# Appendix A - Reports

# DFO 3.4.1 - 1 Proposed Access Road Fisheries Assessments, Doris North Project, 2015

# Memorandum

Refer to File: C.1 - 0298923-0038 (Proposed Access Road Fisheries Assessment Memo 2015).docx

| | |
|---|---|
| **Date:** | November 24, 2015 |
| **To:** | John Roberts, VP Environmental Affairs<br>Katsky Venter, Environmental Advisor<br>Sharleen Hamm, Project Manager |
| **From:** | Fraser Ross (B.Sc., R.P.Bio.) |
| **Cc:** | April Hayward (Ph.D.), Project Manager<br>Marc Wen (M.Sc., R.P.Bio.), Partner in Charge |
| **Subject:** | **Proposed Access Road Fisheries Assessments, Doris North Project, 2015** |

## GLOSSARY AND ABBREVIATIONS

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

| | |
|---|---|
| **CPUE** | Catch-per-unit-effort |
| **DELTs** | Deformities, Erosion, Lesions, or Tumors |
| **ERM** | ERM Consultants Canada Ltd. |
| **FHAP** | Fish Habitat Assessment Procedures |
| **FL** | Fork Length |
| **SHIM** | Sensitive Habitat Inventory Mapping |
| **TMAC** | TMAC Resources Inc. |

## 1. INTRODUCTION

ERM Consultants Canada Ltd. (ERM) conducted fisheries assessments along proposed access roads at the request of TMAC Resources Inc. (TMAC) during the open-water season of 2015. The three proposed road routes are:

- Doris Connector Vent Raise Access Road;
- Doris Central Vent Raise Access Road; and
- Roberts Bay Discharge Access Road (Figure 1-1).

The objectives of the 2015 Proposed Access Road Fisheries Assessments were as follows:

- to determine the locations of waterbodies along each of three proposed road routes;
- to sample the fish communities in all waterbodies along each road route;
- to assess the habitat value of each waterbody; and
- to assess the surface connectivity of these waterbodies to other fish-bearing waterbodies.

This memorandum presents the results of these assessments.

A rainfall event in the latter half of July 2015 caused unseasonably high flow conditions in streams around the Doris North Project (the Project) area. At the Doris Creek hydrology station, located downstream of Doris Lake, discharge was greater at that time than during spring freshet (3.24 $m^3/s$ on July 29th whereas the freshet peak on June 15 was 2.92 $m^3/s$; ERM 2015 in progress). In 2015, the average discharge in Doris Creek between July 15 and September 15 was 1.54 $m^3/s$, whereas during the same period in previous years (2009 to 2014) discharge was 0.60 $m^3/s$. Although none of the sample sites reported herein are located on Doris Creek downstream of the lake, the hydrograph data substantiates field observations that discharge levels at the sample sites and in the general Project area were more typical of peak freshet conditions than what would be expected in mid-August.

# 2. METHODOLOGY

## 2.1 Desktop Assessment

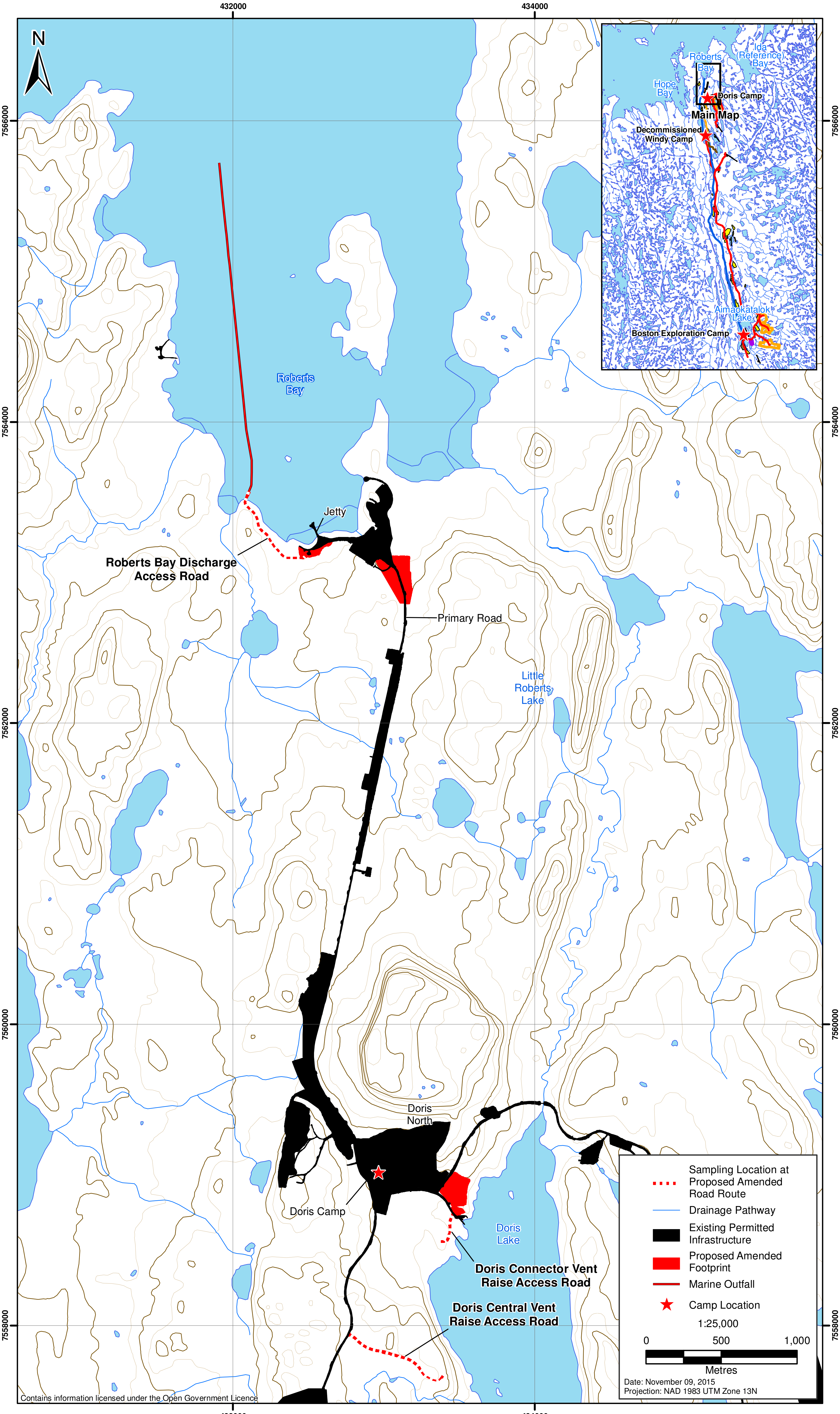
Prior to fieldwork, the proposed roads were plotted on topographic maps to identify locations where the routes bisect waterbodies. The fisheries values of these locations would later be assessed in the field.

Historical fish community and habitat data were reviewed for waterbodies along and surrounding each road route to determine the proximity of known fish-bearing waterbodies to potential crossing sites.

## 2.2 Fish Habitat Assessment

Fish habitat was assessed along each road route on August 13 and 14, 2015. A preliminary assessment was completed to determine whether locations identified during the desktop mapping exercise contained habitats that could support fish (e.g., defined stream channels, ponds). Locations were categorized as “potential fish habitat” or as “not fish habitat” (e.g., subsurface flow, surface water with no defined channel). Sites that did not contain fish habitat were not considered further in the assessment.

Figure 1-1
Proposed Access Road Sampling Locations, Doris North Project, 2015



For sites categorized as potential fish habitat, additional habitat data were collected to determine its value. Habitats were surveyed using methods based on the Fish Habitat Assessment Procedures (FHAP; Johnston and Slaney 1996). Representative sections of each reach were chosen for assessment and individual habitat units were measured with respect to length, bankfull and wetted width, depth, substrate composition, residual pool depth, bank stability, bank height, and instream cover. Stream attributes were marked using a handheld GPS unit and representative photographs were taken. Barriers or seasonal restrictions to fish migration were also noted and measured, where appropriate. Habitat suitability for spawning, rearing, and overwintering was described and an overall habitat quality ranking was applied (Table 2-1).

**Table 2-1. Overall Habitat Quality Rankings and Criteria**

| | Habitat Quality Ranking | | |
|---|---|---|---|
| | **High** | **Medium** | **Low** |
| Definition | Habitat that is necessary to sustain an Aboriginal, commercial, or recreational fishery, any species at risk*, or because of the habitat's relative rareness, productivity, and/or sensitivity. | Habitat that is used by fish for feeding, growth, and migration but is not deemed to be essential. This category of habitat usually contains a large amount of similar habitat that is readily available to the fishery. | Habitat that has low productive capacity and contributes marginally to fish production. |
| Indicators | The presence of high-value spawning or rearing habitat (e.g., locations with an abundance of suitably sized spawning gravels, deep pools, undercut banks, or stable debris, which are necessary to the population), or the presence of any species at risk*, its residence, or its critical habitat. | Migration corridors, the presence of suitable spawning habitat, habitat with moderate rearing potential for the fish species present. | The absence of suitable spawning habitat, and habitat with low rearing potential (e.g., locations with a distinct absence of deep pools, undercut banks, or stable debris, and with little or no suitably sized spawning gravels for the fish species present). |

*Notes: * those designated by the Committee on the Status of Endangered Wildlife in Canada, or species listed on Schedule 1 of the Species At Risk Act (2002).*

The connectivity of each stream to other fish-bearing waterbodies was assessed to help determine whether the stream might provide seasonal habitat to fish. Small Arctic streams flow seasonally; some flow only during freshet then become dry later in the summer, while others flow throughout the ice-free period but freeze to the substrate in winter. These seasonal streams are only of value to fish if they are connected to other habitat types where fish can overwinter, such as lakes or deep ponds.

## 2.3 Fish Community Assessment

Backpack electrofishing was the primary method used to sample stream fish communities on August 13 and 14, 2015. Figures 2.3-1 and 2.3-2 show the stream sections sampled by electrofishing in an unnamed tributary to Doris Lake and an unnamed tributary to Roberts Bay respectively. A crew leader operated a Smith-Root LR-24 and was accompanied by one dip netter. Anode ring diameter was 28 cm and dip net diameter was 21 cm with 3.2 mm mesh.

A systematic sweep sampling approach was conducted moving in an upstream direction that covered the entire wetted width of the stream, including all channels where flow was braided. Electrofishing effort was not pre-determined because the primary objective was to determine whether fish were present in the stream and, if so, determine fish community composition. Electrofisher voltage (V), duty cycle (%) and frequency (Hz) settings were adapted at each site to maximize catch efficacy.

All captured fish were identified to species and given a unique sample number. Fork Length (FL) was measured to the nearest 1 mm with a measuring board and wet weight was measured to the nearest 0.1 g using an electronic scale for each fish. Where parasites or deformities, erosions, lesions, or tumors (DELTs) were observed, this information was recorded for each fish. In addition, all observations of fish that were seen but not captured were noted.

All captured fish were placed immediately in a holding tank for species identification, enumeration, and biological processing and then released back into the site once collection was complete. Electrofishing effort was standardised as Catch Per Unit Effort (CPUE), which was calculated as the number of fish captured per 100 s.

*CPUE = number of fish caught * [100/(electrofishing effort in seconds)]*

Field crews intended to set minnow traps as a second method of sampling fish communities; however, insufficient water depths prevented their use.

# 3. RESULTS AND DISCUSSION

## 3.1 Desktop Assessment

The review of topographic maps identified locations where both the proposed Doris Connector Vent Raise Access Road and the Roberts Bay Discharge Access Road bisect drainages. Conflicting data exists for a third drainage under the proposed Doris Central Vent Raise Access Road; 1:50,000 map data indicates that the drainage turns south and away from the road route before they cross (e.g. Figure 1-1), whereas more recent, site plan map data indicates that this road would cross a drainage (e.g. Figure 2.3-1). Given this uncertainty, the drainage routes would later be assessed in the field.

## 3.2 Historical Fisheries Data Review

Historical fisheries data are summarized below for waterbodies along and surrounding each road route.

### *3.2.1 Doris Connector Vent Raise Access Road*

Topographic mapping indicates that the Doris Connector Vent Raise Access Road bisects one small unnamed surface drainage that discharges directly into Doris Lake. No historical fisheries data exists for this waterbody. Doris Lake has been extensively sampled; the fish community consists of Lake Trout (*Salvelinus namaycush*), Lake Whitefish (*Coregonus clupeiformis*), Cisco (*Coregonus artedii*), and Ninespine Stickleback (*Pungitius pungitius*; Rescan 2010).

Figure 2.3-1

**Electrofishing Sample Route along Unnamed Tributary to Doris Lake, Doris North Project, 2015**

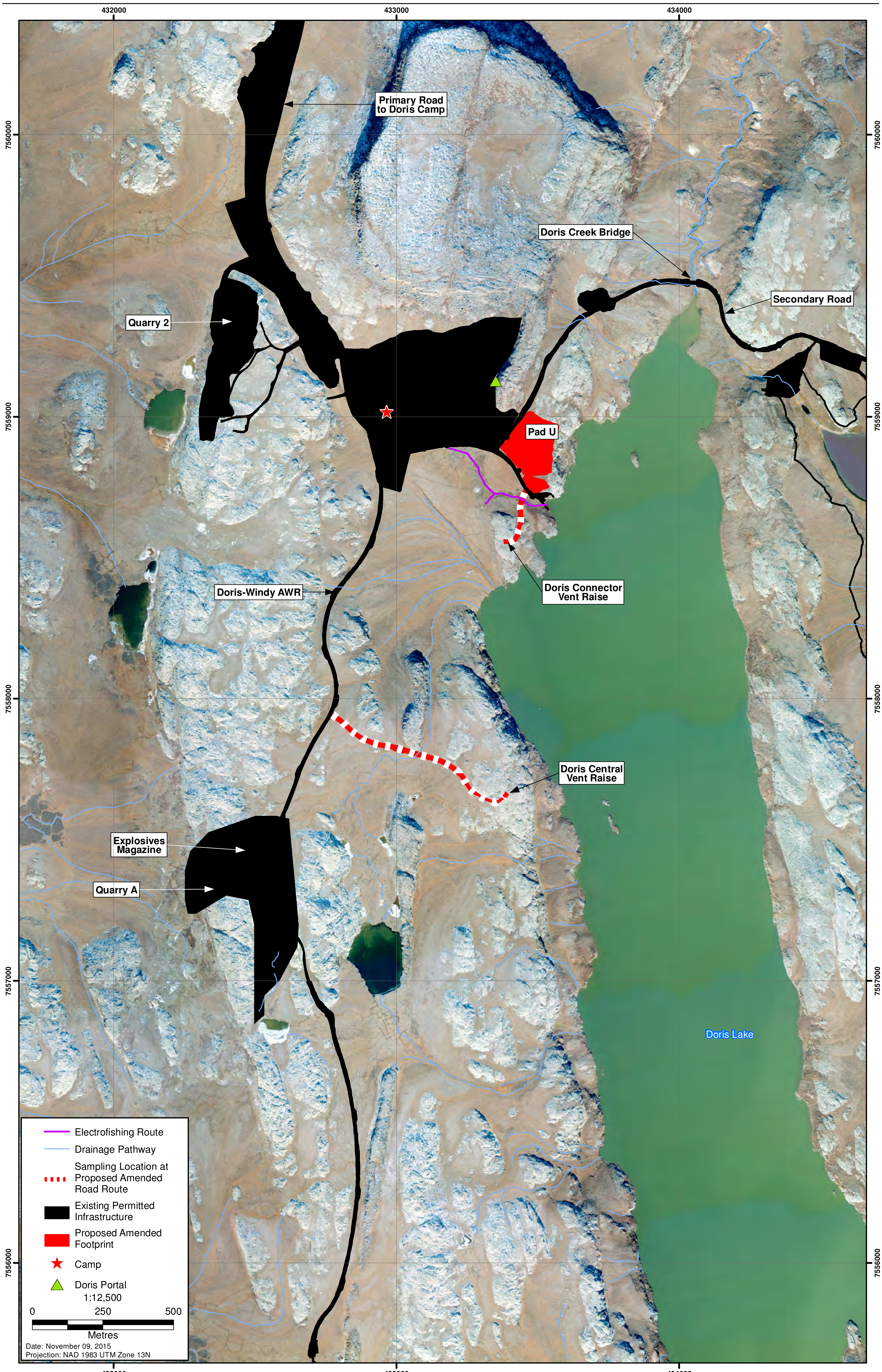
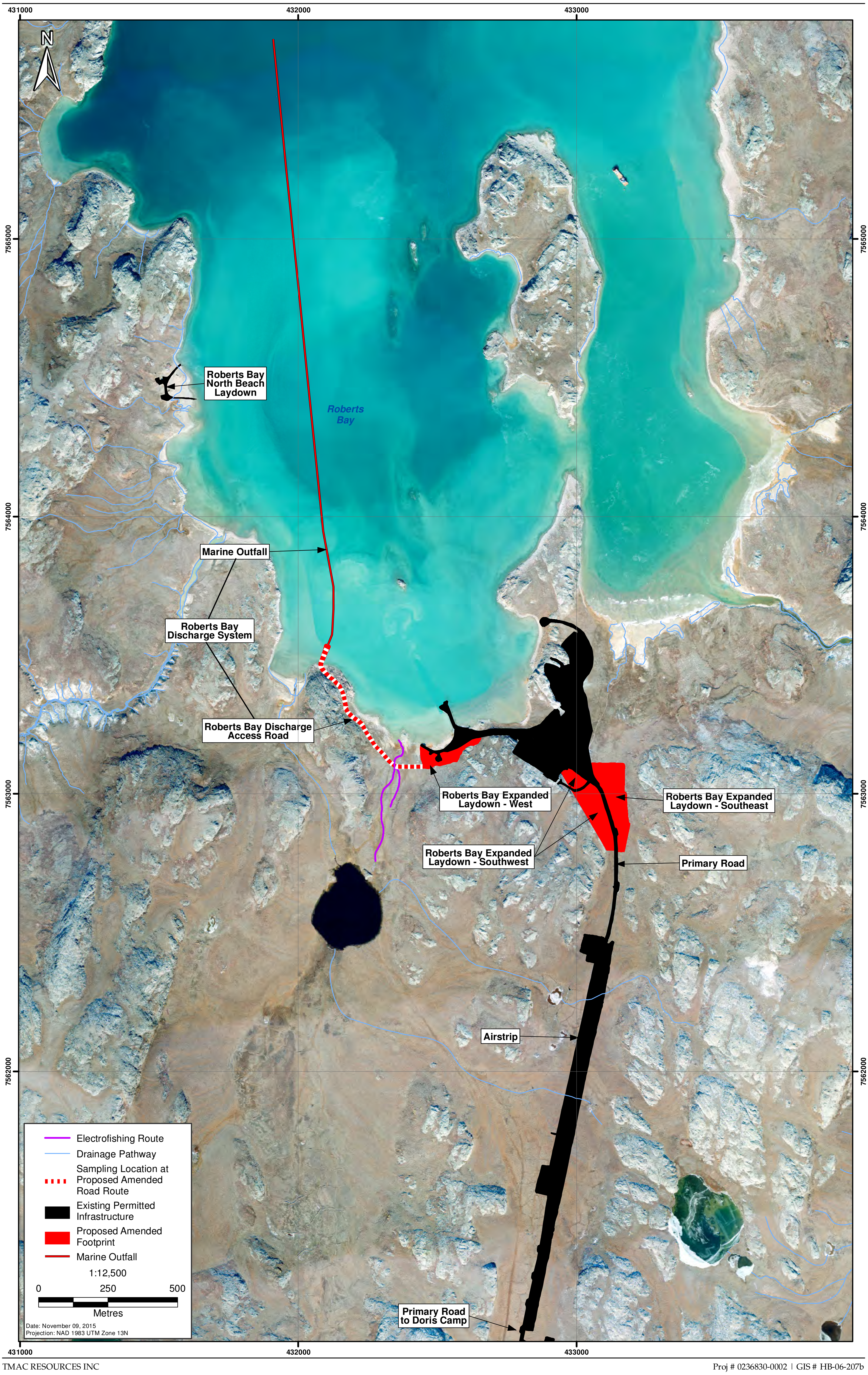


Figure 2.3-2

**Electrofishing Sample Route along Unnamed Tributary to Roberts Bay, Doris North Project, 2015**

ERM



### *3.2.2 Doris Central Vent Raise Access Road*

A review of historical fisheries data found that Sensitive Habitat Inventory Mapping (SHIM) was completed on a drainage that crosses the proposed Doris Central Vent Raise Access Road in 2010 (Rescan 2011). SHIM is a field-based method used to collect reliable, high quality, current and spatially accurate information about freshwater habitats and watercourses (Mason and Knight 2001). SHIM found that the general direction of drainage does cross the proposed access road (despite what 1:50,000 topographic mapping suggested), but there is no defined stream channel in the area; instead the area is covered with terrestrial vegetation that seeps towards Doris Lake through poorly defined pathways. When the SHIM sampling was completed, no fish community sampling could be completed as there was not a defined waterbody to sample.

### *3.2.3 Roberts Bay Discharge Access Road*

The proposed Roberts Bay Discharge Access Road crosses one small, unnamed stream that drains into the southern end of Roberts Bay. This stream was sampled on one previous occasion; in August 2009 fish community and fish habitat were sampled (Rescan 2010). In 4,455 seconds of electrofishing effort, 12 Ninespine Sticklebacks were captured (CPUE = 0.27). On August 1, 2009 the lowest 100 m of the stream was flowing; above this section were isolated pockets of water and seepage through terrestrial vegetation. In the flowing section of the creek, the mean wetted depth was 0.2 m and wetted width was 0.3 m. Spawning habitat was rated as fair due to the presence of riffles with gravel substrate that could be used by spawning salmonids and wetted vegetation that could be used by spawning coarse fish species. Overall, fine sediment was the dominant substrate type (90%) and gravels comprised the remainder. Rearing, adult feeding, and migration quality were all rated as poor, and no overwintering habitat was observed.

A small, unnamed pond located in the headwaters of the stream's watershed had not been sampled previously.

## 3.3 Fish Habitat Assessment

### *3.3.1 Doris Connector Vent Raise Access Road*

The desktop assessment identified one location where the Doris Connector Vent Raise Access Road intersects a waterbody; the proposed route crosses a small, unnamed tributary to Doris Lake. The field assessment of the road route completed on August 13, 2015 confirmed that this was the only location where the road bisects a drainage.

The stream is approximately 500 m in length, draining land to the south and east of the existing Float Plane Dock Access Road. Its headwaters consist of a series of discontinuous channel braids, which converge into a poorly connected channel in the vicinity of the proposed stream crossing. From there, the stream flows intermittently in a channel to a culvert under the Float Plane Dock Access Road and into Doris Lake.

The upper section of the watershed provides poor quality fish habitat. The braided channels are poorly defined, narrow (mean width 0.28 m), shallow (mean depth 0.11 m), and have poor connectivity with each other and with the lower section of the creek (Plate 3.2-1). Dense in-channel terrestrial vegetation and low discharge even during peak periods limit fish movement and the habitat value in this section. Where the proposed road route crosses the stream, the stream channel is poorly defined and is dominated by terrestrial vegetation, suggesting that it contains flow for a short period during most years (Plate 3.2-2). This area did contain a small amount of flow during August 2015 due to anomalous weather conditions; however, it is expected that this area would cease flowing soon after freshet in most years. Habitat throughout this section is of poor quality.

*Plate 3.2-1. The upper stream section consists of small, braided channels with poor connectivity to the lower section of the stream, August 13, 2015.*

Just upstream of Doris Lake the stream flows through a single 6” diameter culvert under the Doris Lake boat launch ramp. Just upstream of the culvert there is a 3 m section of creek that has a defined channel that could provide some rearing habitat to coarse fish. During the site visit, the channel downstream of the culvert was poorly defined and contained little flow; the majority of water discharging from the culvert percolated subsurface through loose gravels before entering Doris Lake (Plate 3.2-3).

Access to the entire stream for fish in Doris Lake is limited; subsurface flow downstream of the culvert and heavy instream vegetation will restrict fish movement during most flow conditions.

*Plate 3.2-2. The stream section upstream of the culvert is poorly defined due to heavy in-channel vegetation, August 13, 2015.*

*Plate 3.2-3. Discharge from the Doris Lake boat launch culvert percolates into loose gravels, August 13, 2015.*

### *3.3.2 Doris Central Vent Raise Access Road*

A field crew walked the full length of the proposed Doris Central Vent Raise Access Road but no waterbodies were identified. Similar to results from historical SHIM mapping, the field assessment found that the proposed road route does cross the drainage pathway, but there is no defined stream channel. Instead, the area is covered with terrestrial vegetation and the land drains towards Doris Lake through poorly defined pathways. As no fish habitat exists along this route, no additional habitat data were collected.

### *3.3.3 Roberts Bay Discharge Access Road*

The desktop assessment identified one location where the Roberts Bay Discharge Access Road intersects a waterbody; the proposed route crosses a small, unnamed tributary to Roberts Bay. The field assessment of the road route completed on August 13, 2015 confirmed that this was the only location where the road bisects a drainage.

The stream is approximately 500 m in length, draining land at the southern end of Roberts Bay. The stream can be divided into two sections; the upper section has a poorly defined channel and is dominated by terrestrial vegetation, and the lower section contains a well-defined channel that discharges into Roberts Bay.

Marginal fish habitat exists in the upstream section of the stream. No salmonid spawning, rearing, migration, or overwintering habitat exists, but it may provide limited rearing habitat to coarse fish. This section is approximately 400 m in length and has a poorly defined channel where water seeps downslope primarily through dense terrestrial vegetation. Some surface water was flowing through grasses in this section of the stream during the August 2015 fieldwork, but this is likely atypical for this time of year based on the aforementioned high flows observed locally in 2015. Dense terrestrial vegetation indicates that this area typically flows for only a brief period during spring snow melt.

There was poor, but existing, connectivity between the upper reaches of the stream and an unnamed pond during the site visit on August 13, 2015. The dominant outflow of this pond flows to the northwest, but some water does seep through a heavily vegetated area and into the creek when water levels are high. This connection is weak, but small bodied fish may occasionally pass through this avenue.

The downstream section of the stream is approximately 100 m in length, containing multiple braided, well defined channels that gradually merge and provide good connectivity between the creek and Roberts Bay. The proposed road route intersects with the upstream portion of this section of the creek. Similar to the habitat assessment completed in 2009, fine sediments dominated the streambed substrate with lesser amounts of gravel also. The overall value of the creek was rated as poor as the stream has low quality rearing, adult feeding, and migration habitat and has no overwintering habitat; however, the downstream section may provide fair spawning and juvenile rearing habitat.

## 3.4 Fish Community Assessment

### *3.4.1 Doris Connector Vent Raise Access Road*

Fish do inhabit the stream that intersects with the Doris Connector Vent Raise Access Road, but fish density and diversity are both low. In 1962 seconds of electrofishing, four Ninespine Sticklebacks were captured (CPUE = 0.20) and two additional fish were observed but not captured. All of these fish were caught or observed in a 3 m section of stream just upstream of the existing culvert, confirming that fish are able to pass from the lake upstream through the culvert during freshet (Figure 3.4-1). Fish use appears to be restricted to this small section of the stream; no fish were captured or observed in the remainder of the stream, including where the stream and the road intersect, despite a high level of effort. Upstream of this small fish-bearing section of the creek, the channel is poorly defined and is dominated by dense terrestrial vegetation that limits fish passage. The fish-bearing section of stream is approximately 50 m downstream of the intersection of the stream and the proposed road route.

In 2015, stream flow conditions were unusual due to a large rainfall event in July. Channel morphology and an abundance of terrestrial vegetation suggest that this stream typically flows for a far shorter period than was observed in 2015. This stream provides a small amount of poor quality rearing habitat for a short duration to coarse fish in Doris Lake.

### *3.4.2 Doris Central Vent Raise Access Road*

No waterbodies exist along the route of the proposed Doris Central Vent Raise Access Road, so no community sampling was completed in this area. Terrestrial drainage passes under the proposed access road, but there is no defined stream channel; instead the area is covered with terrestrial vegetation that seeps towards Doris Lake through poorly defined pathways.

### *3.4.3 Roberts Bay Discharge Access Road*

A total of four Ninespine Sticklebacks were captured in the stream that flows under the proposed Roberts Bay Discharge Access Road in 4,284 seconds of electrofishing (CPUE = 0.01). This finding is similar to 2009, where only Ninespine Sticklebacks were captured. All fish were captured in the lower section of the stream downstream of the location where the proposed road intersects (Figure 3.4-2). This indicates that poor habitat conditions and dense vegetation prelimit upstream movement of fish from Roberts Bay beyond the lower 100 m section of the stream.

**Figure 3.4-1**

**Fish-bearing Reach of an Unnamed Stream that Intersects the Doris Connector Vent Raise Access Road on August 13 2015, Doris North Project**

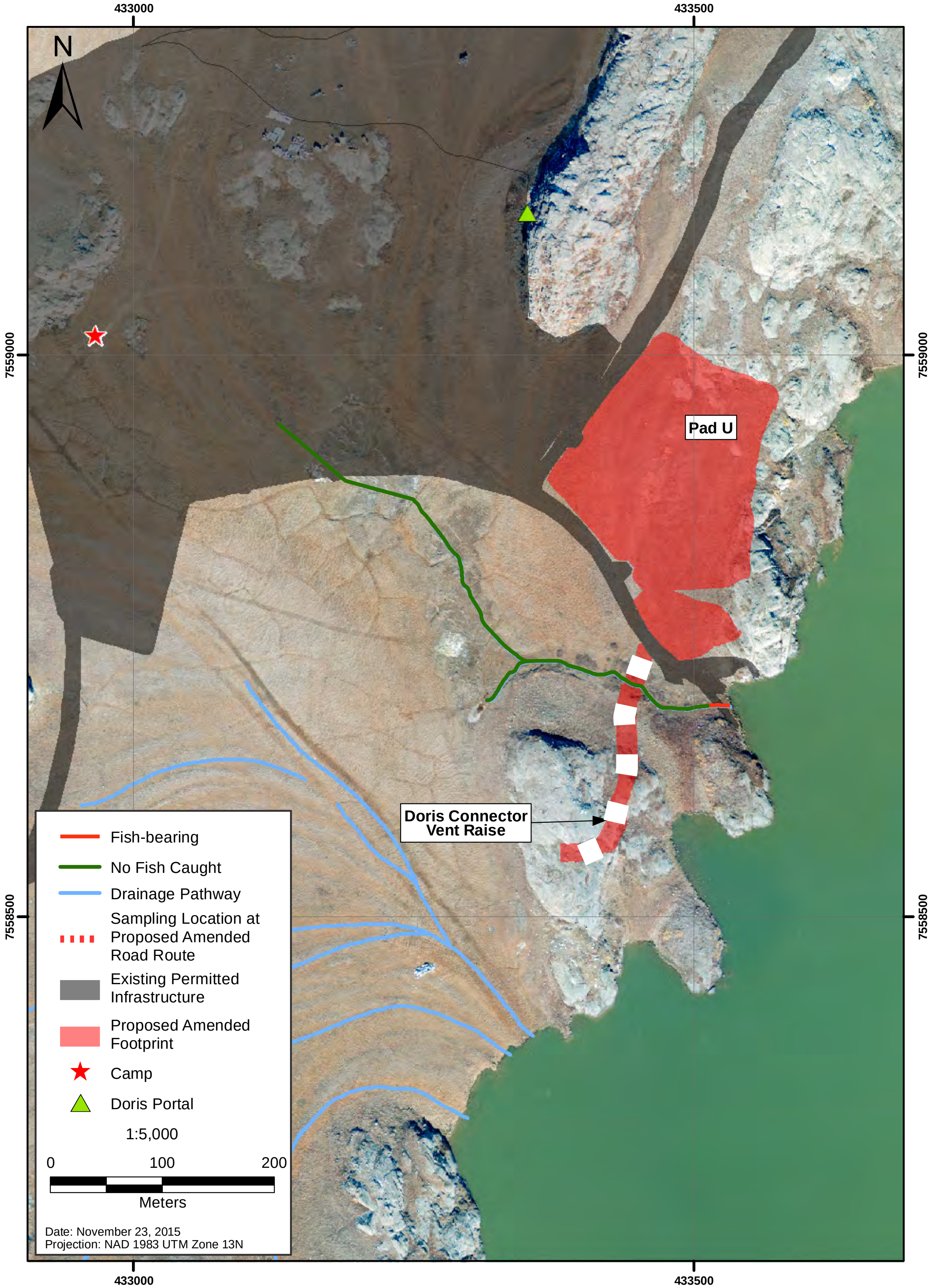
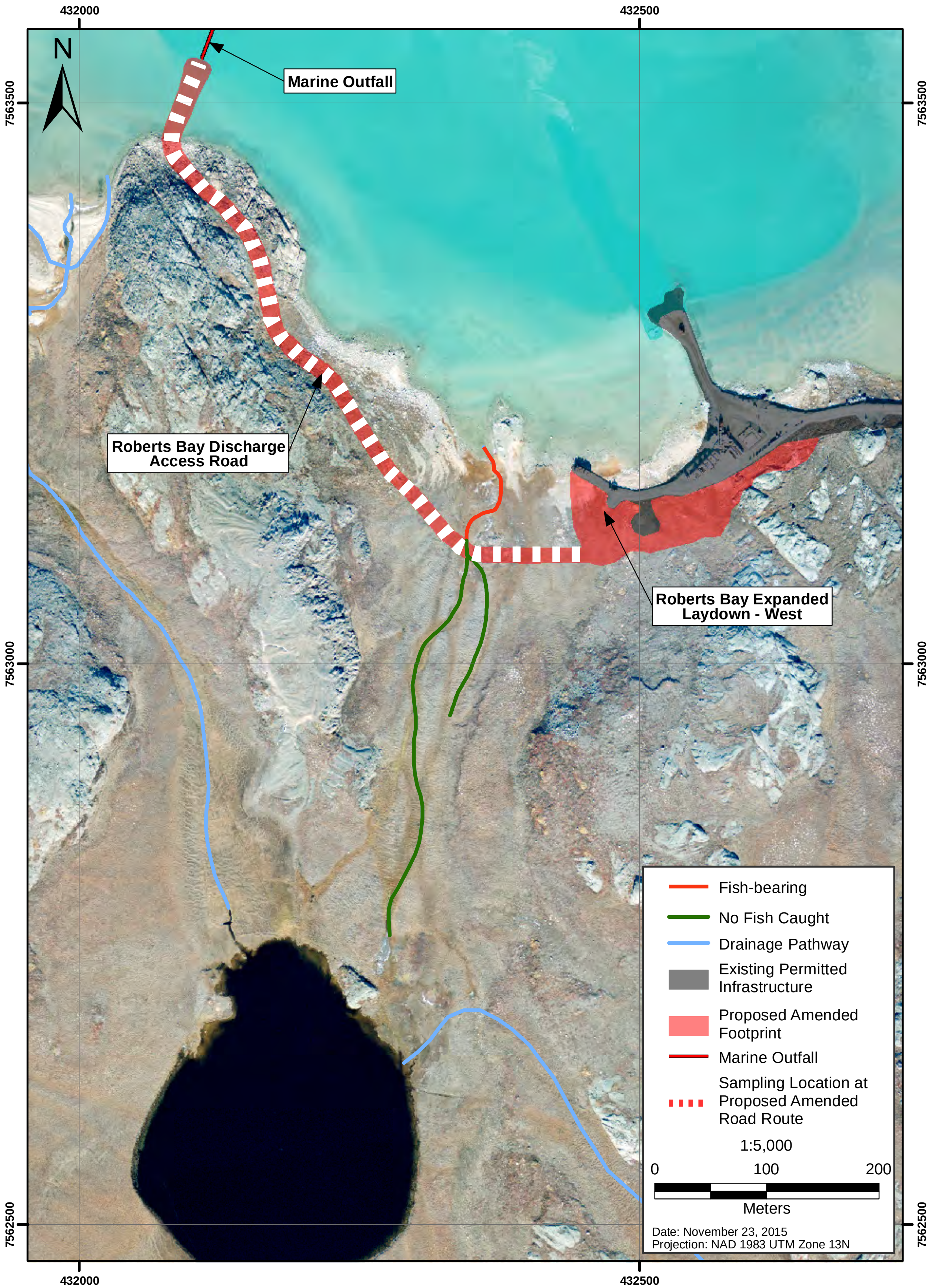


**Figure 3.4-2**

**Fish-bearing Reach of an Unnamed Stream that intersects the Roberts Bay Discharge Access Road on August 13 2015, Doris North Project**



# 4. SUMMARY

### *4.1.1 Doris Connector Vent Raise Access Road*

One short stream that contains poor quality fish habitat intersects the proposed Doris Connector Vent Raise Access Road. The stream channel throughout is poorly defined and fish movement within the stream is limited by a culvert, dense vegetation growth, and shallow water depths.

Ninespine Sticklebacks inhabit the stream in low densities. Their distribution appears to be restricted to the lowest few metres of the creek just upstream of Doris Lake and approximately 50 m downstream of the proposed road crossing. It appears that fish from Doris Lake can access this section of the creek during peak discharge events, but movement beyond this section is limited as the stream channel is poorly defined and it is dominated by dense terrestrial vegetation.

### *4.1.2 Doris Central Vent Raise Access Road*

No fish habitat exists along the proposed route for the Doris Central Vent Raise Access Road. Terrestrial drainage passes under the proposed access road, but there is no defined stream channel; instead the area is covered with terrestrial vegetation that seeps towards Doris Lake through poorly defined pathways.

### *4.1.3 Roberts Bay Discharge Access Road*

A single stream intersects the proposed route of the Roberts Bay Discharge Access Road. Upstream of the crossing the stream channel is poorly defined, where dense terrestrial vegetation and shallow water depths limit fish passage and use even during peak flow periods. No fish were captured in this section of the creek during the current sampling program or during the one previous sampling event.

The stream does provide some fish habitat adjacent to and downstream of the location where it intersects with the proposed road route. This section of creek (approximately 100 m in length) has a clearly defined channel and provides some rearing habitat for coarse fish that can access the creek from Roberts Bay. In two years of sampling, Ninespine Stickleback is the only species that has been captured in this stream.

Prepared by:

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Reviewed by:

April Hayward, Ph.D.
Project Manager, ERM

## REFERENCES

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Rescan. 2011. *2010 Freshwater fish and fish habitat baseline report, Hope Bay Belt Project*. Prepared for Newmont Mining Corporation by Rescan Environmental Services Ltd.: Vancouver, BC.

EC-7 – 1 Threespine Stickleback Toxicity Testing

EC-7 – 2 Groundwater Results QA/QC

EC-7 – 3 Groundwater Analytical Results

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FILE:GOLDER/1011034.STB

**DATE:** 15 November 2010

**TO:** Peter Chapman
Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, B.C.
V5C 6C6

**REPORT ON: THREESPINE STICKLEBACK TOXICITY TESTING**

**SAMPLE DESCRIPTION:**

| | |
|---|---|
| IRC Sample ID No.: | 1011034 |
| **Sample Name:** | **10WBW001 Zone 6** |
| Date collected: | 31 October 2010; 1400 hrs |
| Date received: | 2 November 2010; 1630 hrs |
| Amount, Container: | 4 x 20L plastic containers |
| Physical description: | Opaque, yellow-orange liquid |
| Date, time tested: | 3 November 2010; 0945 hrs |

| **96 HR TEST RESULTS:** |
|---|
| The 96 hour (static) $LC_{50}$ was greater than 100% (v/v sample). |
| 30% stickleback mortality in 100% concentration. |

The $LC_{50}$ is defined as the median lethal concentration or the concentration at which there is 50% fish mortality. Results are calculated using the method described by Stephan (Methods for calculating an $LC_{50}$ in: Aquatic Toxicology and Hazard Evaluation, American Society for Testing and Materials, 1977).

The method used for this test was as per the "Biological Test Method: Acute Lethality Test Using Threespine Stickleback (*Gasterosteus aculeatus*)" EPS 1/RM/10, July 1990. Test volume was 20 litres with 10 fish exposed in each test vessel. Aeration was by forced air through airstones at a rate of approximately 6.5 ± 1 ml/L/min. The sample was not pH adjusted or filtered prior to testing.

The initial dissolved oxygen level was 8.5 mg/L at 14.5°C, the conductivity was 49.0 mS/cm and the initial pH was 7.5. Sample salinity was 31.3 ppt. After pre-aerating the sample for 30 minutes, the dissolved oxygen level was 8.8 mg/L. As the dissolved oxygen level was greater than 70% saturation and less than 100% saturation the test was initiated at this time. The test set up technician was KA.

Please call should you have any questions.

IRC Integrated Resource Consultants Inc.

Carolyn Wilson
Laboratory Biologist
enclosure

FILE:GOLDER/1011034.STB

**RAW DATA:**

| TEST CONCENTRATION | HOURS | 0 | 24 | 48 | 72 | 96 |
|---|---|---|---|---|---|---|
| 100% | Percent Survival | 100% | 100% | 80% | 70% | 70% |
| | Dissolved Oxygen (mg/L) | 8.8 | 8.4 | 8.2 | 8.3 | 8.3 |
| | Temperature (°C) | 14.5 | 14.5 | 15.0 | 15.0 | 15.0 |
| | pH | 7.6 | 7.7 | 7.8 | 7.8 | 7.8 |
| | Conductivity (mS/cm) | 49.1 | | | | 50.0 |
| | Salinity (ppt) | 31.4 | 31.5 | 31.6 | 31.9 | 31.9 |
| | Symptoms | 1 | 2 | 2 | 2 | 2 |
| | Loading Density (g/L) | 0.30 | 0.30 | 0.24 | 0.21 | 0.21 |
| 50% | Percent Survival | 100% | 100% | 90% | 90% | 90% |
| | Dissolved Oxygen (mg/L) | 8.9 | 8.3 | 8.2 | 8.3 | 8.2 |
| | Temperature (°C) | 14.5 | 14.5 | 15.0 | 15.0 | 15.0 |
| | pH | 8.0 | 7.9 | 7.9 | 7.9 | 7.9 |
| | Conductivity (mS/cm) | 48.2 | | | | 49.1 |
| | Salinity (ppt) | 30.7 | 30.9 | 31.1 | 31.1 | 31.3 |
| | Symptoms | 1 | 2 | 2 | 2 | 2 |
| | Loading Density (g/L) | 0.30 | 0.30 | 0.27 | 0.27 | 0.27 |
| 25% | Percent Survival | 100% | 100% | 80% | 80% | 80% |
| | Dissolved Oxygen (mg/L) | 8.9 | 8.3 | 8.3 | 8.4 | 8.4 |
| | Temperature (°C) | 14.5 | 15.0 | 15.0 | 15.0 | 15.0 |
| | pH | 8.2 | 8.0 | 8.0 | 8.0 | 8.0 |
| | Conductivity (mS/cm) | 47.9 | | | | 48.3 |
| | Salinity (ppt) | 30.5 | 30.7 | 30.7 | 30.9 | 31.0 |
| | Symptoms | 1 | 1,2 | 1,2 | 1,2 | 1,2 |
| | Loading Density (g/L) | 0.30 | 0.30 | 0.24 | 0.24 | 0.24 |
| 12.5% | Percent Survival | 100% | 100% | 100% | 100% | 100% |
| | Dissolved Oxygen (mg/L) | 8.8 | 8.4 | 8.5 | 8.4 | 8.3 |
| | Temperature (°C) | 14.5 | 15.0 | 15.0 | 15.0 | 15.0 |
| | pH | 8.4 | 8.2 | 8.2 | 8.2 | 8.2 |
| | Conductivity (mS/cm) | 47.7 | | | | 48.2 |
| | Salinity (ppt) | 30.3 | 30.4 | 30.6 | 30.7 | 30.8 |
| | Symptoms | 1 | 1,2 | 1,2 | 1,2 | 1,2 |
| | Loading Density (g/L) | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| 6.2% | Percent Survival | 100% | 100% | 100% | 100% | 100% |
| | Dissolved Oxygen (mg/L) | 8.9 | 8.3 | 8.3 | 8.3 | 8.2 |
| | Temperature (°C) | 14.5 | 15.0 | 15.0 | 15.0 | 14.5 |
| | pH | 8.3 | 8.2 | 8.1 | 8.1 | 8.1 |
| | Conductivity (mS/cm) | 47.5 | | | | 47.5 |
| | Salinity (ppt) | 30.2 | 30.3 | 30.3 | 30.4 | 30.4 |
| | Symptoms | 1 | 1,2 | 1,2 | 1,2 | 1,2 |
| | Loading Density (g/L) | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| CONTROL | Percent Survival | 100% | 100% | 100% | 100% | 100% |
| | Dissolved Oxygen (mg/L) | 8.9 | 8.1 | 8.0 | 8.0 | 7.9 |
| | Temperature (°C) | 14.5 | 15.0 | 14.5 | 15.0 | 15.0 |
| | pH | 8.4 | 8.2 | 8.1 | 8.1 | 8.1 |
| | Conductivity (mS/cm) | 47.3 | | | | 47.6 |
| | Salinity (ppt) | 30.1 | 30.1 | 30.2 | 30.1 | 30.2 |
| | Symptoms | 1 | 1 | 1 | 1 | 1 |
| | Loading Density (g/L) | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| | Technician | KA | LH | LH | LH | LH |

**KEY TO SYMPTOMS:**

1 = no apparent effect
2 = fish showing signs of stress
3 = loss of equilibrium

## TEST FISH STOCK INFORMATION

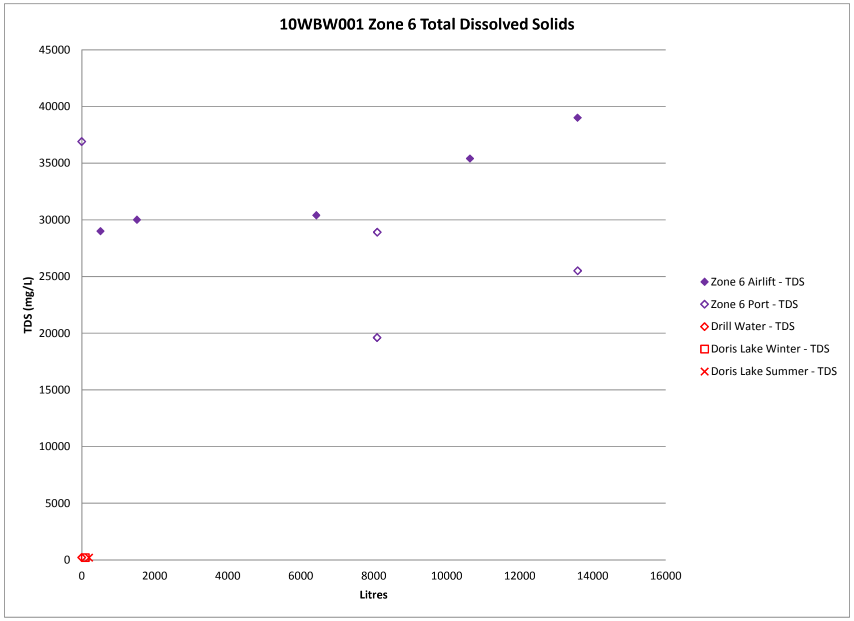
| | | |
|---|---|---|
| Date received: | 20 October 2010 | |
| Source: | Ladner Trunk Road | |
| Species: | *Gasterosteus aculeatus* (Threespine Stickleback) | |
| | | |
| Fork Length: | Mean: | 38.4 mm ± 5.8 mm |
| | Range: | 30.0 mm – 45.0 mm |
| | | |
| Wet weight: | Mean: | 0.59 g ± 0.17 g |
| | Range: | 0.29 g – 0.80 g |
| | | |
| Condition Factor (100xWt/length$^3$cm): | 1.04 | |

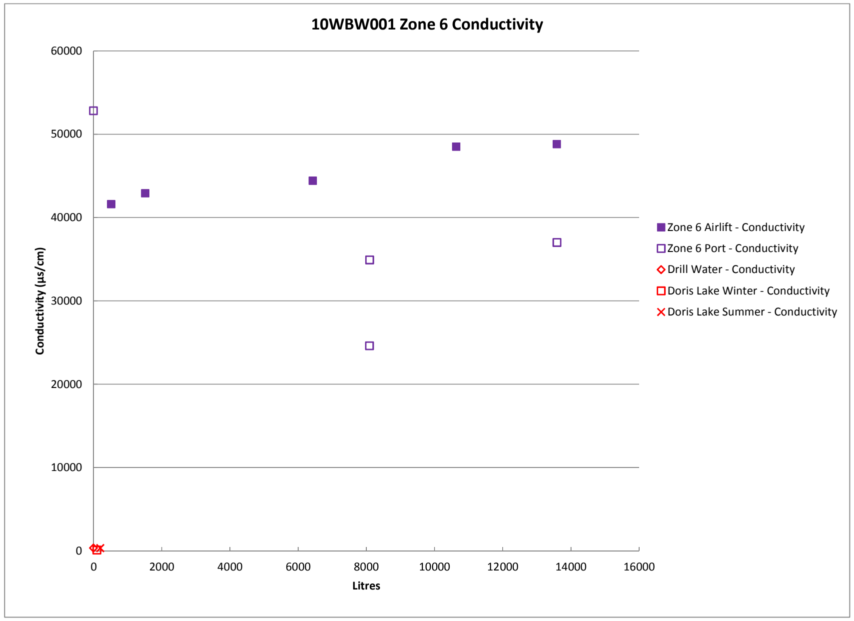
| Acclimation History | |
|---|---|
| Acclimation temperature: | 14.0 to 15.0 ° CELSIUS |
| Treatments: | None |
| Water: | Dechlorinated tap water, adjusted to 30.0ppt using dry ocean salts |
| Feeding: | Freeze-dried brine shrimp |
| Salinity: | 1.0 to 26.1 ppt |
| Mortality: | 0.92% in week prior to testing |

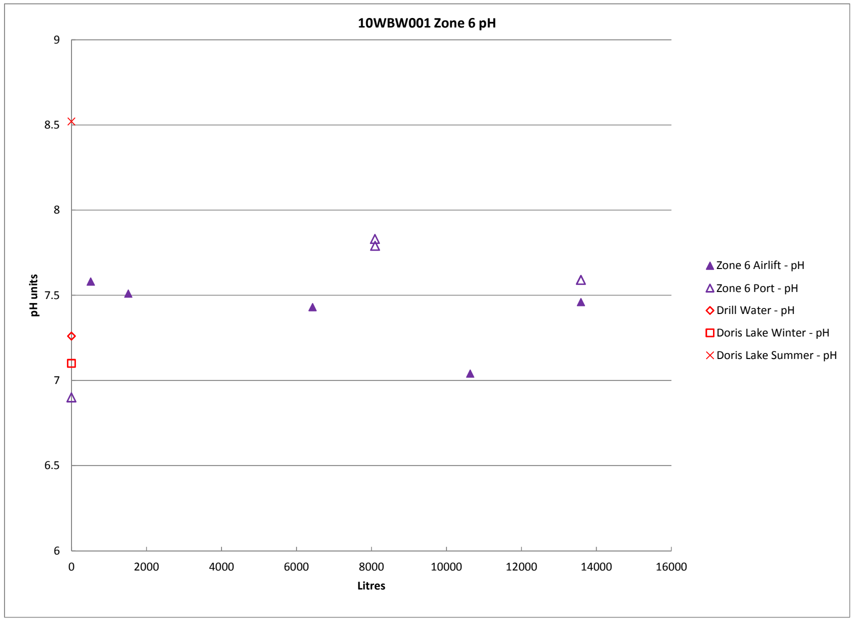
## THREESPINE STICKLEBACK REFERENCE TOXICANT DATA

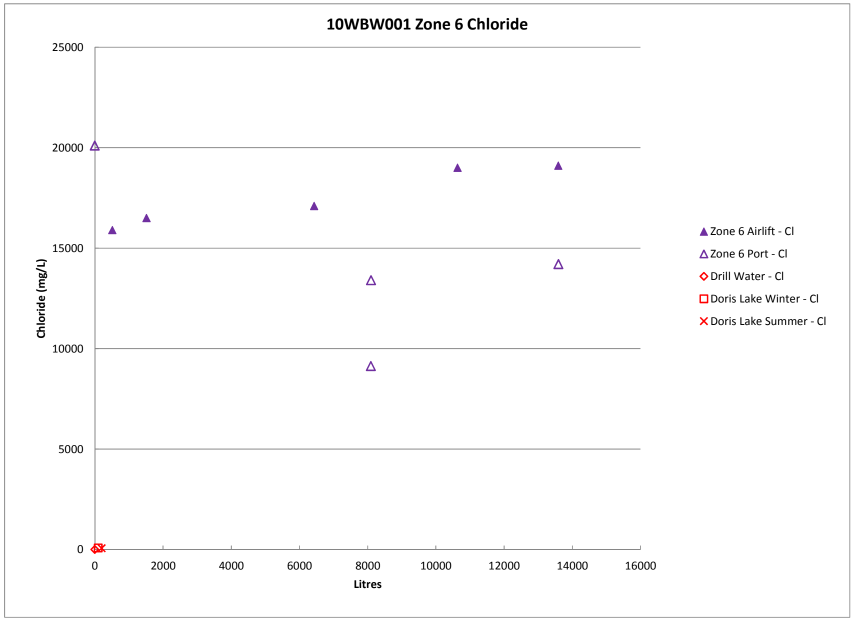
| Stock Arrival Date (y/m/d) | Test Date (y/m/d) | Toxicant | Log $LC_{50}$ (mg/L) |
|---|---|---|---|
| 05.03.01 | 05.03.30 | Phenol | 1.33 |
| 05.06.02 | 05.06.17 | " | 1.26 |
| 05.08.16 | 05.09.07 | " | 1.21 |
| 05.11.10 | 05.12.02 | " | 1.30 |
| 06.02.22 | 06.03.15 | " | 1.16 |
| 06.06.02 | 06.06.26 | " | 1.36 |
| 06.08.18 | 06.08.31 | " | 1.10 |
| 06.12.08 | 06.12.20 | " | 1.03 |
| 07.02.14 | 07.02.14 | " | 1.02 |
| 07.04.24 | 07.05.16 | " | 1.14 |
| 07.07.17 | 07.08.08 | " | 1.23 |
| 07.11.02 | 07.11.16 | " | 1.11 |
| 08.01.23 | 08.02.08 | " | 1.13 |
| 08.05.10 | 08.05.24 | " | 1.22 |
| 08.08.19 | 08.09.05 | " | 1.16 |
| 08.12.04 | 08.12.16 | " | 1.29 |
| 09.03.04 | 09.03.19 | " | 1.10 |
| 09.06.05 | 09.06.18 | " | 1.30 |
| 09.09.21 | 09.09.30 | " | 1.29 |
| 10.02.27 | 10.03.19 | " | 1.10 |
| 10.06.03 | 10.07.06 | " | 1.28 |
| 10.09.09 | 10.09.24 | " | 1.19 |
| 10.10.20 | 10.11.09 | " | 1.11 |
| **LAB GEOMETRIC MEAN (LOG) ± 2 standard deviations:** | | | 1.19 mg/L ± 0.19 |
| **Warning Limits (Log Values):** | | | 1.01 mg/L to 1.38 mg/L |

J:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110125 Westbay Data Report\Appendices\Appendix M Water quality interpretive graphs

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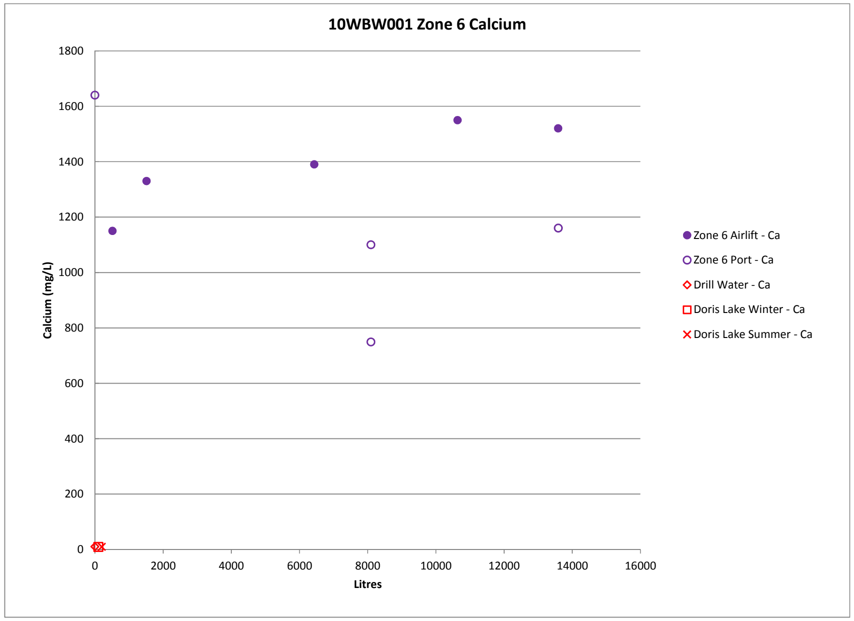
2010 West Bay Data Report - Appendix M

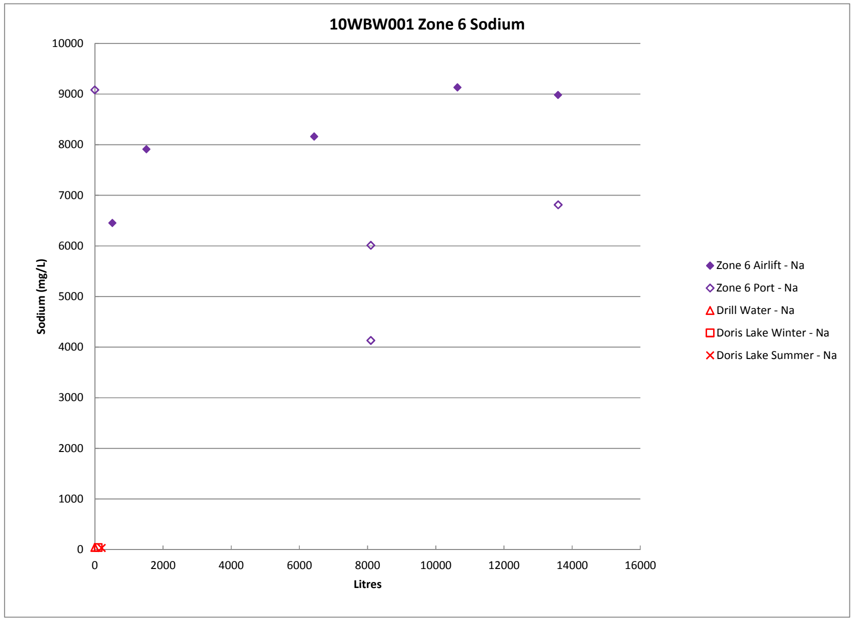
Doris Central 10WBW001
Zone 6

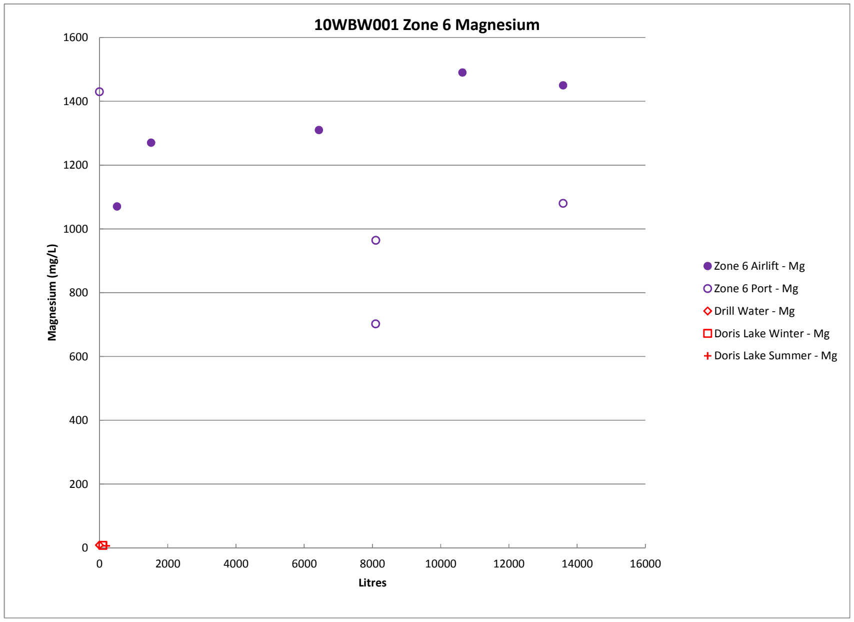
Job No: 1CH008.013
Filename: Figures M1-9_DorisCentral_20110202.pptx

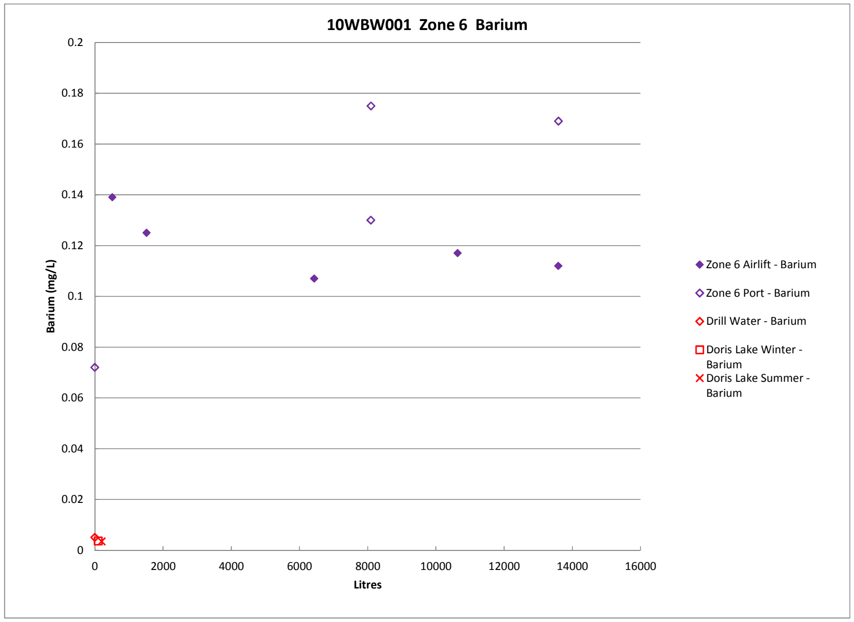
HOPE BAY MINING LTD.

