Site Overview

Tailings Storage Facility (Tailings Pond)
Main Waste Stockpile
Qanaiyaq
Oxide Stockpile
Main Pit
Aqqaluk Pit

500 meters
In 2010 7,705,700 tonnes of waste rock were hauled from the mine.

Main Waste Stockpile received 6,865,500 tonnes at:

- 1.5% Zn
- 1.3% Pb
- 3.3% Fe

In total the Main Waste Stockpile contains 52.1 million tonnes of waste with similar metal contents as that of 2010.
Acid Rock Drainage (ARD)

Caused by biological and chemical oxidation of metal sulfides in mining wastes

Creates acid and dissolved metals which could impact streams, lakes, and soils
2010 TDS Loads to Tailings Pond in Tonnes

- Main Waste Stockpile bypass WTP3, 23,091, 74%
- Red Dog Creek Pumpback to Pond, 6,766, 22%
- Overburden Pumpback, 194, 1%
- Bons Water non Potable, 66, 0%
- Ore Moisture, 589, 2%
- Runoff into pond, 366, 1%
- Runoff into seepage pond, 11, 0%
TDS Concentration in Tailings Pond Water Over Time

mg/L

5/15/98  5/15/99  5/15/00  5/15/01  5/15/02  5/15/03  5/15/04  5/15/05  5/15/06  5/15/07  5/15/08  5/15/09  5/15/10
Bactericides and Armoring Agents

Lined Test Pits on Main Waste Rock Stockpile, Red Dog Mine
Small Scale Cover Trials

Prepared Control Cell

Prepared Cell with compacted waste rock
Cover Trials Cover Application

One meter loose cover on cell 2

Placement of trafficable layer over GCL on cell 4
Potential Cover Materials

- **Glacial Silt** – not present (no glaciation)
- **Sand and gravel** – not enough
- **Tundra soil** – not thick enough, too high of impact to environment
- **Crushed rock**
  - Siksikpuk shale – too siliceous
  - Okpikruak shale – low organic content
  - Kivalina shale – good organic content and acid neutralizing
Kivalina Cover Material from Aqqaluk Stripping

Zn %
0.0 – 0.1 green
0.1 – 0.5 Lt green
0.5 – 1.0 Yellow
Large Scale Cover Test

Oxide Stockpile
Regrade and Compact Waste Rock
Application of Compacted Layer
Upper Uncompacted Layer
Installation of Lysimeter tanks

O'Kane Consultants Inc.
Hydroseeding & Native Plant Transplants
Oxide Stockpile Reclamation
Cumulative water balance fluxes for Oxide Stockpile, West station

**Frost-free Water Balance**

2008-09

- Precipitation
- Potential Evaporation
- Actual Evaporation
- Measured Change in Storage
- Calculated Change in Storage
- Runoff
- Net Percolation

Net percolation approximately 16-17% of annual precipitation

2009-10

- Precipitation
- Potential Evaporation
- Actual Evaporation
- Measured Change in Storage
- Calculated Change in Storage
- Runoff
- Net Percolation

Net percolation approximately 10-11% of annual precipitation
Main Waste Stockpile Resloping
Thermistor String T05-68
Temperatures March 25, 2006

Degrees C

Meters below surface
Thermistor String T05-68
Temperatures Oct 05 to Jul 08
Pink areas are low apparent resistivity and dark blue areas are high resistivity.

The deep red colour along the east side of line 10380 is the Main Waste Stockpile.

The pink area to the west of the line is the Tailings Storage Facility.

The circled areas along the line are flow paths from the Stockpile to the Tailings Storage Facility.
Airborne Apparent Resistivity Section Along Foot of Main Waste Stockpile

Section Line 10380

Flown along foot of Main Waste Stockpile
Differential Apparent Resistivity Section
Ground Apparent Resistivity Sections
Along Foot of Main Waste Stockpile

Auger holes

Bedrock surface from drilling

Water level from drilling
Conclusions

Continued unimpeded runoff from the Main Waste Stockpile will cause the TDS in the Tailings Pond to increase.

• High TDS in the tailings pond will inhibit the treatment of sufficient water from the Tailings Pond to meet long-term discharge goals.

• Engineered cover systems installed on the Main Waste Stockpile should result in less water infiltrating the stockpile and less TDS load reporting to the Tailings Pond.
Conclusions continued

High TDS runoff from the Main Waste Stockpile should be intercepted and treated in WTP3 to lower the TDS before the runoff enters the Tailings Pond.

- Geophysical surveys have been used to locate high TDS water flows from the Main Waste Stockpile.
- Enhanced water collection systems will be installed in the areas identified from the geophysical surveys and auger drilling.