46
22-Aug-05	16:00	46
22-Aug-05	17:00	48
22-Aug-05	18:00	**52**

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
22-Aug-05	19:00	46
22-Aug-05	20:00	**54**
22-Aug-05	21:00	46
22-Aug-05	22:00	44
22-Aug-05	23:00	**56**
23-Aug-05	0:00	48
23-Aug-05	1:00	37
23-Aug-05	2:00	43
23-Aug-05	3:00	46
23-Aug-05	4:00	46
23-Aug-05	5:00	44
23-Aug-05	6:00	43
23-Aug-05	7:00	37
23-Aug-05	8:00	28
23-Aug-05	9:00	30
23-Aug-05	10:00	26
23-Aug-05	11:00	24
23-Aug-05	12:00	24
23-Aug-05	13:00	24
23-Aug-05	14:00	26
23-Aug-05	15:00	13
23-Aug-05	16:00	17
23-Aug-05	17:00	20
23-Aug-05	18:00	15
23-Aug-05	19:00	20
23-Aug-05	20:00	19
23-Aug-05	21:00	26
23-Aug-05	22:00	22
23-Aug-05	23:00	20
24-Aug-05	0:00	11
24-Aug-05	1:00	7
24-Aug-05	2:00	4
24-Aug-05	3:00	2
24-Aug-05	4:00	2
24-Aug-05	5:00	7
24-Aug-05	6:00	0
24-Aug-05	7:00	0
24-Aug-05	8:00	6
24-Aug-05	9:00	9
24-Aug-05	10:00	13
24-Aug-05	11:00	19
24-Aug-05	12:00	15
24-Aug-05	13:00	15
24-Aug-05	14:00	15
24-Aug-05	15:00	22
24-Aug-05	16:00	26
24-Aug-05	17:00	19
24-Aug-05	18:00	28
24-Aug-05	19:00	22
24-Aug-05	20:00	17
24-Aug-05	21:00	13
24-Aug-05	22:00	15
24-Aug-05	23:00	17
25-Aug-05	0:00	17
25-Aug-05	1:00	11
25-Aug-05	2:00	11
25-Aug-05	3:00	17
25-Aug-05	4:00	17
25-Aug-05	5:00	6
25-Aug-05	6:00	6
25-Aug-05	7:00	11
25-Aug-05	8:00	4
25-Aug-05	9:00	0
25-Aug-05	10:00	6
25-Aug-05	11:00	4
25-Aug-05	12:00	6
25-Aug-05	13:00	0
25-Aug-05	14:00	6
25-Aug-05	15:00	6
25-Aug-05	16:00	7
25-Aug-05	17:00	9
25-Aug-05	18:00	7
25-Aug-05	19:00	4
25-Aug-05	20:00	6

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
25-Aug-05	21:00	6
25-Aug-05	22:00	9
25-Aug-05	23:00	7
26-Aug-05	0:00	7
26-Aug-05	1:00	0
26-Aug-05	2:00	11
26-Aug-05	3:00	20
26-Aug-05	4:00	20
26-Aug-05	5:00	15
26-Aug-05	6:00	19
26-Aug-05	7:00	7
26-Aug-05	8:00	4
26-Aug-05	9:00	15
26-Aug-05	10:00	15
26-Aug-05	11:00	7
26-Aug-05	12:00	4
26-Aug-05	13:00	13
26-Aug-05	14:00	11
26-Aug-05	15:00	7
26-Aug-05	16:00	11
26-Aug-05	17:00	11
26-Aug-05	18:00	7
26-Aug-05	19:00	7
26-Aug-05	20:00	0
26-Aug-05	21:00	0
26-Aug-05	22:00	6
26-Aug-05	23:00	0
27-Aug-05	0:00	0
27-Aug-05	1:00	0
27-Aug-05	2:00	0
27-Aug-05	3:00	0
27-Aug-05	4:00	0
27-Aug-05	5:00	11
27-Aug-05	6:00	4
27-Aug-05	7:00	9
27-Aug-05	8:00	6
27-Aug-05	9:00	7
27-Aug-05	10:00	9
27-Aug-05	11:00	7
27-Aug-05	12:00	9
27-Aug-05	13:00	4
27-Aug-05	14:00	9
27-Aug-05	15:00	7
27-Aug-05	16:00	6
27-Aug-05	17:00	6
27-Aug-05	18:00	6
27-Aug-05	19:00	9
27-Aug-05	20:00	13
27-Aug-05	21:00	20
27-Aug-05	22:00	22
27-Aug-05	23:00	24
28-Aug-05	0:00	32
28-Aug-05	1:00	35
28-Aug-05	2:00	28
28-Aug-05	3:00	35
28-Aug-05	4:00	26
28-Aug-05	5:00	43
28-Aug-05	6:00	43
28-Aug-05	7:00	41
28-Aug-05	8:00	41
28-Aug-05	9:00	41
28-Aug-05	10:00	44
28-Aug-05	11:00	**52**
28-Aug-05	12:00	**50**
28-Aug-05	13:00	48
28-Aug-05	14:00	**56**
28-Aug-05	15:00	46
28-Aug-05	16:00	44
28-Aug-05	17:00	35
28-Aug-05	18:00	37
28-Aug-05	19:00	28
28-Aug-05	20:00	28
28-Aug-05	21:00	32
28-Aug-05	22:00	30

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
28-Aug-05	23:00	22
29-Aug-05	0:00	22
29-Aug-05	1:00	26
29-Aug-05	2:00	30
29-Aug-05	3:00	30
29-Aug-05	4:00	39
29-Aug-05	5:00	37
29-Aug-05	6:00	35
29-Aug-05	7:00	43
29-Aug-05	8:00	44
29-Aug-05	9:00	43
29-Aug-05	10:00	**50**
29-Aug-05	11:00	**50**
29-Aug-05	12:00	48
29-Aug-05	13:00	43
29-Aug-05	14:00	43
29-Aug-05	15:00	37
29-Aug-05	16:00	37
29-Aug-05	17:00	43
29-Aug-05	18:00	37
29-Aug-05	19:00	37
29-Aug-05	20:00	33
29-Aug-05	21:00	33
29-Aug-05	22:00	41
29-Aug-05	23:00	37
30-Aug-05	0:00	33
30-Aug-05	1:00	39
30-Aug-05	2:00	39
30-Aug-05	3:00	35
30-Aug-05	4:00	33
30-Aug-05	5:00	33
30-Aug-05	6:00	39
30-Aug-05	7:00	35
30-Aug-05	8:00	39
30-Aug-05	9:00	33
30-Aug-05	10:00	33
30-Aug-05	11:00	33
30-Aug-05	12:00	35
30-Aug-05	13:00	32
30-Aug-05	15:00	32
30-Aug-05	16:00	32
30-Aug-05	17:00	30
30-Aug-05	18:00	2
30-Aug-05	19:00	9
30-Aug-05	20:00	13
30-Aug-05	21:00	17
30-Aug-05	22:00	17
30-Aug-05	23:00	11
31-Aug-05	0:00	15
31-Aug-05	1:00	7
31-Aug-05	2:00	6
31-Aug-05	3:00	4
31-Aug-05	4:00	11
31-Aug-05	5:00	0
31-Aug-05	6:00	0
31-Aug-05	7:00	0
31-Aug-05	8:00	4
31-Aug-05	9:00	6
31-Aug-05	10:00	7
31-Aug-05	11:00	6
31-Aug-05	12:00	7
31-Aug-05	13:00	9
31-Aug-05	14:00	7
31-Aug-05	15:00	13
31-Aug-05	16:00	15
31-Aug-05	17:00	19
31-Aug-05	18:00	17
31-Aug-05	19:00	20
31-Aug-05	20:00	13
31-Aug-05	21:00	13
31-Aug-05	22:00	17
31-Aug-05	23:00	20
1-Sep-05	0:00	20
1-Sep-05	1:00	17

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
1-Sep-05	2:00	15
1-Sep-05	3:00	13
1-Sep-05	4:00	17
1-Sep-05	5:00	11
1-Sep-05	6:00	13
1-Sep-05	7:00	13
1-Sep-05	8:00	19
1-Sep-05	9:00	13
1-Sep-05	10:00	19
1-Sep-05	11:00	20
1-Sep-05	12:00	20
1-Sep-05	13:00	20
1-Sep-05	14:00	20
1-Sep-05	15:00	19
1-Sep-05	16:00	28
1-Sep-05	17:00	24
1-Sep-05	18:00	22
1-Sep-05	19:00	20
1-Sep-05	20:00	17
1-Sep-05	21:00	19
1-Sep-05	22:00	28
1-Sep-05	23:00	28
2-Sep-05	0:00	20
2-Sep-05	1:00	22
2-Sep-05	2:00	13
2-Sep-05	3:00	30
2-Sep-05	4:00	26
2-Sep-05	5:00	28
2-Sep-05	6:00	26
2-Sep-05	7:00	24
2-Sep-05	8:00	26
2-Sep-05	9:00	28
2-Sep-05	10:00	26
2-Sep-05	11:00	28
2-Sep-05	12:00	26
2-Sep-05	13:00	20
2-Sep-05	14:00	22
2-Sep-05	15:00	17
2-Sep-05	16:00	20
2-Sep-05	17:00	13
2-Sep-05	18:00	19
2-Sep-05	19:00	19
2-Sep-05	20:00	24
2-Sep-05	21:00	24
2-Sep-05	22:00	24
2-Sep-05	23:00	32
3-Sep-05	0:00	37
3-Sep-05	1:00	33
3-Sep-05	2:00	33
3-Sep-05	3:00	30
3-Sep-05	4:00	30
3-Sep-05	5:00	26
3-Sep-05	6:00	48
3-Sep-05	7:00	37
3-Sep-05	8:00	33
3-Sep-05	9:00	39
3-Sep-05	10:00	37
3-Sep-05	11:00	37
3-Sep-05	12:00	37
3-Sep-05	13:00	37
3-Sep-05	14:00	37
3-Sep-05	15:00	43
3-Sep-05	16:00	41
3-Sep-05	17:00	41
3-Sep-05	18:00	26
3-Sep-05	19:00	26
3-Sep-05	20:00	26
3-Sep-05	21:00	30
3-Sep-05	22:00	30
3-Sep-05	23:00	33
4-Sep-05	0:00	33
4-Sep-05	1:00	30
4-Sep-05	2:00	26
4-Sep-05	3:00	30

