Concept to Closure
Victoria Junction Coal Preparation Plant

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Closure Design

- Site Description
- Closure Objectives
- Closure Plan Description
- Cover Design
- Benefits
Closure Objectives

• Protective of human health and environment

• Significant benefit to the environment maximize reductions in contaminant loadings

• Designing for simple and robust measures with acceptable level of long-term maintenance
Design influenced by need to collect and treat water during the transition period

Incorporates improvements to water management and sludge handling

Addresses foundations and subsurface infrastructure

Provides for on-site management of ARD generating and other (demolition debris) closure materials
Closure Plan Description
Closure Options

Typical design process of identify and evaluate options against performance criteria.

The overall site closure options, commonly accepted in the mining industry, were considered:

• Collect and treat
• Clean-up all
• Cover all
• Clean-up/consolidate and cover
Closure Plan Description

- Remove ARD generating fills and vegetate
- Cover foundations with till and vegetate

- Cover tailings ponds with HDPE geomembrane
- Construct new water treatment ponds on top
- New ponds to be free draining and sludge removed by excavator

- Stacker area will become repository for ARD generating fills from the remainder of the Plant Site area
Closure Plan Description

- Asphalt from the surge ponds to be removed
- Smaller geomembrane lined surge pond required for transition period
- Excess surge pond capacity to be utilized as sludge repository
Cover Design
Type of Cover

Dry ‘Impervious’ Cover
• Isolate the runoff from the ARD material
• Minimize infiltration to reduce transport out of the CWR pile
• Reduce oxygen influx
Cover Design
Constraints

- Vegetative cover – aesthetics
- 3:1 side slopes on the order of 80 m long – economical practicality
- Minimize intrusion into the wetland
Low permeability elements:
- Locally available low permeability soils
- Geosynthetic Clay Liners (GCLs)
- Geomembrane (HDPE) – preferred option
• Adequate drainage to avoid build up of hydro-static pressure in the drainage layer.
• Adequate drainage to ensure vertical seepage forces.
Cover Design
Slope Stability and Adequate Drainage

- Length of the vegetative section limited due to drainage constraints.
- Geocomposite drain for capacity and ease of construction.
Cover Design
Typical Section

- Top edge ditch to collect and divert water from the drainage area.
- Top edge ditch discharges down the slope at several designed sections.
- Perimeter ditch to convey water to discharge locations.
Defects only allow infiltration when there is water in the drainage layer.

Only water coming in contact with the defect can potentially infiltrate.

Predicted infiltration 10 mm/a or <1%.
• Relatively fine grained wastes – diffusion dominates
• Point source oxygen diffusing into the waste.
• Sulphide depletion in the vicinity of the defect will gradually result lengthening of the pathway for oxygen diffusion.
Benefits Timeline

i. Plant Site Operations
ii. Cessation of Operations
iii. Transition Stage
iv. Closure Stage
v. Very Long Term
Benefits

Cessation of Operations

Estimated Volume of Water Treated:
600,000 m³/a

Estimated Volume of Sludge Generated:
8,000 m³/a

(based on 4,000 m³ for 276,000 m³ Mar-Sept. 2004)
Benefits

Transition Stage

Estimated Volume of Water Treated:
100,000 m³/a

Estimated Volume of Sludge Generated:
1,500 – 3,000 m³/a

New Water Treatment Ponds to improve sludge handling

LBC completed 2004

'Extra' Surge Pond capacity converted to Sludge Repositories

New Surge Pond lined with geomembrane
Benefits
Closure Stage

Estimated Volume of Water Treated:
0 m³/a

Estimated Volume of Sludge Generated:
0 m³/a
Benefits

Current Conditions

High infiltration rate results in high mound and high groundwater flux leaving the site.

Precipitation mobilizes contaminants and carries them to the Northwest Brook. Contaminants in groundwater report to surface.

Contaminants building up along the groundwater pathway (porewater and possibly products of precipitation).

Contaminants building up in the wetland and possibly the sediments of the Northwest Brook (sludges, salts, pore water).
Benefits
Transition Stage 1

Assumed 20 years for mound to reach steady state and groundwater flux leaving the site to reach reduced steady state.

Precipitation mobilizes contaminants and carries them to the Northwest Brook. Contaminants in groundwater report to surface.

Contaminants stored in the wetland and possibly the sediments of the Northwest Brook may re-mobilize and report to Northwest Brook.

Contaminants may flush out along the groundwater pathway.
Benefits
Transition Stage 2

Mound in the CWR pile at steady state.

Precipitation mobilizes ‘flushed’ contaminants and carries them to the Northwest Brook. Contaminants in groundwater report to surface.

Contaminants along groundwater pathway are being ‘flushed’ out.

Contaminants stored in the wetland and possibly the sediments of the Northwest Brook are being ‘flushed’ out.
Benefits
Closure Stage

- Contaminants in groundwater report to surface water. Some deposition and flushing of contaminants in response to seasonal/meteorological events.
- Mound in the CWR pile at steady state.
- Contaminants stored in the wetland and possibly the sediments of the Northwest Brook may re-mobilize and report to Northwest Brook.

Diagram:
- Grand Lake
- Deep Groundwater Flow
- Wetland
- Northwest Brook
- Mound in the CWR pile at steady state
- Contaminants stored in the wetland and possibly the sediments of the Northwest Brook may re-mobilize and report to Northwest Brook.
Benefits
Very Long Term

Contaminant sources depleted.

Northwest Brook

Deep Groundwater Flow

Grand Lake

Wetland
Benefits
Reduction in Loadings Leaving the Site

• Benefit

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Cessation of Operations</th>
<th>Closure Stage 40 mm/a through geomembrane</th>
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<tbody>
<tr>
<td>Sulphate (kg/a)</td>
<td>1,301,800</td>
<td>116,500</td>
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<tr>
<td>Iron (kg/a)</td>
<td>82,200</td>
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<tr>
<td>Aluminium (kg/a)</td>
<td>11,700</td>
<td>4,000</td>
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</tbody>
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• On the order of $20-30/m² for the ‘cover’ alone