






Mount Polley Mines

Mount Polley Project



Tailings Facility Summary



February 3, 2005

Knight Piesold ref #: 101-01/10

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Overview of Presentation

- ✦ General information
- ✦ Project background
- ✦ Tailings Storage Facility
- ✦ TSF - Ultimate Design
- ✦ Checklist

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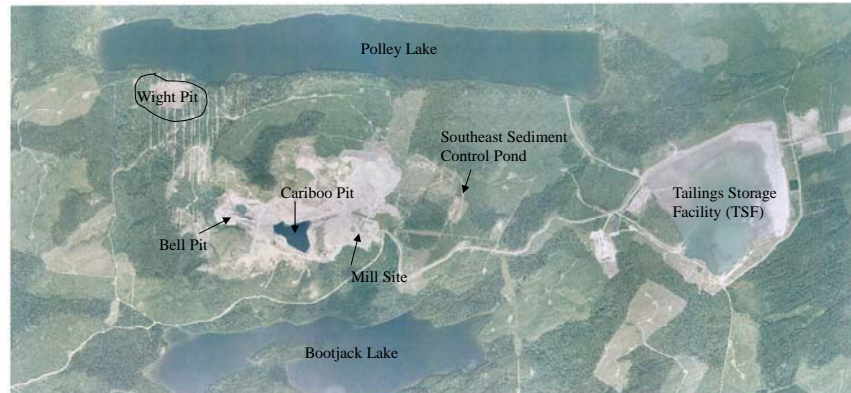
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General Information

- ✦ Mount Polley Project, 2001 Air photo



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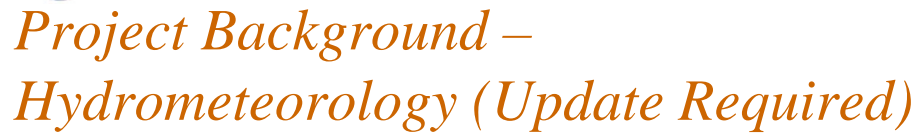
General Information

- ✦ Production started June 1997
- ✦ Care and Maintenance status October 2001 to March 2005
- ✦ Regular inspections
- ✦ Start up March 2005
- ✦ Stage 4 Tailing Storage Facility (TSF) construction per existing permits to elevation 948m from May 2005 to present
- ✦ Additional Mines Branch permits required for on-going expansion of TSF
- ✦ Stage 5 crest for 951m to be constructed before October 2006
- ✦ Stage 4 raise was an upstream cap
- ✦ Stage 5 raise will be a modified centerline construction

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- [illegible]

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- [illegible]

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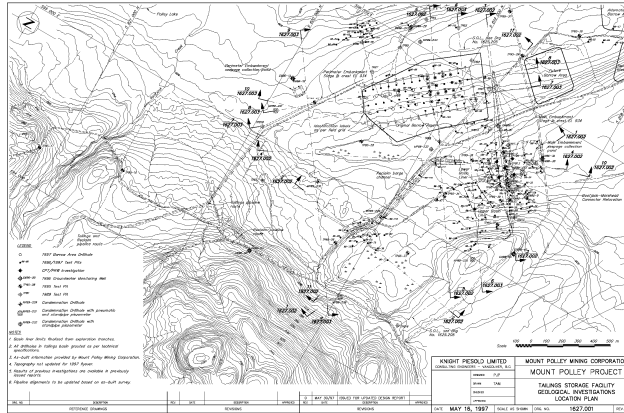
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Project Background – TSF Geology

- Previous investigation work from 1989 to 1999 included: testpits, drillholes, laboratory tests and Cone Penetration Tests.