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
4-Sep-05	4:00	30
4-Sep-05	5:00	30
4-Sep-05	6:00	26
4-Sep-05	7:00	28
4-Sep-05	8:00	33
4-Sep-05	9:00	28
4-Sep-05	10:00	30
4-Sep-05	11:00	30
4-Sep-05	12:00	22
4-Sep-05	13:00	22
4-Sep-05	14:00	22
4-Sep-05	15:00	22
4-Sep-05	16:00	24
4-Sep-05	17:00	20
4-Sep-05	18:00	22
4-Sep-05	19:00	20
4-Sep-05	20:00	19
4-Sep-05	21:00	15
4-Sep-05	22:00	19
4-Sep-05	23:00	22
5-Sep-05	0:00	19
5-Sep-05	1:00	26
5-Sep-05	2:00	22
5-Sep-05	3:00	26
5-Sep-05	4:00	26
5-Sep-05	5:00	30
5-Sep-05	6:00	22
5-Sep-05	7:00	32
5-Sep-05	8:00	24
5-Sep-05	9:00	26
5-Sep-05	10:00	28
5-Sep-05	11:00	28
5-Sep-05	12:00	24
5-Sep-05	13:00	22
5-Sep-05	14:00	22
5-Sep-05	15:00	19
5-Sep-05	16:00	15
5-Sep-05	17:00	20
5-Sep-05	18:00	13
5-Sep-05	19:00	17
5-Sep-05	20:00	15
5-Sep-05	21:00	7
5-Sep-05	22:00	6
5-Sep-05	23:00	6
6-Sep-05	0:00	7
6-Sep-05	1:00	11
6-Sep-05	2:00	7
6-Sep-05	3:00	6
6-Sep-05	4:00	6
6-Sep-05	5:00	9
6-Sep-05	6:00	11
6-Sep-05	7:00	0
6-Sep-05	8:00	7
6-Sep-05	9:00	13
6-Sep-05	10:00	7
6-Sep-05	11:00	11
6-Sep-05	12:00	15
6-Sep-05	13:00	15
6-Sep-05	14:00	17
6-Sep-05	15:00	13
6-Sep-05	16:00	15
6-Sep-05	17:00	20
6-Sep-05	18:00	22
6-Sep-05	19:00	28
6-Sep-05	20:00	33
6-Sep-05	21:00	35
6-Sep-05	22:00	33
6-Sep-05	23:00	35
7-Sep-05	0:00	35
7-Sep-05	1:00	37
7-Sep-05	2:00	30
7-Sep-05	3:00	41
7-Sep-05	4:00	32
7-Sep-05	5:00	33

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
7-Sep-05	6:00	28
7-Sep-05	7:00	26
7-Sep-05	8:00	22
7-Sep-05	9:00	7
7-Sep-05	10:00	19
7-Sep-05	11:00	22
7-Sep-05	12:00	24
7-Sep-05	13:00	26
7-Sep-05	14:00	20
7-Sep-05	15:00	22
7-Sep-05	16:00	26
7-Sep-05	17:00	32
7-Sep-05	18:00	32
7-Sep-05	19:00	32
7-Sep-05	20:00	33
7-Sep-05	21:00	32
7-Sep-05	22:00	30
7-Sep-05	23:00	22
8-Sep-05	0:00	26
8-Sep-05	1:00	26
8-Sep-05	2:00	24
8-Sep-05	3:00	28
8-Sep-05	4:00	22
8-Sep-05	5:00	26
8-Sep-05	6:00	32
8-Sep-05	7:00	32
8-Sep-05	8:00	37
8-Sep-05	9:00	41
8-Sep-05	10:00	28
8-Sep-05	11:00	37
8-Sep-05	12:00	37
8-Sep-05	13:00	37
8-Sep-05	14:00	33
8-Sep-05	15:00	30
8-Sep-05	16:00	24
8-Sep-05	17:00	28
8-Sep-05	18:00	26
8-Sep-05	19:00	24
8-Sep-05	20:00	24
8-Sep-05	21:00	22
8-Sep-05	22:00	22
8-Sep-05	23:00	19
9-Sep-05	0:00	26
9-Sep-05	1:00	22
9-Sep-05	2:00	22
9-Sep-05	3:00	13
9-Sep-05	4:00	15
9-Sep-05	5:00	20
9-Sep-05	6:00	17
9-Sep-05	7:00	22
9-Sep-05	8:00	17
9-Sep-05	9:00	19
9-Sep-05	10:00	17
9-Sep-05	11:00	15
9-Sep-05	12:00	17
9-Sep-05	13:00	22
9-Sep-05	14:00	28
9-Sep-05	15:00	22
9-Sep-05	16:00	20
9-Sep-05	17:00	22
9-Sep-05	18:00	19
9-Sep-05	19:00	22
9-Sep-05	20:00	22
9-Sep-05	21:00	19
9-Sep-05	22:00	20
9-Sep-05	23:00	13
10-Sep-05	0:00	20
10-Sep-05	1:00	20
10-Sep-05	2:00	24
10-Sep-05	3:00	9
10-Sep-05	4:00	20
10-Sep-05	5:00	9
10-Sep-05	6:00	0
10-Sep-05	7:00	7

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
10-Sep-05	8:00	4
10-Sep-05	9:00	15
10-Sep-05	10:00	13
10-Sep-05	11:00	13
10-Sep-05	12:00	19
10-Sep-05	13:00	22
10-Sep-05	14:00	22
10-Sep-05	15:00	20
10-Sep-05	16:00	13
10-Sep-05	17:00	22
10-Sep-05	18:00	22
10-Sep-05	19:00	13
10-Sep-05	20:00	13
10-Sep-05	21:00	13
10-Sep-05	22:00	13
10-Sep-05	23:00	4
11-Sep-05	0:00	13
11-Sep-05	1:00	39
11-Sep-05	2:00	41
11-Sep-05	3:00	37
11-Sep-05	4:00	30
11-Sep-05	5:00	46
11-Sep-05	6:00	39
11-Sep-05	7:00	44
11-Sep-05	8:00	48
11-Sep-05	9:00	46
11-Sep-05	10:00	41
11-Sep-05	11:00	44
11-Sep-05	12:00	46
11-Sep-05	13:00	**48**
11-Sep-05	14:00	**65**
11-Sep-05	15:00	**48**
11-Sep-05	16:00	**56**
11-Sep-05	17:00	**52**
11-Sep-05	18:00	**44**
11-Sep-05	19:00	**50**
11-Sep-05	20:00	**46**
11-Sep-05	21:00	**52**
11-Sep-05	22:00	**50**
11-Sep-05	23:00	**56**
12-Sep-05	0:00	**59**
12-Sep-05	1:00	**67**
12-Sep-05	2:00	**63**
12-Sep-05	3:00	46
12-Sep-05	4:00	44
12-Sep-05	5:00	39
12-Sep-05	6:00	37
12-Sep-05	7:00	37
12-Sep-05	8:00	39
12-Sep-05	9:00	41
12-Sep-05	10:00	37
12-Sep-05	11:00	37
12-Sep-05	12:00	41
12-Sep-05	13:00	41
12-Sep-05	14:00	41
12-Sep-05	15:00	46
12-Sep-05	16:00	46
12-Sep-05	17:00	41
12-Sep-05	18:00	41
12-Sep-05	19:00	28
12-Sep-05	20:00	37
12-Sep-05	21:00	28
12-Sep-05	22:00	28
12-Sep-05	23:00	32
13-Sep-05	0:00	22
13-Sep-05	1:00	24
13-Sep-05	2:00	20
13-Sep-05	3:00	13
13-Sep-05	4:00	20
13-Sep-05	5:00	37
13-Sep-05	6:00	46
13-Sep-05	7:00	37
13-Sep-05	8:00	44
13-Sep-05	9:00	37

