4.5 TILL PLACEMENT

Photo 4: Till placement on the Perimeter Embankment at Ch. 46+00 m.

Till was placed for 5 days during this reporting period with rain at the end of the week. Till is now placed to elevation 954 m around the entire TSF except for a 100 m long section at West End of the Perimeter. There is approximately 1 day of till placement remaining.

Photo 5: Zone F and T placement to elevation 954 on 2:1 slope.

Zone F placement on the South and Perimeter Embankment is approximately 50% complete. Zone T has not been placed on the South but has been placed on approximately 50% of the Perimeter and Main Embankments. Filter runs have been scheduled for the last 2 weekends and filter supply is good.

5.0 CONSTRUCTION CONTRACTING

Lake Excavating currently has two hoes (320 and 330), two packers, three articulated trucks and a D8 dozer on site. Lake excavating will be leaving site soon due to the till program being completed.

6.0 ENGINEERING ISSUES

No issues have been encountered.

7.0 CONSTRUCTION QUALITY ASSURANCE AND QUALITY CONTROL ACTIVITIES – KP

The following KP activities were performed during this reporting period:

- Monitoring of construction material placement along the Perimeter, Main, and South Embankments.
- The following TSF construction material sample results were collected:
    - R-S6-ZF-41 to 43
    - C-S6-ZF-11

KP is assisting the MPMC bucking room to with the soil testing.

- Monitoring of TSF piezometers and inclinometers. The piezometer readings have been entered into the data base for analysis and no extreme readings were detected. The pond elevation on October 5 was 949.96 m.

  The inclinometer readings were taken on September 30 and several attempts were made to download the data from the data logger. It appears that the data was erased by the recorder and that the data logger is not functional. Duram Instrumentations will be notified about the problem this week to try and resolve the issue. The data logger was recently repaired in August and was functioning properly initially.

- Assisting with surveying the alignment and grade staking for till
- Construction planning and scheduling.
- Preparation of weekly reports.

Submitted by,

Knight Piésold Ltd.

Jim McDonald
Staff Engineer

Knight Piésold
CONSULTING

File No.:VA101-1/21-A.01
Cont. No.:VA08-02305

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January 13, 2009

Mr. Ron Martel
Environmental Superintendent
Mount Polley Mining Corporation
P.O. Box 12
Likely, BC VOL 1N0

Dear Ron,

Re: Drainage Ditch below Polley Lake Haul Road (Wight Pit RDS Diversion Ditch)

Knight Piésold Ltd (KPL) has been retained to asses a drainage ditch, detention pond and conveyance pipe that will collect runoff below the Wight Pit and Polley Lake haul roads, and discharge it into the perimeter embankment seepage collection pond. The objective of this assessment is to:

- identify the flow capacity of the installed pipeline;
- calculate the maximum storage capacity of the pond and ditch;
- determine the return period event that can be passed by the system; and
- identify the location and size of the spillway along the ditch alignment.

Site description

The drainage ditch starts approximately 200 metres north of the intersection of the Wight Pit Haul Road and the Polley Lake Haul Road. It runs parallel to the Polley Lake Haul Road at 0.3-0.5% for approximately 4 km where it empties into a small detention pond. Runoff is conveyed from the detention pond in a 22" HDPE pipe adjacent to the haul road and crosses Bootjack Creek on the existing bridge. The pipe discharges the runoff into a second ditch, which then flows into the perimeter embankment seepage collection pond (PESCP). Figure 1 shows the alignment of the ditch, location of the detention pond and drainage pipe alignment. This letter considers a catchment area equivalent to 1.44 km^2 above the Polley Lake Haul Road.

Average monthly flow

Average monthly precipitation values were provided in the KP report 'On-Going Construction Requirements' (Ref. no. 10162/9-3, 1997). The KP letter 'Mount Polley Water Balance' (VA-0816, 2004) reviews these numbers with no significant changes and also provides runoff coefficients for all areas of the mine site. Table 1 summarizes this information and presents the predicted total runoff as well as the average monthly flows in the ditch. Determining monthly runoff requires use of runoff coefficients. The catchment has been divided into two arbitrary sub-catchments: 50% of the area is evaluated as disturbed and assigned a freshet coefficient of 1.0 and a general coefficient of 0.6, while the remaining 50% is undisturbed and is assigned a coefficient of 0.24 for all seasons. Any increase in disturbed area over the life of the mine will result in a corresponding increase in runoff. The maximum monthly flow occurs in April and is a result of snowmelt and precipitation. The April flow of 0.042 m^3/s is well below the calculated maximum flow of 0.5 m^3/s that the pipe is capable of carrying.

Summary of Comments on Microsoft Word - VA08-02305.doc

Page: 1

Number: 1 Author: rmartel Subject: Sticky Note Date: 1/19/2009 10:56:23 AM
Discharges

Number: 2 Author: rmartel Subject: Sticky Note Date: 1/19/2009 10:58:13 AM
then

Number: 3 Author: rmartel Subject: Sticky Note Date: 1/19/2009 10:58:54 AM
the second portion of the ditch

Storm Events

The calculation of average monthly flows assumes that the runoff occurs at a constant rate across the entire month. Runoff will be much higher during storm events due to the short term nature of intense precipitation. KPL has analysed the predicted runoff during 24 hour storm events with return periods ranging from 2 to 100 years. The 24 hour intensities were calculated based on the Intensity-Frequency-Duration curve from the 'Report on ongoing Construction Requirements' which is included as Appendix A. The results are summarized in Table 2.

The return period of the storm is a statistical function and means that if a storm has a return period of 2 years it is expected, on average, that a storm of this magnitude or greater will occur once every other year. Stated another way, every year there is a 50% chance that a storm will meet or exceed the precipitation magnitude of the 2 year storm. KPL has used the Soil Conservation Service (SCS) Curve Number approach to assess the runoff resulting from the above storm events. This approach requires selection of a Hydrologic Soil Group, where Group A soils are the most permeable and Group D are the least permeable. Group D soils were chosen for the disturbed proportion of the catchment and Group C soils for the undisturbed portion of the catchment. The lower permeability Group C reflects the high till content of the soils found onsite.

Land use and treatment are also factors in selecting the Curve Number. The disturbed area has been assigned the land use "Newly graded...no vegetation" with a corresponding Group D Curve Number 94 (Ponce p.161). The undisturbed half has been assigned the land use "Woods Fair: Woods are grazed but not burned, and some forest litter covers the soil.", with a corresponding Group C Curve Number 73 (Ponce p.163). The average Curve Number for the catchment as a whole is then calculated as 84. The SCS runoff model is highly sensitive to the curve number selection and ideally the model would be calibrated against site specific data.

Conveyance Pipe over Bootjack Creek

The pipe that will convey water across Bootjack Creek is a 22" HDPE DR 15.5 pipe with a nominal internal diameter of 480 mm. The HydroCAD simulation for the site indicated that the peak flows in the ditch during all of the 2 to 100 year storm events will exceed the capacity of the pipe. Increasing flow through the existing pipe is not a possibility as there is limited head available between the detention pond and the outlet ditch. Three alternatives remain:

- Attenuate the peak flow with a detention pond;
- Provide a spillway and allow the excess to spill into the environment; and/or
- Add to or enlarge the pipeline.

KPL recommends a combination of these three options. Specifically, provide a pond to attenuate the flows up to and including the 10 year event, construct a spillway to allow larger events to dissipate into the environment and, upon closure, add a second pipe parallel to the existing pipe, unless the closure water management plan negates the need to divert any water to the TSF. As can be seen in Table 2, the 10 year storm requires 1700 m^3 of storage. Storms of higher intensity are shown as spilling over the spillway. These results are discussed further in the following section.

This letter has not considered the results of adding further catchment to the system post closure when MPMC may want to minimize diversions and return the catchments to as close to their natural drainage as possible. Care should be given to the potential expansion of this system post closure. Should MPMC want to continue conveying this water to the PESCP, it could be conceivable to move some of the tailings pipes from their current position to run parallel to this existing pipeline.

Detention Pond

The newly constructed detention pond, shown in Photos 1 and 2, serves three functions,

- detain the peak flows and allow them to drain slowly;
- create a head water to drive the flow in the pipe; and
- facilitate construction of an inflow structure for the pipe.

Base flows predicted in Table 1 range from nearly zero in winter to 42 L/s during spring snowmelt, which are well below the 500 L/s capacity of the outflow pipe. As a result it is expected that the pond will remain mostly empty under normal operating conditions. The outline and plan of the existing pond are shown on Figures 2 and 3. The dimensions used in these figures are based on visual estimations by KPL staff after construction of the pond, and wherever possible actual survey data has been used to locate points. Modelling shows that storm events will result in flows that exceed the outflow capacity. Whenever inflow exceeds outflow there will be storage of water. The hydrographs for the storage are shown on Figures 4 to 11. It can be seen in the hydrographs that inflows exceed outflows for approximately 1 to 3 hours depending on the storm event. The maximum storage that is shown on the hydrographs is summarized in Table 2. When inflow is less than outflow storage begins to decrease.

KPL has used a design pond that approximates the existing pond. The design pond is a square with 15 metres per side and walls that slope at 1V:1H. There is additional volume in the ditch which has been modelled as a rectangular prism with dimensions: 150 metres (length), 0.95 metres (width at base) and 1V:1H side slopes. The spill way for the modelled pond is a 5 metre long broad crested weir that is 2.2 metres above the invert of the outlet pipe. The approximate location of the spillway is shown in Photo 3. The top of the embankment is 3.3 metres above the invert and is shown in Photo 4. The volume available to store water below natural ground level is estimated at 930 m^3. This estimate is based on visual inspection soon after construction and should be updated when actual survey data becomes available. It includes the pond and ditch below elevation 943.8 metres.

There is enough volume to attenuate the 2 year storm below natural ground level within the pond and ditch. At 900 m^3 of required storage, the 5 year storm is within the error margin of the volume estimate and will likely still be stored entirely below natural ground level. The 10 year storm will require 770 m^3 of storage above natural ground level. Distributed evenly over the pond and ditch, this is approximately 0.74 metres above ground level. The top of the berm has been surveyed at 945.4 meters, which is approximately one metre above the 10 year storm event. However the top of the berm is not consistently at or above this elevation.

1700 m 3?(RM)

Detention Pond Outlet

The pond outlet should be funnel shaped to direct water into the pipe and may be constructed from any combination of concrete sand bags or rock. Construction of the outflow should also give consideration to expansion at closure when a second pipe may be required to accommodate larger flows. A grate should also be provided to prevent larger debris from entering and blocking pipe flow. The pond outlet will require regular maintenance to ensure ongoing functionality.

Page: 3

Number: 1 Author: rmartel Subject: Sticky Note Date: 1/19/2009 11:31:01 AM
1700m3?

Conclusions

The Wight Pit RDS Diversion Ditch, along with the associated storage pond and conveyance pipeline will be able to convey the 10 Year storm event based on the present catchment area and runoff coefficient assumptions. The 15 Year and greater storm events will be partially conveyed with this system, with excess flows exiting the spillway of the diversion ditch located 150 metres upstream of the storage pond. The excess flow will report to the ditch adjacent to the Polley Lake Pump Road and report to Polley Lake.

Should you have any questions regarding this letter, please contact us at your convenience.

Yours truly,
KNIGHT PIESOLD LTD.

Signed:	Reviewed:
Mark Smith, EIT	Greg Smyth
Staff Engineer	Senior Scientist

Approved:
Ken Brouwer, P.Eng.
Managing Director

References:

Ponce V. M. 1989. *Engineering Hydrology Principles and Practices*, Prentice Hall, New Jersey.

HydroCAD 8.50 Sampler Build 1 HydroCAD Software Solutions LLC

Knight Piésold, 1997, *Report on Ongoing Construction Requirements* Ref. No. 10162/9-3

Knight Piésold, 2004, *Mount Polley Water Balance* V4-0816

Attachments:

Table 1 Rev 0	Predicted Average Monthly Conditions
Table 2 Rev 0	Predicted Flows, Storage Volumes and Pond Elevations Resulting from Storm Events with ARI of 2 – 100 Years
Figure 1 Rev 0	Polley Lake Haul Road Detention Pond General Arrangement
Figure 2 Rev 0	Polley Lake Haul Road Detention Pond Plan View
Figure 3 Rev 0	Polley Lake Haul Road Detention Pond Cross Sections

Figure 4 Rev 0	Detention Pond Hydrograph 2 Year Storm Event
Figure 5 Rev 0	Detention Pond Hydrograph 5 Year Storm Event
Figure 6 Rev 0	Detention Pond Hydrograph 10 Year Storm Event
Figure 7 Rev 0	Detention Pond Hydrograph 15 Year Storm Event
Figure 8 Rev 0	Detention Pond Hydrograph 20 Year Storm Event
Figure 9 Rev 0	Detention Pond Hydrograph 25 Year Storm Event
Figure 10 Rev 0	Detention Pond Hydrograph 50 Year Storm Event
Figure 11 Rev 0	Detention Pond Hydrograph 100 Year Storm Event
Photo 1	Detention Pond, Ditch and Outflow Pipe
Photo 2	Detention Pond and Drainage Ditch
Photo 3	Lowest 150m of Drainage Ditch
Photo 4	Waste pile/berm on lower bank of ditch
Appendix A	Short Duration Rainfall Intensity

/ms

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TABLE 1

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT

PREDICTED AVERAGE MONTHLY CONDITIONS
BASE FLOWS

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Month	Average Precipitation (mm)	Snowmelt (mm)	Total Free Water (mm)	Total Runoff (m^3)	Average Monthly Flows (m^3/s)
January	63.7	0	0	0	0
February	37.7	0	0	0	0
March	30.0	16.5	46.5	41,551	0.016
April	40.1	82.7	122.8	109,636	0.042
May	55.1	66.2	121.3	108,261	0.040
June	111.2	0	111.2	75,260	0.029
July	80.1	0	80.1	54,212	0.020
August	90.6	0	90.6	61,318	0.023
September	46.6	0	46.6	31,539	0.012
October	56.9	0	56.9	38,510	0.014
November	63.9	0	63.9	43,248	0.017
December	64.0	0	0	0	0

M:\1\01\00001\21\A\Correspondence\VA08-02305 Polley Lake Haul Road detention pond\data\[Tables 1 & 2 (Monthly & Storm Flows).xls]Storm

NOTES:

1. FOR THE PURPOSES OF THIS REPORT, IT HAS BEEN ASSUMED THAT ALL DECEMBER, JANUARY AND FEBRUARY PRECIPITATION FALLS AS SNOW. THE ACCUMULATED SNOW THEN MELTS 10% IN MARCH, 50% IN APRIL AND 40% IN MAY.

2. TOTAL RUNOFF IS BASED ON 50% UNDISTURBED AREA (RUNOFF COEFFICIENT = 0.24) AND 50% DISTURBED AREA (FRESHET RUNOFF COEFFECIENT = 1.0; GENERAL RUNOFF COEFFICIENT = 0.6).

3. MAXIMUM FLOW THROUGH 22" HDPE IS ESTIMATED AT 0.5m^3/s.

4. MONTHLY AVERAGE PRECIPITATION IS DETERMINED IN LETTER 'MOUNT POLLEY WATER BALANCE' V4-0816, JULY 30, 2004.

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TABLE 2

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT

PREDICTED FLOWS, STORAGE VOLUMES AND POND ELEVATIONS RESULTING FROM STORM EVENTS WITH ARI OF 2 - 100 YEARS

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Average Recurrence Interval	24 Hour Precipitaion (mm)	Runoff Volume (m^3)	Peak Inflow (m^3/s)	Peak Outflow Through Pipe (m^3/s)	Maximum Storage (m^3)	Maximum Pond Elevation (m)	Peak Spillway Outflow (m^3/s)	Total Spillway Volume (m^3)
2	25	5,310	0.73	0.46	700	943.3	0	0
5	26	5,930	0.85	0.47	900	943.5	0	0
10	29	7,942	1.23	0.49	1,700	944.3	0	0
15	31	9,390	1.51	0.50	1,870	944.4	0.47	660
20	34	11,700	1.97	0.50	2,000	944.5	1.15	1,900
25	36	13,400	2.30	0.50	2,080	944.6	1.57	2,850
50	41	17,700	3.20	0.51	2,200	944.7	2.59	5,560
100	46	22,430	4.17	0.51	2.380	944.8	3.59	8,665

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NOTES:

1. RETURN PERIOD STORM EVENTS ARE DERIVED FROM REPORT ON ON-GOING CONSTRUCTION REQUIREMENTS REF NO 10162/9-3.
2. MAXIMUM FLOW THROUGH 22" HDPE IS ESTIMATED AT 0.5m^3/s.
3. WHEN INFLOW EXCEEDS OUTFLOW, STORAGE INCREASES. MAXIMUM STORAGE OCCURS WHEN INFLOW DECREASES TO A VALUE LESS THAN OUTFLOW.