Date: February 2011
Approved: JH
Figure: M.4

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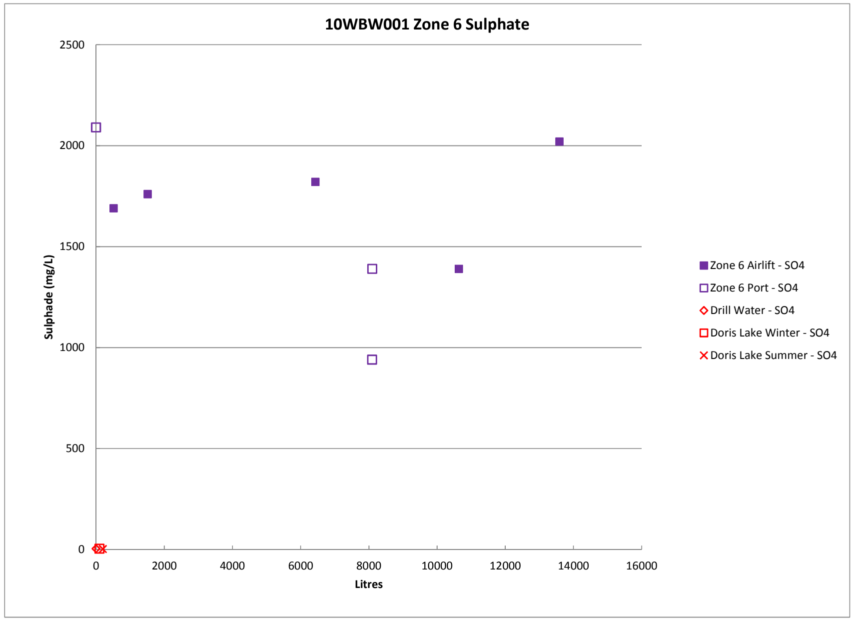
| | | |
|---|---|---|
| Job No: 1CH008.013 | | 2010 West Bay Data Report - Appendix M |
| Filename: Figures M1-9_DorisCentral_20110202.pptx | HOPE BAY MINING LTD. | Doris Central 10WBW001 Zone 6 |
| | | Date: February 2011 · Approved: JH · Figure: M.5 |

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2010 West Bay Data Report - Appendix M

Doris Central 10WBW001
Zone 6

Job No: 1CH008.013

Filename: Figures M1-9_DorisCentral_20110202.pptx

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Date: February 2011

Approved: JH

Figure: M.6

**Table N1: Comparison of Repeated Samples from the Same Port, Over Time**

| | | Repeated port samples over time | | RPD | Repeated port samples over time | | RPD | Repeated port samples over time | | RPD | Repeated port samples over time | | RPD | Repeated port samples over time | | RPD | Repeated port samples over time | | RPD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Sample ID / Unique ID** | **Units** | **10WBW001-35** | **10WBW001-100** | | **10WBW001-100** | **10WBW001-106** | | **10WBW001-36** | **10WBW001-101** | | **10WBW001-101** | **10WBW001-108** | | **10WBW001-37** | **10WBW001-102** | | **10WBW001-102** | **10WBW001-105** | |
| **Sample From** | | **Westbay Port** | **Westbay Port** | | **Westbay Port** | **Westbay Port** | | **Westbay Port** | **Westbay Port** | | **Westbay Port** | **Westbay Port** | | **Westbay Port** | **Westbay Port** | | **Westbay Port** | **Westbay Port** | |
| **Sample label for graph** | | 10WBW001-Zone 1-Port Final-S35 | 10WBW001-Zone 1-Port after 2mths-S100 | | 10WBW001-Zone 1-Port after 2mths-S100 | 10WBW001-Zone 1-Port after bulk-S106 | | 10WBW001-Zone 6-Port Final-S36 | 10WBW001-Zone 6-Port after 2mths-S101 | | 10WBW001-Zone 6-Port after 2mths-S101 | 10WBW001-Zone 6-Port after bulk-S108 | | 10WBW001-Zone 10-Port Final-S37 | 10WBW001-Zone 10-Port after 2mths-S102 | | 10WBW001-Zone 10-Port after 2mths-S102 | 10WBW001-Zone 10-Port after bulk-S105 | |
| **Sample Zone** | | 1 | 1 | | 1 | 1 | | 6 | 6 | | 6 | 6 | | 10 | 10 | | 10 | 10 | |
| **Location of port in zone** | | Top | Top | | Top | Top | | Top | Top | | Top | Top | | Top | Top | | Top | Top | |
| **Zone port drillhole depth** | | 548.0 | 548.0 | | 548.0 | 548.0 | | 246.0 | 246.0 | | 246.0 | 246.0 | | 63.5 | 63.5 | | 63.5 | 63.5 | |
| **Total Litres purged from zone before sample was taken** | | 3186 | 3189 | | 3189 | 3192 | | 8096 | 8099 | | 8099 | 13592 | | 3008 | 3011 | | 3011 | 3014 | |
| **Zone volumes purged before sample was taken** | | 27.4 | 27.4 | | 27.4 | 27.5 | | 46.6 | 46.6 | | 46.6 | 79.3 | | 11.0 | 11.0 | | 11.0 | 11.0 | |
| **ALS DATA** | | | | | | | | | | | | | | | | | | | |
| **ALS Date Sampled** | | 04-AUG-10 | 19-OCT-10 | | 19-OCT-10 | 30-OCT-10 | | 05-AUG-10 | 19-OCT-10 | | 19-OCT-10 | 01-NOV-10 | | 05-AUG-10 | 20-OCT-10 | | 20-OCT-10 | 29-OCT-10 | |
| **ALS Time Sampled** | | 13:42 | 12:00 | | 12:00 | 13:00 | | 09:00 | 15:00 | | 15:00 | 15:00 | | 11:40 | 11:00 | | 11:00 | 15:00 | |
| **Matrix** | | Seawater | Seawater | | Seawater | Seawater | | Seawater | Seawater | | Seawater | BOTH | | Seawater | Seawater | | Seawater | Seawater | |
| **Physical Tests** | | | | | | | | | | | | | | | | | | | |
| **Conductivity (EC)** | uS/cm | 46600 | 46700 | 0% | 46700 | 46900 | 0% | 24600 | 34900 | -35% | 34900 | 37000 | -6% | 30300 | 33800 | -11% | 33800 | 43300 | -25% |
| **Density** | | | 1.01 | | 1.01 | 1.03 | -2% | | 1.01 | | 1.01 | 1.03 | -2% | | 1.01 | | 1.01 | 1.01 | 0% |
| **Hardness (as CaCO3)** | mg/L | 12700 | 12600 | 1% | 12600 | 12100 | 4% | 4760 | 6720 | -34% | 6720 | 7340 | -9% | 6030 | 6360 | -5% | 6360 | 8900 | -33% |
| **pH** | pH | 7.43 | 7.38 | 1% | 7.38 | 7.69 | -4% | 7.83 | 7.79 | 1% | 7.79 | 7.59 | 3% | 7.47 | 7.46 | 0% | 7.46 | 7.44 | 0% |
| **Salinity (EC)** | g/L | | 30.50 | | 30.50 | 31.2 | -2% | | 22.10 | | 22.10 | 23.5 | -6% | | | | | 28.5 | |
| **Total Dissolved Solids** | mg/L | 47800 | 42300 | 12% | 42300 | 47500 | -12% | 19600 | 28900 | -38% | 28900 | 25500 | 13% | 23100 | 28300 | -20% | 28300 | 34500 | -20% |
| **Anions and Nutrients** | | | | | | | | | | | | | | | | | | | |
| **Alkalinity, Bicarbonate (as CaCO3)** | mg/L | <2 | <2 | | <2 | <2 | | | 44.2 | | 44.2 | 43.7 | 1% | | 77.3 | | 77.3 | 106 | -31% |
| **Alkalinity, Carbonate (as CaCO3)** | mg/L | | <2 | | <2 | <2 | | | <2 | | <2 | <2 | | | <1 | | <1 | <2 | |
| **Alkalinity, Hydroxide (as CaCO3)** | mg/L | | <2 | | <2 | <2 | | | <2 | | <2 | <2 | | | <1 | | <1 | <2 | |
| **Alkalinity, Total (as CaCO3)** | mg/L | | <2 | | <2 | <2 | | 44.2 | 44.2 | 0% | 44.2 | 43.7 | 1% | 49.7 | 77.3 | -43% | 77.3 | 106 | -31% |
| **Ammonia as N** | mg/L | | | | | 0.0631 | | | | | | 2.32 | | | | | | 3.46 | |
| **Bromide (Br)** | mg/L | 100 | 101 | -1% | 101 | 101 | 0% | 21.2 | 38.1 | -57% | 38.1 | 41.3 | -8% | 27.6 | 36.4 | -28% | 36.4 | 41 | -12% |
| **Chloride (Cl)** | mg/L | 19000 | 19000 | 0% | 19000 | 18400 | 3% | 09130 | 13400 | -38% | 13400 | 14200 | -6% | 11500 | 13100 | -13% | 13100 | 16500 | -23% |
| **Fluoride (F)** | mg/L | <0.75 | <0.75 | | <0.75 | <0.75 | | <0.75 | <0.75 | | <0.75 | <0.75 | | <0.75 | <0.75 | | <0.75 | <0.75 | |
| **Nitrate (as N)** | mg/L | <0.5 | 0.96 | | 0.96 | <0.5 | | <0.5 | <0.5 | | <0.5 | <0.5 | | <0.5 | <0.5 | | <0.5 | <1 | |
| **Nitrite (as N)** | mg/L | <0.1 | <0.1 | | <0.1 | <0.1 | | <0.1 | <0.1 | | <0.1 | <0.1 | | <0.1 | <0.1 | | <0.1 | <0.2 | |
| **Ortho Phosphate as P** | mg/L | | 0.0264 | | 0.0264 | 0.0086 | 102% | | 0.0017 | | 0.0017 | <0.001 | | | <0.001 | | <0.001 | <0.001 | |
| **Total Phosphate as P** | mg/L | | | | | 0.0163 | | | | | | 0.0162 | | | | | | 0.0389 | |
| **Silicate (as SIO2)** | mg/L | | 7.8 | | 7.8 | <10 | | | 5.0 | | 5.0 | 5.8 | -15% | | 3.8 | | 3.8 | 7.5 | -65% |
| **Sulfate (SO4)** | mg/L | 0981 | 980 | 0% | 980 | 935 | 5% | 0940 | 1390 | -39% | 1390 | 1500 | -8% | 1160 | 1230 | -6% | 1230 | 1580 | -25% |
| **Total Metals** | | | | | | | | | | | | | | | | | | | |
| **Aluminum (Al)-Total** | mg/L | 0.0992 | 0.0136 | 152% | 0.0136 | 0.0086 | 45% | 0.0281 | 0.0052 | 138% | 0.0052 | 0.0059 | -13% | 0.0146 | <0.005 | | <0.005 | <0.005 | |
| **Antimony (Sb)-Total** | mg/L | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | 0.00745 | 0.005 | 39% | 0.005 | 0.00461 | 8% | 0.00349 | 0.00099 | 112% | 0.00099 | 0.00054 | 59% |
| **Arsenic (As)-Total** | mg/L | <0.002 | <0.002 | | <0.002 | <0.002 | | 0.003 | <0.002 | | <0.002 | <0.002 | | <0.002 | <0.002 | | <0.002 | <0.002 | |
| **Barium (Ba)-Total** | mg/L | 0.051 | 0.053 | -3% | 0.053 | 0.0521 | 1% | 0.130 | 0.175 | -30% | 0.175 | 0.169 | 3% | 0.179 | 0.177 | 1% | 0.177 | 0.129 | 31% |
| **Beryllium (Be)-Total** | mg/L | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |
| **Bismuth (Bi)-Total** | mg/L | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |
| **Boron (B)-Total** | mg/L | 2.93 | 2.89 | 1% | 2.89 | 3.25 | -12% | 1.04 | 1.38 | -28% | 1.38 | 1.50 | -8% | 1.51 | 1.53 | -1% | 1.53 | 2.8 | -59% |
| **Cadmium (Cd)-Total** | mg/L | <0.00012 | 0.000066 | | 0.000066 | 0.000085 | -25% | <0.00012 | <0.00005 | | <0.00005 | <0.00005 | | <0.00012 | <0.00005 | | <0.00005 | <0.00005 | |
| **Calcium (Ca)-Total** | mg/L | 5070 | 4960 | 2% | 4960 | 4700 | 5% | 0805 | 1140 | -34% | 1140 | 1170 | -3% | 1020 | 1080 | -6% | 1080 | 1540 | -35% |
| **Cesium (Cs)-Total** | mg/L | 0000 | 0.00102 | 3% | 0.00102 | 0.0011 | -8% | 0000 | 0000 | -23% | 0000 | 0.00095 | -4% | 0.00097 | 0.001 | -3% | 0.001 | 0.00151 | -41% |
| **Chromium (Cr)-Total** | mg/L | 0.01 | 0.0006 | 160% | 0.0006 | 0.0002 | 104% | 0.00 | 0.00 | 139% | 0.00 | <0.0005 | | 0.0030 | 0.00011 | 186% | 0.00011 | 0.00016 | -37% |
| **Cobalt (Co)-Total** | mg/L | <0.0005 | 0.000073 | | 0.000073 | 0.000051 | 35% | <0.0005 | 0.000092 | | 0.000092 | 0.000103 | -11% | <0.0005 | 0.000084 | | 0.000084 | 0.000132 | -44% |
| **Copper (Cu)-Total** | mg/L | 0.0018 | 0.00059 | 101% | 0.00059 | 0.00102 | -53% | <0.001 | <0.0005 | | <0.0005 | 0.00061 | | <0.001 | <0.0005 | | <0.0005 | <0.0005 | |
| **Gallium (Ga)-Total** | mg/L | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |
| **Iron (Fe)-Total** | mg/L | 0.46 | 0.24 | 62% | 0.24 | 0.197 | 20% | 1.60 | 2.94 | -59% | 2.94 | 2.28 | 25% | 3.95 | 4.31 | -9% | 4.31 | 11 | -87% |
| **Lead (Pb)-Total** | mg/L | 0.0013 | <0.0003 | | <0.0003 | <0.0003 | | <0.001 | 0.00035 | | 0.00035 | <0.0003 | | <0.001 | <0.0003 | | <0.0003 | <0.0003 | |
| **Lithium (Li)-Total** | mg/L | 0.37 | 0.346 | 7% | 0.346 | 0.381 | -10% | 0.093 | 0.117 | -23% | 0.117 | 0.131 | -11% | 0.128 | 0.128 | 0% | 0.128 | 0.2 | -44% |
| **Magnesium (Mg)-Total** | mg/L | 0071 | 064 | 10% | 064 | 67.8 | -5% | 0739 | 1010 | -31% | 1010 | 1080 | -7% | 867 | 797 | 8% | 797 | 1230 | -43% |
| **Manganese (Mn)-Total** | mg/L | 0.72 | 0.72 | -1% | 0.72 | 0.712 | 1% | 0.56 | 0.95 | -52% | 0.95 | 0.892 | 6% | 1.09 | 1.15 | -5% | 1.15 | 1.73 | -40% |
| **Mercury (Hg)-Total** | mg/L | | <0.00001 | | <0.00001 | <0.00001 | | | <0.00001 | | <0.00001 | | | | <0.00001 | | <0.00001 | <0.00001 | |
| **Molybdenum (Mo)-Total** | mg/L | 0.0136 | 0.0089 | 42% | 0.0089 | 0.0088 | 1% | 0.0403 | 0.037 | 9% | 0.037 | 0.0361 | 2% | 0.0225 | 0.0244 | -8% | 0.0244 | 0.0072 | 109% |
| **Nickel (Ni)-Total** | mg/L | 0.00437 | 0.00075 | 141% | 0.00075 | 0.00265 | -112% | 0.00159 | 0.00059 | 92% | 0.00059 | 0.00120 | -68% | 0.00237 | <0.0005 | | <0.0005 | <0.0005 | |
| **Phosphorus (P)-Total** | mg/L | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | |
| **Potassium (K)-Total** | mg/L | 040 | 040 | 0% | 040 | 39 | 3% | 125 | 171 | -31% | 171 | 172 | -1% | 166 | 166 | 0% | 166 | 262 | -45% |
| **Rhenium (Re)-Total** | mg/L | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |
| **Rubidium (Rb)-Total** | mg/L | 000 | 0.0526 | -5% | 0.0526 | 0.0531 | -1% | 000 | 000 | -30% | 000 | 0.102 | 2% | 0.0816 | 0.0842 | -3% | 0.0842 | 0.104 | -21% |
| **Selenium (Se)-Total** | mg/L | <0.002 | <0.002 | | <0.002 | <0.002 | | <0.002 | <0.002 | | <0.002 | <0.002 | | <0.002 | <0.002 | | <0.002 | <0.002 | |
| **Silicon (Si)-Total** | mg/L | 2.61 | 2.79 | -7% | 2.79 | 2.47 | 12% | 2.88 | 3.5 | -19% | 3.5 | 3.82 | -9% | 2.12 | 2.42 | -13% | 2.42 | 3.51 | -37% |
| **Silver (Ag)-Total** | mg/L | <0.0002 | <0.0001 | | <0.0001 | <0.0001 | | <0.0002 | <0.0001 | | <0.0001 | 0.00018 | | <0.0002 | <0.0001 | | <0.0001 | <0.0001 | |
| **Sodium (Na)-Total** | mg/L | 7470 | 7200 | 4% | 7200 | 6850 | 5% | 4460 | 6410 | -36% | 6410 | 6790 | -6% | 5590 | 5530 | 1% | 5530 | 8990 | -48% |
| **Strontium (Sr)-Total** | mg/L | 0060 | 57.2 | 5% | 57.2 | 54.6 | 5% | 0010 | 0014 | -35% | 0014 | 14.6 | -5% | 11.7 | 11.1 | 5% | 11.1 | 16.4 | -39% |
| **Tellurium (Te)-Total** | mg/L | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |
| **Thallium (Tl)-Total** | mg/L | <0.0005 | <0.00005 | | <0.00005 | <0.00005 | | <0.0005 | <0.00005 | | <0.00005 | <0.00005 | | <0.0005 | <0.00005 | | <0.00005 | <0.00005 | |
| **Thorium (Th)-Total** | mg/L | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |
| **Tin (Sn)-Total** | mg/L | <0.001 | <0.001 | | <0.001 | <0.001 | | <0.001 | <0.001 | | <0.001 | <0.001 | | <0.001 | <0.001 | | <0.001 | <0.001 | |
| **Titanium (Ti)-Total** | mg/L | 0.0082 | <0.005 | | <0.005 | <0.005 | | <0.005 | <0.005 | | <0.005 | <0.005 | | <0.005 | <0.005 | | <0.005 | <0.005 | |
| **Tungsten (W)-Total** | mg/L | <0.001 | 0.0014 | | 0.0014 | 0.0016 | -13% | 0.0334 | 0.0247 | 30% | 0.0247 | 0.0227 | 8% | 0.0067 | 0.0051 | 27% | 0.0051 | 0.0059 | -15% |
| **Uranium (U)-Total** | mg/L | <0.0005 | <0.00005 | | <0.00005 | <0.00005 | | <0.0005 | <0.00005 | | <0.00005 | 0.000059 | | <0.0005 | 0.000057 | | 0.000057 | <0.00005 | |
| **Vanadium (V)-Total** | mg/L | 0.00 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |
| **Yttrium (Y)-Total** | mg/L | <0.0005 | 0.00052 | | 0.00052 | 0.00057 | -9% | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |
| **Zinc (Zn)-Total** | mg/L | 0.503 | 0.279 | 57% | 0.279 | 0.285 | -2% | 0.195 | 0.236 | -19% | 0.236 | 0.115 | 69% | 0.261 | 0.173 | 41% | 0.173 | 0.107 | 47% |
| **Zirconium (Zr)-Total** | mg/L | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |
| **Dissolved Metals** | | | | | | | | | | | | | | | | | | | |
| **Aluminum (Al)-Dissolved** | mg/L | <0.005 | <0.005 | | <0.005 | 0.005 | | <0.005 | <0.005 | | <0.005 | <0.005 | | <0.005 | <0.005 | | <0.005 | <0.005 | |
| **Antimony (Sb)-Dissolved** | mg/L | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | 0.00703 | 0.0048 | 38% | 0.0048 | 0.00393 | 20% | 0.00306 | 0.00097 | 104% | 0.00097 | 0.00053 | 59% |
| **Arsenic (As)-Dissolved** | mg/L | <0.002 | <0.002 | | <0.002 | <0.002 | | <0.002 | <0.002 | | <0.002 | <0.002 | | <0.002 | <0.002 | | <0.002 | <0.002 | |
| **Barium (Ba)-Dissolved** | mg/L | 0.052 | 0.053 | -2% | 0.053 | 0.0526 | 1% | 0.120 | 0.178 | -39% | 0.178 | 0.169 | 5% | 0.169 | 0.178 | -5% | 0.178 | 0.122 | 37% |
| **Beryllium (Be)-Dissolved** | mg/L | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |
| **Bismuth (Bi)-Dissolved** | mg/L | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |
| **Boron (B)-Dissolved** | mg/L | 2.99 | 2.92 | 2% | 2.92 | 3.3 | -12% | 0.94 | 1.38 | -38% | 1.38 | 1.48 | -7% | 1.42 | 1.54 | -8% | 1.54 | 2.86 | -60% |
| **Cadmium (Cd)-Dissolved** | mg/L | <0.00012 | 0.000083 | | 0.000083 | 0.000097 | -16% | <0.00012 | <0.00005 | | <0.00005 | <0.00005 | | <0.00012 | <0.00005 | | <0.00005 | <0.00005 | |
| **Calcium (Ca)-Dissolved** | mg/L | 4960 | 4920 | 1% | 4920 | 4730 | 4% | 0749 | 1100 | -38% | 1100 | 1160 | -5% | 1010 | 1110 | -9% | 1110 | 1560 | -34% |
| **Cesium (Cs)-Dissolved** | mg/L | 0000 | 0.00102 | 3% | 0.00102 | 0.0011 | -8% | 0000 | 0000 | -31% | 0000 | 0.00097 | -3% | 0.00092 | 0.00104 | -12% | 0.00104 | 0.00148 | -35% |
| **Chromium (Cr)-Dissolved** | mg/L | <0.001 | <0.0001 | | <0.0001 | <0.0001 | | <0.001 | <0.0001 | | <0.0001 | <0.0005 | | <0.001 | <0.0001 | | <0.0001 | <0.0001 | |
| **Cobalt (Co)-Dissolved** | mg/L | <0.0005 | <0.00005 | | <0.00005 | <0.00005 | | <0.0005 | 0.000087 | | 0.000087 | 0.000091 | -4% | <0.0005 | 0.000102 | | 0.000102 | 0.000187 | -59% |
| **Copper (Cu)-Dissolved** | mg/L | <0.001 | <0.0005 | | <0.0005 | 0.00067 | | <0.001 | <0.0005 | | <0.0005 | <0.0005 | | <0.001 | <0.0005 | | <0.0005 | 0.00296 | |
| **Gallium (Ga)-Dissolved** | mg/L | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |
| **Iron (Fe)-Dissolved** | mg/L | <0.05 | 0.06 | | 0.06 | 0.075 | -29% | 0.06 | 0.13 | -73% | 0.13 | 0.503 | -119% | 2.68 | 3.15 | -16% | 3.15 | 8.94 | -96% |
| **Lead (Pb)-Dissolved** | mg/L | <0.001 | <0.0003 | | <0.0003 | <0.0003 | | <0.001 | <0.0003 | | <0.0003 | <0.0003 | | <0.001 | <0.0003 | | <0.0003 | <0.0003 | |
| **Lithium (Li)-Dissolved** | mg/L | 0.37 | 0.350 | 6% | 0.350 | 0.39 | -11% | 0.087 | 0.12 | -32% | 0.12 | 0.127 | -6% | 0.121 | 0.13 | -7% | 0.13 | 0.201 | -43% |
| **Magnesium (Mg)-Dissolved** | mg/L | 0070 | 064 | 8% | 064 | 68.1 | -6% | 0702 | 0964 | -31% | 0964 | 1080 | -11% | 849 | 869 | -2% | 869 | 1250 | -36% |
| **Manganese (Mn)-Dissolved** | mg/L | 0.69 | 0.71 | -2% | 0.71 | 0.725 | -2% | 0.53 | 0.94 | -57% | 0.94 | 0.888 | 6% | 1.04 | 1.17 | -12% | 1.17 | 1.69 | -36% |
| **Mercury (Hg)-Dissolved** | mg/L | < | <0.00001 | | <0.00001 | <0.00001 | | < | <0.00001 | | <0.00001 | | | < | <0.00001 | | <0.00001 | <0.00001 | |
| **Molybdenum (Mo)-Dissolved** | mg/L | 0.0128 | 0.0092 | 33% | 0.0092 | 0.009 | 2% | 0.0379 | 0.037 | 2% | 0.037 | 0.0345 | 7% | 0.0211 | 0.0259 | -20% | 0.0259 | 0.0044 | 142% |
| **Nickel (Ni)-Dissolved** | mg/L | <0.0005 | <0.0005 | | <0.0005 | 0.00237 | | 0.00076 | <0.0005 | | <0.0005 | 0.00158 | | <0.0005 | <0.0005 | | <0.0005 | 0.0006 | |
| **Phosphorus (P)-Dissolved** | mg/L | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | | <1 | <1 | |
| **Potassium (K)-Dissolved** | mg/L | 039 | 039 | 0% | 039 | 40 | -3% | 117 | 160 | -31% | 160 | 172 | -7% | 160 | 173 | -8% | 173 | 249 | -36% |
| **Rhenium (Re)-Dissolved** | mg/L | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |
| **Rubidium (Rb)-Dissolved** | mg/L | 000 | 0.0528 | -5% | 0.0528 | 0.0532 | -1% | 000 | 000 | -40% | 000 | 0.106 | 3% | 0.0766 | 0.085 | -10% | 0.085 | 0.107 | -23% |
| **Selenium (Se)-Dissolved** | mg/L | <0.002 | <0.002 | | <0.002 | <0.002 | | <0.002 | <0.002 | | <0.002 | <0.002 | | <0.002 | <0.002 | | <0.002 | <0.002 | |
| **Silicon (Si)-Dissolved** | mg/L | 2.3 | 2.42 | -5% | 2.42 | 2.43 | 0% | 2.48 | 2.88 | -15% | 2.88 | 3.33 | -14% | 1.99 | 2.38 | -18% | 2.38 | 3.3 | -32% |
| **Silver (Ag)-Dissolved** | mg/L | <0.0002 | <0.0001 | | <0.0001 | <0.0001 | | <0.0002 | <0.0001 | | <0.0001 | <0.0001 | | <0.0002 | <0.0001 | | <0.0001 | <0.0001 | |
| **Sodium (Na)-Dissolved** | mg/L | 7290 | 7200 | 1% | 7200 | 6910 | 4% | 4130 | 6010 | -37% | 6010 | 6810 | -12% | 5400 | 5780 | -7% | 5780 | 8700 | -40% |
| **Strontium (Sr)-Dissolved** | mg/L | 0059 | 56.7 | 4% | 56.7 | 55.1 | 3% | 0009 | 0013 | -37% | 0013 | 14.6 | -11% | 11.3 | 11.7 | -3% | 11.7 | 16.8 | -36% |
| **Tellurium (Te)-Dissolved** | mg/L | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |
| **Thallium (Tl)-Dissolved** | mg/L | <0.0005 | <0.00005 | | <0.00005 | <0.00005 | | <0.0005 | <0.00005 | | <0.00005 | <0.00005 | | <0.0005 | <0.00005 | | <0.00005 | <0.00005 | |
| **Thorium (Th)-Dissolved** | mg/L | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |
| **Tin (Sn)-Dissolved** | mg/L | <0.001 | <0.001 | | <0.001 | <0.001 | | <0.001 | <0.001 | | <0.001 | <0.001 | | <0.001 | <0.001 | | <0.001 | <0.001 | |
| **Titanium (Ti)-Dissolved** | mg/L | <0.005 | <0.005 | | <0.005 | <0.005 | | <0.005 | <0.005 | | <0.005 | <0.005 | | <0.005 | <0.005 | | <0.005 | <0.005 | |
| **Tungsten (W)-Dissolved** | mg/L | <0.001 | 0.0014 | | 0.0014 | 0.0015 | -7% | 0.0316 | 0.0246 | 25% | 0.0246 | 0.0231 | 6% | 0.0059 | 0.005 | 17% | 0.005 | 0.006 | -18% |
| **Uranium (U)-Dissolved** | mg/L | <0.0005 | <0.00005 | | <0.00005 | <0.00005 | | <0.0005 | <0.00005 | | <0.00005 | 0.000058 | | <0.0005 | 0.000059 | | 0.000059 | <0.00005 | |
| **Vanadium (V)-Dissolved** | mg/L | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |
| **Yttrium (Y)-Dissolved** | mg/L | <0.0005 | 0.00051 | | 0.00051 | 0.00054 | -6% | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |
| **Zinc (Zn)-Dissolved** | mg/L | 0.0897 | 0.1130 | -23% | 0.1130 | 0.137 | -19% | 0.02 | 0.0705 | -116% | 0.0705 | 0.0295 | 82% | 0.0504 | 0.061 | -19% | 0.061 | 0.0851 | -33% |
| **Zirconium (Zr)-Dissolved** | mg/L | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | | <0.0005 | <0.0005 | |

**RPDs greater than 20% are highlighted, to show parameters with the greatest variation between samples.**

### Table N2: Comparison of Duplicate Samples

| | | Duplicate | | RPD | Duplicate | | RPD | Duplicate | | RPD | Duplicate | | RPD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Sample ID / Unique ID** | **Units** | **10WBW001-03b** | **10WBW001-04b** | | **10WBW001-15** | **10WBW001-16** | | **10WBW001-25** | **10WBW001-26** | | **10WBW001-02a** | **10WBW001-04a** | |
| **Sample From** | | **Westbay Port** | **Westbay Port** | | **Westbay airlift** | **Westbay airlift** | | **Westbay airlift** | **Westbay airlift** | | **Other** | **Other** | |
| **Sample Label** | | 10WBW001-Zone 10-Port Initial-S03b | 10WBW001-Zone 10-Port InitialD-S04b | | 10WBW001-Zone 10-Airlift Purge-S15 | 10WBW001-Zone 10-Airlift Final-S16D | | 10WBW001-Zone 1-Airlift Final-S25 | 10WBW001-Zone 1-Airlift Final-S26D | | 10WBW001 Drill Tank | 10WBW001 Drill Tank Dup | |
| **Sample Zone** | | 10 | 10 | | 10 | 10 | | 1 | 1 | | n/a | n/a | |
| **Location of port in zone** | | Top | Top | | Bottom | Bottom | | Middle | Middle | | n/a | n/a | |
| **Zone port drillhole depth** | | 63.5 | 63.5 | | 107.50 | 107.50 | | 554.00 | 554.00 | | n/a | n/a | |
| **Total Litres purged from zone before sample was taken** | | 0 | 2 | | 3008 | 3008 | | 3065 | 3065 | | n/a | n/a | |
| **Zone volumes purged before sample was taken** | | 0.0 | 0.3 | | 11.0 | 11.0 | | 26.2 | 26.2 | | n/a | n/a | |
| **ALS DATA** | | | | | | | | | | | | | |
| **ALS Date Sampled** | | 09-JUL-10 | 09-JUL-10 | | 21-JUL-10 | 21-JUL-10 | | 25-JUL-10 | 25-JUL-10 | | 25-APR-10 | 25-APR-10 | |
| **ALS Time Sampled** | | 14:00 | 14:00 | | 16:28 | 17:28 | | 12:37 | 12:37 | | 16:00 | 16:00 | |
| **Matrix** | | Water | Water | | Water | Water | | Water | Water | | Water | Water | |
| | | | | | | | | | | | | | |
| **Physical Tests** | | | | | | | | | | | | | |
| **Conductivity (EC)** | uS/cm | 27600 | 27500 | 0% | 46500 | 46600 | 0% | 47600 | 47600 | 0% | 335 | 339 | -1% |
| **Density** | | 1.00 | 1.01 | -1% | | | | | | | | | |
| **Hardness (as CaCO3)** | mg/L | 4960 | 5060 | -2% | 8360 | 9250 | -10% | 11500 | 11100 | 4% | 57.8 | 59.8 | -3% |
| **pH** | pH | 7.37 | 7.42 | -1% | 7.35 | 7.39 | -1% | 7.65 | 7.72 | -1% | 7.20 | 7.26 | -1% |
| **Total Dissolved Solids** | mg/L | 18700 | 18500 | 1% | 32200 | 32700 | -2% | 33300 | 32400 | 3% | 197 | 202 | -3% |
| | | | | | | | | | | | | | |
| **Anions and Nutrients** | | | | | | | | | | | | | |
| **Alkalinity, Total (as CaCO3)** | mg/L | 66.3 | 64.8 | 2% | 82.3 | 81.7 | 1% | | | | 35.6 | 35.2 | 1% |
| **Chloride (Cl)** | mg/L | 9650 | 9610 | 0% | 17700 | 18200 | -3% | 18700 | 18800 | -1% | 83.4 | 82.5 | 1% |
| **Fluoride (F)** | mg/L | <5 | <5 | | <1 | <1 | | <1 | <1 | | 0.069 | 0.069 | 0% |
| **Nitrate (as N)** | mg/L | <5 | <5 | | <1 | <1 | | <1 | <1 | | 0.053 | <0.050 | |
| **Nitrite (as N)** | mg/L | <5 | <5 | | <1 | <1 | | <1 | <1 | | <0.050 | <0.050 | |
| **Sulfate (SO4)** | mg/L | 995 | 991 | 0% | 1750 | 1790 | -2% | 0960 | 0964 | 0% | 4.05 | 3.70 | 9% |
| | | | | | | | | | | | | | |
| **Additional Anions and Nutrients** | | | | | | | | | | | | | |
| **Bicarbonate (HCO3)** | mg/L | 80.9 | 79.0 | 2% | 100 | 99.6 | 0% | 010 | 010 | 5% | 43.4 | 43.0 | 1% |
| **Carbonate (CO3)** | mg/L | <5 | <5 | | <5 | <5 | | <5 | <5 | | <5.0 | <5.0 | |
| **Hydroxide (OH)** | mg/L | <5 | <5 | | <5 | <5 | | <5 | <5 | | <5.0 | <5.0 | |
| **Ion Balance** | % | 101 | 103 | -2% | 96.6 | 109 | -12% | 95.5 | 89.8 | 6% | 93.7 | 99.3 | -6% |
| **Nitrate and Nitrite as N** | mg/L | <7.1 | <7.1 | | <1.4 | <1.4 | | <1.4 | <1.4 | | <0.071 | <0.071 | |
| **TDS (Calculated)** | mg/L | 16800 | 16900 | -1% | 30300 | 32600 | -7% | 31000 | 30500 | 2% | 170 | 171 | -1% |
| | | | | | | | | | | | | | |
| **Total Metals** | | | | | | | | | | | | | |
| **Aluminum (Al)-Total** | mg/L | <0.2 | <0.2 | | <2 | <2 | | <2 | <2 | | 0.014 | 0.021 | -40% |
| **Antimony (Sb)-Total** | mg/L | <0.008 | <0.008 | | <0.08 | <0.08 | | <0.08 | <0.08 | | <0.00040 | <0.00040 | |
| **Arsenic (As)-Total** | mg/L | <0.08 | <0.08 | | 0.083 | 0.090 | -8% | 0.296 | 0.101 | 98% | 0.00076 | 0.00067 | 13% |
| **Barium (Ba)-Total** | mg/L | 0.187 | 0.185 | 1% | 0.102 | 0.113 | -10% | 0.054 | 0.059 | -9% | 0.0050 | 0.0057 | -13% |
| **Beryllium (Be)-Total** | mg/L | <0.02 | <0.02 | | <0.2 | <0.2 | | <0.2 | <0.2 | | <0.0010 | <0.0010 | |
| **Boron (B)-Total** | mg/L | 1.34 | 1.37 | -2% | 2.32 | 2.31 | 0% | 2.56 | 2.50 | 2% | <0.050 | <0.050 | |
| **Cadmium (Cd)-Total** | mg/L | <0.001 | <0.001 | | <0.01 | <0.01 | | <0.01 | <0.01 | | <0.000050 | <0.000050 | |
| **Calcium (Ca)-Total** | mg/L | 851 | 867 | -2% | 1590 | 1580 | 1% | 4430 | 4380 | 1% | 10.5 | 10.8 | -3% |
| **Chromium (Cr)-Total** | mg/L | <0.016 | 0.024 | | 0.61 | 0.66 | -8% | 0.62 | 0.74 | -18% | <0.0050 | <0.0050 | |
| **Cobalt (Co)-Total** | mg/L | <0.004 | <0.004 | | <0.04 | <0.04 | | <0.04 | <0.04 | | <0.0020 | <0.0020 | |
| **Copper (Cu)-Total** | mg/L | <0.02 | <0.02 | | <0.2 | <0.2 | | <0.2 | <0.2 | | 0.0040 | 0.0054 | -30% |
| **Iron (Fe)-Total** | mg/L | 3.53 | 3.65 | -3% | 7.15 | 7.14 | 0% | 0.15 | 0.16 | -6% | 0.118 | 0.149 | -23% |
| **Lead (Pb)-Total** | mg/L | <0.002 | <0.002 | | <0.02 | <0.02 | | <0.02 | <0.02 | | 0.00063 | 0.00018 | 111% |
| **Lithium (Li)-Total** | mg/L | 0.13 | 0.14 | -7% | <1.2 | <1.2 | | <1.2 | <1.2 | | <0.010 | <0.010 | |
| **Magnesium (Mg)-Total** | mg/L | 726 | 736 | -1% | 1290 | 1290 | 0% | 0051 | 0053 | -4% | 8.59 | 8.73 | -2% |
| **Manganese (Mn)-Total** | mg/L | 1.04 | 1.06 | -2% | 1.73 | 1.76 | -2% | 0.62 | 0.64 | -4% | 0.0066 | 0.0072 | -9% |
| **Mercury (Hg)-Total** | mg/L | <0.0001 | <0.0001 | | <0.0001 | <0.0001 | | <0.0001 | <0.0001 | | <0.00010 | <0.00010 | |
| **Molybdenum (Mo)-Total** | mg/L | 0.0244 | 0.0237 | 3% | <0.02 | <0.02 | | <0.02 | <0.02 | | <0.0050 | <0.0050 | |
| **Nickel (Ni)-Total** | mg/L | 0.0138 | 0.0144 | -4% | <0.04 | <0.04 | | 0.068 | 0.074 | -8% | <0.0020 | <0.0020 | |
| **Potassium (K)-Total** | mg/L | 114 | 116 | -2% | 294 | 292 | 1% | 044 | 045 | -3% | 3.13 | 3.14 | 0% |
| **Selenium (Se)-Total** | mg/L | <0.4 | <0.4 | | <0.4 | <0.4 | | <0.4 | <0.4 | | 0.00058 | 0.00057 | 2% |
| **Silver (Ag)-Total** | mg/L | <0.002 | <0.002 | | <0.02 | <0.02 | | <0.02 | <0.02 | | <0.00050 | <0.00050 | |
| **Sodium (Na)-Total** | mg/L | 4860 | 4930 | -1% | 9260 | 9580 | -3% | 7420 | 7870 | -6% | 43.0 | 43.9 | -2% |
| **Thallium (Tl)-Total** | mg/L | <0.002 | <0.002 | | <0.02 | <0.02 | | <0.02 | <0.02 | | <0.00010 | <0.00010 | |
| **Tin (Sn)-Total** | mg/L | <0.05 | <0.05 | | <0.08 | <0.08 | | <0.08 | <0.08 | | <0.050 | <0.050 | |
| **Titanium (Ti)-Total** | mg/L | <0.012 | <0.012 | | <0.12 | <0.12 | | <0.12 | <0.12 | | <0.0010 | <0.0010 | |
| **Uranium (U)-Total** | mg/L | <0.002 | <0.002 | | <0.02 | <0.02 | | <0.02 | <0.02 | | <0.00010 | <0.00010 | |
| **Vanadium (V)-Total** | mg/L | <0.1 | <0.1 | | 0.20 | 0.22 | -10% | 0.21 | 0.23 | -9% | <0.0010 | <0.0010 | |
| **Zinc (Zn)-Total** | mg/L | <0.08 | <0.08 | | <0.8 | <0.8 | | <0.8 | <0.8 | | 0.0131 | 0.0252 | -63% |
| | | | | | | | | | | | | | |
| **Dissolved Metals** | | | | | | | | | | | | | |
| **Aluminum (Al)-Dissolved** | mg/L | 0.13 | <0.1 | | <1 | <1 | | <1 | <1 | | <0.010 | <0.010 | |
| **Antimony (Sb)-Dissolved** | mg/L | <0.008 | <0.008 | | <0.08 | <0.08 | | <0.08 | <0.08 | | <0.00040 | <0.00040 | |
| **Arsenic (As)-Dissolved** | mg/L | <0.08 | <0.08 | | 0.091 | 0.097 | -6% | <0.08 | 0.090 | | 0.00066 | 0.00068 | -3% |
| **Barium (Ba)-Dissolved** | mg/L | 0.186 | 0.188 | -1% | 0.100 | 0.097 | 3% | 0.051 | 0.052 | -2% | 0.0040 | 0.0042 | -5% |
| **Beryllium (Be)-Dissolved** | mg/L | <0.01 | <0.01 | | <0.1 | <0.1 | | <0.1 | <0.1 | | <0.0010 | <0.0010 | |
| **Boron (B)-Dissolved** | mg/L | 1.31 | 1.38 | -5% | 2.23 | 2.32 | -4% | 2.87 | 2.74 | 5% | <0.050 | <0.050 | |
| **Cadmium (Cd)-Dissolved** | mg/L | <0.001 | <0.001 | | <0.01 | <0.01 | | <0.01 | <0.01 | | <0.000050 | <0.000050 | |
| **Calcium (Ca)-Dissolved** | mg/L | 822 | 837 | -2% | 1420 | 1560 | -9% | 4520 | 4360 | 4% | 10.1 | 10.3 | -2% |
| **Chromium (Cr)-Dissolved** | mg/L | 0.0178 | 0.0264 | -39% | 0.747 | 0.874 | -16% | 0.351 | 0.532 | -41% | <0.0050 | <0.0050 | |
| **Cobalt (Co)-Dissolved** | mg/L | <0.002 | <0.002 | | <0.02 | <0.02 | | <0.02 | <0.02 | | <0.0020 | <0.0020 | |
| **Copper (Cu)-Dissolved** | mg/L | <0.012 | <0.012 | | 0.19 | <0.12 | | <0.12 | <0.12 | | 0.0028 | 0.0028 | 0% |
| **Iron (Fe)-Dissolved** | mg/L | 1.88 | 1.63 | 14% | 5.77 | 6.25 | -8% | <0.15 | <0.15 | | 0.072 | 0.075 | -4% |
| **Lead (Pb)-Dissolved** | mg/L | <0.002 | <0.002 | | <0.02 | <0.02 | | <0.02 | <0.02 | | 0.00015 | 0.00012 | 22% |
| **Lithium (Li)-Dissolved** | mg/L | 0.128 | 0.136 | -6% | <0.6 | <0.6 | | <0.6 | <0.6 | | 0.0034 | <0.0030 | |
| **Magnesium (Mg)-Dissolved** | mg/L | 707 | 721 | -2% | 1170 | 1300 | -11% | 0046 | 0045 | 2% | 7.90 | 8.28 | -5% |
| **Manganese (Mn)-Dissolved** | mg/L | 1.01 | 1.01 | 0% | 1.56 | 1.72 | -10% | 0.544 | 0.53 | 2% | 0.0054 | 0.0056 | -4% |
| **Mercury (Hg)-Dissolved** | mg/L | <0.0001 | <0.0001 | | <0.0001 | <0.0001 | | <0.0001 | <0.0001 | | <0.00010 | <0.00010 | |
| **Molybdenum (Mo)-Dissolved** | mg/L | 0.0240 | 0.0239 | 0% | <0.02 | <0.02 | | <0.02 | <0.02 | | <0.0050 | <0.0050 | |
| **Nickel (Ni)-Dissolved** | mg/L | 0.0146 | 0.0159 | -9% | <0.02 | <0.02 | | 0.061 | 0.066 | -8% | <0.0020 | <0.0020 | |
| **Potassium (K)-Dissolved** | mg/L | 129 | 131 | -2% | 206 | 294 | -35% | 039 | 037 | 4% | 2.47 | 2.67 | -8% |
| **Selenium (Se)-Dissolved** | mg/L | <0.4 | <0.4 | | <0.4 | <0.4 | | <0.4 | <0.4 | | 0.00044 | 0.00060 | -31% |
| **Silver (Ag)-Dissolved** | mg/L | <0.002 | <0.002 | | <0.02 | <0.02 | | <0.02 | <0.02 | | <0.00010 | <0.00010 | |
| **Sodium (Na)-Dissolved** | mg/L | 4470 | 4540 | -2% | 7970 | 9450 | -17% | 6730 | 6260 | 7% | 40.0 | 42.0 | -5% |
| **Thallium (Tl)-Dissolved** | mg/L | <0.001 | <0.001 | | <0.01 | 0.010 | | <0.01 | <0.01 | | <0.00010 | <0.00010 | |
| **Tin (Sn)-Dissolved** | mg/L | <0.05 | <0.05 | | <0.05 | <0.05 | | <0.05 | <0.05 | | <0.050 | <0.050 | |
| **Titanium (Ti)-Dissolved** | mg/L | 0.0135 | 0.0081 | 50% | <0.06 | <0.06 | | <0.06 | <0.06 | | <0.0010 | <0.0010 | |
| **Uranium (U)-Dissolved** | mg/L | <0.002 | <0.002 | | <0.02 | <0.02 | | <0.02 | <0.02 | | <0.00010 | <0.00010 | |
| **Vanadium (V)-Dissolved** | mg/L | 0.077 | 0.099 | -25% | 0.259 | 0.292 | -12% | 0.122 | 0.174 | -35% | <0.0010 | <0.0010 | |
| **Zinc (Zn)-Dissolved** | mg/L | 0.026 | 0.022 | 17% | 0.22 | <0.2 | | <0.2 | <0.2 | | 0.0032 | 0.0038 | -17% |
| | | | | | | | | | | | | | |
| **Isotope Chemistry** | | | | | | | | | | | ? | ? | |
| **Delta 2H x 1000** | | -110.12 | -109.57 | 1% | -77.72 | -77.67 | 0% | -138.13 | -138.57 | 0% | -19.16 | -19.25 | 0% |
| **Delta 18O x 1000** | | -14 | -13.96 | 0% | -10 | -10.18 | -2% | -19.06 | -19.07 | 0% | | | |

**RPDs greater than 20% are highlighted, to show parameters above the recommended duplicate limits.**

**Table N3: Ion Balance Assessment**

| Sample label | Alkalinity, Total (as CaCO3) | Chloride (Cl) | Sulfate (SO4) | Calcium (Ca)-Dissolved | Magnesium (Mg)-Dissolved | Potassium (K)-Dissolved | Sodium (Na)-Dissolved | Cation Balance | Anion Balance | Ion Balance |
|---|---|---|---|---|---|---|---|---|---|---|
| Units | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | meq/L | meq/L | **% diff** |
| Doris Lake Winter | 34.4 | 76.6 | 3.44 | 9.3 | 7.37 | 2.31 | 38 | 2.78 | 2.92 | **2.38** |
| 10WBW001 Drill Tank | 35.6 | 83.4 | 4.05 | 10.1 | 7.9 | 2.47 | 40 | 2.96 | 3.15 | **3.10** |
| 10WBW001 Casing Flow | 52.9 | 1960 | 195 | 111 | 140 | 34.2 | 1110 | 66.19 | 60.33 | **4.63** |
| 10WBW001 Drill Tank Dup | 35.2 | 82.5 | 3.7 | 10.3 | 8.28 | 2.67 | 42 | 3.09 | 3.10 | **0.25** |
| equipment blank DI | | | | | | | | | | |
| 10WBW001-Zone 1-Port Initial-S01b | | 18200 | 1020 | 4390 | 172 | 54 | 6840 | 531.98 | 533.91 | **0.18** |
| 10WBW001-Zone 6-Port Initial-S02b | 87.3 | 20100 | 2090 | 1640 | 1430 | 251 | 9080 | 600.69 | 611.46 | **0.89** |
| 10WBW001-Zone 10-Port Initial-S03b | 66.3 | 9650 | 995 | 822 | 707 | 129 | 4470 | 296.83 | 293.87 | **0.50** |
| 10WBW001-Zone 10-Port InitialD-S04b | 64.8 | 9610 | 991 | 837 | 721 | 131 | 4540 | 301.83 | 292.63 | **1.55** |
| Doris Lake Summer | 31.8 | 60.3 | 2.42 | 9.7 | 5.96 | 2.11 | 29.6 | 2.32 | 2.38 | **1.48** |
| 10WBW001-Zone 10-Airlift Purge-S12 | 90.6 | 15200 | 1490 | 1230 | 990 | 225 | 7130 | 458.58 | 461.00 | **0.26** |
| 10WBW001-Zone 10-Airlift Purge-S14 | 83.3 | 17100 | 1700 | 1340 | 1070 | 245 | 7840 | 502.03 | 518.75 | **1.64** |
| 10WBW001-Zone 10-Airlift Purge-S15 | 82.3 | 17700 | 1750 | 1420 | 1170 | 206 | 7970 | 518.91 | 536.67 | **1.68** |
| 10WBW001-Zone 10-Airlift Final-S16D | 81.7 | 18200 | 1790 | 1560 | 1300 | 294 | 9450 | 603.18 | 551.58 | **4.47** |
| 10WBW001-Zone 1-Port Purge-S17 | | 19100 | 1010 | 4480 | 80.3 | 42.5 | 6810 | 527.33 | 559.06 | **2.92** |
| 10WBW001-Zone 1-Airlift Purge - S20 | | 19000 | 997 | 4260 | 65.6 | 39.1 | 6480 | 500.71 | 555.97 | **5.23** |
| RO Water | <5 | 0.65 | <0.5 | 0.75 | 0.12 | <0.5 | 1.4 | | | |
| 10WBW001-Zone 1-Airlift Final-S25 | | 18700 | 960 | 4520 | 46.1 | 38.5 | 6730 | 522.93 | 546.75 | **2.23** |
| 10WBW001-Zone 1-Airlift Final-S26D | | 18800 | 964 | 4360 | 45 | 37 | 6260 | 494.39 | 549.65 | **5.29** |
| 10WBW001-Zone 6-Airlift Purge -S28 | 63.4 | 15900 | 1690 | 1150 | 1070 | 170 | 6450 | 430.20 | 484.34 | **5.92** |
| 10WBW001-Zone 6-Airlift Purge-S31 | 67.7 | 16500 | 1760 | 1330 | 1270 | 186 | 7910 | 519.52 | 502.79 | **1.64** |
| 10WBW001-Zone 6-Airlift Final-S33 | 70.8 | 17100 | 1820 | 1390 | 1310 | 194 | 8160 | 536.88 | 521.00 | **1.50** |
| Westbay Sampler Bottles Equipment blank | <5 | 7.03 | <0.5 | <0.5 | 0.24 | <0.5 | 1.4 | | | |
| 10WBW001-Zone 1-Port Final-S35 | | 19000 | 981 | 4960 | 69.5 | 39 | 7290 | 571.18 | 555.64 | **1.38** |
| 10WBW001-Zone 6-Port Final-S36 | 44.2 | 9130 | 940 | 749 | 702 | 117 | 4130 | 277.69 | 277.64 | **0.01** |
| 10WBW001-Zone 10-Port Final-S37 | 49.7 | 11500 | 1160 | 1010 | 849 | 160 | 5400 | 359.12 | 349.09 | **1.42** |
| 10WBW001-Zone 1-Port after 2mths-S100 | <2 | 19000 | 980 | 4920 | 64.1 | 39 | 7200 | | | |
| 10WBW001-Zone 6-Port after 2mths-S101 | 44.2 | 13400 | 1390 | 1100 | 964 | 160 | 6010 | 399.60 | 407.29 | **0.95** |
| 10WBW001-Zone 10-Port after 2mths-S102 | 77.3 | 13100 | 1230 | 1110 | 869 | 173 | 5780 | 382.61 | 396.17 | **1.74** |
| 10WBW001-Zone 6-Airlift 160L sample-S103 | 72.4 | 19000 | 2020 | 1550 | 1490 | 233 | 9130 | 602.84 | 578.72 | **2.04** |
| Gas Can Rinsate blank | <2 | <0.5 | <0.5 | 0.224 | <0.1 | <2 | <2 | | | |
| 10WBW001-Zone 10-Port after bulk-S105 | 106 | 16500 | 1580 | 1560 | 1250 | 249 | 8700 | 565.31 | 499.80 | **6.15** |
| 10WBW001-Zone 1-Port after bulk-S106 | <2 | 18400 | 935 | 4730 | 68.1 | 40 | 6910 | | | |
| 10WBW001-Zone 6-Airlift 80L sample-S107 | 76.5 | 19100 | 2000 | 1520 | 1450 | 229 | 8980 | 591.43 | 581.20 | **0.87** |
| 10WBW001-Zone 6-Port after bulk-S108 | 43.7 | 14200 | 1500 | 1160 | 1080 | 172 | 6810 | 447.22 | 432.10 | **1.72** |
| 10WBW002-Zone 1-Port Initial-S01 | 56 | 114000 | <100 | 72100 | 113 | 39 | 655 | | | |
| 10WBW002-Zone 1-Port Purge-S02 | 59.5 | 123000 | <100 | 79800 | 124 | 52 | 300 | | | |
| 10WBW002-Zone 1-Port Purge-S109a | | | | 74700 | 110 | <200 | 1680 | | | |
| 10WBW002-Zone 1-Port Purge-S109b | | | | | | | | | | |
| Glycol & water mix from inside Westbay 10WBW002 | 42.8 | 46800 | <500 | 29400 | 65 | <200 | <200 | | | |
| 10WBW002-Zone 1-Port Purge-S121 | 59 | 133000 | <2500 | 73100 | 113 | <200 | 490 | | | |
| Glycol & water mix prepared at camp | 46.1 | 53 | <50 | 8.55 | 5.9 | 31 | 30 | | | |
| Spyder Lake | 7.9 | 7.58 | 1.63 | 3 | 1.42 | 0.72 | 3.8 | 0.45 | 0.41 | **5.23** |
| 10WBW004 -Drill Tank Beginning | 41.9 | 16400 | 50 | 8320 | 84.7 | 83 | 439 | 443.35 | 463.85 | **2.26** |
| 10WBW004 - Drill Tank End | 13 | 7530 | 5.28 | 4330 | 18.7 | 12.6 | 62.7 | 220.65 | 212.48 | **1.89** |
| 10WBW004 - Zone 6-Port Initial-S123 | 35.8 | 12100 | 244 | 5050 | 311 | 47 | 1820 | 357.91 | 346.64 | **1.60** |
| 10WBW004 - Zone 6-Port Purge-S124 | 35.5 | 12400 | 264 | 4630 | 312 | 47 | 1820 | 337.04 | 355.50 | **2.67** |
| 10WBW004 - Zone 6-Port Purge-S125 | 35.3 | 12400 | 260 | 4580 | 309 | 47 | 1790 | 332.99 | 355.41 | **3.26** |
| 10WBW004 - Zone 6-Port Purge-S126 | 40 | 13700 | 336 | 4180 | 404 | 48 | 2410 | 347.83 | 393.71 | **6.19** |
| 10WBW004 - Zone 6-Port Purge-S128 | 48.7 | 12600 | 322 | 4230 | 365 | 48 | 2200 | 337.99 | 362.61 | **3.51** |
| 10WBW004 - Zone 6-Port Purge-S129 | 50.5 | 13400 | 349 | 4350 | 425 | 50 | 2510 | 362.44 | 385.74 | **3.11** |
| 10WBW004 - Zone 6-Port Purge-S130 | 53 | 13400 | 347 | 4620 | 432 | 53 | 2600 | 380.48 | 385.75 | **0.69** |
| 10WBW004 - Zone 6-Port Purge Final Dec-S131 | 53.5 | 12800 | 330 | 4080 | 387 | 49 | 2330 | 337.99 | 368.50 | **4.32** |