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Project Background – TSF Geology

- Major geological units in TSF:
 - Surficial Till
 - Glaciolacustrine / glaciofluvial sediments
 - Basal Till
 - Bedrock

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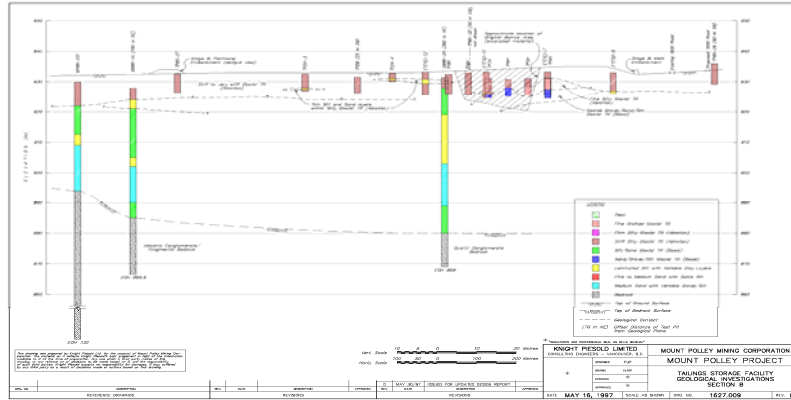
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Project Background

✦ Perimeter Geological X-sections



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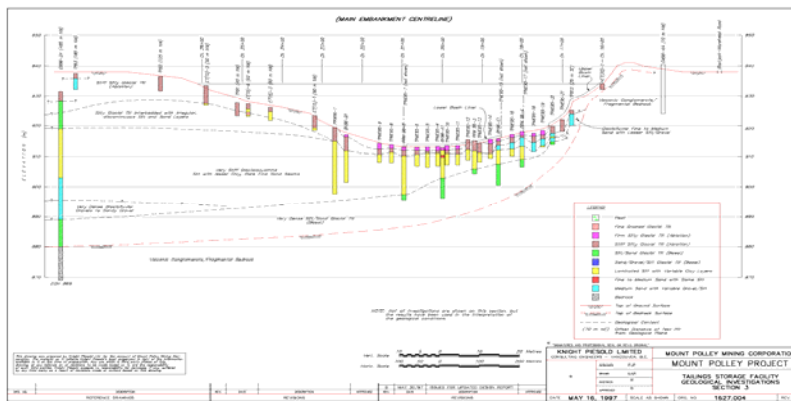
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Project Background

✦ Main Geological X-sections



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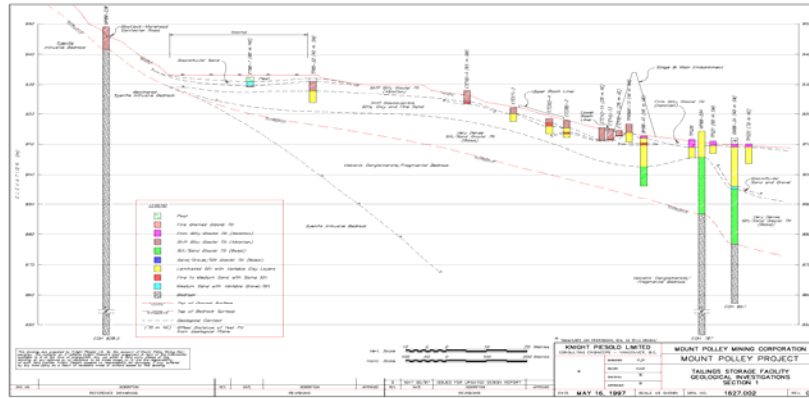
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Project Background



✦ South Geological X-sections



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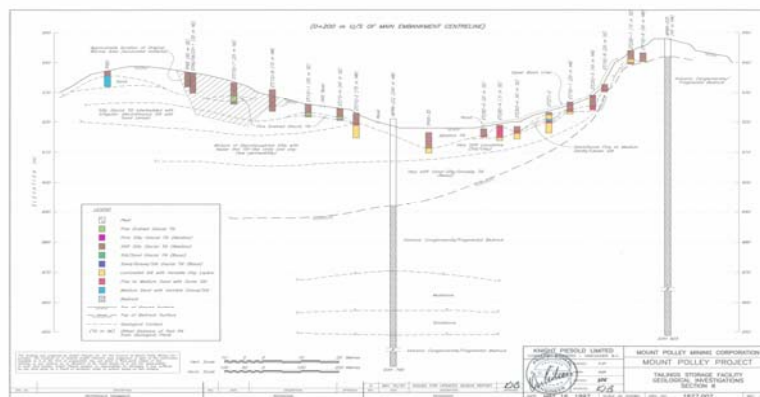
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Project Background



