

# Concept to Closure Victoria Junction Coal Preparation Plant

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# **Closure Design**



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

#### **Site Description**





## **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



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## Closure Plan Description Outcomes

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- 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



## **Cover Design** 'Impervious' Component



Low permeability elements:

- Locally available low permeability soils
- Geosynthetic Clay Liners (GCLs)
- Geomembrane (HDPE) preferred option



## **Cover Design** Slope Stability and Adequate Drainage



- 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

GEOTEXTILE





- 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



## Cover Design Infiltration







- 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%.</li>

## Cover Design Oxygen





- 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 m<sup>3</sup>/a

Estimated Volume of Sludge Generated:

8,000 m<sup>3</sup>/a

(based on 4,000 m<sup>3</sup> for 276,000 m<sup>3</sup> Mar-Sept. 2004)

#### Benefits Transition Stage





Estimated Volume of Water Treated: 100,000 m<sup>3</sup>/a

Estimated Volume of Sludge Generated: 1,500 – 3,000 m<sup>3</sup>/a

#### **Benefits** Closure Stage





Estimated Volume of Water Treated: 0 m<sup>3</sup>/a

Estimated Volume of Sludge Generated: 0 m<sup>3</sup>/a

#### Benefits Current Conditions





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





#### **Benefits** Transition Stage 2

**Grand Lake** 





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

**Grand Lake** 





Northwest Brook may re-mobilize and report to Northwest Brook.

#### Benefits Very Long Term









#### • Benefit

Parameter	Cessation of Operations	<b>Closure Stage</b> 40 mm/a through geomembrane
Sulphate (kg/a)	1,301,800	116,500
Iron (kg/a)	82,200	32,300
Aluminium (kg/a)	11,700	4,000

• On the order of \$20-30/m<sup>2</sup> for the 'cover' alone