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
13-Sep-05	10:00	37
13-Sep-05	11:00	32
13-Sep-05	12:00	28
13-Sep-05	13:00	30
13-Sep-05	14:00	24
13-Sep-05	15:00	20
13-Sep-05	16:00	26
13-Sep-05	17:00	24
13-Sep-05	18:00	13
13-Sep-05	19:00	33
13-Sep-05	20:00	30
13-Sep-05	21:00	33
13-Sep-05	22:00	44
13-Sep-05	23:00	39
14-Sep-05	0:00	39
14-Sep-05	1:00	33
14-Sep-05	2:00	30
14-Sep-05	3:00	37
14-Sep-05	4:00	30
14-Sep-05	5:00	33
14-Sep-05	6:00	28
14-Sep-05	7:00	24
14-Sep-05	8:00	11
14-Sep-05	9:00	11
14-Sep-05	10:00	20
14-Sep-05	11:00	24
14-Sep-05	12:00	32
14-Sep-05	13:00	26
14-Sep-05	14:00	33
14-Sep-05	15:00	32
14-Sep-05	16:00	32
14-Sep-05	17:00	35
14-Sep-05	18:00	39
14-Sep-05	19:00	39
14-Sep-05	20:00	39
14-Sep-05	21:00	39
14-Sep-05	22:00	39
14-Sep-05	23:00	39
15-Sep-05	0:00	46
15-Sep-05	1:00	46
15-Sep-05	2:00	41
15-Sep-05	3:00	46
15-Sep-05	4:00	46
15-Sep-05	5:00	46
15-Sep-05	6:00	41
15-Sep-05	7:00	37
15-Sep-05	8:00	37
15-Sep-05	9:00	41
15-Sep-05	10:00	33
15-Sep-05	11:00	37
15-Sep-05	12:00	37
15-Sep-05	13:00	39
15-Sep-05	14:00	37
15-Sep-05	15:00	28
15-Sep-05	16:00	30
15-Sep-05	17:00	37
15-Sep-05	18:00	35
15-Sep-05	19:00	32
15-Sep-05	20:00	33
15-Sep-05	21:00	41
15-Sep-05	22:00	39
15-Sep-05	23:00	39
16-Sep-05	0:00	39
16-Sep-05	1:00	43
16-Sep-05	2:00	43
16-Sep-05	3:00	37
16-Sep-05	4:00	30
16-Sep-05	5:00	37
16-Sep-05	6:00	33
16-Sep-05	7:00	28
16-Sep-05	8:00	37
16-Sep-05	9:00	35
16-Sep-05	10:00	28
16-Sep-05	11:00	28

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
16-Sep-05	12:00	37
16-Sep-05	13:00	33
16-Sep-05	14:00	26
16-Sep-05	15:00	28
16-Sep-05	16:00	17
16-Sep-05	17:00	19
16-Sep-05	18:00	22
16-Sep-05	19:00	20
16-Sep-05	20:00	24
16-Sep-05	21:00	24
16-Sep-05	22:00	20
16-Sep-05	23:00	20
17-Sep-05	0:00	7
17-Sep-05	1:00	7
17-Sep-05	2:00	11
17-Sep-05	3:00	7
17-Sep-05	4:00	11
17-Sep-05	5:00	11
17-Sep-05	6:00	11
17-Sep-05	7:00	15
17-Sep-05	8:00	22
17-Sep-05	9:00	26
17-Sep-05	10:00	17
17-Sep-05	11:00	20
17-Sep-05	12:00	28
17-Sep-05	13:00	32
17-Sep-05	14:00	32
17-Sep-05	15:00	24
17-Sep-05	16:00	13
17-Sep-05	17:00	22
17-Sep-05	18:00	24
17-Sep-05	19:00	32
17-Sep-05	20:00	28
17-Sep-05	21:00	28
17-Sep-05	22:00	30
17-Sep-05	23:00	28
18-Sep-05	0:00	20
18-Sep-05	1:00	20
18-Sep-05	2:00	22
18-Sep-05	3:00	26
18-Sep-05	4:00	26
18-Sep-05	5:00	33
18-Sep-05	6:00	17
18-Sep-05	7:00	7
18-Sep-05	8:00	19
18-Sep-05	9:00	15
18-Sep-05	10:00	20
18-Sep-05	11:00	20
18-Sep-05	12:00	28
18-Sep-05	13:00	20
18-Sep-05	14:00	11
18-Sep-05	15:00	20
18-Sep-05	16:00	17
18-Sep-05	17:00	15
18-Sep-05	18:00	9
18-Sep-05	19:00	11
18-Sep-05	20:00	9
18-Sep-05	21:00	4
18-Sep-05	22:00	0
18-Sep-05	23:00	0
19-Sep-05	0:00	6
19-Sep-05	1:00	7
19-Sep-05	2:00	6
19-Sep-05	3:00	7
19-Sep-05	4:00	0
19-Sep-05	5:00	0
19-Sep-05	6:00	13
19-Sep-05	7:00	19
19-Sep-05	8:00	22
19-Sep-05	9:00	28
19-Sep-05	10:00	28
19-Sep-05	11:00	26
19-Sep-05	12:00	20
19-Sep-05	13:00	17

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
19-Sep-05	14:00	17
19-Sep-05	15:00	17
19-Sep-05	16:00	4
19-Sep-05	17:00	22
19-Sep-05	18:00	20
19-Sep-05	19:00	22
19-Sep-05	20:00	19
19-Sep-05	21:00	28
19-Sep-05	22:00	35
19-Sep-05	23:00	32
20-Sep-05	0:00	30
20-Sep-05	1:00	30
20-Sep-05	2:00	32
20-Sep-05	3:00	28
20-Sep-05	4:00	22
20-Sep-05	5:00	17
20-Sep-05	6:00	22
20-Sep-05	7:00	26
20-Sep-05	8:00	22
20-Sep-05	9:00	32
20-Sep-05	10:00	28
20-Sep-05	11:00	32
20-Sep-05	12:00	28
20-Sep-05	13:00	28
20-Sep-05	14:00	28
20-Sep-05	15:00	33
20-Sep-05	16:00	32
20-Sep-05	17:00	30
20-Sep-05	18:00	33
20-Sep-05	19:00	33
20-Sep-05	20:00	30
20-Sep-05	21:00	28
20-Sep-05	22:00	22
20-Sep-05	23:00	17
21-Sep-05	0:00	13
21-Sep-05	1:00	7
21-Sep-05	2:00	13
21-Sep-05	3:00	13
21-Sep-05	4:00	13
21-Sep-05	5:00	13
21-Sep-05	6:00	15
21-Sep-05	7:00	15
21-Sep-05	8:00	13
21-Sep-05	9:00	13
21-Sep-05	10:00	7
21-Sep-05	11:00	7
21-Sep-05	12:00	11
21-Sep-05	13:00	6
21-Sep-05	14:00	19
21-Sep-05	15:00	15
21-Sep-05	16:00	13
21-Sep-05	17:00	11
21-Sep-05	18:00	4
21-Sep-05	19:00	6
21-Sep-05	20:00	6
21-Sep-05	21:00	6
21-Sep-05	22:00	7
21-Sep-05	23:00	4
22-Sep-05	0:00	9
22-Sep-05	1:00	9
22-Sep-05	2:00	11
22-Sep-05	3:00	15
22-Sep-05	4:00	11
22-Sep-05	5:00	15
22-Sep-05	6:00	13
22-Sep-05	7:00	9
22-Sep-05	8:00	9
22-Sep-05	9:00	11
22-Sep-05	10:00	11
22-Sep-05	11:00	11
22-Sep-05	12:00	11
22-Sep-05	13:00	7
22-Sep-05	14:00	9
22-Sep-05	15:00	7

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
22-Sep-05	16:00	7
22-Sep-05	17:00	6
22-Sep-05	18:00	7
22-Sep-05	19:00	9
22-Sep-05	20:00	7
22-Sep-05	21:00	2
22-Sep-05	22:00	0
22-Sep-05	23:00	4
23-Sep-05	0:00	0
23-Sep-05	1:00	0
23-Sep-05	2:00	7
23-Sep-05	3:00	13
23-Sep-05	4:00	13
23-Sep-05	5:00	17
23-Sep-05	6:00	17
23-Sep-05	7:00	24
23-Sep-05	8:00	22
23-Sep-05	9:00	22
23-Sep-05	10:00	28
23-Sep-05	11:00	26
23-Sep-05	12:00	22
23-Sep-05	13:00	26
23-Sep-05	14:00	19
23-Sep-05	15:00	24
23-Sep-05	16:00	26
23-Sep-05	17:00	26
23-Sep-05	18:00	24
23-Sep-05	19:00	22
23-Sep-05	20:00	28
23-Sep-05	21:00	20
23-Sep-05	22:00	17
23-Sep-05	23:00	22
24-Sep-05	0:00	15
24-Sep-05	1:00	13
24-Sep-05	2:00	11
24-Sep-05	3:00	7
24-Sep-05	4:00	20
24-Sep-05	5:00	15
24-Sep-05	6:00	9
24-Sep-05	7:00	17
24-Sep-05	8:00	20
24-Sep-05	9:00	24
24-Sep-05	10:00	26
24-Sep-05	11:00	24
24-Sep-05	12:00	28
24-Sep-05	13:00	28
24-Sep-05	14:00	24
24-Sep-05	15:00	20
24-Sep-05	16:00	19
24-Sep-05	17:00	17
24-Sep-05	18:00	19
24-Sep-05	19:00	15
24-Sep-05	20:00	19
24-Sep-05	21:00	26
24-Sep-05	22:00	24
24-Sep-05	23:00	24
25-Sep-05	0:00	24
25-Sep-05	1:00	32
25-Sep-05	2:00	41
25-Sep-05	3:00	33
25-Sep-05	4:00	28
25-Sep-05	5:00	32
25-Sep-05	6:00	32
25-Sep-05	7:00	37
25-Sep-05	8:00	37
25-Sep-05	9:00	37
25-Sep-05	10:00	35
25-Sep-05	11:00	37
25-Sep-05	12:00	28
25-Sep-05	13:00	26
25-Sep-05	14:00	28
25-Sep-05	15:00	37
25-Sep-05	16:00	30
25-Sep-05	17:00	30