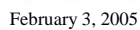
✦ South Geological X-sections



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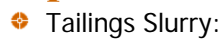
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- Solid throughput: **20,000 tonnes per day**
- Percent solids: **25 – 30%**
- Solid Specific Gravity: **2.70**
- In situ density: **1.44 tonne/m³**
- Geochemical characteristics:

- Seepage water quality: **Ron Martel**
- Supernatant water quality: **Ron Martel**

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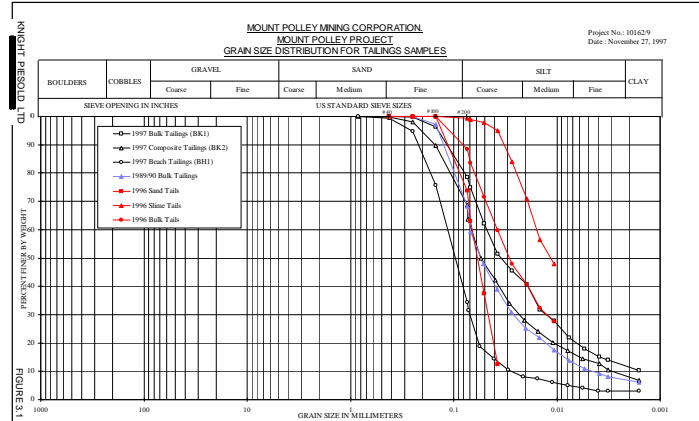
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Project Background – Tailings Properties

✦ Tailings PSA summary :



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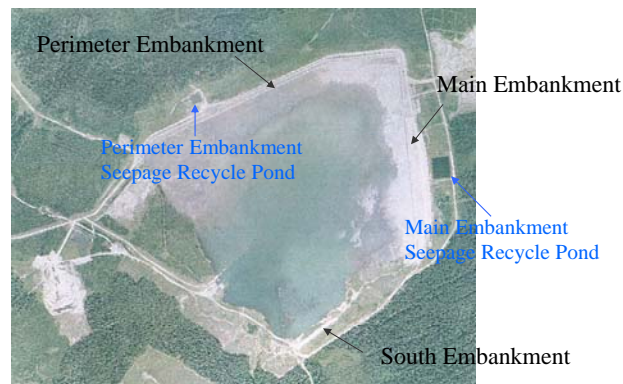
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Tailings Storage Facility

✦ Tailings Storage Facility (TSF) layout:

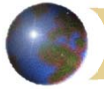


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2001 Air Photo

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Tailings Storage Facility

✦ Currently Permitted:

- ✦ Stage 1a/1b constructed to El. 934m in 1996/1997 – reviewed by Fred Matich
- ✦ Stage 2a/2b constructed to El. 937m in 1998 – reviewed by Chuck Brawner
- ✦ Stage 3a/3b constructed to El. 942.5m in 2000/2001 – reviewed by Chris Carr
- ✦ Stage 3c constructed to El. 945m in 2004/2005 – reviewed by Chris Carr
- ✦ Stage 4 construct to El. 948m on embankments in progress

✦ Pending Permits:

- ✦ On-going expansions to El. 965m embankments to 2012
- ✦ Stage 5 construct to El. 951m on embankments summer 2006

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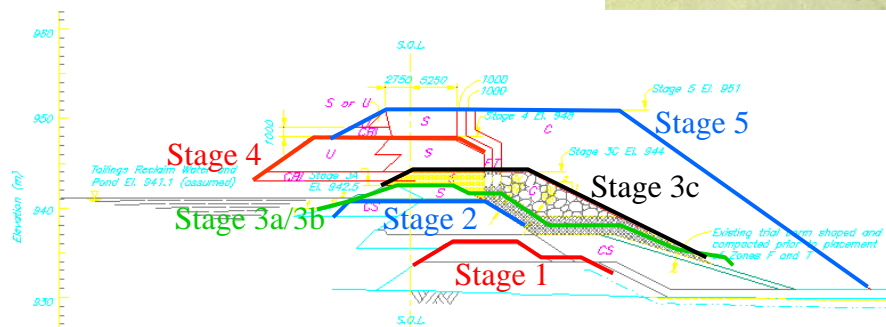
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Tailings Storage Facility

