Managing
3 meters of
Rainfall per year

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Myra Falls Operations

- Underground base metal mine producing zinc and copper concentrates with gold and silver credits.
- Accessed by a 90 km asphalt road from Campbell River
- In operation since 1966 (prospecting dates back to 1864)
- Mined 26 million tonnes
- Employs 469 people
- Unique setting located within a Provincial Park
- Footprint of 220 ha within the 3300 ha Strathcona-Westmin (Class B) Provincial Park.
Strathcona Provincial Park
Rugged Mountain Wilderness Area
Mine Site Overview and Topography

- Buttle Lake
- Tailings facility
- Diversion ditch
- Waste rock dumps
- HW Mine
- Polishing ponds
- Super Pond
- Lynx TDF
- Mill area
Collection and Treatment of Mine Drainage Inputs

- Historic waste rock dumps
- Tailings disposal facility(ies)
- Dormant/exhausted mines – Lynx and Myra, both open pit and underground
- Active underground mines – HW and Phillips Reach
- Mill complex and Paste Plant
- Camp and administration buildings
- Surface runoff
Lynx Underground Mine input
HW Mine and Myra Mine input
Surface runoff capture
Waste rock dumps and Tailings Facility
Tailings Facility decant
New Pump House
Water Treatment System

- Collection, discharge and mixing of all inputs upstream of the primary water treatment pond - Superpond
- Lime addition / pH adjustment at the head of the Superpond to precipitate metal hydroxides
- Six downstream settling ponds
Mixing of collected inputs
Water Treatment System
## Pre-treatment vs. Post-treatment – in mg/L

### MIX TANKS

<table>
<thead>
<tr>
<th></th>
<th>pH unit</th>
<th>TSS</th>
<th>T - Zn</th>
<th>T - Cu</th>
<th>T - Pb</th>
<th>T - Cd</th>
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</thead>
<tbody>
<tr>
<td>Mean</td>
<td>7.17</td>
<td>136.5</td>
<td>6.96</td>
<td>2.99</td>
<td>0.212</td>
<td>0.046</td>
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<tr>
<td>Range</td>
<td>5.8 - 11.5</td>
<td>6.3 - 998</td>
<td>0.0 - 16.2</td>
<td>0.3 - 74.7</td>
<td>0.1 - 0.76</td>
<td>0.0 - 0.089</td>
</tr>
</tbody>
</table>

### EFFLUENT

<table>
<thead>
<tr>
<th></th>
<th>pH unit</th>
<th>TSS</th>
<th>T - Zn</th>
<th>T - Cu</th>
<th>T - Pb</th>
<th>T - Cd</th>
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</thead>
<tbody>
<tr>
<td>Mean</td>
<td>8.87</td>
<td>5.52</td>
<td>0.23</td>
<td>0.024</td>
<td>0.0026</td>
<td>0.007</td>
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<tr>
<td>Range</td>
<td>7.7 - 9.49</td>
<td>3 - 10.9</td>
<td>0.023 - 0.973</td>
<td>0.0041 - 0.0794</td>
<td>0.0006 - 0.0089</td>
<td>0.0003 - 0.239</td>
</tr>
</tbody>
</table>
Challenges

- Geography – steep slopes, fast runoff, limited diversion options, small footprint
- Changing weather patterns – greater extremes, more precipitation
- Cyclical nature of mining with changes in
  - Tailings disposal strategy
  - Regulations and permits
  - Mining rates
  - Ore types
  - Mining methods
  - Ownership
  - Metal prices
Geography of Myra Valley
Annual Precipitation Trend (1979-2007)
Powerhouse Observations - Environment Canada Station

Annual Precipitation 1979-2007 projected
Myra Creek in full flood
Lynx Diversion Ditch
Lynx Diversion Ditch breached
Lynx Diversion Ditch under repair
Myra Falls
Debris flow
Road washout
Thelwood Bridge washout
Jim Mitchell pipeline
Jim Mitchell washout and debris flow
A Challenge Met

- Buttle Lake Recovery
  - In the mid-70s Buttle Lake showed increasing zinc trends and decreasing plankton trends.
  - In 1982 a new water treatment system was constructed around the waste rock dumps to intercept ARD.
  - Elected to switch from subaqueous tailings deposition in the lake to surface storage in 1984 (Social License).
  - By 1995 the aquatic ecosystem had recovered dramatically and was considered to be equivalent to pre-mining conditions (Hallam Knight Piesold, 1995).
Zinc Concentrations in Buttle Lake 1966 - 1995

Surface water quality on Buttle Lake at Gold River Bridge.

- Total Zn (µg/L)

- Lynx open pit (most waste rock generated)
- Lynx underground
- Myra underground
- H-W underground (on-land tailings disposal)
- 875 tonnes/day (subaqueous tailings disposal)
- 2700 t/d
- 4000 t/d
- 3385 t/d

- Clark report identifies significant changes in water quality and attributes them to the Lynx open pit and waste damps.
- Diss. Zn occasionally out of compliance at Lynx pond (PE-4077-01)
- Tailings proven not to be the cause of high metals (Pedersen).
- Diversions around waste rock and full water treatment in 1982.
- Pollution Control Objectives

Figure 1
Myra Falls Mine Timeline
Addressing the future

● The new site Water Balance will help
  - Quantify all inputs
  - Identify inputs for possible point source treatment
  - Take advantage of new water treatment technology
  - Reduce reliance on pumping and lime addition

● The new Outer Drain and Pump House will help
  - Focus pumping from those sections of the Tailings Facility Outer Drain that must be captured and treated
Addressing the future (continued)

- The new Lynx Paste Tailings Facility will soon be functional, with potential for short term rain storm storage.
- A vegetated cover on the current Tailings Facility and a more aggressive reclamation of the existing footprint will help slow the rate of surface runoff.
Water Balance – impact of rain storms

<table>
<thead>
<tr>
<th>Source</th>
<th>Average day</th>
<th>Rain storm</th>
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<tbody>
<tr>
<td>Mill Process</td>
<td>21%</td>
<td>9%</td>
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<tr>
<td>HW/Myra Mine</td>
<td>6%</td>
<td>4%</td>
</tr>
<tr>
<td>Phillips Reach/Lynx Mine</td>
<td>7%</td>
<td>8%</td>
</tr>
<tr>
<td>Lynx Pit runoff</td>
<td>1%</td>
<td>11%</td>
</tr>
<tr>
<td>HW/Camp buildings and runoff</td>
<td>3%</td>
<td>7%</td>
</tr>
<tr>
<td>TDF and Paste Plant</td>
<td>16%</td>
<td>30%</td>
</tr>
<tr>
<td>Pump House</td>
<td>46%</td>
<td>31%</td>
</tr>
<tr>
<td>Reclaim water at 8,000m³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Tailings Facility Dam Upgrade Work
2006 TDF Upgrade Work
Paste Tailings Slope

4% - 6% Slope