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
25-Sep-05	18:00	33
25-Sep-05	19:00	35
25-Sep-05	20:00	24
25-Sep-05	21:00	24
25-Sep-05	22:00	19
25-Sep-05	23:00	22
26-Sep-05	0:00	24
26-Sep-05	1:00	32
26-Sep-05	2:00	32
26-Sep-05	3:00	30
26-Sep-05	4:00	20
26-Sep-05	5:00	22
26-Sep-05	6:00	26
26-Sep-05	7:00	30
26-Sep-05	8:00	22
26-Sep-05	9:00	19
26-Sep-05	10:00	11
26-Sep-05	11:00	15
26-Sep-05	12:00	19
26-Sep-05	13:00	15
26-Sep-05	14:00	7
26-Sep-05	15:00	15
26-Sep-05	16:00	13
26-Sep-05	17:00	11
26-Sep-05	18:00	17
26-Sep-05	19:00	13
26-Sep-05	20:00	13
26-Sep-05	21:00	9
26-Sep-05	22:00	19
26-Sep-05	23:00	19
27-Sep-05	0:00	13
27-Sep-05	1:00	9
27-Sep-05	2:00	7
27-Sep-05	3:00	6
27-Sep-05	4:00	6
27-Sep-05	5:00	6
27-Sep-05	6:00	6
27-Sep-05	7:00	6
27-Sep-05	8:00	19
27-Sep-05	9:00	22
27-Sep-05	10:00	17
27-Sep-05	11:00	24
27-Sep-05	12:00	33
27-Sep-05	13:00	30
27-Sep-05	14:00	43
27-Sep-05	15:00	33
27-Sep-05	16:00	33
27-Sep-05	17:00	33
27-Sep-05	18:00	37
27-Sep-05	19:00	41
27-Sep-05	20:00	41
27-Sep-05	21:00	43
27-Sep-05	22:00	37
27-Sep-05	23:00	44
28-Sep-05	0:00	48
28-Sep-05	1:00	43
28-Sep-05	2:00	43
28-Sep-05	3:00	44
28-Sep-05	4:00	41
28-Sep-05	5:00	41
28-Sep-05	6:00	24
28-Sep-05	7:00	20
28-Sep-05	8:00	17
28-Sep-05	9:00	13
28-Sep-05	10:00	26
28-Sep-05	11:00	2
28-Sep-05	12:00	17
28-Sep-05	13:00	9
28-Sep-05	14:00	22
28-Sep-05	15:00	22
28-Sep-05	16:00	26
28-Sep-05	17:00	28
28-Sep-05	18:00	17
28-Sep-05	19:00	28

RESOLUTE BAY WEATHER STATION
HOURLY MAXIMUM WIND SPEED
BETWEEN AUGUST 1 & SEPTEMBER 15, 2005

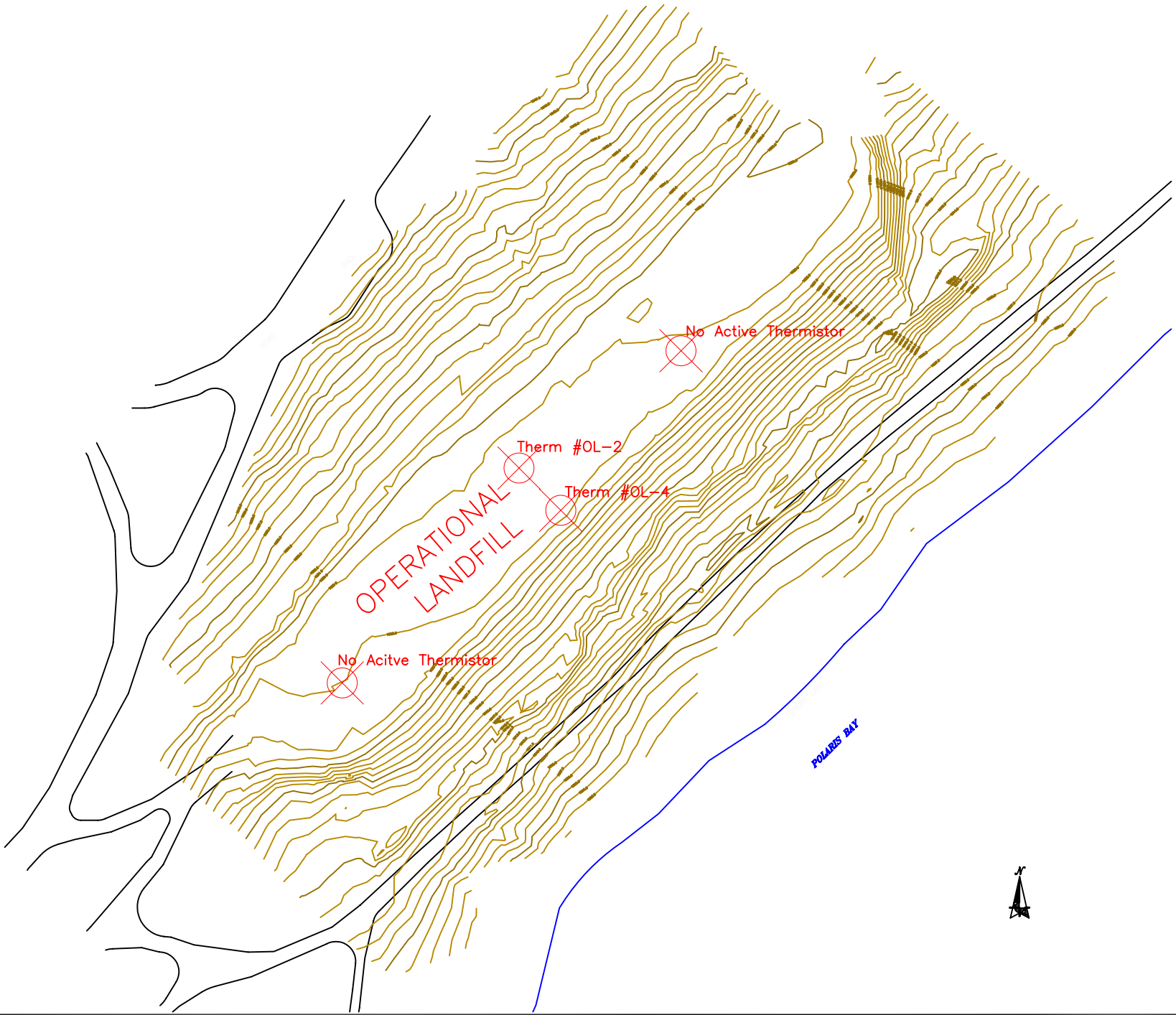
Station Name	RESOLUTE CARS
Province	NUNAVUT
Latitude	74.72
Longitude	-94.99
Elevation	67.4
Climate Identifier	2403500
WMO Identifier	71924
TC Identifier	YRB

All times are specified in Local Standard Time (LST).
Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Date/Time	Time	Wind Spd (km/h)
28-Sep-05	20:00	20
28-Sep-05	21:00	24
28-Sep-05	22:00	22
28-Sep-05	23:00	24
29-Sep-05	0:00	20
29-Sep-05	1:00	24
29-Sep-05	2:00	26
29-Sep-05	3:00	24
29-Sep-05	4:00	24
29-Sep-05	5:00	26
29-Sep-05	6:00	30
29-Sep-05	7:00	28
29-Sep-05	8:00	26
29-Sep-05	9:00	28
29-Sep-05	10:00	33
29-Sep-05	11:00	30
29-Sep-05	12:00	33
29-Sep-05	13:00	32
29-Sep-05	14:00	28
29-Sep-05	15:00	37
29-Sep-05	16:00	35
29-Sep-05	17:00	35
29-Sep-05	18:00	35
29-Sep-05	19:00	33
29-Sep-05	20:00	33
29-Sep-05	21:00	37
29-Sep-05	22:00	37
29-Sep-05	23:00	32
30-Sep-05	0:00	32
30-Sep-05	1:00	26
30-Sep-05	2:00	30
30-Sep-05	3:00	33
30-Sep-05	4:00	33
30-Sep-05	5:00	30
30-Sep-05	6:00	35
30-Sep-05	7:00	39
30-Sep-05	8:00	41
30-Sep-05	9:00	39
30-Sep-05	10:00	39
30-Sep-05	11:00	41
30-Sep-05	12:00	43
30-Sep-05	13:00	37
30-Sep-05	14:00	39
30-Sep-05	15:00	37
30-Sep-05	16:00	37
30-Sep-05	17:00	37
30-Sep-05	18:00	37
30-Sep-05	19:00	37
30-Sep-05	20:00	37
30-Sep-05	21:00	26
30-Sep-05	22:00	9
30-Sep-05	23:00	9

APPENDIX 7

Landfill Thermistor Monitoring Data



LEGEND:

ROAD

SHORE LINE

TOP OF WASTE OR GROUND SURFACE CONTOUR
(MAJOR INTERVAL 5m)
(MINOR INTERVAL 1m)

TECKCO Logo colour.JPG

SOURCE OF DRAWING:

