POLARIS MINE

DECOMMISSIONING AND RECLAMATION PROGRESS REPORT

3rd QUARTER 2003

FOR THE

NUNAVUT WATER BOARD &

INDIAN AND NORTHERN

AFFAIRS CANADA

teckcominco

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POLARIS MINE

DECOMMISSIONING AND RECLAMATION ACTIVITIES

QUARTERLY REPORTING – 3rd QUARTER 2003

SUBMITTED TO

THE NUNAVUT WATER BOARD

AND TO THE

DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS CANADA

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1. EXECUTIVE SUMMARY IN INUKTITUT

Refer to Appendix 1 for an executive summary of plans, reports and studies conducted under this licence during the period July 1, 2003 to September 30, 2003 that has been translated into Inuktitut.

2. INTRODUCTION

This is the third quarterly Decommissioning and Reclamation progress report submitted in relation to the Polaris Mine's Decommissioning and Reclamation Plan ('Closure Plan') and in compliance of the Water Licence NWB1POL0311 issued on April 24, 2003 with and effective date of March 1, 2003.

The Polaris Closure Plan dated March 2001 received its initial conditional approved April 15, 2002. The Closure Plan was jointly conditionally approved by the Nunavut Water Board ('NWB') and the Department of Indian and Northern Affairs Canada ('INAC'). The Closure Plan has subsequently received further approvals. The approvals contain reporting requirements and this document has been prepared to consolidate all of the reporting requirements into one document. This report is being submitted to both NWB and INAC on a quarterly basis with an annual report completed by March 31st of the subsequent year.

3. STATUS OF AUTHORIZATIONS AND/OR APPROVALS

As of September 30, 2003, the status of project approvals received during the quarter was as follows:

1. Closure Plan Approvals:
   a. The proposal for decommissioning the Frustration Lake Freshwater System was approved in a letter from the NWB and INAC dated July 4, 2003.
   b. The approval for the decommissioning of Garrow Lake dam by the NWB and INAC has been received.
   c. The approval for the decommissioning of the marine dock and adjacent shoreline by the NWB and INAC has been received.
2. Application for an Authorization under the Fisheries Act to decommission Garrow Lake dam and to decommission the marine dock was submitted to DFO in October 2001. Approval of the application by DFO was granted in July 2003.
3. Application to the NWB and INAC for additional underground storage locations for disposal of hydrocarbon contaminated soils was submitted on September 16, 2003. Approvals for this application were outstanding at the end of the reporting period.

4. UNAUTHORIZED DISCHARGES AND SUMMARY OF FOLLOW UP ACTIONS

There were no unauthorized discharges of water or effluent during the 3rd Quarter of 2003.

5. PROGRESS REPORT OF STUDIES / PLANS REQUESTED

The routine monitoring required as part of the Closure Plan approvals and the Water Licence are included in other sections of the report and so are not duplicated in this section of the report.

The Closure Plan approvals and/or the Water Licence require submission of the following plans and/or reports:

a) Certified landfill cover design specifications and plans:
   - These were submitted for review during the quarter.
b) Certified design drawings and specifications for Garrow Lake Dam Decommissioning:
   - These were submitted for review during the quarter.
c) Certified specifications and design drawings for sealing the mine entrances:
   - These were submitted for review during the quarter.
d) Certified specifications and design drawings for Decommissioning the marine dock and adjacent shoreline:
   - These were submitted for review during the quarter.
e) During August, the first phase of the Environmental Effects Monitoring (EEM) program was conducted as required under the new Metal Mining Effluent Regulations. Sampling of Garrow Lake effluent discharge was undertaken and field data characterizing Garrow Creek and Garrow Bay were collected. The data collected during the August field program will be used to refine the proposed 2004 field season program. The results of the field program will be discussed with the Technical Advisory Committee of Environment Canada prior to year end.
f) During August, the field work for study program required under the Fisheries Authorization (from the Department of Fisheries and Oceans) related to Garrow Lake was undertaken. Water quality data was collected, sediments sampled and sculpins collected for analysis. At the end of the quarter, the samples collected had all been forwarded to various laboratories for analysis with results pending.
g) Approval of the Melt Water Disposal Protocol required weekly inspections of the area of the mine being used for melt water disposal, logging of the filling of the storage area, and the requirement to take at least one sample of the melt waters being disposed. The mine underground workings were in active use during the melt water disposal period. Regular inspections of the area were conducted as required and a log of the rate of filling of the storage area was recorded (and filed at Polaris). Several water samples were taken and are presented in Appendix 2.
h) An Annual Geotechnical inspection of the Garrow Lake Dam and the Operational Landfill are required in the Water Licence. Both of these areas were inspected by EBA Engineering Consultants and their reports are included in Section 12.3.1 and Section 12.3.2 of this report.
i) Both the Landfill Operating Protocol approval and a site inspection report by INAC in July 2003 requested a review of the subsidence of the Reclamation Landfill area. Refer to Section 12.3.3 of this report for a review conducted Mr. T. Feduniak, P.Eng.
j) Part B (5) of the Water Licence requires a cost estimate to be provided for the re-construct Garrow Lake Dam in the event that the water quality of Garrow Lake deteriorates. This estimate is provided in Section 8.2 of this report.

6. DECOMMISSIONING AND RECLAMATION PROGRESS REPORT

Manpower levels increased substantially during the period as the return of daylight and warmer weather permitted more outside activities. Manpower on site at beginning of the period was 39 and increased steadily. By the end of the reporting period there were 126 people on site.

6.1. Building Demolition

6.1.1. Mill / Offices / Warehouse Facilities / Barge

- By end of July, the Barge superstructure demolition was 100% complete, the hull tank top was removed and hull fuel tank cleaning was in progress and nearing completion.
- By the end of August the barge fuel tanks had been fully cleaned by the specialized tank cleaning contractor (Smitts).
- The barge berthing area was dewatered to allow completion of cutting up the barge hull.
- As of September 18th the barge hull / mill / office structures had been completely demolished and transported to LRD quarry for burial. The only remaining structure is the access ramp which supports site service lines (water lines, power lines, sewer line) which are still active. This will remain in place until next year.
- Backfilling of the barge hull excavation had not started at the end of the quarter as excavation of contaminated soils around the barge area was in progress.

6.1.2. Product Storage Building

- The remainder of the siding was removed from the building and preparations for structure demolition continued during July.
- The building skeleton was collapsed on August 2nd.
- Structural steel, cladding, conveyor gallery and the majority of the building components were removed from the site and placed into LRD for burial. Only the stub columns and partial foundations remain in place at the end of September. The contractor (SNC) estimates that work is 98% complete in this area.

6.1.3. Thickener Building

- Foundation removal has been completed and re-grading of the foundation areas essentially complete.
- Re-grading of the spills containment area adjacent to the thickener is complete (after removal of metals contaminated soils which have been placed underground as per the approved protocols).
- Approximately ½ shift of re-grading work remains to complete work in this general area as of the end of the 3rd quarter.

6.1.4. CRF Plant

- Hydrocarbon contaminated soils removed.
- Demolition and site grading has been completed in this area.

6.1.5. Tank Farm

- The tank farm has three tanks. Cleaning of Tank #1 was completed on July 20th and was partially re-filled with new fuel from the supply ship. It was cleaned this year so that in 2004 when it is time to decommission the tank, there will be essentially no sludge to remove.

- The other two tanks remain to be cleaned.

6.1.6. Accommodations Building

- No demolition activities in this area have been initiated as the facility will remain in active use until the summer of 2004.

6.1.7. Other Buildings / Structures

- The majority of the tailings lines have been removed and placed into the mine for disposal. Some lines remain in the area between the Barge and the Tank Farm area.
- Reclaim water lines have been removed. Some were temporarily used to assist in siphoning at Garrow Lake dam and for piping underground. All of the reclaim water lines were disposed of either in LRD quarry or underground at the end of the quarter.

6.2. Earthworks

6.2.1. Marine Dock and Adjacent Shoreline

- Removal of the ship loader was completed.
- Glycol freeze pipes in dock cells have been drained and removed.
- Excavation of clean fill above high tide level was initiated early in the period in cells 1 & 2 after removal of overlying metals contaminated fill. Unexpected hydrocarbon (diesel fuel) contamination was discovered during the excavation of the dock cells. Progress on cell excavation was substantially slowed during the removal of the hydrocarbon contaminated soils. The hydrocarbon contaminated soils were disposed of in the mine as per the Closure Plan protocols.
- The hydrocarbon contamination in cell 2 extended into the corner of cell 3. At the end of the quarter work was nearing completion on removing the remainder of this contamination. As planned, work on dock cells 3 and 4 were delayed awaiting completion of the annual sealift at the end of August so the supply ship could use the remaining portion of the dock. At the end of September, excavation of dock cells 3 and 4 were almost complete to just above high tide elevation. The contractor (SNC) estimates that the removal of the dock area is 60% complete at the end of the quarter.
- Prevention of sediments contaminating the ocean was done through a number of procedural methods as required by project approvals. Fill within the dock cells were excavated while the sheet piles remained in place so that the sheetpiles provided a barrier to contain sediment laden waters. Excavation of the adjacent shoreline was done while a berm was maintained between the work areas and the ocean. Water pumped from excavations in the dock area were directed to settling ponds and/or through filter fabrics prior to being allowed to discharge to the ocean. If observations or measurements indicated that sediment levels were of concern, work was stopped until either the weather improved or sediment controls were improved.
- It was decided in August to defer the final cutting of the sheet pile structures until April 2004 so that this activity could be done while the pack ice is still present.

- The area north of the dock has been re-graded to design elevations. At the end of September, the berm between the ocean and the shoreline was removed once there was ice coverage. The area north of the dock has been partially excavated to design depth and a berm remains in place between the ocean and the excavated area.

6.2.2. Garrow Lake Dam

- Additional siphons were installed at Garrow Lake dam to assist in lowering the lake level.
- Siphoning at Garrow Lake dam was active throughout most of July, August and September. Siphoning of the dam concluded on September 18th with the lake elevation at 1005.9 which is slightly (30mm) above the original elevation.
- Water quality testing continued to demonstrate that key parameters such as zinc levels and turbidity levels were well below permitted levels through out the discharge season as expected.
- The wave break structure is quite visible now that Garrow Lake has been lowered. TCL to consider what actions can be taken to improve the visual appearance without impacting the aquatic environment. No decision as to action was finalized at the end of the quarter.
- The shell of the dam is being removed before it freezes too hard for the winter. This allowed the underlying Styrofoam mixed with fill to be removed and hauled to Little Red Dog Quarry for disposal as per approved protocols.

6.2.3. Operational Landfill

- Drilling and blasting of cover cap material in the New Quarry was undertaken during the period for the lower 1200 mm of the cap. Hauling and placing of the material on the landfill was ongoing through the period.
- In July, blasting at LRD was conducted to produce limestone rock for the top 600 mm layer of the landfill cover cap. The blasting did not produce material that met the design requirements for the cap requirements so the fill will be used elsewhere (too much oversize material). Revisions to the blasting designs are being made to produce material that meets design requirements.
- Placement and compaction of the first two lifts (600 mm each) of the landfill were completed during the quarter. Placement of the final 600 mm lift of the landfill consisting of quarried limestone had not started at the end of September.

6.2.4. Little Red Dog Quarry Landfill ('LRDQL')

- Refuse disposal in LRDQL continued throughout the period with substantial demolition debris from the Barge and Concentrate Storage Shed being hauled there for disposal. Refer to Section 12.1.1 for An update of the materials placed in LRDQL and associated photographs.
- Melt water in LRDQL pit area was evident throughout most of the summer months assisting with minimizing void spaces in the fill. In early July, a dye used to colour Anfo was identified in the melt water. This was cleaned up and samples of the water taken as discussed in Appendix 7 of this report. The sample results are included in Appendix 8.

- Clean fill material from the notch area and adjacent areas around LRDQL were hauled into the pit as infill material to mix with the building debris.
- Materials stockpiled in the quarry are being further processed by a shearer to reduce material sizes (to minimize void spaces). The bailing machine was also active during the period bundling and compacting siding.
- Materials are being placed into the landfill with minimal void space. As a result the elevation of the final fill elevation in the LRDQL will be lower than the entrance notch in the pit wall. Initial plans for the notch were conservative to ensure the notch did not extend deeper than the fill in LRDQL. In 2004 the elevation of the notch will be adjusted to match with the cap in LRDQL once final elevations are determined.
- At the end of September, much of the barge hull structure was laid out of the bench at the bottom of LRDQL. Additional cutting up of this material will be done prior to burial to minimize the amount of fill required to cover the steel.

6.2.5. Back 40 Area (Including CRF Area, New Quarry, North Pit, Subsidence Area, North Portal Area)

- Re-grading of this general area continued to restore the site to more natural appearing contours and to ensure original drainage of the site is restored. Substantial progress was made and work in this area will continue late into the fall.
- On August 4th re-grading of the North Pit area was completed.

6.2.6. Roadways

- Partial re-contouring of roadways was initiated in July and August to minimize final contouring requirements in 2004. As all roads remained in use during the quarter. Culverts have not yet been removed.

6.3. Contaminated Soil Remediation

6.3.1. Marine Dock and Adjacent Foreshore

- As part of the approved protocol for removing the freeze pipes located in the dock area, the type of coolant used in the system was to be determined. The coolant was sampled and sent to a commercial lab which confirmed that the fluid was a combination of diethylene and ethylene glycol (See lab results in Appendix 3). The lab was requested only to determine the type of glycol and not the concentrations for cost reasons so the report indicates the glycol types as either being ‘found’ or ‘not found’. All freeze pipes have been drained and removed consistent with the approved removal protocols. The glycol is being incinerated onsite in a 2 stage incinerator as approved in the Closure Plan. In total, approximately 500 Imperial gallons had been recovered.
- While there was no indication in Phase 1 ESA that there had been spills of glycol, the approved monitoring plan specifies that soils samples would be taken to confirm the absence of glycol contamination. The soils in the dock area were tested for glycol contamination as required by the Closure Plan and no evidence of glycol contamination of soils in was found (refer to Appendix 3).
- Metals contamination in the dock area was delineated and excavated during the period. The metals contaminated soils are being disposed of in the mine as per the approved protocols. Confirmatory samples taken and confirmations received

to determine the disposition of the dock materials. In 2004 confirmatory 'sign-off' reports will be submitted for this area once work on adjacent areas have been completed.

- Work was slowed by the unexpected discovery of hydrocarbon contaminated soils in dock cells 1 & 2. Work removing the hydrocarbon contaminated soils in dock cells 1 & 2 continued throughout July and August. At the end of August remediation had been confirmed to be complete in this area. Some minor contamination extends into cell #3 and at the end of the 3rd Quarter, excavation of this material was underway and nearing completion.

6.3.2. Barge Area

- Excavation of hydrocarbon and metals contaminated soils surrounding and under the Barge area was initiated in August as demolition of the Barge neared completion.
- At the end of September, excavation of contaminated soils below the Barge hull area and widening the footprint of the Barge excavation outline was continuing due to extensive hydrocarbon contamination of the soils. Work in this area will remain a priority as removal of contaminated soils must be completed prior to next spring's melt water run off to prevent contamination of surface water.

6.3.3. Exploration Waste Dump / Stockpile Area

- Prior to closure of the mine, the operations initiated the removal of the waste rock stockpile adjacent to the Exploration Portal. The waste pile contains metal sulphides and some hydrocarbon contamination from shop areas up slope.
- Continuing from June into July, delineation sampling using a drill was conducted to define contamination to be targeted for remediation.
- Excavation of this area approximately 90% completed at the end of the period. Work will be on-going in the 4th quarter.

6.3.4. Product Storage Building

- After removal of the remainder of the Product Storage (Concentrate) Building, final clean up of the metals contaminated soils within the building foot print was initiated. Metals contaminated soils have been removed and in most areas remedial targets have been achieved. Remedial work was not complete in this area at the end of the Quarter. A remedial 'Close-out' report will be prepared by GLL staff and submitted with the 4th Quarter reports.

6.3.5. Fuel Bladder Area

- Confirmatory samples verified that remediation has been completed in this area.
- Cosmetic re-grading of the area disturbed by remedial excavation has been completed. A remedial Close-out report by GLL for this area will be submitted with the 4th Quarter reporting.

6.3.6. Thickener Spills Pond

- Metals contaminated soils were removed from the spills pond during July transported underground for disposal.
- Confirmatory sampling results confirm remediation of contaminated soils have been successful in this area. A remedial Close-out report by GLL will be submitted with the 4th Quarter reporting.

6.3.7. CRF Plant Area

- Remediation of hydrocarbon contaminated soils adjacent to the CRF Plant was completed in July.
- A Close-out report for this area will be prepared and submitted with the 4th Quarter reporting.

6.3.8. North Portal Ore Stockpile

- Cleanup of contaminated soils in the lead stockpile area adjacent to the North Portal were underway in July.
- Work was nearing completion at the end of September.
- A remedial Close-out report will be prepared by GLL staff and included with the 4th Quarter reports.

6.3.9. Marine Foreshore – June 2002 Oil Spill

- Removal of residual hydrocarbon contaminated soils on the foreshore from the June 2002 oil spill was completed by July 12th. Laboratory results confirm remediation is complete in this area.
- Contaminated soils were placed underground in the mine as per the approved protocols.
- A remedial Close-out report will be prepared by GLL staff and included with the 4th Quarter reports.

6.3.10. Main Snow Dump

- Remedial work in this area has been completed and GLL staff will prepare a Close-out report for submission with the 4th Quarter reports.

6.4. Disposal of Hazardous Materials / Special Wastes

- It was planned to ship special waste materials off site for sale, recycling or to a certified disposal company in 2003. The general contractor did not order the waste manifests insufficient time and delays were experienced in obtaining the required manifests for shipping. As a result the manifests were not available in time to be able to meet the shipping schedule. The special wastes on site will therefore be shipped out during the 2004 shipping season.

- Waste oils (hydraulic, engine oil), waste fuel (old fuel, tank cleanings), and glycol are being disposed of in the on-site incinerator as approved in the DRP. The incinerator uses fuel to provide heat to ensure the incinerator operates at the correct temperatures. Volumes incinerated are as follows (Imperial Gallons):

2003	**Wastes**	**Fuel**
July	7,489	3,148
August	117	61
Sept.	10,356	3,510
Total Quarter	17,962	6,719
Total YTD	23,624	3,510

Note: June was the only other month in 2003 that significant incineration of materials occurred.

- There have been on-going mechanical problems with the incinerator which has slowed progress incinerating waste fuels, oils and glycol. Complete replacement of its refractory was completed in August. The manufacturer supplied the incorrect refractory for the materials being incinerated. Considerable effort to overcome these problems has been done by the general site contractor (SNC). It is expected the technical problems will be resolved in the near future.

7. UPDATE OF DECOMMISSIONING AND RECLAMATION SCHEDULE

Appendix 4 contains an updated decommissioning schedule current as of September 30, 2003. The source of the data for the schedule is primarily from our demolition contactor. There are some revisions to the near term portions of the schedule due to more detailed planning. The project is still forecast to be completed by the end of September of 2004.

8. PROJECT COST ESTIMATE UPDATE

8.1. Update of Estimated Mine Decommissioning, Reclamation and Monitoring Costs

Appendix 5 contains the detailed estimate of Mine Closure Costs updated as of September 30, 2003 in accordance with Part B, Item 3 or Part G, Item 21 and forecasts of cost to the end of 2011.

In summary, total Mine Closure Costs to September 30, 2003 were $37,094,000. Estimated costs to complete decommissioning, reclamation and monitoring through to 2011 have increased to $56,925,000.

8.2. Cost Estimate To Re-Construct Garrow Lake Dam

Part B (5) of the Water Licence requires the preparation and submission of a cost estimate to re-construct Garrow Lake Dam in the event that water quality being discharged from Garrow Lake deteriorates and other mitigative actions fail in restoring acceptable water quality. Cascade Management Inc. developed the cost estimate based on their current project management experience at Polaris as project managers for the decommissioning and reclamation of the site. This experience provides them with site specific knowledge and access to current actual costs. The estimate provided in Appendix 6 is based on the assumption that reconstruction is required after reclamation at the site has been completed and equipment and manpower are no longer located as the island. In this situation, the necessary equipment, manpower and infrastructure would need to be re-mobilized to the site increasing the costs. The estimated cost to rebuild the Garrow Lake dam is $1,250,000. It is important stress that these costs only become significant after the fall of 2004 once equipment and manpower is demobilized from the site.

9. PUBLIC CONSULTATION / PARTICIPATION

Patrick Duxbury, Mine Reclamation Coordinator, NWB was on site in September participating in a site inspection. After the site visit, Patrick stopped in Resolute for a few days to update residents of the status of the project.

TCL has set aside building furniture and other items and is prepared consider additional donations but requires firm commitments from the community regarding transportation of the items off site. TCL will not leave materials on the site after we demobilize so arrangements must be finalized by the end of March 2004 or we will be forced to schedule these items for demolition. This has previously been discussed with the local communities and J Knapp the site manager will be writing the communities again stressing the need for them to make plans regarding transportation of materials from site.

Inuit employment was identified in the DRP as one of the opportunities that would be pursued during the decommissioning phase of the mine and formed one of the requirements during tendering of the project work. While the site does not maintain a formal system for tracking Inuit employment, during July when activities were near their peak, a snap shot of our transportation schedule indicates that for the week of July 21 to 26th there were 26 Inuit employees on roll. Numbers of Inuit and non-Inuit employees varied on a weekly basis throughout the 3rd Quarter as activities changed.

10. SUMMARY OF WORK DONE IN RESPONSE TO INSPECTION/COMPLIANCE REPORTS

On July 2nd and 3rd the INAC conducted a site inspection of the reclamation project and issued a report dated July 22, 2003. A copy of the report and Teck Cominco's response is attached in Appendix 7.

During the INAC inspection in July, free standing water in Little Red Dog Quarry was observed. A dye used to colour the Anfo manufactured onsite was observed in some of the water. Concerns of the contamination lowering the freezing point of the water were expressed with a request for the water to be sampled. The dye was removed from the water and the water was sampled. While not requested, it was decided by site staff to demonstrate that the freezing point of the water in LRDQ had not been impacted. A test was conducted by Gartner Lee Ltd. staff and demonstrated that there was no measurable suppression of the freezing point. The results of this test are included in Appendix 8.

Also during the INAC July inspection, TCL was requested to submit material sizing and moisture tests of the bottom layer of cover cap material being placed at the time of the inspection. Results are included in EBA Engineering Consultants landfill inspection report included in Appendix 15 of this report.

INAC conducted a second site inspection from September 8 to 10th. As of the end of the 3rd Quarter, the site inspection report has not yet been received.

11. FRESHWATER USE

Freshwater use from Frustration Lake for all uses during the 2nd Quarter of 2003 was:

July 2003	3,514 cu. M.
Aug 2003	4,814 cu. M.
Sept 2003	18,926 cu. M.
Total 3rd Quarter	27,254 cu. M.
Total 2nd Quarter	29,088 cu. M.
Total 1st Quarter	56,927 cu. M.
Total Sept. 30 YTD	113,269 cu. M.

12. PHYSICAL MONITORING OF SITE

12.1. Disposal of Demolition Debris and Contaminated Soils

12.1.1. Disposal of Demolition Debris Into Little Red Dog Quarry Landfill

The approval letter for Landfill protocols requires us to report with record of materials (preferably in digital form). Refer to Appendix 9 for a listing of both quantities and general descriptions of the types of demolition debris transported to LRDQL during the quarter, drawings of disposal locations, and a photographic log of the work during the period. Any equipment originally containing hazardous materials such as hydraulic oils, fuel, greases and/or batteries are required to undergo an inspection to verify they have been properly prepared for disposal. As decommissioning of the mechanical portions of the barge facility was completed in prior periods, and there were not mobile equipment discarded in the period, there are no hazardous material inspections to report this period.

12.1.2. Disposal of Demolition Debris Into the Reclamation Landfill

The Reclamation Landfill was actively used by the mine during the final years of operations as part of the progressive reclamation activities. The Reclamation Landfill is also known as the Subsidence Area Landfill or the Sinkhole Landfill. No disposal of materials has occurred in this area after the mine ceased operations. Non-hazardous wastes (primarily wood, scrap steel, tires, mobile equipment, ocean going shipping containers, etc.) were placed into this area. A general record of the types of materials disposed of there were maintained and a photographic record was kept. Any equipment containing hazardous materials (fuels, hydraulic fluids, lead-acid batteries) had these materials removed and a document kept verifying that the equipment had been prepared for disposal. Fill from surrounding areas was placed overtop of this area in lifts as the area subsided to ensure the material was well buried.

Previously, it had been believed that all of the disposal records for this landfill had been lost during the initial stages of site decommissioning. Most of these records have been recovered and are included as Appendix 10.

12.1.3. Placement of Metals / Hydrocarbon Contaminated Soils Underground in the Mine

Refer to Appendix 11 for maps and quantities of metals and hydrocarbon contaminated soils placed underground.

12.2. Thermistors Data

12.2.1. Garrow Lake Dam

Garrow Lake dam has three sets of thermistors that are recorded on a monthly basis. This will continue until Garrow Lake has been lowered to its original elevation. This data is reported in Appendix 12.

12.2.2. Operational Landfill

The Operational Landfill currently has four thermistors in operation that are monitored on a monthly basis. The Closure Plan indicates that a minimum of three will be maintained to confirm that freezing of the landfill has occurred.
Refer to Appendix 13 for Data

12.2.3. Little Red Dog Quarry Landfill

Heavy metal pipes have been installed in the pit bottom and will remain in place during the filling of Little Red Dog Quarry Landfill. Once placing of the debris is complete and the pipes are extended to their final elevation, thermistor strings will be installed in the pipes. Thermistor readings will then be recorded on a monthly basis while personnel are on site and after the fall of 2004, they will be monitored during regular site inspections.

12.3. Geotechnical Inspections

Part H, Section 6 of the Water Licence requires that an annual geotechnical inspection be conducted of the landfill and remaining sections of Garrow Dam. Approvals for the Operating Protocols for the Landfills and site inspection reports from this summer required a review of the Reclamation Landfill area subsidence be conducted. These have been completed as required and are discussed below.

12.3.1. Geotechnical Inspection of Garrow Lake Dam

On August 19 and 20, 2002 a geotechnical inspection of the Garrow Lake Dam was conducted by EBA Engineering Consultants Ltd. ('EBA'). EBA inspected for seepage, instability and settlement. They observed the adjacent shoreline, and reviewed 2002 and 2003 ground temperature data and reservoir water level data. In Summary EBA reported that 'It is EBA's opinion that the dam is continuing to perform well.' The complete inspection report dated November 5, 2003 is included in Appendix 14.

12.3.2. Geotechnical Inspection of the Operational Landfill Cover

On August 22, 2003 EBA conducted a geotechnical inspection of the construction of the Operational Landfill cover. EBA reviewed the design drawings, the construction methods and materials being used. Recommendations in their inspection report dated November 10, 2003 included:

1. To visually monitor the landfill cover in the spring run off and heavy rainfall events.
    - This can be done in 2004 while the island is inhabited.
    - Subsequent to 2004 the cover will be inspected during the annual geotechnical inspection in the summer. The slope and cover material of the cover were specifically designed to address snow melt and precipitation events.
2. For at least the first year, keep a stockpile of limestone fill to facilitate any remediation.
    - The construction of the cap will be complete before spring/summer melt and precipitation so that equipment and materials will be available for the first wet season.
3. Areas rutted under the weight of rubber tired vehicles should be graded before the final 0.6 m thick cap is placed.
    - The ruts have been removed.

The geotechnical report is included in its entirety in Appendix 15 of this report.

12.3.3. Geotechnical Review of the Reclamation Landfill Subsidence Area

Mr. Trevor Feduniak, P. Eng. is currently on staff with Teck Cominco at the Polaris site as one of our representatives during the reclamation activities. Mr. Feduniak was previously the Senior Mine Engineer in the Mine Engineering department. He is familiar with the underground operations, the mine design considerations, and the mine subsidence monitoring program. As knowledge of subsidence is very site specific, we selected Mr. Feduniak to review the history of subsidence at Polaris, to document subsidence data collected and to consider the course of action that we need to consider for this area.

In summary, his conclusions are that apart from the 'sinkhole' area of the Reclamation Landfill area of the site, subsidence is not of concern. As the last precise subsidence survey was completed during the summer of 2002 while active mining was still on-going, he recommends that a precise survey of the remaining monitoring stations should be conducted in the summer of 2004. This survey will give an up to-date picture of the progression of the subsidence in the sinkhole area. At that time a more reliable forecast of future subsidence in the sinkhole area will be made and the preferred remedial option will be proposed. Mr. Feduniak's report is included in Appendix 16.

12.4. Bathymetric Survey of Garrow Lake

Section H of the Water Licence and in conformance with the DRP, a detailed bathymetric survey was required after deposition of tailings into Garrow Lake had been completed. This survey was undertaken in August 2003 and is the most accurate, detailed survey taken to date. The survey was contracted to Focus Engineering Consultants. The results of the survey are included in Appendix 17 of this report.

12.5. Erosion Monitoring

12.5.1. Garrow Lake Erosion Pins

In compliance with Section H of the Water Licence and the DRP monitoring plan, monitoring of Garrow Lake shoreline is required to identify any instability of the foreshore which could result in sedimentation occurring in Garrow Lake. This is being monitored in a number of ways. As required, four rebar pins were installed just above the water line in Garrow Lake in the spring of 2003. The distance from the top of the pin to the ground surface was measured on a monthly basis in July, August and September to determine if there is any measurable erosion occurring. As Garrow Lake was being drawn down through the summer, the pin locations started beside the waters edge in July and by the end of August, the pins were several metres from the waters edge. At the same time as the heights of the pins were measured, photographs were taken of the pin area to visually record whether or not erosion is occurring in each of the locations. As is clear from the September photographs, snow on the ground hampers the value of photographs at this time of the year.

As another check of the water quality in Garrow Lake, as part of the weekly effluent sampling during the discharge season, TSS is measured at the Discharge Point of the siphons at Garrow Dam. There was no indication of any concerns of sediment in the water column from these results.

In summary, there was no evidence of any erosion occurring around the lake through the required monitoring methods or by general observations by the staff conducting the sampling. The locations of the monitoring pins, the pin measurements and the photographs are included in Appendix 18.

12.5.2. Marine Dock and Adjacent Foreshore Erosion Monitoring

As required in the approved DRP, Part H of the Water Licence and in our Section 35(2) Fisheries Authorization, monitoring of the dock and shoreline areas were conducted during the period when work was occurring in those areas. Daily TSS measurements and weekly photographs were taken along the shoreline at 200 metre intervals except for Station 1825 which was adjusted to be adjacent to the dock cells. The stations are numbered to match the section line numbering in the Westmar design drawings of the shore area. Stations monitored include Station 600, 800, 1000, 1200, 1400, 1425, 1600, and 1800.

Appendix 19 contains both the daily turbidity / TSS sampling results and a series of photographs taken on a weekly basis while work is active in the intertidal zone.

Gartner Lee Ltd. staff was tasked with the regular sampling and photographing of the dock and shoreline area. The TSS samples were analyzed in the onsite temporary laboratory to minimize time delays in obtaining the analysis. Initially, an error in laboratory methodology resulted in an over statement of TSS results. Once the cause of the methodology problem was resolved the staff was able to provide turnaround times of less than a day. Samples were not taken every day during the summer as there were periods where no remedial work in the area was conducted. On a daily basis, one of the samples taken was deemed to represent the background level of turbidity. The sample location selected was either the north or south sample point measured that was outside of the active area of work. If the wind and/or current were moving in a southerly direction, then the most northerly sample point was used. If the wind and/or current were moving in a northerly direction, then the most southerly sample point was used. If TSS levels or visual observations indicated excessive turbidity, work was stopped until the cause of the turbidity had been resolved. There were days where natural turbidity was high due to storm events. Late in the season as the ocean froze over, monitoring was suspended.

13. GARROW LAKE STRATIGRAPHIC MONITORING

The Water Licence requires that a monitoring event of Garrow Lake Stratigraphy be conducted during the mid-winter, maximum ice thickness and at maximum ice melt during the summer. In previous reports, the mid winter and maximum ice thickness sampling have been submitted. The maximum ice melt sampling is normally conducted during mid August when there is usually (but not always) a brief period where Garrow Lake is ice free. One of the key elements of the sampling program is the analysis of hydrogen sulphide found in the lower areas of the lake. The measurement of hydrogen sulphide has historically been done on site due to the time sensitive nature of analyzing the H_2S due to off gassing. This is the first year that the mine is no longer operating and we have had to rely on contracting this work to a consultant who employs one of our previous employees who is an assayer, is familiar with this complex analysis, and is capable of doing it at the site. This was the manner in which we obtained the data in January and March 2003 sampling events. When the consulting company was contacted this summer to arrange for sampling this summer, we were informed that the individual had just resigned and was no longer doing consulting work. We then looked for an alternate method of analyzing for H_2S and determined that there is an electronic instrument capable of doing the analysis onsite. We purchased this unit and had it shipped to site. After many shipping delays by the airlines due to weather conditions in the north, it arrived on site. Upon unpacking it; we discovered that it had been damaged during shipping. We arranged for another unit to be shipped to us but by the time it arrived, Garrow Lake had a thin layer of ice. This ice will need to thicken adequately for it to be safe to conduct the sampling. It is anticipated that the results will be reported in the 4th Quarter report.

14. SUMMARY OF EFFLUENT MONITORING AND EFFLUENT CHARACTERIZATION

Appendix 20 contains the effluent monitoring results as required in Part H in the form set out in Schedule 6 of the Metal Mining Effluent Regulations and as required in Part H of the Water Licence. This will be the only quarter in 2003 where effluent was being discharged from Garrow Lake.

15. SUMMARY OF EEM STUDY PROGRAM PROGRESS

In compliance with the Metal Mining Effluent Regulations, site characterization field studies were undertaken in August of Garrow Creek, Garrow Bay and a reference location. The field program had been presented and approved by Environment Canada's Technical Advisory Committee ('TAC'). Field conditions were extreme as expected and only through the diligence and hard efforts of the seasoned consultants was the program successfully undertaken. Preliminary results will be presented to the TAC prior to year end to obtain guidance regarding the 2004 field program.

16. SUMMARY OF GARROW LAKE DFO STUDY PROGRAM PROGRESS

During the August field program for the EEM study program, the study program required under the DFO Fisheries Authorization was successfully undertaken. Samples were obtained of water, sediments and sculpins from Garrow Lake. Results will be presented in a report to be issued in 2004.

APPENDIX 1

EXECUTIVE SUMMARY

IN INUKTITUT

<u>ᒪᕈᓕᖅᑭᒥ ᐅᔭᖅᓯᐅᕐᕕᕐᑯᑖ</u>

<u>ᐃᒍᑎᓇᓂᖅ ᖃᓄᐃᑐᓂᕕᓂᖏᓄᓗ ᐅᑎᑎᑎᓇᓂᒧ ᐱᓕᓇᐊᑦ</u>

<u>ᐊᕕᒃᑐᓯᒪᓗᑎᒃ ᐅᓂᒃᑳᑦ - ᐱᖓᔪᕆᓕᑕᖓ 2003ᒥ</u>

ᐅᓂᑲᓕᐊᖑᔪᑦ ᑐᓂᔭᐅᔪᖅ

ᓄᓇᕗᕐᒥ ᐃᒪᓕᓇᓱᖏᑕ ᑲᑎᒪᓱᖏᓄᑦ

ᐊᒪᓗ ᐅᑯᓄᖓ

ᐃᓄᓕᓇᓱᑐᖅᑲᑲᓄᑦ ᑲᓇᑕᒥ

1. ᑭᓱᒨᒪᖕᖔᑦ

ᐅᓇ ᓇᐃᒃᓕᒋᐊᕐᓯᒪᔪᖅ ᒪᕈᓕᕿᒥ ᐅᔭᕋᒃᓯᐅᕐᕕᒥ ᐅᓂᒃᑲᓕᐊᖑᔪᖅ ᐅᑎᑎᑕᐅᓂᕆᓇᓱᓂᖕᖓᑕ ᐱᓕᕆᐊᖑᓂᖕᖓᓂᒃ ᑕᕿᖕᖓᓄᑦ ᔪᓚᐃᒥᑦ ᓯᑎᐱᕆᓗᑦ 2003ᒥ.

2. ᐃᓗᓕᖕᖓᓂᑐᑦ ᑭᓱᒪᖕᖔᑕ

ᐃᓗᓕᕆᔭᖕᒋᑦ ᑎᑎᕋᓯᒪᔪ ᐅᓂᒃᑲᓕᐊᖑᔪᑦ ᐃᒪᐃᑐᔪᑦ:

1. ᓯᕗᓕᕐᑎᓄᖕᖓᔪᑦ ᓇᐃᓕᒋᐊᓯᒪᔪᑦ ᐃᓄᑎᑐᖕᖓᓗᑎᒃ
2. ᑭᓱᒨᒪᖕᖔᑦ
3. ᖃᓄᐃᓕᖕᖓᓕᒪᖕᖔᑕ ᒪᓕᑕᐅᖁᔭᔪᑦ ᐊᒪᓗ/ᐅᕙᓗᓃᑦ ᐊᖕᒋᑕᐅᓯᒪᔪᑦ
4. ᐊᖕᒋᑕᐅᓯᒪᖕᒋᑐᑦ ᑲᔪᓯᑎᑕᐅᓯᒪᔪᑦ ᐊᒪᓗ ᓇᐃᓕᒋᐊᕐᓯᒪᔪᑦ ᖃᓄᐃᓕᐅᕐᓯᒪᓕᒪᖕᖔᑕ
5. ᐱᓕᕆᐊᕆᓯᒪᓕᑕᖕᒋᑕ ᐅᓂᑲᖕᒋᑦ ᖃᐅᔨᓴᓂᐅᔪᑦ/ᐊᕿᑕᐅᓯᒪᔪᑦ ᕿᓄᐊᕆᔭᐅᓯᒪᔪᑦ
6. ᐃᒍᑎᕆᓂᖅ ᖃᓄᐃᑐᓂᕕᓂᖕᖓᓄᓗ ᐅᑎᓯᓂᖅᒧᑦ ᐅᓂᑳᑦ

6.1. ᐃᓪᓗᓂ ᐃᒍᑎᕆᓂᖅ

6.1.1. ᓯᖃᓕᓯᒪᔪᑯᕕᒃ/ᑎᑎᕋᕖᑦ/ᓯᕐᓗᐊᑦ/ᐳᒃᑕᓛᕐᑐᖅ ᐃᒃᓗ
6.1.2. ᑭᓱᕈᓗᔭᖃᕐᕕᒃ ᓯᕐᓗᐊᕕᒃ
6.1.3. ᑭᓂᕐᑐᓕᐅᕐᕕᒃ ᐃᓪᓗ
6.1.4. ᐃᓚᒃᓴᖃᕐᕕᒃ ᐃᓪᓗ
6.1.5. ᐅᕐᓱᐊᓗᖃᕐᕕᒃ
6.1.6. ᐊᖕᒋᕋᖃᕕᐅᔪᑦ ᐃᓪᓗᐃᑦ
6.1.7. ᐊᓯᖕᒋᑦ ᐃᓪᓗᐃᑦ/ᑭᓱᖃᕖᑦ

6.2. ᓄᓇᓕᕆᓂᐅᔪᑦ

6.2.1. ᑐᓚᒃᑕᕐᕕᒃ ᓯᒃᔭᖕᖓᓗ
6.2.2. ᑰᖕᒧᑦ ᓯᒥᒃ
6.2.3. ᒪᓇ ᐊᕐᑐᕐᑕᐅᔪᖅ ᐊᒃᑕᕐᕕᒃ
6.2.4. ᐃᓗᓴᓕᐊᖑᓯᒪᔪᖅ ᐊᐅᐸᕐᑐᖅ ᕿᒥᑯᓗᒧᕐᑐᓴᖅ
6.2.5. ᓴᓗᒪᕐᓴᑕᐅᓂᐅᔫᑉ ᐃᓚᖕᖓ
6.2.6. ᐊᖁᑏᑦ

6.3. ᓱᕈᓯᒪᔫᑉ ᓄᓇᖕᖓᑕ ᓴᓗᒪᕐᓴᑕᐅᓂᖕᖓ

6.3.1. ᑐᓚᒃᑕᕐᕕᒃ ᓯᒃᔭᖕᖓᓗ
6.3.2. ᐳᒃᑕᓛᕐᑐᑦ ᐃᓪᓘᑉ ᒥᒃᓵ
6.3.3. ᓴᕕᓴᓯᐅᑎᓗᒋᑦ ᐊᒃᑕᕕᕕᓂᖕᒋᑦ/ᓄᐊᕕᐅᔪᖅ ᓄᓇᖕᖓ
6.3.4. ᐱᖁᑎᒋᔭᐅᔪᓄᑦ ᓯᕐᓗᐊᖃᕕᒃ
6.3.5. ᖃᑕᐅᔭᐅᖕᒋᑐᕐᒥᑐᑦ ᐅᕐᓱᐊᓗᖃᕐᕕᒃ
6.3.6. ᑭᓂᕐᑐᓕᐅᕐᕕᒃ ᑯᕕᔪᖃᓂᕐᐸᑦ ᑕᓯᑯᓗᒃ
6.3.7. ᐃᓚᓴᖃᕕᒃ
6.3.8. ᐅᐊᓇᐸᓯᖕᖓᑕ ᐊᓂᕕᖕᖓ ᓴᕕᕋᔭᓴᖃᕕᒃ
6.3.9. ᑕᕆᐅᑉ ᓯᔭᖕᖓᑕ ᓯᕗᓂᖕᖓ -ᔪᓂ 2002ᒥ ᐅᕐᓱᐊᓗᒥ ᑯᕕᓂᑯ
6.3.10. ᐊᐳᑕᐃᔭᐃᕕᓗᐊᑕᖅ
6.3.11. ᐃᒋᑕᐅᓂᖕᒋᑦ ᓱᑯᓇᑐᕐᑕᓛᑦ/ᐱᑐᐃᓇᐅᖕᒋᑐᑦ ᐃᒋᑕᒃᓴᐅᔪᑦ

7. ᖃᓄᐃᓕᖓᓕᒪᖔᑕ ᐃᒍᑎᕆᔪᑦ ᖃᓄᐃᑐᓂᕕᓂᖓᓄᓗ ᐅᑎᑎᓇᓱᓂᕆᔭᖕᒋᑦ

8. ᐱᓕᕆᓂᖕᒋᓄᑦ ᖃᓯᓗᐊᓂ ᐊᑐᓂᐊᕐᓱᒋᓚᐅᒪᖔᑕ ᖃᓄᐃᓕᖓᓕᒪᖔᑕ

   8.1. ᖃᓄᐃᓕᖓᓕᒪᖔᑕ ᖃᓯᕐᓗᐊᕐᓱᒋᔭᐅᓚᐅᑐᑦ ᐅᔭᕐᓯᐅᓂᒧᑦ ᐃᒍᑎᕆᓂᒧᑦ, ᖃᓄᐃᑐᓂᕕᓂᖓᓄ ᐅᑎᑎᑕᐅᓂᒧᑦ ᖃᐅᔨᓴᓂᒧᓗ ᐊᑭᖕᒋᑦ

   8.2. ᖃᓯᕐᓂᐊᕐᓱᒋᔭᐅᒪᖓᑕ ᓯᒥᒃᑕᐅᓯᒪᔫᑉ ᐊᕿᑕᐅᒋᐊᑲᓂᓂᖓᓄᑦ

9. ᐃᓄᑐᐃᓇᐃ ᑐᓴᕕᐅᓇᓱᓂᖕᒋᑦ/ᐃᓚᐅᑎᑕᐅᓂᖕᒋᑦ

10. ᓇᐃᓕᒋᐊᕐᓯᒪᔪᑦ ᖃᓄᐃᓕᐅᓯᒪᓕᒪᖔᑕ ᒪᓕᓗᒋᑦ ᐱᓕᕆᐊᖑᖁᔭᐅᓯᒪᔪᑦ ᖃᐅᔨᓴᑎᓄᑦ/ᐊᕿᑕᐅᖁᔭᐅᔪᓗ ᐅᓂᑳᑦ

11. ᐃᒪᕐᒥᒃ ᐊᑐᕐᓂᖅ

12. ᐅᐸᑕᐅᓯᒪᓗᓂ ᖃᐅᔨᓴᓂᖅ ᑕᐃᑲᓂᓗᓂ

   12.1. ᐊᒃᑕᕐᓯᓂᖅ ᐃᒍᑎᑕᐅᓯᒪᔪᓂ ᒪᕐᓗᑯᓂᒃ ᐊᒪᓗ ᓱᕈᑎᕐᓯᒪᔪᓂ ᓄᓇᓂᒃ

      12.1.1. ᐊᒃᑕᕐᓯᓂᖅ ᐃᒍᑎᑕᐅᓯᒪᔪᓂ ᒪᕐᓗᑯᓂᒃ ᐊᐅᐸᑐᖅ ᕿᒥᑯᓗᒧ ᐃᓗᑐᑎᑕᐅᓯᒪᔪᕐᒧᑦ
      12.1.2. ᐊᒃᑕᕐᓯᓂᖅ ᐃᒍᑎᑕᐅᓯᒪᔪᑦ ᒪᕐᓗᑯᓂᒃ ᐃᓕᕐᑯᓯᑐᖃᕕᓂᖓᓄ ᐅᑎᑎᑕᐅᓇᓱᓂᖓ
      12.1.3. ᐊᒃᑕᕐᓯᓂᖅ ᓴᕕᕐᔭᓂᒃ/ᐅᕐᓱᐊᓗᕕᓂᕐᓂᒃ ᑐᐊᐸᒥ ᓱᕈᓯᒪᔪᓂ ᓄᓇᐅᑉ ᐊᑕᓄᑕᐅᓂᖕᒋᑦ ᐅᔭᕐᑕᕐᕕᐅᔪᓄᕐᑕᐅᓂᖕᒋᑦ

   12.2. ᐅᓇᓂᖕᒋᑕ ᖃᐅᔨᓴᐅᑎᖕᒋᑦ

      12.2.1. ᒋᐊᕈ ᑕᓯᐅᑉ ᑯᖓᑕ ᓯᒥᖓ
      12.2.2. ᐊᑐᕐᑕᐅᔪᖅ ᐊᒃᑕᕐᕕᒃ
      12.2.3. ᐃᓗᕐᓴᓕᐊᖑᓯᒪᔪᖅ ᐊᐅᐸᕐᑐᖅ ᕿᒥᑯᓗᒃ

   12.3. ᐅᔭᕋᖓᑕ ᖃᓄᐃᓕᖓᓂᖓᑕ ᖃᐅᔨᓴᑕᐅᓂᖕᒋᑦ

      12.3.1. ᐅᔭᕋᖓᑕ ᖃᓄᐃᓕᖓᓂᖓᑕ ᖃᐅᔨᓴᑕᐅᓂᖓ ᐃᒥᕐᑕᕐᕕᐅ ᑯᖓᑕ ᓯᒥᖓ
      12.3.2. ᐅᔭᕋᖓᑕ ᖃᓄᐃᓕᖓᓂᖓᑕ ᖃᐅᔨᓴᑕᐅᓂᖓ ᐊᑐᕐᑕᐅᔫᑉ ᐊᒃᑕᕕᐅ ᖃᐸᒃᓴᖓ
      12.3.3. ᐅᔭᕋᖓᑕ ᖃᓄᐃᓕᖓᓂᖓᑕ ᕿᒥᕈᔭᐅᓂᖓ ᖃᓄᐃᑐᓂᕕᓂᖓᓄ ᐅᑎᑎᑕᐅᔪᑖ

   12.4. ᐃᑎᓂᖓᑕ ᖃᐅᔨᓴᑕᐅᓂᖓ ᐃᒥᕐᑕᕐᕕᐅ ᐃᒪᖓ

   12.5. ᑎᓱᕙᓕᐊᓂᖓᑕ ᖃᐅᔨᓴᑕᐅᓂᖓ

      12.5.1. ᒋᐊᕈ ᑕᓯᐅᑉ ᑎᓱᕙᓕᐊᓂᖓᑕ ᖃᐅᔨᓴᑕᐅᔪᑎᖕᒋᑦ
      12.5.2. ᑐᓚᑕᕐᕕᒃ ᐊᒪᓗ ᓯᕐᔭᖓᑕ ᓯᕗᓂᐊᑕ ᑎᓱᕙᓕᐊᓂᖓᑕ ᖃᐅᔨᓴᑕᐅᓂᖓ

13. ᒋᐊᕈ ᑕᓯᐅᑉ ᓄᓇᖓᑕ ᕐᑯᓕᕆᓂᖕᒋᑕ ᖃᐅᔨᓴᑕᐅᓂᖓ

14. ᓇᐃᓕᒋᐊᕐᓯᒪᔪᑦ ᑰᒃᐸᓕᐊᔫᑉ ᖃᐅᔨᓴᑕᐅᓂᖓ ᑰᒃᐸᓕᐊᔪᓗ ᖃᓄᐃᓕᖓᓕᐸᓕᐊᓂᕆᔭᖓᑕ ᖃᐅᔨᓴᑕᐅᓂᖓ

15. ᓇᐃᓕᒋᐊᕐᓯᒪᔪᖅ ᖃᐅᔨᓴᑕᐅᓂᖓ ᐊᕙᑎᖓᑕ ᖃᐅᔨᓴᑕᐅᓂᖓ ᖃᓄᐃᓕᖓᓕᒪᖔᑦ

16. ᓇᐃᒃᓕᒋᐊᕐᓯᒪᔪᑦ ᒋᐊᕈ ᑕᓯᖓᑕ ᐃᒪᕐᒥᐅᑕᓕᕆᔨᑯᑦ ᖃᐅᔨᓴᓂᕕᓂᖕᒋᑕ ᖃᓄᐃᑐᓂᕆᔭᖕᒋᑦ ᖃᓄᐃᓕᖓᓕᒪᖔᑕ

ᐃᓚᒋᐊᕈᑎᖏᑦ

3. ᖃᓄᐃᓕᖓᓕᓂᖏᑦ ᐊᖓᔪᖃᐅᑎᐅᔪᑦ ᐊᒪᓗ/ᐅᕙᓗᓃᑦ ᓇᒪᒃᓴᕐᑎᐅᔪᑦ

ᓯᑎᐱᕆ 30, 2003ᖑᑎᓕᓗᒍ ᑕᐃᑯᐊ ᑕᒪᕐᒥᒃ ᐊᖏᑕᐅᔭᕆᐊᓖᑦ ᐅᑯᓄᖓᖓᔪᑦ ᒪᑐᓂᓴᖓᑕ ᐊᕿᓯᒪᓂᓴᖏᑦ, ᐃᒪᒧ ᐱᔪᓇᐅᑎᒃ ᐊᒪᓗ ᐃᒪᒥᐅᑕᓕᕆᐹᑯᑦ ᐊᖓᔪᖃᖃᕖᖏᑦ ᐱᔭᐅᓯᒪᓕᓚᐅᑐᑦ.

4. ᐊᖏᑕᐅᓯᒪᖏᑐᑦ ᑯᕕᑎᓯᓃᑦ ᐊᒪᓗ ᓇᐃᓕᒋᐊᓯᒪᔪᑦ ᖃᓄᐃᓕᖓᓕᒫᖓᑕ ᖃᓄᐃᓕᒋᐊᓯᒪᓕᒫᖓᑕᓗᓂᑦ.

ᐊᖏᑕᐅᓯᒪᖏᑐᓂᒃ ᑯᕕᑎᓯᓂᕐᑕᖃᓚᐅᖏᑐᖅ ᐃᒪᕐᒥᒃ ᐅᕙᓗᓂ ᑰᑯᑦ ᑕᕙᓂ ᐅᓂᑲᐅᓯᕆᔭᓂ.

5. ᖃᓄᐃᓕᖓᓕᒫᖓᑕ ᖃᐅᔨᓴᓂᐅᔪᑦ/ᖃᓄᐃᓕᖓᑎᓗᒋᑦ ᐊᕿᑕᐅᓯᒪᔪᑦ ᑐᓯᕋᔭᐅᓯᒪᔪᑦ

ᐅᒪ ᐊᑕᓂᑐᑦ ᐅᓂᑳᓯᒪᔪᑦ ᑐᔪᑕᐅᓚᐅᑐᑦ ᕿᒥᕈᔭᐅᓂᐊᕐᒪᑕ ᒪᓕᓗᒋᑦ ᓇᒪᒋᔭᐅᔭᕆᐊᖃᓂᖏᑦ:

ᐃ) ᒪᓇ ᐊᑐᕐᑕᐅᔪᖅ ᓴᐅᔭᐅᔪᐃᑦ ᖃᕙᒃᓴᖓ
ᐱ) ᑎᑎᕋᐅᔭᕐᑕᐅᓗᑎᒃ ᖃᓄᐃᓕᖓᓂᐊᕐᒪᖔᑕ ᒋᐊᕈ ᑯᖓᑕ ᓯᒥᖓᑕ ᐃᒍᑎᕐᑕᐅᓂᖓ
ᑎ) ᑎᑎᕋᐅᔭᕐᑕᐅᓗᑎᒃ ᖃᓄᐃᓕᖓᓂᐊᒪᖓᑦ ᓯᒥᒃᓴᖏᑦ ᐅᔭᕋᒃᑕᕐᕕᐅᔪᑦ ᐃᓯᕐᑕᕐᕕᖏᑦ
ᑭ) ᑎᑎᕋᐅᔭᕐᑕᐅᓗᑎᒃ ᖃᓄᐃᓕᖓᓂᐊᒪᖔᑦ ᐃᒍᑎᑕᐅᓂᖓ ᑐᓚᒃᑕᕐᕕᐅᑉ ᓯᒃᔭᖓᓗ:

ᐊᓯᖏᑦ ᖃᐅᔨᓴᑕᐅᓃᑦ ᑕᕙᓂ ᐅᓂᑲᕐᒥ ᑎᑎᕋᓯᒪᔪᑦ ᐅᒪ ᑭᖑᓂᐊᓂ.

6. ᐃᒍᑎᑕᐅᓂᖓᑕ ᖃᓄᐃᑐᓂᕕᓂᖓᓄᓗ ᐅᑎᑎᑕᐅᓂᖓ ᖃᓄᐃᓕᖓᓕᒫᖏᑦ ᐅᓂᖄᖅ

ᐱᓇᓱᐊᕐᑎᐅᔪᑦ ᐱᒋᐊᕐᓂᖓᓂ ᔪᓚᐃ 39ᖑᓚᐅᑐᑦ ᐊᒪᓗ ᐅᖃᓯᕙᓕᐊᖏᓇᓕᒫᕐᓗᑎᒃ ᐊᐅᔭᐅᓂᖓᓂ. ᓯᑎᐱᕆᐅᑉ ᓄᖑᖓᓂ 126ᖑᓕᓚᐅᑐᑦ ᒪᕈᓕᕿᒥᑐᑦ.

6.1. ᐃᒡᓗᓂ ᐃᒍᑎᓇᓂᖅ

6.1.1. ᓯᖃᓕᓯᒪᕕᒃ/ᑎᑎᕋᕖᑦ/ᓯᕐᓗᐊᖃᕕᐅᕚᑦ/ᐳᒃᑖᕐᑐᖅ ᐃᒃᓗ

- ᓯᑎᐱᕆ 18ᖑᓕᑎᓗᒍ ᐳᒃᑖᕐᑐᖅ ᐃᒡᓗ/ᓯᖃᓕᓯᒪᕕᒃ/ᑎᑎᕋᕖᓪᓗ ᐃᒍᑎᑕᐅᓯᒪᑎᐊᓕᓚᐅᑐᑦ ᐊᒪᓗ ᐃᓗᓴᓕᐊᕆᓯᒪᔪᕐᒧᓕᓗᑎᒃ ᓴᐅᔭᐅᔫᒃᓴᐃᑦ. ᑕᐃᒪ ᐊᒥᐊᑯᑐᐊᖑᔪᖅ ᐃᒡᓗᔪᓂ ᐊᖁᑎᖓ ᐃᒡᓗᒨᖓᐅᔪᖅ ᑕᓇ ᓱᓪᓗᕐᑕᖃᐅᒪᑦ (ᐃᒪᒧᑦ ᓱᓪᓗᐃᑦ, ᐃᑯᒪᐅᑎᓄᑦ ᐅᐊᔭᐃᑦ, ᑯᕕᕐᑐᑦ ᖁᕖᑦ ᓱᓪᓗᖓ) ᓱᓕ ᐊᑐᕐᑕᐅᒪᑕ. ᑕᓇ ᐊᕐᒍᓛᕐᑐᖅ ᑭᓯᐊᓂ ᐹᕐᑕᐅᑕᐃᓈᕐᑐᖅ.

6.1.2. ᑭᓱᕈᓗᔭᖃᐅᑎᐅᔪᖅ ᓯᕐᓗᐊᖃᕕᒃ ᐃᒡᓗ

- ᐃᒃᓗ ᓴᐅᓂᑐᐃᓇᐅᓕᑐᖅ ᐅᕈᑎᑕᐅᓚᐅᑐᖅ ᐊᒥᓯ 2ᖑᑎᓗᒍ.
- ᐃᓚᐃᓇᖓ ᑐᖓᕕᖓ ᓱᓕ ᑕᐃᑲᓂᓚᐅᑐᖅ ᓯᑎᐱᕆᐅᑉ ᓄᖑᐊᓂ.

6.1.3. ᑭᓂᕐᑐᓕᐅᕐᕕᒃ ᐃᒡᓗ

- ᑐᖓᖓ ᐲᔭᕐᑕᐅᓯᒪᓂᖓ ᐱᔭᕆᓯᒪᓕᑐᖅ ᐊᒪᓗ ᐊᕿᓱᑕᐅᒋᐊᓚᑲᓂᓗᓂ ᑐᖓᕕᓂᖓ ᐊᕿᒋᐊᕆᐊᓖᑦ ᐱᔭᕆᓯᒪᓕᕐᒥᔪᖅ.

6.1.4. ᐃᓚᓴᖃᐅᑎᒃ ᐃᒡᓗ

- ᐃᒍᑎᓇᓂᖅ ᐃᒡᓗᖃᕕᕕᓂᐅᔪᕐᓗ ᐊᕿᓱᑕᐅᑲᓂᓂᖓ ᐱᔭᕆᓯᒪᔪᖅ ᑕᕙᓂ.

6.1.5. ᐅᕐᓱᐊᓗᖃᐅᑎᖃᕕᒃ

- ᐅᕐᓱᐊᓗᖃᕕᐅᔪᖅ ᖃᑕᐅᔭᕐᔪᐊᑕᓕᒃ ᐱᖓᓱᓂᒃ. ᓴᓗᒪᕐᓴᑕᐅᓂᖓ ᓯᕗᓕᕐᐸᖑᔫᑉ ᖃᑕᐅᔭᐅ ᐱᔭᕆᓯᒪᓕᕐᑐᖅ. ᒪᑮᒃ ᓱᓕ ᖃᑕᐅᔭᕐᔪᐊ ᓴᓗᒪᕐᓴᑕᐅᔭᕆᐊᓖᒃ.

6.1.6. ᓯᓂᒃᑕᕐᕕᐅᖃᕐᑐᑦ ᐃᒡᓗ

- ᐃᒍᑎᑕᐅᔪᖃᕆᐊᓯᒪᖏᑐᖅ ᑕᕙᓂ ᑕᓇ ᓱᓕ ᐃᒡᓗᔪᖅ ᑕᐃᒪᐃᓕᖓᓂᐊᑐᖅ ᐊᑐᕐᑕᐅᖏᓇᓂᐊᕈᓂᓗ ᑎᑭᓚᐅᖏᓂᖓᓂ ᐊᐅᔭᖓ 2004ᒥ.

6.1.7. ᐊᓯᖏᑦ ᐃᓘᐃᑦ/ᑭᓱᖃᕖᑦ

- ᐊᑕᖏᐸᓗᓗᒋᑦ ᐊᒥᐊᑯᕐᓗᑯᖏᑕ ᓱᓪᓗᖏᑦ ᐄᔭᕐᑕᐅᓯᒪᓕᑐᑦ ᐊᒪᓗ ᐅᔭᕐᑕᕕᐅᓚᐅᑐᓄᑦ ᑕᐃᒍᖓᑕᐅᓯᒪᓕᑐᑦ ᐊᒃᑕᑕᐅᓯᒪᔦᑦ ᑕᐃᒍᖓ.

6.2. ᓄᓇᓕᕆᓂᐅᔪᖅ

6.2.1. ᑐᓚᒃᑕᖅᑭᒃ ᓯᒃᔭᖓᓗ

- ᑎᓴᒪᐃᓕᖃᖓᔪᖅ ᑐᓚᒃᑕᕐᑭᖓ. ᐊᐅᔭᐅᑎᓗᒍ ᐱᓕᕆᐊᖑᓚᐅᑐᖅ ᐃᓱᒪᒋᔭᓗᐊᑕᕆᓗᓂ ᐱᓕᕆᐊᓗᐊᑕᕆᓗᓂᐅᒃ ᓯᕗᓕᐅᑎᑕᐅᓗᑎᒃ ᒪᕈᐃᖑᔪᑦ. ᐱᔭᐃᓗᑎᒃ ᓄᓇᖓᓂᒃ ᑐᓚᑕᕐᑭᒥ, ᐅᕐᓱᐊᓗᕈᔦᐃᓗ ᑯᕕᓂᑯᐃᑦ ᓇᓂᔭᐅᓚᐅᑐᑦ ᖃᐅᔮᔭᐅᓚᐅᑐᑦ ᑕᒪᓇ ᐱᓇᓱᐊᕐᓂᖓᓂ ᓱᑲᐃᓕᒋᐊᕐᑎᓯᓚᐅᑐᖅ ᓴᓗᒪᓴᐃᓂᕆᔭᖓ ᓱᕈᓯᒪᔦᕐᒥᒃ.
- ᑕᐃᑯᐊ ᑲᑐᕋᑎᐅᔦᑦ (ᓯ.ᓇ.ᓴ) ᐃᓱᒪᔦᑦ 60ᐳᓴᖓᓂᓗᐊᖃᐃ ᐱᔭᕆᓯᓯᒪᓕᑐᑦ ᑕᒪᑐᒥᖓ ᐱᔭᕆᐊᓕᒥᓂ ᐱᔭᕆᓯᓯᒪᓗᐊᕋᓱᕆᓕᕐᑐᑦ.
- ᓇᑲᑎᕆᓂᖅ ᖃᓕᕆᑎᓯᒪᔦᓂᒃ ᐃᒡᓗᕕᓂᕈᔦᓂᒃ ᐱᓕᕆᐊᖑᓛᕐᑐᖅ ᐊᐃᕆᓕ 2004ᖑᓕᕐᐸᑦ ᑕᐃᒪ ᓱᓕ ᕐᑯᐊᖑᒪᑕ ᒪᓇ..
- ᐅᐊᓇᕐᐸᓯᖓ ᑐᓚᒃᑕᕐᕕᐅᑉ ᐊᕐᕿᓱᑕᐅᕆᐊᓚᑲᓂᓯᒪᔪᖅ ᓯᕕᖓᔭᕐᑯᓗᒍ ᕐᑯᒻᒧᑦ.

6.2.2. ᕿᐊᕈ ᑕᓯᐅᑉ ᑯᖓᑕ ᓯᒥᖓ

- ᒥᕐᓗᐊᓂᖅ ᓯᒥᖓᒍᑦ ᐱᔭᕆᑕᐅᓚᐅᑐᖅ ᓯᑎᐱᕆ 18ᖑᑎᓗᒍ ᑕᓯᐅᑉ ᐃᒪᖃᓂᕆᔭᖓ 1005.9ᖑᓕᕐᑐᖅ (30ᒥᓕᒥᑕᒥ) ᕐᑯᑎᓂᓴᐅᕋᔪᒃᑐᖅ ᖃᓄᐃᑐᔦᓯᓚᑕᖓᓂᑦ.
- ᐃᒪᐅᕐ ᐱᐅᓂᖓᑕ ᖃᐅᔨᓴᑕᐅᓂᖓ ᓱᓕ ᑲᔦᓯᓚᐅᑐᖅ ᑕᒪᑯᐊ ᐱᔦᑕᐅᓗᐊᕐᑐᑦ ᓴᕕᕋᔭᒃᓴᐃᑦ ᐃᒪᕐᒥᑐᑦ ᐊᒪᓗ ᓯᐅᕋᕈᔦᓂᖓ ᐊᑎᓂᓴᐅᓚᐅᑐᑦ ᑭᖑᒪᔭᐅᔦᕐᒥᑦ.

6.2.3. ᒪᓇ ᐊᑐᕐᑕᐅᔪᖅ ᐊᒃᑕᕐᑭᒃ

- ᑐᐊᐸᒃᒥ ᐅᓯᑲᕐᑕᓂ ᐊᒪᓗ ᐃᓗᓕᓱᐃᓂᖅ ᓯᕗᓕᐊᔪᖅ ᐊᓕᖅ 1200 ᒥᓕᒥᑕᒥ ᐃᑎᓂᓕ ᐅᓕᓕᐊᖑᔪᖅ ᐱᔭᕆᑕᐅᓕᓚᓕᕐᑐᖅ. ᑭᖑᓕᐸᖑᔪᖅ ᖃᐸᕆᓂᐊᕐᑕᖓ 600 ᒥᓕᒥᑕᐅᔪᖅ ᖃᐸᕆᓂᐊᕐᑕᖓ ᓱᓕ ᐱᕆᐸᑕᐅᓯᒪᖏᑐᖅ.

6.2.4. ᐊᐅᐸᕐᑐᑯᓗ ᕿᒥ ᐃᓗᑐᕐᑎᓯᒪᔪᖅ (ᐃᓗᑐᕐᑎᓯᒪᔪᖅ)

- ᐊᑐᕈᓇᐃᑐᑦ ᐊᒃᑕᓚᓴᐃᑦ ᐃᓗᑐᕐᑎᓯᒪᔦᕐᒥ ᑲᔦᓯᓚᐅᑐᑦ ᑕᕗᓂ ᐅᓂᑲᓕᐊᕐᓂ.
- ᓄᖑᐊᓂ ᓯᑎᐱᕆᐅᑉ, ᐊᑕᖏᑲᓴᕐᓗᒍ ᐃᒍᑎᕐᓯᒪᔪᖅ ᑐᓚᑕᕐᑭᒃ ᐅᓯᑲᕐᑕᑕᐅᓚᐅᑐᖅ ᐃᓗᑐᕐᑎᓯᒪᔦᕐᒧᑦ. ᓇᑲᑎᕆᑲᓂᓂᐅᓂᐊᑐᖅ ᑕᒪᑯᓂᖓ ᑲᔦᓯᑎᑕᐅᓂᐊᕐᑐᖅ ᓯᕗᓂᐊᓂ ᓴᐅᔭᐅᓚᐅᖏᓂᖏᓂ.

6.2.5. ᓴᓗᒪᖕᓴᑕᐅᓂᖓ ᐃᓚᖓ (ᐃᓚᐅᓗᓂ ᐃᓚᓴᖃᐅᑎᖃᑭᒃ, ᓄᑕᖅ ᑐᐊᐸᒃᑕᕐᑭᒃ, ᐅᐊᓇᐸᓯᖓ ᐃᓗᖕᓴᐅᑉ, ᓄᑖᕐᓗ ᐊᕐᕿᑕᐅᔪᖅ, ᐅᐊᓇᐸᓯᖓᓗ ᑐᓚᑕᕐᑭ)

- ᐊᕐᕿᓱᑕᐅᑲᓂᓂᖓ ᓄᓇᖓ ᑕᒪᑐᒪ ᓄᓇᐅᔪᑉ ᓱᓕ ᑲᔦᓯᓚᐅᑐᖅ ᐅᑎᑎᑕᐅᓇᓱᓗᓂ ᖃᓄᐃᑐᓂᕕᓂᖓᓄᑦ ᐃᓄᒧᑦ ᐊᕐᕿᓱᑕᐅᒪᖏᑐᕕᓂᐅᔭᓕᑎᓇᓱᒃᓗᒍ. ᐊᖏᔪᐊᓗᒥ ᐱᓕᕆᓚᐅᑐᑦ ᑕᑯᓇᓂ ᓄᓇᐅᔦᕐᓂ ᐅᑭᐅᕐᒧᑦ ᑎᑭᓗᒍ.
- ᓄᓇᖓᑕ ᐊᕐᕿᓱᑕᐅᑲᓂᓂᖓ ᐅᐊᓇᐸᓯᖓᓂ ᐃᓗᑐᕐᓯᒪᔦᑦ ᐱᔭᕆᑕᐅᓚᐅᑐᖅ.

6.2.6. ᐊᕐᑯᑏᑦ

- ᐃᓚᖓ ᓯᕕᖓᓂᖓᑕ ᐊᕐᑯᑎᐅᔦᑦ ᐱᕆᐊᑕᐅᓚᐅᑐᖅ ᐱᔭᕆᐊᑭᓂᓴᐅᕐᑯᓗᒍ ᐱᓕᕆᐊᒃᓴᕆᔭᖓᑦ 2004ᖑᓕᕐᐸᑦ ᐊᒥᐊᑯᖓ.

6.3. ᓱᕈᓯᒪᔪᖅ ᓄᓇᖓᑕ ᓴᓗᒪᓴᑕᐅᓂᖓ

6.3.1. ᑐᓚᒃᑕᕐᑭᒃ ᓯᔭᖓᓗ

- ᓱᕈᓯᒪᔦᑦ ᓴᕕᕋᔭᐃᑦ ᑐᓚᑕᕕᒥᑐᑦ ᐃᓚᖓᑕᐅᓚᐅᑐᑦ ᖃᐅᔨᓴᑕᐅᔪᑎᓴᓂᒃ ᐊᒪᓗ ᓱᕈᓯᒪᔦᑦ ᓄᓇᖓ ᐄᔭᕐᑕᐅᓚᐅᑐᖅ ᓄᓇᐅᓗ ᐃᓗᐊᓄᕐᑕᐅᓗᓂ ᐊᕐᕿᓯᒪᔭᖓᑦ ᐊᖏᑕᐅᓯᒪᔪᖅ ᒪᓕᓗᒍ.

6.3.2 ᐳᒃᑖᕐᑐᑦ ᐃᒡᓘᑉ ᒥᒃᓵ

- ᐄᔭᕐᑕᐅᓂᖓ ᓱᕈᓯᒪᔩᑉ ᓄᓇᐅᑉ ᐳᒃᑖᕐᑐᑉ ᐃᓂᖓᑕ ᒥᒃᓴᓂ ᓱᓕ ᑲᔦᓯᔪᖅ.
- ᐱᓕᕆᓂᐅᔪᖅ ᑕᒪᓂ ᓱᓕ ᓯᕗᓕᐸᐅᑎᑕᐅᓂᐊᕐᑐᖅ ᐱᔭᓴᐅᔦᓂ ᐄᔭᕐᑕᐅᓗᑎᒃ ᓱᕈᓯᒪᔦᑦ ᓄᓇᐃᑦ ᐱᔭᕆᑕᐅᔭᕆᐊᓖᑦ ᓯᕗᓂᐊᓂ ᐅᐱᖓᓵᖑᓛᕐᑐᖅ ᐊᐅᐸᓕᐊᓚᐅᖏᓂᖓᓂ ᑕᒪᑯᐊ ᓱᕈᓇᕐᑐᑦ ᑰᕐᑯᓇᕆ ᓯᐊᒪᕐᑯᓇᒍ ᑰᓂᑯᑦ.

6.3.3 **ᓴᕕᒃᓴᕐᓯᐅᑎᓄᒋᑦ ᐊᒃᑕᕕᐱᓂᖏᑦ/ᓄᐊᕕᐅᔪᖅ ᓄᓇᖓ**

- ᐱᔭᕐᑕᐅᓂᖓ ᑕᓱᒪ ᐱᔭᕆᓯᒪᓂᕆᔭᖓ ᐃᒪᖅ 90>ᓴᐅᓕᕐᑐᖅ ᑕᕙᓂ ᐅᓂᑲᕐᕕᒋᔭᓂ.

6.3.4 **ᐱᕐᑯᑎᒋᔪᐅᔪᓄ ᓯᕐᓗᐊᖅᕕᒃ**

- ᑭᖑᓕᕐᕚᖅ ᓴᓗᒪᖅᓴᑕᐅᓂᖓ ᓴᕕᕋᔪᕕᓃᑦ ᓱᕈᐃᓯᒪᔪᑦ ᓄᓇᒥᒃ ᐃᒡᓗᖅᕕᐅᔫᑉ ᖃᓂᒋᔪᓚ ᐱᔭᕆᓯᒪᑲᓴᑎᐊᓕᕐᑐᖅ.

6.3.5 **ᖃᑕᐅᔪᐅᖏᑐᕐᒥᑐᓄᑦ ᐅᕐᓱᐊᓗᖅᕕᒃ**

- ᓱᓕᓂᕋᐃᔪᑦ ᖃᐅᔨᓴᕈᑏᑦ ᓇᓗᓇᐃᓯᔪᑦ ᖃᓄᐃᑐᓂᕕᓂᖓᓄᑦ ᐅᑎᑎᐅᓇᓱᓂᖅ ᐱᔭᕆᑕᐅᔪᖅ ᑕᒪᓂ.

6.3.6 ᑭᓂᕐᑐᓕᐅᕐᕕᒃ ᑯᕕᔪᖅᑲᓂᐸᑦ ᑕᓯᑯᓗ

- ᑕᐃᒪᐃᓚᑕᕈᑕᐅᓇᓱᒃᑐᑦ ᖃᐅᔨᓴᕈᑏᑦ ᖃᐅᔨᓴᑕᐅᓂᖏᑦ ᓇᓗᓇᐃᓯᓚᑕᕐᑐᑦ ᓴᓗᒪᓴᑕᐅᓇᓱᓂᖏᑦ ᓱᕈᕐᑎᕐᓯᒪᔪᑦ ᓄᓇᐃᑦ ᑕᐃᑲᓂᑐᑦ ᓴᓗᒪᕐᓯᒪᓚᑖᓕᕐᓂᖏᓂᒃ.

6.3.7 ᐃᓚᒃᓴᖅᕕᒃ

- ᓴᓗᒪᖅᓴᑕᐅᓂᖓ ᐅᕐᓱᐊᓗᕕᓃᑦ ᓄᓇᑯᔪᕈᔪᓂᑦ ᑯᕕᓂᑯᐃᑦ ᖃᓂᒋᔪᓂ ᐃᓚᓴᖅᕕᐅᑉ ᐃᓗ ᐱᔭᕆᑕᐅᓚᐅᑐᖅ ᔪᓚᐃᖑᑎᓗᒍ.

6.3.8 ᐅᐊᓇᐸᓯᖓᑕ ᐊᓂᕕᖓ ᓴᕕᕋᔪᒃᓴᖅᕕᒃ

- ᓴᓗᒪᖅᓴᑕᐅᓂᖓ ᓱᕈᓯᒪᔪᑉ ᓄᓇᐅᑉ ᓴᕕᓴᐃ ᖃᑎᓯᓯᒪᖃᑕᓚᐅᑐᑦ ᐱᔭᕆᓇᐊᒃᓕᓚᐅᑐᖅ ᓯᑎᐱᓇᐅᑉ ᓄᖑᐊᓂ.

6.3.9 **ᑕᓇᐅᑉ ᓯᔪᖓᑕ ᓯᕗᓂᐊ - ᔪᓂ 2002ᒥ ᐅᕐᓱᐊᓗᒥ ᑯᕕᓂᑯ**

- ᐱᔭᕐᑕᐅᓂᖓ ᐊᒥᐊᑯᔫᑉ ᐅᕐᓱᕕᓂᕈᔪᒃ ᓱᕈᓯᒪᔪᑦ ᓯᔪᖓᑕ ᓯᕗᓂᐊᓂᑐᖅ ᔪᓂ 2002ᒥ ᑯᕕᔪᖅᑲᓚᐅᑎᓗᒍ ᐱᔭᕆᑕᐅᓚᐅᑐᖅ ᔪᓚᐃ 12ᑎᓗᒍ.

6.3.10. ᐊᐳᑕᐃᔪᐃᕕᓗᐊᑕᖅ

- ᓴᓗᒪᓴᑕᐅᓂᖓ ᑕᕙᓂ ᐱᔭᕆᓯᒪᓕᑐᖅ.

6.4. ᐃᒥᑕᐅᓂᖏᑦ ᓱᑯᓇᑐᑕᓖᑦ/ᐱᑐᐃᓇᐅᖏᑐᑦ ᐃᒥᑕᓴᐅᔪᑦ

- ᐊᕐᕿᓯᓯᒪᓚᐅᓯᒪᔪᑦ ᐱᑐᐃᓇᐅᖏᑐᕐᒥᒃ ᐃᒥᑕᓴᐅᒧᑦ ᐊᐅᓚᐅᔪᐅᓂᐊᕐᑐᑦ ᑕᐃᑲᖓ 2003ᖑᓕᕐᐸᑦ. ᑕᒪᓇ ᑭᖑᕙᓇᐊᑕᐅᔪᓇᐊᖅᑲᓕᓚᐅᑐᖅ ᑕᐃᑯᐊ ᐱᔪᐅᔪᓇᐊᓖᑦ ᐸᐃᐸᑦ ᑭᖑᕙᖓᓂᖏᓄᑦ ᑕᐃᒪᐃᒪᑦ ᐊᐅᓚᐅᔪᐅᓛᓕᕐᑐᑦ 2004ᖑᓕᕐᐸᑦ.
- ᐊᑐᕐᑕᐅᓂᕐᓗᑯᐃᑦ ᐅᕐᓱᐃᑦ (ᐳᓚᓴᐅᑎᓖᑦ, ᐅᕐᓱᐃᑦ ᐅᐊᕈᑎᖏᑦ), ᐊᑐᕐᓂᓗᑯᐃ ᐅᕐᓱᐃᑦ (ᐃᒐᓯᐅᑦ ᐅᕐᓱᖅ, ᐅᕐᓱᐊᓗᖅᑲᐅᑎᓂᒃ ᓴᓗᒪᖅᓴᐃᓂᕐᓗᑯᐃᑦ), ᐃᒪᒧᓗ ᐅᕐᑯᓴᐅᑎᓄ ᐃᓚᓴᐃᑦ ᐃᒥᑕᐅᓖᕐᑐᑦ ᑕᐃᑲᓂ ᐃᒑᓗᒧᑦ ᐊᖏᑕᐅᓯᒪᔫᕐᒧᑦ ᓄᓇᒥᐅᑕᓕᓇᐹᑯᓄᑦ.

7. ᖃᓄᐃᓕᖓᓕᒫᖓᑕ ᐃᒍᑎᓇᔪᑦ ᖃᓄᐃᑐᓂᕕᓂᖓᓄ ᐅᑎᑎᓇᓱᓂᓇᔪᖏᑕ ᐊᕐᕿᓯᒪᓂᖏᑦ

ᐃᓚᒋᐊᕈᑖ ᑭ ᑎᑎᕋᕐᓯᒪᔪᕐᑕᓕᒃ ᖃᓄᐃᓕᖓᓕᒪᖓᑕ ᐃᒍᑎᓇᔪᑦ ᒪᓇᐅᔪᖅ.

8. ᐱᓕᕆᓂᖏᓄᑦ ᖃᓯᓗᐊᓂ ᐊᑐᓂᐊᕐᓱᒋᒪᐅᒪᖓᑕ ᖃᓄᐃᓕᖓᓕᒪᖓᑕᓗ

8.1. **ᖃᓄᐃᓕᖓᓕᒪᖓᑕ ᖃᓯᕋᓗᐊᕋᓱᒋᔭᐅᓚᐅᑐᑦ ᐅᔭᕋᓯᐅᓂᓗ ᐃᒍᑎᓇᓂᓗᑦ, ᖃᓄᐃᑐᓂᕕᓂᖓᓄ ᐅᑎᑎᑕᐅᓂᓗ ᖃᐅᔨᓴᓂᓗᓗ ᐊᑭᖏᑦ**

ᐃᓚᒋᐊᕈᑖ ᒋ ᑎᑎᕋᕐᓯᒪᔪᕐᑕᓕᒃ ᖃᓯᕋᓗᐊᕋᔭᒪᖖᑦ ᐅᔭᕋᓯᕐᕕᐅᑉ ᒪᑐᓂᖓᑕ ᐊᑭᖓ ᐊᕐᕿᒋᐊᓯᒪᓕᑐᖅ ᓯᑎᐱᕿ 30, 2003ᒧᑦ ᑎᑭᓗᒍ..

ᓇᐃᓇᕐᓗᒍ, ᑲᑎᓗᒋᑦ ᐅᔭᕋᓯᐅᕐᕕᐅᑉ ᒪᑐᔭᐅᓂᖓᑕ ᐊᑭᖓ ᓯᑎᐱᕿ 30, 2003ᒧ ᑎᑭᓗᒍ $37,094.00ᖑᓚᐅᑐᖅ. ᓂᕆᐅᓇᕐᑐᖅ ᐱᔭᕆᑕᐅᐸᑦ ᐃᒍᑎᑕᐅᓂᖓ, ᖃᓄᐃᑐᓂᕕᓂᖓᓄ ᐅᑎᑎᑕᐅᓂᖅ ᖃᐅᔨᓴᓂᓗ ᑎᑭᓗᒍ 2011ᒧᑦ ᖁᕙᕆᐊᓯᒪᓕᑐᑦ $56,925,000ᒧᑦ.

8.2. ᖃᓯᕋᓂᐊᕋᓱᒋᔭᐅᒪᖓᑕ ᓯᒥᒃᑕᐅᓯᒪᔫᑉ ᐊᕐᕿᑕᐅᒋᐊᑲᓂᓂᖓᓄᑦ

ᑕᐃᒪᐃᑕᕆᐊᖅᑲᐸᑦ ᐊᕐᕿᑕᐅᑲᓂᓗᓂ ᒋᐊᕈ ᑯᖓᑕ ᓯᒥᖓ, ᓂᕆᐅᓇᕐᑐᖅ ᐊᑭᒋᓚᔪᕐᑕᖓ $1,250,000ᖑᓚᔪᕐᑐᖅ. ᑐᑭᓯᓇᕈᑎᑲᓂᖏᑦ ᖃᓯᕋᓗᐊᕋᔭᒪᖖᑦ ᐃᓚᒋᐊᕈᑖ ᒥ ᒥᑐᖅ.

9. ᐃᓄᑐᐃᓇᐃᑦ ᑐᓴᕝᕕᐅᓇᓱᓂᖏᑦ/ᐃᓚᐅᑎᑕᐅᓂᖏᑦ

ᐸᑐᓐᒃ ᑕᑉᐱᐊᓐ, ᐅᔭᕐᓯᐅᕕᐅ ᓴᓗᒪᓴᑕᐅᓂᖓᓂ ᐊᐅᓚᓯᔨᐅᔪᖅ, ᓄᓇᕗᒥ ᐃᒪᓕᓐᓰᖏᑕ ᑲᑎᒪᔩᖏ ᑕᐃᑲᓂᓚᐅᑐᑦ ᓯᑎᐱᓐᐅᑎᓗᒍ ᖃᐅᔨᓴᑕᐅᑎᓗᒍ ᐃᓚᐅᓗᑎᒃ. ᑮᖑᓂᐊᓂ ᑕᐃᑲᓂᓚᐅᑎᓗᒋᑦ ᐸᑐᓐᒃ ᕿᓴᓗᒥᓚᐅᑐᖅ ᐊᒥᓱᖏᑐᓂ ᐅᓪᓗᓂ ᓄᓇᓕᒥᐅᓂᒃ ᑐᓴᑎᓯᔭᕐᑐᓗᓂ ᖃᓄᐃᓕᖓᓕᒪᖔᑕ.