**Table N4: Evaluation of Blank Samples**

| Sample label | Units | 10WBW001-Zone 6-Port Final-S36 | equipment blank DI | % of ground water sample | RO Water | % of ground water sample | Westbay Sampler Bottles Equipment blank | % of ground water sample | Gas Can Rinsate blank | % of ground water sample | 10WBW004 Rinsate blank | % of ground water sample |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Sample ID** | | **10WBW001-36** | **10WBW001-05** | | **10WBW001-22** | | **10WBW001-34** | | **10WBW001-104** | | **10WBW004-127** | |
| **Sample Comments** | | Groundwater sample for comparison with blank samples | Equipment blank DI water | | RO blank | | Rinse blank of Westbay sampler probe bottles | | DI water rinsate of gas cans used in bulk samples. | | Rinsate blank of Westbay sample probe | |
| **ALS DATA** | | | | | | | | | | | | |
| **ALS File No.** | | L917645 | L880950 | | L915201 | | L915201 | | L948685 | | L960194 | |
| **Date Lab Received** | | 09-Aug-10 09:10 | 27-Apr-10 15:23 | | 01-Aug-10 11:24 | | 01-Aug-10 11:24 | | 29-Oct-10 10:28 | | 03-Dec-10 17:00 | |
| **ALS Report Date** | | 20-Aug-10 | 06-May-10 | | 13-Aug-10 | | 13-Aug-10 | | 22-Nov-10 | | 22-Dec-10 | |
| **RESULTS OF ANALYSIS** | | | | | | | | | | | | |
| **ALS SRK Sample ID** | | 10WBW001-36 | 10WBW001-05 | | 10WBW001-22 | | 10WBW001-34 | | 10WBW001-104 | | 10WBW004-127 | |
| **ALS Date Sampled** | | 05-AUG-10 | 25-APR-10 | | 26-JUL-10 | | 28-JUL-10 | | 25-OCT-10 | | 26-NOV-10 | |
| **ALS Time Sampled** | | 09:00 | 00:00 | | 09:10 | | 11:00 | | 00:00 | | 18:00 | |
| **ALS Sample ID** | | L917645-2 | L880950-5 | | L915201-8 | | L915201-22 | | L948685-1 | | L960194-8 | |
| **Matrix** | | Seawater | Water | | Water | | Water | | Water | | Water | |
| | | | | | | | | | | | | |
| **Physical Tests** | | | | | | | | | | | | |
| **Conductivity (EC)** | uS/cm | 24600 | | | 5.97 | 0.0% | 24.7 | 0.1% | <2 | | 28.3 | 0.1% |
| **Density** | | | | | | | | | 1.00 | | 1.01 | |
| **Hardness (as CaCO3)** | mg/L | 4760 | | | 2.4 | 0.1% | <1 | | 0.56 | 0.0% | | |
| **pH** | pH | 7.83 | | | 6.38 | | 6.11 | | 7.29 | | 6.34 | |
| **Salinity (EC)** | g/L | | | | | | | | | | | |
| **Total Dissolved Solids** | mg/L | 19600 | | | 10.0 | 0.1% | 18.0 | 0.1% | <10 | | 12 | 0.1% |
| | | | | | | | | | | | | |
| **Anions and Nutrients** | | | | | | | | | | | | |
| **Alkalinity, Bicarbonate (as CaCO3)** | mg/L | | | | | | | | <2 | | <1.0 | |
| **Alkalinity, Carbonate (as CaCO3)** | mg/L | | | | | | | | <2 | | <1.0 | |
| **Alkalinity, Hydroxide (as CaCO3)** | mg/L | | | | | | | | <2 | | <1.0 | |
| **Alkalinity, Total (as CaCO3)** | mg/L | 44.2 | | | <5 | | <5 | | <2 | | <1.0 | |
| **Ammonia as N** | mg/L | | | | | | | | <0.005 | | | |
| **Bromide (Br)** | mg/L | 21.2 | | | | | | | <0.05 | | <0.050 | |
| **Chloride (Cl)** | mg/L | 9130 | | | 0.65 | 0.0% | 7.03 | 0.1% | <0.5 | | 6.33 | 0.1% |
| **Fluoride (F)** | mg/L | <0.75 | | | <0.05 | | <0.05 | | <0.02 | | <0.020 | |
| **Nitrate (as N)** | mg/L | <0.5 | | | <0.05 | | <0.05 | | <0.005 | | <0.0050 | |
| **Nitrite (as N)** | mg/L | <0.1 | | | <0.05 | | <0.05 | | <0.001 | | <0.0010 | |
| **Ortho Phosphate as P** | mg/L | | | | | | | | | | | |
| **Total Phosphate as P** | mg/L | | | | | | | | 0.0052 | | | |
| **Silicate (as SIO2)** | mg/L | | | | | | | | <1 | | | |
| **Sulfate (SO4)** | mg/L | 940 | | | <0.5 | | <0.5 | | <0.5 | | <0.50 | |
| | | | | | | | | | | | | |
| **Additional Anions and Nutrients** | | | | | | | | | | | | |
| **Bicarbonate (HCO3)** | mg/L | | | | <5 | | <5 | | | | | |
| **Carbonate (CO3)** | mg/L | | | | <5 | | <5 | | | | | |
| **Hydroxide (OH)** | mg/L | | | | <5 | | <5 | | | | | |
| **Ion Balance** | % | | | | Low EC | | Low EC | | | | | |
| **Nitrate and Nitrite as N** | mg/L | | | | <0.071 | | <0.071 | | | | | |
| **TDS (Calculated)** | mg/L | | | | 2.9 | | 8.7 | | | | | |
| | | | | | | | | | | | | |
| **Total Metals** | | | | | | | | | | | | |
| **Aluminum (Al)-Total** | mg/L | 0.0281 | <0.010 | | <0.01 | | <0.01 | | 0.0086 | 30.6% | | |
| **Antimony (Sb)-Total** | mg/L | 0.00745 | <0.00040 | | <0.0004 | | <0.0004 | | <0.00001 | | | |
| **Arsenic (As)-Total** | mg/L | 0.003 | <0.00040 | | <0.0004 | | <0.0004 | | <0.00005 | | | |
| **Barium (Ba)-Total** | mg/L | 0.130 | <0.0030 | | <0.003 | | <0.003 | | 0.00017 | 0.1% | | |
| **Beryllium (Be)-Total** | mg/L | <0.0005 | <0.0010 | | <0.001 | | <0.001 | | <0.000005 | | | |
| **Bismuth (Bi)-Total** | mg/L | <0.0005 | | | | | | | <0.00005 | | | |
| **Boron (B)-Total** | mg/L | 1.04 | <0.050 | | <0.05 | | <0.05 | | 0.0097 | 0.9% | | |
| **Cadmium (Cd)-Total** | mg/L | <0.00012 | <0.000050 | | <0.00005 | | 0.000190 | | <0.000005 | | | |
| **Calcium (Ca)-Total** | mg/L | 0805 | <0.50 | | <0.5 | | <0.5 | | <0.05 | | | |
| **Cesium (Cs)-Total** | mg/L | 0000 | | | | | | | <0.000005 | | | |
| **Chromium (Cr)-Total** | mg/L | 0.00 | <0.0050 | | <0.005 | | <0.005 | | <0.0005 | | | |
| **Cobalt (Co)-Total** | mg/L | <0.0005 | <0.0020 | | <0.002 | | <0.002 | | <0.00005 | | | |
| **Copper (Cu)-Total** | mg/L | <0.001 | <0.0010 | | 0.0807 | | <0.001 | | 0.0161 | | | |
| **Gallium (Ga)-Total** | mg/L | <0.0005 | | | | | | | <0.00005 | | | |
| **Iron (Fe)-Total** | mg/L | 1.60 | <0.010 | | <0.01 | | 0.037 | 2.3% | <0.03 | | | |
| **Lead (Pb)-Total** | mg/L | <0.001 | <0.00010 | | 0.00244 | | 0.00067 | | 0.00114 | | | |
| **Lithium (Li)-Total** | mg/L | 0.093 | <0.010 | | <0.01 | | <0.01 | | <0.0002 | | | |
| **Magnesium (Mg)-Total** | mg/L | 0739 | <0.10 | | <0.1 | | <0.1 | | <0.1 | | | |
| **Manganese (Mn)-Total** | mg/L | 0.56 | <0.0020 | | <0.002 | | 0.0023 | 0.4% | <0.0002 | | | |
| **Mercury (Hg)-Total** | mg/L | | <0.00010 | | <0.0001 | | <0.0001 | | <0.00005 | | | |
| **Molybdenum (Mo)-Total** | mg/L | 0.0403 | <0.0050 | | <0.005 | | <0.005 | | <0.00005 | | | |
| **Nickel (Ni)-Total** | mg/L | 0.00159 | <0.0020 | | <0.002 | | <0.002 | | <0.0002 | | | |
| **Phosphorus (P)-Total** | mg/L | <1 | | | | | | | <0.3 | | | |
| **Potassium (K)-Total** | mg/L | 125 | <0.10 | | <0.1 | | <0.1 | | <2 | | | |
| **Rhenium (Re)-Total** | mg/L | <0.0005 | | | | | | | <0.000005 | | | |
| **Rubidium (Rb)-Total** | mg/L | 000 | | | | | | | <0.00002 | | | |
| **Selenium (Se)-Total** | mg/L | <0.002 | <0.00040 | | <0.0004 | | <0.0004 | | <0.0002 | | | |
| **Silicon (Si)-Total** | mg/L | 2.88 | | | | | | | <0.05 | | | |
| **Silver (Ag)-Total** | mg/L | <0.0002 | <0.00050 | | <0.0001 | | <0.0001 | | 0.0000058 | | | |
| **Sodium (Na)-Total** | mg/L | 4460 | <1.0 | | <1 | | <1 | | <2 | | | |
| **Strontium (Sr)-Total** | mg/L | 0010 | | | | | | | <0.005 | | | |
| **Tellurium (Te)-Total** | mg/L | <0.0005 | | | | | | | <0.00001 | | | |
| **Thallium (Tl)-Total** | mg/L | <0.0005 | <0.00010 | | <0.0001 | | <0.0001 | | <0.000002 | | | |
| **Thorium (Th)-Total** | mg/L | <0.0005 | | | | | | | <0.000005 | | | |
| **Tin (Sn)-Total** | mg/L | <0.001 | <0.050 | | <0.05 | | <0.05 | | <0.0002 | | | |
| **Titanium (Ti)-Total** | mg/L | <0.005 | <0.0010 | | <0.001 | | <0.001 | | <0.0002 | | | |
| **Tungsten (W)-Total** | mg/L | 0.0334 | | | | | | | <0.00001 | | | |
| **Uranium (U)-Total** | mg/L | <0.0005 | <0.00010 | | <0.0001 | | <0.0001 | | 0.0000020 | | | |
| **Vanadium (V)-Total** | mg/L | <0.0005 | <0.0010 | | <0.001 | | <0.001 | | <0.00005 | | | |
| **Yttrium (Y)-Total** | mg/L | <0.0005 | | | | | | | <0.000005 | | | |
| **Zinc (Zn)-Total** | mg/L | 0.195 | <0.0040 | | 0.0408 | 20.9% | 0.0300 | 15.4% | 0.0056 | 2.9% | | |
| **Zirconium (Zr)-Total** | mg/L | <0.0005 | | | | | | | <0.00005 | | | |
| | | | | | | | | | | | | |

| Sample label | Units | 10WBW001-Zone 6-Port Final-S36 | equipment blank DI | % of ground water sample | RO Water | % of ground water sample | Westbay Sampler Bottles Equipment blank | % of ground water sample | Gas Can Rinsate blank | % of ground water sample | 10WBW004 Rinsate blank | % of ground water sample |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Sample ID** | | **10WBW001-36** | **10WBW001-05** | | **10WBW001-22** | | **10WBW001-34** | | **10WBW001-104** | | **10WBW004-127** | |
| **Sample Comments** | | Groundwater sample for comparison with blank samples | Equipment blank DI water | | RO blank | | Rinse blank of Westbay sampler probe bottles | | DI water rinsate of gas cans used in bulk samples. | | Rinsate blank of Westbay sample probe | |
| **Dissolved Metals** | | | | | | | | | | | | |
| **Aluminum (Al)-Dissolved** | mg/L | <0.005 | <0.010 | | <0.01 | | <0.01 | | <0.003 | | | |
| **Antimony (Sb)-Dissolved** | mg/L | 0.00703 | <0.00040 | | <0.0004 | | <0.0004 | | 0.000021 | 0.3% | | |
| **Arsenic (As)-Dissolved** | mg/L | <0.002 | <0.00040 | | <0.0004 | | <0.0004 | | <0.00005 | | | |
| **Barium (Ba)-Dissolved** | mg/L | 0.120 | <0.0030 | | <0.003 | | <0.003 | | 0.00044 | 0.4% | | |
| **Beryllium (Be)-Dissolved** | mg/L | <0.0005 | <0.0010 | | <0.001 | | <0.001 | | <0.000005 | | | |
| **Bismuth (Bi)-Dissolved** | mg/L | <0.0005 | | | | | | | <0.00005 | | | |
| **Boron (B)-Dissolved** | mg/L | 0.94 | <0.050 | | <0.05 | | <0.05 | | <0.005 | | | |
| **Cadmium (Cd)-Dissolved** | mg/L | <0.00012 | <0.000050 | | <0.00005 | | <0.00005 | | 0.0000102 | | | |
| **Calcium (Ca)-Dissolved** | mg/L | 749 | | | 0.75 | 0.1% | <0.5 | | 0.224 | 0.0% | | |
| **Cesium (Cs)-Dissolved** | mg/L | 0.00069 | | | | | | | <0.000005 | | | |
| **Chromium (Cr)-Dissolved** | mg/L | <0.001 | <0.0050 | | <0.005 | | <0.005 | | <0.0005 | | | |
| **Cobalt (Co)-Dissolved** | mg/L | <0.0005 | <0.0020 | | <0.002 | | <0.002 | | <0.00005 | | | |
| **Copper (Cu)-Dissolved** | mg/L | <0.001 | <0.0010 | | 0.0031 | | <0.001 | | 0.0123 | | | |
| **Gallium (Ga)-Dissolved** | mg/L | <0.0005 | | | | | | | <0.00005 | | | |
| **Iron (Fe)-Dissolved** | mg/L | 0.06 | | | <0.03 | | <0.03 | | <0.03 | | | |
| **Lead (Pb)-Dissolved** | mg/L | <0.001 | <0.00010 | | <0.0001 | | <0.0001 | | 0.00114 | | | |
| **Lithium (Li)-Dissolved** | mg/L | 0.087 | <0.0030 | | <0.003 | | <0.003 | | <0.0002 | | | |
| **Magnesium (Mg)-Dissolved** | mg/L | 702 | | | 0.12 | 0.0% | 0.24 | 0.0% | <0.1 | | | |
| **Manganese (Mn)-Dissolved** | mg/L | 0.53 | | | <0.005 | | <0.005 | | <0.0002 | | | |
| **Mercury (Hg)-Dissolved** | mg/L | < | <0.00010 | | <0.0001 | | <0.0001 | | <0.00005 | | | |
| **Molybdenum (Mo)-Dissolved** | mg/L | 0.0379 | <0.0050 | | <0.005 | | <0.005 | | <0.00005 | | | |
| **Nickel (Ni)-Dissolved** | mg/L | 0.00076 | <0.0020 | | <0.002 | | <0.002 | | <0.0002 | | | |
| **Phosphorus (P)-Dissolved** | mg/L | <1 | | | | | | | <0.3 | | | |
| **Potassium (K)-Dissolved** | mg/L | 117 | | | <0.5 | | <0.5 | | <2 | | | |
| **Rhenium (Re)-Dissolved** | mg/L | <0.0005 | | | | | | | <0.000005 | | | |
| **Rubidium (Rb)-Dissolved** | mg/L | 000 | | | | | | | <0.00002 | | | |
| **Selenium (Se)-Dissolved** | mg/L | <0.002 | <0.00040 | | <0.0004 | | <0.0004 | | <0.0002 | | | |
| **Silicon (Si)-Dissolved** | mg/L | 2.48 | | | | | | | <0.05 | | | |
| **Silver (Ag)-Dissolved** | mg/L | <0.0002 | <0.00010 | | <0.0001 | | <0.0001 | | <0.000005 | | | |
| **Sodium (Na)-Dissolved** | mg/L | 4130 | | | 1.4 | 0.0% | 1.4 | 0.0% | <2 | | | |
| **Strontium (Sr)-Dissolved** | mg/L | 0009 | | | | | | | <0.005 | | | |
| **Tellurium (Te)-Dissolved** | mg/L | <0.0005 | | | | | | | <0.00001 | | | |
| **Thallium (Tl)-Dissolved** | mg/L | <0.0005 | <0.00010 | | <0.0001 | | <0.0001 | | <0.000002 | | | |
| **Thorium (Th)-Dissolved** | mg/L | <0.0005 | | | | | | | <0.000005 | | | |
| **Tin (Sn)-Dissolved** | mg/L | <0.001 | <0.050 | | <0.05 | | <0.05 | | <0.0002 | | | |
| **Titanium (Ti)-Dissolved** | mg/L | <0.005 | <0.0010 | | <0.001 | | <0.001 | | <0.0002 | | | |
| **Tungsten (W)-Dissolved** | mg/L | 0.0316 | | | | | | | <0.00001 | | | |
| **Uranium (U)-Dissolved** | mg/L | <0.0005 | <0.00010 | | <0.0001 | | <0.0001 | | <0.000002 | | | |
| **Vanadium (V)-Dissolved** | mg/L | <0.0005 | <0.0010 | | <0.001 | | <0.001 | | <0.00005 | | | |
| **Yttrium (Y)-Dissolved** | mg/L | <0.0005 | | | | | | | <0.000005 | | | |
| **Zinc (Zn)-Dissolved** | mg/L | 0.02 | <0.0020 | | 0.0030 | 16.1% | 0.0031 | 16.7% | 0.0109 | 58.6% | | |
| **Zirconium (Zr)-Dissolved** | mg/L | <0.0005 | | | | | | | <0.00005 | | | |
| **Delta 2H x 1000** | | -117.72 | -144.31 | | -149.55 | | | | | | | |
| **Delta 18O x 1000** | | -15.00 | -15.60 | | -18.97 | | | | | | | |
| **Parameters with detectable concentrations in blanks are higlighted.** | | | | | | | | | | | | |

**Table N5: Comparison of Airlift and Port Samples**

| | | Airlift vs Port | | RPD | Airlift vs Port | | RPD | Airlift vs Port | | RPD | Airlift vs Port | | RPD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Sample ID / Unique ID | Units | 10WBW001-33 | 10WBW001-36 | | 10WBW001-26 | 10WBW001-35 | | 10WBW001-16 | 10WBW001-37 | | 10WBW001-103 | 10WBW001-108 | |
| Sample From | | Westbay airlift | Westbay Port | | Westbay airlift | Westbay Port | | Westbay airlift | Westbay Port | | Westbay airlift | Westbay Port | |
| Sample label for graph | | 10WBW001-Zone 6-Airlift Final-S33 | 10WBW001-Zone 6-Port Final-S36 | | 10WBW001-Zone 1-Airlift Final-S26D | 10WBW001-Zone 1-Port Final-S35 | | 10WBW001-Zone 10-Airlift Final-S16D | 10WBW001-Zone 10-Port Final-S37 | | 10WBW001-Zone 6-Airlift 160L sample-S103 | 10WBW001-Zone 6-Port after bulk-S108 | |
| Sample Zone | | 6 | 6 | | 1 | 1 | | 10 | 10 | | 6 | 6 | |
| Location of port in zone | | Bottom | Top | | Middle | Top | | Bottom | Top | | Bottom | Top | |
| Zone port drillhole depth | | 274.00 | 246.0 | | 554.00 | 548.0 | | 107.50 | 63.5 | | 274.00 | 246.0 | |
| Total Litres purged from zone before sample was taken | | 6433 | 8096 | | 3065 | 3186 | | 3008 | 3008 | | 10639 | 13592 | |
| Zone volumes purged before sample was taken | | 36.7 | 46.6 | | 26.2 | 27.4 | | 11.0 | 11.0 | | 61.7 | 79.3 | |
| ALS DATA | | | | | | | | | | | | | |
| ALS Date Sampled | | 27-JUL-10 | 05-AUG-10 | | 25-JUL-10 | 04-AUG-10 | | 21-JUL-10 | 05-AUG-10 | | 25-OCT-10 | 01-NOV-10 | |
| ALS Time Sampled | | 15:21 | 09:00 | | 12:37 | 13:42 | | 17:28 | 11:40 | | 00:00 | 15:00 | |
| Matrix | | Water | Seawater | | Water | Seawater | | Water | Seawater | | Water | BOTH | |
| | | | | | | | | | | | | | |
| Physical Tests | | | | | | | | | | | | | |
| Conductivity (EC) | uS/cm | 44400 | 24600 | 57% | 47600 | 46600 | 2% | 46600 | 30300 | 42% | 48500 | 37000 | 27% |
| Density | | | | | | | | | | | | 1.03 | |
| Hardness (as CaCO3) | mg/L | 8870 | 4760 | 60% | 11100 | 12700 | -13% | 9250 | 6030 | 42% | 10000 | 7340 | 31% |
| pH | pH | 7.43 | 7.83 | -5% | 7.72 | 7.43 | 4% | 7.39 | 7.47 | -1% | 7.04 | 7.59 | -8% |
| Salinity (EC) | g/L | | | | | | | | | | 32.4 | 23.5 | 32% |
| Total Dissolved Solids | mg/L | 30400 | 19600 | 43% | 32400 | 47800 | -38% | 32700 | 23100 | 34% | 35400 | 25500 | 33% |
| | | | | | | | | | | | | | |
| Anions and Nutrients | | | | | | | | | | | | | |
| Alkalinity, Total (as CaCO3) | mg/L | 70.8 | 44.2 | 46% | | | | 81.7 | 49.7 | 49% | 72.4 | 43.7 | 49% |
| Ammonia as N | mg/L | | | | | | | | | | 3.14 | 2.32 | 30% |
| Bromide (Br) | mg/L | | 21.2 | | | 100 | | | 27.6 | | 49.1 | 41.3 | 17% |
| Chloride (Cl) | mg/L | 17100 | 09130 | 61% | 18800 | 19000 | -1% | 18200 | 11500 | 45% | 19000 | 14200 | 29% |
| Fluoride (F) | mg/L | <1 | <0.75 | | <1 | <0.75 | | <1 | <0.75 | | 0.091 | <0.75 | |
| Nitrate (as N) | mg/L | <1 | <0.5 | | <1 | <0.5 | | <1 | <0.5 | | <0.5 | <0.5 | |
| Nitrite (as N) | mg/L | <1 | <0.1 | | <1 | <0.1 | | <1 | <0.1 | | <0.1 | <0.1 | |
| Total Phosphate as P | mg/L | | | | | | | | | | 0.0262 | 0.0162 | 47% |
| Silicate (as SIO2) | mg/L | | | | | | | | | | 6.1 | 5.8 | 5% |
| Sulfate (SO4) | mg/L | 1820 | 0940 | 64% | 0964 | 0981 | -2% | 1790 | 1160 | 43% | 2020 | 1500 | 30% |
| | | | | | | | | | | | | | |
| Total Metals | | | | | | | | | | | | | |
| Aluminum (Al)-Total | mg/L | <2 | 0.0281 | | <2 | 0.0992 | | <2 | 0.0146 | | 0.0318 | 0.0059 | 137% |
| Antimony (Sb)-Total | mg/L | <0.08 | 0.00745 | | <0.08 | <0.0005 | | <0.08 | 0.00349 | | 0.00127 | 0.00461 | -114% |
| Arsenic (As)-Total | mg/L | 0.121 | 0.003 | 192% | 0.101 | <0.002 | | 0.090 | <0.002 | | 0.007 | <0.002 | |
| Barium (Ba)-Total | mg/L | 0.107 | 0.130 | -19% | 0.059 | 0.051 | 14% | 0.113 | 0.179 | -45% | 0.117 | 0.169 | -36% |
| Beryllium (Be)-Total | mg/L | <0.2 | <0.0005 | | <0.2 | <0.0005 | | <0.2 | <0.0005 | | <0.0005 | <0.0005 | |
| Bismuth (Bi)-Total | mg/L | | <0.0005 | | | <0.0005 | | | <0.0005 | | <0.0005 | <0.0005 | |
| Boron (B)-Total | mg/L | 1.91 | 1.04 | 59% | 2.50 | 2.93 | -16% | 2.31 | 1.51 | 42% | 2.65 | 1.50 | 55% |
| Cadmium (Cd)-Total | mg/L | <0.01 | <0.00012 | | <0.01 | <0.00012 | | <0.01 | <0.00012 | | <0.00005 | <0.00005 | |
| Calcium (Ca)-Total | mg/L | 1280 | 805 | 46% | 4380 | 5070 | -15% | 1580 | 1020 | 43% | 1600 | 1170 | 31% |
| Cesium (Cs)-Total | mg/L | | 0.00072 | | | 0.00105 | | | 0.00097 | | 0.00155 | 0.00095 | 48% |
| Chromium (Cr)-Total | mg/L | 0.86 | 0.00 | 199% | 0.74 | 0.01 | 197% | 0.66 | 0.0030 | 198% | <0.0005 | <0.0005 | |
| Cobalt (Co)-Total | mg/L | <0.04 | <0.0005 | | <0.04 | <0.0005 | | <0.04 | <0.0005 | | 0.000381 | 0.000103 | 115% |
| Copper (Cu)-Total | mg/L | <0.2 | <0.001 | | <0.2 | 0.0018 | | <0.2 | <0.001 | | <0.0005 | 0.00061 | |
| Gallium (Ga)-Total | mg/L | | <0.0005 | | | <0.0005 | | | <0.0005 | | <0.0005 | <0.0005 | |
| Iron (Fe)-Total | mg/L | 3.54 | 1.60 | 75% | 0.16 | 0.46 | -96% | 7.14 | 3.95 | 58% | 4.53 | 2.28 | 66% |
| Lead (Pb)-Total | mg/L | <0.02 | <0.001 | | <0.02 | 0.0013 | | <0.02 | <0.001 | | <0.0003 | <0.0003 | |
| Lithium (Li)-Total | mg/L | <1.2 | 0.093 | | <1.2 | 0.37 | | <1.2 | 0.128 | | 0.228 | 0.131 | 54% |
| Magnesium (Mg)-Total | mg/L | 1210 | 739 | 48% | 53 | 71 | -29% | 1290 | 867 | 39% | 1510 | 1080 | 33% |
| Manganese (Mn)-Total | mg/L | 1.81 | 0.56 | 106% | 0.64 | 0.72 | -11% | 1.76 | 1.09 | 47% | 2.08 | 0.892 | 80% |
| Mercury (Hg)-Total | mg/L | <0.0001 | | | <0.0001 | | | <0.0001 | | | <0.00005 | | |
| Molybdenum (Mo)-Total | mg/L | <0.02 | 0.0403 | | <0.02 | 0.0136 | | <0.02 | 0.0225 | | 0.0140 | 0.0361 | -88% |
| Nickel (Ni)-Total | mg/L | <0.04 | 0.00159 | | 0.074 | 0.00437 | 178% | <0.04 | 0.00237 | | 0.00095 | 0.00120 | -23% |
| Phosphorus (P)-Total | mg/L | | <1 | | | <1 | | | <1 | | <1 | <1 | |
| Potassium (K)-Total | mg/L | 203 | 125 | 48% | 045 | 040 | 12% | 292 | 166 | 55% | 240 | 172 | 33% |
| Rhenium (Re)-Total | mg/L | | <0.0005 | | | <0.0005 | | | <0.0005 | | <0.0005 | <0.0005 | |
| Rubidium (Rb)-Total | mg/L | | 0.0765 | | | 0.0500 | | | 0.0816 | | 0.1420 | 0.102 | 33% |
| Selenium (Se)-Total | mg/L | <0.4 | <0.002 | | <0.4 | <0.002 | | <0.4 | <0.002 | | <0.002 | <0.002 | |
| Silicon (Si)-Total | mg/L | | 2.88 | | | 2.61 | | | 2.12 | | 3.68 | 3.82 | -4% |
| Silver (Ag)-Total | mg/L | <0.02 | <0.0002 | | <0.02 | <0.0002 | | <0.02 | <0.0002 | | <0.0001 | 0.00018 | |
| Sodium (Na)-Total | mg/L | 7450 | 4460 | 50% | 7870 | 7470 | 5% | 9580 | 5590 | 53% | 9350 | 6790 | 32% |
| Strontium (Sr)-Total | mg/L | | 10 | | | 60 | | | 11.7 | | 21.2 | 14.6 | 37% |
| Tellurium (Te)-Total | mg/L | | <0.0005 | | | <0.0005 | | | <0.0005 | | <0.0005 | <0.0005 | |
| Thallium (Tl)-Total | mg/L | <0.02 | <0.0005 | | <0.02 | <0.0005 | | <0.02 | <0.0005 | | <0.00005 | <0.00005 | |
| Thorium (Th)-Total | mg/L | | <0.0005 | | | <0.0005 | | | <0.0005 | | <0.0005 | <0.0005 | |
| Tin (Sn)-Total | mg/L | <0.08 | <0.001 | | <0.08 | <0.001 | | <0.08 | <0.001 | | <0.001 | <0.001 | |
| Titanium (Ti)-Total | mg/L | <0.12 | <0.005 | | <0.12 | 0.0082 | | <0.12 | <0.005 | | <0.005 | <0.005 | |
| Tungsten (W)-Total | mg/L | | 0.0334 | | | <0.001 | | | 0.0067 | | 0.0056 | 0.0227 | -121% |
| Uranium (U)-Total | mg/L | <0.02 | <0.0005 | | <0.02 | <0.0005 | | <0.02 | <0.0005 | | 0.00023 | 0.000059 | 118% |
| Vanadium (V)-Total | mg/L | 0.27 | <0.0005 | | 0.23 | 0.001 | 199% | 0.22 | <0.0005 | | 0.00054 | <0.0005 | |
| Yttrium (Y)-Total | mg/L | | <0.0005 | | | <0.0005 | | | <0.0005 | | <0.0005 | <0.0005 | |
| Zinc (Zn)-Total | mg/L | <0.8 | 0.195 | | <0.8 | 0.503 | | <0.8 | 0.261 | | 0.046 | 0.115 | -86% |
| Zirconium (Zr)-Total | mg/L | | <0.0005 | | | <0.0005 | | | <0.0005 | | <0.0005 | <0.0005 | |
| | | | | | | | | | | | | | |
| Dissolved Metals | | | | | | | | | | | | | |
| Aluminum (Al)-Dissolved | mg/L | <1 | <0.005 | | <1 | <0.005 | | <1 | <0.005 | | <0.005 | <0.005 | |
| Antimony (Sb)-Dissolved | mg/L | <0.08 | 0.00703 | | <0.08 | <0.0005 | | <0.08 | 0.00306 | | 0.00121 | 0.00393 | -106% |
| Arsenic (As)-Dissolved | mg/L | 0.102 | <0.002 | | 0.090 | <0.002 | | 0.097 | <0.002 | | 0.0066 | <0.002 | |
| Barium (Ba)-Dissolved | mg/L | 0.120 | 0.120 | 0% | 0.052 | 0.052 | 0% | 0.097 | 0.169 | -54% | 0.113 | 0.169 | -40% |
| Beryllium (Be)-Dissolved | mg/L | <0.1 | <0.0005 | | <0.1 | <0.0005 | | <0.1 | <0.0005 | | <0.0005 | <0.0005 | |
| Bismuth (Bi)-Dissolved | mg/L | | <0.0005 | | | <0.0005 | | | <0.0005 | | <0.0005 | <0.0005 | |

| | | Airlift vs Port | | RPD | Airlift vs Port | | RPD | Airlift vs Port | | RPD | Airlift vs Port | | RPD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Sample ID / Unique ID** | **Units** | **10WBW001-33** | **10WBW001-36** | | **10WBW001-26** | **10WBW001-35** | | **10WBW001-16** | **10WBW001-37** | | **10WBW001-103** | **10WBW001-108** | |
| **Boron (B)-Dissolved** | mg/L | 1.97 | 0.94 | 71% | 2.74 | 2.99 | -9% | 2.32 | 1.42 | 48% | 2.64 | 1.48 | 56% |
| **Cadmium (Cd)-Dissolved** | mg/L | <0.01 | <0.00012 | | <0.01 | <0.00012 | | <0.01 | <0.00012 | | <0.00005 | <0.00005 | |
| **Calcium (Ca)-Dissolved** | mg/L | 1390 | 749 | 60% | 4360 | 4960 | -13% | 1560 | 1010 | 43% | 1550 | 1160 | 29% |
| **Cesium (Cs)-Dissolved** | mg/L | | 0.00069 | | | 0.00105 | | | 0.00092 | | 0.00154 | 0.00097 | 45% |
| **Chromium (Cr)-Dissolved** | mg/L | 0.682 | <0.001 | | 0.532 | <0.001 | | 0.874 | <0.001 | | <0.0005 | <0.0005 | |
| **Cobalt (Co)-Dissolved** | mg/L | <0.02 | <0.0005 | | <0.02 | <0.0005 | | <0.02 | <0.0005 | | 0.000315 | 0.000091 | 110% |
| **Copper (Cu)-Dissolved** | mg/L | <0.12 | <0.001 | | <0.12 | <0.001 | | <0.12 | <0.001 | | <0.0005 | <0.0005 | |
| **Gallium (Ga)-Dissolved** | mg/L | | <0.0005 | | | <0.0005 | | | <0.0005 | | <0.0005 | <0.0005 | |
| **Iron (Fe)-Dissolved** | mg/L | 3.32 | 0.06 | 193% | <0.15 | <0.05 | | 6.25 | 2.68 | 80% | 4.31 | 0.503 | 158% |
| **Lead (Pb)-Dissolved** | mg/L | <0.02 | <0.001 | | <0.02 | <0.001 | | <0.02 | <0.001 | | <0.003 | <0.0003 | |
| **Lithium (Li)-Dissolved** | mg/L | <0.6 | 0.087 | | <0.6 | 0.37 | | <0.6 | 0.121 | | 0.223 | 0.127 | 55% |
| **Magnesium (Mg)-Dissolved** | mg/L | 1310 | 0702 | 60% | 0045 | 0070 | -43% | 1300 | 849 | 42% | 1490 | 1080 | 32% |
| **Manganese (Mn)-Dissolved** | mg/L | 1.96 | 0.53 | 115% | 0.53 | 0.69 | -26% | 1.72 | 1.04 | 49% | 2.03 | 0.888 | 78% |
| **Mercury (Hg)-Dissolved** | mg/L | <0.0001 | | | <0.0001 | | | <0.0001 | | | <0.00005 | | |
| **Molybdenum (Mo)-Dissolved** | mg/L | <0.02 | 0.0379 | | <0.02 | 0.0128 | | <0.02 | 0.0211 | | 0.0138 | 0.0345 | -86% |
| **Nickel (Ni)-Dissolved** | mg/L | <0.02 | 0.00076 | | 0.066 | <0.0005 | | <0.02 | <0.0005 | | 0.00101 | 0.00158 | -44% |
| **Phosphorus (P)-Dissolved** | mg/L | | <1 | | | <1 | | | <1 | | <1 | <1 | |
| **Potassium (K)-Dissolved** | mg/L | 194 | 117 | 50% | 037 | 039 | -5% | 294 | 160 | 59% | 233 | 172 | 30% |
| **Rhenium (Re)-Dissolved** | mg/L | | <0.0005 | | | <0.0005 | | | <0.0005 | | <0.0005 | <0.0005 | |
| **Rubidium (Rb)-Dissolved** | mg/L | | 0.0725 | | | 0.0504 | | | 0.0766 | | 0.1400 | 0.106 | 28% |
| **Selenium (Se)-Dissolved** | mg/L | <0.4 | <0.002 | | <0.4 | <0.002 | | <0.4 | <0.002 | | <0.002 | <0.002 | |
| **Silicon (Si)-Dissolved** | mg/L | | 2.48 | | | 2.3 | | | 1.99 | | 3.49 | 3.33 | 5% |
| **Silver (Ag)-Dissolved** | mg/L | <0.02 | <0.0002 | | <0.02 | <0.0002 | | <0.02 | <0.0002 | | <0.0001 | <0.0001 | |
| **Sodium (Na)-Dissolved** | mg/L | 8160 | 4130 | 66% | 6260 | 7290 | -15% | 9450 | 5400 | 55% | 9130 | 6810 | 29% |
| **Strontium (Sr)-Dissolved** | mg/L | | 9.0 | | | 58.9 | | | 11.3 | | 21.1 | 14.6 | 36% |
| **Tellurium (Te)-Dissolved** | mg/L | | <0.0005 | | | <0.0005 | | | <0.0005 | | <0.0005 | <0.0005 | |
| **Thallium (Tl)-Dissolved** | mg/L | <0.01 | <0.0005 | | <0.01 | <0.0005 | | 0.010 | <0.0005 | | <0.00005 | <0.00005 | |
| **Thorium (Th)-Dissolved** | mg/L | | <0.0005 | | | <0.0005 | | | <0.0005 | | <0.0005 | <0.0005 | |
| **Tin (Sn)-Dissolved** | mg/L | <0.05 | <0.001 | | <0.05 | <0.001 | | <0.05 | <0.001 | | <0.001 | <0.001 | |
| **Titanium (Ti)-Dissolved** | mg/L | <0.06 | <0.005 | | <0.06 | <0.005 | | <0.06 | <0.005 | | <0.005 | <0.005 | |
| **Tungsten (W)-Dissolved** | mg/L | | 0.0316 | | | <0.001 | | | 0.0059 | | 0.0053 | 0.0231 | -125% |
| **Uranium (U)-Dissolved** | mg/L | <0.02 | <0.0005 | | <0.02 | <0.0005 | | <0.02 | <0.0005 | | 0.000231 | 0.000058 | 120% |
| **Vanadium (V)-Dissolved** | mg/L | 0.229 | <0.0005 | | 0.174 | <0.0005 | | 0.292 | <0.0005 | | <0.0005 | <0.0005 | |
| **Yttrium (Y)-Dissolved** | mg/L | | <0.0005 | | | <0.0005 | | | <0.0005 | | <0.0005 | <0.0005 | |
| **Zinc (Zn)-Dissolved** | mg/L | <0.2 | 0.02 | | <0.2 | 0.0897 | | <0.2 | 0.0504 | | 0.0384 | 0.0295 | 26% |
| **Zirconium (Zr)-Dissolved** | mg/L | | <0.0005 | | | <0.0005 | | | <0.0005 | | <0.0005 | <0.0005 | |
| | | | | | | | | | | | | | |
| **Isotope Chemistry** | | | | | | | | | | | | | |
| **Delta 2H x 1000** | | -85.71 | -117.72 | -31% | -138.57 | -138 | 0% | -77.67 | -106.52 | -31% | | | |
| **Delta 18O x 1000** | | -10.9 | -15 | -32% | -19.07 | -18.83 | 1% | -10.18 | -13.49 | -28% | | | |

**RPDs greater than 20% are highlighted, to show parameters with the greatest variation between samples.**

SRK CONSULTING (CANADA) INC.
ATTN: MELISSA PITZ
SUITE 205
2100 AIRPORT DRIVE
SASKATOON SK S7L 6M6
Phone: 306-955-4732

Date Received: 29-OCT-10
Report Date: 22-NOV-10 09:12 (MT)
Version: FINAL

# Certificate of Analysis

Lab Work Order #: L948685
Project P.O. #: NOT SUBMITTED
Job Reference:
Legal Site Desc:
C of C Numbers:

# ALS LABORATORY GROUP ANALYTICAL REPORT

| | Sample ID<br>Description<br>Sampled Date<br>Sampled Time<br>Client ID | L948685-1<br>WATER<br>25-OCT-10<br><br>10WBW001-104 | L948685-2<br>WATER<br>25-OCT-10<br><br>10WBW001-103 | | | |
|---|---|---|---|---|---|---|
| **Grouping** | **Analyte** | | | | | |
| **WATER** | | | | | | |
| **Physical Tests** | Conductivity (uS/cm) | <2.0 | 48500 | | | |
| | Hardness (as CaCO3) (mg/L) | 0.56 | 10000 | | | |
| | pH (pH) | 7.29 | 7.04 | | | |
| | Total Dissolved Solids (mg/L) | <10 | 35400 | | | |
| **Leachable Anions & Nutrients** | Anion Sum (meq/L) | <0.10 | 580 | | | |
| | Cation Sum (meq/L) | <0.10 | 603 | | | |
| | Cation - Anion Balance (%) | 0.0 | 2.0 | | | |
| **Anions and Nutrients** | Alkalinity, Bicarbonate (as CaCO3) (mg/L) | <2.0 | | | | |
| | Alkalinity, Carbonate (as CaCO3) (mg/L) | <2.0 | | | | |
| | Alkalinity, Hydroxide (as CaCO3) (mg/L) | <2.0 | | | | |
| | Alkalinity, Total (as CaCO3) (mg/L) | <2.0 | 72.4 | | | |
| | Ammonia as N (mg/L) | <0.0050 | 3.14 | | | |
| | Bromide (Br) (mg/L) | <0.050 | 49.1 | | | |
| | Chloride (Cl) (mg/L) | <0.50 | 19000 | | | |
| | Fluoride (F) (mg/L) | <0.020 | 0.091 | | | |
| | Nitrate (as N) (mg/L) | <0.0050 | <0.50 | | | |
| | Nitrite (as N) (mg/L) | <0.0010 | <0.10 | | | |
| | Total Phosphate as P (mg/L) | 0.0052 | 0.0262 | | | |
| | Silicate (as SIO2) (mg/L) | <1.0 | 6.1 | | | |
| | Sulfate (SO4) (mg/L) | <0.50 | 2020 | | | |
| **Total Metals** | Aluminum (Al)-Total (mg/L) | 0.0086 | 0.0318 | | | |
| | Antimony (Sb)-Total (mg/L) | <0.000010 | 0.00127 | | | |
| | Arsenic (As)-Total (mg/L) | <0.000050 | 0.0070 | | | |
| | Barium (Ba)-Total (mg/L) | 0.00017 | 0.117 | | | |
| | Beryllium (Be)-Total (mg/L) | <0.0000050 | <0.00050 | | | |
| | Bismuth (Bi)-Total (mg/L) | <0.000050 | <0.00050 | | | |
| | Boron (B)-Total (mg/L) | 0.0097 | 2.65 | | | |
| | Cadmium (Cd)-Total (mg/L) | <0.0000050 | <0.000050 | | | |
| | Calcium (Ca)-Total (mg/L) | <0.050 | 1600 | | | |
| | Cesium (Cs)-Total (mg/L) | <0.0000050 | 0.00155 | | | |
| | Chromium (Cr)-Total (mg/L) | <0.00050 | <0.00050 | | | |
| | Cobalt (Co)-Total (mg/L) | <0.000050 | 0.000381 | | | |
| | Copper (Cu)-Total (mg/L) | 0.0161 | <0.00050 | | | |
| | Gallium (Ga)-Total (mg/L) | <0.000050 | <0.00050 | | | |
| | Iron (Fe)-Total (mg/L) | <0.030 | 4.53 | | | |
| | Lead (Pb)-Total (mg/L) | 0.00114 | <0.00030 | | | |

# ALS LABORATORY GROUP ANALYTICAL REPORT

| Grouping | Analyte | | | | | |
|---|---|---|---|---|---|---|
| | Sample ID | L948685-1 | L948685-2 | | | |
| | Description | WATER | WATER | | | |
| | Sampled Date | 25-OCT-10 | 25-OCT-10 | | | |
| | Sampled Time | | | | | |
| | Client ID | 10WBW001-104 | 10WBW001-103 | | | |
| **WATER** | | | | | | |
| **Total Metals** | Lithium (Li)-Total (mg/L) | <0.00020 | 0.228 | | | |
| | Magnesium (Mg)-Total (mg/L) | <0.10 | 1510 | | | |
| | Manganese (Mn)-Total (mg/L) | <0.00020 | 2.08 | | | |
| | Mercury (Hg)-Total (mg/L) | <0.000050 | <0.000050 | | | |
| | Molybdenum (Mo)-Total (mg/L) | <0.000050 | 0.0140 | | | |
| | Nickel (Ni)-Total (mg/L) | <0.00020 | 0.00095 | | | |
| | Phosphorus (P)-Total (mg/L) | <0.30 | <1.0 | | | |
| | Potassium (K)-Total (mg/L) | <2.0 | 240 | | | |
| | Rhenium (Re)-Total (mg/L) | <0.0000050 | <0.00050 | | | |
| | Rubidium (Rb)-Total (mg/L) | <0.000020 | 0.142 | | | |
| | Selenium (Se)-Total (mg/L) | <0.00020 | <0.0020 | | | |
| | Silicon (Si)-Total (mg/L) | <0.050 | 3.68 | | | |
| | Silver (Ag)-Total (mg/L) | 0.0000058 | <0.00010 | | | |
| | Sodium (Na)-Total (mg/L) | <2.0 | 9350 | | | |
| | Strontium (Sr)-Total (mg/L) | <0.0050 | 21.2 | | | |
| | Tellurium (Te)-Total (mg/L) | <0.000010 | <0.00050 | | | |
| | Thallium (Tl)-Total (mg/L) | <0.0000020 | <0.000050 | | | |
| | Thorium (Th)-Total (mg/L) | <0.0000050 | <0.00050 | | | |
| | Tin (Sn)-Total (mg/L) | <0.00020 | <0.0010 | | | |
| | Titanium (Ti)-Total (mg/L) | <0.00020 | <0.0050 | | | |
| | Tungsten (W)-Total (mg/L) | <0.000010 | 0.0056 | | | |
| | Uranium (U)-Total (mg/L) | 0.0000020 | 0.000230 | | | |
| | Vanadium (V)-Total (mg/L) | <0.000050 | 0.00054 | | | |
| | Yttrium (Y)-Total (mg/L) | <0.0000050 | <0.00050 | | | |
| | Zinc (Zn)-Total (mg/L) | 0.0056 | 0.0456 | | | |
| | Zirconium (Zr)-Total (mg/L) | <0.000050 | <0.00050 | | | |
| **Dissolved Metals** | Aluminum (Al)-Dissolved (mg/L) | <0.0030 | <0.0050 | | | |
| | Antimony (Sb)-Dissolved (mg/L) | 0.000021 | 0.00121 | | | |
| | Arsenic (As)-Dissolved (mg/L) | <0.000050 | 0.0066 | | | |
| | Barium (Ba)-Dissolved (mg/L) | 0.00044 | 0.113 | | | |
| | Beryllium (Be)-Dissolved (mg/L) | <0.0000050 | <0.00050 | | | |
| | Bismuth (Bi)-Dissolved (mg/L) | <0.000050 | <0.00050 | | | |
| | Boron (B)-Dissolved (mg/L) | <0.0050 | 2.64 | | | |
| | Cadmium (Cd)-Dissolved (mg/L) | 0.0000102 | <0.000050 | | | |
| | Calcium (Ca)-Dissolved (mg/L) | 0.224 | 1550 | | | |
| | Cesium (Cs)-Dissolved (mg/L) | <0.0000050 | 0.00154 | | | |
| | Chromium (Cr)-Dissolved (mg/L) | <0.00050 | <0.00050 | | | |

# ALS LABORATORY GROUP ANALYTICAL REPORT

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Sample ID** | L948685-1 | L948685-2 | | | |
| | **Description** | WATER | WATER | | | |
| | **Sampled Date** | 25-OCT-10 | 25-OCT-10 | | | |
| | **Sampled Time** | | | | | |
| | **Client ID** | 10WBW001-104 | 10WBW001-103 | | | |
| **Grouping** | **Analyte** | | | | | |
| **WATER** | | | | | | |
| **Dissolved Metals** | Cobalt (Co)-Dissolved (mg/L) | <0.000050 | 0.000315 | | | |
| | Copper (Cu)-Dissolved (mg/L) | 0.0123 | <0.00050 | | | |
| | Gallium (Ga)-Dissolved (mg/L) | <0.000050 | <0.00050 | | | |
| | Iron (Fe)-Dissolved (mg/L) | <0.030 | 4.31 | | | |
| | Lead (Pb)-Dissolved (mg/L) | 0.00114 | <0.0030 | | | |
| | Lithium (Li)-Dissolved (mg/L) | <0.00020 | 0.223 | | | |
| | Lithium (Li)-Dissolved (mg/L) | <0.00020 | 0.223 | | | |
| | Magnesium (Mg)-Dissolved (mg/L) | <0.10 | 1490 | | | |
| | Manganese (Mn)-Dissolved (mg/L) | <0.00020 | 2.03 | | | |
| | Mercury (Hg)-Dissolved (mg/L) | <0.000050 | <0.000050 | | | |
| | Molybdenum (Mo)-Dissolved (mg/L) | <0.000050 | 0.0138 | | | |
| | Nickel (Ni)-Dissolved (mg/L) | <0.00020 | 0.00101 | | | |
| | Phosphorus (P)-Dissolved (mg/L) | <0.30 | <1.0 | | | |
| | Potassium (K)-Dissolved (mg/L) | <2.0 | 233 | | | |
| | Rhenium (Re)-Dissolved (mg/L) | <0.0000050 | <0.00050 | | | |
| | Rubidium (Rb)-Dissolved (mg/L) | <0.000020 | 0.140 | | | |
| | Selenium (Se)-Dissolved (mg/L) | <0.00020 | <0.0020 | | | |
| | Silicon (Si)-Dissolved (mg/L) | <0.050 | 3.49 | | | |
| | Silicon (Si)-Dissolved (mg/L) | <0.050 | 3.49 | | | |
| | Silver (Ag)-Dissolved (mg/L) | <0.0000050 | <0.00010 | | | |
| | Sodium (Na)-Dissolved (mg/L) | <2.0 | 9130 | | | |
| | Strontium (Sr)-Dissolved (mg/L) | <0.0050 | 21.1 | | | |
| | Tellurium (Te)-Dissolved (mg/L) | <0.000010 | <0.00050 | | | |
| | Thallium (Tl)-Dissolved (mg/L) | <0.0000020 | <0.000050 | | | |
| | Thorium (Th)-Dissolved (mg/L) | <0.0000050 | <0.00050 | | | |
| | Thorium (Th)-Dissolved (mg/L) | <0.0000050 | <0.00050 | | | |
| | Tin (Sn)-Dissolved (mg/L) | <0.00020 | <0.0010 | | | |
| | Titanium (Ti)-Dissolved (mg/L) | <0.00020 | <0.0050 | | | |
| | Tungsten (W)-Dissolved (mg/L) | <0.000010 | 0.0053 | | | |
| | Uranium (U)-Dissolved (mg/L) | <0.0000020 | 0.000231 | | | |
| | Vanadium (V)-Dissolved (mg/L) | <0.000050 | <0.00050 | | | |
| | Yttrium (Y)-Dissolved (mg/L) | <0.0000050 | <0.00050 | | | |
| | Zinc (Zn)-Dissolved (mg/L) | 0.0109 | 0.0384 | | | |
| | Zirconium (Zr)-Dissolved (mg/L) | <0.000050 | <0.00050 | | | |

# Reference Information

## Test Method References:

| ALS Test Code | Matrix | Test Description | Method Reference** |
|---|---|---|---|
| **ALK-PCT-VA** | Water | Alkalinity by Auto. Titration | APHA 2320 "Alkalinity" |

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

| | | | |
|---|---|---|---|
| **ALK-PCT-VA** | Water | Alkalinity by Auto. Titration | APHA 2320 Alkalinity |

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

| | | | |
|---|---|---|---|
| **ALK-SCR-VA** | Water | Alkalinity by colour or titration | EPA 310.2 OR APHA 2320 |

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.
OR
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

| | | | |
|---|---|---|---|
| **ANIONS-BR-IC-VA** | Water | Bromide by Ion Chromatography | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

| | | | |
|---|---|---|---|
| **ANIONS-CL-IC-VA** | Water | Chloride by Ion Chromatography | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

| | | | |
|---|---|---|---|
| **ANIONS-F-IC-VA** | Water | Fluoride by Ion Chromatography | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

| | | | |
|---|---|---|---|
| **ANIONS-NO2-IC-VA** | Water | Nitrite by Ion Chromatography | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, the nitrite detection is by UV absorbance and not conductivity.

| | | | |
|---|---|---|---|
| **ANIONS-NO3-IC-VA** | Water | Nitrate by Ion Chromatography | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, the nitrate detection is by UV absorance and not conductivity.

| | | | |
|---|---|---|---|
| **ANIONS-SO4-IC-VA** | Water | Sulfate by Ion Chromatography | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

| | | | |
|---|---|---|---|
| **EC-PCT-VA** | Water | Conductivity (Automated) | APHA 2510 Auto. Conduc. |

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

| | | | |
|---|---|---|---|
| **F-SIE-VA** | Water | Fluoride by SIE | APHA 4500-F "Fluoride" |

This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using a selective ion electrode. This method has a significant negative interference (i.e. results could be biased low) when Al3+ is present in the sample at a concentration greater than 2.5 mg/L.

| | | | |
|---|---|---|---|
| **F-SIE-VA** | Water | Fluoride by SIE | APHA 4500-F Fluoride |

This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using a selective ion electrode. This method has a significant negative interference (i.e. results could be biased low) when Al3+ is present in the sample at a concentration greater than 2.5 mg/L.

| | | | |
|---|---|---|---|
| **HARDNESS-CALC-VA** | Water | Hardness | APHA 2340B |

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

| | | | |
|---|---|---|---|
| **HG-DIS-CVAFS-VA** | Water | Dissolved Mercury in Water by CVAFS | EPA SW-846 3005A & EPA 245.7 |

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

| | | | |
|---|---|---|---|
| **HG-TOT-CVAFS-VA** | Water | Total Mercury in Water by CVAFS | EPA 245.7 |

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

| | | | |
|---|---|---|---|
| **IONBALANCE-VA** | Water | Ion Balance Calculation | APHA 1030E |

# Reference Information

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

**MET-D-L-HRMS-VA** Water Diss. Metals in Water by HR-ICPMS EPA 200.8

Trace metals in water are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration modified from APHA Method 3030B.

**MET-DIS-ICP-VA** Water Dissolved Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

**MET-T-L-HRMS-VA** Water Total Metals in Water by HR-ICPMS EPA 200.8

Trace metals in water are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The procedures may involve preliminary sample treatment by acid digestion modified from APHA Method 3030E.

**MET-TOT-ICP-VA** Water Total Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

**NH3-F-VA** Water Ammonia by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulphuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

**PH-MAN-VA** Water pH by Manual Meter APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

It is recommended that this analysis be conducted in the field.

**PH-MAN-VA** Water pH by Manual Meter APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

It is recommended that this analysis be conducted in the field.

**PO4-T-COL-VA** Water Total Phosphate P by Color APHA 4500-P "Phosphorous"

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

**PO4-T-COL-VA** Water Total Phosphate P by Color APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

**SILICATE-COL-VA** Water Silicate by Colourimetric analysis APHA 4500-SIO2 D.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 D. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

**TDS-VA** Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

| Laboratory Definition Code | Laboratory Location |
|---|---|

# Reference Information

VA ALS LABORATORY GROUP - VANCOUVER, BC, CANADA

**Chain of Custody Numbers:**

**GLOSSARY OF REPORT TERMS**

*Surrogate A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*
*mg/kg milligrams per kilogram based on dry weight of sample.*
*mg/kg wwt milligrams per kilogram based on wet weight of sample.*
*mg/kg lwt milligrams per kilogram based on lipid-adjusted weight of sample.*
*mg/L milligrams per litre.*
*< - Less than.*
*D.L. The reported Detection Limit, also known as the Limit of Reporting (LOR).*
*N/A Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as receieved by the laboratory.*
*UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.*
*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*

# KIA-8 - 1 Response Memo to Kitikmeot Inuit Association (KIA) for Technical Comment KIA-8

# Memorandum

**Date:** December 8, 2015

**To:** John Roberts, TMAC Resources Inc.

**From:** Mike Henry, ERM

**CC:** Jim Chan, ERM and Derek Chubb, ERM

**Subject:** **TMAC Resources Inc. - Response to KIA - 8 (formally Information Request (KIA-29 IR)**

**INTRODUCTION**

This memorandum responds to the Information Request (KIA-29) provided by the Kitikmeot Inuit Association (KIA) in September 2015 with respect to TMAC Resources Inc.'s (TMAC) amendment application for the Doris North Project Certificate No.003 and the Type A Water Licence (2AM-DOH1323). Provided below is the initial and follow-up responses to the KIA-29 IR.

**KIA COMMENT:**

*What is the distance from the diffuser at which CCME water quality guidelines will be met in Roberts Bay (i.e.: what is the size of the mixing zone)? Please demonstrate how the 20:1dilution will be achieved. Please provide modeling results for all three discharge scenarios (groundwater only, groundwater and TIA, TIA only) in both the open water season when full exchange with Melville Sound is expected and under ice when the water exchange is negligible. We note these seasonal differences specifically as they were highlighted by TMAC in Package 2.*

INITIAL TMAC RESPONSE:

The initial TMAC response to the KIA-29 IR submitted in October 2015 follows:

Dilution will be achieved rapidly given the pumping and small portals. Of the Canadian Council of Ministers of the Environment (CCME) metals in effluent, maximum predicted chromium concentrations (0.0062 mg/L; Table 4.5-3, document P4-1) will require the greatest dilution to meet CCME guideline levels (0.0015 mg/L; Table 4.5-1, document P4-1) in the receiving environment of Roberts Bay (baseline: 0.001 mg/L; Table 4.5-2, document P4-1), in this case a 9.2:1 dilution. This will be reached within 1 m of the diffuser portals, and given this parameter requires the greatest dilution, the 'CCME mixing zone' will be 1 m. Modelling results for the 3 requested scenarios during summer and winter can be provided during the technical review portion of the Amendment review process.

**FOLLOW-UP TMAC RESPONSE:**

This response provides additional modelling results for the three requested discharge scenarios of discharge of TIA and groundwater combined, TIA water only, and groundwater only. With respect to the mixing zone and simulation results for achievable effluent dilutions within Roberts Bay, additional information can be found in *Doris North Gold Mine Project: Discharge of Treated Water to Roberts Bay* (Rescan 2011).

The objective of this exercise was to estimate the water quality concentrations in Roberts Bay for those parameters with Canadian Council of Ministers of the Environment (CCME) marine water quality guidelines for the protection of aquatic life (PAL) based on the three discharge scenarios. The data used in model calculations and the model assumptions are the same as listed in Section 4.5.2.2 of Package 4, with the following additional information:

- For each of the three modelled scenarios, maximum predicted water quality concentrations for the TIA and groundwater, groundwater only, and TIA only discharge were obtained from Table 6-3 of the *Doris North Project – Water and Load Balance* (Package 6 document 10; SRK 2015);
- Combined TIA and groundwater are discharged at a constant rate of 80 L/s during the summer months (June to September), TIA effluent is discharged at 45 L/s during the summer months only, and groundwater is discharged at 35 L/s continuously over the year.

Table 1 presents the background water quality for Roberts Bay, the predicted water quality concentrations in each of the potential discharge scenarios into Roberts Bay (i.e., TIA and groundwater combined, groundwater only, and TIA effluent only), and the associated CCME water quality guidelines for the protection of marine life. These guidelines are conservative empirical thresholds that are meant to be protective of all forms of aquatic life and all aspects of aquatic cycles, including the most sensitive species over the long term. In the case of the marine CCME metals (arsenic, cadmium, chromium, and mercury), each guideline concentration includes a safety factor that is 10× lower than the toxic threshold concentration for the most sensitive species. For conservatism, the *maximum* predicted concentrations that would be discharged from the three effluent streams were used in the modelling exercise.

Results of Roberts Bay water quality concentrations under the three discharge scenarios are presented in Figures 1a through 1c and in Table 2. Results indicate that the maximum water quality concentrations for all parameters are predicted to occur when combined TIA and groundwater are discharged into Roberts Bay (Table 2). Concentrations of nitrate, arsenic, and cadmium were estimated to increase only slightly over baseline conditions (2.7-13.2%), while increases in chromium and mercury concentrations were projected to be greater, between 30 and 91%. Results for mercury should be interpreted cautiously as the modelling exercise used an undetectable concentration (0.0001 mg/L) as an input and this detection limit was far greater than the typically available ultra-low detection limit of 0.0000005 mg/L. Regardless, the resulting concentrations in Roberts Bay are predicted to be far below CCME guidelines for all water quality parameters, with nitrate, arsenic, chromium, and mercury near or more than an order of magnitude lower than their respective guideline limit. Given these low predicted concentrations and that all marine water quality guidelines have 10× safety factors applied to their limits (CCME

2015), the water quality in Roberts Bay is predicted to be safe for marine life for each of the discharge scenarios.

**REFERENCES**

CCME. 2015. *Canadian Water Quality Guidelines for the Protection of Aquatic Life: Summary Table.* http://ceqg-rcqe.ccme.ca/ (accessed November 2015).

Rescan. 2011. *Doris North Gold Mine Project: Discharge of Treated Water to Roberts Bay.* Prepared for Hope Bay Mining Limited by Rescan Environmental Services Ltd.