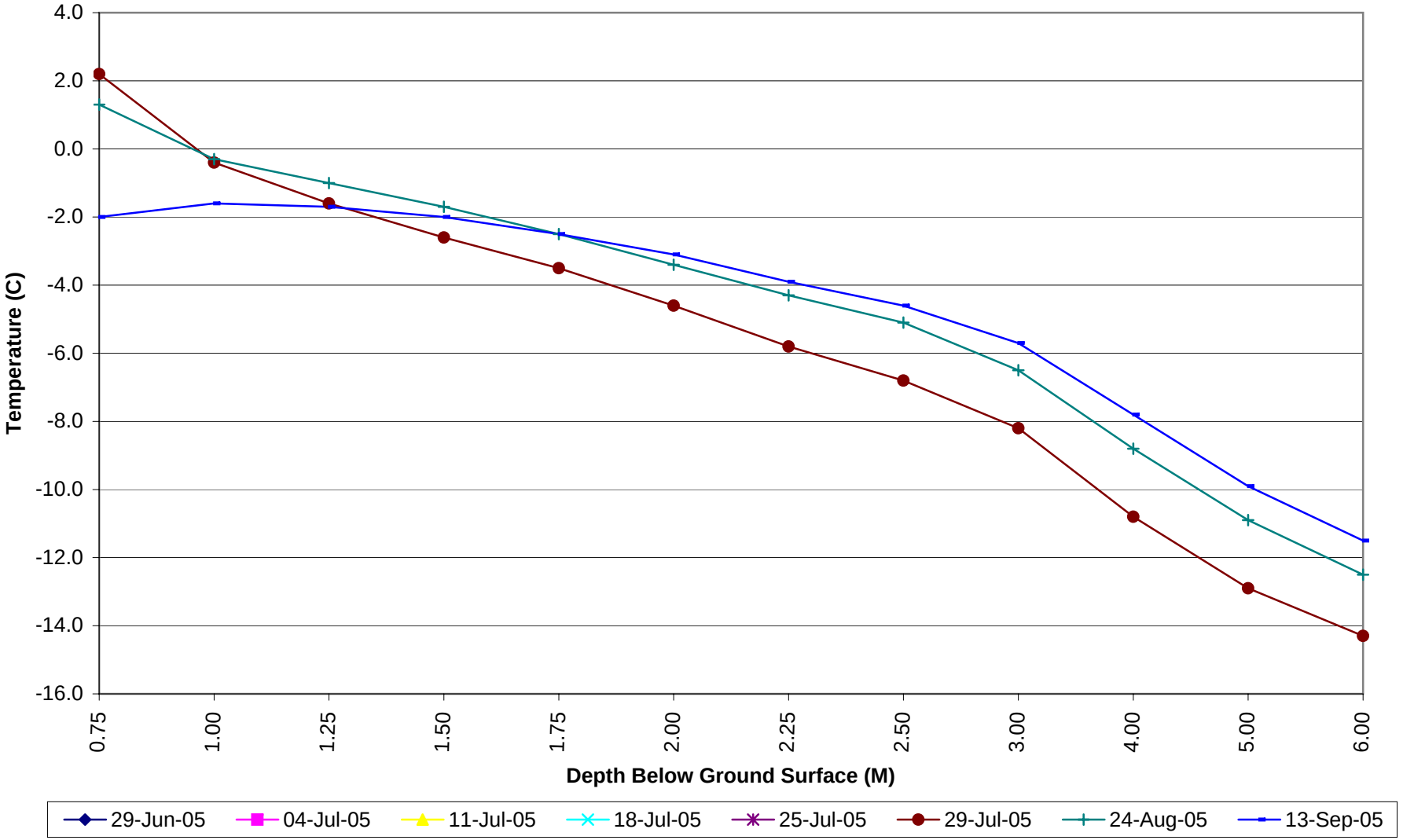
SURVEY INFORMATION OF GROUND SURFACE AS OF APRIL, 2003 SUPPLIED BY RSW OPTICOM INC. DATE OF SURVEY 21 APRIL, 2003.
Contours have been altered since April 2003 so drawing is for illustrative purposes only.

DRAWING INFORMATION:	
REVIEWED BY:	
DRAWN BY:	
DATE ISSUED:	December 2005
PROJECT NUMBER:	
FILE NAME:	
REVISION:	0

OPERATIONAL LANDFILL - THERMISTOR LOCATIONS

NOT TO SCALE | FIGURE 1

POLARIS MINE - OPERATIONAL LANDFILL TEMPERATURE PROFILES BY BY DATE
Thermistor #OL-2

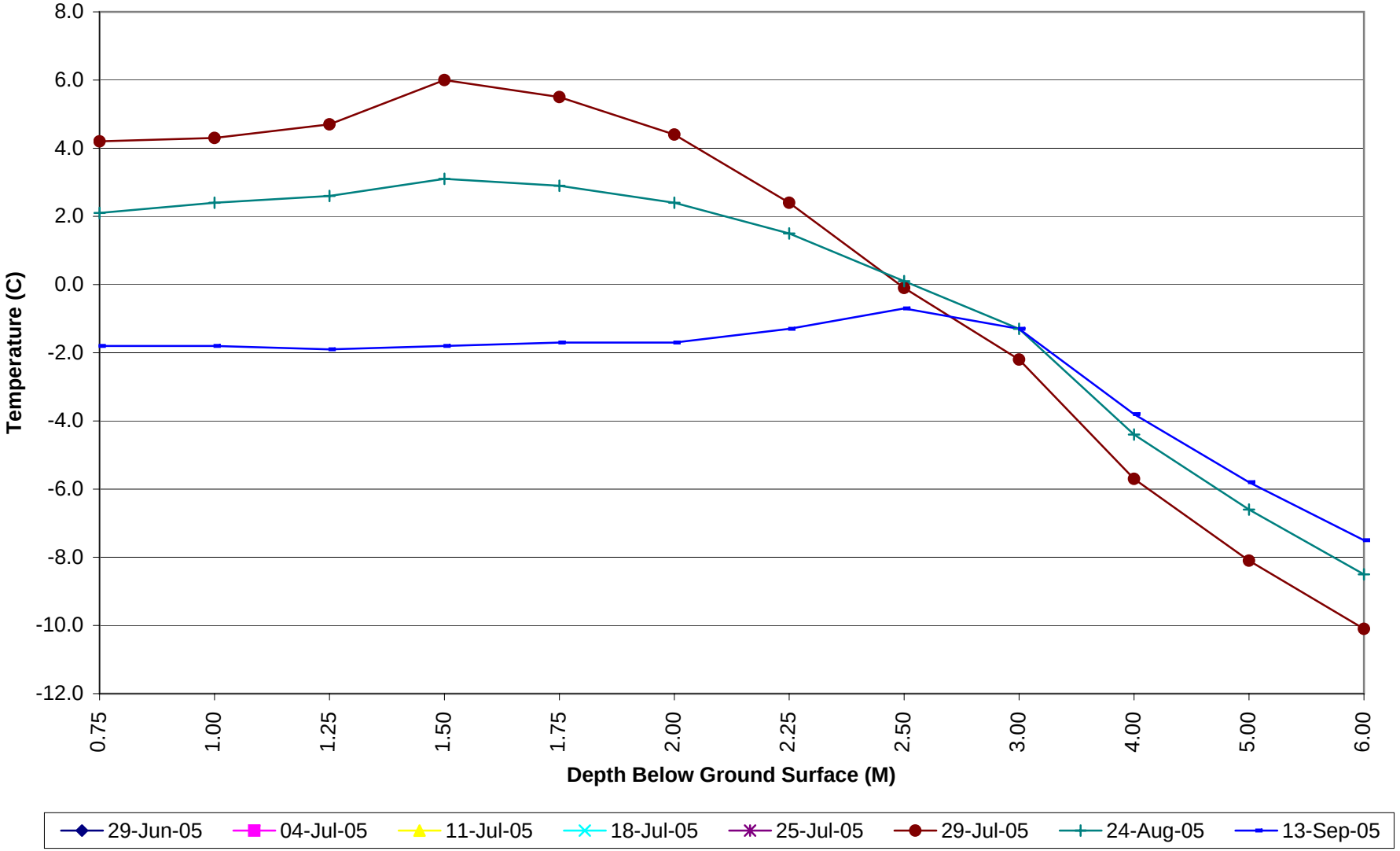


POLARIS MINE - OPERATIONAL LANDFILL - THERMISTOR STRING #OL-2

Thermistor Bulb Nbr	Distance BGS (M)	TEMPERATURE (^{0}C) BY DATE							
		27-Jun-05	04-Jul-05	11-Jul-05	18-Jul-05	25-Jul-05	29-Jul-05	24-Aug-05	13-Sep-05
1	0.75						2.2	1.3	-2.0
2	1.00						-0.4	-0.3	-1.6
3	1.25						-1.6	-1.0	-1.7
4	1.50						-2.6	-1.7	-2.0
5	1.75						-3.5	-2.5	-2.5
6	2.00						-4.6	-3.4	-3.1
7	2.25						-5.8	-4.3	-3.9
8	2.50						-6.8	-5.1	-4.6
9	3.00						-8.2	-6.5	-5.7
10	4.00						-10.8	-8.8	-7.8
11	5.00						-12.9	-10.9	-9.9
12	6.00						-14.3	-12.5	-11.5