ᑲᒥᑯᑦ ᓴᓂᕚᐃᓯᒪᔪᑦ ᐃᓗᒥᓯᐅᑎᓂᒃ ᐊᒪᓗ ᐊᓯᖏᓂ ᐊᒪᓗ ᐅᐸᓗᖓᐃᓯᒪᓗᑎᒃ ᐃᓱᒪᓴᓯᐅᕈᑎᒥᒃ ᑐᓂᕈᑎᓴᕐᒥᒃ ᑭᓯᐊᓂ ᓱᓕᓚᑦᑐᒥ ᑕᐃᒪᐃᓂᐊᓂᕐᓯᒪᔪᓂ ᓄᓇᓕᒥᖓᑦᑐᓂᒃ ᖃᓄ ᐊᐅᓚᐅᔭᐅᒐᔭᒪᖔᑕ ᐃᓱᒪᓇᑦᑐᖅ. ᑲᒥᑯᑦ ᕿᒪᐃᓇᐃᑐᐃᓇᔭᖏᑐᑦ ᒪᕈᓕᕿᒧᑦ ᐱᔭᓐᕈᑕ ᑕᐃᒪ ᖃᓄᐃᓕᔭᐅᓂᐊᕐᒪᖔᑕ ᐊᕿᑕᐅᓯᒪᓕᓐᐊᖃᓂᐊᑐᑦ ᓄᖑᐊᓂ ᒪᔨ 2004 ᐅᕙᓗᓂᑦ ᑕᐃᒪᐃᑐᒪᖏᑲᓗᐊᓗᑕ ᐃᒋᑕᓐᐊᖃᓂᐊᕐᑎᒍᑦ ᑕᒪᑯᐊ ᓄᐊᓯᒪᔭᕗᑦ ᑐᓂᔭᒃᓴᐃᑦ. ᑕᒪᓇ ᐅᖃᐅᓯᐅᓯᒪᔪᒐᓗᐊᖅ ᒪᑐᒪ ᓯᕗᓂᐊᓂ ᓄᓇᓕᒥᐅ ᐅᖃᖃᑎᒋᔭᐅᓗᑎᒃ ᐊᒪᓗ ᔫᓐ ᓈᑉ ᑕᐃᑲᓂ ᐊᐅᓚᓯᔨᐅᔪᖅ ᑎᑎᕋᖃᓂᓂᐊᑐᖅ ᓄᓇᓕᓄ ᐊᕿᓯᔭᓐᐊᖃᓂᕋᓕᓗᒋᑦ ᖃᓄ ᑕᑯᐊ ᓄᓇᓕᖏᓄᑕᐅᓂᐊᒪᖔᑕ.

ᐃᓄᐃ ᐃᖃᓇᐃᔮᑦ ᓇᓂᔭᐅᓯᒪᓕᑐᑦ ᐃᒍᑎᓐᓂᕐᒥ ᑕᕙᓂ ᐱᕕᖅᑭᓇᓂᐊᑐᑦ ᑕᒪᓇᓗ ᑲᔪᓯᑎᑕᐅᒐᔭᕐᓗᓂ ᐃᒍᑎᓐᓂᖏᓂ ᐅᔭᕐᒃᓯᐅᕝᕕᒥ ᐊᒪᓗ ᑕᓇ ᐃᓚᒋᔭᐅᖅᓯᐅᑎᓗᓂ ᑲᔪᓯᑎᑕᐅᔪᓐᓇᐊᓕᓂ ᑲᑐᕐᑕᓐᔭᐅᓇᓱᒃᑎᓗᒍ ᐃᓗᐊᓂᖅᓯᐅᑎᓚᐅᒪᑦ ᐱᓇᓱᐊᒐᕐᒥ. ᔪᓚᐃᖑᑎᓗᒍ ᐱᓕᓐᕕᔪᐊᑎᓗᒋᑦ, ᑕᑯᓴᐅᔪᖅ ᐃᖏᕐᓂᓐᖅᑕᓚᐅᑕᕗᑦ ᐱᓴᓱᐊᕈᓯᖓᓂ ᔪᓚᐃ 21ᒥᑦ 26ᒧᑦ 26ᖑᓚᐅᑐᑦ ᐃᓄᐃᑦ ᐃᖃᓇᐃᔮᑦ ᐃᖃᓇᐃᔭᓐᐊᓚᐅᑐᑦ. ᐊᒥᓱᓂᖏᑦ ᐃᓄᐃᑦ ᐊᒪᓗ ᐃᓅᖏᑐᑦ ᐃᖃᓇᐃᔮᑦ ᐊᔩᒋᖃᑦᖏᑐᑦ ᐊᑐᓂ ᐱᓇᓱᐊᕈᓯᐅᔪᕐᓂ ᑕᑯᓇᓂ ᐊᕕᒃᑐᓯᒪᔪᓂ ᐱᖓᓱᔪᓂ ᐱᓕᓐᓂᐅᔪᑦ ᐊᓯᔩᕐᐊᓕᐊᖏᓇᕐᒪᑕ.

10. ᓇᐃᓕᒋᐊᕐᓯᒪᔪᖅ ᖃᓄᐃᓕᐅᓯᒪᓕᒪᖔᑕ ᒪᓕᒍᑦ ᐱᓕᓐᐊᖑᕐᑯᔭᐅᓯᒪᔪᑦ ᖃᐅᔨᓴᑎᓄᑦ/ᐊᕿᑕᐅᕐᑯᔭᐅᔪᓗ ᐅᓂᒃᑳᑦ

ᔪᓚᐃ 2ᖑᑎᓗᒍ 3ᒥᓗ ᐃᓄᓕᓐᓰᑐᖅᑯᑦ ᖃᐅᔨᓴᓚᐅᑐᑦ ᒪᕈᓕᕿᒥ ᕿᒥᕈᓗᑎᒃ ᑕᒪᑐᓂᖓ ᓴᓗᒪᓴᑕᐅᔪᓂ ᐊᒪᓗ ᐅᓂᑲᒥ ᑐᓂᓯᓚᐅᑐᑦ ᔪᓚᐃ 22, 2003ᖑᑎᓗᒍ. ᐊᔾᖓᓂ ᑕᓱᒪ ᐅᓂᒃᑳᑉ ᐊᒪᓗ ᑲᒥᑯᑦ ᑭᐅᔪᑎᖏᑦ ᐃᓚᐅᖅᑕᐅᔪᑦ ᐃᓚᒋᐊᕈᑖ ᓂ ᒥᑐᖅ.

ᐃᓄᓕᓐᓰᑐᖅᑯᑦ ᕿᒥᕈᑲᓂᓕᓚᐅᒥᔪᑦ ᒪᕈᕆᓕᕐᑕᖓᓂᒃ ᓯᑎᐱᕆ 8ᒥᑦ 10ᒧᑦ. ᓄᖑᐊᓂ ᓯᑎᐱᓐᐅᑉ, ᒪᕈᓕᕿᐅᑉ ᕿᒥᕈᔭᐅᓂᖓᑕ ᐅᓂᒃᑳᖓ ᓱᓕ ᐱᔭᐅᓚᐅᖏᑐᖅ.

11. ᐃᒪᕐᒥᒃ ᐊᑐᓂᖅ

ᑕᓐᐅᖑᖏᑐᕐᒥᒃ ᐃᒪᕐᒥᒃ ᐊᑐᓂᖅ ᔭᓄᐊᓐᒥᑦ ᓯᑎᐱᓐᒧᑦ 113,000 ᑭᐸᓐᓯᓯᒪᔪᑦ ᒥᑕᒥ ᐊᑐᓚᐅᑐᑦ. ᓄᖑᐊᓂ ᐊᕐᒍᔪᑉ ᐊᑐᓂ ᐃᒪᒥ ᓂᓐᐅᓇᕐᑐᖅ ᑐᖓᓂᓂᐊᑐᖅ ᐃᓱᓕᑦᕕᐊᑕ ᐃᒪᒧ ᐱᔪᓇᐅᑎᐅᑉ.

12. ᐅᐸᑕᐅᓯᒪᓗᓂ ᖃᐅᔨᓴᓂᖅ ᑕᐃᑲᓂᓗᓂ

12.1. ᐊᒃᑕᕐᓯᓂᖅ ᐃᒍᑎᑕᐅᓯᒪᔪᓂ ᒪᕐᓗᒃᑯᓂᒃ ᐊᒪᓗ ᓱᕈᑎᓯᒪᔪᓂ ᓄᓇᓂᒃ

12.1.1 ᐊᒃᑕᓯᓂᖅ ᐃᒍᑎᑕᐅᓯᒪᔪᓂ ᒪᕐᓗᒃᑯᓂᒃ ᐊᐅᐸᑐᖅ ᕿᒥᒃᑯᓗᒧ ᐃᓗᑐᕐᑎᑕᐅᓯᒪᔪᕐᒧᑦ

ᐃᓚᒋᐊᕈᑖ ᓕ ᑮᖑᓕᓐᓂᒃ ᑕᒪᐃᓂ ᐊᒥᓱᓂᖏᓄᓗ ᑭᓱᒪᖔᑕᓗ ᖃᓄᐃᑐᐃ ᐃᒍᑎᑕᐅᓂᖏᑦ ᐃᒋᑕᓴᐅᒪᖔᑕ ᐃᓗᕐᓴᕐᒧᑕᐅᔪᑦ.

12.1.2 ᐊᒃᑕᓯᓂᖅ ᐃᒍᑎᑕᐅᓯᒪᔪᑦ ᒪᕐᓗᒃᑯᓄᑦ ᐃᓕᕐᑯᓯᑐᖅᑲᕕᓂᖓᓄ ᐅᑎᑎᑕᐅᓇᓱᓂᖓ

ᐅᒪ ᓯᕗᓂᐊᓂ, ᐅᐱᕈᓱᓚᐅᑐᑦ ᑕᐃᑯᐊ ᐃᒋᑕᓴᐅᔪᑦ ᑎᑎᕋᕐᓯᒪᔪᑦ ᑕᕗᖓᑐᓴᐃᑦ ᐊᓯᐅᓇᓱᒋᔭᐅᓗᑎᒃ ᒪᕈᓕᕿᒥᑐᑦ ᐃᒍᑎᑕᐅᕙᓕᐊᓕᓵᕐᑎᓗᒋᑦ. ᑕᒪᕐᒥᑲᓴᒃ ᑎᑎᕋᕐᓯᒪᔪᑦ ᓇᓂᔭᐅᓯᒪᓕᕐᑐᑦ ᐊᒪᓗ ᐃᓚᐅᓗᑎᒃ ᑕᕙᓂ ᑎᑎᕋᕐᓯᒪᔪᓂ ᐃᓚᒋᐊᕈᑖ ᔨ ᒥᑐᑦ

12.1.3 ᐊᒃᑕᕿᓯᓂᖅ ᓴᕕᕋᔭᓂᒃ/ᐅᕐᓱᐊᓗᕕᓂᕐᓂᒃ ᑐᐊᕙᖕᒥᑦ ᓱᕈᓯᒪᔪᓂ ᓄᓇᐅᑉ ᐊᑕᓄᑕᐅᓂᖏᑦ ᐅᔭᕋᑕᕕᐅᔪᓄᑕᐅᓂᖏᑦ

ᐃᓚᒋᐊᕈᑖ ᓇ ᓄᓇᖑᐊᕐᑕᓕᒃ ᐊᒪᓗ ᐊᒥᔪᓂᖏᑦ ᓴᕕᕋᔦᐃᑦ ᐊᒪᓗ ᓱᕈᑕᐅᓯᒪᔪᑦ ᐅᕐᓱᐊᓗᕈᔪᓄᑦ ᓄᓇᐃᑦ ᓄᓇᐅᑉ ᐊᑕᓄᖃᑕᐅᔪᑦ..

12.2. ᐅᓇᕐᓂᖏᑕ ᖃᐅᔨᓴᐅᑎᖏᑦ

12.2.1. ᒋᐊᕈ̇ ᑕᓯᐅᑉ ᖁᖓᑕ ᓯᒥᖓ

ᐅᓇᓂᖓᑕ ᐅᖃᓕᒪᑕᐅᓂᖏᑦ ᐃᒥᕐᑕᕕᒥᑦ ᑕᓯᐅᑉ ᓯᒥᖓᓂ ᐅᓂᑲᐅᓯᐅᔪᑦ ᐃᓚᒋᐊᕈᑖ ᓇ ᒥᑐᑦ.

12.2.2. ᐊᑐᕐᑕᐅᔪᖅ ᐊᒃᑕᕐᕕᒃ

ᐅᓇᓂᖓᑕ ᐅᖃᓕᒪᑕᐅᓂᖏᑦ ᐊᑐᕐᑕᐅᔪᖅ ᐊᒃᑕᕐᕕᒥ ᐅᓂᑲᐅᓯᐅᔪᑦ ᐃᓚᒋᐊᕈᑖ ᐅ ᒥᑐᑦ.

12.2.3. ᐃᓗᓴᓕᐊᖑᓯᒪᔪᖅ ᐊᐅᐸᑐᖅ ᕿᒥᑯᓗᒃ

ᐅᓇᓂᖓᑕ ᖃᐅᔨᓴᕈᑎᖏᑦ ᐊᖅᑕᐅᓖᖏᑐᑦ ᑭᓯᐊᓂ ᑕᐃᑯᐊ ᐃᒋᑕᐅᔪᒃᓴᑦ ᐃᓗᓴᓕᐊᖑᓯᒪᔪᕐᒧᑦ ᐱᔭᕆᑕᐅᐸᑕ 2004ᖑᓕᕐᐸᑦ.

12.3 ᐅᔭᕋᖓᑕ ᖃᓄᐃᓕᖓᓂᖓᑕ ᖃᐅᔨᓴᑕᐅᓂᖏᑦ

12.3.1. ᐅᔭᕋᖓᑕ ᖃᓄᐃᓕᖓᓂᖓᑕ ᖃᐅᔨᓴᑕᐅᓂᖓ ᐃᒥᕐᑕᕕᐅᑉ ᑯᖓᑕ ᓯᒥᖓ

ᕿᒥᕈᓂ ᖃᐅᔨᓴᓂᐅᓚᐅᑐᖅ ᑲᔪᓯᑎᑕᐅᓚᐅᑐᖅ ᐃᐱᐊ ᓴᓇᔨᖏᓄᑦ ᑕᕙᓂ ᐃᓚᐅᓗᓂ ᐃᓚᒋᐊᕈᑖ ᐳ ᒥᑐᖅ.

12.3.2. ᐅᔭᕋᖓᑕ ᖃᓄᐃᓕᖓᓂᖓᑕ ᖃᐅᔨᓴᑕᐅᓂᖓ ᐊᑐᕐᑕᐆᑉ ᐊᒃᑕᕕᐅᑉ ᖃᐸᓴᖓ

ᕿᒥᕈᓂᐅᓚᐅᑐᖅ ᖃᐅᔨᓴᓗᑎᒃ ᑲᔪᓯᑎᑕᐅᓚᐅᑐᖅ ᐃᐱᐊ ᓴᓇᔨᖏᓄᑦ ᐊᒪᓗ ᑕᕙᓂ ᐃᓚᐅᓗᓂ ᐃᓚᒋᐊᕈᑖ ᑐ ᒥᑐᖅ.

12.3.3. ᐅᔭᕋᖓᑕ ᖃᓄᐃᓕᖓᓂᖓᑕ ᖃᐅᔨᓴᑕᐅᓂᖏᑦ

ᒥᔅᑕ ᑯᓇᕙ ᕕᑐᓂᐊᒃ, ᐅᒪ ᓯᕗᓂᐊᓂ ᐊᖓᔪᖃᓇᔭᐅᓚᐅᑐᖅ ᐅᔭᕋᓯᐅᕐᑏᑦ ᓴᓇᔨᖏᓄᑦ ᒪᕈᓕᕿᒥ. ᐅᓂᑲᓕᐅᓚᐅᑐᖅ ᐅᑎᑎᑕᐅᓂᓴᖓ ᒪᕐᓗᑯᐃᑦ ᖃᐸᓴᖓᑕ ᒥᒃᓴᓄᑦ. ᓄᖃᓇᐊᕈᑖᑦ ᐃᓱᒪᒋᔭᒥᓂ ᑎᑎᖃᓗᓂ ᐅᖃᓯᒪᔪᖅ ᐊᓯᖓᖏ "ᑲᑕᕕᒃ" ᓄᓇᖓ ᐅᑎᑎᑕᐅᓂᓴᖓᑕ ᑐᐊᐸᑕᕕᐅᓂᐊᑑᑉ, ᑲᑕᓂᓇᓚᔭᕐᑕᖑᒎᖅ ᐃᓱᓛᓗᓇᖏᑐᖅ. ᒪᓕᑕᐅᔪᓇᑐᕐᒥ ᐅᖃᐅᓯᖃᓯᒪᔪᖅ ᖃᐅᔨᓴᑕᐅᓯᐊᕐᓗᓂ ᐊᒥᐊᑯᒋᓕᑕᖓᑕ ᖃᐅᔨᓴᕕᖏᑦ ᑲᔪᓯᑎᑕᐅᔭᕆᐊᓖᑦ ᐊᐅᔭᖓᓂ 2004. ᑕᒪᓇ ᖃᐅᔨᓴᓂᐅᔪᖅ ᑐᑭᓯᓇᓯᑎᓯᓂᐊᑐᖅ ᖃᓄᐃᓕᖓᓕᓂᕆᔭᖓᓂᒃ ᖃᓄᐃᐸᓕᐊᒪᖔᑦ ᑕᐃᓇ ᑲᑖᓂᐊᓗᕆᔭᕐᑑᑉ ᖃᓄᐃᑐᓕᓂᖓ ᖃᐅᔮᔭᐅᓕᕋᔭᕐᒪᑦ. ᑕᐃᓱᒪᓂᐅᓕᕐᐸᑦ ᐅᐱᓇᕐᑐᓂᒃ ᓯᕗᓂᑎᓂ ᑲᑐᖃᕋᔭᒪᖔᑦ ᓄᓇᒥᒃ ᑕᐃᓇ ᑲᑦᕕᒃ ᖃᓄᐃᑲᔭᒪᖔᑦ ᐃᓱᒪᓕᐅᕈᓇᓯᒪᔭᕐᑐᑦ ᐊᒪᓗ ᐱᔪᒥᓇᓂᓴᐅᒍᖅ ᑕᐃᓱᒪᓂᐅᓕᕐᐸᑦ ᖃᓄᑐᕈᑏᑦ ᐅᐸᓗᖓᐃᔭᑕᐅᓕᕐᓗᑎᒃ. ᒥᔅᑕ ᕕᑐᓂᐊᑉ ᐅᓂᑲᖓ ᐃᓚᐅᖃᑕᐅᔪᖅ ᐃᓚᒋᐊᕈᑖ ᑯ ᒥᑐᖅ..

12.4. ᐃᑎᓂᖓᑕ ᖃᐅᔨᓴᑕᐅᓂᖓ ᒋᐊᕈ ᐃᒪᖓ

ᖃᐅᔨᓴᓂᐅᔪᖅ ᓯᕕᖓᓂᖓᓂᒃ ᑕᓯᐅᑉ ᐃᖃᖓᓂᒃ ᐊᒪᓗ ᐊᒥᐊᑯᕐᓗᑯᐃᑦ ᐃᖃᖓᓄᖃᑕᕐᑐᑦ ᖃᐅᔨᓴᑕᐅᓚᐅᑐᑦ ᐊᓚᓯᐅᑎᓗᒍ ᐊᒪᓗ ᓄᓇᖑᐊ ᑕᕙᓂ ᐃᓚᐅᔪᖅ ᐃᓚᒋᐊᕈᑖ ᒍ ᒥᑐᖅ.

13. ᐃᒥᕐᑕᕐᕕᐅᑉ ᑕᓯᐅᑉ ᓄᓇᖓᑕ ᖁᓕᓇᓂᖏᑕ ᖃᐅᔨᓴᑕᐅᓂᖓ

ᐃᒪᒧᑦ ᐱᔭᓇᐅᑎᒃ ᐅᖃᓯᒪᒪᑦ ᐃᒪᓂ ᐱᖅᑕᕐᖁᔨᓗᑎᒃ ᖃᐅᔨᓴᕈᑎᓂᒃ ᐃᑎᓕᓇᖑᔪᕐᓂᑦ ᐃᒪᒥᑦ ᒋᐊᕈ̇ ᑕᓯᕐᒥᑦ ᓯᑯᖃᖏᓂᕐᐸᓯᐊᖑᓕᕐᐸᑦ ᐊᐅᔭᑯᑦ. ᐊᐅᓚᐅᑎᕈᔪᓄᖓᔪᓄᑦ ᐊᑲᐅᖏᓕᐅᕈᑎᖃᓚᐅᓂᖓ ᑲᔪᓯᑎᖏᔪᑕᐅᓕᓚᐅᑐᖅ ᐊᐅᔭᖓᓂ ᐃᒪᒥ ᐱᔭᓇᐊᖅᑯᓗᐊᓗᑕ ᐱᓚᐅᖏᑐᒧᑦ ᑭᓯᐊᓂ ᓯᑯᖓ ᐊᑐᕐᓇᕈᓂᕐᐸᑦ ᐱᓱᒃᕕᐅᔭᓇᕐᓯᒃᐸᑦ ᐱᓛᕐᑐᒧᑦ.

14. ᓇᐃᓕᒋᐊᕐᓯᒪᔪᖅ ᑰᑉᐸᓕᐊᑉᔪᑉ ᖃᐅᔨᓴᑕᐅᓂᖓ ᑰᑉᐸᓕᐊᔪᕐᒧ ᖃᓄᐃᓕᖓᓕᐸᓕᐊᓂᕆᔭᖓᑕ ᖃᐅᔨᓴᑕᐅᓂᖓ

ᐃᓚᒋᐊᕈᑖ ᓱ ᑎᑎᕋᓯᒪᔪᕐᑕᓕᒃ ᑰᒥᒃ ᖃᐅᔨᓴᓂᐅᑉ ᖃᐅᔨᔭᐅᓂᖏᓂᒃ ᑕᐃᒪᐃᖁᔭᐅᒪᑕ ᓴᕕᕐᔭᓴᓂ ᐅᔭᕐᓯᐅᕐᑏᑦ ᑯᓕᕆᖃᑕᕐᑐᑦ ᒪᓕᒐᖏ ᒪᓕᓗᒋᑦ.

15. ᓇᐃᓕᒋᐊᕐᓯᒪᔪᑦ ᖃᐅᔨᓴᑕᐅᓂᖓ ᐊᕙᑎᖓ ᖃᓄᐃᓕᖓᓕᒪᖔᑦ

ᐊᒐᓯᐅᑎᓗᒍ ᒪᓕᕐᑯᒧᑕ ᓴᕕᕐᔭᓴᓂ ᐅᔭᕐᓯᐅᕐᑏᑦ ᑯᓕᕆᖃᑕᕐᑐᑦ ᒪᓕᒐᖏᓂᒃ, ᖃᐅᔨᓴᑐᖃᓚᐅᑐᖅ ᐃᒪᖓ ᖃᓄᑎᒋ ᐱᐅᑎᒋᒪᖐᑦ ᐊᒪᓗ ᓴᕕᕐᔭᖃᓂᖓ ᐃᖃᖓ ᒋᐊᕈ ᑰᖓᓂᑦ. ᐊᒪᓗᑲᓂᖅ, ᒋᐊᕈ ᑲᖏᓱᖓᓂ ᐃᒪᖓ ᖃᓄᑎᒋ ᐱᐅᑎᒋᒪᖐᑦ, ᓴᕕᕐᔭᓴᖃᒪᖐᑦ ᐃᖃᖓᓂ ᐊᒪᓗ ᐊᒧᒪᔪᕐᓂ ᖃᐅᔨᓴᕐᑕᐅᓚᐅᕐᑐᑦ. ᖃᐅᔨᔭᐅᔪᑦ ᑐᓂᕈᑕᐅᓛᕐᑐᑦ ᐊᕙᑎᓕᕆᔨᑯᓄᑦ ᐊᕐᒎᑉ ᓄᖑᐊᓂ. ᖃᐅᔨᔭᐅᓚᐅᑐᑦ ᐊᒐᓯᐅᑎᓗᒍ ᖃᐅᔨᓴᕈᑎᕙᓃᑦ ᐊᑐᑕᐅᓛᕐᑐᑦ ᖃᐅᔨᓴᑲᓂᓕᕐᐸᑕ ᖃᐅᔨᓴᕆᐊᖃᓂᖏᑦ ᒪᓕᓗᒍ 2004ᒥ.

16. ᓇᐃᓕᒋᐊᓯᒪᔪᖅ ᒋᐊᕈ ᑕᓯᖓᑕ ᐃᒪᒥᐅᑕᓕᕆᔨᑯᑦ ᖃᐅᔨᓴᓂᖏᓂᖏᑕ ᖃᓄᐃᑐᓂᕆᔭᖏᑦ ᖃᓄᐃᓕᖓᓕᒪᖔᑕ

ᐊᒐᓯᐅᑎᓗᒍ ᒪᕈᓕᕿᒥ ᖃᐅᔨᓴᓂᐅᓚᐅᑐᖅ ᑕᐃᒪᐃᖁᔨᐅᓂᖓᓄᑦ ᐃᒪᒥᐅᑕᓕᕆᔨᑯᓄᑦ ᐃᒪᒥᐅᑕᓕᕆᔨᑯᑦ ᐊᖏᓂᕆᔭᖓ ᑲᔪᓯᑎᐊᓚᐅᑐᖅ. ᐱᔭᐅᔭᕆᐊᓖᑦ ᖃᐅᔨᓴᑕᐅᔪᓴᐃᑦ ᐃᒪᐃᑦ, ᐃᖃᖓᓂ ᐱᔭᐅᔪᓗ, ᑲᓇᔪᐃᓗ ᒋᐊᕈ ᑕᓯᖓᓂ ᐱᔭᐅᓚᐅᑐᑦ. ᖃᐅᔨᔭᐅᔪᑦ ᖃᐅᔨᓴᑕᐅᓂᒥᑦ ᐅᓂᑲᓂᖃᑕᐅᓚᕐᑑᑦ 2004ᖑᓕᕐᐸᑦ.

APPENDIX 2

SURFACE MELT WATER

SAMPLE ANALYSIS

POLARIS MINE

MELT WATER SAMPLE ANALYSIS RESULTS

JULY 2, 2003

Project	Polaris 23-305 Soil/Water Analysis
Report to	Gartner Lee Ltd.
ALS File No.	T1168
Date Received	05-07-03
Date:	14-07-03

RESULTS OF ANALYSIS

		U/G Water #1	Melt Water #2
Sample ID		U/G Water #1	Melt Water #2
Date Sampled		02-07-03	02-07-03
Time Sampled			
ALS Sample ID		9	10
Nature		Water	Water
Physical Tests			
Hardness	CaCO3	459	289
Total Metals			
Aluminum	T-Al	<0.02	0.01
Antimony	T-Sb	<0.001	<0.0005
Arsenic	T-As	<0.002	<0.001
Barium	T-Ba	0.04	0.03
Beryllium	T-Be	<0.005	<0.005
Boron	T-B	0.3	0.3
Cadmium	T-Cd	0.0007	0.00033
Calcium	T-Ca	151	86.6
Chromium	T-Cr	<0.001	<0.0005
Cobalt	T-Co	0.003	0.0009
Copper	T-Cu	0.007	0.014
Iron	T-Fe	<0.03	<0.03
Lead	T-Pb	0.044	0.027
Lithium	T-Li	<0.05	<0.05
Magnesium	T-Mg	20	17.8
Manganese	T-Mn	0.11	0.02
Mercury	T-Hg	<0.0002	<0.0002
Molybdenum	T-Mo	0.003	0.003
Nickel	T-Ni	0.01	0.005
Selenium	T-Se	<0.004	<0.002
Silver	T-Ag	<0.0001	<0.00005
Sodium	T-Na	36	31
Thallium	T-Tl	<0.0004	0.0003
Titanium	T-Ti	<0.05	<0.05
Uranium	T-U	0.0014	0.0013
Vanadium	T-V	<0.03	<0.03
Zinc	T-Zn	1.65	1.07
Inorganic Parameters			
Sulphide	S	<0.02	<0.02
Extractable Hydrocarbons			
EPH10-19		8.4	0.8
EPH19-32		<1	

APPENDIX 3

ANALYSIS OF

FREEZE PIPE GLYCOL

AND

SOIL SAMPLES FOR GLYCOL CONTAMINATION

POLARIS MINE - ANALYSIS OF DOCK FREEZE PIPE COOLANT

Project	Polaris Soil/Product Analysis
Report to	Gartner Lee Ltd.
ALS File No.	S8818
Date Received	02/06/2003
Date:	10/06/2003

RESULTS OF ANALYSIS

Sample ID	DOCK-1- 270503
Date Sampled	27/05/2003
Time Sampled	
ALS Sample ID	13
Nature	Product
Physical Tests	
Moisture %	-
Glycols	
Diethylene Glycol	Found
Ethylene Glycol	Found
1,2-Propylene Glycol	Not Found
Polycyclic Aromatic Hydrocarbons	
Acenaphthene	-
Acenaphthylene	-
Anthracene	-
Benz(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(g,h,i)perylene	-
Benzo(k)fluoranthene	-
Chrysene	-
Dibenz(a,h)anthracene	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-c,d)pyrene	-
Naphthalene	-
Phenanthrene	-
Pyrene	-
Extractable Hydrocarbons	
EPH10-19	-
EPH19-32	-
LEPH	-
HEPH	-

Footnotes:

POLARIS MINE - ANALYSIS OF DOCK FREEZE PIPE COOLANT

Project	Polaris Soil/Product Analysis
Report to	Gartner Lee Ltd.
ALS File No.	S8818
Date Received	02/06/2003
Date:	10/06/2003

DETECTION LIMITS

Sample ID	DOCK-1- 270503
Date Sampled	27/05/2003
Time Sampled	
ALS Sample ID	13
Nature	Product
Physical Tests	
Moisture %	-
Glycols	
Diethylene Glycol	5
Ethylene Glycol	5
1,2-Propylene Glycol	5
Polycyclic Aromatic Hydrocarbons	
Acenaphthene	-
Acenaphthylene	-
Anthracene	-
Benz(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(g,h,i)perylene	-
Benzo(k)fluoranthene	-
Chrysene	-
Dibenz(a,h)anthracene	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-c,d)pyrene	-
Naphthalene	-
Phenanthrene	-
Pyrene	-
Extractable Hydrocarbons	
EPH10-19	-
EPH19-32	-
LEPH	-
HEPH	-

POLARIS MINE - DOCK SOIL SAMPLES TESTED FOR GLYCOL CONTAMINATION

Project Polaris Soil Analysis 23-305
Report to Gartner Lee Ltd.
ALS File No. S8646
Date Received 28/05/2003
Date: 05/06/2003

RESULTS OF ANALYSIS

Sample ID	Dock-62-I	Dock-63-I	Dock-66-I	Dock-67-I	Dock-72-I	Dock-73-I	Dock-74-I
Date Sampled	23/05/2003	23/05/2003	23/05/2003	23/05/2003	23/05/2003	23/05/2003	23/05/2003
Time Sampled							
ALS Sample ID	1	2	3	4	5	6	7
Nature	Sediment/Soil	Sediment/Soil	Sediment/Soil	Sediment/Soil	Sediment/Soil	Sediment/Soil	Sediment/Soil
Physical Tests							
Moisture %	5.6	5	4.6	4.9	6.6	6.6	4.9
pH	-	7.54	7.96	-	-	-	7.29
Total Metals							
Antimony T-Sb	-	-	<20	-	-	-	-
Arsenic T-As	-	-	<10	-	-	-	-
Barium T-Ba	-	-	325	-	-	-	-
Beryllium T-Be	-	-	<1	-	-	-	-
Cadmium T-Cd	-	-	20	-	-	-	-
Chromium T-Cr	-	-	8	-	-	-	-
Cobalt T-Co	-	-	<4	-	-	-	-
Copper T-Cu	-	-	22	-	-	-	-
Lead T-Pb	-	11200	4510	-	-	-	8570
Mercury T-Hg	-	-	0.08	-	-	-	-
Molybdenum T-Mo	-	-	<8	-	-	-	-
Nickel T-Ni	-	-	16	-	-	-	-
Selenium T-Se	-	-	<4	-	-	-	-
Silver T-Ag	-	-	<4	-	-	-	-
Tin T-Sn	-	-	<10	-	-	-	-
Vanadium T-V	-	-	47	-	-	-	-
Zinc T-Zn	-	18700	8620	-	-	-	23900
Glycols							
Diethylene Glycol	<10	<10	<10	<10	<10	<10	<10
Ethylene Glycol	<10	<10	<10	<10	<10	<10	<10
1,2-Propylene Glycol	<10	<10	<10	<10	<10	<10	<10

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

POLARIS MINE - DOCK SOIL SAMPLES TESTED FOR GLYCOL CONTAMINATION

Project	Polaris Soil Analysis 23-305
Report to	Gartner Lee Ltd.
ALS File No.	S8646
Date Received	28/05/2003
Date:	05/06/2003

DETECTION LIMITS

Sample ID	Dock-62-I	Dock-63-I	Dock-66-I	Dock-67-I	Dock-72-I	Dock-73-I	Dock-74-I
Date Sampled	23/05/2003	23/05/2003	23/05/2003	23/05/2003	23/05/2003	23/05/2003	23/05/2003
Time Sampled							
ALS Sample ID	1	2	3	4	5	6	7
Nature	Sediment/Soil	Sediment/Soil	Sediment/Soil	Sediment/Soil	Sediment/Soil	Sediment/Soil	Sediment/Soil
Physical Tests							
Moisture %	0.1	0.1	0.1	0.1	0.1	0.1	0.1
pH	-	0.01	0.01	-	-	-	0.01
Total Metals							
Antimony T-Sb	-	-	20	-	-	-	-
Arsenic T-As	-	-	10	-	-	-	-
Barium T-Ba	-	-	2	-	-	-	-
Beryllium T-Be	-	-	1	-	-	-	-
Cadmium T-Cd	-	-	1	-	-	-	-
Chromium T-Cr	-	-	4	-	-	-	-
Cobalt T-Co	-	-	4	-	-	-	-
Copper T-Cu	-	-	2	-	-	-	-
Lead T-Pb	-	100	100	-	-	-	50
Mercury T-Hg	-	-	0.05	-	-	-	-
Molybdenum T-Mo	-	-	8	-	-	-	-
Nickel T-Ni	-	-	10	-	-	-	-
Selenium T-Se	-	-	4	-	-	-	-
Silver T-Ag	-	-	4	-	-	-	-
Tin T-Sn	-	-	10	-	-	-	-
Vanadium T-V	-	-	4	-	-	-	-
Zinc T-Zn	-	2	2	-	-	-	1
Glycols							
Diethylene Glycol	10	10	10	10	10	10	10
Ethylene Glycol	10	10	10	10	10	10	10
1,2-Propylene Glycol	10	10	10	10	10	10	10

POLARIS MINE - DOCK SOIL SAMPLES TESTED FOR GLYCOL CONTAMINATION

Project	Polaris Soil Analysis
Report to	Gartner Lee Ltd.
ALS File No.	T5093
Date Received	10/10/2003
Date:	20/10/2003

RESULTS OF ANALYSIS

Sample ID	DOCK- 262-I	DOCK- 264-F	DOCK- 265-F
Date Sampled	07/10/2003	07/10/2003	07/10/2003
Time Sampled			
ALS Sample ID	12	13	14
Nature	Sediment/Soil	Sediment/Soil	Sediment/Soil
Physical Tests			
Moisture %	-	12.6	8.4
pH	-	-	-
Total Metals			
Antimony T-Sb	-	-	-
Arsenic T-As	-	-	-
Barium T-Ba	-	-	-
Beryllium T-Be	-	-	-
Cadmium T-Cd	-	-	-
Chromium T-Cr	-	-	-
Cobalt T-Co	-	-	-
Copper T-Cu	-	-	-
Lead T-Pb	977	-	-
Mercury T-Hg	-	-	-
Molybdenum T-Mo	-	-	-
Nickel T-Ni	-	-	-
Selenium T-Se	-	-	-
Silver T-Ag	-	-	-
Tin T-Sn	-	-	-
Vanadium T-V	-	-	-
Zinc T-Zn	3140	-	-
Glycols			
Diethylene Glycol	-	<10	<10
Ethylene Glycol	-	<10	<10
1,2-Propylene Glycol	-	<10	<10
Polycyclic Aromatic Hydrocarbons			
Acenaphthene	-	-	<0.04
Acenaphthylene	-	-	<0.05
Anthracene	-	-	<0.05
Benz(a)anthracene	-	-	<0.05
Benzo(a)pyrene	-	-	<0.05
Benzo(b)fluoranthene	-	-	<0.05
Benzo(g,h,i)perylene	-	-	<0.05
Benzo(k)fluoranthene	-	-	<0.05
Chrysene	-	-	<0.05
Dibenz(a,h)anthracene	-	-	<0.05
Fluoranthene	-	-	<0.05
Fluorene	-	-	<0.05
Indeno(1,2,3-c,d)pyrene	-	-	<0.05
Naphthalene	-	-	<0.05
Phenanthrene	-	-	<0.05
Pyrene	-	-	<0.05
Extractable Hydrocarbons			
EPH10-19	-	<200	<200
EPH19-32	-	<200	<200
LEPH	-	-	<200
HEPH	-	-	<200

Footnotes:

POLARIS MINE - DOCK SOIL SAMPLES TESTED FOR GLYCOL CONTAMINATION

Project	Polaris Soil Analysis
Report to	Gartner Lee Ltd.
ALS File No.	T5093
Date Received	10/10/2003
Date:	20/10/2003

DETECTION LIMITS

Sample ID	DOCK- 262-I	DOCK- 264-F	DOCK- 265-F
Date Sampled	07/10/2003	07/10/2003	07/10/2003
Time Sampled			
ALS Sample ID	12	13	14
Nature	Sediment/Soil	Sediment/Soil	Sediment/Soil
Physical Tests			
Moisture %	-	0.1	0.1
pH	-	-	-
Total Metals			
Antimony T-Sb	-	-	-
Arsenic T-As	-	-	-
Barium T-Ba	-	-	-
Beryllium T-Be	-	-	-
Cadmium T-Cd	-	-	-
Chromium T-Cr	-	-	-
Cobalt T-Co	-	-	-
Copper T-Cu	-	-	-
Lead T-Pb	100	-	-
Mercury T-Hg	-	-	-
Molybdenum T-Mo	-	-	-
Nickel T-Ni	-	-	-
Selenium T-Se	-	-	-
Silver T-Ag	-	-	-
Tin T-Sn	-	-	-
Vanadium T-V	-	-	-
Zinc T-Zn	2	-	-
Glycols			
Diethylene Glycol	-	10	10
Ethylene Glycol	-	10	10
1,2-Propylene Glycol	-	10	10
Polycyclic Aromatic Hydrocarbons			
Acenaphthene	-	-	0.04
Acenaphthylene	-	-	0.05
Anthracene	-	-	0.05
Benz(a)anthracene	-	-	0.05
Benzo(a)pyrene	-	-	0.05
Benzo(b)fluoranthene	-	-	0.05
Benzo(g,h,i)perylene	-	-	0.05
Benzo(k)fluoranthene	-	-	0.05
Chrysene	-	-	0.05
Dibenz(a,h)anthracene	-	-	0.05
Fluoranthene	-	-	0.05
Fluorene	-	-	0.05
Indeno(1,2,3-c,d)pyrene	-	-	0.05
Naphthalene	-	-	0.05
Phenanthrene	-	-	0.05
Pyrene	-	-	0.05
Extractable Hydrocarbons			
EPH10-19	-	200	200
EPH19-32	-	200	200
LEPH	-	-	200
HEPH	-	-	200

APPENDIX 4

UPDATE OF

DECOMMISSIONING AND RECLAMATION

SCHEDULE

POLARIS MINE - DECOMMISSIONING & RECLAMATION SCHEDULE

UPDATED AS OF September 24, 2003

ACTIVITY	Prior Periods	3rd Qtr. 2003			4th Qtr. 2003			1st Qtr. 2004			2nd Qtr. 2004			3rd Qtr. 2004		
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
CONTRACTOR MOBILIZATION																
Pre-mobilization Planning / Order Materials/Equip																
Ship to Site with Contractor Equipment																
Offload Ship																
Setup Warehousing/Laydown Area																
SETUP TEMPORARY FACILITIES																
DECOMMISSIONING UNDERGROUND																
Remove / Salvage Mine Equipment & Crusher	Cancelled															
Remove Refrigeration Plant																
Remove Surface Ventilation Fans																
Seal Mine Openings																
MILL / BARGE DEMOLITION																
Initial Cleanup of Barge by Teck Cominco																
Removal of Barge Services																
Transfer fuel to Tank Farm & Clean Hull																
Remove hazardous Materials / Wastes																
Remove / Salvage Process Equipment																
Demolish Internal Equipment																
Demolish Structure																
Remove Hydrocarbon/Metals Contaminated Soils																
Regrade Area Surounding Barge																
PRODUCT STORAGE BUILDING DEMOLITION																
Cleanup of Building / Remove Liquids from Equip.																
Demolish Exterior Conveyors																
Demolish Reclaim Conveyors																
Remove Cladding from Building																
Demolish Structure																
Demolish Foundations																
Remove Contaminated Soils																
Regrading Area																
SHIP LOADER / RECLAIM CONVEYOR DEMOL.																
Cleanup of Conveyor Areas/Remove Oils																
Demolish Conveyors																

POLARIS MINE - DECOMMISSIONING & RECLAMATION SCHEDULE

UPDATED AS OF September 24, 2003

ACTIVITY	Prior Periods	3rd Qtr. 2003			4th Qtr. 2003			1st Qtr. 2004			2nd Qtr. 2004			3rd Qtr. 2004		
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
DOCK DECOMMISSIONING																
Inspect / Remove Glycols from Freeze Pipes																
Remove Metals Contaminated Soils																
Remove Cells 1 & 2																
Remove Cells 3 & 4																
Removal of Temporary Dock																
Shoreline Recontouring																
Berm Removal																
Grade New Beach to Final Profiles																
TAILINGS SYSTEM DEMOLITION																
Final Cleanup of Thickener																
Flush Tails Lines																
Salvage Equipment																
Remove hazardous Materials / Wastes																
Remove Tails Line / Return Line																
Demolish Equipment																
Demolish Structure																
Remove Foundations																
Remove Contaminated Soils																
Regrading																
GARROW LAKE / DAM DECOMMISSIONING																
Drawdown Lake																
Removal of Centre Section of Dam																
Creek Channel Construction																
Final Grading / Armouring of Dam Remnants																
CRF PLANT DEMOLITION																
Final Cleanup of Plant																
Remove hazardous Materials / Wastes																
Demolish Plant Equipment																
Demolish Buildings																
Site Grading (Plant & Surrounding Area)																

POLARIS MINE - DECOMMISSIONING & RECLAMATION SCHEDULE

UPDATED AS OF September 24, 2003

	Prior	3rd Qtr. 2003			4th Qtr. 2003			1st Qtr. 2004			2nd Qtr. 2004			3rd Qtr. 2004		
ACTIVITY	**Periods**	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
ACCOMODATIONS COMPLEX DEMOLITION																
Establish Temporary Offices / Building Services																
Use Accomodations Complex																
Establish Temporary Camp Accomodations																
Use Temporary Camp																
Remove hazardous Materials / Wastes																
Demolish Buildings																
Regrade Area																
Remove Temporary Camp																
FUEL STORAGE (TANK FARM) DEMOLITION																
Use with Temporary Modifications																
Transfer Fuel to Temporary Storage																
Cleaning of Tanks / Piping																
Demolish Tanks / Piping																
Cleanup of Berm & Liner																
Site Grading																
BLADDER AREA CONTAMINATED SOILS																
Cleanup of Hydrocarbon Soils																
Area Grading																
MISC. BUILDING DEMOLITION																
Exploration Quonset Huts																
Core Shack (Atco Trailer)																
Emergency Shelter at North Portal																
Steam Wash Bay & Tire Shop (relocated in 3rd Qtr)																
Generator Building																
Bent Horn Building																
Dock Office Trailer (relocated in 3rd Qtr)																
Airstrip Storage Hut																
Fresh Water Pump House																
Frsh Water Tank & Shed																
Carpenter Shop (used as temp. warehouse)																
Shipping Containers (Sea Cans - more to move on-going)																
Foldaways by Temporary Dock (3)																
Firehall																

POLARIS MINE - DECOMMISSIONING & RECLAMATION SCHEDULE
UPDATED AS OF September 24, 2003

	Prior	3rd Qtr. 2003			4th Qtr. 2003			1st Qtr. 2004			2nd Qtr. 2004			3rd Qtr. 2004		
ACTIVITY	Periods	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
OPERATIONAL LANDFILL CLOSURE																
Reclocate Construction Landfill																
Hauling Landfill Cover Cap Material																
LRD QUARRY Landfill																
Cut Notch into Quarry / Construct Haul Road																
Installation of Thermistor Pipe Stands																
Placing debris in Quarry																
Grading of Notch to Match Cap																
Placement of Cap and Final Grading																
Installation of Thermistors into Pipes																
MISC. SITE RECLAMATION & EARTHWORKS																
Reduction in spare parts/supplies by TCML																
Ship Mill Process Chemicals South for Sale/Recycle																
Site Cleanup of scrap material during operations																
Regrading North 40 Area																
Grading of Reclamation Landfill Area																
Road Closure / Culvert Removals/Runway																
DEMOBILIZE FROM SITE																
Prepare Equipment / Supplies for shipping from site																
Prepare Residual Chemicals / Wastes for shipping																
Last Ship from Polaris																

APPENDIX 5

UPDATE OF ESTIMATED

MINE DECOMMISSIONING, RECLAMATION

AND

MONITORING COSTS

POLARIS MINE DECOMMISSIONING, RECLAMATION AND MONITORING COST ESTIMATE
3rd QUARTER 2003 UPDATE

	BUDGET		SEPT 30, 2003 CLAIMED TO DATE		FORECAST FINAL PROJECT COST		NOTES
	By Code	Subtotals	By Code	Subtotals	By Code	Subtotals	
DEMOLITION & RECLAMATION (BARE COSTS)							
MINE EQUIPMENT REMOVAL							
Hazardous Materials Removal	35,845		853		30,845		
Mine Refrigeration Plant	145,525		14,281		92,044		
Mobile & Mine Equipment	2,919		2,524		22,919		
Remove Salvaged Mine Equipment	20,754		3,983		5,754		
Misc Sub Contract Costs	45,957		23,297		45,385		
		$ 251,000		$ 44,938		$ 196,947	
MINE ACCESS SEALING							
Seal Mine Portals	60,000		464		73,509		
		$ 60,000		$ 464		$ 73,509	
CONCENTRATOR BUILDING							
Miscellaneous Materials	22,092				-		
Mill Equipment Clean-Up - Fuels	16,398				-		
Mill Equipment Clean-Up	99,900		40,613		40,625		
Hazardous Materials Removal	151,117		94,476		147,099		
Barge Demolition	608,592		441,028		513,459		
Misc Process Equipment Demolition & Removal	197,432		183,317		183,346		
Misc Sub Contract Costs	88,469		83,898		87,013		
		$ 1,184,000		$ 843,332		$ 971,542	
CONCENTRATE STORAGE STRUCTURE & EQUIPMENT							
Concentrate Storage Equipment Clean-Up	26,117		1,905		1,900		
Conveyors	67,600		8,421		8,431		
Concentrate Storage Structure & Equipment	555,283		78,302		116,564		
		$ 649,000		$ 88,628		$ 126,895	
SHIP LOADER & CONVEYOR							
Conveyors	50,000		24,592		24,593		
		$ 50,000		$ 24,592		$ 24,593	
DOCK & SHORELINE							
Dock & Shoreline Reclamation	869,000		240,476		939,131		
		$ 869,000		$ 240,476		$ 939,131	
THICKENER & TAILINGS LINES							
Hazardous Materials Removal	22,577		16,452		16,456		
Tailings Thickener	377,423		91,269		113,259		
		$ 400,000		$ 107,721		$ 129,715	
GARROW LAKE							
Garrow Lake Siphons & Lake Drawdown	120,391		202,648		204,366		
Dam/Spillway Modifications	95,467		66,583		172,865		
Escalation Allowance	3,142				-		
		$ 219,000		$ 269,231		$ 377,231	
CRF PLANT STRUCTURE & EQUIPMENT							
CRF Plant Equipment Clean-Up	7,002		1,040		1,041		
CRF Plant Equipment Removal	17,533		9,406		9,404		
CRF Plant Buildings Demolition	130,455		23,497		23,517		
Misc Sub Contract Costs	11,010		46,766		46,764		
		$ 166,000		$ 80,709		$ 80,726	
ACCOMMODATION COMPLEX STRUCTURE & EQUIPMENT							
Accommodation Complex Building Demolition	249,000		10,211		171,125		
		$ 249,000		$ 10,211		$ 171,125	
FUEL STORAGE & HANDLING EQUIPMENT							
Miscellaneous Materials	3,681		2,531		(1,319)		
Purge & Decommission Fuel Tanks	53,404		296,235		319,000		
Hazardous Materials Removal	50,645		125,575		164,272		
Fuel Pumping & Distribution Systems	87,270				90,133		
		$ 195,000		$ 424,341		$ 572,086	
BUILDINGS & CONTAINERS							
Miscellaneous Materials	1,323				-		
Misc Warehouse / Shipping Equipment	1,221		3,292		3,292		
Misc Buildings Demolition	250,456		35,397		169,268		
		$ 253,000		$ 38,689		$ 172,560	
MISC CONTRACTOR LABOUR							
Unallocated Labour	133,000		79,131		129,027		
		$ 133,000		$ 79,131		$ 129,027	
GENERAL SITE GRADING							
Hazardous Materials Removal	44,719		20,938		46,870		
General Site Grading & Reclamation	7,129		207,612		201,505		
Escalation Allowance	4,152				-		
		$ 56,000		$ 228,550		$ 248,375	

POLARIS MINE DECOMMISSIONING, RECLAMATION AND MONITORING COST ESTIMATE
3rd QUARTER 2003 UPDATE

	BUDGET		SEPT 30, 2003 CLAIMED TO DATE		FORECAST FINAL PROJECT COST		NOTES
	By Code	Subtotals	By Code	Subtotals	By Code	Subtotals	
LANDFILL RECLAMATION							
Landfill Reclamation	432,000		645,694		800,374		
		$ 432,000		$ 645,694		$ 800,374	
CONTAMINATED SOILS - CLEANUP							
Metals & Hydrocarbon Contaminated Soils Cleanup & Disposal	366,623		900,231		1,445,291		
Hydrocarbon Contaminated Soils (By Polaris)	6,097		13,131		13,131		
Metals Contaminated Soils (By Polaris)	173,605		52,382		52,382		
U/G Handling & Disposal Of Contaminated Soils	48,675		244,463		440,925		
		$ 595,000		$ 1,210,207		$ 1,951,729	
QUARRIES & MINE SURFACE RECLAMATION (EARTHWORK)							
Backfill & Re-Contouring	263,000		177,581		319,452		
		$ 263,000		$ 177,581		$ 319,452	
MISC. DEMOLITION & CLEAN-UP							
Misc Unallocated Clean-Up / Demo	380,000		41,405		44,157		
		$ 380,000		$ 41,405		$ 44,157	
EQUIPMENT PURCHASE/RENTAL							
Contractor Equipment Rental	5,274,900		2,761,061		5,144,900		
Contractor Misc Equipment Purchase	719,407		432,906		448,309		
Escalation Allowance	59,693				-		
		$ 6,054,000		$ 3,193,967		$ 5,593,209	
MISC. SERVICES & SUPPLIES							
Misc Purchased Materials / Supplies	235,333		159,773		233,181		
Escalation Allowance	19,667				-		
		$ 255,000		$ 159,773		$ 233,181	
FUEL							
Fuel Supply	3,294,536		4,216,186		4,216,186		
Fuel Taxes (Heating & Power Generation)	68,677				99,727		
Fuel Taxes (Equipment)	467,343		325,719		677,493		
Escalation Allowance	157,444				-		
		$ 3,988,000		$ 4,541,905		$ 4,993,406	
MAINTENANCE OF EQUIPMENT & FACILITIES							
Mobile Equip Maintenance	1,296,759		3,705,847		5,106,671		
Building Maintenance	506,923		1,159,481		1,388,571		
Escalation Allowance	101,318				-		
		$ 1,905,000		$ 4,865,328		$ 6,495,242	
PRE - PURCHASED EQUIPMENT (BY COMINCO)							
Construction Equipment - Purchase (By Owner)	541,000		541,271		541,271		
		$ 541,000		$ 541,271		$ 541,271	
CONTRACTOR'S FIELD SUPPORT & SUPPLIES							
TRANSPORTATION (SHIPPING)							
Packing & Preparation	85,326		60,035		92,804		
Shipping Costs	948,661		1,258,272		1,870,797		
Escalation Allowance	78,013				-		
		$ 1,112,000		$ 1,318,307		$ 1,963,601	
CONTRACTOR MOB, DEMOB & SUPERVISION							
Contractor Mob/Demob	61,883		87,810		251,831		
Contractor Supervisory/Admin Personnel	2,127,339		1,839,016		2,959,195		
Safety Services & Supplies	36,000		221,846		295,231		
Misc Temporary Services / Modifications	223,824		872,350		1,008,541		
Escalation Allowance	13,954				-		
		$ 2,463,000		$ 3,021,022		$ 4,514,798	
MISC. SERVICES & SUPPLIES							
Communications & TV	374,000		91,235		217,679		
Escalation Allowance	31,000				-		
		$ 405,000		$ 91,235		$ 217,679	
ACCOMODATIONS							
Catering	1,487,166		1,156,195		1,831,193		
Escalation Allowance	122,834				-		
		$ 1,610,000		$ 1,156,195		$ 1,831,193	
TRAVEL & PERSONNEL							
Travel (Airfares & Expenses)	1,552,881		2,052,383		3,435,600		
Travel Premium - Revised Rotation Schedule	1,072,773				-		
Misc Personnel Transport	72,274		121,525		172,274		
Escalation Allowance	575,072				-		
		$ 3,273,000		$ 2,173,908		$ 3,607,874	

POLARIS MINE DECOMMISSIONING, RECLAMATION AND MONITORING COST ESTIMATE
3rd QUARTER 2003 UPDATE

	BUDGET		SEPT 30, 2003 CLAIMED TO DATE		FORECAST FINAL PROJECT COST		NOTES
	By Code	Subtotals	By Code	Subtotals	By Code	Subtotals	
CONTRACTOR INDIRECTS							
HO MOB & DEMOB SUPPORT							
Mob & Demob	1,912,000		1,526,300		1,912,376		
		$ 1,912,000		$ 1,526,300		$ 1,912,376	
CONTRACTOR MANAGEMENT SUPPORT							
Personnel	3,928,932		2,391,496		3,928,932		
Safety & First Aid Personnel to Provide Overlap	184,068		111,792		183,644		
		$ 4,113,000		$ 2,503,288		$ 4,112,576	
OTHER CONTRACTOR INDIRECTS							
Contractor's General Indirects	4,952,000		3,469,507		5,482,420		
		$ 4,952,000		$ 3,469,507		$ 5,482,420	
ENGINEERING / PROJECT MANAGEMENT							
ENVIRONMENTAL SITE ASSESMENT							
Environmental Consultants - Site Assesment	275,787		272,949		314,609		
Site Assessment - Unallocated	207,874		105,263		191,524		
Escalation Allowance	2,339				-		
		$ 486,000		$ 378,212		$ 506,133	
CLOSURE PLAN							
Environmental Consultants - Closure Plan	415,772		372,272		372,272		
Escalation Allowance	2,228				-		
		$ 418,000		$ 372,272		$ 372,272	
ENGINEERING / SPECIAL CONSULTANTS							
Design Consultants - Dock / Loadout	1,316		1,413		1,413		
Design Consultants - Tailings / Garrow Lake	3,520		3,515		3,515		
Design Consultants - Dock / Loadout	79,684		65,354		79,994		
Design Consultants - Tailings / Garrow Lake	54,780		45,328		45,328		
Sitework & Demolition Procedures - Design Services	18,300		14,465		55,400		
Escalation Allowance	2,400				-		
		$ 160,000		$ 130,075		$ 185,650	
PROJECT MANAGEMENT CONSULTANT (HO STAFF)							
Project Management - Salaries	411,069		757,118		982,069		
Project Management - Reimb Expenses	100,000		57,487		100,000		
Escalation Allowance	31,931				-		
		$ 543,000		$ 814,605		$ 1,082,069	
CONSTRUCTION MANAGEMENT (FIELD STAFF)							
Construction Management - Salaries	2,142,878		921,834		1,755,878		
Escalation Allowance	179,122				-		
		$ 2,322,000		$ 921,834		$ 1,755,878	
ENVIRONMENTAL TESTING AND SAMPLING							
Environmental Reclamation Supervision - Staff	337,123		265,245		668,060		
Escalation Allowance	29,550				-		
Environmental Reclamation Supervision - Testing	330,000		94,680		239,060		
Additional Sampling and Consultant Services (MMER)	0		140,996		396,192		
Escalation Allowance	26,327				-		
		$ 723,000		$ 500,921		$ 1,303,312	
OWNER'S COSTS							
SALARIES & EXPENSES							
Teck Cominco HO Proj Mgmnt (Staff Lab)	374,631		314,923		563,132		
Teck Cominco HO Proj Mgmnt (Misc Material & Exp)	199,149		131,845		178,333		
Escalation Allowance	34,220				-		
		$ 608,000		$ 446,768		$ 741,465	
OVERHEAD / HO SUPPORT							
Land Leases, Licences	175,000		96,398		237,525		
Miscellaneous Permits	45,000		9,118		10,222		
Insurance	445,900		106,692		174,310		
Property Taxes	495,000		37,181		495,000		
Home Office General Admin (Labour & Exp)	722,384		14,313		30,000		
Public Relations	74,292		58,718		74,292		
Legal	57,540		48,021		68,431		
Escalation Allowance	168,560				-		
Misc Owner's Overhead	6,324		13,882		13,882		
		$ 2,190,000		$ 384,323		$ 1,103,662	
GENERAL ADMIN							
Closure Management - Polaris Personnel	54,000				-		
Escalation Allowance	2,880				-		
Closure Wrap Up	5,120		27,132		45,667		
		$ 62,000		$ 27,132		$ 45,667	

POLARIS MINE DECOMMISSIONING, RECLAMATION AND MONITORING COST ESTIMATE
3rd QUARTER 2003 UPDATE

	BUDGET		SEPT 30, 2003 CLAIMED TO DATE		FORECAST FINAL PROJECT COST		NOTES
	By Code	Subtotals	By Code	Subtotals	By Code	Subtotals	
POST RECLAMATION COSTS (2005 - 2011)							
SITE MONITORING AND HOLDING COSTS							
Annual Post Closure Environmental Monitoring (2005 to 2011)	510,000				510,000		
Final Sampling Program, Data Evaluation and Reporting in 2011	160,000				160,000		
Land Lease/Licence costs from 2005 to 2011	126,000				126,000		
Property Taxes - 2005 to 2011	70,000				70,000		
Escalation Allowance	135,000				135,000		
		$ 1,001,000		$ -		$ 1,001,000	Corrected typos from 2nd Qtr Report For Forecast Costs
UNALLOCATED							
Uncoded Forecast Cost Adjustments (Net)	-		-				
		$ -		$ -		$ -	
TOTAL DECOMMISSIONING / RECLAMATION & MONITORING COSTS		**$ 47,500,000**		**$ 37,094,048**		**$ 56,925,108**	

APPENDIX 6

COST ESTIMATE

TO

RE-CONSTRUCT GARROW LAKE DAM

Polaris Mine Closure

CASCADE PROJECT 2071

<u>Garrow Lake Level Control Structure</u>

<u>Order Of Magnitude</u>

<u>Cost Estimate</u>

<u>October 30, 2003</u>

GARROW LAKE LEVEL CONTROL STRUCTURE
COST ESTIMATE

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

In April 2002 Teck Cominco received approval to re-establish original water levels in Garrow Lake and to remove the central portion of the existing Garrow Lake Dam and re-establish natural flow out of the lake via the existing creek bed. Teck Cominco has proposed a long term sampling program which will monitor concentration of metals in the discharge into Garrow Bay. Concern has been expressed by regulators with regard to the potential for higher than anticipated levels of heavy metals (lead and zinc) in the discharge from Garrow Lake once original lake levels have been established. While Teck Cominco considers this to be a highly unlikely occurrence, contingency plans have been established to re-instate a portion of the Garrow Lake dam to raise the lake level back to 2002 levels, where it has been demonstrated that metals concentrations in the discharge remain well within allowable limits.

In order to determine financial liability should such action be required, Teck Cominco requested Cascade Management Inc to prepare an order of magnitude cost estimate of the construction of such a level control structure.

This cost estimate has been prepared as requested and Cascade Management Inc are of the opinion that, subject to the assumptions outlined in this report, this structure could be completed for a total cost of $1,270,000, plus or minus 25%. The following report is intended to outline the basis of this estimate and the assumptions made in arriving at the estimated cost.

2.0 BASIS OF ESTIMATE

2.1 SCOPE OF ESTIMATE

Estimate Format

Project cost codes have been established for the Polaris Mine Closure and Reclamation work currently underway. For simplicity, the same coding structure was used for this estimate.

The cost estimate is to be considered "Order of Magnitude" only and is based on certain assumptions with regard to Scope of Work, using historical (i.e. recent actual cost experience) pricing data for the Polaris Reclamation.

Purpose of Estimate

To provide a reasonable estimate of cost exposure (liability) to Teck Cominco should it become necessary to reinstate Garrow Lake water levels.

Work Included

- Carry out site investigation and prepare detail drawings and specifications for construction of level control structure.
- Procurement of necessary materials and construction services.
- Construct level control structure, including field supervision and quality control inspections.
- Cleanup and demobilize from site.

Work Excluded

- Environmental sampling and testing.
- Regulatory approvals and permits.
- Escalation

2.2 INFORMATION BASIS & ASSUMPTIONS

Project Schedule

It has been assumed that the work would be carried out in one construction season, most likely during the period of mid-July to mid-August. It is estimated that 30 working days would be required for work on site.

Design

For purposes of estimating it has been assumed that the level control structure would be of sufficient height to raise the water level of Garrow Lake back to 2002 levels (approximately 1.5M) and would be located across the creek bed in the location of the existing dam. Allowance has been made for provision of a synthetic liner to provide an impermeable core. A rock lined spillway would be provided to effect natural discharge from Garrow Lake.

It should be noted that the impact of the design of the actual structure on the cost of construction is somewhat less significant than normal, due to the high cost of mobilizing and demobilizing personnel and equipment to and from the site. Once personnel and equipment have been mobilized to the site, actual construction costs should be adequately covered by the current estimate and contingency allowances.

Procurement

Materials would be purchased in advance by Teck Cominco and delivered to the island for use by the Contractor. Construction would be competitively bid.

Construction Philosophy

Local contractors, competitively bid on a Lump Sum basis.

Construction Facilities

Temporary camp will be required (tents) with regular air support from Resolute Bay. Supervisors of the work will be required to be fully trained in emergency first aid. Basic emergency supplies will be provided by the Contractor.

2.3 PRICES

Labour Rates

Crew size has been established based on the assumed Scope of Work. Labour rates are based on current labour rates for the Polaris project, with applicable additives for Contractor's overhead and overtime premiums. Labour costs have been estimated using the following crew requirements;

- 1 Foreman
- 3 Equipment Operators
- 1 Mechanic
- 1 Surveyor
- 1 Cook
- 1 Bull Cook

Material Prices

- Cost allowance.

Equipment Prices

- Based on historical data.

Equipment costs are based on the following requirements;

- 1 Excavator
- 1 Dozer
- 1 Loader
- 1 Truck
- 1 Temp Camp

Currency & Escalation

- All costs are estimated in 2003 Canadian Dollars. No allowance has been made for escalation since it is unknown when, or if, the work would be required.
-

Taxes & Duty

Included where applicable.

2.4 ACCURACY OF ESTIMATE

Given the level of detail available and the assumptions made, it would be reasonable to expect an accuracy of ±25% of estimated cost, including contingency.

2.5 CONTINGENCIES

Project Contingency

Given the expected accuracy of the estimate, for financial planning purposes Cascade Management would recommend, and have included, a contingency of 25 percent.

2.6 ESTIMATE SUMMARY

Based on the above, the Order of Magnitude cost estimate for construction of a level control structure at Garrow Lake has been determined as per the following summary;

▪ Base Construction Cost	369,000
▪ Transportation (Shipping)	150,000
▪ Mobilization & Demobilization	78,500
▪ Accommodations/Camp	49,500
▪ Contractor Overhead	162,000
▪ Engineering	121,350
▪ Construction Supervision	57,650
▪ Owner's Project Management	31,000
Sub Total	1,019,000
▪ Contingency	251,000
TOTAL	$1,270,000

A copy of the detailed cost estimate is included for reference in the Appendix of this report.

3.0 APPENDICIES

3.1 Detailed Cost Estimate

APPENDIX 1

DETAILED COST ESTIMATE

COST CENTER && PROJECT CODE	QTY	Units	Hrs	LABOUR AND EQUIPMENT Lab Cost	Const Equip	Sub Con	MATERIAL / LUMP SUM Material	Lump Sum	Misc Allowance	TOTAL
141 LEVEL CONTROL STRUCTURE										
1410-02.280-01 - Dam/Spillway Modifications										
0002 Mobilize to site and set up plant	8.0	Day	768	40,059	35,264	0	0	0	0	75,323
0003 Supply Equipment Consumables (Ground Engaging Tools)	1.0	Allow	0	0	0	0	25,000	0	0	25,000
0004 Spare parts and maintenance supplies for equipment	30.0	Day	0	0	0	0	26,460	0	0	26,460
0005 Fuel & Lube Allowance	30.0	Day	0	0	0	0	9,930	0	0	9,930
0006 Supply impermeable liner for dam core (if	1.0	Allow	0	0	0	0	25,000	0	0	25,000
0007 Re-establish dam core 40m long X 25m wide X 3m high (3000 cm @ 200 cm/day = 15 days)	15.0	Day	1,440	75,110	66,120	0	0	0	0	141,230
0008 Tear down and demobilize	7.0	Day	672	35,052	30,856	0	0	0	0	65,908
0099 Rounding Off Adjustment	1.0	Lot	0	0	0	0	0	0	149	149
Sub Total:			2,880	150,221	132,240	0	86,390	0	149	369,000
211 TRANSPORTATION (SHIPPING)										
2110-01.100-02 - Shipping Costs										
0002 Shipping - Resolute to LCI.	3.0	Day	0	0	0	0	0	0	75,000	75,000
0003 Demobilization - Shipping from LCI to Resolute	3.0	Day	0	0	0	0	0	0	75,000	75,000
Sub Total:			0	0	0	0	0	0	150,000	150,000
212 CONTRACTOR MOB, DEMOB & SUPERVISION										
2120-01.005-01 - Contractor Mob/Demob										
0002 Mobilization - Preparation and loading/unloading of equipment	72.0	MT	0	0	0	0	0	0	25,200	25,200
0003 Mobilization - Load and unload fuel in 45 gallon drums; 8 per pallet = 5000 gal or 14 Tonnes	14.0	MT	0	0	0	0	0	0	4,900	4,900
0004 Mobilization - Load & Unload Two Containers (Tools and Mechanics shop)	2.0	Ea	0	0	0	0	0	0	6,000	6,000
0005 Mobilization - Load & Unload One container of misc gear (lube oil, filters, etc.)	1.0	Ea	0	0	0	0	0	0	3,000	3,000

COST CENTER && PROJECT CODE	QTY	Units	Hrs	LABOUR AND EQUIPMENT Lab Cost	Const Equip	Sub Con	MATERIAL / LUMP SUM Material	Lump Sum	Misc Allowance	TOTAL
0008 Demobilization - Load & Unload Fuel drums and pallets	1.0	Lot	0	0	0	0	0	0	4,900	4,900
0009 Demobilization - Load & Unload Containers	3.0	Ea	0	0	0	0	0	0	9,000	9,000
0010 Demobilization - Load and unload equipment	72.0	MT	0	0	0	0	0	0	25,200	25,200
0099 Rounding Off Adjustment	1.0	Lot	0	0	0	0	0	0	300	300
Sub Total:			0	0	0	0	0	0	78,500	78,500

215 ACCOMODATIONS

2150-01.810-01 - Site Accommodations / Camp Costs

0001 Camp Costs - Assume $50.00 / Manday X 8 men = $400 per day)	30.0	Day	0	0	0	12,000	0	0	0	12,000
0002 Airfares based on 8 men on site for 30 days ($3,000 per man)	8.0	Ea	0	0	0	24,000	0	0	0	24,000
0003 Sustaining air freight assuming two flights per week @ $1500/Trip (9 Trips)	9.0	Trips	0	0	0	13,500	0	0	0	13,500
Sub Total:			0	0	0	49,500	0	0	0	49,500

319 GENERAL CONTRACTOR OH

3190-01.000-00 - Contractor's Overhead - Summary Account (Lump Sum)

0000 General Contractor Overhead	15.0	%	0	0	0	0	0	0	97,050	97,050
0001 Contractor's Fee	10.0	%	0	0	0	0	0	0	64,700	64,700
0099 Rounding Off Adjustment	1.0	Lot	0	0	0	0	0	0	250	250
Sub Total:			0	0	0	0	0	0	162,000	162,000

721 ENGINEERING / SPECIAL CONSULTANTS

721B-17.110-05 - Design Consultants - Tailings / Garrow Lake

0000 Design Of Replacement Level Control Structure	15.0	%	0	0	0	0	0	0	121,350	121,350
Sub Total:			0	0	0	0	0	0	121,350	121,350

732 CONSTRUCTION MANAGEMENT (FIELD STAFF)

7320-01.010-01 - Construction Management - Salaries

0000 Teck Cominco Field Supervision and Construction Management	1.0	Lot	400	48,000	0	0	0	0	0	48,000

COST CENTER && PROJECT CODE	QTY	Units	Hrs	LABOUR AND EQUIPMENT Lab Cost	Const Equip	Sub Con	MATERIAL / LUMP SUM Material	Lump Sum	Misc Allowance	TOTAL
Sub Total:			400	48,000	0	0	0	0	0	48,000
7320-01.010-02 - Construction Management - Reimb Expenses										
0000 Teck Cominco Field Supervision and Construction Management - Expenses	1.0	Allow	0	0	0	0	0	0	9,650	9,650
Sub Total:			0	0	0	0	0	0	9,650	9,650
811 OWNER'S PROJECT MANAGEMENT										
8110-17.020-01 - Cominco HO Proj Mgmnt (Staff Lab)										
0001 Teck Cominco HO Administration and Project Management - Salaries	1.0	Mhrs	160	19,200	0	0	0	0	0	19,200
Sub Total:			160	19,200	0	0	0	0	0	19,200
8110-17.030-01 - Cominco HO Proj Mgmnt (Misc Material & Exp)										
0002 Teck Cominco HO Administration and Project Management - Expenses (based on two round trips to site plus misc office expenses)	1.0	Allow	0	0	0	0	0	0	11,800	11,800
Sub Total:			0	0	0	0	0	0	11,800	11,800
981 CONTINGENCY										
9810-19.900-01 - Project Contingency - General										
0001 Project Contingency	25.0	%	0	0	0	0	0	0	254,500	254,500
0002 Rounding Off Adjustment	-1.0	Lot	0	0	0	0	0	0	-3,500	-3,500
Sub Total:			0	0	0	0	0	0	251,000	251,000
Project Total:			*3,440*	*217,421*	*132,240*	*49,500*	*86,390*	*0*	*784,449*	*1,270,000*

APPENDIX 7

TECK COMINCO RESPONSE TO

JULY 2003 INAC SITE INSPECTION

teckcominco

John Knapp
Site Manager

September 8, 2003

Indian and Northern Affairs Canada
Land Administration
Box 100
Iqaluit, NU
X0A 0H0

Attention: Carl McLean, Manager, Land Administration

Dear Mr. McLean,

Re: Polaris Mine Closure DIAND Inspection July 2 – 3, 2003

This letter has been written in response to your letter of July 22, 2003, regarding DIAND's comments respecting observations made during a site visit July 2nd – 3rd. Firstly, I wish to apologize for the delayed response to the concerns raised in your letter. Please be assured that your comments and concerns received immediate attention. The preparation of this response was delayed by a combination of personnel scheduling issues, coupled with the high workloads associated with the compressed summer construction season. I am confident that you will note significant progress, in compliance with approved procedures and protocols, during your next site visit, scheduled for the near future. For clarity, the concerns and questions raised in your letter of July 22nd have been copied to this letter and I will deal with each as they are presented.

Operational Landfill**:**

1) It was not clear who was responsible for inspecting construction of the cover material, since the GLL site staff are only involved with confirmation testing of the contaminated site reclamation aspects of the work. TC must ensure that the landfill cover is inspected to insure it meets the guidelines in the reclamation plan.

   Teck Cominco representatives ensure that construction standards pertaining to the entire project are met. Compaction tests have been performed, and material sizing has been initiated. Recording of thermistor readings was initiated in March 1999 and continued throughout the course of the project until summer 2003. Thermistor data for this year has been reported in the 1st and 2nd quarter project reports to you and the NWB. The placement of the covercap during summer 2003 resulted in the destruction of these *instruments, but they will be reinstated upon completion of the construction work. Readings will be obtained, recorded, and reported as required by the terms of the Polaris Water License and Reclamation and Closure Plan approval.*

As-builts will be prepared once construction is complete. Surveying is an ongoing process to maintain adequate construction controls and to ensure placement of sufficient cover materials. In August, 2003, following the placement of the underlying portion of the covercap, a Nunavut registered professional geotechnical engineer from EBA Engineering was engaged to conduct a site examination of the work undertaken to date and to ensure compliance with the design criteria. No significant issues were raised. This inspection was done as part of the annual geotechnical inspection of the landfill and other surface structures as required by our Water Licence, with the formal inspection report to be submitted by the middle of October.

Please forward information pertaining to the construction of the Operational Landfill to DIAND including thermistor readings, material testing results (moisture contents, grain size, density) and as-built drawings. The thermal analysis for the cover design assumed certain properties for the cover material(s). TC should verify that these assumptions are valid for the actual materials being placed. The final thickness of the cover should be based on the actual cover material properties.

Please see above. Material sizing and moisture results will be reported in the upcoming Quarterly report. All indications to date are that the covercap will exceed the design criteria, resulting in an increased factor of safety.

2) Tailing Thickener

A considerable amount of loose Styrofoam and fiberglass insulation was noted in the debris around the tailings thickener pad. This material is easily blown around and distributed over the site and must be cleaned up before the elements carry this material offsite. Once all of the contaminated fill is removed from the thickener pad and area TC must conduct confirmatory soil testing.

The loose Styrofoam and fibreglass that was noted in the area of the thickener has been contained and removed. Although the material spread to a greater than anticipated extent, it should be noted that the reason that it had not been cleaned up prior to the date of the inspection was that the tundra was still water logged and any effort to even walk in the area would have produced significant environmental degradation. Greater efforts to contain demolition debris are now being expended. Further, work schedules in areas involving foam insulation products are being reviewed for opportunities to further reduce the risks of spreading materials by wind.

No mention was made in the closure plan about retaining the lagoon and dikes, and filling with excavated spoil. If the lagoon remains, it will be a prominent embankment structure on the surface of the land, and hence will not satisfy the overall reclamation philosophy of returning the site to as natural a condition as possible. TC should clarify their position in writing for approval by DIAND and the other regulators.

Numerous approaches, suggestions, and opportunities are considered during any project. This holds true of the Polaris Reclamation and Closure Project as well. Teck Cominco confirms that there were discussions regarding the merits of utilising the overflow lagoon at the tailings thickener as a depository for some of the frozen core from the Garrow Lake dam. However, this idea has since been abandoned, and at no point did Teck Cominco Limited consider implementing this approach without the knowledge and agreement of the Regulatory parties concerned. We are cognisant of the attention this project is receiving, and of the need to follow the procedures and protocols established in conjunction with the Regulators. Any work plan that deviates from what is established in the Plan will be discussed with, and approved by, the appropriate regulators prior to implementation.

3) Frustration Lake Jetty

Concern was noted by the inspection team about the erosion of the road due the meltwater runoff. TC plans to flatten out the shoulders and generally contour the road to the surrounding terrain. We remind TC to ensure that natural drainage courses are not blocked and that excessive erosion will not be initiated due to improper contouring.

Teck Cominco acknowledges that the access road to the Frustration Lake jetty was partially washed out on the date of the inspection. This has been an ongoing difficulty even during the operational period. Teck Cominco confirms their intent to restore natural drainage courses and to remove improvements that impede the natural flows. During 2004, the Frustration Lake access road, the pipeline, culverts, and cribbing will be removed, and the roadway and pipebed recontoured to blend smoothly with the existing topography so as to not impede natural drainage.

4) Little Red Quarry

The preferred method of tire disposal is to shred the tires. However, if shredding is not possible, TC should ensure that all tires be placed into the bottom of the pit so that there is no chance that they could work their way to the surface. The tires should be dispersed so that there isn't a concentration of tires in any one area. Tires should be placed flat to minimize void space and subsequent settlement. If a lot of tires remain to be disposed of, another option may be to place them into an underground drift, where the landfilling protocols would not be an issue.

Teck Cominco Limited will ensure the tires are placed flat within areas of demolition debris. Where possible, the preferred location will be underwater, prior to covering with infill material, thereby eliminating the potential for void space. Tires will be dispersed to avoid concentrations of such debris in any given area.

Although there is photo documentation and surveying being done of the material placed into the quarry, a lot of the material does not appear to be placed in a manner that minimizes voids. This issue must be corrected immediately and placement practices must conform to the protocols given in the joint authorization.

The placement and subsequent covering of demolition debris is a several-step process. If the material is observed in the early stages, it would be concluded that demolition protocols were not being followed. However, Teck Cominco is confident that the contractor is following the protocols, and doing a good job of placing material so as to minimize void spaces. Initially, material is discharged from the haul truck into large temporary stockpiles with significant void space. These piles are then rehandled with bulldozers or wheeled loaders to reduce the thickness of the material and to reduce the likelihood of void space when fill material is placed. Large pieces such as piping and structural steel columns that would create voids are processed with the hydraulic shears and siding is compacted in the bailer prior to burial. In many cases, an excavator fitted with the hydraulic shears is used to place large pieces underwater prior to covering with fill, which eliminates the possibility of void spaces remaining.

TC must ensure that they immediately implement a plan to cleanup any future spills or fluid releases within the LRD Quarry. ….It is important that TC ensure that wastes are clean of fluids before placing them into the LRD Quarry and that measures are in place to remove and deal with any contaminating fluids in the pit. We request that TC periodically conduct and record the results of confirmatory sampling of water quality, particularly for the presence of hydrocarbons and salts in the pit wastewater. These results must be provided to DIAND with the along with quarterly reports.

Steps have been taken to ensure compliance with this issue. Teck Cominco have conducted tests to verify that freezing point depression has not occurred. The test report is appended to this letter, and will be submitted with the next Quarterly Report. The need for immediate resolution of the issue precluded submission of the samples to an outside laboratory. Since the underlying question concerned the freezing point of the water, the water was sampled, cooled, and its freezing point noted. No significant difference from fresh water properties was noted.

TC must also provide DIAND with a quarterly report that includes an inventory of the material, locations of the material, and photo documentation of the debris disposed of in LRD.

This material has been submitted in the Quarterly reports as required under the terms of the joint Plan approval.

5) Mill Barge Complex

During demolition work, the north end of the barge rose a total of 1.4 m. TC should ensure that these conditions do not pose a threat to the safety of the demolition works underway.

The fact that the mill/barge complex would float during demolition was anticipated during the planning stages of the project and the resulting demolition plan was developed *to exploit this situation. In no case were employees or equipment placed at risk. The barge was free-floating from the outset, consistent with observations made by staff during the operating phase of the mine. As a result, there were no sudden movements or shifts in the barge while it rose in the excavation as its weight decreased during the course of demolition. Ultimately, before the hull integrity was compromised, the excavation was dewatered of accumulated meltwater that was disposed of underground as previously approved by DIAND, EC, and NWB. The final hull demolition is being done in the dry, and is progressing well.*

As noted at the tailings thickener, TC must collect all loose insulation and materials that can blow around. Regular policing of the grounds around areas of demolition would ensure that debris is not carried off site by the wind.

Demolition is an ongoing process and loose insulation etc. is being exposed daily. Such material is collected on a daily basis in order to prevent dispersal by the wind. Other aspects of the project where this remains an issue, such as at the Tailings dam, are being evaluated for alternatives and opportunities that would diminish the risk of materials being spread by the elements.

6) Meltwater Runoff Disposal Area

TC was required to take at least one meltwater sample for analysis for potential hydrocarbon and mineral sulphide contamination. Please forward this information, as well as a revised description of the actual meltwater storage plan to DIAND.

Samples were taken and submitted to an outside laboratory for analysis. The results will be included in the next Quarterly Report, but they have been appended to this letter for your review during the upcoming site visit. Additionally, the meltwater, which ultimately accumulated in the barge area excavation, was tested several times to determine its salt content and to verify that the water would freeze as expected. All determinations indicated that although the water was contaminated, its physical properties, specifically its S.G. and freezing point, remained very similar to those of fresh water.

The meltwater disposal took place as described in the March 20th letter to DIAND, EC, and NWB. Non-contaminated meltwater was contained and directed through uncontaminated ditching to the ocean. Water that entered the industrial areas of the facility was automatically deemed to be contaminated. Initial meltwaters mobilized some hydrocarbons within the area, as expected, and were passed through an oil-water separator before being pumped into the underground receiving environment. Later, as the melt progressed, and hydrocarbons diminished, the water flows exceeded the capacity of the oil-water separator. This water, while contaminated, did not bear free hydrocarbons and was discharged directly into the underground workings. The receiving environment was checked routinely by the Underground Supervisor and his observations logged. At no time was water discharged without his knowledge and agreement. The remaining capacity of the receiving environment was monitored, and at not time was it exceeded. Ventilation checks with respect to volumes and air quality were conducted on *an ongoing basis to ensure environmental and safety issues were dealt with. Further, the discharged water was monitored to ensure there were no free hydrocarbons, and that it was freezing in place as expected.*

7) Contaminated Soils Storage Area(s)

An updated estimate of the breakdown of contaminated soils placed underground must be provided to DIAND, as well as the locations being used for disposal.

The quantities and location maps are available in the quarterly report. The updated estimates for final quantities are not yet available due to difficulties in determining the contaminant boundaries in certain specific areas. This information will be provided in the Polaris Quarterly report as soon as it is available, as required by the terms of the joint approval of the Closure and Reclamation Plan. Teck Cominco Metals Limited would welcome the opportunity to discuss this further during your scheduled site visit.

8) Ammonium Nitrate Storage Area

DIAND's preferred method of disposing any unused amounts of ammonium nitrate is to mix it with diesel fuel into ANFO and detonate it on site at a safe location, rather than landfilling. This will also get rid of some of the leftover diesel fuel. This would also be subject to approval of the other regulators

The majority of this material will be consumed during the decommissioning period as stated in the Inspection Report. Significant quantities are required to produce the necessary rock and infill material for the Polaris landfill covercaps. It will not be used at Garrow Lake dam. Remaining quantities will be disposed of utilising methods that are acceptable to all the regulatory agencies concerned. There are, however, significant environmental and safety concerns relating to the destruction of Ammonium Nitrate by detonation. Since Ammonium Nitrate is not classified as a hazardous material Teck Cominco Limited recommends that this material be disposed of in the underground workings where it will be inaccessible and encapsulated due to the portal plugs. Additionally, the presence of permafrost throughout the underground workings will prevent any dispersal by water. Teck Cominco Metals Limited views this approach as consistent with the approvals already received under the closure plan.

9) Reclamation Costs and Schedule

TC must submit monthly and quarterly statements of the cost tracking for the decommissioning and reclamation activities, including the percentage of work completed and estimated cost to complete, as required by their Water License. This is required for ongoing assessment of their closure bond and security requirements.

The approval under the Water Licence that contains the bonding requirements specifies that schedule and cost forecasts are to be provided on a quarterly basis. We understand *the need for this information to be submitted so that DIAND and the NWB are aware of any significant changes to schedules or costs. The 1st and 2nd Quarterly reports for 2003 have been submitted and contain this information. The next formal report will be submitted by November 15, 2003 and contain both current costs and forecast costs to complete the decommissioning and reclamation work. If more frequent updates on progress and costs are desired, we suggest a monthly conference call where any significant issues can be discussed in a timely manner and provide an opportunity for other areas of interest to also be discussed.*

We request TC to submit an updated list of activities and timelines for all aspects of the reclamation.

This has been recently submitted in the 2nd Quarter project report submitted to DIAND and the NWB.

We appreciate that DIAND feels that Teck Cominco is progressing very well towards our reclamation objectives and remain confident that all applicable standards and commitments are at the least being met, and in many cases exceeded.

Please feel free to contact me if the above leads to any concerns or further questions.