**Table 1. Roberts Bay Background Water Quality and Predicted Maximum Water Quality in Marine Outfall Mixing Box.**

| WQ Parameter | CCME WQ Guideline Concentration | Roberts Bay Background Concentration | Predicted Maximum Outfall Concentration (Groundwater + TIA)[a] | Predicted Maximum Outfall Concentration (Groundwater Only)[a] | Predicted Maximum Outfall Concentration (TIA Only)[a] |
|---|---|---|---|---|---|
| Nitrate | 45 | 0.067 | 0.80 | 0.93 | 0.40 |
| Salinity | ±10% baseline | 27.05 | 26.7 | 26.7 | 0 |
| Arsenic | 0.0125 | 0.00094 | 0.0035 | 0.0024 | 0.0092 |
| Cadmium | 0.00012 | 0.000056 | 0.00018 | 0.00012 | 0.00046 |
| Chromium | 0.0015 | 0.001 | 0.0039 | 0.00086 | 0.01 |
| Mercury[b] | 0.000016 | 0.0000013 | <0.0001 | 0.000049 | <0.0001 |

*Note: all concentrations are in mg/L except salinity which is parts per thousand.*

*[a] - all discharge water quality data taken from Table 6-3 of the Doris North project - Water and Load Balance Report (Package 6, Volume 10)*

*[b] - mercury concentrations for TIA discharge were not available because of poor detection limits for the mill effluent (0.0001 mg/L).*

**Table 2. Predicted Roberts Bay Water Quality Concentrations based on TIA-Groundwater Combined, Groundwater Only, and TIA Only Discharge.**

| WQ Parameter | Predicted Roberts Bay Concentration using Maximum Predicted Outfall Levels (TIA + Groundwater) | Predicted Roberts Bay Concentration using Maximum Predicted Outfall Levels (Groundwater Only) | Predicted Roberts Bay Concentration using Maximum Predicted Outfall Levels (TIA Only) | Maximum Allowable Concentrations in Discharge to Meet CCME in Roberts Bay[a] | % Increase over Roberts Bay Background Concentration (TIA and Groundwater) | % Increase over Roberts Bay Background Concentration (Groundwater only) | % Increase over Roberts Bay Background Concentrations (TIA only) |
|---|---|---|---|---|---|---|---|
| Nitrate | 0.076 | 0.075 | 0.068 | 3,730 | 13.2 | 11.3 | 1.6 |
| Salinity | 27.046 | 27.047 | 27.049 | 0-260 | -0.02 | -0.01 | 0.00 |
| Arsenic | 0.00097 | 0.00095 | 0.00097 | 0.96 | 3.3 | 1.4 | 2.9 |
| Cadmium | 0.000058 | 0.000057 | 0.000057 | 0.0053 | 2.7 | 1.0 | 2.4 |
| Chromium | 0.00015 | 0.00011 | 0.00013 | 0.0425 | 45.8 | 6.7 | 32.6 |
| Mercury[b] | 0.0000025 | 0.0000017 | 0.0000016 | 0.0013 | 91.4 | 32.3 | 25.0 |

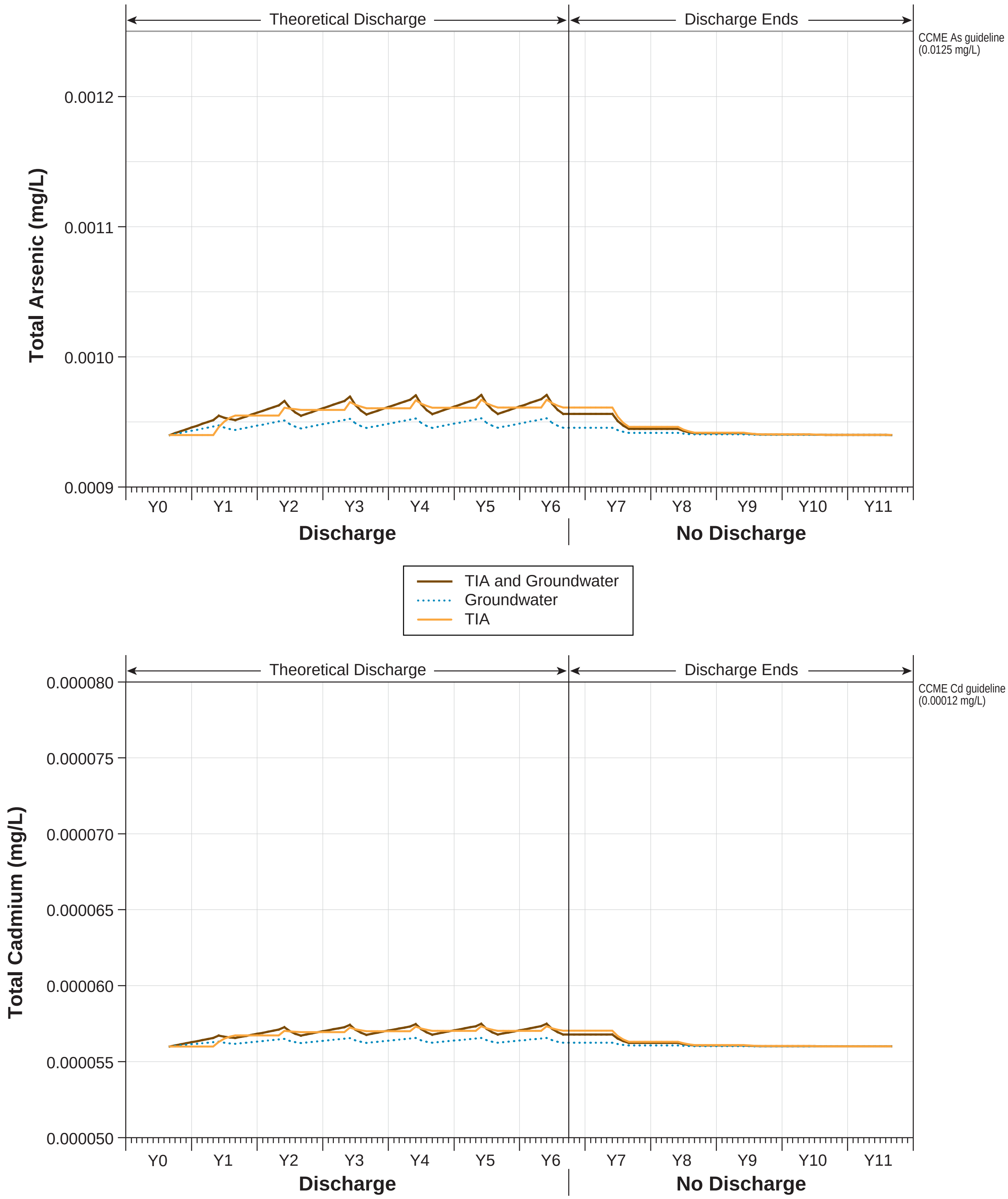
*Note: all concentrations are in mg/L except salinity which is parts per thousand.*

*[a] – concentrations taken from Package 4, Table 4.5-3.*

*[b] - mercury concentrations for TIA discharge were not available because of poor detection limits for the mill effluent (0.0001 mg/L) . The detection limit was used for modelling purposes.*

**Figure 1a**

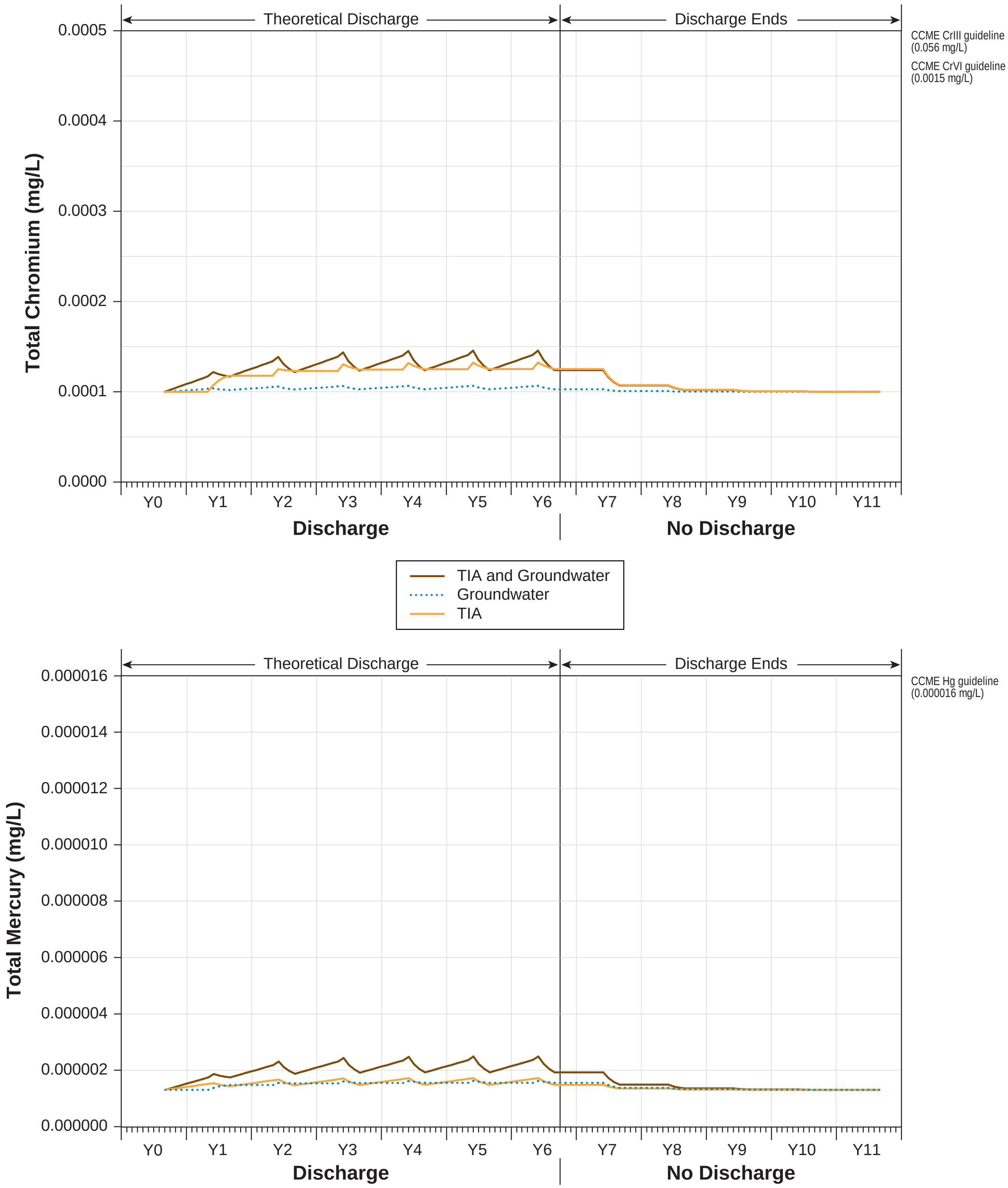
## Time Evolution of Total Arsenic and Total Cadmium Concentrations in Roberts Bay during TIA and Groundwater Discharge




*Note: Allowable effluent concentrations are based on continuous 80 L/s of TIA and groundwater discharge during the open-water season, 45 L/s of TIA discharge during the open-water season, and 35 L/s of groundwater discharged over the year.*

## Figure 1b

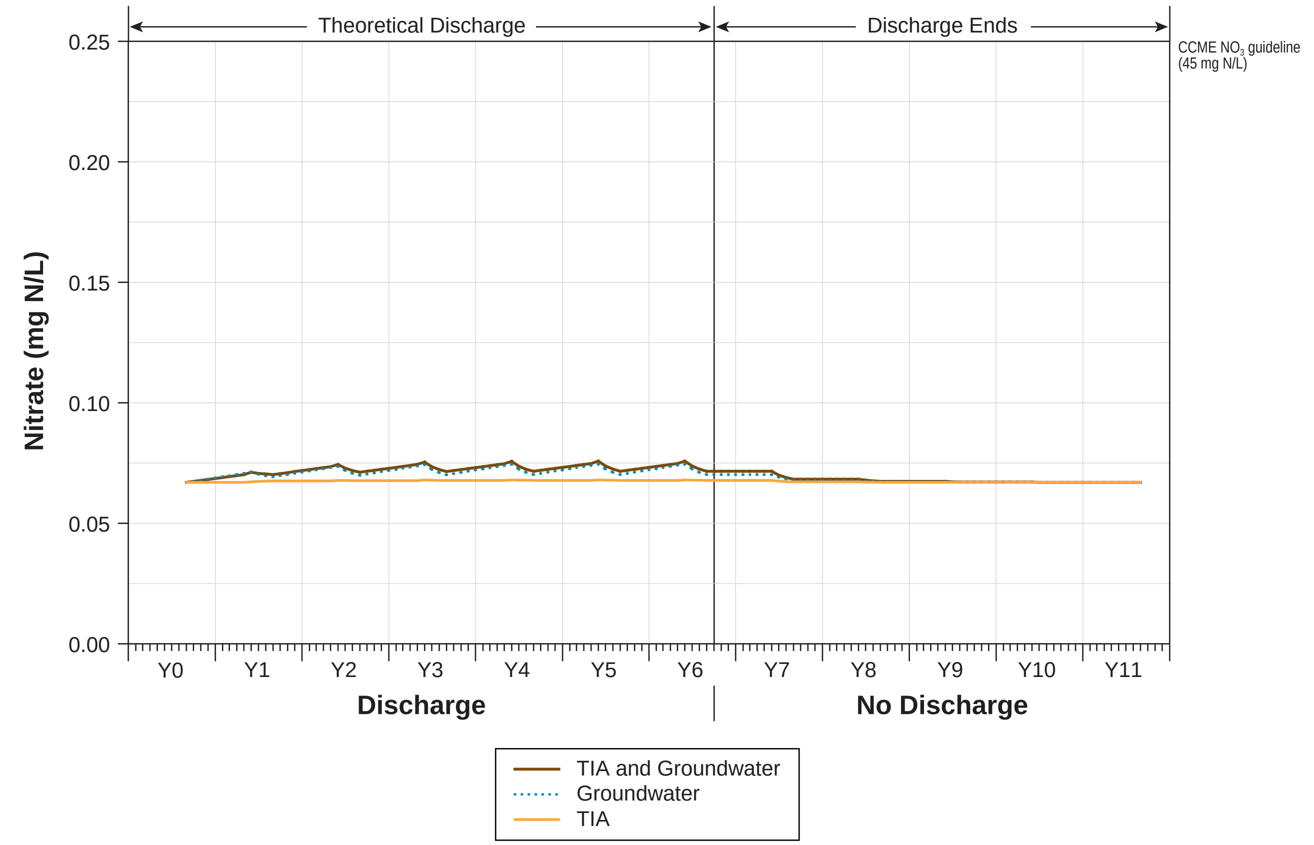
## Time Evolution of Total Chromium and Total Mercury Concentrations in Roberts Bay during TIA and Groundwater Discharge

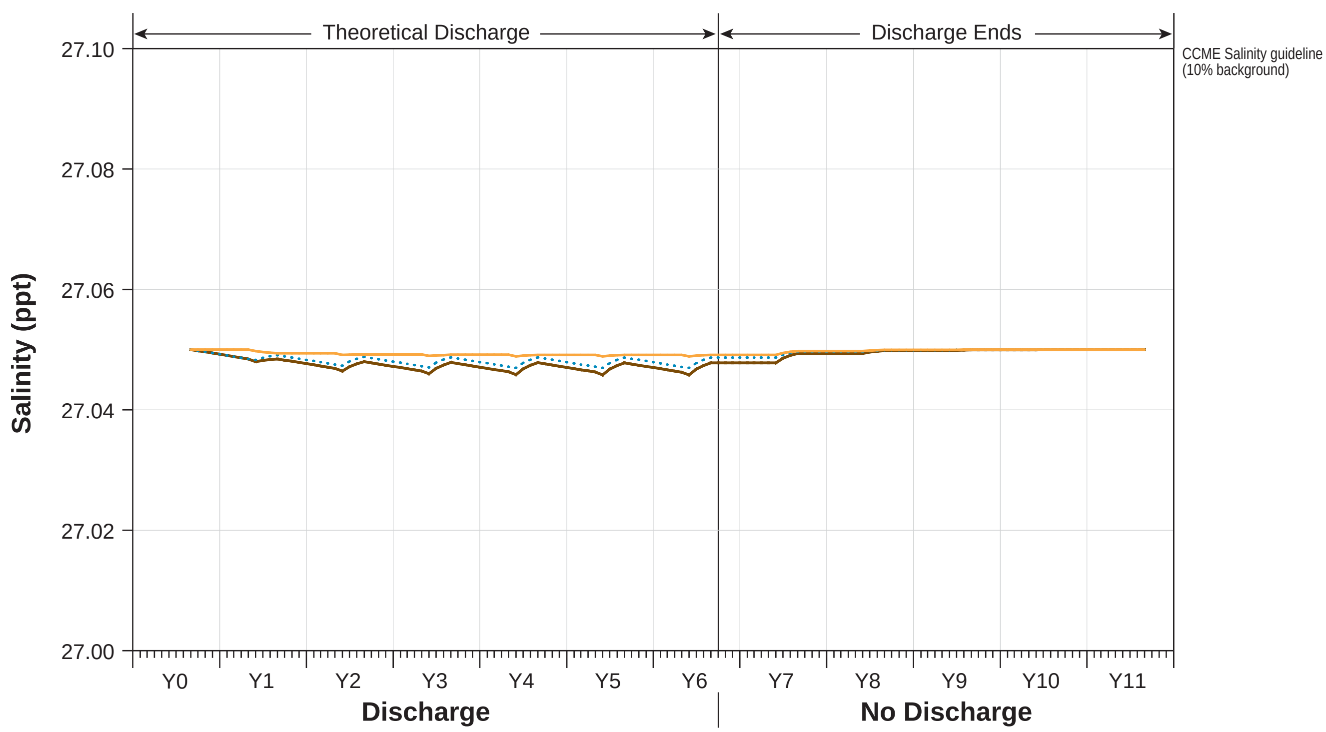



*Note: Allowable effluent concentrations are based on continuous 80 L/s of TIA and groundwater discharge during the open-water season, 45 L/s of TIA discharge during the open-water season, and 35 L/s of groundwater discharge over the year. Mercury concentrations for TIA and TIA and Groundwater discharge were unavailable because of poor detection limits for the mill effluent.*

**Figure 1c**

## Time Evolution of Total Nitrate Concentrations and Salinity in Roberts Bay during TIA and Groundwater Discharge




*Note: Allowable effluent concentrations are based on continuous 80 L/s of TIA and groundwater discharge during the open-water season, 45 L/s of TIA discharge during the open-water season, and 35 L/s of groundwater discharged over the year.*

# AANDC TC-3 — SRK Technical Memo Estimation of the Time Required for the Underground Mine to Fill

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# Memo

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|---|---|---|---|
| **To:** | John Roberts, PEng | **Client:** | TMAC Resources Inc. |
| **From:** | Gregory Fagerlund, MSc | **Project No:** | 1CT022.002 |
| **Reviewed By:** | Maritz Rykaart, PhD, PEng | **Date:** | December 4, 2015 |
| **Subject:** | Response to NRCan IR-3 & AANDC IR#13: Estimation of the Time Required for the Underground Mine to Fill | | |

# 1 NRCan Information Request 3 (NRCan IR-3)

### 1.1.1 Subject

Post-mining groundwater flow regime around the underground mine.

### 1.1.2 Reference

Package 5 (P5-2), Package 6 (P6-3)

### 1.1.3 Rationale

NRCan requests clarification as to how groundwater flow into the underground mine will change once mining has ceased. NRCan requests clarification on how groundwater inflow rates will change and an approximate time frame for when the groundwater system will reach a post-mining state of equilibrium. This information will assist in confirming that the long-term potential contaminants in the underground mine (resulting from disposal of waste) do not have an effect on local groundwater that surrounds the underground mine. Such contamination could potentially occur if there is a groundwater flow reversal once a mine has filled with surface water and groundwater.

### 1.1.4 Information Request

a. Please provide clarification on the post-mining groundwater flow regime in the vicinity of the underground mine.

b. Please provide information on the time required for the underground mine to fill and clarification on post-mining groundwater regime (flow directions and rates) and potential impacts to the groundwater quality.

## 1.2 AANDC IR#13 – Tailings Management Plan

### 1.2.1 References

2.2 New Tailings Storage Requirements

Package 6, Part 7, Page 4 (PDF page 104)

Geochemical Characterization of Tailings from the Doris Deposits, Hope Bay 5 Summary and Conclusions

Package 6, Part 7, Page 30 (PDF page 91)

### 1.2.2 Issue/Concern or Information Deficiency

Concern that the strategy proposed by the proponent will accumulate a large volume of potentially acid generating (PAG) material and detoxified tailings underground. The detoxified tailings with acidic pH and elevated concentration of Cd, Co, Cu, Fe, Mn, Ni, Pb, and Zn can contaminate underground water.

### 1.2.3 Rationale

About 6% (i.e. 150,000 tonnes or 116,000 $m^3$) of the tailings are comprised of detoxified cyanide leach tailings, and this tailings stream will be sent underground where it will be mixed with underground waste rock for use as structural mine backfill.

The proponent states, that 'The detoxified tailings also showed a propensity for leaching of several metals in the humidity cell tests. In addition to arsenic, neutral pH metal leaching of ammonia, cadmium, copper, iron, selenium and silver was reported in the Doris North detoxified tailings, and cadmium and selenium in the Doris Central detoxified tailings. Acidic conditions developed in the Doris Central detoxified tailings after 202 weeks of testing. At acidic pH, increased metal leaching of Cd, Co, Cu, Fe, Mn, Ni, Pb, and Zn was noted.' The potential leaching of contaminates under low pH conditions can be a significant source of underground water contamination.

### 1.2.4 Information Request

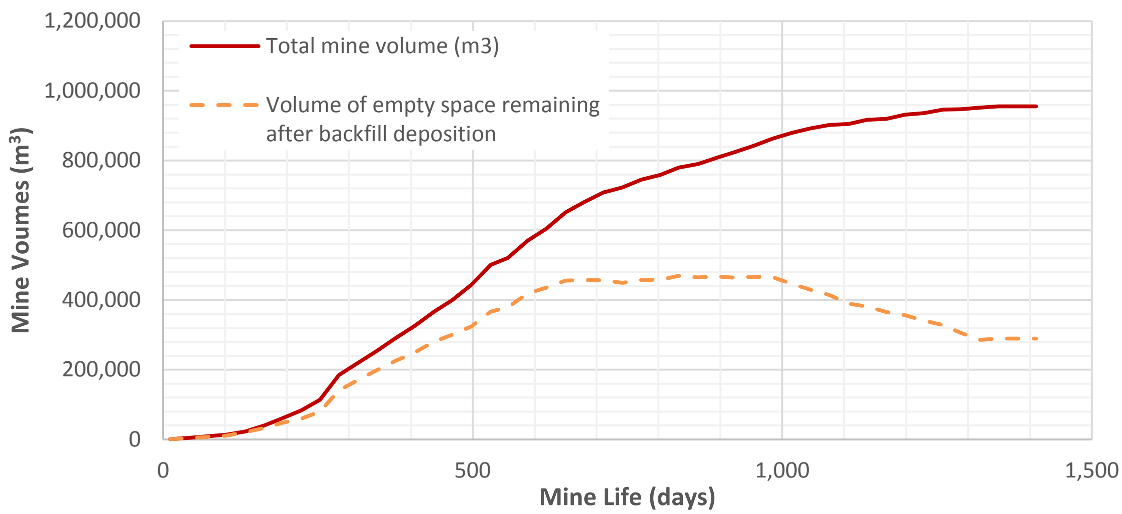
Please provide an analysis of the combined impact of detoxified tailings and backfilled PAG waste rock on groundwater.

# 2 TMAC Response

This response relates directly to item b. in NRCanIR-3 and follows on the response to AANDC-IR#13 which both required an estimate of the time for reflooding the Doris underground mine.

Once mining at Doris ceases, and the mine workings have been prepared for closure, mine dewatering pumps will be switched off and the mine will reflood. Figure 1 shows a plot of the mine volumes over time for the portions of Doris Central and Connector zones which are below the elevation of Doris Lake, including both talik and non talik zones, which is the maximum level to which the mine would flood. Two curves are represented: one curve corresponds to the total mine volume and the other, the volume of empty space remaining after backfill is deposited. Figure 2 shows a plot of the predicted inflow versus mine level elevation (in mine grid elevations).

The reflood time was estimated using a simplified step-wise approach that uses the groundwater inflow numerical predictions and the planned volume of mine workings. The time to reflood each mine level was calculated based on inflow rate predictions presented in Document P6-3, Groundwater Inflow and Quality Model at the respective mine levels and the planned mine volumes.




Note: A 30% porosity is assumed for tailings and waste rock backfill.

**Figure 1: Estimated volume of the mine over time for the Doris Central and Connector Zones**

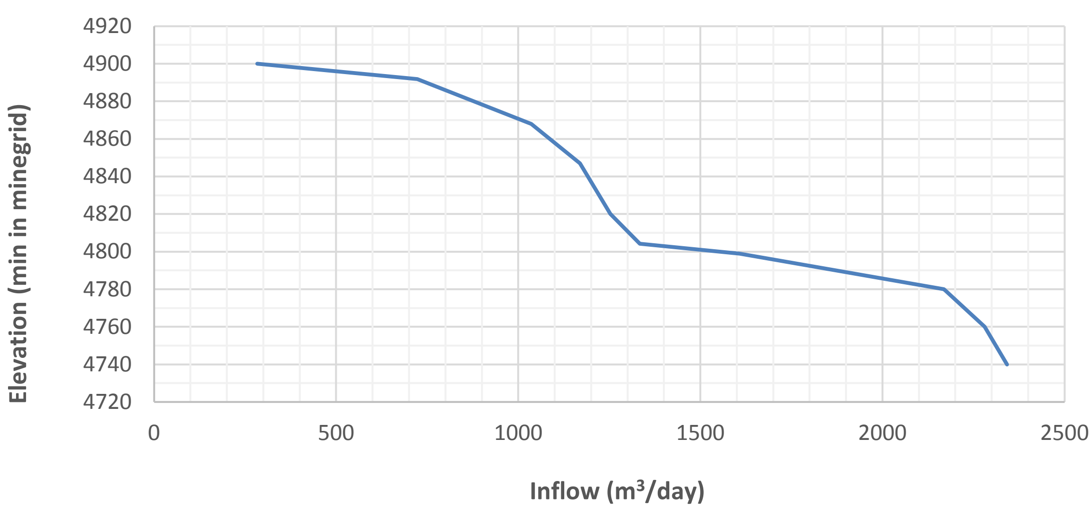



**Figure 2: Predicted mine inflow in the Doris Central and Connector Zones versus elevation**

The estimated groundwater reflood time at different times throughout the mine life is shown in Figure 3. Three reflood time curves are presented as follows:

- The base case reflood time estimation based on the inflow rates presented in Document P6-3. This corresponds to a mine inflow rate of about 1,450 $m^3$/day when mining ceases;
- A hypothetical case with a constant reflood inflow rate of 500 $m^3$/day for all mine levels. This rate corresponds to the lower end of the predicted inflow rates, when the mine begins to receive groundwater inflow; and
- A hypothetical case with a constant reflood inflow rate of 2,650 $m^3$/day for all mine levels. This rate corresponds to the maximum inflow rate predicted by the numerical model.

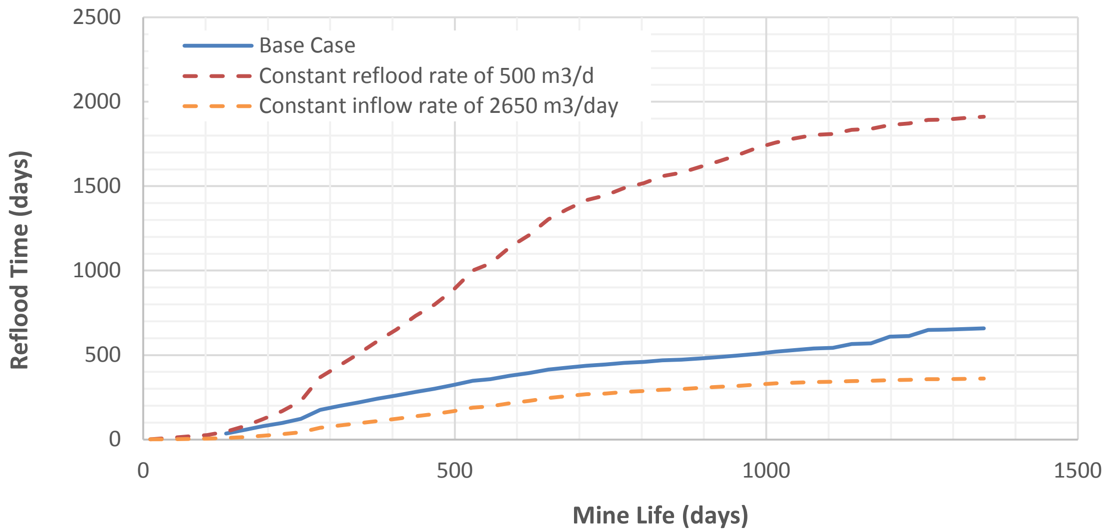



**Figure 3: Reflood time estimates at different times throughout the mine life of Doris Central and Connector Zones**

When the mine has been fully developed, the total reflood time is estimated to be about 2 years (660 days) for the base case. For the two hypothetical reflood scenarios presented in Figure 3, minimum and maximum reflood times of 1 and 5 years respectively can be observed.

It should be noted that these reflood estimates do not account for backfill being placed as mining progress. Over the life of mine approximately 810,000 $m^3$ of backfill is placed. This backfill consists of mine waste rock and filtered tailings. This material will reduce the volume of the mine and as a result the reflood values as presented are conservative, i.e. reflooding would occur much faster. If the two hypothetical scenarios account for backfill deposition, the minimum and maximum reflood times are reduced to 4 months and 1.7 years respectively.

# AANDC TC 9 — SRK Technical Memo Filtering Requirements

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# Memo

| | | | |
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| **To:** | John Roberts, PEng | **Client:** | TMAC Resources Inc. |
| **From:** | Emma Helmers, EIT<br>Arcesio Lizcano, PhD | **Project No:** | 1CT022.002 |
| **Reviewed By:** | Maritz Rykaart, PhD, PEng | **Date:** | December 4, 2015 |
| **Subject:** | Response to AANDC-NIRB IR#22: TIA Interim Dike – Filtering Requirements | | |

# 1 AANDC-NIRB IR #22

## 1.1 Issue

The filtering requirements of the TIA Interim Dike require clarification to determine if the impacts predicted (or lack thereof) are valid.

## 1.2 Reference

Package 6 Engineering and Design Documents, P6-13 Tailings Management System: Section 1.1 Paragraph 4 “The remaining portion of the TIA between the Interim Dike and the existing North Dam (completed in 2012, SRK (2012)) will not contain any tailings, and will act as a Reclaim Pond.”

P6-13 Tailings Management System: Section 4.2 Paragraph 1 “Tailings will be retained between the South Dam and the Interim Dike”; P6-13 Tailings Management System: Section 4.4.2 Paragraph 1; P6-13 Tailings Management System: Appendix A, Drawing DN-TIA-04.

## 1.3 Concern

There are statements in the text which describe the purpose of the Interim Dike is to impound tailings between the South Dam and the Interim Dike. Therefore, it is inferred that the Interim Dike is actually a filter dike; retaining the tailings on the upstream side while allowing the supernatant water to flow through the dike to the downstream reclaim pond. However, the drawings show the Interim Dike to be mainly constructed with Run of Quarry material. The concern is if the Run of Quarry material will be a suitable filter material to retain the tailings upstream of the Interim Dike while allowing the water to filter through to the downstream reclaim pond.

It is also noted that P6-13 Tailings Management System: Section 4.4.2 Paragraph 1, does mention “The upstream face of the Interim Dike will, if required be clad with a layer of graded rock that would act as a filter to ensure tailings solids does not migrate through the Dike. Alternately, the upstream slope will be clad with a geotextile to serve this filtering function." However, these mitigations may not be practical to employ if the Run of Quarry design does not work, since the tailings facility will already be in operation, and could have tailings and turbid supernatant water encroaching on the upstream face of the Dike. Given the importance of the Interim Dike, it is prudent to implement best practice, and design and construct the Dike in a way that does not require post-construction retrofitting from the onset.

If the Run of Quarry material does not act as a filter it may result in reclaim water turbidity and silting up of the downstream reclaim pond.

## 1.4 Information Request

Please comment on the rational for the design process and the proposed mitigation strategy.

Please provide supporting design calculations to show that the Interim Dike constructed of Run of Quarry material will in fact be a suitable filter matrix for retaining the tailings on the upstream side while allowing the supernatant water to flow through the dike to the downstream reclaim pond.

If the Run of Quarry material becomes clogged, how will tailings supernatant water be transferred from the Tailings Management Pond to the downstream Reclaim Pond? Consequently, describe potential effects of possible buildup of hydrostatic head on the upstream side of the Interim Dike, on the dike's stability.

## 1.5 Importance of Issue

It is important that the Interim Dike function properly to retain tailings on the upstream side of the TIA while allowing filtered tailings water to flow through the dike to the downstream reclaim pond for the proposed TIA to function properly and avoid unpredicted impacts to the environment. This information will assist AANDC in the subsequent technical review of this component of the Project.

# 2 TMAC Response

## 2.1 Context

As described in Document P6-13 Tailings Management System, the Interim Dike will retain tailings on the upstream side and allow water flow through its body to the downstream Reclaim Pond. The upstream face of the Interim Dike will, if required, be clad with a layer of graded rock that would act as a filter to ensure tailings solids do not migrate through the Dike. Alternately, the upstream slope may be clad with a geotextile to serve this filtering function.

This memo presents a filter design for the Interim Dike and discusses the performance of the Interim Dike itself as a filter. The memo also includes the alternative design option involving the installation of a geotextile along the upstream face of the Interim Dike.

## 2.2 Filter Design

### 2.2.1 Design Considerations

The following six aspects have been considered in the design of the suitable filter material for retaining tailings while allowing the flow of water through it:

- Filter ability;
- Internal stability;
- Self-healing;
- Material segregation; and
- Permeability and Drainage capacity.

The filter has been designed based on the particle size distribution of the Doris North tailings (SRK 2006; Pocock 2009; Knight Piesold 2009) and is presented in Figure 1.

### 2.2.2 Filter Ability

In order for a coarser material to appropriately retain a finer material, the pore size of the coarser material must be small enough such that grains of the finer material cannot freely pass through. Best practice filter criteria have been developed based on laboratory testing and failure investigations since 1940 (Bertram 1940, Terzaghi and Peck 1948, Sherard and Dunnigan 1989). Table 1 lists these criteria.

**Table 1: Filter Criteria (Messerklinger 2013)**

| Soil Group | Fines Content <0.075 mm | Filter Criteria Determined by Tests after Sherard and Dunnigan (1989) | State-of-the-Art Criteria in Dam Engineering |
|---|---|---|---|
| 1 | 85-100 | $D_{15f}$[1] = $7d_{85b}$[2] to $12d_{85b}$ | $D_{15f} \leq 9d_{85b}$ |
| 2 | 40-80 | $D_{15f}$ = 0.7 to 1.5 mm | $D_{15f} \leq$ 0.7 mm |
| 3 | 0-15 | $D_{15f} = 7d_{85b}$ to $10d_{85b}$[3] | $D_{15f} \leq$ 4 to 5 $d_{85b}$[4] |
| 4 | 15-40 | Intermediate between group 2 and 3 | Intermediate between group 2 and 3 |

**Notes:**
[1] Diameter at which 15% of the filter material is finer
[2] Diameter at which 85% of the tailings material is finer
[3] 7 For subrounded grain shape and 10 for angular grain shape
[4] Incorporates a factor of safety of 2

Figure 1 shows three grain size distribution curves for the Doris North tailings. The average fines content (material finer than 0.075 mm) is approximately 50%, which puts the tailings in the Soil Group 2 of Table 1. Based on the state-of-the-art criteria in dam engineering shown in Table 1, the $D_{15f}$ of the filter (the diameter at which 15% of the filter material is finer) must be less than or equal to 0.7 mm. Therefore, the coarse $D_{15f}$ limit of the filter material was set to 0.7 mm and the fine $D_{15f}$ limit of the filter material to 0.48 mm. The latter was calculated by multiplying the $d_{85b}$ of the finest tailings specimen by 4 following the piping criterion of Terzaghi (Terzaghi and Peck 1948).

### 2.2.3 Internal Stability

Filter materials must be internally stable, meaning the finest particles in the filter do not migrate through their coarse particles, even at high hydraulic gradients. Experimental investigations have led to the criteria that the coefficient of uniformity ($C_u$, which is equal to $D_{60}$ divided by $D_{10}$) of the filter material should not be greater than 12 (Kenney and Lau 1986).

For the filter design, $D_{10f}$ was calculated by multiplying the $d_{10b}$ of the tailings material by the ratio of the $D_{15f}$ of the filter material to the $d_{15b}$ of tailings in order to get a filter curve of similar shape to the tailings curve. This was done for both the fine and coarse limits of the filter to get an envelope. The $D_{60f}$ was then chosen by applying a coefficient of uniformity of 12.

### 2.2.4 Self-Healing

A filter material must have less than 5% non-plastic fines ($I_P$<5%) so that cracks that open due to e.g. differential settlement (or strains) can close again easily (Messerklinger 2013). However, the Bulletin 141 of the International Commission of Large Dams (ICOLD 2011) Bulletin on CFRD's, No. 141 allows 7% of fines. The maximum fines percentage in the filter design shown in Figure 1 is approximately 7%.

### 2.2.5 Material Segregation

When a material segregates from itself, meaning that the coarser materials separate from the finer particles, the filter can no longer fulfill its purpose of preventing fine particles moving from the tailings to the filter or within the filter itself (Messerklinger 2013). Based on observations and laboratory investigations, Milligan (2003) presented a segregation criterion shown in Figure 1 as a "coarse limit" for a filter material.

### 2.2.6 Permeability and Drainage Capacity

In order to ensure that the filter will be several times more permeable than the tailings, thereby avoiding the buildup of excess pore pressure, the filter design followed the Terzaghi permeability criterion $D_{15f}/d_{15b} \geq 4$. The filter also fulfills the Terzaghi criterion $D_{15f}/d_{85b} \geq 4$ and the Sherard recommendation that $D_{15f} \geq 0.2$ mm (Messerklinger 2013), both designed to increase drainage capacity.

## 2.3 Interim Dike as a Filter

Based on experience with Run-of-Quarry (ROQ) rock during design of the tailings containment area (SRK 2006), the expected $D_{50}$ of the Interim Dike ROQ rock is 114 mm for the coarse fraction, and 2.45 mm for the fine fraction. The ROQ envelopes are shown in Figure 1. The ROQ rock of the Interim Dike will therefore not act as a filter for the tailings material and a specific, filter material as shown in Figure 1 and described in Section 2.2 is required.

## 2.4 Alternative Design Option

There are no borrow material at site that satisfied the filter criteria and therefore the filter material will be manufactured through crushing and screening. A cost trade-off will be completed at the detailed engineering stage and if the designed filter is difficult and/or expensive to attain by crushing and screening, a geotextile may be installed on the upstream face of the Interim Dike. The geotextile should have a maximum apparent opening size (AOS) of less than 0.7 mm (determined maximum $D_{85f}$). Subaqueous geotextile installations have been carried out at other mines and remediation sites in Canada such as the Seabee Mine (SRK 2012) and the Lorado Mill Tailings Remediation Project (SRK 2014). A common technique is to attach steel pipe to the end of the geotextile and lower this pipe to the toe of the constructed dam from a boat or with an excavator that has an extended reach. The geotextile is then tied into the crest of the dam, as pictured in Figure 2.

## 2.5 Filter Clogging

The ROQ material of the Interim Dike will not clog if the filter design as presented is constructed. Consequently, no buildup of hydrostatic head on the upstream side of the Interim Dike is expected.

# 3 References


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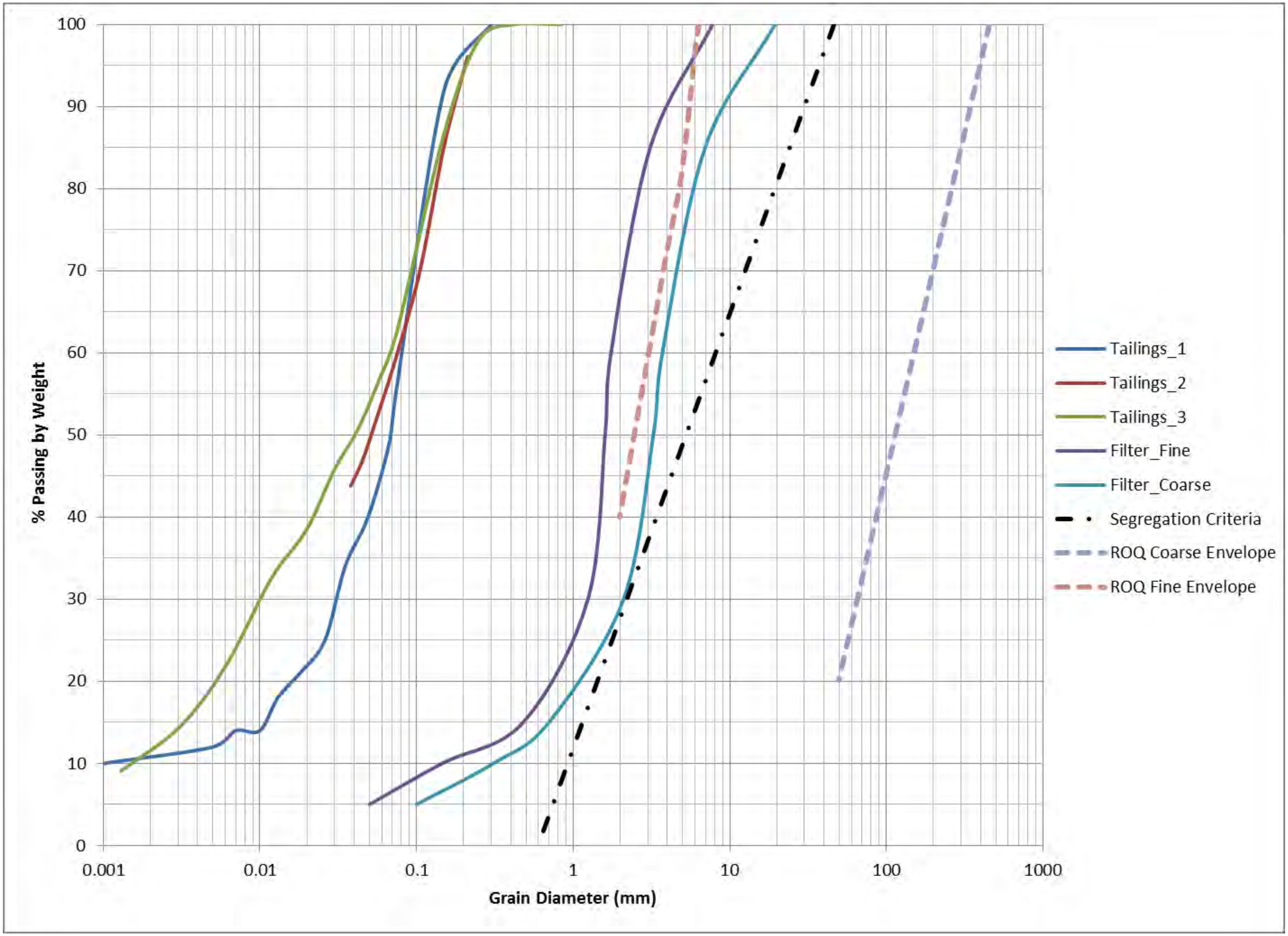
# Figures




srk consulting

TMAC RESOURCES

Type A Water License Information Requests

**Interim Dike Filter Design**

Job No: 1CT022.002

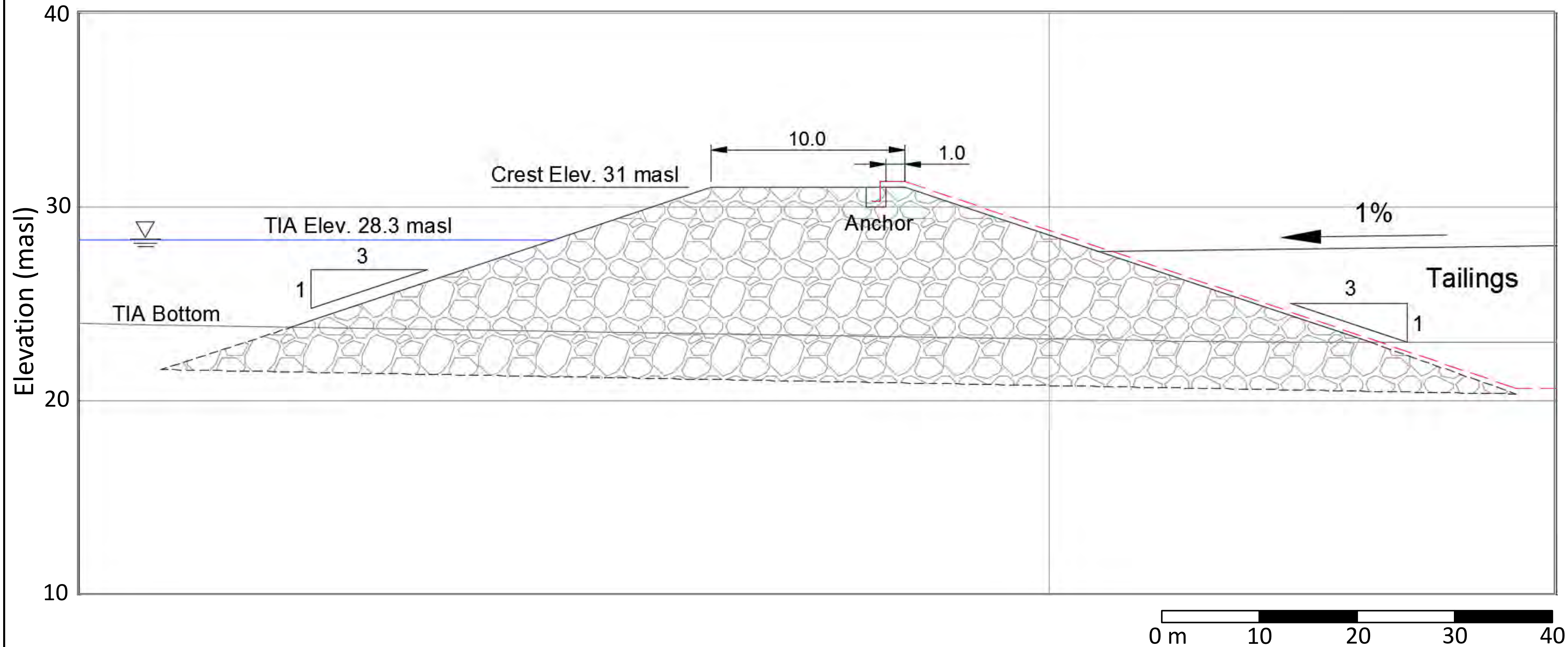
Filename: AANDC_IR22_Figures_FilterDesign_EH_TS_al_20151204.pptx

Hope Bay Project

Date: December 2015

Approved: EH

Figure: 1




**Notes**

1. All dimensions and elevations are in meters unless stated otherwise.
2. Horizontal scale is equivalent to vertical scale
3. Cross section modified from DN-TIA-03 in SRK (2015).

**Legend**

Reclaim Pond Surface

Geotextile Filter

ROQ Fill Material

| | | |
|---|---|---|
| srk consulting | TMAC RESOURCES | Type A Water License Information Requests<br>**Typical Interim Dike Cross Section Sketch with Geotextile Filter** |
| Job No: 1CT022.002<br>Filename: AANDC_IR22_Figures_FilterDesign_EH_TS_al_20151204.pptx | Hope Bay Project | Date: December 2015 / Approved: AL / Figure: 2 |

# AANDC TC 10 — SRK Technical Memo Closure Cost Estimate Analysis

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# Memo

| | | | |
|---|---|---|---|
| **To:** | John Roberts, PEng | **Client:** | |
| **From:** | Iozsef Miskolczi, PEng | **Project No:** | 1CT022.002 |
| **Reviewed by :** | Maritz Rykaart, PhD, PEng | **Date:** | December 18, 2015 |
| **Subject:** | Response to IR AANDC TC10 - Closure Cost Estimate | | |

# 1 Introduction

As part of the supporting documents for Amendment #1 to the Water License No. 2AM-DOH1323, TMAC Resources Inc. submitted an Interim Closure and Reclamation Plan (Document P5-2) and the associated closure cost estimate (Document P6-5).

During the technical review process, Aboriginal Affairs and Northern Development Canada (AANDC) reviewed both documents and provided comments. AANDC also retained Amec Foster Wheeler (AMEC) to provide an Independent Closure Cost Estimate based on the same Document P5-2. This estimate has been calculated using the RECLAIM 7.0 Model for Reclamation and Closure Security Estimate and is based on a geotechnical site inspection that was conducted this past August and a review of TMAC Resources Inc.'s (TMAC) licence amendment application. A total closure cost estimate of $47,818,382 was calculated, compared to $25,061,000 estimated by TMAC.

This memorandum presents an analysis of the AANDC cost estimate and provides a summary of the differences between what AANDC is proposing and what TMAC has provided. A complete list of the changes and corrections made to the AANDC estimate is provided in Attachment 1.

# 2 Review of the AANDC Cost Estimate

The independent cost estimate was summarised in a technical memorandum (AANDC 2015) and details of the estimates for each work area were provided as appendices while select assumptions used to derive the costs were summarised in the body of the memo.

The AANDC cost estimate was completed using the RECLAIM version 7.0 cost model (Brodie 2014), and considerable effort was made to retain as much as possible the functional structure of the TMAC estimate, which was based on a work breakdown structure detailed in Document P5-2. This was achieved by grouping similar activities from the various work areas into the functional sheets provided in the RECLAIM template, and some of those sheets were renamed or repurposed as necessary. This made it relatively easy to complete a direct comparison of the costs estimated for the similar activities comprising the two cost models.

In general the AANDC estimate follows the structure of the TMAC estimate. Most quantities and many of the task unit rates are the same but in some instances new unit rates or new quantities were introduced in the AANDC estimate; however the assumptions or calculations supporting these new values were not included in the cost model provided for review.

# 3 Basis for Comparison

## 3.1 Model Structure

Taking as basis for comparison the AANDC estimate, the main differences in the cost models are as follows:

- Direct Costs
  - A new cost category was introduced representing Interim Care and Maintenance activities.
  - The cost category for off-site disposal of hazardous waste and hydrocarbon contaminated soils was omitted.
- Indirect Costs
  - Some of the costs are calculated as percentage of the direct costs, as opposed to being a first principles approach.
  - An “Engineering” cost category was introduced.
  - The “Hydrocarbon Decontamination” category was omitted.
  - A new category was introduced named “Health & Safety Plans, Monitoring, and QA/QC”.
  - The “General Administration” category was omitted.

To make a direct comparison possible, the cost categories not used under either of the costing models were added as blank lines, such that both estimates have the same number of categories. Except for the omitted cost categories (e.g. hydrocarbon decontamination) all activities and tasks as presented in Document P5-2 are accounted for in the AANDC model.

## 3.2 Cost Comparison Basis

A detailed reviewed of the AANDC cost estimate was completed by SRK on behalf of TMAC and the findings are summarised in Section 4. The review process was structured in a way that provides a systematic breakdown of the discrepancies between the two cost estimates and detailed notes were prepared documenting each of the changes made to the AANDC estimate (Attachment 1). The analysis was completed in three steps, as follows:

1. Remove obvious “typographical type” errors related to quantities and/or unit rates applied;

2. Correct assumptions made in the AANDC cost estimate to reflect the actual site conditions and the existing Interim Closure Plan (Document P5-2); and

3. Where necessary, replace the unsupported AANDC unit rates with the well-documented TMAC unit rates.

A few general observations were made with regards to the cost discrepancy between the two models, which are summarised in the sub-sections following below.

**Direct Costs**

- The main source of discrepancy between the costs is the Interim Care and Maintenance category, which was not included in the original TMAC estimate.

**Indirect costs**

- The AANDC memo states that the main difference in overall costs is partly originating from the fact that the TMAC reclamation costs are based on equipment existing on site at time of closure. This is not accurate, and the Mobilization/Demobilization cost category in the TMAC estimate (Document P6-5) provided detailed costs for shipping the equipment to and from site by barge.
- In the AANDC estimate, owner's costs with camp rental and camp operations are included in the Mobilization/Demobilization category. The TMAC model (Document P6-5) assumed that existing camp facilities will be used for closure; however, this was revised to include an allowance for camp rental cost during the 2.5 years required for active water management post-closure.
- Some of the indirect cost categories were calculated as percentages of the direct costs. This practice is common for interim closure cost estimates, where final closure task definitions are somewhat vague or uncertain. The original TMAC estimate provided an itemised description and costing for these indirect cost items, based on unit rates where appropriate. For compatibility and ease of comparison with the AANDC cost estimate, the percentage method was adopted by TMAC for these categories, but percentages were adjusted as necessary to produce a more realistic cost.

# 4 Cost Comparison

Once the obvious errors were corrected in the AANDC cost estimate model, the overall cost was reduced from $47.8 M to $43.8 M, which we believe represents the true cost as intended by AANDC.

As a next step, the assumptions made in the AANDC estimate were adjusted or corrected to reflect the site conditions and the closure activities detailed in Document P5-2, while the unit rates remained the same as in the previous step. In this step the cost for Interim Care and Maintenance and the camp rental cost for the active water management period were also included. Due to the large amounts removed by eliminating the winter road and the commuter flights, the overall cost was further reduced to $26.2 M.

In the final step of this analysis, the unit rates used in the AANDC estimate were replaced with the equivalent unit rates in the TMAC estimate. This was done because none of the AANDC unit rates were supported by productivity calculations or third-party quotations and, although these units may be reasonable, cannot be assessed on their merits. The overall closure cost in this case became $28.9 M.  This is about $3.9 M higher than the original TMAC cost, due to the increase from the Interim Care and Maintenance and mobile camp rental costs.

Table 1 provides a summary of the cost categories as included in the two cost estimate models. The costs are broken out by the three analysis steps detailed in Section 3.2.  The detailed cost estimate model is provided in Attachment 2.

**Table 1: Summary of Cost Categories**

| AANDC Cost Categories (RECLAIM V. 7 Model) | TMAC Cost Categories (SRK Model) | AANDC Estimate | TMAC Estimate (Absolute) [1] | TMAC Estimate (Rounded) [2] | AANDC Estimate with Errors Corrected | AANDC Estimate with Assumptions Corrected | Revised TMAC Estimate corrected with Select AANDC Assumptions |
|---|---|---|---|---|---|---|---|
| **DIRECT COSTS** | | | | | | | |
| Open Pit | Roberts Bay Area / Airstrip | $ 947,269 | $ 762,129 | $ 763,000 | $ 919,329 | $ 919,329 | $ 768,158 |
| UG Mine | U/G Workings and Reagent Pads | $ 255,351 | $ 144,618 | $ 145,000 | $ 246,351 | $ 239,726 | $ 144,561 |
| Tailings | North and South Dams / Interim Dyke | $ 8,341,610 | $ 8,655,952 | $ 8,656,000 | $ 8,341,610 | $ 8,341,610 | $ 8,655,951 |
| Rock Pile | Doris Windy Road / Secondary Road | $ 786,873 | $ 547,408 | $ 549,000 | $ 783,581 | $ 783,581 | $ 547,927 |
| Doris Camp | Doris Camp | $ 4,369,083 | $ 2,996,539 | $ 2,997,000 | $ 4,082,823 | $ 4,182,275 | $ 2,996,446 |
| Chemicals | Quarry #2 / Doris Mtn / Quarry #3 Waste Area / Ocean Discharge System | $ 900,502 | $ 372,859 | $ 376,000 | $ 895,502 | $ 622,002 | $ 372,923 |
| Surface and Groundwater Management | Surface Water Management | $ 1,015,000 | $ 3,361,200 | $ 3,361,000 | $ 1,015,000 | $ 507,507 | $ 3,361,200 |
| Interim Care and Maintainance | Not Included | $ 4,192,002 | $ - | $ - | $ 4,173,252 | $ 1,991,028 | $ 2,408,390 |
| Not Inlcuded | Off-site Disposal | $ - | $ 491,960 | $ 492,000 | $ - | $ - | $ 491,960 |
| | **SUBTOTAL: DIRECT COSTS** | **$ 20,807,690** | **$ 17,332,665** | **$ 17,339,000** | **$ 20,457,448** | **$ 17,587,059** | **$ 19,747,514** |
| | | | | | | | |
| **INDIRECT COSTS** | | | | | | | |
| Mobilization/Demobilization | Mobilization & Demobilization | $ 17,289,163 | $ 1,037,786 | $ 1,038,000 | $ 16,209,163 | $ 3,331,424 | $ 2,865,058 |
| Post-Closure Monitoring & Maintenance | Post-Closure Monitoring | $ 1,814,608 | $ 884,000 | $ 884,000 | $ 1,814,608 | $ 868,500 | $ 868,500 |
| Engineering (8%, reduced to 1%) | Not Included | $ 1,664,615 | $ - | $ - | $ 204,574 | $ 175,871 | $ 197,475 |
| Not Included | Hydrocarbon Decontamination | $ - | $ 150,000 | $ 150,000 | $ - | $ - | $ - |
| Project Management (7%, reduced to 2%) | Field Support | $ 1,456,538 | $ 347,003 | $ 347,000 | $ 409,149 | $ 351,741 | $ 394,950 |
| Health & Safety Plans/Monitoring & QA/QC (2%) | Not Included | $ 416,154 | $ - | $ - | $ 409,149 | $ 351,741 | $ 394,950 |
| Not Included | General Administration[3] | $ - | $ 1,935,021 | $ 1,935,000 | $ - | $ - | $ 618,571 |
| Bonding/Insurance (1%) | Not Included | $ 208,077 | $ - | $ - | $ 208,077 | $ - | $ - |
| Contingency (20%) | Contingency (20%)[4] | $ 4,161,538 | $ 3,368,141 | $ 3,368,000 | $ 4,091,490 | $ 3,517,412 | $ 3,851,111 |
| Market Price Factor Adjustment (0%) | Not Included | $ - | $ - | $ - | $ - | $ - | $ - |
| | **SUBTOTAL: INDIRECT COSTS** | **$ 27,010,693** | **$ 7,721,951** | **$ 7,722,000** | **$ 23,346,210** | **$ 8,596,688** | **$ 9,190,615** |
| | | | | | | | |
| | **TOTAL COSTS** | **$ 47,818,383** | **$ 25,054,616** | **$ 25,061,000** | **$ 43,803,657** | **$ 26,183,747** | **$ 28,938,129** |

**NOTES:**

1. The TMAC cost estimate is based on precise numbers, but the presented numbers in the supporting documents are rounded (see Note 2 below).
2. The TMAC numbers as shown in the supporting documents are rounded numbers. The rounding occurs at two levels; all line items are rounded to the nearest $1,000 or a minimum of $1,000.
3. The TMAC General Administration cost was reduced by an amount equal to H&S Plans/Monitoring & QA/QC, as these tasks are assumed to be part of the camp administrator's duties.
4. The cost of off-site disposal was subtracted from Direct Costs when calculating the Contingency.

# 5 References

AANDC (2015). Reclamation Cost Estimate Amendment No. 1 to Nunavut Water Board License No. 2AM-DOH1323 Doris North Project Kitikmeot Region, Nunavut. Technical Memorandum Prepared by Amec Foster Wheeler Environment & Infrastructure a Division of Amec Foster Wheeler Americas Limited, Project No. TV154011, December 8, 2015.

Brodie Consulting Ltd., 2014. RECLAIM Version 7.0 User Manual. MS Excel Workbook and User Manual prepared for Aboriginal Affairs and Northern Development Canada – Water Resources Division. March 2014.

# Attachment 1: List of Errors and Assumptions Corrected

# 1 Listing of Errors and Assumptions Corrected

This list of notes should be read in conjunction with the complete sheets of the cost analysis provided in Attachment 2. The cells highlighted in each of the cost category sheets represent changes made to the AANDC cost model. The following notes describe the changes that were made for each of the highlighted cells.

## 1.1 Errors corrected

Each of the estimate sheets were reviewed and compared to the original TMAC estimate. In a few cases quantities or unit rates values were obviously erroneous. These include order-of-magnitude differences, mismatch with the referenced unit of measurement, or values not representing the actual site conditions.

These errors were corrected and the notes are summarised below following the AANDC estimate structure.

**1_Open Pit**

- Roberts Bay Tank Farm: Number of tanks in this tank farm were miscounted (one tank by AANDC instead of four). Quantities were adjusted accordingly for “wash tanks” and dismantle tanks…” tasks.
- Quarry #1 Tank Farm: Number of tanks in this farm was miscounted (four tanks instead of one). Quantities were adjusted to show one 5ML tank for “drain tanks…” and dismantle 5ML diesel…” tasks. Quantity was adjusted to 2 for “Disconnect piping and controls” task.

**4_Rock Pile**

- Explosives Facility: “Load all waste and debris into containers”: AANDC used the facility surface area as metric for loading waste, which is inappropriate and results in very high cost. Unit rate is also inconsistent with the rate used for the same task in other places. The quantity of waste was revised.

**5_Doris Camp**

- Accommodation Complex: the number of trailer units in AANDC estimate is 283; we believe this to be a typo, as the actual number is 83. Quantity was revised.
- Tank Farm: the quantities for the tasks “Decommission Fuel Transfer Facility” and “Wash Tanks” were switched in the AANDC estimate. The quantities were revised to reflect the actual task. Unit rates were correct.
- Tank Farm: the unit and quantity for the “prepare pieces for transportation” were erroneous and were corrected to be consistent with the immediately following task.
- Sewage Treatment Plant: the quantity for “Load debris into containers for transport (to Roberts Bay)” was erroneous and inconsistent with the following task. The quantity was revised.

- Fire Water Storage Tank: the last 5 lines in the quantities column were translated, resulting in erroneous task costs. Quantities were corrected to match the TMAC estimate.
- Expanded Laydown Area (Pad U): the unit rate used for the “LHD remaining ore to TIA” task was $16.35, although RECLAIM rate code SBSH was used, which is $6.30. The unit rate was corrected to reflect the RECLAIM unit rate.

**6_Chemicals**

- Communications Tower: AANDC used 11 $m^3$ of waste to be removed from the top of Doris Mountain. This is inconsistent with the other quantities for the same activity, and it was replaced with a value of 9.

**8_Interim Care and Maintenance**

- Geotechnical Assessment: a quantity of 1.5 was used for the yearly unit rate. This was corrected to 1.

**9_Mobilization / Demobilization**

- Worker Accommodations: The total number of months for camp operations during active water management was set to 60 (i.e. 5 years). Since 18 months were accounted for under the closure activities, these months were removed from the total and the quantity was revised to the balance of 42.

## 1.2 Revised Assumptions

Some of the assumptions made to derive the units, quantities, and task unit rates did not represent the existing site conditions and/or were inconsistent with the reclamation tasks described in the Interim Closure and Reclamation Plan (Document P5-2). Where encountered, these assumptions were adjusted or corrected to align with the Plan.

**2_UG Mine**

- Doris North Vent Raise: the unit rate for the “Prepare units for shipping off-site” was intended as an aggregate rate for preparing all parts at once. The AANDC estimate used multiples of these rates matching the number of equipment parts removed. This was corrected to the unit quantity. This same correction was done for the Doris Connector and Doris Central vent raises.

**5_Doris Camp**

- Tank Farm: AANDC used a quantity of 5 for the “Dismantle tanks and cut into manageable pieces” task. While this is correct for the tank farm, two more tanks of similar size exist on site (the Fire Water Tank and the water tank for Boston) for which dismantling costs were not accounted for under the AANDC assumption. The quantity was adjusted to 7.
- Tank Farm: the 60 m3 quantity for the waste resulting from the dismantling of the tanks is too high, especially when the selected unit rates are used to calculate the task cost. The quantities were corrected to be equal to the volumes calculated by TMAC.

- Office and Mine Dry Complex: the unit rate for “collect all debris” (C310L) is appropriate for collecting loose debris from pad surface opposed to actual volume of debris, as presented in the AANDC estimate. The quantity was corrected to match the selected unit rate.

**6_Chemicals**

- Roberts Bay Discharge System: a much higher unit rate was used for the task of “Cut pipelines into manageable pieces” compared to the tailings line at the TIA. As this pipeline is 10 inch HDPE, similar to the tailings lines, it was considered that a similar unit rate is more appropriate. Unit rate was corrected to $22.

**7_Surface and Groundwater Management**

- Operate / Maintain Water Management System: AANDC assumed 5 years for the two tasks under this category, and used a quantity of 60 monthly rates for the cost. Given the plan for the water management detailed in the Closure Plan, only 29 months of active water management will be required, with 22 months for direct support (the balance is supported under general closure activities). The quantities were adjusted accordingly.

**8_Interim Care and Maintenance**

- On-site care-taker: AANDC assumed 5 months per year, which is inconsistent with the other assumptions for this activity (6 months for camp operations). The quantity was increased to 6.
- Mobile camp rental: the AANDC estimate includes camp rental cost, however the existing camp is still functional at this time. The rental allowance was removed.
- Technician: the site caretaker is normally in charge of operating the pumping system. This position was removed.
- Mobilization / Excavator: The AANDC assumptions list articulates the need for a small excavator, yet a 36.1 t (operating weight) machine is specified for mobilization. This was reduced to a 20 t (operating weight) machine.
- Winter Road: AANDC estimate assumed 116 km of winter road will be constructed for mobilization. Since Hope Bay has a barge off-loading facility and all-weather road access to all site facilities, no winter roads will be necessary.

**9_Mobilization / Demobilization**

- Mobilize Heavy Equipment / Excavators: AANDC assumed 2 excavator to be mobilized, and a third one under the Interim Care and Maintenance activities. This was reduced to 1, for a total of two machines available for closure.
- Mobilize Heavy Equipment / Dozers: AANDC assumed 2 dozers to be mobilized, and a third one under the Interim Care and Maintenance activities. This was reduced to 0, for a total of one machine available for closure.