✦ Perimeter Embankment X-section:



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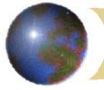
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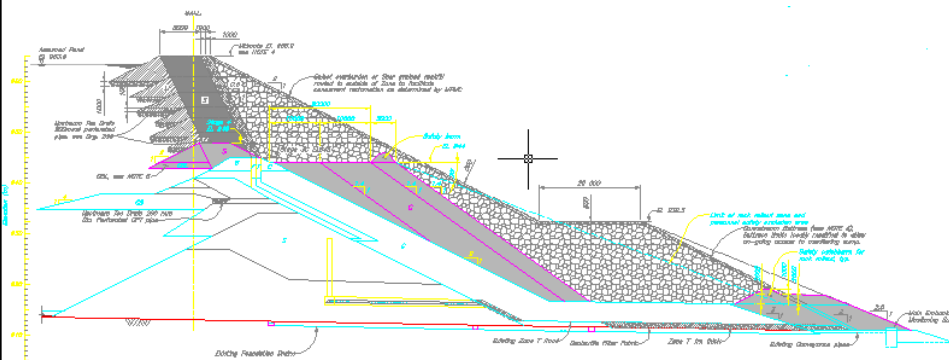
Figure 1 is a cross-section diagram of the dam embankment at Section A. The vertical axis represents Elevation (m), ranging from 910 to 980. The horizontal axis represents the distance from the upstream toe to the downstream toe. The diagram shows the profile of the embankment at different stages of construction: Stage 1 (red), Stage 2 (blue), Stage 3a/3b (green), Stage 3c (black), and Stage 5 (red). The S.O.L. (State of Limit) is indicated by a yellow line. The downstream buttress is shown as a structure on the right side of the embankment. The existing conveyance pipes (typ.) are shown as a series of lines at the base of the embankment. A detail view of the downstream buttress is shown in the top right corner.

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Tailings Storage Facility

Main Embankment X-section



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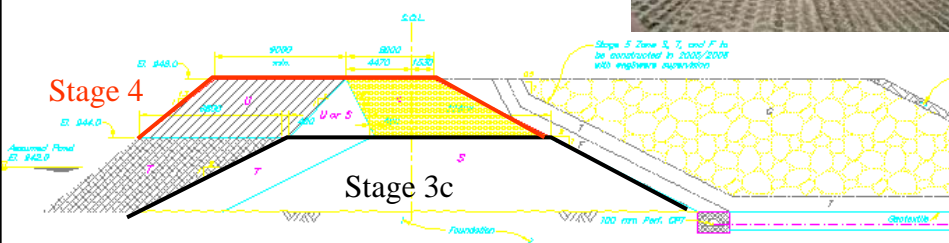
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Tailings Storage Facility

South Embankment X-section:



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TSF – Ultimate Design

- ✦ Design Criteria
- ✦ Geotechnical Model
- ✦ Proposed Expansions
- ✦ Water Management
- ✦ Construction Quality Assurance
- ✦ Monitoring
- ✦ Closure
- ✦ Schedule and Sequence

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TSF – Ultimate Design

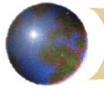
✦ Design Criteria

Design Operation Life		7 years
Hazard rating:	During Operations	LOW by CDA Consequence Classification
	After Closure	HIGH by CDA Consequence Classification
Design Earthquakes:	Operations DBE	1 in 475 year event ($M = 6.5$, $A_{max} = 0.37$ g)
	MDE	50% of the 1 in 2000 year event or MCE ($M = 6.5$, $A_{max} = 0.065$ g)
	After Closure MCE	1 in 2000 year event
Embankment Crest Width: (Final Width)		9 m
Design Tonnage		7,300,000 tpy (20,000 tpd)
Freeboard:	Operations	24 hour PMP event (679,000 m ³) plus 1.0 m wave run
	Closure	Sufficient to provide routing of PMF plus wave run-up
Storage Capacity:		76,000,000 tonnes