Yours truly,

Cominco Mining Partnership

John Knapp
Site Manager
Polaris Reclamation Project

Enclosures (2)

cc: Mr. Philippe DiPizzo, Nunavut Water Board
Mr. Bruce Donald, Reclamation Manager, TCL
Mr. Bob Hutchinson, General Manager, Projects, TCL
Mr. Walter Kuit, Director, Environmental Affairs, TCL
Ms. Colette Meloche, Environmental Assessment Specialist, EC

APPENDIX 8

LITTLE RED DOG QUARRY LANDFILL WATER SAMPLE ANALYSIS AND FREEZE TEST RESULTS

Project	23305 Polaris Water Analysis
Report to	Gartner Lee Ltd.
ALS File No.	T2135
Date Received	31/07/2003
Date:	08/08/2003

RESULTS OF ANALYSIS	**Detection Limits**	**Results**
Sample ID		LRD-1 25 07 03
Date Sampled		25/07/2003
Time Sampled		11:20
ALS Sample ID		1
Nature		Water
Physical Tests		
Conductivity (uS/cm)	2	3280
pH	-	-
Dissolved Anions		
Alkalinity-Total CaCO3	1	64
Alkalinity-Bicarbonate CaCO3	1	64
Chloride Cl	5	577
Total Metals		
Antimony T-Sb	-	-
Arsenic T-As	-	-
Barium T-Ba	-	-
Beryllium T-Be	-	-
Cadmium T-Cd	-	-
Chromium T-Cr	-	-
Cobalt T-Co	-	-
Copper T-Cu	-	-
Lead T-Pb	-	-
Mercury T-Hg	-	-
Molybdenum T-Mo	-	-
Nickel T-Ni	-	-
Selenium T-Se	-	-
Silver T-Ag	-	-
Tin T-Sn	-	-
Vanadium T-V	-	-
Zinc T-Zn	-	-
Extractable Hydrocarbons		
EPH10-19	0.3	1
EPH19-32	1	1

Footnotes:

< = Less than the detection limit indicated.
EPH = Extractable Petroleum Hydrocarbons.
Water samples only - Results are expressed as milligrams per litre except where noted.
Water samples only - EPH10-19 is equivalent to EHw10-19.

Gartner Lee Limited

MEMORANDUM

To:	Bruce Donald, Teck Cominco Ltd.		
CC:	John Knapp	Date:	August 15, 2003
From:	Dennis Lu	Ref:	23305
Subject:	Freezing point of LRD Water		

The purpose of this exercise was to determine the freezing point of water contained at the Little Red Dog Quarry (LRD). A sample was taken from the LRD on August 15, 2003 to characterize the freezing point. An electronic multimeter (YSI 85D) was used to determine the temperature and salinity. For the purposes of comparing the freezing point of LRD pit water to distilled water, a control sample of distilled water was run.

The samples were stored in 300mL beakers in the freezer until the samples were approximately 40% frozen. At this point the ice in the beaker was broken up and the instrument inserted in the ice/water mixture. The mixture was then stirred in order to maintain a constant temperature. When the readings became stable, temperature and salinity parameters were taken. The results from the experiment are as follows:

Parameter	LRD Water	Distilled Water (control)
Temperature	0.1°C	0.3°C
Salinity	1.1ppt	0.0ppt

A photo to illustrate the process is located below.

Photo 1: Top view of measuring instrument and LRD ice/water mixture.

APPENDIX 9

RECORD OF DEBRIS PLACED

INTO

LITTLE RED DOG QUARRY LANDFILL

PLACEMENT OF DEBRIS INTO LRD QUARRY LANDFILL

3rd QUARTER, 2003

DRAWING OF WASTE PLACEMENT

The following two drawings indicate the areas where debris was placed each month during the 3rd quarter of 2003 (July 1, 2003 to September 30, 2003). The locations represent the final placement locations and not temporary staging areas. The drawing also includes locations of debris placed prior to the beginning of the quarter where the debris was placed at the same elevation in the quarry.

The drawings represent the Second Lift (L2) and Third Lift (L3) of debris in the quarry. Both of these lifts are being placed into Bench 6 of Little Red Dog Quarry Landfill ('LRDQL'). The drawing indicates a different colour for each month that the debris was placed. However, note that September 2002 and 2003 both use the colour Red. However each area is dated, for example 'L2 – 2003 – 05' represents Lift 2, for the month of May, 2003.

RECORD OF WASTE SOURCE/VOLUME & TYPE

Following the placement drawings are records from each month showing the source of the debris, where it was hauled to, the quantity and the type of debris.

VERIFICATION OF HYDROCARBON REMOVAL

There was no equipment that required hydrocarbon removal during the period. The demolition of the mill facilities had progressed to the point where the equipment had all been cleaned by the 3rd Quarter. No mobile equipment was disposed of during the period.

PHOTOGRAPHIC RECORD

As specified in the Closure Plan, a photographic record of debris placement is being maintained. Attached to this appendix are pictures of typical debris being placed in LRDQL.

The water pooled in the bottom of the quarry is from natural melt water as the 3rd quarter of the year includes the two snow free months. Bulky items that are difficult to cut up or shred (tires) have been preferentially placed in the water so that their void spaces are filled. During the periods of active demolition, materials arrive at the LRDQL quicker than they can be processed and as result temporary piles of debris frequently build up until they can be processed further. An example is in Photographs #25 and #26 where sheet metal siding is piled in one area until the bailing machine (Photographs #28 and #48) can compact them. The water lines shown in Photographs xxx and xxx are the water return lines from the Tailings Thickener and are not tailings pipelines. Photograph #6 shows melt water contaminated with a red dye used in the production of Anfo. This should not have been placed into LRDQL but the contractor made an error in sorting. A skimmer was used to capture the dye and tests of the water were taken to confirm that the freezing temperatures were not affected. Refer to Appendix 7 of the 3rd Quarter report for further information. The water samples taken are included in Appendix 8.

POLARIS MINE DEBRIS DISPOSAL IN LANDFILLS - 3rd QUARTER 2003

Date	Origin Location	Disposal Location	Material	Quantity (m3)
1-Jul-03	Barge	L.R.D.	Steel	312
1-Jul-03	Barge	L.R.D.	Steel	228
1-Jul-03	Barge	L.R.D.	Steel	180
1-Jul-03	CRF Plant	Sink Hole	Concrete	80
1-Jul-03	CRF Plant	Sink Hole	Concrete	72
2-Jul-03	Barge	L.R.D.	Steel	12
2-Jul-03	Barge	L.R.D.	Steel	144
2-Jul-03	Dock	L.R.D.	Steel	15
3-Jul-03	Dock	L.R.D.	Steel	15
3-Jul-03	Dock	L.R.D.	Steel	45
4-Jul-03	Barge	L.R.D.	Steel	24
4-Jul-03	Burn Pit	L.R.D.	Garbage	40
4-Jul-03	Burn Pit	L.R.D.	Garbage	36
5-Jul-03	Barge	L.R.D.	Steel	108
5-Jul-03	Barge	L.R.D.	Steel	132
5-Jul-03	Burn Pit	L.R.D.	Steel	36
5-Jul-03	Dock	L.R.D.	Steel	30
6-Jul-03	Barge	L.R.D.	Steel	144
6-Jul-03	Storage building	L.R.D.	Steel	24
7-Jul-03	Barge	L.R.D.	Steel	60
7-Jul-03	Barge	L.R.D.	Steel	72
8-Jul-03	Barge	L.R.D.	Steel	180
9-Jul-03	Barge	L.R.D.	Steel	108
9-Jul-03	Storage building	L.R.D.	Steel	60
10-Jul-03	Barge	L.R.D.	Steel	180
10-Jul-03	Dock	L.R.D.	Concrete	15
10-Jul-03	Dock	L.R.D.	Steel	36
10-Jul-03	Dock	L.R.D.	Steel	36
10-Jul-03	Dock	L.R.D.	Steel	15
11-Jul-03	Barge	L.R.D.	Steel	180
11-Jul-03	Dock	L.R.D.	Steel	15
12-Jul-03	Barge	L.R.D.	Steel	72
12-Jul-03	Barge	L.R.D.	Steel	5
12-Jul-03	Dock	L.R.D.	Steel	18
12-Jul-03	Dock	L.R.D.	Steel	45
13-Jul-03	Barge	L.R.D.	Steel	60
13-Jul-03	Thickener	L.R.D.	Steel	120
13-Jul-03	Thickener	L.R.D.	Steel	48
13-Jul-03	Thickener	L.R.D.	Steel	24
14-Jul-03	Barge	L.R.D.	Steel	84
14-Jul-03	Thickener	Sink Hole	Concrete	80
14-Jul-03	Thickener	Sink Hole	Concrete	60
14-Jul-03	Thickener	L.R.D.	Steel	48
15-Jul-03	Barge	L.R.D.	Steel	192
15-Jul-03	Barge	L.R.D.	Steel	144
15-Jul-03	Barge	L.R.D.	Steel	204
15-Jul-03	Barge	L.R.D.	Steel	132
15-Jul-03	Thickener	Sink Hole	Concrete	60
15-Jul-03	Thickener	Sink Hole	Concrete	50
16-Jul-03	Barge	L.R.D.	Steel	24
16-Jul-03	Barge	L.R.D.	Steel	264
16-Jul-03	Barge	L.R.D.	Steel	120
16-Jul-03	Dock	L.R.D.	Steel	75
16-Jul-03	Thickener	L.R.D.	Steel	36
17-Jul-03	Barge	L.R.D.	Steel	108
17-Jul-03	Barge	L.R.D.	Steel	120
17-Jul-03	Barge	L.R.D.	Steel	120
17-Jul-03	Thickener	L.R.D.	Steel	12
18-Jul-03	Barge	L.R.D.	Steel	120
18-Jul-03	Barge	L.R.D.	Steel	156
18-Jul-03	Barge	L.R.D.	Steel	132
18-Jul-03	Barge	L.R.D.	Steel	204
18-Jul-03	Dock	L.R.D.	Steel	15
19-Jul-03	Barge	L.R.D.	Concrete	130
19-Jul-03	Barge	L.R.D.	Steel	20
19-Jul-03	Barge	L.R.D.	Steel	96
19-Jul-03	Barge	L.R.D.	Steel	108

POLARIS MINE DEBRIS DISPOSAL IN LANDFILLS - 3rd QUARTER 2003

Date	Origin Location	Disposal Location	Material	Quantity (m3)
19-Jul-03	Barge	L.R.D.	Steel	228
20-Jul-03	Barge	L.R.D.	Concrete	144
20-Jul-03	Barge	L.R.D.	Concrete	108
20-Jul-03	Barge	L.R.D.	Steel	160
20-Jul-03	Barge	L.R.D.	Steel	108
20-Jul-03	Barge	L.R.D.	Steel	12
20-Jul-03	Barge	L.R.D.	Steel	84
20-Jul-03	Barge	L.R.D.	Steel	192
21-Jul-03	Barge	L.R.D.	Concrete	26
21-Jul-03	Barge	Sink Hole	Concrete	12
21-Jul-03	Barge	L.R.D.	Steel	40
21-Jul-03	Barge	L.R.D.	Steel	210
21-Jul-03	Barge	L.R.D.	Steel	60
21-Jul-03	Barge	L.R.D.	Steel	108
21-Jul-03	Barge	L.R.D.	Steel	228
22-Jul-03	Barge	L.R.D.	Steel	140
22-Jul-03	Barge	L.R.D.	Steel	80
22-Jul-03	Barge	L.R.D.	Steel	108
22-Jul-03	Barge	L.R.D.	Steel	84
22-Jul-03	Barge	L.R.D.	Steel	264
22-Jul-03	Dock	L.R.D.	Steel	15
23-Jul-03	Barge	Sink Hole	Concrete	12
23-Jul-03	Barge	L.R.D.	Steel	96
24-Jul-03	Barge	L.R.D.	Concrete	198
24-Jul-03	Barge	L.R.D.	Concrete	72
24-Jul-03	Barge	L.R.D.	Concrete	126
24-Jul-03	Barge	L.R.D.	Concrete	180
24-Jul-03	Barge	L.R.D.	Concrete	78
25-Jul-03	Barge	L.R.D.	Steel	96
26-Jul-03	Barge	L.R.D.	Concrete	30
26-Jul-03	Barge	L.R.D.	Concrete	36
27-Jul-03	Barge	L.R.D.	Steel	70
27-Jul-03	Barge	L.R.D.	Steel	84
27-Jul-03	Barge	L.R.D.	Steel	36
27-Jul-03	Barge	L.R.D.	Steel	36
27-Jul-03	Barge	L.R.D.	Steel	84
27-Jul-03	Barge	L.R.D.	Steel	24
29-Jul-03	Barge	L.R.D.	Steel	72
29-Jul-03	Barge	L.R.D.	Steel	72
30-Jul-03	Barge	L.R.D.	Steel	168
30-Jul-03	Barge	L.R.D.	Steel	168
31-Jul-03	Barge	L.R.D.	Steel	48
31-Jul-03	Barge	L.R.D.	Steel	120
1-Aug-03	Barge	L.R.D.	Steel	12
1-Aug-03	Barge	L.R.D.	Steel	228
1-Aug-03	Barge	L.R.D.	Steel	192
1-Aug-03	Barge	L.R.D.	Steel	252
1-Aug-03	Barge	L.R.D.	Steel	216
1-Aug-03	Storage building	L.R.D.	Steel	120
1-Aug-03	Thickener	L.R.D.	Steel	15
2-Aug-03	Barge	L.R.D.	Steel	72
2-Aug-03	Barge	L.R.D.	Steel	180
2-Aug-03	Barge	L.R.D.	Steel	216
2-Aug-03	CRF Plant	L.R.D.	Cement bag	130
3-Aug-03	L.R.D.	L.R.D.	Steel & plastic	72
3-Aug-03	Storage building	L.R.D.	Steel	120
3-Aug-03	Storage building	L.R.D.	Steel	108
4-Aug-03	Barge	L.R.D.	Steel	20
5-Aug-03	Barge	L.R.D.	Steel	30
6-Aug-03	Barge	L.R.D.	Steel	13
6-Aug-03	Barge	L.R.D.	Steel	60
7-Aug-03	Barge	L.R.D.	Steel	104
8-Aug-03	Barge	L.R.D.	Steel	26
9-Aug-03	Barge	L.R.D.	Steel	13
9-Aug-03	Tank Farm	Underground	Pipe	105
10-Aug-03	Storage building	L.R.D.	Steel	195
10-Aug-03	Storage building	L.R.D.	Steel	300

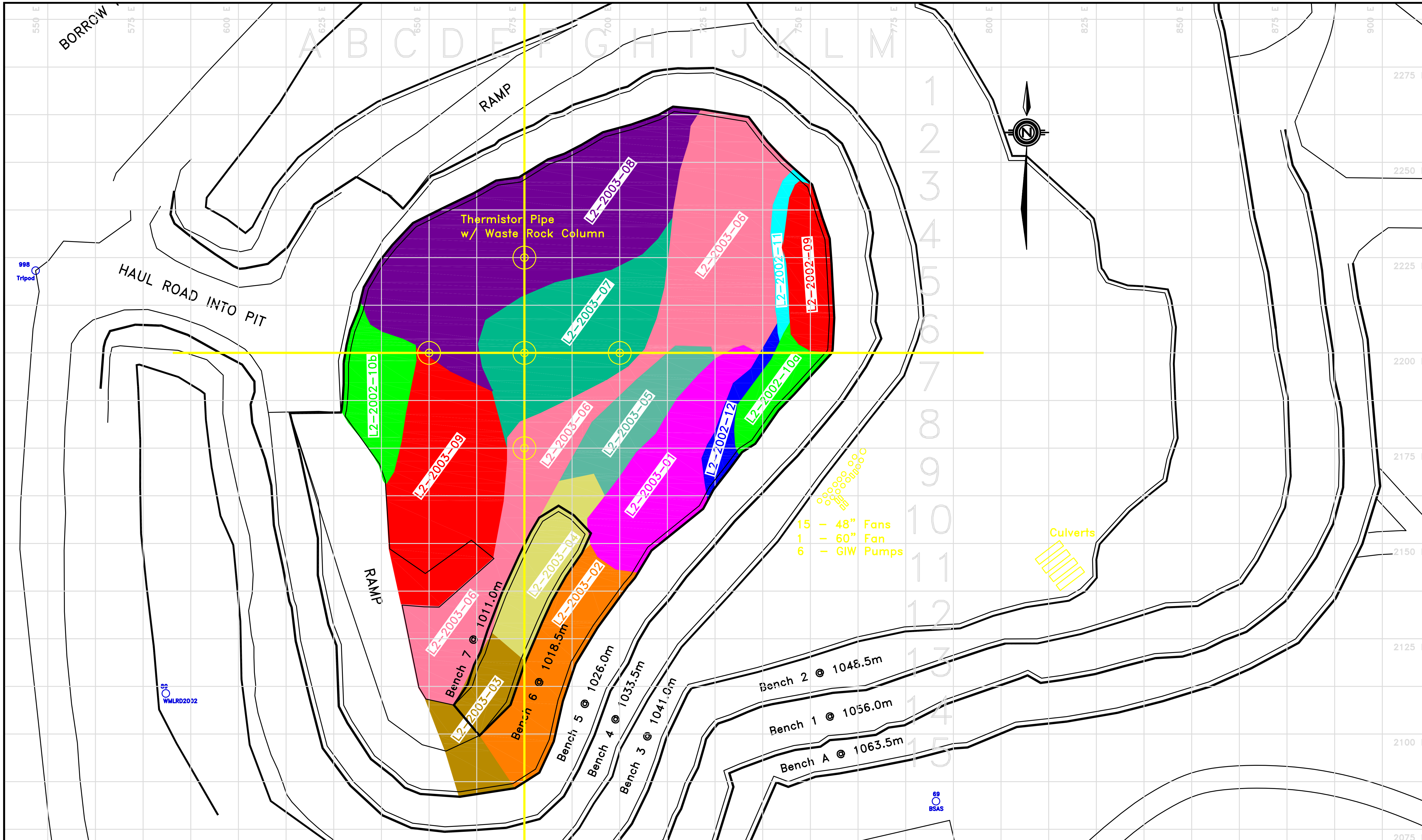
POLARIS MINE DEBRIS DISPOSAL IN LANDFILLS - 3rd QUARTER 2003

Date	Origin Location	Disposal Location	Material	Quantity (m3)
10-Aug-03	Thickener	L.R.D.	Tailling line	52
11-Aug-03	Barge	L.R.D.	Steel	169
11-Aug-03	Barge	L.R.D.	Steel	78
11-Aug-03	Raisebore	L.R.D.	Steel	18
11-Aug-03	Thickener	L.R.D.	Tailling line	65
12-Aug-03	Barge	L.R.D.	Steel	210
12-Aug-03	Storage building	L.R.D.	Steel	128
12-Aug-03	Storage building	L.R.D.	Steel	256
12-Aug-03	Storage building	L.R.D.	Steel	247
12-Aug-03	Storage building	L.R.D.	Steel	156
13-Aug-03	Storage building	L.R.D.	Steel	195
13-Aug-03	Storage building	L.R.D.	Steel	130
13-Aug-03	Storage building	L.R.D.	Steel	26
13-Aug-03	Storage building	L.R.D.	Steel	221
13-Aug-03	Storage building	L.R.D.	Steel	208
13-Aug-03	Storage building	L.R.D.	Steel	234
14-Aug-03	Barge	L.R.D.	Steel	150
14-Aug-03	Barge	L.R.D.	Steel	221
14-Aug-03	Barge	L.R.D.	Steel	360
14-Aug-03	Storage building	L.R.D.	Steel	220
14-Aug-03	Storage building	L.R.D.	Steel	15
14-Aug-03	Storage building	L.R.D.	Steel	130
14-Aug-03	Storage building	L.R.D.	Steel	13
14-Aug-03	Storage building	L.R.D.	Steel	169
14-Aug-03	Storage building	L.R.D.	Steel	143
15-Aug-03	Barge	L.R.D.	Steel	240
15-Aug-03	Barge	L.R.D.	Steel	26
15-Aug-03	Barge	L.R.D.	Steel	39
15-Aug-03	Storage building	L.R.D.	Steel	91
15-Aug-03	Storage building	L.R.D.	Steel	156
15-Aug-03	Storage building	L.R.D.	Steel	13
16-Aug-03	Barge	L.R.D.	Steel	20
16-Aug-03	Barge	L.R.D.	Steel	156
16-Aug-03	North Portal	L.R.D.	Steel	60
18-Aug-03	Loon Lake	L.R.D.	Steel	50
22-Aug-03	Barge	L.R.D.	Steel	75
22-Aug-03	Dock	L.R.D.	Steel	30
23-Aug-03	Storage building	L.R.D.	Steel	15
24-Aug-03	Barge	L.R.D.	Steel	50
24-Aug-03	Storage building	L.R.D.	Steel	24
25-Aug-03	Barge	L.R.D.	Steel	40
25-Aug-03	Storage building	L.R.D.	Steel	12
26-Aug-03	Barge	L.R.D.	Concrete	72
26-Aug-03	Barge	L.R.D.	Steel	24
26-Aug-03	Storage building	L.R.D.	Steel	24
28-Aug-03	Barge	L.R.D.	Steel	90
28-Aug-03	Barge	L.R.D.	Steel	12
29-Aug-03	Barge	L.R.D.	Steel	20
30-Aug-03	Barge	L.R.D.	Steel	72
30-Aug-03	Barge	L.R.D.	Steel	10
30-Aug-03	Barge	L.R.D.	Steel	48
30-Aug-03	Barge	L.R.D.	Steel	12
30-Aug-03	Barge	L.R.D.	Steel	48
30-Aug-03	Barge	L.R.D.	Steel	72
31-Aug-03	Barge	L.R.D.	Steel	24
31-Aug-03	Barge	L.R.D.	Steel	36
31-Aug-03	Shoreline North	L.R.D.	Steel	30
1-Sep-03	Barge	L.R.D.	Steel	12
1-Sep-03	Storage building	L.R.D.	Steel	48
2-Sep-03	Barge	L.R.D.	Steel	30
2-Sep-03	Barge	L.R.D.	Steel	36
2-Sep-03	Barge	L.R.D.	Steel	12
3-Sep-03	Barge	L.R.D.	Steel	36
3-Sep-03	Dock	L.R.D.	Concrete	90
4-Sep-03	Barge	L.R.D.	Steel	160
4-Sep-03	Barge	L.R.D.	Steel	12
4-Sep-03	Barge	L.R.D.	Steel	24

POLARIS MINE DEBRIS DISPOSAL IN LANDFILLS - 3rd QUARTER 2003

Date	Origin Location	Disposal Location	Material	Quantity (m3)
4-Sep-03	Barge	L.R.D.	Steel	12
5-Sep-03	Barge	L.R.D.	Concrete	16
5-Sep-03	Barge	L.R.D.	Steel	300
5-Sep-03	Shoreline North	L.R.D.	Concrete	45
5-Sep-03	Storage building	L.R.D.	Steel	12
6-Sep-03	Barge	L.R.D.	Steel	320
7-Sep-03	Barge	L.R.D.	Steel	60
7-Sep-03	Dock	L.R.D.	Steel	30
9-Sep-03	Dock	L.R.D.	Steel	15
9-Sep-03	Storage building	L.R.D.	Steel	18
10-Sep-03	Barge	L.R.D.	Steel	40
10-Sep-03	Barge	L.R.D.	Steel	12
11-Sep-03	Barge	L.R.D.	Steel	450
12-Sep-03	Barge	L.R.D.	Steel	240
13-Sep-03	Barge	L.R.D.	Steel	100
15-Sep-03	Barge	L.R.D.	Steel	18
15-Sep-03	Barge	L.R.D.	Steel	80
15-Sep-03	Barge	L.R.D.	Steel	80
15-Sep-03	Barge	L.R.D.	Steel	18
15-Sep-03	Storage building	L.R.D.	Steel	32
16-Sep-03	Dock	L.R.D.	Steel	210
16-Sep-03	Dock	L.R.D.	Styrofoam	3
17-Sep-03	Barge	L.R.D.	Steel	80
18-Sep-03	Barge	L.R.D.	Steel	120
18-Sep-03	Barge	L.R.D.	Steel	48
18-Sep-03	Barge	L.R.D.	Steel	18
19-Sep-03	Arctic Club	L.R.D.	Steel	12
20-Sep-03	Garrow Lake Dam	L.R.D.	Plastic pipe	120
20-Sep-03	Garrow Lake Dam	L.R.D.	Plastic pipe	200
21-Sep-03	Garrow Lake Dam	L.R.D.	Plastic pipe	280
21-Sep-03	Storage building	L.R.D.	Steel	36
21-Sep-03	Storage building	L.R.D.	Steel	12
22-Sep-03	Barge	L.R.D.	Steel	30
22-Sep-03	Barge	L.R.D.	Steel	108
22-Sep-03	Storage building	L.R.D.	Steel	24
22-Sep-03	Storage building	L.R.D.	Steel	24
23-Sep-03	Barge	L.R.D.	Steel	16
23-Sep-03	Storage building	L.R.D.	Steel	36
23-Sep-03	Storage building	L.R.D.	Steel	12
24-Sep-03	Barge	L.R.D.	Steel	12
24-Sep-03	Dock	L.R.D.	Steel	30
24-Sep-03	Storage building	L.R.D.	Steel	24
25-Sep-03	Garrow Lake Dam	L.R.D.	Styrofoam	12
25-Sep-03	Storage building	L.R.D.	Steel	48
26-Sep-03	Barge	L.R.D.	Steel	48
26-Sep-03	Garrow Lake Dam	L.R.D.	Styrofoam	48
26-Sep-03	Garrow Lake Dam	L.R.D.	Styrofoam	24
26-Sep-03	Garrow Lake Dam	L.R.D.	Styrofoam	12
26-Sep-03	Garrow Lake Dam	L.R.D.	Styrofoam	24
26-Sep-03	Storage building	L.R.D.	Steel	12
26-Sep-03	Storage building	L.R.D.	Steel	12
27-Sep-03	Garrow Lake Dam	L.R.D.	Styrofoam	72
27-Sep-03	Storage building	L.R.D.	Steel	12
28-Sep-03	Garrow Lake Dam	L.R.D.	Styrofoam/gravel	96
29-Sep-03	Garrow Lake Dam	L.R.D.	Styrofoam/gravel	12
29-Sep-03	Storage building	L.R.D.	Steel	12
30-Sep-03	Dock	L.R.D.	Steel	64
			TOTAL PLACED	**22,882**

Note: Volume in m^3 is loose volume before additional cutting / compacting in LRDQL



Cominco

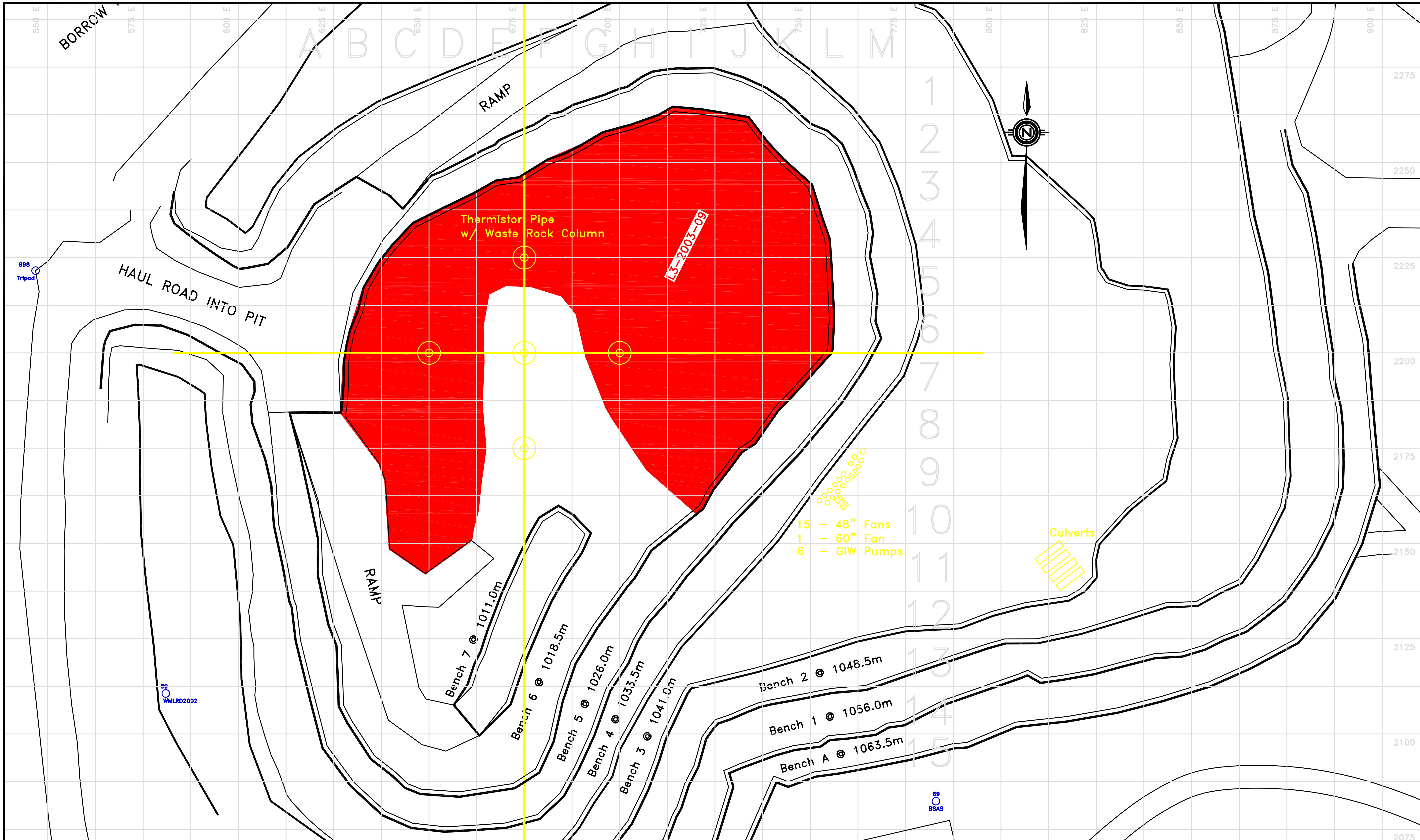
POLARIS PROJECT

LRD Quarry – LIFT 02

Demolition Debris Placement

DRAWN BY:	SCALE:	DATE:	DWG #:
TSF	1:1000	JULY-2003	

R:\37 – RECLAMATION PLANNING/37.02 Contaminated Soil/LRD Debris Placement



Cominco

POLARIS PROJECT

LRD Quarry – LIFT 03

Demolition Debris Placement

DRAWN BY: TSF	SCALE: 1:1000	DATE: JULY–2003	DWG #:

R:\37 – RECLAMATION PLANNING/37.02 Contaminated Soil/LRD Debris Placement

POLAIRS MINE – 2003 3rd QUARTER REPORT
PHOTOGRAPSH OF LITTLE RED DOG QUARRY LANDFILL DISPOSAL

Photograph #1
02-Jul-2003

Photograph #2
02-Jul-2003

Photograph #3
02-Jul-2003

Photograph #4
02-Jul-2003

Photograph #5
02-Jul-2003

Photograph #6
05-Jul-2003

POLAIRS MINE – 2003 3rd QUARTER REPORT
PHOTOGRAPSH OF LITTLE RED DOG QUARRY LANDFILL DISPOSAL

Photograph #7
09-Jul-2003

Photograph #8
10-Jul-2003

Photograph #9
14-Jul-2003

Photograph #10
15-Jul-2003

Photograph #11
21-Jul-2003

Photograph #12
31-Jul-2003

POLAIRS MINE – 2003 3rd QUARTER REPORT
PHOTOGRAPSH OF LITTLE RED DOG QUARRY LANDFILL DISPOSAL

Photograph #13
31-Jul-2003

Photograph #14
02-Aug-2003

Photograph #15
02-Aug-2003

Photograph #16
02-Aug-2003

Photograph #17
10-Aug-2003

Photograph #18
10-Aug-2003

POLAIRS MINE – 2003 3^{rd} QUARTER REPORT
PHOTOGRAPSH OF LITTLE RED DOG QUARRY LANDFILL DISPOSAL

Photograph #19
10-Aug-2003

Photograph #20
13-Aug-2003

Photograph #21
13-Augl-2003

Photograph #22
14-Aug-2003

Photograph #23
14-Aug-2003

Photograph #24
15-Aug-2003

POLAIRS MINE – 2003 3rd QUARTER REPORT
PHOTOGRAPSH OF LITTLE RED DOG QUARRY LANDFILL DISPOSAL

Photograph #25
18-Aug-2003

Photograph #26
25-Aug-2003

Photograph #27
26-Aug-2003

Photograph #28
28-Aug-2003

Photograph #29
28-Aug-2003

Photograph #30
30-Aug-2003

POLAIRS MINE – 2003 3rd QUARTER REPORT
PHOTOGRAPSH OF LITTLE RED DOG QUARRY LANDFILL DISPOSAL

Photograph #31
31-Aug-2003

Photograph #32
31-Aug-2003

Photograph #33
31-Aug-2003

Photograph #34
31-Aug-2003

Photograph #35
01-Sep-2003

Photograph #36
01-Sep-2003

POLAIRS MINE – 2003 3rd QUARTER REPORT
PHOTOGRAPSH OF LITTLE RED DOG QUARRY LANDFILL DISPOSAL

Photograph #37
07-Sep-2003

Photograph #38
07-Sep-2003

Photograph #39
07-Sep-2003

Photograph #40
08-Sep-2003

Photograph #41
08-Sep-2003

Photograph #42
08-Sep-2003

POLAIRS MINE – 2003 3rd QUARTER REPORT
PHOTOGRAPSH OF LITTLE RED DOG QUARRY LANDFILL DISPOSAL

Photograph #43
10-Sep-2003

Photograph #44
14-Sep-2003

Photograph #45
16-Sep-2003

Photograph #46
18-Sep-2003

Photograph #47
18-Sep-2003

Photograph #48
18-Sep-2003

POLAIRS MINE – 2003 3rd QUARTER REPORT
PHOTOGRAPSH OF LITTLE RED DOG QUARRY LANDFILL DISPOSAL

Photograph #49
20-Sep-2003

Photograph #50
20-Sep-2003

Photograph #51
23-Sep-2003

Photograph #52
27-Sep-2003

Photograph #53
27-Sep-2003

APPENDIX 10

RECORD OF DEBRIS PLACED

INTO

THE RECLAMATION LANDFILL

POLARIS MINE

RECLAMATION LANDFILL

RECORD OF DISPOSAL

Prepared by: **B. Donald, Teck Cominco Limited**
September 30, 2003

RECLAMATION LANDFILL

OVERVIEW OF DOCUMENT

The purpose of this report is to document the use of the Reclamation Landfill (aka Subsidence Landfill) at the Polaris Mine. This landfill was initiated in 1997 with two goals in mind:

- To initiate clean up of the mine site by disposing of obsolete equipment, and non-hazardous materials and supplies, and
- To make use of the fill being placed into the 'subsidence area' of the mine to provide a thick cover over the debris.

The Reclamation Landfill is located directly over some of the original underground stopes that were initially mined after the mine opened. The location of the Reclamation Landfill is indicated on the site plan provided in Appendix 1.

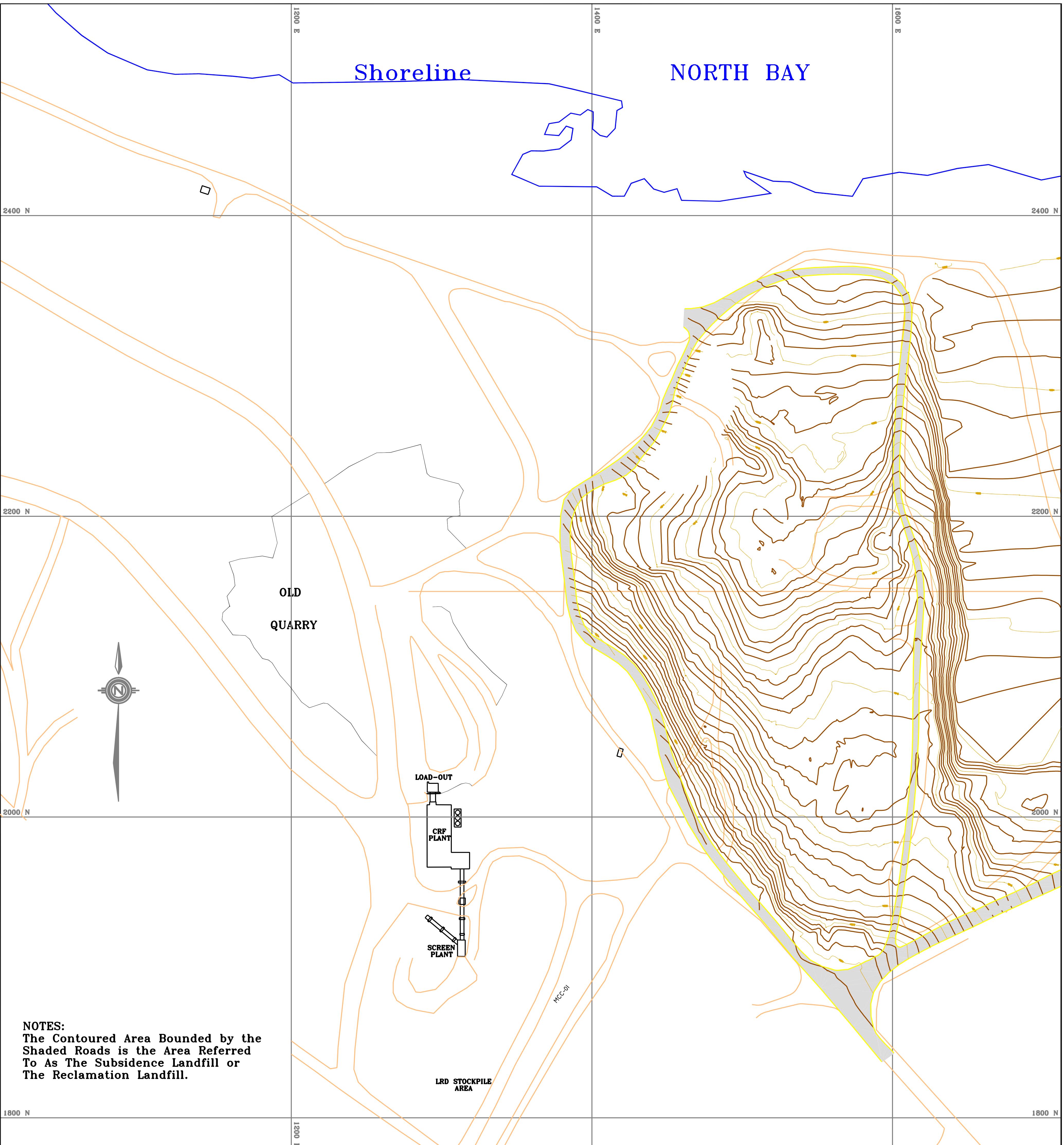
A number of areas around the site had obsolete equipment stored along with other types of obsolete materials and supplies. Cleanup of these areas once it was confirmed that the equipment/materials had no further useful life is consistent with responsible site management practices and with the concept of progressive reclamation. In 1997, an Operating Superintendent at the site was assigned the responsibility to manage the cleanup. When operating personnel could be spared from their regular operating duties, they were assigned the task of site cleanup. To ensure the Reclamation Landfill was only used for disposal of benign materials, procedures were established directing that no hazardous or special waste materials were deposited in the landfill, and that equipment designated for disposal was properly prepared first. The equipment was prepared by removing their batteries (to be shipped south for proper disposal) and all oils, greases and fuels were removed (refer to email from J. Knapp attached in Appendix 2). Once the equipment was ready for disposal, the mechanic completing work signed a form confirming that the equipment had been properly prepared. Copies of the completed forms (electronically scanned) are included in Appendix 3.

Photographs were taken on a regular basis through the process of placing materials in the Reclamation Landfill. These photographs are included in Appendix 3 and are grouped by month and/or year.

Initially after closure of the mine, it was believed that the information collected had been inadvertently lost during the demolition of the administration offices. However, it was later discovered that these records had been removed and placed into temporary storage and have now been retrieved. The records have been digitized and this document is the result to ensure there are electronic copies for safe keeping.

APPENDIX 1

LOCATION PLAN OF RECLAMATION LANDFILL



POLARIS MINE

DRAWN BY:	DB	JULY 2002	RECLAMATION LANDFILL LOCATION
REVISED BY:	DATE:	REVISION:	
JJC	JULY 2001	2001 UPDATE	
TSF	JULY 2002	2002 UPDATE	
BJD	Sept. 2003		
			SCALE: N.T.S.
			DATE: 01-OCT-03
			Figure 1

APPENDIX 2

NOTE FROM

J. KNAPP, MANAGER POLARIS OPERATIONS

REGARDING

THE DISPOSAL OF MATERIAL IN THE

RECLAMATION LANDFILL

SIMMS PAUL (P.) POL

From: KNAPP JOHN (J.B.) POL
Sent: Friday, February 09, 2001 10:46 AM
To: 'edenholm@gartnerlee.com'
Cc: SIMMS PAUL (P.) POL
Subject: RE: Closure Plan

Hello Eric,
Sorry it has taken forever to respond but I have a multitude of excuses. Regardless, we don't have a documented procedure that will help very much.

We use a checklist for all disposed mobile equipment. The checklist records the equipment number and description (ie 692 Toyota) and then the following check:
Drain all oils/fluids/fuel
Remove All Filters
Remove all residual oil/grease

It is signed by the tradesman doing the work, and then endorsed by his supervisor.
This record is then maintained in a binder which is also used to keep photographic documentation of materials that are placed in the sinkhole.
No hazardous materials are to be disposed of in any landfill

The Surface Supervisor is involved in the placement of material, as their crew is responsible for moving scrap to the sinkhole. The Operating Superintendent, who has overall responsibility for the Surface Crew and Mill Crew is involved in maintained the records and photographic log.

Let me know of any other questions and I'll try to be more timely.
Best regards,
John

-----Original Message-----
From: Eric Denholm [SMTP:edenholm@ssimicro.com]
Sent: Friday, January 19, 2001 10:08 AM
To: john.knapp@cominco.com
Subject: Closure Plan

Hi John:

We have been working on the changes to the landfill design as discussed at the meeting in Calgary. When we get a design thickness of the single layer cover that incorporates effects of pore water salinity, we will give you a call.

Regarding the reclamation landfill in the subsidence area, we have a question for you. I understand from Tony that you have a documented procedure for approving and inventorying all materials placed in this landfill. We suspect that this information may be necessary to back up the intended bulk fill (non-engineered) cover planned for this landfill.

Is this info. in a format that you could send to me so that we are up-to-date on your procedures should the question arise? We discussed making such info. an appendix to the landfill report.

I never gave you my card when we were in Calgary and some programs have trouble opening the attacehd card file ...

Eric Denholm
Geological / Environmental Engineering
P.O. Box 98
4909-50th Ave.
Yellowknife, NT   X1A 2N1
ph (867) 873-5808
fax (867) 873-4453
home (867) 669-7855
cell (867) 444-1256

Thanks,

Eric D. << File: Card for Eric Denholm >>

APPENDIX 3

MOBILE EQUIPMENT

PREPARATION RECORDS

LIST OF ITEMS BURIED IN THE SINKHOLE

ROYARY BATH DRUM,GEARS AND GUARDS.
ELECTRICAL CABLE TRAYS.
JUMBO BOOM.
SCALFING.
USED GRIZZLY.
WOODEN PALLETS.
WAREHOUSE SCALFING.
SEVERAL PUMP BOXES.
DUMP TRUCK BOXES.
SCOOP BUCKETS,CANOPY,and MAIN FRAME.
FLOTATION ROTORS.
STEEL PUMP CASINGS.
20 AND 40 FOOT CONTAINRES
STEEL PLATES DIFF SIZES,THICKNESS
VENT TUBING
SPLIT SETS
SULLAIR COMPRESSORS
COVERTS
JEEP PARTS
PIPE RACKES
OLD GANG PLANK
FLOTATION LAUNDER
TIRES DIFF SIZES,JEEP ,LOADERS SCOOPS
RIMS,DIFFERENT SIZES
DIFFERENT SIZES CHAINS
ELECTRIAL MOTOR DIFFERENT SIZES
WOODEN CRATES
STABILIZER BARS
DIAMOND DRILL SLUDGE TANK
DOCK BOLLARD
DRUM TILTER
CONVEYOR PULLEYS
VEHICLES

Shop Sketch

Cominco

Toyota #662 + 659

have had all liquids remove and have been scraped after being striped of usable parts. + sent to sink hole.

Mech. Gord Dehaca

completed May 30/02

Serge Gingras May 30/02

Job Description		Originator		Materials and specifications		
Limits and tolerance unless specified will be		Fractional ± 1/64	Decimal ± .005	Angular ±½°	Specified	Scale
Machine finish required	As cast:	Rough	Medium	Fine	Other	

Remarks:

Date , 19

Name (please print)

211-1219 H.P.

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: Toyota Equipment #: 604

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	Y	
Remove all residual oil/grease	J	

Tradesman Signature: 2 Boyd

Supervisor's Signature: Serge

TSK
June/98

TO BE GIVEN TO JOHN KNAPP FOR FILING

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: Toyota   Equipment #: 761

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: J Pope

Supervisor's Signature Serge

JTSK
June/98

TO BE GIVEN TO JOHN KNAPP FOR FILING

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: GMC BUS Equipment #: 696

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: JB

Supervisor's Signature Serge

TO BE GIVEN TO JOHN KNAPP FOR FILING

Fuel still draining
DRAINED EVERYTHING ELSE Done

TK Rec'd June 24/98
Sunk Wm.

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Paus Mancarrier.

Equipment Description: PAUS Equipment #: ____

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: [signature]

Supervisor's Signature Serge

TO BE GIVEN TO JOHN KNAPP FOR FILING

Jun 29/98.
Sink Hole

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: Toyota Equipment #: 749

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: Jim Denny.

Supervisor's Signature

TSK July 2/98

TO BE GIVEN TO JOHN KNAPP FOR FILING

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: toyotA Equipment #: 695

	Yes	No
Drain all oils/fluids/fuel	✓	___
Remove all filters	✓	___
Remove all residual oil/grease	✓	___

Tradesman Signature: Jos. Ba...

Supervisor's Signature Serge

July 7/98

TO BE GIVEN TO JOHN KNAPP FOR FILING

John Knap

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: TOYOTA Equipment #: 738

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: P. Hawkins.

Supervisor's Signature Serge

TO BE GIVEN TO JOHN KNAPP FOR FILING

RSK
July 10/98

John Knapp

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: DUX BARBARm Equipment #: 153

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: AB PV

Supervisor's Signature

JSK
July 14/98

TO BE GIVEN TO JOHN KNAPP FOR FILING

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: Paus / Flinger Truck Equipment #: ____

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: ____

Supervisor's Signature ____

TO BE GIVEN TO JOHN KNAPP FOR FILING

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: ST 8A Rear frame Equipment #: 102

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: ______________________

Supervisor's Signature ______________________

TO BE GIVEN TO JOHN KNAPP FOR FILING

ITSK. Rec'd Aug 19/98

John Knapp

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: FORD F250 Equipment #: 733

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: [signature]

Supervisor's Signature [signature]

TBK
Rec'd Aug 19/98

TO BE GIVEN TO JOHN KNAPP FOR FILING

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: PJ 75 Equipment #: 661

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: Joseph Kontsok

Supervisor's Signature Serge Gingras

TO BE GIVEN TO JOHN KNAPP FOR FILING

Rec'd
[illegible]
Nov 14/98

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: TOYOTA PZ-75 Equipment #: 767

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: [signature]

Supervisor's Signature Serge

6/3/99.

TO BE GIVEN TO JOHN KNAPP FOR FILING

Rec'd.
Paul
MAR 6/99

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: INGERSOL-RAND DRILL.   Equipment #: 160

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature:

Supervisor's Signature

TO BE GIVEN TO JOHN KNAPP FOR FILING

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: TOYOTA Equipment #: 650

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: JBJ

Supervisor's Signature George

TO BE GIVEN TO JOHN KNAPP FOR FILING

Advised by Ron Matthews that this will be disposed of July/Aug in 850-172 via Ramp

JBK
Aug 1/97

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: ToyoTA   Equipment #: 663

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: J.B.

Supervisor's Signature Serge

TO BE GIVEN TO JOHN KNAPP FOR FILING

Advised by R Matthews that this will be disposed of July/Aug in 850-172 via Ramp

JBK
Aug 1/97

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: ToyoTA Equipment #: 652

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: JBJ

Supervisor's Signature Serge

850-172

TO BE GIVEN TO JOHN KNAPP FOR FILING

Advised by R Mathews, July 31/97 that this will be disposed of in 850-172 via ramp.

JBK
July 31/97

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: TOYOTA Equipment #: 747

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: JBJ

Supervisor's Signature Serge

TO BE GIVEN TO JOHN KNAPP FOR FILING

Advised by Ron Matthews that this will be disposed of in July/Aug in 850-172 via the Ramp.

JBK
Aug 1/97

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: Toyota

Equipment #: 692

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: JBJ

Supervisor's Signature: George

TO BE GIVEN TO JOHN KNAPP FOR FILING

Advised by Ron Matthews that this will be disposed of in July/Aug in 850-172 via the Ramp.

JBK
Aug 1/97

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: Toyota.　　Equipment #: 668

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: J.BJ.

Supervisor's Signature Serge

TO BE GIVEN TO JOHN KNAPP FOR FILING

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: toyota   Equipment #: 658

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: ______________________

Supervisor's Signature ______________________

TO BE GIVEN TO JOHN KNAPP FOR FILING

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: Toyota   Equipment #: 660

	Yes	No
Drain all oils/fluids/fuel	✓	
Remove all filters	✓	
Remove all residual oil/grease	✓	

Tradesman Signature: A. Skoalos

Supervisor's Signature Serge

TO BE GIVEN TO JOHN KNAPP FOR FILING

Speedimemo

Cominco

210-1217

FROM WAYNE MORTON

DEPARTMENT MINE-ENG

SEND TO: BRAD SEWELL

POSTAL CODE

DATE

SUBJECT CEMENT DUMP SITE

Message:

THE LOCATION OF THE DUMPED CEMENT IN THE SUBSIDENCE SINK HOLE IS:

2018.0 NORTH
1555.0 EAST
1015.0 ELEVATION (TOP)

USE THIS AREA FOR YOUR REPLY:

REPLY FROM

DATE

AVOID VERBAL INSTRUCTIONS — USE SPEEDI MEMOS

SENDER: RETAIN PART 2

RESPONDENT: RETURN LAST PART

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: Ford F-250 4X4 Equipment #: 759

	Yes	No
Drain all oils/fluids/fuel	✓	___
Remove all filters	✓	___
Remove all residual oil/grease	✓	___

Tradesman Signature: G.D. T.P.

Supervisor's Signature ______________

Mar 21/2002

TO BE GIVEN TO JOHN KNAPP FOR FILING

Paul Simms

Shop Sketch

Cominco

206 W-20 Case Loader
All oils, fuel + coolant + filters
were removed on May 31/02
and loader was sent to
sink hole.

Warren Clapperton
Tim Pope.

Serge Grinyer

Job Description		Originator		Materials and specifications		
Limits and tolerance unless specified will be		Fractional ± 1/64	Decimal ± .005	Angular ± ½°	Specified	Scale
Machine finish required	As cast:	Rough	Medium	Fine	Other	

Remarks:

Date ______ , 19 ______

Name (please print) ______

211-1219 H.P

POLARIS RECLAMATION PROJECT

OBSOLETE EQUIPMENT TO BE BURIED

Equipment Description: ~~[illegible]~~ Toyota Equipment #: 742

W.O.# 105513

	Yes	No
Drain all oils/fluids/fuel	LJ	
Remove all filters	LJ	
Remove all residual oil/grease	LJ	

Tradesman Signature: [illegible]

Supervisor's Signature: Serge

TO BE GIVEN TO JOHN KNAPP FOR FILING

APPENDIX 4

PHOTOGRAPHS OF THE

RECLAMATION LANDFILL DEBRIS

PHOTOGRAPHS – LATE MAY / JUNE 1997

PHOTOGRAPHS – JULY 1998

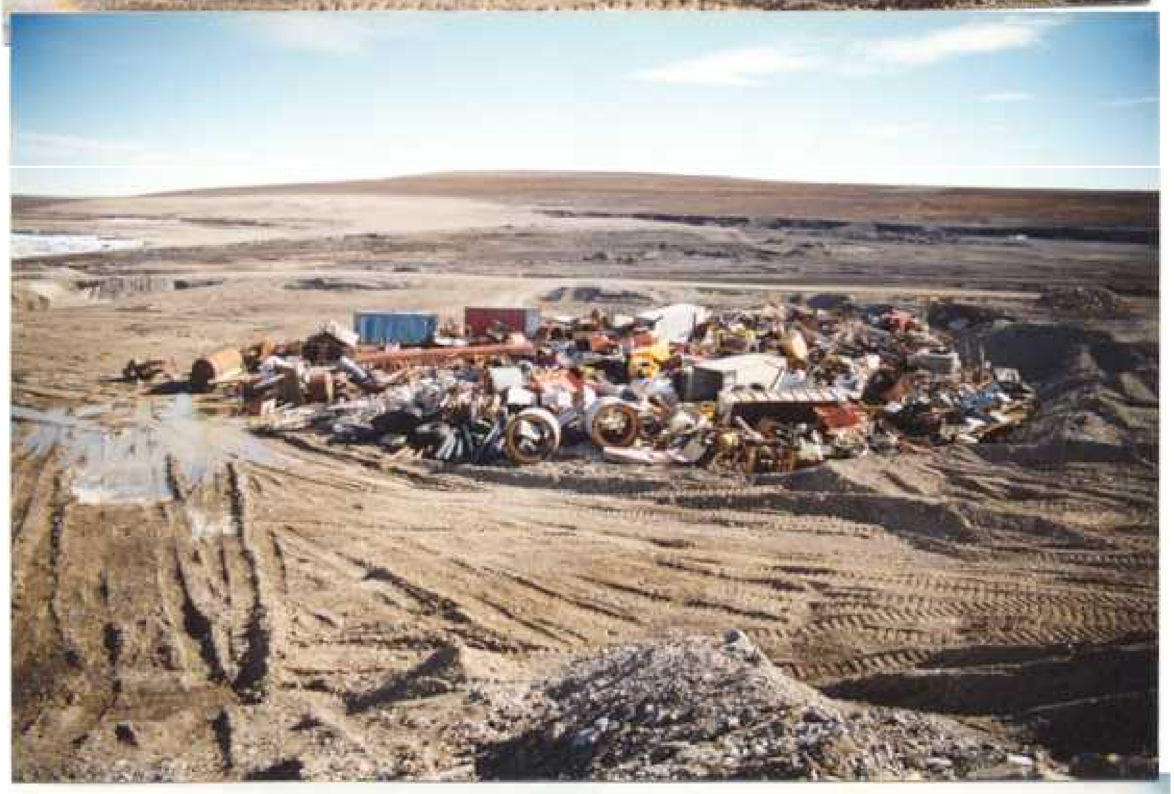
Sinkhole
07/25/98

Sinkhole
07/25/98

Sinkhole
07/25/98

Sinkhole
07/25/98







Sinkhole 07/20/98

Sinkhole 07/20/98

Sinkhole
07/25/98

Sinkhole
07/25/98

Sinkhole
07/25/98

07/25/98

SINKHOLE
~~08~~/07/98
08

Sinkhole
07/25/98

PHOTOGRAPHS – AUGUST 1998

SINKHOLE
08/07/98

SINKHOLE
08/07/98

PHOTOGRAPHS – AUGUST 1999



PHOTOGRAPHS – SEPTEMBER 1999




ATCO


ATCO

PHOTOGRAPHS – JULY 2000





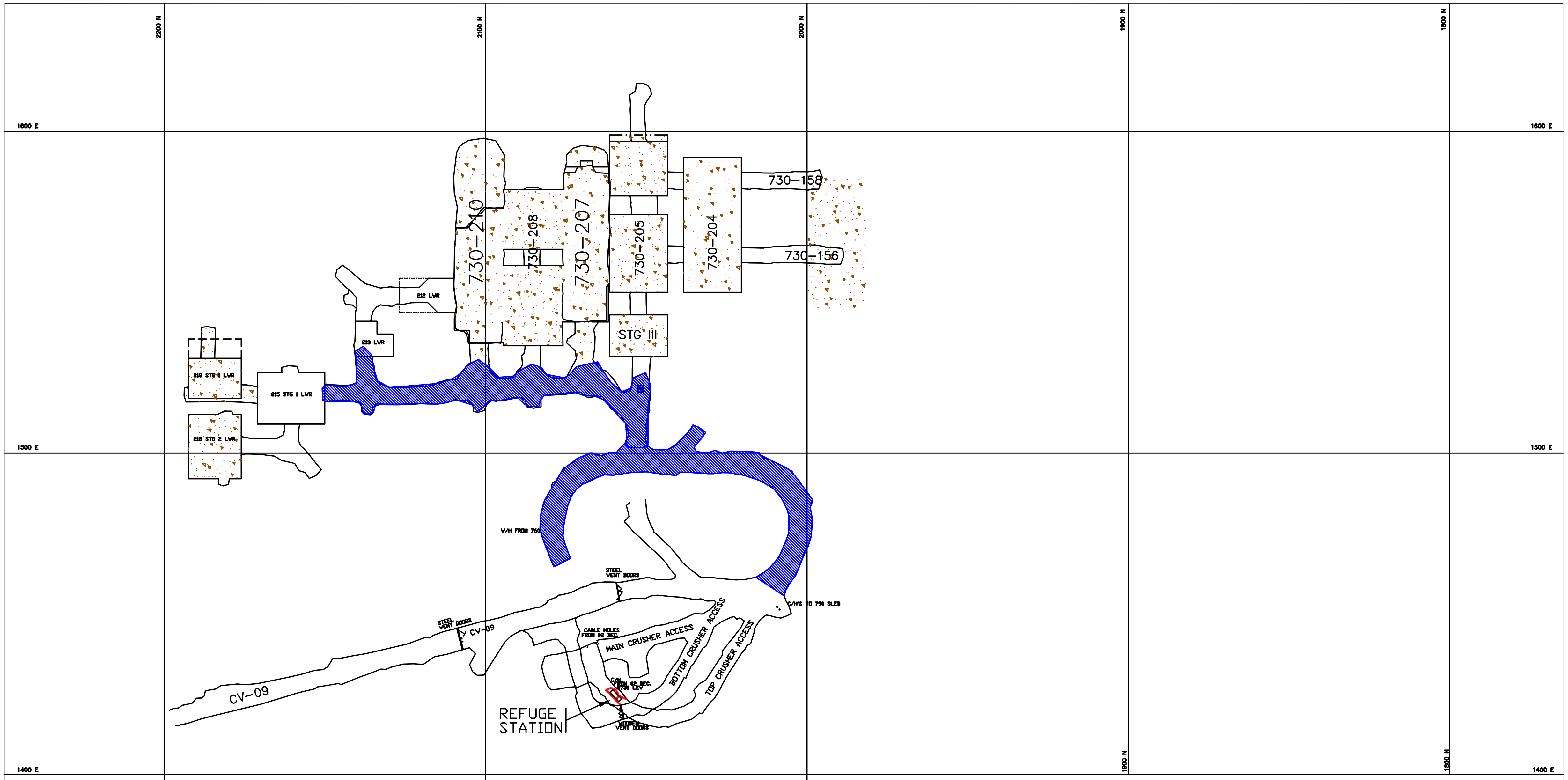
PHOTOGRAPHS – 2001

APPENDIX 11

RECORD OF PLACEMENT OF

METALS / HYDROCARBON CONTAMINATED SOILS

UNDERGROUND IN THE MINE



MATERIALS PLACED UNDERGROUND

NORMAL MINE BACKFILL FROM OPERATIONS

METALS CONTAMINATED SOILS

HYDROCARBON CONTAMINATED SOILS

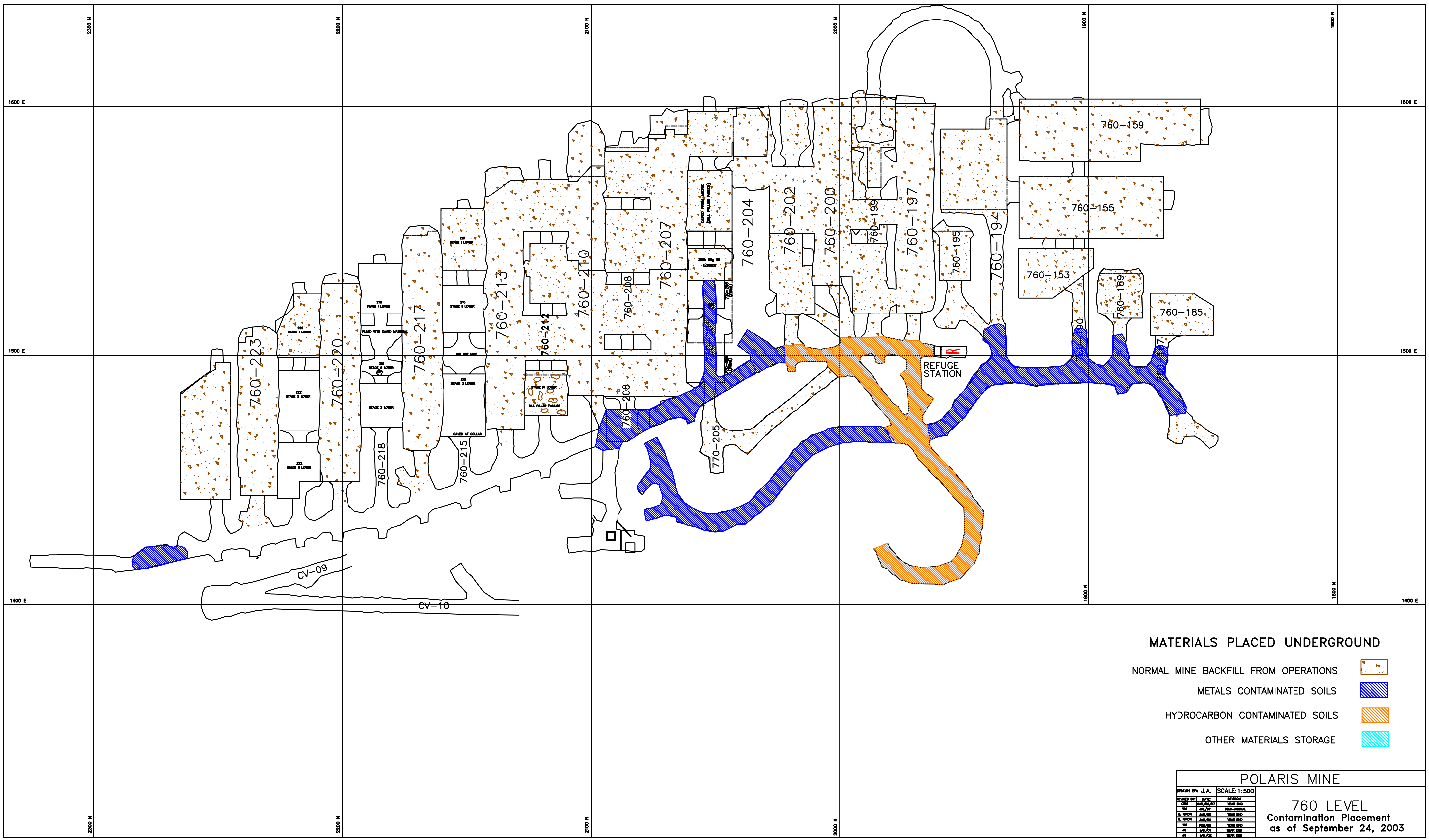
OTHER MATERIALS STORAGE

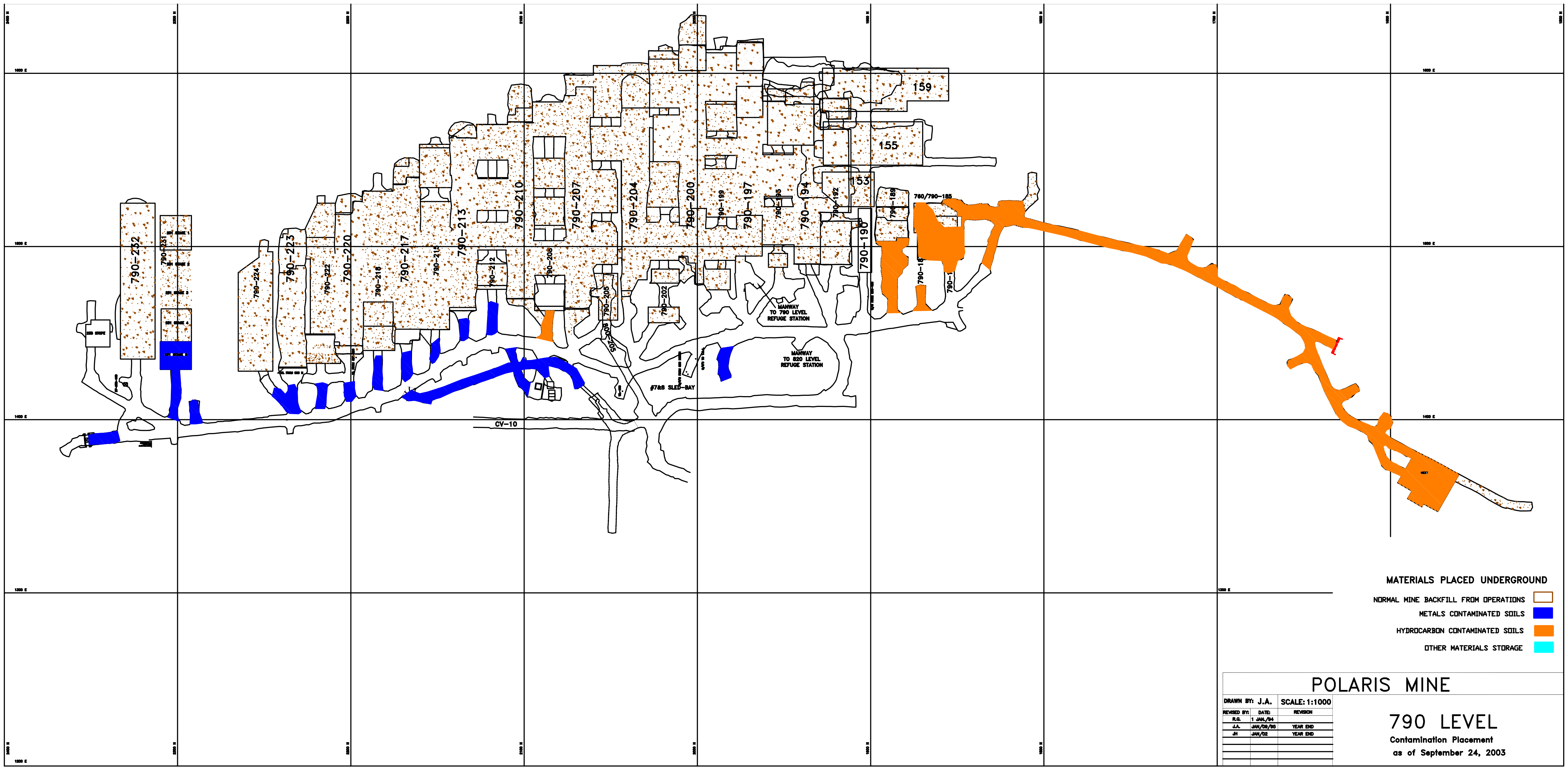
POLARIS MINE

DRAWN BY: J.A. SCALE: 1:500

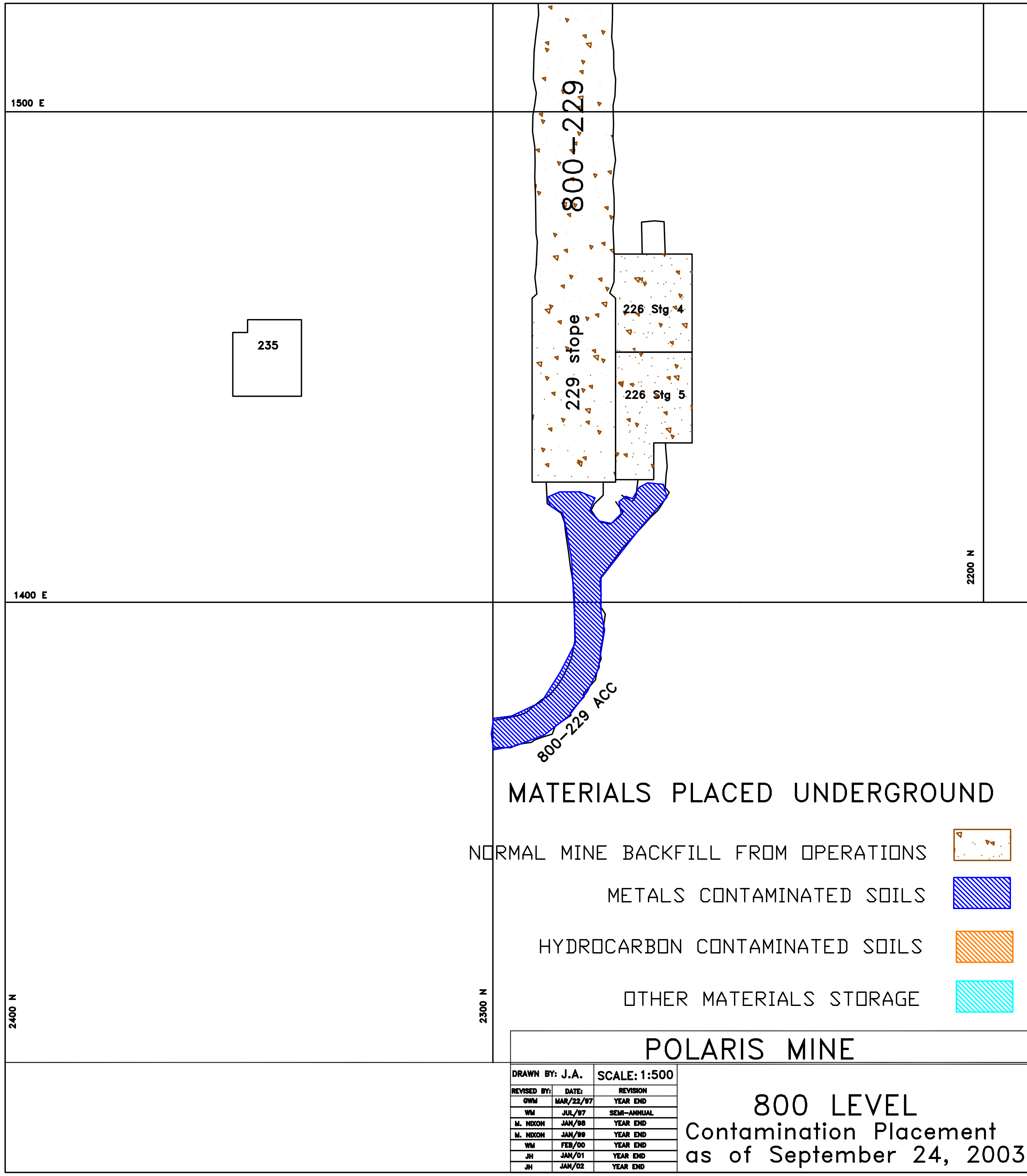
730 LEVEL

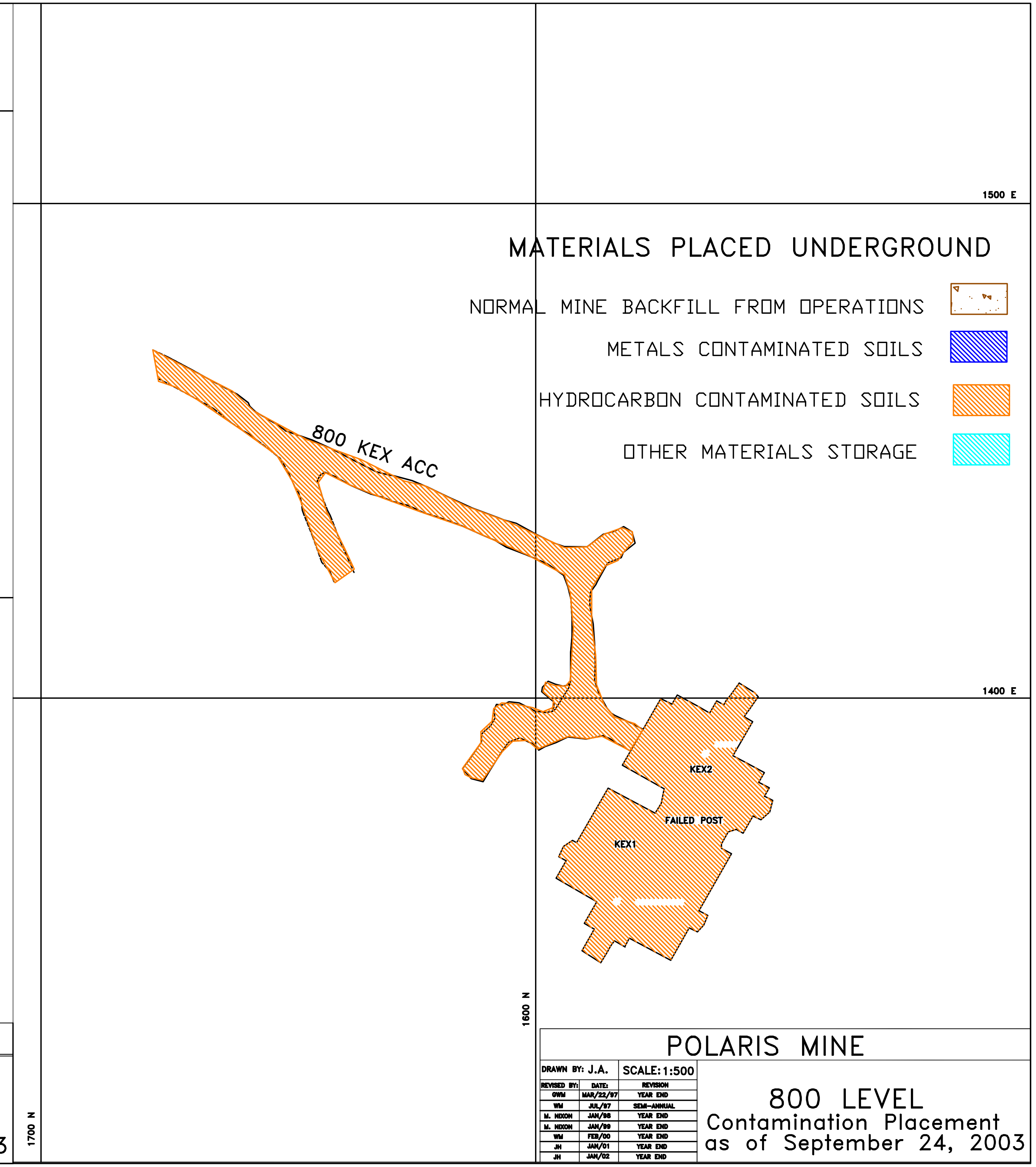
Contamination Placement
as of September 24, 2003

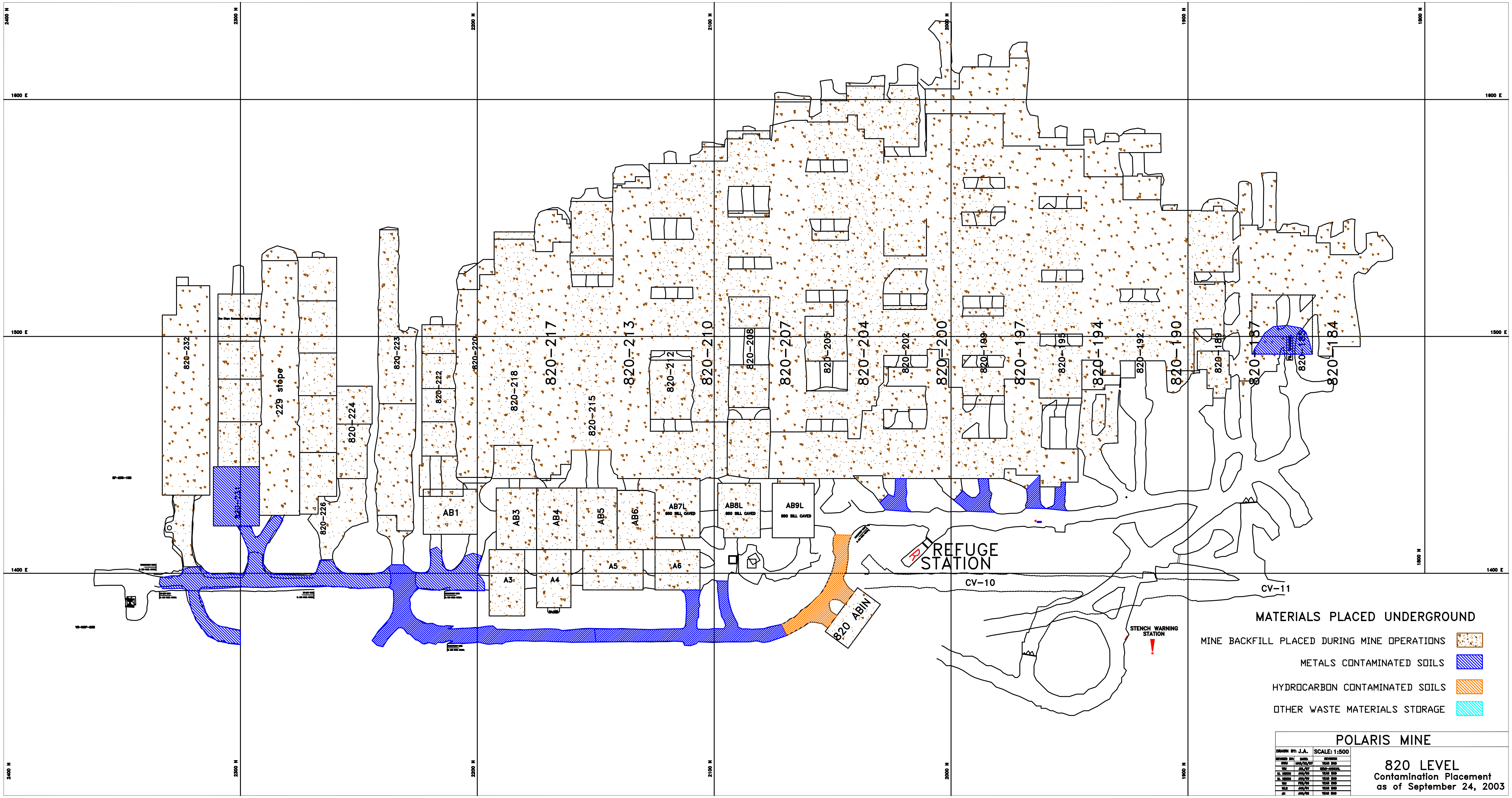

MATERIALS PLACED UNDERGROUND
NORMAL MINE BACKFILL FROM OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER MATERIALS STORAGE
POLARIS MINE
DRAWN BY: J.A.
SCALE: 1:500
REVISED BY: | DATE: | REVISION
GWM | MAR/22/97 | YEAR END
WM | JUL/97 | SEMI-ANNUAL
M. NIXON | JAN/98 | YEAR END
M. NIXON | JAN/99 | YEAR END
WM | FEB/00 | YEAR END
JH | JAN/01 | YEAR END
JH | JAN/02 | YEAR END
760 LEVEL
Contamination Placement
as of September 24, 2003
2300 N
2200 N
2100 N
2000 N
1900 N
1800 N
1600 E
1500 E
1400 E
760-159
760-155
760-153
760-185
760-189
760-194
760-195
760-197
760-199
760-200
760-202
760-204
760-207
760-208
760-210
760-212
760-213
760-215
760-217
760-218
760-220
760-223
770-205
REFUGE STATION
CV-09
CV-10



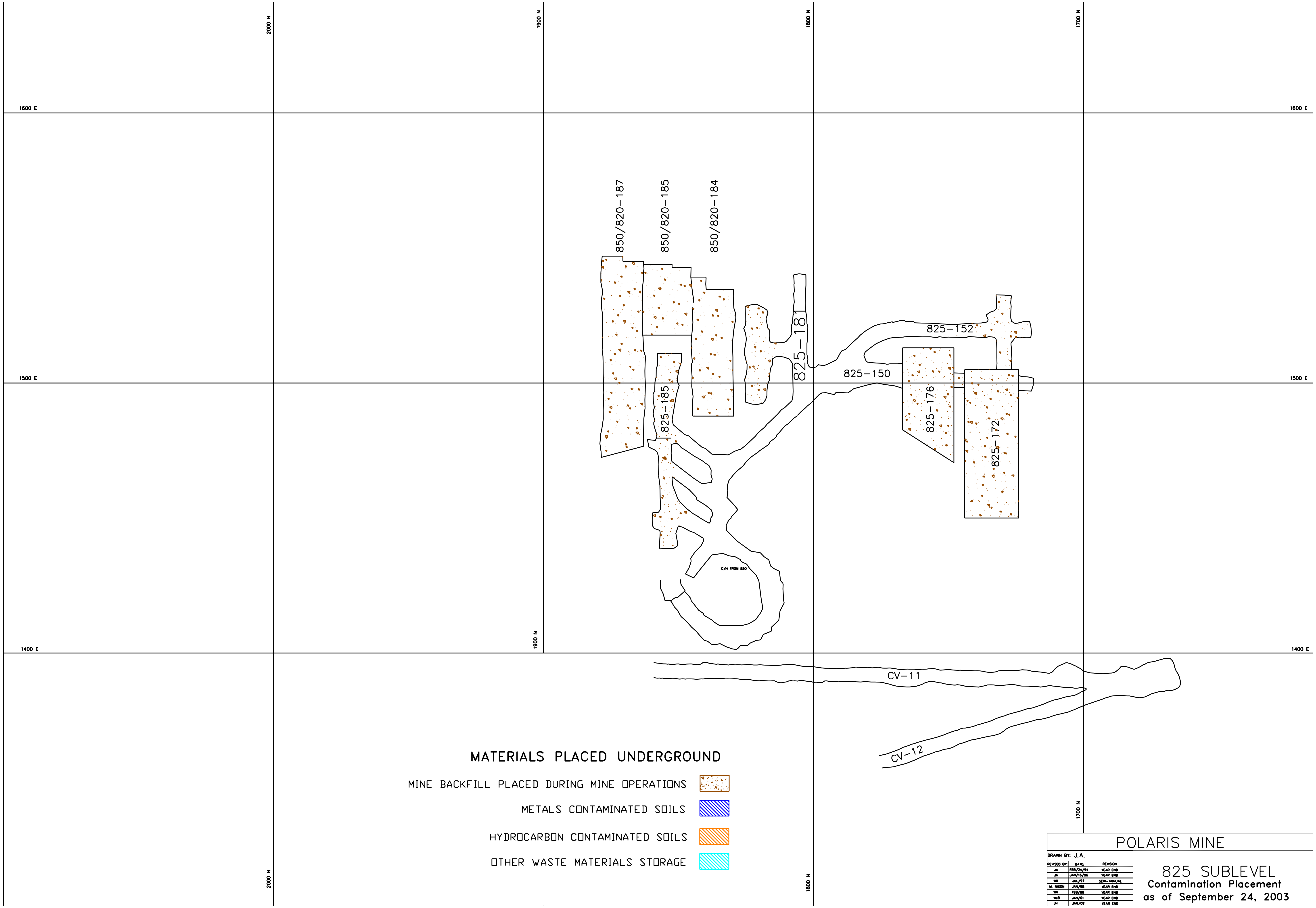
159
155
153
790/790-185
790-232
790-224
790-223
790-222
790-220
790-218
790-217
790-213
790-212
790-210
790-208
790-207
790-205
790-204
790-202
790-200
790-199
790-197
790-194
790-192
790-190
790-188
MANWAY
TO 790 LEVEL
REFUGE STATION
MANWAY
TO 820 LEVEL
REFUGE STATION
#7&8 SLED-BAY
CV-10
MATERIALS PLACED UNDERGROUND
NORMAL MINE BACKFILL FROM OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER MATERIALS STORAGE
POLARIS MINE
DRAWN BY: J.A.
SCALE: 1:1000
REVISED BY: DATE: REVISION
R.G. 1 JAN./94
J.A. JAN/09/95 YEAR END
JH JAN/02 YEAR END
790 LEVEL
Contamination Placement
as of September 24, 2003


1500 E
1400 E
2400 N
2300 N
2200 N
800-229
229 stope
226 Stg 4
226 Stg 5
235
800-229 ACC
MATERIALS PLACED UNDERGROUND
NORMAL MINE BACKFILL FROM OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER MATERIALS STORAGE
POLARIS MINE
DRAWN BY: J.A.
SCALE: 1:500
REVISED BY: DATE: REVISION
GWM MAR/22/97 YEAR END
WM JUL/97 SEMI-ANNUAL
M. NIXON JAN/98 YEAR END
M. NIXON JAN/99 YEAR END
WM FEB/00 YEAR END
JH JAN/01 YEAR END
JH JAN/02 YEAR END
800 LEVEL
Contamination Placement
as of September 24, 2003