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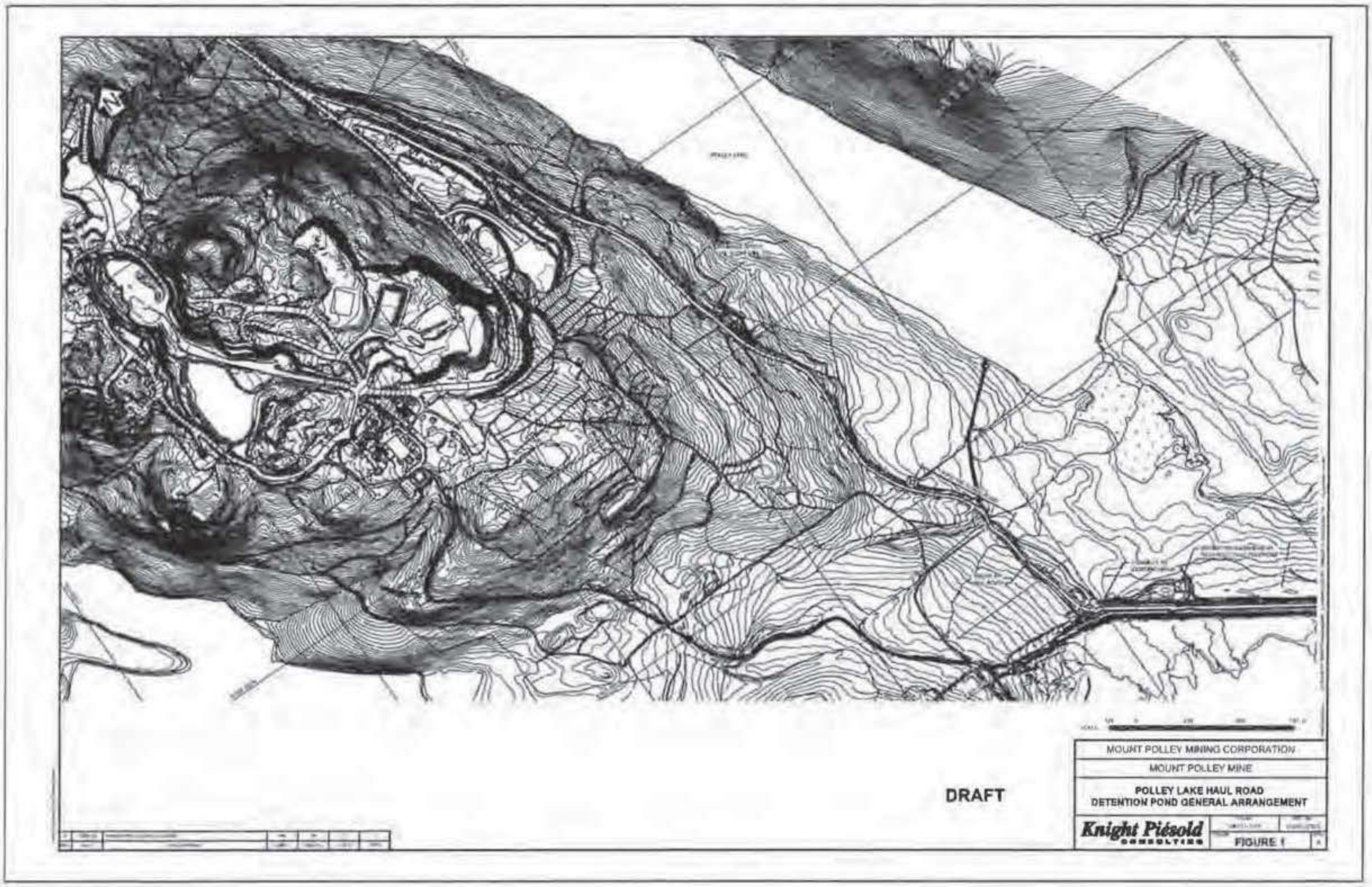
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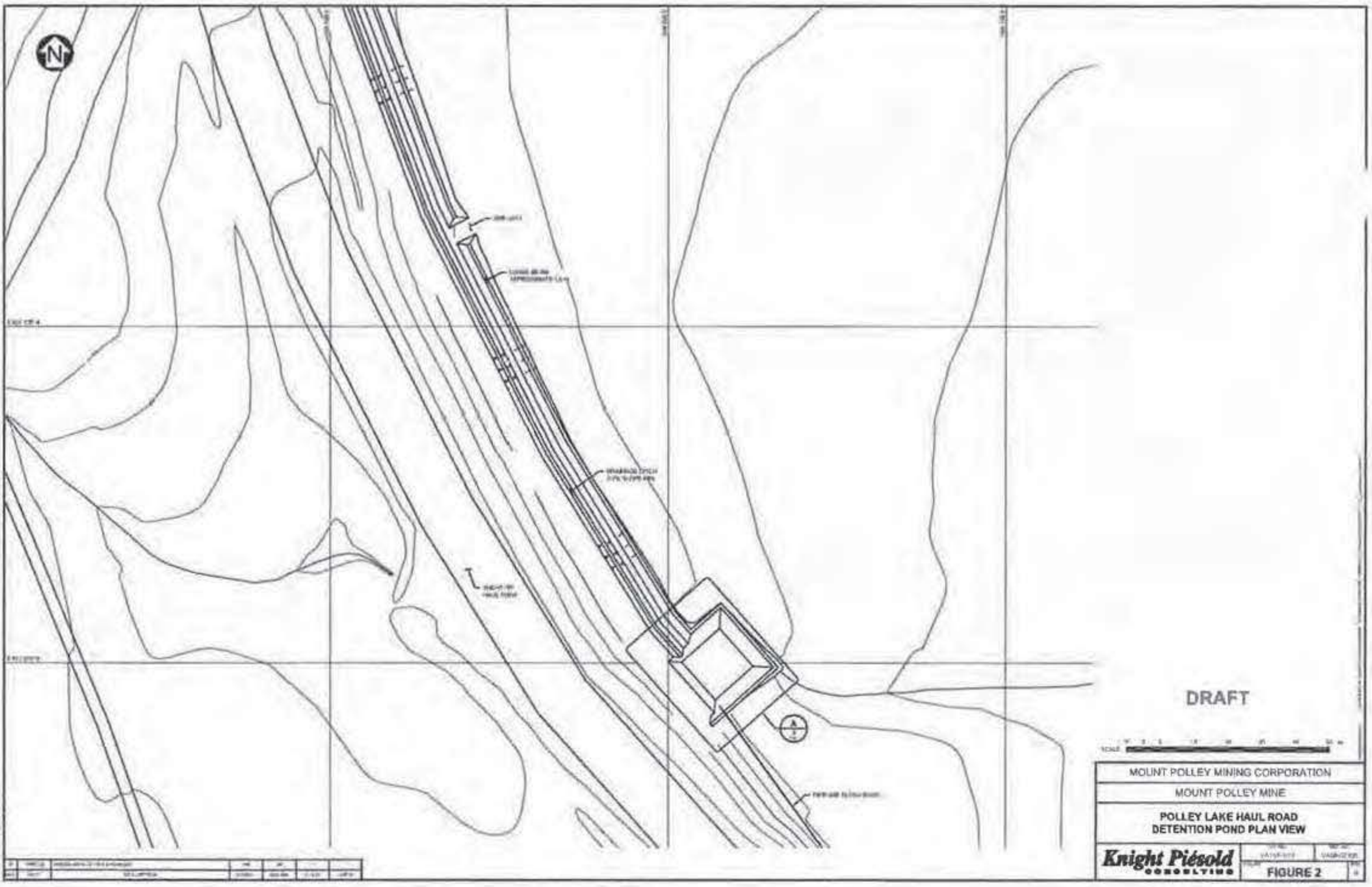
MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY MINE
POLLEY LAKE HAUL ROAD
DETENTION POND GENERAL ARRANGEMENT
Knight Piésold
CONSULTING
FIGURE 1



MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY MINE

POLLEY LAKE HAUL ROAD
DETENTION POND PLAN VIEW

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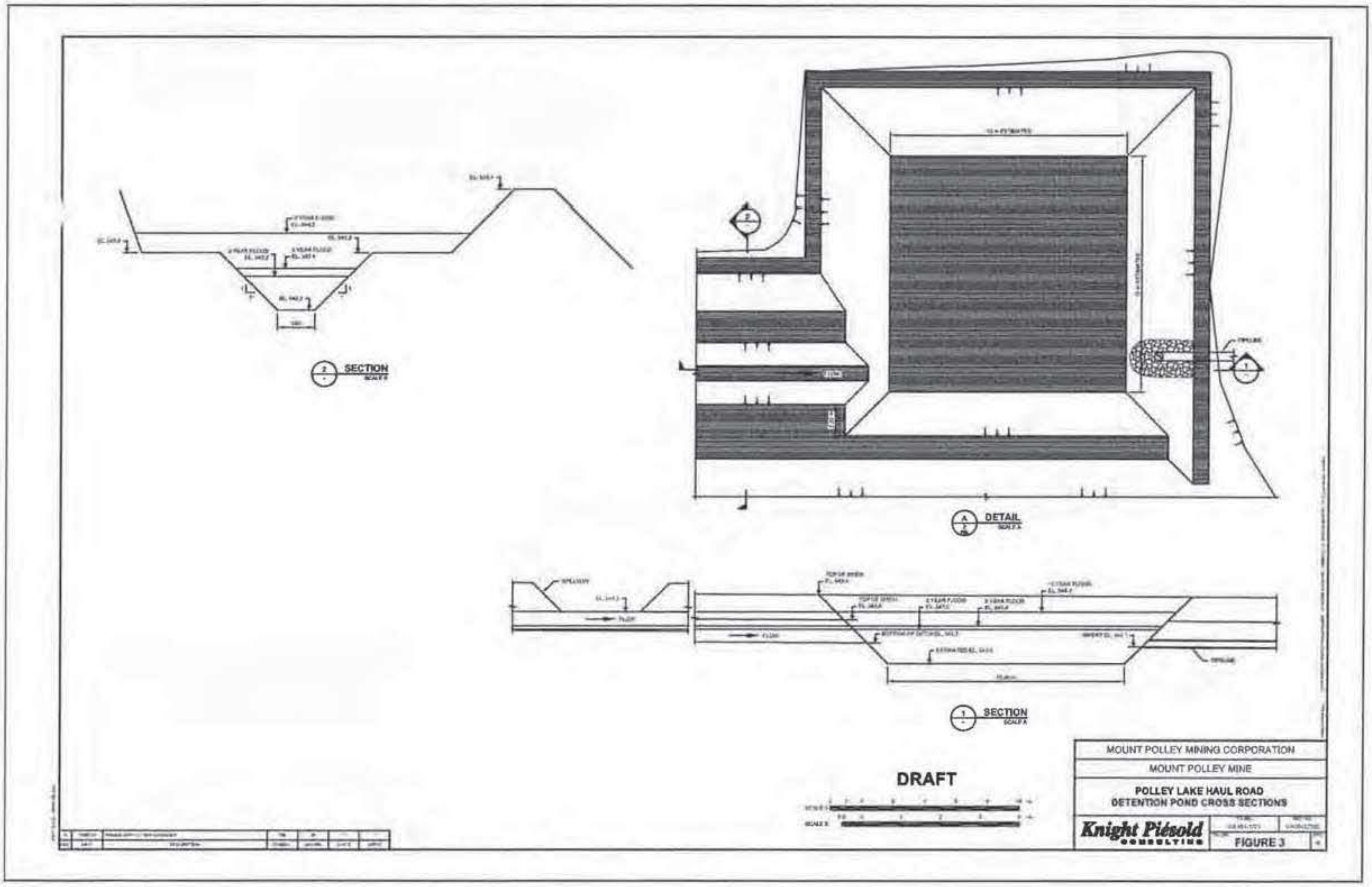
FIGURE 2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MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY MINE
POLLEY LAKE HAUL ROAD
DETENTION POND CROSS SECTIONS
Knight Piésold CONSULTING
FIGURE 3

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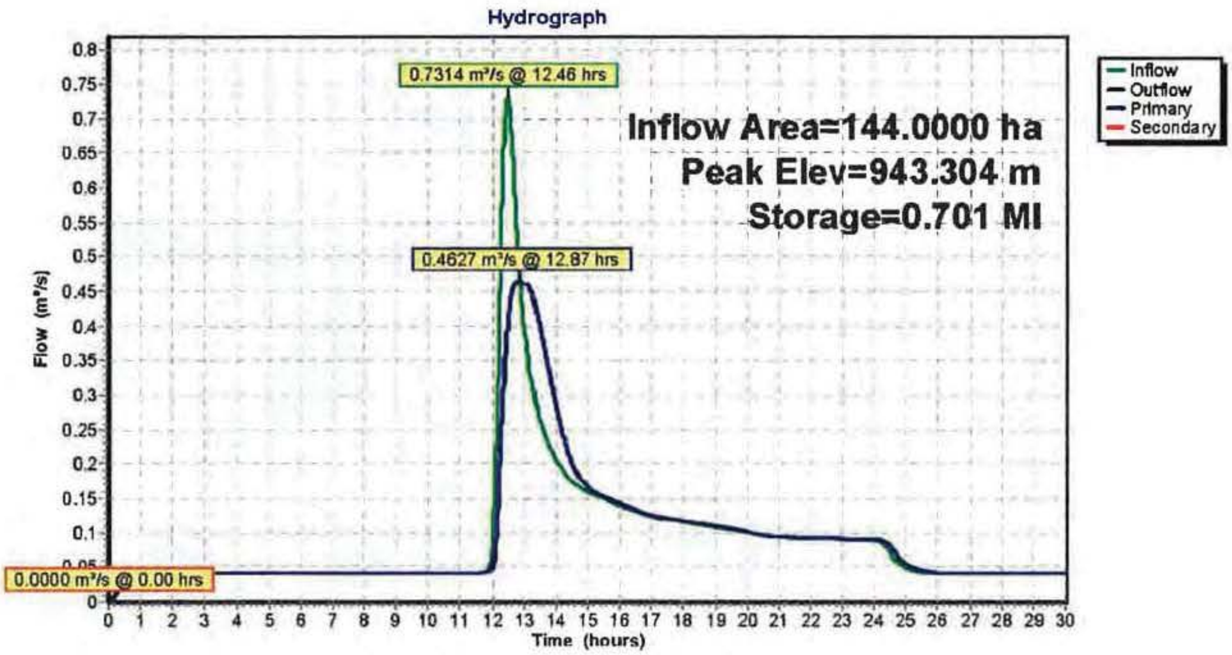

NOTES:
1. PRIMARY OUTFLOW IS THROUGH 22" DR15.5 HDPE PIPE.
2. SECONDARY OUTFLOW IS OVER 5M WIDE SPILLWAY.

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MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY MINE

DETENTION POND HYDROGRAPH
2 YEAR STORM EVENT

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P/A NO
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FIGURE 4

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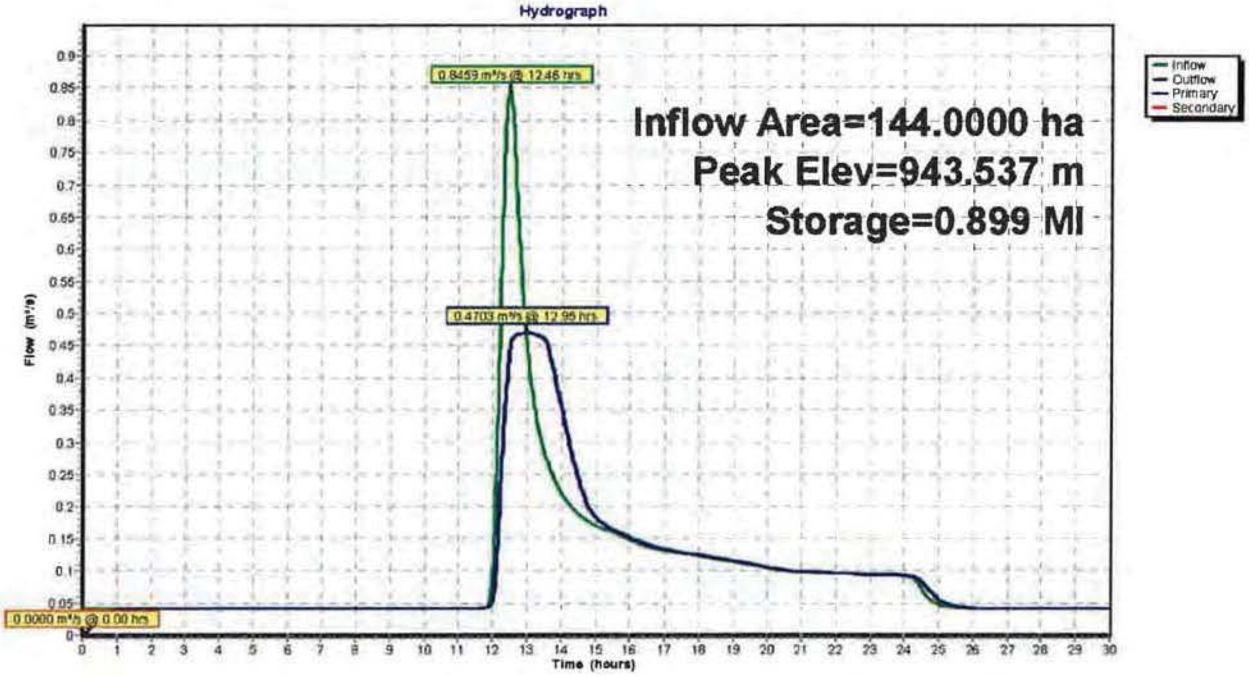

NOTES:
1. PRIMARY OUTFLOW IS THROUGH 22" DR15.5 HDPE PIPE.
2. SECONDARY OUTFLOW IS OVER 5M WIDE SPILLWAY.

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MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY MINE

DETENTION POND HYDROGRAPH
5 YEAR STORM EVENT

Knight Piésold
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P/A NO. VA101/1-21
REF NO. VA80-02305

FIGURE 5
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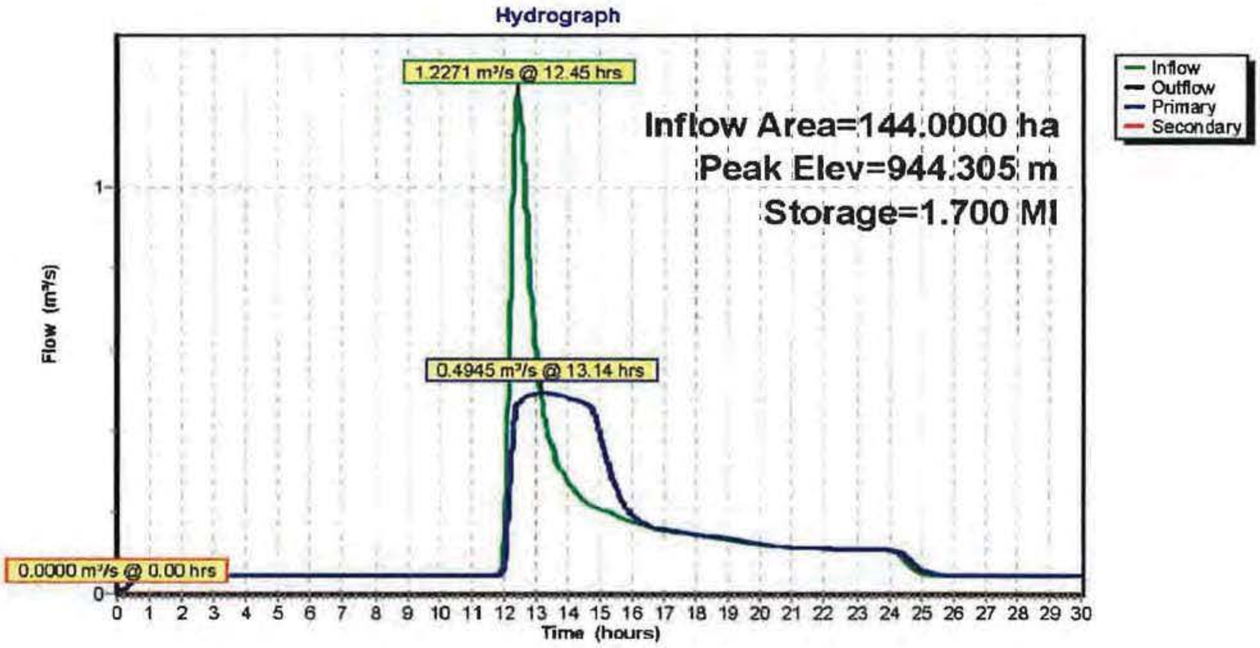

NOTES:
1. PRIMARY OUTFLOW IS THROUGH 22" DR15.5 HDPE PIPE
2. SECONDARY OUTFLOW IS OVER 5M WIDE SPILLWAY.