denotes the minimum distance (M) BGS that the temperatures are less than 0^{0}C

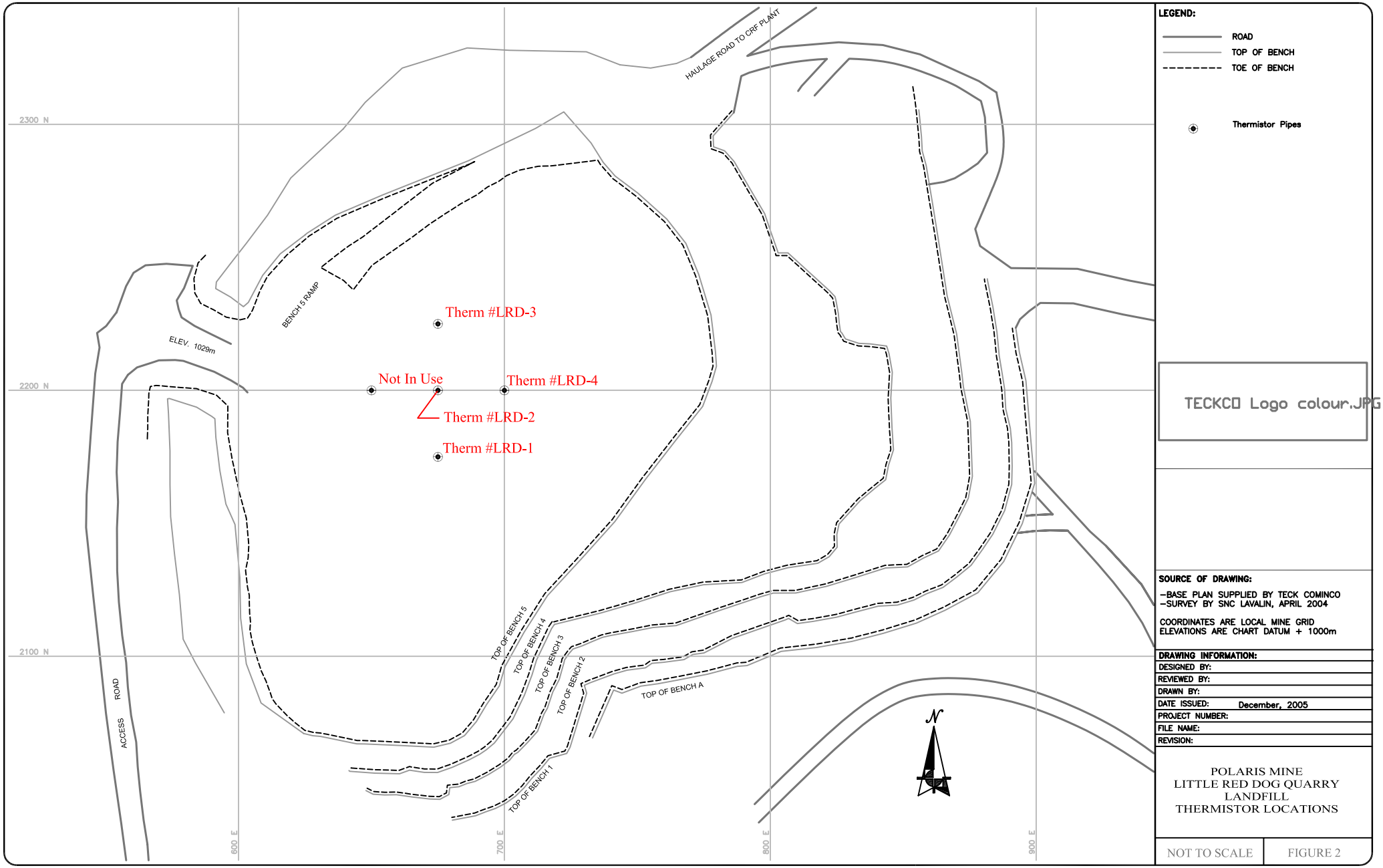
POLARIS MINE - OPERATIONAL LANDFILL TEMPERATURE PROFILES BY BY DATE
Thermistor #OL-4



POLARIS MINE - OPERATIONAL LANDFILL - THERMISTOR STRING # OL-4

Thermistor Bulb Nbr	Distance BGS (M)	TEMPERATURE (^{0}C) BY DATE							
		27-Jun-05	04-Jul-05	11-Jul-05	18-Jul-05	25-Jul-05	29-Jul-05	24-Aug-05	13-Sep-05
1	0.75						4.2	2.1	-1.8
2	1.00						4.3	2.4	-1.8
3	1.25						4.7	2.6	-1.9
4	1.50						6.0	3.1	-1.8
5	1.75						5.5	2.9	-1.7
6	2.00						4.4	2.4	-1.7
7	2.25						2.4	1.5	-1.3
8	2.50						-0.1	0.1	-0.7
9	3.00						-2.2	-1.3	-1.3
10	4.00						-5.7	-4.4	-3.8
11	5.00						-8.1	-6.6	-5.8
12	6.00						-10.1	-8.5	-7.5

denotes the minimum distance (M) BGS that the temperatures are less than 0^{0}C



LEGEND:

- ROAD
- TOP OF BENCH
- TOE OF BENCH
- Thermistor Pipes

TECKCO Logo colour.JPG

SOURCE OF DRAWING:

-BASE PLAN SUPPLIED BY TECK COMINCO
-SURVEY BY SNC LAVALIN, APRIL 2004

COORDINATES ARE LOCAL MINE GRID
ELEVATIONS ARE CHART DATUM + 1000m

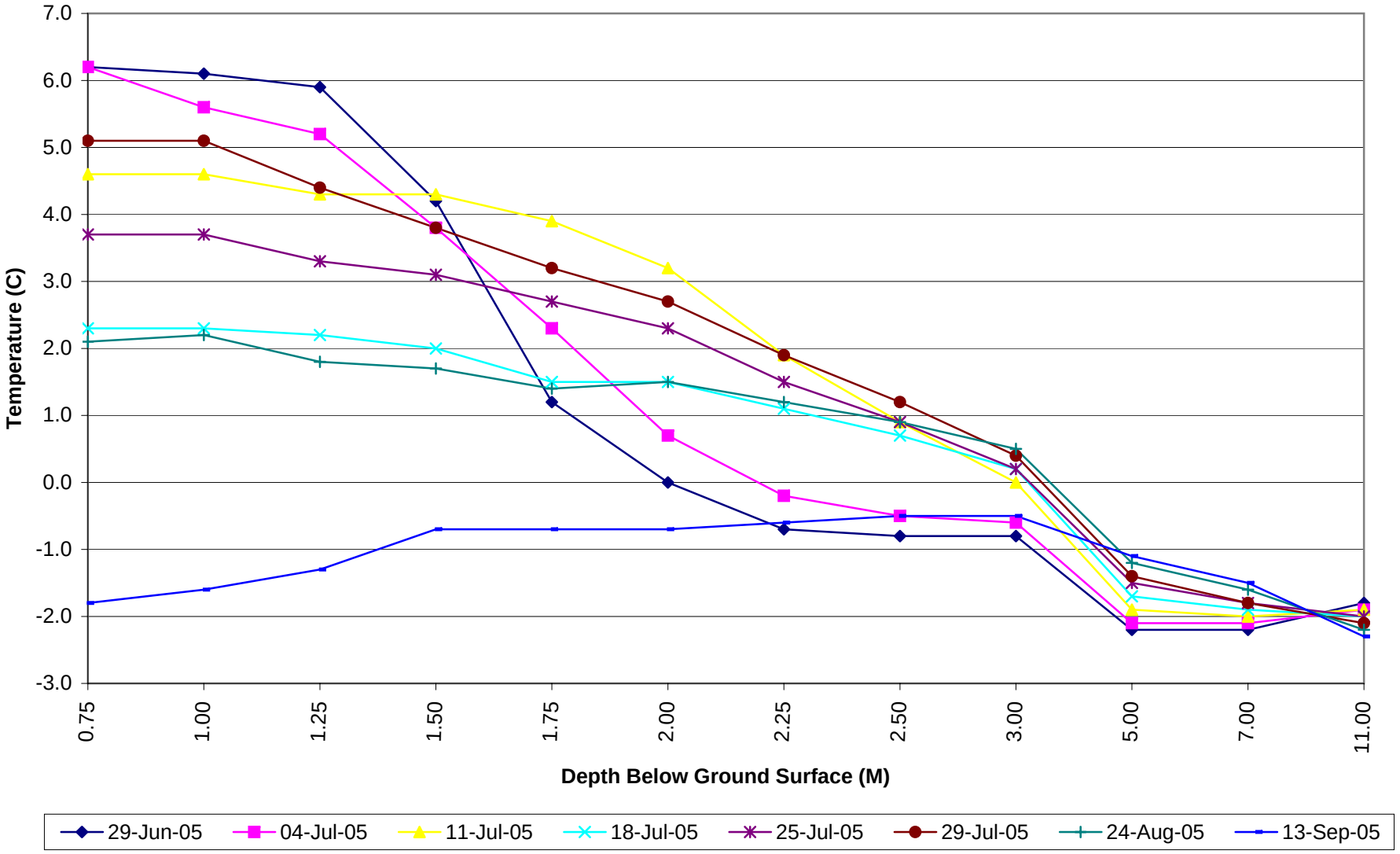
DRAWING INFORMATION:	
DESIGNED BY:	
REVIEWED BY:	
DRAWN BY:	
DATE ISSUED:	December, 2005
PROJECT NUMBER:	
FILE NAME:	
REVISION:	