1500 E
1400 E
1700 N
1600 N
MATERIALS PLACED UNDERGROUND
NORMAL MINE BACKFILL FROM OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER MATERIALS STORAGE
800 KEX ACC
KEX2
FAILED POST
KEX1
POLARIS MINE
DRAWN BY: J.A.
SCALE: 1:500
REVISED BY: DATE: REVISION
GWM MAR/22/97 YEAR END
WM JUL/97 SEMI-ANNUAL
M. NIXON JAN/98 YEAR END
M. NIXON JAN/99 YEAR END
WM FEB/00 YEAR END
JH JAN/01 YEAR END
JH JAN/02 YEAR END
800 LEVEL
Contamination Placement
as of September 24, 2003



MATERIALS PLACED UNDERGROUND
MINE BACKFILL PLACED DURING MINE OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER WASTE MATERIALS STORAGE
REFUGE STATION
CV-10
CV-11
820 ABIN
STENCH WARNING STATION
820-232
229 stope
820-224
820-226
820-223
820-222
820-220
820-218
820-217
820-215
820-213
820-212
820-210
820-208
820-207
820-205
820-204
820-202
820-200
820-197
820-194
820-192
820-190
820-184
AB1
AB3
AB4
AB5
AB6
AB7L
AB8L
AB9L
A3
A4
A5
A6
POLARIS MINE
820 LEVEL
Contamination Placement
as of September 24, 2003
SCALE: 1:500

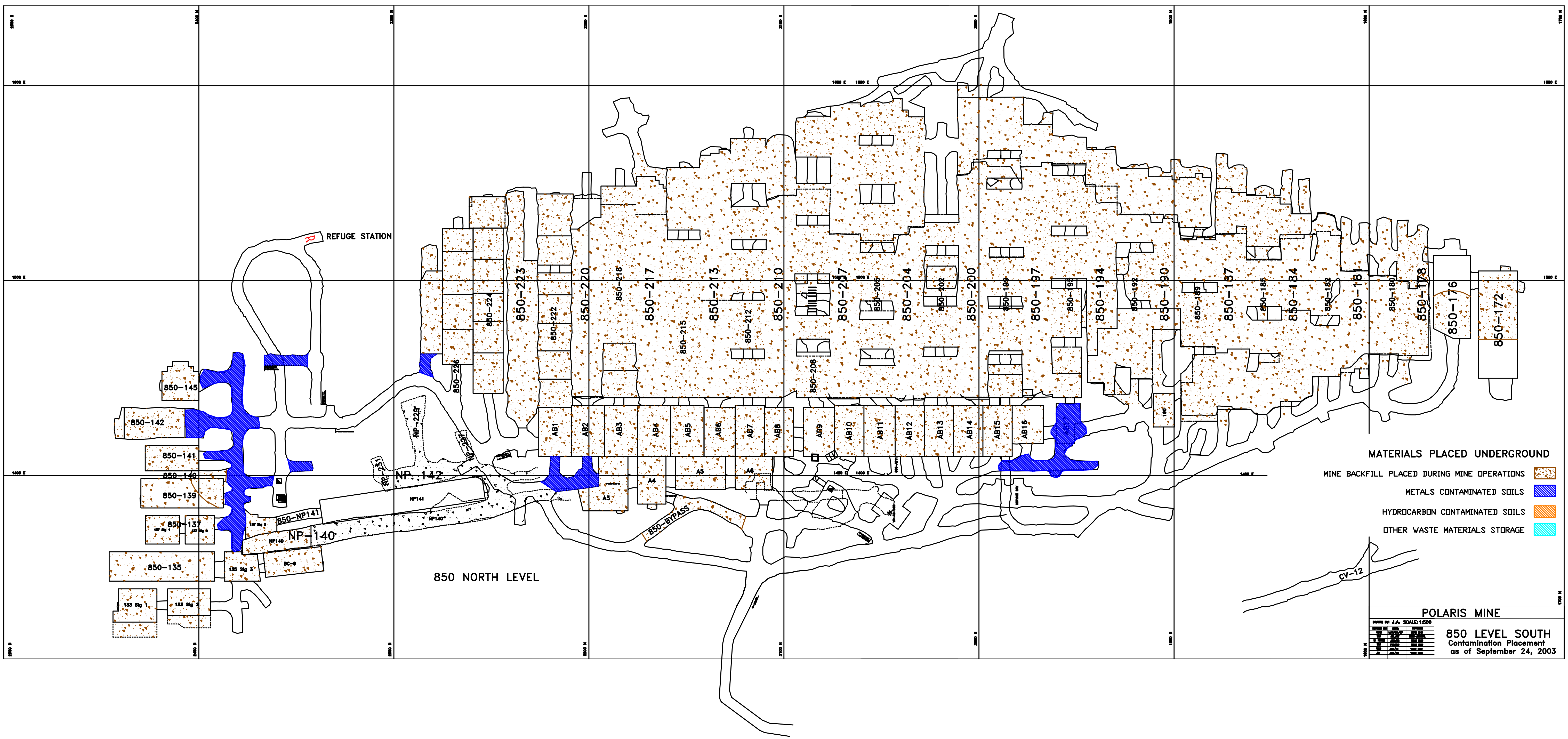


POLARIS MINE

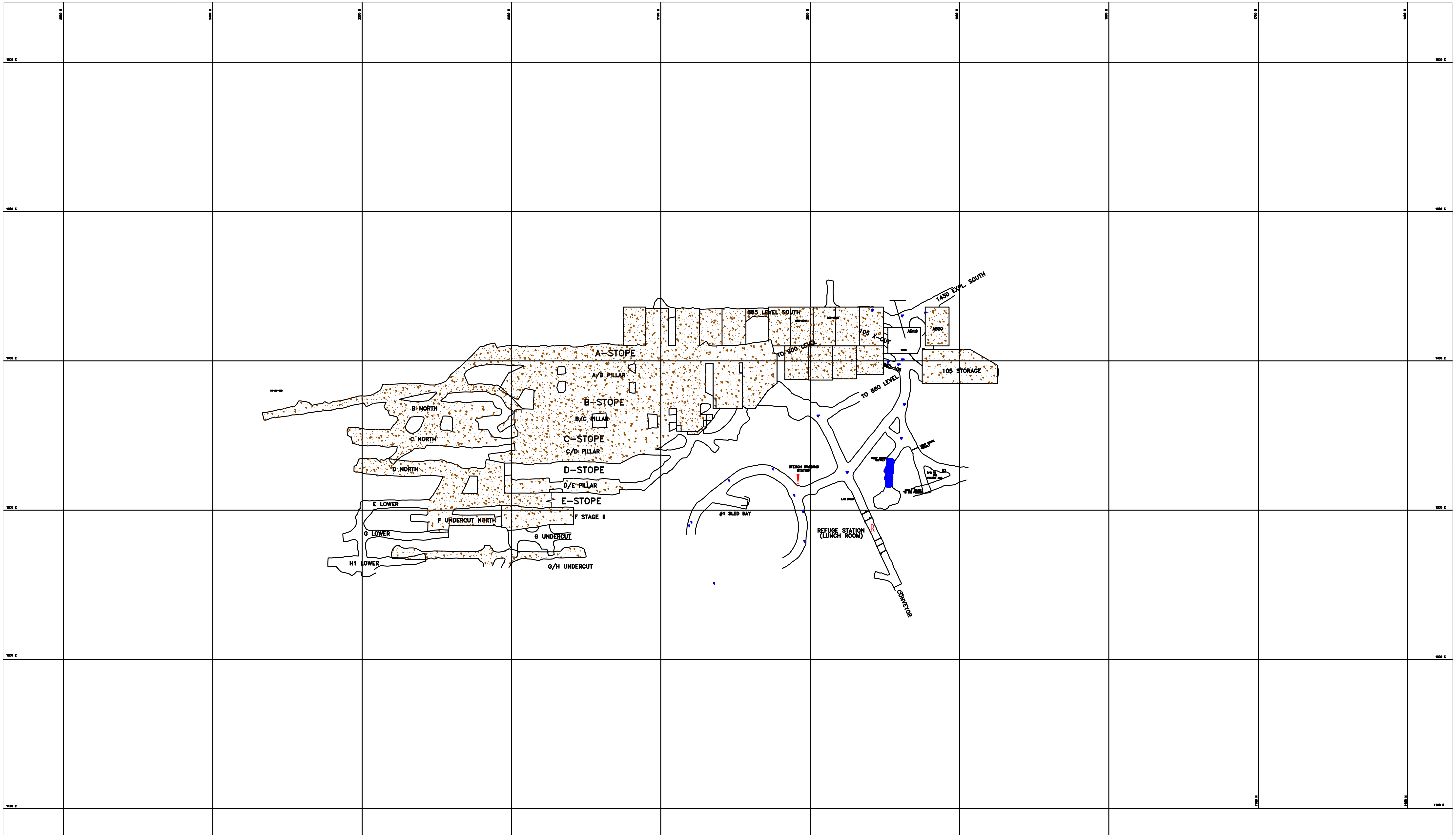
825 SUBLEVEL

Contamination Placement

as of September 24, 2003


REFUGE STATION
850-145
850-142
850-141
850-140
850-139
850-137
850-135
133 Stg 1
133 Stg 2
135 Stg 3
BC-6
850-NP141
NP140
NP-140
NP141
NP-142
850 NORTH LEVEL
850-226
850-224
850-223
850-222
850-220
850-218
850-217
850-215
850-213
850-212
850-210
850-208
850-207
850-205
850-204
850-202
850-200
850-199
850-197
850-195
850-194
850-192
850-190
850-189
850-187
850-185
850-184
850-182
850-181
850-180
850-178
850-176
850-172
AB1
AB2
AB3
AB4
AB5
AB6
AB7
AB8
AB9
AB10
AB11
AB12
AB13
AB14
AB15
AB16
AB17
A3
A4
A5
A6
850-BYPASS
CV-12
MATERIALS PLACED UNDERGROUND
MINE BACKFILL PLACED DURING MINE OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER WASTE MATERIALS STORAGE
POLARIS MINE
850 LEVEL SOUTH
Contamination Placement
as of September 24, 2003

POLARIS MINE
880 LEVEL SOUTH
Contamination Placement
as of September 24, 2003
MATERIALS PLACED UNDERGROUND
MINE BACKFILL PLACED DURING MINE OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER WASTE MATERIALS STORAGE
Mak Parts
Pump
Compressor
Hydraulic Pack
Tailings Lines
REFUGE STATION
NEAR BY
LADDER UP TO
REFUGE STATION
REFUGE STATION
NEXT RIGHT
SLED-BAY
A STOPE
A/B UNDERCUT
B STOPE
B/C UNDERCUT
880 DUMP
NP-231
NP-229
NP-227
NP-142
NP-140
880-145
880-142
880-141
880-139
880-137
880-135
125W
880-124W
880-224
880-223
880-222
880-220
880-218
880-217
880-215
880-213
880-212
880-210
880-207
880-205
880-204
880-202
880-200
880-199
880-197
880-195
880-194
880-192
880-190
880-188
880-187
880-185
880-184
880-182
880-181
880-180
880-178
AB1
AB2
AB3
AB4
AB5
AB6
AB7
AB8
AB9
AB10
AB11
AB12
AB13
AB14
AB15
AB16
AB17
AB19
AB20
105-6
105-7



MATERIALS PLACED UNDERGROUND

MINE BACKFILL PLACED DURING MINE OPERATIONS

METALS CONTAMINATED SOILS

HYDROCARBON CONTAMINATED SOILS

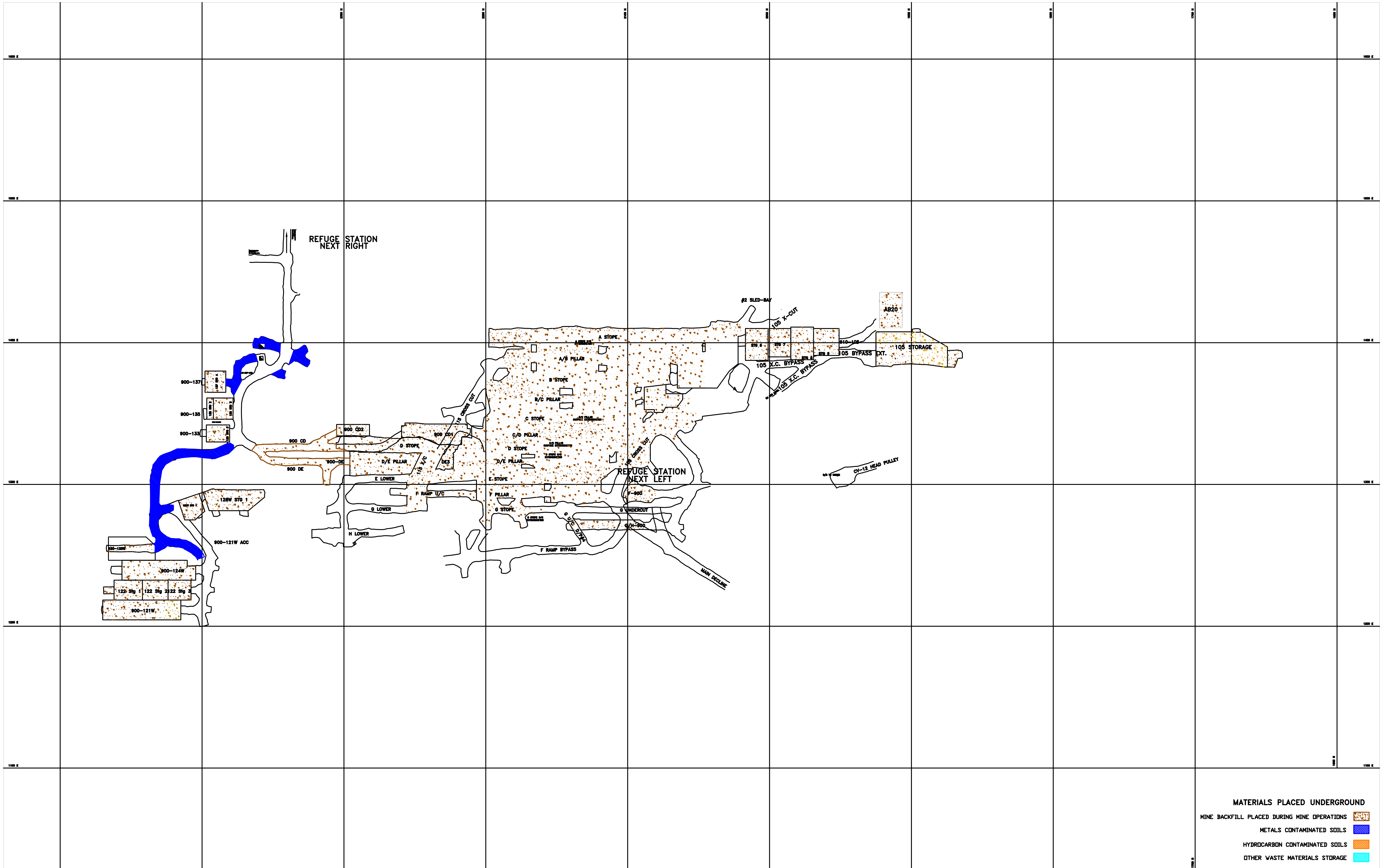
OTHER WASTE MATERIALS STORAGE

POLARIS MINE

DRAWN BY: J.A.		SCALE:1:1000
REVISED BY:	DATE:	REVISION
R.G.	1 JAN./94	
J.A.	JAN/09/95	YEAR END

885 LEVEL

Contamination Placement
as of September 24, 2003



MATERIALS PLACED UNDERGROUND

- MINE BACKFILL PLACED DURING MINE OPERATIONS
- METALS CONTAMINATED SOILS
- HYDROCARBON CONTAMINATED SOILS
- OTHER WASTE MATERIALS STORAGE

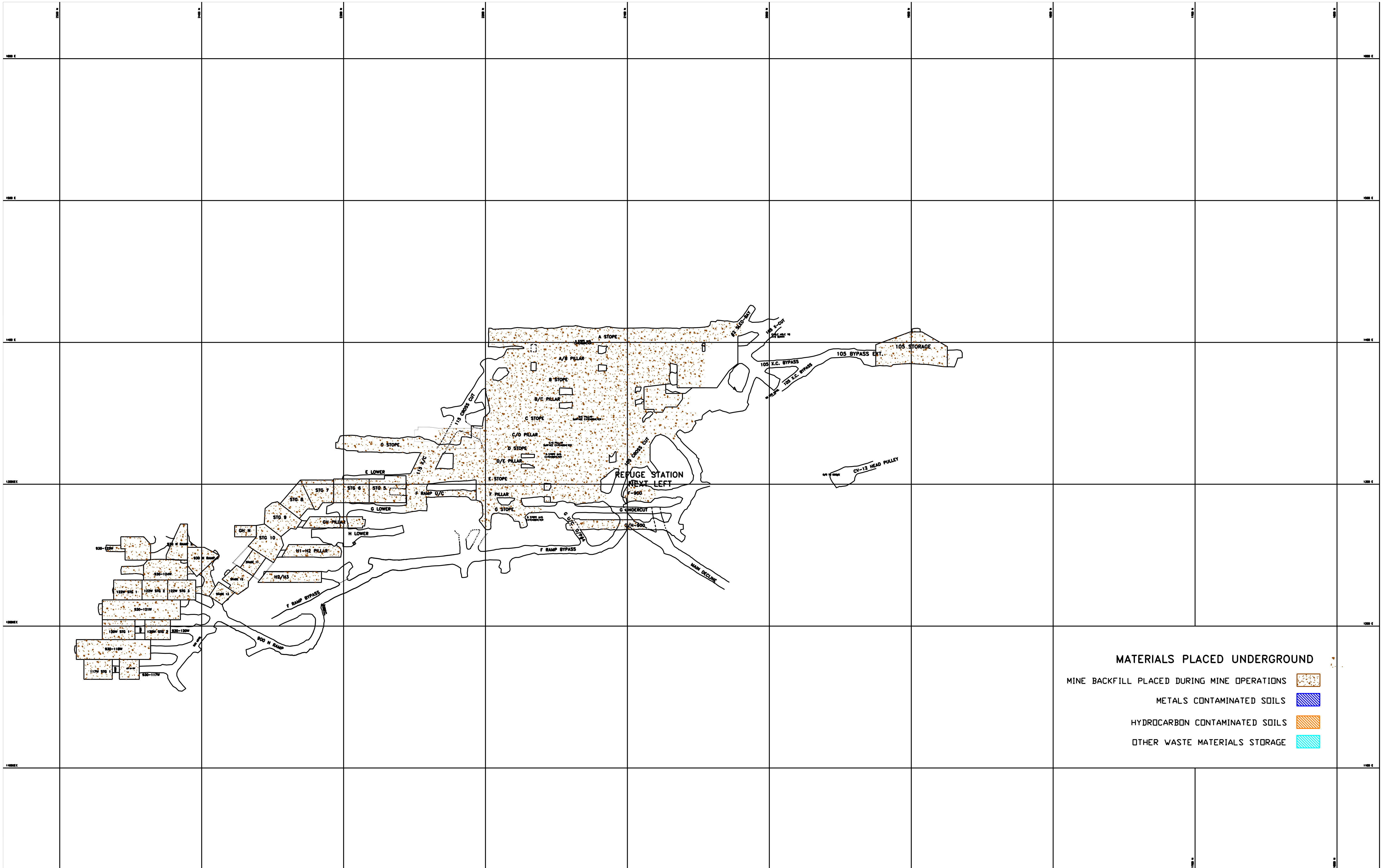
POLARIS MINE

DRAWN BY: J.A. SCALE: 1:1000

REVISED BY:	DATE:	REVISION
R.G.	1 JAN./94	
J.A.	JAN/09/95	YEAR END
JH	JAN/02	YEAR END

900 LEVEL

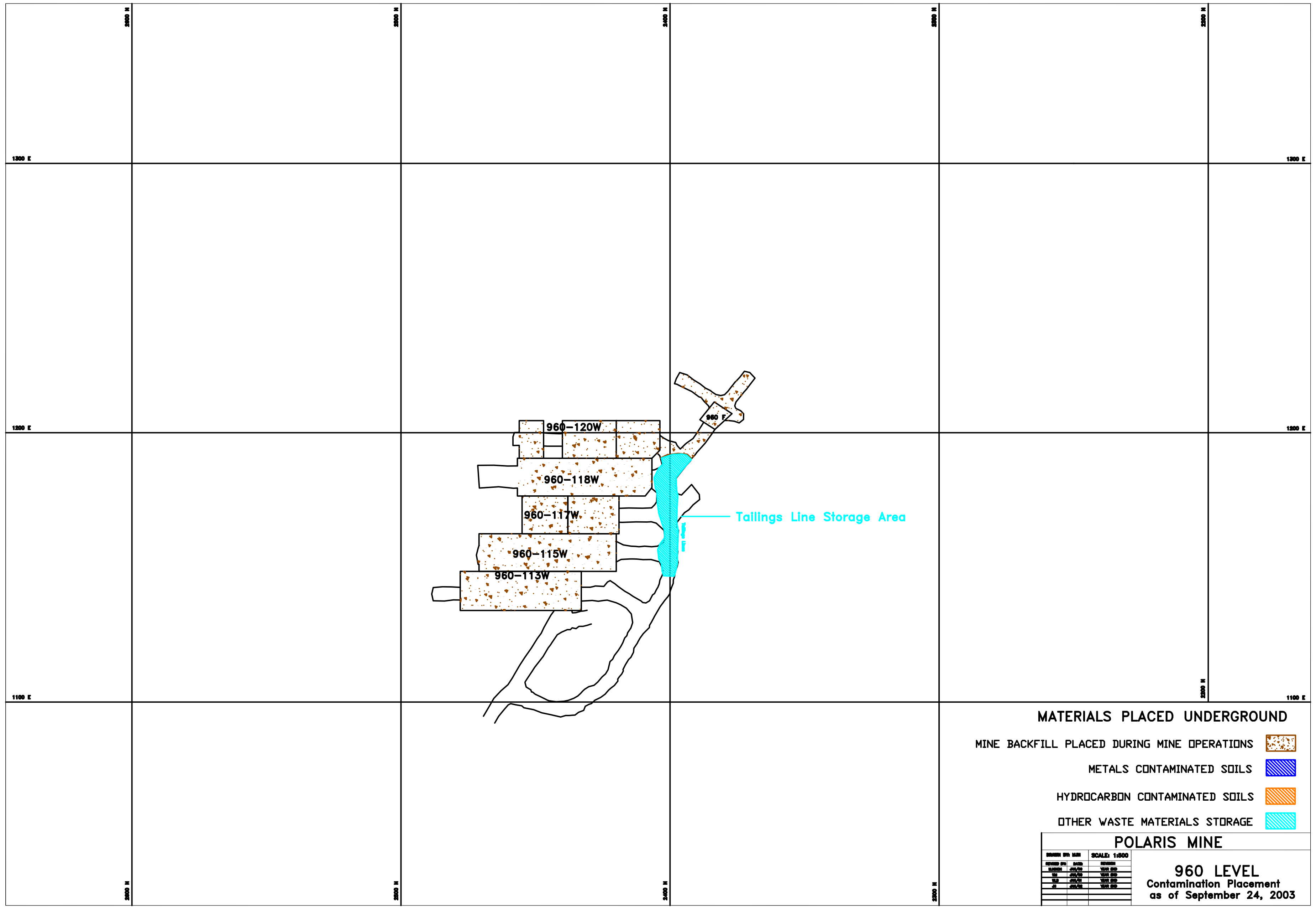
Contamination Placement
as of September 24, 2003

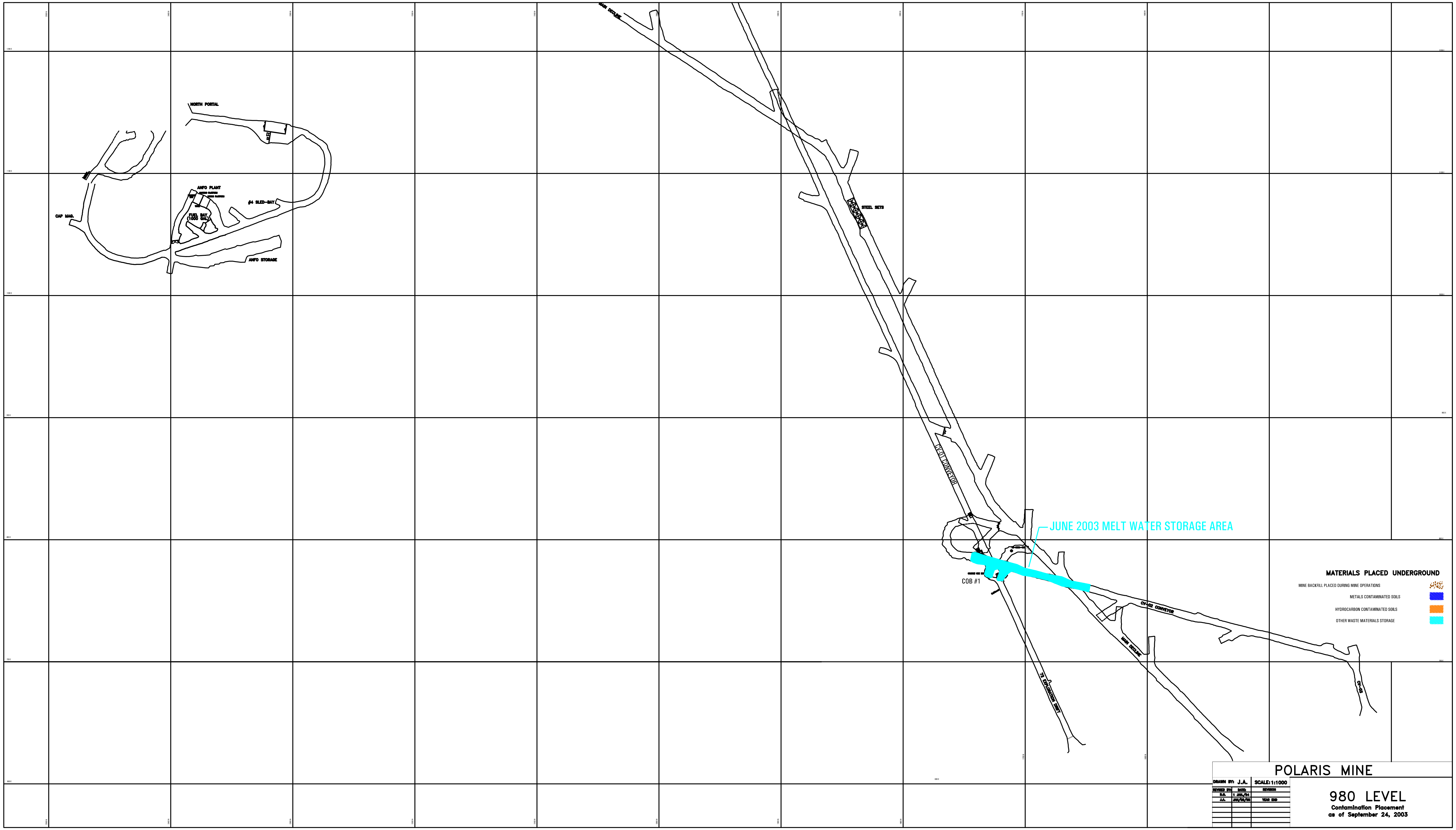


POLARIS MINE

DRAWN BY: J.A.

930 LEVEL
Contamination Placement
as of September 24, 2003


960-120W
960-118W
960-117W
960-115W
960-113W
Tailings Line Storage Area
MATERIALS PLACED UNDERGROUND
MINE BACKFILL PLACED DURING MINE OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER WASTE MATERIALS STORAGE
POLARIS MINE
SCALE: 1:500
960 LEVEL
Contamination Placement
as of September 24, 2003


NORTH PORTAL
AMFO PLANT
FUEL BAY (1000 GAL)
#4 SLED-BAY
CAP MAG.
AMFO STORAGE
STEEL SETS
JUNE 2003 MELT WATER STORAGE AREA
COB #1
CV-02 CONVEYOR
MAIN DECLINE
MATERIALS PLACED UNDERGROUND
MINE BACKFILL PLACED DURING MINE OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER WASTE MATERIALS STORAGE
POLARIS MINE
DRAWN BY: J.A.
SCALE: 1:1000
REVISED BY: DATE: REVISION
R.G. 1 JAN./94
J.A. JAN/08/95 YEAR END
980 LEVEL
Contamination Placement
as of September 24, 2003

APPENDIX 12

THERMISTOR DATA

OF

GARROW LAKE DAM

POLARIS MINE - GARROW LAKE DAM THERMISTOR TEMPERATURES
2003

NORTH

DATE	Core A	Core B	Core C	Core D	Core E	Core F	Core G	Core H	Core J	Bedrock K	Bedrock L
15-Jan-03											
10-Feb-03	-18.9	-15.7	-14.0	-12.9	-12.2	-11.9	-11.7	-11.7	-11.9	-12.0	-12.0
11-Mar-03	-20.8	-17.9	-15.7	-14.3	-13.1	-12.6	-12.2	-12.2	-12.2	-12.2	-12.1
17-Apr-03	-20.8	-18.7	-17.1	-15.8	-14.5	-13.6	-13.1	-13.1	-12.8	-12.8	-12.5
14-May-03	-17.7	-17.5	-16.9	-16.0	-15.0	-14.2	-13.7	-13.7	-13.3	-13.1	-12.9
16-Jun-03	-13.9	-19.1	-14.9	-15.0	-14.6	-14.3	-13.8	-13.8	-13.5	-13.3	-13.0
18-Jul-03	-9.6	-15.9	-11.5	-12.8	-13.4	-13.5	-13.3	-13.3	-13.4	-13.4	-13.2
25-Aug-03	-6.2	-13.3	-10.4	-11.7	-12.4	-12.9	-12.9	-12.9	-13.1	-13.3	-13.6
16-Sep-03	-5.6	-13.3	-9.6	-10.9	-11.7	-12.3	-12.4	-12.4	-12.8	-13.0	-12.9

CENTRE

DATE	Core A	Core B	Core C	Core D	Core E	Core F	Core G	Bedrock H	Bedrock J	Bedrock K	Bedrock L
15-Jan-03											
10-Feb-03	-13.7	-12.7	-12.2	-12.0	-11.8	-11.8	-11.8	-11.8	-11.8	-11.9	-12.1
11-Mar-03	-15.3	-14.0	-13.2	-12.6	-12.2	-12.2	-12.1	-12.1	-12.0	-11.8	-12.1
17-Apr-03	-16.6	-15.3	-14.5	-13.7	-13.1	-12.9	-12.7	-12.7	-12.4	-12.2	-12.4
14-May-03	-16.5	-15.7	-14.9	-14.3	-13.6	-13.4	-13.1	-13.1	-12.6	-12.5	-12.6
16-Jun-03	-15.0	-14.9	-14.5	-14.2	-13.7	-13.5	-13.5	-13.5	-12.9	-12.8	-12.8
18-Jul-03	-12.4	-12.9	-13.3	-13.6	-13.5	-13.4	-13.4	-13.4	-13.1	-13.0	-13.0
25-Aug-03	-11.0	-11.7	-12.5	-13.0	-13.1	-13.3	-13.3	-13.3	-13.0	-13.0	-13.1
16-Sep-03	-10.0	-10.8	-11.7	-12.2	-12.6	-12.9	-12.9	-12.9	-12.8	-12.8	-12.9

SOUTH

DATE	Core A	Core B	Core C	Core D	Core E	Core F	Core G	Core H	Bedrock J	Bedrock K	Bedrock L
15-Jan-03											
10-Feb-03	-12.8	-12.3	-11.9	-11.8	-11.6	-11.8	-11.5	-11.5	-11.6	-11.6	-11.8
11-Mar-03	-14.1	-13.5	-12.9	-12.6	-12.4	-12.4	-12.0	-12.0	-11.9	-11.8	-12.0
17-Apr-03	-15.5	-14.8	-14.1	-13.8	-13.4	-13.3	-12.8	-12.8	-12.5	-12.3	-12.3
14-May-03	-15.7	-15.1	-14.6	-14.3	-13.9	-13.8	-13.3	-13.3	-12.9	-12.6	-12.6
16-Jun-03	-14.3	-13.5	-13.9	-13.2	-13.2	-12.5	-13.4	-13.4	-12.8	-12.1	-12.6
18-Jul-03	-11.9	-11.5	-12.5	-12.8	-13.0	-13.4	-13.2	-13.2	-13.1	-12.9	-13.0
25-Aug-03	-10.7	-11.1	-11.7	-12.1	-12.4	-12.9	-12.8	-12.8	-12.9	-12.9	-13.0
16-Sep-03	-9.9	-10.5	-11.1	-11.4	-11.7	-12.2	-12.2	-12.2	-12.5	-12.6	-12.8

APPENDIX 13

THERMISTOR DATA

OF

OPERATIONAL LANDFILL

LEGEND:

ROAD
TAILINGS LINE
SHORE LINE
TOP OF WASTE OR GROUND SURFACE CONTOUR
(MAJOR INTERVAL 5m)
(MINOR INTERVAL 1m)

NOTES:

SECTIONS PROVIDED ON DRAWINGS 2330604, 5, 6

SOURCE OF DRAWING:

SURVEY INFORMATION OF GROUND SURFACE AS OF APRIL, 2003 SUPPLIED BY RBM OPTICOM INC. DATE OF SURVEY 21 APRIL, 2003

DRAWING INFORMATION:	
REVIEWED BY:	
DRAWN BY:	
DATE ISSUED:	DECEMBER, 2003
PROJECT NUMBER:	
FILE NAME:	
REVISION:	0

OPERATIONAL LANDFILL - THERMISTOR LOCATIONS

Drawing No.

POLARIS MINE - OPERATIONAL LANDFILL - THERMISTOR STRING #1
TEMPERATURES IN DEGREES C

	Bead # 1	Bead # 2	Bead # 3	Bead # 4	Bead # 5	Bead # 6	Bead # 7	Bead # 8	Bead # 9	Bead # 10
Installation Depth Below Collar (M)	-0.5	-1.0	-1.5	-2.0	-3.0	-4.0	-4.5	-5.0	-5.5	-6.0
Calibration Factors	-0.01	0.12	-0.02	-0.02	-0.18	-0.03	-0.01	-0.1	-0.03	-0.07
Temperatures										
20-Mar-99	-22.9	-23.9	-24.0	-23.7	-21.7	-17.0	-15.9	-15.0	-14.2	-13.5
22-Mar-99	-22.7	-23.3	-23.5	-23.3	-21.6	-17.1	-16.0	-15.2	-14.3	-13.6
23-Mar-99	-22.5	-23.2	-23.3	-23.1	-21.5	-17.2	-16.0	-15.2	-14.4	-13.6
24-Mar-99	-22.4	-23.0	-23.2	-22.9	-21.4	-17.2	-16.1	-15.3	-14.4	-13.7
25-Mar-99	-22.4	-22.9	-23.0	-22.8	-21.4	-17.2	-16.2	-15.4	-14.5	-13.8
26-Mar-99	-23.1	-22.8	-22.9	-22.6	-21.3	-17.3	-16.2	-15.4	-14.5	-13.8
27-Mar-99	-23.7	-23.0	-22.8	-22.5	-21.2	-17.3	-16.3	-15.5	-14.6	-13.9
29-Mar-99	-24.7	-23.4	-22.8	-22.4	-21.0	-17.4	-16.4	-15.6	-14.7	-14.0
30-Mar-99	-25.9	-23.9	-23.0	-22.3	-21.0	-17.4	-16.4	-15.6	-14.7	-14.0
06-Apr-99	-24.1	-24.1	-23.5	-22.7	-20.9	-17.5	-16.6	-15.9	-15.0	-14.3
13-Apr-99	-22.7	-22.8	-22.6	-22.2	-20.8	-17.6	-16.8	-16.0	-15.3	-14.5
20-Apr-99	-19.9	-20.6	-21.2	-21.3	-20.6	-17.7	-16.9	-16.2	-15.5	-14.7
26-Apr-99	-18.4	-19.8	-20.5	-20.6	-20.0	-17.7	-17.0	-16.4	-15.6	-14.9
04-May-99	-16.2	-18.0	-19.0	-19.5	-19.4	-17.6	-17.0	-16.4	-15.7	-15.1
11-May-99	-14.1	-16.2	-17.4	-18.2	-18.7	-17.4	-16.9	-16.4	-15.8	-15.2
18-May-99	-9.6	-12.8	-15.0	-16.5	-17.7	-17.2	-16.8	-16.4	-15.8	-15.3
25-May-99	-6.7	-10.1	-12.6	-14.5	-16.5	-16.8	-16.6	-16.3	-15.8	-15.3
01-Jun-99	-5.0	-8.4	-10.7	-12.7	-15.1	-16.3	-16.2	-16.0	-15.7	-15.3
08-Jun-99	-0.5	-2.9	-7.0	-10.2	-13.6	-15.7	-15.8	-15.8	-15.5	-15.2
15-Jun-99	-0.7	-2.7	-5.6	-8.3	-12.0	-15.0	-15.3	-15.4	-15.3	-15.1
22-Jun-99	0.2	-1.8	-4.5	-7.1	-10.7	-14.2	-14.7	-14.9	-15.0	-14.9
29-Jun-99	1.3	-1.3	-3.5	-5.9	-9.4	-13.2	-14.0	-14.3	-14.5	-14.6
05-Jul-99	4.3	-0.5	-2.3	-4.7	-8.8	-12.8	-13.5	-13.9	-14.2	-14.4
13-Jul-99	3.9	2.9	-1.6	-4.3	-8.0	-12.2	-13.0	-13.5	-13.8	-14.1
20-Jul-99	3.3	1.3	-1.3	-3.8	-7.4	-11.6	-12.5	-13.0	-13.4	-13.8
27-Jul-99	3.9	1.7	-1.1	-3.4	-6.8	-11.1	-12.0	-12.5	-13.1	-13.4
03-Aug-99	4.8	2.0	-0.8	-3.0	-6.4	-10.6	-11.5	-12.1	-12.7	-13.2
10-Aug-99	4.8	2.4	-0.8	-2.8	-6.0	-10.3	-11.1	-11.8	-12.3	-12.8
17-Aug-99	3.9	2.0	-0.7	-2.6	-5.7	-9.9	-10.7	-11.4	-12.0	-12.5
24-Aug-99	1.4	0.7	-0.7	-2.5	-5.4	-9.6	-10.4	-11.1	-11.7	-12.3
31-Aug-99	0.0	0.1	-0.7	-2.4	-5.2	-9.3	-10.2	-10.8	-11.4	-12.0
07-Sep-99	-0.2	-0.1	-0.2	-1.5	-4.3	-8.2	-9.5	-10.2	-10.8	-11.5
14-Sep-99	-0.4	-0.1	-0.3	-1.6	-4.1	-8.0	-9.3	-10.0	-10.6	-11.2
22-Sep-99	-1.3	-0.4	-0.4	-1.6	-4.0	-7.8	-9.1	-9.7	-10.4	-11.1
28-Sep-99	-1.0	-0.5	-0.5	-1.6	-3.9	-7.6	-8.8	-9.5	-10.2	-10.9
05-Oct-99	-5.9	-3.0	-1.4	-1.8	-3.9	-7.4	-8.6	-9.3	-10.0	-10.7
12-Oct-99	-8.1	-5.4	-3.7	-2.8	-3.9	-7.3	-8.5	-9.1	-9.8	-10.5
19-Oct-99	-12.9	-9.4	-6.3	-4.5	-4.3	-7.2	-8.3	-9.0	-9.6	-10.3
26-Oct-99	-14.3	-11.3	-8.4	-6.4	-5.2	-7.2	-8.2	-8.8	-9.5	-10.1
02-Nov-99	-15.8	-13.7	-10.8	-8.3	-6.3	-7.3	-8.2	-8.7	-9.3	-10.0
09-Nov-99	-21.1	-16.7	-12.7	-10.0	-7.6	-7.6	-8.2	-8.7	-9.3	-9.9
16-Nov-99	-20.7	-17.0	-13.7	-11.5	-9.0	-8.1	-8.4	-8.8	-9.3	-9.8
23-Nov-99	-18.6	-17.8	-15.7	-13.3	-10.3	-8.7	-8.8	-9.0	-9.4	-9.8
30-Nov-99	-19.3	-16.7	-15.1	-13.6	-11.4	-9.4	-9.2	-9.3	-9.5	-9.9
07-Dec-99	-24.9	-21.4	-17.8	-15.2	-12.3	-10.0	-9.6	-9.6	-9.8	-10.0
13-Dec-99	-26.8	-23.8	-20.3	-17.3	-13.6	-10.6	-10.1	-10.0	-10.0	-10.2
22-May-00	-12.3	-14.1	-15.7	-16.9	-18.2	-18.1	-17.8	-17.4	-16.9	-16.4
29-May-00	-10.3	-13.2	-14.7	-15.9	-17.2	-17.6	-17.4	-17.2	-16.8	-16.4
06-Jun-00	-0.3	-0.1	-1.0	-2.3	-10.8	-12.2	-13.0	-15.6	-16.6	-16.2
16-Jun-00	1.0	-2.0	-5.7	-9.6	-13.9	-16.2	-16.4	-16.4	-16.2	-16.0
26-Jun-00	5.3	1.2	-1.8	-5.6	-10.9	-14.8	-15.5	-15.8	-15.8	-15.7
04-Jul-00	2.1	0.7	-1.3	-4.4	-9.3	-13.7	-14.7	-15.1	-15.3	-15.4
11-Jul-00	2.8	1.0	-1.2	-3.9	-8.2	-12.8	-14.0	-14.5	-14.8	-15.0
18-Jul-00	2.5	1.2	-1.1	-3.5	-7.5	-12.1	-13.3	-13.9	-14.3	-14.6
19-Sep-00	-3.9	-0.4	-1.0	-2.1	-4.6	-8.4	-9.6	-10.3	-11.0	-11.6
26-Sep-00	-6.3	-3.7	-2.4	-2.6	-4.5	-8.2	-9.4	-10.1	-10.8	-11.4
10-Oct-00	-9.9	-7.4	-5.6	-4.9	-5.2	-7.9	-9.0	-9.7	-10.3	-10.9
10-Nov-00	-18.7	-16.8	-14.2	-12.0	-9.5	-8.8	-9.2	-9.5	-9.9	-10.4
27-Apr-01	-19.8	-21.5	-23.0	-23.7	-23.5	-21.0	-19.8	-19.1	-18.2	-17.3
22-May-01	-9.9	-12.8	-15.5	-17.6	-19.7	-19.6	-19.1	-18.7	-18.2	-17.5
18-Jun-01	1.9	-0.7	-3.9	-7.3	-12.1	-16.0	-16.8	-17.0	-17.0	-16.9
19-Jul-01	8.5	2.4	-1.1	-3.4	-7.3	-12.0	-13.4	-14.1	-14.6	-15.0
21-Aug-01	0.0	0.0	-0.1	-2.0	-5.3	-9.8	-11.2	-11.9	-12.6	-13.2
21-Aug-01	0.0	0.0	-0.1	-2.0	-5.3	-9.8	-11.2	-11.9	-12.6	-13.2
16-Nov-02	-14.3	-13.3	-11.4	-9.7	-8.1	-8.5	-9.1	-9.5	-10.0	-10.6
18-Dec-02	-18.6	-17.6	-16.8	-15.8	-13.7	-11.0	-10.6	-10.5	-10.5	-10.7
10-Feb-03	-27.6	-25.3	-23.4	-21.6	-18.6	-14.8	-13.8	-13.3	-12.9	-12.5
11-Mar-03	-28.3	-26.2	-24.9	-23.8	-21.4	-17.0	-15.7	-15.0	-14.3	-13.8
17-Apr-03	-24.7	-24.5	-24.0	-23.3	-21.9	-18.6	-17.4	-16.7	-16.0	-15.2
15-May-03	-15.2	-17.1	-18.1	-18.8	-19.4	-18.3	-17.6	-17.1	-16.6	-15.9
17-Jun-03	-28.3	-26.2	-24.9	-23.8	-21.4	-17.0	-15.7	-15.0	-14.3	-13.8
18-Jul-03	-0.1	-0.1	-2.6	-3.7	-8.2	-10.5	-13.3	-13.8	-14.1	-14.6
25-Aug-03	-0.1	-0.2	-1.0	-2.5	-5.3	-9.5	-10.8	-11.5	-12.2	-13.0
16-Sep-03	-0.1	-0.3	-1.2	-2.5	-4.9	-8.7	-9.8	-10.5	-11.2	-11.8

POLARIS MINE - OPERATIONAL LANDFILL - THERMISTOR STRING #2
TEMPERATURES IN DEGREES C

	Bead # 1	Bead # 2	Bead # 3	Bead # 4	Bead # 5	Bead # 6	Bead # 7	Bead # 8	Bead # 9	Bead # 10
Installation Depth Below Collar (M)	-0.5	-1.0	-1.5	-2.0	-2.5	-3.0	-3.5	-4.0	-4.5	-5.0
Calibration Factors	-0.02	-0.04	-0.08	-0.06	-0.03	0.04	-0.03	-0.14	-0.12	-0.01

Temperatures

20-Mar-99	-24.2	-24.8	-24.9	-24.5	-23.8	-22.7	-21.5	-20.0	-18.6	-17.4
22-Mar-99	-24.0	-24.2	-24.5	-24.2	-23.5	-22.5	-21.5	-20.1	-18.7	-17.5
23-Mar-99	-23.7	-24.2	-24.3	-24.0	-23.4	-22.5	-21.4	-20.1	-18.8	-17.6
24-Mar-99	-23.5	-24.0	-24.1	-23.9	-23.3	-22.4	-21.4	-20.1	-18.8	-17.6
25-Mar-99	-23.5	-23.8	-23.9	-23.7	-23.1	-22.3	-21.3	-20.1	-18.8	-17.6
26-Mar-99	-24.0	-23.8	-23.8	-23.6	-23.0	-22.2	-21.3	-20.1	-18.9	-17.7
27-Mar-99	-24.3	-24.0	-23.7	-23.5	-22.9	-22.2	-21.3	-20.1	-18.9	-17.7
29-Mar-99	-25.2	-24.4	-23.8	-23.3	-22.8	-22.0	-21.2	-20.1	-18.9	-17.8
30-Mar-99	-26.1	-25.0	-23.9	-23.3	-22.7	-21.9	-21.2	-20.0	-18.9	-17.8
06-Apr-99	-24.7	-24.8	-24.3	-23.6	-22.8	-21.9	-21.0	-20.0	-19.0	-18.0
13-Apr-99	-23.5	-23.6	-23.4	-23.0	-22.5	-21.8	-21.0	-20.0	-19.0	-18.1
20-Apr-99	-20.9	-21.5	-22.0	-22.2	-21.9	-21.4	-20.8	-20.0	-19.1	-18.2
26-Apr-99	-19.9	-20.7	-21.4	-21.5	-21.3	-20.9	-20.5	-19.8	-19.0	-18.3
04-May-99	-18.1	-19.3	-20.1	-20.4	-20.5	-20.4	-20.1	-19.6	-18.9	-18.2
11-May-99	-16.1	-17.6	-18.8	-19.4	-19.7	-19.7	-19.5	-19.2	-18.7	-18.2
18-May-99	-12.5	-14.6	-16.6	-17.8	-18.5	-18.8	-18.9	-18.8	-18.5	-18.0
25-May-99	-10.2	-12.3	-14.5	-15.9	-17.0	-17.7	-18.1	-18.2	-18.1	-17.8
01-Jun-99	-7.6	-10.4	-12.7	-14.3	-15.6	-16.5	-17.1	-17.5	-17.5	-17.4
08-Jun-99	-3.3	-6.2	-9.6	-11.9	-13.8	-15.2	-16.0	-16.7	-16.9	-17.0
15-Jun-99	-1.4	-4.1	-7.4	-9.8	-11.9	-13.6	-14.7	-15.7	-16.2	-16.5
22-Jun-99	-0.4	-2.1	-5.0	-7.7	-10.2	-12.1	-13.4	-14.7	-15.5	-15.9
29-Jun-99	1.6	-1.0	-3.6	-6.1	-8.4	-10.4	-11.9	-13.3	-14.4	-15.1
05-Jul-99	4.2	0.0	-2.7	-5.3	-7.6	-9.6	-11.2	-12.7	-13.8	-14.6
13-Jul-99	3.9	1.1	-1.9	-4.4	-6.7	-8.7	-10.3	-11.9	-13.1	-13.9
20-Jul-99	3.1	1.0	-1.5	-3.8	-6.0	-7.9	-9.5	-11.1	-12.4	-13.3
27-Jul-99	4.0	1.2	-1.3	-3.4	-5.4	-7.3	-8.8	-10.4	-11.7	-12.7
03-Aug-99	4.3	1.6	-1.1	-3.1	-5.0	-6.8	-8.3	-9.9	-11.1	-12.1
10-Aug-99	4.2	1.7	-1.0	-2.8	-4.7	-6.4	-7.8	-9.4	-10.6	-11.7
17-Aug-99	3.3	1.7	-0.8	-2.6	-4.4	-6.0	-7.4	-8.9	-10.2	-11.2
24-Aug-99	1.0	0.5	-0.7	-2.4	-4.2	-5.7	-7.1	-8.6	-9.8	-10.8
31-Aug-99	0.0	0.0	-0.9	-2.4	-4.0	-5.5	-6.7	-8.2	-9.4	-10.4
07-Sep-99	-0.1	-0.2	-1.0	-2.4	-3.9	-5.3	-6.5	-7.9	-9.1	-10.1
14-Sep-99	-0.2	-0.3	-1.2	-2.3	-3.7	-5.1	-6.3	-7.6	-8.8	-9.8
21-Sep-99	-0.8	-0.5	-1.4	-2.5	-3.7	-5.0	-6.1	-7.4	-8.6	-9.5
28-Sep-99	-1.1	-1.2	-1.8	-2.6	-3.7	-4.9	-6.0	-7.2	-8.3	-9.3
05-Oct-99	-4.7	-3.2	-2.7	-3.0	-3.9	-4.9	-5.9	-7.1	-8.1	-9.1
12-Oct-99	-6.8	-5.2	-4.3	-4.0	-4.3	-5.0	-5.8	-6.9	-7.9	-8.8
19-Oct-99	-11.7	-9.0	-6.7	-5.6	-5.2	-5.4	-6.1	-7.0	-7.9	-8.7
26-Oct-99	-13.9	-11.3	-9.0	-7.6	-6.7	-6.4	-6.6	-7.2	-7.9	-8.6
02-Nov-99	-15.9	-14.0	-11.5	-9.7	-8.3	-7.6	-7.5	-7.7	-8.1	-8.7
09-Nov-99	-19.7	-16.3	-13.2	-11.3	-9.9	-8.9	-8.5	-8.3	-8.5	-8.9
16-Nov-99	-20.3	-17.0	-14.3	-12.7	-11.3	-10.2	-9.6	-9.1	-9.0	-9.2
23-Nov-99	-19.1	-18.1	-16.1	-14.4	-12.7	-11.4	-10.6	-9.9	-9.6	-9.6
30-Nov-99	-18.7	-17.0	-15.6	-14.6	-13.4	-12.3	-11.5	-10.8	-10.3	-10.1
07-Dec-99	-24.2	-21.2	-18.1	-16.0	-14.4	-13.1	-12.2	-11.4	-10.8	-9.9
13-Dec-99	-26.6	-23.8	-20.7	-18.3	-16.1	-14.4	-13.2	-12.1	-11.4	-11.0
22-May-00	-11.9	-13.3	-15.0	-16.3	-17.3	-18.1	-18.5	-18.8	-18.9	-18.6
29-May-00	-11.0	-12.7	-14.2	-15.3	-16.3	-17.1	-17.7	-18.1	-18.3	-18.2
06-Jun-00	-7.2	-10.0	-12.3	-13.9	-15.2	-16.2	-16.8	-17.4	-17.6	-17.7
16-Jun-00	0.0	-2.3	-6.7	-10.2	-12.6	-14.3	-15.4	-16.3	-16.8	-17.1
26-Jun-00	2.4	-1.0	-4.3	-7.1	-9.7	-11.9	-13.3	-14.8	-15.7	-16.2
04-Jul-00	1.4	-0.4	-3.2	-5.8	-8.2	-10.3	-11.9	-13.6	-14.7	-15.4
11-Jul-00	1.7	-0.2	-2.8	-5.0	-7.3	-9.3	-10.9	-12.6	-13.9	-14.7
18-Jul-00	1.8	-0.2	-2.4	-4.5	-6.6	-8.6	-10.1	-11.8	-13.0	-14.1
19-Sep-00	-3.8	-2.4	-2.5	-3.2	-4.3	-5.4	-6.5	-7.9	-9.0	-10.0
26-Sep-00	-5.7	-4.1	-3.7	-3.9	-4.6	-5.6	-6.5	-7.8	-8.9	-9.8
10-Oct-00	-9.5	-7.7	-6.6	-6.1	-6.1	-6.4	-7.0	-7.8	-8.7	-9.5
10-Nov-00	-18.6	-16.8	-14.7	-13.0	-11.6	-10.6	-10.1	-9.8	-9.8	-10.0
27-Apr-01	-20.5	-22.2	-23.3	-23.9	-23.9	-23.6	-23.1	-22.3	-21.3	-20.4
22-May-01	-15.1	-17.4	-18.9	-20.0	-20.6	-21.0	-21.0	-20.8	-20.5	-20.0
18-Jun-01	-0.3	-3.2	-6.6	-9.4	-12.1	-14.2	-15.6	-17.0	-17.7	-18.2
19-Jul-01	4.3	-0.1	-2.4	-4.7	-7.0	-9.0	-10.5	-12.3	-13.6	-14.7
21-Aug-01	-0.1	-0.1	-1.3	-3.0	-4.9	-6.5	-8.0	-9.6	-11.0	-12.1
14-Sep-02	-0.1	-0.4	-1.6	-3.0	-4.5	-5.9	-7.2	-8.6	-9.8	-10.9
23-Oct-02	-6.9	-6.9	-6.8	-6.8	-6.8	-7.0	-7.5	-8.1	-8.9	-9.6
16-Nov-02	-14.8	-13.1	-11.7	-10.5	-9.6	-9.2	-9.1	-9.2	-9.5	-9.9
18-Dec-02	-18.4	-17.7	-17.0	-16.1	-15.1	-14.0	-13.1	-12.3	-11.7	-11.4
10-Feb-03	-27.0	-25.2	-23.5	-21.9	-20.2	-18.8	-17.7	-16.4	-15.4	-14.6
11-Mar-03	-28.0	-26.4	-25.3	-24.2	-22.9	-21.6	-20.3	-18.9	-17.6	-16.5
17-Apr-03	-24.9	-24.9	-24.4	-23.7	-15.8	-22.2	-21.4	-20.4	-19.3	-18.4
15-May-03	-16.0	-17.3	-18.1	-18.9	-19.4	-19.7	-19.7	-19.5	-19.1	-18.6
17-Jun-03	-1.5	-4.0	-6.6	-8.9	-11.0	-12.8	-14.0	-15.2	-16.1	-16.5
18-Jul-03	-0.1	-0.5	-2.6	-3.7	-8.0	-10.4	-13.3	-13.9	-14.2	-14.6
25-Aug-03	-0.1	-0.7	-2.1	-3.5	-5.0	-6.4	-7.6	-8.9	-10.1	-11.1
16-Sep-03	-0.2	-1.1	-2.2	-3.3	-4.6	-5.8	-6.8	-8.1	-9.2	-9.8

POLARIS MINE - OPERATIONAL LANDFILL - THERMISTOR STRING #4
TEMPERATURES IN DEGREES C

	Bead # 1	Bead # 2	Bead # 3	Bead # 4	Bead # 5	Bead # 6	Bead # 7	Bead # 8	Bead # 9	Bead # 10	Bead # 11	Bead # 12
Installation Depth Below Collar (M)	-0.5	-1.0	-1.5	-2.0	-2.5	-3.0	-4.0	-5.0	-5.5	-6.0	-6.5	-7.0
Calibration Factors	-0.06	-0.01	-0.04	-0.02	-0.01	0.03	-0.03	-0.04	-0.04	-0.15	-0.06	-0.09
Temperatures												
20-Mar-99	-23.1	-23.8	-23.7	-23.3	-22.5	-21.2	-18.1	-15.3	-14.2	-13.3	-12.5	
22-Mar-99	-22.7	-23.2	-23.3	-22.9	-22.2	-21.1	-18.2	-15.4	-14.3	-13.4	-12.6	
23-Mar-99	-22.7	-23.1	-23.1	-22.7	-22.1	-21.0	-18.2	-15.5	-14.3	-13.5	-12.7	
24-Mar-99	-22.4	-22.9	-22.9	-22.6	-22.0	-20.9	-18.2	-15.5	-14.4	-13.5	-12.7	
25-Mar-99	-22.3	-22.7	-22.7	-22.4	-21.8	-20.8	-18.2	-15.6	-14.4	-13.6	-12.8	
26-Mar-99	-22.7	-22.6	-22.5	-22.3	-21.7	-20.7	-18.2	-15.6	-14.5	-13.6	-12.8	
27-Mar-99	-23.2	-22.6	-22.4	-22.2	-21.6	-20.6	-18.2	-15.6	-14.5	-13.7	-12.8	
29-Mar-99	-24.3	-23.0	-22.4	-22.0	-21.4	-20.5	-18.2	-15.7	-14.6	-13.7	-12.9	
30-Mar-99	-25.4	-23.4	-22.6	-21.9	-21.3	-20.4	-18.1	-15.7	-14.6	-13.8	-13.0	
06-Apr-99	-23.9	-23.6	-23.0	-22.3	-21.4	-20.3	-18.1	-15.8	-14.8	-14.0	-13.2	
13-Apr-99	-22.4	-22.3	-22.0	-21.7	-21.1	-20.2	-18.1	-15.9	-15.0	-14.2	-13.4	
20-Apr-99	-20.3	-20.8	-21.0	-20.9	-20.6	-19.8	-18.0	-16.0	-15.1	-14.4	-13.6	
26-Apr-99	-18.8	-20.0	-20.3	-20.2	-19.9	-19.3	-17.8	-16.0	-15.2	-14.5	-13.8	-13.2
04-May-99	-17.6	-18.7	-19.0	-19.2	-19.1	-18.8	-17.6	-16.0	-15.3	-14.6	-13.9	-13.3
11-May-99	-15.3	-17.0	-17.7	-18.1	-18.3	-18.1	-17.3	-15.9	-15.2	-14.6	-14.0	-13.5
18-May-99	-10.5	-13.7	-15.3	-16.4	-17.0	-17.2	-16.9	-15.7	-15.2	-14.6	-14.1	-13.6
25-May-99	-8.0	-11.2	-13.0	-14.4	-15.4	-16.0	-16.2	-15.5	-15.1	-14.6	-14.1	-13.6
01-Jun-99	-6.2	-9.5	-11.2	-12.7	-13.8	-14.7	-15.5	-15.2	-14.8	-14.5	-14.0	-13.6
08-Jun-99	-1.9	-4.7	-7.7	-10.1	-11.9	-13.3	-14.6	-14.7	-14.5	-14.2	-13.9	-13.6
15-Jun-99	-1.3	-3.5	-5.9	-8.1	-9.9	-11.5	-13.6	-14.2	-14.2	-14.0	-13.7	-13.5
22-Jun-99	-0.4	-2.5	-4.7	-6.7	-8.4	-10.1	-12.4	-13.6	-13.7	-13.7	-13.5	-13.3
29-Jun-99	0.3	-1.8	-3.7	-5.5	-7.1	-8.7	-11.1	-12.6	-13.0	-13.1	-13.2	-13.1
05-Jul-99	2.1	-1.4	-3.2	-4.9	-6.5	-8.0	-10.6	-12.2	-12.6	-12.8	-13.0	-12.9
13-Jul-99	3.1	-0.8	-2.6	-4.3	-5.8	-7.3	-9.9	-11.5	-12.1	-12.4	-12.6	-12.7
20-Jul-99	2.4	-0.6	-2.2	-3.7	-5.2	-6.7	-9.2	-11.0	-11.6	-11.9	-12.2	-12.4
27-Jul-99	3.1	-0.4	-1.9	-3.3	-4.7	-6.1	-8.6	-10.4	-11.0	-11.4	-11.8	-12.0
03-Aug-99	3.5	-0.2	-1.7	-3.0	-4.3	-5.7	-8.1	-10.0	-10.6	-11.1	-11.5	-11.7
10-Aug-99	3.6	0.0	-1.5	-2.8	-4.0	-5.3	-7.7	-9.6	-10.2	-10.7	-11.2	-11.5
17-Aug-99	3.2	0.2	-1.3	-2.5	-3.7	-5.0	-7.3	-9.2	-9.9	-10.4	-10.9	-11.1
24-Aug-99	1.1	0.0	-1.2	-2.3	-3.4	-4.7	-7.0	-8.8	-9.5	-10.1	-10.5	-10.9
07-Sep-99	0.0	-0.3	-0.1	-0.6	-1.5	-2.4	-4.6	-6.6	-7.5	-8.4	-9.1	-9.6
14-Sep-99	-0.6	-0.6	-0.2	-0.9	-1.6	-2.4	-4.4	-6.3	-7.3	-8.1	-8.8	-9.3
21-Sep-99	-1.3	-1.8	-1.5	-1.4	-1.9	-2.5	-4.3	-6.1	-7.0	-7.9	-8.6	-9.1
28-Sep-99	-2.4	-1.6	-1.7	-2.0	-2.3	-2.8	-4.3	-5.9	-6.8	-7.6	-8.3	-8.8
05-Oct-99	-10.1	-6.9	-4.3	-3.1	-3.0	-3.1	-4.3	-5.8	-6.7	-7.4	-8.1	-8.7
12-Oct-99	-14.6	-8.7	-6.2	-4.8	-4.2	-4.0	-4.5	-5.8	-6.6	-7.3	-7.9	-8.4
19-Oct-99	-15.7	-14.1	-10.2	-7.0	-5.7	-5.0	-4.9	-5.8	-6.4	-7.1	-7.7	-8.2
26-Oct-99	-16.5	-15.6	-12.1	-9.1	-7.6	-6.6	-5.7	-6.0	-6.6	-7.1	-7.7	-8.1
02-Nov-99	-18.9	-16.9	-14.6	-11.4	-9.5	-8.1	-6.5	-6.4	-6.7	-7.2	-7.7	-8.1
09-Nov-99	-25.9	-22.1	-16.9	-12.7	-10.8	-9.4	-7.5	-6.9	-7.0	-7.4	-7.7	-8.1
16-Nov-99	-24.7	-21.6	-17.0	-13.5	-11.8	-10.6	-8.4	-7.4	-7.4	-7.6	-7.9	-8.2
23-Nov-99	-17.4	-19.1	-17.6	-15.2	-13.4	-11.8	-9.3	-8.1	-7.9	-7.9	-8.1	-8.3
30-Nov-99	-25.6	-19.3	-16.4	-14.7	-13.5	-12.4	-10.2	-8.7	-8.4	-8.2	-8.3	-8.4
07-Dec-99	-28.8	-25.7	-21.0	-17.0	-14.9	-13.3	-10.8	-9.3	-8.9	-8.6	-8.6	-8.6
13-Dec-99	-30.5	-27.3	-23.4	-19.5	-17.1	-15.0	-11.7	-9.9	-9.3	-9.0	-8.9	-8.8
22-May-00	-3.3	-10.4	-11.9	-13.8	-14.9	-15.7	-16.7	-16.7	-16.4	-16.0	-15.5	-15.0
29-May-00	3.3	-9.5	-11.7	-13.2	-14.1	-14.9	-15.9	-16.1	-16.0	-15.7	-15.3	-14.9
06-Jun-00	4.3	-5.8	-9.3	-11.7	-13.0	-13.9	-15.2	-15.5	-15.5	-15.3	-15.1	-14.7
16-Jun-00	16.3	6.8	2.5	-1.8	-5.7	-8.8	-13.1	-14.6	-14.8	-14.9	-14.7	-14.5
26-Jun-00	15.8	5.5	2.0	-1.1	-3.5	-5.8	-10.2	-12.8	-13.6	-14.0	-14.1	-14.1
04-Jul-00	7.5	2.9	1.6	-0.8	-2.9	-4.8	-8.8	-11.5	-12.5	-13.1	-13.5	-13.6
11-Jul-00	7.1	3.2	-1.7	-6.6	-10.9	-13.5	-15.0	-15.3	-15.5	-15.6	-15.3	-15.1
18-Jul-00	4.8	3.0	-1.5	-5.9	-10.0	-12.5	-14.4	-14.8	-15.1	-15.3	-15.1	-15.0
19-Sep-00	-6.1	-3.8	-1.5	-1.4	-1.9	-2.6	-4.6	-6.5	-7.4	-8.3	-9.0	-9.5
26-Sep-00	-10.4	-5.6	-3.5	-2.6	-2.6	-3.0	-4.6	-6.3	-7.2	-8.1	-8.7	-9.3
10-Oct-00	-9.4	-10.0	-7.3	-5.5	-5.0	-4.7	-5.1	-6.3	-7.0	-7.7	-8.4	-8.9
10-Nov-00	-19.4	-19.0	-16.4	-13.1	-11.4	-10.1	-8.2	-7.6	-7.7	-8.0	-8.3	-8.6
27-Apr-01	-17.5	-18.2	-20.1	-21.9	-22.4	-22.4	-21.3	-19.5	-18.5	-17.4	-16.5	-15.8
22-May-01	-0.2	-8.9	-12.0	-15.1	-16.7	-17.8	-18.7	-18.3	-17.8	-17.2	-16.6	-16.1
18-Jun-01	6.4	1.7	-0.8	-3.6	-6.3	-8.6	-12.6	-14.9	-15.4	-15.7	-15.6	-15.5
19-Jul-01	18.4	5.9	0.0	-1.8	-3.5	-5.1	-8.4	-10.8	-11.9	-12.7	-13.2	-13.5
21-Aug-01	2.3	0.0	0.0	-1.0	-2.3	-3.5	-6.3	-8.6	-9.6	-10.5	-11.2	-11.7
14-Sep-02	3.5	-0.1	-0.6	-1.5	-2.5	-3.5	-6.0	-8.1	-9.1	-10.0		
23-Oct-02	-6.8	-6.7	-6.7	-6.6	-6.6	-6.5	-6.8	-7.6	-8.2	-8.9	-9.5	-10.0
16-Nov-02	-19.4	-17.0	-14.8	-13.1	-11.6	-10.3	-8.8	-8.5	-8.8	-9.1	-9.5	-9.8
18-Dec-02	-22.1	-19.3	-18.7	-18.2	-17.5	-16.6	-14.0	-11.9	-11.2	-10.8	-10.5	-10.5
10-Feb-03	-31.7	-29.2	-27.1	-25.4	-23.8	-22.1	-18.8	-16.1	-15.0	-14.1	-13.5	-13.0
11-Mar-03	-25.5	-29.6	-27.6	-26.6	-25.7	-24.7	-21.7	-18.7	-17.3	-16.2	-15.2	-14.5
17-Apr-03	-21.6	-24.8	-25.1	-24.9	-24.5	-23.9	-22.3	-20.2	-19.1	-18.0	-17.1	-16.3
15-May-03	-6.1	-13.6	-15.6	-16.9	-18.0	-18.8	-19.7	-19.3	-18.8	-18.2	-17.6	-17.0
17-Jun-03	8.2	-0.3	-2.9	-5.8	-8.3	-10.5	-13.8	-15.5	-15.4	-15.9	-16.2	-16.2
18-Jul-03	7.1	3.2	-1.7	-6.6	-10.9	-13.5	-15.0	-15.3	-15.5	-15.6	-15.3	-15.1
25-Aug-03	0.7	-0.1	-0.9	-2.1	-3.3	-4.4	-7.0	-9.2	-10.1	-11.0	-11.8	-12.3
16-Sep-03	0.0	-0.3	-1.1	-2.0	-3.1	-4.0	-6.3	-8.3	-9.2	-10.1	-10.8	-11.3

POLARIS MINE - OPERATIONAL LANDFILL - THERMISTOR STRING #5
TEMPERATURES IN DEGREES C

	Bead # 1	Bead # 2	Bead # 3	Bead # 4	Bead # 5	Bead # 6	Bead # 7	Bead # 8	Bead # 9	Bead # 10	Bead # 11	Bead # 12
Installation Depth Below Collar (M)	0.2	-0.3	-1.3	-2.3	-3.3	-4.3	-5.3	-5.8	-6.3	-6.8	-7.3	-7.8
Calibration Factors	-0.01	-0.07	-0.01	-0.12	0.03	0.03	-0.02	-0.06	0.02	-0.02	-0.12	0.02

Temperatures

20-Mar-99	-19.9	-23.6	-25.1	-23.9	-21.4	-18.5	-15.5	-14.6	-13.9	-13.1	-12.4	
22-Mar-99	-19.0	-23.5	-24.5	-23.6	-21.4	-18.6	-15.7	-14.8	-14.1	-13.2	-12.5	
23-Mar-99	-19.1	-23.3	-24.3	-23.4	-21.3	-18.6	-15.8	-14.9	-14.1	-13.2	-12.6	
24-Mar-99	-20.5	-23.1	-24.1	-23.3	-21.3	-18.7	-15.8	-14.9	-14.2	-13.3	-12.7	
25-Mar-99	-21.6	-23.0	-23.9	-23.1	-21.2	-18.7	-15.9	-15.0	-14.3	-13.3	-12.7	
26-Mar-99	-22.6	-23.5	-23.7	-23.0	-21.2	-18.7	-16.0	-15.1	-14.3	-13.4	-12.7	
27-Mar-99	-24.9	-23.9	-23.6	-22.9	-21.1	-18.7	-16.0	-15.1	-14.3	-13.4	-12.8	
29-Mar-99	-29.1	-25.0	-23.6	-22.7	-21.0	-18.7	-16.1	-15.2	-14.5	-13.5	-12.8	
30-Mar-99	-25.6	-26.2	-23.8	-22.6	-21.0	-18.8	-16.2	-15.3	-14.5	-13.6	-12.9	
06-Apr-99	-18.8	-24.6	-24.4	-22.7	-20.8	-18.8	-16.5	-15.6	-14.9	-14.0	-13.2	
13-Apr-99	-20.1	-23.1	-23.3	-22.3	-20.8	-18.9	-16.7	-15.9	-15.2	-14.3	-13.5	
20-Apr-99	-16.6	-20.7	-21.9	-21.8	-20.6	-18.9	-16.8	-16.1	-15.5	-14.5	-13.7	
26-Apr-99	-16.4	-19.8	-21.2	-21.0	-20.2	-18.8	-17.0	-16.3	-15.6	-14.8	-14.0	-13.3
04-May-99	-14.4	-18.1	-19.9	-20.3	-19.8	-18.7	-17.1	-16.4	-15.8	-15.0	-14.2	-13.6
11-May-99	-8.9	-16.1	-18.6	-19.5	-19.3	-18.5	-17.1	-16.5	-16.0	-15.1	-14.4	-13.8
18-May-99	-6.0	-11.8	-16.1	-18.2	-18.7	-18.2	-17.0	-16.5	-16.0	-15.3	-14.6	-13.9
25-May-99	-5.0	-9.2	-13.6	-16.5	-17.8	-17.7	-16.9	-16.5	-16.1	-15.4	-14.7	-14.1
01-Jun-99	2.4	-6.3	-11.5	-14.9	-16.8	-17.1	-16.7	-16.4	-16.0	-15.4	-14.8	-14.2
08-Jun-99	3.3	-3.3	-9.0	-13.2	-15.6	-16.4	-16.4	-16.2	-15.9	-15.4	-14.8	-14.2
15-Jun-99	7.1	-2.0	-7.2	-11.5	-14.5	-15.7	-16.0	-16.0	-15.7	-15.3	-14.8	-14.3
22-Jun-99	2.4	-0.8	-5.4	-10.1	-13.3	-14.9	-15.6	-15.6	-15.5	-15.2	-14.8	-14.3
29-Jun-99	6.7	1.7	-3.8	-8.3	-11.9	-13.8	-15.0	-15.1	-15.1	-14.9	-14.7	-14.3
05-Jul-99	8.2	4.9	-1.1	-7.3	-11.2	-13.2	-14.6	-14.8	-14.9	-14.8	-14.6	-14.2
13-Jul-99	7.5	5.0	-1.5	-6.4	-10.2	-12.5	-14.0	-12.2	-14.5	-14.5	-14.4	-14.1
20-Jul-99	6.4	3.6	-1.0	-5.6	-9.4	-11.7	-13.5	-13.9	-14.1	-14.2	-14.2	-14.0
27-Jul-99	9.8	4.3	-0.8	-5.0	-8.7	-11.0	-12.9	-13.4	-13.7	-13.9	-14.0	-13.9
03-Aug-99	10.0	5.0	-0.5	-4.6	-8.1	-10.5	-12.4	-12.9	-13.2	-13.6	-13.7	-13.7
10-Aug-99	10.3	4.8	-0.4	-4.2	-7.6	-9.9	-11.9	-12.5	-12.9	-13.3	-13.5	-13.5
17-Aug-99	6.2	4.0	-0.2	-3.9	-7.2	-9.5	-11.5	-12.1	-12.5	-12.9	-13.2	-13.3
24-Aug-99	1.5	1.6	-0.2	-3.6	-6.8	-9.1	-11.1	-11.7	-12.1	-12.6	-12.9	-13.1
31-Aug-99	-0.3	0.2	-0.3	-3.4	-6.5	-8.7	-10.7	-11.4	-11.8	-12.3	-12.7	-12.9
07-Sep-99	0.0	-0.2	-0.4	-3.3	-6.2	-8.4	-10.4	-11.0	-11.5	-12.0	-12.4	-12.7
15-Sep-99	-0.7	-0.3	-0.5	-3.2	-5.9	-8.1	-10.1	-10.7	-11.1	-11.7	-12.2	-12.5
21-Sep-99	-1.3	-0.8	-0.7	-3.1	-5.7	-7.8	-9.8	-10.4	-10.9	-11.5	-12.0	-12.3
28-Sep-99	-1.9	-0.7	-0.9	-3.1	-5.5	-7.6	-9.5	-10.1	-10.6	-11.2	-11.8	-12.1
05-Oct-99	-8.8	-4.1	-1.5	-3.1	-5.4	-7.4	-9.2	-9.9	-10.3	-11.0	-11.5	-11.9
12-Oct-99	-13.0	-6.3	-3.2	-3.5	-5.3	-7.2	-9.0	-9.6	-10.1	-10.8	-11.3	-11.6
19-Oct-99	-15.4	-12.1	-5.8	-4.4	-5.4	-6.9	-8.7	-9.4	-9.9	-10.5	-11.1	-11.5
26-Oct-99	-16.5	-14.2	-8.6	-6.2	-5.8	-7.0	-8.6	-9.2	-9.7	-10.3	-10.9	-11.3
02-Nov-99	-18.4	-16.4	-11.4	-7.8	-6.6	-7.2	-8.5	-9.1	-9.5	-10.2	-10.7	-11.2
09-Nov-99	-25.5	-20.7	-13.2	-9.4	-7.6	-7.5	-8.5	-9.0	-9.4	-10.0	-10.5	-11.0
16-Nov-99	-24.3	-20.6	-14.4	-10.9	-8.7	-8.1	-8.6	-9.4	-9.4	-9.9	-10.5	-10.9
23-Nov-99	-18.2	-19.8	-16.5	-12.3	-9.8	-8.7	-8.8	-9.1	-9.4	-9.9	-10.4	-10.7
30-Nov-99	-24.7	-18.8	-16.0	-13.2	-10.8	-9.4	-9.1	-9.3	-9.5	-9.9	-10.3	-10.7
07-Dec-99	-28.4	-25.4	-18.5	-14.1	-11.5	-10.1	-9.5	-9.5	-9.6	-10.0	-10.3	-10.6
13-Dec-99	-30.3	-27.5	-21.4	-15.9	-12.6	-10.7	-9.9	-9.8	-9.9	-10.1	-10.4	-10.6
22-May-00	-5.2	-11.4	-14.4	-16.8	-18.3	-18.5	-18.0	-17.7	-17.3	-16.5	-15.8	-15.2
29-May-00	1.0	-10.7	-13.6	-15.9	-17.4	-18.0	-17.7	-17.5	-17.1	-16.5	-15.9	-15.2
06-Jun-00	2.7	-7.0	-12.0	-14.9	-16.6	-17.3	-17.4	-17.2	-16.9	-16.4	-15.9	-15.3
16-Jun-00	13.3	-1.0	-7.8	-12.5	-15.3	-16.4	-16.8	-16.8	-16.6	-16.2	-15.8	-15.3
26-Jun-00	13.9	3.3	-3.8	-9.5	-13.4	-15.3	-16.2	-16.3	-16.2	-16.0	-15.7	-15.2
04-Jul-00	7.5	2.3	-2.1	-7.8	-12.0	-14.3	-15.6	-15.9	-15.9	-15.8	-15.5	-15.2
11-Jul-00	7.6	3.5	1.8	-0.9	-2.5	-4.3	-7.8	-10.6	-11.6	-12.3	-13.0	-13.0
18-Jul-00	5.2	3.2	1.6	-0.8	-2.3	-3.9	-7.2	-9.9	-10.9	-11.6	-12.4	-12.5
19-Sep-00	-5.8	-2.2	-1.4	-3.6	-6.2	-8.3	-10.4	-11.0	-11.5	-12.1	-12.6	-12.9
26-Sep-00	-9.7	-4.3	-2.3	-3.8	-6.0	-8.1	-10.1	-10.7	-11.2	-11.9	-12.4	-12.7
10-Oct-00	-9.1	-8.6	-5.4	-5.1	-6.1	-7.8	-9.6	-10.2	-10.7	-11.3	-11.9	-12.3
10-Nov-00	-19.2	-18.2	-13.8	-10.6	-8.9	-8.6	-9.3	-9.7	-10.0	-10.6	-11.1	-11.5
27-Apr-01	-17.9	-20.2	-23.2	-23.8	-22.9	-21.4	-19.3	-18.5	-17.8	-16.8	-15.8	-15.1
22-May-01	-1.9	-11.5	-16.4	-19.3	-20.4	-20.2	-19.2	-18.7	-18.1	-17.3	-16.5	-15.7
18-Jun-01	4.7	-0.5	-6.4	-11.6	-15.3	-17.0	-17.7	-17.7	-17.5	-17.1	-16.6	-16.0
19-Jul-01	17.4	4.8	-1.8	-6.4	-10.3	-12.9	-14.9	-15.4	-15.6	-15.8	-15.8	-15.5
21-Aug-01	2.5	0.0	-0.7	-4.3	-7.7	-10.2	-12.4	-13.0	-13.5	-14.0	-14.4	-14.5
14-Sep-02	2.6	-0.1	-1.2	-4.0	-6.8	-9.1	-11.1	-11.8	-12.3	-13.0	-13.5	-13.8
23-Oct-02	-6.7	-6.6	-6.3	-6.2	-6.7	-8.0	-9.7	-10.3	-10.8	-11.5	-12.1	-12.5
16-Nov-02	-18.7	-16.1	-12.6	-9.8	-8.5	-8.6	-9.6	-10.0	-10.4	-10.9	-11.6	-11.9
18-Dec-02	-21.5	-19.5	-18.6	-16.3	-13.6	-11.7	-10.8	-10.7	-10.8	-10.9	-11.3	-11.6
10-Feb-03	-30.9	-28.8	-25.6	-21.9	-18.5	-16.1	-14.2	-13.6	-13.2	-12.8	-12.5	-12.4
11-Mar-03	-27.7	-29.1	-27.1	-24.7	-21.6	-18.7	-16.2	-15.5	-14.9	-14.1	-13.6	-13.2
17-Apr-03	-22.8	-25.5	-25.4	-24.2	-22.5	-20.6	-18.4	-18.4	-16.8	-15.9	-15.1	-14.5
15-May-03	-8.9	-15.5	-18.0	-19.8	-20.5	-20.0	-18.8	-18.2	-17.6	-16.8	-16.0	-15.3
17-Jun-03	5.3	-2.1	-7.4	-11.8	-15.0	-16.6	-17.3	-17.3	-17.1	-16.8	-16.3	-15.8
18-Jul-03	2.5	0.0	-0.7	-4.3	-7.7	-10.2	-12.4	-13.0	-13.5	-14.0	-14.4	-14.5
25-Aug-03	0.0	-0.2	-1.8	-4.9	-7.9	-10.2	-12.2	-12.9	-13.3	-13.9	-14.2	-14.3
16-Sep-03	0.0	-0.2	-1.9	-4.4	-7.0	-9.1	-11.1	-11.7	-12.2	-12.8	-13.5	-13.6

APPENDIX 14

GEOTECHNICAL INSPECTION

OF

GARROW LAKE DAM

November 5, 2003

EBA File: 0101-94-11552.003

Teck Cominco Ltd.
Little Cornwallis Island
Polaris, NU
X0A 0Y0

Attention: Mr. Bruce Donald

Subject: Garrow Lake Dam
2003 Annual Assessment
Polaris, Nunavut

1.0 GENERAL

EBA Engineering Consultants Ltd. (EBA) observed the Garrow Lake Dam at the Polaris Mine, Little Cornwallis Island, Nunavut on August 20, 2002. The Polaris Mine and Garrow Lake Dam are owned and operated by Teck Cominco Ltd. (Teck Cominco). EBA's site representative for the 2003 dam assessment was Mr. Mark Watson, P.Eng.

The dam was constructed in the winters of 1990 and 1991. Details of the dam construction are discussed in EBA's 1991 report "As-Built Report for Garrow Lake Dam". The dam has previously been inspected by EBA in 1993, 1994, 1996, 1998, 2000 and 2002.

The 2003 dam assessment consisted of the following activities:

- Assessment of any existing seepage, instability or settlement;
- Observation of siphon discharge practices;
- Observation of limited portions of the reservoir shoreline immediately to the north of the dam abutments;
- Review of 2002 and 2003 ground temperature data; and
- Review of the 2002 and 2003 reservoir water level data.

John Knapp of Teck Cominco accompanied EBA during the 2003 dam inspection.

Information provided during Mr. Watson's site visit included:

- Reservoir level data and siphon discharge rate information
- Ground temperature data

Since EBA's 2002 visit, there have been no earthworks on the dam.

Mine operations at Polaris ceased at the end of August 2002. Water levels in the reservoir are presently being lowered in preparation for the 2004 decommissioning of the dam. Previous recommendations by EBA, for the decommissioning of the dam were provided in EBA's 2001 report "Garrow Lake Dam Decommissioning – Polaris Mine Operations, Nunavut".

2.0 GROUND TEMPERATURES

Ground temperature measurements were recorded on a monthly basis in 2002/03 by Teck Cominco's mine site personnel. Ground temperature profiles are shown in Figures 1, 3 and 5, and temperature variation over time is shown in Figures 2, 4, and 6. The ground temperatures have been relatively stable over the years with the exception of 1999 when ground temperatures warmed in response to unusually warm weather experienced at the Polaris Mine.

The general trend in the collected data since dam construction has historically been one of slight warming; however, the 2001 and 2002 data collected indicated that this trend attenuated. In 2003, the trend observed was that of slight warming of 0.1 to 0.2 C°. The temperatures remain consistently lower than predicted by the thermal analysis used to support the dam design.

3.0 RESERVOIR LEVEL

The mill ceased drawing water out of Garrow Lake and ceased to deposit tailings in Garrow Lake at the end of August 2002. The present objective is to draw the water level down to original water level in preparation for decommissioning of the dam in 2004.

The reservoir elevation was 1006.55 m on August 20, 2003. This is approximately 0.85 m higher than the lake elevation before impoundment, approximately 3.65 m below the maximum design water level and 1.3 m lower than when the dam was last inspected in 2002. The lake level history is shown in Figure 7.

4.0 SEEPAGE AND EROSION FEATURES

On August 20, 2003, EBA found no signs of seepage from the dam and there were no reports of seepage by mine personnel.

A very small pool of water is ponded just past the downstream toe of the west abutment. Runoff from the approach road to the dam has a direct path to this location. Standing water was observed in this area by EBA in 1996, 1998, 2000 and 2002. The area has always been slightly depressed and likely has collected runoff from the surrounding area.

As reported in previous years, surface run-off has created an erosion gully on the west side of the west access road from the top of the dam to the toe of the dam. The erosion gully (up to 1.5 m deep in 2002) was filled with drifted snow on August 20, 2003. A detailed description of the erosion is provided in EBA's 2002 Dam Inspection Report.

The gully does not affect the dam performance; however it may require filling for aesthetic reclamation purposes. This could be done in 2004. It may be possible to use excavated dam rip rap material as gully backfill. Dam reclamation earthworks should not concentrate surface flows in areas where patterned ground or any other evidence of ice-rich permafrost is present.