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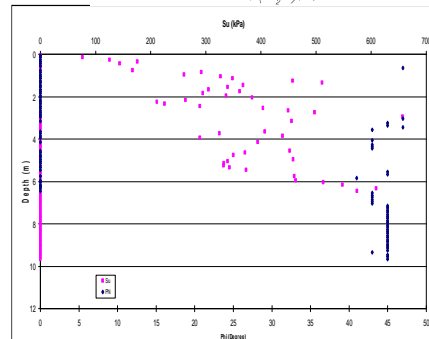
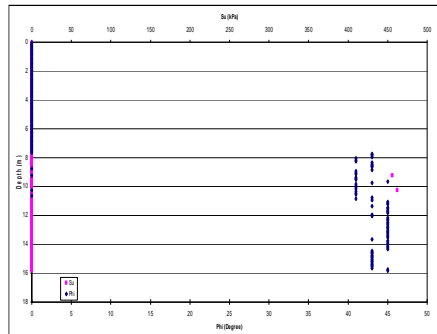
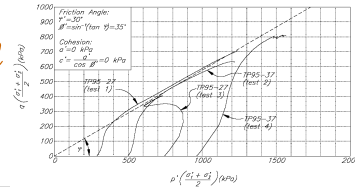
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TSF – Ultimate Design

Generic Geotechnical Model



Designs based on conservative lower bound numbers: $\phi' = 35^\circ$, $S_u = 0 \text{ kPa}$

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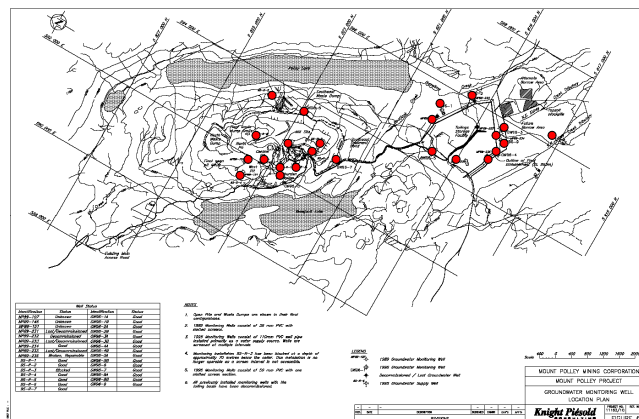
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TSF – Ultimate Design

Hydrogeology

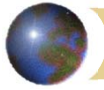
● = Groundwater well



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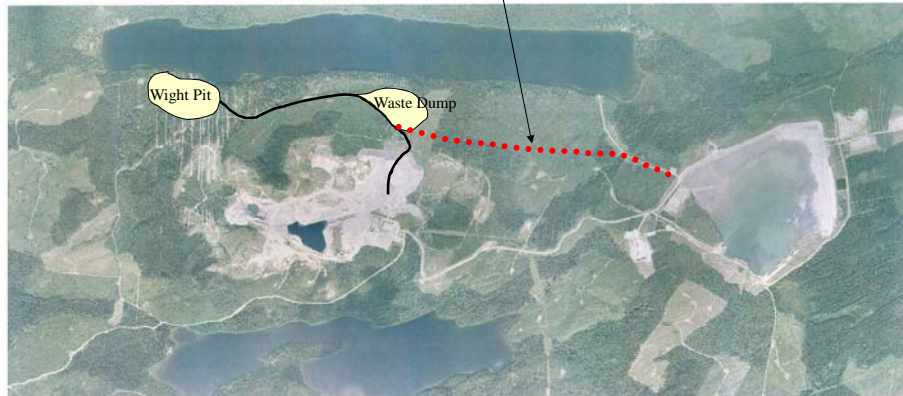
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TSF – Ultimate Design

- ✦ Proposed waste rock dump and haul road.