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MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY MINE

DETENTION POND HYDROGRAPH
10 YEAR STORM EVENT

Knight Piésold CONSULTING

P/A NO VA101/1-21
REF NO VA08-02305
FIGURE 6
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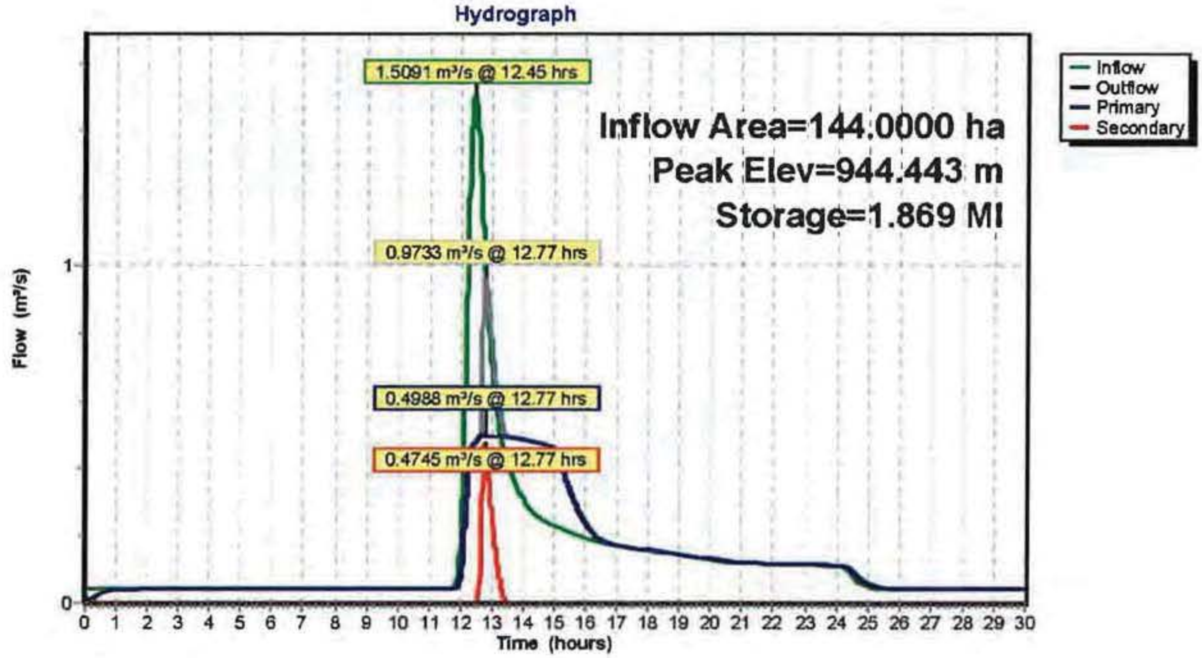

NOTES:
1. PRIMARY OUTFLOW IS THROUGH 22" DR15.5 HDPE PIPE.
2. SECONDARY OUTFLOW IS OVER 5M WIDE SPILLWAY.

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MOUNT POLLEY MINING CORPORATION

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DETENTION POND HYDROGRAPH
15 YEAR STORM EVENT

Knight Piésold
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FIGURE 7

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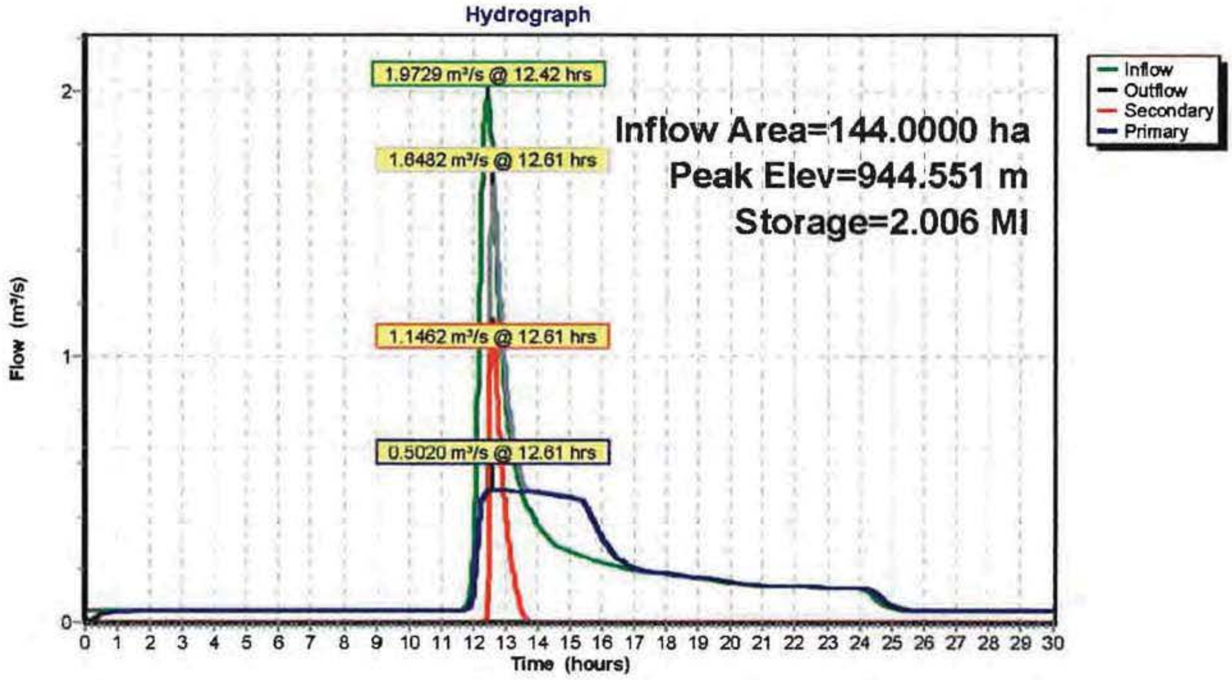

NOTES:
1. PRIMARY OUTFLOW IS THROUGH 22" DR15.5 HDPE PIPE.
2. SECONDARY OUTFLOW IS OVER 5M WIDE SPILLWAY.

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MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY MINE

DETENTION POND HYDROGRAPH
20 YEAR STORM EVENT

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FIGURE 8

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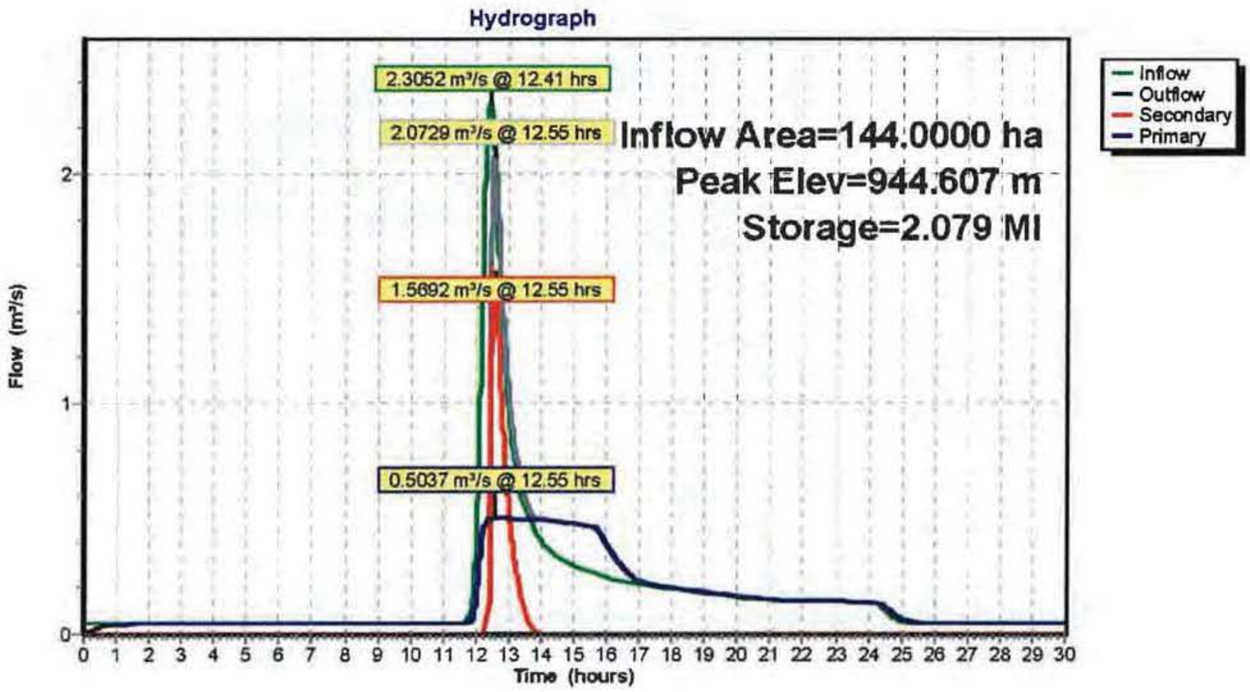

NOTES:
1. PRIMARY OUTFLOW IS THROUGH 22" DR15,5 HDPE PIPE.
2. SECONDARY OUTFLOW IS OVER 5M WIDE SPILLWAY.

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MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY MINE

DETENTION POND HYDROGRAPH
25 YEAR STORM EVENT

Knight Piésold
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FIGURE 9

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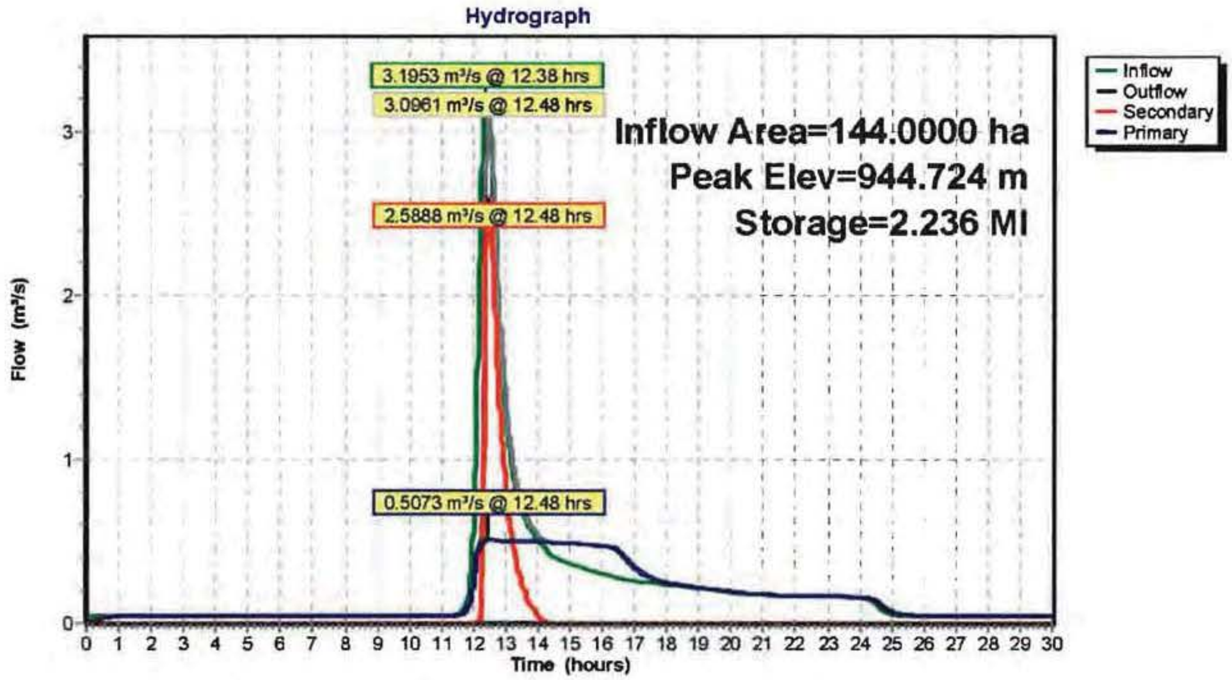

NOTES:
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MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY MINE

DETENTION POND HYDROGRAPH
50 YEAR STORM EVENT

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P/A NO. VA101/1-21
REF NO. VA08-02305
FIGURE 10
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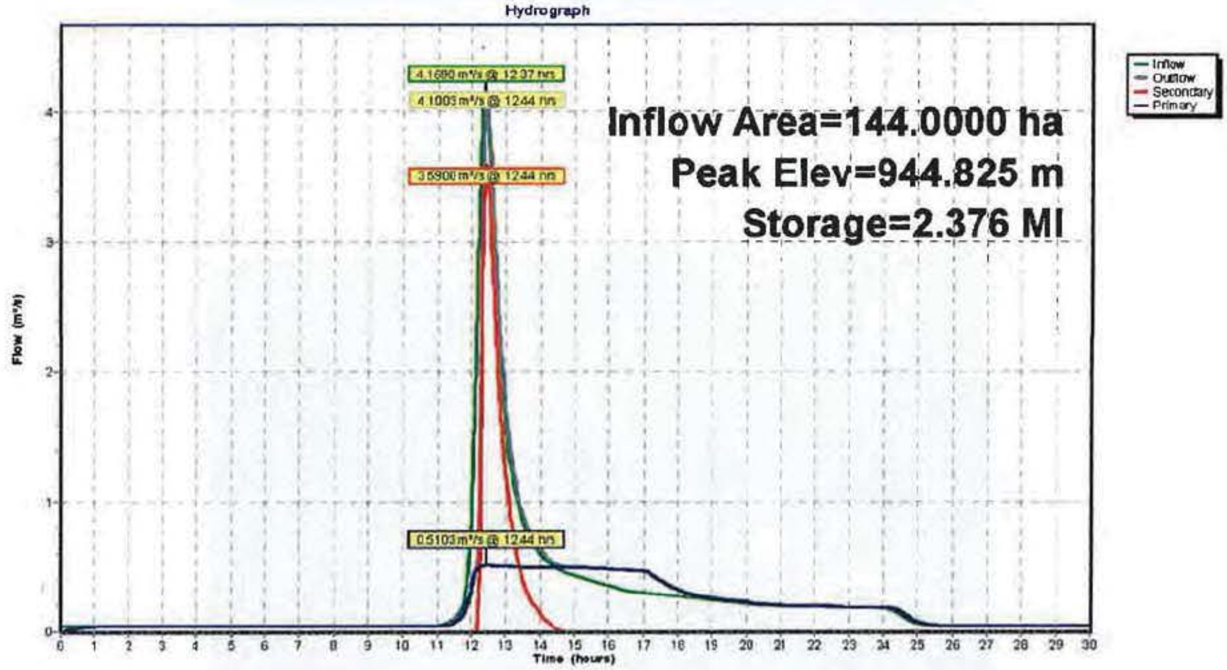

NOTES:
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MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY MINE

DETENTION POND HYDROGRAPH
100 YEAR STORM EVENT

Knight Piésold
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P/A NO
VA101/1-21

REF NO
VA08-02305

FIGURE 11

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PHOTO 1 – Detention pond, ditch and outflow pipe.

PHOTO 2 – Detention pond and ditch, the spoil pile/berm can be seen on the right bank

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT

PHOTO 3 – Bottom 150m of ditch, showing terrain where spillway will release.

PHOTO 4– Waste pile/berm on lower bank of ditch.

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT

APPENDIX A

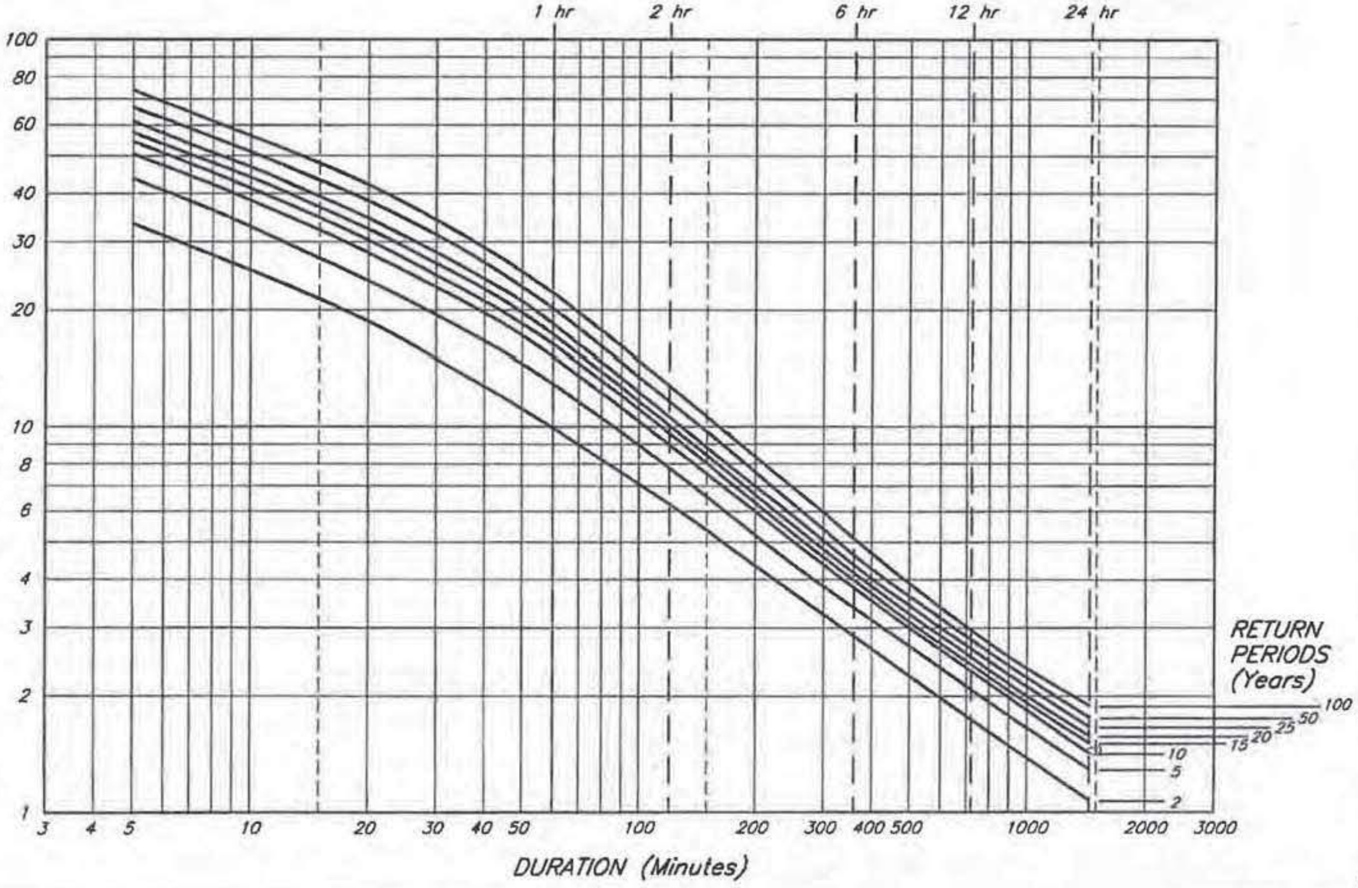
Short Duration Rainfall Intensity Duration vs Frequency Data for the Mine Site

CAD FILE: \10162\8\FIG\A6 Plot 1=1

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

SHORT DURATION RAINFALL INTENSITY – DURATION VS FREQUENCY DATA FOR MINE SITE



Nov. 28, 1997

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

FIGURE 2.1

A6

From: Alexis McPherson
Sent: Monday, August 10, 2009 10:43 PM
To: Ken Brouwer; Les Galbraith; Ron Martel (rmartel@mountpolley.com)
Cc: tfisch@mountpolley.com; DonParsons@ImperialMetals.com; afrye@mountpolley.com
Subject: Toe Drain Construction - Weekly Report August 4th to 9th
Attachments: Weekly Report Aug 4-9.pdf

Hello,

The weekly toe drain construction report is attached.