5.0 DAM STABILITY

The upstream and downstream dam slopes of Garrow Lake Dam have remained stable and there is negligible erosion on the slopes (Photos 1 and 2).

There has been a considerable amount of vehicle traffic on the west half of the dam since EBA's 2002 site visit. This traffic has occurred while adding and maintaining siphon lines. A modest curb of granular ridge has developed on the upstream crest shoulder from material displaced by rubber tired vehicle traffic. On the downstream side the ridge is absence, however, some areas of disturbance and subsequent redressing are apparent (Photos 3 and 4). A shallow dish shaped depression that was about 1.5m diameter remained on August 20, that was free of any water (Photo 4).

These areas do not present any influence on the short-term dam performance and can be addressed at the time of decommissioning of the dam.

6.0 RESERVOIR SLOPES

There were three polar bears in the vicinity of the mine site during EBA's site visit; therefore, for safety reasons, EBA's inspection of the shorelines of the reservoir was limited to visual examination of the shorelines visible from the dam site and access road.

The lowering of the water level has exposed more beach (Photo 5). Upslope of the beach, the sides of the reservoir remain stable with no evidence of any new erosion or instability.

The reservoir is operating at water levels more than a metre below the levels of the last few years. At present rates of water removal via the siphons, the lake level is falling by about 2.0 to 2.5 cm per day. Shallow slope movements and erosion appear to be similar to that observed in previous years.

7.0 SIPHONS

Water has been discharged regularly from Garrow Lake since 1994. The number of siphons have varied during that time. At the time of closure in 2002, there were ten 300 mm diameter siphons. On August 20, 2003, EBA observed that another eight 250 mm diameter siphons were added since EBA's last visit. A nineteenth pipe was observed at the site on the east side of the 250 mm and 300 mm diameter lines. This pipe was found by TC to be inappropriate for use at this site and was inactive. Between August 18 and 22, 2003 fifteen to seventeen of the available eighteen siphons were operating simultaneously. Maintenance staff were working to keep lines functioning.

The siphons terminate at the same location as they have in the past, approximately 60 m downstream of the crest of the dam, and discharge into half culvert sections. The culverts discharge into a pool that has been partly armoured with rip rap.

Flow rates from each of the 15 operating siphons were observed to be approximately 19,500 gpm. Total annual discharge data provided by Teck Cominco:

Year	Annual Discharge (m^3)
2000	4,262,425
2001	2,955,954
2002	5,048,667

Siphon discharge observed during the 2003 site visit is shown in Photo 6.

8.0 SUMMARY

It is EBA's opinion that the dam is continuing to perform well. Ground temperatures are generally stable, and there are no signs of instability or significant erosion on the dam. The dam condition should continue to be monitored by TeckCominco on a monthly basis for any signs of seepage or distress and ground temperatures should continue to be measured. EBA should be informed of any soft areas, signs of instability/erosion or visible seepage through the dam. The erosion noted at the edge of the west access road to the reservoir does not adversely affect the dam in any way.

9.0 CLOSURE

We trust that this information meets your requirements at this time. Please contact the undersigned if you have any questions.

Yours truly,
EBA Engineering Consultants Ltd.

REGISTERED PROFESSIONAL ENGINEER
Nov 5/03
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LICENSEE
NWT/NU

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MDW:ln
L01 Bruce Donald Teck Cominco Nov 05 03.doc

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
03/11/05 P 018
EBA ENGINEERING CONSULTANTS LTD.

Photo 1
Upstream slope - looking west.

Photo 2
Downstream slope - looking west.

Photo 3
Downstream slope - looking east.
Very little ponded water at toe of dam.

Photo 4
Dam crest - looking east.

Photo 5
East abutment - beach condition after lowering reservoir.

Photo 6
Siphon discharge into Garrow Lake.
Single line in foreground was inactive.

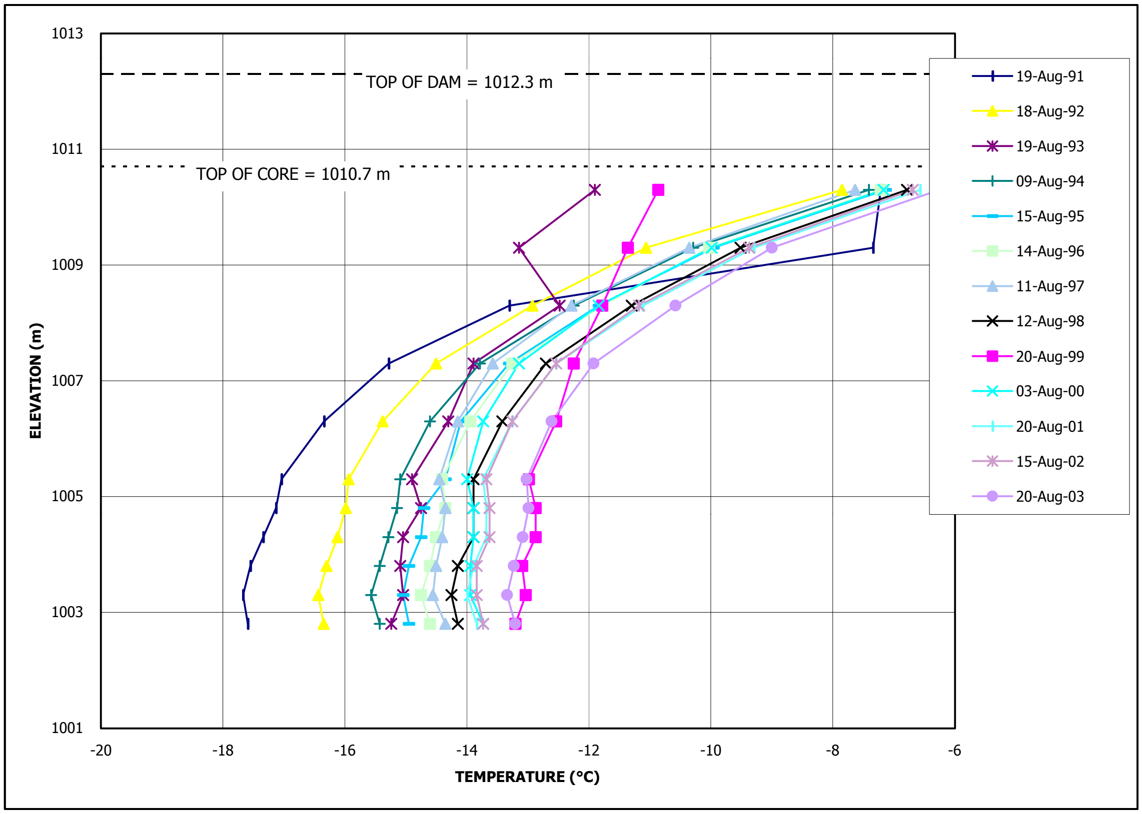

FIGURE 1: NORTH THERMISTOR - TEMPERATURE PROFILE

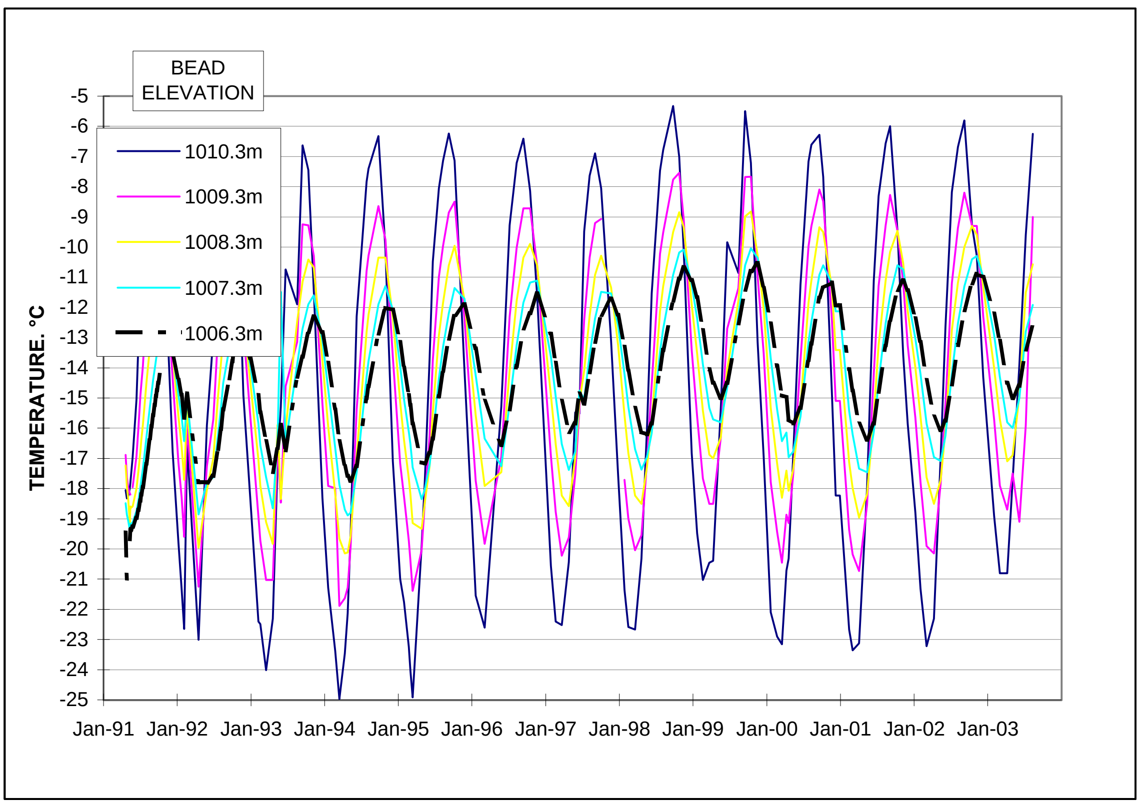

FIGURE 2: NORTH THERMISTOR - TEMPERATURE HISTORY

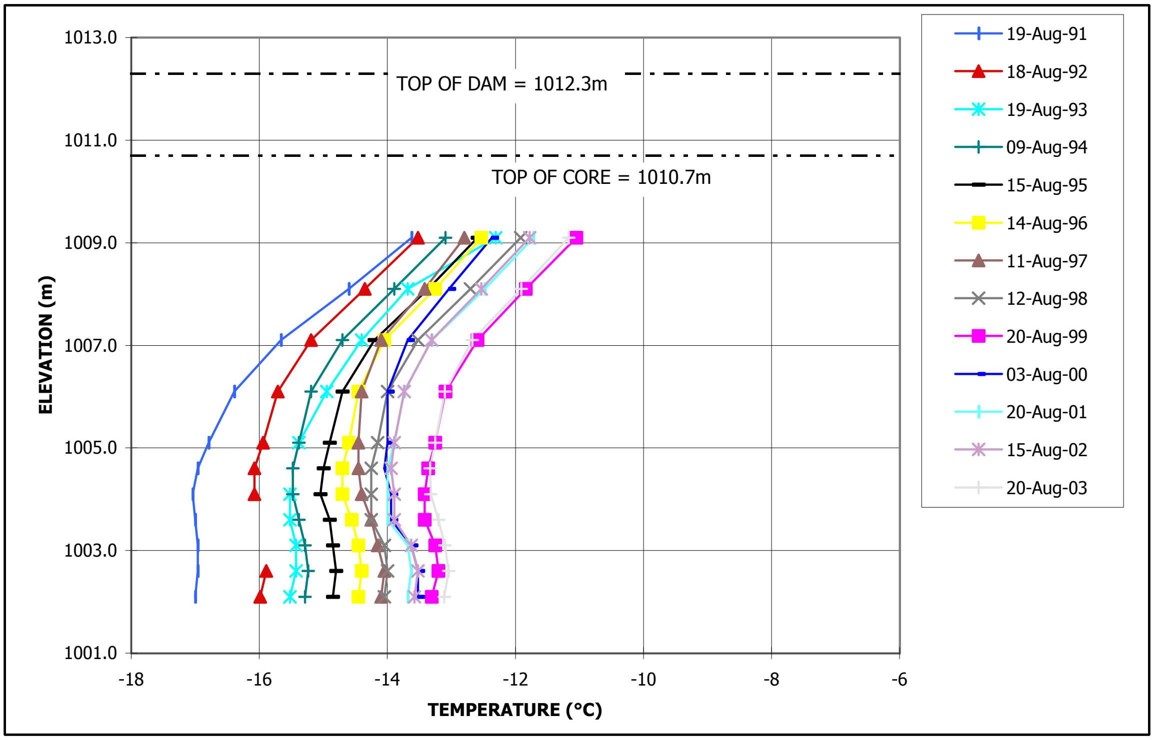

FIGURE 3: CENTRE THERMISTOR - TEMPERATURE PROFILE

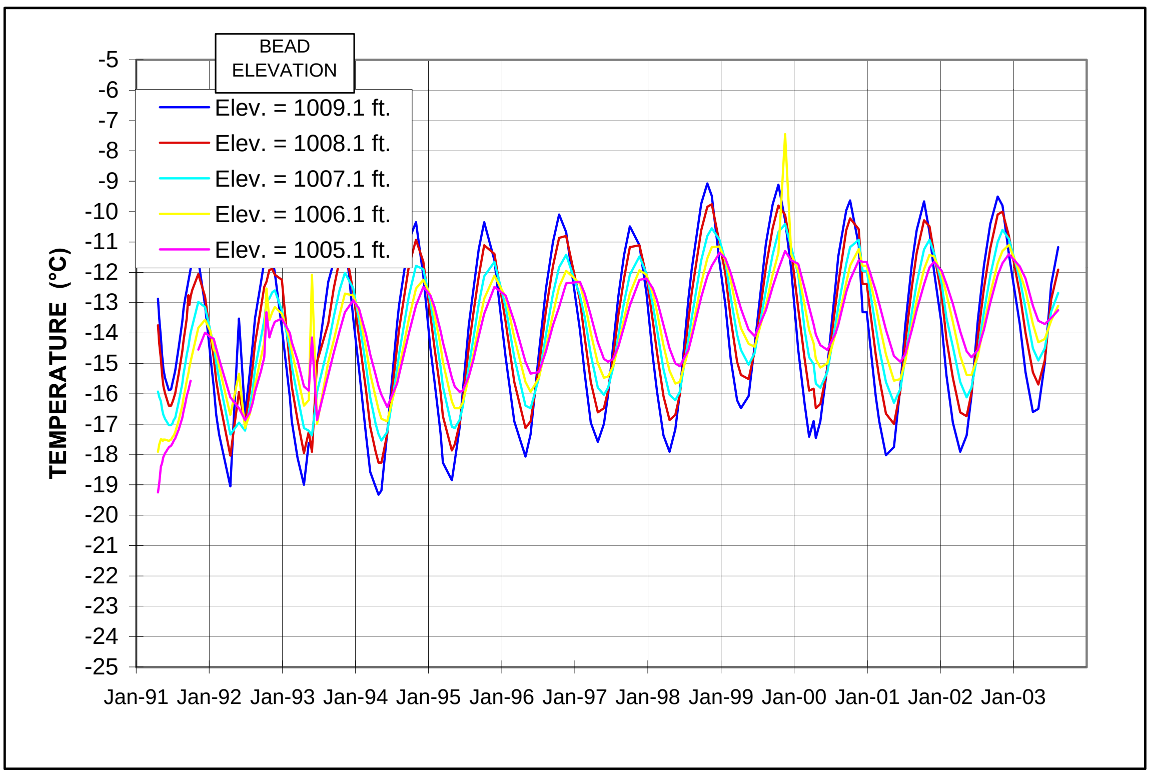

FIGURE 4: CENTRE THERMISTOR - TEMPERATURE HISTORY

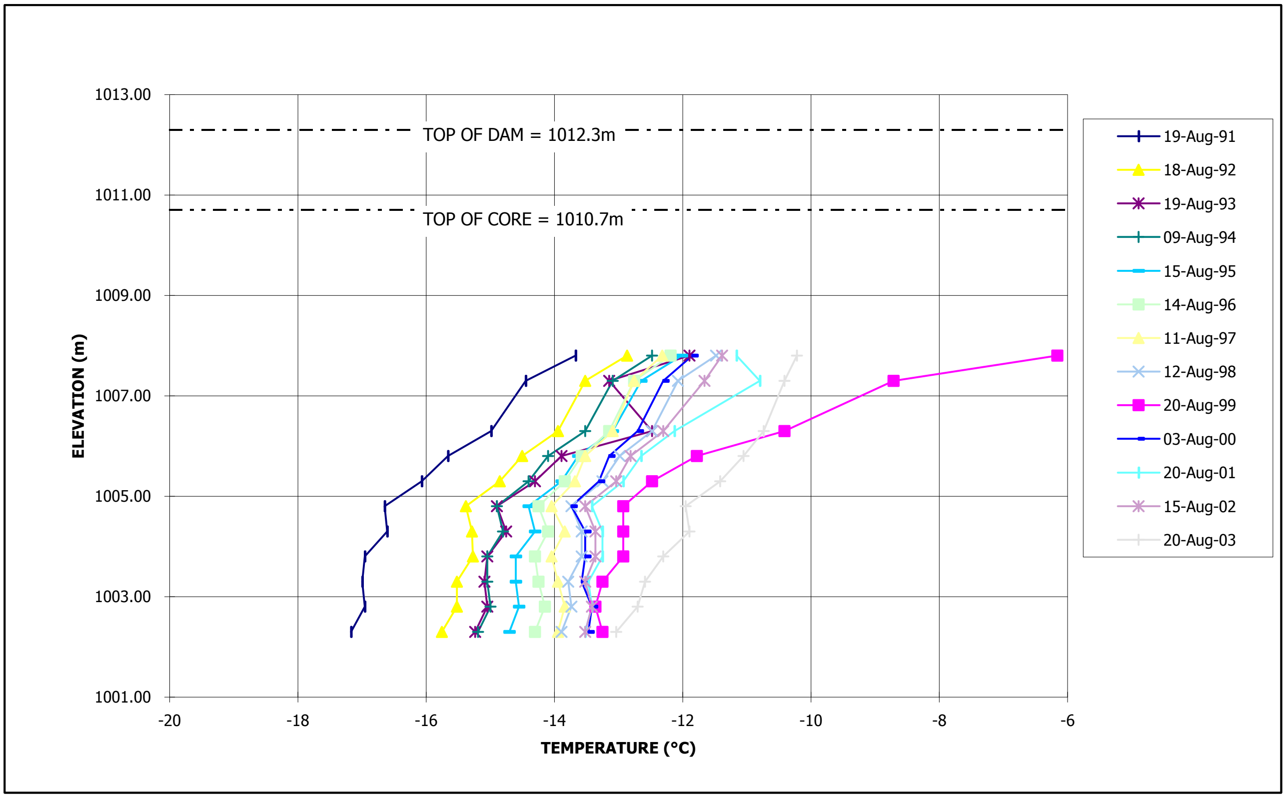

FIGURE 5: SOUTH THERMISTOR - TEMPERATURE PROFILE

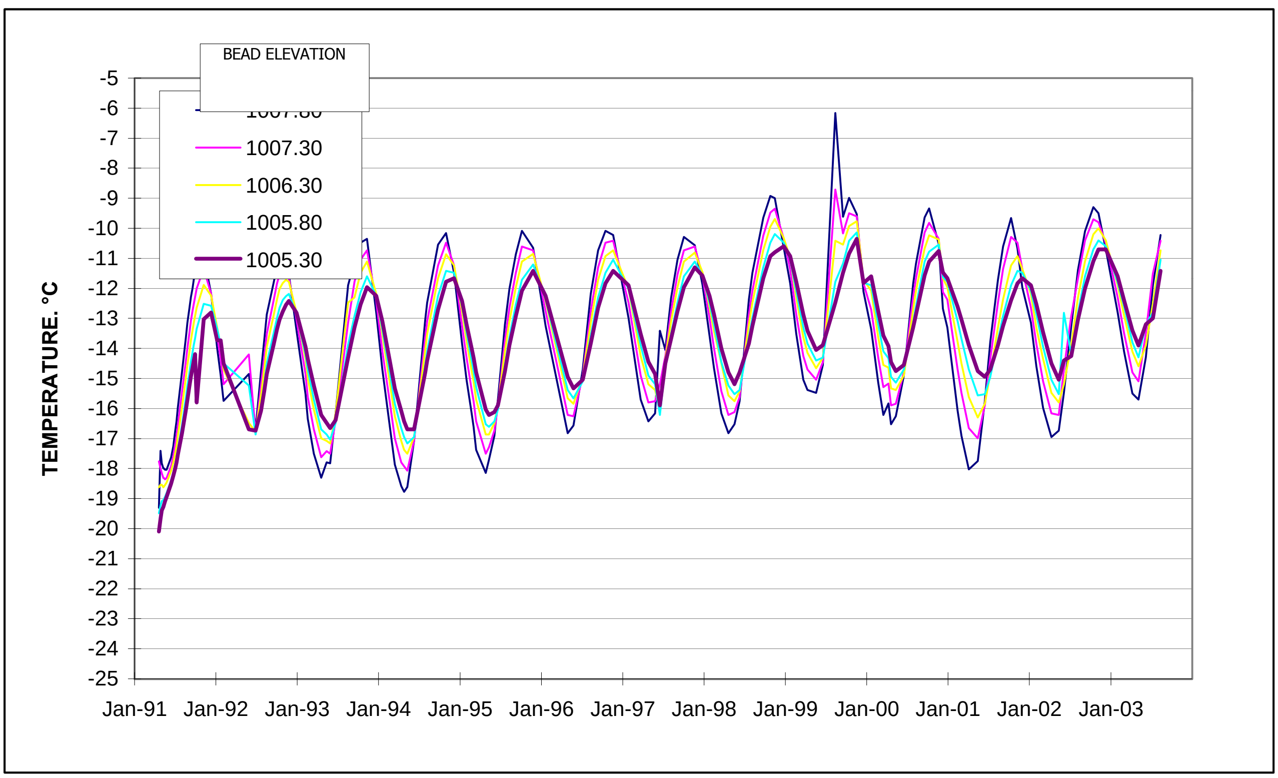

FIGURE 6: SOUTH THERMISTOR - TEMPERATURE HISTORY

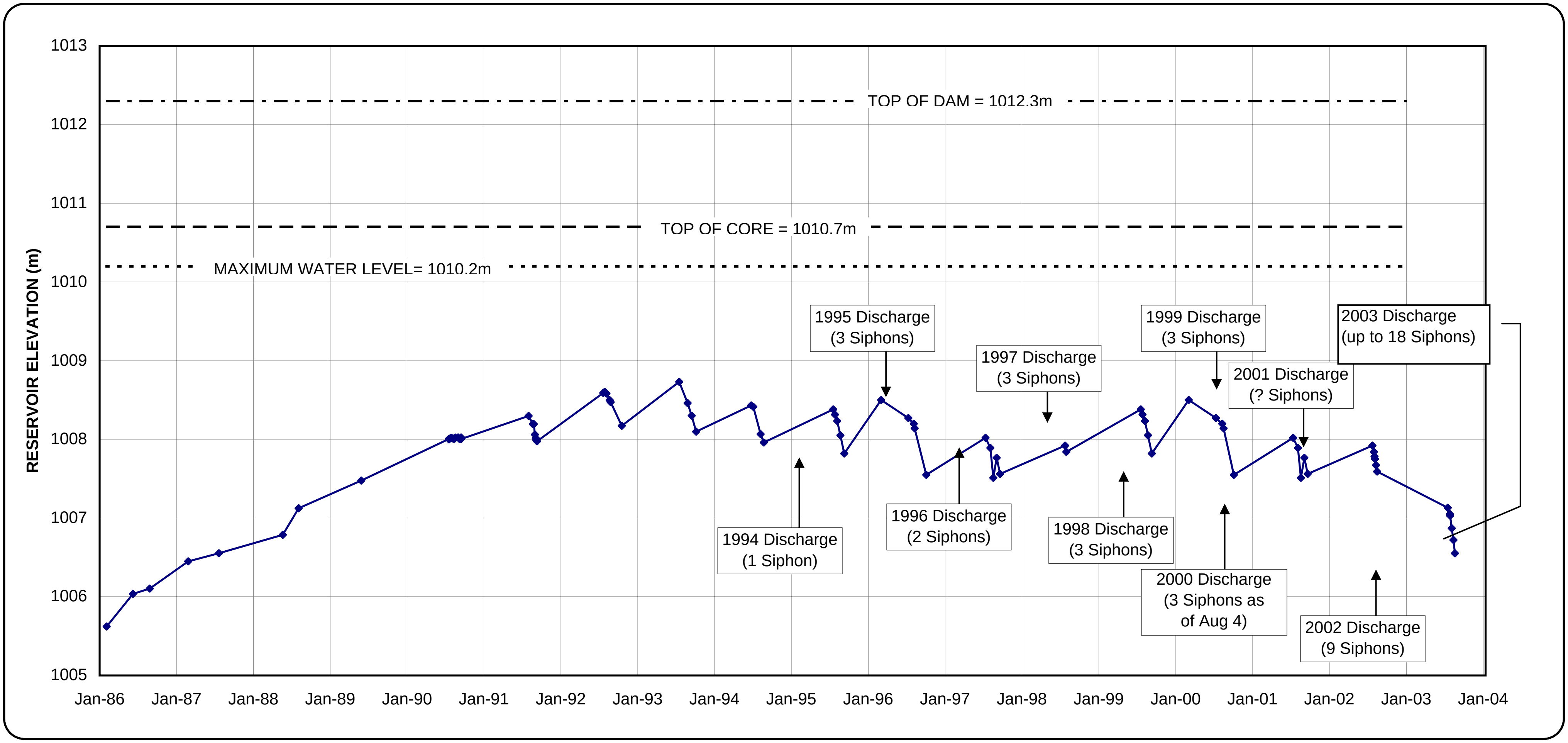

FIGURE 7: GARROW LAKE - RESERVOIR LEVEL

APPENDIX 15

GEOTECHNICAL INSPECTION

OF

OPERATIONAL LANDFILL

November 10, 2003

EBA File: 0101-94-11552.003

Teck Cominco Ltd.
Little Cornwallis Island
Polaris, NU
X0A 0Y0

Attention: Mr. Bruce Donald

Subject: Landfill Cover 2003
Polaris, Nunavut

1.0 GENERAL

EBA Engineering Consultants Ltd. (EBA) was requested by Teck Cominco Ltd. (TC) to observe the Operational Landfill capping materials and review capping procedures that have been followed up to August 22, 2003 at Polaris Mine, Little Cornwallis Island, Nunavut. This work was carried out in conjunction with EBA's review of the Garrow Lake Dam on August 19 through 22, 2003.

EBA was authorized to carry out this work by Mr. Bruce Donald on behalf of TC on August 15, 2003. The work was carried out under TC PO# 21.19-P01.

2.0 BACKGROUND

The purpose of this review was to help TC respond to a letter by Indian and Northern Affairs Canada (DIAND) dated July 22, 2003. In DIAND's July 22 letter they report the following:

- "The landfill is being constructed according to the guidelines given in Volume 2 of the Polaris Mine Decommissioning and Reclamation Plan (GLL, 2001)."
- "Cover materials were selected to minimize erosion and remain stable over the long term."
- "Liner permeability is not a concern at the Polaris Landfill (s) as the waste is designed to be encapsulated in permafrost."
- "The cover design is meant to promote permafrost aggradation and to limit the active zone to the cover material itself."
- "It was not clear (to DIAND on July 2 and 3, 2003) who was responsible for inspecting construction of the cover material - - ."

DIAND requested that TC "ensure that the landfill cover is inspected to ensure it meets the guidelines in the reclamation plan". Specifically, DIAND requested the following information:

- Thermistor readings
- Materials testing results (moisture contents, grain-size, density)
- And as-built drawings.

DIAND stated that the thermal analysis for the cover design assumed certain properties for the cover material (s). TC should verify that these assumptions are valid for the actual materials being placed. The final thickness of the cover should be based on the actual cover material properties.

3.0 INFORMATION REVIEWED

EBA was also provided the following background information by TC:

- Decommissioning and Reclamation Plan Volumes 1,2 and 3 of 4, Supporting Documentation dated March 2001.
- Annotated Operational Landfill Drawings prepared by Gartner Lee Ltd. (GLL) dated May 27, 2003, that include:
  - Dwg 23306-0 - Specifications
  - Dwg 23306-1 - Operational Landfill Existing Top of Waste and Ground Surface (Spring 2003)
  - Dwg 23306-2 - Top of Waste After Regrading
  - Dwg 23306-3 - Top of Final Cover
  - Dwg 23306-4 - Sections 1, 2, 5 , 8 and 10
  - Dwg 23306-5 - Sections 13, 15, 18 and 20
  - Dwg 23306-6 - Sections 22, 23, 24 and 25

EBA was advised that hand written notes on TC's set of drawings had been agreed to with GLL and that revised drawings were to be provided by GLL. Specifications for the landfill cap materials that are described herein are based on the edited drawings provided by TC.

The Volume 2 reclamation guidelines referenced by DIAND call for a minimum 1.8 m thick cover of coarse shale or equivalent material and finished slopes of 4 Horizontal to 1 Vertical or flatter.

EBA was told that in subsequent communications between TC, GLL (the landfill closure designers) and the Regulatory Agencies, it was agreed that available hard limestones would be used in the top 0.6 of the cap instead of the shale to provide a more erosion resistant surface material. Shale was approved as cover for the initial 1.2 m above the landfill.

Specifications for material properties prepared by GLL comprise the following:

Cover Materials Description	Minimum Thickness of Layer	Maximum Size and Particle Size Distribution ASTM C136-01	Allowable Lift thickness (tolerance)	Test Frequency
Zone A (Bottom Layer): Beach Gravel, Shale or Limestone	1.2 m	Max. 300 mm Max. 10% passing US #200 sieve opening size.	600 mm (100 mm)	1 per 10,000 cu. m.
Zone B (Upper Layer): Limestone	0.6 m	Well Graded Max. 300 mm Max. 10% passing US #200 sieve opening size.	600 mm (100 mm)	1 per 10,000 cu. m.

Other parameters and procedures specified by GLL on the Drawings dated May 27, 2003 are:

- Owner should survey and review "before and after" results to confirm that adequate thicknesses of Capping Layers A and B are in-place and that the Operational Landfill Grading is carried out in accordance with the lines and grades.
- Owner should review and approve Plate Load Test results. These tests are to be carried out in accordance with the procedures described in Drawing 23306-0
- " Placement of the final cover material (Type A and B) shall be completed such that large void spaces are not created. Where void spaces are created (e.g. collection of large particles placed together) they should be removed by breaking of the large particles, regrading, excavating, or other means necessary before compacting."
- Compaction to consist of 4 passes of the track of a Caterpillar D8 or equivalent/minimum 5 ton vibratory compactor.

It is understood that Pierre Goinet of SNC Lavalin participated in the Operational Landfill Closure activities by providing before and after topographic survey and assistance with the Plate Load Testing program.

4.0 FIELD OBSERVATIONS AND REVIEW OF TC MONITORING PROGRAM

4.1 Description of Fieldwork

EBA was at the Polaris Mine site August 18 through August 22, 2003. Estimated daily average air temperatures were typically close to 0°C and were reported by TC to have been near these temperatures for at least 2 weeks. For the first two days of EBA's visit there was a light snowfall at night that thawed by the following afternoon. There was no further fresh snowfall for the remainder of the time, however, patches of snow that had developed prior to EBA's visit remained for the entire time.

Site reconnaissance work was carried out in the afternoon after any nighttime snowfall had melted. Ground surface conditions were typically wet.

On August 19, August 20 and August 21, 2003, Mr. Mark Watson, P. Eng., of EBA visited the Operational Landfill and respective borrow site for the capping materials. On August 19, Mr. Watson was accompanied to site by Mr. Ian Dickie and Mr. John Knapp as part of an overall site orientation. Mr. Knapp accompanied Mr. Watson to site again on August 21, 2003 to provide more history on some localized features observed by Mr. Watson.

Mr. Watson walked the top and side slope of the landfill and took photographs of selected features. Selected photographs are provided in Appendix C.

4.2 Landfill Setting

The landfill is located on southeast facing terrain with slope gradients estimated from pre-existing contour information to be about 15 percent. The terrain immediately upslope is mapped as marine terrace and the terrain at the same elevation on either side is mapped as marine veneer over gently sloped bedrock. Surface soils are mapped as predominantly gravel or sand and gravel.

Figure 1 is a key plan of the layout of the road and landfill development with respect to the Polaris Mine.

4.3 Landfill Configuration

Plan and cross-sectional views of the before and after Operational Landfill configurations are shown in Figures 2 through 6. A typical design section prescribed by GLL is provided in Figure 4. A contour plan and a typical as-built section up to the time of EBA's site visit in August 2003 are provided in Figures 5 and 6, respectively. Photographs of the in-progress landfill on August 19 and 20, 2003 are provided in Appendix C.

The landfill forms a 50 to 70 m wide bench with side slopes reported to be about 4 Horizontal:1 Vertical (25 percent). Materials at the landfill consist predominantly of a surface layer of imported shale (Photos 1 and 2) overlying a frozen mix of construction debris and incinerated domestic refuse mixed with soil. Based on draft copies of the before and after survey data provided by SNC Lavalin Engineers and Constructors Inc. (SNC) on behalf of TC the shale cap fill is reported to be at least 1.2 m thick throughout the site. The fill overlies about 7 or 8 m of refuse at the deepest part of the landfill. An open excavation at an instrumentation location on the top bench of the landfill showed a fill thickness consistent with the TC draft survey values at that location.

EBA observed that the imported shale cover consists of angular gravel, with sand, trace to some silt and with platy to blocky angular cobble size shale fragments. Gradation test results are described in Section 4.4. Photographs of the shale stockpile taken at the borrow source are also provided as Photos 3 and 4.

Native materials on the slopes immediately up-gradient of the landfill are brown sand and gravel with some silt (Photos 5, 6 and 7).

A remnant pile of stockpiled "beach" gravel remains at the toe of the landfill at the north east toe of the landfill (Photo 8).

Some mixing of the shale fill with brown sand and gravel fill with silt occurred in on the top of the flat bench and in particular in an area of excavation and backfill that preceded the landfill capping (around June 2003, personal communication with John Knapp). The excavation and backfill was carried out in conjunction with the remediation of an old hydrocarbon spill located upslope of the landfill. A sketched plan showing the influenced area is provided in Appendix B. Some rutting of the fills on the top of the operational landfill coincident with the bottom of the remediated site is apparent. Rutting has occurred under the traffic of rubber tired vehicles and minor pooling of runoff (recent snowmelt) water was occurring in this area (Photos 9 and 10). TC has stated that the grades on the surface of the operational landfill, disturbed by rutting will be restored at the time the limestone cover materials are placed.

4.4 Moisture Content and Gradation Analysis

The results of two gradation analyses carried out by TC were provided to EBA (dated July 28 and August 18). Results of the gradation analyses are shown in Appendix B. Testing frequencies by TC are below that specified by GLL, however, the materials tested comply with the GLL gradation specification. TC reported that two or three other samples taken during cap placement remain to be tested.

In general the shale fill appears clast supported, however, the fractions of sand and silt vary somewhat. Some areas showed substantial segregation at finished grade comprising entirely of gravel to cobble size angular materials that are very pervious (Photo 1). In other areas the matrix material is sand with some silt.

Moisture content measured on the July 28 shale sample was 4.9 percent.

4.5 Density and Plate Load Test Results

There was no requirement in the GLL 2001 Decommissioning and Reclamation Plan or subsequent drawings and specifications (2003) to measure in situ density. Compaction procedures and plate load testing were, however, prescribed. It is understood that these tests were carried out in the presence of Pierre Goinet of SNC Lavalin.

TC carried out Plate Load Tests on the upper flat bench on August 7 and 8. Fourteen tests (14) were done on the bottom lift and nineteen (19) tests were done on the top lift. Minimum test frequency is about one test one 2000 sq. m. on the upper bench. SNC (conversation with Pierre Goinet, of SNC) reported that although excavations were made on the slope to check the fill thickness, no plate load testing was done on the side slopes for safety reasons.

Test results reported by TC for the upper bench comply with the GLL specifications.

4.6 Thermal Parameters

In permafrost the depth of annual thaw near surface ground surface is termed the active layer. In general, where mineral soils exist within the active layer and slope gradients are flat, the active layer thickness will be less for soils that retain more moisture than for soils that are dry. The same relationship holds true on slopes provided there is not any persistent flow of surface water.

Geothermal analyses reported by GLL were based on assumed soil parameters. For the purpose of the analyses the assumed moisture content for the shale cover was 0.1 percent which for practical purposes is dry.

The measured moisture content from a single sample of shale fill is about 5 percent. This moisture is consistent with the results of work done by EBA on shale fills at Garrow Dam (EBA, 2001 Project No101-94-11552.002).

The drainage catchment area for the landfill is minimal and there have been no reported perennial drainage paths in the area of the landfill. Therefore, based on the observed moisture content information and general compliance of the shale fill with the specified parameters, EBA would estimate the actual depth of active layer to be either the same or less than predicted in the GLL report.

4.7 Other Observations

Ground Temperature Information

TC provided EBA ground temperature measurements collected seasonally from March 1999 to June 2003 at 5 monitoring locations on the top of the Operational Landfill (See Appendix B). Ground temperatures were measured at 0.5 m depth increments to a maximum depth of 5 m using permanent thermistor string installations. The ground temperature information indicates that the landfill was frozen back at the monitoring locations to depths greater than 5 m and that an active layer thickness of less than 1.5 m existed.

Topographic Survey of Landfill

Redistribution of materials at the Operational Landfill was carried out under the direction of TC and surveyed by SNC Lavalin. TC forwarded draft copies of the plotted survey information to EBA. The survey information was prepared for TC by SNC Lavalin and showed the topography before and after placement of the initial lift of capping material. The draft profiles show general compliance with the GLL design grades. Based on the draft information provided the operational landfill is in fact close to the final design elevations and therefore the finished landfill cap elevation after placement of the 0.6 m of limestone in 2004 will be up to 0.6 m higher than the design grades specified.

TC have indicated that final surveyed profiles confirming the cap thickness of 1200 mm will be provided in subsequent reviews.

8.0 DISCUSSION AND CONCLUSIONS

Based on the results of a review of the information provided by TC and visual assessment of the materials. The majority of the fills placed and exposed at the ground surface are shales imported from the New Quarry. Some of the locally derived materials have also been used, however, it is difficult to be certain of the exact proportion.

The particle size distributions as determined by TC from two samples are in compliance with the GLL specification. Testing frequencies are below that specified, however TC report that other samples collected during placement have been taken and are in store awaiting testing.

Density testing was not specified by GLL in either the Decommissioning and Reclamation Plan or on the Operational Landfill Design documents, however, compaction procedures and quality control testing via a plate load test procedure were outlined by GLL and were followed by TC. Plate load test results were in compliance with the specification.

Moisture content tests were not a requirement of the specified GLL quality control program however, one moisture content was measured incidental to gradation test by TC. The result is consistent with test results on shale fill materials reported previously by EBA for the Garrow Lake Dam construction and is consistent with EBA's expectations for this material.

One of the underlying concerns expressed in the July 22, 2003 letter by DIAND was the expected depth of active layer. Based on the above information EBA expect that the active layer will equal or be less than predicted by GLL.

5.0 RECOMMENDATIONS

Based on EBA's observations in August 2003 the following recommendations are provided:

- Visually monitor the landfill cover during spring runoff and heavy rainfall events for evidence of concentrated surface runoff, heavy seepage emerging from the landfill cover, or subsidence which could in any way interfere with the ability of the cover to adequately protect the landfill from erosion or shallow instability.
- For at least the first year keep a stockpile of limestone fill to facilitate remediation, if needed.
- Areas rutted under the weight of rubber tired vehicles should be graded to remove the ruts and to positively shed surface water before placement of the 0.6 m thick limestone cap.

9.0 CLOSURE

We trust that this information meets your requirements at this time. Please contact the undersigned if you have any questions.

Yours truly,
EBA Engineering Consultants Ltd.

Reviewed by:

REGISTERED PROFESSIONAL ENGINEER
Nov 10/03
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LICENSEE
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MDW:ln

Attachments

Figures 1 through 6
Appendix A - EBA General Conditions
Appendix B - Information Provided by TC
Appendix C - Photographs of Landfill in August 2003

THE ASSOCIATION OF
PROFESSIONAL ENGINEERS,
GEOLOGISTS and GEOPHYSICISTS
OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
03/11/11 P 018
EBA ENGINEERING
CONSULTANTS LTD.

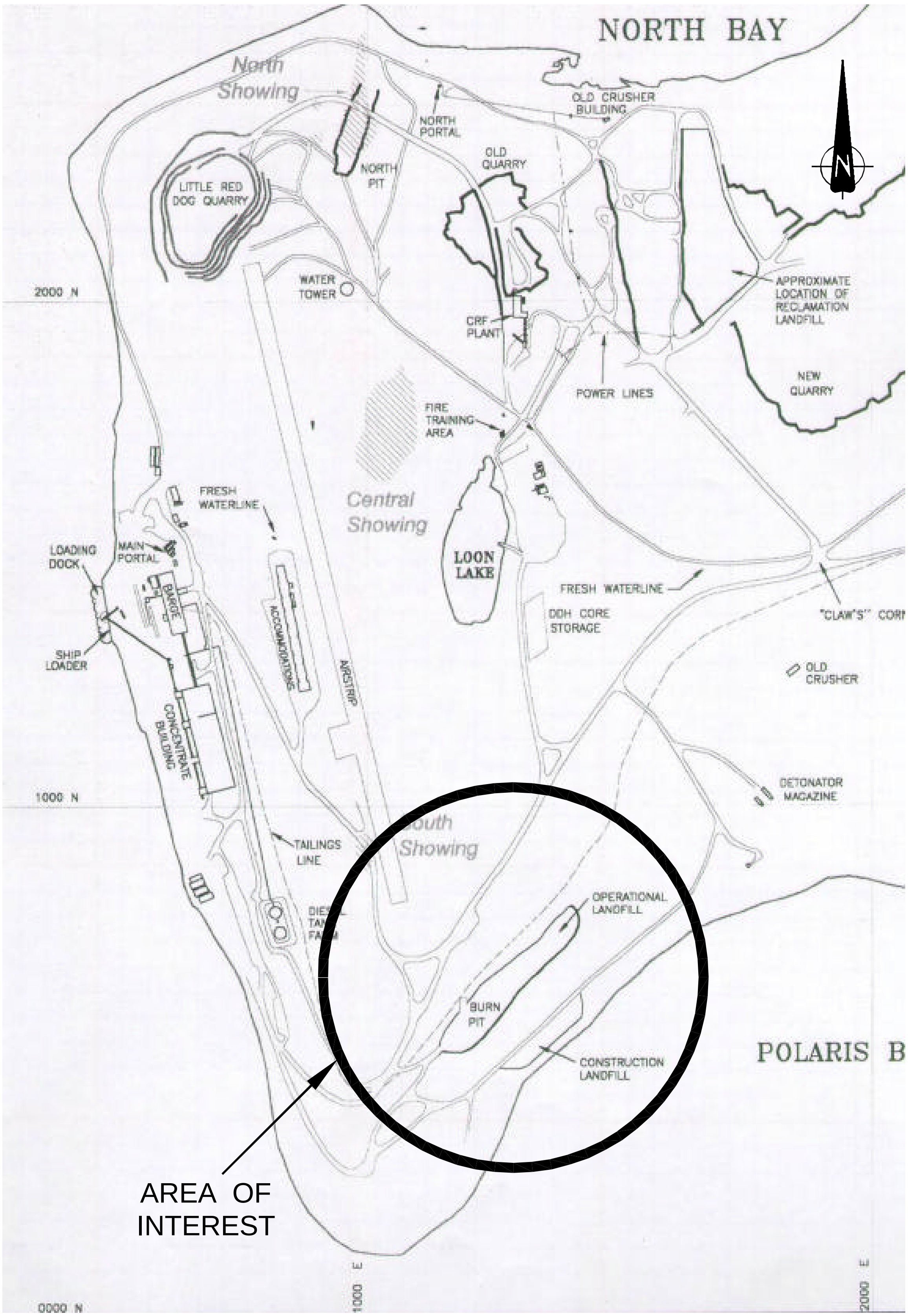


Figure 1

Key Plan

11552R23B.dwg

REFERENCE:

Base drawing from TECK COMINCO LTD.,
Figure No.: APPENDIX 2
Project Number: 20-935
File Name: 20935-F2-LF02.DWG
Date Issued: March 2, 2001

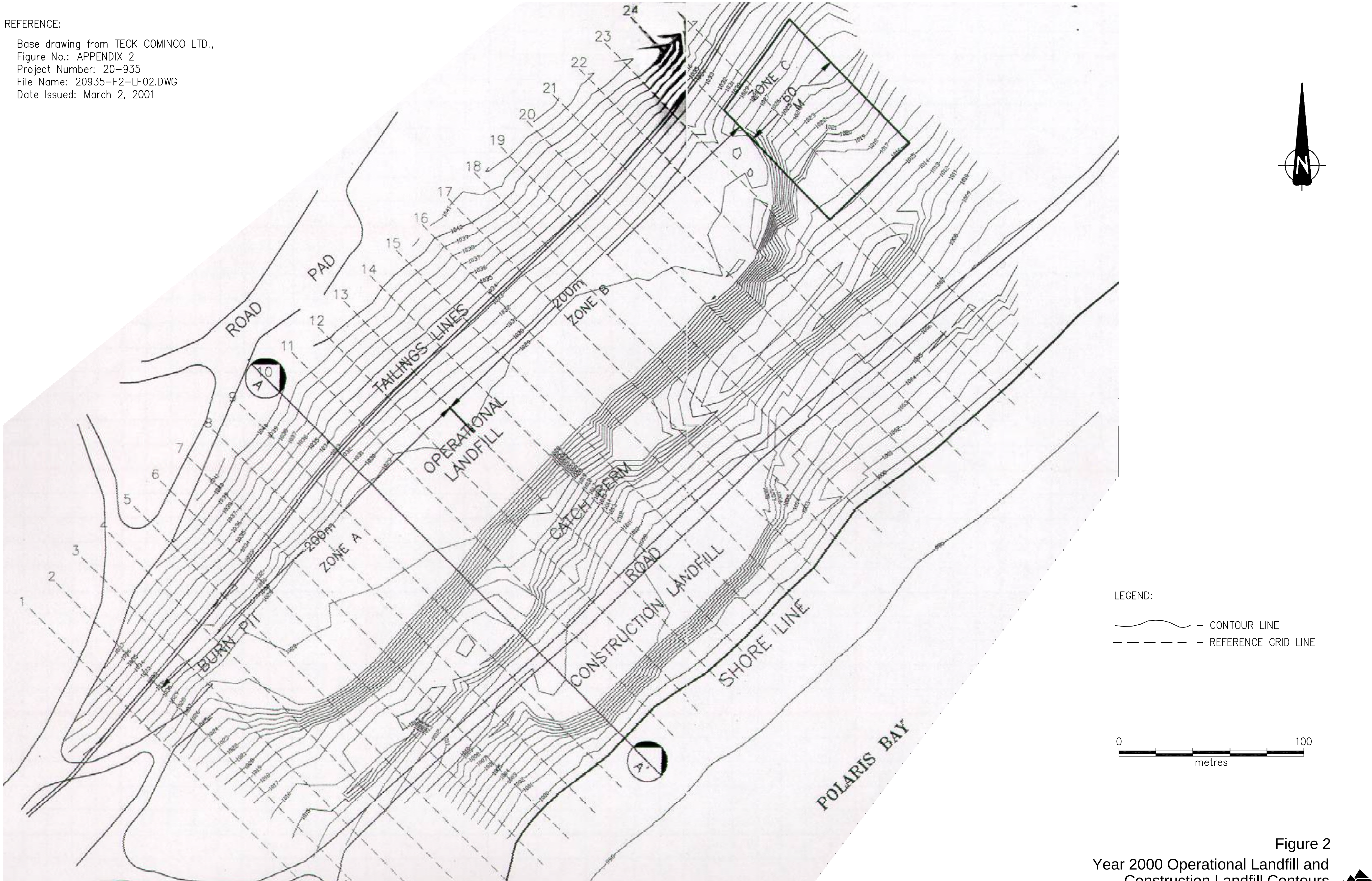


Figure 2
Year 2000 Operational Landfill and Construction Landfill Contours

11552R24B.dwg

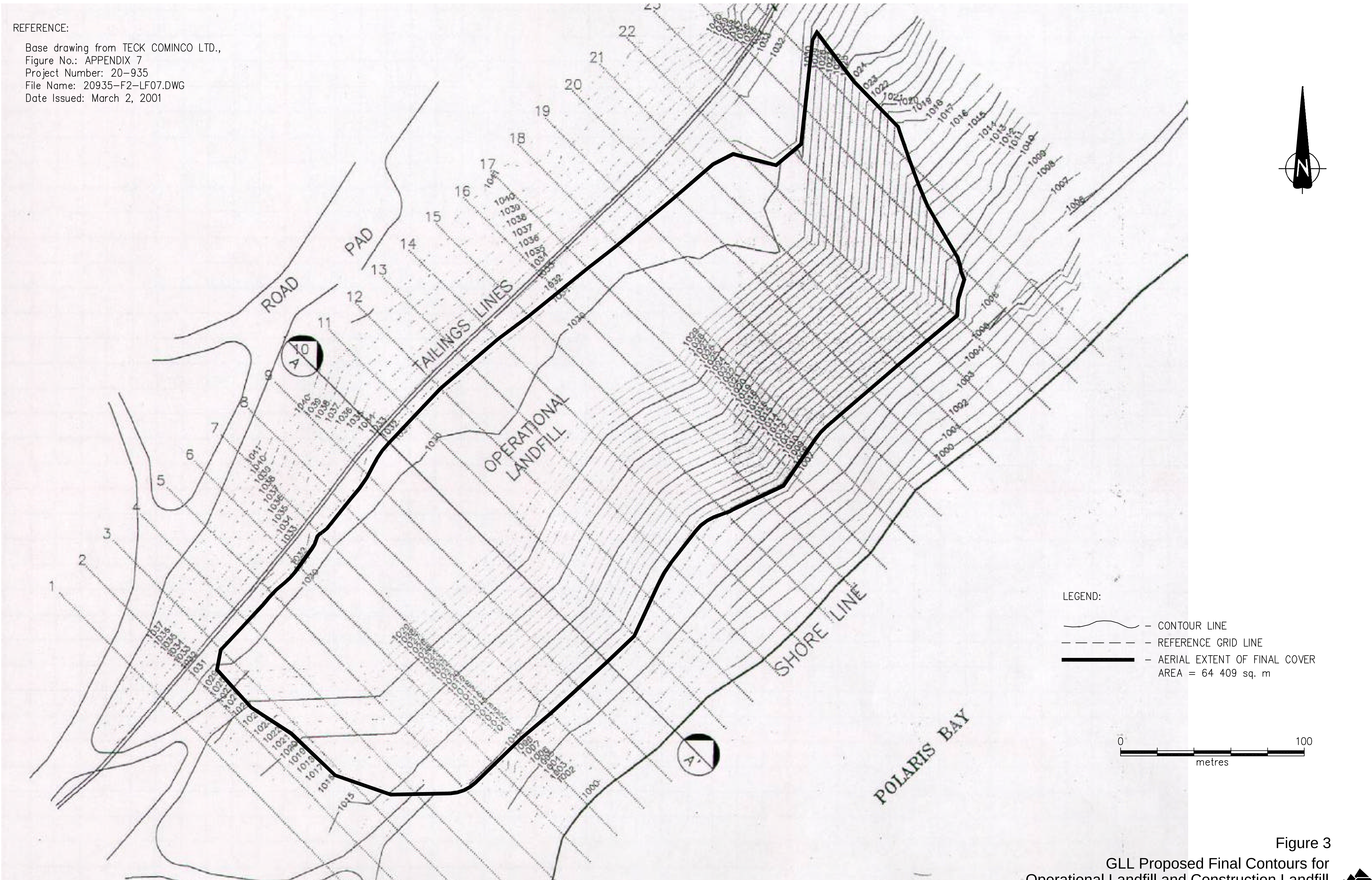


Figure 3
GLL Proposed Final Contours for
Operational Landfill and Construction Landfill

11552R25B.dwg

REFERENCE:

Base drawing from TECK COMINCO LTD.,
Figure No.: APPENDIX 8
Project Number: 20–935
File Name: 20935–F2–LF08.DWG
Date Issued: March 21, 2001

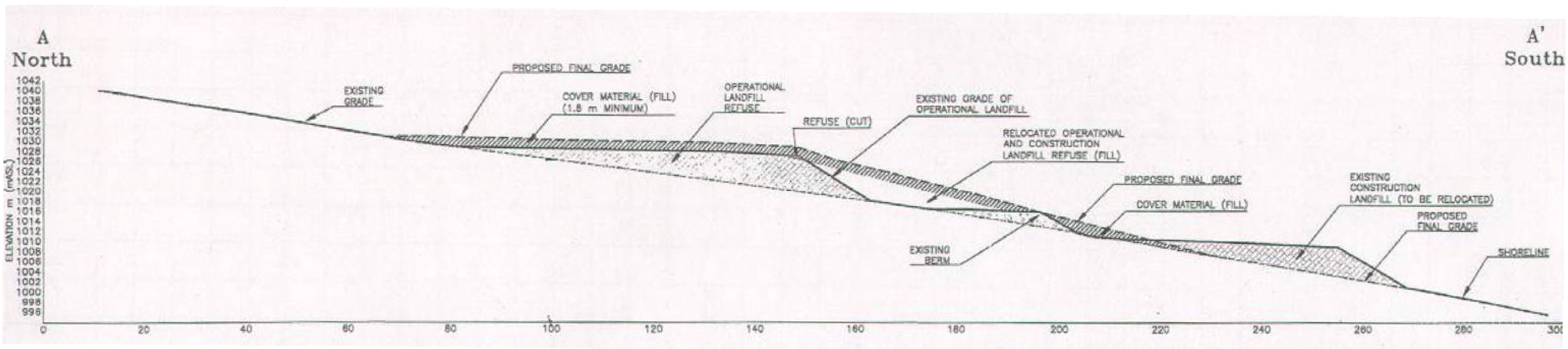
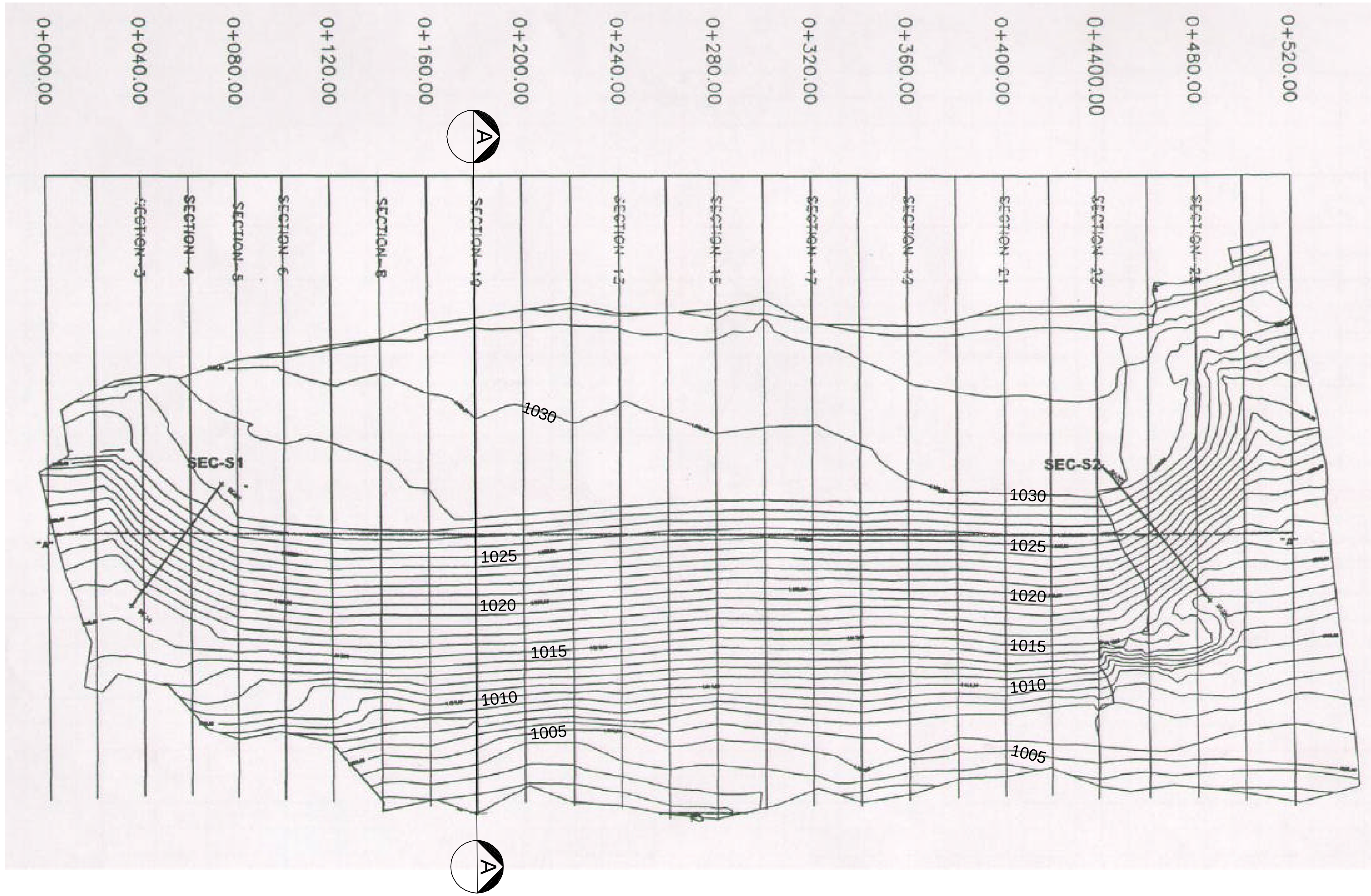


Figure 4
Cross-Section A-A Showing
Proposed Redistribution of Material and Final Cover

11552R26B.dwg

REFERENCE:

Draft survey plan provided by TECK COMINCO LTD.,
Contour Interval: 1 m



0 100
metres

Figure 5

Draft Plan Showing Contours on
August 2003 and before Final Placement of
600 mm Thick Cap of Limestone (Scheduled for 2004)

11552R27B.dwg

REFERENCE:
Draft cross–section drawing provided by TECK COMINCO LTD.,

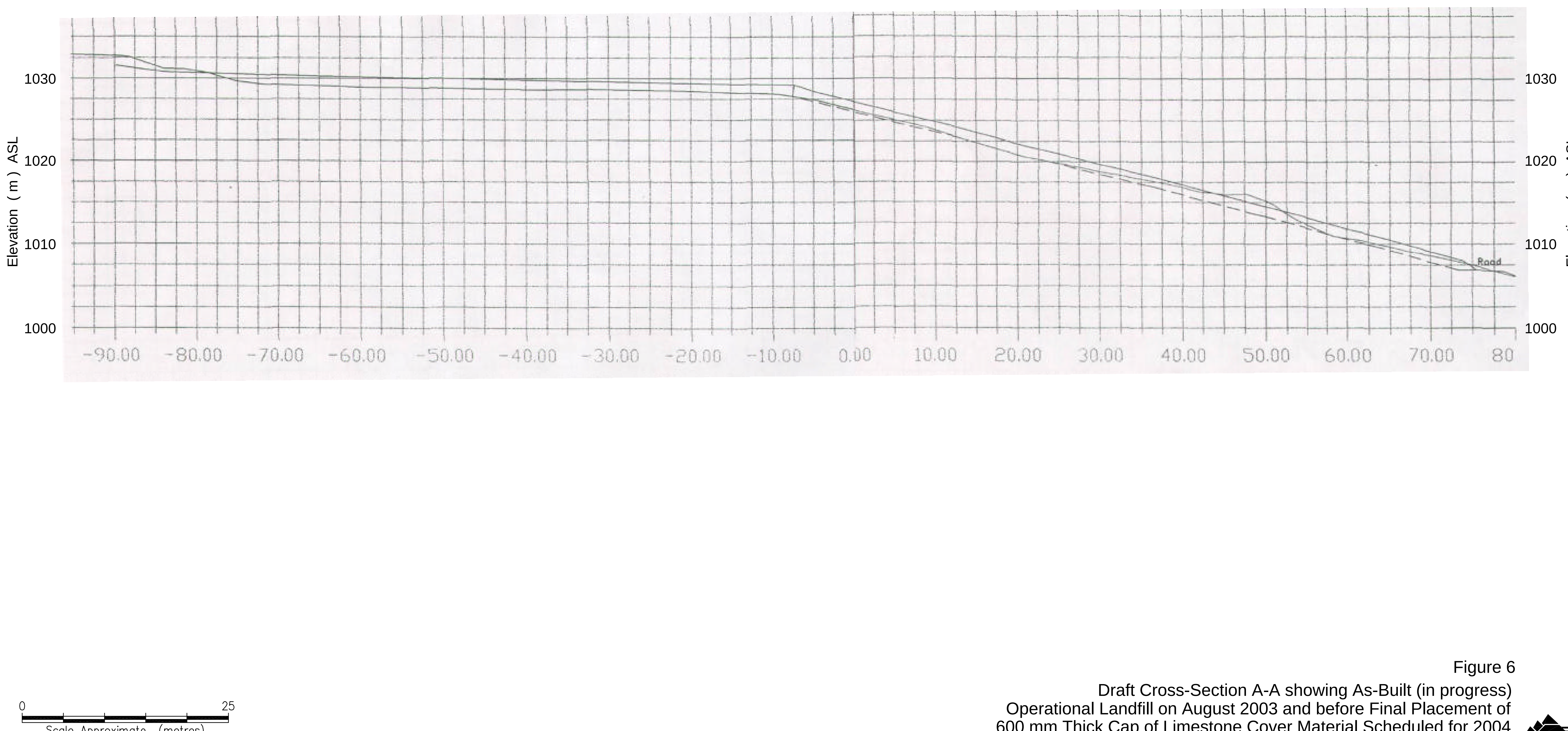


Figure 6
Draft Cross-Section A-A showing As-Built (in progress) Operational Landfill on August 2003 and before Final Placement of 600 mm Thick Cap of Limestone Cover Material Scheduled for 2004

11552R28B.dwg

APPENDIX A

This report incorporates and is subject to these "General Conditions".

1.0 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of EBA's client. EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

3.0 LOGS OF TEST HOLES

The test hole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

4.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

5.0 SURFACE WATER AND GROUNDWATER CONDITIONS

Surface and groundwater conditions mentioned in this report are those observed at the times recorded in the report. These conditions vary with geological detail between observation sites; annual, seasonal and special meteorologic conditions; and with development activity. Interpretation of water conditions from observations and records is judgmental and constitutes an evaluation of circumstances as influenced by geology, meteorology and development activity. Deviations from these observations may occur during the course of development activities.

6.0 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

7.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

8.0 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

9.0 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

10.0 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

11.0 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

12.0 SAMPLES

EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the client's expense upon written request, otherwise samples will be discarded.

13.0 STANDARD OF CARE

Services performed by EBA for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practising under similar conditions in the jurisdiction in which the services are provided. Engineering judgement has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

14.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

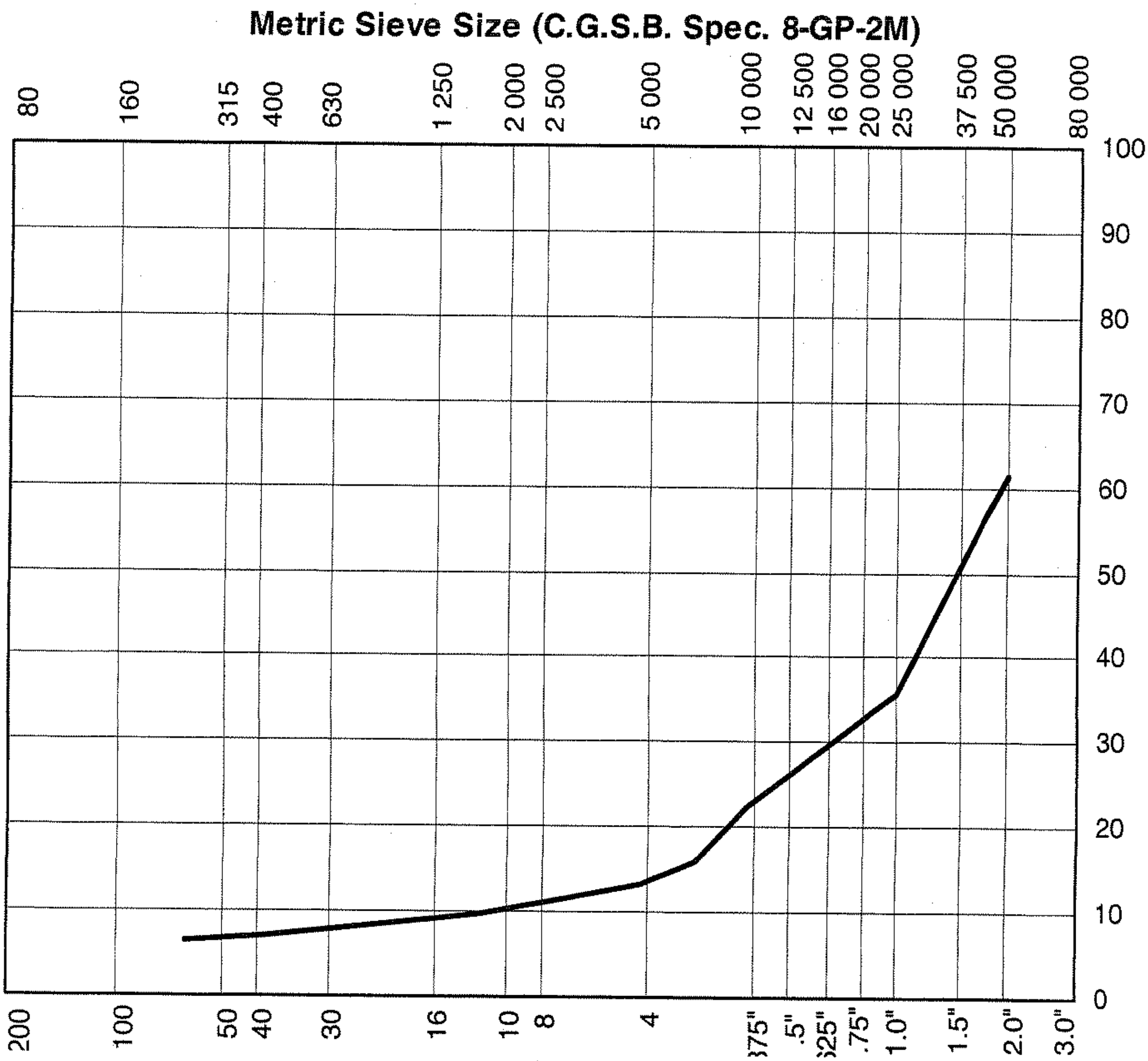
15.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by EBA shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancies, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by EBA shall be deemed to be the overall original for the Project.

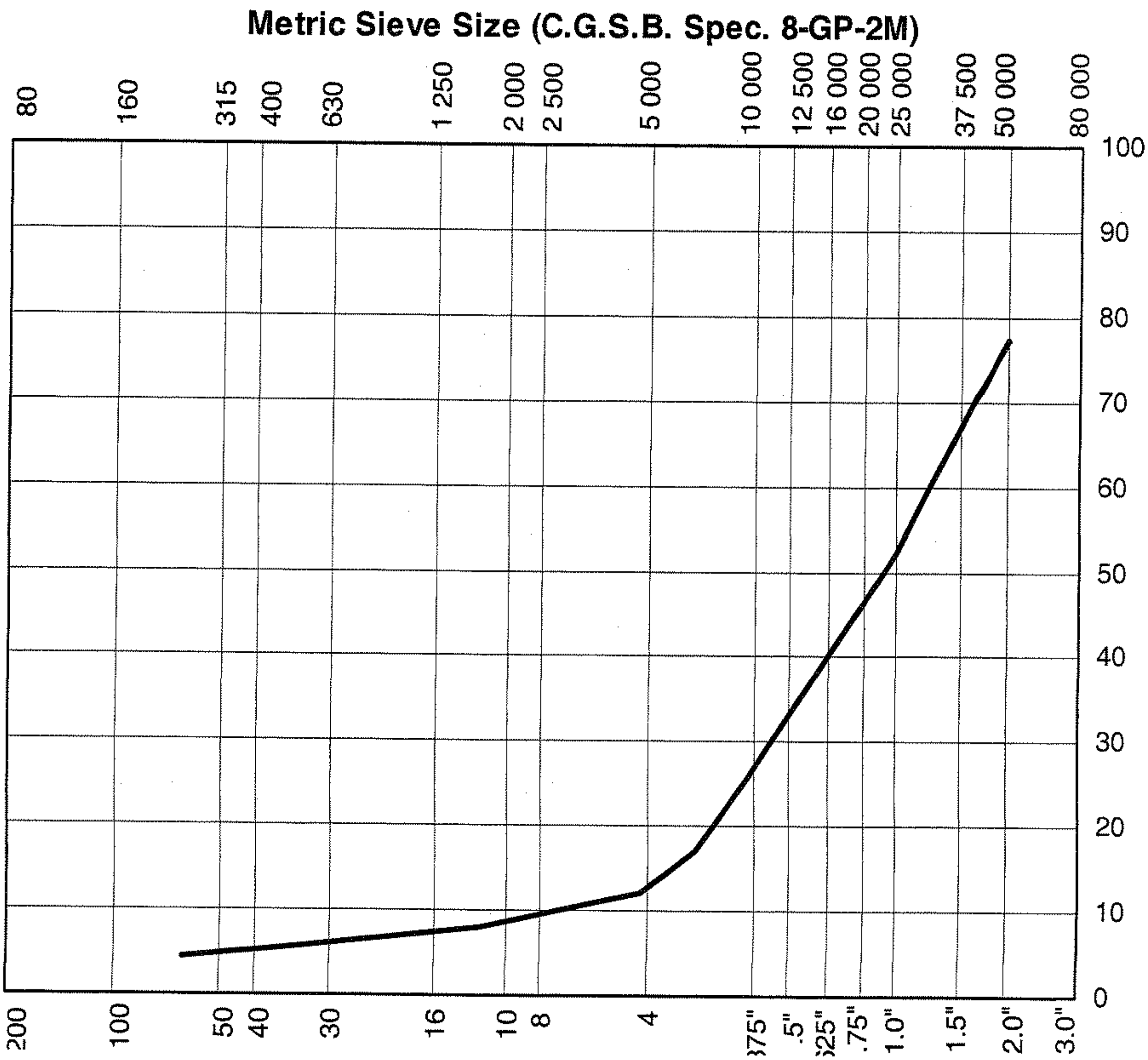
The Client agrees that both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA's instruments of professional service will be used only and exactly as submitted by EBA.

The Client recognizes and agrees that electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

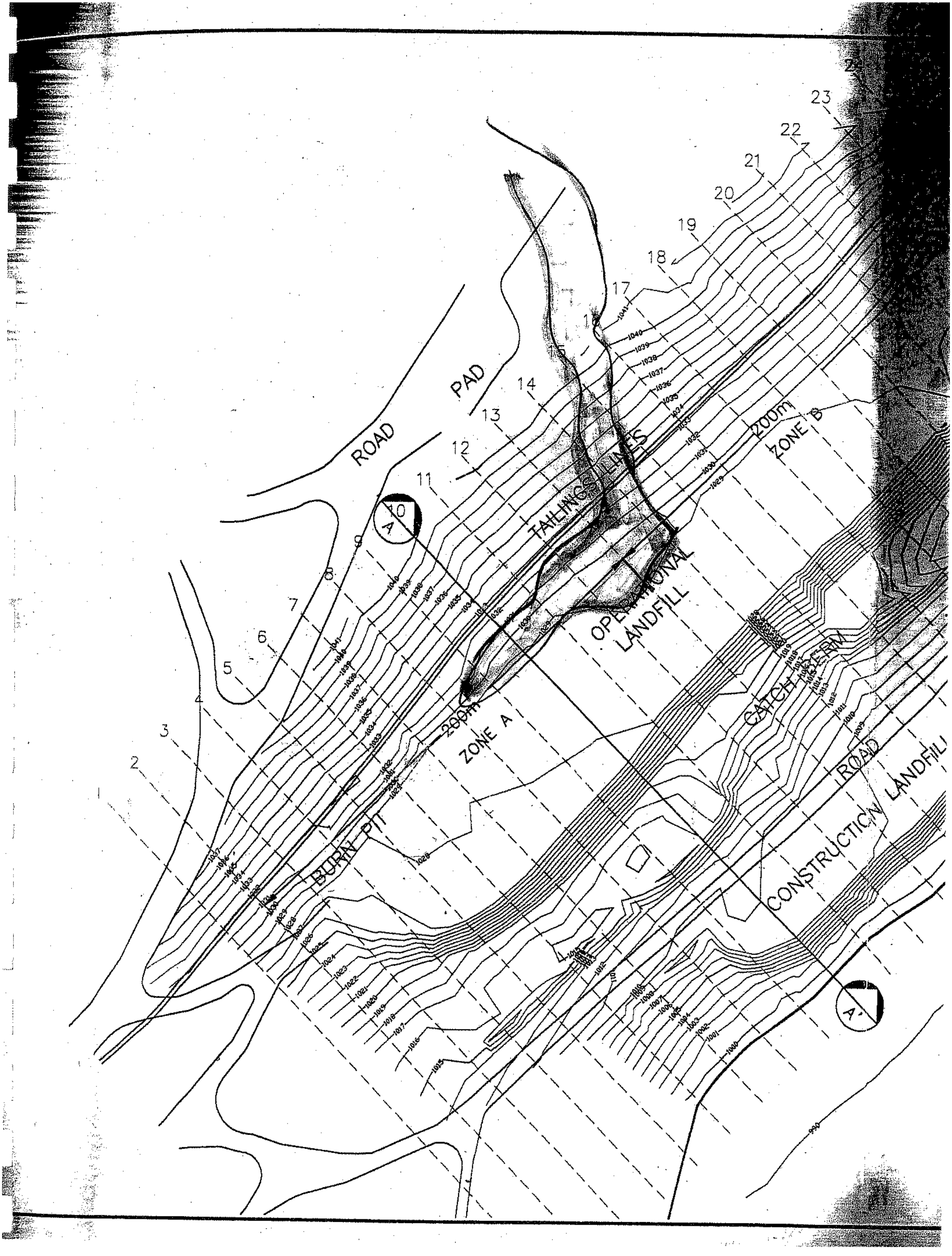
APPENDIX B



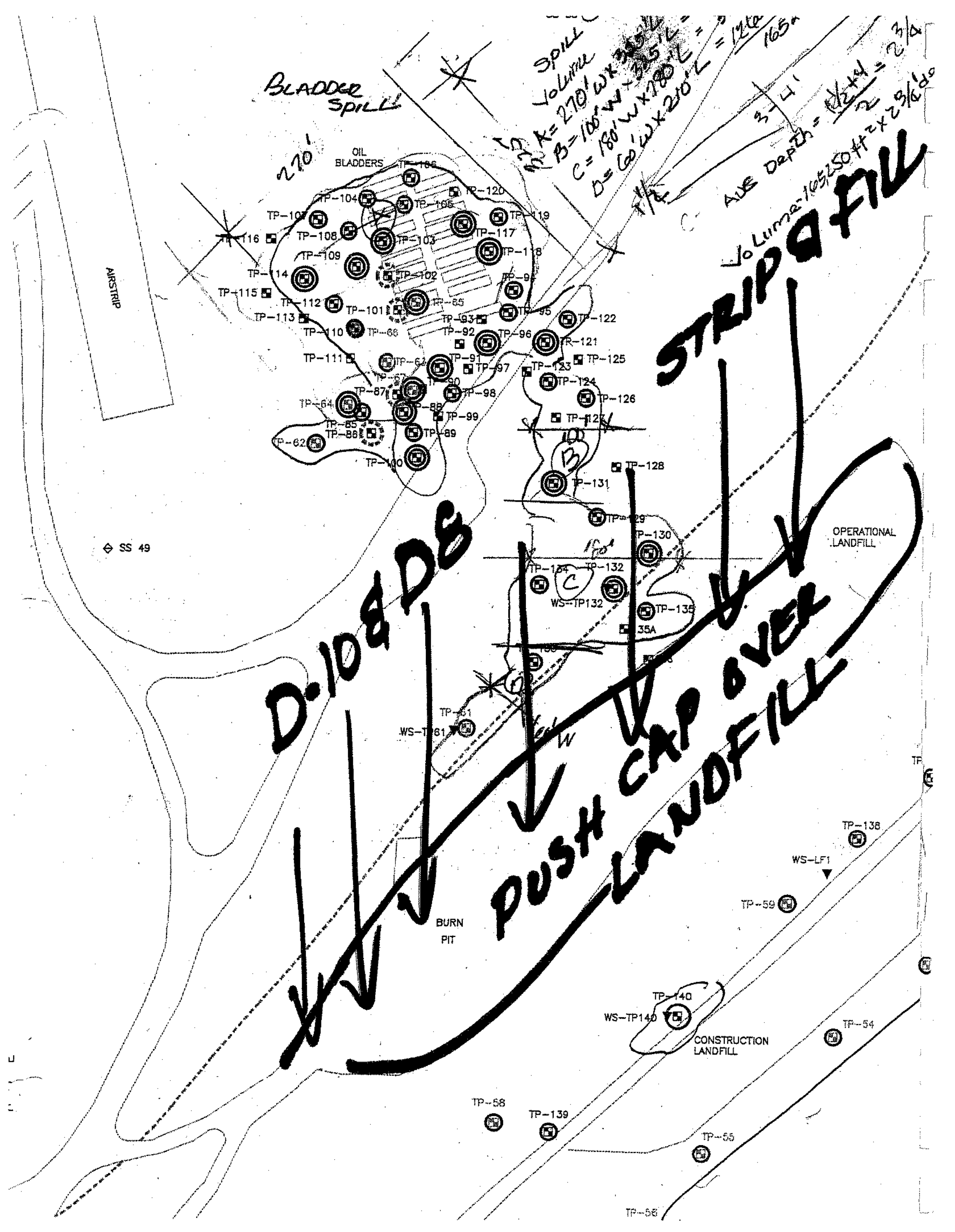
Plotted August 18th Results of Sieve Analysis by TC for 200 mm minus Material– Only 80 mm minus portion plotted



Plotted July 28th Results of Sieve Analysis by TC for 150 mm minus Material– Only 80 mm minus portion plotted



ROAD PAD
TAILINGS LINES
OPERATIONAL LANDFILL
200m
ZONE B
ZONE A
200m
BURN PIT
CATCH BERM
ROAD
CONSTRUCTION LANDFILL
A
10
A'



BLADDER SPILL
SPILL VOLUME
A = 270' W x 385' L =
B = 100' W x 385' L =
C = 180' W x 180' L =
D = 60' W x 210' L = 12,6
165
3' - 4'
AVE Depth = (3+4)/2 = 3/4
Volume = 105250 ft² x 23/6 d
270'
OIL BLADDERS
AIRSTRIP
SS 49
STRIP & FILL
D-10 & D8
PUSH CAP OVER LANDFILL
OPERATIONAL LANDFILL
BURN PIT
CONSTRUCTION LANDFILL
B
C
100'
160'
TP-106
TP-120
TP-104
TP-105
TP-107
TP-119
TP-116
TP-108
TP-103
TP-117
TP-109
TP-118
TP-114
TP-102
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TP-86
TP-89
TP-62
TP-100
TP-128
TP-131
TP-129
TP-130
TP-134
TP-132
WS-TP132
TP-135
35A
TP-61
WS-TP61
TP-138
WS-LF1
TP-59
TP-140
WS-TP140
TP-54
TP-58
TP-139
TP-55
TP-56

TEMPERATURES IN DEGREES C

	Bead # 1	Bead # 2	Bead # 3	Bead # 4	Bead # 5	Bead # 6	Bead # 7	Bead # 8	Bead # 9	Bead # 10
Installation Depth Below Collar (M)	-0.5	-1.0	-1.5	-2.0	-3.0	-4.0	-4.5	-5.0	-5.5	-6.0
Calibration Factors	-0.01	0.12	-0.02	-0.02	-0.18	-0.03	-0.01	-0.1	-0.03	-0.07