POLARIS MINE
LITTLE RED DOG QUARRY
LANDFILL
THERMISTOR LOCATIONS

NOT TO SCALE

FIGURE 2

POLARIS MINE - LRD QUARRY LANDFILL TEMPERATURE PROFILES BY BY DATE
Thermistor #LRD-1

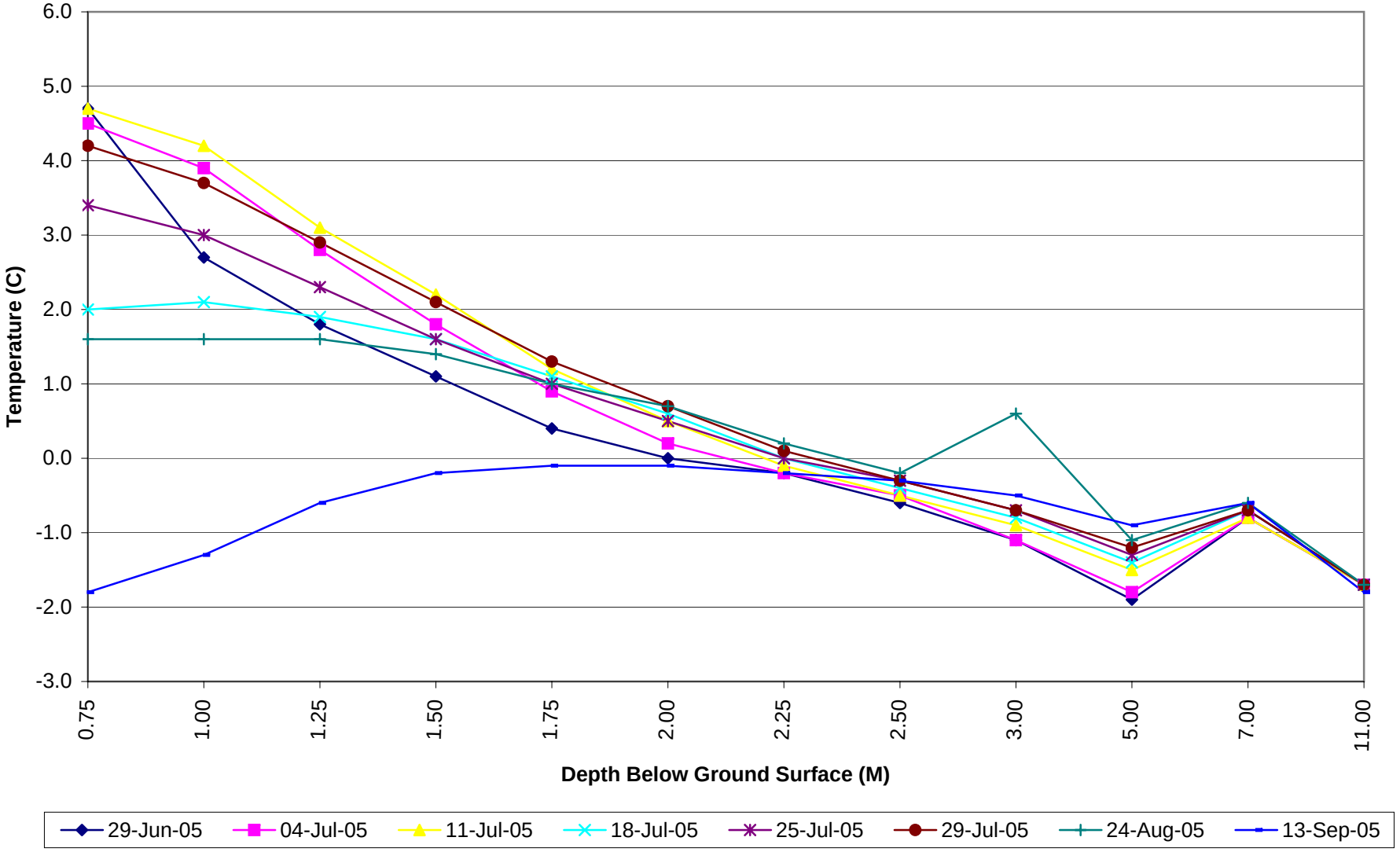


POLARIS MINE - LRD QUARRY LANDFILL - THERMISTOR STRING # LRD-1 (South East)

Thermistor Bulb Nbr	Distance BGS (M)	TEMPERATURE (^{0}C) BY DATE							
		27-Jun-05	04-Jul-05	11-Jul-05	18-Jul-05	25-Jul-05	29-Jul-05	24-Aug-05	13-Sep-05
1	0.75	6.2	6.2	4.6	2.3	3.7	5.1	2.1	-1.8
2	1.00	6.1	5.6	4.6	2.3	3.7	5.1	2.2	-1.6
3	1.25	5.9	5.2	4.3	2.2	3.3	4.4	1.8	-1.3
4	1.50	4.2	3.8	4.3	2.0	3.1	3.8	1.7	-0.7
5	1.75	1.2	2.3	3.9	1.5	2.7	3.2	1.4	-0.7
6	2.00	0.0	0.7	3.2	1.5	2.3	2.7	1.5	-0.7
7	2.25	-0.7	-0.2	1.9	1.1	1.5	1.9	1.2	-0.6
8	2.50	-0.8	-0.5	0.9	0.7	0.9	1.2	0.9	-0.5
9	3.00	-0.8	-0.6	0.0	0.2	0.2	0.4	0.5	-0.5
10	5.00	-2.2	-2.1	-1.9	-1.7	-1.5	-1.4	-1.2	-1.1
11	7.00	-2.2	-2.1	-2.0	-1.9	-1.8	-1.8	-1.6	-1.5
12	11.00	-1.8	-1.9	-1.9	-2.0	-2.0	-2.1	-2.2	-2.3

denotes the minimum distance (M) BGS that the temperatures are less than 0^{0}C

POLARIS MINE - LRD QUARRY LANDFILL TEMPERATURE PROFILES BY BY DATE
Thermistor #LRD-2

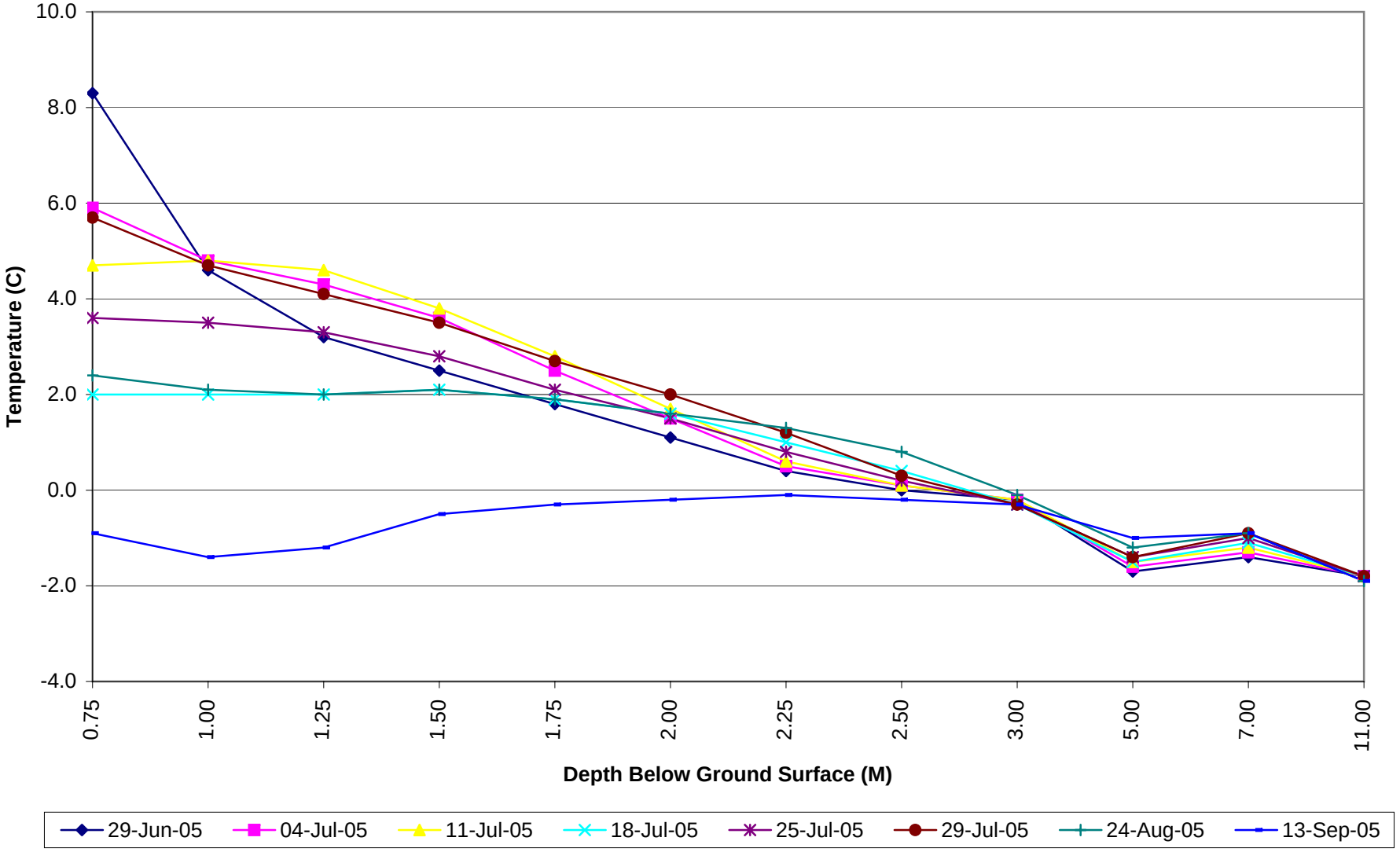


POLARIS MINE - LRD QUARRY LANDFILL - THERMISTOR STRING #LRD-2 (Centre)