Cheers,
Alexis

Knight Piésold
CONSULTING

MOUNT POLLEY PROJECT
SOUTH EMBANKMENT TOE DRAIN CONSTRUCTION

TO: Knight Piésold Ltd,
Mount Polley Mines

DATE: Sunday, August 9th, 2009

ATTN: Ken Brouwer, Les Galbraith, Ron Martel

REF NO: VA101-1/26

CC: Don Pearsons, Tim Fisch, Art Frye

REPORT NO: 1 (August 4th to 9th)

SUBJECT: 2009 SOUTH EMBANKMENT TOE DRAIN CONSTRUCTION WEEKLY PROGRESS REPORT

1.0 GENERAL

1.1 PERSONNEL

The following are the key personnel involved in the 2009 South Embankment Toe Drain Construction at Mount Polley Mines.

- Mount Polley Mines (MPMC, Owner) – Ron Martel – Environmental Superintendent, John Anderson – Tailings Supervisor
- Knight Piésold Ltd. (KP, Consultant Engineers) – Ken Brouwer – Project Principal, Les Galbraith – Project Manager, Alexis McPherson – Field Manager/Field Engineer
- Construction Crew – Dennis MacKenzie – Contractor/Excavator Operator, Tony Sloan – Labourer (Shift 1), Frances Enyedy – Labourer (Shift 1), Nigel McKimm – Labourer (Shift 2), Sheila Gruenwald – Labourer (Shift 2)

1.2 WEATHER

The temperatures between August 4th and 9th, 2009 ranged from approximately 20 to 30°C. It ranged fro sunny to overcast during the day with thick fog the morning of August 6th. There were no weather related construction delays during this time period.

2.0 TOE DRAIN CONSTRUCTION

2.1 GENERAL

The following sections address toe drain construction scheduling and progress to date and toe drain construction materials.

2.2 SCHEDULING AND PROGRESS TO DATE

Toe drain construction started the morning of August 4th. The field engineer arrived on site in the late afternoon and began construction supervision and QA/QC activities the morning of August 5th.

Toe drain construction was scheduled to be completed in 21 days (from schedule provided by Ron Martel). Construction is on track to be completed in that time period (Figure 1) although it is anticipated that toe drain will restricted by sand cell production before the toe drain reaches its ultimate extent. Due to this anticipated restriction, it is proposed that toe drain construction be divided into two phases; Phase 1a and 1b.

In Phase 1a the toe drain will be constructed from west to east along the south embankment, tying into the outlet drain at approximately Station 12+50. Toe drain construction will then be but on hold until the sand cells have been completed to, or near, the ultimate extent of the toe drain (approximately Station 18+10). Construction will then resume, Phase 1b, until toe drain construction reaches its ultimate extent.

Phase 1a is expected to be complete by August 17th (Figure 2) and Phase 1b is expected to be complete 8 or 9 days after construction resumes, assuming no significant construction delays.

2.3 CONSTRUCTION MATERIALS

It has been proposed by Ron Martel that wood chips will be placed above the final layer of Zone F to promote anaerobic bacteria growth in an effort to pre-treat the toe drain water. Tim Fisch is expected to provide a decision early next week as to whether or not wood chips will be placed.

3.0 EMBANKMENT CONSTRUCTION

3.1 GENERAL

The following sections address embankment construction requirements for 2009 and 2010 and construction scheduling and materials.

3.2 EMBANKMENT RAISES

An updated filling schedule indicates that a 2.5m embankment raise is required in 2009 (pre 2010 freshet) and a 4m embankment raise is required in 2010 (pre 2011 freshet). The rate of tailings production is the key driver to these embankment raises. At a production rate of 20,000 tpd an average embankment raise of 2.5m is required each year to store the additional tailings produced.

A letter outlining the embankment construction requirements for 2009 and 2010 will be distributed Wednesday August 12th.

3.3 CONSTRUCTION SCHEDULING AND MATERIALS

Scheduling for 2009 embankment construction should be discussed when Ron Martel returns from his holidays August 24th.

A number of alternate concepts for construction materials have been discussed informally (i.e. use of till for the buttress and Zone U) and the practicability of these concepts may have been further investigated by MPMC. It would be much appreciated if the results, if any, of these investigations were communicated with KP to incorporate into calculations of the amount of construction material required and for consideration of the construction specifications of these materials.

A calculation of the amount of till available from the current borrow is underway with and the results will be distributed Wednesday August 12th.

4.0 FINAL COMMENTS

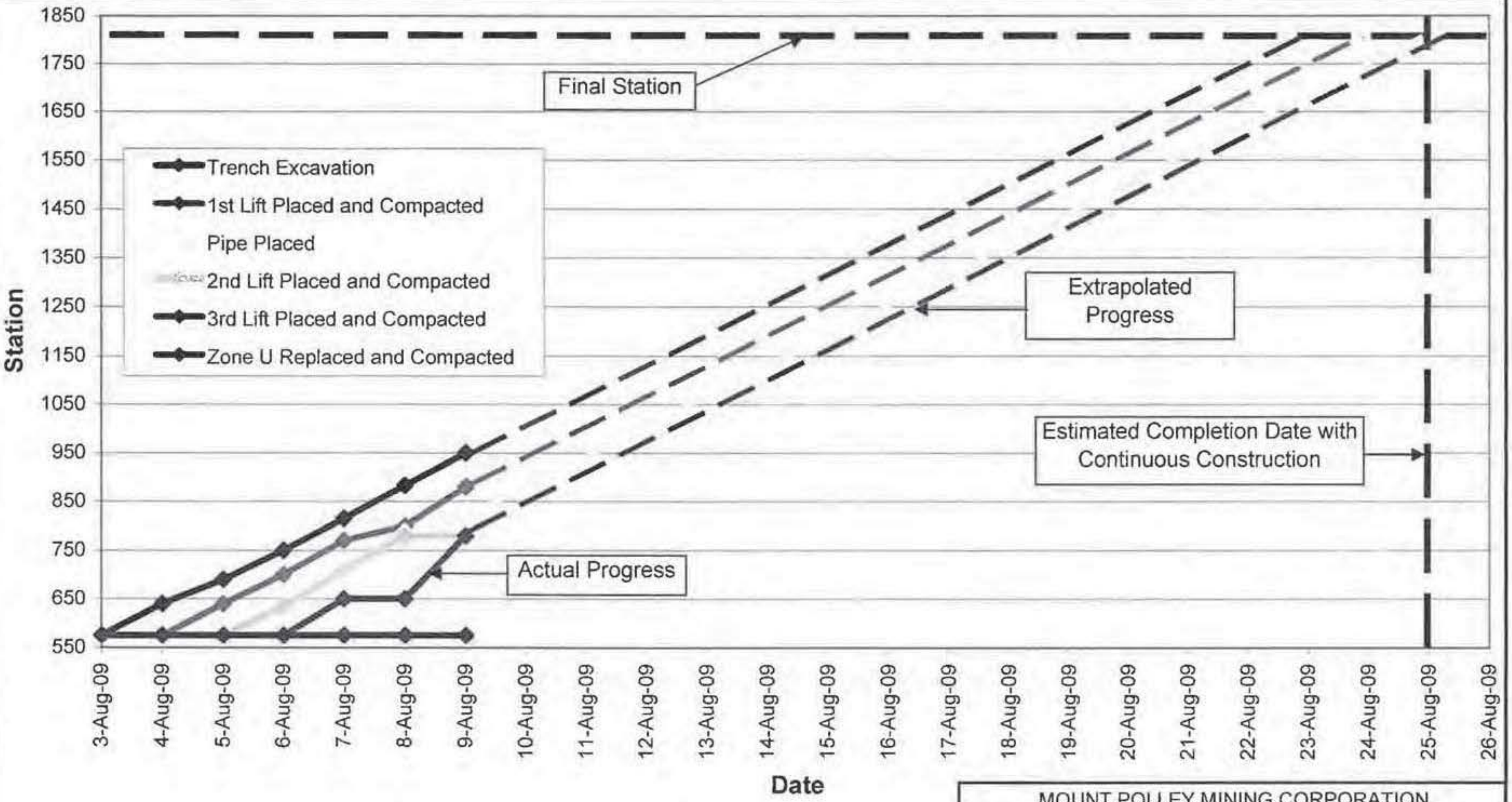
Please contact the field engineer on site if you have any questions, comments or concerns regarding the information presented within this report or if you would like any additional information presented on a weekly basis.

Submitted by:

Alexis McPherson
Staff Engineer
Knight Piésold Ltd

Attachments:

Figure 1 – South Embankment Toe Drain Construction – Continuous Construction
Figure 2 – South Embankment Toe Drain Construction – Phase 1a



MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY MINE

SOUTH EMBANKMENT TOE DRAIN CONSTRUCTION CONTINUOUS CONSTRUCTION

Knight Piésold
CONSULTING

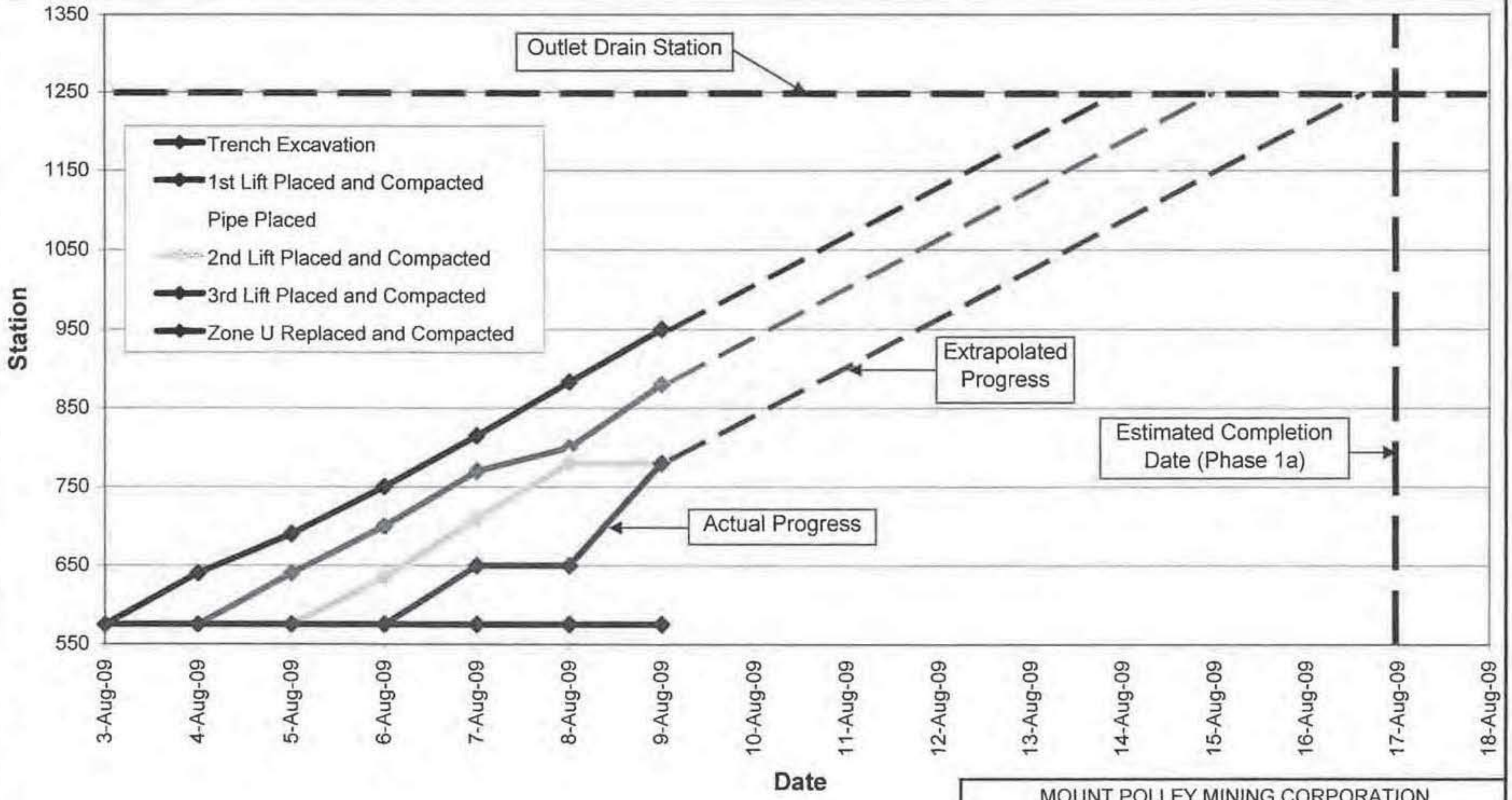
P/A NO.
VA101-1/26

REF NO.
-

FIGURE 1

REV
0

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	AUG09'09	ISSUED FOR INFORMATION	AM	AM	AM



0	AUG09'09	ISSUED FOR INFORMATION	AM	AM	AM
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY MINE

SOUTH EMBANKMENT TOE DRAIN CONSTRUCTION PHASE 1a

Knight Piésold CONSULTING

P/A NO. VA101-1/26

REF NO -

FIGURE 2

REV 0

BRITISH
COLUMBIA
The Best Place on Earth

File: PE-11678

November 25, 2009

Mount Polley Mining Corporation
PO Box 12
Likely BC V0L 1N0

Attn: Ron Martel

Hazeltine Creek Flow Assessment Monitoring Review, Non-Compliance Advisory

The monitoring report **Assessment of Hazeltine Creek Flows** by Knight Piesold Ltd. (April 14, 2009) submitted to Mount Polley Mining Corporation, indicates accumulative flow measurement discrepancies at the Hazeltine Creek gauging station (W7). This report was reviewed by Environmental Protection staff and it was found that Mount Polley Mining Corporation did not comply with the requirements of Section 3.3 of Permit PE-11678. The information submitted in the report indicates that the flow rating is progressively shifting throughout the entire period of data collection. The various factors contributing to this are:

- Staff gauge jacking, leaking weir, geo-textile fabric and downstream and in-pool vegetation affecting flow through the weir. Details of these factors are described in the report noted above.

Mount Polley Mining Corporation was evaluated as out of compliance for failure to maintain a suitable flow measuring device as required in Section 3.3 of Permit PE-11678. In order to bring Mount Polley Mining Corporation into compliance, the following actions are required:

- Refer to the recommendations from Knight Piesold Ltd., second option (second bullet) of the above noted report. The recommended second option should be in place at W7 by the 2010 non-freezing flow measuring season.

Also note that Section 3.3 of the permit requires annual checking and calibration of all staff gauges and flow measuring devices. The results of these checks should be reported in the subsequent annual report along with hydrology data summaries.

Ministry of Environment Cariboo Region

Mailing/Location Address:
400 - 640 Borland Street
Williams Lake BC V2G 2T1

Telephone: 250-398-4530
Facsimile: 250-398-4214
Web: [illegible]

[illegible] management [illegible] questions [illegible] regarding the administration of this permit, please feel free to contact the undersigned at [illegible] 4550.

Yours truly,

Brian Chapman
Environmental Protection Officer
Cariboo Region

cc: Moss Giasson, MEMPR, Victoria BC

From: Kurt Merrifield
To: Greg Johnston; Mark Smith; Les Galbraith; Ken Brouwer; rmartel@mountpolley.com
Cc: lmoger@mountpolley.com
Subject: March 13 Weekly Report
Date: Sunday, March 14, 2010 12:16:20 PM
Attachments: weekly.doc

Hello all,

Please see attached

Thanks, Kurt

WEEKLY SITE REPORT

CLIENT: MOUNT POLLEY MINING CORP. **PROJECT: MOUNT POLLEY MINE TAILINGS STORAGE FACILITY STAGE 6B EMBANKMENT RAISE**	**Project #:** VA101-1/29	**Pages** (including this page): 2
	Date: Mar 21, 2010	
	KP Inspector: Kurt Merrifield	

To: Les Galbraith, Ken Brouwer, Ron Martel, Greg Johnson
Cc: Luke Moger

SECTION 1.0 - GENERAL

1.1 REPORTING PERIOD

This weekly report covers the period between March 14 and March 21, 2010.

1.2 WEATHER

The weather for the reporting period was a mixture of sun and cloud, with temperatures fluctuating above the freezing point. The weekly weather statistics for Williams Lake BC, derived from the following link (www.theweathernetwork.com), and are summarized below:

Max Temp: 10°C

Min temp: -2°C

Precip Accumulation: 1-2 mm

1.3 GROUND CONDITIONS

The air temperature on site has fluctuated around -2° to 8° for most of the week, with surface thawing during the day and ground freezing overnight. Ground conditions were generally good on site.

1.4 SAFETY

There were no safety incidents during this reporting period. Necessary safety precautions were preformed during all activities on site.

SECTION 2.0 - CONSTRUCTION ACTIVITIES

2.1 ZONE C

MPMC has placed no new Zone C material.

2.2 ZONE S

Zone S is now at a compliance elevation of 954.6 m for the entire perimeter of the dam, ahead of the April 1, 2010 deadline. Zone 2 till placement continues from corner 2 to corner 3 at an elevation of 954.9 m

Till pit development (over burden stripping, waste haulage, water control) as well as haul road maintenance are ongoing at the borrow site.

2.3 ZONE F

Filter material has be placed and compacted to an elevation of 954.6 m for the entire perimeter of the dam. The ¾ minus crush, stockpiled below the ME, was deemed acceptable by MPMC analysis (see attached).

2.4 ZONE T

No new transition material has been placed and compacted this week.

2.5 ZONE U

MPMC continues sand cell development along the SE, as well as along the PE abutment; however, the slurry in the mill has had limited sand build up over the last week.

Test holes have found no new snow and ice on the ME.

SECTION 3.0 - CONSTRUCTION CONTRACTING

The Lake Excavating Zone S production group consisted of:

- six 40 tonne and one 30 tonne rock trucks
- one 245 excavator and one 320 excavator
- one D8L and one D9 Dozer
- two 10 tonne vibrating compactors.

Pit development and maintenance forced a halt to till placement on Mar 21, 2010.

SECTION 4.0 - CONSTRUCTION QUALITY ASSURANCE AND QUALITY CONTROL ACTIVITIES - KP

The following KP activities were performed during this reporting period:

- Monitoring of construction material placement and compaction for Zone S and F construction
- Downloads of piezometer and inclinometer data
- Monitoring pit development and water control
- Preparation of weekly reports.

Submitted by,

Knight Piésold Ltd.

Kurt Merrifield

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY

OPERATION, MAINTENANCE AND SURVEILLANCE MANUAL

Rev. No.	Revision	Date	Approved
0	Issued in Final	December 22, 2004	
1	Issued in Final	February 06,2006	RM
2	Issued in Final	March 31, 2006	RM
3	Issued in Final	August 28, 2006	RM
4	Issued in Final	October 06, 2006	RM
5	Issued in Draft	November 28, 2007	RM
6	Issued in Draft	July 01, 2008	RM
7	Issued in Draft	December 31, 2009	RM
8	Final Copy	March 30, 2010	RM

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY

OPERATION, MAINTENANCE AND SURVEILLANCE MANUAL
(REF. NO. VA101-00001/9-1)

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MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY

OPERATION, MAINTENANCE AND SURVEILLANCE MANUAL

SECTION 1.0 - INTRODUCTION

1.1 OVERVIEW

This Operations, Maintenance and Surveillance Manual applies to the Tailings Storage Facility and related pipelines and structures at the Mount Polley Mine. This Manual describes the roles and responsibilities of Mount Polley site personnel for the management of the TSF and associated facilities; operation, surveillance and maintenance requirements; inspection requirements; and emergency plans and procedures.