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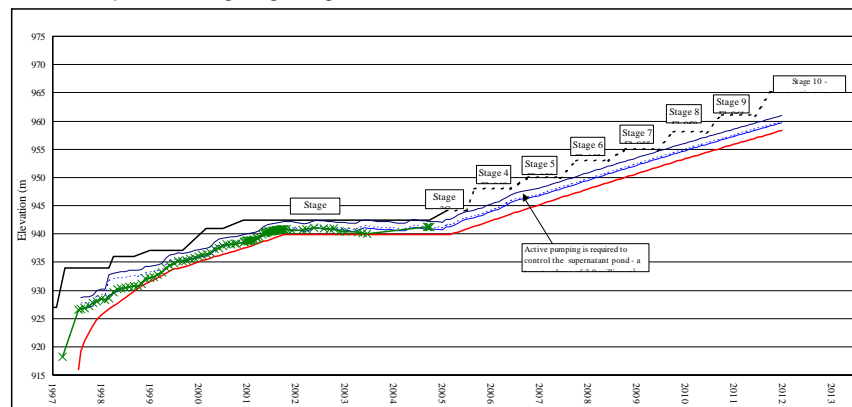
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TSF – Ultimate Design

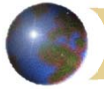
- ✦ Proposed On-going Stages



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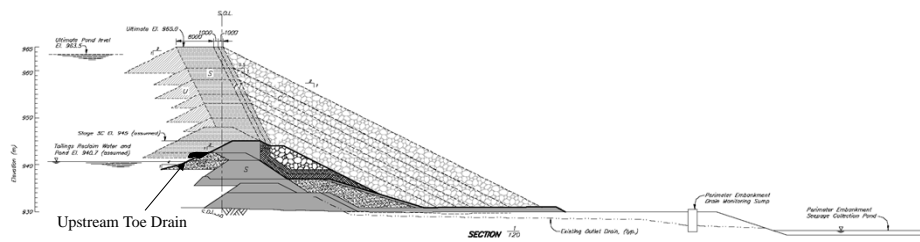
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TSF – Ultimate Design

✦ Draft Perimeter Embankment X-section



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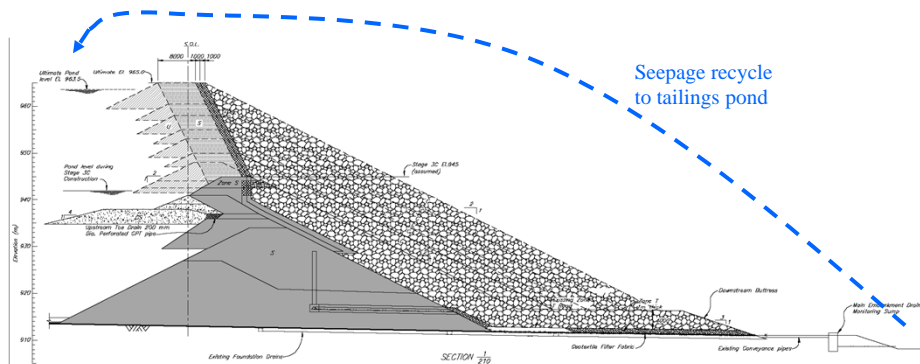
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TSF – Ultimate Design

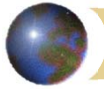
✦ Draft Main Embankment X-section



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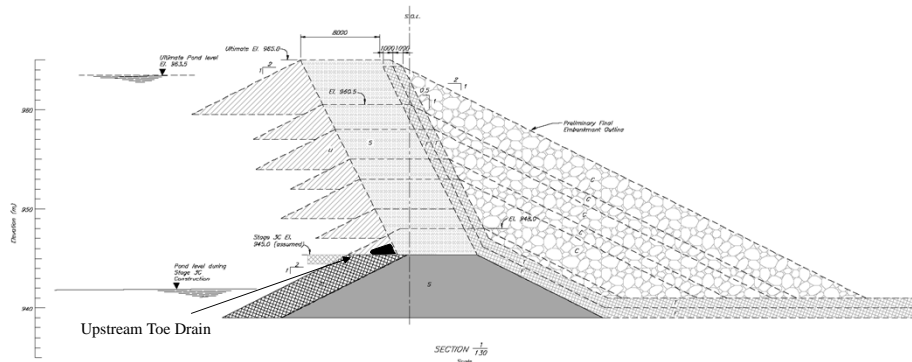
Knight Piesold ref #: 101-01/10