- Mobilize Heavy Equipment / Loaders: AANDC assumed 2 loaders to be mobilized, and a third one under the Interim Care and Maintenance activities. This was reduced to 1, for a total of two machines available for closure.
- Mobilize Heavy Equipment / Light Duty Vehicles: AANDC assumed 6 vehicles to be mobilized, and 2 more under the Interim Care and Maintenance activities. This was reduced to 2, for a total of 4 vehicles available for closure.
- Mobilize Camp: AANDC estimate assumes 5 seasons for mobile camp rentals. This was reduced to 2.5, representing the time required to complete active water management and breaching the North Dam.
- Mobilize workers: For both winter and summer flights from Yellowknife to Cambridge Bay, the quantities were reduced to 0 as cost of transportation is included in camp operations cost.
- Worker Accommodations: AANDC estimate assumes 18 months of large camp (>25 persons) for 18 months and 60 months of the smaller camp (<10 person) for completion of decommissioning/reclamation and water treatment activities respectively. Based on the AANDC calculations, water discharge from TIA will be completed in 29 months. With decommissioning/reclamation activities completed in 12 months (i.e. larger camp) the water management personnel will spend the balance of 17 months in the smaller camp. The quantities were adjusted accordingly.
- Winter Road: AANDC estimate assumed 116 km of winter road will be constructed for mobilization. Since Hope Bay has a barge off-loading facility and all-weather road access to all site facilities, no winter roads will be necessary.
- Demobilize Heavy Equipment / Excavators: AANDC estimate assumes 3 excavators were on site for completion of the works. This was reduced to 2 to match the total number of equipment mobilized.
- Demobilize Heavy Equipment / Dozers: AANDC estimate assumes 2 dozers were on site for completion of the works. This was reduced to 1 to match the total number of equipment mobilized.
- Demobilize Heavy Equipment / Loaders: AANDC estimate assumes 3 loaders were on site for completion of the works. This was reduced to 2 to match the total number of equipment mobilized.
- Demobilize Heavy Equipment / Light Duty Vehicles: AANDC estimate assumes 6 vehicles were on site for completion of the works. This was reduced to 4 to match the total number of equipment mobilized.
- Demobilize Heavy Equipment / Standard 20’ Container: AANDC estimate assumes 10 containers need to be demobilized. This was increased to 12 to account for the 2 containers mobilized under Interim Care and Maintenance activities.

**10_Post-Closure Monitoring and Maintenance**

The AANDC estimate was calculated by assuming fractions of each task to compute a yearly amalgamated cost of $235,000. It included a task for vegetation monitoring and a task for decommissioning the water management structures.

This amalgamated yearly rate was applied to each of the 10 years duration of post-closure monitoring, and then the Net Present Value was calculated using a discount rate of 5%. This method results in inaccuracies when estimating the NPV, because in reality different costs will be incurred each year, and the NPV should reflect that.

To correct these assumptions the vegetation monitoring task was removed (no revegetation completed at closure), together with the decommissioning of water management structure task (accounted for under direct costs). The actual yearly expenditures were then computed and the NPV calculated based on these yearly values.

## 1.3 Revised Unit Rates

The AANDC cost estimate did not detail the methodology for determining the unit rates used in the estimate. By comparison, most of the TMAC task unit rates were calculated from first principles based on contractor's quotations for equipment and labor as well as productivity factors applied for each task or activity. In some instances lump sum rates were used, and these were based on SRK's experience with similar projects.

In most instances the AANDC made use of the TMAC unit rates, and these were left as is. In instances where new unit rates were proposed for certain tasks, these were replaced with the TMAC rates due to the fact that no supporting documentation was provided to provide a base for the evaluation of the suitability of the new unit rate.

Although the quantities and the unit rates from the AANDC estimate were essentially restored to the original TMAC values in the analysis process, the totals for the various cost categories are slightly different. This is because some of the decimal points and fractions of units were lost in the transfer process and could not be restored to their original values.

## 1.4 Indirect Costs

**Engineering**

This task category was omitted from the original TMAC cost, due to the fact that no major earthworks will be required under the general closure plan. Therefore the cost representing 8% of the direct costs was considered excessive, and was reduced to 2% of direct costs.

Cost of final tailings covers design was considered as part of separate obligations under the Water License.

### Hydrocarbon Decontamination

The engineering and sampling/testing cost for this category in the original TMAC estimate was assumed to be accounted for under the AANDC Engineering cost category, and was therefore removed from this updated estimate.

### Project Management

This category is equivalent to the “Field Support” category in the original TMAC estimate; however the 7% of the direct costs was considered excessive. This percentage was reduced to 2% of the direct costs, to match the cost calculated by TMAC from first principles.

### General Administration

This category was omitted from the AANDC estimate. The total presented in the original TMAC estimate was split into three parts, to match the AANDC structure and assumptions. The camp operations portion was accounted for under the Mob/Demob activities, while the category cost presented in this revised estimate is the balance between the remainder (after camp operations removed) and the H&S Plans/Monitoring & QA/QC. This was done under the assumption that these H&S tasks will be part of the duties of camp management.

### Contingency

The costs of off-site disposal was subtracted from the Direct Costs when calculating the Contingency. This was done because the cost for shipping and disposal is based on contractor quotations, thus the uncertainty in this cost is greatly reduced.

# Attachment 2: Detailed Cost Estimate Model

| ACTIVITY/MATERIAL | Units | Quantity | Cost Code | Unit Cost | Cost | Errors Corrected Quantity | Errors Corrected Unit Cost | Errors Corrected Cost | | | Assumptions Corrected Quantity | Assumptions Corrected Unit Cost | Assumptions Corrected Cost | | Unit Rates Corrected Quantity | AANDC Unit Cost | AANDC Cost | | SRK Unit Cost | SRK Cost | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JETTY | | | | | | | | | | | | | | | | | | | | | |
| Remove rock fill to 0.3 m below LLWL, place in surrounding water | m3 | 1013.8 | SSC3L | $ 8.90 | $ 9,023 | 1013.8 | $ 8.90 | $ 9,022.82 | $ 13,750.82 | | 1013.8 | $ 8.90 | $ 9,022.82 | $ 13,750.82 | 1013.8 | $ 8.90 | $ 9,022.82 | $ 13,750.82 | $ 1.23 | $ 1,244.29 | $ 7,276.25 |
| Remove on-shore mooring points | LS | 1 | OSHRL | $ 1,500.00 | $ 1,500 | 1 | $ 1,500.00 | $ 1,500.00 | | | 1 | $ 1,500.00 | $ 1,500.00 | | 1 | $ 1,500.00 | $ 1,500.00 | | $ 1,200.00 | $ 1,200.00 | |
| | LS | 1 | FSHRL | | | | | | | | | | | | | | | | | | |
| Remove mooring buoy | | | | $ 3,000.00 | $ 3,000 | 1 | $ 3,000.00 | $ 3,000.00 | | | 1 | $ 3,000.00 | $ 3,000.00 | | 1 | $ 3,000.00 | $ 3,000.00 | | $ 2,500.00 | $ 2,500.00 | |
| | m2 | 1900 | c518l | | | | | | | | | | | | | | | | | | |
| Crown jetty for positive drainage | | | | $ 0.12 | $ 228 | 1900 | $ 0.12 | $ 228.00 | | | 1900 | $ 0.12 | $ 228.00 | | 1900 | $ 0.12 | $ 228.00 | | $ 1.23 | $ 2,331.97 | |
| ROBERTS BAY TANK FARM - 20ML | | | | | | | | | | | | | | | | | | | | | |
| Drain tanks into portable fuel storage (EnviroTanks) | each | 4 | C203L | $ 10,000.00 | $ 40,000 | 4 | $ 10,000.00 | $ 40,000.00 | $ 491,345.07 | | 4 | $ 10,000.00 | $ 40,000.00 | $ 491,345.07 | 4 | $ 10,000.00 | $ 40,000.00 | $ 491,345.07 | $ 256.75 | $ 1,027.01 | $ 435,805.97 |
| Decomission fuel transfer facilities | each | 1 | C102L | $ 550.00 | $ 550 | 1 | $ 550.00 | $ 550.00 | | | 1 | $ 550.00 | $ 550.00 | | 1 | $ 550.00 | $ 550.00 | | $ 1,288.18 | $ 1,288.18 | |
| Wash tanks | each | 1 | C204L | $ 1,420.00 | $ 1,420 | 4 | $ 1,420.00 | $ 5,680.00 | | miscounted tanks | 4 | $ 1,420.00 | $ 5,680.00 | | 4 | $ 1,420.00 | $ 5,680.00 | | $ 1,123.28 | $ 4,493.14 | |
| Operate oil/water separator | m3 | 50 | C208L | $ 30.00 | $ 1,500 | 50 | $ 30.00 | $ 1,500.00 | | | 50 | $ 30.00 | $ 1,500.00 | | 50 | $ 30.00 | $ 1,500.00 | | $ 31.00 | $ 1,549.99 | |
| Disconnect piping and controls | each | 1 | C102L | $ 550.00 | $ 550 | 1 | $ 550.00 | $ 550.00 | | | 1 | $ 550.00 | $ 550.00 | | 1 | $ 550.00 | $ 550.00 | | $ 448.37 | $ 448.37 | |
| Dismantle tanks and cut into manageable pieces | each | 1 | CUT5L | $ 100,000.00 | $ 100,000 | 4 | $ 100,000.00 | $ 400,000.00 | | miscounted tanks | 4 | $ 100,000.00 | $ 400,000.00 | | 4 | $ 100,000.00 | $ 400,000.00 | | $ 100,000.00 | $ 400,000.00 | |
| Load pieces for transportation | m3 | 43.5 | C401L | $ 13.13 | $ 571 | 43.5 | $ 13.13 | $ 571.16 | | | 43.5 | $ 13.13 | $ 571.16 | | 43.5 | $ 13.13 | $ 571.16 | | $ 10.23 | $ 444.91 | |
| Haul cut metal to Landfill | m3 | 51.4 | C415L | $ 6.34 | $ 326 | 51.4 | $ 6.34 | $ 325.88 | | | 51.4 | $ 6.34 | $ 325.88 | | 51.4 | $ 6.34 | $ 325.88 | | $ 5.99 | $ 308.06 | |
| Remove and stockpile liner protection cover | m3 | 5455 | SB1L | $ 4.30 | $ 23,457 | 5455 | $ 4.30 | $ 23,456.50 | | | 5455 | $ 4.30 | $ 23,456.50 | | 5455 | $ 4.30 | $ 23,456.50 | | $ 2.75 | $ 14,994.13 | |
| Load contained contaminated soils into megabags for shipping off-site | m3 | 50 | C412L | $ 100.25 | $ 5,013 | 50 | $ 100.25 | $ 5,012.50 | | | 50 | $ 100.25 | $ 5,012.50 | | 50 | $ 100.25 | $ 5,012.50 | | $ 70.75 | $ 3,537.45 | |
| Haul contaminated material to Roberts Bay laydown | m3 | 56.8 | C404L | $ 6.34 | $ 360 | 56.8 | $ 6.34 | $ 360.11 | | | 56.8 | $ 6.34 | $ 360.11 | | 56.8 | $ 6.34 | $ 360.11 | | $ 2.52 | $ 143.09 | |
| Clean liner | m2 | 10300 | C210L | $ 0.39 | $ 4,017 | 10300 | $ 0.39 | $ 4,017.00 | | | 10300 | $ 0.39 | $ 4,017.00 | | 10300 | $ 0.39 | $ 4,017.00 | | $ 0.39 | $ 4,017.30 | |
| Remove and cut liner into manageable pieces | m2 | 10300 | C302L | $ 0.56 | $ 5,768 | 10300 | $ 0.56 | $ 5,768.00 | | | 10300 | $ 0.56 | $ 5,768.00 | | 10300 | $ 0.56 | $ 5,768.00 | | $ 0.16 | $ 1,652.84 | |
| Load Debris into Waste Trucks | m3 | 92.7 | C401L | $ 13.13 | $ 1,217 | 92.7 | $ 13.13 | $ 1,217.15 | | | 92.7 | $ 13.13 | $ 1,217.15 | | 92.7 | $ 13.13 | $ 1,217.15 | | $ 10.23 | $ 948.13 | |
| Haul containers to Quarry 3 | m3 | 92.7 | C415L | $ 6.34 | $ 588 | 92.7 | $ 6.34 | $ 587.72 | | | 92.7 | $ 6.34 | $ 587.72 | | 92.7 | $ 6.34 | $ 587.72 | | $ 5.99 | $ 555.58 | |
| Landfill Level containment berms | m2 | 231.3 | C505L | $ 1.58 | $ 365 | 231.3 | $ 1.58 | $ 365.45 | | | 231.3 | $ 1.58 | $ 365.45 | | 231.3 | $ 1.58 | $ 365.45 | | $ 1.23 | $ 283.89 | |
| Regrade area for positive drainage | m2 | 11530 | C518L | $ 0.12 | $ 1,384 | 11530 | $ 0.12 | $ 1,383.60 | | | 11530 | $ 0.12 | $ 1,383.60 | | 11530 | $ 0.12 | $ 1,383.60 | | $ 0.01 | $ 113.91 | |
| QUARRY 1 TANK FARM | | | | | | | | | | | | | | | | | | | | | |
| 5ML Drain tanks into portable fuel storage (EnviroTanks) | each | 4 | C203L | $ 10,000.00 | $ 40,000 | 1 | $ 10,000.00 | $ 10,000.00 | $ 221,347.93 | miscounted tanks | 1 | $ 10,000.00 | $ 10,000.00 | $ 221,347.93 | 1 | $ 10,000.00 | $ 10,000.00 | $ 221,347.93 | $ 256.75 | $ 256.75 | $ 183,822.79 |
| 1ML Drain Tanks into portable fuel storage (EnviroTanks) | each | 1 | C203L | $ 10,000.00 | $ 10,000 | 1 | $ 10,000.00 | $ 10,000.00 | | | 1 | $ 10,000.00 | $ 10,000.00 | | 1 | $ 10,000.00 | $ 10,000.00 | | $ 256.75 | $ 256.75 | |
| Decommission fuel transfer facilities | each | 1 | C102L | $ 550.00 | $ 550 | 1 | $ 550.00 | $ 550.00 | | | 1 | $ 550.00 | $ 550.00 | | 1 | $ 550.00 | $ 550.00 | | $ 448.37 | $ 448.37 | |
| Wash tanks | each | 2 | C204L | $ 1,420.00 | $ 2,840 | 2 | $ 1,420.00 | $ 2,840.00 | | | 2 | $ 1,420.00 | $ 2,840.00 | | 2 | $ 1,420.00 | $ 2,840.00 | | $ 1,123.28 | $ 2,246.57 | |
| Operate oil/water separator | m3 | 220 | C208L | $ 30.00 | $ 6,600 | 220 | $ 30.00 | $ 6,600.00 | | | 220 | $ 30.00 | $ 6,600.00 | | 220 | $ 30.00 | $ 6,600.00 | | $ 31.00 | $ 6,819.95 | |
| Disconnect piping and controls | each | 5 | C102L | $ 550.00 | $ 2,750 | 1 | $ 550.00 | $ 550.00 | | miscounted controls and piping | 1 | $ 550.00 | $ 550.00 | | 1 | $ 550.00 | $ 550.00 | | $ 448.37 | $ 448.37 | |
| Dismantle 5ML diesel fuel tank and cut into manageable pieces | each | 4 | CUT5L | $ 100,000.00 | $ 400,000 | 1 | $ 100,000.00 | $ 100,000.00 | | miscounted tanks | 1 | $ 100,000.00 | $ 100,000.00 | | 1 | $ 100,000.00 | $ 100,000.00 | | $ 100,000.00 | $ 100,000.00 | |
| Dismantle 1ML jet fuel tank and cut into manageable pieces | each | 1 | CUT1L | $ 50,000.00 | $ 50,000 | 1 | $ 50,000.00 | $ 50,000.00 | | | 1 | $ 50,000.00 | $ 50,000.00 | | 1 | $ 50,000.00 | $ 50,000.00 | | $ 50,000.00 | $ 50,000.00 | |
| Prepare pieces for transportation | m3 | 174 | C401L | $ 13.13 | $ 2,285 | 174 | $ 13.13 | $ 2,284.62 | | | 174 | $ 13.13 | $ 2,284.62 | | 174 | $ 13.13 | $ 2,284.62 | | $ 10.23 | $ 1,779.66 | |
| Haul cut metal to Landfill | m3 | 174 | C415L | $ 6.34 | $ 1,103 | 174 | $ 6.34 | $ 1,103.16 | | | 174 | $ 6.34 | $ 1,103.16 | | 174 | $ 6.34 | $ 1,103.16 | | $ 5.99 | $ 1,042.84 | |
| Remove and stockpile liner protection cover | m3 | 2190 | SB1L | $ 4.30 | $ 9,417 | 2190 | $ 4.30 | $ 9,417.00 | | | 2190 | $ 4.30 | $ 9,417.00 | | 2190 | $ 4.30 | $ 9,417.00 | | $ 2.75 | $ 6,019.64 | |
| Load contained contaminated soils into megabags for shipping off-site | m3 | 50 | C412L | $ 100.25 | $ 5,013 | 50 | $ 100.25 | $ 5,012.50 | | | 50 | $ 100.25 | $ 5,012.50 | | 50 | $ 100.25 | $ 5,012.50 | | $ 70.75 | $ 3,537.45 | |
| Haul megabags to Roberts Bay laydown | m3 | 53.4 | C404L | $ 6.34 | $ 339 | 53.4 | $ 6.34 | $ 338.56 | | | 53.4 | $ 6.34 | $ 338.56 | | 53.4 | $ 6.34 | $ 338.56 | | $ 2.52 | $ 134.52 | |
| Clean liner | m2 | 6521 | C210L | $ 0.39 | $ 2,543 | 6521 | $ 0.39 | $ 2,543.19 | | | 6521 | $ 0.39 | $ 2,543.19 | | 6521 | $ 0.39 | $ 2,543.19 | | $ 0.39 | $ 2,543.38 | |
| Remove and cut liner into manageable pieces | m2 | 6521 | C302L | $ 0.56 | $ 3,652 | 6521 | $ 0.56 | $ 3,651.76 | | | 6521 | $ 0.56 | $ 3,651.76 | | 6521 | $ 0.56 | $ 3,651.76 | | $ 0.16 | $ 1,046.42 | |
| Drain and wash empty fuel drums | each | 150 | C205L | $ 60.00 | $ 9,000 | 150 | $ 60.00 | $ 9,000.00 | | | 150 | $ 60.00 | $ 9,000.00 | | 150 | $ 60.00 | $ 9,000.00 | | $ 17.74 | $ 2,661.01 | |
| Crush empty fuel drums | each | 150 | C301L | $ 35.00 | $ 5,250 | 150 | $ 35.00 | $ 5,250.00 | | | 150 | $ 35.00 | $ 5,250.00 | | 150 | $ 35.00 | $ 5,250.00 | | $ 20.64 | $ 3,095.96 | |
| Load debris for transport to landfill | m3 | 68.2 | C401L | $ 13.13 | $ 895 | 68.2 | $ 13.13 | $ 895.47 | | | 68.2 | $ 13.13 | $ 895.47 | | 68.2 | $ 13.13 | $ 895.47 | | $ 10.23 | $ 697.54 | |
| Haul waste to Landfill | m3 | 68.2 | C415L | $ 6.34 | $ 432 | 68.2 | $ 6.34 | $ 432.39 | | | 68.2 | $ 6.34 | $ 432.39 | | 68.2 | $ 6.34 | $ 432.39 | | $ 5.99 | $ 408.74 | |
| Level containment berms | m2 | 279.3 | C505L | $ 1.58 | $ 441 | 279.3 | $ 1.58 | $ 441.29 | | | 279.3 | $ 1.58 | $ 441.29 | | 279.3 | $ 1.58 | $ 441.29 | | $ 1.23 | $ 342.80 | |
| Regrade area for positive drainage | m2 | 3650 | C5018L | $ 0.12 | $ 438 | 3650 | $ 0.12 | $ 438.00 | | | 3650 | $ 0.12 | $ 438.00 | | 3650 | $ 0.12 | $ 438.00 | | $ 0.01 | $ 36.06 | |

| ACTIVITY/MATERIAL | Units | Quantity | Cost Code | Unit Cost | Cost | Errors Corrected Quantity | Errors Corrected Unit Cost | Errors Corrected Cost | | Assumptions Corrected Quantity | Assumptions Corrected Unit Cost | Assumptions Corrected Cost | | Unit Rates Corrected Quantity | AANDC Unit Cost | AANDC Cost | | SRK Unit Cost | SRK Cost | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MECHANICAL SHOP COMPLEX | | | | | | | | | | | | | | | | | | | | |
| Decommission electrical, mechanical, heating (including connections to generator house & | each | 7 | C105L | $ 640.00 | $ 4,480 | 7 | $ 640.00 | $ 4,480.00 | $ 77,495.98 | 7 | $ 640.00 | $ 4,480.00 | $ 77,495.98 | 7 | $ 640.00 | $ 4,480.00 | $ 77,495.98 | $ 639.99 | $ 4,479.94 | $ 56,681.16 |
| Demolish (steel modular structure) | m3 | 2204.4 | C305L | $ 19.00 | $ 41,884 | 2204.4 | $ 19.00 | $ 41,883.60 | | 2204.4 | $ 19.00 | $ 41,883.60 | | 2204.4 | $ 19.00 | $ 41,883.60 | | $ 12.90 | $ 28,428.61 | |
| Demolish wood structures (warehouse roof, crew lounge) | m3 | 283.2 | C305L | $ 19.00 | $ 5,381 | 283.2 | $ 19.00 | $ 5,380.80 | | 283.2 | $ 19.00 | $ 5,380.80 | | 283.2 | $ 19.00 | $ 5,380.80 | | $ 12.90 | $ 3,652.23 | |
| Demolish tent structure (light vehicle shop) | m3 | 460.3 | C305L | $ 19.00 | $ 8,746 | 460.3 | $ 19.00 | $ 8,745.70 | | 460.3 | $ 19.00 | $ 8,745.70 | | 460.3 | $ 19.00 | $ 8,745.70 | | $ 12.90 | $ 5,936.17 | |
| Collect Debris | m2 | 685.8 | C310L | $ 0.18 | $ 123 | 685.8 | $ 0.18 | $ 123.44 | | 685.8 | $ 0.18 | $ 123.44 | | 685.8 | $ 0.18 | $ 123.44 | | $ 0.17 | $ 118.78 | |
| Load debris for transport to landfill | m3 | 867.1 | C401L | $ 13.13 | $ 11,385 | 867.1 | $ 13.13 | $ 11,385.02 | | 867.1 | $ 13.13 | $ 11,385.02 | | 867.1 | $ 13.13 | $ 11,385.02 | | $ 10.23 | $ 8,868.63 | |
| Haul debris to Landfill | m3 | 867.1 | C415L | $ 6.34 | $ 5,497 | 867.1 | $ 6.34 | $ 5,497.41 | | 867.1 | $ 6.34 | $ 5,497.41 | | 867.1 | $ 6.34 | $ 5,497.41 | | $ 5.99 | $ 5,196.80 | |
| WASTE MANAGEMENT FACILITY | | | | | | | | | | | | | | | | | | | | |
| Collect ashes and place in containers | m3 | 0.5 | C207L | $ 13.13 | $ 7 | 0.5 | $ 13.13 | $ 6.57 | $ 22,021.71 | 0.5 | $ 13.13 | $ 6.57 | $ 22,021.71 | 0.5 | $ 13.13 | $ 6.57 | $ 22,021.71 | $ 747.69 | $ 373.85 | $ 19,409.63 |
| Dismantle (welding crew) | each | 2 | C308L | $ 1,500.00 | $ 3,000 | 2 | $ 1,500.00 | $ 3,000.00 | | 2 | $ 1,500.00 | $ 3,000.00 | | 2 | $ 1,500.00 | $ 3,000.00 | | $ 511.00 | $ 1,022.00 | |
| Demolish wood structures (roof, entryway, etc.) | m3 | 76.2 | C305L | $ 19.00 | $ 1,448 | 76.2 | $ 19.00 | $ 1,447.80 | | 76.2 | $ 19.00 | $ 1,447.80 | | 76.2 | $ 19.00 | $ 1,447.80 | | $ 12.90 | $ 982.70 | |
| Disconnect containers and prep for shipping off-site | each | 11 | C108L | $ 1,325.00 | $ 14,575 | 11 | $ 1,325.00 | $ 14,575.00 | | 11 | $ 1,325.00 | $ 14,575.00 | | 11 | $ 1,325.00 | $ 14,575.00 | | $ 1,321.37 | $ 14,535.06 | |
| Collect all debris | m2 | 128.7 | C310L | $ 0.18 | $ 23 | 128.7 | $ 0.18 | $ 23.17 | | 128.7 | $ 0.18 | $ 23.17 | | 128.7 | $ 0.18 | $ 23.17 | | $ 0.17 | $ 22.29 | |
| Load debris for transport to landfill | m3 | 152.5 | C401L | $ 13.13 | $ 2,002 | 152.5 | $ 13.13 | $ 2,002.33 | | 152.5 | $ 13.13 | $ 2,002.33 | | 152.5 | $ 13.13 | $ 2,002.33 | | $ 10.23 | $ 1,559.76 | |
| Haul debris to Landfill | m3 | 152.5 | C415L | $ 6.34 | $ 967 | 152.5 | $ 6.34 | $ 966.85 | | 152.5 | $ 6.34 | $ 966.85 | | 152.5 | $ 6.34 | $ 966.85 | | $ 5.99 | $ 913.98 | |
| LAYDOWN AREA | | | | | | | | | | | | | | | | | | | | |
| Decommission vehicle plug system | each | 1 | C105L | $ 640.00 | $ 640 | 1 | $ 640.00 | $ 640.00 | $ 21,216.88 | 1 | $ 640.00 | $ 640.00 | $ 21,216.88 | 1 | $ 640.00 | $ 640.00 | $ 21,216.88 | $ 639.99 | $ 639.99 | $ 15,778.06 |
| Remove cables and posts | each | 8 | C314L | $ 150.00 | $ 1,200 | 8 | $ 150.00 | $ 1,200.00 | | 8 | $ 150.00 | $ 1,200.00 | | 8 | $ 150.00 | $ 1,200.00 | | $ 403.25 | $ 3,225.96 | |
| Collect all debris | m2 | 24491.6 | C310L | $ 0.18 | $ 4,408 | 24491.6 | $ 0.18 | $ 4,408.49 | | 24491.6 | $ 0.18 | $ 4,408.49 | | 24491.6 | $ 0.18 | $ 4,408.49 | | $ 0.17 | $ 4,242.05 | |
| Load debris for transport to landfill | m3 | 10 | C401L | $ 13.13 | $ 131 | 10 | $ 13.13 | $ 131.30 | | 10 | $ 13.13 | $ 131.30 | | 10 | $ 13.13 | $ 131.30 | | $ 10.23 | $ 102.28 | |
| Haul debris to Landfill | m3 | 10 | C415L | $ 6.34 | $ 63 | 10 | $ 6.34 | $ 63.40 | | 10 | $ 6.34 | $ 63.40 | | 10 | $ 6.34 | $ 63.40 | | $ 5.99 | $ 59.93 | |
| Regrade area for positive drainage | m2 | 24491.6 | C518L | $ 0.12 | $ 2,939 | 24491.6 | $ 0.12 | $ 2,938.99 | | 24491.6 | $ 0.12 | $ 2,938.99 | | 24491.6 | $ 0.12 | $ 2,938.99 | | $ 0.01 | $ 241.97 | |
| Laydown Area Expansion Collect all debris | m2 | 38800 | C310L | $ 0.18 | $ 6,984 | 38800 | $ 0.18 | $ 6,984.00 | | 38800 | $ 0.18 | $ 6,984.00 | | 38800 | $ 0.18 | $ 6,984.00 | | $ 0.17 | $ 6,720.33 | |
| Load waste into containers for shipping off-site | m3 | 10 | C401L | $ 13.13 | $ 131 | 10 | $ 13.13 | $ 131.30 | | 10 | $ 13.13 | $ 131.30 | | 10 | $ 13.13 | $ 131.30 | | $ 10.23 | $ 102.28 | |
| Haul debris to Landfill | m3 | 10 | C415L | $ 6.34 | $ 63 | 10 | $ 6.34 | $ 63.40 | | 10 | $ 6.34 | $ 63.40 | | 10 | $ 6.34 | $ 63.40 | | $ 5.99 | $ 59.93 | |
| Breach safety berms and Regrade area for positive drainage | m2 | 38800 | C518L | $ 0.12 | $ 4,656 | 38800 | $ 0.12 | $ 4,656.00 | | 38800 | $ 0.12 | $ 4,656.00 | | 38800 | $ 0.12 | $ 4,656.00 | | $ 0.01 | $ 383.33 | |
| OVERBURDEN DUMP | | | | | | | | | | | | | | | | | | | | |
| Collect all debris | m2 | 10448 | C310L | $ 0.18 | $ 1,881 | 10448 | $ 0.18 | $ 1,880.64 | $ 19,180.42 | 10448 | $ 0.18 | $ 1,880.64 | $ 19,180.42 | 10448 | $ 0.18 | $ 1,880.64 | $ 19,180.42 | $ 0.17 | $ 1,809.64 | $ 15,259.14 |
| Load waste into containers for shipping off-site | m3 | 10 | C401L | $ 13.13 | $ 131 | 10 | $ 13.13 | $ 131.30 | | 10 | $ 13.13 | $ 131.30 | | 10 | $ 13.13 | $ 131.30 | | $ 10.23 | $ 102.28 | |
| Haul debris to Landfill | m3 | 10 | C415L | $ 6.34 | $ 63 | 10 | $ 6.34 | $ 63.40 | | 10 | $ 6.34 | $ 63.40 | | 10 | $ 6.34 | $ 63.40 | | $ 5.99 | $ 59.93 | |
| Grade for positive drainage | m2 | 10448 | C505L | $ 1.58 | $ 16,508 | 10448 | $ 1.58 | $ 16,507.84 | | 10448 | $ 1.58 | $ 16,507.84 | | 10448 | $ 1.58 | $ 16,507.84 | | $ 1.23 | $ 12,823.35 | |
| Breach the berm to original ground in several locations (4 locations) to restore natural flow path | m2 | 378 | C505L | $ 1.58 | $ 597 | 378 | $ 1.58 | $ 597.24 | | 378 | $ 1.58 | $ 597.24 | | 378 | $ 1.58 | $ 597.24 | | $ 1.23 | $ 463.94 | |
| ROBERTS BAY ACCESS ROAD | | | | | | | | | | 0 | $ - | | | | | | | | | |
| Crown road for positive drainage | m2 | 3378 | C518L | $ 0.12 | $ 405 | 3378 | $ 0.12 | $ 405.36 | $ 405.36 | 3378 | $ 0.12 | $ 405.36 | $ 405.36 | 3378 | $ 0.12 | $ 405.36 | $ 405.36 | $ 0.01 | $ 33.37 | $ 33.37 |

| ACTIVITY/MATERIAL | Units | Quantity | Cost Code | Unit Cost | Cost |
|---|---|---|---|---|---|
| COMMUNICATIONS TOWER | | | | | |
| Decommission Tower | each | 1 | C105L | $ 640.00 | $ 640 |
| Remove communication equipment | each | 4 | C107L | $ 350.00 | $ 1,400 |
| Dismantle towers | each | 1 | C311L | $ 15,500.00 | $ 15,500 |
| Prep tower sections for shipping off-site | m | 8 | C312L | $ 1,500.00 | $ 12,000 |
| Collect all debris | m2 | 1.4 | C310L | $ 0.18 | $ - |
| Load waste into containers for shipping off-site | m3 | 10.5 | C401L | $ 13.13 | $ 138 |
| Haul hazardous waste to Roberts Bay | m3 | 5 | C404L | $ 6.34 | $ 32 |
| Haul debris to Landfill | m2 | 5.5 | C415L | $ 6.34 | $ 35 |
| ALL WEATHER AIRSTRIP | | | | | |
| Decommission Airstrip | each | 1 | C109L | $ 1,500.00 | $ 1,500 |
| Remove lighting fixtures (airstrip lighting, approach lights) | each | 70 | C110L | $ 100.00 | $ 7,000 |
| Collect all debris | m2 | 2850 | C310L | $ 0.18 | $ 513 |
| Load waste for transport to landfill | m3 | 1.2 | C401L | $ 13.13 | $ 16 |
| Haul debris to Landfill | m3 | 1.2 | C416L | $ 6.34 | $ 8 |
| Crown airstrip and airstrip expansion for positive drainage | m2 | 42000 | C518L | $ 0.12 | $ 5,040 |
| Other | | | #N/A | $ - | $ - |
| SOUTH APRON | | | | | |
| Crown for positive drainage | m2 | 4500 | C518L | $ 0.12 | $ 540 |
| Other | | | #N/A | $ - | $ - |
| NORTH APRON | | | | | |
| Decommission electrical, and heating from traffic control tower | each | 1 | C107L | $ 350.00 | $ 350 |
| Demolish control tower structure (wood shack) | m3 | 11.7 | C305L | $ 19.00 | $ 222 |
| Disconnect containers and prep for shipping off-site | each | 5 | C108L | $ 1,325.00 | $ 6,625 |
| Collect all debris | m2 | 12.2 | C310L | $ 0.18 | $ 2 |
| Load waste for transport to landfill | m3 | 17.6 | C401L | $ 13.13 | $ 231 |
| Haul debris to landfill | m3 | 17.6 | C416L | $ 6.34 | $ 112 |
| Crown for positive drainage | m2 | 5517.2 | C518L | $ 0.12 | $ 662 |
| Other | | | #N/A | $ - | $ - |
| | | Annual pumping costs | | | $ - |
| Number of years of pump flooding | years | | | | |
| | | Total pumping costs | | | $ - |
| | | | **Total** | | $ 947,269 |
| | | | **% of Total** | | |

**Errors Corrected**

| ACTIVITY/MATERIAL | Quantity | Unit Cost | Cost | |
|---|---|---|---|---|
| COMMUNICATIONS TOWER | | | | |
| Decommission Tower | 1 | $ 640.00 | $ 640.00 | $ 29,744.69 |
| Remove communication equipment | 4 | $ 350.00 | $ 1,400.00 | |
| Dismantle towers | 1 | $ 15,500.00 | $ 15,500.00 | |
| Prep tower sections for shipping off-site | 8 | $ 1,500.00 | $ 12,000.00 | |
| Collect all debris | 1.4 | $ 0.18 | $ 0.25 | |
| Load waste into containers for shipping off-site | 10.5 | $ 13.13 | $ 137.87 | |
| Haul hazardous waste to Roberts Bay | 5 | $ 6.34 | $ 31.70 | |
| Haul debris to Landfill | 5.5 | $ 6.34 | $ 34.87 | |
| ALL WEATHER AIRSTRIP | | | | |
| Decommission Airstrip | 1 | $ 1,500.00 | $ 1,500.00 | $ 14,076.36 |
| Remove lighting fixtures (airstrip lighting, approach lights) | 70 | $ 100.00 | $ 7,000.00 | |
| Collect all debris | 2850 | $ 0.18 | $ 513.00 | |
| Load waste for transport to landfill | 1.2 | $ 13.13 | $ 15.76 | |
| Haul debris to Landfill | 1.2 | $ 6.34 | $ 7.61 | |
| Crown airstrip and airstrip expansion for positive drainage | 42000 | $ 0.12 | $ 5,040.00 | |
| Other | 0 | $ - | $ - | |
| SOUTH APRON | | | | |
| Crown for positive drainage | 4500 | $ 0.12 | $ 540.00 | $ 540.00 |
| Other | 0 | $ - | $ - | |
| NORTH APRON | | | | |
| Decommission electrical, and heating from traffic control tower | 1 | $ 350.00 | $ 350.00 | $ 8,204.23 |
| Demolish control tower structure (wood shack) | 11.7 | $ 19.00 | $ 222.30 | |
| Disconnect containers and prep for shipping off-site | 5 | $ 1,325.00 | $ 6,625.00 | |
| Collect all debris | 12.2 | $ 0.18 | $ 2.20 | |
| Load waste for transport to landfill | 17.6 | $ 13.13 | $ 231.09 | |
| Haul debris to landfill | 17.6 | $ 6.34 | $ 111.58 | |
| Crown for positive drainage | 5517.2 | $ 0.12 | $ 662.06 | |
| Other | 0 | $ - | $ - | |
| Total | | | | $ 919,329.45 |

**Assumptions Corrected**

| ACTIVITY/MATERIAL | Quantity | Unit Cost | Cost | |
|---|---|---|---|---|
| COMMUNICATIONS TOWER | | | | |
| Decommission Tower | 1 | $ 640.00 | $ 640.00 | $ 29,744.69 |
| Remove communication equipment | 4 | $ 350.00 | $ 1,400.00 | |
| Dismantle towers | 1 | $ 15,500.00 | $ 15,500.00 | |
| Prep tower sections for shipping off-site | 8 | $ 1,500.00 | $ 12,000.00 | |
| Collect all debris | 1.4 | $ 0.18 | $ 0.25 | |
| Load waste into containers for shipping off-site | 10.5 | $ 13.13 | $ 137.87 | |
| Haul hazardous waste to Roberts Bay | 5 | $ 6.34 | $ 31.70 | |
| Haul debris to Landfill | 5.5 | $ 6.34 | $ 34.87 | |
| ALL WEATHER AIRSTRIP | | | | |
| Decommission Airstrip | 1 | $ 1,500.00 | $ 1,500.00 | $ 14,076.36 |
| Remove lighting fixtures (airstrip lighting, approach lights) | 70 | $ 100.00 | $ 7,000.00 | |
| Collect all debris | 2850 | $ 0.18 | $ 513.00 | |
| Load waste for transport to landfill | 1.2 | $ 13.13 | $ 15.76 | |
| Haul debris to Landfill | 1.2 | $ 6.34 | $ 7.61 | |
| Crown airstrip and airstrip expansion for positive drainage | 42000 | $ 0.12 | $ 5,040.00 | |
| Other | 0 | $ - | $ - | |
| SOUTH APRON | | | | |
| Crown for positive drainage | 4500 | $ 0.12 | $ 540.00 | $ 540.00 |
| Other | 0 | $ - | $ - | |
| NORTH APRON | | | | |
| Decommission electrical, and heating from traffic control tower | 1 | $ 350.00 | $ 350.00 | $ 8,204.23 |
| Demolish control tower structure (wood shack) | 11.7 | $ 19.00 | $ 222.30 | |
| Disconnect containers and prep for shipping off-site | 5 | $ 1,325.00 | $ 6,625.00 | |
| Collect all debris | 12.2 | $ 0.18 | $ 2.20 | |
| Load waste for transport to landfill | 17.6 | $ 13.13 | $ 231.09 | |
| Haul debris to landfill | 17.6 | $ 6.34 | $ 111.58 | |
| Crown for positive drainage | 5517.2 | $ 0.12 | $ 662.06 | |
| Other | 0 | $ - | $ - | |
| Total | | | | $ 919,329.45 |

**Unit Rates Corrected**

| ACTIVITY/MATERIAL | Quantity | AANDC Unit Cost | AANDC Cost | | SRK Unit Cost | SRK Cost | |
|---|---|---|---|---|---|---|---|
| COMMUNICATIONS TOWER | | | | | | | |
| Decommission Tower | 1 | $ 640.00 | $ 640.00 | $ 29,744.69 | $ 639.99 | $ 639.99 | $ 22,571.56 |
| Remove communication equipment | 4 | $ 350.00 | $ 1,400.00 | | $ 352.56 | $ 1,410.25 | |
| Dismantle towers | 1 | $ 15,500.00 | $ 15,500.00 | | $ 15,417.42 | $ 15,417.42 | |
| Prep tower sections for shipping off-site | 8 | $ 1,500.00 | $ 12,000.00 | | $ 619.32 | $ 4,954.53 | |
| Collect all debris | 1.4 | $ 0.18 | $ 0.25 | | $ 0.17 | $ 0.24 | |
| Load waste into containers for shipping off-site | 10.5 | $ 13.13 | $ 137.87 | | $ 10.23 | $ 107.39 | |
| Haul hazardous waste to Roberts Bay | 5 | $ 6.34 | $ 31.70 | | $ 1.75 | $ 8.77 | |
| Haul debris to Landfill | 5.5 | $ 6.34 | $ 34.87 | | $ 5.99 | $ 32.96 | |
| ALL WEATHER AIRSTRIP | | | | | | | |
| Decommission Airstrip | 1 | $ 1,500.00 | $ 1,500.00 | $ 14,076.36 | $ 306.75 | $ 306.75 | $ 4,033.99 |
| Remove lighting fixtures (airstrip lighting, approach lights) | 70 | $ 100.00 | $ 7,000.00 | | $ 40.00 | $ 2,799.96 | |
| Collect all debris | 2850 | $ 0.18 | $ 513.00 | | $ 0.17 | $ 493.63 | |
| Load waste for transport to landfill | 1.2 | $ 13.13 | $ 15.76 | | $ 10.23 | $ 12.27 | |
| Haul debris to Landfill | 1.2 | $ 6.34 | $ 7.61 | | $ 5.36 | $ 6.43 | |
| Crown airstrip and airstrip expansion for positive drainage | 42000 | $ 0.12 | $ 5,040.00 | | $ 0.01 | $ 414.94 | |
| Other | 0 | $ - | $ - | | | $ - | |
| SOUTH APRON | | | | | | | |
| Crown for positive drainage | 4500 | $ 0.12 | $ 540.00 | $ 540.00 | $ 0.01 | $ 44.46 | $ 44.46 |
| Other | 0 | $ - | $ - | | | $ - | |
| NORTH APRON | | | | | | | |
| Decommission electrical, and heating from traffic control tower | 1 | $ 350.00 | $ 350.00 | $ 8,204.23 | $ 352.56 | $ 352.56 | $ 7,441.25 |
| Demolish control tower structure (wood shack) | 11.7 | $ 19.00 | $ 222.30 | | $ 12.90 | $ 150.89 | |
| Disconnect containers and prep for shipping off-site | 5 | $ 1,325.00 | $ 6,625.00 | | $ 1,321.37 | $ 6,606.84 | |
| Collect all debris | 12.2 | $ 0.18 | $ 2.20 | | $ 0.17 | $ 2.11 | |
| Load waste for transport to landfill | 17.6 | $ 13.13 | $ 231.09 | | $ 10.23 | $ 180.01 | |
| Haul debris to landfill | 17.6 | $ 6.34 | $ 111.58 | | $ 5.36 | $ 94.33 | |
| Crown for positive drainage | 5517.2 | $ 0.12 | $ 662.06 | | $ 0.01 | $ 54.51 | |
| Other | 0 | $ - | $ - | | | | |
| Total | | | | $ 919,329.45 | | | **$ 768,157.63** |

| ACTIVITY/MATERIAL | Unit | Qty | Code | Unit Cost | Cost | Errors Corrected Quantity | Errors Corrected Unit Cost | Errors Corrected Cost | | Assumptions Corrected Quantity | Assumptions Corrected Unit Cost | Assumptions Corrected Cost | | Unit Rates Corrected Quantity | AANDC Unit Cost | AANDC Cost | SRK Cost | SRK Unit Cost | SRK Cost | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DORIS NORTH DECLINE PORTAL | | | | | | | | | $ 28,816.23 | | | | $ 28,816.23 | | | | | | | |
| Remove ducts, pipes, electrical cables | lm | 100 | C316L | $113.00 | $ 11,300.00 | 100 | $113.00 | $ 11,300.00 | | 100 | $113.00 | $ 11,300.00 | | 100 | $113.00 | $ 11,300.00 | $ 28,816.23 | $112.09 | $ 11,209.30 | $ 28,565.81 |
| Construct portal plug | m3 | 707 | C503L | $24.53 | $ 17,343.00 | 707 | $24.53 | $ 17,342.71 | | 707 | $24.53 | $ 17,342.71 | | 707 | $24.53 | $ 17,342.71 | | $24.53 | $ 17,342.23 | |
| Regrade area for positive drainage | m2 | 1446 | C518L | $0.12 | $ 174.00 | 1446 | $0.12 | $ 173.52 | | 1446 | $0.12 | $ 173.52 | | 1446 | $0.12 | $ 173.52 | | $0.01 | $ 14.29 | |
| DORIS NORTH VENT RAISE | | | | | | | | | $ 68,815.47 | | | | $ 64,840.47 | | | | $ 74,434.97 | | | $ 35,012.23 |
| Remove ducts, pipes, and cables | lm | 100 | C316L | $113.00 | $ 11,300.00 | 100 | $113.00 | $ 11,300.00 | | 100 | $113.00 | $ 11,300.00 | | 100 | $113.00 | 11,300.00 | | $112.09 | $ 11,209.30 | |
| Construct a concrete cap (0.5 m thick reinforced concrete) to seal the top | each | 1 | C603L | $40,000.00 | $ 40,000.00 | 1 | $40,000.00 | $ 40,000.00 | | 1 | $40,000.00 | $ 40,000.00 | | 1 | $40,000.00 | $ 40,000.00 | | $14,007.27 | $ 14,007.27 | |
| Decommission and dismantle all ventilation and heating facilities | each | 4 | C105L | $640.00 | $ 2,560.00 | 4 | $640.00 | $ 2,560.00 | | 4 | $640.00 | $ 2,560.00 | | 4 | $640.00 | $ 2,560.00 | | $639.99 | $ 2,559.97 | |
| Prepare units for shipping off-site | each | 4 | C108L | $1,325.00 | $ 5,300.00 | 4 | $1,325.00 | $ 5,300.00 | | 1 | $1,325.00 | $ 1,325.00 | | 1 | $1,325.00 | $ 1,325.00 | | $1,321.37 | $ 1,321.37 | |
| Haul units to Roberts Bay | hrs | 3 | C404AL | $155.00 | $ 465.00 | 3 | $155.00 | $ 465.00 | | 3 | $155.00 | $ 465.00 | | 33.2 | $155.00 | $ 5,146.00 | | $2.52 | $ 83.64 | |
| Regrade pads for positive drainage | m2 | 4150 | C518L | $0.12 | $ 498.00 | 4150 | $0.12 | $ 498.00 | | 4150 | $0.12 | $ 498.00 | | 4150 | $0.12 | $ 498.00 | | $0.01 | $ 41.00 | |
| Drain and decommission Enviro Tank | each | 1 | C203L | $10,000.00 | $ 10,000.00 | 1 | $1,000.00 | $ 1,000.00 | | 1 | $1,000.00 | $ 1,000.00 | | 1 | $1,000.00 | $ 1,000.00 | | $256.75 | $ 256.75 | |
| Haul Enviro Tank to Roberts Bay | hrs | 1.5 | C404AL | $155.00 | $ 233.00 | 1.5 | $155.00 | $ 232.50 | | 1.5 | $155.00 | $ 232.50 | | 33.2 | $155.00 | $ 5,146.00 | | $2.52 | $ 83.64 | |
| Remove liner and cut into manageable pieces | m2 | 1230 | C302L | $0.56 | $ 689.00 | 1230 | $0.56 | $ 688.80 | | 1230 | $0.56 | $ 688.80 | | 1230 | $0.56 | $ 688.80 | | $0.16 | $ 197.38 | |
| Load waste for transport to landfill | m3 | 11 | C401L | $13.13 | $ 144.00 | 11 | $13.13 | $ 144.43 | | 11 | $13.13 | $ 144.43 | | 11 | $13.13 | $ 144.43 | | $10.23 | $ 112.51 | |
| Haul waste to landfill | m3 | 11 | C414L | $6.34 | $ 70.00 | 11 | $6.34 | $ 69.74 | | 11 | $6.34 | $ 69.74 | | 11 | $6.34 | $ 69.74 | | $4.17 | $ 45.92 | |
| Backfill area to prevent permanent ponding | m2 | 4150 | C505L | $1.58 | $ 6,557.00 | 4150 | $1.58 | $ 6,557.00 | | 4150 | $1.58 | $ 6,557.00 | | 4150 | $1.58 | $ 6,557.00 | | $1.23 | $ 5,093.50 | |
| DORIS CONNECTOR VENT RAISE | | | | | | | | | $ 58,102.51 | | | | $ 56,777.51 | | | | $ 56,978.49 | | | $ 30,074.80 |
| Remove ducts, pipes, and cables | lm | 100 | C316L | $113.00 | $ 11,300.00 | 100 | $113.00 | $ 11,300.00 | | 100 | $113.00 | $ 11,300.00 | | 100 | $113.00 | $ 11,300.00 | | $112.09 | $ 11,209.30 | |
| Decommission and dismantle all ventilation facilities | each | 2 | C105L | $640.00 | $ 1,280.00 | 2 | $640.00 | $ 1,280.00 | | 2 | $640.00 | $ 1,280.00 | | 2 | $640.00 | $ 1,280.00 | | $639.99 | $ 1,279.98 | |
| Prepare units for shipping off-site | each | 2 | C108L | $1,325.00 | $ 2,650.00 | 2 | $1,325.00 | $ 2,650.00 | | 1 | $1,325.00 | $ 1,325.00 | | 1 | $1,325.00 | $ 1,325.00 | | $1,321.37 | $ 1,321.37 | |
| Haul units to Roberts Bay | hrs | 1.5 | C404L | $6.34 | $ 10.00 | 1.5 | $6.34 | $ 9.51 | | 1.5 | $6.34 | $ 9.51 | | 33.2 | $6.34 | $ 210.49 | | $2.52 | $ 83.64 | |
| Construct a concrete cap (0.5 m thick reinforced concrete) to seal the top | each | 1 | C603L | $40,000.00 | $ 40,000.00 | 1 | $40,000.00 | $ 40,000.00 | | 1 | $40,000.00 | $ 40,000.00 | | 1 | $40,000.00 | $ 40,000.00 | | $14,007.27 | $ 14,007.27 | |
| Remove culvert | each | 1 | RCULL | $2,625.00 | $ 2,625.00 | 1 | $2,625.00 | $ 2,625.00 | | 1 | $2,625.00 | $ 2,625.00 | | 1 | $2,625.00 | $ 2,625.00 | | $2,000.00 | $ 2,000.00 | |
| Crown road for positive drainage | km | 0.2 | CRWNL | $1,190.00 | $ 238.00 | 0.2 | $1,190.00 | $ 238.00 | | 0.2 | $1,190.00 | $ 238.00 | | 0.2 | $1,190.00 | $ 238.00 | | $866.22 | $ 173.24 | |
| DORSI CENTRAL VENT RAISE | | | | | | | | | $ 58,697.51 | | | | $ 57,372.51 | | | | $ 57,573.49 | | | $ 30,507.91 |
| Remove ducts, pipes, and cables | lm | 100 | C316L | $113.00 | $ 11,300.00 | 100 | $113.00 | $ 11,300.00 | | 100 | $113.00 | $ 11,300.00 | | 100 | $113.00 | $ 11,300.00 | | $112.09 | $ 11,209.30 | |
| Decommission and dismantle all ventilation facilities | each | 2 | C105L | $640.00 | $ 1,280.00 | 2 | $640.00 | $ 1,280.00 | | 2 | $640.00 | $ 1,280.00 | | 2 | $640.00 | $ 1,280.00 | | $639.99 | $ 1,279.98 | |
| Prepare units for shipping off-site | each | 2 | C108L | $1,325.00 | $ 2,650.00 | 2 | $1,325.00 | $ 2,650.00 | | 1 | $1,325.00 | $ 1,325.00 | | 1 | $1,325.00 | $ 1,325.00 | | $1,321.37 | $ 1,321.37 | |
| Haul units to Roberts Bay | hrs | 1.5 | C404L | $6.34 | $ 10.00 | 1.5 | $6.34 | $ 9.51 | | 1.5 | $6.34 | $ 9.51 | | 33.2 | $6.34 | $ 210.49 | | $2.52 | $ 83.64 | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Construct a concrete cap (0.5 m thick reinforced concrete) to seal the top | each | 1 | C603L | $40,000.00 | $ 40,000.00 | 1 | $40,000.00 | $ 40,000.00 | | 1 | $40,000.00 | $ 40,000.00 | | 1 | $40,000.00 | $ 40,000.00 | | $14,007.27 | $ 14,007.27 | |
| Remove culvert | each | 1 | RCULL | $2,625.00 | $ 2,625.00 | 1 | $2,625.00 | $ 2,625.00 | | 1 | $2,625.00 | $ 2,625.00 | | 1 | $2,625.00 | $ 2,625.00 | | $2,000.00 | $ 2,000.00 | |
| Crown road for positive drainage | km | 0.7 | CRWNL | $1,190.00 | $ 833.00 | 0.7 | $1,190.00 | $ 833.00 | | 0.7 | $1,190.00 | $ 833.00 | | 0.7 | $1,190.00 | $ 833.00 | | $866.22 | $ 606.35 | |
| Other | | | #N/A | $0.00 | $ - | 0 | $0.00 | $ - | | 0 | $0.00 | $ - | | 0 | $0.00 | $ - | | $0.00 | $ - | |
| EQUIPMENT LAYDOWN AREA | | | | | | | | | $ 6,950.40 | | | | $ 6,950.40 | | | | $ 6,950.40 | | | $ 4,328.47 |
| Collect all debris | m2 | 21870 | C310L | $0.18 | $ 3,937.00 | 21870 | $0.18 | $ 3,936.60 | | 21870 | $0.18 | $ 3,936.60 | | 21870 | $0.18 | $ 3,936.60 | | $0.17 | $ 3,787.98 | |
| Load waste for transport to landfill | m3 | 20 | C401L | $13.13 | $ 263.00 | 20 | $13.13 | $ 262.60 | | 20 | $13.13 | $ 262.60 | | 20 | $13.13 | $ 262.60 | | $10.23 | $ 204.56 | |
| Regrade area for positive drainage | m2 | 21870 | C518L | $0.12 | $ 2,624.00 | 21870 | $0.12 | $ 2,624.40 | | 21870 | $0.12 | $ 2,624.40 | | 21870 | $0.12 | $ 2,624.40 | | $0.01 | $ 216.07 | |
| Haul waste to Landfill | m3 | 20 | C417L | $6.34 | $ 127.00 | 20 | $6.34 | $ 126.80 | | 20 | $6.34 | $ 126.80 | | 20 | $6.34 | $ 126.80 | | $5.99 | $ 119.87 | |
| Other | | | #N/A | $0.00 | $ - | 0 | $0.00 | $ - | | 0 | $0.00 | $ - | | 0 | $0.00 | $ - | | $0.00 | $ - | |
| MATERIALS LAYDOWN AREA | | | | | | | | | $ 10,409.10 | | | | $ 10,409.10 | | | | $ 10,409.10 | | | $ 6,439.25 |
| Collect all debris | m2 | 33399 | C310L | $0.18 | $ 6,012.00 | 33399 | $0.18 | $ 6,011.82 | | 33399 | $0.18 | $ 6,011.82 | | 33399 | $0.18 | $ 6,011.82 | | $0.17 | $ 5,784.85 | |
| Load waste to ship to Landfill | m3 | 20 | C401L | $13.13 | $ 263.00 | 20 | $13.13 | $ 262.60 | | 20 | $13.13 | $ 262.60 | | 20 | $13.13 | $ 262.60 | | $10.23 | $ 204.56 | |
| Regrade area for positive drainage | m2 | 33399 | C518L | $0.12 | $ 4,008.00 | 33399 | $0.12 | $ 4,007.88 | | 33399 | $0.12 | $ 4,007.88 | | 33399 | $0.12 | $ 4,007.88 | | $0.01 | $ 329.97 | |
| Haul waste to Landfill | m3 | 20 | C417L | $6.34 | $ 127.00 | 20 | $6.34 | $ 126.80 | | 20 | $6.34 | $ 126.80 | | 20 | $6.34 | $ 126.80 | | $5.99 | $ 119.87 | |
| Other | | | #N/A | $0.00 | $ - | 0 | $0.00 | $ - | | 0 | $0.00 | $ - | | 0 | $0.00 | $ - | | $0.00 | $ - | |
| AMMONIUM NITARATE STORAGE BUILDING | | | | | | | | | $ 10,135.66 | | | | $ 10,135.66 | | | | $ 10,135.66 | | | $ 6,164.35 |
| Remove and stockpile liner protection cover | m3 | 1505 | SB1L | $4.30 | $ 6,472.00 | 1505 | $4.30 | $ 6,471.50 | | 1505 | $4.30 | $ 6,471.50 | | 1505 | $4.30 | $ 6,471.50 | | $2.75 | $ 4,136.79 | |
| Clean liner | m2 | 2800 | C210L | $0.39 | $ 1,092.00 | 2800 | $0.39 | $ 1,092.00 | | 2800 | $0.39 | $ 1,092.00 | | 2800 | $0.39 | $ 1,092.00 | | $0.39 | $ 1,092.08 | |
| Remove and cut liner into manageable pieces | m2 | 2800 | C302L | $0.56 | $ 1,568.00 | 2800 | $0.56 | $ 1,568.00 | | 2800 | $0.56 | $ 1,568.00 | | 2800 | $0.56 | $ 1,568.00 | | $0.16 | $ 449.32 | |
| Load waste for transport to landfill | m3 | 25.2 | C401L | $13.13 | $ 331.00 | 25.2 | $13.13 | $ 330.88 | | 25.2 | $13.13 | $ 330.88 | | 25.2 | $13.13 | $ 330.88 | | $10.23 | $ 257.74 | |
| Haul waste to Landfill | m3 | 25.2 | C417L | $6.34 | $ 160.00 | 25.2 | $6.34 | $ 159.77 | | 25.2 | $6.34 | $ 159.77 | | 25.2 | $6.34 | $ 159.77 | | $5.99 | $ 151.03 | |
| Level containment berms | m2 | 32 | C505L | $1.58 | $ 51.00 | 32 | $1.58 | $ 50.56 | | 32 | $1.58 | $ 50.56 | | 32 | $1.58 | $ 50.56 | | $1.23 | $ 39.28 | |
| Regrade area for positive drainage | m2 | 3858 | C518L | $0.12 | $ 463.00 | 3858 | $0.12 | $ 462.96 | | 3858 | $0.12 | $ 462.96 | | 3858 | $0.12 | $ 462.96 | | $0.01 | $ 38.12 | |
| Other | | | #N/A | $0.00 | $ - | 0 | $0.00 | $ - | | 0 | $0.00 | $ - | | 0 | $0.00 | $ - | | $0.00 | $ - | |
| EXPLORATION DRILLING SUPPORT BUILDING | | | | | | | | | $ 4,424.13 | | | | $ 4,424.13 | | | | $ 4,424.13 | | | $ 3,468.44 |
| Decommission electrical, mechanical, heating | each | 2 | C105L | $640.00 | $ 1,280.00 | 2 | $640.00 | $ 1,280.00 | | 2 | $640.00 | $ 1,280.00 | | 2 | $640.00 | $ 1,280.00 | | $639.99 | $ 1,279.98 | |
| Demolish building (tent structure) | m3 | 149.6 | C305L | $19.00 | $ 2,842.00 | 149.6 | $19.00 | $ 2,842.40 | | 149.6 | $19.00 | $ 2,842.40 | | 149.6 | $19.00 | $ 2,842.40 | | $12.90 | $ 1,929.29 | |
| Collect all debris | m2 | 335 | C310L | $0.18 | $ 60.00 | 335 | $0.18 | $ 60.30 | | 335 | $0.18 | $ 60.30 | | 335 | $0.18 | $ 60.30 | | $0.17 | $ 58.02 | |
| Load waste for transport to landfill | m3 | 12.4 | C401L | $13.13 | $ 163.00 | 12.4 | $13.13 | $ 162.81 | | 12.4 | $13.13 | $ 162.81 | | 12.4 | $13.13 | $ 162.81 | | $10.23 | $ 126.83 | |
| Haul waste to Landfill | m3 | 12.4 | C417L | $6.34 | $ 79.00 | 12.4 | $6.34 | $ 78.62 | **$ 246,351.01** | 12.4 | $6.34 | $ 78.62 | **$ 239,726.01** | 12.4 | $6.34 | $ 78.62 | **$ 249,722.47** | $5.99 | $ 74.32 | **$ 144,561.26** |
| | | | | Total | $ 255,351.00 | | | | | | | | | | | | | | | |
| | | | | % of Total | | | | | | | | | | | | | | | | |