Temperatures

20-Mar-99	-22.9	-23.9	-24.0	-23.7	-21.7	-17.0	-15.9	-15.0	-14.2	-13.5
22-Mar-99	-22.7	-23.3	-23.5	-23.3	-21.6	-17.1	-16.0	-15.2	-14.3	-13.6
23-Mar-99	-22.5	-23.2	-23.3	-23.1	-21.5	-17.2	-16.0	-15.2	-14.4	-13.6
24-Mar-99	-22.4	-23.0	-23.2	-22.9	-21.4	-17.2	-16.1	-15.3	-14.4	-13.7
25-Mar-99	-22.4	-22.9	-23.0	-22.8	-21.4	-17.2	-16.2	-15.4	-14.5	-13.8
26-Mar-99	-23.1	-22.8	-22.9	-22.6	-21.3	-17.3	-16.2	-15.4	-14.5	-13.8
27-Mar-99	-23.7	-23.0	-22.8	-22.5	-21.2	-17.3	-16.3	-15.5	-14.6	-13.9
29-Mar-99	-24.7	-23.4	-22.8	-22.4	-21.0	-17.4	-16.4	-15.6	-14.7	-14.0
30-Mar-99	-25.9	-23.9	-23.0	-22.3	-21.0	-17.4	-16.4	-15.6	-14.7	-14.0
6-Apr-99	-24.1	-24.1	-23.5	-22.7	-20.9	-17.5	-16.6	-15.9	-15.0	-14.3
13-Apr-99	-22.7	-22.8	-22.6	-22.2	-20.8	-17.6	-16.8	-16.0	-15.3	-14.5
20-Apr-99	-19.9	-20.6	-21.2	-21.3	-20.6	-17.7	-16.9	-16.2	-15.5	-14.7
26-Apr-99	-18.4	-19.8	-20.5	-20.6	-20.0	-17.7	-17.0	-16.4	-15.6	-14.9
4-May-99	-16.2	-18.0	-19.0	-19.5	-19.4	-17.6	-17.0	-16.4	-15.7	-15.1
11-May-99	-14.1	-16.2	-17.4	-18.2	-18.7	-17.4	-16.9	-16.4	-15.8	-15.2
18-May-99	-9.6	-12.8	-15.0	-16.5	-17.7	-17.2	-16.8	-16.4	-15.8	-15.3
25-May-99	-6.7	-10.1	-12.6	-14.5	-16.5	-16.8	-16.6	-16.3	-15.8	-15.3
1-Jun-99	-5.0	-8.4	-10.7	-12.7	-15.1	-16.3	-16.2	-16.0	-15.7	-15.3
8-Jun-99	-0.5	-2.9	-7.0	-10.2	-13.6	-15.7	-15.8	-15.8	-15.5	-15.2
15-Jun-99	-0.7	-2.7	-5.6	-8.3	-12.0	-15.0	-15.3	-15.4	-15.3	-15.1
22-Jun-99	0.2	-1.8	-4.5	-7.1	-10.7	-14.2	-14.7	-14.9	-15.0	-14.9
29-Jun-99	1.3	-1.3	-3.5	-5.9	-9.4	-13.2	-14.0	-14.3	-14.5	-14.6
5-Jul-99	4.3	-0.5	-2.3	-4.7	-8.8	-12.8	-13.5	-13.9	-14.2	-14.4
13-Jul-99	3.9	2.9	-1.6	-4.3	-8.0	-12.2	-13.0	-13.5	-13.8	-14.1
20-Jul-99	3.3	1.3	-1.3	-3.8	-7.4	-11.6	-12.5	-13.0	-13.4	-13.8
27-Jul-99	3.9	1.7	-1.1	-3.4	-6.8	-11.1	-12.0	-12.5	-13.1	-13.4
3-Aug-99	4.8	2.0	-0.8	-3.0	-6.4	-10.6	-11.5	-12.1	-12.7	-13.2
10-Aug-99	4.8	2.4	-0.8	-2.8	-6.0	-10.3	-11.1	-11.8	-12.3	-12.8
17-Aug-99	3.9	2.0	-0.7	-2.6	-5.7	-9.9	-10.7	-11.4	-12.0	-12.5
24-Aug-99	1.4	0.7	-0.7	-2.5	-5.4	-9.6	-10.4	-11.1	-11.7	-12.3
31-Aug-99	0.0	0.1	-0.7	-2.4	-5.2	-9.3	-10.2	-10.8	-11.4	-12.0
7-Sep-99	-0.2	-0.1	-0.2	-1.5	-4.3	-8.2	-9.5	-10.2	-10.8	-11.5
14-Sep-99	-0.4	-0.1	-0.3	-1.6	-4.1	-8.0	-9.3	-10.0	-10.6	-11.2
22-Sep-99	-1.3	-0.4	-0.4	-1.6	-4.0	-7.8	-9.1	-9.7	-10.4	-11.1
28-Sep-99	-1.0	-0.5	-0.5	-1.6	-3.9	-7.6	-8.8	-9.5	-10.2	-10.9
5-Oct-99	-5.9	-3.0	-1.4	-1.8	-3.9	-7.4	-8.6	-9.3	-10.0	-10.7
12-Oct-99	-8.1	-5.4	-3.7	-2.8	-3.9	-7.3	-8.5	-9.1	-9.8	-10.5
19-Oct-99	-12.9	-9.4	-6.3	-4.5	-4.3	-7.2	-8.3	-9.0	-9.6	-10.3
26-Oct-99	-14.3	-11.3	-8.4	-6.4	-5.2	-7.2	-8.2	-8.8	-9.5	-10.1
2-Nov-99	-15.8	-13.7	-10.8	-8.3	-6.3	-7.3	-8.2	-8.7	-9.3	-10.0
9-Nov-99	-21.1	-16.7	-12.7	-10.0	-7.6	-7.6	-8.2	-8.7	-9.3	-9.9
16-Nov-99	-20.7	-17.0	-13.7	-11.5	-9.0	-8.1	-8.4	-8.8	-9.3	-9.8
23-Nov-99	-18.6	-17.8	-15.7	-13.3	-10.3	-8.7	-8.8	-9.0	-9.4	-9.8
30-Nov-99	-19.3	-16.7	-15.1	-13.6	-11.4	-9.4	-9.2	-9.3	-9.5	-9.9
7-Dec-99	-24.9	-21.4	-17.8	-15.2	-12.3	-10.0	-9.6	-9.6	-9.8	-10.0
13-Dec-99	-26.8	-23.8	-20.3	-17.3	-13.6	-10.6	-10.1	-10.0	-10.0	-10.2
22-May-00	-12.3	-14.1	-15.7	-16.9	-18.2	-18.1	-17.8	-17.4	-16.9	-16.4
29-May-00	-10.3	-13.2	-14.7	-15.9	-17.2	-17.6	-17.4	-17.2	-16.8	-16.4
6-Jun-00	-0.3	-0.1	-1.0	-2.3	-10.8	-12.2	-13.0	-15.6	-16.6	-16.2
16-Jun-00	1.0	-2.0	-5.7	-9.6	-13.9	-16.2	-16.4	-16.4	-16.2	-16.0
26-Jun-00	5.3	1.2	-1.8	-5.6	-10.9	-14.8	-15.5	-15.8	-15.8	-15.7
4-Jul-00	2.1	0.7	-1.3	-4.4	-9.3	-13.7	-14.7	-15.1	-15.3	-15.4
11-Jul-00	2.8	1.0	-1.2	-3.9	-8.2	-12.8	-14.0	-14.5	-14.8	-15.0
18-Jul-00	2.5	1.2	-1.1	-3.5	-7.5	-12.1	-13.3	-13.9	-14.3	-14.6
19-Sep-00	-3.9	-0.4	-1.0	-2.1	-4.6	-8.4	-9.6	-10.3	-11.0	-11.6
26-Sep-00	-6.3	-3.7	-2.4	-2.6	-4.5	-8.2	-9.4	-10.1	-10.8	-11.4
10-Oct-00	-9.9	-7.4	-5.6	-4.9	-5.2	-7.9	-9.0	-9.7	-10.3	-10.9
10-Nov-00	-18.7	-16.8	-14.2	-12.0	-9.5	-8.8	-9.2	-9.5	-9.9	-10.4
27-Apr-01	-19.8	-21.5	-23.0	-23.7	-23.5	-21.0	-19.8	-19.1	-18.2	-17.3
22-May-01	-9.9	-12.8	-15.5	-17.6	-19.7	-19.6	-19.1	-18.7	-18.2	-17.5
18-Jun-01	1.9	-0.7	-3.9	-7.3	-12.1	-16.0	-16.8	-17.0	-17.0	-16.9
19-Jul-01	8.5	2.4	-1.1	-3.4	-7.3	-12.0	-13.4	-14.1	-14.6	-15.0
21-Aug-01	0.0	0.0	-0.1	-2.0	-5.3	-9.8	-11.2	-11.9	-12.6	-13.2
21-Aug-01	0.0	0.0	-0.1	-2.0	-5.3	-9.8	-11.2	-11.9	-12.6	-13.2
16-Nov-02	-14.3	-13.3	-11.4	-9.7	-8.1	-8.5	-9.1	-9.5	-10.0	-10.6
18-Dec-02	-18.6	-17.6	-16.8	-15.8	-13.7	-11.0	-10.6	-10.5	-10.5	-10.7
10-Feb-03	-27.6	-25.3	-23.4	-21.6	-18.6	-14.8	-13.8	-13.3	-12.9	-12.5
11-Mar-03	-28.3	-26.2	-24.9	-23.8	-21.4	-17.0	-15.7	-15.0	-14.3	-13.8
17-Apr-03	-24.7	-24.5	-24.0	-23.3	-21.9	-18.6	-17.4	-16.7	-16.0	-15.2
15-May-03	-15.2	-17.1	-18.1	-18.8	-19.4	-18.3	-17.6	-17.1	-16.6	-15.9
17-Jun-03	-24.7	-24.5	-24.0	-23.3	-21.9	-18.6	-17.4	-16.7	-16.0	-15.2

TEMPERATURES IN DEGREES C

	Bead # 1	Bead # 2	Bead # 3	Bead # 4	Bead # 5	Bead # 6	Bead # 7	Bead # 8	Bead # 9	Bead # 10
Installation Depth Below Collar (M)	-0.5	-1.0	-1.5	-2.0	-2.5	-3.0	-3.5	-4.0	-4.5	-5.0
Calibration Factors	-0.02	-0.04	-0.08	-0.06	-0.03	0.04	-0.03	-0.14	-0.12	-0.01

Temperatures

20-Mar-99	-24.2	-24.8	-24.9	-24.5	-23.8	-22.7	-21.5	-20.0	-18.6	-17.4
22-Mar-99	-24.0	-24.2	-24.5	-24.2	-23.5	-22.5	-21.5	-20.1	-18.7	-17.5
23-Mar-99	-23.7	-24.2	-24.3	-24.0	-23.4	-22.5	-21.4	-20.1	-18.8	-17.6
24-Mar-99	-23.5	-24.0	-24.1	-23.9	-23.3	-22.4	-21.4	-20.1	-18.8	-17.6
25-Mar-99	-23.5	-23.8	-23.9	-23.7	-23.1	-22.3	-21.3	-20.1	-18.8	-17.6
26-Mar-99	-24.0	-23.8	-23.8	-23.6	-23.0	-22.2	-21.3	-20.1	-18.9	-17.7
27-Mar-99	-24.3	-24.0	-23.7	-23.5	-22.9	-22.2	-21.3	-20.1	-18.9	-17.7
29-Mar-99	-25.2	-24.4	-23.8	-23.3	-22.8	-22.0	-21.2	-20.1	-18.9	-17.8
30-Mar-99	-26.1	-25.0	-23.9	-23.3	-22.7	-21.9	-21.2	-20.0	-18.9	-17.8
6-Apr-99	-24.7	-24.8	-24.3	-23.6	-22.8	-21.9	-21.0	-20.0	-19.0	-18.0
13-Apr-99	-23.5	-23.6	-23.4	-23.0	-22.5	-21.8	-21.0	-20.0	-19.0	-18.1
20-Apr-99	-20.9	-21.5	-22.0	-22.2	-21.9	-21.4	-20.8	-20.0	-19.1	-18.2
26-Apr-99	-19.9	-20.7	-21.4	-21.5	-21.3	-20.9	-20.5	-19.8	-19.0	-18.3
4-May-99	-18.1	-19.3	-20.1	-20.4	-20.5	-20.4	-20.1	-19.6	-18.9	-18.2
11-May-99	-16.1	-17.6	-18.8	-19.4	-19.7	-19.7	-19.5	-19.2	-18.7	-18.2
18-May-99	-12.5	-14.6	-16.6	-17.8	-18.5	-18.8	-18.9	-18.8	-18.5	-18.0
25-May-99	-10.2	-12.3	-14.5	-15.9	-17.0	-17.7	-18.1	-18.2	-18.1	-17.8
1-Jun-99	-7.6	-10.4	-12.7	-14.3	-15.6	-16.5	-17.1	-17.5	-17.5	-17.4
8-Jun-99	-3.3	-6.2	-9.6	-11.9	-13.8	-15.2	-16.0	-16.7	-16.9	-17.0
15-Jun-99	-1.4	-4.1	-7.4	-9.8	-11.9	-13.6	-14.7	-15.7	-16.2	-16.5
22-Jun-99	-0.4	-2.1	-5.0	-7.7	-10.2	-12.1	-13.4	-14.7	-15.5	-15.9
29-Jun-99	1.6	-1.0	-3.6	-6.1	-8.4	-10.4	-11.9	-13.3	-14.4	-15.1
5-Jul-99	4.2	0.0	-2.7	-5.3	-7.6	-9.6	-11.2	-12.7	-13.8	-14.6
13-Jul-99	3.9	1.1	-1.9	-4.4	-6.7	-8.7	-10.3	-11.9	-13.1	-13.9
20-Jul-99	3.1	1.0	-1.5	-3.8	-6.0	-7.9	-9.5	-11.1	-12.4	-13.3
27-Jul-99	4.0	1.2	-1.3	-3.4	-5.4	-7.3	-8.8	-10.4	-11.7	-12.7
3-Aug-99	4.3	1.6	-1.1	-3.1	-5.0	-6.8	-8.3	-9.9	-11.1	-12.1
10-Aug-99	4.2	1.7	-1.0	-2.8	-4.7	-6.4	-7.8	-9.4	-10.6	-11.7
17-Aug-99	3.3	1.7	-0.8	-2.6	-4.4	-6.0	-7.4	-8.9	-10.2	-11.2
24-Aug-99	1.0	0.5	-0.7	-2.4	-4.2	-5.7	-7.1	-8.6	-9.8	-10.8
31-Aug-99	0.0	0.0	-0.9	-2.4	-4.0	-5.5	-6.7	-8.2	-9.4	-10.4
7-Sep-99	-0.1	-0.2	-1.0	-2.4	-3.9	-5.3	-6.5	-7.9	-9.1	-10.1
14-Sep-99	-0.2	-0.3	-1.2	-2.3	-3.7	-5.1	-6.3	-7.6	-8.8	-9.8
21-Sep-99	-0.8	-0.5	-1.4	-2.5	-3.7	-5.0	-6.1	-7.4	-8.6	-9.5
28-Sep-99	-1.1	-1.2	-1.8	-2.6	-3.7	-4.9	-6.0	-7.2	-8.3	-9.3
5-Oct-99	-4.7	-3.2	-2.7	-3.0	-3.9	-4.9	-5.9	-7.1	-8.1	-9.1
12-Oct-99	-6.8	-5.2	-4.3	-4.0	-4.3	-5.0	-5.8	-6.9	-7.9	-8.8
19-Oct-99	-11.7	-9.0	-6.7	-5.6	-5.2	-5.4	-6.1	-7.0	-7.9	-8.7
26-Oct-99	-13.9	-11.3	-9.0	-7.6	-6.7	-6.4	-6.6	-7.2	-7.9	-8.6
2-Nov-99	-15.9	-14.0	-11.5	-9.7	-8.3	-7.6	-7.5	-7.7	-8.1	-8.7
9-Nov-99	-19.7	-16.3	-13.2	-11.3	-9.9	-8.9	-8.5	-8.3	-8.5	-8.9
16-Nov-99	-20.3	-17.0	-14.3	-12.7	-11.3	-10.2	-9.6	-9.1	-9.0	-9.2
23-Nov-99	-19.1	-18.1	-16.1	-14.4	-12.7	-11.4	-10.6	-9.9	-9.6	-9.6
30-Nov-99	-18.7	-17.0	-15.6	-14.6	-13.4	-12.3	-11.5	-10.8	-10.3	-10.1
7-Dec-99	-24.2	-21.2	-18.1	-16.0	-14.4	-13.1	-12.2	-11.4	-10.8	-9.9
13-Dec-99	-26.6	-23.8	-20.7	-18.3	-16.1	-14.4	-13.2	-12.1	-11.4	-11.0
22-May-00	-11.9	-13.3	-15.0	-16.3	-17.3	-18.1	-18.5	-18.8	-18.9	-18.6
29-May-00	-11.0	-12.7	-14.2	-15.3	-16.3	-17.1	-17.7	-18.1	-18.3	-18.2
6-Jun-00	-7.2	-10.0	-12.3	-13.9	-15.2	-16.2	-16.8	-17.4	-17.6	-17.7
16-Jun-00	0.0	-2.3	-6.7	-10.2	-12.6	-14.3	-15.4	-16.3	-16.8	-17.1
26-Jun-00	2.4	-1.0	-4.3	-7.1	-9.7	-11.9	-13.3	-14.8	-15.7	-16.2
4-Jul-00	1.4	-0.4	-3.2	-5.8	-8.2	-10.3	-11.9	-13.6	-14.7	-15.4
11-Jul-00	1.7	-0.2	-2.8	-5.0	-7.3	-9.3	-10.9	-12.6	-13.9	-14.7
18-Jul-00	1.8	-0.2	-2.4	-4.5	-6.6	-8.6	-10.1	-11.8	-13.0	-14.1
19-Sep-00	-3.8	-2.4	-2.5	-3.2	-4.3	-5.4	-6.5	-7.9	-9.0	-10.0
26-Sep-00	-5.7	-4.1	-3.7	-3.9	-4.6	-5.6	-6.5	-7.8	-8.9	-9.8
10-Oct-00	-9.5	-7.7	-6.6	-6.1	-6.1	-6.4	-7.0	-7.8	-8.7	-9.5
10-Nov-00	-18.6	-16.8	-14.7	-13.0	-11.6	-10.6	-10.1	-9.8	-9.8	-10.0
27-Apr-01	-20.5	-22.2	-23.3	-23.9	-23.9	-23.6	-23.1	-22.3	-21.3	-20.4
22-May-01	-15.1	-17.4	-18.9	-20.0	-20.6	-21.0	-21.0	-20.8	-20.5	-20.0
18-Jun-01	-0.3	-3.2	-6.6	-9.4	-12.1	-14.2	-15.6	-17.0	-17.7	-18.2
19-Jul-01	4.3	-0.1	-2.4	-4.7	-7.0	-9.0	-10.5	-12.3	-13.6	-14.7
21-Aug-01	-0.1	-0.1	-1.3	-3.0	-4.9	-6.5	-8.0	-9.6	-11.0	-12.1
14-Sep-02	-0.1	-0.4	-1.6	-3.0	-4.5	-5.9	-7.2	-8.6	-9.8	-10.9
23-Oct-02	-6.9	-6.9	-6.8	-6.8	-6.8	-7.0	-7.5	-8.1	-8.9	-9.6
16-Nov-02	-14.8	-13.1	-11.7	-10.5	-9.6	-9.2	-9.1	-9.2	-9.5	-9.9
18-Dec-02	-18.4	-17.7	-17.0	-16.1	-15.1	-14.0	-13.1	-12.3	-11.7	-11.4
10-Feb-03	-27.0	-25.2	-23.5	-21.9	-20.2	-18.8	-17.7	-16.4	-15.4	-14.6
11-Mar-03	-28.0	-26.4	-25.3	-24.2	-22.9	-21.6	-20.3	-18.9	-17.6	-16.5
17-Apr-03	-24.9	-24.9	-24.4	-23.7	-15.8	-22.2	-21.4	-20.4	-19.3	-18.4
15-May-03	-16.0	-17.3	-18.1	-18.9	-19.4	-19.7	-19.7	-19.5	-19.1	-18.6
17-Jun-03	-1.5	-4.0	-6.6	-8.9	-11.0	-12.8	-14.0	-15.2	-16.1	-16.5

POLARIS MINE - OPERATIONAL LANDFILL - THERMISTOR STRING #3
TEMPERATURES IN DEGREES C

	Bead # 1	Bead # 2	Bead # 3	Bead # 4	Bead # 5	Bead # 6	Bead # 7	Bead # 8	Bead # 9	Bead # 10
Installation Depth Below	0.2	-0.3	-0.8	-1.3	-2.3	-3.3	-3.8	-4.3	-4.8	-5.3
Calibration Factors	0.05	-0.04	-0.02	-0.03	-0.02	-0.02	-0.36	-0.02	-0.13	-0.01

Temperatures

20-Mar-99	-17.7	-23.6	-24.8	-25.2	-24.4	-21.7	-20.2	-18.9	-17.6	-16.6
22-Mar-99	-16.9	-23.6	-24.2	-24.7	-24.0	-21.6	-20.2	-19.0	-17.8	-16.7
23-Mar-99	-17.1	-23.2	-24.2	-24.5	-23.8	-21.6	-20.2	-19.1	-17.8	-16.8
24-Mar-99	-18.6	-23.1	-23.9	-24.3	-23.7	-21.5	-20.2	-19.1	-17.8	-16.8
25-Mar-99	-20.5	-23.1	-23.7	-24.1	-23.5	-21.4	-20.2	-19.1	-17.9	-16.9
26-Mar-99	-20.8	-23.8	-23.7	-23.9	-23.4	-21.4	-20.2	-19.1	-17.9	-16.9
27-Mar-99	-23.9	-24.3	-23.9	-23.9	-23.3	-21.3	-20.2	-19.1	-18.0	-17.0
29-Mar-99	-29.2	-25.5	-24.5	-24.0	-23.1	-21.2	-20.1	-19.1	-18.0	-17.1
30-Mar-99	-24.5	-26.7	-25.1	-24.3	-23.0	-21.2	-20.1	-19.1	-18.0	-17.1
6-Apr-99	-15.4	-24.5	-24.8	-24.6	-23.2	-21.0	-20.0	-19.1	-18.1	-17.3
13-Apr-99	-16.8	-23.4	-23.6	-23.6	-22.7	-21.0	-20.0	-19.2	-18.2	-17.4
20-Apr-99	-14.8	-20.8	-21.6	-22.1	-22.1	-20.7	-19.8	-19.2	-18.3	-17.5
26-Apr-99	-14.4	-19.8	-21.0	-21.5	-21.4	-20.4	-19.6	-19.1	-18.3	-17.6
4-May-99	-11.3	-18.3	-19.6	-20.2	-20.6	-20.0	-19.4	-18.9	-18.3	-17.6
11-May-99	-5.2	-16.2	-18.0	-18.9	-19.7	-19.5	-19.0	-18.7	-18.2	-17.6
18-May-99	-4.0	-12.1	-14.7	-16.4	-18.3	-18.9	-18.5	-18.4	-18.0	-17.5
25-May-99	-2.6	-9.6	-12.2	-14.0	-16.6	-18.0	-17.9	-18.0	-17.7	-17.3
1-Jun-99	6.1	-5.9	-9.9	-12.0	-14.9	-16.9	-17.1	-17.4	-17.3	-17.1
8-Jun-99	6.1	-2.9	-6.0	-8.6	-12.8	-15.8	-16.3	-16.7	-16.8	-16.7
15-Jun-99	10.4	-1.1	-3.8	-6.2	-10.7	-14.4	-15.2	-15.9	-16.2	-16.3
22-Jun-99	3.5	-0.4	-2.6	-4.8	-9.2	-13.1	-14.1	-15.0	-15.6	-15.8
29-Jun-99	9.5	1.8	-1.2	-3.4	-7.6	-11.7	-12.8	-13.9	-14.6	-15.0
5-Jul-99	9.3	4.9	0.1	-2.5	-6.9	-11.0	-12.2	-13.3	-14.1	-14.6
13-Jul-99	8.9	4.2	1.0	-1.6	-5.9	-10.1	-11.4	-12.6	-13.5	-14.0
20-Jul-99	8.7	3.3	0.9	-1.3	-5.2	-9.4	-10.7	-11.9	-12.9	-13.4
27-Jul-99	11.2	4.5	1.2	-1.1	-4.7	-8.7	-10.0	-11.3	-12.3	-12.9
3-Aug-99	9.3	4.5	1.6	-0.8	-4.3	-8.2	-9.5	-10.7	-11.7	-12.4
10-Aug-99	10.2	4.5	1.8	-0.6	-4.0	-7.7	-9.0	-10.2	-11.2	-11.9
17-Aug-99	6.3	3.4	1.7	-0.4	-3.7	-7.3	-8.5	-9.8	-10.8	-11.5
24-Aug-99	1.4	1.0	0.5	-0.4	-3.5	-6.9	-8.2	-9.4	-10.4	-11.1
31-Aug-99	-0.3	0.0	-0.1	-0.6	-3.3	-6.6	-7.8	-9.0	-10.1	-10.7
7-Sep-99	-0.1	-0.2	-0.1	-0.7	-3.2	-6.4	-7.5	-8.7	-9.7	-10.4
14-Sep-99	-0.7	-0.4	-0.1	-0.8	-3.2	-6.2	-7.2	-8.4	-9.4	-10.2
21-Sep-99	-1.3	-1.5	-0.9	-1.0	-3.1	-6.0	-7.0	-8.2	-9.2	-9.9
28-Sep-99	-2.3	-1.4	-1.4	-1.7	-3.3	-5.9	-6.8	-8.0	-8.9	-9.6
5-Oct-99	-9.6	-5.8	-3.6	-2.9	-3.6	-5.8	-6.7	-7.8	-8.7	-9.4
12-Oct-99	-13.8	-7.6	-5.6	-4.8	-4.5	-5.9	-6.7	-7.7	-8.5	-9.2
19-Oct-99	-15.6	-13.0	-9.4	-7.4	-5.7	-6.3	-6.8	-7.6	-8.4	-9.0
26-Oct-99	-16.5	-14.8	-11.7	-9.9	-7.6	-7.0	-7.2	-7.8	-8.4	-9.0
2-Nov-99	-18.6	-16.6	-14.5	-12.5	-9.3	-7.9	-7.7	-8.1	-8.6	-9.0
9-Nov-99	-25.7	-21.1	-16.8	-14.2	-10.9	-8.9	-8.5	-8.6	-8.8	-9.1
16-Nov-99	-24.6	-21.4	-17.5	-15.2	-12.3	-10.0	-9.3	-9.2	-9.2	-9.4
23-Nov-99	-17.7	-19.6	-18.6	-17.1	-13.7	-11.0	-10.1	-9.8	-9.7	-9.7
30-Nov-99	-25.4	-19.3	-17.4	-16.4	-14.3	-11.8	-10.9	-10.4	-10.2	-10.1
7-Dec-99	-28.6	-25.6	-21.8	-19.1	-15.3	-12.5	-11.5	-11.1	-10.6	-10.5
13-Dec-99	-30.4	-27.4	-24.4	-21.9	-17.3	-13.5	-12.3	-11.7	-11.2	-10.9
22-May-00	-5.0	-11.8	-13.5	-14.9	-17.1	-18.4	-18.5	-18.6	-18.4	-18.2
29-May-00	2.3	-11.2	-12.9	-14.1	-16.1	-17.6	-17.8	-18.0	-18.0	-17.8
6-Jun-00	3.8	-7.0	-10.3	-12.3	-15.0	-16.8	-17.1	-17.4	-17.5	-17.4
16-Jun-00	15.4	5.9	-0.5	-4.8	-11.1	-15.2	-15.9	-16.5	-16.8	-16.9
26-Jun-00	14.4	3.3	-0.4	-3.0	-8.3	-12.9	-14.1	-15.2	-15.8	-16.2
4-Jul-00	7.2	1.7	-0.1	-2.3	-7.0	-11.6	-12.9	-14.1	-15.0	-15.4
11-Jul-00	7.6	2.5	-0.1	-2.0	-6.2	-10.6	-12.0	-13.3	-14.2	-14.8
18-Jul-00	4.6	2.2	0.0	-1.7	-5.7	-9.8	-11.2	-12.6	-13.5	-14.2
19-Sep-00	-6.3	-4.5	-2.8	-2.7	-4.0	-6.6	-7.6	-8.7	-9.7	-10.4
26-Sep-00	-10.4	-6.1	-4.3	-3.8	-4.5	-6.6	-7.5	-8.5	-9.5	-10.2
10-Oct-00	-9.3	-9.8	-7.5	-6.6	-6.2	-7.1	-7.6	-8.4	-9.2	-9.8
10-Nov-00	-19.2	-18.7	-16.5	-14.8	-11.9	-10.1	-9.6	-9.7	-9.8	-10.0
27-Apr-01	-17.6	-19.6	-21.6	-22.8	-23.5	-22.6	-21.8	-21.1	-20.2	-19.4
22-May-01	-1.2	-11.9	-14.6	-16.3	-18.9	-20.0	-19.8	-19.8	-19.5	-19.1
18-Jun-01	5.5	0.6	-1.9	-4.7	-10.0	-14.4	-15.6	-16.5	-17.1	-17.4
19-Jul-01	18.8	4.9	-0.3	-2.0	-5.9	-10.0	-11.3	-12.7	-13.8	-14.4
21-Aug-01	2.7	0.0	0.0	-1.0	-4.1	-7.7	-8.9	-10.2	-11.3	-12.1

DESTROYED

POLARIS MINE - OPERATIONAL LANDFILL - THERMISTOR STRING #4
TEMPERATURES IN DEGREES C

	Bead # 1	Bead # 2	Bead # 3	Bead # 4	Bead # 5	Bead # 6	Bead # 7	Bead # 8	Bead # 9	Bead # 10	Bead # 11	Bead # 12
Installation Depth Below Collar (M)	-0.5	-1.0	-1.5	-2.0	-2.5	-3.0	-4.0	-5.0	-5.5	-6.0	-6.5	-7.0
Calibration Factors	-0.06	-0.01	-0.04	-0.02	-0.01	0.03	-0.03	-0.04	-0.04	-0.15	-0.06	-0.09

Temperatures

20-Mar-99	-23.1	-23.8	-23.7	-23.3	-22.5	-21.2	-18.1	-15.3	-14.2	-13.3	-12.5	
22-Mar-99	-22.7	-23.2	-23.3	-22.9	-22.2	-21.1	-18.2	-15.4	-14.3	-13.4	-12.6	
23-Mar-99	-22.7	-23.1	-23.1	-22.7	-22.1	-21.0	-18.2	-15.5	-14.3	-13.5	-12.7	
24-Mar-99	-22.4	-22.9	-22.9	-22.6	-22.0	-20.9	-18.2	-15.5	-14.4	-13.5	-12.7	
25-Mar-99	-22.3	-22.7	-22.7	-22.4	-21.8	-20.8	-18.2	-15.6	-14.4	-13.6	-12.8	
26-Mar-99	-22.7	-22.6	-22.5	-22.3	-21.7	-20.7	-18.2	-15.6	-14.5	-13.6	-12.8	
27-Mar-99	-23.2	-22.6	-22.4	-22.2	-21.6	-20.6	-18.2	-15.6	-14.5	-13.7	-12.8	
29-Mar-99	-24.3	-23.0	-22.4	-22.0	-21.4	-20.5	-18.2	-15.7	-14.6	-13.7	-12.9	
30-Mar-99	-25.4	-23.4	-22.6	-21.9	-21.3	-20.4	-18.1	-15.7	-14.6	-13.8	-13.0	
6-Apr-99	-23.9	-23.6	-23.0	-22.3	-21.4	-20.3	-18.1	-15.8	-14.8	-14.0	-13.2	
13-Apr-99	-22.4	-22.3	-22.0	-21.7	-21.1	-20.2	-18.1	-15.9	-15.0	-14.2	-13.4	
20-Apr-99	-20.3	-20.8	-21.0	-20.9	-20.6	-19.8	-18.0	-16.0	-15.1	-14.4	-13.6	
26-Apr-99	-18.8	-20.0	-20.3	-20.2	-19.9	-19.3	-17.8	-16.0	-15.2	-14.5	-13.8	-13.2
4-May-99	-17.6	-18.7	-19.0	-19.2	-19.1	-18.8	-17.6	-16.0	-15.3	-14.6	-13.9	-13.3
11-May-99	-15.3	-17.0	-17.7	-18.1	-18.3	-18.1	-17.3	-15.9	-15.2	-14.6	-14.0	-13.5
18-May-99	-10.5	-13.7	-15.3	-16.4	-17.0	-17.2	-16.9	-15.7	-15.2	-14.6	-14.1	-13.6
25-May-99	-8.0	-11.2	-13.0	-14.4	-15.4	-16.0	-16.2	-15.5	-15.1	-14.6	-14.1	-13.6
1-Jun-99	-6.2	-9.5	-11.2	-12.7	-13.8	-14.7	-15.5	-15.2	-14.8	-14.5	-14.0	-13.6
8-Jun-99	-1.9	-4.7	-7.7	-10.1	-11.9	-13.3	-14.6	-14.7	-14.5	-14.2	-13.9	-13.6
15-Jun-99	-1.3	-3.5	-5.9	-8.1	-9.9	-11.5	-13.6	-14.2	-14.2	-14.0	-13.7	-13.5
22-Jun-99	-0.4	-2.5	-4.7	-6.7	-8.4	-10.1	-12.4	-13.6	-13.7	-13.7	-13.5	-13.3
29-Jun-99	0.3	-1.8	-3.7	-5.5	-7.1	-8.7	-11.1	-12.6	-13.0	-13.1	-13.2	-13.1
5-Jul-99	2.1	-1.4	-3.2	-4.9	-6.5	-8.0	-10.6	-12.2	-12.6	-12.8	-13.0	-12.9
13-Jul-99	3.1	-0.8	-2.6	-4.3	-5.8	-7.3	-9.9	-11.5	-12.1	-12.4	-12.6	-12.7
20-Jul-99	2.4	-0.6	-2.2	-3.7	-5.2	-6.7	-9.2	-11.0	-11.6	-11.9	-12.2	-12.4
27-Jul-99	3.1	-0.4	-1.9	-3.3	-4.7	-6.1	-8.6	-10.4	-11.0	-11.4	-11.8	-12.0
3-Aug-99	3.5	-0.2	-1.7	-3.0	-4.3	-5.7	-8.1	-10.0	-10.6	-11.1	-11.5	-11.7
10-Aug-99	3.6	0.0	-1.5	-2.8	-4.0	-5.3	-7.7	-9.6	-10.2	-10.7	-11.2	-11.5
17-Aug-99	3.2	0.2	-1.3	-2.5	-3.7	-5.0	-7.3	-9.2	-9.9	-10.4	-10.9	-11.1
24-Aug-99	1.1	0.0	-1.2	-2.3	-3.4	-4.7	-7.0	-8.8	-9.5	-10.1	-10.5	-10.9
7-Sep-99	0.0	-0.3	-0.1	-0.6	-1.5	-2.4	-4.6	-6.6	-7.5	-8.4	-9.1	-9.6
14-Sep-99	-0.6	-0.6	-0.2	-0.9	-1.6	-2.4	-4.4	-6.3	-7.3	-8.1	-8.8	-9.3
21-Sep-99	-1.3	-1.8	-1.5	-1.4	-1.9	-2.5	-4.3	-6.1	-7.0	-7.9	-8.6	-9.1
28-Sep-99	-2.4	-1.6	-1.7	-2.0	-2.3	-2.8	-4.3	-5.9	-6.8	-7.6	-8.3	-8.8
5-Oct-99	-10.1	-6.9	-4.3	-3.1	-3.0	-3.1	-4.3	-5.8	-6.7	-7.4	-8.1	-8.7
12-Oct-99	-14.6	-8.7	-6.2	-4.8	-4.2	-4.0	-4.5	-5.8	-6.6	-7.3	-7.9	-8.4
19-Oct-99	-15.7	-14.1	-10.2	-7.0	-5.7	-5.0	-4.9	-5.8	-6.4	-7.1	-7.7	-8.2
26-Oct-99	-16.5	-15.6	-12.1	-9.1	-7.6	-6.6	-5.7	-6.0	-6.6	-7.1	-7.7	-8.1
2-Nov-99	-18.9	-16.9	-14.6	-11.4	-9.5	-8.1	-6.5	-6.4	-6.7	-7.2	-7.7	-8.1
9-Nov-99	-25.9	-22.1	-16.9	-12.7	-10.8	-9.4	-7.5	-6.9	-7.0	-7.4	-7.7	-8.1
16-Nov-99	-24.7	-21.6	-17.0	-13.5	-11.8	-10.6	-8.4	-7.4	-7.4	-7.6	-7.9	-8.2
23-Nov-99	-17.4	-19.1	-17.6	-15.2	-13.4	-11.8	-9.3	-8.1	-7.9	-7.9	-8.1	-8.3
30-Nov-99	-25.6	-19.3	-16.4	-14.7	-13.5	-12.4	-10.2	-8.7	-8.4	-8.2	-8.3	-8.4
7-Dec-99	-28.8	-25.7	-21.0	-17.0	-14.9	-13.3	-10.8	-9.3	-8.9	-8.6	-8.6	-8.6
13-Dec-99	-30.5	-27.3	-23.4	-19.5	-17.1	-15.0	-11.7	-9.9	-9.3	-9.0	-8.9	-8.8
22-May-00	-3.3	-10.4	-11.9	-13.8	-14.9	-15.7	-16.7	-16.7	-16.4	-16.0	-15.5	-15.0
29-May-00	3.3	-9.5	-11.7	-13.2	-14.1	-14.9	-15.9	-16.1	-16.0	-15.7	-15.3	-14.9
6-Jun-00	4.3	-5.8	-9.3	-11.7	-13.0	-13.9	-15.2	-15.5	-15.5	-15.3	-15.1	-14.7
16-Jun-00	16.3	6.8	2.5	-1.8	-5.7	-8.8	-13.1	-14.6	-14.8	-14.9	-14.7	-14.5
26-Jun-00	15.8	5.5	2.0	-1.1	-3.5	-5.8	-10.2	-12.8	-13.6	-14.0	-14.1	-14.1
4-Jul-00	7.5	2.9	1.6	-0.8	-2.9	-4.8	-8.8	-11.5	-12.5	-13.1	-13.5	-13.6
11-Jul-00	7.1	3.2	-1.7	-6.6	-10.9	-13.5	-15.0	-15.3	-15.5	-15.6	-15.3	-15.1
18-Jul-00	4.8	3.0	-1.5	-5.9	-10.0	-12.5	-14.4	-14.8	-15.1	-15.3	-15.1	-15.0
19-Sep-00	-6.1	-3.8	-1.5	-1.4	-1.9	-2.6	-4.6	-6.5	-7.4	-8.3	-9.0	-9.5
26-Sep-00	-10.4	-5.6	-3.5	-2.6	-2.6	-3.0	-4.6	-6.3	-7.2	-8.1	-8.7	-9.3
10-Oct-00	-9.4	-10.0	-7.3	-5.5	-5.0	-4.7	-5.1	-6.3	-7.0	-7.7	-8.4	-8.9
10-Nov-00	-19.4	-19.0	-16.4	-13.1	-11.4	-10.1	-8.2	-7.6	-7.7	-8.0	-8.3	-8.6
27-Apr-01	-17.5	-18.2	-20.1	-21.9	-22.4	-22.4	-21.3	-19.5	-18.5	-17.4	-16.5	-15.8
22-May-01	-0.2	-8.9	-12.0	-15.1	-16.7	-17.8	-18.7	-18.3	-17.8	-17.2	-16.6	-16.1
18-Jun-01	6.4	1.7	-0.8	-3.6	-6.3	-8.6	-12.6	-14.9	-15.4	-15.7	-15.6	-15.5
19-Jul-01	18.4	5.9	0.0	-1.8	-3.5	-5.1	-8.4	-10.8	-11.9	-12.7	-13.2	-13.5
21-Aug-01	2.3	0.0	0.0	-1.0	-2.3	-3.5	-6.3	-8.6	-9.6	-10.5	-11.2	-11.7
14-Sep-02	3.5	-0.1	-0.6	-1.5	-2.5	-3.5	-6.0	-8.1	-9.1	-10.0		
23-Oct-02	-6.8	-6.7	-6.7	-6.6	-6.6	-6.5	-6.8	-7.6	-8.2	-8.9	-9.5	-10.0
16-Nov-02	-19.4	-17.0	-14.8	-13.1	-11.6	-10.3	-8.8	-8.5	-8.8	-9.1	-9.5	-9.8
18-Dec-02	-22.1	-19.3	-18.7	-18.2	-17.5	-16.6	-14.0	-11.9	-11.2	-10.8	-10.5	-10.5
10-Feb-03	-31.7	-29.2	-27.1	-25.4	-23.8	-22.1	-18.8	-16.1	-15.0	-14.1	-13.5	-13.0
11-Mar-03	-25.5	-29.6	-27.6	-26.6	-25.7	-24.7	-21.7	-18.7	-17.3	-16.2	-15.2	-14.5
17-Apr-03	-21.6	-24.8	-25.1	-24.9	-24.5	-23.9	-22.3	-20.2	-19.1	-18.0	-17.1	-16.3
15-May-03	-6.1	-13.6	-15.6	-16.9	-18.0	-18.8	-19.7	-19.3	-18.8	-18.2	-17.6	-17.0
17-Jun-03	8.2	-0.3	-2.9	-5.8	-8.3	-10.5	-13.8	-15.5	-15.4	-15.9	-16.2	-16.2

POLARIS MINE - OPERATIONAL LANDFILL - THERMISTOR STRING #5
TEMPERATURES IN DEGREES C

	Bead # 1	Bead # 2	Bead # 3	Bead # 4	Bead # 5	Bead # 6	Bead # 7	Bead # 8	Bead # 9	Bead # 10	Bead # 11	Bead # 12
Installation Depth Below Collar (M)	0.2	-0.3	-1.3	-2.3	-3.3	-4.3	-5.3	-5.8	-6.3	-6.8	-7.3	-7.8
Calibration Factors	-0.01	-0.07	-0.01	-0.12	0.03	0.03	-0.02	-0.06	0.02	-0.02	-0.12	0.02

Temperatures

20-Mar-99	-19.9	-23.6	-25.1	-23.9	-21.4	-18.5	-15.5	-14.6	-13.9	-13.1	-12.4	
22-Mar-99	-19.0	-23.5	-24.5	-23.6	-21.4	-18.6	-15.7	-14.8	-14.1	-13.2	-12.5	
23-Mar-99	-19.1	-23.3	-24.3	-23.4	-21.3	-18.6	-15.8	-14.9	-14.1	-13.2	-12.6	
24-Mar-99	-20.5	-23.1	-24.1	-23.3	-21.3	-18.7	-15.8	-14.9	-14.2	-13.3	-12.7	
25-Mar-99	-21.6	-23.0	-23.9	-23.1	-21.2	-18.7	-15.9	-15.0	-14.3	-13.3	-12.7	
26-Mar-99	-22.6	-23.5	-23.7	-23.0	-21.2	-18.7	-16.0	-15.1	-14.3	-13.4	-12.7	
27-Mar-99	-24.9	-23.9	-23.6	-22.9	-21.1	-18.7	-16.0	-15.1	-14.3	-13.4	-12.8	
29-Mar-99	-29.1	-25.0	-23.6	-22.7	-21.0	-18.7	-16.1	-15.2	-14.5	-13.5	-12.8	
30-Mar-99	-25.6	-26.2	-23.8	-22.6	-21.0	-18.8	-16.2	-15.3	-14.5	-13.6	-12.9	
6-Apr-99	-18.8	-24.6	-24.4	-22.7	-20.8	-18.8	-16.5	-15.6	-14.9	-14.0	-13.2	
13-Apr-99	-20.1	-23.1	-23.3	-22.3	-20.8	-18.9	-16.7	-15.9	-15.2	-14.3	-13.5	
20-Apr-99	-16.6	-20.7	-21.9	-21.8	-20.6	-18.9	-16.8	-16.1	-15.5	-14.5	-13.7	
26-Apr-99	-16.4	-19.8	-21.2	-21.0	-20.2	-18.8	-17.0	-16.3	-15.6	-14.8	-14.0	-13.3
4-May-99	-14.4	-18.1	-19.9	-20.3	-19.8	-18.7	-17.1	-16.4	-15.8	-15.0	-14.2	-13.6
11-May-99	-8.9	-16.1	-18.6	-19.5	-19.3	-18.5	-17.1	-16.5	-16.0	-15.1	-14.4	-13.8
18-May-99	-6.0	-11.8	-16.1	-18.2	-18.7	-18.2	-17.0	-16.5	-16.0	-15.3	-14.6	-13.9
25-May-99	-5.0	-9.2	-13.6	-16.5	-17.8	-17.7	-16.9	-16.5	-16.1	-15.4	-14.7	-14.1
1-Jun-99	2.4	-6.3	-11.5	-14.9	-16.8	-17.1	-16.7	-16.4	-16.0	-15.4	-14.8	-14.2
8-Jun-99	3.3	-3.3	-9.0	-13.2	-15.6	-16.4	-16.4	-16.2	-15.9	-15.4	-14.8	-14.2
15-Jun-99	7.1	-2.0	-7.2	-11.5	-14.5	-15.7	-16.0	-16.0	-15.7	-15.3	-14.8	-14.3
22-Jun-99	2.4	-0.8	-5.4	-10.1	-13.3	-14.9	-15.6	-15.6	-15.5	-15.2	-14.8	-14.3
29-Jun-99	6.7	1.7	-3.8	-8.3	-11.9	-13.8	-15.0	-15.1	-15.1	-14.9	-14.7	-14.3
5-Jul-99	8.2	4.9	-1.1	-7.3	-11.2	-13.2	-14.6	-14.8	-14.9	-14.8	-14.6	-14.2
13-Jul-99	7.5	5.0	-1.5	-6.4	-10.2	-12.5	-14.0	-12.2	-14.5	-14.5	-14.4	-14.1
20-Jul-99	6.4	3.6	-1.0	-5.6	-9.4	-11.7	-13.5	-13.9	-14.1	-14.2	-14.2	-14.0
27-Jul-99	9.8	4.3	-0.8	-5.0	-8.7	-11.0	-12.9	-13.4	-13.7	-13.9	-14.0	-13.9
3-Aug-99	10.0	5.0	-0.5	-4.6	-8.1	-10.5	-12.4	-12.9	-13.2	-13.6	-13.7	-13.7
10-Aug-99	10.3	4.8	-0.4	-4.2	-7.6	-9.9	-11.9	-12.5	-12.9	-13.3	-13.5	-13.5
17-Aug-99	6.2	4.0	-0.2	-3.9	-7.2	-9.5	-11.5	-12.1	-12.5	-12.9	-13.2	-13.3
24-Aug-99	1.5	1.6	-0.2	-3.6	-6.8	-9.1	-11.1	-11.7	-12.1	-12.6	-12.9	-13.1
31-Aug-99	-0.3	0.2	-0.3	-3.4	-6.5	-8.7	-10.7	-11.4	-11.8	-12.3	-12.7	-12.9
7-Sep-99	0.0	-0.2	-0.4	-3.3	-6.2	-8.4	-10.4	-11.0	-11.5	-12.0	-12.4	-12.7
15-Sep-99	-0.7	-0.3	-0.5	-3.2	-5.9	-8.1	-10.1	-10.7	-11.1	-11.7	-12.2	-12.5
21-Sep-99	-1.3	-0.8	-0.7	-3.1	-5.7	-7.8	-9.8	-10.4	-10.9	-11.5	-12.0	-12.3
28-Sep-99	-1.9	-0.7	-0.9	-3.1	-5.5	-7.6	-9.5	-10.1	-10.6	-11.2	-11.8	-12.1
5-Oct-99	-8.8	-4.1	-1.5	-3.1	-5.4	-7.4	-9.2	-9.9	-10.3	-11.0	-11.5	-11.9
12-Oct-99	-13.0	-6.3	-3.2	-3.5	-5.3	-7.2	-9.0	-9.6	-10.1	-10.8	-11.3	-11.6
19-Oct-99	-15.4	-12.1	-5.8	-4.4	-5.4	-6.9	-8.7	-9.4	-9.9	-10.5	-11.1	-11.5
26-Oct-99	-16.5	-14.2	-8.6	-6.2	-5.8	-7.0	-8.6	-9.2	-9.7	-10.3	-10.9	-11.3
2-Nov-99	-18.4	-16.4	-11.4	-7.8	-6.6	-7.2	-8.5	-9.1	-9.5	-10.2	-10.7	-11.2
9-Nov-99	-25.5	-20.7	-13.2	-9.4	-7.6	-7.5	-8.5	-9.0	-9.4	-10.0	-10.5	-11.0
16-Nov-99	-24.3	-20.6	-14.4	-10.9	-8.7	-8.1	-8.6	-9.4	-9.4	-9.9	-10.5	-10.9
23-Nov-99	-18.2	-19.8	-16.5	-12.3	-9.8	-8.7	-8.8	-9.1	-9.4	-9.9	-10.4	-10.7
30-Nov-99	-24.7	-18.8	-16.0	-13.2	-10.8	-9.4	-9.1	-9.3	-9.5	-9.9	-10.3	-10.7
7-Dec-99	-28.4	-25.4	-18.5	-14.1	-11.5	-10.1	-9.5	-9.5	-9.6	-10.0	-10.3	-10.6
13-Dec-99	-30.3	-27.5	-21.4	-15.9	-12.6	-10.7	-9.9	-9.8	-9.9	-10.1	-10.4	-10.6
22-May-00	-5.2	-11.4	-14.4	-16.8	-18.3	-18.5	-18.0	-17.7	-17.3	-16.5	-15.8	-15.2
29-May-00	1.0	-10.7	-13.6	-15.9	-17.4	-18.0	-17.7	-17.5	-17.1	-16.5	-15.9	-15.2
6-Jun-00	2.7	-7.0	-12.0	-14.9	-16.6	-17.3	-17.4	-17.2	-16.9	-16.4	-15.9	-15.3
16-Jun-00	13.3	-1.0	-7.8	-12.5	-15.3	-16.4	-16.8	-16.8	-16.6	-16.2	-15.8	-15.3
26-Jun-00	13.9	3.3	-3.8	-9.5	-13.4	-15.3	-16.2	-16.3	-16.2	-16.0	-15.7	-15.2
4-Jul-00	7.5	2.3	-2.1	-7.8	-12.0	-14.3	-15.6	-15.9	-15.9	-15.8	-15.5	-15.2
11-Jul-00	7.6	3.5	1.8	-0.9	-2.5	-4.3	-7.8	-10.6	-11.6	-12.3	-13.0	-13.0
18-Jul-00	5.2	3.2	1.6	-0.8	-2.3	-3.9	-7.2	-9.9	-10.9	-11.6	-12.4	-12.5
19-Sep-00	-5.8	-2.2	-1.4	-3.6	-6.2	-8.3	-10.4	-11.0	-11.5	-12.1	-12.6	-12.9
26-Sep-00	-9.7	-4.3	-2.3	-3.8	-6.0	-8.1	-10.1	-10.7	-11.2	-11.9	-12.4	-12.7
10-Oct-00	-9.1	-8.6	-5.4	-5.1	-6.1	-7.8	-9.6	-10.2	-10.7	-11.3	-11.9	-12.3
10-Nov-00	-19.2	-18.2	-13.8	-10.6	-8.9	-8.6	-9.3	-9.7	-10.0	-10.6	-11.1	-11.5
27-Apr-01	-17.9	-20.2	-23.2	-23.8	-22.9	-21.4	-19.3	-18.5	-17.8	-16.8	-15.8	-15.1
22-May-01	-1.9	-11.5	-16.4	-19.3	-20.4	-20.2	-19.2	-18.7	-18.1	-17.3	-16.5	-15.7
18-Jun-01	4.7	-0.5	-6.4	-11.6	-15.3	-17.0	-17.7	-17.7	-17.5	-17.1	-16.6	-16.0
19-Jul-01	17.4	4.8	-1.8	-6.4	-10.3	-12.9	-14.9	-15.4	-15.6	-15.8	-15.8	-15.5
21-Aug-01	2.5	0.0	-0.7	-4.3	-7.7	-10.2	-12.4	-13.0	-13.5	-14.0	-14.4	-14.5
14-Sep-02	2.6	-0.1	-1.2	-4.0	-6.8	-9.1	-11.1	-11.8	-12.3	-13.0	-13.5	-13.8
23-Oct-02	-6.7	-6.6	-6.3	-6.2	-6.7	-8.0	-9.7	-10.3	-10.8	-11.5	-12.1	-12.5
16-Nov-02	-18.7	-16.1	-12.6	-9.8	-8.5	-8.6	-9.6	-10.0	-10.4	-10.9	-11.6	-11.9
18-Dec-02	-21.5	-19.5	-18.6	-16.3	-13.6	-11.7	-10.8	-10.7	-10.8	-10.9	-11.3	-11.6
10-Feb-03	-30.9	-28.8	-25.6	-21.9	-18.5	-16.1	-14.2	-13.6	-13.2	-12.8	-12.5	-12.4
11-Mar-03	-27.7	-29.1	-27.1	-24.7	-21.6	-18.7	-16.2	-15.5	-14.9	-14.1	-13.6	-13.2
17-Apr-03	-22.8	-25.5	-25.4	-24.2	-22.5	-20.6	-18.4	-18.4	-16.8	-15.9	-15.1	-14.5
15-May-03	-8.9	-15.5	-18.0	-19.8	-20.5	-20.0	-18.8	-18.2	-17.6	-16.8	-16.0	-15.3
17-Jun-03	5.3	-2.1	-7.4	-11.8	-15.0	-16.6	-17.3	-17.3	-17.1	-16.8	-16.3	-15.8

11552Q03A.cdr

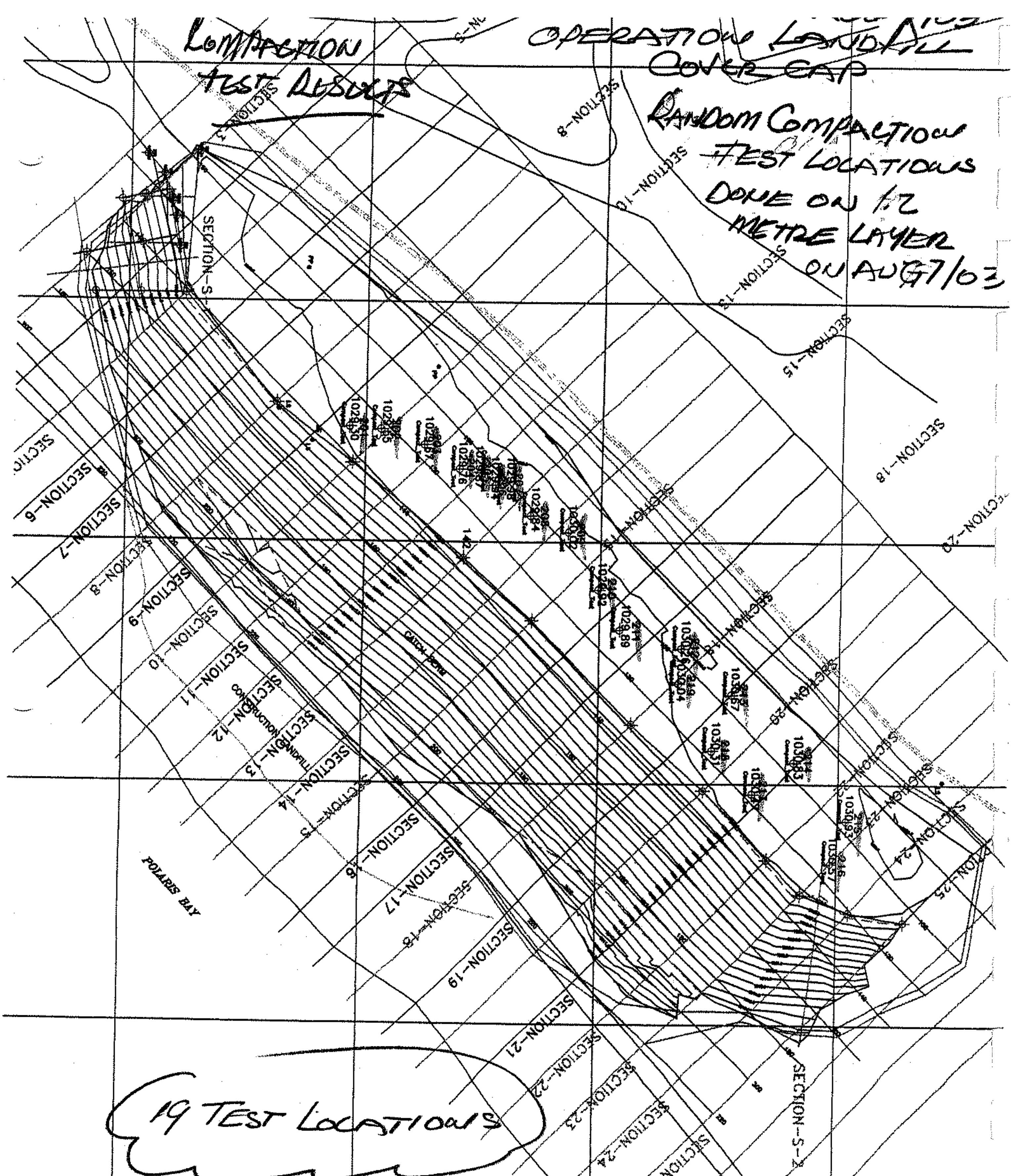
a) Plate load tests should be completed on each lift to verify that adequate compaction has been achieved. b) The plate load tests should be completed at a frequency of one test for every 5,000 square metres. A minimum 25 mm thick, round steel plate with an area of 0.0929 square metres (1 square foot) (diameter of plate = 0.344 m) shall be placed on the surface of the compacted cover material. The edge of the plate should be flat not rounded. Prior to starting the test, the surface of the test location (over an area with a diameter of 0.6 m) shall be groomed smooth using the steel plate. c) A force of 13.3 kN (3,000 lbs) shall be applied to the plate (located in the center of the smooth area) in a manner that the load reaches the soil as a static load, without impact, fluctuation or eccentricity. The load shall be applied for a period of 5 minutes. The plate shall be removed without disturbing the soil around the edge of the plate. The displacement of the soil shall be measured at four equidistant locations along the edge of the test area to the nearest 1 mm. All four displacement measurements at each test location should be recorded as well as the average displacement. The average displacement shall not exceed 10.0 mm for any test. e) For each test location, the following information shall be recorded: date, time, material type, lift number, location (co-ordinates or shown on a plan drawing), applied load, the four displacement measurements, the average displacement, pass/fail compaction requirement. f) If a plate load test fails, the area between passing plate load tests should be recompacted and retested until the compaction standard is achieved. g) All test results are to be forwarded to the Owner for review and approval after each lift is tested and before subsequent lifts are placed.

TK
Q
SDC
will
address

COMPACTION TEST RESULTS

OPERATION LANDFILL COVER CAP

RANDOM COMPACTION TEST LOCATIONS DONE ON 1.2 METRE LAYER ON AUG 7/03



19 TEST LOCATIONS

OP. LANDFILL COMPACTION TEST

CC IAN DICKIE TECK COMINCO
HERB McLEAN SLE&C

Weather - Cold - 4°C
WINDY

[signature]

OPERATIONAL LAND FILL
COMPACTION TEST LOCATIONS

3000 lb / wt on 12"

	Point Num	Northing	Easting	Elevation	Descriptor/Name	Time Start	End	Plate M... displacement		
1	201	593.460	1252.379	1029.299	Aug 7/03	3.00	3:10	0	0	0
2	202	606.115	1253.433	1029.552	〃	3:12	3:20	0	0	2
3	203	623.709	1259.794	1029.669		3:20	3:27	0	0	0
4	204	638.672	1270.042	1029.759		3:27	3:35	2	0	0
5	205	648.079	1271.376	1029.873		3:35	3.42	2	0	0
6	206	654.436	1276.802	1029.943		3:42	3.50	0	0	2
7	207	659.050	1275.635	1029.983		3:50	3:57	0	0	0
8	208	670.131	1289.238	1029.837		3:57	4.05	0	0	2
9	209	685.956	1296.020	1030.015		4:05	4.12	3	0	0
10	210	699.009	1319.504	1029.924		4.12	4.19	2	0	0
11	211	707.997	1336.406	1029.889		4.19	4.26	0	0	0
12	212	733.266	1344.157	1030.255		4.26	4.35	0	0	0
13	213	754.039	1363.459	1030.666		4:35	4.42	2	0	0
14	214	781.081	1390.836	1030.831		4:42	4.50	0	0	0
15	215	803.700	1415.462	1030.927		4.50	4.58	0	0	0
16	216	797.234	1433.457	1030.572		5:05	5:12	2	3	0
17	217	763.152	1404.141	1030.474		5:12	5:19	0	0	0
18	218	745.922	1386.018	1030.305		5:19	5.26	0	0	0
19	219	732.255	1358.949	1030.043		5.26	5.35	0	0	0
20										

TEST MATERIAL
NEW QUARRY BLASTED ROCK

[illegible] SURV
FRI 8 AUG/03

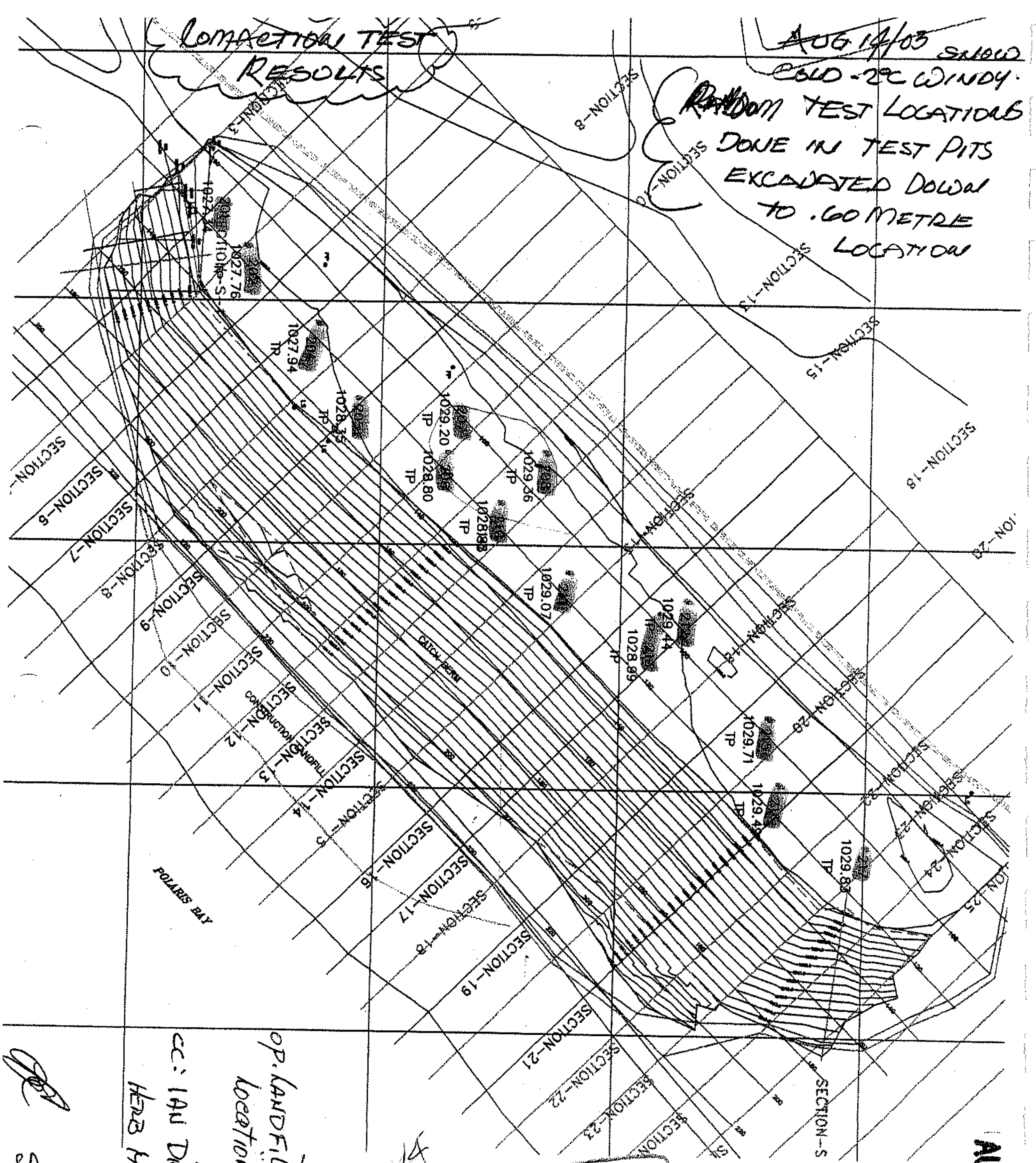
C.C. IAN DICKIE TECK COMINCO
HERB McLEAN SLE &C

TEST WERE DONE WITH A 3000 LB WEIGHT
& 12" dia

Aug 11/03
[illegible]

COMPACTION TEST RESULTS

AUG 14/03 SNOW
COLD -2°C WINDY.
RANDOM TEST LOCATIONS
DONE IN TEST PITS
EXCAVATED DOWN
TO .60 METRE
LOCATION



AUG 13 2003

17 LOCATIONS TESTED
MATERIAL IS NEW QUARRY
BLASTED SHOT ROCK.

OP. LANDFILL TEST PIT
LOCATIONS

cc: IAN DICKIE TECK COM
HERB McLEAN S/E & C

SUZI

Operational Landfill
Test Pit Locations

3000LB DT

	Point Num.	Northing	Easting	Elevation	Descriptor/Name	Time Start	End	Displacement 1	2	3	4
1	201	527.148	1163.258	1027.336	TP Aug 14/03	3:10	3:18	0	0	0	0
2	202	539.217	1188.929	1027.756	TP	3:18	3:25	0	0	2m	0
3	XXX	XXX	XXX	XXX	XXX	3:25	3:32	2m	0	0	0
4	204	563.479	1220.310	1027.944	TP	3:32	3:39	2m	2m	2m	0
5	205	583.413	1248.532	1028.349	TP	3:39	3.46	0	0	0	0
6	206	619.386	1271.940	1028.797	TP	3.46	3.54	0	0	0	0
7	207	625.825	1248.996	1029.203	TP	✓ 3.54	4:04	water		in pit	
8	208	660.925	1271.591	1029.362	TP	✓ 4:04	4:10	water		in pit	
9	XXX	XXX	XXX	XXX	XXX	✓ 4:10	4:17	0	0	2m	0
10	210	641.966	1292.397	1028.848	TP	4.18	4.25	6	0	0	0
11	211	669.164	1319.550	1029.070	TP	4:25	4.33	2	3	0	0
12	212	719.456	1331.364	1029.439	TP	4.33	4:39	0	0	0	0
13	213	705.308	1344.190	1028.990	TP	4.39	4:46	0	2	0	0
14	XXX	XXX	XXX	XXX							
15	215	752.686	1377.931	1029.715	TP	4:46	4:54	3	0	0	0
16	216	756.761	1406.586	1029.486	TP	4:54	5.06	0	2	0	0
17	217	792.912	1428.963	1029.833	TP	5.06	5.16	0	0	0	0
18											

SURV
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cc: IAN DICKIE TEEKCOMINCO
HERB McLEAN S/E & C

APPENDIX C

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GEOTECHNICAL REVIEW

OF THE

RECLAMATION LANDFILL SUBSIDENCE AREA

POLARIS MINE

RESPONSE TO REGULATORS QUESTIONS REGARDING

SUBSIDENCE AT THE RECLAMATION LANDFILL

Prepared by: Trevor Feduniak, P.Eng.

September 30, 2003

EXECUTIVE SUMMARY

The Polaris Mine Decommissioning and Reclamation Plan, March 2001 ('DRP') identifies the Reclamation Landfill area as being influenced by significant subsidence referred to as a 'Sinkhole'. The Approved plan is to ensure that there is at least a 1.8 metre cap over the landfill area. However, this does not address the concern that the area is continuing to actively subside which could present a public/wildlife safety issue.

Required in the letter of Approval of the operating protocols for the landfills at the site, and as a result of a site inspection by DIAND in September of 2003, Polaris was requested to review the geotechnical aspects of the 'Sinkhole' area. This report presents the currently available data for this area, an explanation of the subsidence mechanisms at work, and a proposed course of action to respond to the potential issues of concern.

The caving of the overlying strata into the 202 Stage III stope has resulted in substantial localized subsidence ('sinkhole') that is atypical of subsidence being experienced elsewhere at Polaris. Monitoring of subsidence at Polaris indicates that subsidence over the majority of the mine is not a concern in either the short or long term. However, in the area of 202 Stope, substantial subsidence has been occurring since 1999 as evidenced by the precise subsidence monitoring conducted while the mine was operating. The last precise subsidence survey was conducted in 2002 and the sinkhole area was still actively subsiding at that time.

The development of subsidence prediction and modeling is a well developed science in Europe due to the impact of coal mining in populated areas on civil structures. While the behaviour of subsidence not exactly the same in base metal mines, the rock mechanic principles and empirical application of them to base metal mines does give guidance in understanding the subsidence mechanisms at work. Typically in coal mines, the length of time that subsidence occurs is measured in relatively few years. Similar trends have been observed at Polaris over other areas of the mine. In the area of the sinkhole, significant movement at surface has been measured for several years prior to 2002. Conducting a precise level survey in 2004 will indicate whether the subsidence has entered the decelerating phase of the subsidence cycle. Once these measurements have been obtained, a better assessment of the current and future expectations for ground movement around the sinkhole will then be possible. At that time a more informed decision as to whether or not any future action or monitoring is required.

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RESPONSE TO REGULATORS QUESTIONS REGARDING SUBSIDENCE AT THE RECLAMATION LANDFILL

1. Introduction

Part H, Item 6 of Polaris's Water Licence requires an annual geotechnical inspection be conducted. Included in the approval of Polaris's Landfill Operating Protocol's, is the requirement 'That TCL provide assurance which demonstrates that the mine workings under the Reclamation Landfill have been sufficiently supported or backfilled to prevent further subsidence.' as part of the Annual Geotechnical Inspection.

The Department of Indian Affairs and Northern Development (DIAND) conducted a site inspection between September 8th to 10th, During the site visit, discussions were held with John Knapp (Site Manager) regarding ongoing subsidence over the underground mining area. The inspection report requested that the following issues be evaluated:

1. A description of the mechanism of subsidence
2. Thermal regime and ice conditions in the overburden
3. Thermal regime and need for installation of thermistors to monitor permafrost temperatures from the surface, around the underground opening
4. Impact of surface water pond on thermal regime and permafrost stability.
5. Impact of placing fill on the rate and amount of subsidence and the permafrost regime
6. Estimate of maximum extent and depth of subsidence zone
7. Assessment of physical stability and protection required
8. Recommendations for ongoing assessment and monitoring

This document will respond to all of the above comments although not in the order listed above.

2. Description of Mechanisms of Subsidence

2.1. Rock Mechanics and Subsidence Monitoring at the Polaris Mine

Monitoring and prediction of the stability of underground mine workings has been key to the successful mining of the Polaris ore body. The objective of recovering a mineral resource is to extract the maximum ore possible given safety and economic constraints. As such, mine planning attempts to maximize the volume of ore removed in a manner that minimizes the quantities of ore that must remain in place either because they are uneconomic or are required to support the ground around the mine workings (i.e. 'pillars').

Each underground mine is unique. The shape of the ore body, the composition of the ore and host rock, the depth of the ore body, its width, length and dip are all different. The types of rock underlying and overlying the mine differ from mine to mine. Faulting, weathering, ground water conditions, rock temperatures, faulting of the rock, and surrounding pre-mine ground pressures are all factors that affect the stability and behavior of the mine openings and surrounding rock masses. As a result of these and other variables, the prediction of subsidence is complex and reliant on site specific experience to develop an understanding of how the mining activities will influence subsidence at that site.

Pre-mining evaluations of mine designs are based on data collected at the exploration stage, through lab testing of the rocks to determine their physical characteristics, and experience of mining similar ore bodies at other locations. The development and refinement of mine designs evolve as experience and knowledge of individual ore bodies are gained during the mining process. As the mine is developed, rock mechanics instrumentation is utilized to monitor the physical conditions of the mine such as ground pressures, ground temperatures, and ground movements around the underground openings. At some mines, surface subsidence monitoring is an important aspect that is monitored. Visual observations by experienced mining personal are key in monitoring the immediate day to day stability of the ground surrounding the mine openings. Polaris Operations utilized graduate mining engineers (normally with at least one or more staff members registered as a Professional Engineer) to ensure competent planning and management of the mine design and monitoring process occurred.

At Polaris, early mining was done utilizing open stopes (i.e. areas where a volume of ore is removed is referred to as a 'stope') that were not re-filled (i.e. left 'open') after mining of that area was completed. For this method to work, the size of the stope was limited so that the ground surrounding the stope would stay intact. To allow for improved recovery of ore, and to provide for improved ground conditions (i.e. stable ground that was safe for personnel working in the area), the mine had to provide additional support to the mined out stopes by re-filling the void space in the stopes with fill ('backfill'). Initially the backfill consisted of waste rock with water added to increase the structural strength. The permafrost conditions in the mine caused the water in the rock to freeze adding strength to the backfill. The placement of backfill must be done soon after the stope is mined, before the rock surrounding the stope starts to fail (i.e. break up falling into the stope). While the use of frozen backfill was successful, it became apparent that a stronger backfill would provide additional support allowing for even better recovery of ore. It was determined that the use of backfill consisting of cement mixed with waste rock (i.e. Cemented Rock Fill or 'CRF') would provide superior backfill strength and the strength would be obtained in a shorter period of time. Although this was a very expensive process, the improved ground support and improved ore recovery justified the additional cost. The improved support for the stopes had the additional benefit that the amount of subsidence measured at surface was reduced.

2.2. Subsidence Mechanisms

There is substantial technical knowledge related to the process of mining induced subsidence. This technical expertise was initially developed in Europe where coal mining near populated areas created significant damage related to the subsidence of roads, pipelines, houses and other civil structures. Subsidence related to coal mining typically differs from metal mining ('hard rock mining') subsidence in a number of ways. Normally coal mining is occurs in relatively thin coal beds (several metres thick not tens of metres thick as with Polaris), with relatively substantial thickness of cover (relative to the ore body thickness), and the extraction of the coal beds occurs over large areas (often extending for miles) using relatively uniform patterns of extracted areas and adjacent areas where ground has been left intact for support (‘pillars’). These configurations allow for relatively accurate mathematical predictions of amounts of subsidence, timing of subsidence, and amount of surface strains (i.e. surface cracking). Initial planning is done using information from similar mines/ground conditions documented in reference materials but as site specific empirical data is collected, the accuracy of the predictions are refined.

The following explanation is simplistic to give the reader an understanding of the subsidence mechanism coal mines. Typically, the subsidence is caused by the strata overlying the mining area bending uniformly as mining progresses. The overlying stratum behaves like a beam that sags as support is removed from beneath it (i.e. by the mining removing coal or other mineral). As there is less rock to support the weight of the overlying strata, the remaining rock (‘pillars’) must support increasing loads. At some point, the pillars are not capable of holding the amount of weight they are exposed to and they begin to fail. As the pillars crumble, the overlying strata subsides. The debris from the failed pillars (and roof over the mine openings) starts to partially fill the mine openings. As this process of crushing the pillars progresses, at some point, support for the overlying strata is gradually regained and the subsidence slows and eventually ceases. The surface of the ground appears to gradually and uniformly subside. Some coal mines (but not most), place fill into the areas where they have removed the coal to provide additional support and to reduce the amount of subsidence. The backfill must be placed soon after mining or else the area will start to fail before the backfilling is completed. If the coal seam is very thick and/or if the seam is close to surface, or if there are irregular patterns to the mine layout, or if the overlying strata if more brittle, different mechanisms of subsidence may occur and the resulting subsidence may not be uniform.

The mechanisms of surface subsidence are usually different for metal mines. While the same physical principles apply, the conditions surrounding metal mines are often very different from coal mines. The ore body is often much thicker so that mining open creates high stopes with tall, slender pillars between the stopes. Often, the distance to surface relative to the height of the stope is less that in a coal mine. The rock types are often much harder and more brittle in nature. If the width of the stope is narrow enough and the pillar adjacent to it is strong enough, the stope can remain stable over a very long period of time and there is no disturbance of the surface. If the stope is wider or the adjacent pillar is not strong enough, the roof of the stope or the pillar itself may fail in a brittle manner. As the failure progresses, series of rock pieces or larger blocks of rock from the roof and/or the pillar break up and fall into the stope. Broken rock occupies more space than solid rock due to the void spaces between the broken pieces. As failure of the surrounding rocks progress further and further from the opening, the area affected above the stope typically becomes wider (i.e. similar to the shape of an ice cream cone). As the failure of the overlying strata progresses further and further upward, the volume of broken rock continues to increase so that at some point it occupies enough space that the broken rock starts to provide support again until the remaining strata overtop of it is adequately supported and becomes stable (if the distance is far enough to surface). This mechanism can result in several different subsidence effects on surface. If the volume of the stope is small relative to the volume of rock overlying it, the overlying strata may bend so that at surface subsidence is similar to the example of the coal mine. Alternately, if the volume of the stope is substantial relative to the distance to surface, then failure of the overlying rock can progress through to surface causing a more localized area of subsidence where the surface subsides with steeply dipping angles (i.e. a ‘sinkhole’). In extreme cases an open hole extending from surface down into the stope can occur (this would generally only occur when the volume of rock overlying the collapsing stope is relatively small compared to the volume of rock required to fill the stope, typically when the stope is very near surface). As ore bodies are not usually uniform, consequently mine designs are also not normally uniform. As a result, subsidence over the mine may be a mixture of the above subsidence mechanisms. Subsidence at Polaris is primarily smooth and uniform due to the use of backfill. Early in the mine life, there was one area (the 202 Stage III stope) where premature failure of the stope before it could be backfilled has resulted progressive failure of the overlying strata resulting in a ‘sinkhole’ type of subsidence to occur. The failure of this area emphasized the need to backfill stopes and was the standard procedure adopted for stopes after 202 Stope was mined This procedure has prevented other areas from experiencing excessive subsidence.

Empirical monitoring of subsidence at Polaris has been a useful tool in predicting the behaviour of the ground in response to mining. Monitoring of subsidence at Polaris has been done both utilizing precise survey measurements of the bedrock surface, and through visual observations of indications of subsidence. A network of monitoring pins anchored to bedrock was established over the mining area in the 1980’s. While mining was active (until 2002), these monitoring stations were surveyed twice per year with adequate precision to detect small changes in pin elevations. These measurements have identified the expected maximum angle of draw of the subsidence zones (i.e. the angle from the extracted area to surface affected by subsidence) to be approximately 40 degrees. This information is useful predicting the ultimate boundaries of subsidence at surface. The length of time subsidence is active is influenced the area being mined, the depth of mining and the angle of draw. Appendix A shows a graph of subsidence over time at a typical coal mine (Subsidence Engineers’ Handbook, National Coal Board). The graph illustrates the relationship between these factors and indicates that typical duration for subsidence to be active in a typical coal mine is up to 5 years. While these charts are not directly applicable to base metal mines, it does indicate that subsidence occurs over a relatively short period of time.

3. Estimate of Maximum Extent and Depth of Subsidence Zone

Subsidence progresses through a series of phases over time starting from no movement, to accelerating vertical movement, to decelerating rate of movement, and finally to little or no movement. A typical graph of the amount of subsidence compared to time is presented in the Subsidence Engineers Handbook and is also included in Appendix A. At Polaris, while the time frames for subsidence to occur will be different from the example in the Handbook, the process will be similar showing the same series of phases of changing rates of subsidence over time. Appendix B contains the following figures:

- Location Plan of Subsidence Monitoring Stations and Outline of Mine Workings
  This drawing shows the outline of the mine workings in plan view indicating the locations of the subsidence survey monitoring stations. The majority of these stations are no longer required due to little on-going ground movement and have been

destroyed intentionally as part of re-contouring the site as part of the reclamation activities, through substantial ground movement (in the sinkhole area) or by accident. Our contractor has been instructed to save key monitoring stations around the sinkhole area for future monitoring requirements.

- Graph of Surface Subsidence Versus Time Along Section 1500 E.
  This graph indicates the total subsidence over time for a series of monitoring stations that extend in a North – South line at about the 1500 E section line. The chart shows that subsidence is in the deceleration phase at the south end (Station Sub-5), is still undergoing substantial subsidence just north of the sinkhole (Stations Sub 20 and Sub 22), and has substantially decreasing rates of subsidence as you move further north from the sinkhole (as the amount of mine workings under the stations decrease).
- Graph of Surface Subsidence Versus Time for 2150 N Section – East
  This graph shows the subsidence compared to time for stations east of the sinkhole area. As can be seen from the plan drawing, the location of these subsidence monitoring stations start at the edge of mining and extend out over un-mined areas. The amount of subsidence of these stations is relatively small and subsidence is nearing completion.
- Graph of Surface Subsidence Versus Time for 2150 N Section – West
  This graph shows the subsidence compared to time for stations near the sinkhole area and extending to the west. The stations closest to the sinkhole area are still undergoing significant subsidence and the stations further west are still subsiding significantly but at reducing rates the further away from the sinkhole area. All of the stations in this graph are located over top of mining areas with substantial extraction and that have experienced continuing mining activity throughout the monitoring period. With the cessation of mining, subsidence rates in these areas will start to decrease. The data in this graph is current as of the summer of 2002.

The ‘sinkhole’ area of subsidence is located directly over top of 202 Stage III stope. A cross section of the stopes in this area relative to the surface identifies the location of this ground failure (Appendix B). Golder Associates Ltd., a mining/rock mechanics engineering consulting firm reviewed this problem as part of their report ‘Site Visit to Cominco Ltd.s’ Polaris Mine’ dated February 1994. This report indicates that a block over top of this stope failed and moved downward in excess of 3.5 metres at the 850 Level (report Section 5.3, Appendix C). The report includes several generalized sketches indicating the observations of the block failure as evidenced underground. Referring to Section 3.3 of Golder Associates’ 1995 site visit report (Appendix C), makes a number of observations:

a) Most subsidence monitors at the mine are maintaining constant velocity or de-accelerating.
b) Monitoring data suggests an angle of draw of about 40 degrees.
c) ‘At Polaris, the ore is both shallow and thick, and various coal subsidence formula become difficult to apply.’
d) ‘A recent review by Golder Associates ….found that published information on subsidence over base metal mines was extremely limited and mainly referred to caving. Thus, there is little precedent which can be used to assess future subsidence (North Keel and Ocean Zone) at Polaris. More or less sole reliance will be on the

> information currently being gathered and mine derived relationships (assisted, for example, by numerical modeling).'

The Golder report has photographs of the surface tension cracks which are also included in Appendix C.

Monitoring in the active area of the sinkhole is difficult as the ground movements are large enough that the survey stations have been destroyed and subsequently buried as fill has been placed into the sinkhole. Maximum vertical movement in the area is estimated to be in the order of 10 metres. Subsidence west of the sinkhole is active but more moderate. The area west of the sinkhole is also over areas where thick sections of ore have been mined. However, relative to the horizontal distances involved the change in surface contours are more modest and are not of any concern. A drawing titled '2150 Section Through Sinkhole Area' (Appendix B) indicates the approximate surface over this area and shows the changes to surface contours as a result of subsidence up until relative total subsidence to July of 2002. As there is data missing within the most active area of the sinkhole, the drawing does not necessarily accurately represent the area in the middle of the sinkhole.

As previously identified, most of the monitoring stations have either been destroyed through ground movement or were removed in 2003 as part of the reclamation re-contouring activities. However, key subsidence stations related to the sinkhole area are being retained so that they can be re-surveyed in 2004. It is anticipated that the 2004 survey will indicated decreasing rates of subsidence.

A simple method of observing subsidence is from visual observations. At the boundaries of subsidence where the slope of the surface ground changes, the ground surface is placed into tension causing cracks to form in the surface soils. During the snow free months, recording the locations of new tension cracks is a practical method of monitoring if the area of subsidence is expanding. These observations have been mapped on a regular basis with the results plotted on a surface plan (refer to Appendix B). This data was last updated in 2002. As the ground surface was being re-graded during 2003 during reclamation activities, no observations of surface cracks were made. It is planned to identify and map any new cracks during the summer of 2004.

4. Impact of Placing Fill on the Rate and Amount of Subsidence and the Permafrost Regime

4.1. Impact of Placing Fill on the Rate of Subsidence

As referred to in Section 2.2 above, the Subsidence Engineers' Handbook states that the length of time that subsidence is active is a function of mining depth, draw angle and the rate of extraction, and that the time to complete subsidence is measured in years. While the time frames are extended at Polaris, it still indicates that the time frame for active subsidence to be occurring is limited.

The Handbook also indicates that increasing the depth of cover increases the length of time for subsidence to finish (Appendix A). In the area of the Sinkhole, there is approximately 150 metres of cover, so even if 10 or 15 metres of fill were added, the relative change in cover thickness is small and would have little effect on subsidence rates.

4.2. Impact of Fill on the Permafrost Regime

Placing fill in the sinkhole area is no different from placing fill anywhere else on the island. Permafrost will be established in the fill over a relatively short period of time. The thicker the fill, the more time it would take for the permafrost to be fully re-established. The primary purpose of placing fill in the sinkhole area to restore previous elevations of the ground surface in this area. Whether or not permafrost is reinstated in the new fill in several months or in a few years has no impact on the ground surface elevation which is the primary issue of concern.

5. Thermal Regime at the Polaris Mine Site

5.1. The Need for Installation of Thermistors to Monitor Permafrost Temperatures from the Surface and/or Around Mine Workings

There is an extensive history of ground temperature monitoring related to the mine workings at the Polaris Mine. The mine has measured rock temperatures in and adjacent to mining areas for mining planning purposes. Some examples are:

a) Ground Stability of Mine Workings Due to Thermal Regime
   Prior to developing mine workings in an area, mine engineers needed to be confident that the planned workings would be in an area where the ground is frozen. Thermistors were installed in drill holes that were drilled from surface into the ground ahead of mining. Additional thermistors were placed into drill holes that were drilled from underground workings to confirm the temperature forecasts provided by the surface drill holes. Figure 7 in Volume 1 of the Decommissioning and Reclamation Plan (March 2001) was developed though the collection of this data.

b) Ground Stability of Mine Workings Due to Summer Air Temperatures – the stability of the ground immediately surrounding the underground mine workings was key to providing safe working conditions for personnel working underground. Mines utilize high horsepower fans to force large volumes of fresh air underground to provide fresh air for diesel equipment and to provide clean air for personnel. Experience has shown that if the surfaces of the rock around the tunnels underground are allowed to thaw (in summer when air temperatures are above freezing), that localized sections of rock become unstable (referred to as ‘Loose’) and are a hazard to personnel working in the area. Thermistors were commonly placed into drill holes in the walls and roofs of the tunnels to monitor rock temperature changes related to local mining activities and seasonal temperature changes. This data indicates that warming of the rock face underground is affected within only a few metres of the mine openings during the warm summer months. It is important to note that after the completion of placing contaminated soils underground in 2004, all of the entrances to the mine will be sealed preventing any air flow in the mine so that the warming effect by air during the summer months will no longer be a factor.

c) Performance of Backfill – as indicated earlier in this report, the mine utilized a water/waste rock backfill to increase the stability of most stopes once mining had been completed. It was important from an operational stand point to determine how quickly the water/rock backfill froze as it would not provide adequate strength until this occurred. Thermistors were placed into this fill and into the adjacent pillars to confirm that the fill had frozen and that the surrounding ground did not thaw as a result. Monitoring of the fill indicated that up to two years was required for fill in large stopes to completely freeze. An individual stope could have upwards of 110,000 tonnes of fill placed that would be frozen as a result of the surrounding ground temperatures. The thermal mass of the surrounding ground is immense. Disturbing the thermal regime by placing materials in the mine is very localized and temporary.

Given over 20 years experience monitoring temperatures in and around the mine during on-going mining and backfilling of openings has clearly demonstrated that there are no concerns with the thawing of the ground at that depth. There is no need to verify this by additional monitoring using thermistors.

5.2. Thermal Regime and Ice Conditions in the Overburden

Temperature monitoring of surface and near surface ground temperatures has been conducted at Polaris for a number of years. Near surface permafrost conditions are a consideration for civil structures at the site such as Garrow Lake Dam and the Operational Landfill. Starting in 2004, monitoring of the Little Red Dog Quarry Landfill will be initiated and continue until 2011. Monitoring of the Garrow Lake dam and the Operational Landfill clearly demonstrates that large quantities of fill placed on surface quickly freeze and within a short period of time, only a relatively shallow active layer (less than 1.5 metres deep) temporarily thaws during the summer season. The effects of global warming were reviewed to determine the effect in the thickening of the active layer related to the landfill cover designs proposed in the DRP. Conservative forecasts indicate on slight increases in the thickness of the active layer (refer to the Polaris Mine Decommissioning and Reclamation Plan, Volume 2, Landfill Closure Report).