1.2 KEY PERSONNEL AND RESPONSIBILITIES

Table 1.1 identifies current key personnel (March 2010) and their responsibilities for management, operations, surveillance and inspections at the Mount Polley Mine Site and Tailings Storage Facility.

Government agencies involved in the operation, maintenance and surveillance of the Tailings Storage Facility include the Ministry of Energy, Mines and Petroleum Resources (MEMPR); Ministry of Environment (MOE), Ministry of Forests (MOF); and Department of Fisheries and Oceans (DFO).

1.3 TRAINING REQUIREMENTS

Training programs are required for any personnel involved in the operation, inspection and surveillance of the Tailings Storage Facility. A refresher course is required once per year. The training programs must be conducted by the Tailings Project Coordinator, qualified Professional Engineer or a suitably qualified individual familiar with the design, operation, maintenance and inspection of all civil and mechanical works associated with the facility.

Each training session must be documented, and a record kept. The records will contain a detailed list of site activities for which the trainee was trained on, and be signed by the person who provided/supervised the training.

1.4 DESIGN AND OPERATING CHANGES

Changes to the design or operating plan for the Tailings Storage Facility and related pipelines and structures must be reviewed, approved and documented. Design changes may be submitted to the Engineer of Record for review. Operational changes will be reviewed and approved by the

Mine Manager. In all cases, documentation of the change, including as-built records, are required.

1.5 CONTROL OF THIS MANUAL

This manual will be controlled by the Environmental Superintendent. Copies will be maintained at the following locations:

- One (1) copy for Mount Polley Mining Corporation (Vancouver office),
- One (1) copy for the Environmental Superintendent's office,
- One (1) copy in the Tailings Project Coordinator's office,
- One (1) copy for the Operating Crew (Mill Shifter's Office),
- One (1) copy for the Regional Water Manager (Williams Lake),
- Two (2) copies for the Director of the Provincial Emergency Program (P.E.P.),
- One (1) copy for the MEMPR Geotechnical Manager,
- One (1) copy for the Design Engineer of Record,
- One (1) copy for the General Manager,
- One (1) copy for the Mill Superintendent,
- One (1) copy for the Mill Maintenance Superintendent.

Mount Polley Mining Corporation is responsible for maintaining a record of the location of each copy of the Manual and to ensure the copies in these locations are kept up to date.

1.6 REVISIONS TO THE MANUAL

Reviews of the Manual are conducted at least annually.

The operating procedures and personnel at the Mount Polley Mine may change during the operation of the mine. It is the responsibility of the Environmental Superintendent to ensure that the Operations, Maintenance and Surveillance Manual is updated to reflect these changes. Substantial revisions to the Manual shall be submitted to the Ministry of Energy, Mines and Petroleum Resources.

A letter of transmittal that clearly identifies the distribution list must accompany each revision of this manual. An update may comprise the entire manual or be limited to specific pages or sections. A copy of each transmittal letter must be kept on record in the office of the Environmental Superintendent. Each revised page of the manual must be clearly marked as to the revision date prior to replacement. The replaced pages must be filed and kept on record in the office of the Tailings Projects Coordinator.

1.7 REFERENCES

References relating to MPMC's Tailings Storage Facility and associated pipelines and facilities are included in Appendix A.

SECTION 2.0 - DESCRIPTION OF TAILINGS IMPOUNDMENT

2.1 GENERAL

The following sections provide a brief summary of the design and management of the Tailings Storage Facility and associated facilities. Additional information is available in the cited references in Appendix A.

2.2 DESIGN BASIS

Mill tailings are discharged as slurry into the Tailings Storage Facility, which has been designed to provide environmentally secure storage of the solid tailings and supernatant for mill process. As the solids settle out of the slurry, process fluids are collected and recycled back to the mill for re-use in the milling process. There is no surface discharge of any process solution from the Tailings Storage Facility. The basis of design must address the following:

- Permanent, secure and total confinement of all solid tailings material within a lined engineered impoundment,
- Secure and reliable transportation of the tailings from the mill to the Tailings Storage Facility,
- Collection and transport of runoff from waste rock storage areas to the Tailings Storage Facility,
- Temporary storage of supernatant water on the tailings beach, as required, with maximum recycling to the mill to produce a zero discharge condition for process water,
- Collection of all free draining liquids from the tailings deposit. Temporary storage is provided in lined external ponds. The water from the ponds is pumped into the supernatant pond and recycled to the mill to ensure that no discharges occur,
- Inclusion of monitoring facilities in the Tailings Storage Facility to confirm that the design objectives and operating requirements are being met,
- Staged development of the facility to enable modifications and upgrades to be implemented based on operating experiences and to distribute the capital expenditures over the life of the project.

The design basis and operating criteria for the Tailings Storage Facility and associated pipelines and structures are summarized in Table 2.1.

2.3 PROJECT DESCRIPTION

2.3.1 Site Location

The location of the Mine and access roads are shown on Figure 2.1. The Mount Polley Mine is located in central British Columbia, approximately 60 km northeast of Williams Lake. The main access route is via Likely Road. The turn to the Mine is located approximately 1.5 km east of Morehead Lake. The Mine is located a further 11 km to the southeast, on the Bootjack Lake Forest Service Road.

The Tailings Storage Facility is accessible along the following routes:

- Along the access road located on the south side of the Mill Site. This is the primary access to the TSF on the Mine site;
- Along the Polley Lake haul road south of the Wight Pit.
- Along the SE Zone dump road, which in turn ties into the Polley Lake haul road.
- Along the Gavin Lake Forest Service Road, which can be accessed from the Likely Road, located approximately 14 km south of Moorhead Lake. The TSF is located at approximately kilometre 16 along the road.

2.3.2 Project History

The Mount Polley mine commenced production on June 13, 1997. Ore is crushed and processed by selective flotation to produce a copper-gold concentrate. The mine was on care and maintenance status from October 2001 to February 2005. The mill throughput rate is approximately 20,000 tonnes per day (approx. 7.3 million tonnes per year). Mill tailings are discharged as slurry into the Tailings Storage Facility located on the south area of the Mine property. Additional historic information regarding the TSF and associated pipelines and facilities are available in the reports cited in Appendix A.

2.4 DESIGN FEATURES

Tailings slurry is conveyed from the Concentrator to the TSF via a tailings discharge pipeline. The tailings are deposited into the impoundment through moveable end discharge pipeline on the embankment crest. Some Tailings are used to construct sand cells. A floating reclaim pump recycles process water from the supernatant pond in the TSF for use in the mill processing circuit. Sediment ponds and seepage collection ponds are designed to intercept runoff from the surface and seepage from the embankment respectively. Drains, instrumentation and monitoring wells are constructed in and around the TSF to assist in monitoring the performance of the facility. Additional details are available in the reports referenced in Appendix A. As-built drawings for the latest construction program are included in Appendix D.

2.5 DEPOSITION PLAN

The objectives of the long-term tailings deposition strategy is to:

- Maximize the storage capacity of the facility.
- Maintain the supernatant pond in the area of the reclaim barge so as to maximize the amount of clean process water available for reclaim.
- Establish free draining tailings beaches adjacent to the embankments during the winter season to facilitate future embankment raises and to enhance embankment stability.

The above strategy is implemented by sequentially rotating the tailings discharge point along the entire length of the Perimeter, Main and South embankments on the upstream face, which allows inactive areas of the tailings beach to partially dry and consolidate. Eventually, beaches will be formed around the entire upstream perimeter of the Facility and all supernatant water will be centralized around the reclaim barge.

Tailings settle in the tailings facility and form beaches with three distinct slopes. A sandy beach develops as the coarser tailings fraction settles more rapidly adjacent to the embankment. The average beach slope above water is about 0.5 percent. As the tailings flow into the supernatant pond it forms a submerged beach with a slope of 1 to 2 percent. Finer tailings particles are transported further out into the supernatant pond before settling at a slope of about 0.3 percent. The latest bathymetric survey of the tailings surface in the TSF is included in Figure 2.2.

Staged tailings deposition strategy is currently being implemented by MPMC, and one of the objectives of this plan is to ensure that tailings solids are deposited along the extent of all tailings embankments. The fundamental requirement of the tailings deposition plan is to ensure that a blanket of tailings solids is present immediately upstream of all embankments and along the abutments. Thus, there is a fundamental objective to establish beaches adjacent to the embankments, but it is not necessary to continuously maintain a minimum width of exposed beach adjacent to the embankment, and periodic temporary (less than 2 months duration) shallow flooding (less than 0.5 meters depth) of the beaches is anticipated.

Tailings deposited into sand cells and worked by a dozer along the upstream Zone U of the tailings embankment is also considered to be 'tailings beach' for this evaluation. One of the objectives of the tailings deposition plan currently being implemented by MPMC is to allow for sufficient flexibility to enable these sand cells to be constructed. It is recognized that this deposition strategy may result in short term flooding of the sandy tailings beaches elsewhere within the impoundment, but that the depth of flooding along the submerged tailings beaches must be no greater than 0.5 m depth before tailings deposition is re-instated over that section of flooded beach.

MPMC increases the frequency of measurements to at least once per week for embankment instrumentation systems (piezometer readings, foundation drain flow rate and turbidity) adjacent to embankment areas where tailings beaches are temporarily flooded.

2.6 CLOSURE PLAN

At closure of the Tailings Storage Facility, it is currently envisaged that the tailings surface will be decommissioned so as to develop a mixed forested/wetlands complex with a gradual transition towards a ponded area at the final spillway. This would require covering of the tailings embankments and the upland portions of the exposed tailings beach with a layer of soil stockpiled during operations. The topsoil would be revegetated with indigenous species of conifer and deciduous trees, willow and marshland grasses. Ultimately, all water would be routed over the tailings surface, through the wetlands and the final spillway.

Pipework for the tailings and reclaim systems will systematically be removed once all water quality and pit flooding requirements are met. Similarly, the seepage collection ponds and recycle pumps would be retained until monitoring results indicate that drainage flows and seepage from the tailings area are of suitable quality for direct release to the environment. At that time, the seepage collection ponds could be decommissioned and the pumps removed. The groundwater monitoring wells and piezometers in the tailings embankment would be retained for use as long term monitoring devices. On-going monitoring of all reclamation measures will be carried out post closure, to confirm that the reclamation objectives are being achieved and sustained.

SECTION 3.0 - OPERATIONS MAINTENANCE AND SURVEILLANCE

3.1 GENERAL

The Tailings Storage Facility is comprised of several components and associated facilities. These components and facilities must be inspected and maintained regularly to ensure that any changes to the TSF conditions, performance, or a potentially hazardous condition can be identified and promptly addressed. Selected photographs of the TSF and associated components are included in Appendix E. An inspection and surveillance schedule is provided on Table 3.1.

The Mill Maintenance Superintendent is responsible for ensuring that surveillance is carried out regularly.

The Mill Maintenance Superintendent is responsible for daily management of the TSF and directs an operating crew to carry out routine activities. A list of site personnel and associated responsibilities are provided on Table 1.1.

The Tailings Project Coordinator will conduct a Dam Surveillance walkover at least once per quarter. All Dam Surveillance reports should be reviewed by the Mill Maintenance Superintendent and filed at the Mount Polley Mine Site.
Additional (non-routine), documented drive by's of the TSF and associated facilities will be required following extreme or unusual events. The Environmental Superintendent must be made aware of any unusual events or observations, and must contact the Design Engineer as required. Typical examples of unusual events and observations to be made during such walkovers are outlined in Table 3.2.

An inspection log is provided in Appendix B to help guide the observation and surveillance process. The inspection log covers major items related to the TSF and associated facilities. Additional details are provided in the following sections.

3.2 TAILINGS BASIN

The projected rate at which the tailings basin will fill, combined with storage provisions for make-up and storm water, determine the rate of rise for the embankment. The anticipated filling schedule and staged construction sequence is shown on Figure 3.1.

Close monitoring of the pond elevation, depth, area and volume is important for the following reasons:

- To ensure that there is a sufficient volume of water available as make-up water while the pond is frozen and precipitation is at a minimum.
- To enable monitoring of the supernatant pond depth/area/volume so that tailings characteristics such as dry density can be determined.
- To monitor water recoveries.

- To enable the correlation of the pond level with other data, such as the piezometer pressures and drain flow quantities.

Adjustments to the basin filling curve may be required due to variation between actual and projected mill throughput rates, tailings deposition characteristics, water inputs and outputs and in-situ tailings density. Adjustments to these variables will change the rate of rise for the tailings and embankments.

The TSF was previously operated under a water deficient condition, which means more process water was needed than available in the supernatant pond. This condition changed once the mill started up again in February 2005. The mine is operating under surplus conditions, which means there is more water in the system than is required. Therefore, a combination of careful water management and tailings deposition is required to maximize the storage potential in the embankment without compromising the freeboard or embankment stability.

3.3 TAILINGS POND

3.3.1 Pond Level Operations

The TSF is required to have sufficient live storage capacity for containment of 679,000 cubic meters of runoff from the entire contributing catchment area during a 24-hour PMP event. This volume of stormwater would result in an incremental rise in the tailings pond level of approximately 0.39 meters. The TSF design also incorporates an allowance of 1 metre of freeboard for wave run-up. Therefore, the normal and maximum operating pond levels are as follows:

- Normal Operating Level – Water level at least 1.39 meters below the embankment crest;
- Maximum Operating Level – Water level is 1 meter below the embankment crest, which also means the loss of storage capacity for a 24-hour PMP event.

Tailings deposition will cease if the pond level reaches maximum operating level and the removal of water from the pond will commence using the reclaim barge. The area downstream of the dam will also be evacuated and access restricted as per the Emergency Preparedness Plan.

There are no restrictions, with respect to dam safety on the rate of filling of the supernatant pond up to the normal operating pond level or rate of emergency draw down within the pond.

3.3.2 Surveillance

The pond level must be at least 1.39 meters below the crest elevation under normal operating conditions. Emergency procedures, discussed in Section 5.0, must be followed if the pond reaches the maximum operating level. Regular inspections of the pond level must be carried out according to the schedule outlined in Table 3.1. An inspection log is provided in Appendix B.

Additional pond level inspections are required after an unusual event. Table 3.2 outlines the additional observations that will need to be documented.

3.4 TAILINGS EMBANKMENT

3.4.1 Components

The tailings embankment consists of the Main, Perimeter and South Embankments. The embankments are constructed using zoned earthfill and rockfill and have been raised in stages by a combination of centreline and modified centreline approaches. Details of the design and construction are reported in various Knight Piésold reports and are referenced in Appendix A.

An upstream toe drain on the Main and Perimeter embankments allows for the controlled removal of process water from the upstream face of the embankment. Foundation and chimney drains are also included in the embankments to prevent build-up of excess pore pressures beneath the embankment and to transfer groundwater and/or seepage to the seepage collection ponds located at the downstream toe of the Main and Perimeter Embankments.

Monitoring sumps are located at the downstream toe of the Main and Perimeter Embankments. They are used to facilitate monitoring of flow rates and water clarity from the embankment drains and diversion channels.

3.4.2 Surveillance and Maintenance

Regular surveillance of the embankments and associated structures should follow the schedule outlined in Table 3.1. An inspection log is provided in Appendix B. Typical observations to be made during surveillance include:

- Evidence indicating dam structure deformation (e.g. slope bulging, tension cracks on the crest or crest settlement);
- Evidence indicating seepage, runoff or erosion;
- Clarity and quantity (visual estimate) of seepage water entering the seepage collection sumps;
- Possible evidence indicating piping downstream of the embankments;
- Other unusual conditions in the TSF area.

The embankment and associated structures do not require regular maintenance; however, specific maintenance items may be identified as a result of regular observations and surveillance of the embankment.

Table 3.2 outlines additional observations that will need to be documented after any unusual event.

3.5 TAILINGS DISCHARGE PIPELINE

3.5.1 Components and Operation

Tailings slurry is conveyed from the Concentrator through approximately 7000 metres of HDPE pipe to the TSF where it is discharged through a series of spigots along the embankment crest. The pipeline includes the following components:

- A 610 mm diameter DR 11 HDPE pipe from the Concentrator to the T2 Dropbox;
- A 610 mm diameter DR 15.5 HDPE pipe from the T2 Dropbox to the TSF;
- Two short sections of 762 mm diameter DR 15.5 HDPE pipe are included at the start of the two pipeline sections at the Concentrator.
- The T2 Drop box; (not in use)
- Moveable discharge section;
- A Dump Valve at the start of the Perimeter Embankment & start of the South Embankment;
- Sand cell skids with valve assemblies on the Perimeter & South Embankments;
- "Y" valve assembly at 5 corners;
- Pressure sensor device near the booster station.

The tailings pipeline is located on the shoulder of the access road from the mine. Tailings slurry is gravity fed to the TSF through the tailings pipeline. The tailings pipeline has a variable downhill slope that ranges from flat to 8.0% that ensures drainage.

The T2 Dropbox is located approximately mid-way along the pipeline and allows for the addition of runoff from the Southeast Sediment Pond into the tailings stream. It also serves as an overflow for the reclaim booster sump.

The deposition of tailings over the beach in the TSF is accomplished by end dumping. A dump valve is located at the start of the Perimeter and South Embankments to allow discharge of tailings during relocation of the discharge section. A "Y" valve assembly at 5 corners allows for the distribution to the Perimeter/Main or to the South/Main embankments.

The tailings discharge pipeline does not require any external adjustments during normal operations. The discharge pipeline will drain by gravity to the TSF in the event of a mill shutdown or power failure. However, the following points must be remembered during operation of the pipeline:

- Never leave all valves closed along the tailings discharge pipeline as they may be permanently blocked from sanding or suffer damages from excessively high pressures; (refer to Appendix F)
- Ensure that there is an open pathway for tailings to exit before the pipeline is filled.

During a mill shutdown or during freezing conditions the valve between the Southeast Sediment Pond and the T2 Dropbox must be open in order to prevent water from filling up the Reclaim Booster Sump when the pumps are not operating.

3.5.2 Surveillance and Maintenance

The tailings discharge pipeline will be inspected and maintained regularly to ensure that the system operates properly. Table 3.1 provides a schedule for regular surveillance of the pipeline. An inspection log is provided in Appendix B. Typical observations to be made during surveillance include:

- Locations of external excessive wear or damage of the pipeline;
- Evidence indicating leakage from the pipeline;
- Ensure a constant grade of all pipelines leading onto the embankments, maintaining a proper flow, to prevent sanding up or freezing of the lines.;
- Ensure that the valve between the Dropbox and Southeast Sediment Pond is open during a mill shutdown or freezing conditions when the booster pump is shut off.

Additional inspections are required after an unusual event. Table 3.2 outlines additional observations that will need to be documented. Repairs to the discharge pipeline, dropbox and/or discharge sections may be required after any unusual event.