1 **Tailings Impoundment Name: North and South Dams / Interim Dyke** **Pond # 1**

| ACTIVITY/MATERIAL | Notes | Units | Quantity | Cost Code | Unit Cost | Cost |
|---|---|---|---|---|---|---|
| CONTROL ACCESS | | | | | | |
| Fence | | m | | #N/A | $ - | $ - |
| Signs | | each | | #N/A | $ - | $ - |
| Berm | | m3 | | #N/A | $ - | $ - |
| Block roads | | m3 | | #N/A | $ - | $ - |
| Crown Access Roads | | km | 0.2 | CRWNL | $ 1,190.00 | $ 238.00 |
| STABILIZE EMBANKMENT(S) | | | | | | |
| Breach North dam by cutting a 20 m slot down to original ground (drill and blast) | | m3 | 7028 | RB1H | $ 31.99 | $ 224,826.00 |
| Load and haul material | | m3 | 31021.1 | SB3H | $ 8.90 | $ 276,088.00 |
| Clad the cut core faces for thermal protection | | m3 | 614.2 | RR2H | $ 20.65 | $ 12,683.00 |
| Vegetate | | ha | | #N/A | $ - | $ - |
| Raise crest | | m3 | | #N/A | $ - | $ - |
| Flatten slopes | | m3 | | #N/A | $ - | $ - |
| SHORELINE PROTECTION | | | | #N/A | $ - | $ - |
| Install separation geotextile | | m2 | 54340 | GSTH | $ 6.00 | $ 326,040.00 |
| Haul and place riprap to prevent erosion | | m3 | 24700 | RR2H | $ 20.65 | $ 510,055.00 |
| Recontour Interim Dyke Crest | | m3 | 2000 | DRH | $ 2.40 | $ 4,800.00 |
| COVER TAILINGS | | | | | | |
| Grade/shape tailings surface | | m3 | | #N/A | $ - | $ - |
| Liner bedding | | m3 | | #N/A | $ - | $ - |
| Grade/shape tailings surface | | m2 | 440000 | SBTL | $ 1.35 | $ 594,000.00 |
| Supply geotextile/geosynthetic | | m2 | | #N/A | $ - | $ - |
| Install geotextile/geosynthetic | | m2 | | #N/A | $ - | $ - |
| Soil cover | | m3 | | #N/A | $ - | $ - |
| Produce ROQ (quarry drill and blast | | m3 | 132000 | RB1H | $ 31.99 | $ 4,222,680.00 |
| LHDP ROQ (0.3m thick cover | | m3 | 132000 | SBSH | $ 16.35 | $ 2,158,200.00 |
| Vegetate | | m2 | | #N/A | $ - | $ - |
| Other | | | | #N/A | $ - | $ - |
| SPECIALIZED ITEMS | | | | | | |
| Remove thermosyphons radiators and towers | | each | 12 | THRL | $ 1,000.00 | $ 12,000.00 |
| Install permanent instrumentation, supply & technican | | each | | #N/A | $ - | $ - |
| Install permanent instrumentation, drilling | | each | | #N/A | $ - | $ - |
| TREAT SEEPAGE - see "Water Management" and "Water Treatment" | | | | | | |
| TREAT SUPERNATANT | | | | | | |
| Pump water (to pit, U/G) | | m3 | | #N/A | $ - | $ - |
| Equipment maintenance and parts | | allow | | #N/A | $ - | $ - |
| Supply reagents | | tonne | | #N/A | $ - | $ - |
| | | | | Annual treatment costs | | $ - |
| Number of years of treatment | | years | | | | |
| | | | | Total treatment costs | | $ - |
| | | | | **Total** | | $ 8,341,610.00 |
| | | | | **% of Total** | | |

**Errors Corrected**

| ACTIVITY/MATERIAL | Quantity | Unit Cost | Cost | |
|---|---|---|---|---|
| Fence | 0 | $ - | $ - | $ 238.00 |
| Signs | 0 | $ - | $ - | |
| Berm | 0 | $ - | $ - | |
| Block roads | 0 | $ - | $ - | |
| Crown Access Roads | 0.2 | $ 1,190.00 | $ 238.00 | |
| Breach North dam by cutting a 20 m slot down to original ground (drill and blast) | 7028 | $ 31.99 | $ 224,825.72 | $ 513,596.74 |
| Load and haul material | 31021.1 | $ 8.90 | $ 276,087.79 | |
| Clad the cut core faces for thermal protection | 614.2 | $ 20.65 | $ 12,683.23 | |
| Vegetate | 0 | $ - | $ - | |
| Raise crest | 0 | $ - | $ - | |
| Flatten slopes | 0 | $ - | $ - | |
| Install separation geotextile | 54340 | $ 6.00 | $ 326,040.00 | $ 840,895.00 |
| Haul and place riprap to prevent erosion | 24700 | $ 20.65 | $ 510,055.00 | |
| Recontour Interim Dyke Crest | 2000 | $ 2.40 | $ 4,800.00 | |
| Grade/shape tailings surface | 0 | $ - | $ - | $ 6,974,880.00 |
| Liner bedding | 0 | $ - | $ - | |
| Grade/shape tailings surface | 440000 | $ 1.35 | $ 594,000.00 | |
| Supply geotextile/geosynthetic | 0 | $ - | $ - | |
| Install geotextile/geosynthetic | 0 | $ - | $ - | |
| Soil cover | 0 | $ - | $ - | |
| Produce ROQ (quarry drill and blast | 132000 | $ 31.99 | $ 4,222,680.00 | |
| LHDP ROQ (0.3m thick cover | 132000 | $ 16.35 | $ 2,158,200.00 | |
| Vegetate | 0 | $ - | $ - | |
| Other | 0 | $ - | $ - | |
| Remove thermosyphons radiators and towers | 12 | $ 1,000.00 | $ 12,000.00 | $ 12,000.00 |
| Install permanent instrumentation, supply & technican | 0 | $ - | $ - | |
| Install permanent instrumentation, drilling | 0 | $ - | $ - | |
| Total | | | | $ 8,341,609.74 |

**Assumptions Corrected**

| ACTIVITY/MATERIAL | Quantity | Unit Cost | Cost | |
|---|---|---|---|---|
| Fence | 0 | $ - | $ - | $ 238.00 |
| Signs | 0 | $ - | $ - | |
| Berm | 0 | $ - | $ - | |
| Block roads | 0 | $ - | $ - | |
| Crown Access Roads | 0.2 | $ 1,190.00 | $ 238.00 | |
| Breach North dam by cutting a 20 m slot down to original ground (drill and blast) | 7028 | $ 31.99 | $ 224,825.72 | $ 513,596.74 |
| Load and haul material | 31021.1 | $ 8.90 | $ 276,087.79 | |
| Clad the cut core faces for thermal protection | 614.2 | $ 20.65 | $ 12,683.23 | |
| Vegetate | 0 | $ - | $ - | |
| Raise crest | 0 | $ - | $ - | |
| Flatten slopes | 0 | $ - | $ - | |
| Install separation geotextile | 54340 | $ 6.00 | $ 326,040.00 | $ 840,895.00 |
| Haul and place riprap to prevent erosion | 24700 | $ 20.65 | $ 510,055.00 | |
| Recontour Interim Dyke Crest | 2000 | $ 2.40 | $ 4,800.00 | |
| Grade/shape tailings surface | 0 | $ - | $ - | $ 6,974,880.00 |
| Liner bedding | 0 | $ - | $ - | |
| Grade/shape tailings surface | 440000 | $ 1.35 | $ 594,000.00 | |
| Supply geotextile/geosynthetic | 0 | $ - | $ - | |
| Install geotextile/geosynthetic | 0 | $ - | $ - | |
| Soil cover | 0 | $ - | $ - | |
| Produce ROQ (quarry drill and blast | 132000 | $ 31.99 | $ 4,222,680.00 | |
| LHDP ROQ (0.3m thick cover | 132000 | $ 16.35 | $ 2,158,200.00 | |
| Vegetate | 0 | $ - | $ - | |
| Other | 0 | $ - | $ - | |
| Remove thermosyphons radiators and towers | 12 | $ 1,000.00 | $ 12,000.00 | $ 12,000.00 |
| Install permanent instrumentation, supply & technican | 0 | $ - | $ - | |
| Install permanent instrumentation, drilling | 0 | $ - | $ - | |
| Total | | | | $ 8,341,609.74 |

**Unit Rates Corrected**

| ACTIVITY/MATERIAL | Quantity | AANDC Unit Cost | AANDC Cost | SRK Cost | SRK Unit Cost | SRK Cost | |
|---|---|---|---|---|---|---|---|
| Fence | 0 | $ - | $ - | $ 238.00 | $ - | $ - | $ 173.24 |
| Signs | 0 | $ - | $ - | | $ - | $ - | |
| Berm | 0 | $ - | $ - | | $ - | $ - | |
| Block roads | 0 | $ - | $ - | | $ - | $ - | |
| Crown Access Roads | 0.2 | $ 1,190.00 | $ 238.00 | | $ 866.22 | $ 173.24 | |
| Breach North dam by cutting a 20 m slot down to original ground (drill and blast) | 7028 | $ 31.99 | $ 224,825.72 | $ 513,596.74 | $ 31.99 | $ 224,819.34 | $ 508,604.90 |
| Load and haul material | 31021.1 | $ 8.90 | $ 276,087.79 | | $ 8.82 | $ 273,741.63 | |
| Clad the cut core faces for thermal protection | 614.2 | $ 20.65 | $ 12,683.23 | | $ 16.35 | $ 10,043.94 | |
| Vegetate | 0 | $ - | $ - | | $ - | $ - | |
| Raise crest | 0 | $ - | $ - | | $ - | $ - | |
| Flatten slopes | 0 | $ - | $ - | | $ - | $ - | |
| Install separation geotextile | 54340 | $ 6.00 | $ 326,040.00 | $ 840,895.00 | $ 28.27 | $ 1,536,441.23 | $ 1,759,900.53 |
| Haul and place riprap to prevent erosion | 24700 | $ 20.65 | $ 510,055.00 | | $ 8.82 | $ 217,961.91 | |
| Recontour Interim Dyke Crest | 2000 | $ 2.40 | $ 4,800.00 | | $ 2.75 | $ 5,497.39 | |
| Grade/shape tailings surface | 0 | $ - | $ - | $ 6,974,880.00 | $ - | $ - | $ 6,381,139.98 |
| Liner bedding | 0 | $ - | $ - | | $ - | $ - | |
| Grade/shape tailings surface | 440000 | $ 1.35 | $ 594,000.00 | | $ - | $ - | |
| Supply geotextile/geosynthetic | 0 | $ - | $ - | | $ - | $ - | |
| Install geotextile/geosynthetic | 0 | $ - | $ - | | $ - | $ - | |
| Soil cover | 0 | $ - | $ - | | $ - | $ - | |
| Produce ROQ (quarry drill and blast | 132000 | $ 31.99 | $ 4,222,680.00 | | $ 31.99 | $ 4,222,560.08 | |
| LHDP ROQ (0.3m thick cover | 132000 | $ 16.35 | $ 2,158,200.00 | | $ 16.35 | $ 2,158,579.89 | |
| Vegetate | 0 | $ - | $ - | | $ - | $ - | |
| Other | 0 | $ - | $ - | | $ - | $ - | |
| Remove thermosyphons radiators and towers | 12 | $ 1,000.00 | $ 12,000.00 | $ 12,000.00 | $ 511.00 | $ 6,131.99 | $ 6,131.99 |
| Install permanent instrumentation, supply & technican | 0 | $ - | $ - | | $ - | $ - | |
| Install permanent instrumentation, drilling | 0 | $ - | $ - | | $ - | $ - | |
| Total | | | | $ 8,341,609.74 | | | $ 8,655,950.64 |

**Rock Pile Name:** Doris Windy Road / Secondary Road

| ACTIVITY/MATERIAL | Units | Quantity | Cost Code | Unit Cost | Cost | Errors Corrected: Quantity | Unit Cost | Cost | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ALL WEATHER ROAD | | | | | | | | | | |
| Remove bridges | each | 3 | RBRGL | $ 50,000.00 | $ 150,000.00 | 3 | $ 50,000.00 | $ 150,000.00 | $ 261,900.00 | |
| Remove Arched Culvert | each | 1 | RARCL | $ 100,000.00 | $ 100,000.00 | 1 | $ 100,000.00 | $ 100,000.00 | | |
| Crown road for positive drainage | km | 10 | CRWNL | $ 1,190.00 | $ 11,900.00 | 10 | $ 1,190.00 | $ 11,900.00 | | |
| QUARRY A | | | | | | | | | | |
| No decomm required | | | #N/A | $ - | $ - | 0 | $ - | $ - | $ - | |
| QUARRY B | | | | | | | | | | |
| No decomm required | | | #N/A | $ - | $ - | 0 | $ - | $ - | $ - | |
| QUARRY D | | | | | | | | | | |
| Scale vertical walls | | | #N/A | $ - | $ - | 0 | $ - | $ - | $ - | |
| EXPLOSIVES STORAGE FACILITY | | | | | | | | | | |
| Remove all explosive magazines | m3 | 66.4 | C305L | $ 19.00 | $ 1,262.00 | 66.4 | $ 19.00 | $ 1,261.60 | $ 4,431.15 | |
| Demolish entry gates | m3 | 0.5 | C305L | $ 19.00 | $ 10.00 | 0.5 | $ 19.00 | $ 9.50 | | |
| Load all debris for transport to landfill | m3 | 25.4 | C401L | $ 13.13 | $ 334.00 | 25.4 | $ 13.13 | $ 333.50 | | |
| Haul waste to the landfill | m3 | 25.4 | C414L | $ 6.34 | $ 161.00 | 25.4 | $ 6.34 | $ 161.04 | | |
| Regrade area for positive drainage | m3 | 2805.8 | DSL | $ 0.95 | $ 2,666.00 | 2805.8 | $ 0.95 | $ 2,665.51 | | |
| Secondary Road | | | | | | | | | | |
| Remove Doris Creek bridge | ls | 1 | RBRGL | $ 50,000.00 | $ 50,000.00 | 1 | $ 50,000.00 | $ 50,000.00 | $ 279,587.20 | |
| Cut tailings line running alongside the road into manageable pieces | m | 5750 | PLRL | $ 22.00 | $ 126,500.00 | 5750 | $ 22.00 | $ 126,500.00 | | |
| Strap together or load pipe sections in containers for transport to landfill | m3 | 2760 | C401L | $ 13.13 | $ 36,239.00 | 2760 | $ 13.13 | $ 36,238.80 | | |
| Haul waste to the landfill | m3 | 2760 | C404L | $ 6.34 | $ 17,498.00 | 2760 | $ 6.34 | $ 17,498.40 | | |
| Remove pipe culvert east of the bridge | lm | 18.8 | RCULL | $ 2,625.00 | $ 49,350.00 | 18.8 | $ 2,625.00 | $ 49,350.00 | | |
| Tailings Discharge And Reclaim Water Pipelines | | | | | | | | | | |
| Cut pipelines into manageable pieces | lm | 8125 | PLRL | $ 22.00 | $ 178,750.00 | 8125 | $ 22.00 | $ 178,750.00 | $ 188,004.91 | |
| Decommission electrical (heat tracing) | each | 4 | C105L | $ 640.00 | $ 2,560.00 | 4 | $ 640.00 | $ 2,560.00 | | |
| Collect electrical cables and controllers and prep for shipping off-site | m2 | 4062.5 | C310L | $ 0.18 | $ 731.00 | 4062.5 | $ 0.18 | $ 731.25 | | |
| Load debris for transport to landfill | m3 | 306.3 | C401L | $ 13.13 | $ 4,022.00 | 306.3 | $ 13.13 | $ 4,021.72 | | |
| Haul waste to the landfill | m3 | 306.3 | C404L | $ 6.34 | $ 1,942.00 | 306.3 | $ 6.34 | $ 1,941.94 | | |
| TIA Access Road (Chainage 0+725) | | | | | | | | | | |
| Crown road for positive drainage | km | 0.29 | CRWNL | $ 1,190.00 | $ 345.00 | 0.29 | $ 1,190.00 | $ 345.10 | $ 4,648.30 | |
| Remove floating dock and bridge | m3 | 132 | C401L | $ 13.13 | $ 1,733.00 | 132 | $ 13.13 | $ 1,733.16 | | |
| Load all debris to haul to Landfill | m3 | 132 | C401L | $ 13.13 | $ 1,733.00 | 132 | $ 13.13 | $ 1,733.16 | | |
| Haul waste to the landfill | m3 | 132 | C404L | $ 6.34 | $ 837.00 | 132 | $ 6.34 | $ 836.88 | | |
| Explosives Facility | | | | | | | | | | |
| Remove all explosive magazines | m3 | 265.6 | C305L | $ 19.00 | $ 5,046.00 | 265.6 | $ 19.00 | $ 5,046.40 | $ 45,009.33 | |
| Demolish entry gates | m3 | 0.5 | C305L | $ 19.00 | $ 10.00 | 0.5 | $ 19.00 | $ 9.50 | | |
| Remove and stockpile liner protection cover | m3 | 3031 | SB1L | $ 4.30 | $ 13,033.00 | 3031 | $ 4.30 | $ 13,033.30 | | |
| Clean liner | m2 | 4442 | C210L | $ 0.39 | $ 1,732.00 | 4442 | $ 0.39 | $ 1,732.38 | | |
| Remove and cut liner into manageable pieces | m2 | 4442 | C302L | $ 0.56 | $ 2,488.00 | 4442 | $ 0.56 | $ 2,487.52 | | |
| Load waste into containers for shipping off-site | m3 | 200 | C401L | $ 13.13 | $ 2,626.00 | 200 | $ 13.13 | $ 2,626.00 | | |
| Decommission electrical and heating from facilities | each | 2 | C105K | $ 640.00 | $ 1,280.00 | 2 | $ 640.00 | $ 1,280.00 | | |
| Demolish building (tent structure) | m3 | 430 | C305L | $ 19.00 | $ 8,170.00 | 430 | $ 19.00 | $ 8,170.00 | | |
| Disconnect containers and prep for shipping off-site | each | 2 | C108L | $ 1,325.00 | $ 2,650.00 | 2 | $ 1,325.00 | $ 2,650.00 | | |
| Load waste into containers for shipping off-site | m3 | 41.5 | C401L | $ 13.13 | $ 545.00 | 41.5 | $ 13.13 | $ 544.90 | | |
| Collect all debris | m2 | 18558 | C310L | $ 0.18 | $ 3,340.00 | 18558 | $ 0.18 | $ 3,340.44 | | |
| Load all waste and debris and waste into containers | m2 | 18558 | C310L | $ 0.18 | $ 3,340.00 | 3.71 | $ 13.13 | $ 48.71 | | This quantity and unit rate are obviously erroneous |
| Haul waste to lanfill | m3 | 245 | C404L | $ 6.34 | $ 1,553.00 | 245 | $ 6.34 | $ 1,553.30 | | |
| Regrade pad area for positive drainage | m2 | 18558 | C518L | $ 0.12 | $ 2,227.00 | 18558 | $ 0.12 | $ 2,226.96 | | |
| Recontour berms to blend in with topography | m2 | 2166 | C518L | $ 0.12 | $ 260.00 | 2166 | $ 0.12 | $ 259.92 | | |
| | | | | Total | $ 786,873.00 | | | | $ 783,580.89 | |

| ACTIVITY/MATERIAL | Assumptions Corrected: Quantity | Unit Cost | Cost | | Unit Rates Corrected: Quantity | AANDC Unit Cost | AANDC Cost | | SRK Unit Cost | SRK Cost | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Remove bridges | 3 | $ 50,000.00 | $ 150,000.00 | $ 261,900.00 | 3 | $ 50,000.00 | $ 150,000.00 | $ 261,900.00 | $ 50,000.00 | $ 150,000.00 | $ 258,662.20 | |
| Remove Arched Culvert | 1 | $ 100,000.00 | $ 100,000.00 | | 1 | $ 100,000.00 | $ 100,000.00 | | $ 100,000.00 | $ 100,000.00 | | |
| Crown road for positive drainage | 10 | $ 1,190.00 | $ 11,900.00 | | 10 | $ 1,190.00 | $ 11,900.00 | | $ 866.22 | $ 8,662.20 | | this rate has no backup |
| No decomm required (Quarry A) | 0 | $ - | $ - | $ - | 0 | $ - | $ - | $ - | $ - | $ - | $ - | |
| No decomm required (Quarry B) | 0 | $ - | $ - | $ - | 0 | $ - | $ - | $ - | $ - | $ - | $ - | |
| Scale vertical walls | 0 | $ - | $ - | $ - | 0 | $ - | $ - | $ - | $ - | $ - | $ - | |
| Remove all explosive magazines | 66.4 | $ 19.00 | $ 1,261.60 | $ 4,431.15 | 66.4 | $ 19.00 | $ 1,261.60 | $ 4,431.15 | $ 2.91 | $ 193.27 | $ 690.96 | this rate is inappropriate |
| Demolish entry gates | 0.5 | $ 19.00 | $ 9.50 | | 0.5 | $ 19.00 | $ 9.50 | | $ 12.90 | $ 6.45 | | |
| Load all debris for transport to landfill | 25.4 | $ 13.13 | $ 333.50 | | 25.4 | $ 13.13 | $ 333.50 | | $ 10.23 | $ 259.79 | | |
| Haul waste to the landfill | 25.4 | $ 6.34 | $ 161.04 | | 25.4 | $ 6.34 | $ 161.04 | | $ 8.02 | $ 203.73 | | |
| Regrade area for positive drainage | 2805.8 | $ 0.95 | $ 2,665.51 | | 2805.8 | $ 0.95 | $ 2,665.51 | | $ 0.01 | $ 27.72 | | |
| Remove Doris Creek bridge | 1 | $ 50,000.00 | $ 50,000.00 | $ 279,587.20 | 1 | $ 50,000.00 | $ 50,000.00 | $ 279,587.20 | $ 50,000.00 | $ 50,000.00 | $ 155,508.04 | |
| Cut tailings line running alongside the road into manageable pieces | 5750 | $ 22.00 | $ 126,500.00 | | 5750 | $ 22.00 | $ 126,500.00 | | $ 11.13 | $ 63,972.61 | | this rate is too high; what is the productivity? Needs backup info |
| Strap together or load pipe sections in containers for transport to landfill | 2760 | $ 13.13 | $ 36,238.80 | | 2760 | $ 13.13 | $ 36,238.80 | | $ 10.23 | $ 28,229.05 | | |
| Haul waste to the landfill | 2760 | $ 6.34 | $ 17,498.40 | | 2760 | $ 6.34 | $ 17,498.40 | | $ 4.17 | $ 11,520.70 | | |
| Remove pipe culvert east of the bridge | 18.8 | $ 2,625.00 | $ 49,350.00 | | 18.8 | $ 2,625.00 | $ 49,350.00 | | $ 94.98 | $ 1,785.68 | | |
| Cut pipelines into manageable pieces | 8125 | $ 22.00 | $ 178,750.00 | $ 188,004.91 | 8125 | $ 22.00 | $ 178,750.00 | $ 188,004.91 | $ 11.13 | $ 90,396.07 | $ 99,249.34 | this rate is too high; what is the productivity? Needs backup info |
| Decommission electrical (heat tracing) | 4 | $ 640.00 | $ 2,560.00 | | 4 | $ 640.00 | $ 2,560.00 | | $ 639.99 | $ 2,559.97 | | |
| Collect electrical cables and controllers and prep for shipping off-site | 4062.5 | $ 0.18 | $ 731.25 | | 4062.5 | $ 0.18 | $ 731.25 | | $ 0.17 | $ 703.64 | | |
| Load debris for transport to landfill | 306.3 | $ 13.13 | $ 4,021.72 | | 306.3 | $ 13.13 | $ 4,021.72 | | $ 10.23 | $ 3,132.81 | | |
| Haul waste to the landfill | 306.3 | $ 6.34 | $ 1,941.94 | | 306.3 | $ 6.34 | $ 1,941.94 | | $ 8.02 | $ 2,456.84 | | |
| Crown road for positive drainage | 0.29 | $ 1,190.00 | $ 345.10 | $ 4,648.30 | 0.29 | $ 1,190.00 | $ 345.10 | $ 4,648.30 | $ 866.22 | $ 251.20 | $ 3,205.06 | |
| Remove floating dock and bridge | 132 | $ 13.13 | $ 1,733.16 | | 132 | $ 13.13 | $ 1,733.16 | | $ 4.13 | $ 545.00 | | |
| Load all debris to haul to Landfill | 132 | $ 13.13 | $ 1,733.16 | | 132 | $ 13.13 | $ 1,733.16 | | $ 10.23 | $ 1,350.09 | | |
| Haul waste to the landfill | 132 | $ 6.34 | $ 836.88 | | 132 | $ 6.34 | $ 836.88 | | $ 8.02 | $ 1,058.78 | | |
| Remove all explosive magazines | 265.6 | $ 19.00 | $ 5,046.40 | $ 45,009.33 | 265.6 | $ 19.00 | $ 5,046.40 | $ 45,009.33 | $ 2.91 | $ 773.06 | $ 30,611.02 | this rate is inappropriate |
| Demolish entry gates | 0.5 | $ 19.00 | $ 9.50 | | 0.5 | $ 19.00 | $ 9.50 | | $ 12.90 | $ 6.45 | | |
| Remove and stockpile liner protection cover | 3031 | $ 4.30 | $ 13,033.30 | | 3031 | $ 4.30 | $ 13,033.30 | | $ 2.75 | $ 8,331.29 | | |
| Clean liner | 4442 | $ 0.39 | $ 1,732.38 | | 4442 | $ 0.39 | $ 1,732.38 | | $ 0.39 | $ 1,732.51 | | |
| Remove and cut liner into manageable pieces | 4442 | $ 0.56 | $ 2,487.52 | | 4442 | $ 0.56 | $ 2,487.52 | | $ 0.16 | $ 712.81 | | |
| Load waste into containers for shipping off-site | 200 | $ 13.13 | $ 2,626.00 | | 200 | $ 13.13 | $ 2,626.00 | | $ 10.23 | $ 2,045.58 | | |
| Decommission electrical and heating from facilities | 2 | $ 640.00 | $ 1,280.00 | | 2 | $ 640.00 | $ 1,280.00 | | $ 639.99 | $ 1,279.98 | | |
| Demolish building (tent structure) | 430 | $ 19.00 | $ 8,170.00 | | 430 | $ 19.00 | $ 8,170.00 | | $ 12.90 | $ 5,545.41 | | |
| Disconnect containers and prep for shipping off-site | 2 | $ 1,325.00 | $ 2,650.00 | | 2 | $ 1,325.00 | $ 2,650.00 | | $ 1,321.37 | $ 2,642.74 | | |
| Load waste into containers for shipping off-site | 41.5 | $ 13.13 | $ 544.90 | | 41.5 | $ 13.13 | $ 544.90 | | $ 10.23 | $ 424.46 | | |
| Collect all debris | 18558 | $ 0.18 | $ 3,340.44 | | 18558 | $ 0.18 | $ 3,340.44 | | $ 0.17 | $ 3,214.33 | | |
| Load all waste and debris and waste into containers | 3.71 | $ 13.13 | $ 48.71 | | 3.71 | $ 13.13 | $ 48.71 | | $ 10.23 | $ 37.95 | | |
| Haul waste to lanfill | 245 | $ 6.34 | $ 1,553.30 | | 245 | $ 6.34 | $ 1,553.30 | | $ 4.17 | $ 1,022.67 | | |
| Regrade pad area for positive drainage | 18558 | $ 0.12 | $ 2,226.96 | | 18558 | $ 0.12 | $ 2,226.96 | | $ 0.01 | $ 183.34 | | |
| Recontour berms to blend in with topography | 2166 | $ 0.12 | $ 259.92 | | 2166 | $ 0.12 | $ 259.92 | | $ 1.23 | $ 2,658.44 | | |
| | | | | $ 783,580.89 | | | | $ 783,580.89 | | | $ 547,926.62 | |

| ACTIVITY/MATERIAL | Units | Quantity | Cost Code | Unit Cost | Cost |
|---|---|---|---|---|---|
| ACCOMODATION COMPLEX | | | | | |
| Decommission (electrical, mechanical, plumbing) | each | 103 | C105L | $ 640.00 | $ 65,920.00 |
| Disconnect trailers and prep for moving (remove boards/piping, etc.; wrap in plastic) | each | 283 | C108L | $ 1,325.00 | $ 374,975.00 |
| Haul trailers to Roberts Bay for shipping off-site | m3 | 2756 | C404L | $ 6.34 | $ 17,473.00 |
| Demolish cabins | m3 | 319.1 | C305L | $ 19.00 | $ 6,063.00 |
| Demolish cribbing, stairs, entryways, etc. | m3 | 250.3 | C305L | $ 19.00 | $ 4,756.00 |
| Demolish arctic corridor | m3 | 132.5 | C305L | $ 19.00 | $ 2,518.00 |
| Collect all debris | m2 | 380.9 | C310L | $ 0.18 | $ 69.00 |
| Load waste for transport to Landfill | m3 | 623.1 | C401L | $ 13.13 | $ 8,181.00 |
| Haul waste to Landfill | m3 | 623.1 | C414L | $ 6.34 | $ 3,950.00 |
| Regrade area for positive drainage | m2 | 21050 | C518L | $ 0.12 | $ 2,526.00 |
| Regrade pad transitions to blend in with topography | m2 | 15200 | C505L | $ 1.58 | $ 24,016.00 |
| Regrade surface to prevent ponding | m2 | 152000 | C518L | $ 0.12 | $ 18,240.00 |
| TANK FARM | | | | | |
| Drain tanks into portable fuel storage (EnviroTanks) | each | 5 | C203L | $ 10,000.00 | $ 50,000.00 |
| Decommission Fuel Transfer Facilities | each | 5 | C102L | $ 550.00 | $ 2,750.00 |
| Wash tanks | m3 | 7.9 | C204L | $ 1,420.00 | $ 11,218.00 |
| Operate oil/water separator | each | 5 | C208L | $ 30.00 | $ 150.00 |
| Disconnect piping and controls | each | 5 | C102L | $ 550.00 | $ 2,750.00 |
| Dismantle tanks and cut into manageable pieces | each | 5 | CUT1L | $ 50,000.00 | $ 250,000.00 |
| Prepare pieces for transportation | each | 5 | C401L | $ 13.13 | $ 66.00 |
| Haul cut metal to landfill | m3 | 60 | C414L | $ 6.34 | $ 380.00 |
| Remove and stockpile liner protection cover | m3 | 3360 | SB1L | $ 4.30 | $ 14,448.00 |
| Load contained contaminated soils into megabags for shipping off-site | m3 | 50 | C412L | $ 100.25 | $ 5,013.00 |
| Haul contaminated material to Roberts Bay laydown | m3 | 62 | C404L | $ 6.34 | $ 393.00 |
| Clean liner | m2 | 5500 | C210L | $ 0.39 | $ 2,145.00 |
| Remove and cut geosynthetics into manageable pieces | m2 | 5500 | C302L | $ 0.56 | $ 3,080.00 |

**Errors Corrected**

| ACTIVITY/MATERIAL | Quantity | Unit Cost | Cost | | |
|---|---|---|---|---|---|
| ACCOMODATION COMPLEX | | | | | |
| Decommission (electrical, mechanical, plumbing) | 103 | $ 640.00 | $ 65,920.00 | $ 263,686.46 | |
| Disconnect trailers and prep for moving (remove boards/piping, etc.; wrap in plastic) | 83 | $ 1,325.00 | $ 109,975.00 | | counting error; maybe typo |
| Haul trailers to Roberts Bay for shipping off-site | 2756 | $ 6.34 | $ 17,473.04 | | |
| Demolish cabins | 319.1 | $ 19.00 | $ 6,062.90 | | |
| Demolish cribbing, stairs, entryways, etc. | 250.3 | $ 19.00 | $ 4,755.70 | | |
| Demolish arctic corridor | 132.5 | $ 19.00 | $ 2,517.50 | | |
| Collect all debris | 380.9 | $ 0.18 | $ 68.56 | | |
| Load waste for transport to Landfill | 623.1 | $ 13.13 | $ 8,181.30 | | |
| Haul waste to Landfill | 623.1 | $ 6.34 | $ 3,950.45 | | |
| Regrade area for positive drainage | 21050 | $ 0.12 | $ 2,526.00 | | |
| Regrade pad transitions to blend in with topography | 15200 | $ 1.58 | $ 24,016.00 | | |
| Regrade surface to prevent ponding | 152000 | $ 0.12 | $ 18,240.00 | | |
| TANK FARM | | | | | |
| Drain tanks into portable fuel storage (EnviroTanks) | 5 | $ 10,000.00 | $ 50,000.00 | $ 344,633.47 | 10K for draining a tank is too high; what does it include? It is used as a flat rate, no matter the size of the tank |
| Decommission Fuel Transfer Facilities | 5 | $ 550.00 | $ 2,750.00 | | |
| Wash tanks | 5 | $ 1,420.00 | $ 7,100.00 | | rows switched |
| Operate oil/water separator | 7.9 | $ 30.00 | $ 237.00 | | rows switched |
| Disconnect piping and controls | 5 | $ 550.00 | $ 2,750.00 | | |
| Dismantle tanks and cut into manageable pieces | 5 | $ 50,000.00 | $ 250,000.00 | | |
| Prepare pieces for transportation | 60 | $ 13.13 | $ 787.80 | | |
| Haul cut metal to landfill | 60 | $ 6.34 | $ 380.40 | | |
| Remove and stockpile liner protection cover | 3360 | $ 4.30 | $ 14,448.00 | | |
| Load contained contaminated soils into megabags for shipping off-site | 50 | $ 100.25 | $ 5,012.50 | | |
| Haul contaminated material to Roberts Bay laydown | 62 | $ 6.34 | $ 393.08 | | |
| Clean liner | 5500 | $ 0.39 | $ 2,145.00 | | |
| Remove and cut geosynthetics into manageable pieces | 5500 | $ 0.56 | $ 3,080.00 | | |

**Assumptions Corrected**

| ACTIVITY/MATERIAL | Quantity | Unit Cost | Cost | | |
|---|---|---|---|---|---|
| ACCOMODATION COMPLEX | | | | | |
| Decommission (electrical, mechanical, plumbing) | 103 | $ 640.00 | $ 65,920.00 | $ 263,686.46 | |
| Disconnect trailers and prep for moving (remove boards/piping, etc.; wrap in plastic) | 83 | $ 1,325.00 | $ 109,975.00 | | |
| Haul trailers to Roberts Bay for shipping off-site | 2756 | $ 6.34 | $ 17,473.04 | | |
| Demolish cabins | 319.1 | $ 19.00 | $ 6,062.90 | | |
| Demolish cribbing, stairs, entryways, etc. | 250.3 | $ 19.00 | $ 4,755.70 | | |
| Demolish arctic corridor | 132.5 | $ 19.00 | $ 2,517.50 | | |
| Collect all debris | 380.9 | $ 0.18 | $ 68.56 | | |
| Load waste for transport to Landfill | 623.1 | $ 13.13 | $ 8,181.30 | | |
| Haul waste to Landfill | 623.1 | $ 6.34 | $ 3,950.45 | | |
| Regrade area for positive drainage | 21050 | $ 0.12 | $ 2,526.00 | | |
| Regrade pad transitions to blend in with topography | 15200 | $ 1.58 | $ 24,016.00 | | |
| Regrade surface to prevent ponding | 152000 | $ 0.12 | $ 18,240.00 | | |
| TANK FARM | | | | | |
| Drain tanks into portable fuel storage (EnviroTanks) | 5 | $ 10,000.00 | $ 50,000.00 | $ 443,909.18 | |
| Decommission Fuel Transfer Facilities | 5 | $ 550.00 | $ 2,750.00 | | |
| Wash tanks | 5 | $ 1,420.00 | $ 7,100.00 | | |
| Operate oil/water separator | 7.9 | $ 30.00 | $ 237.00 | | |
| Disconnect piping and controls | 5 | $ 550.00 | $ 2,750.00 | | |
| Dismantle tanks and cut into manageable pieces | 7 | $ 50,000.00 | $ 350,000.00 | | the fire water and Boston water tanks must be included here |
| Prepare pieces for transportation | 22.8 | $ 13.13 | $ 299.36 | | these quantities are wrong for the units selected |
| Haul cut metal to landfill | 22.8 | $ 6.34 | $ 144.55 | | these quantities are wrong for the units selected |
| Remove and stockpile liner protection cover | 3360 | $ 4.30 | $ 14,448.00 | | |
| Load contained contaminated soils into megabags for shipping off-site | 50 | $ 100.25 | $ 5,012.50 | | |
| Haul contaminated material to Roberts Bay laydown | 62 | $ 6.34 | $ 393.08 | | |
| Clean liner | 5500 | $ 0.39 | $ 2,145.00 | | |
| Remove and cut geosynthetics into manageable pieces | 5500 | $ 0.56 | $ 3,080.00 | | |

**Unit Rates Corrected**

| ACTIVITY/MATERIAL | Quantity | AANDC Unit Cost | AANDC Cost | | SRK Unit Cost | SRK Cost | | |
|---|---|---|---|---|---|---|---|---|
| ACCOMODATION COMPLEX | | | | | | | | |
| Decommission (electrical, mechanical, plumbing) | 103 | $640.00 | $ 65,920.00 | $ 263,686.46 | $639.99 | $ 65,919.17 | $ 221,320.17 | |
| Disconnect trailers and prep for moving (remove boards/piping, etc.; wrap in plastic) | 83 | $1,325.00 | $ 109,975.00 | | $1,321.37 | $ 109,673.61 | | |
| Haul trailers to Roberts Bay for shipping off-site | 2756 | $6.34 | $ 17,473.04 | | $2.52 | $ 6,942.73 | | |
| Demolish cabins | 319.1 | $19.00 | $ 6,062.90 | | $12.90 | $ 4,115.21 | | |
| Demolish cribbing, stairs, entryways, etc. | 250.3 | $19.00 | $ 4,755.70 | | $12.90 | $ 3,227.94 | | |
| Demolish arctic corridor | 132.5 | $19.00 | $ 2,517.50 | | $12.90 | $ 1,708.76 | | |
| Collect all debris | 380.9 | $0.18 | $ 68.56 | | $0.17 | $ 65.97 | | |
| Load waste for transport to Landfill | 623.1 | $13.13 | $ 8,181.30 | | $10.23 | $ 6,373.01 | | |
| Haul waste to Landfill | 623.1 | $6.34 | $ 3,950.45 | | $4.70 | $ 2,928.38 | | |
| Regrade area for positive drainage | 21050 | $0.12 | $ 2,526.00 | | $0.01 | $ 207.96 | | |
| Regrade pad transitions to blend in with topography | 15200 | $1.58 | $ 24,016.00 | | $1.23 | $ 18,655.72 | | |
| Regrade surface to prevent ponding | 152000 | $0.12 | $ 18,240.00 | | $0.01 | $ 1,501.69 | | |
| TANK FARM | | | | | | | | |
| Drain tanks into portable fuel storage (EnviroTanks) | 5 | $10,000.00 | $ 50,000.00 | $ 443,909.18 | $256.75 | $ 1,283.76 | $ 381,791.75 | |
| Decommission Fuel Transfer Facilities | 5 | $550.00 | $ 2,750.00 | | $448.37 | $ 2,241.85 | | |
| Wash tanks | 5 | $1,420.00 | $ 7,100.00 | | $1,123.28 | $ 5,616.42 | | |
| Operate oil/water separator | 7.9 | $30.00 | $ 237.00 | | $31.00 | $ 244.90 | | |
| Disconnect piping and controls | 5 | $550.00 | $ 2,750.00 | | $448.37 | $ 2,241.86 | | |
| Dismantle tanks and cut into manageable pieces | 7 | $50,000.00 | $ 350,000.00 | | $50,000.00 | $ 350,000.00 | | |
| Prepare pieces for transportation | 22.8 | $13.13 | $ 299.36 | | $10.23 | $ 233.20 | | these quantities were wrong for the |
| Haul cut metal to landfill | 22.8 | $6.34 | $ 144.55 | | $4.70 | $ 107.15 | | |
| Remove and stockpile liner protection cover | 3360 | $4.30 | $ 14,448.00 | | $2.75 | $ 9,235.62 | | |
| Load contained contaminated soils into megabags for shipping off-site | 50 | $100.25 | $ 5,012.50 | | $70.75 | $ 3,537.45 | | |
| Haul contaminated material to Roberts Bay laydown | 62 | $6.34 | $ 393.08 | | $2.52 | $ 156.19 | | |
| Clean liner | 5500 | $0.39 | $ 2,145.00 | | $0.39 | $ 2,145.16 | | |
| Remove and cut geosynthetics into manageable pieces | 5500 | $0.56 | $ 3,080.00 | | $0.16 | $ 882.58 | | |

| ACTIVITY/MATERIAL | Units | Quantity | Cost Code | Unit Cost | Cost |
|---|---|---|---|---|---|
| Load waste into containers for transport to landfill | m3 | 176.6 | C401L | $ 13.13 | $ 2,319.00 |
| Haul waste to landfill | m3 | 176.6 | C414L | $ 6.34 | $ 1,120.00 |
| Level containment berms | m2 | 962 | C505L | $ 1.58 | $ 1,520.00 |
| Regrade area for positive drainage | m2 | 4927.7 | C518L | $ 0.12 | $ 591.00 |
| PERMANAENT POWER GENERATOR | | | | | |
| Decommission (electrical) | each | 8 | C106L | $ 750.00 | $ 6,000.00 |
| Disconnect containers and prep for shipping off-site | each | 8 | C108L | $ 1,325.00 | $ 10,600.00 |
| Haul containers to Roberts Bay laydown | m3 | 265.66 | C404L | $ 6.34 | $ 1,684.00 |
| Dismantle stacks | each | 2 | C313L | $ 20,000.00 | $ 40,000.00 |
| Prep stacks for shipping off-site | each | 2 | C312L | $ 1,500.00 | $ 3,000.00 |
| Haul stack sections to Roberts Bay laydown | m3 | 166 | C404L | $ 6.34 | $ 1,052.00 |
| Collect all debris | m2 | 2103 | C310L | $ 0.18 | $ 379.00 |
| Load waste for shipping to landfill | m3 | 2 | C401L | $ 13.13 | $ 26.00 |
| Haul waste to landfill | m3 | 2 | C414L | $ 6.34 | $ 13.00 |
| BACKUP POWER GENERATOR | | | | | |
| Decommission (electrical) | each | 4 | c105l | $ 640.00 | $ 2,560.00 |
| Disconnect generator units and prep for shipping off-site | each | 2 | c106l | $ 750.00 | $ 1,500.00 |
| Haul units to Roberts Bay laydown | m3 | 67.6 | C404L | $ 6.34 | $ 429.00 |
| Demolish tent housing structure | m3 | 94.1 | C305L | $ 19.00 | $ 1,788.00 |
| Collect all debris | m2 | 259.3 | C310L | $ 0.18 | $ 47.00 |
| Load waste for shipping to landfill | m3 | 122.4 | C401L | $ 13.13 | $ 1,607.00 |
| Haul waste to landfill | m3 | 122.4 | C414L | $ 6.34 | $ 776.00 |
| SEWAGE TREATMENT PLANT | | | | | |
| Flush and remove sewage plumbing, collect sewage sludge/waste water in 55 gallon drum | each | 9 | C206L | $ 657.86 | $ 5,921.00 |
| Decommission (electrical) 9.0 each | each | 9 | C105L | $ 640.00 | $ 5,760.00 |
| Disconnect containers and prep for shipping off-site | each | 9 | C108L | $ 1,325.00 | $ 11,925.00 |
| Haul containers to Roberts Bay laydown | m3 | 597.6 | C404L | $ 6.34 | $ 3,789.00 |
| Collect Debris | m2 | 29.8 | C310L | $ 0.18 | $ 5.00 |
| Load debris into containers for transport (to Roberts Bay) | m3 | 2.8 | C401L | $ 13.13 | $ 37.00 |
| Haul debris to Roberts Bay | m3 | 23.8 | C414L | $ 6.34 | $ 151.00 |
| FIRE WATER STORAGE TANK | | | | | |
| Decommission and disconnect electrical and plumbing | each | 3 | C105L | $ 640.00 | $ 1,920.00 |
| Disconnect and remove container housing the pumps and controls, and prep for shipping | each | 1 | C108L | $ 1,325.00 | $ 1,325.00 |

| ACTIVITY/MATERIAL | Errors Corrected Quantity | Unit Cost | Cost | | | Assumptions Corrected Quantity | Unit Cost | Cost | |
|---|---|---|---|---|---|---|---|---|---|
| Load waste into containers for transport to landfill | 176.6 | $ 13.13 | $ 2,318.76 | | | 176.6 | $ 13.13 | $ 2,318.76 | |
| Haul waste to landfill | 176.6 | $ 6.34 | $ 1,119.64 | | | 176.6 | $ 6.34 | $ 1,119.64 | |
| Level containment berms | 962 | $ 1.58 | $ 1,519.96 | | | 962 | $ 1.58 | $ 1,519.96 | |
| Regrade area for positive drainage | 4927.7 | $ 0.12 | $ 591.32 | | | 4927.7 | $ 0.12 | $ 591.32 | |
| PERMANAENT POWER GENERATOR | | | | | | | | | |
| Decommission (electrical) | 8 | $ 750.00 | $ 6,000.00 | $ 62,754.20 | | 8 | $ 750.00 | $ 6,000.00 | 62754.2044 |
| Disconnect containers and prep for shipping off-site | 8 | $ 1,325.00 | $ 10,600.00 | | | 8 | $ 1,325.00 | $ 10,600.00 | |
| Haul containers to Roberts Bay laydown | 265.66 | $ 6.34 | $ 1,684.28 | | | 265.66 | $ 6.34 | $ 1,684.28 | |
| Dismantle stacks | 2 | $ 20,000.00 | $ 40,000.00 | | | 2 | $ 20,000.00 | $ 40,000.00 | |
| Prep stacks for shipping off-site | 2 | $ 1,500.00 | $ 3,000.00 | | | 2 | $ 1,500.00 | $ 3,000.00 | |
| Haul stack sections to Roberts Bay laydown | 166 | $ 6.34 | $ 1,052.44 | | | 166 | $ 6.34 | $ 1,052.44 | |
| Collect all debris | 2103 | $ 0.18 | $ 378.54 | | | 2103 | $ 0.18 | $ 378.54 | |
| Load waste for shipping to landfill | 2 | $ 13.13 | $ 26.26 | | | 2 | $ 13.13 | $ 26.26 | |
| Haul waste to landfill | 2 | $ 6.34 | $ 12.68 | | | 2 | $ 6.34 | $ 12.68 | |
| BACKUP POWER GENERATOR | | | | | | | | | |
| Decommission (electrical) | 4 | $ 640.00 | $ 2,560.00 | $ 8,706.29 | | 4 | $ 640.00 | $ 2,560.00 | 8706.286 |
| Disconnect generator units and prep for shipping off-site | 2 | $ 750.00 | $ 1,500.00 | | | 2 | $ 750.00 | $ 1,500.00 | |
| Haul units to Roberts Bay laydown | 67.6 | $ 6.34 | $ 428.58 | | | 67.6 | $ 6.34 | $ 428.58 | |
| Demolish tent housing structure | 94.1 | $ 19.00 | $ 1,787.90 | | | 94.1 | $ 19.00 | $ 1,787.90 | |
| Collect all debris | 259.3 | $ 0.18 | $ 46.67 | | | 259.3 | $ 0.18 | $ 46.67 | |
| Load waste for shipping to landfill | 122.4 | $ 13.13 | $ 1,607.11 | | | 122.4 | $ 13.13 | $ 1,607.11 | |
| Haul waste to landfill | 122.4 | $ 6.34 | $ 776.02 | | | 122.4 | $ 6.34 | $ 776.02 | |
| SEWAGE TREATMENT PLANT | | | | | | | | | |
| Flush and remove sewage plumbing, collect sewage sludge/waste water in 55 gallon drum | 9 | $ 657.86 | $ 5,920.74 | $ 27,863.27 | | 9 | $ 657.86 | $ 5,920.74 | 27863.274 |
| Decommission (electrical) 9.0 each | 9 | $ 640.00 | $ 5,760.00 | | | 9 | $ 640.00 | $ 5,760.00 | |
| Disconnect containers and prep for shipping off-site | 9 | $ 1,325.00 | $ 11,925.00 | | | 9 | $ 1,325.00 | $ 11,925.00 | |
| Haul containers to Roberts Bay laydown | 597.6 | $ 6.34 | $ 3,788.78 | | | 597.6 | $ 6.34 | $ 3,788.78 | |
| Collect Debris | 29.8 | $ 0.18 | $ 5.36 | | | 29.8 | $ 0.18 | $ 5.36 | |
| Load debris into containers for transport (to Roberts Bay) | 23.8 | $ 13.13 | $ 312.49 | | typo (?) | 23.8 | $ 13.13 | $ 312.49 | |
| Haul debris to Roberts Bay | 23.8 | $ 6.34 | $ 150.89 | | | 23.8 | $ 6.34 | $ 150.89 | |
| FIRE WATER STORAGE TANK | | | | | | | | | |
| Decommission and disconnect electrical and plumbing | 3 | $ 640.00 | $ 1,920.00 | $ 42,347.69 | | 3 | $ 640.00 | $ 1,920.00 | 42347.691 |
| Disconnect and remove container housing the pumps and controls, and prep for shipping | 1 | $ 1,325.00 | $ 1,325.00 | | | 1 | $ 1,325.00 | $ 1,325.00 | |

| ACTIVITY/MATERIAL | Unit Rates Corrected Quantity | AANDC Unit Cost | AANDC Cost | | SRK Unit Cost | SRK Cost | | |
|---|---|---|---|---|---|---|---|---|
| Load waste into containers for transport to landfill | 176.6 | $13.13 | $ 2,318.76 | | $10.23 | $ 1,806.25 | | |
| Haul waste to landfill | 176.6 | $6.34 | $ 1,119.64 | | $4.70 | $ 829.97 | | |
| Level containment berms | 962 | $1.58 | $ 1,519.96 | | $1.23 | $ 1,180.71 | | |
| Regrade area for positive drainage | 4927.7 | $0.12 | $ 591.32 | | $0.01 | $ 48.68 | | |
| PERMANAENT POWER GENERATOR | | | | | | | | |
| Decommission (electrical) | 8 | $750.00 | $ 6,000.00 | $ 60,054.20 | $754.18 | $ 6,033.41 | $ 47,993.55 | |
| Disconnect containers and prep for shipping off-site | 8 | $1,325.00 | $ 10,600.00 | | $1,321.37 | $ 10,570.95 | | |
| Haul containers to Roberts Bay laydown | 265.66 | $6.34 | $ 1,684.28 | | $2.52 | $ 669.23 | | |
| Dismantle stacks | 40 | $20,000.00 | $ 40,000.00 | | $128.38 | $ 5,135.04 | | unit rate and quantities non-interchangeable |
| Prep stacks for shipping off-site | 40 | $1,500.00 | $ 300.00 | | $619.32 | $ 24,772.64 | | |
| Haul stack sections to Roberts Bay laydown | 166 | $6.34 | $ 1,052.44 | | $2.52 | $ 418.18 | | |
| Collect all debris | 2103 | $0.18 | $ 378.54 | | $0.17 | $ 364.25 | | |
| Load waste for shipping to landfill | 2 | $13.13 | $ 26.26 | | $10.23 | $ 20.46 | | |
| Haul waste to landfill | 2 | $6.34 | $ 12.68 | | $4.70 | $ 9.40 | | |
| BACKUP POWER GENERATOR | | | | | | | | |
| Decommission (electrical) | 4 | $640.00 | $ 2,560.00 | $ 8,706.29 | $639.99 | $ 2,559.97 | $ 7,324.21 | |
| Disconnect generator units and prep for shipping off-site | 2 | $750.00 | $ 1,500.00 | | $754.18 | $ 1,508.35 | | |
| Haul units to Roberts Bay laydown | 67.6 | $6.34 | $ 428.58 | | $2.52 | $ 170.29 | | |
| Demolish tent housing structure | 94.1 | $19.00 | $ 1,787.90 | | $12.90 | $ 1,213.54 | | |
| Collect all debris | 259.3 | $0.18 | $ 46.67 | | $0.17 | $ 44.91 | | |
| Load waste for shipping to landfill | 122.4 | $13.13 | $ 1,607.11 | | $10.23 | $ 1,251.90 | | |
| Haul waste to landfill | 122.4 | $6.34 | $ 776.02 | | $4.70 | $ 575.24 | | |
| SEWAGE TREATMENT PLANT | | | | | | | | |
| Flush and remove sewage plumbing, collect sewage sludge/waste water in 55 gallon drum | 9 | $657.86 | $ 5,920.74 | $ 27,863.27 | $657.86 | $ 5,920.78 | $ 25,438.89 | |
| Decommission (electrical) 9.0 each | 9 | $640.00 | $ 5,760.00 | | $639.99 | $ 5,759.93 | | |
| Disconnect containers and prep for shipping off-site | 9 | $1,325.00 | $ 11,925.00 | | $1,321.37 | $ 11,892.32 | | |
| Haul containers to Roberts Bay laydown | 597.6 | $6.34 | $ 3,788.78 | | $2.52 | $ 1,505.43 | | |
| Collect Debris | 29.8 | $0.18 | $ 5.36 | | $0.17 | $ 5.16 | | |
| Load debris into containers for transport (to Roberts Bay) | 23.8 | $13.13 | $ 312.49 | | $10.23 | $ 243.42 | | |
| Haul debris to Roberts Bay | 23.8 | $6.34 | $ 150.89 | | $4.70 | $ 111.85 | | |
| FIRE WATER STORAGE TANK | | | | | | | | |
| Decommission and disconnect electrical and plumbing | 3 | $640.00 | $ 1,920.00 | $ 42,347.69 | $1,288.18 | $ 3,864.54 | $ 44,714.10 | |
| Disconnect and remove container housing the pumps and controls, and prep for shipping | 1 | $1,325.00 | $ 1,325.00 | | $1,321.37 | $ 1,321.37 | | |

| ACTIVITY/MATERIAL | Units | Quantity | Cost Code | Unit Cost | Cost | Errors Corrected | | | | | Assumptions Corrected | | | | | Unit Rates Corrected | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Quantity | Unit Cost | Cost | | | Quantity | Unit Cost | Cost | | | Quantity | AANDC Unit Cost | AANDC Cost | | SRK Unit Cost | SRK Cost | |
| Haul container to Roberts Bay laydown | m3 | 33.2 | C404L | $ 6.34 | $ 210.00 | 33.2 | $ 6.34 | $ 210.49 | | | 33.2 | $ 6.34 | $ 210.49 | | | 33.2 | $6.34 | $ 210.49 | | $2.52 | $ 83.64 | |
| Remove tank insulation | m3 | 53 | C315L | $ 720.00 | $ 38,160.00 | 53 | $ 720.00 | $ 38,160.00 | | | 53 | $ 720.00 | $ 38,160.00 | | | 53 | $720.00 | $ 38,160.00 | | $720.03 | $ 38,161.68 | |
| Dismantle tanks and cut into manageable pieces (includes water tank for Boston) | m3 | 2.9 | C307L | $ 19.00 | $ 55.00 | 2.9 | $ 19.00 | $ 55.10 | | | 2.9 | $ 19.00 | $ 55.10 | | | 2.9 | $19.00 | $ 55.10 | | $265.78 | $ 770.76 | |
| Prepare pieces for transportation (includes water tank for Boston) | m3 | 2.9 | C401L | $ 13.13 | $ 38.00 | 4.4 | $ 13.13 | $ 57.77 | | one row skipped from original | 4.4 | $ 13.13 | $ 57.77 | | | 4.4 | $13.13 | $ 57.77 | | $10.23 | $ 45.00 | |
| Haul cut metal to Roberts Bay laydown (includes water tank for Boston) | m3 | 4.4 | C404L | $ 6.34 | $ 28.00 | 4.4 | $ 6.34 | $ 27.90 | | one row skipped from original | 4.4 | $ 6.34 | $ 27.90 | | | 4.4 | $6.34 | $ 27.90 | | $2.52 | $ 11.08 | |
| Collect Debris | m3 | 4.4 | C310L | $ 0.18 | $ 1.00 | 73.2 | $ 0.18 | $ 13.18 | | one row skipped from original | 73.2 | $ 0.18 | $ 13.18 | | | 73.2 | $0.18 | $ 13.18 | | $0.17 | $ 12.68 | |
| Load debris for transport Landfill | m2 | 73.2 | C401L | $ 13.13 | $ 961.00 | 29.7 | $ 13.13 | $ 389.96 | | one row skipped from original | 29.7 | $ 13.13 | $ 389.96 | | | 29.7 | $13.13 | $ 389.96 | | $10.23 | $ 303.77 | |
| Haul debris to landfill | m3 | 29.7 | C404L | $ 6.34 | $ 188.00 | 29.7 | $ 6.34 | $ 188.30 | | one row skipped from original | 29.7 | $ 6.34 | $ 188.30 | | | 29.7 | $6.34 | $ 188.30 | | $4.70 | $ 139.58 | |
| Muster Station | | | | | | | | | | | | | | | | | | | | | | |
| Demolish tent structure | m3 | 227.3 | C305L | $ 19.00 | $ 4,319.00 | 227.3 | $ 19.00 | $ 4,318.70 | $ 5,395.20 | | 227.3 | $ 19.00 | $ 4,318.70 | 5395.198 | | 227.3 | $19.00 | $ 4,318.70 | $ 5,395.20 | $12.90 | $ 2,931.33 | $ 3,936.55 |
| Dismantle wood flooring | m3 | 27.3 | C305L | $ 19.00 | $ 519.00 | 27.3 | $ 19.00 | $ 518.70 | | | 27.3 | $ 19.00 | $ 518.70 | | | 27.3 | $19.00 | $ 518.70 | | $12.90 | $ 352.07 | |
| Collect Debris | m2 | 90.9 | C310L | $ 0.18 | $ 16.00 | 90.9 | $ 0.18 | $ 16.36 | | | 90.9 | $ 0.18 | $ 16.36 | | | 90.9 | $0.18 | $ 16.36 | | $0.17 | $ 15.74 | |
| Load debris for transport to landfill | m3 | 42.7 | C404L | $ 6.34 | $ 271.00 | 42.7 | $ 6.34 | $ 270.72 | | | 42.7 | $ 6.34 | $ 270.72 | | | 42.7 | $6.34 | $ 270.72 | | $10.23 | $ 436.73 | |
| Haul Debris to landfill | m3 | 42.7 | C414L | $ 6.34 | $ 271.00 | 42.7 | $ 6.34 | $ 270.72 | | | 42.7 | $ 6.34 | $ 270.72 | | | 42.7 | $6.34 | $ 270.72 | | $4.70 | $ 200.68 | |
| WAREHOUSE / CORE SHACK | | | | | | | | | | | | | | | | | | | | | | |
| Demolish tent structure | m3 | 269.5 | C305L | $ 19.00 | $ 5,125.00 | 269.5 | $ 19.00 | $ 5,120.50 | $ 20,659.97 | | 269.5 | $ 19.00 | $ 5,120.50 | $ 20,659.97 | | 269.5 | $19.00 | $ 5,120.50 | $ 20,659.97 | $12.90 | $ 3,475.55 | $ 13,237.96 |
| Dismantle wood flooring, shelving, and lofts | m3 | 186.2 | C305L | $ 19.00 | $ 3,538.00 | 186.2 | $ 19.00 | $ 3,537.80 | | | 186.2 | $ 19.00 | $ 3,537.80 | | | 186.2 | $19.00 | $ 3,537.80 | | $12.90 | $ 2,401.29 | |
| Collect Debris | m2 | 720.1 | C310L | $ 0.18 | $ 130.00 | 720.1 | $ 0.18 | $ 129.62 | | | 720.1 | $ 0.18 | $ 129.62 | | | 720.1 | $0.18 | $ 129.62 | | $0.17 | $ 124.72 | |
| Load debris for transport to landfill | m3 | 350.3 | C401L | $ 13.13 | $ 4,599.00 | 350.3 | $ 13.13 | $ 4,599.44 | | | 350.3 | $ 13.13 | $ 4,599.44 | | | 350.3 | $13.13 | $ 4,599.44 | | $10.23 | $ 3,582.84 | |
| Haul debris to landfill | m3 | 350.3 | C414L | $ 6.34 | $ 2,221.00 | 350.3 | $ 6.34 | $ 2,220.90 | | | 350.3 | $ 6.34 | $ 2,220.90 | | | 350.3 | $6.34 | $ 2,220.90 | | $4.70 | $ 1,646.30 | |
| Haul all warehouse containers to Roberts Bay | m3 | 796.8 | C404L | $ 6.34 | $ 5,052.00 | 796.8 | $ 6.34 | $ 5,051.71 | | | 796.8 | $ 6.34 | $ 5,051.71 | | | 796.8 | $6.34 | $ 5,051.71 | | $2.52 | $ 2,007.25 | |
| OFFICE & MINE DRY COMPLEX | | | | | | | | | | | | | | | | | | | | | | |
| Decommission (electrical, mechanical, plumbing) | each | 3 | C105L | $ 640.00 | $ 1,920.00 | 3 | $ 640.00 | $ 1,920.00 | $ 97,447.90 | | 3 | $ 640.00 | $ 1,920.00 | 97624.844 | | 3 | $640.00 | $ 1,920.00 | $ 97,624.84 | $639.99 | $ 1,919.98 | $ 76,635.95 |
| Disconnect trailers and prep for moving (remove boards, cladding, etc.; wrap in plastic) | each | 17 | C108L | $ 1,325.00 | $ 22,525.00 | 17 | $ 1,325.00 | $ 22,525.00 | | | 17 | $ 1,325.00 | $ 22,525.00 | | | 17 | $1,325.00 | $ 22,525.00 | | $1,321.37 | $ 22,463.27 | |
| Haul trailers to Roberts Bay for shipping off-site | m3 | 564.4 | C404L | $ 6.34 | $ 3,578.00 | 564.4 | $ 6.34 | $ 3,578.30 | | | 564.4 | $ 6.34 | $ 3,578.30 | | | 564.4 | $6.34 | $ 3,578.30 | | $2.52 | $ 1,421.80 | |
| Demolish arctic corridor | m3 | 219.5 | C305L | $ 19.00 | $ 4,171.00 | 219.5 | $ 19.00 | $ 4,170.50 | | | 219.5 | $ 19.00 | $ 4,170.50 | | | 219.5 | $19.00 | $ 4,170.50 | | $12.90 | $ 2,830.74 | |
| Demolish cribbing, stairs, entryways, etc. | m3 | 998.2 | C305L | $ 19.00 | $ 18,966.00 | 998.2 | $ 19.00 | $ 18,965.80 | | | 998.2 | $ 19.00 | $ 18,965.80 | | | 998.2 | $19.00 | $ 18,965.80 | | $12.90 | $ 12,873.09 | |
| Collect all debris | m3 | 998.2 | C310L | $ 0.18 | $ 180.00 | 998.2 | $ 0.18 | $ 179.68 | | | 1981.2 | $ 0.18 | $ 356.62 | | this unit rate is for collecting loose debris from pad surface; quantity corrected to reflect this | 1981.2 | $0.18 | $ 356.62 | | $0.17 | $ 343.15 | |
| Load debris for transport to landfill | m3 | 2325.6 | C401L | $ 13.13 | $ 30,535.00 | 2325.6 | $ 13.13 | $ 30,535.13 | | | 2325.6 | $ 13.13 | $ 30,535.13 | | | 2325.6 | $13.13 | $ 30,535.13 | | $10.23 | $ 23,786.04 | |
| Haul debris to landfill | m3 | 2325.6 | C414L | $ 6.34 | $ 14,744.00 | 2325.6 | $ 6.34 | $ 14,744.30 | | | 2325.6 | $ 6.34 | $ 14,744.30 | | | 2325.6 | $6.34 | $ 14,744.30 | | $4.70 | $ 10,929.62 | |
| Regrade area for positive drainage | m2 | 6910 | C518L | $ 0.12 | $ 829.00 | 6910 | $ 0.12 | $ 829.20 | | | 6910 | $ 0.12 | $ 829.20 | | | 6910 | $0.12 | $ 829.20 | | $0.01 | $ 68.27 | |
| CRUSHING, MILLING & PROCESSING PLANT | | | | | | | | | | | | | | | | | | | | | | |
| Decommission crusher, milling, and process plants | each | 1 | PLNT1L | $ 150,000.00 | $ 150,000.00 | 1 | $ 150,000.00 | $ 150,000.00 | $ 2,834,547.27 | | 1 | $ 150,000.00 | $ 150,000.00 | 2834547.268 | | 1 | $150,000.00 | $ 150,000.00 | $ 2,834,547.27 | $100,000.00 | $ 100,000.00 | $ 2,031,638.40 |
| Drain chemicals and reagents into containers for shipping off site | m3 | 8.3 | c208al | $ 100.00 | $ 830.00 | 8.3 | $ 100.00 | $ 830.00 | | | 8.3 | $ 100.00 | $ 830.00 | | | 8.3 | $100.00 | $ 830.00 | | $2,628.20 | $ 21,814.09 | |
| Disassemble equipment | each | 1 | PLNT2L | $ 200,000.00 | $ 200,000.00 | 1 | $ 200,000.00 | $ 200,000.00 | | | 1 | $ 200,000.00 | $ 200,000.00 | | | 1 | $200,000.00 | $ 200,000.00 | | $200,000.00 | $ 200,000.00 | |
| Prepare equipment for shipping off-site | each | 1 | PLNT3L | $ 50,000.00 | $ 50,000.00 | 1 | $ 50,000.00 | $ 50,000.00 | | | 1 | $ 50,000.00 | $ 50,000.00 | | | 1 | $50,000.00 | $ 50,000.00 | | $50,000.00 | $ 50,000.00 | |
| Demolish / dismantle mill building | m3 | 123515 | C305L | $ 19.00 | $ 2,346,785.00 | 123515 | $ 19.00 | $ 2,346,785.00 | | | 123515 | $ 19.00 | $ 2,346,785.00 | | | 123515 | $19.00 | $ 2,346,785.00 | | $12.90 | $ 1,592,886.70 | |
| Collect Debris | m2 | 8700 | C310L | $ 0.18 | $ 1,566.00 | 8700 | $ 0.18 | $ 1,566.00 | | | 8700 | $ 0.18 | $ 1,566.00 | | | 8700 | $0.18 | $ 1,566.00 | | $0.17 | $ 1,506.88 | |
| Load waste for transport to Landfill | m3 | 4381.8 | C401L | $ 13.13 | $ 57,533.00 | 4381.8 | $ 13.13 | $ 57,533.03 | | | 4381.8 | $ 13.13 | $ 57,533.03 | | | 4381.8 | $13.13 | $ 57,533.03 | | $10.23 | $ 44,816.69 | |
| Haul debris to landfill | m3 | 4381.8 | C414L | $ 6.34 | $ 27,781.00 | 4381.8 | $ 6.34 | $ 27,780.61 | | | 4381.8 | $ 6.34 | $ 27,780.61 | | | 4381.8 | $6.34 | $ 27,780.61 | | $4.70 | $ 20,593.13 | |
| Rransport drums to Roberts Bay | m3 | 8.3 | C404L | $ 6.34 | $ 53.00 | 8.3 | $ 6.34 | $ 52.62 | | | 8.3 | $ 6.34 | $ 52.62 | | | 8.3 | $6.34 | $ 52.62 | | $2.52 | $ 20.92 | |
| UNDERGROUND WASHBAY | | | 0.74 | | | | | | | | | | | | | | | | | | | |
| Demolish tent structure | m3 | 776.9 | C305L | $ 19.00 | $ 14,761.00 | 776.9 | $ 19.00 | $ 14,761.10 | $ 15,090.86 | | 776.9 | $ 19.00 | $ 14,761.10 | 15090.857 | | 776.9 | $19.00 | $ 14,761.10 | $ 15,090.86 | $12.90 | $ 10,019.14 | $ 10,277.43 |
| Collect Debris | m2 | 155.4 | C310L | $ 0.18 | $ 28.00 | 155.4 | $ 0.18 | $ 27.97 | | | 155.4 | $ 0.18 | $ 27.97 | | | 155.4 | $0.18 | $ 27.97 | | $0.17 | $ 26.92 | |
| Load debris for transport to landfill | m3 | 15.5 | C401L | $ 13.13 | $ 204.00 | 15.5 | $ 13.13 | $ 203.52 | | | 15.5 | $ 13.13 | $ 203.52 | | | 15.5 | $13.13 | $ 203.52 | | $10.23 | $ 158.53 | |
| Haul debris to landfill | m3 | 15.5 | C414L | $ 6.34 | $ 98.00 | 15.5 | $ 6.34 | $ 98.27 | | | 15.5 | $ 6.34 | $ 98.27 | | | 15.5 | $6.34 | $ 98.27 | | $4.70 | $ 72.85 | |
| UNDERGROUND DRILLING SUPPORT SHOP | | | | | | | | | | | | | | | | | | | | | | |
| Demolish tent structure | m3 | 859.2 | C305L | $ 19.00 | $ 16,325.00 | 859.2 | $ 19.00 | $ 16,324.80 | $ 16,710.66 | | 859.2 | $ 19.00 | $ 16,324.80 | 16710.657 | | 859.2 | $19.00 | $ 16,324.80 | $ 16,710.66 | $12.90 | $ 11,080.50 | $ 11,384.40 |
| Collect Debris | m2 | 229.1 | C310L | $ 0.18 | $ 41.00 | 229.1 | $ 0.18 | $ 41.24 | | | 229.1 | $ 0.18 | $ 41.24 | | | 229.1 | $0.18 | $ 41.24 | | $0.17 | $ 39.68 | |
| Load debris for transport to landfill | m3 | 17.7 | C401L | $ 13.13 | $ 232.00 | 17.7 | $ 13.13 | $ 232.40 | | | 17.7 | $ 13.13 | $ 232.40 | | | 17.7 | $13.13 | $ 232.40 | | $10.23 | $ 181.03 | |
| Haul debris to landfill | m3 | 17.7 | C414L | $ 6.34 | $ 112.00 | 17.7 | $ 6.34 | $ 112.22 | | | 17.7 | $ 6.34 | $ 112.22 | | | 17.7 | $6.34 | $ 112.22 | | $4.70 | $ 83.18 | |
| WATER INTAKE STRUCTURE AND PUMPING FACILITY | | | | | | | | | | | | | | | | | | | | | | |