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TSF – Ultimate Design

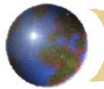
- ✦ Draft South Embankment X-section



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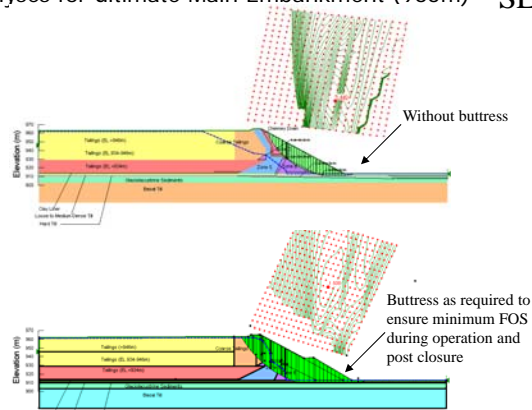
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TSF – Ultimate Design

- ✦ Typical analyses for ultimate Main Embankment (965m) SLOPE/W



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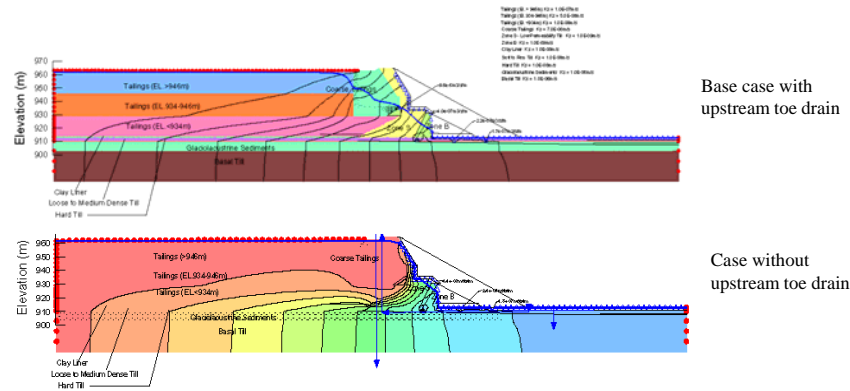
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TSF – Ultimate Design

✦ Typical analyses for ultimate Main Embankment (965m) SEEP/W



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TSF – Sand Cell Construction

✦ Cell dimensions: 18m x 150m





Sand Cell Procedure

Step 1 - Drains are set at end on cell, tailings are discharged from the opposite end of the cell. (Note: if drains are not set at the very end of the cell of the cell slimes will build)

Step 2 - A cat works the cell lengthwise by pushing material forward, then back blading which helps separate the fines from the coarse tailings. The cell must be worked constantly to prevent the build up of slimes.

Step 3 – As soon as possible, sand is pushed up against the core to prevent the core from becoming saturated.

Step 4 - The drains are raised as the elevation of the sand increases.
Note: The success of this procedure is dependent on the quality of the tailings.



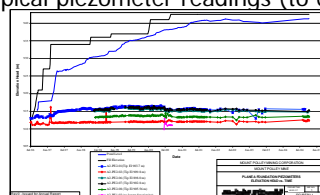
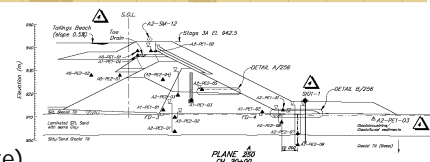
1 foot of sand in 7.5 hours



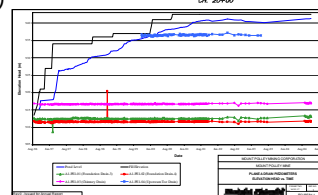


TSF – Ultimate Design

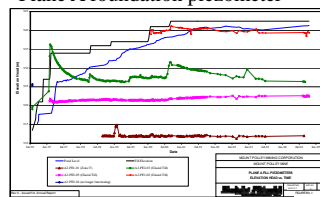
- Typical piezometer readings (to date)