Thermistor Bulb Nbr	Distance BGS (M)	TEMPERATURE (^{0}C) BY DATE							
		27-Jun-05	04-Jul-05	11-Jul-05	18-Jul-05	25-Jul-05	29-Jul-05	24-Aug-05	13-Sep-05
1	0.75	4.7	4.5	4.7	2.0	3.4	4.2	1.6	-1.8
2	1.00	2.7	3.9	4.2	2.1	3.0	3.7	1.6	-1.3
3	1.25	1.8	2.8	3.1	1.9	2.3	2.9	1.6	-0.6
4	1.50	1.1	1.8	2.2	1.6	1.6	2.1	1.4	-0.2
5	1.75	0.4	0.9	1.2	1.1	1.0	1.3	1.0	-0.1
6	2.00	0.0	0.2	0.5	0.6	0.5	0.7	0.7	-0.1
7	2.25	-0.2	-0.2	-0.1	0.0	0.0	0.1	0.2	-0.2
8	2.50	-0.6	-0.5	-0.5	-0.4	-0.3	-0.3	-0.2	-0.3
9	3.00	-1.1	-1.1	-0.9	-0.8	-0.7	-0.7	0.6	-0.5
10	5.00	-1.9	-1.8	-1.5	-1.4	-1.3	-1.2	-1.1	-0.9
11	7.00	-0.8	-0.8	-0.8	-0.7	-0.7	-0.7	-0.6	-0.6
12	11.00	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.8

denotes the minimum distance (M) BGS that the temperatures are less than 0^{0}C

POLARIS MINE - LRD QUARRY LANDFILL TEMPERATURE PROFILES BY BY DATE
Thermistor #LRD-3

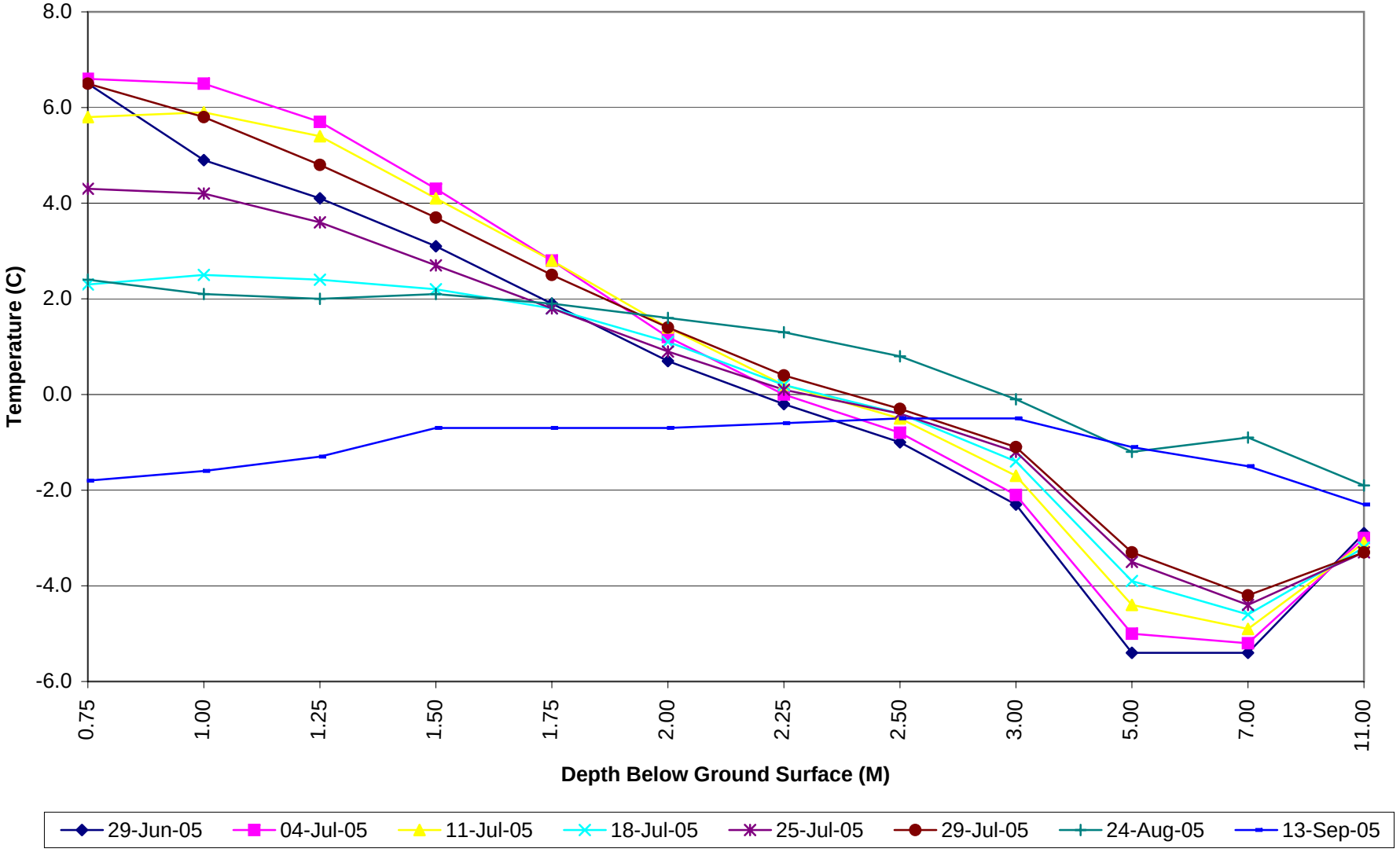


POLARIS MINE - LRD QUARRY LANDFILL - THERMISTOR STRING # LRD-3 (North West)

Thermistor Bulb Nbr	Distance BGS (M)	TEMPERATURE (^{0}C) BY DATE							
		27-Jun-05	04-Jul-05	11-Jul-05	18-Jul-05	25-Jul-05	29-Jul-05	24-Aug-05	13-Sep-05
1	0.75	8.3	5.9	4.7	2.0	3.6	5.7	2.4	-0.9
2	1.00	4.6	4.8	4.8	2.0	3.5	4.7	2.1	-1.4
3	1.25	3.2	4.3	4.6	2.0	3.3	4.1	2.0	-1.2
4	1.50	2.5	3.6	3.8	2.1	2.8	3.5	2.1	-0.5
5	1.75	1.8	2.5	2.8	1.9	2.1	2.7	1.9	-0.3
6	2.00	1.1	1.5	1.7	1.6	1.5	2.0	1.6	-0.2
7	2.25	0.4	0.5	0.6	1.0	0.8	1.2	1.3	-0.1
8	2.50	0.0	0.1	0.1	0.4	0.2	0.3	0.8	-0.2
9	3.00	-0.2	-0.2	-0.2	-0.3	-0.3	-0.3	-0.1	-0.3
10	5.00	-1.7	-1.6	-1.5	-1.5	-1.4	-1.4	-1.2	-1.0
11	7.00	-1.4	-1.3	-1.2	-1.1	-1.0	-0.9	-0.9	-0.9
12	11.00	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.9	-1.9

denotes the minimum distance (M) BGS that the temperatures are less than 0^{0}C

POLARIS MINE - LRD QUARRY LANDFILL TEMPERATURE PROFILES BY BY DATE
Thermistor #LRD-4



POLARIS MINE - LRD QUARRY LANDFILL - THERMISTOR STRING # LRD-4 (North East)

Thermistor Bulb Nbr	Distance BGS (M)	TEMPERATURE (^{0}C) BY DATE							
		27-Jun-05	04-Jul-05	11-Jul-05	18-Jul-05	25-Jul-05	29-Jul-05	24-Aug-05	13-Sep-05
1	0.75	6.5	6.6	5.8	2.3	4.3	6.5	2.4	-1.8
2	1.00	4.9	6.5	5.9	2.5	4.2	5.8	2.1	-1.6
3	1.25	4.1	5.7	5.4	2.4	3.6	4.8	2.0	-1.3
4	1.50	3.1	4.3	4.1	2.2	2.7	3.7	2.1	-0.7
5	1.75	1.9	2.8	2.8	1.8	1.8	2.5	1.9	-0.7
6	2.00	0.7	1.2	1.4	1.1	0.9	1.4	1.6	-0.7
7	2.25	-0.2	0.0	0.2	0.2	0.1	0.4	1.3	-0.6
8	2.50	-1.0	-0.8	-0.5	-0.4	-0.4	-0.3	0.8	-0.5
9	3.00	-2.3	-2.1	-1.7	-1.4	-1.2	-1.1	-0.1	-0.5
10	5.00	-5.4	-5.0	-4.4	-3.9	-3.5	-3.3	-1.2	-1.1
11	7.00	-5.4	-5.2	-4.9	-4.6	-4.4	-4.2	-0.9	-1.5
12	11.00	-2.9	-3.0	-3.1	-3.2	-3.3	-3.3	-1.9	-2.3

denotes the minimum distance (M) BGS that the temperatures are less than 0^{0}C

APPENDIX 8

Former Concentrate Storage Building Soil Sample Data

ALS Environmental

CERTIFICATE OF ANALYSIS

Date: August 24, 2005

ALS File No. W2700

Report On: Polaris Soil Analysis

Report To: **Teck Cominco Metals Ltd.**
Bag 2000
Kimberley, BC
V1A 3E1

Received: August 9, 2005

ALS ENVIRONMENTAL
per:

[redacted]

Heather A. Ross-Easton, B.Sc. - Project Chemist
Leanne Harris, B.Sc. - Project Chemist

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. W2700

RESULTS OF ANALYSIS - Sediment/Soil

Sample ID		ConShed North	ConShed Mid	ConShed South
Sample Date		05-08-06	05-08-06	05-08-06
Sample Time		11:00	11:00	11:00
ALS ID		*1*	*2*	*3*
Physical Tests				
pH		8.53	8.43	8.53
Total Metals				
Lead	T-Pb	556	1290	903
Zinc	T-Zn	1740	3770	2720

Results are expressed as milligrams per dry kilogram except where noted.

A Campbell Brothers Limited Company

File No. W2700

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.

Laboratory Location: ALS Environmental, Vancouver

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

Laboratory Location: ALS Environmental, Vancouver

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

This Certificate Of Analysis shall only be reproduced in full, except with the written approval of ALS Environmental.

End of Report

A Campbell Brothers Limited Company

APPENDIX 9

Electronic Copy of Report on CD