3.6 RECLAIM PIPELINE

3.6.1 Components and Operation

Reclaim water is pumped from the Tailings Storage Facility for re-use at the Mill site. The reclaim pipeline includes the following components:

- Floating Reclaim Pump Barge; C/W Spargers
- A 610 mm diameter steel pipe connecting the barge to the reclaim line;
- Booster Pump Station beside the T2 Dropbox;
- A 610 mm diameter HDPE pipe from the steel pipe to the Booster Pump Station;
- A 610 mm diameter HDPE pipe from the Booster Pump Station and the Mill site.

The floating reclaim pump barge is located in the TSF in an excavated channel. The barge is accessible from land along an access walkway. The floating reclaim pump barge was designed by others. Refer to the manufacturer's manual for details related to operations, inspections and maintenance.

The reclaim pipeline is located beside the tailings pipeline on the shoulder of the access road. The pressure rating of the HDPE pipeline decreases as it approaches the Booster Pump Station and Mill site.

The Booster Pump Station is located mid-way along the reclaim pipeline, beside the T2 Dropbox. A valve located on the pipeline leading in from the Southeast Sediment Pond may be used to divert water into the reclaim pipeline. Water from the Southeast Sediment Pond can be diverted into the reclaim pipeline only if it is clear. Two overflow pipes connect the sump beneath the pump station to the T2 Dropbox to ensure water will not overflow in the pump station sump.

The reclaim pipeline does not require any external adjustments during normal operations. However, during maintenance periods, barge relocation or during a prolonged shutdown under extreme cold conditions the reclaim system should be drained via a drain valve located on the barge.

The Pump Barge and Booster Pump Station may be operated from the Mill control room. Both pumps may also be operated locally from the barge or pump station to provide water as required at the Mill site.

3.6.2 Surveillance and Maintenance

The reclaim pipeline, pump barge and booster pump station shall be inspected according to the schedule outlined in Table 3.1 and an inspection log completed as provided in Appendix B. Typical areas to inspect during surveillance of the reclaim pipeline include:

- Locations of excessive wear of the pipeline; (filed with maintenance department)
- Evidence indicating leakage from the pipeline;
- Monitor TSF Pond and Barge elevations to ensure that a gradient is maintained in the steel pipe. The barge ramp may need to be relocated higher or a new channel excavated for the re location of the barge;
- The de-icing system for the pump barge should be checked to ensure that it is working prior to freezing conditions;
- Monitor water from the Southeast Sediment Pond to ensure that it's clear before diverting it to the reclaim line.

Additional inspections are required after any unusual event. Table 3.2 outlines additional observations that will need to be documented. Repairs to the reclaim pipeline, barge and/or pump station may be required after any unusual event.

3.7 SEDIMENT PONDS

3.7.1 Components and Operation

A series of diversion ditches divert runoff to two collection ponds where the water is then directed to the TSF or pumped back to the Mill site. The two ponds are the Mill Site Sump and the Southeast Sediment Pond.

The Mill Site Sump is located south of the Concentrator Building. Runoff water from the Mill Site area is collected along diversion ditches and directed to the sump. The water collected in the sump is either pumped back to the mill or allowed to flow by gravity to an inlet point (T1) on the tailings pipeline. The normal operating level is the invert of the bottom inlet at the manhole (El. 1102.7 metres). The water level is kept at this low level so that storage capacity for the design storm event is available in the sump. Discharge from the manhole is conveyed to the reclaim line in an 8 inch (200 mm) HDPE pipeline. The pipeline is buried through the Millsite area and runs in the pipe containment channel, where it is connected to the 22 inch DR17 HDPE tailings line via a prefabricated Tee in a section of the pipeline that flows by gravity (non-pressurized flow). Currently, water is pumped into the reclaim line immediately adjacent to the Millsite Sump. The water level is maintained at the bottom inlet on the manhole at all times.

The Southeast Sediment Pond is located south of the East Rock storage area. Runoff water from the waste rock dump is collected along diversion ditches at the toe and directed to the pond. Water is decanted through a manhole which has four valved inlet pipes which can be used to control the water level in the sediment pond. The normal operating level is the invert of the second inlet at the manhole (El. 1054.5 metres). The water shall not be permitted to rise above this so that storage capacity for the design storm event is available in the pond. A 10 inch (250 mm) DR21 HDPE discharge pipeline runs from the manhole to the reclaim booster sump. By using manually operated valves at the sump, the water can be directed to the sump, if sufficiently clear, or into the T2 Dropbox.

3.7.2 Surveillance and Maintenance

The Mill Site Sump and Southeast Sediment Pond shall be inspected according to the schedule outlined in Table 3.1 and an inspection log completed as provided in Appendix B. Typical observations to be made during surveillance include:

- Water levels in the Mill Site Sump and Southeast Sediment Pond;
- Evidence indicating leakage from the pipelines;
- Erosion in the collection ditches;
- Evidence indicating slope deformation or erosion (i.e. tension cracks at the crest, erosion channels, bulging at the toe);
- Evidence indicating seepage out of the ponds.

The sediment ponds do not require regular maintenance; however, specific maintenance items may be identified during regular surveillance of the ponds.

Table 3.2 outlines additional observations that will need to be documented after any unusual event.

3.8 SEEPAGE COLLECTION PONDS

3.8.1 Components and Operation

The Main and Perimeter Seepage Collection Ponds are located at the downstream toe of the Main and Perimeter Embankments respectively. The ponds collect drainage water from the toe and foundation embankment drains as well as from local runoff.

A corrugated steel pipe connects each pond to a seepage recycle sump where recycle pumps are located. The pumps will recycle the seepage water back into the TSF through 8" (Perimeter) and 8" (Main) diameter, HDPE pipes that extend over the embankment crest. Level sensors in the seepage recycle sump controls the pumping frequency.

The seepage collection ponds and recycle pumps generally operate without requiring any external adjustments. However, the following special circumstances require adjustments to the operating procedures:

- During spring freshet, the pumps may not be able to keep up with the high inflows. All diversion ditches that feed the ponds may need to be directed away. Also, if water quality and permits allow, discharge of water may be possible.
- Under freezing conditions, the pumps are operated on a timed pumping cycle based on site conditions to prevent the pipes from freezing. The pumps will turn on and off based on the cycle time rather than water level. Once the temperatures return to normal the pumps can operate under normal conditions.

3.8.2 Surveillance and Maintenance

The seepage collection ponds and recycle pumps shall be inspected, by the surface crew, according to the schedule outlined in Table 3.1 and an inspection log completed as provided in Appendix B. Typical observations to be made during surveillance are as follows:

- Water levels in both collection ponds;
- Pump back flow rates from both pumps;
- Evidence indicating seepage from the collection ponds;
- Evidence indicating erosion or instability on the slopes of the ponds;
- The overflow culverts and pipelines between the monitoring sumps and recycle sumps are free of any obstructions;

- Ensure that the discharge end of the seepage recycle pipeline isn't submerged in tailings.

Additional observations will also be required under special circumstances as follows:

- Monitor the pumping from the ponds during freezing conditions to ensure that the pumping cycle is adequate at keeping the pipes from freezing and in keeping the pond level constant;
- Monitor the water quality in the ponds during spring freshet to ensure that the seepage water from the TSF is at acceptable levels if water permits allow for discharge.

Table 3.2 lists additional events and circumstances that will require increased observations and documentation.

3.9 INSTRUMENTATION

3.9.1 Components and Location

The tailings embankment and associated facilities were constructed with various instrumentation to assist in monitoring the facility. The various components are as follows:

- Vibrating Wire Piezometers;
- Slope Inclinometers;
- Groundwater Monitoring Wells.

The locations of the piezometers and slope inclinometers are on the drawings located in Appendix D.

The piezometers measure the pore pressures in the foundation soils, embankment foundation drains and embankment fill. They are connected to instrumentation readout panels located on the crest of the embankments and read using a piezometer readout box. A summary of the existing vibrating wire piezometers is presented on Table 3.3 with trigger levels, which if exceeded, will require investigation and possible contingency or remedial actions. Data may be entered on the piezometer data sheet included in Appendix C. A summary of the piezometer data will be sent to Knight Piésold according to the schedule outlined on Table 3.1

Four slope inclinometers are currently installed at the toe of the Main Embankment in order to measure potential deformation of the embankment materials. Operational procedures for operation of the inclinometer probe and data reduction are provided in the manufacturer's instruction book. Readings are carried out manually and displacements are calculated using software from RST and spreadsheets set up by MPMC. The spreadsheets are updated on site and summaries will be sent to Knight Piésold regularly. A summary of the existing slope inclinometers is presented on Table 3.4 with trigger levels, which if exceeded, will require investigation and possible contingency or remedial actions.

Survey and surface movement monuments (to be installed) will be used to measure the vertical and lateral movement of the earthfill dams. Data is entered on the survey data sheet included in Appendix C. Trigger levels and the required appropriate actions are summarized on Table 3.5. A summary of the results will be sent to Knight Piésold according to the schedule outlined on Table 3.1.

Groundwater monitoring wells are located around the perimeter of the TSF. MPMC regularly measures the water levels and water quality from each well and submits the reports to the appropriate agencies. The location of the groundwater monitoring wells is shown on Figure 3.2.

3.9.2 Surveillance and Maintenance

All instrumentation components must be read regularly. The monitoring frequency for each is outlined on the schedule in Table 3.1. Data may be entered on the appropriate sheets included in Appendix C.

Data must be collected, plotted and reported according to the schedule outlined in Table 3.1. The design engineer must be notified of any anomalous trends. Additional readings and inspections as outlined in Table 3.2 will also be required after any unusual event or observation.

Generally, the instruments do not require regular maintenance but may require occasional maintenance as follows:

- The piezometer wires may need to be cut and re-attached if the readout box is unable to acquire any data;
- Piezometer wires that are exposed may become corroded and may need to be trimmed until a fresh surface is exposed to allow readings to be taken;
- Cover survey points with 20 litre buckets to keep snow off in the winter months;
- Protect surface movement monuments with used tires. These monuments need to be re-established and protected again after construction of a new embankment lift.

SECTION 4.0 - SAFETY INSPECTIONS AND REVIEWS

4.1 ANNUAL INSPECTIONS

Annual Inspections of the tailings impoundment and associated facilities are required to evaluate the current and past performance of the facility and to observe potential deficiencies in its condition, performance and/or operation. The Environmental Superintendent is responsible for arranging the inspections. This level of dam safety evaluation should be based on detailed observations made by the Design Engineer on site and the relevant information on the TSF operations collected by site personnel. Additional reviews may be required also as a follow up to the report of an unusual event or observation.

The Environmental Superintendent or designate should accompany the Design Engineer during the annual inspection. The Design Engineer will evaluate the safety of the TSF and incorporate a routine review of the following:

- The consequences classification of the dam;
- The operations and maintenance manual;
- The availability of all documents pertaining to dam safety on site;
- The site surveillance practice;
- Changes in relevant regulatory requirements since the last inspection.

The Design Engineer will issue an annual inspection report after completing the review. The report will include the following:

- Conclusions on the status of the TSF;
- Statements indicating completion of recommendations from previous inspections and reviews;
- New recommendations if necessary.

The General Manager and the Ministry of Energy, Mines and Petroleum Resources should review each annual inspection report. Copies of the reports should be made available on site and are available in the office of the Design Engineer. The General Manager should prepare and execute an appropriate action plan to ensure that all recommendations made in the annual inspection report are followed. This action plan should be documented.

4.2 DAM SAFETY REVIEW

The principle objective of a Dam Safety review (DSR) is to ascertain that a dam has an adequate margin of safety, based on the current engineering practice and updated design input data. A DSR may also be carried out to address a specific problem.

A qualified engineer will be responsible for conducting each DSR at the Tailings Storage Facility. The engineer conducting the DSR must be qualified to conduct safety evaluations and be familiar with the designs and other site-specific conditions and requirements pertaining to operations of the impoundment and associated facilities; but ideally should not have been involved in the design, construction or operation of the TSF.

Routine DSR's at the TSF will be carried out every 5 years but this scheduling requirement should be confirmed or revised at the time of each annual inspection. The next DSR for the TSF is scheduled for 2011.

A detailed scope of work for each DSR will be defined by the engineer prior to conducting the review, and be consistent with current engineering practice at the time it is conducted. Each DSR will evaluate the safety of the TSF and incorporate a detailed review of the following:

- The consequences classification of the dam;
- The adequacy of past annual inspection practice, the annual inspection recommendations, and their implementation;
- The Operation and Maintenance Manual;
- Timing for the next regular DSR.

Each DSR report should include conclusions and, if necessary, recommendations pertaining to the safety of the TSF. Copies of the DSR will be sent to the Environmental Superintendent and the Ministry of Energy, Mines and Petroleum Resources for review. Similar to the annual inspection report, an action plan should be prepared by the Environmental Superintendent to address the DSR recommendations. A copy of each report will be sent to the Ministry of Energy, Mines and Petroleum Resources and will also be available at the site and at the office of the Design Engineer.

SECTION 5.0 - EMERGENCY PREPAREDNESS AND RESPONSE PLANS

5.1 GENERAL

This Emergency Preparedness and Response Plan will enable MPMC to identify emergency and hazardous conditions threatening the TSF, expedite effective response actions to prevent failure, and reduce loss of life and property damage should failure occur.

In the event that MPMC is unable to comply with any of the terms and conditions of the permit, due to any cause, MPMC will:

1) Immediately notify the Ministry of Energy, Mines and Petroleum Resources of the failure to comply.
2) Immediately take action to stop, contain, and clean up unauthorized discharges or otherwise stop the non-compliance, correct the problem, and if applicable, repeat sampling and analysis of any non-compliance immediately.
3) Submit a detailed written report to the Ministry of Energy, Mines and Petroleum Resources within thirty (30) days (five days for upsets and bypasses), unless requested earlier by the Ministry of Energy, Mines and Petroleum Resources. The report will contain a description of the non-compliance, including exact dates and times, if the non-compliance has not been corrected, the anticipated time it is expected to continue, and the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the non-compliance.

5.2 WARNING SIGNS

Three levels of emergency conditions (or warning signs) can be identified with respect to the site operations. These are defined as follows:

Level 1
Unusual conditions that do not yet represent a potential emergency, but do require prompt investigation and resolution.

Level 2
Conditions that represent a potential emergency, if sustained or allowed to progress, but no emergency situation is imminent.

Level 3
An emergency defined by either failure of a significant component of the TSF and/or associated facility or a significant failure of the performance of a component of the TSF. Such failure may have already occurred, or be imminent.

Typical situations that would be classified under the three levels of emergency conditions (Level 1, 2 or 3) and the actions to be taken are outlined in Table 5.1 and described below:

Level 1 Situation

The action in the event of a Level 1 Emergency Condition will typically involve an investigation, intensified monitoring, inspecting and/or testing, and defining and implementing possible corrective measures.

Construction equipment will be available at the Mine and include, but not be limited to, an excavator, a grader, haul trucks and a bulldozer. Material will be available both at the TSF and at the Mine for use in repairing or remediation of any damaged areas.

Level 2 Situation

The first action in the event of a Level 2 Emergency Condition is to discuss and define an action plan, at the site, under the direction of the Environmental Superintendent. After such a plan is prepared, it must be presented to the Mine Manager for approval. Construction equipment should be made available, if required, at short notice.

Level 3 Situation

The first actions in the event of any Level 3 Emergency Condition are:

- Check that all persons who could possibly be affected are safe; and
- Initiate the appropriate chain of communications.

The person who initiated the communication should then stand-by at a safe location near the problem area and await further instructions or decisions. All those involved in emergency response, after first having communicated with the appropriate parties, should consider two types of actions as first steps in the emergency response, with respect to the protection of human life and health, environment and property:

- What can be done to prevent the situation from worsening?
- What can be done to reduce the consequences of the impending or actual failure?

Any such action must be presented to the Mine Manager who will decide on its implementation in consultation with the Ministry of Energy, Mines and Petroleum Resources.

5.3 INCIDENT NOTIFICATION PROCEDURES

The following incident notification procedures are to be followed for all emergency conditions.

Level 1 and Level 2

The notification procedures are as follows:

- The person first noticing a Level 1 or Level 2 Emergency Condition shall notify the General Manager and initiate corrective actions and intensified monitoring.

- The General Manager shall notify the Design Engineer as appropriate.

Level 3

The notification procedure for a Level 3 Emergency Condition is as follows:

- The person noticing a Level 3 Emergency Condition shall notify the General Manager and initiate corrective actions and/or intensified monitoring, as appropriate.
- The General Manager shall notify MPMC Corporate office, MPMC Project director, and the Design Engineer.

In the event of an emergency situation that will result in an actual or potentially imminent dam failure, or release of untreated water, the General Manager shall also notify the Ministry of Energy, Mines and Petroleum Resources.

Names and telephone numbers for the key contacts are given in Table 1.1

SECTION 6.0 - CERTIFICATION

This report was prepared and approved by the undersigned.

Prepared by: ______________________________

Ron Martel
Environmental Superintendent

Luke Moger
Project Coordinator

Approved by: ______________________________

Tim Fisch
General Manager

E:\Mark Work\MPMC\STAGE 6B BUILD\[Design Change 03 30 10.xls]Design Change

FILE NO.: 2010-002

DATE: 30-Mar-10

REQUEST FOR APPROVAL BY DESIGN OFFICE OF CHANGE / SUBSTITUTION

PROJECT: Mt. Polley - Stage 6b Construction

PROJECT NO.: 101-0001/29

AREA OF WORK: All embankments

GENERAL DESCRIPTION OF PROPOSED WORK: where?

MPMC would like to replace The remaing Stage 6b and all stage 7a Zone U till with mine waste rock. The new design will have the Zone u constructed prior to till placment.

Please review the proposed change / substitution as per the attached sheets.
No. of Sheets: 2

Reference Drawings / Clauses: See drawing 226

Signed: Mark Smith

Originator: Mark Smith, EIT

FOR VANCOUVER OFFICE USE

Date Received: 30 March 2010

Proposed change / substitution not approved:

approved as submitted:

approved as amended:

No. of sheets attached: 3 (amendments only)

Signed: Engineer: Director:

Date Returned: 1 April 2010

Knight Piesold Ltd.
1400 - 750 West Pender Street
Vancouver, B.C. V6C 2T8
Phone: (604) 685-0543
Fax: (604) 685-0147

Notes:
1. Originator to keep a copy of all submissions and attachments.
2. Vancouver office to keep a file copy of completed request form with attachments, marked up as described above.