The rate of subsidence in the sinkhole area is expected to continue at a decreasing rate over the next few years. Past experience has shown that water pooling over this area during the summer months can infiltrate into new surface cracks caused by ongoing settlement. The depth that this water penetrates the strata overlying the mine has not been investigated. The immense thermal mass of the frozen overburden and bedrock freezes the water before it penetrates into the mine workings (refer to the Conclusion section of the memorandum prepared by Trevor Feduniak titled ‘Subsidence Analysis’ attached in Appendix D). Once the subsidence in the sinkhole area slows, there will be no new surface cracking and no new conduits for water to flow into the overburden will be created. Existing cracks will be ice filled in a self healing process. Any water penetrating cracks in the near surface strata adds to the strength of the strata as it freezes (a ‘healing’ process).

5.3. Impact of Surface Water Ponding on Thermal Regime and Permafrost Stability.

During the DIAND site inspection in September 2003, the option of allowing water to pond rather than placing fill into the Sinkhole was discussed as a method of filling any holes caused by subsidence of the sinkhole. It is felt that making this decision is premature at this time until further subsidence data can be collected in 2004.

6. Assessment of Physical Stability and Protection Required

The following is a listing of the types of conditions that if formed by the subsidence referred to as the 'sinkhole' area, could represent a hazard to the public and/or wildlife:

1. If the surface of the ground is unstable it could present a danger to the public/wildlife walking or the public operating motorized equipment over the sinkhole area. The potential danger is that subsidence of the bedrock continues to occur while the overlying soils form a bridge overtop of it. If the activities of people or wildlife were to break the bridging, then the soils could potentially suddenly slump into the underlying void causing harm to those overtop of this area.
   - This area has in the order of 10 to 20 metres of overburden soils overlying the bedrock. During the initial period of active subsidence in this area, heavy mobile equipment has operated adjacent to it and over top of it, placing fill and re-contouring the area without incident. There has never been any evidence of this occurring.
   - As the rate of subsidence decreases, the risk is further reduced as the ground surface has more time to react (i.e. settle).
   - The potential for unexpected, sudden subsidence caused by people or wildlife walking over this area or from operating light motorized equipment is considered remote based on previous experience (at Polaris as well as at other Teck Cominco mine sites) although one can not say categorically that it would never occur.

2. If the slope of the ground is excessively steep, this could represent an unexpected hazard to persons operating motorized equipment in the area. Also at some point, if the slopes are too steep, wildlife could also become trapped in the sinkhole area:
   - The slope of the ground in the area is relatively smooth with low slopes so that there is no concern of thus type of problems at the current time.
   - While there was no survey conducted during 2003, visual observations did not identify localized movement in the Sinkhole area.

- The area will be inspected (and surveyed) in 2004 and if significant subsidence has occurred by that time, adjacent slopes could be re-contoured as there will still equipment available on site.
- Beyond 2004, the rate of subsidence is expected to be decreasing so that the potential for steep slopes forming is a decreasing risk. A survey review in 2004 will be required to confirm this and to forecast future subsidence rates.

3. If the surface contours are altered so that water collects in the low areas creating a pond, there is a potential that the public and/or wildlife could drown in the water.
   - This is not considered a hazard any more or less than any other pond or lake on the island.
   - If ponding of water were to occur, it is not anticipated that any action would be required from a public/wildlife safety perspective.

7. Recommendations for On-going Assessment and Monitoring

As previously discussed the precise surveying of subsidence monitoring stations installed in the surface bedrock were established to provide information for mine planning and design activities. Vertical subsidence movements as little as 0.01 metres were monitored. Now that mining has been completed, the need for this level of accuracy of monitoring is not required. The purpose of monitoring subsidence is now one of public safety which requires a much coarser level of survey accuracy. Once the 2004 precise survey has been completed, subsidence rate curves will be updated and a forecast of future subsidence trends will be more definitive.

Inspection of the mine area will be conducted to determine if there are any new tension cracks in the soils. If there are, these will be surveyed and plotted onto the surface plans to identify any trends indicating changes in the subsidence boundaries. This monitoring can be conducted post 2004 as part of the annual site inspections.

In preparation for longer term monitoring of the site, a topographical survey was completed in 2003. Apart from a final precise survey of the remaining subsidence monitoring stations in 2004, future subsidence monitoring should consist of topographical monitoring of the soil surface to identify potential changes of drainage patterns and for public safety (i.e. settlement causing hazards to the public riding on quads or snow mobiles) purposes. A copy of this survey is included in Appendix E. As with monitoring of the tension cracks, it is recommended that some key locations are surveyed as part of the annual site inspections.

Yours truly,

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APPENDIX A

1. Time / Subsidence Relationships – Subsidence Engineers' Handbook, National Coal Board, 1975

2. Time – Subsidence Curve – Subsidence Engineers' Handbook, National Coal Board, 1975

Subsidence Engineers' Handbook

NCB

National Coal Board
Mining Department 1975

Time/Subsidence Relationship

Permanent repairs should not normally be carried out if a damaged property is due to be undermined again in another seam or by another face in the same seam lying within the critical area. First-aid repairs are often satisfactory for short periods, but discretion is necessary when long intervals are likely to occur between successive excavations or when the property is going to be in an unstable state over a long period.

If the stability of a building is affected and the site is required for development, an estimate should be made of the earliest date when building could safely commence. This should be done by plotting a development curve or a time/subsidence curve and usually ignoring any possible residual subsidence period, which in any case would probably be covered by the site preparation period.

The nomogram in Fig. 33 may be used for this estimation of total time for a single face working. Starting at the depth line, the limit angle is next chosen and this gives the diameter of the critical area (2R). The value for the rate of advance of the face is next intersected to give the total time on the right-hand half of the base line. In the example the broken line shows that for a seam 450 m deep and an angle of draw of 35°, the width of the critical area is 630 m. With a face advance of 1400 m per year the time taken to work the panel is about 6 months.

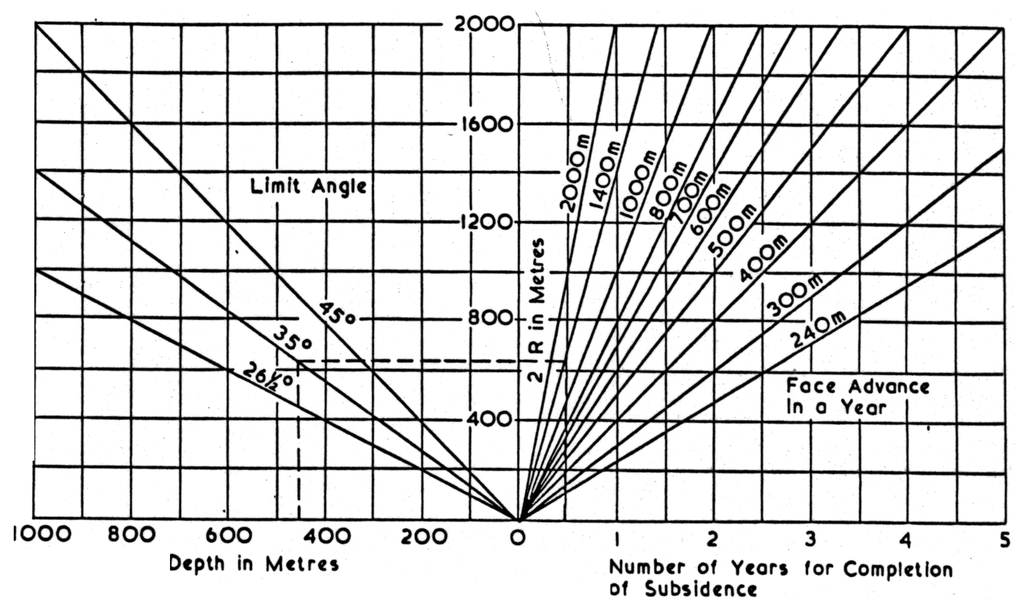
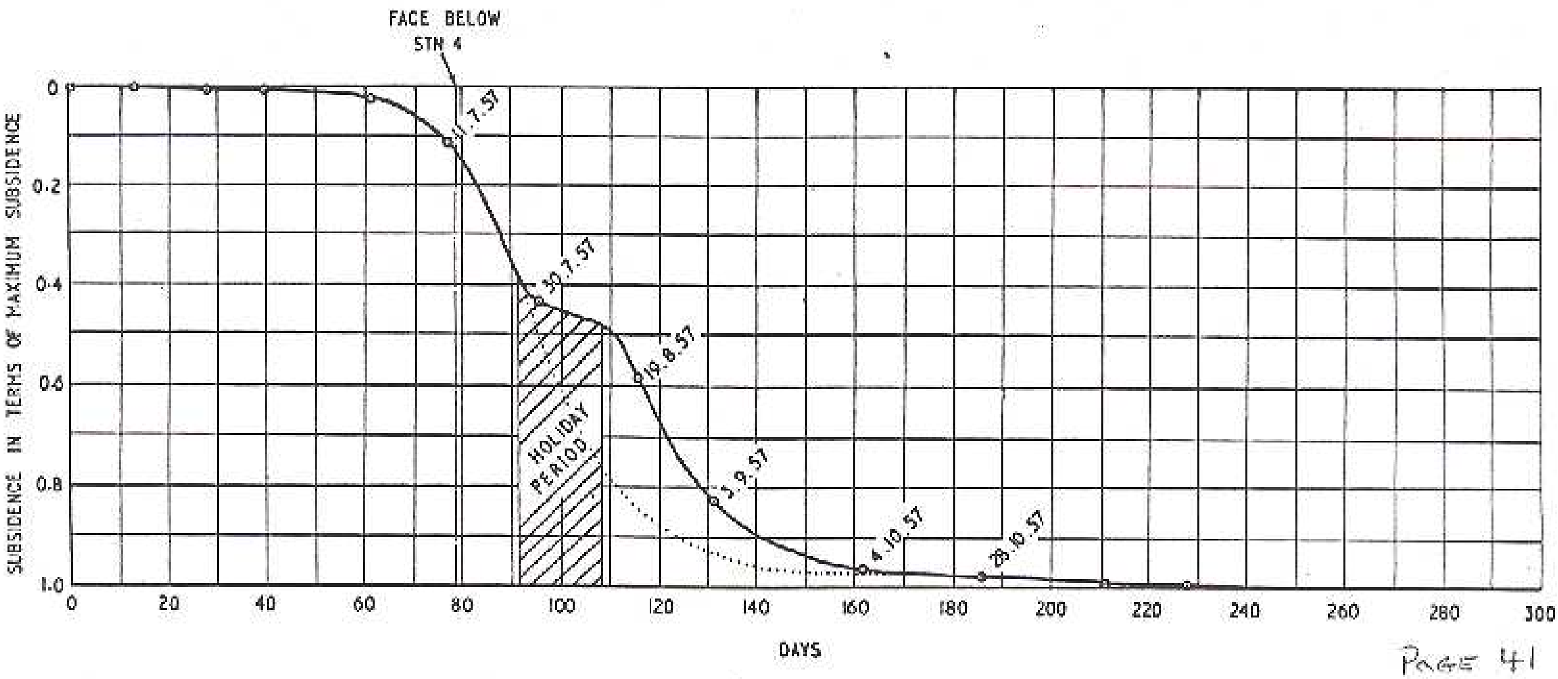


Fig. 33 Nomogram for estimating duration of subsidence.



PAGE 41

Fig. 30 National Case No. 9—time-subsidence curve.

<u>APPENDIX B</u>

1. **Plan of Subsidence Monitoring Stations and Outline of Mine Workings**

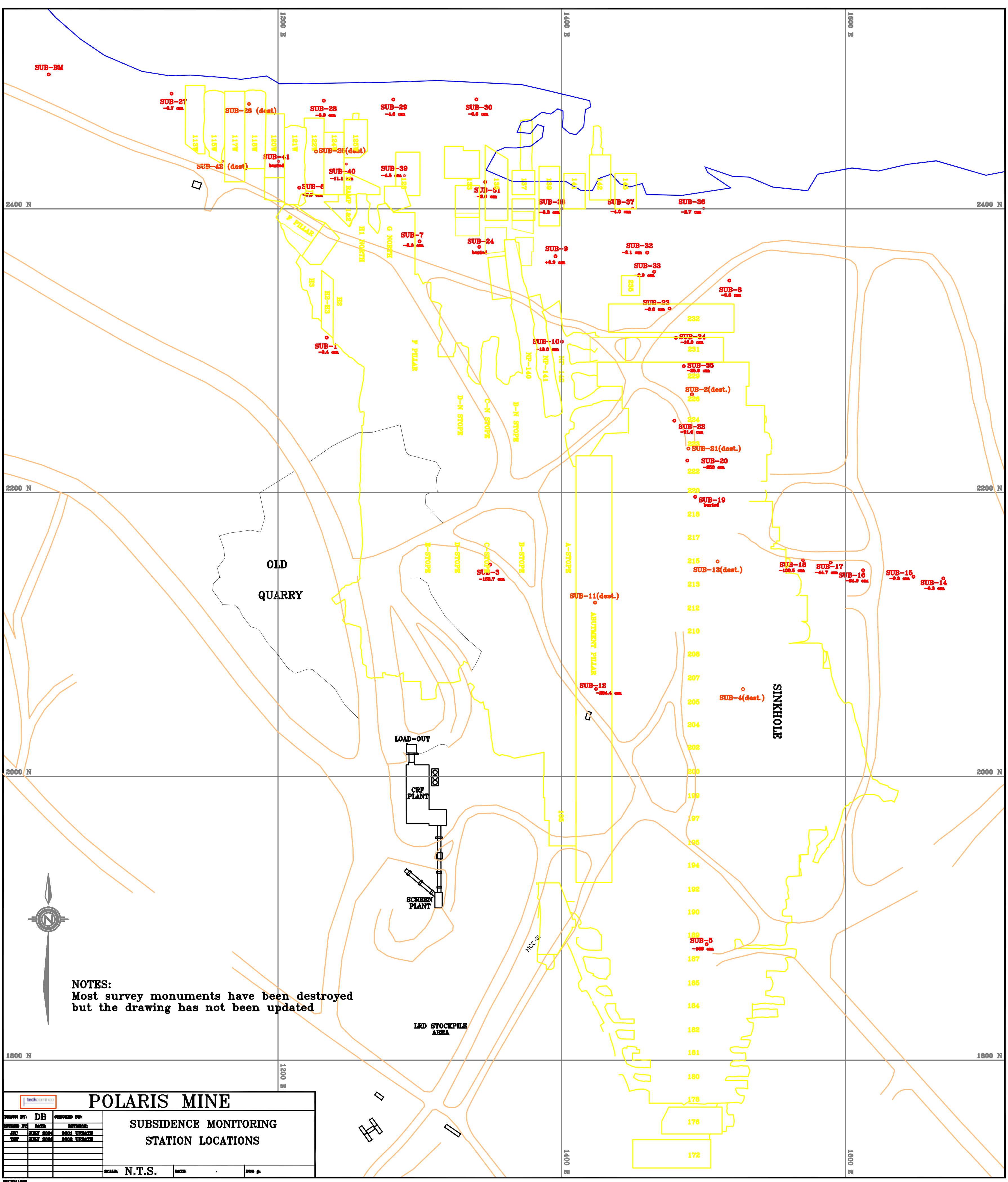
2. **Graph of Surface Subsidence Versus Time Along Section 1500 E**

3. **Graph of Surface Subsidence Versus Time for 2150 N Section – West**

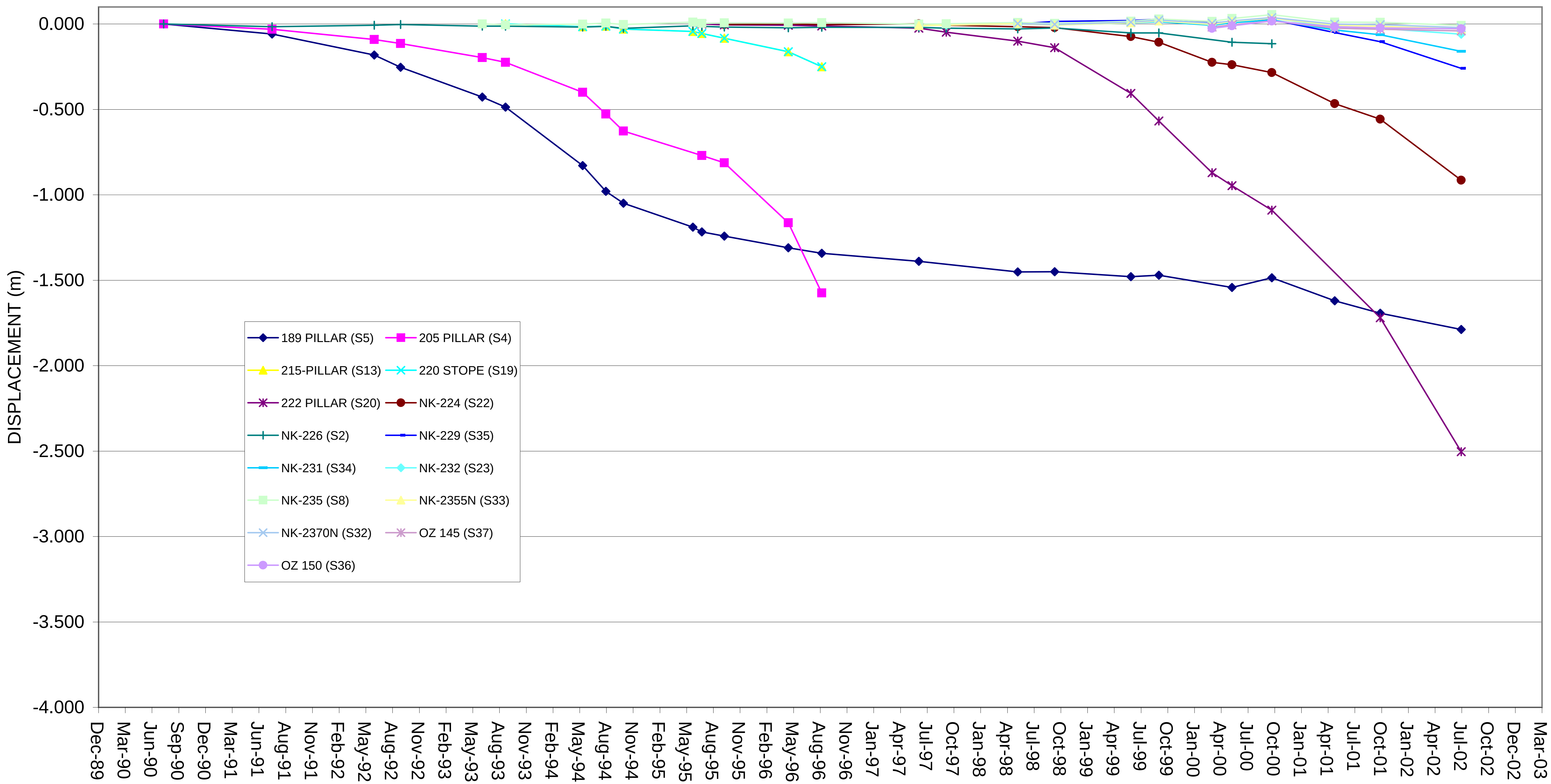
4. **Graph of Surface Subsidence Versus Time for 2150 Section – East**

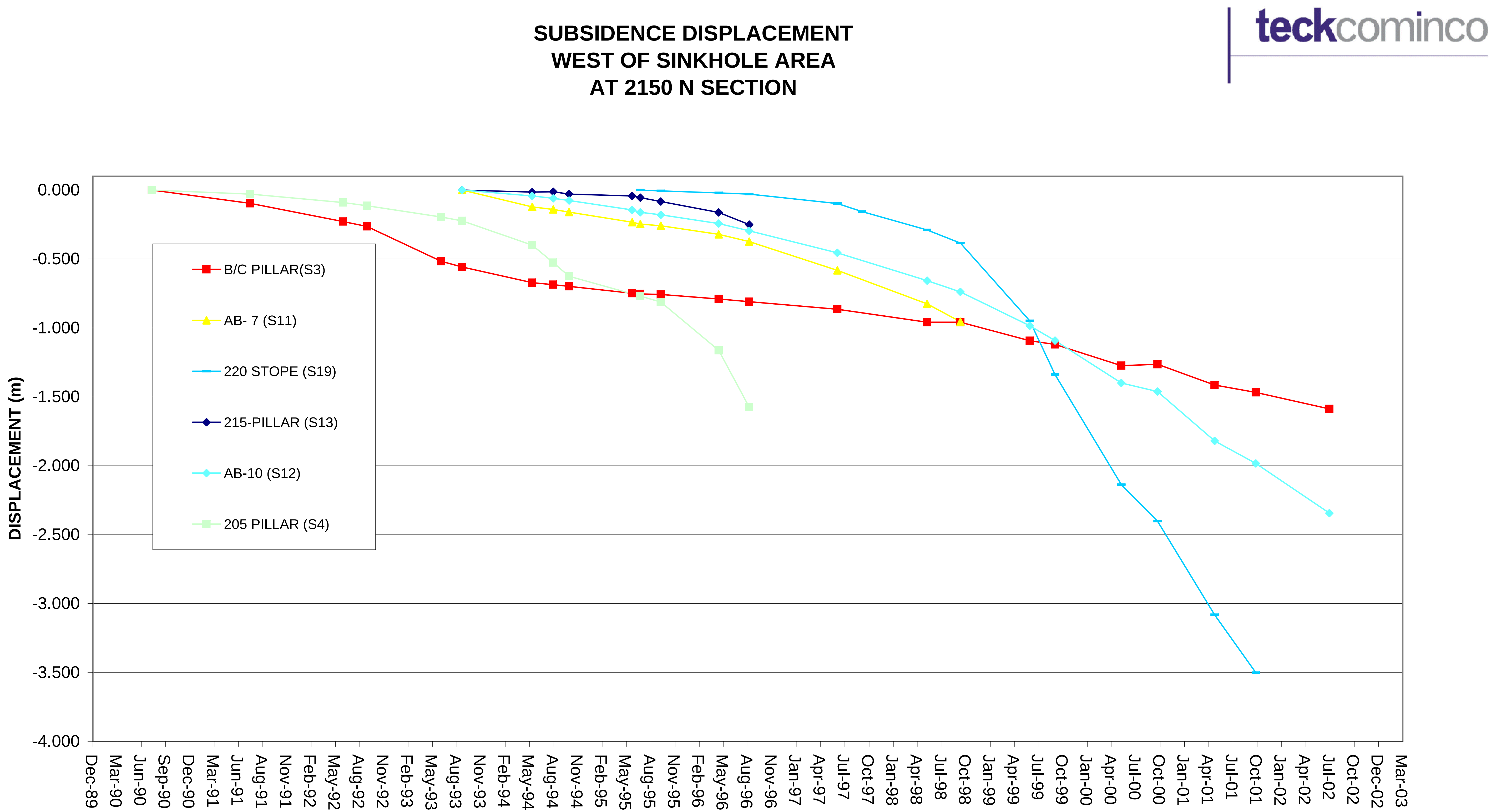
5. **Cross Section Titled '2150 Section Through Sinkhole Area'**

6. **Plan View of Mine Area Identifying Locations of Surface Tension Cracks**


1200 E
1400 E
1600 E
2400 N
2200 N
2000 N
1800 N
SUB-BM
SUB-27
SUB-26 (dest)
SUB-28
SUB-29
SUB-30
SUB-41
SUB-25 (dest)
SUB-42 (dest)
SUB-40
SUB-39
SUB-6
SUB-31
SUB-38
SUB-37
SUB-36
SUB-7
SUB-24
SUB-9
SUB-32
SUB-33
SUB-8
SUB-23
SUB-34
SUB-1
SUB-10
SUB-35
SUB-2(dest.)
SUB-22
SUB-21(dest.)
SUB-20
SUB-19
SUB-13(dest.)
SUB-18
SUB-17
SUB-16
SUB-15
SUB-14
SUB-3
SUB-11(dest.)
SUB-12
SUB-4(dest.)
SUB-5
OLD
QUARRY
SINKHOLE
LOAD-OUT
CRF PLANT
SCREEN PLANT
LRD STOCKPILE AREA
MCC-III
NOTES:
Most survey monuments have been destroyed
but the drawing has not been updated
POLARIS MINE
SUBSIDENCE MONITORING
STATION LOCATIONS
DB
N.T.S.

SUBSIDENCE DISPLACEMENT
NORTH - SOUTH THROUGH SINKHOLE AREA
AT 1500 E SECTION





SUBSIDENCE DISPLACEMENT
WEST OF SINKHOLE AREA
AT 2150 N SECTION
teckcominco
DISPLACEMENT (m)
0.000
-0.500
-1.000
-1.500
-2.000
-2.500
-3.000
-3.500
-4.000
B/C PILLAR(S3)
AB- 7 (S11)
220 STOPE (S19)
215-PILLAR (S13)
AB-10 (S12)
205 PILLAR (S4)
Dec-89
Mar-90
Jun-90
Sep-90
Dec-90
Mar-91
Jun-91
Aug-91
Nov-91
Feb-92
May-92
Aug-92
Nov-92
Feb-93
May-93
Aug-93
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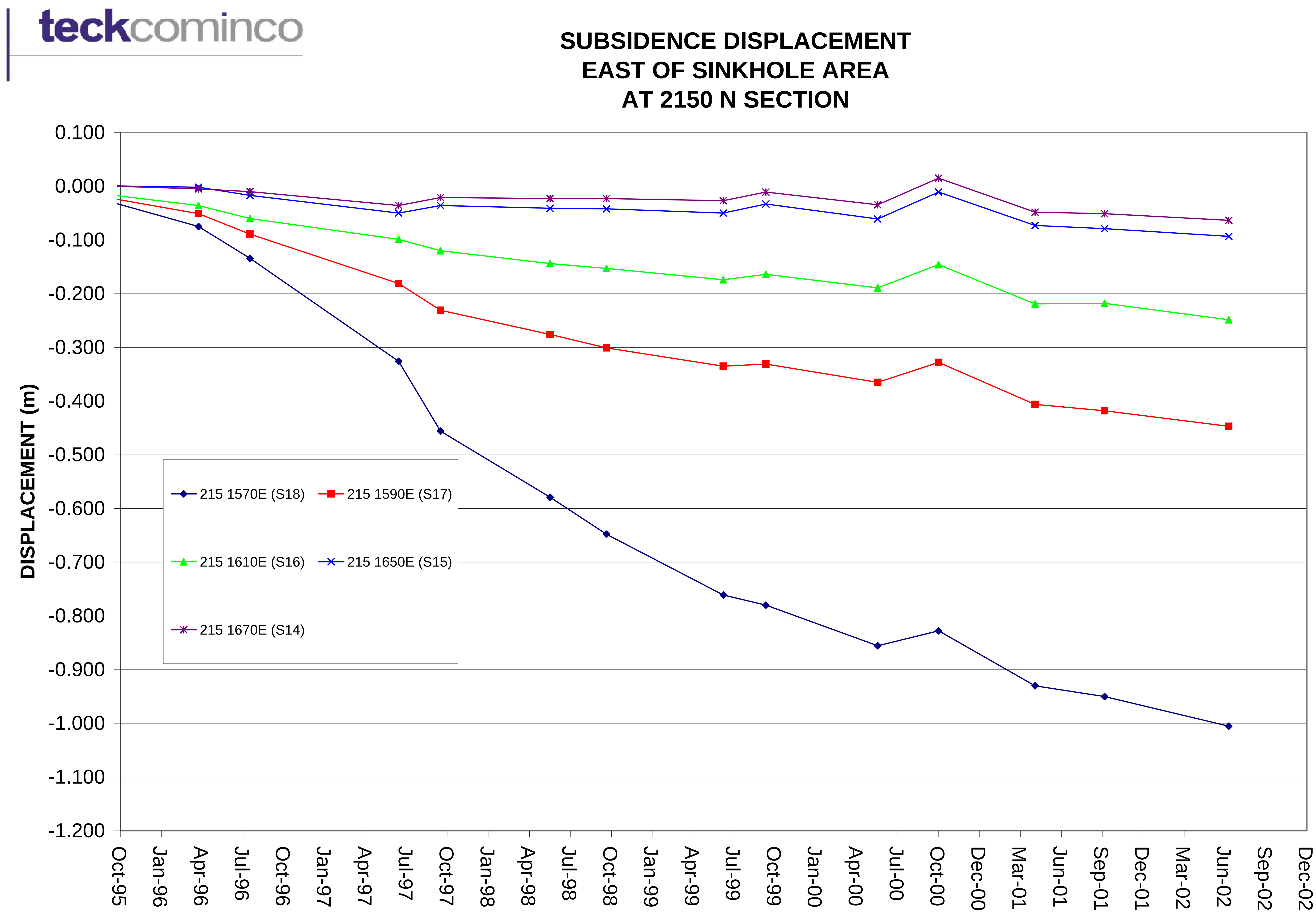
Apr-02
Jul-02
Oct-02
Dec-02
Mar-03



teckcominco
SUBSIDENCE DISPLACEMENT
EAST OF SINKHOLE AREA
AT 2150 N SECTION
DISPLACEMENT (m)
0.100
0.000
-0.100
-0.200
-0.300
-0.400
-0.500
-0.600
-0.700
-0.800
-0.900
-1.000
-1.100
-1.200
215 1570E (S18)
215 1590E (S17)
215 1610E (S16)
215 1650E (S15)
215 1670E (S14)
Oct-95
Jan-96
Apr-96
Jul-96
Oct-96
Jan-97
Apr-97
Jul-97
Oct-97
Jan-98
Apr-98
Jul-98
Oct-98
Jan-99
Apr-99
Jul-99
Oct-99
Jan-00
Apr-00
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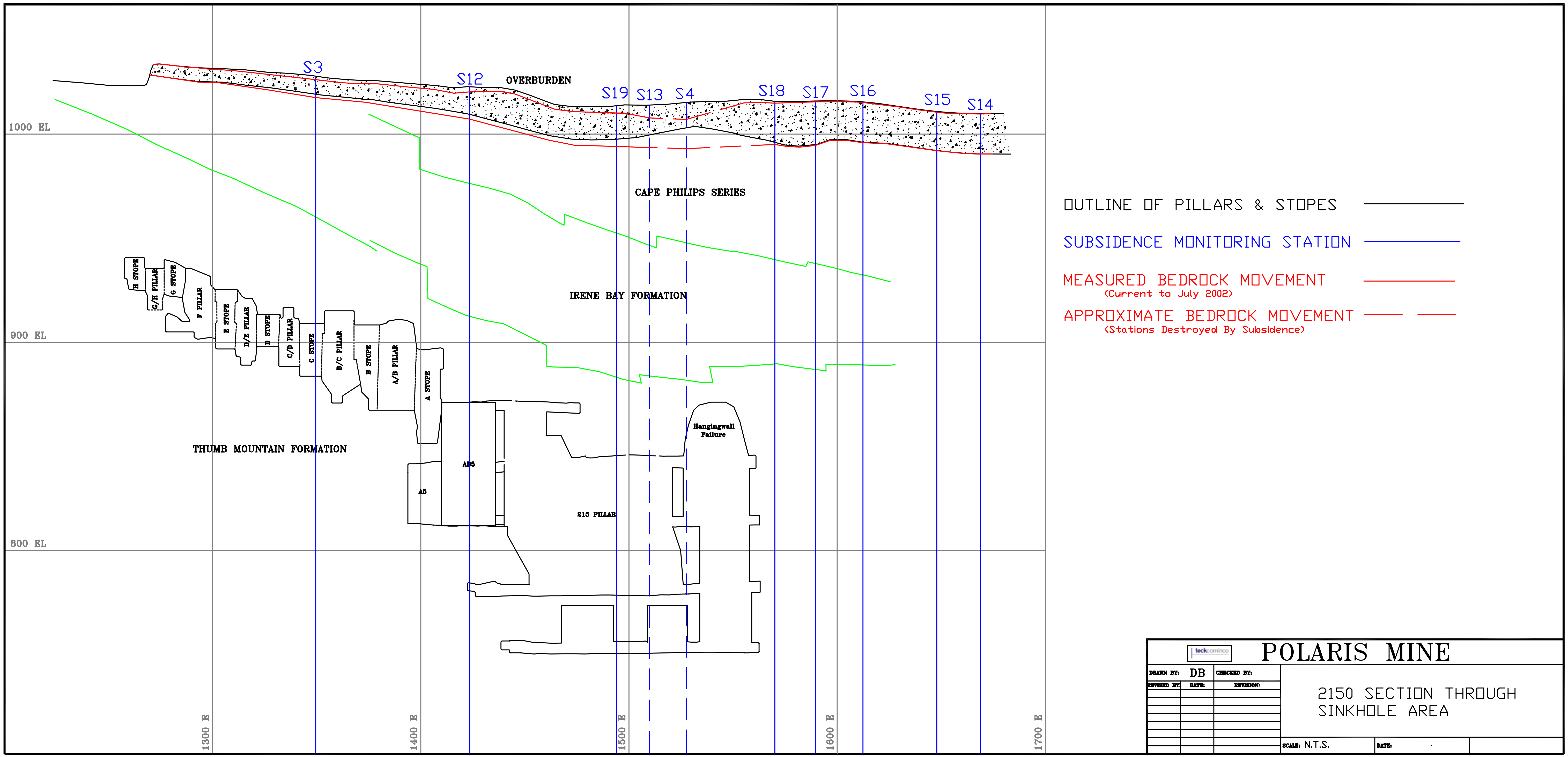
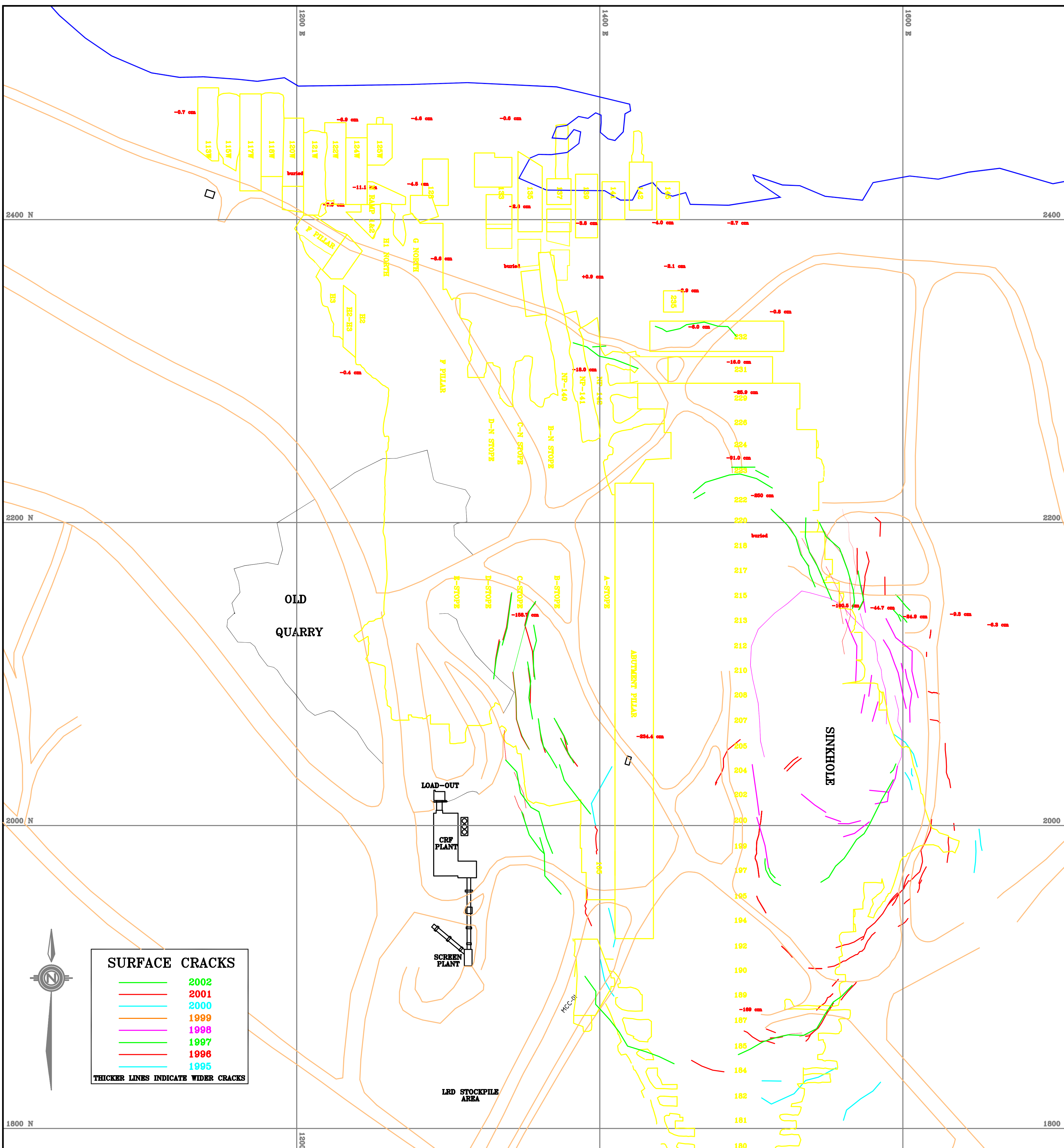
Mar-02
Jun-02
Sep-02
Dec-02



S3
S12
OVERBURDEN
S19
S13
S4
S18
S17
S16
S15
S14
1000 EL
CAPE PHILIPS SERIES
IRENE BAY FORMATION
900 EL
H STOPE
G/H PILLAR
G STOPE
F PILLAR
E STOPE
D/E PILLAR
D STOPE
C/D PILLAR
C STOPE
B/C PILLAR
B STOPE
A/B PILLAR
A STOPE
Hangingwall Failure
THUMB MOUNTAIN FORMATION
AB5
A5
215 PILLAR
800 EL
1300 E
1400 E
1500 E
1600 E
1700 E
OUTLINE OF PILLARS & STOPES
SUBSIDENCE MONITORING STATION
MEASURED BEDROCK MOVEMENT
(Current to July 2002)
APPROXIMATE BEDROCK MOVEMENT
(Stations Destroyed By Subsidence)
POLARIS MINE
DRAWN BY: DB
CHECKED BY:
REVISED BY:
DATE:
REVISION:
2150 SECTION THROUGH SINKHOLE AREA
SCALE: N.T.S.
DATE:



POLARIS MINE

SURFACE TENSION CRACKS

DRAWN BY:	DB	CHECKED BY:
REVISED BY:	DATE:	REVISION:
JJC	JULY 2001	2001 UPDATE
TSF	JULY 2002	2002 UPDATE

SCALE: N.T.S. DATE: . DWG #:

FILENAME

APPENDIX C

1. **Excerpts from Report on ‘Site visit to Cominco Ltd.’s Polaris Mine’ by Golder Associates Ltd., February 1994**

2. **Excerpts from Report on ‘Visit to Polaris Mine November and December 1995’ by Golder Associates Ltd., May 31, 1996**

Golder Associates Ltd.

500 - 4260 Still Creek Drive
Burnaby, British Columbia, Canada V5C 6C6
Telephone (604) 298-6623
Fax (604) 298-5253

Golder Associates

REPORT ON

SITE VISIT
TO
COMINCO LTD.'S
POLARIS MINE

1994

Submitted to:

Cominco Ltd.
Polaris Operations
Polaris, NWT
X0E 0Y0

DISTRIBUTION:

3 copies -	Cominco Ltd. Little Cornwallis Island, NWT
3 copies -	Cominco Ltd. Vancouver, B.C.
2 copies -	Golder Associates Ltd. Vancouver, B.C.

February 1994 932-1510

- Movements on the 880 level were difficult to interpret due to erratic results.

Due to problems with maintaining convergence stations, the program was discontinued and is being replaced by a qualitative visual monitoring program.

4.3 Subsidence

Surface subsidence measurements continue over the Keel and Panhandle Zones. In 1993, an additional eight stations were added to the existing five. The locations of the monitoring points are shown in Figure 1. The new stations will provide information above the abutment pillar and northern stoping areas

Two measurements have been made since the December 1992 visit. Only three stations, B/C, 189 and 205 are showing significant movement. The movement recorded at these three stations is summarized in Table 1 and graphed in Figure 2.

Table 1

Summary of Subsidence 1990-1993 for B/C, 189 and 205 Stations

Station	Total Movement (mm)	1990-1991 Movement (mm)	1991-1992 Movement (mm)	1992-1993 Movement (mm)
B/C	558	97	167	294
189	486	58	195	233
205	224	30	84	110

Table 1 shows a yearly trend of increasing subsidence at the B/C and 189 stations. This corresponds to the nearly 100% extraction of the ore beneath these stations. The station above 205 is beginning to show the effects of the northward advance of the mining front.

4.4 Surface Extensometer

The two surface extensometer installations adjacent to the B/C and 189 surface subsidence stations have been monitored since 1988. Plots of cumulative movement of these two extensometers are presented in Figures 3 and 4. Total movement recorded for the B/C extensometer is 19 millimetres and for the 189 extensometer, 77 millimetres. These values are approximately 4% and 16% of total subsidence measured at that point.

Both extensometers record some minor separation at 40-60 metres depth. The disparity between the measured surface subsidence and the movement indicated by the extensometers indicates that the hangingwall may be moving as a relatively cohesive mass (or as a series of large blocks).

5.0 KEEL PILLAR MINING

Pillar mining in the Keel Zone has rapidly become the primary source of ore at the Polaris Mine. Pillar ore now forms 72% of production tonnes versus 14% in 1988.

5.1 Review of Pillar Mining Experience

A considerable amount of information has been collected on the pillar mining carried out to date. This information was reviewed and will be applied to the analysis of future pillar mining operations.

5.1.1 Pillar Recovery

Table 2 presents experience with pillar mining to date. The percentage extraction of both tonnes and metal are included as well as comments on stability related issues.

Table 2

Summary of Keel Pillar Mining Experience

Pillar	% Tonnage Recovery	% Metal Recovery	Comments
180	-	60	Backfill problems
182	-	100	Back failure in Stage II
185	85	75	Backfill problems in Stage I, back failure in Stages II and III
189	105	95	
192	92	85	Backfill problems in Stage I Back failure in Stage IV
195 *	100	85	Back/hangingwall failure in Stage III, 90 metre high fill exposure
199 *	72	70	Significant ore loss in Stages I and III. Major back/hangingwall failure in Stage III
202-I	88	81	
202-II	102	99	Major failure of 820/850 block in Stage II

* Pillar not complete

The first pillars to be recovered tended to encounter problems with fill wall stability. However, with improved fill quality these problems appear to be resolved (for the fill wall dimensions currently being exposed). Recently there has been an increased incidence of back failures. These failures appear, in part, to be influenced by the various faults that traverse the orebody.

Recovered metal range from a low of 60% to a high of 100% with an average of 80%. Recovered tons range from a low of 72% to a high of 105%. The ratio of % metal to % tonnage is an average 0.92.

5.1.2 Backfill Performance

Backfill performance during pillar extraction is summarized in Table 3

Table 3

Summary of Exposed Backfill Stability*

Pillar	Stage	Maximum Height of Backfill Exposure (m)	Maximum E-W Span of Backfill (m)	Comments
185	II	50	24	
189	II	66	34	
192	I	65	33	Fail
192	II	65	25	
195	II	69	25	
195	III	71	26	
195	IV	95	22	
199	I	80	37	Fail
199	II	83	10	
199	III	87	28	Fail
199	IV	95	25	
202	I	51	26	

* Note: This table does not include early failures that were attributed to poor quality backfill.

Backfill stability would appear to be controlled by the following factors:

- The content and distribution of water in the fill;
- The time allowed for the fill to freeze;
- The height and width of exposed fill wall;

- The length of time between exposing a fill wall and backfilling of the pillar;

A reasonable amount of information is available on the water content and distribution within specific fill blocks. Where low moisture fill is anticipated, a "skin" of ore may be left to reduce the potential for fill dilution. The time required for the fill to freeze is also relatively well established and blocks are scheduled to allow sufficient time for ice formation. Stable exposure heights and widths have yet to be established. The data in the above table and in Figure 5 would indicate that the exposed width may play as big a role as the exposed height. This may be a result of the surfaces formed during fill deposition as shown in Figure 5.

5.2 Current Status of Pillar Mining in the Keel Zone

Active pillars in the Keel Zone are:

- 192 Stage III
  - Good recovery, no major problems to date.
- 195 Stage V
  - Mining block adjacent to major back failure, cable bolted back next to failure in good condition.

  199 Stage IV
  - Mining block adjacent to major back failure, some drilling problems on 850 level.
- 202 Stage II
  - Good recovery in 760/790 block, severe problems in 820/850 block with large ground displacements (see Section 5.3).
- 205 Stage I
  - Initial block development in place at eastern end.

5.3 202 Pillar Mining

The following outlines the sequence of events in mining of Stage II:

Mine and fill 760 to 790 level;

- Observed horizontal cracking and difficulty in maintaining blasthole integrity;

Mass blast 820 to 790 level;

- Continuous movement of the 850 to 820 block after the mass blast.

The block is bounded on the west by a steeply dipping structure and appears to be bounded by a similar structure on the eastern side. The top of the block is between 6 and 12 metres above the 850 Level. Figure 6 shows the approximate size of the block and the associated structures.

Total downward movement of the block is in excess of 3.5 metres on the 850 level (see Photographs 14 and 15). The block appears to be moving as a large mass and not rubblizing internally. **It is important to note that the total void space above the level must be equal to 3.5 metres.**

Important considerations in developing a plan to recover the block are as follows:

- 17,000 tonnes of ore from the 820/790 block remains on the 790 level;
- The 35,000 tonnes of ore in the 820/850 block is primarily from the high grade P1 horizon;
- Material above and to the east of the failure will be low grade or barren rock;
- The ultimate hangingwall on the 880 level has not been cable bolted;
- Significant back failures had occurred in both the 195 and 199 pillars.

From a geotechnical point of view it is important that any mining plan incorporate the following:

- Test holes towards the 199 pillar to establish the north-south extent of the back failure;
- Cable bolt the ultimate hangingwall on the 880 Level and, dependent upon the condition of the block below 880, cable bolt downwards to secure the ground above the sliding block. It must be recognized that due to the magnitude of the movements which have occurred that cable bolting may not be successful;
- Ensure that the drawpoint on 790 level is kept full to minimize the impact of any potential air blast should the sliding block fail suddenly;
- Development of a plan to fill the void should it become necessary;
- If an option is to mine Block III to induce failure of Block II then the size of Block III should be kept to minimum. This will reduce the size of the backfill exposure when both blocks are empty.

In evaluating a recovery plan it is very important to consider the risks associated with the plan and the consequences of both success and failure. The problem is 202 cannot be analyzed in isolation from the other stoping areas.

A number of controls exist that influence the course of action. These include:

- backfill disrupts float circuit and causes metal losses

- hangingwall dilution can slow the mill, but does not tend to cause metal loss
- the implication of these is that fill failure may be more costly ton for ton than hangingwall failure
- there is little flexibility in the overall extraction sequence (ie. few primary stopes remain that can be used to augment production when disruptions occur)

A number of potential recovery options were discussed. A final plan was developed at a ensuing meeting the week after the site visit.

5.4 General Pillar Mining Comments

5.4.1 Mass Blasting

A number of mass blasts have been undertaken during pillar recovery operations. Mass blasts are only considered when ground movements in the mining block become a potential safety concern or cause significant blasthole stability problems. Mining blocks of up to 40,000 tonnes have been mass blasted with large quantities of explosives assigned to a limited number of delays. Often, the blasts have had only minor void space.

Mass blasting has both positive and negative results.

Positive

- Efficiency gains through concentrated blasthole loading operations and reduced redrilling potential.
- Good fragmentation potential and therefore efficient mucking operations.

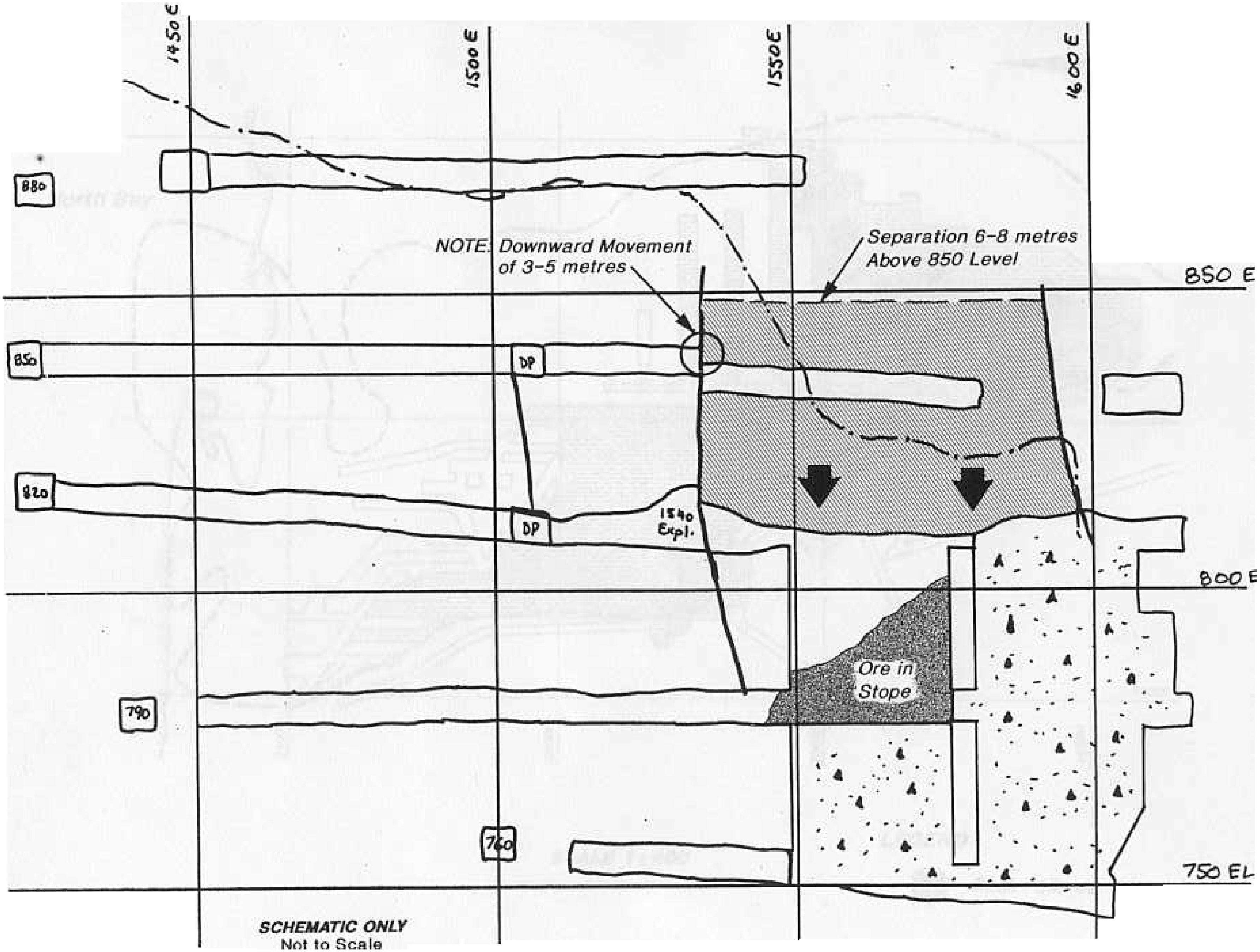
Negative

- High explosive quantities detonating over a short time period and small void ratio will result in high vibration and gas levels. This could potentially result in both new fracture creation, extension and opening existing fractures (blast damage).
- Large blast volumes will result in larger local stress redistribution and potentially more severe stress effects.

5.4.2 Size of Mining Blocks

When stability problems have been either identified through geologic mapping or encountered during pillar extraction, the post pillar location has been changed. In most cases the stage size has been increased to include the problem area.

PROJECT NO DRAWN REVIEWED DATE

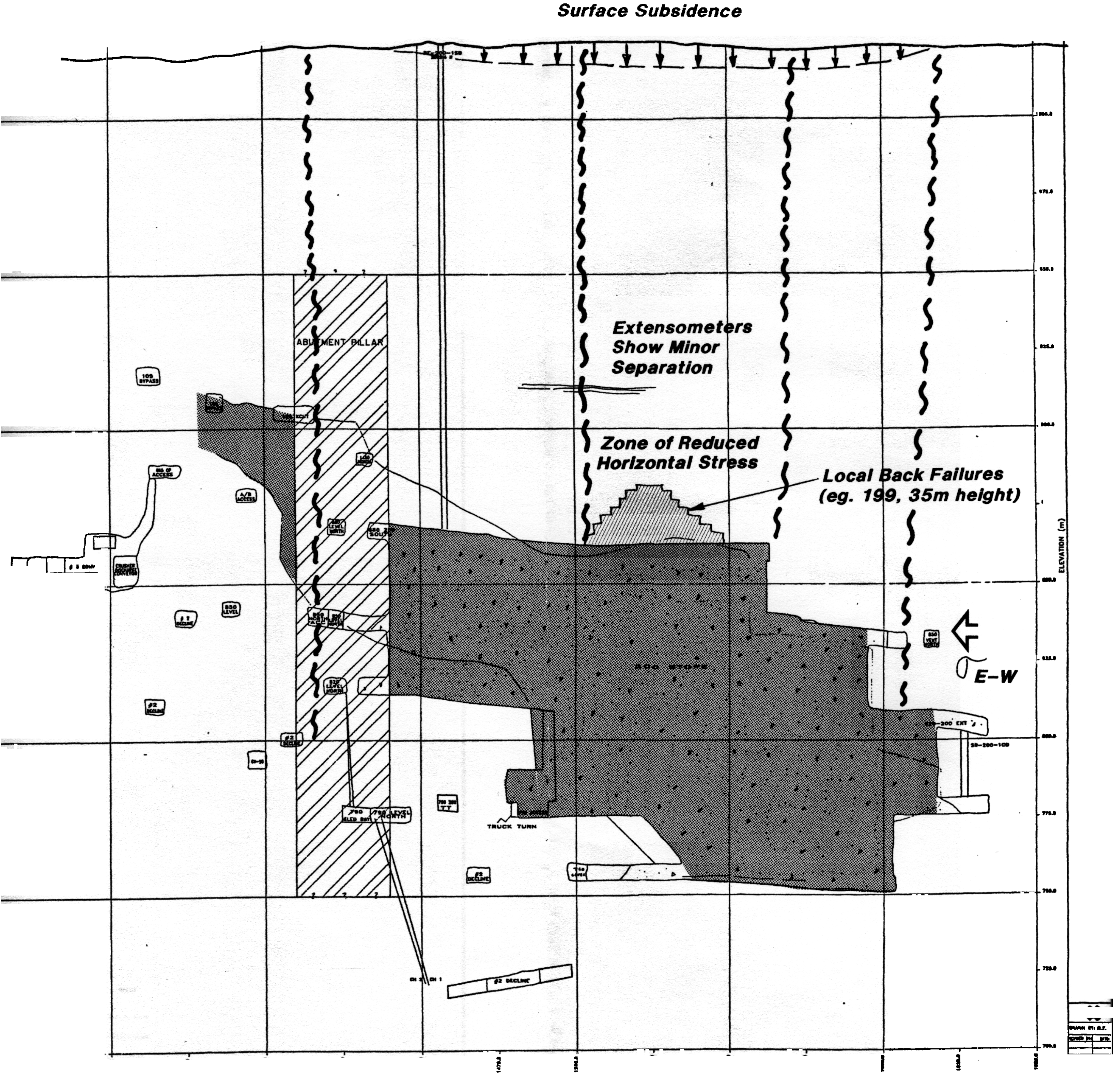


202 PILLAR SECTION

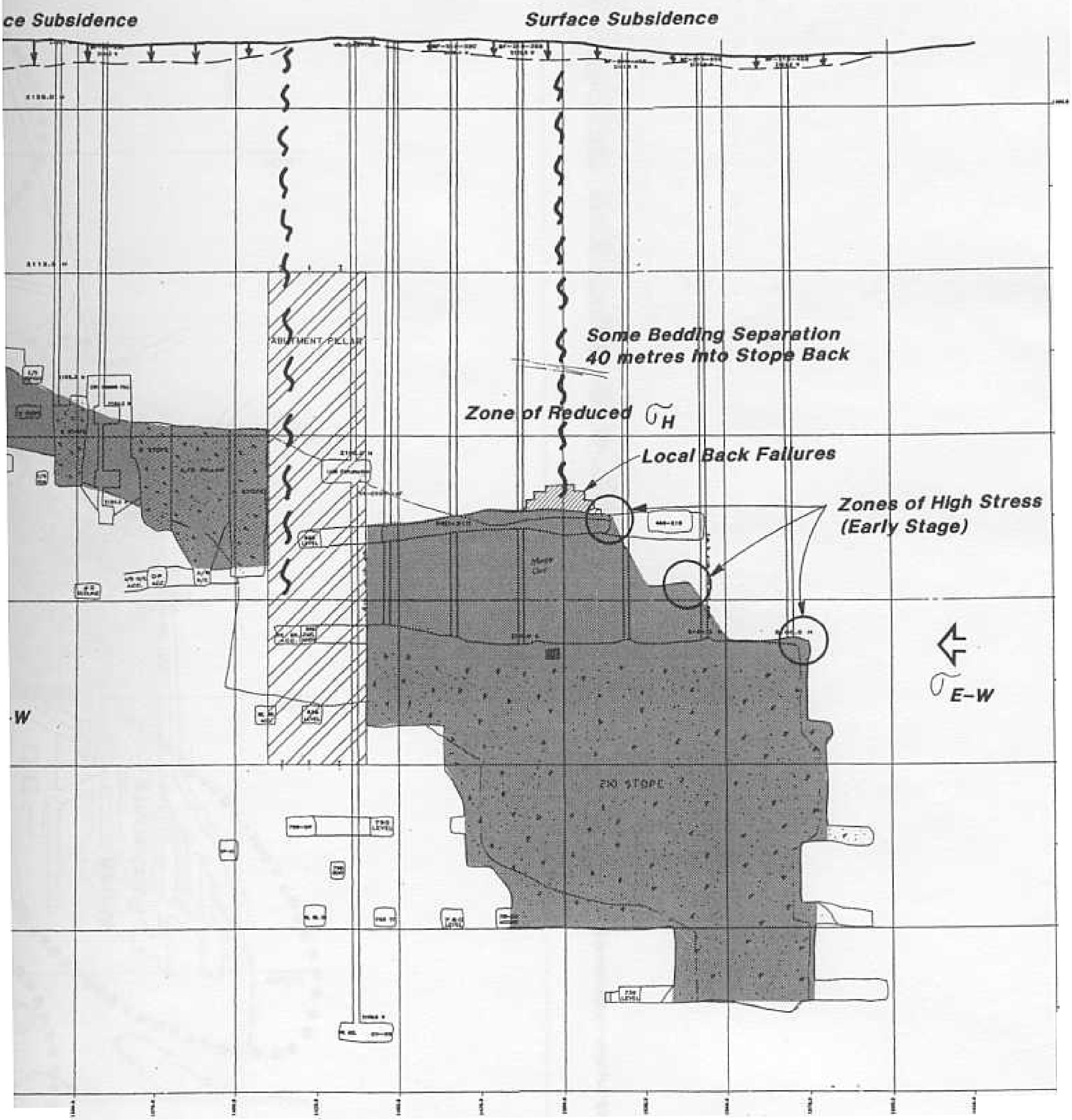
Figure 6

Golder Associates

HANGINGWALL MODEL



HANGINGWALL MODE



Golder Associates Ltd.

500 - 4260 Still Creek Drive
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Fax (604) 298-5253

Golder Associates

REPORT ON

VISIT TO POLARIS MINE
NOVEMBER AND DECEMBER 1995

Submitted to:

Cominco Ltd.
Polaris Operation
Polaris, NWT
X0E 0Y0

DISTRIBUTION:

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May 31, 1996

952-1472

150 Area (see Photograph 28 and 29)

- **850L:** Stringer ore at fringes of main orebody will provide secondary ore source. Ground conditions rated as "fair". Back supported with Split Sets.

Lower S. Keel (see Photograph 30)

- **790L:** Stringer ore, secondary source. Back conditions rated as "good".

General

- Ground conditions do not appear to have substantially changed between the November and December visits. Overall, observed conditions were better than those during 1994 visit. In part, this is a result of more attention to ground support, both quality and timing of installation;

- Poorest observed ground conditions in abutment development were on the 880 mL;

- Poorest observed pillar conditions were along the 850 mL drill sub in the 208 and 212 pillars.

Support

- More screen is being installed. The quality of installation has improved substantially compared to the 1994 visit. In particular, screen is now being placed tight to the walls and back.

- A remote arm for placement of shotcrete has been built in the mine shops (see Photograph 20). Initial trials have indicated a number of problems with operating the arm and the quality of the placed shotcrete;

Subsidence

- Subsidence induced cracks have appeared on surface (see Photographs 44 to 48).

3.0 GROUND CONTROL

3.1 Current Ground Control Problems

Ground problems continue in the Keel Pillar stopes; for example, loss of access in the 208 pillar and wedging in the 212 pillar. These problems include:

hangingwall failures - Irene Bay;

wall slabbing in P1 ore;

wedging all north-south structure;

movement of ground in all stopes.

The cause of these problems has been discussed in previous visit reports. The important issue is, however, that problems will continue to occur as the highest, widest and weakest of the Keel Pillars are now being mined. The problems encountered in 208 can thus be expected in 212. Access will be lost (850/820), wedging will occur and re-drills will be necessary all leading to slower production and lower recovery.

As discussed in the following section, the majority of ground control problems appear to manifest themselves during Stage III stoping. This is due to a number of factors including thicker ore, weaker ground, etc. Improved support will mitigate against some of the problems. Other approaches include faster mining (with the aid of CRF) or a change in stage size. Observations, made by mine staff, that ground problems increase if a stage remains open for more than about 90 days, underline the benefits of faster mining.

3.2 Stoping Achievements

The mine has maintained a database on a number of key statistics on pillar mining. A review of this database indicates the following:

- Pillar recovery has decreased from approximately 92% of blasthole reserves in 1993 to approximately 82% of blasthole reserves in 1995, Figure 1a;
- Average daily production rates have been very variable (see Figure 1b), ranging from a high of 2,750 tonnes/da to less than 500 tonnes/da. Achievable daily production rates appear to be in the 500 to 750 tonnes/da range (see Figures 1b and 2). Discussions with mine staff indicate that production delays were largely associated with ground control problems;
- Average recoveries by stage were remarkably similar (see Figure 3a). However, the variation in recovery as measured by the co-efficient of variation (standard deviation/mean) clearly demonstrates the substantial risk of not meeting production targets during Stage II and Stage III mining (see Figure 3b);

- A typical section through a Keel pillar is given in Figure 4. This section illustrates that Stage III generally is tallest section and therefore weakest of the overall pillar; closest to the overlying, poor quality, Irene Bay; and contains the highest portion of high grade, weak ore. In addition, loss of access to the 850/820 drill subs leads to production delays due to increased support and poorer fragmentation;

3.3 Subsidence

The following summarises salient events regarding subsidence:

- Subsidence induced cracking has been observed at surface over and adjacent to the Keel mining area. The location of the cracks is shown in Figure 5.

- Surface cracking appears to be closely associated with those areas in the Keel where there has been 100% ore extraction. No cracking has been *observed* over the Panhandle mining area or over partially extracted areas of the Keel. The cracks appear to be located near vertically over the mined out outline on the 850/820 level.

  Surface monitoring shows continuing ground movement (see Figure 6). The maximum *measured* subsidence is approximately 1.25 m and is located over the 189 pillar area.

- Most subsidence monitors are maintaining constant velocity or de-accelerating.

- Analysis by mine staff of the monitoring data suggest an angle of draw of 40°.

- Given the location of the surface cracking, the angle of cave along the east and western sides of the orebody may be about 20° to 30°.

This information will assist in planning the North Keel and Ocean Zones where undue subsidence could lead to water inflow. A number of relationships exist for the prediction of surface subsidence. Unfortunately, these were generally developed for coal mining, where the ratio of depth to mined thickness (coal seam thickness) is high, often 50 or greater. At Polaris, the ore is both shallow and thick, and various coal subsidence formula become difficult to apply.

A recent review by Golder Associates (see Appendix II) found that published information on subsidence over base metal mines was extremely limited and mainly referred to caving. Thus, there is little precedent which can be used to assess future subsidence

(North Keel and Ocean Zone) at Polaris. More or less sole reliance will be on the information currently being gathered and mine derived relationships (assisted, for example, by numerical modelling).

3.4 Support

Improvements continue to be made in ground support practices. These include:

- screening and strapping of walls;
- installation of support prior to changes in ground conditions; and
- substantial reduction in backlog of support installation.

Salient comments are as follows:

Screening in the weak P1 ore should be to the sill. Bolts should be installed at the base of the screen. There may be some operational difficulties with this approach. It will enhance the effectiveness of the screen.

- The shotcrete arm should be modified in order to obtain a better application. Continued experimentation with shotcrete is required.
- The use of Split Set bolts instead of resin bar as a means of wall support has been proposed. From a purely ground control perspective, Split Set bolts can provide effective support. However, it is questionable whether the changes can be economically justified.

3.5 Cemented Rock Fill

The CRF plant is in the process of being commissioned. A number of start-up problems are being experienced which have been exacerbated by the extreme climate at Polaris.

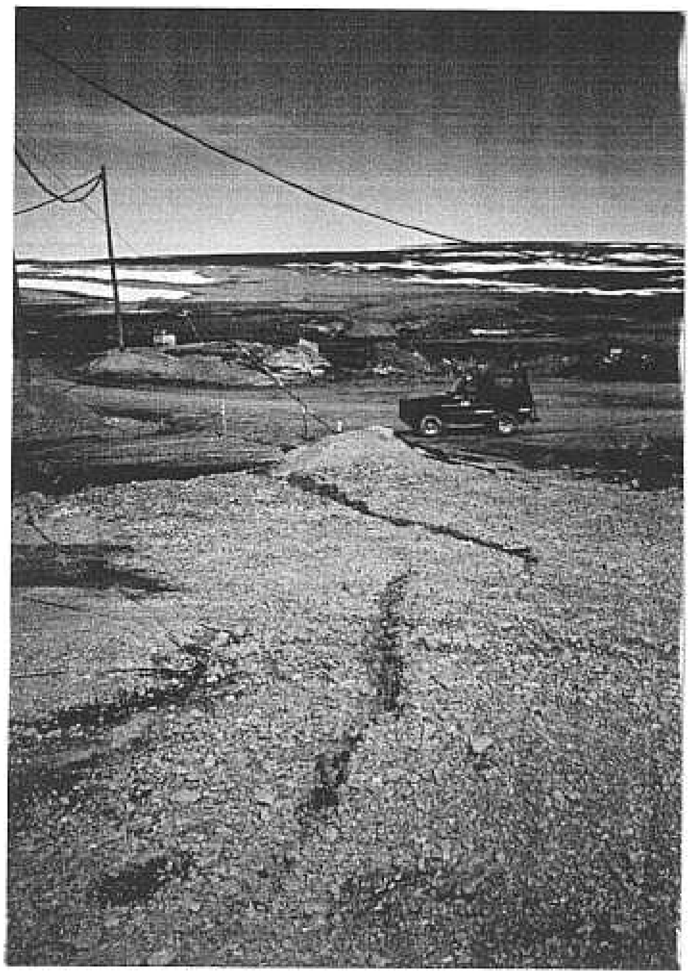
The requirements and opportunities associated with CRF have been discussed in previous review reports and extensively by Polaris staff. The major impact of CRF with be the greater stoping control that can be realised and the faster stope cycle time that can be achieved. It is believed that this will be a significant factor in the mining of the abutment pillar.

PHOTOGRAPH 43

Surface subsidence cracks.

PHOTOGRAPH 44

Surface subsidence cracks.



PHOTOGRAPH 45

Surface subsidence cracks.

PHOTOGRAPH 46

Surface subsidence cracks.

PHOTOGRAPH 47

Surface subsidence cracks.

PHOTOGRAPH 48

Surface subsidence cracks.

APPENDIX D

1. **Polaris Operations Internal memorandum – Trevor Feduniak (Senior Mine Engineer) to John Knapp (Manager) Regarding 'Subsidence Analysis', December 4, 2002**

teckcominco

Memorandum

To: John Knapp – Mine Manager

From: Trevor Feduniak – Senior Mine Engineer

Date: December 4, 2002

Subject: Subsidence Analysis

A surface subsidence analysis was conducted in the fall of 2002.

Measurement Method:

Subsidence at Polaris has been measured since 1990 by surveying the elevation of monitor posts at strategic locations. New posts have been added over the years to provide more detail, most recently in summer 1999. Some attrition has occurred; posts have fallen over due to large amounts of subsidence, and more commonly, posts have been damaged by surface mining activities.

The survey is done using a leveling instrument, using a benchmark post (located far from mining-influenced ground) as a reference. The posts are measured in sequence, and the loop is closed back at the benchmark. Closure error is distributed evenly among all measurements. In an effort to reduce the closure error, or at least distribute it more accurately, the surveys for the past couple of years were done as a series of sub-loops rather than one large loop of all stations. The results indicate that the new method increases our accuracy.

Typically only two measurements per year are practical, due to the leveling instrument's sensitivity to the cold weather and wind. This year, only one level loop was conducted (July). A measurement in September was not possible due to a decrease in manpower, a direct result of the scheduled completion of mining activities at the end of August.

Analysis:

Subsidence at Polaris is defined as a drop of greater than 50mm from original elevation, along with a downward trend observed over several readings. Closure accuracy, natural ground movement from freeze-thaw cycles, and heavy equipment activity nearby prevent us from defining mining-induced subsidence any more closely. It is important to observe the same post over a long period of time before drawing any conclusions.

The posts have been divided into several areas for convenience of analysis:

Sinkhole:

Located over the centre of the Keel mining zone, the Sinkhole has subsided more than 10 meters (a rough estimate). The Keel Zone was 120m top to bottom, and was mined without leaving posts or pillars. Hangingwall ground support in the stopes was limited to 8' swellex. Large-scale hangingwall caves at 880 level were induced in Pillars from 190 to 212, leaving large voids that were impossible to backfill. Tension cracks appeared on surface (see surface drawing for location).

There is comparatively little subsidence data on the Sinkhole area. Monitor posts were installed in ground that was likely already moving, and were destroyed or fell over quickly.

The attached graph of post movement near the sinkhole is at a different scale compared to the other areas to show the larger movements involved.

SUB-20, started to move in 1998, and has dropped 2.50m. We expect the deceleration phase to begin soon, and when this happens, we would probably be able to predict the final level of subsidence in this area.

SUB-22, continuing north, started moving in 1999. Currently down 0.91m, this post is still in the high velocity part of the expected curve.

SUB-3 is located west of the Sinkhole, over the Panhandle zone. This station has been moving at a fairly constant rate since 1994. Panhandle pillars have been mined during that time. Tension cracks in this area are quite pronounced and extend throughout the cement storage pad area. These cracks may be related to Abutment mining and were probably affected by the undercutting of A Stope late last year.

SUB-12 is right over top of the Abutment Pillar. This post showed some movement before Abutment mining began in 1997, but increased in velocity afterwards. It is down 2.34m. This station should enter the deceleration phase in the near future.

SUB-5 is at the south end of the Sinkhole. There has been very little mining at this end of the ore body in recent years, and the graph shows that this post underwent acceleration, rapid movement, and then deceleration. This station is currently at 1.69m, the same as a year ago. No further subsidence to the south is expected after backfilling 185 Stope during the reclamation phase.

Subsidence Front:

Immediately north of the Sinkhole, the Subsidence Front covers the northern limit of ground movement, and beyond that, posts that have just started to move. These posts are above the North Keel Zone, which has been mined differently than the Central Keel. The North Keel is 30m high, deeper underground, and is filled entirely with CRF. The entire hangingwall has been supported with 26’ or 40’ grouted cables.

SUB-23 passed the 50mm limit that defines subsidence, having been displaced 0.06m to date. This station is located directly above 232 Stope, our most northern large tonnage North Keel stope. This stope is completely filled with dry fill and is 80m from the shoreline.

SUB-33, 32, 36, 37 and 8 are located north of SUB-23 and none of these stations are defined as subsidence (>50mm). With little to no extraction in this area and no signs of major acceleration, large-scale subsidence similar to the sinkhole is not expected.

North:

These subsidence posts are located over the Ocean Zone and are beginning to trend downward; however, the movement isn’t characterized as subsidence. The Ocean Zone has been mined 30m high, with 4m rib pillars running north-south and 5m posts running east-west between pillar stages. The entire hangingwall has been supported with 26’ grouted cables. Mining of the Ocean Zone has spanned 4 years with no subsidence. No hanging wall failures have occurred and all stopes were completely dry filled. No major subsidence concerns are anticipated in the Ocean Zone.

Also in the northern end of the orebody is SUB-10. SUB-10 was installed to monitor the northern limit of the Panhandle, which is not part of the Ocean Zone. This station is located over NP-142 stope. This station has entered the high acceleration range due to the recent mining of NP141. This station has been displaced 0.18m and surface tension cracks have appeared on surface. The cracks run parallel to the extraction limits of the Panhandle, not the Ocean Zone. It is expected that the conservative mining method of the Ocean Zone will contain any major subsidence caused from mining in the southern part of the mine.

East:

Delineating the eastern limits of subsidence, this series of posts runs from the end of 215 Pillar (part of the Central Keel) towards the New Quarry.

SUB-18, closest to 215 Pillar, has subsided 1.05m. There was a large hangingwall cave in Stage 1 of 215 Pillar (the easternmost stage). The rest of the pillar was taken in smaller stages and filled with CRF, and no further hangingwall damage was incurred.

The rest of the posts show constant and diminishing movement as they get further from 215 Pillar, as expected. All stations are defined as subsidence with SUB-14 having been displaced 0.063m. Surface tension cracks have not extended further to the east and we predicted that this would also be true for major surface subsidence.

West:

Located over the West Panhandle, these posts have just moved into the classification of subsidence, with measurements ranging from 70mm to 110mm. We can measure these posts most accurately because they are closest to the Benchmark. Like the North Keel, the West Panhandle is filled with CRF and dry fill. The panhandle also has a few 5m posts and the hangingwall has been supported with 26’ grouted cables. In 2002, mining in this area experienced high levels of activity with 35% of our total production from this Panhandle zone. Some subsidence was expected due to the high activity levels in this zone this past year.

Conclusions:

The principle reason to monitor subsidence is to predict the possibility of connecting the mine workings directly to the ocean via a large crack. The worst case scenario is a high volume failure flooding the mine before the completion of reclamation backfilling. A lesser problem would be flooding after closure.

From observations of the Sinkhole, tension cracks visible on surface form long before there is a route for large volumes of water to drain underground. It should be noted that we have never had surface water enter the mine workings, even with the existence of surface tension cracks and large seasonal runoff. We will continue to watch for the formation of surface tension cracks during the reclamation project. Underground, we have kept the hangingwall stable through intensive ground support measures and conservative recoveries by leaving large posts behind.

The extent of the subsidence limits is a direct footprint of the orebody with the exception of the Ocean Zone, which has not experienced any subsidence. The stability of the Ocean Zone can be attributed directly to the conservative mining extraction and extensive measures taken in ground support.

The different mining methods for the north end of the ore body will not induce subsidence similar to that experienced over the Central Keel; and there is no significant risk of an inflow of water.

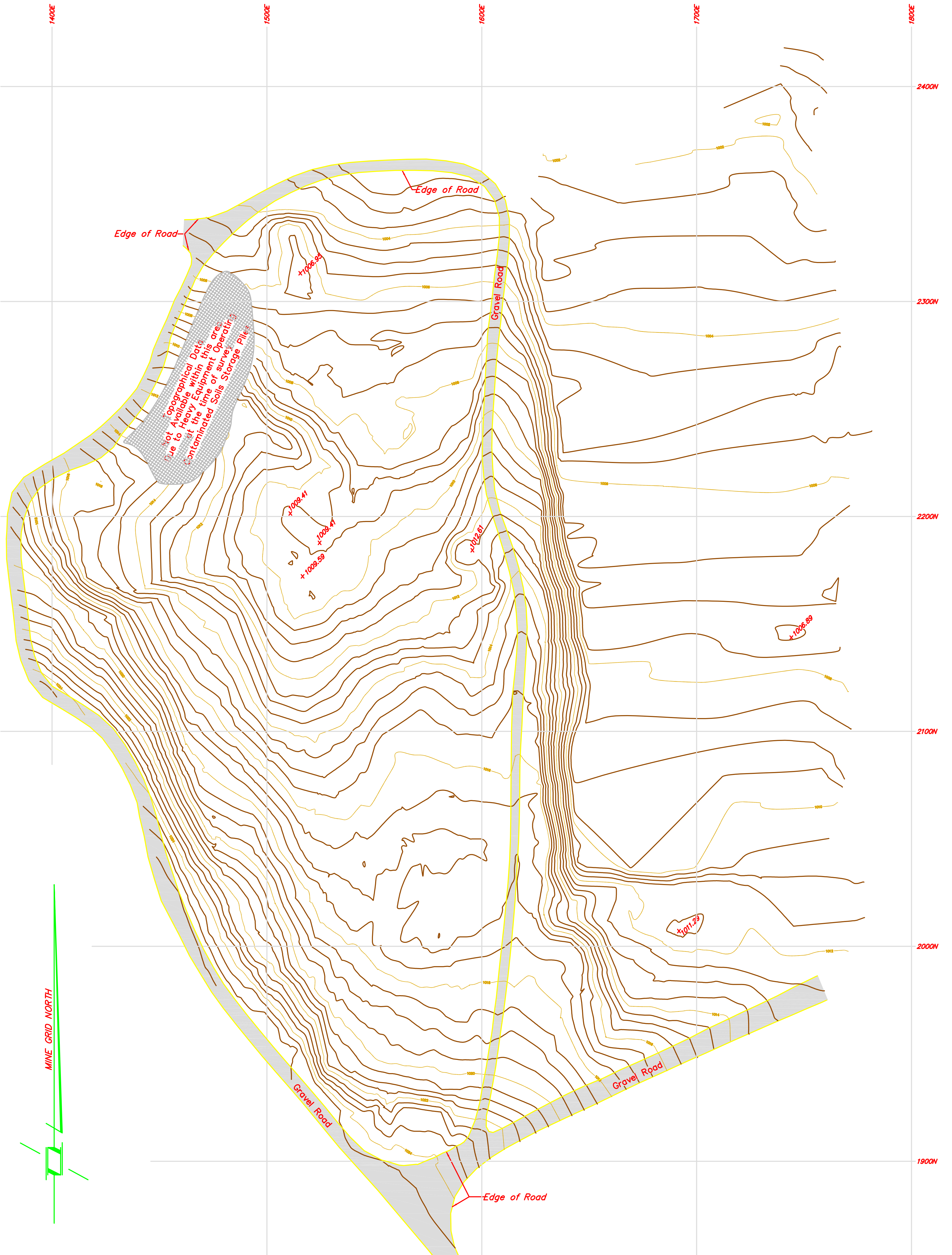
Trevor Feduniak, P.Eng.

Senior Mine Engineer

APPENDIX E

TOPOGRAPHIC SURVEY OF SIBSIDENCE AREA

By FOCUS SURVEYS



Indicates Surveyed Topo Point
DATE of SURVEY = August 29, 2003
CONTOUR INTERVAL = 0.5 m.
DATUM FOR ELEVATIONS IS C.P.#2 = 1065.34 m.

DATE	REVISIONS	DR/CK

TOPOGRAPHIC SURVEY
OF SUBSIDENCE AREA
POLARIS MINE
NUNAVUT

teckcominco

FOCUS
Focus Surveys
A DIVISION OF THE FOCUS CORPORATION LTD.

Edmonton	(780)466-6555
Calgary	(403)269-2252
Grande Prairie	(780)539-3222
Medicine Hat	(403)527-3707
Regina	(306)586-0837
Fort St.John	(250)785-7776

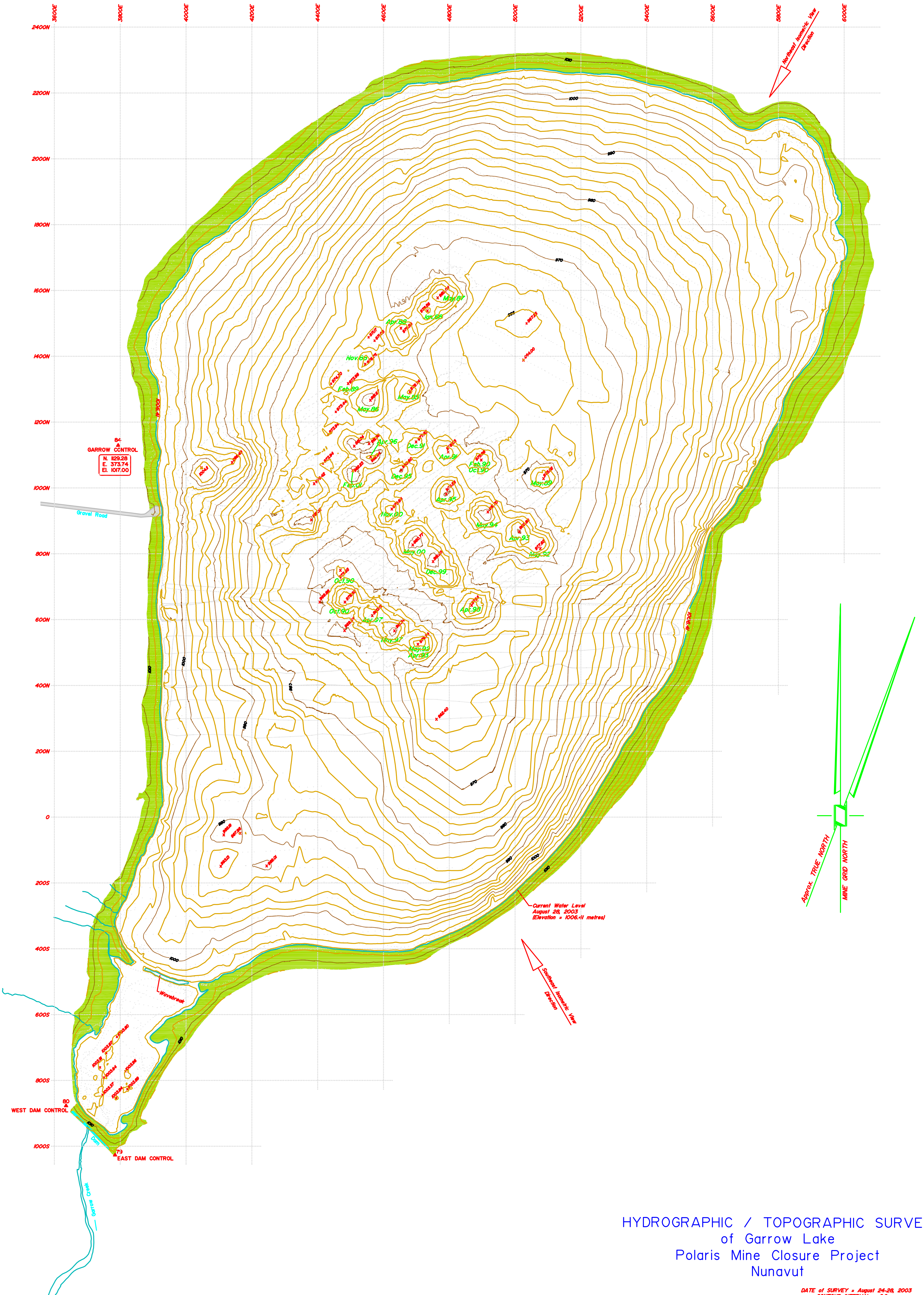
DRAWN BY : KK	CHK'D BY : MT
DATE : SEPTEMBER 12/03	SCALE: 1:1000
JOB : 322789-00	FILE NO.
DWG : SUBSIDENCE TOPO.DWG	SHEET 1 OF 1

APPENDIX 17

BATHYMETRIC SURVEY

OF

GARROW LAKE



HYDROGRAPHIC / TOPOGRAPHIC SURVEY of Garrow Lake Polaris Mine Closure Project Nunavut

teckcominco

DATE of SURVEY = August 24-28, 2003
CONTOUR INTERVAL = 2.0 m.
DATUM FOR ELEVATIONS IS MINE CONTROL POINT 84
Depth Sounding & Surveyed Topo Point shown thus.....
Survey Control Points shown thus..... ▲
Spot Elevation shown thus..... x (Typ.) 967.98
May.97 (typ.) indicates date of tailing pile derived from Teck Cominco records

This drawing is based on the Polaris Mine datum - Subtract 1000m from elevations to approximate geodetic elevation datum.