| ACTIVITY/MATERIAL | Units | Quantity | Cost Code | Unit Cost | Cost |
|---|---|---|---|---|---|
| Remove water intake line from Doris Lake | lm | 25 | PLRH | $ 72.00 | $ 1,800.00 |
| Decommission pumping facility (remove electrical) | each | 2 | C105L | $ 640.00 | $ 1,280.00 |
| Prep containers for shipping off-site | each | 2 | C108L | $ 1,325.00 | $ 2,650.00 |
| Disconnect and remove generator fuel tank (place in Doris tank farm for cleaning) | each | 1 | C105L | $ 640.00 | $ 640.00 |
| Clean TidyTank and prep for shipping off-site | each | 1 | C204L | $ 1,420.00 | $ 1,420.00 |
| Run oil-water separator | m3 | 3 | C208L | $ 30.00 | $ 90.00 |
| Prep generator container for shipping off-site | each | 1 | C108L | $ 1,325.00 | $ 1,325.00 |
| Haul containers to Roberts Bay laydown | m3 | 66.4 | C404L | $ 6.34 | $ 421.00 |
| Collect Debris | m2 | 2226.2 | C310L | $ 0.18 | $ 401.00 |
| Load debris for transport to landfill | m3 | 20 | C401L | $ 13.13 | $ 263.00 |
| Haul debris to landfill | m3 | 20 | C414L | $ 6.34 | $ 127.00 |
| SEDIMENTATION / POLLUTION CONTROL POND | | | | | |
| Disconnect piping and electrical wiring, remove sump pumps | each | 2 | C105L | $ 640.00 | $ 1,280.00 |
| Remove and cut liner into manageable pieces (Sedimentation Pond only) | m2 | 14110 | C302L | $ 0.56 | $ 7,902.00 |
| Load waste for transport to Landfill | m3 | 42.3 | C401L | $ 13.13 | $ 555.00 |
| Haul Debris to landfill | m3 | 42.3 | C414L | $ 6.34 | $ 268.00 |
| Breach Pollution Control pond and Sedimentation Pond containment berms | m3 | 2608.2 | SB1L | $ 4.30 | $ 11,215.00 |
| Rip-rap breach for erosion protection | m3 | 13.8 | RR1L | $ 13.50 | $ 186.00 |
| UNDERGROUND SUPPORT MECHANICAL SHOP | | | | | |
| Decommission electrical, mechanical (including connections to generator house & transf | each | 3 | C105L | $ 640.00 | $ 1,920.00 |
| Demolish building | m3 | 2281.6 | C305L | $ 19.00 | $ 43,350.00 |
| Collect Debris | m2 | 456.3 | C310L | $ 0.18 | $ 82.00 |
| Load waste for transport to Landfill | m3 | 504.5 | C401L | $ 13.13 | $ 6,624.00 |
| Haul debris to landfill | m3 | 504.5 | C414L | $ 6.34 | $ 3,199.00 |
| Load hazardous waste into container for transport off site | m3 | 33.2 | C401L | $ 13.13 | $ 436.00 |
| Haul Waste container to Roberts Bay | m3 | 33.2 | C414L | $ 6.34 | $ 210.00 |
| FRESH WATER PIPELINES | | | | | |
| Cut pipelines into manageable pieces | lm | 830 | PLRL | $ 22.00 | $ 18,260.00 |
| Decommission electrical (heat tracing) | each | 4 | C105L | $ 640.00 | $ 2,560.00 |
| Collect electrical cables and controllers and prep for shipping off-site | m2 | 1600 | C310L | $ 0.18 | $ 288.00 |
| Load debris for transport to landfill | m3 | 28.2 | C404L | $ 6.34 | $ 179.00 |
| Haul debris to landfill | m3 | 28.2 | C414L | $ 6.34 | $ 179.00 |
| HELECOPTER SUPPORT FACILITIES | | | | | |
| Dismantle helicopter pads and walkway | m3 | 15 | C305L | $ 19.00 | $ 285.00 |
| Demolish helishack | m3 | 27.9 | C305L | $ 19.00 | $ 530.00 |
| Demolish washcar and other facilities | m3 | 81.8 | C305L | $ 19.00 | $ 1,554.00 |
| Collect Debris | m2 | 154.2 | C310L | $ 0.18 | $ 28.00 |
| Load debris for transport to landfill | m3 | 234.4 | C401L | $ 13.13 | $ 3,078.00 |
| Haul debris to landfill | m3 | 234.4 | C414L | $ 6.34 | $ 1,486.00 |
| Regrade surface for positive drainage | m2 | 1582.4 | C518L | $ 0.12 | $ 190.00 |
| WASTE ROCK PAD | | | | | |
| No decomm required | m2 | 11500 | #N/A | $ - | $ - |

**Errors Corrected**

| ACTIVITY/MATERIAL | Quantity | Unit Cost | Cost | |
|---|---|---|---|---|
| Remove water intake line from Doris Lake | 25 | $ 72.00 | $ 1,800.00 | $ 10,416.09 |
| Decommission pumping facility (remove electrical) | 2 | $ 640.00 | $ 1,280.00 | |
| Prep containers for shipping off-site | 2 | $ 1,325.00 | $ 2,650.00 | |
| Disconnect and remove generator fuel tank (place in Doris tank farm for cleaning) | 1 | $ 640.00 | $ 640.00 | |
| Clean TidyTank and prep for shipping off-site | 1 | $ 1,420.00 | $ 1,420.00 | |
| Run oil-water separator | 3 | $ 30.00 | $ 90.00 | |
| Prep generator container for shipping off-site | 1 | $ 1,325.00 | $ 1,325.00 | |
| Haul containers to Roberts Bay laydown | 66.4 | $ 6.34 | $ 420.98 | |
| Collect Debris | 2226.2 | $ 0.18 | $ 400.72 | |
| Load debris for transport to landfill | 20 | $ 13.13 | $ 262.60 | |
| Haul debris to landfill | 20 | $ 6.34 | $ 126.80 | |
| SEDIMENTATION / POLLUTION CONTROL POND | | | | |
| Disconnect piping and electrical wiring, remove sump pumps | 2 | $ 640.00 | $ 1,280.00 | $ 21,406.74 |
| Remove and cut liner into manageable pieces (Sedimentation Pond only) | 14110 | $ 0.56 | $ 7,901.60 | |
| Load waste for transport to Landfill | 42.3 | $ 13.13 | $ 555.40 | |
| Haul Debris to landfill | 42.3 | $ 6.34 | $ 268.18 | |
| Breach Pollution Control pond and Sedimentation Pond containment berms | 2608.2 | $ 4.30 | $ 11,215.26 | |
| Rip-rap breach for erosion protection | 13.8 | $ 13.50 | $ 186.30 | |
| UNDERGROUND SUPPORT MECHANICAL SHOP | | | | |
| Decommission electrical, mechanical (including connections to generator house & transf | 3 | $ 640.00 | $ 1,920.00 | $ 55,821.55 |
| Demolish building | 2281.6 | $ 19.00 | $ 43,350.40 | |
| Collect Debris | 456.3 | $ 0.18 | $ 82.13 | |
| Load waste for transport to Landfill | 504.5 | $ 13.13 | $ 6,624.09 | |
| Haul debris to landfill | 504.5 | $ 6.34 | $ 3,198.53 | |
| Load hazardous waste into container for transport off site | 33.2 | $ 13.13 | $ 435.92 | |
| Haul Waste container to Roberts Bay | 33.2 | $ 6.34 | $ 210.49 | |
| FRESH WATER PIPELINES | | | | |
| Cut pipelines into manageable pieces | 830 | $ 22.00 | $ 18,260.00 | $ 21,465.58 |
| Decommission electrical (heat tracing) | 4 | $ 640.00 | $ 2,560.00 | |
| Collect electrical cables and controllers and prep for shipping off-site | 1600 | $ 0.18 | $ 288.00 | |
| Load debris for transport to landfill | 28.2 | $ 6.34 | $ 178.79 | |
| Haul debris to landfill | 28.2 | $ 6.34 | $ 178.79 | |
| HELECOPTER SUPPORT FACILITIES | | | | |
| Dismantle helicopter pads and walkway | 15 | $ 19.00 | $ 285.00 | $ 7,150.71 |
| Demolish helishack | 27.9 | $ 19.00 | $ 530.10 | |
| Demolish washcar and other facilities | 81.8 | $ 19.00 | $ 1,554.20 | |
| Collect Debris | 154.2 | $ 0.18 | $ 27.76 | |
| Load debris for transport to landfill | 234.4 | $ 13.13 | $ 3,077.67 | |
| Haul debris to landfill | 234.4 | $ 6.34 | $ 1,486.10 | |
| Regrade surface for positive drainage | 1582.4 | $ 0.12 | $ 189.89 | |
| WASTE ROCK PAD | | | | |
| No decomm required | 11500 | $ - | $ - | $ - |

**Assumptions Corrected**

| ACTIVITY/MATERIAL | Quantity | Unit Cost | Cost | | |
|---|---|---|---|---|---|
| Remove water intake line from Doris Lake | 25 | $ 72.00 | $ 1,800.00 | 10416.092 | |
| Decommission pumping facility (remove electrical) | 2 | $ 640.00 | $ 1,280.00 | | |
| Prep containers for shipping off-site | 2 | $ 1,325.00 | $ 2,650.00 | | |
| Disconnect and remove generator fuel tank (place in Doris tank farm for cleaning) | 1 | $ 640.00 | $ 640.00 | | |
| Clean TidyTank and prep for shipping off-site | 1 | $ 1,420.00 | $ 1,420.00 | | |
| Run oil-water separator | 3 | $ 30.00 | $ 90.00 | | |
| Prep generator container for shipping off-site | 1 | $ 1,325.00 | $ 1,325.00 | | |
| Haul containers to Roberts Bay laydown | 66.4 | $ 6.34 | $ 420.98 | | |
| Collect Debris | 2226.2 | $ 0.18 | $ 400.72 | | |
| Load debris for transport to landfill | 20 | $ 13.13 | $ 262.60 | | |
| Haul debris to landfill | 20 | $ 6.34 | $ 126.80 | | |
| SEDIMENTATION / POLLUTION CONTROL POND | | | | | |
| Disconnect piping and electrical wiring, remove sump pumps | 2 | $ 640.00 | $ 1,280.00 | 21406.741 | |
| Remove and cut liner into manageable pieces (Sedimentation Pond only) | 14110 | $ 0.56 | $ 7,901.60 | | |
| Load waste for transport to Landfill | 42.3 | $ 13.13 | $ 555.40 | | |
| Haul Debris to landfill | 42.3 | $ 6.34 | $ 268.18 | | |
| Breach Pollution Control pond and Sedimentation Pond containment berms | 2608.2 | $ 4.30 | $ 11,215.26 | | local excavation, rate too high |
| Rip-rap breach for erosion protection | 13.8 | $ 13.50 | $ 186.30 | | |
| UNDERGROUND SUPPORT MECHANICAL SHOP | | | | | |
| Decommission electrical, mechanical (including connections to generator house & transf | 3 | $ 640.00 | $ 1,920.00 | 55821.553 | |
| Demolish building | 2281.6 | $ 19.00 | $ 43,350.40 | | |
| Collect Debris | 456.3 | $ 0.18 | $ 82.13 | | |
| Load waste for transport to Landfill | 504.5 | $ 13.13 | $ 6,624.09 | | |
| Haul debris to landfill | 504.5 | $ 6.34 | $ 3,198.53 | | |
| Load hazardous waste into container for transport off site | 33.2 | $ 13.13 | $ 435.92 | | |
| Haul Waste container to Roberts Bay | 33.2 | $ 6.34 | $ 210.49 | | |
| FRESH WATER PIPELINES | | | | | |
| Cut pipelines into manageable pieces | 830 | $ 22.00 | $ 18,260.00 | 21465.576 | |
| Decommission electrical (heat tracing) | 4 | $ 640.00 | $ 2,560.00 | | |
| Collect electrical cables and controllers and prep for shipping off-site | 1600 | $ 0.18 | $ 288.00 | | |
| Load debris for transport to landfill | 28.2 | $ 6.34 | $ 178.79 | | |
| Haul debris to landfill | 28.2 | $ 6.34 | $ 178.79 | | |
| HELECOPTER SUPPORT FACILITIES | | | | | |
| Dismantle helicopter pads and walkway | 15 | $ 19.00 | $ 285.00 | 7150.712 | |
| Demolish helishack | 27.9 | $ 19.00 | $ 530.10 | | |
| Demolish washcar and other facilities | 81.8 | $ 19.00 | $ 1,554.20 | | |
| Collect Debris | 154.2 | $ 0.18 | $ 27.76 | | |
| Load debris for transport to landfill | 234.4 | $ 13.13 | $ 3,077.67 | | |
| Haul debris to landfill | 234.4 | $ 6.34 | $ 1,486.10 | | |
| Regrade surface for positive drainage | 1582.4 | $ 0.12 | $ 189.89 | | |
| WASTE ROCK PAD | | | | | |
| No decomm required | 11500 | $ - | $ - | 0 | |

**Unit Rates Corrected**

| ACTIVITY/MATERIAL | Quantity | AANDC Unit Cost | AANDC Cost | | SRK Unit Cost | SRK Cost | |
|---|---|---|---|---|---|---|---|
| Remove water intake line from Doris Lake | 25 | $72.00 | $ 1,800.00 | $ 10,416.09 | $11.13 | $ 278.14 | $ 7,879.88 |
| Decommission pumping facility (remove electrical) | 2 | $640.00 | $ 1,280.00 | | $1,288.18 | $ 2,576.36 | |
| Prep containers for shipping off-site | 2 | $1,325.00 | $ 2,650.00 | | $1,321.37 | $ 2,642.74 | |
| Disconnect and remove generator fuel tank (place in Doris tank farm for cleaning) | 1 | $640.00 | $ 640.00 | | $93.46 | $ 93.46 | |
| Clean TidyTank and prep for shipping off-site | 1 | $1,420.00 | $ 1,420.00 | | $23.40 | $ 23.40 | |
| Run oil-water separator | 3 | $30.00 | $ 90.00 | | $31.00 | $ 93.00 | |
| Prep generator container for shipping off-site | 1 | $1,325.00 | $ 1,325.00 | | $1,321.37 | $ 1,321.37 | |
| Haul containers to Roberts Bay laydown | 66.4 | $6.34 | $ 420.98 | | $2.52 | $ 167.27 | |
| Collect Debris | 2226.2 | $0.18 | $ 400.72 | | $0.17 | $ 385.59 | |
| Load debris for transport to landfill | 20 | $13.13 | $ 262.60 | | $10.23 | $ 204.56 | |
| Haul debris to landfill | 20 | $6.34 | $ 126.80 | | $4.70 | $ 93.99 | |
| SEDIMENTATION / POLLUTION CONTROL POND | | | | | | | |
| Disconnect piping and electrical wiring, remove sump pumps | 2 | $640.00 | $ 1,280.00 | $ 21,406.74 | $639.99 | $ 1,279.98 | $ 7,715.33 |
| Remove and cut liner into manageable pieces (Sedimentation Pond only) | 14110 | $0.56 | $ 7,901.60 | | $0.16 | $ 2,264.23 | |
| Load waste for transport to Landfill | 42.3 | $13.13 | $ 555.40 | | $10.23 | $ 432.64 | |
| Haul Debris to landfill | 42.3 | $6.34 | $ 268.18 | | $4.70 | $ 198.80 | |
| Breach Pollution Control pond and Sedimentation Pond containment berms | 2608.2 | $4.30 | $ 11,215.26 | | $1.23 | $ 3,201.17 | |
| Rip-rap breach for erosion protection | 13.8 | $13.50 | $ 186.30 | | $24.53 | $ 338.50 | |
| UNDERGROUND SUPPORT MECHANICAL SHOP | | | | | | | |
| Decommission electrical, mechanical (including connections to generator house & transf | 3 | $640.00 | $ 1,920.00 | $ 55,821.55 | $639.99 | $ 1,919.98 | $ 39,377.39 |
| Demolish building | 2281.6 | $19.00 | $ 43,350.40 | | $12.90 | $ 29,424.20 | |
| Collect Debris | 456.3 | $0.18 | $ 82.13 | | $0.17 | $ 79.03 | |
| Load waste for transport to Landfill | 504.5 | $13.13 | $ 6,624.09 | | $10.23 | $ 5,159.98 | |
| Haul debris to landfill | 504.5 | $6.34 | $ 3,198.53 | | $4.70 | $ 2,371.00 | |
| Load hazardous waste into container for transport off site | 33.2 | $13.13 | $ 435.92 | | $10.23 | $ 339.57 | |
| Haul Waste container to Roberts Bay | 33.2 | $6.34 | $ 210.49 | | $2.52 | $ 83.64 | |
| FRESH WATER PIPELINES | | | | | | | |
| Cut pipelines into manageable pieces | 830 | $22.00 | $ 18,260.00 | $ 21,465.58 | $11.13 | $ 9,234.31 | $ 12,492.36 |
| Decommission electrical (heat tracing) | 4 | $640.00 | $ 2,560.00 | | $639.99 | $ 2,559.97 | |
| Collect electrical cables and controllers and prep for shipping off-site | 1600 | $0.18 | $ 288.00 | | $0.17 | $ 277.13 | |
| Load debris for transport to landfill | 28.2 | $6.34 | $ 178.79 | | $10.23 | $ 288.43 | |
| Haul debris to landfill | 28.2 | $6.34 | $ 178.79 | | $4.70 | $ 132.53 | |
| HELECOPTER SUPPORT FACILITIES | | | | | | | |
| Dismantle helicopter pads and walkway | 15 | $19.00 | $ 285.00 | $ 7,150.71 | $4.13 | $ 61.93 | $ 5,018.03 |
| Demolish helishack | 27.9 | $19.00 | $ 530.10 | | $12.90 | $ 359.81 | |
| Demolish washcar and other facilities | 81.8 | $19.00 | $ 1,554.20 | | $12.90 | $ 1,054.92 | |
| Collect Debris | 154.2 | $0.18 | $ 27.76 | | $0.17 | $ 26.71 | |
| Load debris for transport to landfill | 234.4 | $13.13 | $ 3,077.67 | | $10.23 | $ 2,397.42 | |
| Haul debris to landfill | 234.4 | $6.34 | $ 1,486.10 | | $4.70 | $ 1,101.61 | |
| Regrade surface for positive drainage | 1582.4 | $0.12 | $ 189.89 | | $0.01 | $ 15.63 | |
| WASTE ROCK PAD | | | | | | | |
| No decomm required | 11500 | $0.00 | $ - | $ - | $0.00 | $ - | $ - |

| ACTIVITY/MATERIAL | Units | Quantity | Cost Code | Unit Cost | Cost |
|---|---|---|---|---|---|
| RUN-OFF DIVERSION BERM | | | | | |
| Breach the berm to original ground in several locations (4 locations) to restore natural flo | m3 | 378 | SB1L | $ 4.30 | $ 1,625.00 |
| Remove cut liners and load for transport to landfill | m3 | 0.3 | C302L | $ 0.56 | $ - |
| Haul debris to landfill | m3 | 0.3 | C414L | $ 6.34 | $ 2.00 |
| SEWAGE DISCHARGE LINE | | | | | |
| Flush pipeline prior to decommissioning | each | 1 | SEWL | $ 770.00 | $ 770.00 |
| Cut pipelines into manageable pieces and place in containers for shipping off-site | lm | 1190 | PLRL | $ 22.00 | $ 26,180.00 |
| Remove electrical cables and controllers | each | 1 | C105L | $ 640.00 | $ 640.00 |
| Load debris into containers for shipping off-site | m3 | 90.8 | C412L | $ 100.25 | $ 9,103.00 |
| Haul debris to landfill | m3 | 90.8 | C414L | $ 6.34 | $ 576.00 |
| SEDIMENTATION BERM | | | | | |
| Breach the berm to restore a free drainage path | m2 | 24 | SB1L | $ 4.30 | $ 103.00 |
| Rip-rap breach for erosion protection | m3 | 3.6 | RR1L | $ 13.50 | $ 49.00 |
| SUMPS | | | | | |
| Decommision sumps | each | 2 | C102L | $ 550.00 | $ 1,100.00 |
| Remove pumps, pipes, cables, culverts | ls | 2 | RPPCL | $ 2,000.00 | $ 4,000.00 |
| Backfill sump excavation | m3 | 28.3 | SBSL | $ 3.20 | $ 91.00 |
| EXPANDED WASTE ROCK STORAGE (PAD T) | | | | | |
| Regrade Stockpile | m2 | 50400 | SBSL | $ 3.20 | $ 161,280.00 |
| Load waste for transport to landfill | m3 | 10 | C401L | $ 13.13 | $ 131.00 |
| Haul debris to landfill | m3 | 10 | C404L | $ 6.34 | $ 63.00 |
| EXPANDED LAYDOWN AREA (PAD U) | | | | | |
| Remove pumps, pipes, cables, culverts | ls | 1 | RPPCL | $ 2,000.00 | $ 2,000.00 |
| Breach Sedimentation Pond containment berms | m3 | 120 | SB1L | $ 4.30 | $ 516.00 |
| Collect all debris | m2 | 35200 | C310L | $ 0.18 | $ 6,336.00 |
| LHD remaining ore to TIA | m3 | 1760 | SBSH | $ 16.35 | $ 28,776.00 |
| Load waste into containers for shipping off-site | m3 | 10 | C412L | $ 100.25 | $ 1,003.00 |
| Haul containers to landfill | m3 | 10 | C414L | $ 6.34 | $ 63.00 |
| | | | | Total | $ 4,369,083.00 |
| | | | | % of Total | |

**Errors Corrected**

| ACTIVITY/MATERIAL | Quantity | Unit Cost | Cost | | |
|---|---|---|---|---|---|
| RUN-OFF DIVERSION BERM | | | | | |
| Breach the berm to original ground in several locations (4 locations) to restore natural flo | 378 | $ 4.30 | $ 1,625.40 | $ 1,627.47 | |
| Remove cut liners and load for transport to landfill | 0.3 | $ 0.56 | $ 0.17 | | |
| Haul debris to landfill | 0.3 | $ 6.34 | $ 1.90 | | |
| SEWAGE DISCHARGE LINE | | | | | |
| Flush pipeline prior to decommissioning | 1 | $ 770.00 | $ 770.00 | $ 37,268.37 | |
| Cut pipelines into manageable pieces and place in containers for shipping off-site | 1190 | $ 22.00 | $ 26,180.00 | | |
| Remove electrical cables and controllers | 1 | $ 640.00 | $ 640.00 | | |
| Load debris into containers for shipping off-site | 90.8 | $ 100.25 | $ 9,102.70 | | |
| Haul debris to landfill | 90.8 | $ 6.34 | $ 575.67 | | |
| SEDIMENTATION BERM | | | | | |
| Breach the berm to restore a free drainage path | 24 | $ 4.30 | $ 103.20 | $ 151.80 | |
| Rip-rap breach for erosion protection | 3.6 | $ 13.50 | $ 48.60 | | |
| SUMPS | | | | | |
| Decommision sumps | 2 | $ 550.00 | $ 1,100.00 | $ 5,190.56 | |
| Remove pumps, pipes, cables, culverts | 2 | $ 2,000.00 | $ 4,000.00 | | |
| Backfill sump excavation | 28.3 | $ 3.20 | $ 90.56 | | |
| EXPANDED WASTE ROCK STORAGE (PAD T) | | | | | |
| Regrade Stockpile | 50400 | $ 3.20 | $ 161,280.00 | $ 161,474.70 | |
| Load waste for transport to landfill | 10 | $ 13.13 | $ 131.30 | | |
| Haul debris to landfill | 10 | $ 6.34 | $ 63.40 | | |
| EXPANDED LAYDOWN AREA (PAD U) | | | | | |
| Remove pumps, pipes, cables, culverts | 1 | $ 2,000.00 | $ 2,000.00 | $ 21,005.90 | |
| Breach Sedimentation Pond containment berms | 120 | $ 4.30 | $ 516.00 | | |
| Collect all debris | 35200 | $ 0.18 | $ 6,336.00 | | |
| LHD remaining ore to TIA | 1760 | $ 6.30 | $ 11,088.00 | | SBSH in Reclaim is 6.30, not 16.35 |
| Load waste into containers for shipping off-site | 10 | $ 100.25 | $ 1,002.50 | | |
| Haul containers to landfill | 10 | $ 6.34 | $ 63.40 | | |
| | | | | **$ 4,082,822.71** | |

**Assumptions Corrected**

| ACTIVITY/MATERIAL | Quantity | Unit Cost | Cost | |
|---|---|---|---|---|
| RUN-OFF DIVERSION BERM | | | | |
| Breach the berm to original ground in several locations (4 locations) to restore natural flo | 378 | $ 4.30 | $ 1,625.40 | 1627.47 |
| Remove cut liners and load for transport to landfill | 0.3 | $ 0.56 | $ 0.17 | |
| Haul debris to landfill | 0.3 | $ 6.34 | $ 1.90 | |
| SEWAGE DISCHARGE LINE | | | | |
| Flush pipeline prior to decommissioning | 1 | $ 770.00 | $ 770.00 | 37268.372 |
| Cut pipelines into manageable pieces and place in containers for shipping off-site | 1190 | $ 22.00 | $ 26,180.00 | |
| Remove electrical cables and controllers | 1 | $ 640.00 | $ 640.00 | |
| Load debris into containers for shipping off-site | 90.8 | $ 100.25 | $ 9,102.70 | |
| Haul debris to landfill | 90.8 | $ 6.34 | $ 575.67 | |
| SEDIMENTATION BERM | | | | |
| Breach the berm to restore a free drainage path | 24 | $ 4.30 | $ 103.20 | 151.8 |
| Rip-rap breach for erosion protection | 3.6 | $ 13.50 | $ 48.60 | |
| SUMPS | | | | |
| Decommision sumps | 2 | $ 550.00 | $ 1,100.00 | 5190.56 |
| Remove pumps, pipes, cables, culverts | 2 | $ 2,000.00 | $ 4,000.00 | |
| Backfill sump excavation | 28.3 | $ 3.20 | $ 90.56 | |
| EXPANDED WASTE ROCK STORAGE (PAD T) | | | | |
| Regrade Stockpile | 50400 | $ 3.20 | $ 161,280.00 | 161474.7 |
| Load waste for transport to landfill | 10 | $ 13.13 | $ 131.30 | |
| Haul debris to landfill | 10 | $ 6.34 | $ 63.40 | |
| EXPANDED LAYDOWN AREA (PAD U) | | | | |
| Remove pumps, pipes, cables, culverts | 1 | $ 2,000.00 | $ 2,000.00 | 21005.9 |
| Breach Sedimentation Pond containment berms | 120 | $ 4.30 | $ 516.00 | |
| Collect all debris | 35200 | $ 0.18 | $ 6,336.00 | |
| LHD remaining ore to TIA | 1760 | $ 6.30 | $ 11,088.00 | |
| Load waste into containers for shipping off-site | 10 | $ 100.25 | $ 1,002.50 | |
| Haul containers to landfill | 10 | $ 6.34 | $ 63.40 | |
| | | | $ **4,182,275.37** | |

**Unit Rates Corrected**

| ACTIVITY/MATERIAL | Quantity | AANDC Unit Cost | AANDC Cost | | SRK Unit Cost | SRK Cost | |
|---|---|---|---|---|---|---|---|
| RUN-OFF DIVERSION BERM | | | | | | | |
| Breach the berm to original ground in several locations (4 locations) to restore natural flo | 378 | $4.30 | $ 1,625.40 | $ 1,627.47 | $1.23 | $ 463.94 | $ 468.42 |
| Remove cut liners and load for transport to landfill | 0.3 | $0.56 | $ 0.17 | | $10.23 | $ 3.07 | |
| Haul debris to landfill | 0.3 | $6.34 | $ 1.90 | | $4.70 | $ 1.41 | |
| SEWAGE DISCHARGE LINE | | | | | | | |
| Flush pipeline prior to decommissioning | 1 | $770.00 | $ 770.00 | $ 37,268.37 | $657.86 | $ 657.86 | $ 15,892.83 |
| Cut pipelines into manageable pieces and place in containers for shipping off-site | 1190 | $22.00 | $ 26,180.00 | | $11.13 | $ 13,239.55 | |
| Remove electrical cables and controllers | 1 | $640.00 | $ 640.00 | | $639.99 | $ 639.99 | |
| Load debris into containers for shipping off-site | 90.8 | $100.25 | $ 9,102.70 | | $10.23 | $ 928.69 | |
| Haul debris to landfill | 90.8 | $6.34 | $ 575.67 | | $4.70 | $ 426.73 | |
| SEDIMENTATION BERM | | | | | | | |
| Breach the berm to restore a free drainage path | 24 | $4.30 | $ 103.20 | $ 151.80 | $1.23 | $ 29.46 | $ 117.76 |
| Rip-rap breach for erosion protection | 3.6 | $13.50 | $ 48.60 | | $24.53 | $ 88.31 | |
| SUMPS | | | | | | | |
| Decommision sumps | 2 | $550.00 | $ 1,100.00 | $ 5,190.56 | $639.99 | $ 1,279.98 | $ 6,742.77 |
| Remove pumps, pipes, cables, culverts | 2 | $2,000.00 | $ 4,000.00 | | $2,500.00 | $ 5,000.00 | |
| Backfill sump excavation | 28.3 | $3.20 | $ 90.56 | | $16.35 | $ 462.79 | |
| EXPANDED WASTE ROCK STORAGE (PAD T) | | | | | | | |
| Regrade Stockpile | 50400 | $3.20 | $ 161,280.00 | $ 161,474.70 | $0.12 | $ 6,185.84 | $ 6,335.12 |
| Load waste for transport to landfill | 10 | $13.13 | $ 131.30 | | $10.23 | $ 102.28 | |
| Haul debris to landfill | 10 | $6.34 | $ 63.40 | | $4.70 | $ 47.00 | |
| EXPANDED LAYDOWN AREA (PAD U) | | | | | | | |
| Remove pumps, pipes, cables, culverts | 1 | $2,000.00 | $ 2,000.00 | $ 21,005.90 | $2,000.00 | $ 2,000.00 | $ 18,712.30 |
| Breach Sedimentation Pond containment berms | 120 | $4.30 | $ 516.00 | | $2.75 | $ 329.84 | |
| Collect all debris | 35200 | $0.18 | $ 6,336.00 | | $0.17 | $ 6,096.80 | |
| LHD remaining ore to TIA | 1760 | $6.30 | $ 11,088.00 | | $5.76 | $ 10,136.38 | |
| Load waste into containers for shipping off-site | 10 | $100.25 | $ 1,002.50 | | $10.23 | $ 102.28 | |
| Haul containers to landfill | 10 | $6.34 | $ 63.40 | | $4.70 | $ 47.00 | |
| | | | | **$ 4,179,575.37** | | | **$ 2,996,445.57** |

| ACTIVITY/MATERIAL | Units | Quantity | Cost Code | Unit Cost | Cost | Errors Corrected Quantity | Unit Cost | Cost | | Assumptions Corrected Quantity | Unit Cost | Cost | | Unit Rates Corrected Quantity | AANDC Unit Cost | AANDC Cost | | SRK Unit Cost | SRK Cost | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUARRY #2 | | | | | | | | | | | | | | | | | | | | |
| No decomm required | | | #N/A | $ - | $ - | 0 | $ - | $ - | $ - | 0 | $ - | $ - | $ - | 0 | $ - | $ - | $ - | $ - | $ - | $ - |
| OVERBURDEN DUMP | | | | | | | | | | | | | | | | | | | | |
| Reslope to 3H:1V | m3 | 8781.3 | SC1L | $ 6.80 | $ 59,713.00 | 8781.3 | $ 6.80 | $ 59,712.84 | $ 107,278.62 | 8781.3 | $ 6.80 | $ 59,712.84 | $ 107,278.62 | 8781.3 | $ 6.80 | $ 59,712.84 | $ 107,278.62 | $ 3.27 | $ 28,740.61 | $ 65,978.37 |
| Grade top for positive drainage | m2 | 18441 | C505L | $ 1.58 | $ 29,137.00 | 18441 | $ 1.58 | $ 29,136.78 | | 18441 | $ 1.58 | $ 29,136.78 | | 18441 | $ 1.58 | $ 29,136.78 | | $ 1.23 | $ 22,633.56 | |
| Install erosion protection measures (coconut matting) | m2 | 2634 | GSTH | $ 6.00 | $ 15,804.00 | 2634 | $ 6.00 | $ 15,804.00 | | 2634 | $ 6.00 | $ 15,804.00 | | 2634 | $ 6.00 | $ 15,804.00 | | $ 4.79 | $ 12,604.20 | |
| Remove culvert | ls | 1 | RCULL | $ 2,625.00 | $ 2,625.00 | 1 | $ 2,625.00 | $ 2,625.00 | | 1 | $ 2,625.00 | $ 2,625.00 | | 1 | $ 2,625.00 | $ 2,625.00 | | $ 2,000.00 | $ 2,000.00 | |
| Other | | | #N/A | $ - | $ - | 0 | $ - | $ - | | | | | | | | | | | | |
| TREATED SEWAGE DISCHARGE AREAS | | | | | | | | | | | | | | | | | | | | |
| Fill in low-lying areas (assumed sourced within 0.5km) | m3 | 69.1 | SB4H | $ 11.00 | $ 760.00 | 69.1 | $ 11.00 | $ 760.10 | $ 1,079.30 | 69.1 | $ 11.00 | $ 760.10 | $ 1,079.30 | 69.1 | $ 11.00 | $ 760.10 | $ 1,079.30 | $ 16.35 | $ 1,129.98 | $ 1,384.56 |
| Erosion protection: Supply and place cocoa matting | m2 | 53.2 | GSTH | $ 6.00 | $ 319.00 | 53.2 | $ 6.00 | $ 319.20 | | 53.2 | $ 6.00 | $ 319.20 | | 53.2 | $ 6.00 | $ 319.20 | | $ 4.79 | $ 254.57 | |
| Other | | | #N/A | $ - | $ - | 0 | $ - | $ - | | 0 | $ - | $ - | | 0 | $ - | $ - | | | | |
| Quarry #3 - | | | | | | | | | | | | | | | | | | | | |
| No decomm required | | | #N/A | $ - | $ - | 0 | $ - | $ - | $ - | 0 | $ - | $ - | $ - | 0 | $ - | $ - | $ - | $ - | $ - | $ - |
| Q#3 Access Road | | | | | | | | | | | | | | | | | | | | |
| Crown road for positive drainage | km | 0.2 | CRWNL | $ 1,190.00 | $ 238.00 | 0.2 | $ 1,190.00 | $ 238.00 | $ 238.00 | 0.2 | $ 1,190.00 | $ 238.00 | $ 238.00 | 0.2 | $ 1,190.00 | $ 238.00 | $ 238.00 | $ 866.22 | $ 173.24 | $ 173.24 |
| Quarry #3 Landfill | | | | | | | | | | | | | | | | | | | | |
| LHDP ROQ to construct 1m landfill cap | m3 | 19520 | RB4L | $ 12.50 | $ 244,000.00 | 19520 | $ 12.50 | $ 244,000.00 | $ 244,000.00 | 19520 | $ 12.50 | $ 244,000.00 | $ 244,000.00 | 19520 | $ 12.50 | $ 244,000.00 | $ 244,000.00 | $ 6.28 | $ 122,573.28 | $ 122,573.28 |
| COMMUNICATIONS TOWER | | | | | | | | | | | | | | | | | | | | |
| Remove communications equipment | each | 12 | C107L | $ 350.00 | $ 4,200.00 | 12 | $ 350.00 | $ 4,200.00 | $ 65,936.72 | 12 | $ 350.00 | $ 4,200.00 | $ 65,936.72 | 12 | $ 350.00 | $ 4,200.00 | $ 65,936.72 | $ 352.56 | $ 4,230.74 | $ 65,592.17 |
| Dismantle the communications towers and prepare for shipping off-site | each | 2 | C311L | $ 15,500.00 | $ 31,000.00 | 2 | $ 15,500.00 | $ 31,000.00 | | 2 | $ 15,500.00 | $ 31,000.00 | | 2 | $ 15,500.00 | $ 31,000.00 | | $ 15,417.42 | $ 30,834.85 | |
| Demolish equipment housing shack | m3 | 9 | C305L | $ 19.00 | $ 171.00 | 9 | $ 19.00 | $ 171.00 | | 9 | $ 19.00 | $ 171.00 | | 9 | $ 19.00 | $ 171.00 | | $ 12.90 | $ 116.07 | |
| Remove electrical and fiber optics cables | each | 12 | C105L | $ 640.00 | $ 7,680.00 | 12 | $ 640.00 | $ 7,680.00 | | 12 | $ 640.00 | $ 7,680.00 | | 12 | $ 640.00 | $ 7,680.00 | | $ 639.99 | $ 7,679.90 | |
| Remove all equipment, material, and waste from Doris Mountain (helicopter) | m3 | 11 | DEB1L | $ 2,500.00 | $ 27,500.00 | 9 | $ 2,500.00 | $ 22,500.00 | | 9 | $ 2,500.00 | $ 22,500.00 | | 9 | $ 2,500.00 | $ 22,500.00 | | $ 2,501.40 | $ 22,512.63 | |
| Load waste into trucks for transport to landfill | m3 | 9 | C401L | $ 13.13 | $ 118.00 | 9 | $ 13.13 | $ 118.17 | | 9 | $ 13.13 | $ 118.17 | | 9 | $ 13.13 | $ 118.17 | | $ 10.23 | $ 92.05 | |
| Transport Waste to Landfill | m3 | 9 | C415L | $ 6.34 | $ 57.00 | 9 | $ 6.34 | $ 57.06 | | 9 | $ 6.34 | $ 57.06 | | 9 | $ 6.34 | $ 57.06 | | $ 4.70 | $ 42.30 | |
| Transport Communications tower equipment to Roberts Bay | m3 | 33.2 | C404L | $ 6.34 | $ 210.00 | 33.2 | $ 6.34 | $ 210.49 | | 33.2 | $ 6.34 | $ 210.49 | | 33.2 | $ 6.34 | $ 210.49 | | $ 2.52 | $ 83.64 | |
| LAND FARM | | | | | | | | | | | | | | | | | | | | |
| Load contained contaminated soils into megabags for shipping off-site | m3 | 100 | C412L | $ 100.25 | $ 10,025.00 | 100 | $ 100.25 | $ 10,025.00 | $ 45,159.49 | 100 | $ 100.25 | $ 10,025.00 | $ 45,159.49 | 100 | $ 100.25 | $ 10,025.00 | $ 45,159.49 | $ 70.75 | $ 7,074.89 | $ 28,927.30 |
| Haul megabags to Roberts Bay laydown | m3 | 100 | C404L | $ 6.34 | $ 634.00 | 100 | $ 6.34 | $ 634.00 | | 100 | $ 6.34 | $ 634.00 | | 100 | $ 6.34 | $ 634.00 | | $ 2.52 | $ 251.91 | |
| Treat contained water and discharge | ls | 1 | TRTL | $ 6,500.00 | $ 6,500.00 | 1 | $ 6,500.00 | $ 6,500.00 | | 1 | $ 6,500.00 | $ 6,500.00 | | 1 | $ 6,500.00 | $ 6,500.00 | | $ 5,000.00 | $ 5,000.00 | |
| Remove and stockpile liner protection cover | m3 | 2591 | SB1L | $ 4.30 | $ 11,141.00 | 2591 | $ 4.30 | $ 11,141.30 | | 2591 | $ 4.30 | $ 11,141.30 | | 2591 | $ 4.30 | $ 11,141.30 | | $ 2.75 | $ 7,121.87 | |
| Clean liner | m2 | 4384 | C210L | $ 0.39 | $ 1,710.00 | 4384 | $ 0.39 | $ 1,709.76 | | 4384 | $ 0.39 | $ 1,709.76 | | 4384 | $ 0.39 | $ 1,709.76 | | $ 0.39 | $ 1,709.89 | |
| Remove and cut liner into manageable pieces | m2 | 13152 | C302L | $ 0.56 | $ 7,365.00 | 13152 | $ 0.56 | $ 7,365.12 | | 13152 | $ 0.56 | $ 7,365.12 | | 13152 | $ 0.56 | $ 7,365.12 | | $ 0.16 | $ 2,110.50 | |
| Load waste for transport to landfill | m3 | 118.4 | C401L | $ 13.13 | $ 1,555.00 | 118.4 | $ 13.13 | $ 1,554.59 | | 118.4 | $ 13.13 | $ 1,554.59 | | 118.4 | $ 13.13 | $ 1,554.59 | | $ 10.23 | $ 1,210.99 | |
| Haul Material to Landfill | m3 | 118.4 | C414L | $ 6.34 | $ 751.00 | 118.4 | $ 6.34 | $ 750.66 | | 118.4 | $ 6.34 | $ 750.66 | | 118.4 | $ 6.34 | $ 750.66 | | $ 4.70 | $ 556.44 | |
| Level containment berms | m2 | 3134.8 | C505L | $ 1.58 | $ 4,953.00 | 3134.8 | $ 1.58 | $ 4,952.98 | | 3134.8 | $ 1.58 | $ 4,952.98 | | 3134.8 | $ 1.58 | $ 4,952.98 | | $ 1.23 | $ 3,847.50 | |
| Regrade area for positive drainage | m2 | 4384 | C518L | $ 0.12 | $ 526.00 | 4384 | $ 0.12 | $ 526.08 | | 4384 | $ 0.12 | $ 526.08 | | 4384 | $ 0.12 | $ 526.08 | | $ 0.01 | $ 43.31 | |
| Other | | | #N/A | $ - | $ - | | | | | | | | | | | | | | | |

| ACTIVITY/MATERIAL | Units | Quantity | Cost Code | Unit Cost | Cost |
|---|---|---|---|---|---|
| BATCH PLANT PAD | | | | | |
| Collect all debris | m2 | 740.3 | C310L | $ 0.18 | $ 133.00 |
| Load waste for transport to landfill | m3 | 3 | C401L | $ 13.13 | $ 39.00 |
| Haul waste to Landfill | m3 | 3 | C414L | $ 6.34 | $ 19.00 |
| Regrade area for positive drainage | m2 | 740.3 | C518L | $ 0.12 | $ 89.00 |
| Other | | | #N/A | $ - | $ - |
| BURN PAD | | | | | |
| Collect ashes and place in containers | m3 | 0.1 | C207L | $ 13.13 | $ 1.00 |
| Dismantle (welding crew) | each | 1 | C308L | $ 1,500.00 | $ 1,500.00 |
| Load waste into containers for shipping off-site | m3 | 0.2 | C401L | $ 13.13 | $ 3.00 |
| Haul containers to Roberts Bay laydown | m3 | 0.2 | C404L | $ 6.34 | $ 1.00 |
| Regrade area for positive drainage | m2 | 400 | C518L | $ 0.12 | $ 48.00 |
| Other | | | #N/A | $ - | $ - |
| ROBERTS BAY DISCHARGE SYSTEM | | | | | |
| Cut pipelines into manageable pieces | lm | 5470 | PLRH | $ 72.00 | $ 393,840.00 |
| Decommission electrical (heat tracing) | each | 11 | C106L | $ 750.00 | $ 8,250.00 |
| Collect electrical cables and controllers and prep for shipping off-site | m2 | 5470 | C310L | $ 0.18 | $ 985.00 |
| Load debris for transport to landfill | m3 | 1160 | C401L | $ 13.13 | $ 15,231.00 |
| Haul debris to landfill | m3 | 1160 | C404L | $ 6.34 | $ 7,354.00 |
| Remove rock fill to 0.3 m below LLWL | m3 | 485 | SC3L | $ 8.90 | $ 4,317.00 |

**Errors Corrected**

| ACTIVITY/MATERIAL | Quantity | Unit Cost | Cost | |
|---|---|---|---|---|
| Collect all debris | 740.3 | $ 0.18 | $ 133.25 | $ 280.50 |
| Load waste for transport to landfill | 3 | $ 13.13 | $ 39.39 | |
| Haul waste to Landfill | 3 | $ 6.34 | $ 19.02 | |
| Regrade area for positive drainage | 740.3 | $ 0.12 | $ 88.84 | |
| Collect ashes and place in containers | 0.1 | $ 13.13 | $ 1.31 | $ 1,553.21 |
| Dismantle (welding crew) | 1 | $ 1,500.00 | $ 1,500.00 | |
| Load waste into containers for shipping off-site | 0.2 | $ 13.13 | $ 2.63 | |
| Haul containers to Roberts Bay laydown | 0.2 | $ 6.34 | $ 1.27 | |
| Regrade area for positive drainage | 400 | $ 0.12 | $ 48.00 | |
| Cut pipelines into manageable pieces | 5470 | $ 72.00 | $ 393,840.00 | $ 429,976.30 |
| Decommission electrical (heat tracing) | 11 | $ 750.00 | $ 8,250.00 | |
| Collect electrical cables and controllers and prep for shipping off-site | 5470 | $ 0.18 | $ 984.60 | |
| Load debris for transport to landfill | 1160 | $ 13.13 | $ 15,230.80 | |
| Haul debris to landfill | 1160 | $ 6.34 | $ 7,354.40 | |
| Remove rock fill to 0.3 m below LLWL | 485 | $ 8.90 | $ 4,316.50 | |
| | | | | $ 895,502.14 |

**Assumptions Corrected**

| ACTIVITY/MATERIAL | Quantity | Unit Cost | Cost | | |
|---|---|---|---|---|---|
| Collect all debris | 740.3 | $ 0.18 | $ 133.25 | $ 280.50 | |
| Load waste for transport to landfill | 3 | $ 13.13 | $ 39.39 | | |
| Haul waste to Landfill | 3 | $ 6.34 | $ 19.02 | | |
| Regrade area for positive drainage | 740.3 | $ 0.12 | $ 88.84 | | |
| Collect ashes and place in containers | 0.1 | $ 13.13 | $ 1.31 | $ 1,553.21 | |
| Dismantle (welding crew) | 1 | $ 1,500.00 | $ 1,500.00 | | |
| Load waste into containers for shipping off-site | 0.2 | $ 13.13 | $ 2.63 | | |
| Haul containers to Roberts Bay laydown | 0.2 | $ 6.34 | $ 1.27 | | |
| Regrade area for positive drainage | 400 | $ 0.12 | $ 48.00 | | |
| Cut pipelines into manageable pieces | 5470 | $ 22.00 | $ 120,340.00 | $ 156,476.30 | this pipeline is no different than the tailings line; same unit rate should apply |
| Decommission electrical (heat tracing) | 11 | $ 750.00 | $ 8,250.00 | | |
| Collect electrical cables and controllers and prep for shipping off-site | 5470 | $ 0.18 | $ 984.60 | | |
| Load debris for transport to landfill | 1160 | $ 13.13 | $ 15,230.80 | | |
| Haul debris to landfill | 1160 | $ 6.34 | $ 7,354.40 | | |
| Remove rock fill to 0.3 m below LLWL | 485 | $ 8.90 | $ 4,316.50 | | |
| | | | | $ 622,002.14 | |

**Unit Rates Corrected**

| ACTIVITY/MATERIAL | Quantity | AANDC Unit Cost | AANDC Cost | | SRK Unit Cost | SRK Cost | |
|---|---|---|---|---|---|---|---|
| Collect all debris | 740.3 | $ 0.18 | $ 133.25 | $ 280.50 | $ 0.17 | $ 128.22 | $ 180.32 |
| Load waste for transport to landfill | 3 | $ 13.13 | $ 39.39 | | $ 10.23 | $ 30.68 | |
| Haul waste to Landfill | 3 | $ 6.34 | $ 19.02 | | $ 4.70 | $ 14.10 | |
| Regrade area for positive drainage | 740.3 | $ 0.12 | $ 88.84 | | $ 0.01 | $ 7.31 | |
| Collect ashes and place in containers | 0.1 | $ 13.13 | $ 1.31 | $ 1,553.21 | $ 747.69 | $ 74.77 | $ 592.27 |
| Dismantle (welding crew) | 1 | $ 1,500.00 | $ 1,500.00 | | $ 511.00 | $ 511.00 | |
| Load waste into containers for shipping off-site | 0.2 | $ 13.13 | $ 2.63 | | $ 10.23 | $ 2.05 | |
| Haul containers to Roberts Bay laydown | 0.2 | $ 6.34 | $ 1.27 | | $ 2.52 | $ 0.50 | |
| Regrade area for positive drainage | 400 | $ 0.12 | $ 48.00 | | $ 0.01 | $ 3.95 | |
| Cut pipelines into manageable pieces | 5470 | $ 22.00 | $ 120,340.00 | $ 156,476.30 | $ 11.13 | $ 60,857.42 | $ 87,521.35 |
| Decommission electrical (heat tracing) | 11 | $ 750.00 | $ 8,250.00 | | $ 639.99 | $ 7,039.91 | |
| Collect electrical cables and controllers and prep for shipping off-site | 5470 | $ 0.18 | $ 984.60 | | $ 0.17 | $ 947.43 | |
| Load debris for transport to landfill | 1160 | $ 13.13 | $ 15,230.80 | | $ 10.23 | $ 11,864.38 | |
| Haul debris to landfill | 1160 | $ 6.34 | $ 7,354.40 | | $ 5.36 | $ 6,216.95 | |
| Remove rock fill to 0.3 m below LLWL | 485 | $ 8.90 | $ 4,316.50 | | $ 1.23 | $ 595.26 | |
| | | | | $ 622,002.14 | | | $ 372,922.87 |

**1 Capital Expenditures and Short Term Water Treatment identified in 'Instructions' worksheet**

| ACTIVITY/MATERIAL | Units | Quantity | Cost Code | Unit Cost | Cost |
|---|---|---|---|---|---|
| BREACH DYKE EMBANKMENT | | | | | |
| Remove fill | m3 | | #N/A | $ - | $ - |
| Contour water intake area | m3 | | #N/A | $ - | $ - |
| INSPECT AND MAINTAIN W ATER | | | | | |
| Inspect and maintain water management structures | ls | 5 | WTR3L | $ 20,000.00 | $ 100,000.00 |
| OPERATE / MAINTAIN W ATER MANAGEMENT SYSTEM | | | | | |
| Technician (camp support incl under Mob) | month | 60 | WTR1L | $ 9,450.00 | $ 567,000.00 |
| Site support, consumables | month | 60 | WTR2L | $ 5,800.00 | $ 348,000.00 |
| CONSTRUCT PASSIVE TREATMENT SYSTEM (e.g. Constructed Wetland) | | | | | |
| Construct access roads | km | | #N/A | $ - | $ - |
| Install HDPE piping system from collection pond | m | | #N/A | $ - | $ - |
| Inter-cell flow structures | allow | | #N/A | $ - | $ - |
| Install liners | m2 | | #N/A | $ - | $ - |
| Install growth media | m3 | | #N/A | $ - | $ - |
| Wetland vegetation | ha | | #N/A | $ - | $ - |
| CONSTRUCT WATER TREATMENT PLANT | | | | | |
| Build treatment plant | LS | | #N/A | $ - | $ - |
| Build sludge containment facility | LS | | #N/A | $ - | $ - |
| | | | | Total | $ 1,015,000.00 |

**Errors Corrected**

| ACTIVITY/MATERIAL | Quantity | Unit Cost | Cost | |
|---|---|---|---|---|
| Inspect and maintain water management structures | 5 | $ 20,000.00 | $ 100,000.00 | $ 100,000.00 |
| Technician (camp support incl under Mob) | 60 | $ 9,450.00 | $ 567,000.00 | $ 915,000.00 |
| Site support, consumables | 60 | $ 5,800.00 | $ 348,000.00 | |
| Total | | | | **$ 1,015,000.00** |

**Assumptions Corrected**

| ACTIVITY/MATERIAL | Quantity | Unit Cost | Cost | | |
|---|---|---|---|---|---|
| Inspect and maintain water management structures | 5 | $ 20,000.00 | $ 100,000.00 | $ 100,000.00 | 3 years of WM after closure + one season when North Dam breached |
| Technician (camp support incl under Mob) | 29.3333333 | $ 9,450.00 | $ 277,200.00 | $ 407,506.67 | water management for 3 years only+ one season for dam breach; variable duration for each of the 3 years |
| Site support, consumables | 22.4666667 | $ 5,800.00 | $ 130,306.67 | | part of the first year support is provided by demolition works |
| Total | | | | **$ 507,506.67** | |

**Unit Rates Corrected**

| ACTIVITY/MATERIAL | Quantity | AANDC Unit Cost | AANDC Cost | | SRK Unit Cost | SRK Cost | | |
|---|---|---|---|---|---|---|---|---|
| Inspect and maintain water management structures | 5 | $ 20,000.00 | $ 100,000.00 | $ 100,000.00 | $ 70,000.00 | $ 350,000.00 | $ 350,000.00 | |
| Technician (camp support incl under Mob) | 29.333333 | $ 9,450.00 | $ 277,200.00 | $ 407,506.67 | $ 56,700.00 | $ 1,663,200.00 | $ 3,011,200.00 | SRK daily rates extrapolated to Monthly to match AANDC quantities |
| Site support, consumables | 22.466667 | $ 5,800.00 | $ 130,306.67 | | $ 60,000.00 | $ 1,348,000.00 | | SRK daily rates extrapolated to Monthly to match AANDC quantities |
| Total | | | | **$ 507,506.67** | | | **$ 3,361,200.00** | |

| AL | Units | Quantity | Cost Code | Unit Cost | Cost |
|---|---|---|---|---|---|
| INTERIM CARE & MAINTENANCE | | | | | |
| on-site caretaker | manmonths | 5 | MM1L | $ 17,550.00 | $ 87,750.00 |
| *extra personnel* | manmonths | | | | $ - |
| -electrician | manmonths | 5 | MM2L | $ 25,650.00 | $ 128,250.00 |
| -mechanic | manmonths | 5 | MM3L | $ 20,250.00 | $ 101,250.00 |
| flights (yellowknife - cambridge bay) | | 20 | FLT1 | $ - | $ - |
| mobile camp rental | allow | 1 | CPRTL | $ 425,000.00 | $ 425,000.00 |
| annual fuel | litre | 22500 | FCGH | $ 1.40 | $ 31,500.00 |
| misc. supplies | allow | | #N/A | $ - | $ - |
| pick-up truck | month | 24 | EQP1L | $ 2,000.00 | $ 48,000.00 |
| small dozer | month | 12 | EQP2L | $ 8,000.00 | $ 96,000.00 |
| small excavator | month | 12 | EQP3L | $ 10,000.00 | $ 120,000.00 |
| snow machine | month | 12 | EQP4L | $ 10,000.00 | $ 120,000.00 |
| articulated dump truck | month | 12 | EQP5L | $ 10,000.00 | $ 120,000.00 |
| communications | month | | #N/A | $ - | $ - |
| camp operations (<10 persons) | month | 6 | CPOPL | $ 60,000.00 | $ 360,000.00 |
| SNP/AEMP water sampling & reporting | each | 1 | WSH | $ 10,000.00 | $ 10,000.00 |
| geotechnical assessment | each | 1.5 | GEOIL | $ 25,000.00 | $ 37,500.00 |