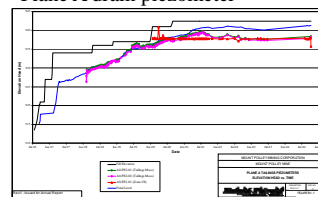
Plane A foundation piezometer



Plane A drain piezometer



Plane A fill piezometer

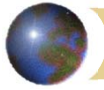


Plane A tailings piezometer

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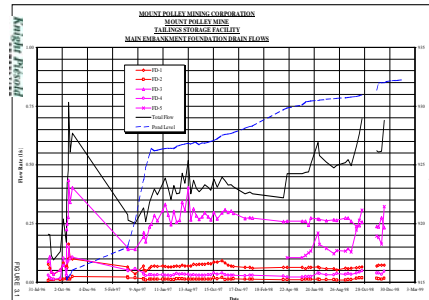
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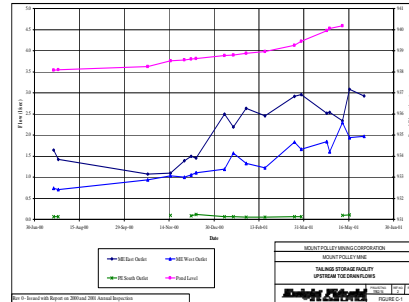


TSF – Ultimate Design

✦ Drain Flow Readings



Typical foundation drain flow readings



Typical upstream toe drain flow readings

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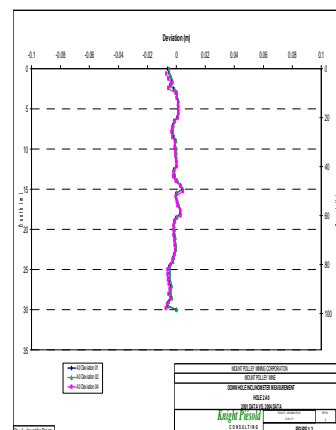
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✦ Inclinometer readings

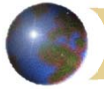


Typical inclinometer reading

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TSF – Ultimate Design

✦ Water Management

■ Tailings Deposition Strategy

⊗ = Pump

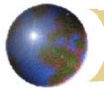


- Seepage from Main Embankment Seepage Recycle Pond pumped into tailings pond
- Tailings supernatant pond volume increases over life of mine
- Freeboard maintained for containment of PMP runoff plus 1m for wave run-up

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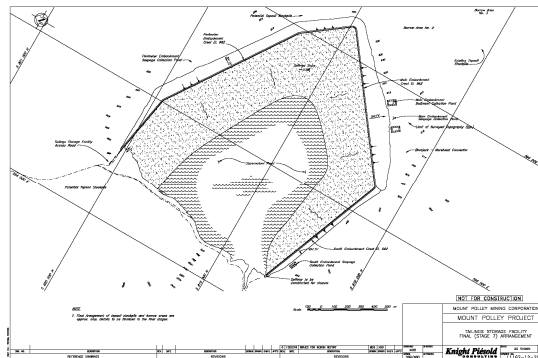
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TSF – Ultimate Design

✦ Proposed Closure Plan

■ From Report on Cycloned sand Construction of Stage 3 and On-going Stages of The Tailings Storage Facility, 1999



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TSF – Ultimate Design

- ✦ Proposed Schedule
 - Design Report by March 1, 2005
 - Agency review and approval by May 1, 2005
 - Stage 4 construction commenced May 1, 2005



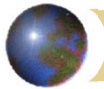
2006 Checklist

- ☐ Make a checklist
- ☐ Maintain Beaches
- ☐ Install new inclinometers on the Main Embankment.
- ☐ Investigate and fix seepage on the Perimeter Embankment before Zone C is placed. This may involve extending the upstream to drain outlet pipe to the ultimate toe.
- ☐ Dig test pits near the South Embankment and place Zone S in areas where the basin liner is less than 2m thick.
- ☐ Place stage 5 Zone C starting on the Main Embankment to 944m. Place Till to 948m starting on the Perimeter Embankment.
- ☐ Place Zone F, Zone T and Zone C from 944m to 951m.
- ☐ Install upstream toe drain in the Zone U at 948m.

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- ☐ Install downstream toe drain and sump on the South Embankment.
- ☐ Place CBL on the Zone U at 948m.
- ☐ Place Zone U and Zone S on all Embankments to 951m.
- ☐ Remove and ultimately reestablishing seepage pond pipelines.

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