DATE	REVISIONS	DR/CK

FOCUS
Focus Surveys
A DIVISION OF THE FOCUS CORPORATION LTD.

Edmonton	(780) 466-6555
Calgary	(403) 269-2252
Grande Prairie	(780) 539-3222
Medicine Hat	(403) 527-3707
Regina	(306) 586-0837
Fort St.John	(250) 785-7776

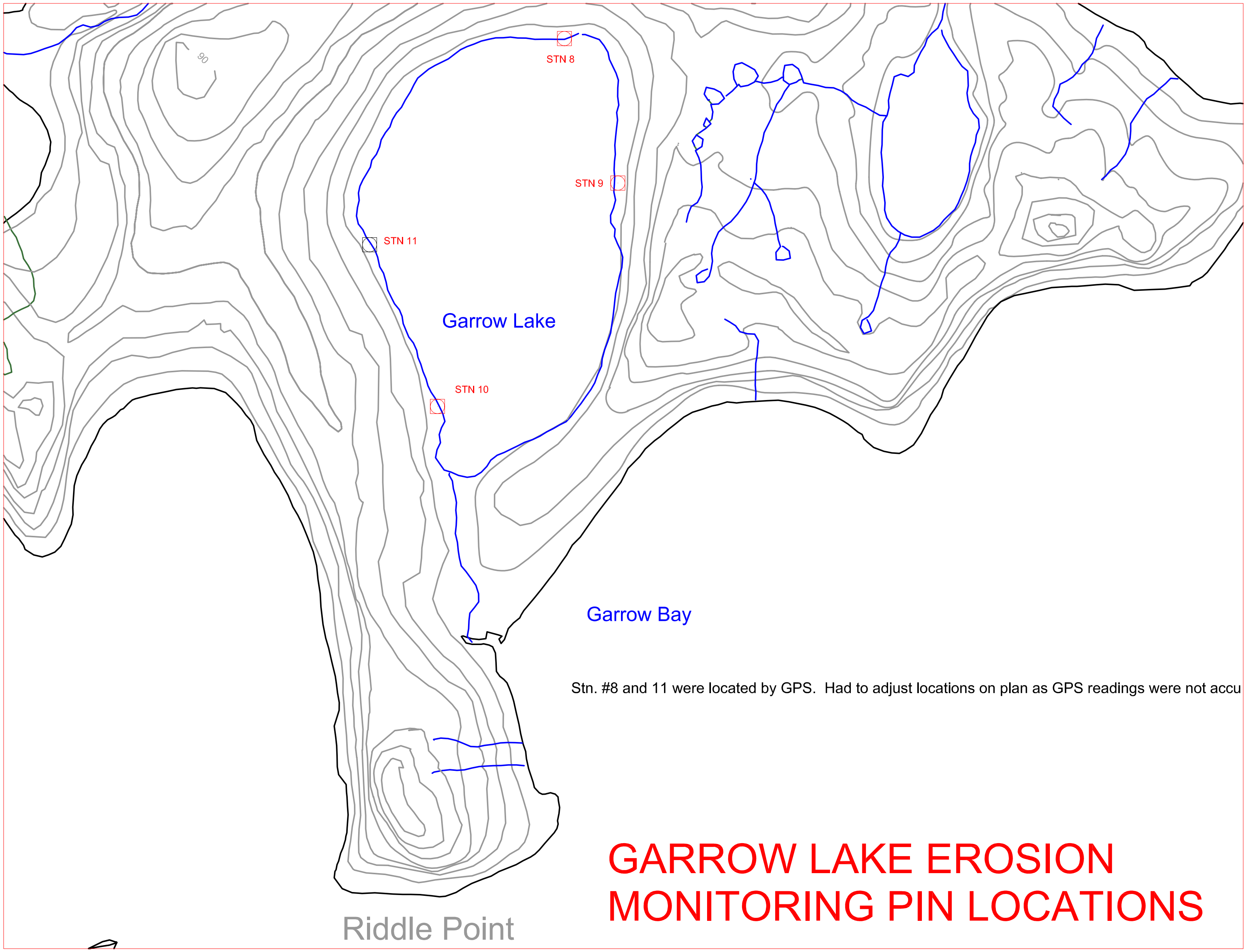
Drawn by : KK	Chk'd by : MT
Date : October 16/03	Scale: 1:5000
Job : 322789-00	FILE No.
Dwg : 322789-00-TP2-0	

APPENDIX 18

RECORD OF

GARROW LAKE

EROSION PIN MONITORING



GARROW LAKE EROSION MONITORING PIN LOCATIONS

GARROW LAKE EROSION MONITORING PINS

Month	Distance (cm) - Top of Pin to Ground				Photographs Taken
	Stn. 8	Stn. 9	Stn. 10	Stn. 11	
Jul-03	56.5	45.0	61.5	50.0	Yes
Aug-03	56.5	45.0	61.5	50.0	Yes
Sep-03	56.5	44.0	61.0	50.0	Yes
Jul-04					
Aug-04					
Sep-04					

Station # 8 - Garrow Lake North Quadrant
Station # 9 - Garrow Lake East Quadrant
Station # 10 - Garrow Lake South Quadrant
Station # 11 - Garrow Lake West Quadrant

Note - Distance measured is along the side of the pin (not vertical distance)
- Photographs are required of each pin location at the time the measurements are taken

GARROW LAKE

EROSION MONITORING

PHOTOGRAPHS

JULY 2003

JULY 2003

STN 8

STN 9

JULY 2003

STN 10

STN 11

GARROW LAKE

EROSION MONITORING

PHOTOGRAPHS

AUGUST 2003

AUGUST 2003

STN 8

STN 9

AUGUST 2003

STN 10

STN 11

<u>GARROW LAKE</u>

<u>EROSION MONITORING</u>

<u>PHOTOGRAPHS</u>

<u>SEPTEMBER 2003</u>

SEPTEMBER 2003

STN 8

STN 9

SEPTEMBER 2003

STN 10

STN 11

APPENDIX 19

RECORD OF THE

MARINE DOCK AND ADJACENT FORESHORE

EROSION MONITORING

2003 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

TSS = (Filter full(g)) - (Filter empty(g)) * (1000 (mL/L) Sample volume (mL)) * 1000mg/g

Normal, Outlined	Background value determined from uninfluenced area each day. Location changes based on observations of wind/ocean direction.
Bold, Italics, Shaded	Exceeds 25 mg/L. over background which is the level permited under the Fisheries Authorization.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
Note from July 14 to July 27 Used Improper methodology for analyzing sea water. No rinsing of sample to dissolve salt. Resulted in overstatement of TSS							
DS2-800	14/07/2003	1.76	NA		light wind	N	Turbidity measured 16 hours after collecting the sample. Sample Lost
DS2-1000	14/07/2003	3.53	33.8		light wind	N	Turbidity measured 16 hours after collecting the sample.
DS2-1200	14/07/2003	1.54	31.0		light wind	N	Turbidity measured 16 hours after collecting the sample.
DS2-1400	14/07/2003	4.98	39.0		light wind	N	Turbidity measured 16 hours after collecting the sample.
DS2-1600	14/07/2003	2.53	33.0		light wind	N	Turbidity measured 16 hours after collecting the sample.
DS2-1800	14/07/2003	2.33	32.4		light wind	N	Turbidity measured 16 hours after collecting the sample.
DS2-600	16/07/2003	2.03	15.7	SW		N	
DS2-800	16/07/2003	0.55	14.4	SW		N	
DS2-1000	16/07/2003	1.1	15.4	SW		N	
DS2-1200	16/07/2003	0.93	16.9	SW		N	
DS2-1400	16/07/2003	1.41	14.8	SW		N	
DS2-1400 QA/QC Duplicate	16/07/2003	0.79	18.9	SW		N	
DS3-1425	16/07/2003	2.66	16.8	SW		N	
DS3-1425 QA/QC Duplicate	16/07/2003	0.9	19.4	SW		N	
DS2-1600	16/07/2003	1.04	19.2	SW		N	
DS2-1800	16/07/2003	1.07	17.8	SW		N	
DS2-600	17/07/2003	1.14	18.5	S	13	N	
DS2-800	17/07/2003	0.55	16.3	S	13	N	
DS2-1000	17/07/2003	0.66	17.9	S	13	N	
DS2-1200	17/07/2003	1.46	18.2	S	13	N	
DS2-1400	17/07/2003	1.55	20.5	S	13	N	
DS3-1425	17/07/2003	0.65	20.9	S	13	N	
DS3-1425 QA/QC Duplicate	17/07/2003	na	20.9	S	13	N	
DS2-1600	17/07/2003	0.86	20	S	13	N	
DS2-1800	17/07/2003	0.41	18.7	S	13	N	
DS2-1800 QA/QC Duplicate	17/07/2003	na	17.9	S	13	N	
DS2-600	18/07/2003	0.71	16.8	SW	20	N	
DS2-800	18/07/2003	0.62	17.3	SW	20	N	
DS2-1000	18/07/2003	1.25	16.2	SW	20	N	
DS2-1200	18/07/2003	0.57	17.3	SW	20	N	
DS2-1400	18/07/2003	0.41	20.3	SW	20	N	
DS3-1425	18/07/2003	0.68	17.6	SW	20	N	
DS3-1425 QA/QC Duplicate	18/07/2003	na	18.4	SW	20	N	
DS2-1600	18/07/2003	0.92	17.9	SW	20	N	
DS2-1800	18/07/2003	0.92	18.1	SW	20	N	
DS2-1800 QA/QC Duplicate	18/07/2003	na	17.9	SW	20	N	
DS2-600	19/07/2003	1.14	14.9	SW	20	N	Ice packed along shore & light rain
DS2-800	19/07/2003	1.13	14.1	SW	20	N	Ice packed along shore & light rain
DS2-1000	19/07/2003	1.7	15.1	SW	20	N	Ice packed along shore & light rain
DS2-1200	19/07/2003	1.11	17.2	SW	20	N	Ice packed along shore & light rain
DS2-1400	19/07/2003	5.77	21.7	SW	20	N	Big waves icy & light rain
DS3-1425	19/07/2003	3.17	19.3	SW	20	N	Big waves icy & light rain
DS3-1425 QA/QC Duplicate	19/07/2003	4.46	20.4	SW	20	N	Big waves icy & light rain
DS2-1600	19/07/2003	5.26	27.1	SW	20	N	Caused by wave action
DS2-1800	19/07/2003	2.35	19.7	SW	20	N	Big waves icy & light rain

2003 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

TSS = (Filter full(g)) - (Filter empty(g)) * (1000 (mL/L) Sample volume (mL)) * 1000mg/g

Normal, Outlined	Background value determined from uninfluenced area each day. Location changes based on observations of wind/ocean direction.
Bold, Italics, Shaded	Exceeds 25 mg/L. over background which is the level permited under the Fisheries Authorization.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
DS2-600	20/07/2003	1.79	15.2	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS2-800	20/07/2003	1.17	17	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS2-1000	20/07/2003	0.84	18.8	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS2-1200	20/07/2003	1.31	14.7	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS2-1400	20/07/2003	0.69	19.6	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS3-1425	20/07/2003	0.91	19.2	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS3-1425 QA/QC Duplicate	20/07/2003	1.63	13	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS2-1600	20/07/2003	0.7	19.2	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS2-1800	20/07/2003	0.36	10.8	SW	5	N	partly cloudy, partly snowing, calm water, ice packed along shore
DS2-600	21/07/2003	0.55	16.8	S	6	S	clear sky, ice moving, small waves
DS2-800	21/07/2003	0.95	18	S	6	S	clear sky, ice moving, small waves
DS2-1000	21/07/2003	0.78	16.4	S	6	S	clear sky, ice moving, small waves
DS2-1200	21/07/2003	0.84	19.8	S	6	S	wind fr N, clear sky, ice moving, waves getting bigger
DS2-1400	21/07/2003	0.48	16.3	S	6	S	clear sky, ice moving,
DS3-1425	21/07/2003	3.06	18.8	S	6	S	clear sky, ice moving,
DS3-1425 QA/QC Duplicate	21/07/2003	0.73	17	S	6	S	clear sky, ice moving,
DS2-1600	21/07/2003	0.69	17.8	S	6	S	clear sky, ice moving, bigger waves from N
DS2-1800	21/07/2003	1.44	19.2	S	6	S	clear sky, ice moving, bigger waves from N
DS2-600	22/07/2003	13.3	36.2	N	13	N	clear sky, windy, small waves
DS2-800	22/07/2003	4.38	24.9	N	13	N	clear sky, windy, small waves
DS2-1000	22/07/2003	19	46.2	N	13	N	clear sky, windy, small waves
DS2-1200	22/07/2003	9.13	33.4	N	13	N	clear sky, windy, small waves
DS2-1400	22/07/2003	0.99	20.4	N	13	N	clear sky, windy, small waves
DS3-1425	22/07/2003	1.05	21.7	N	13	N	clear sky, windy, small waves
DS3-1425 QA/QC Duplicate	22/07/2003	1.89	21.1	N	13	N	clear sky, windy, small waves
DS2-1600	22/07/2003	2.27	22.8	N	13	N	clear sky, windy, small waves
DS2-1800	22/07/2003	5.07	22.3	N	13	N	clear sky, windy, small waves
DS2-600	23/07/2003	0.55	10.7	SW	4	N	foggy, high tide
DS2-800	23/07/2003	0.55	15.9	SW	4	N	foggy, high tide
DS2-1000	23/07/2003	0.46	na	SW	4	N	not measured
DS2-1200	23/07/2003	0.41	7.6	SW	4	N	foggy, high tide, measured using 0.45 micron filter (ran out of glass fiber filters)
DS2-1400	23/07/2003	0.84	9.8	SW	4	N	foggy, high tide, measured using 0.45 micron filter (ran out of glass fiber filters)
DS3-1425	23/07/2003	0.61	15.7	SW	4	N	foggy, high tide, measured using 0.45 micron filter (ran out of glass fiber filters)
DS2-1600	23/07/2003	0.42	15.8	SW	4	N	foggy, high tide, measured using 0.45 micron filter (ran out of glass fiber filters)
DS2-1600 QA/QC Duplicate	23/07/2003	0.42	4.2	SW	4	N	foggy, high tide, measured using 0.45 micron filter (ran out of glass fiber filters)
DS2-1800	23/07/2003	0.49	5	SW	4	N	foggy, high tide, measured using 0.45 micron filter (ran out of glass fiber filters)
DS2-600	24/07/2003	0.53	7.2	S	3	N	clear sky, high tide
DS2-800	24/07/2003	0.51	6.7	S	3	N	clear sky, high tide
DS2-1000	24/07/2003	0.67	7.3	S	3	N	clear sky, high tide
DS2-1200	24/07/2003	1.56	7.6	S	3	N	clear sky, high tide
DS2-1400	24/07/2003	2.05	8.3	S	3	N	clear sky, high tide
DS3-1425	24/07/2003	1.14	7.2	S	3	N	clear sky, high tide
DS2-1600	24/07/2003	0.93	8.7	S	3	N	clear sky, high tide
DS2-1800	24/07/2003	0.94	8.4	S	3	N	clear sky, high tide
DS2-600	25/07/2003	0.82	6.2	S	12	N	light rain, foggy, ice along shore
DS2-800	25/07/2003	0.42	6.4	S	12	N	light rain, foggy, ice along shore
DS2-1000	25/07/2003	0.75	7.5	S	12	N	light rain, foggy, ice along shore
DS2-1200	25/07/2003	0.78	8.2	S	12	N	light rain, foggy, ice along shore
DS2-1400	25/07/2003	1.36	9.3	S	12	N	light rain, foggy, ice along shore,slushy ice front of dock, water from the dock sediment pond silting the water between 1200 and 1400
DS3-1425	25/07/2003	0.71	9.3	S	12	N	light rain, foggy, ice along shore, slushy ice front of dock
DS2-1600	25/07/2003	0.63	7.7	S	12	N	light rain, foggy, ice along shore
DS2-1800	25/07/2003	0.55	7.2	S	12	N	light rain, foggy, ice along shore

2003 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

TSS = (Filter full(g)) - (Filter empty(g)) * (1000 (mL/L) Sample volume (mL)) * 1000mg/g

Normal, Outlined	Background value determined from uninfluenced area each day. Location changes based on observations of wind/ocean direction.
Bold, Italics, Shaded	Exceeds 25 mg/L. over background which is the level permited under the Fisheries Authorization.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
DS2-600	26/07/2003	1.01	5.3	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS2-800	26/07/2003	1.04	2.6	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS2-1000	26/07/2003	2.78	7.7	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS2-1200	26/07/2003	0.65	6	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS2-1400	26/07/2003	1.5	9.5	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS3-1425	26/07/2003	1.2	8.3	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS2-1600	26/07/2003	0.54	4.7	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS2-1600 QA/QC Duplicate	26/07/2003	0.5	4.4	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS2-1800	26/07/2003	0.54	5.1	NW	3	N	High tide, ice packed in the Bay, and shore, cloudy
DS2-600	27/07/2003	2.11	11.9	S	5	N	High tide,calm water, cloudy, silting between 600 & 800
DS2-800	27/07/2003	0.81	10.3	S	5	N	High tide,calm water, cloudy, silting between 600 & 801
DS2-1000	27/07/2003	0.69	9.1	S	5	N	High tide, calm water,cloudy
DS2-1200	27/07/2003	0.48	10.4	S	5	N	High tide, calm water,cloudy
DS2-1400	27/07/2003	0.57	9.5	S	5	N	High tide, calm water,cloudy
DS2-1600	27/07/2003	0.58	5.2	S	5	N	High tide, calm water,cloudy,ice packed along shore
DS2-1800	27/07/2003	0.56	2	S	5	N	High tide, calm water,cloudy,ice packed along shore
DS2-1800 QA/QC Duplicate	27/07/2003	0.69	2.3	S	5	N	High tide, calm water,cloudy,ice packed along shore
Changed methodology, started rinsing with 1L distilled water to remove salt from filter paper before weighing.							
DS2-600 Rinsed	28/7/2003	6.17	6.2	S	13	N	600 & 800/ 1L rinsed distilled
DS2-600 Not rinsed	28/7/2003	6.17	20.2	S	13	N	Ice packed in the Bay and shore, raining, high tide
DS2-800 Rinsed	28/7/2003	92.1	***67.2***	S	13	N	Not due to construction activities, Ice packed in bay, should revisit southern silt fence
DS2-800 Not rinsed	28/7/2003	92.1	84	S	13	N	Ice packed in the Bay,and shore,wtaer flow Fr. S to N. Raining, high tide
DS2-1000 Rinsed	28/7/2003	13	9.6	S	13	N	Ice packed in the Bay,and shore. Raining, high tide
DS2-1000 Not rinsed	28/7/2003	13	25.2	S	13	N	Ice packed in the Bay, and shore, wtaer flow Fr. S to N. Raining, high tide
DS2-1200 Rinsed	28/7/2003	7.9	6.6	S	13	N	Ice packed in the Bay,and shore. Raining, high tide
DS2-1400 Rinsed	28/7/2003	3.46	4.2	S	13	N	Ice packed in the Bay,and shore. Raining, high tide
DS2-1400 Not rinsed	28/7/2003	3.46	20	S	13	N	Ice packed in the Bay, and shore, wtaer flow Fr. S to N. Raining, high tide
DS2-1425 Rinsed	28/7/2003	8.08	5.8	S	13	N	Ice packed in the Bay,and shore. Raining, high tide
DS2-1425 Not rinsed	28/7/2003	8.08	18	S	13	N	Ice packed in the Bay, and shore, wtaer flow Fr. S to N. Raining, high tide
DS2-1600 Rinsed	28/7/2003	1.66	3.4	S	13	N	Ice packed in the Bay,and shore. Raining, high tide
DS2-1600 Not rinsed	28/7/2003	1.66	17.4	S	13	N	Ice packed in the Bay, and shore, wtaer flow Fr. S to N. Raining, high tide
DS2-1800 Rinsed	28/7/2003	1.1	1	S	13	N	Ice packed in the Bay,and shore. Raining, high tide
DS2-1800 Not rinsed	28/7/2003	1.1	7.2	S	13	N	Ice packed in the Bay, and shore, wtaer flow Fr. S to N. Raining, high tide
DS2-1800 QA/QC Rinsed	28/7/2003	1.68	0.8	S	13	N	Ice packed in the Bay,and shore. Raining, high tide
DS2-1800 QA/QC Not rinsed	28/7/2003	1.68	6.4	S	13	N	Ice packed in the Bay, and shore, wtaer flow Fr. S to N. Raining, high tide
DS2-600 Rinsed	29/7/2003	9.99	9.9	W	15	N	Ice packed in the Bay and shore, snowing
DS2-600 Not rinsed	29/7/2003	9.99	18.8	W	15	N	Ice packed in the Bay and shore, snowing
DS2-800 Rinsed	29/7/2003	3.95	4.6	W	15	N	Ice packed in the Bay and shore, snowing
DS2-800 Not rinsed	29/7/2003	3.64	33.8	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1000 Rinsed	29/7/2003	4.04	4.7	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1000 Not rinsed	29/7/2003	3.63	23.6	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1200 Rinsed	29/7/2003	2.92	3.8	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1200 Not rinsed	29/7/2003	2.78	23.2	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1400 Rinsed	29/7/2003	1.91	5.2	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1400 Not rinsed	29/7/2003	1.39	34.2	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1425 Rinsed	29/7/2003	3.01	5.3	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1425 Not rinsed	29/7/2003	2.65	***35.6***	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1600 Rinsed	29/7/2003	4.47	4.1	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1600 Not rinsed	29/7/2003	2.12	30.8	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1800 Rinsed	29/7/2003	4.11	2.1	W	15	N	Ice packed in the Bay and shore, snowing
DS2-1800 Not rinsed	29/7/2003	5.79	11.6	W	15	N	Ice packed in the Bay and shore, snowing

2003 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

TSS = (Filter full(g)) - (Filter empty(g)) * (1000 (mL/L) Sample volume (mL)) * 1000mg/g

Normal, Outlined	Background value determined from uninfluenced area each day. Location changes based on observations of wind/ocean direction.
Bold, Italics, Shaded	Exceeds 25 mg/L. over background which is the level permited under the Fisheries Authorization.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
DS2-600 Rinsed	30/07/2003	5.28	7	SW	25	N	Ice packed in the Bay and shore
DS2-600 Not rinsed	30/07/2003	5.28	21.6	SW	25	N	Ice packed in the Bay and shore
DS2-800 Rinsed	30/07/2003	6.08	6	SW	25	N	Ice packed in the Bay and shore
DS2-800 Not Rinsed	30/07/2003	6.08	19.6	SW	25	N	Ice packed in the Bay and shore
DS2-1000 Rinsed	30/07/2003	3.92	8.4	SW	25	N	Ice packed in the Bay and shore
DS2-1000 Not rinsed	30/07/2003	3.92	33	SW	25	N	Ice packed in the Bay and shore
DS2-1200 Rinsed	30/07/2003	2.53	4.4	SW	25	N	Ice packed in the Bay and shore
DS2-1200 Not rinsed	30/07/2003	2.53	22.4	SW	25	N	Ice packed in the Bay and shore
DS2-1400 Rinsed	30/07/2003	3.64	7.6	SW	25	N	Ice packed in the Bay and shore
DS2-1400 Not rinsed	30/07/2003	3.64	4.4	SW	25	N	Ice packed in the Bay and shore
DS2-1425 Rinsed	30/07/2003	4.51	11.4	SW	25	N	Ice packed in the Bay and shore
DS2-1425 Not rinsed	30/07/2003	4.51	***38.8***	SW	25	N	Ice packed in the Bay and shore
DS2-1600 Rinsed	30/07/2003	0.63	3.8	SW	25	N	Ice packed in the Bay and shore
DS2-1600 Not rinsed	30/07/2003	0.63	17.8	SW	25	N	Ice packed in the Bay and shore
DS2-1800 Rinsed	30/07/2003	0.88	3.4	SW	25	N	Ice packed in the Bay and shore
DS2-1800 Not rinsed	30/07/2003	0.88	13.8	SW	25	N	Ice packed in the Bay and shore
DS2-1800 QA/QC Rinsed	30/07/2003	1.27	2.6	SW	25	N	Ice packed in the Bay and shore
DS2-1800 QA/QC Not rinsed	30/07/2003	1.27	15.8	SW	25	N	Ice packed in the Bay and shore
DS2-600	01/08/2003	1.4	2	W	9	N	Partly cloudy, low tide, ice packed in the bay and shore
DS2-800	01/08/2003	1.36	5.9	W	9	N	Partly cloudy, low tide, ice packed in the bay and shore
DS2-1000	01/08/2003	3.03	5.9	W	9	N	Partly cloudy, low tide, ice packed in the bay and shore
DS2-1200	01/08/2003	1.12	2.8	W	9	N	Partly cloudy, low tide, ice packed in the bay and shore
DS2-1400	01/08/2003	5.3	6.3	W	9	N	Partly cloudy, low tide, ice packed in the bay and shore
DS3-1425	01/08/2003	NA	NA	W	9	N	Too much water on dock DS2-1425
DS2-1600	01/08/2003	0.88	10.2	W	9	N	Partly cloudy, low tide, ice packed in the bay and shore
DS2-1800	01/08/2003	0.68	2.1	W	9	N	Partly cloudy, low tide, ice packed in the bay and shore
DS2-1800 QA/QC Duplicate	01/08/2003	0.72	1.5	W	9	N	Partly cloudy, low tide, ice packed in the bay and shore
DS2-600	02/08/2003	0.77	0.6	NW	10	N	Low tide, fogged in, picture taken
DS2-800	02/08/2003	2.79	1.5	NW	10	N	Low tide, fogged in, picture taken
DS2-1000	02/08/2003	1.91	2	NW	10	N	Low tide, fogged in, picture taken
DS2-1200	02/08/2003	1.27	1.1	NW	10	N	Low tide, fogged in, picture taken
DS2-1400	02/08/2003	50.9	***36.2***	NW	10	N	Work stopped during break, loading from stockpile during night shift
DS3-1425	02/08/2003	NA	NA	NW	10	N	Too much water on dock DS2-1425
DS2-1600	02/08/2003	1.3	1.9	NW	10	N	Low tide, fogged in, picture taken
DS2-1800	02/08/2003	0.62	2.3	NW	10	N	Low tide, fogged in, picture taken
DS2-1800 QA/QC Duplicate	02/08/2003	0.9	1.9	NW	10	N	Low tide, fogged in, picture taken
DS2-600	03/08/2003	1.4	1.6	NW	10	NA	Ice along shore, open water in bay, high tide coming in
DS2-800	03/08/2003	0.8	0.9	NW	10	NA	Ice along shore, open water in bay, high tide coming in
DS2-1000	03/08/2003	1.07	1.1	NW	10	NA	Ice along shore, open water in bay, high tide coming in
DS2-1200	03/08/2003	2.07	3.7	NW	10	NA	Ice along shore, open water in bay, high tide coming in
DS2-1400	03/08/2003	NA	NA	NW	10	NA	Too much water on dock DS2-1400
DS3-1425	03/08/2003	3.17	2.2	NW	10	NA	Ice along shore, open water in bay, high tide coming in
DS2-1600	03/08/2003	2.25	3.5	NW	10	NA	Ice along shore, open water in bay, high tide coming in
DS2-1800	03/08/2003	2.02	3.7	NW	10	NA	Ice along shore, open water in bay, high tide coming in
DS2-1800 QA/QC Duplicate	03/08/2003	2.27	26	NW	10	NA	Forgot to rinse sample with distilled water
DS2-600	04/08/2003	35.6	***39.3***	NE	25	S	Wave action, not due to construction activities
DS2-800	04/08/2003	2.33	4.3	NE	25	S	Ice along shore, open water in bay
DS2-1000	04/08/2003	1.02	NA	NE	25	S	Forgot to wiegh empty filter
DS2-1200	04/08/2003	1.31	24.8	NE	25	S	Wave action, not due to construction activities
DS2-1400	04/08/2003	NA	NA	NE	25	S	Too much water on dock DS2-1400
DS3-1425	04/08/2003	0.81	1.9	NE	25	S	Ice along shore, open water in bay
DS2-1600	04/08/2003	2.16	4.4	NE	25	S	Ice along shore, open water in bay
DS2-1800	04/08/2003	2.87	7.2	NE	25	S	Ice along shore, open water in bay
DS2-1800 QA/QC Duplicate	04/08/2003	2.4	5.7	NE	25	S	Ice along shore, open water in bay

2003 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

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Bold, Italics, Shaded	Exceeds 25 mg/L. over background which is the level permited under the Fisheries Authorization.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
DS2-600	05/08/2003	2.84	5	NE	15	NA	Ice along shore, open water in bay
DS2-800	05/08/2003	0.85	2.4	NE	15	NA	Ice along shore, open water in bay
DS2-1000	05/08/2003	1.56	3.7	NE	15	NA	Ice along shore, open water in bay
DS2-1200	05/08/2003	3.47	5.9	NE	15	NA	Ice along shore, open water in bay
DS2-1400	05/08/2003	NA	NA	NE	15	NA	Too much water on dock DS2-1400
DS3-1425	05/08/2003	2.04	3.8	NE	15	NA	Ice along shore, open water in bay
DS2-1600	05/08/2003	1.48	3.6	NE	15	NA	Ice along shore, open water in bay
DS2-1800	05/08/2003	2.48	4.2	NE	15	NA	Ice along shore, open water in bay
DS2-1800 QA/QC Duplicate	05/08/2003	2.16	6.9	NE	15	NA	Ice along shore, open water in bay
DS2-600	06/08/2003	1.75	1.8	NA	NA	S	Partly cloudy, calm water
DS2-800	06/08/2003	0.64	0.9	NA	NA	S	Partly cloudy, calm water
DS2-1000	06/08/2003	0.75	1	NA	NA	S	Partly cloudy, calm water
DS2-1200	06/08/2003	0.77	1.9	NA	NA	S	Partly cloudy, calm water
DS2-1400	06/08/2003	0.85	1.3	NA	NA	S	Partly cloudy, calm water
DS3-1425	06/08/2003	NA	NA	NA	NA	S	Too much water to access station
DS2-1600	06/08/2003	NA	NA	NA	NA	S	Forgot to write the wieght,filter empty
DS2-1800	06/08/2003	0.97	1.4	NA	NA	S	Partly cloudy, calm water
DS2-1800 QA/QC Duplicate	06/08/2003	1.07	2.8	NA	NA	S	Partly cloudy, calm water
DS2-600	07/08/2003	60.5	93.7	SW	30	N	Cloudy, big waves from SW
DS2-800	07/08/2003	110	***177.2***	SW	30	N	Not due to construction activities, not working in dock cells or along shoreline
DS2-1000	07/08/2003	85	112.4	SW	30	N	Cloudy, big waves from SW
DS2-1200	07/08/2003	84.5	***119.6***	SW	30	N	Not due to construction activities, not working in dock cells or along shoreline
DS2-1400	07/08/2003	139	***206***	SW	30	N	Washing of fines from within cells, asked to reinforce silt fencing along dock cells
DS3-1425	07/08/2003	NA	NA	SW	30	N	Cloudy, big waves from SW
DS2-1600	07/08/2003	54.6	103.2	SW	30	N	Not due to construction activities, not working in dock cells or along shoreline
DS2-1800	07/08/2003	58.5	106.8	SW	30	N	Not due to construction activities, not working in dock cells or along shoreline
DS2-1800 QA/QC Duplicate	07/08/2003	61.5	78.4	SW	30	N	Cloudy, big waves from SW
DS2-600	08/08/2003	2.73	2	S	10	N	Cloudy, foggy, ice packed along shore, open water in the Bay
DS2-800	08/08/2003	1.75	3.1	S	10	N	Cloudy, foggy, ice packed along shore, open water in the Bay
DS2-1000	08/08/2003	1.32	3.3	S	10	N	Cloudy, foggy, ice packed along shore, open water in the Bay
DS2-1200	08/08/2003	1.97	2.2	S	10	N	Cloudy, foggy, ice packed along shore, open water in the Bay
DS2-1400 at 1325	08/08/2003	81.2	***61.2***	S	10	N	Work stopped during break and did not continue during night shift.
DS3-1425 at 1450	08/08/2003	1.38	2.7	S	10	N	Cloudy, foggy, ice packed along shore, open water in the Bay
DS2-1600	08/08/2003	1.34	3	S	10	N	Cloudy, foggy, ice packed along shore, open water in the Bay
DS2-1800	08/08/2003	1.13	***27.1***	S	10	N	Work stopped during break and did not continue during night shift.
DS2-1800 QA/QC Duplicate	08/08/2003	1.23	7.1	S	10	N	Cloudy, foggy, ice packed along shore, open water in the Bay
DS2-600	09/08/2003	5.79	14	SW	15	N	Waves Fr. SW. cloudy, high tide going down
DS2-800	09/08/2003	6.04	18.8	SW	15	N	Waves Fr. SW. cloudy, high tide going down
DS2-1000	09/08/2003	7.7	17.4	SW	15	N	Waves Fr. SW. cloudy, high tide going down
DS2-1200	09/08/2003	8.82	18	SW	15	N	Waves Fr. SW. cloudy, high tide going down
DS2-1400 at 1325	09/08/2003	132	***126***	SW	15	N	Caused by construction activities. Stop work order issued
DS3-1425 at 1450	09/08/2003	2.02	15.2	SW	15	N	Waves Fr. SW. cloudy, high tide going down
DS2-1600	09/08/2003	5.04	13.6	SW	15	N	Waves Fr. SW. cloudy, high tide going down
DS2-1800	09/08/2003	10	31	SW	15	N	Stop work order issued
DS2-1800 QA/QC Duplicate	09/08/2003	14.2	27.6	SW	15	N	Waves Fr. SW. cloudy, high tide going down
DS2-600	10/08/2003	84.6	107.6	W	24	N	Big waves from the South
DS2-800	10/08/2003	18.8	31	W	24	N	Big waves from the South
DS2-1000	10/08/2003	26.6	33.6	W	24	N	Big waves from the South
DS2-1200	10/08/2003	46.2	80	W	24	N	Big waves from the South
DS2-1400 at 1325	10/08/2003	33.5	67.2	W	24	N	Big waves from the South
DS3-1425 at 1450	10/08/2003	25.1	50.8	W	24	N	Big waves from the South
DS2-1600	10/08/2003	41.9	66.4	W	24	N	Big waves from the South
DS2-1800	10/08/2003	6.88	24.8	W	24	N	Big waves from the South
DS2-1800 QA/QC Duplicate	10/08/2003	7.78	24.4	W	24	N	Big waves from the South

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Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
DS2-600	11/08/2003	30.6	21.8	S	17	N	Big waves from the South
DS2-800	11/08/2003	23	22.2	S	17	N	Big waves from the South
DS2-1000	11/08/2003	22.4	29.4	S	17	N	Big waves from the South
DS2-1200	11/08/2003	24.7	26.8	S	17	N	Big waves from the South
DS2-1400 at 1325	11/08/2003	15	24.2	S	17	N	Big waves from the South
DS3-1425 at 1450	11/08/2003	2.3	7	S	17	N	Big waves from the South
DS2-1600	11/08/2003	16.1	22.8	S	17	N	Big waves from the South
DS2-1800	11/08/2003	32.5	40.2	S	17	N	Not due to construction activities, not working in area along exposed shoreline.
DS2-1800 QA/QC Duplicate	11/08/2003	32.5	43	S	17	N	Big waves from the South
DS2-600	12/08/2003	4.76	16.6	S	14	S	
DS2-800	12/08/2003	1.18	3.3	S	14	S	
DS2-1000	12/08/2003	2.68	0.2	S	14	S	
DS2-1200	12/08/2003	3.44	0	S	14	S	
DS2-1400 at 1325	12/08/2003	48.1	***46.6***	S	14	S	Not due to construction activities, not working at dock or along expoosed shoreline
DS3-1425 at 1450	12/08/2003	12.1	17.4	S	14	S	
DS2-1600	12/08/2003	10.6	15.2	S	14	S	
DS2-1800	12/08/2003	11.2	22.5	S	14	S	
DS2-1800 QA/QC Duplicate	12/08/2003	11.9	20.6	S	14	S	
DS2-600	13/08/2003	25.5	25.9	W	20	N	
DS2-800	13/08/2003	15.8	19.4	W	20	N	
DS2-1000	13/08/2003	32	33.4	W	20	N	
DS2-1200	13/08/2003	35.2	39.8	W	20	N	
DS2-1400 at 1325	13/08/2003	187	***224***	W	20	N	Work stopped during break, loading stockpile during night shift
DS3-1425 at 1450	13/08/2003	35.8	41.8	W	20	N	
DS2-1600	13/08/2003	56	***71.8***	W	20	N	Work stopped during break, loading stockpile during night shift
DS2-1800	13/08/2003	37.6	***53***	W	20	N	Work stopped during break, loading stockpile during night shift
DS2-1800 QA/QC Duplicate	13/08/2003	34.7	49	W	20	N	
DS2-600	15/08/2003	0.87	3.6	W	5	S	
DS2-800	15/08/2003	0.6	4	W	5	S	
DS2-1000	15/08/2003	0.58	3.4	W	5	S	
DS2-1200	15/08/2003	0.74	3.4	W	5	S	
DS2-1400 at 1325	15/08/2003	0.95	4.1	W	5	S	
DS3-1425 at 1450	15/08/2003	0.82	4.5	W	5	S	
DS2-1600	15/08/2003	0.79	2.8	W	5	S	
DS2-1800	15/08/2003	0.67	4.1	W	5	S	
DS2-1800 QA/QC Duplicate	15/08/2003	0.81	4	W	5	S	
DS2-600	16/08/2003	1.87	5.1	NA	NA	NA	
DS2-800	16/08/2003	1.77	3.3	NA	NA	NA	
DS2-1000	16/08/2003	4.68	6	NA	NA	NA	
DS2-1200	16/08/2003	3.16	4.7	NA	NA	NA	
DS2-1400 at 1325	16/08/2003	3.4	5.3	NA	NA	NA	
DS3-1425 at 1450	16/08/2003	2.69	5.2	NA	NA	NA	
DS2-1600	16/08/2003	5.46	6.5	NA	NA	NA	
DS2-1800	16/08/2003	2.65	3.7	NA	NA	NA	
DS2-1800 QA/QC Duplicate	16/08/2003	2.77	5.2	NA	NA	NA	
DS2-600	17/08/2003	1.14	4.5	NW	12	S	
DS2-800	17/08/2003	0.59	3.8	NW	12	S	
DS2-1000	17/08/2003	0.86	3.3	NW	12	S	
DS2-1200	17/08/2003	1.02	3.5	NW	12	S	
DS2-1400 at 1325	17/08/2003	1.11	4.1	NW	12	S	
DS3-1425 at 1450	17/08/2003	1.73	3.1	NW	12	S	
DS2-1600	17/08/2003	1.14	3.9	NW	12	S	
DS2-1800	17/08/2003	0.93	3.9	NW	12	S	
DS2-1800 QA/QC Duplicate	17/08/2003	0.82	4.9	NW	12	S	

2003 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

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Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
DS2-600	18/08/2003	0.82	4.5	S	13	S	
DS2-800	18/08/2003	0.76	3.6	S	13	S	
DS2-1000	18/08/2003	0.51	3	S	13	S	
DS2-1200	18/08/2003	1.03	6.1	S	13	S	
DS2-1400 at 1325	18/08/2003	1.29	4.5	S	13	S	
DS3-1425 at 1450	18/08/2003	1.92	4.3	S	13	S	
DS2-1600	18/08/2003	1.98	5.6	S	13	S	
DS2-1800	18/08/2003	1.81	5.5	S	13	S	
DS2-1800 QA/QC Duplicate	18/08/2003	1.71	4.6	S	13	S	
DS2-600	19/08/2003	1.58	3.7	N	6	NA	
DS2-800	19/08/2003	1.97	3.7	N	6	NA	
DS2-1000	19/08/2003	2.56	4.2	N	6	NA	
DS2-1200	19/08/2003	2.47	4.5	N	6	NA	
DS2-1400 at 1325	19/08/2003	3.58	6.8	N	6	NA	
DS2-1400 at 1325 QA/QC Duplicate	19/08/2003	2.28	5.4	N	6	NA	
DS3-1425 at 1450	19/08/2003	1.9	3.6	N	6	NA	
DS2-1600	19/08/2003	0.64	2.9	N	6	NA	
DS2-1800	19/08/2003	1.07	18.7	N	6	NA	Forgot to rinse filter
DS2-600	20/08/2003	1.11	4.3	SW	12	NA	
DS2-600 QA/QC duplicate	20/08/2003	0.98	4.4	SW	12	NA	
DS2-800	20/08/2003	0.99	4.9	SW	12	NA	
DS2-1000	20/08/2003	1.59	4	SW	12	NA	
DS2-1200	20/08/2003	1.58	5.4	SW	12	NA	
DS2-1400 at 1325	20/08/2003	1.12	5.3	SW	12	NA	
DS3-1425 at 1450	20/08/2003	1.5	3.8	SW	12	NA	
DS2-1600	20/08/2003	0.95	4.5	SW	12	NA	
DS2-1800	20/08/2003	0.99	-2.7	SW	12	NA	Filter ripped on tin plate
DS2-600	21/08/2003	1.19	9.5	NW	12	NA	
DS2-800	21/08/2003	1.52	5.4	NW	12	NA	
DS2-800 QA/QC Duplicate	21/08/2003	1.54	4.1	NW	12	NA	
DS2-1000	21/08/2003	0.69	4.7	NW	12	NA	
DS2-1200	21/08/2003	3.14	7	NW	12	NA	
DS2-1400 at 1325	21/08/2003	3.5	6	NW	12	NA	
DS3-1425 at 1450	21/08/2003	2.75	5	NW	12	NA	
DS2-1600	21/08/2003	0.88	5.2	NW	12	NA	
DS2-1800	21/08/2003	1.41	4.2	NW	12	NA	
DS2-600	22/08/2003	1.05	5.3	W	15	NA	
DS2-800	22/08/2003	1.06	17.6	W	15	NA	Forgot to rinse filter
DS2-1000	22/08/2003	1.7	4.9	W	15	NA	
DS2-1200	22/08/2003	2.88	4.3	W	15	NA	
DS2-1400	22/08/2003	5.11	8	W	15	NA	
DS3-1425	22/08/2003	2.3	4.8	W	15	NA	
DS2-1600	22/08/2003	0.92	4.7	W	15	NA	
DS2-1800	22/08/2003	1.31	5.3	W	15	NA	
DS3-1425 QA/QC	22/08/2003	2.21	7.6	W	15	NA	
DS2-600	23/08/2003	2.92	2.1	SW	15	N	waves from SW to NE
DS2-800	23/08/2003	26.1	24.1	SW	15	N	Caused by wave action
DS2-1000	23/08/2003	17.6	17.5	SW	15	N	Caused by wave action
DS2-1200	23/08/2003	29.1	10.1	SW	15	N	waves from SW to NE
DS2-1400 at south side of dock cell	23/08/2003	3.18	1	SW	15	N	waves from SW to NE
DS3-1425 at north side of dock cell	23/08/2003	3.02	12.5	SW	15	N	Caused by wave action
DS2-1600	23/08/2003	2.61	8.6	SW	15	N	waves from SW to NE
DS2-1800	23/08/2003	2.39	0.8	SW	15	N	waves from SW to NE
DS2-1800 QA/QC Duplicate	23/08/2003	2.39	2.3	SW	15	N	waves from SW to NE

2003 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

TSS = (Filter full(g)) - (Filter empty(g)) * (1000 (mL/L) Sample volume (mL)) * 1000mg/g

Normal, Outlined	Background value determined from uninfluenced area each day. Location changes based on observations of wind/ocean direction.
Bold, Italics, Shaded	Exceeds 25 mg/L. over background which is the level permited under the Fisheries Authorization.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
DS2-600	24/08/2003	1.89	5.7	SE	15	N	waves from SW to NE
DS2-800	24/08/2003	2.3	1.2	SE	15	N	waves from SW to NE
DS2-1000	24/08/2003	6.73	3.8	SE	15	N	waves from SW to NE
DS2-1200	24/08/2003	5.21	3.7	SE	15	N	waves from SW to NE
DS2-1200 QA/QC duplicate	24/08/2003	3.74	4.3	SE	15	N	waves from SW to NE
DS2-1400 at south side of dock cell	24/08/2003	8.76	8.9	SE	15	N	waves from SW to NE
DS3-1425 at north side of dock cell	24/08/2003	3.86	3	SE	15	N	waves from SW to NE
DS2-1600	24/08/2003	2.88	6.2	SE	15	N	waves from SW to NE
DS2-1800	24/08/2003	1.26	2.7	SE	15	N	waves from SW to NE
DS2-600	25/08/2003	0.89	5.1	SW	5	NA	waves from West to east
DS2-600 QA/QC duplicate using ne	25/08/2003	0.89	3.9	SW	5	NA	waves from West to east
DS2-800	25/08/2003	1.28	3.5	SW	5	NA	waves from West to east
DS2-800 QA/QC Duplicate	25/08/2003	1.23	4.4	SW	5	NA	waves from West to east
DS2-1000	25/08/2003	1.02	4.4	SW	5	NA	waves from West to east
DS2-1200	25/08/2003	1.67	3.6	SW	5	NA	waves from West to east
DS2-1400 at south side of dock cell	25/08/2003	1.63	8.9	SW	5	NA	waves from West to east
DS3-1425 at north side of dock cell	25/08/2003	2.23	1.1	SW	5	NA	waves from West to east
DS2-1600	25/08/2003	1.67	2.4	SW	5	NA	waves from West to east
DS2-1800	25/08/2003	1.14	2.7	SW	5	NA	waves from West to east
DS2-600	26/08/2003	1.04	3.5	S	0	NA	no flow direction, no waves
DS2-600 (S&S filter)	26/08/2003	1.85	6.3	S	0	NA	no flow direction, no waves
DS2-800	26/08/2003	0.95	4.8	S	0	NA	no flow direction, no waves
DS2-800 QA/QC Duplicate	26/08/2003	1.65	3.7	S	0	NA	no flow direction, no waves
DS2-1000	26/08/2003	0.96	3.9	S	0	NA	no flow direction, no waves
DS2-1000 (S&S filter)	26/08/2003	0.91	4.7	S	0	NA	no flow direction, no waves
DS2-1200	26/08/2003	0.8	1.5	S	0	NA	no flow direction, no waves
DS2-1200 (S&S filter)	26/08/2003	2.1	6.3	S	0	NA	no flow direction, no waves
DS2-1400 at south side of dock cell	26/08/2003	1.33	5.7	S	0	NA	no flow direction, no waves
DS2-1400 Duplicate	26/08/2003	1.48	5	S	0	NA	no flow direction, no waves
DS3-1425 at north side of dock cell	26/08/2003	2.84	4.3	S	0	NA	no flow direction, no waves
DS2-1600	26/08/2003	1.25	6.3	S	0	NA	no flow direction, no waves
DS201800	26/08/2003	1.78	5.6	S	0	NA	no flow direction, no waves
DS2-600	27/08/2003	1.34	8.31	E	3	NA	no flow direction, no waves
DS2-600 QA/QC Duplicate	27/08/2003	1.67	3.8	E	3	NA	no flow direction, no waves
DS2-800	27/08/2003	1.2	7.4	E	3	NA	no flow direction, no waves
DS2-800 (S&S filter)	27/08/2003	1.06	6.7	E	3	NA	no flow direction, no waves
DS2-1000	27/08/2003	0.65	5.9	E	3	NA	no flow direction, no waves
DS2-1000 (S&S filter)	27/08/2003	1.68	4.3	E	3	NA	no flow direction, no waves
DS2-1200	27/08/2003	1.78	2.9	E	3	NA	no flow direction, no waves
DS2-1600	27/08/2003	0.92	5.6	E	3	NA	no flow direction, no waves
DS2-1800	27/08/2003	0.93	5.6	E	3	NA	no flow direction, no waves
DS2-600	31/08/2003	0.42	3.9	W	2	S	
DS2-800	31/08/2003	0.96	5	W	2	S	
DS2-1000	31/08/2003	0.6	5.7	W	2	S	
DS2-1200	31/08/2003	1.16	4.8	W	2	S	
DS2-1200 QA/QC duplicate	31/08/2003	0.81	4.9	W	2	S	
DS2-1400 at south side of dock cell	31/08/2003	0.76	4	W	2	S	
DS3-1425 at north side of dock cell	31/08/2003	1.6	2.5	W	2	S	
DS2-1600	31/08/2003	1.94	5	W	2	S	
DS2-1800	31/08/2003	1.09	3.6	W	2	S	

No work along shoreline from September 1 to September 15 except September 12th, no TSS sampling as a result.

2003 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

TSS = (Filter full(g)) - (Filter empty(g)) * (1000 (mL/L) Sample volume (mL)) * 1000mg/g

Normal, Outlined	Background value determined from uninfluenced area each day. Location changes based on observations of wind/ocean direction.
Bold, Italics, Shaded	Exceeds 25 mg/L. over background which is the level permited under the Fisheries Authorization.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Water Flow Direction	Comments
DS2-600	12/09/2003	1.24	6	SW	18	NA	
DS2-800	12/09/2003	1.91	2.7	SW	18	NA	
DS2-1000	12/09/2003	1.11	5.3	SW	18	NA	
DS2-1200	12/09/2003	1.26	5.8	SW	18	NA	
DS2-1400 at south side of dock cell	12/09/2003	1.82	5.1	SW	18	NA	
DS3-1425 at north side of dock cell	12/09/2003	0.68	3.7	SW	18	NA	
DS2-1600	12/09/2003	1.05	6.2	SW	18	NA	
DS2-1800	12/09/2003	0.64	5.5	SW	18	NA	
Work along shoreline, TSS sampling resumed							
DS2-600	15/09/2003	0.45	4.8	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS2-800	15/09/2003	0.57	3.8	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS2-1000	15/09/2003	0.75	3.8	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS2-1200	15/09/2003	0.45	4.5	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS2-1400 at 1325	15/09/2003	1.46	5	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS3-1425 at 1450	15/09/2003	0.99	4.9	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS2-1600	15/09/2003	0.84	4.8	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS2-1800	15/09/2003	0.55	3.5	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS2-1800 QA/QC Duplicate	15/09/2003	0.7	4.1	W	15	NA	Ice pacted in the Bay and shore,light snow, slush on surface .
DS2-600	17/09/2003	0.65	4.7	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-800	17/09/2003	0.66	3.4	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1000	17/09/2003	0.55	5	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1200	17/09/2003	0.41	4.7	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1400 at 1325	17/09/2003	2.11	6.2	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS3-1425 at 1450	17/09/2003	1.45	5.9	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1600	17/09/2003	0.54	4.3	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1800	17/09/2003	0.73	3.5	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1800 QA/QC Duplicate	17/09/2003	0.73	4.7	NW	17	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-600	18/09/2003	0.46	4.2	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS2-800	18/09/2003	0.79	4.2	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS2-1000	18/09/2003	0.62	4.4	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS2-1200	18/09/2003	0.47	4.1	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS2-1400 at 1325	18/09/2003	0.8	4.5	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS3-1425 at 1450	18/09/2003	0.97	2.8	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS2-1600	18/09/2003	0.69	4	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS2-1800	18/09/2003	0.48	3.2	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS2-1800 QA/QC Duplicate	18/09/2003	0.48	3	W	20	NA	Low tide , slush on surface, ice packed in the Bay and shore.Picture taken
DS2-600	19/09/2003	0.43	3.5	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-800	19/09/2003	0.39	3.9	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1000	19/09/2003	0.45	3.9	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1200	19/09/2003	0.54	4	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1400 at 1325	19/09/2003	0.58	3.8	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS3-1425 at 1450	19/09/2003	0.89	3.8	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1600	19/09/2003	0.56	4	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1800	19/09/2003	1.4	4.1	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-1800 QA/QC Duplicate	19/09/2003	1.4	4.6	S	7	NA	Low tide , slush on surface, ice packed in the Bay and shore.
DS2-600	20/09/2003	1.03	4	S	5	NA	Low tide , slush on surface, ice packed in the Bay and shore, foggy, light snow.
DS2-800	20/09/2003	0.82	4.6	S	5	NA	Low tide , slush on surface, ice packed in the Bay and shore, foggy, light snow.
DS2-1000	20/09/2003	NA	NA	S	5	NA	Low tide , slush on surface, iced in too much, Foggy, light snow.
DS2-1200	20/09/2003	NA	NA	S	5	NA	Low tide , slush on surface, iced in too much, Foggy, light snow.
DS2-1400 at 1325	20/09/2003	NA	NA	S	5	NA	Low tide , slush on surface, iced in too much, Foggy, light snow.
DS3-1425 at 1450	20/09/2003	NA	NA	S	5	NA	Low tide , slush on surface, iced in too much, Foggy, light snow.
DS2-1600	20/09/2003	NA	NA	S	5	NA	Low tide , slush on surface, iced in too much, Foggy, light snow.
DS2-1800	20/09/2003	NA	NA	S	5	NA	Low tide , slush on surface, iced in too much, Foggy, light snow.
DS2-1800 QA/QC Duplicate	20/09/2003	NA	NA	S	5	NA	Low tide , slush on surface, iced in too much, Foggy, light snow.

TSS Sampling completed September 19th, shore iced in.

Marine Shoreline Photographs
Week of July 18, 2003

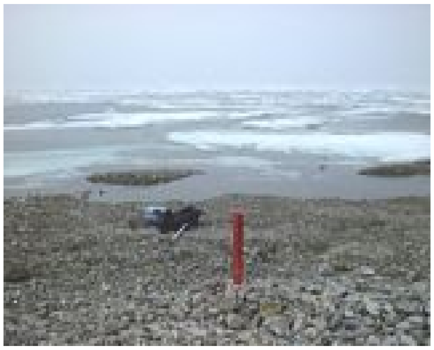

Station 800N


Station 1000N


Station 1200N


Station 1400N


Station 1600N


Station 1800N

Marine Shoreline Photographs
Week of July 25, 2003


Station 600N


Station 800N


Station 1000N


Station 1200N


Station 1400N


Station 1425N


Station 1600N


Station 1800N

Marine Shoreline Photographs
Week of August 2, 2003


Station 600N


Station 800N


Station 1000N


Station 1200N


Station 1400N

Could not access station

Station 1425N


Station 1600N


Station 1800N

Marine Shoreline Photographs
Week of August 9, 2003


Station 600N


Station 800N


Station 1000N


Station 1200N


Station 1400N


Station 1425N


Station 1600N


Station 1800N

Marine Shoreline Photographs
Week of August 17, 2003


Station 600N


Station 800N


Station 1000N


Station 1200N


Station 1400N


Station 1425N


Station 1600N


Station 1800N

Marine Shoreline Photographs
Week of August 24, 2003


Station 600N


Station 800N


Station 1000N


Station 1200N


Station 1400N


Station 1425N


Station 1600N


Station 1800N

Marine Shoreline Photographs
Week of September 21, 2003

Station 600N

Station 800N

Station 1000N

Station 1200N

Station 1400N

Could not access station

Station 1425N

Station 1600N

Station 1800N

APPENDIX 20

SUMMARY OF

EFFLUENT MONITORING

AND

EFFLUENT CHARACTERIZATION

POLARIS MINE – MMER MONITORING REPORT

3rd QUARTER 2003

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 Test.

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 (Annual)

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 Test (Annual).

APPENDIX F (Mass Loadings)

i. Concentration & monthly mean concentrations of each deleterious substance of Schedule 4
ii. pH of the effluents samples as required by subsection 12(1)
iii. Description of sample collection method
iv. Total volume of effluent deposited during each month of the quarter as per section 19
v. Mass loading of the deleterious substances set out in Schedule 4 and as per section 20

APPENDIX G

i. Results of the effluent characterization as per paragraph 15(1)(a)

APPENDIX A

96-h Acute Rainbow Trout Toxicity Test

<u>Reporting Requirements for Reference Method EPS 1/RM/13</u>

<u>Section 8.1.1 Effluent</u>

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: Wednesday July 30, 2003 - 1:00 PM
   - Test 2: Wednesday August 20, 2003 - 12:30 AM
   - Test 3: Tuesday September 16, 2003 - 5:00 PM

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
   - Dennis Lu (Gartner Lee)

<u>Section 8.1.2 Test Facilities and Conditions</u>

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
   - Salinity controls were run
   - Sample water salinity was 2ppt (Test 1); 4ppt (Test 2), and 6ppt (Test 3)

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

iv. Percent mortality of fish in stock tank(s)
   - Test 1: 0.1%
   - Test 2: 0.1%
   - Test 3: 1%

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

vi. Date and time for start of definitive test
   - Test 1: Saturday August 2, 2003 - 2:00 PM
   - Test 2: Friday August 22, 2003 - 12:30 PM
   - Test 3: Friday September 19, 2003 - 5:00 PM

vii. Person(s) performing the test and verifying the results
   - Andy Diewald, Devika Jayaweera, May Lee

viii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - Test 1: pH - 7.8, T - 15.0°C, DO - 10.0mg/L, C - 4100µmhos/cm
   - Test 2: pH - 7.8, T - 15.0°C, DO - 10.1mg/L, C - 6000µmhos/cm
   - Test 3: pH - 8.1, T - 16.0°C, DO - 10.0mg/L, C - 8000µmhos/cm

Reporting Requirements for Reference Method EPS 1/RM/13

ix. Confirmation that no adjustment of sample or solution pH occurred
- Test 1: No pH adjustment
- Test 2: No pH adjustment
- Test 3: No pH adjustment

x. Indication of aeration of test solutions before introduction of fish
- Test 1: 6.5 ± 1 mL/min/L for 60mins
- Test 2: 6.5 ± 1 mL/min/L for 90mins
- Test 3: 6.5 ± 1 mL/min/L for 120mins

xi. Concentrations and volumes tested
- Concentrations (% effluent volume / total volume) tested and total volumes used were:
- Control (0%) - 12 L (test 1&2), 15 L (test 3)
- 6.25% - 12 L (test 1&2), 15 L (test 3)
- 12.5% - 12 L (test 1&2), 15 L (test 3)
- 25% - 12 L (test 1&2), 15 L (test 3)
- 50% - 12 L (test 1&2), 15 L (test 3)
- 100% - 12 L (test 1&2), 15 L (test 3)
- Salinity Control - 12 L (test 1&2), 15 L (test 3)

xii. Measurements of dissolved oxygen, pH and temperature
- Test 1: DO: 8.2 - 10.1 mg/L, pH: 7.0 - 7.8, T: 15.0 °C
- Test 2: DO: 8.2 - 10.1 mg/L, pH: 7.1 - 7.8, T: 15.0 °C
- Test 3: DO: 8.2 - 10.0 mg/L, pH: 6.6 - 8.1, T: 15.0 - 16.0 °C

xiii. Number of fish added to each test vessel
- 10 fish/ vessel

xiv. Mean and range of fork length of control fish at end of test
- Test 1: 42mm (40-44)
- Test 2: 38mm (35-42)
- Test 3: 36mm (32-40)

xv. Mean wet weight of individual control fish at end of the test
- Test 1: 0.57g (0.43-0.68)
- Test 2: 0.59g (0.43-0.72)
- Test 3: 0.50g (0.35-0.61)

xvi. Estimated loading density of fish in test solutions
- Test 1: 0.48g/L
- Test 2: 0.49g/L
- Test 3: 0.33g/L

Section 8.1.3 Results

i. Number of mortalities of fish in each test solution
- Results were the same for Test 1, Test 2, and Test 3, except where noted
- Control (0%) - 0
- 6.25% - 0
- 12.5% - 0
- 25% - 0
- 50% - 0 (test 1&2), 1 (test 3)
- 100% - 0
- Salinity Control - 0

Reporting Requirements for Reference Method EPS 1/RM/13

ii. Number of control fish showing atypical/stressed behaviour
    - None in Test 1, Test 2, or Test 3

iii. Mean mortality rate in solutions of effluent and control water
    - Results were the same for Test 1, Test 2, and Test 3, except where noted
    - Control (0%) - 0%
    - 6.25% - 0%
    - 12.5% - 0%
    - 25% - 0%
    - 50% - 0% (test 1&2), 10% (test 3)
    - 100% - 0%
    - Salinity Control - 0%

iv. Estimate of 96-h LC50 in multi-concentration tests
    - Results were the same for Test 1, Test 2, and Test 3
    - 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: (Jul-10-03) 96-h LC_{50} = 36mg/L SDS, 95% CL = 30-42mg/L
    - Test 2: (Aug-5-03) 96-h LC_{50} = 24mg/L SDS, 95% CL = 18-32mg/L
    - Test 3: (Sep-3-03) 96-h LC_{50} = 24mg/L SDS, 95% CL = 22-26mg/L

APPENDIX B

72-h Acute *Daphnia magna* Toxicity Test

Reporting Requirements for Reference Method EPS 1/RM/14

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^{o} 22’ 32” N, 97^{o} 48’ 37” W.

ii. Date & time of sampling
   - Samples for monthly acute toxicity testing were collected
   - Test 1: Wednesday July 30, 2003 - 1:00 PM
   - Test 2: Wednesday August 20, 2003 - 12:30 AM
   - Test 3: Tuesday September 16, 2003 - 5:00 PM

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
   - Dennis Lu (Gartner Lee)

Section 8.1.2 Test Facilities and Conditions

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

ii. Indications of deviations from requirements in Sections 2 to 7 of Method EPS 1/RM/13
   - No deviations from requirements
   - Salinity controls were run
   - Sample water salinity was 2ppt (Test 1); 4ppt (Test 2), and 6ppt (Test 3)

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

iv. Species of test organism
   - *Daphnia magna*

v. Date and time for start of definitive test
   - Test 1: Saturday August 2, 2003 - 2:00 PM
   - Test 2: Friday August 22, 2003 - 3:30 PM
   - Test 3: Friday September 19, 2003 - 3:15 PM

vi. Person(s) performing the test and verifying the results
   - Andy Diewald and May Lee

vii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - Test 1: pH - 7.5, T - 21.0°C, DO - 8.7mg/L, C - 4100μmhos/cm
   - Test 2: pH - 7.8, T - 20.0°C, DO - 8.9mg/L, C - 9280μmhos/cm
   - Test 3: pH - 8.0, T - 19.5°C, DO - 8.7mg/L, C - 11330μmhos/cm

viii. Confirmation that no adjustment of sample or solution pH occurred
   - Test 1: No pH adjustment
   - Test 2: No pH adjustment
   - Test 3: No pH adjustment

ix. Indication of any adjustment of hardness of effluent sample
  - Test 1: No hardness adjustment
  - Test 2: No hardness adjustment
  - Test 3: No hardness adjustment

x. Indication of any aeration of sample
  - Test 1: No pre-aeration adjustment
  - Test 2: No pre-aeration adjustment
  - Test 3: 25-50 mL/min/L for 10mins

xi. Concentrations and volumes tested
  - Concentrations (% effluent volume / total volume) tested and total volumes used were:
  - Control (0%) - 200 mL
  - 6.25% - 200 mL
  - 12.5% - 200 mL
  - 25% - 200 mL
  - 50% - 200 mL
  - 100% - 200 mL
  - Salinity Control - 200 mL

xii. Measurements of dissolved oxygen, pH and temperature
  - Test 1: DO: 8.3 - 8.7 mg/L, pH: 7.5 - 7.9, T: 20.0 - 21.0 °C
  - Test 2: DO: 8.4 - 9.0 mg/L, pH: 7.6 - 8.1, T: 20.0 - 20.5 °C
  - Test 3: DO: 8.3 - 9.1 mg/L, pH: 7.6 - 8.1, T: 19.5 - 21.0 °C

xiii. 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: 9 days to brood, >15 neonates/brood, 4.6% mortality in 7d prior to test
  - Test 2: 9 days to brood, >19.9 neonates/brood, 10.0% mortality in 7d prior to test
  - Test 3: 8 days to brood, >26.3 neonates/brood, 5.5% mortality in 7d prior to test

xiv. 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 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, Test 2, and Test 3, except where noted
  - Control (0%) - 0 dead / immobile (test 1&2), 1 dead (test 3)
  - 6.25% - 0 dead / immobile
  - 12.5% - 0 dead / immobile
  - 25% - 0 dead / immobile
  - 50% - 0 dead / immobile
  - 100% - 0 dead / immobile (test 1&2), 1 dead (test 3)
  - Salinity Control - 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

Reporting Requirements for Reference Method EPS 1/RM/14

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
- Test 3: 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: (Aug-7-03) 96-h LC_{50} = 453µg/L Zinc, 95% CL = 377-544µg/L
- Test 2: (Aug-7-03) 96-h LC_{50} = 453µg/L Zinc, 95% CL = 377-544µg/L
- Test 3: (Sep-23-03) 96-h LC_{50} = 429µg/L Zinc, 95% CL = 355-518µg/L

APPENDIX C

7-d Topsmelt Growth and Survival Toxicity Test

Reporting Requirements for Reference Method EPA/600/R-95/136

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 yearly sublethal toxicity testing were collected:
     Wednesday August 20, 2003 - 12:30 AM

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
   - Dennis Lu (Gartner Lee)

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
   - August 21, 2003

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
   - <10% mortality

vii. Age at start of test
   - 10 days post-hatch

viii. Unusual appearance, behaviour, or treatment of larvae before their use in the test
   - Nothing unusual, no excessive crowding of larvae, larvae appear healthy, disease-free, stress free,

ix. Confirmation that larvae are actively feeding and swimbladders are not inflated
   - 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
   - Holding water conditions upon arrival were DO=supersaturated, pH=7.3, T=22°C
   - Organisms were acclimated slowly overnight
   - Addition of EVS lab seawater at intervals of 30 – 60min to reach acceptable conditions
   - Organisms were acclimated to DO=8mg/L, salinity=28ppt,T=20°C

Reporting Requirements for Reference Method EPA/600/R-95/136

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. 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 was 5.3ppt

iii. Date and time for start of definitive test
   - Friday August 22, 2003 - 5:00 PM

iv. Test vessel description
   - 600mL beaker

v. Person(s) performing the test and verifying the results
   - Kevin Goodearle, Julianna Kalocai, Sioe Lie Kwee, Rachel DeWynter, Edmund Canaria, and Armando Tang

vi. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - pH - 7.9, T - 20.0°C, DO - 11.0mg/L, C - 9570µmhos/cm, (salinity - 5.3 ppt)

vii. Confirmation that no adjustment of sample or solution pH occurred
   - No pH adjustment

viii. Indication of aeration of test solutions before introduction of fish
   - Pre-aeration at 6.5mL/min/L for 30mins due to supersaturation of sample with O_2 when sample was heated to 20°C
   - DO was reduced from 11.0mg/L to 7.8 mg/L

ix. Indication that EC guidance document for salinity adjustment was followed
   - No deviations from EC guidance document on preparation of hypersaline brine
   - HSB prepared from natural seawater concentrated to 90ppt (by freezing/refreezing to remove frozen layer and concentrate salts)
   - No deviations from EC guidance document for salinity adjustment of sample
   - HSB was added to samples to salinity adjust them from 5.3ppt to 30ppt

x. Type and source of control/dilution water
   - UV-sterilized, 0.45µm-filtered natural seawater from the Vancouver Aquarium

xi. Concentrations and volumes tested
   - Concentrations (% effluent volume / total volume) tested and total volumes used were:
   - Control (0%) - 200 mL
   - Salinity Control (0%) - 200 mL
   - 4.5% - 200mL
   - 9.0% - 200mL
   - 18.1% - 200mL
   - 36.2% - 200mL
   - 72.3% - 200mL

xii. Number of replicated per concentration
   - 5 replicates per concentration

xiii. Number of organisms added to each test vessel
   - 5 fish per vessel

xiv. Manner and rate of exchange of test solutions
   - Daily renewal

xv. Measurements of dissolved oxygen, pH and temperature
- DO: 6.6 - 7.8 mg/L, pH: 7.7 - 8.2, T: 19.0 - 20.0 °C, salinity: 29 - 31 ppt

Results

i. Number and % of mortalities of fish in each test solution
- Totals from all 5 replicates are presented:
- Control (0%) - 1/25 = 4%
- Salinity Control - 0/25 = 0%
- 4.5% - 0/25 = 0%
- 9.0% - 0/25 = 0%
- 18.1% - 0/25 = 0%
- 36.2% - 0/25 = 0%
- 72.3% - 1/25 = 4%

ii. Average dry weight per original fish in test vessel
- Means from all 5 replicates are presented:
- Control (0%) - 1.18 mg
- Salinity Control - 1.14 mg
- 4.5% - 1.13 mg
- 9.0% - 1.32 mg
- 18.1% - 1.09 mg
- 36.2% - 1.11 mg
- 72.3% - 1.14 mg

iii. Estimate of 7-d LC_{50} (95% CL)
- 7-d LC_{50} concentration > 72.3% 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
- 7-d IC_{25} concentration > 72.3% effluent (highest concentration tested due to dilution for salinity adjustment)
- Quantal statistic methods not applicable

v. Current reference toxicity tests (95% CL) for 7-d LC_{50} for survival and 7-d IC_{50} for growth
- Reference toxicity tests for Toxicant: Copper
- Test conducted on August 22, 2003, 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 = 122mg/L Cu, 95% CL = 111-135mg/L
- 7-d IC_{50} growth = 122mg/L Cu, 95% CL = 106-132mg/L

vi. Reference toxicity warning limits (+/- SD) for 7-d LC_{50} for survival and 7-d IC_{50} for growth
- Reference toxicity tests for Toxicant: Copper
- 7-d LC_{50} survival = 139 ± 63mg/L Cu,
- 7-d IC_{50} growth = 136 ± 52mg/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 yearly sublethal toxicity testing were collected:
     Wednesday August 20, 2003 - 12:30 AM

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
   - Dennis Lu (Gartner Lee)

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
   - M-REP, Escondido, California
   - All adults providing gametes are from the same population and source
   - Gametes are spawned in-house at EVS

iv. Date test species acquired on
   - August 22, 2003

v. Holding time and conditions for adults
   - Adults received at the testing laboratory the day of the test, shipped overnight

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

vii. Weekly percent mortality of adults being held over 7d preceding test
   - <2% per day over the 7 days preceding the test

viii. Age of test organisms
   - < 4 hours after spawning

ix. Unusual appearance, behaviour, or treatment of adults or gametes before test start
   - Organisms appear healthy

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
   - 10:10 min (10min sperm + 10min sperm & egg)

iii. Date and time for start of definitive test

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

- Friday August 22, 2003 - 5:00 PM

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

v. Person(s) performing the test and verifying the results
- Kevin Goodearle, Julianna Kalocai, Sioe Lie Kwee, Rachel DeWynter, Edmund Canaria, and Armando Tang

vi. Indication of rate and duration of pre-aeration of test solutions before initiation of test
- No pre-aeration

vii. Confirmation that no adjustment of sample or solution pH occurred
- No pH adjustment

viii. Procedure for sample filtration
- No sample filtration

ix. Procedure for preparation of hypersaline brine (HSB) as per EC guidance document on salinity adjustment – July 1997
- No deviations from EC guidance for salinity adjustment

x. Procedure for salinity adjustment as per EC guidance document on salinity adjustment – July 1997
- No deviations from EC guidance for salinity adjustment
- Salinity adjusted from 5ppt to 29ppt

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

xii. Concentrations and volumes tested
- 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
- 36.5% - 10mL
- 73.0% - 10mL

xiii. Number of replicated per concentration
- 4 replicates per treatment concentration

xiv. Number of organisms per container
- 2000 eggs per 10mL vessel

xv. Measurements of pH and dissolved oxygen in sample water before use
- pH - 8.3, DO - 8.4mg/L

xvi. Measurements of pH, temperature, dissolved oxygen, and salinity during test
- pH - 7.9-8.4, T - 15.0-15.5°C, DO - 8.1-8.4mg/L, salinity - 29ppt

Results

i. Number and % of fertilized eggs in each test concentration
- (Number is equal to percent since totals were 100)
- Control (0%): #F = 51, 50, 52, 54 #UF = 49, 50, 49, 46
- Salinity Control: #F = 51, 52, 50, 51 #UF = 49, 48, 50, 49
- 4.6%: #F = 35, 40, 29, 45 #UF = 65, 60, 71, 55
- 9.1%: #F = 36, 28, 33, 25 #UF = 64, 72, 67, 75
- 18.2%: #F = 22, 24, 18, 20 #UF = 78, 78, 82, 80
- 36.5%: #F = 12, 8, 7, 10 #UF = 88, 92, 93, 90
- 73.0%: #F = 1, 0, 2, 0 #UF = 99, 100, 98, 100

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

ii. Estimate of IC_{25} (95% CL) for fertilization success
- IC_{25} concentration = 3.8 (1.1 - 7.2)% v/v effluent
- Quantal statistic method = log linear interpolation

iii. Current reference toxicity tests (95% CL) for IC_{50} for fertilization
- Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
- Test conducted on August 22, 2003, same day as effluent test
- Reference test conducted under same conditions
- IC_{50} for fertilization = 1.3mg/L SDS, 95% CL = 1.1-1.5mg/L

APPENDIX E

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

Reporting Requirements for Reference Method EPA/600/4-91/003 Method 1009.0

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:
     Wednesday August 20, 2003 - 12:30 AM

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
   - Dennis Lu (Gartner Lee)

vii. Temperature of water upon receipt at lab
   - 13°C

Test Organisms

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

ii. Name and city of testing laboratory
   - Saskatchewan Research Council [SRC], Saskatoon, SK

iii. Source of test species
   - Sexually mature male and female branches
   - Obtained from USEPA, Hatfield Marine Science Center, Newport Oregon, 1995
   - Appear in good health
   - Females have trichogynes, males have sori with spermatia

Test Facilities and Conditions

i. Test type & method
   - *Champia parvula* sexual reproduction test
   - Static, non-renewal
   - 2-day exposure, followed by 5-7 day recovery period for cystocarp development
   - Reference Method - EPA/600/4-91/003, Method 1009.0

ii. Date and time for start of definitive test
   - Friday August 22, 2003 – 10:00 AM

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

iv. Person(s) performing the test and verifying the results
   - Mary Moody

v. Indication of pre-aeration of test solutions
   - No pre-aeration

vi. Confirmation that no pH adjustment of sample or solution occurred
   - No pH adjustment

Reporting Requirements for Reference Method EPA/600/4-91/003 Method 1009.0

vii. Indication that EC guidance document for salinity adjustment was followed
- No deviations from EC guidance document on preparation of hypersaline brine
- HSB prepared from natural seawater at 90ppt
- No deviations from EC guidance document for salinity adjustment of sample
- Salinity adjustment: 642mL effluent + 258mL HSB + 9mL test nutrient solution
- Salinity of samples adjusted from 5ppt to 30ppt

viii. Type and source of control/dilution water
- 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. Concentrations and volumes of test solutions
- Concentrations (% effluent volume / total volume) tested and total volumes used were:
- Control (Natural Seawater) (0%) - 100mL, 4.5cm depth
- Salinity Control Brine (0%) - 100mL, 4.5cm depth
- 4.5% - 100mL, 4.5cm depth
- 8.9% - 100mL, 4.5cm depth
- 17.8% - 100mL, 4.5cm depth
- 35.6% - 100mL, 4.5cm depth
- 71.3% - 100mL, 4.5cm depth

x. Number of replicated per concentration
- 3 replicates per concentration

xi. Number of organisms per test chamber
- 5 female branches + 2 male branches per chamber

xii. Measurements of pH, temperature, dissolved oxygen, and salinity of sample before use
- pH - 7.93, T - 23.5°C, DO - 9.4mg/L, salinity - 5ppt

xiii. Measurements of pH, temperature, dissolved oxygen, and salinity of sample during test
- DO: 7.8 - 8.0 mg/L, pH: 7.74 - 8.98, T: 23°C, salinity: 30ppt

Results

i. Number and % mortality of female plants after recovery in each test solution
- Totals from all 3 replicates are presented:
- Control (0%): 0 (0%) mortality
- Salinity Control (0%): 0 (0%) mortality
- 4.5%: 0 (0%) mortality
- 8.9%: 0 (0%) mortality
- 17.8%: 0 (0%) mortality
- 35.6%: 0 (0%) mortality
- 71.3%: 0 (0%) mortality

ii. Mean number of cystocarps per plant in each test concentration
- Control (0%): 57.4; 49.6; 44.2
- Salinity Control (0%): 66.4; 44.0; 45.2
- 4.5%: 52.2; 51.4; 57.4
- 8.9%: 61.2; 63.6; 41.2
- 17.8%: 30.4; 34.4; 18.6
- 35.6%: 6.6; 6.0; 7.6
- 71.3%: 0.0; 2.4; 1.4

Reporting Requirements for Reference Method EPA/600/4-91/003 Method 1009.0

iii. Estimate of IC_{25} (95% CL) for cystocarp development
- IC_{25} concentration = 13.6 (9.0-16.0)% effluent v/v
- Quantal statistic method was linear interpolation

iv. Current reference toxicity tests (95% CL) for IC_{50} for cystocarp development
- Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
- Test conducted on July 29, 2003, within 30 days of effluent test
- Reference toxicant test was conducted under the same experimental conditions as the effluent test
- IC_{50} cystocarp development = 1.19mg/L SDS, 95% CL = 1.14-1.23mg/L

v. Reference toxicity warning limits (+/- 2SD) for IC_{50} for cystocarp development
- Reference toxicity tests for Toxicant: SDS
- 7-d IC_{50} growth = 1.47 (1.17-1.84) mg/L SDS

APPENDIX F

Effluent Metals Concentrations and Loadings

2003 3rd QUARTER MMER REPORT

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

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
07-Jul-03	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]
14-Jul-03	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]
21-Jul-03	25-Jul-03	*0.0001*	0.00122	*0.005*	0.00793	0.00126	0.0479	*3*	*0.005*	7.77	Water Pump
28-Jul-03	30-Jul-03	*0.0004*	0.00057	*0.005*	0.00319	0.00115	0.0625	*3*	*0.005*	7.84	Water Pump
04-Aug-03	05-Aug-03	*0.0005*	0.00068	*0.005*	0.00083	0.00144	0.0892	*3*	*0.005*	7.85	Water Pump
11-Aug-03	12-Aug-03	*0.001*	0.00091	*0.005*	0.00124	0.00256	0.151	*3*	*0.005*	7.94	Water Pump
18-Aug-03	19-Aug-03	*0.001*	0.00097	*0.005*	0.00046	0.00265	0.146	8	*0.005*	8.1	Water Pump
25-Aug-03	26-Aug-03	*0.001*	0.0009	*0.005*	0.00114	0.00261	0.16	*3*	*0.005*	7.96	Water Pump
01-Sep-03	02-Sep-03	*0.0002*	0.00089	*0.005*	0.00333	0.00274	0.15	10	*0.005*	8.06	Water Pump
08-Sep-03	09-Sep-03	*0.002*	0.00107	*0.005*	0.00117	0.00292	0.158	11	0.01	7.94	Water Pump
15-Sep-03	16-Sep-03	*0.001*	0.00099	-	0.00046	0.00365	0.186	5	*0.005*	7.96	Water Pump
22-Sep-03	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]
29-Sep-03	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[2]	na[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] - "na" refers to no effluent discharge to sample

Concentrations in red italics were set to the detection limit

MONTHLY MEAN CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4

MONTH OF	MONTHLY MEAN CONCENTRATION[1] OF DELETERIOUS SUBSTANCE[2] Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226
July/03	0.0003	0.00090	0.005	0.00556	0.00121	0.055	3	0.005
August/03	0.0009	0.00087	0.005	0.00092	0.00232	0.137	4	0.005
September/03	0.0011	0.00098	0.005	0.00165	0.00310	0.165	9	0.007

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

Note[2] - Monthly Mean Concentrations - the MEAN value of the concentrations measured in all water samples collected during each month when a deleterious substance is deposited.

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)
		Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]	
07-Jul-03	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]
14-Jul-03	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]
21-Jul-03	25-Jul-03	0.005	0.061	0.25	0.3965	0.063	2.395	150	250,000	50,000
28-Jul-03	30-Jul-03	0.027268	0.038857	0.34085	0.217462	0.078396	4.260625	204.51	340,850	68,170
04-Aug-03	05-Aug-03	0.0382705	0.052048	0.382705	0.063529	0.110219	6.827457	229.623	382,705	76,541
11-Aug-03	12-Aug-03	0.069936	0.063642	0.34968	0.086721	0.179036	10.56034	209.808	349,680	69,936
18-Aug-03	19-Aug-03	0.0636	0.061692	0.318	0.029256	0.16854	9.2856	508.8	318,000	63,600
25-Aug-03	26-Aug-03	0.079663	0.071697	0.398315	0.090816	0.20792	12.74608	238.989	398,315	79,663
01-Sep-03	02-Sep-03	0.0189928	0.084518	0.47482	0.31623	0.260201	14.2446	949.64	474,820	94,964
08-Sep-03	09-Sep-03	0.277646	0.148541	0.694115	0.162423	0.405363	21.93403	1527.053	1,388,230	138,823
15-Sep-03	16-Sep-03	0.081164	0.080352	-	0.037335	0.296249	15.0965	405.82	405,820	81,164
22-Sep-03	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]
29-Sep-03	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]	na[3]

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] - Average Flow rate is the weekly flow as recorded by flow meter totalizers divided by 7

Note [3] - "na" refers to no effluent discharge to sample

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/03	0.50	1.55	9.16	9.52	2.19	103	5,495	9,158,175	340,023	594,222
August/03	1.95	1.93	11.23	2.09	5.16	306	9,201	11,227,425	510,583	2,261,153
September/03	3.78	3.13	17.53	5.16	9.62	513	28,825	22,688,700	762,676	1,961,166

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 is the actual total volume as recorded by flow meter totalizers for each month.

APPENDIX G

Results of Effluent Characterization

RESULTS OF EFFLUENT CHARACTERIZATION

AS PER PARAGRAPH 15(1)(a)

Nine effluent samples were collected on a weekly basis during the 3rd Quarter of 2003 beginning on July 25, 2003 and ceasing on September 16, 2003. Three of the nine samples were “monthly” samples and analysed 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.

No holding times were missed for any of the water chemistry of toxicity testing samples.

Water samples for acute and sublethal toxicity testing were collected using a pump system from about 20 m downstream of the dam on Garrow Lake, within the main flow of the creek. Acute Lethality Testing was conducted during three months (July, August, and September) during the quarter. 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 once during August 2003. As this is considered a marine discharge, marine species were used for sublethal testing following brine adjustment of the brackish effluent (as per test protocols). Testing for fish (7-d Topsmelt growth and survival) and invertebrates (Sand dollar) was conducted at EVS Environment Consultants, Vancouver, while algae (48-h *Champia*) testing was undertaken by the Saskatchewan Research Council, Saskatoon.

There were no effects observed in the Topsmelt Survival and Growth Test at 100% effluent v/v.

Sublethal effects were observed for the echinoid and algal tests and concentrations less than 100% effluent v/v. In the echinoid *(Dendraster excentricus)* fertilization test (EVS Consultants), the LOAEL was 4.6% v/v effluent, the IC_{25} was 3.8% v/v, and the IC_{50} was 13.0% v/v. In the *Champia parvula* sexual reproduction test (Saskatchewan Research Council) the LOAEL was 17.8% v/v effluent, the IC_{25} 13.6% v/v, and the IC_{50} was 18.8% v/v.

Zinc was the primary contaminant of potential concern (COPC) identified in mine effluent and is the only metal to consistently exceed BC Ambient Water Quality Guidelines (BC AWQG) in effluent. During the 9 week discharge period, effluent zinc concentration averaged 128 ± 49µg/L (range 48 – 186µg/L), which is well below the MMER effluent limit of 500µg/L. The BC AWQG is 10µg/L. On August 19, 2003, when the sublethal samples were collected, the concentration of Zn in the effluent was 146µg/L. Converting the echinoid test endpoints into Zn concentrations results in a Lowest Observed Adverse Effect Level (LOAEL) of 6.7µg/L Zinc, an IC_{25} of 5.5µg/L, and an IC_{50} of 19.0µg/L. Reference toxicity tests of zinc on *Dendraster* fertilization give mean EC_{50} concentrations of 8.5-60µg/L (Dinnel et al. 1983). The concentration of zinc in the effluent that corresponds to the IC_{50} (i.e., 19.0µg/L) is within the effects range reported in reference *Dendraster* fertilization tests. Thus the echinoid test is quite sensitive to zinc, with the LOAEL being less than the BC AWQG concentration.

Endpoints for the *Champia* test in terms of zinc concentrations were 26.0µg/L Zn (LOAEL), 19.9µg/L (IC_{25}), and 27.4µg/L (IC_{50}). The reference IC_{25} endpoint for zinc in the *Champia* test performed in-house at SRC was 27µg/L (95% confidence limits 16-42µg/L). This reference concentration is very similar to zinc concentrations in the mine effluent at the toxicity endpoints observed in the *Champia* test. *Champia* also appears to be sensitive to zinc concentrations at or below the BC AWQG.

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.