**Errors Corrected**

| AL | Quantity | Unit Cost | Cost | | |
|---|---|---|---|---|---|
| on-site caretaker | 5 | $17,550.00 | $ 87,750.00 | $ 1,784,250.00 | |
| *extra personnel* | 0 | $0.00 | $ - | | |
| -electrician | 5 | $25,650.00 | $ 128,250.00 | | |
| -mechanic | 5 | $20,250.00 | $ 101,250.00 | | |
| flights (yellowknife - cambridge bay) | 20 | $0.00 | $ - | | |
| mobile camp rental | 1 | $425,000.00 | $ 425,000.00 | | |
| annual fuel | 22500 | $1.40 | $ 31,500.00 | | |
| misc. supplies | 0 | $0.00 | $ - | | |
| pick-up truck | 24 | $2,000.00 | $ 48,000.00 | | |
| small dozer | 12 | $8,000.00 | $ 96,000.00 | | |
| small excavator | 12 | $10,000.00 | $ 120,000.00 | | |
| snow machine | 12 | $10,000.00 | $ 120,000.00 | | |
| articulated dump truck | 12 | $10,000.00 | $ 120,000.00 | | |
| communications | 0 | $0.00 | $ - | | |
| camp operations (<10 persons) | 6 | $60,000.00 | $ 360,000.00 | | |
| SNP/AEMP water sampling & reporting | 1 | $10,000.00 | $ 10,000.00 | | |
| geotechnical assessment | 1 | $25,000.00 | $ 25,000.00 | | one inspection per year |

**Assumptions Corrected**

| AL | Quantity | Unit Cost | Cost | | |
|---|---|---|---|---|---|
| on-site caretaker | 6 | $ 17,550.00 | $ 105,300.00 | $ 1,228,300.00 | summer months |
| *extra personnel* | | | | | |
| -electrician | 3 | $ 25,650.00 | $ 76,950.00 | | half the time on site |
| -mechanic | 3 | $ 20,250.00 | $ 60,750.00 | | half the time on site |
| flights (yellowknife - cambridge bay) | 0 | $ - | $ - | | |
| mobile camp rental | 0 | $ 425,000.00 | $ - | | existing camp still functional |
| annual fuel | 22,500 | $ 1.40 | $ 31,500.00 | | |
| misc. supplies | 0 | $ - | $ - | | |
| pick-up truck | 24 | $ 2,000.00 | $ 48,000.00 | | |
| small dozer | 12 | $ 8,000.00 | $ 96,000.00 | | |
| small excavator | 12 | $ 10,000.00 | $ 120,000.00 | | |
| snow machine | 12 | $ 10,000.00 | $ 120,000.00 | | |
| articulated dump truck | 12 | $ 10,000.00 | $ 120,000.00 | | |
| communications | 0 | $ - | $ - | | |
| camp operations (<10 persons) | 6 | $ 60,000.00 | $ 360,000.00 | | |
| SNP/AEMP water sampling & reporting | 1 | $ 10,000.00 | $ 10,000.00 | | |
| geotechnical assessment | 1 | $ 25,000.00 | $ 25,000.00 | | |

**Unit Rates Corrected**

| AL | Quantity | AANDC Unit Cost | AANDC Cost | | SRK Unit Cost | SRK Cost | |
|---|---|---|---|---|---|---|---|
| on-site caretaker | 6 | $ 17,550.00 | $ 105,300.00 | $ 1,228,300.00 | $ 56,700.00 | $ 340,200.00 | $ 1,524,940.78 |
| *extra personnel* | | | | | | | |
| -electrician | 3 | $ 25,650.00 | $ 76,950.00 | | $ 34,491.60 | $ 103,474.80 | |
| -mechanic | 3 | $ 20,250.00 | $ 60,750.00 | | $ 32,706.00 | $ 98,118.00 | |
| flights (yellowknife - cambridge bay) | 0 | $ - | $ - | | $ - | $ - | |
| mobile camp rental | 0 | $ 425,000.00 | $ - | | $ 424,703.00 | $ - | |
| annual fuel | 22500 | $ 1.40 | $ 31,500.00 | | $ 1.44 | $ 32,400.00 | |
| misc. supplies | 0 | $ - | $ - | | $ - | $ - | |
| pick-up truck | 24 | $ 2,000.00 | $ 48,000.00 | | $ 3,688.00 | $ 88,512.00 | |
| small dozer | 12 | $ 8,000.00 | $ 96,000.00 | | $ 8,000.00 | $ 96,000.00 | |
| small excavator | 12 | $ 10,000.00 | $ 120,000.00 | | $ 10,000.00 | $ 120,000.00 | |
| snow machine | 12 | $ 10,000.00 | $ 120,000.00 | | $ 7,103.00 | $ 85,236.00 | |
| articulated dump truck | 12 | $ 10,000.00 | $ 120,000.00 | | $ 10,000.00 | $ 120,000.00 | |
| communications | 0 | $ - | $ - | | $ - | $ - | |
| camp operations (<10 persons) | 6 | $ 60,000.00 | $ 360,000.00 | | $ 61,000.00 | $ 366,000.00 | |
| SNP/AEMP water sampling & reporting | 1 | $ 10,000.00 | $ 10,000.00 | | $ 10,000.00 | $ 10,000.00 | |
| geotechnical assessment | 1 | $ 25,000.00 | $ 25,000.00 | | $ 25,000.00 | $ 25,000.00 | |

| AL | Units | Quantity | Cost Code | Unit Cost | Cost | Errors Corrected Quantity | Errors Corrected Unit Cost | Errors Corrected Cost | | Assumptions Corrected Quantity | Assumptions Corrected Unit Cost | Assumptions Corrected Cost | | | Unit Rates Corrected Quantity | AANDC Unit Cost | AANDC Cost | | SRK Unit Cost | SRK Cost | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Management** | | | | | | | | | | | | | | | | | | | | | |
| Inspect and maintain water management structures | ls | 1 | WTR3L | $ 20,000.00 | $ 20,000.00 | 1 | $20,000.00 | $ 20,000.00 | | 1 | $ 20,000.00 | $ 20,000.00 | | | 1 | $ 20,000.00 | $ 20,000.00 | | $ 20,000.00 | $ 20,000.00 | |
| Operate / maintain pumping system | | | | | | | | | | | | | | | | | | | | | |
| technician (camp support incl under Mob) | month | 6 | WTR1L | $ 9,450.00 | $ 56,700.00 | 6 | $9,450.00 | $ 56,700.00 | | 0 | $ 9,450.00 | $ - | | care taker would operate pumps | 0 | $ 9,450.00 | $ - | | $ 57,645.00 | $ - | |
| site support, consumables | month | 6 | WTR2L | $ 5,800.00 | $ 34,800.00 | 6 | $5,800.00 | $ 34,800.00 | | 6 | $ 5,800.00 | $ 34,800.00 | | | 6 | $ 5,800.00 | $ 34,800.00 | | $ 3,333.33 | $ 19,999.98 | |
| **interim water treatment** | | | #N/A | $ - | $ - | | | | | | | | | | | | | | | | |
| equipment mob / demob (see below) | each | 1 | | | $ - | 1 | $0.00 | $ - | | 1 | $ - | $ - | | | 1 | $ - | $ - | | $ - | $ - | |
| | Annual Interim C&M Cost | | | | $ 1,796,750.00 | | | | | | | | | | | | | | | | |
| Number of years of ICM | years | 1.5 | Total | | $ 4,192,001.64 | **1.5** | | | **$ 2,676,375.00** | 1.5 | | | **$ 1,842,450.00** | | 1.5 | | | **$1,842,450.00** | | | **$ 2,287,411.17** |
| EQUIPMENT MOBILIZATION | | | | | | | | | | | | | | | | | | | | | |
| Excavators | | | | | | | | | | | | | | | | | | | | | |
| | tonne | 36.1 | MOB1L | $ 443.00 | $ 15,992.00 | 36.1 | $443.00 | $ 15,992.30 | $ 162,843.00 | 20 | $ 443.00 | $ 8,860.00 | $ 148,578.40 | switched to small excavator (CAT 318) consistent with rental cost assumption | 20 | $ 443.00 | $ 8,860.00 | $ 148,578.40 | $ 443.00 | $ 8,860.00 | $ 120,978.40 |
| | tonne | 36.1 | MOB1L | $ 443.00 | $ 15,992.00 | 36.1 | $443.00 | $ 15,992.30 | | 20 | $ 443.00 | $ 8,860.00 | | switched to small excavator (CAT 318) consistent with rental cost assumption | 20 | $ 443.00 | $ 8,860.00 | | $ 443.00 | $ 8,860.00 | |
| Dump trucks | | | | | | | | | | | | | | | | | | | | | |
| | tonne | 34.4 | MOB1L | $ 443.00 | $ 15,239.00 | 34.4 | $443.00 | $ 15,239.20 | | 34.4 | $ 443.00 | $ 15,239.20 | | | 34.4 | $ 443.00 | $ 15,239.20 | | $ 443.00 | $ 15,239.20 | |
| | tonne | 34.4 | MOB1L | $ 443.00 | $ 15,239.00 | 34.4 | $443.00 | $ 15,239.20 | | 34.4 | $ 443.00 | $ 15,239.20 | | | 34.4 | $ 443.00 | $ 15,239.20 | | $ 443.00 | $ 15,239.20 | |
| Loaders | | | | | | | | | | | | | | | | | | | | | |
| | tonne | 30 | MOB1L | $ 443.00 | $ 13,290.00 | 30 | $443.00 | $ 13,290.00 | | 30 | $ 443.00 | $ 13,290.00 | | | 30 | $ 443.00 | $ 13,290.00 | | $ 443.00 | $ 13,290.00 | |
| | tonne | 30 | MOB1L | $ 443.00 | $ 13,290.00 | 30 | $443.00 | $ 13,290.00 | | 30 | $ 443.00 | $ 13,290.00 | | | 30 | $ 443.00 | $ 13,290.00 | | $ 443.00 | $ 13,290.00 | |

| AL | Units | Quantity | Cost Code | Unit Cost | Cost |
|---|---|---|---|---|---|
| Light duty vehicles | | | | | |
| | each | 2 | MOB3L | $ 5,050.00 | $ 10,100.00 |
| | each | 2 | MOB3L | $ 5,050.00 | $ 10,100.00 |
| Standard 20' containers | | | | | |
| | each | 2 | MOB2L | $ 13,400.00 | $ 26,800.00 |
| | each | 2 | MOB2L | $ 13,400.00 | $ 26,800.00 |
| WINTER ROAD | | | | | |
| Construction and operation | km | 116 | WRCH | $ 11,500.00 | $ 1,334,000.00 |
| Limited winter use | km | 116 | WRUL | $ 0.29 | $ 34.00 |
| | | | Total Equipment Mobilization | | $ 1,496,877.00 |

**Errors Corrected**

| AL | Quantity | Unit Cost | Cost | |
|---|---|---|---|---|
| Light duty vehicles | | | | |
| | 2 | $5,050.00 | $ 10,100.00 | |
| | 2 | $5,050.00 | $ 10,100.00 | |
| Standard 20' containers | | | | |
| | 2 | $13,400.00 | $ 26,800.00 | |
| | 2 | $13,400.00 | $ 26,800.00 | |
| WINTER ROAD | | | | |
| Construction and operation | 116 | $11,500.00 | $ 1,334,000.00 | $ 1,334,033.64 |
| Limited winter use | 116 | $0.29 | $ 33.64 | |
| | | | | $4,173,252 |

**Assumptions Corrected**

| AL | Quantity | Unit Cost | Cost | | |
|---|---|---|---|---|---|
| Light duty vehicles | | | | | |
| | 2 | $ 5,050.00 | $ 10,100.00 | | |
| | 2 | $ 5,050.00 | $ 10,100.00 | | |
| Standard 20' containers | | | | | |
| | 2 | $ 13,400.00 | $ 26,800.00 | | |
| | 2 | $ 13,400.00 | $ 26,800.00 | | |
| WINTER ROAD | | | | | |
| Construction and operation | 0 | $ 11,500.00 | $ - | $ - | no winter road is necessary |
| Limited winter use | 0 | $ 0.29 | $ - | | |
| | | | | $ 1,991,028.40 | |

**Unit Rates Corrected**

| AL | Quantity | AANDC Unit Cost | AANDC Cost | | | SRK Unit Cost | SRK Cost | |
|---|---|---|---|---|---|---|---|---|
| Light duty vehicles | | | | | | | | |
| | 2 | $ 5,050.00 | $ 10,100.00 | | | $ 5,050.00 | $ 10,100.00 | |
| | 2 | $ 5,050.00 | $ 10,100.00 | | | $ 5,050.00 | $ 10,100.00 | |
| Standard 20' containers | | | | | | | | |
| | 2 | $ 13,400.00 | $ 26,800.00 | | | $ 6,500.00 | $ 13,000.00 | |
| | 2 | $ 13,400.00 | $ 26,800.00 | | | $ 6,500.00 | $ 13,000.00 | |
| WINTER ROAD | | | | | | | | |
| Construction and operation | 0 | $ 11,500.00 | $ - | | 0 | $ 18,236.00 | $ - | $ - |
| Limited winter use | 0 | $ 0.29 | $ - | | | $ - | $ - | |
| | | | | $ 1,991,028.40 | | | | $ 2,408,389.57 |

| ACTIVITY/MATERIAL | Notes | Units | Quantity | Cost Code | Unit Cost | Cost | |
|---|---|---|---|---|---|---|---|
| MOBILIZE HEAVY EQUIPMENT | | | | | | | |
| Excavators | | | | | | | |
| | Edmonton to Hay River (2 x 36.1 tonnes) | tonne | 72.2 | MOB1L | $443.00 | $31,985 | $596,528 |
| | Hay River to Roberts Bay (2 x 36.1 tonnes) | tonne | 72.2 | MOB1L | $443.00 | $31,985 | |
| Dump trucks | | | | | | | |
| | Edmonton to Hay River (3 x 34.4 tonnes) | tonne | 103.2 | MOB1L | $443.00 | $45,718 | |
| | Hay River to Roberts Bay (3 x 34.4 tonnes) | tonne | 103.2 | MOB1L | $443.00 | $45,718 | |
| Dozers | | | | | | | |
| | Edmonton to Hay River (2 x 33.5 tonnes) | tonne | 67 | MOB1L | $443.00 | $29,681 | |
| | Hay River to Roberts Bay (2 x 33.5 tonnes) | tonne | 67 | MOB1L | $443.00 | $29,681 | |
| Loaders | | | | | | | |
| | Edmonton to Hay River (2 x 30 tonnes) | tonne | 60 | MOB1L | $443.00 | $26,580 | |
| | Hay River to Roberts Bay (2 x 30 tonnes) | tonne | 60 | MOB1L | $443.00 | $26,580 | |
| Light duty vehicles | | | | | | | |
| | | each | 6 | MOB3L | $5,050.00 | $30,300 | |
| | | each | 6 | MOB3L | $5,050.00 | $30,300 | |
| Standard 20' containers | | | | | | | |
| | Edmonton to Hay River | each | 10 | MOB2L | $13,400.00 | $134,000 | |
| | Hay River to Roberts Bay | each | 10 | MOB2L | $13,400.00 | $134,000 | |
| MOBILIZE MISC. EQUIPMENT | | | | | | | |
| Pump shipping | | each | | #N/A | $0.00 | $0 | $0 |
| Pipe shipping | | m | | #N/A | $0.00 | $0 | |
| Minor tools and equipment | | allow | | #N/A | $0.00 | $0 | |
| Truck tires | | allow | | #N/A | $0.00 | $0 | |
| Other | | | | #N/A | $0.00 | $0 | |
| MOBILIZE CAMP | | | | | | | |
| | | | | | | | $2,125,000 |
| Reclamation activities | | year | 5 | CPRTL | $425,000.00 | $2,125,000 | |
| Long term reclamation activities (eg pump flooding) | | allow | | #N/A | $0.00 | $0 | |
| MOBILIZE WORKERS | | | | | | | |
| | | | | | | | $3,672,000 |
| flights from Yellowknife to Cambridge Bay in summer months | | month | 9 | FLT1L | $340,000.00 | $3,060,000 | |
| flights from Yellowknife to Cambridge Bay in winter months | | month | 9 | FLT2L | $68,000.00 | $612,000 | |
| Long term reclamation activities (eg pump flooding) - transport | | each | | #N/A | $0.00 | $0 | |
| Long term reclamation activities (eg pump flooding) - travel time | | each | | #N/A | $0.00 | $0 | |
| Monitoring airfare | | each | | #N/A | $0.00 | $0 | |

**Errors Corrected**

| ACTIVITY/MATERIAL | Notes | Quantity | Unit Cost | Cost | |
|---|---|---|---|---|---|
| MOBILIZE HEAVY EQUIPMENT | | | | | |
| Excavators | | | | | |
| | Edmonton to Hay River (2 x 36.1 tonnes) | 72.2 | $443.00 | $ 31,984.60 | $ 596,526.40 |
| | Hay River to Roberts Bay (2 x 36.1 tonnes) | 72.2 | $443.00 | $ 31,984.60 | |
| Dump trucks | | | | | |
| | Edmonton to Hay River (3 x 34.4 tonnes) | 103.2 | $443.00 | $ 45,717.60 | |
| | Hay River to Roberts Bay (3 x 34.4 tonnes) | 103.2 | $443.00 | $ 45,717.60 | |
| Dozers | | | | | |
| | Edmonton to Hay River (2 x 33.5 tonnes) | 67 | $443.00 | $ 29,681.00 | |
| | Hay River to Roberts Bay (2 x 33.5 tonnes) | 67 | $443.00 | $ 29,681.00 | |
| Loaders | | | | | |
| | Edmonton to Hay River (2 x 30 tonnes) | 60 | $443.00 | $ 26,580.00 | |
| | Hay River to Roberts Bay (2 x 30 tonnes) | 60 | $443.00 | $ 26,580.00 | |
| Light duty vehicles | | | | | |
| | | 6 | $5,050.00 | $ 30,300.00 | |
| | | 6 | $5,050.00 | $ 30,300.00 | |
| Standard 20' containers | | | | | |
| | Edmonton to Hay River | 10 | $13,400.00 | $ 134,000.00 | |
| | Hay River to Roberts Bay | 10 | $13,400.00 | $ 134,000.00 | |
| MOBILIZE MISC. EQUIPMENT | | | | | |
| Pump shipping | | 0 | $0.00 | $ - | $ - |
| Pipe shipping | | 0 | $0.00 | $ - | |
| Minor tools and equipment | | 0 | $0.00 | $ - | |
| Truck tires | | 0 | $0.00 | $ - | |
| Other | | 0 | $0.00 | $ - | |
| MOBILIZE CAMP | | | | | |
| Reclamation activities | | 5 | $425,000.00 | $ 2,125,000.00 | $ 2,125,000.00 |
| Long term reclamation activities (eg pump flooding) | | 0 | $0.00 | $ - | |
| MOBILIZE WORKERS | | | | | |
| flights from Yellowknife to Cambridge Bay in summer months | | 9 | $340,000.00 | $ 3,060,000.00 | $ 3,672,000.00 |
| flights from Yellowknife to Cambridge Bay in winter months | | 9 | $68,000.00 | $ 612,000.00 | |
| Long term reclamation activities (eg pump flooding) - transport | | 0 | $0.00 | $ - | |
| Long term reclamation activities (eg pump flooding) - travel time | | 0 | $0.00 | $ - | |
| Monitoring airfare | | 0 | $0.00 | $ - | |

**Assumptions Corrected** / **Unit Rates Corrected**

| ACTIVITY/MATERIAL | Notes | Quantity | Unit Cost | Cost | | | Quantity | AANDC Unit Cost | AANDC Cost | | SRK Unit Cost | SRK Cost | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MOBILIZE HEAVY EQUIPMENT | | | | | | | | | | | | | | |
| Excavators | | | | | | | | | | | | | | |
| | Edmonton to Hay River (2 x 36.1 tonnes) | 36.1 | $ 443.00 | $ 15,992.30 | $ 438,199.80 | one excavator mobilized under ICM | 36.1 | $ 443.00 | $ 15,992.30 | $ 438,199.80 | $443.00 | $ 15,992.30 | $ 300,199.80 | |
| | Hay River to Roberts Bay (2 x 36.1 tonnes) | 36.1 | $ 443.00 | $ 15,992.30 | | | 36.1 | $ 443.00 | $ 15,992.30 | | $443.00 | $ 15,992.30 | | |
| Dump trucks | | | | | | | | | | | | | | |
| | Edmonton to Hay River (3 x 34.4 tonnes) | 103.2 | $ 443.00 | $ 45,717.60 | | | 103.2 | $ 443.00 | $ 45,717.60 | | $443.00 | $ 45,717.60 | | |
| | Hay River to Roberts Bay (3 x 34.4 tonnes) | 103.2 | $ 443.00 | $ 45,717.60 | | | 103.2 | $ 443.00 | $ 45,717.60 | | $443.00 | $ 45,717.60 | | |
| Dozers | | | | | | | | | | | | | | |
| | Edmonton to Hay River (2 x 33.5 tonnes) | 0 | $ 443.00 | $ - | | on dozer mobilized under ICM | 0 | $ 443.00 | $ - | | $443.00 | $ - | | |
| | Hay River to Roberts Bay (2 x 33.5 tonnes) | 0 | $ 443.00 | $ - | | | 0 | $ 443.00 | $ - | | $443.00 | $ - | | |
| Loaders | | | | | | | | | | | | | | |
| | Edmonton to Hay River (2 x 30 tonnes) | 30 | $ 443.00 | $ 13,290.00 | | one loader mobilized under ICM | 30 | $ 443.00 | $ 13,290.00 | | $443.00 | $ 13,290.00 | | |
| | Hay River to Roberts Bay (2 x 30 tonnes) | 30 | $ 443.00 | $ 13,290.00 | | | 30 | $ 443.00 | $ 13,290.00 | | $443.00 | $ 13,290.00 | | |
| Light duty vehicles | | | | | | | | | | | | | | |
| | | 2 | $ 5,050.00 | $ 10,100.00 | | two pickups already mobilized under ICM; 5 considered sufficient | 2 | $ 5,050.00 | $ 10,100.00 | | $5,050.00 | $ 10,100.00 | | |
| | | 2 | $ 5,050.00 | $ 10,100.00 | | | 2 | $ 5,050.00 | $ 10,100.00 | | $5,050.00 | $ 10,100.00 | | |
| Standard 20' containers | | | | | | | | | | | | | | |
| | Edmonton to Hay River | 10 | $ 13,400.00 | $ 134,000.00 | | | 10 | $ 13,400.00 | $ 134,000.00 | | $6,500.00 | $ 65,000.00 | | NTCL rate for shipping containers is lower |
| | Hay River to Roberts Bay | 10 | $ 13,400.00 | $ 134,000.00 | | | 10 | $ 13,400.00 | $ 134,000.00 | | $6,500.00 | $ 65,000.00 | | NTCL rate for shipping containers is lower |
| MOBILIZE MISC. EQUIPMENT | | | | | | | | | | | | | | |
| Pump shipping | | 0 | $ - | $ - | $0 | | 0 | $ - | $ - | $ - | $0.00 | $ - | $ - | |
| Pipe shipping | | 0 | $ - | $ - | | | 0 | $ - | $ - | | $0.00 | $ - | | |
| Minor tools and equipment | | 0 | $ - | $ - | | | 0 | $ - | $ - | | $0.00 | $ - | | |
| Truck tires | | 0 | $ - | $ - | | | 0 | $ - | $ - | | $0.00 | $ - | | |
| Other | | 0 | $ - | $ - | | | 0 | $ - | $ - | | $0.00 | $ - | | |
| MOBILIZE CAMP | | | | | | | | | | | | $ - | | |
| | | | | | $1,062,500 | | | | | | | | | |
| Reclamation activities | | 2.5 | $ 425,000.00 | $ 1,062,500.00 | | accounted for under WM | 2.5 | $ 425,000.00 | $ 1,062,500.00 | $ 1,062,500.00 | $424,703.00 | $ 1,061,757.50 | $ 1,061,757.50 | existing camp facilities wil be used |
| Long term reclamation activities (eg pump flooding) | | | | | | | | | | | | | | |
| MOBILIZE WORKERS | | | | | | | | | | | | | | |
| | | | | | $0 | | | | | | | | | |
| flights from Yellowknife to Cambridge Bay in summer months | | 0 | $ 340,000.00 | $ - | | flights cost included in camp operations cost | 0 | $ 340,000.00 | $ - | 0 | $17,800.00 | $ - | $ - | |
| flights from Yellowknife to Cambridge Bay in winter months | | 0 | $ 68,000.00 | $ - | | there are no reclamation activities in the winter | 0 | $ 68,000.00 | $ - | | $17,800.00 | $ - | | |
| Long term reclamation activities (eg pump flooding) - transport | | 0 | $ - | $ - | | | 0 | $ - | $ - | | | | | |
| Long term reclamation activities (eg pump flooding) - travel time | | 0 | $ - | $ - | | | 0 | $ - | $ - | | | | | |
| Monitoring airfare | | 0 | $ - | $ - | | | 0 | $ - | $ - | | | | | |

| ACTIVITY/MATERIAL | Notes | Units | Quantity | Cost Code | Unit Cost | Cost | |
|---|---|---|---|---|---|---|---|
| WORKER ACCOMODATIONS | | | | | | | $3,870,000 |
| camp operations (winter months , <10 5 full years for water management persons incl food, maintenance, air travel) activites | | month | 60 | CPOPL | $60,000.00 | $3,600,000 | |
| camp operations (winter months , >25 persons, incl food, maintenance, air travel) activities | | month | 18 | CPOPAL | $15,000.00 | $270,000 | |
| Long term reclamation activities (eg pump flooding) | | manmonths | | #N/A | $0.00 | $0 | |
| MOBILIZE FUEL | | | | | | | |
| Fuel freight - reclamation activities | | litre | | #N/A | $0.00 | $0 | $0 |
| Fuel freight - long term reclamation activities | | litre | | #N/A | $0.00 | $0 | |
| Fuel freight accomodations | | litre | | #N/A | $0.00 | $0 | |
| WINTER ROAD | | | | | | | $1,334,034 |
| Construction and operation | | km | 116 | WRCH | $11,500.00 | $1,334,000 | |
| Limited winter use | | km | 116 | WRUL | $0.29 | $34 | |
| Winter road tarriff | | km | | #N/A | $0.00 | $0 | |
| DEMOBILIZE HEAVY EQUIPMENT | | | | | | | |
| Excavators | | | | | | | $685,570 |
| | Edmonton to Hay River (3 x 36.1 tonnes) | tonne | 108.3 | MOB1L | $443.00 | $47,977 | |
| | Hay River to Roberts Bay (3 x 36.1 tonnes) | tonne | 108.3 | MOB1L | $443.00 | $47,977 | |
| Dump trucks | | | | | | | |
| | Edmonton to Hay River (4 x 34.4 tonnes) | tonne | 137.6 | MOB1L | $443.00 | $60,957 | |
| | Hay River to Roberts Bay (4 x 34.4 tonnes) | tonne | 137.6 | MOB1L | $443.00 | $60,957 | |
| Dozers | | | | | | | |
| | Edmonton to Hay River (2 x 33.5 tonnes) | tonne | 67 | MOB1L | $443.00 | $29,681 | |
| | Hay River to Roberts Bay (2 x 33.5 tonnes) | tonne | 67 | MOB1L | $443.00 | $29,681 | |

**Errors Corrected**

| ACTIVITY/MATERIAL | Quantity | Unit Cost | Cost | | |
|---|---|---|---|---|---|
| WORKER ACCOMODATIONS | | | | | |
| camp operations (winter months , <10 5 full years ...) activites | 42 | $60,000.00 | $ 2,520,000.00 | $ 2,790,000.00 | 18 out of 60 months |
| camp operations (winter months , >25 persons ...) activities | 18 | $15,000.00 | $ 270,000.00 | | |
| Long term reclamation activities (eg pump flooding) | 0 | $0.00 | $ - | | |
| MOBILIZE FUEL | | | | | |
| Fuel freight - reclamation activities | 0 | $0.00 | $ - | $ - | |
| Fuel freight - long term reclamation activities | 0 | $0.00 | $ - | | |
| Fuel freight accomodations | 0 | $0.00 | $ - | | |
| WINTER ROAD | | | | | |
| Construction and operation | 116 | $11,500.00 | $ 1,334,000.00 | $ 1,334,033.64 | |
| Limited winter use | 116 | $0.29 | $ 33.64 | | |
| Winter road tarriff | 0 | $0.00 | $ - | | |
| DEMOBILIZE HEAVY EQUIPMENT | | | | | |
| Excavators | | | | $ 685,569.40 | |
| Edmonton to Hay River (3 x 36.1 tonnes) | 108.3 | $443.00 | $ 47,976.90 | | |
| Hay River to Roberts Bay (3 x 36.1 tonnes) | 108.3 | $443.00 | $ 47,976.90 | | |
| Dump trucks | | | | | |
| Edmonton to Hay River (4 x 34.4 tonnes) | 137.6 | $443.00 | $ 60,956.80 | | |
| Hay River to Roberts Bay (4 x 34.4 tonnes) | 137.6 | $443.00 | $ 60,956.80 | | |
| Dozers | | | | | |
| Edmonton to Hay River (2 x 33.5 tonnes) | 67 | $443.00 | $ 29,681.00 | | |
| Hay River to Roberts Bay (2 x 33.5 tonnes) | 67 | $443.00 | $ 29,681.00 | | |

**Assumptions Corrected**

| ACTIVITY/MATERIAL | Quantity | Unit Cost | Cost | | |
|---|---|---|---|---|---|
| WORKER ACCOMODATIONS | | | | $1,200,000 | |
| camp operations (winter months , <10 5 full years ...) activites | 17 | $ 60,000.00 | $ 1,020,000.00 | | water discharge from TIA completed in 29 months, out of which 12 are in the larger camp camp demolition completd in one year |
| camp operations (winter months , >25 persons ...) activities | 12 | $ 15,000.00 | $ 180,000.00 | | |
| Long term reclamation activities (eg pump flooding) | 0 | $ - | $ - | | |
| MOBILIZE FUEL | | | | | |
| Fuel freight - reclamation activities | 0 | $ - | $ - | $0 | |
| Fuel freight - long term reclamation activities | 0 | $ - | $ - | | |
| Fuel freight accomodations | 0 | $ - | $ - | | |
| WINTER ROAD | | | | $0 | |
| Construction and operation | 0 | $ 11,500.00 | $ - | | all-weather road access everywhere on site; no winter road required |
| Limited winter use | 0 | $ 0.29 | $ - | | |
| Winter road tarriff | 0 | $ - | $ - | | |
| DEMOBILIZE HEAVY EQUIPMENT | | | | | |
| Excavators | | | | $630,724 | |
| Edmonton to Hay River (3 x 36.1 tonnes) | 72.2 | $ 443.00 | $ 31,984.60 | | |
| Hay River to Roberts Bay (3 x 36.1 tonnes) | 72.2 | $ 443.00 | $ 31,984.60 | | |
| Dump trucks | | | | | |
| Edmonton to Hay River (4 x 34.4 tonnes) | 137.6 | $ 443.00 | $ 60,956.80 | | |
| Hay River to Roberts Bay (4 x 34.4 tonnes) | 137.6 | $ 443.00 | $ 60,956.80 | | |
| Dozers | | | | | |
| Edmonton to Hay River (2 x 33.5 tonnes) | 33.5 | $ 443.00 | $ 14,840.50 | | |
| Hay River to Roberts Bay (2 x 33.5 tonnes) | 33.5 | $ 443.00 | $ 14,840.50 | | |

**Unit Rates Corrected**

| ACTIVITY/MATERIAL | Quantity | AANDC Unit Cost | AANDC Cost | | | SRK Unit Cost | SRK Cost | | |
|---|---|---|---|---|---|---|---|---|---|
| WORKER ACCOMODATIONS | | | | | | | | | |
| camp operations (winter months , <10 5 full years ...) activites | 17 | $ 60,000.00 | $ 1,020,000.00 | $ 1,200,000.00 | | $60,000.00 | $ 1,020,000.00 | $ 1,200,000.00 | |
| camp operations (winter months , >25 persons ...) activities | 12 | $ 15,000.00 | $ 180,000.00 | | | $15,000.00 | $ 180,000.00 | | |
| Long term reclamation activities (eg pump flooding) | 0 | $ - | $ - | | | $0.00 | $ - | | |
| MOBILIZE FUEL | | | | | | | | | |
| Fuel freight - reclamation activities | 0 | $ - | $ - | | 0 | $0.00 | $ - | $ - | |
| Fuel freight - long term reclamation activities | 0 | $ - | $ - | | | $0.00 | $ - | | |
| Fuel freight accomodations | 0 | $ - | $ - | | | $0.00 | $ - | | |
| WINTER ROAD | | | | | | | | | |
| Construction and operation | 0 | $ 11,500.00 | $ - | | 0 | $18,236.00 | $ - | $ - | |
| Limited winter use | 0 | $ 0.29 | $ - | | | $0.00 | $ - | | |
| Winter road tarriff | 0 | $ - | $ - | | | $0.00 | $ - | | |
| DEMOBILIZE HEAVY EQUIPMENT | | | | | | | | | |
| Excavators | | | | $ 630,723.80 | | | | $ 303,100.80 | |
| Edmonton to Hay River (3 x 36.1 tonnes) | 72.2 | $ 443.00 | $ 31,984.60 | | | $288.00 | $ 20,793.60 | | return NTCL rates are lower for both equipment and containers |
| Hay River to Roberts Bay (3 x 36.1 tonnes) | 72.2 | $ 443.00 | $ 31,984.60 | | | $288.00 | $ 20,793.60 | | return NTCL rates are lower for both equipment and containers |
| Dump trucks | | | | | | | | | |
| Edmonton to Hay River (4 x 34.4 tonnes) | 137.6 | $ 443.00 | $ 60,956.80 | | | $288.00 | $ 39,628.80 | | return NTCL rates are lower for both equipment and containers |
| Hay River to Roberts Bay (4 x 34.4 tonnes) | 137.6 | $ 443.00 | $ 60,956.80 | | | $288.00 | $ 39,628.80 | | return NTCL rates are lower for both equipment and containers |
| Dozers | | | | | | | | | |
| Edmonton to Hay River (2 x 33.5 tonnes) | 33.5 | $ 443.00 | $ 14,840.50 | | | $288.00 | $ 9,648.00 | | return NTCL rates are lower for both equipment and containers |
| Hay River to Roberts Bay (2 x 33.5 tonnes) | 33.5 | $ 443.00 | $ 14,840.50 | | | $288.00 | $ 9,648.00 | | return NTCL rates are lower for both equipment and containers |

| ACTIVITY/MATERIAL | Notes | Units | Quantity | Cost Code | Unit Cost | Cost | |
|---|---|---|---|---|---|---|---|
| Loaders | | | | | | | |
| | Edmonton to Hay River (3 x 30 tonnes) | tonne | 90 | MOB1L | $443.00 | $39,870 | |
| | Hay River to Roberts Bay (3 x 30 tonnes) | tonne | 90 | MOB1L | $443.00 | $39,870 | |
| Light duty vehicles | | | | | | | |
| | Edmonton to Hay River | each | 6 | MOB3L | $5,050.00 | $30,300 | |
| | Hay River to Roberts Bay | each | 6 | MOB3L | $5,050.00 | $30,300 | |
| Standard 20' containers | | | | | | | |
| | Edmonton to Hay River | each | 10 | MOB2L | $13,400.00 | $134,000 | |
| | Hay River to Roberts Bay | each | 10 | MOB2L | $13,400.00 | $134,000 | |
| DEMOBILIZE CAMP | | | | | | | |
| | | allow | | #N/A | 0 | 0 | |
| DEMOBILIZE WORKERS | | | | | | | |
| flights from Yellowknife to Cambridge Bay | in summer months | month | 9 | FLT1L | $340,000.00 | $3,060,000 | |
| flights from Yellowknife to Cambridge Bay | in winter months | month | 9 | FLT2L | $68,000.00 | $612,000 | |
| WINTER ROAD | | | | | | | $1,334,034 |
| Construction and operation | | km | 116 | WRCH | $11,500.00 | $1,334,000 | |
| Limited winter use | | km | 116 | WRUL | $0.29 | $34 | |
| Winter road tarriff | | km | | #N/A | $0.00 | $0 | |
| | | | | | **Total** | **$17,289,163** | $13,617,166 |

**Errors Corrected**

| ACTIVITY/MATERIAL | Notes | Quantity | Unit Cost | Cost | |
|---|---|---|---|---|---|
| Loaders | Edmonton to Hay River (3 x 30 tonnes) | 90 | $443.00 | $ 39,870.00 | |
| Loaders | Hay River to Roberts Bay (3 x 30 tonnes) | 90 | $443.00 | $ 39,870.00 | |
| Light duty vehicles | Edmonton to Hay River | 6 | $5,050.00 | $ 30,300.00 | |
| Light duty vehicles | Hay River to Roberts Bay | 6 | $5,050.00 | $ 30,300.00 | |
| Standard 20' containers | Edmonton to Hay River | 10 | $13,400.00 | $ 134,000.00 | |
| Standard 20' containers | Hay River to Roberts Bay | 10 | $13,400.00 | $ 134,000.00 | |
| DEMOBILIZE CAMP | | 0 | $0.00 | $ - | 0 |
| flights from Yellowknife to Cambridge Bay | in summer months | 9 | $340,000.00 | $ 3,060,000.00 | $ 3,672,000.00 |
| flights from Yellowknife to Cambridge Bay | in winter months | 9 | $68,000.00 | $ 612,000.00 | |
| Construction and operation | | 116 | $11,500.00 | $ 1,334,000.00 | $ 1,334,033.64 |
| Limited winter use | | 116 | $0.29 | $ 33.64 | |
| Winter road tarriff | | 0 | $0.00 | $ - | |
| | | | | | **$16,209,163** |

**Assumptions Corrected**

| ACTIVITY/MATERIAL | Notes | Quantity | Unit Cost | Cost | | |
|---|---|---|---|---|---|---|
| Loaders | Edmonton to Hay River (3 x 30 tonnes) | 60 | $ 443.00 | $ 26,580.00 | | |
| Loaders | Hay River to Roberts Bay (3 x 30 tonnes) | 60 | $ 443.00 | $ 26,580.00 | | |
| Light duty vehicles | Edmonton to Hay River | 4 | $ 5,050.00 | $ 20,200.00 | | |
| Light duty vehicles | Hay River to Roberts Bay | 4 | $ 5,050.00 | $ 20,200.00 | | |
| Standard 20' containers | Edmonton to Hay River | 12 | $ 13,400.00 | $ 160,800.00 | | |
| Standard 20' containers | Hay River to Roberts Bay | 12 | $ 13,400.00 | $ 160,800.00 | | |
| DEMOBILIZE CAMP | | 0 | $ - | $ - | $ - | |
| flights from Yellowknife to Cambridge Bay | in summer months | 0 | $ 340,000.00 | $ - | 0 | already included in camp operating |
| flights from Yellowknife to Cambridge Bay | in winter months | 0 | $ 68,000.00 | $ - | | no winter reclamation work |
| WINTER ROAD | | | | | $0 | |
| Construction and operation | | 0 | $ 11,500.00 | $ - | | all-weather road access everywhere on site; no winter road required |
| Limited winter use | | 0 | $ 0.29 | $ - | | |
| Winter road tarriff | | 0 | $ - | $ - | | |
| | | | | | **$3,331,424** | |

**Unit Rates Corrected**

| ACTIVITY/MATERIAL | Notes | Quantity | AANDC Unit Cost | AANDC Cost | | | SRK Unit Cost | SRK Cost | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Loaders | Edmonton to Hay River (3 x 30 tonnes) | 60 | $ 443.00 | $ 26,580.00 | | | $288.00 | $ 17,280.00 | | return NTCL rates are lower for both equipment and containers |
| Loaders | Hay River to Roberts Bay (3 x 30 tonnes) | 60 | $ 443.00 | $ 26,580.00 | | | $288.00 | $ 17,280.00 | | return NTCL rates are lower for both equipment and containers |
| Light duty vehicles | Edmonton to Hay River | 4 | $ 5,050.00 | $ 20,200.00 | | | $3,300.00 | $ 13,200.00 | | return NTCL rates are lower for both equipment and containers |
| Light duty vehicles | Hay River to Roberts Bay | 4 | $ 5,050.00 | $ 20,200.00 | | | $3,300.00 | $ 13,200.00 | | return NTCL rates are lower for both equipment and containers |
| Standard 20' containers | Edmonton to Hay River | 12 | $ 13,400.00 | $ 160,800.00 | | | $4,250.00 | $ 51,000.00 | | return NTCL rates are lower for both equipment and containers |
| Standard 20' containers | Hay River to Roberts Bay | 12 | $ 13,400.00 | $ 160,800.00 | | | $4,250.00 | $ 51,000.00 | | return NTCL rates are lower for both equipment and containers |
| DEMOBILIZE CAMP | | 0 | $ - | $ - | $ - | | $0.00 | $ - | $ - | |
| DEMOBILIZE WORKERS | | | | | $ - | | | | | |
| flights from Yellowknife to Cambridge Bay | in summer months | 0 | $ 340,000.00 | $ - | | | $17,800.00 | $ - | $ - | |
| flights from Yellowknife to Cambridge Bay | in winter months | 0 | $ 68,000.00 | $ - | | | $17,800.00 | $ - | | |
| Construction and operation | | 0 | $ 11,500.00 | $ - | | 0 | $18,236.00 | $ - | $ - | |
| Limited winter use | | 0 | $ 0.29 | $ - | | | $0.00 | $ - | | |
| Winter road tarriff | | 0 | $ - | $ - | | | $0.00 | $ - | | |
| | | | | | **$ 3,331,423.60** | | | | **$ 2,865,058.10** | |

| ACTIVITY/MATERIAL | Notes | Units | Quantity | Code | Unit Cost | Cost |
|---|---|---|---|---|---|---|
| MONITORING & INSPECTIONS | | | | | | |
| Annual geotechnical inspection | (for first 5 years) | each | 0.5 | GEOI2L | $ 70,000.00 | $ 35,000.00 |
| Cover monitoring | every 2 years | each | 0.5 | GEOI2L | $ 70,000.00 | $ 35,000.00 |
| Regulatory costs* | | each | 1 | RPTL | $ 20,000.00 | $ 20,000.00 |
| Water sampling and testing | | each | 1 | WTR4L | $ 60,000.00 | $ 60,000.00 |
| Vegetation Monitoring | (every 2 years) | each | 0.5 | GEOI2L | $ 70,000.00 | $ 35,000.00 |
| Decommission water management structures | | | 0.1 | DITCL | $ 500,000.00 | $ 50,000.00 |
| SPILLWAY MAINTENANCE | | | | | | |
| Repair erosion | | m3 | | #N/A | $ - | $ - |
| Clear spillway | | each | | #N/A | $ - | $ - |
| CWTS MAINTENANCE | | | | | | |
| Maintain flow, restore vegetation | | allow | | #N/A | $ - | $ - |
| POST-CLOSURE WATER TREATMENT | | | | | | |
| Annual water treatment cost, from "Water Treatment" | | | | | | $ - |
| Subtotal, Annual post-closure costs | | | | | | $ 235,000.00 |
| Discount rate for calculation of net present value of post-closure cost % | | | | 5.00% | | |
| Number of years of post-closure activity | | | | 10 years | | |
| Number of years of post-closure activity | | | | 10 years | | |
| **Present Value of Payment Stream** | | | | | | $ 1,814,608.00 |

*Regulatory costs - annual reporting, management plans, progress reports etc.

**Errors Corrected**

| Quantity | Unit Cost | Cost | | |
|---|---|---|---|---|
| 0.5 | $70,000.00 | $ 35,000.00 | | |
| 0.5 | $70,000.00 | $ 35,000.00 | | |
| 1 | $20,000.00 | $ 20,000.00 | | |
| 1 | $60,000.00 | $ 60,000.00 | | |
| 0.5 | $70,000.00 | $ 35,000.00 | | |
| 0.1 | $500,000.00 | $ 50,000.00 | | included under direct tasks |
| | | | **$ 235,000.00** | |
| | 5% | | | |
| | 10 | | | |
| | | | **$1,814,607.71** | |

**Assumptions Corrected**

| Quantity | Unit Cost | Cost | | |
|---|---|---|---|---|
| 1 | $ 70,000.00 | $ 70,000.00 | $ 270,000.00 | |
| 1 | $ 70,000.00 | $ 70,000.00 | | |
| 1 | $ 20,000.00 | $ 20,000.00 | | |
| 1 | $ 60,000.00 | $ 60,000.00 | | |
| 0 | $ 70,000.00 | $ - | | no revegetation will be completed |
| 0.1 | $ 500,000.00 | $ 50,000.00 | | included under direct tasks |
| | 5% | | | |
| | 10 | | | |
| | | | $ 868,499.66 | |

| | cost per event | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annual geotechnical inspection | $ 70,000.00 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Cover monitoring | $ 70,000.00 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | |
| Regulatory costs | $ 20,000.00 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| Water sampling and testing | $ 60,000.00 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | |
| | undiscounted | $ 150,000.00 | $ 220,000.00 | $ 150,000.00 | $ 150,000.00 | $ 80,000.00 | $ 90,000.00 | $ 20,000.00 | $ 90,000.00 | $ 20,000.00 | $ 90,000.00 | **$ 1,060,000.00** |
| | npv | $142,857.14 | $199,546.49 | $129,575.64 | $123,405.37 | $62,682.09 | $67,159.39 | $14,213.63 | $60,915.54 | $12,892.18 | $55,252.19 | **$868,499.66** |

# AANDC TC 11 — Particle Size Analysis

amec

A Division of AMEC Engineering Pty Limited ABN 73 003 066 715
13 Collingwood Street, Osborne Park WA 6017
Telephone: (08) 9244 1199 Facsimile: (08) 9244 1457
E-mail: src@amecaust.com.au

# TEST CERTIFICATE

**Client:** MIRAMAR HOPE BAY LIMITED
**Project:** DORIS NORTH COMBINED FINAL MILL TAILING

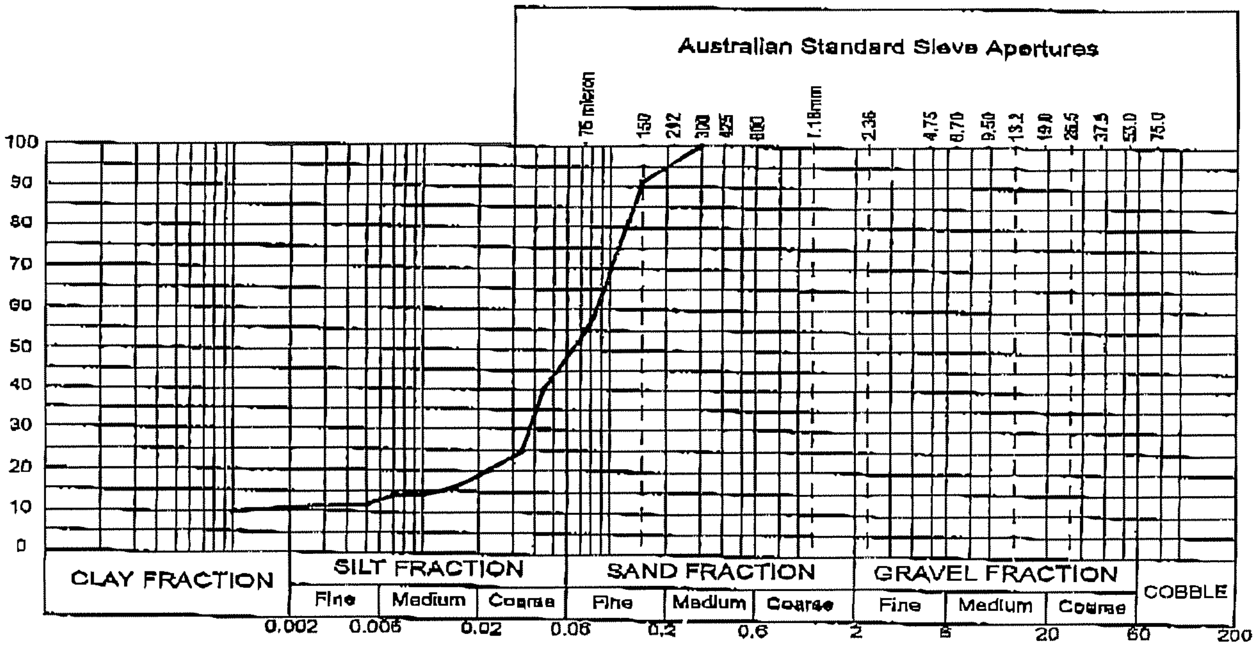
**Sheet No.:** 2 OF 10
**Job No.:** S9645
**Date Tested:** 25.08.03

**Sample ID:** TAILS

## Particle Size Distribution of a Soil

### AS 1289.3.6.2: Sieving with Hydrometer

| Sieving | | | | Hydrometer | | | |
|---|---|---|---|---|---|---|---|
| Sieve Size | % Passing | Sieve Size | % Passing | Diameter | % Passing | Diameter | % Passing |
| 75.0mm | | 1.18 mm | | 67 micron | 49 | 10 micron | 14 |
| 37.5 mm | | 600 micron | | 49 micron | 40 | 7 micron | 14 |
| 19.0 mm | | 425 micron | | 35 micron | 34 | 5 micron | 12 |
| 9.50 mm | | 300 micron | 100 | 26 micron | 25 | 1 micron | 10 |
| 4.75 mm | | 150 micron | 92 | 18 micron | 21 | | |
| 2.36mm | | 75 micron | 56 | 13 micron | 18 | | |




**Remarks:** Sampling Method/s - Submitted by Client.

This laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

Approved: W Rozmianiec

Date: 17.09.03

# POCOCK INDUSTRIAL, INC.
# PARTICLE SIZE ANALYSIS DATA SHEET

Company: **Newmont Mining Corporation**
Project: **Hope Bay**

Table No.: **BB**
Test Date: 12/30/08
By: GDW/NNN
Location: P.I. Lab

Material: **Doris Flotation Tailing**

Purpose: To determine the particle size distribution of the sample.

Procedure: The sample was wet screened at 400 mesh and the oversize fraction dry screened on a Ro-tap.

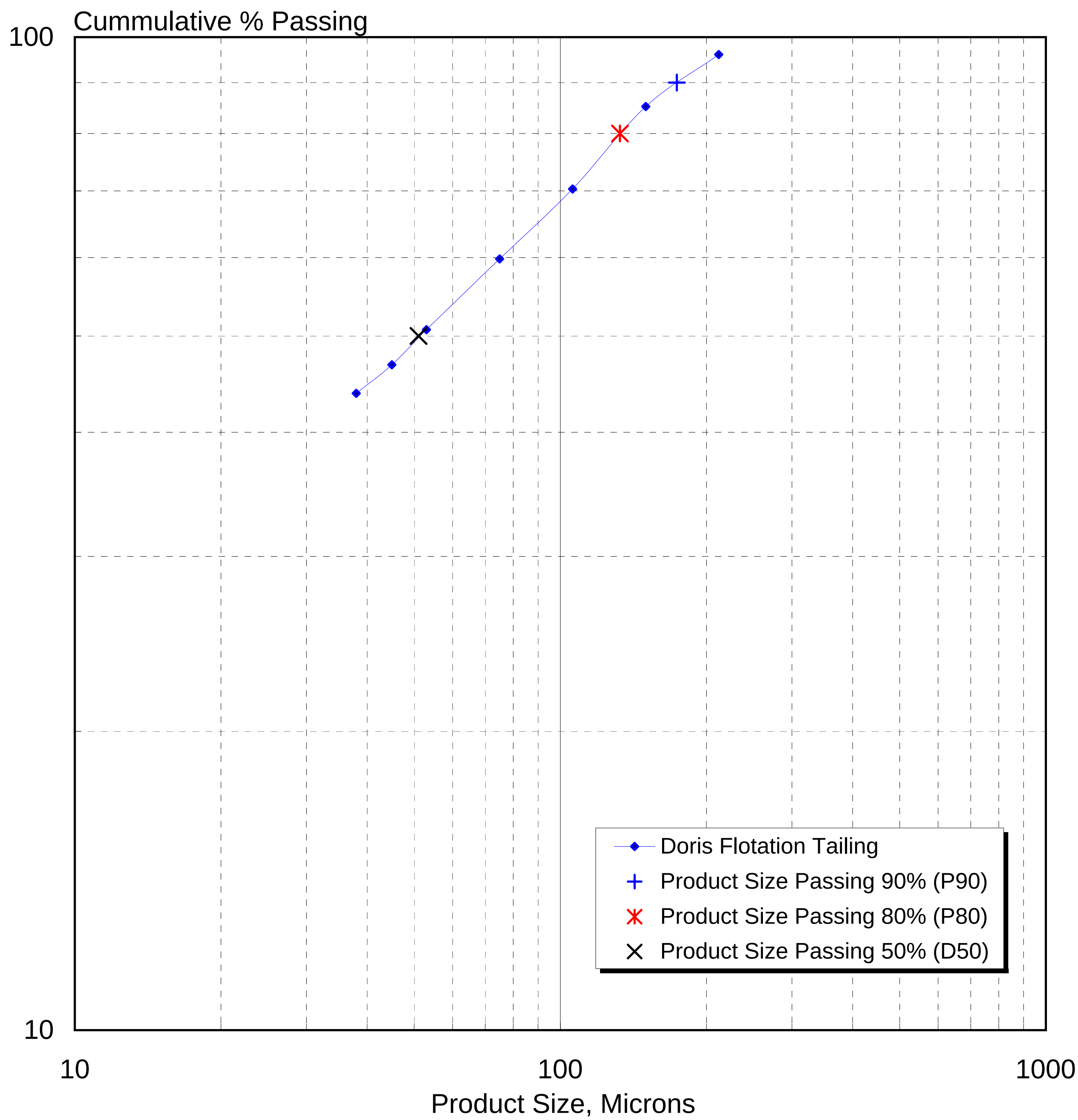
Results:

| **Screen Size** | | **Sample Weights** | | | |
|---|---|---|---|---|---|
| | U.S. | Grams | Wt. % | Cumulative Wt. % | |
| micron | mesh | Retained | Retained | Passing | Retained |
| 212 | 70 | 46.85 | 3.95 | 96.05 | 3.95 |
| 150 | 100 | 129.26 | 10.90 | 85.15 | 14.85 |
| 106 | 140 | 175.64 | 14.81 | 70.33 | 29.67 |
| 75 | 200 | 125.04 | 10.55 | 59.79 | 40.21 |
| 53 | 270 | 107.16 | 9.04 | 50.75 | 49.25 |
| 45 | 325 | 47.00 | 3.96 | 46.79 | 53.21 |
| 38 | 400 | 35.50 | 2.99 | 43.79 | 56.21 |
| -38 | -400 | 519.25 | 43.79 | | |
| | Totals: | 1185.70 | 100% | | |

**Product Size Passing 90% ($P_{90}$) 174 microns**
**Product Size Passing 80% ($P_{80}$) 133 microns**
**Product Size Passing 50% ($D_{50}$) 51 microns**

# FIGURE BB: PARTICLE SIZE DISTRIBUTION

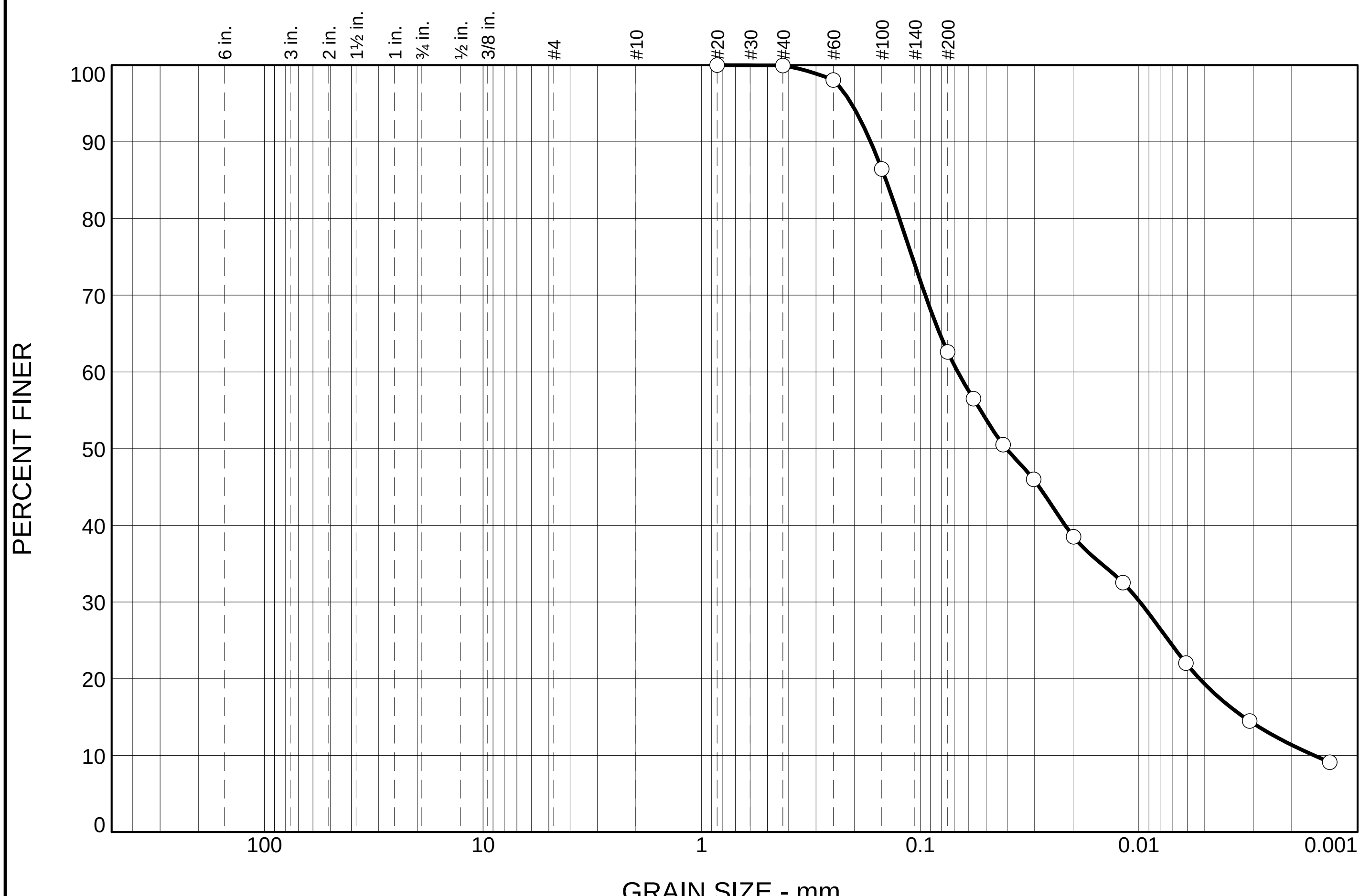
Newmont Mining Corporation
Hope Bay




**Material: Doris Flotation Tailing**

Product Size Passing 90% (P90) 174 microns
Product Size Passing 80% (P80) 133 microns
Product Size Passing 50% (D50) 51 microns
See Table BB For Parameters

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 37.4 | 51.2 | 11.4 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #20 | 100.0 | | |
| #40 | 100.0 | | |
| #60 | 98.1 | | |
| #100 | 86.5 | | |
| #200 | 62.6 | | |
| 0.0571 mm. | 56.5 | | |
| 0.0418 mm. | 50.5 | | |
| 0.0303 mm. | 46.0 | | |
| 0.0199 mm. | 38.5 | | |
| 0.0118 mm. | 32.5 | | |
| 0.0061 mm. | 22.0 | | |
| 0.0031 mm. | 14.5 | | |
| 0.0013 mm. | 9.1 | | |

* (no specification provided)

**Soil Description**

sandy silt

**Atterberg Limits**

PL= NP LL= 16 PI= NP

**Coefficients**

$D_{85}$= 0.1435 $D_{60}$= 0.0674 $D_{50}$= 0.0404
$D_{30}$= 0.0099 $D_{15}$= 0.0033 $D_{10}$= 0.0016
$C_u$= 42.69 $C_c$= 0.92

**Classification**

USCS= ML AASHTO= A-4(0)

**Remarks**

**Sample No.:** 9 **Source of Sample:** **Date:** 3/3/09
**Location:** Doris Central Flotation Tailings **Elev./Depth:**

Knight Piésold CONSULTING

**Client:** Newmont Metallurgical Services
**Project:** Hope Bay
**Project No:** 108-147.03 **Fig.**