FORM F - 3

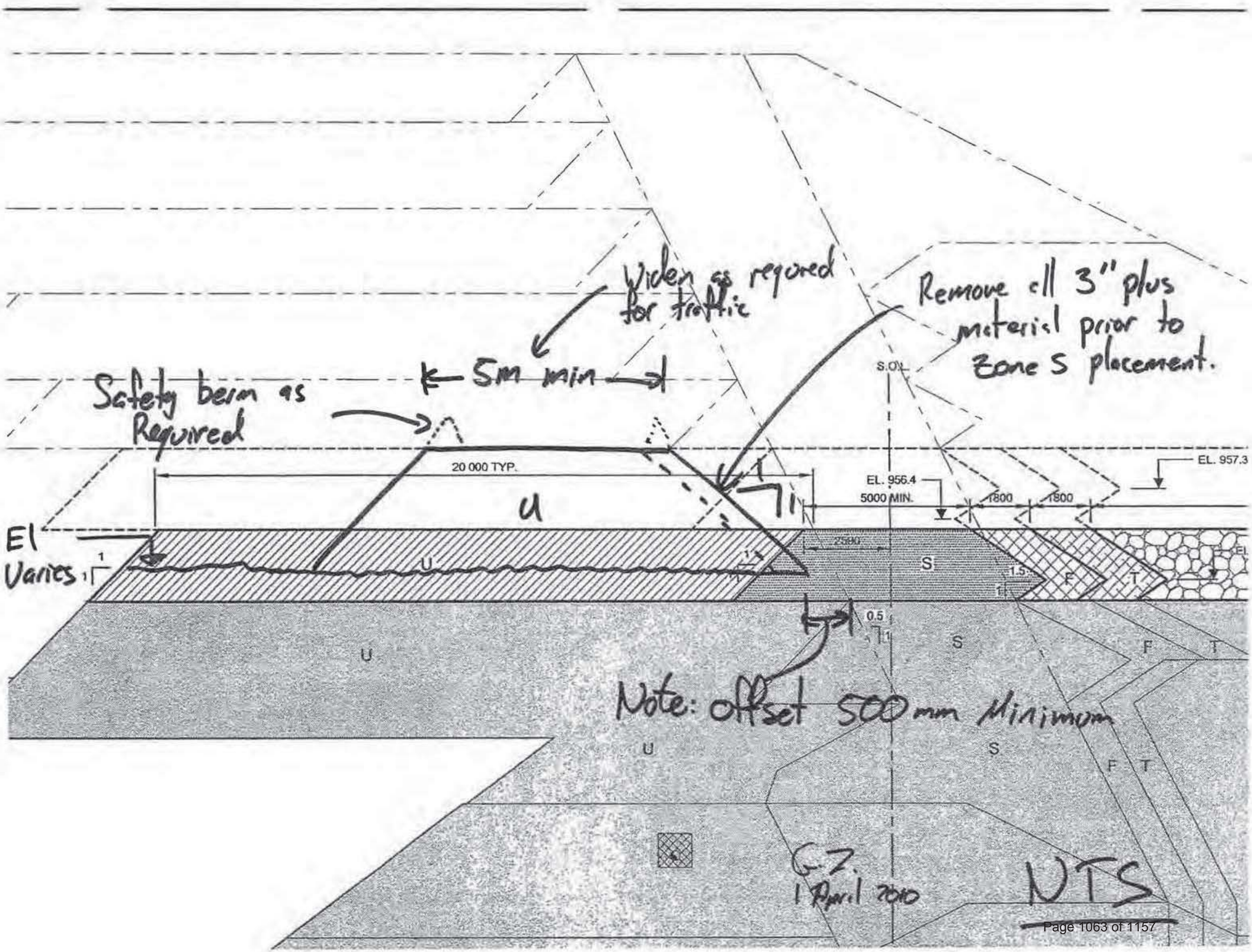
The design change to use waste rock for a reduced width zone U is approved with amendments. The amendments are shown on the attached sketch and summarized as follows.

- Maintain a minimum 5m crest width of zone U. Increase zone U crest width as required for haul traffic.
- Place and compact zone U as for zone C. Place in 2m lift max, compaction by haul traffic.
- Maintain a slope of 1H:1V or flatter on the zone U to zone C interface.
- Remove all particles larger than a coarse gravel, (+75mm or +3") from the interface between zone U and zone C.

The following comments address constructability of the revised zone U.

- Zone S should not be used for equipment traffic. The zone S material does not have sufficient strength or durability for heavy construction equipment traffic. Traffic on the zone S will result in damage to placed material. The zone S damage may include rutting and deformation. Damaged zone S material will need to be removed and replaced.
- Zone U waste rock will have sufficient strength and durability for heavy construction traffic. Use of zone U for construction traffic will need to meet the 'Health, Safety and Reclamation Code for Mine in BC'.

1 April 2010



Widen as reqored for traffic

Remove all 3" plus material prior to Zone S placement.

5m min

Safety berm as Required

u

El Varies

Note: offset 500mm Minimum

G.Z.
1 April 2010

NTS

TABLE 3.3

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY

SUMMARY OF VIBRATING WIRE PIEZOMETERS AND TRIGGER LEVELS

Printed:17-Feb-2015

M:\1\01\00001\29\A\Correspondence\Incomming\From Site Office\2010_05_20 - Summary of Pizometer\[Working piezc

Revised:20-Jun-2010

0.3 Identification Number	Serial Number	Tip El. (m)	Zone Monitored	Trigger Level		
				Frequency (Hz)	Pressure (m H2O)	Elevation (m)
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	
A0-PE2-01	43675	928.0	Tailings			
A0-PE2-02	43657	927.9	Tailings			
[illegible]	[illegible]	[illegible]	[illegible]			
A1-PE1-01	64100	913.0	Foundation Drain	3000	2.0	915.0
A1-PE1-02	64098	912.1	Foundation Drain	3040	2.0	914.1
A1-PE1-03	64105	917.2	Chimney Drain	3015	2.0	919.2
A1-PE1-04	43649	936.3	Upstream Toe Drain			
A1-PE1-05	VW5357	947.9	Chimney Drain	2955	2.0	949.9
[illegible]	[illegible]	[illegible]	[illegible]			
A2-PE1-02	69690	938.5	Glacial Till Fill			
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	
A2-PE2-03	64101	919.4	Glacial Till Fill			
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	
A2-PE2-05	64102	921.9	Glacial Till Fill			
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
A2-PE2-09	VW5355	947.8	Zone U - Sand			
A2-PE2-10	VW5351	948.0	Glacial Till Fill			
[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	43674	[illegible]	Tailings			
[illegible]	43676	[illegible]	Tailings			
B0-PE2-03	VW5366	944.2	Tailings			
B1-PE1-01	64107	917.3	Foundation Drain		Not Functioning	
B1-PE1-02	64106	916.0	Foundation Drain	3080	2.0	918.0
B1-PE1-03	64118	918.7	Chimney Drain	3115	2.0	920.7
B1-PE1-04	VW5362	948.2	Chimney Drain	2969	2.0	950.2
B2-PE1-01	67194	916.3	Zone T			
[illegible]	[illegible]	[illegible]	[illegible]			
B2-PE1-03	69696	914.1	Foundation, depth 1.5 m	2964	7.5	921.6
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	
B2-PE2-02	64116	909.5	Foundation, depth approx. 7.9 m	2865	13.9	923.4
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	
B2-PE2-04	64108	921.0	Glacial Till Fill			
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]			

TABLE 3.3

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY

SUMMARY OF VIBRATING WIRE PIEZOMETERS AND TRIGGER LEVELS

Printed:17-Feb-2015

M:\1\01\00001\29\A\Correspondence\Incomming\From Site Office\2010_05_20 - Summary of Pizometer\[Working piez Revised:20-Jun-2010

0.3 Identification Number	Serial Number	Tip El. (m)	Zone Monitored	Trigger Level		
				Frequency (Hz)	Pressure (m H2O)	Elevation (m)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]			
C1-PE1-01	64111	914.7	Foundation Drain	Not Functioning		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
C1-PE1-04	43653	914.3	Foundation Drain	2960	2.0	916.3
[illegible]	[illegible]	[illegible]	[illegible]			
C2-PE1-02	69695	938.5	Glacial Till Fill			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
C2-PE2-02	64119	910.5	Foundation, depth approx. 5.2 m	2955	11.2	921.7
C2-PE2-03	64112	921.0	Glacial Till Fill			
[illegible]	[illegible]	[illegible]	[illegible]			
C2-PE2-06	43647	906.6	Foundation, depth approx. 9.1 m	2940	15.4	922.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
C2-PE2-08	43656	914.0	Foundation, depth approx. 2.0 m	3000	8.0	922.0
C2-PE2-09	VW5360	947.7	Zone U - Sand			
[illegible]	[illegible]	[illegible]	[illegible]			
D0-PE2-01	VW5365	946.9	Tailings			
D1-PE1-02	66520	928.8	Outlet Drain			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
D1-PE1-04	VW5356	948.2	Chimney Drain	2865	2.0	950.2
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
D2-PE2-02	67192	927.3	Foundation, depth approx. 3.6 m	3030	9.9	937.2
[illegible]	[illegible]	[illegible]	[illegible]			
D2-PE2-04	VW5343	948.3	Glacial Till Fill			
E0-PE2-01	VW5367	944.6	Tailings			
E1-PE1-01	VW5359	947.9	Chimney Drain	2960	2.0	949.9
E2-PE2-01	43651	914.2	Foundation, depth approx. 4.6 m	2930	10.6	924.8
E2-PE2-02	43648	909.7	Foundation, depth approx. 9.1 m	2980	15.1	924.8
E2-PE2-03	VW5361	947.6	Zone U - Sand			
E2-PE2-04	VW5363	948.3	Glacial Till Fill			
F2-PE2-01	53765	938.5	Foundation, depth 1.3 m	Not Functioning		
F2-PE2-02	VW5347	948.1	Glacial Till Fill			
F2-PE2-03	VW5342	940.0	Foundation, depth approx 0.5 m	2794	6.5	946.5
F0-PE2-01	**VW9474**	**?**	**Tailings**	**8487**		
G0-PE2-01	VW5371	946.9	Tailings			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		

TABLE 3.3

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY

SUMMARY OF VIBRATING WIRE PIEZOMETERS AND TRIGGER LEVELS

Printed:17-Feb-2015

M:\1\01\00001\29\A\Correspondence\Incomming\From Site Office\2010_05_20 - Summary of Pizometer\[Working piez Revised:20-Jun-2010

0.3 Identification Number	Serial Number	Tip El. (m)	Zone Monitored	Trigger Level		
				Frequency (Hz)	Pressure (m H2O)	Elevation (m)
[illegible]	[illegible]	[illegible]	[illegible]			
G2-PE2-02	VW5354	948.1	Glacial Till Fill			
H0-PE2-01	VW5369	947.0	Tailings			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
H2-PE2-01	VW5353	948.1	Zone U - Sand			
H2-PE2-02	VW5350	948.5	Glacial Till Fill			
I0-PE2-01	**VW5344**	**?**	**Tailings**	**8476**		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
I2-PE2-02	VW5348	948.1	Glacial Till Fill			
I2-PE2-03	VW5341	944.7	Foundation , dpeth approx. 0.5 m	2765	6.5	951.2

Notes:

1. Trigger level is the level at which the monitoring frequency must be increased (daily) and when contingency or remedial plans must be developed.
2. The trigger level for foundation piezometers is approx. 6.0 metres above ground and is based on the level where the factor of safety is approaching 1.1.
3. The trigger level for drain piezometers is approx. 2.0 metres of head.
4. Fill piezometers have no set trigger level, but must be closely monitored for pressure increases.
5. The required action to be taken by MPMC in the event of rising piezometer readings is to change the reading frequency to daily. The Design Engineer should be contacted if the piezometer readings continue to rise over a period of a few days or the trigger levels are reached in the foundation or drain piezometers. ←

were we notified?

Rev 1 - Issued with VA101-00001/9-1

·om: Ron Martel <rmartel@mountpolley.com>
ent: Thursday, October 07, 2010 3:41 PM
To: Les Galbraith
Cc: Greg Johnston; Ken Brouwer; Luke Moger; Tim Fisch
Subject: 1-Mt Polley OMS Manual_r0
Attachments: MasterMine Emergency Response Plan.doc; June2010monthly.docx; May2010monthly.docx; 1-Mt Polley OMS Manual_r0.doc

Hi Les...per you inspection/ audit, you will find up to date OMS / ERP and evidence that water elevations are tracked on a monthly basis

Thanks for your time

RON M

MOUNT POLLEY MINES

IMPERIAL METALS CORPORATION

MINE EMERGENCY RESPONSE PLAN
2010

Scope:

Being prepared for a mine site emergency is critical in order to effectively respond and control any unexpected occurrence.

Emergencies may be site specific where onsite emergency response team personnel can effectively respond to the situation or the incident may involve the use of outside personnel and other resources necessary to coordinate effective response.

The following plan has been designed and developed for Mount Polley to coordinate and effectively respond to any and all mine emergencies.

Goals:

- To ensure and maintain a high standard of emergency response training for mine personnel.
- To identify and ensure adequate resources are available on site and off site in order to facilitate effective emergency response.
- To introduce and train management in the roles of the" Control Group"
- To introduce and train all workers in the relevance of the Mine Emergency Response Plan.

INTRODUCTION & OVERVIEW

Why have a Mine Emergency Response Plan?

A definitive plan to deal with all types emergencies is important and essential as a part of the mining plan as is mandated by the Health, Safety & Reclamation Code for Mines in British Columbia.

Besides the major benefit of providing guidance during an emergency, developing the plan has other advantages. Unrecognized hazardous conditions that would aggravate an emergency situation may be uncovered, allowing them to be eliminated. The planning process may bring to light deficiencies, such as the lack of resources (equipment, trained personnel, supplies), items that can be rectified before an emergency occurs. In addition an emergency plan promotes safety awareness and shows the organization's commitment to the safety of workers and other parties who may be affected by an eventuality.

The lack of an emergency plan could lead to severe losses such as multiple casualties and possible financial collapse of the organization.

Since emergencies will occur, preplanning is necessary to prevent possible disaster. An urgent need for rapid decisions, shortage of time, and lack of resources and trained personnel can lead to chaos during an emergency.

Time and circumstances in an emergency mean that normal channels of authority and communication cannot be relied upon to function routinely. The stress of the situation can lead to poor judgement resulting in severe losses.

2. What is the overall objective of this plan?

This emergency plan specifies procedures for handling sudden unexpected situations. The objective is to reduce the possible consequences of the emergency by:

- Preventing fatalities and injuries;
- Reducing damage to and protecting company property, inclusive of all machinery and equipment
- Preventing and/or reducing damage to the environment
- Accelerating the resumption of normal operations.

Development of the plan begins with a risk assessment. Which will describe:

- How likely a situation is to occur
- What means are available to stop or prevent the situation and
- What is necessary for a given situation?

From this analysis, appropriate emergency procedures can be established.

3. What is a risk assessment?

Although emergencies by definition are sudden events, some occurrences can be predicted with some degree of certainty. The first step is to find which hazards pose a threat to Mount Polley,s mining operation.

When a list of hazards is made, records of past incidents and occupational experience are not the only sources of valuable information. Since major emergencies are rare events, knowledge of both technological (chemical or physical) and natural hazards can be broadened by consulting with fire departments, insurance companies, engineering consultants, government departments and other mining companies

4. What are technological and natural hazards?

Areas where flammables, explosives, or chemicals are used or stored should be considered as the most likely place for a technological hazard emergency to occur. Examples of these hazards are:

- Fire
- Explosion
- Building collapse
- Major structural failure
- Spills of flammable liquids
- Accidental release of toxic substances
- Deliberate release of hazardous biological agents, or toxic chemicals
- Other terrorist activities
- Accidental release of tailings
- Loss of electrical power
- Loss of water supply
- Loss of communications

The risk from natural hazards is not the same across Canada but the list would include:

- Floods,
- Earthquakes,
- Tornados,
- Other severe wind storms,
- Snow or ice storms,
- Severe extremes in temperature (cold or hot), and
- Pandemic diseases like influenza.

The possibility of one event triggering others must be considered. An explosion may start a fire and cause structural failure while an earthquake might initiate all the events noted in the list of chemical and physical hazards.

5. What are the series of events or decisions that should be considered?

Having identified the hazards, the possible major impacts of each are itemized, as:

- Sequential events (for example, fire after explosion)
- Evacuation
- Casualties
- Damage to plant infrastructure
- Loss of vital records/documents
- Damage to equipment
- Disruption of work

Based on these events, the required actions are determined. For example:

- Declare emergency
- Sound the alert
- Evacuate danger zone
- Isolate source, if possible
- Call for external aid, if needed
- Initiate rescue operations
- Attend to casualties
- Fight fire

The final consideration is a list and the location of resources as needed:

- Medical supplies
- Auxiliary communication equipment
- Power generators
- Respirators
- Chemical and radiation detection equipment
- Mobile equipment
- Emergency protective clothing and equipment
- Fire fighting equipment
- Ambulance
- Rescue equipment
- Trained personnel

6. What are elements of the emergency plan?

The following Mine Emergency Response Plan includes

- All possible emergencies, consequences, required actions, written procedures, and the resources available
- Detailed lists of key personnel including their home telephone numbers, their duties and responsibilities
- Floor plans, site plans and plans of the location of stored hazardous liquids and gases in and around the property
- Large scale maps showing evacuation routes and service conduits (such as gas and water lines).

The plan provides key personnel members with written instructions about their particular emergency duties and outlines the course of action they should take in the event of an emergency

The following are the more relevant parts of the Mine Emergency Response Plan and may not cover every situation in every workplace but reference the most critical elements

7. Objective

The objective is a brief summary of the purpose of the plan; that is, to reduce human injury and damage to property in an emergency. It also specifies those staff members who may put the plan into action.

The objective identifies clearly whom these staff members are since the normal chain of command may not prevail in the event of an emergency. At least one of them must be on the site at all times when the mine is operational. The extent of authority of these personnel must be clearly indicated.

8. Organization

One individual will be appointed and trained to act as Emergency Co-coordinator as well as a "back-up" co-coordinator. However, personnel on the site during an emergency are key in ensuring that prompt and efficient action is taken to minimize loss. In some cases it may be possible to recall off-duty employees to help, but the critical initial decisions usually must be made immediately.

Specific duties, responsibilities, authority, and resources are clearly defined.

Among the responsibilities that must be assigned are:

- Reporting the emergency
- Activating the emergency plan
- Assuming overall command
- Establishing communication
- Alerting staff
- Ordering evacuation
- Alerting external agencies
- Confirming evacuation complete
- Alerting outside population of possible risk
- Requesting external aid
- Coordinating activities of various groups
- Advising relatives of casualties
- Providing medical aid
- Ensuring emergency shut offs are closed
- Sounding the all-clear
- Advising media

This list of responsibilities are clearly defined for all key personnel, however, in some instances where the mine is operating with reduced numbers of personnel it may be necessary to assign them with multiple duties.

External organizations that may be available to provide assistance (with varying response times) include:

- Ministry of Energy & Mines
- Ministry of Water, Land & Air Protection
- Ministry of Forests
- Fire/Rescue departments
- Rescue teams from other mines
- Ambulance services
- Police departments
- Telephone company
- Hospitals
- Utility companies
- Industrial neighbours
- Government agencies

In the event that outside emergency personnel are required to respond to an emergency on the mine site they will be fully briefed of any hazards that they may encounter @ the areas they are responding to.

These organizations will be liaised with in the planning stages to discuss each of their roles during an emergency. Mutual aid with other mines is in place in the event of an emergency.

Pre-planned coordination is necessary to avoid conflicting responsibilities. For example, the police, fire/rescue departments, ambulance services and any other responding agency may be on the scene simultaneously.

A pre-determined chain of command in such a situation is required to avoid organizational difficulties. Under certain circumstances, an outside agency may assume command.

Possible problems in communication have been mentioned in several contexts. Efforts will be made to seek alternate and effective means of communication during an emergency, especially between key personnel such as overall commander, on-scene commander, Mount Polley response personnel, engineering, fire/rescue departments, medical and other outside agencies.

The Mine Emergency Response Plan lists the telephone numbers of all personnel and agencies critical for effective response and control of any outlined or perceived emergency.

9. Procedures

Many factors determine what procedures are needed in an emergency, such as

- The degree of emergency,
- The size of organization,
- The capabilities of the organization in an emergency situation,
- The immediacy of outside aid,
- The physical layout of the premises, and
- The number of structures determines procedures that are needed.

Common elements in all emergencies include pre-emergency preparation and provisions for alerting and evacuating staff, handling casualties, and for containing the emergency.

Natural hazards, such as floods or severe storms, often provide prior warning.

The Mine Emergency Response Plan takes advantage of such warnings with, for example, instructions on sand bagging, removal of equipment to needed locations, providing alternate sources of power, light or water, extra equipment, and relocation of personnel with special skills. Phased states of alert allow such measures to be initiated in an orderly manner.

The evacuation order is of greatest importance in alerting staff. To avoid confusion, only one type of signal will be used for the evacuation order.

Commonly used for this purpose are the Mill fire alarms with personnel mustering at the first aid station

The all-clear signal is less important since time is not such an urgent concern and will be communicated by radio, telephone or by word of mouth.

The following "musts" are part of the Emergency Response Plan:

- Identifying evacuation routes & alternate means of escape.
- Keeping all routes free from obstruction
- Providing training in all emergency response procedures
- Specifying safe locations for staff to gather for head counts to ensure that everyone has left the danger zone. Assign individuals to assist any handicapped employees in emergencies.
- Carrying out treatment of the injured and search for the missing simultaneously with efforts to contain the emergency.
- Providing alternate sources of medical aid when normal facilities may be in the danger zone.
- Containing the extent of the property loss should begin only when the safety of all staff and neighbours at risk has been clearly established.

10. Testing and Revision

Completing a comprehensive plan for handling emergencies is a major step toward preventing disasters. However, it is difficult to predict all of the problems that may happen unless the plan is tested. Exercises and drills will be conducted to practice all or critical portions (such as evacuation) of the plan. A thorough and immediate review/de-briefing after each exercise, drill, or after an actual emergency will point out areas that require improvement.

The plan should be revised when shortcomings have become known, and should be reviewed at least annually. Changes in plant infrastructure, processes, materials used, and key personnel are occasions for updating the plan.

It should be stressed that provision must be made for the training of both individuals and teams, if they are expected to perform adequately in an emergency. An annual full-scale exercise will help in maintaining a high level of proficiency.

In order to maintain a workable and effective plan in place it is necessary to identify some of the most common errors found with most emergency response plans, these being;

1. No upper management support
2. Lack of employee buy-in
3. Poor or no planning
4. Lack of training and practice
5. No designated leader
6. Failure to keep the plan up to date
7. No method of communication to alert employees
8 Applicable Codes and Standards are not a part of the plan
9. No procedures for shutting down critical equipment
10. Employees are not told what actions to take in an emergency

IDENTIFYABLE POTENTIAL MINE SITE/MINE LEASE EMERGENCIES

1. Major Structural Fires

2. Mill, Mine Maintenance and warehouse buildings

3. Forest Fires

4. Land Movements

5. Building Collapse

6. Weather Related Occurrences

7. Avalanches

8. Vehicle accidents

9. Spill Response Procedures

A. **Major Structural Fires**

Structural fires may present a minimal potential hazard at Mount Polley as most buildings are constructed of steel and cement.
The offices and administration complex within the main building would pose a greater threat taking into consideration the materials from which they are constructed of.
The following functions listed below are essential in maintaining the integrity of the fire suppression systems and also providing adequate and effective response in the case of an outbreak of fire.

- Fire Prevention

  Monthly fire suppression systems inspections are essential to ensure the integrity of all systems.
  Scheduled maintenance and repairs are imperative in order to maintain the integrity of fire suppression systems.
  Particular attention to housekeeping and observing the National Fire Code will ensure that fire protection remains effective at all times.
  Combustibles shall not be stored inside buildings unless they are part of a work process.
  Flammable materials such as paints and aerosols shall be stored in approved and appropriate storage cabinets.

- Evacuation of the Entire Building

  All persons shall be evacuated from the building involved and shall assemble in a common area that is a safe distance away and upwind of any fire and smoke.
  Circumstances permitting, the normal designated gathering or muster area shall be the "First Aid Station" located in front of the main administration building

- Head Counts of Persons

  This includes all workers and visitors in the area who have signed in at the administration building inclusive of other workers not directly related to the area but who may have had occasion to enter that area, this being the case a head count shall be performed for all workers and visitors who have reported for work or signed in, on arrival at the mine site.

- Contact the Local Fire Department

  In the event of a fire and to ensure that other resources are readily available, if needed, it is essential to contact the local fire department at "Big Lake".

- Shut Down Utilities

  Shut of and isolate power to the fire area, this will eliminate any further fuelling of the fire

- Flammable Gas Containers

  If it can be achieved safely and if at all possible remove gas cylinders and propane tanks from the fire area.

- Victim Recovery

  If unknown, the start of a search for unaccounted persons should commence at the area last seen.
  After searching this area, a systematic search should be made commencing, if possible, at the most hazardous area and completing the search with the least hazardous.

- Water Sources

  One of the most important factors to consider when fighting fire shall be maintaining an adequate supply of water and ensuring that alternate sources are readily available.

B. Mill, Mine Maintenance & Warehouse Buildings

Successful evacuation and accurate accountability of personnel from the mill complex will preclude the necessity to put emergency response team members at risk if they were required to enter the buildings for the purposes of searching for victims

Basic Evacuation Procedure:

Reasons for Evacuation:

When an emergency occurs that is significant enough to affect the health and safety of employees in any work area, an evacuation of the areas may be required.

Examples of emergencies requiring evacuation are fires that cannot be controlled or contained, the release of toxic gases and any other situation where the health and safety of personnel may be at risk.

It is of the utmost importance, with safety in mind, that a fire be contained at the initial/incipient phase where a hand held fire extinguisher may be most effective

Procedure for Evacuation:

Evacuating a specific area:

1. Anyone finding or recognizing an emergency situation that would be cause for evacuation should ensure that everyone in the immediate area is aware of the emergency by raising/sounding the alarm.
2. Attempts should be made to contain the condition using all reasonable measures without compromising ones own or anyone else's health and safety.
3. If appropriate, close doors around the area to starve the fire of Oxygen and contain any toxic gases.
4. Evacuate the area by attempting to head directly into any flow of fresh air. If this is not possible, head directly outside the affected area using the shortest and safest route possible.
5. When safely outside and at a safe distance, assign someone to watch over the entrances in the event that other personnel may inadvertently enter the affected area.
6. All employees, with the exception of those with assigned duties shall muster at the **FIRST AID STATION**.
7. After personnel from the affected area have mustered at the First aid Station an accurate headcount shall be conducted taking into account any personnel who have been assigned Emergency response duties and any other personnel who may have responded to the alarms from other areas of the mine.
8. The supervisor of the area affected by the emergency shall conduct the headcount.
9. Personnel shall only be allowed to return to their worksite when the designated Control Officer/Incident Commander has given the "all clear".

C. Forest Fires

With the mining area having been "logged off" the potential of a large fire in the pit is minimal, however the potential of forest fire still exists around the property, hence the following considerations should be taken.

- Forest Fire Prevention

It is essential that any burning of combustibles be carried out in a diligent manner, taking into consideration the proximity of forest and timber. Educate and inform visitors and contractors of the importance to be aware of ignition sources if working in or close to forested areas of the mine site.

- Fire Discovery

  Close and early attention shall be made during and after lightening storms to ensure that any fires that have started are extinguished before they spread.

- Initial Attack

  Upon the discovery of a fire and with a failed initial attempt to extinguish it, trained response personnel shall be dispatched as soon as possible.
  Response time is critical in order to achieve early suppression.

- Ministry of Forests

  The Ministry of Forest's fire suppression crews have extensive training and expertise in this field and should be contacted at the onset of a fire

- Access and Egress to the Mine site

  In the event of a forest fire breaching the mine access road, this would probably prevent any egress or entry of the mine site and measures such as providing alternate means of transportation, if necessary, would have to be taken into consideration.
  Another concern would be if persons were stranded at the mine site, food would need to be brought in other than by road.

- Available Equipment

  Mobile equipment such as dozers, front-end loaders and any other available resources shall be readied to respond to the construction of fireguards under the direction of a qualified person.

- Transportation of crews

  The transport of personnel to the fire site shall be necessary by means of crew cabs or other acceptable modes.

- Time scheduling

  A person shall be appointed to keep accurate record of the times and names of personnel accessing and regressing the fire site.

D. Land movement

Prevention of Burial

Either a shift boss or a qualified person will examine dumps or stockpiles at intervals not exceeding 4 hours before any work is performed below in the run-out zone or on top of the dump

The conditions noted shall be recorded in the daily logbook. Items of concern include:

- Dumps and Stockpiles
    - Cracks appearing on the dump floor or face.
    - Subsidence of the dump floor.
    - Material hanging up on the face of the dump.
    - Water flows or pooling

- Pit walls:
    - Cracks developing along or near the edge.
    - Cracks in the face.
    - Overhangs developing on the bench face.
    - Water flowing into the rock

If any of the above items are observed contact the Shift boss who will inspect the site and determine what actions are to be taken. In the event that the area appears unsafe do not enter and contract the Shift boss immediately for direction.

If cracks are observed on the rock dump floor the area shall be blocked off and monitored to determine if additional movement is occurring. Dumping in the area shall not recommence until the Mine Superintendent gives approval.

Overburden and soils piles will slough and compact as they are being built. Dumping shall take place back from the edge and dozed over. If bulging of the face or curved cracks are observed dumping shall cease in the area and the area shall be monitored for additional movement. Dumping in the area shall not recommence until the Mine Superintendent gives approval.

E. Building Collapse

The roofs on the buildings at Mount Polley have been built to withstand a 30-year high for snow load, thus it would be highly unlikely that a building would collapse due to snow load.

However, an indicator has been installed on the main Mill building to indicate depth of snow.
Ice build up on the roof of the main Mill building has been an inherent problem at Mount Polley but shall be remedied by laying heat tape down during 2005.

Collapse Prevention

Monitoring of snow load and frequent inspection of building structures shall be made to identify any defect in structural integrity.

Evacuation of the Buildings

Personnel will be evacuated from the building in the event of a potential or identifiable structural defect.
Evacuation will adopt the same procedure as that which shall be followed for fire and that being to leave the area and "muster" at the *First Aid Station*

Head Counts

In the event of an emergency all personnel on the Mount Polley property shall be accounted for

Structural Integrity

If the structural integrity is compromised in some way, any rescue attempt shall be preceded by an inspection by a qualified and authorized person

Utilities

All electrical supplies together with any gas or water supplies not necessary for any rescue operation shall be isolated from the building involved.

Support Equipment

Any equipment such as lifting or raising devices shall be immediately made available to any rescue operation or any other effort to render the building safe

F. Weather Related Occurrences

Heavy snowfall, rainfall, cold temperatures and high winds can create adverse weather conditions, which could have impact on the safety of personnel and mine production.
To safeguard personnel, property and equipment, operations would need to be shut down if a foreseeable potential for a dangerous occurrence was perceived.
Weather related problems might affect operations at the mine, the safety of personnel on the mine site and the well being of personnel traveling to and from the mine site.
Traveling on the mine site or on the highway may involve vehicle accidents and would require that a proactive approach be taken to avoid such occurrences.

Prevention of Weather Related Occurrences

Consideration should be given to the severity of the weather and the shutting down of operations to ensure the safety of personnel, property and equipment.
Having workers return home may be an option, taking into consideration whether the roads are safe and passable.

Head Count

As is standard procedure, a head count should be taken in the event of any emergency situation.

Travel

To minimize the risk of injury, use buses or multi-passenger vehicles if travel is deemed to be a safe and an appropriate measure.
In the event of extreme weather conditions at the mine site, consider escorting haul trucks and personnel to an area for assembly.

G. Avalanches

The potential for avalanche in and around the Mount Polley mine site is minimal.
Potential areas where an avalanche hazard may exist would be on inactive waste dumps around the property having slopes angles of between 30 & 45 degrees.

Prevention of Occurrence

Ensuring that avalanche areas are monitored and stabilized before any work is conducted near or around them can minimize the risk of an incident.
If work has to be carried out below a potential avalanche zone, then those personnel will be required to carry a transceiver on their person.

Head Count

In the event of an unlikely avalanche, a head count of all workers on site shall be taken.

Pre-Response

Before any search or rescue attempt, the avalanche zone shall be inspected and an assessment made as to the stability of the slope.
If a hazard does exist, control measures shall be taken to ensure stability of the slope
Access will only be allowed to designated personnel.

Support personnel

The local dog masters, if any, need to respond A.S.A.P by the quickest transportation available. *Refer to resource listings*

Support Equipment

Equipment such as shovels, probes and transceivers will be made available in the event of a slide.

H. Vehicle incidents

There is a potential for vehicle accidents involving multiple casualties on the Mine-Access road.
There would be a reasonably high risk of multiple casualties taking into consideration the volume of traffic and the mode of transportation, that being buses and multi-passenger vehicles.

Access control

One of the early priorities would be to prevent access to the scene by assigning 2 persons as guards, one at each end of the mine access road.
Travel into and out of the mine can then be restricted to essential and key personnel.

Emergency Response Personnel

If indeed there are multiple casualties it may be necessary for additional outside medical help. It would take a minimum of 1 hour for help to arrive from Williams Lake and if available, 30 minutes response from Likely; therefore, it is of the utmost importance that a "Triage station" be established so that casualties can be transported in the order of emergency medical importance.

Transportation

Consideration must be given to the situation where there are multiple casualties needing transportation to medical facilities in Williams Lake. If this is the case it may be necessary to facilitate the use of crew cabs or other multi-passenger vehicles as long as they can provide the necessary comfort for the casualties

SPILL

RESPONSE

PROCEDURES

Index

MOUNT POLLEY MINING CORPORATION

STANDARD PROCEDURE

SUBJECT:

Emergency Spill Response Contingency Plan

EFFECTIVE DATE: February 2005
REVISION DATE: May 23, 2007

Policy:

To ensure preparedness and to maximize valuable time in case of an emergency.

To confirm Mount Polley Mining Corporation commitment to operating its business at the highest standards to protect the health and safety of workers, the public and the environment.

Definition of an Emergency

> A current or imminent situation that requires prompt coordination of actions of trained persons to protect health, safety, or welfare of people and to limit damage to property and to the environment.

Definition of a Reportable Spill

Legal Definition:

A spill means any polluting substance whether gaseous, liquid or solid that, in the opinion of the minister, is capable of causing pollution if it were to:

- Escape into the air
- Be spilled onto any land or into any body of water, or
- Escape onto any land or into any body of water.

MOUNT POLLEY MINING CORPORATION

STANDARD PROCEDURE

SUBJECT:

Emergency Spill Response Contingency Plan

Objectives:

1. Ensure compliance with B.C. Environmental Management Act: Part 7
2. Ensure compliance with the Federal Transportation of Dangerous Goods Act.
3. Ensure compliance with the Federal Fisheries Act.
4. Outlines response strategies to spills of potentially hazardous substances at or near the mine-site.
5. Facilitate the rapid deployment of trained personnel to deal with spills so that the environmental impact and risk are minimized.
6. Provides Guidelines for Communicating environmental incidents and issues to corporate management
7. Ensure that responsible personnel are:
    - Familiar with the Emergency Spill Response Contingency Plan.
    - Aware and are trained in the potential hazards associated with the Plan.
    - Understand and are trained in the responsibilities of Team Members.
    - Locations of spill containment materials.
    - Action Plan for respective substances.
    - Reporting procedures.

Plan Audits and Revisions:

The Environmental Superintendent is responsible to conduct an annual review of this plan and revise when necessary.

Training:

It is the responsibility of the Environmental Superintendent, with the assistance of the Safety Department, to organize, coordinate and conduct training sessions of the mine-site Emergency Response Team Members.

MOUNT POLLEY MINING CORPORATION

STANDARD PROCEDURE

SUBJECT:

Critical Personnel Contact Phone Numbers

General Manager	Bus. Ph:	250-790-2215 Loc. 200
Tim Fisch	Home Ph:	s.22
	Sat Phone:	403-987-5822
Environmental Superintendent	Bus. Ph:	250-790-2215 Loc 409
Ron Martel	Home Ph:	s.22
	Cell:	
Human Resources and Safety Superintendent	Bus. Ph:	250-790-2215 Loc 101
Paul Allan	Home Ph:	s.22
Safety Coordinator	Bus. Ph.:	250-790-2215 Loc. 185
Wally Rennie	Home Ph:	s.22
	Cell:	
Mine Superintendent	Bus. Ph:	250-790-2215 Loc 406
Art Frye	Home Ph:	s.22
	Cell:	
Mill Operations Superintendent	Bus. Ph:	250-790-2215 Loc 145
Doug Ablett	Home Ph:	s.22
	Cell:	
Mill Maintenance Superintendent	Bus Ph:	250-790-2215 Loc 102
Darcy Hannas	Home Ph:	s.22
	Cell:	
Administration Manager	Bus. Ph:	250-790-2215 Loc 177
Dale Reimer	Cell Ph:	s.22
Mine Maintenance Superintendent	Bus. Ph:	250-790-2215 Loc 142
Merv Wourms	Home Ph:	s.22

The Provincial Emergency Program **1-800-663-3456**

Environment Canada: Smithers		1-250-561-6902
(24Hour Numbers)		1-250-961-3040
CANUTEC		1-613-996-6666
Ministry of the Environment Williams Lake	Bus Ph.	250-398-4716
Kamloops	Bus Ph:	250-371-6220

Brian Kynoch Company President Cell Ph: s.22

Mines Inspector
Stephen Rothman Bus. Ph: 250- 371-6053
Cell Ph: s.22

MOUNT POLLEY MINING CORP.

STANDARD PROCEDURE

Subject: Agency Critical Contact Phone Numbers

Poison Control Centre:	1-800-567-8911
Hospital Emergency Room:	1-250-392-8225
BC Ambulance Service:	911
Big Lake Fire and Rescue:	1-250-243-2400
City Hall Williams Lake	1-250-392-2311
Likely – Fire and Rescue	1-250-790-2287
Forest Fire Reports:	911 or *5555
Government Agencies:	
Provincial Emergency Program: 24 hour service:	**1-800-663-3456**
Water Land and Air Protection:	1-250-398-4530
(Associated with Ministry of Environment)	1-250-398-4716
	1-250-371-6220
District Inspector of Mines:	1-250-319-2054
Ministry of Health:	1-866-847-4372
RCMP: Williams Lakes Detachment:	1-250-392-6211
Spill Response Advice:	
Canutec: Transport Canada [Quote #2-0053]	1-613-996-6666
	1-800-663-9628
Propane: Canwest	1-250-392-2971
Commercial Clean-Up Services:	
Triple Sanitation:	1-250-392-4414
Gord's Septic Services	1-250-392-4647
Orville's Septic Service	1-250-395-4638

Arrow Transport	1-250-453-9411

MOUNT POLLEY MINING CORP.

STANDARD PROCEDURE

Subject: Regulatory Reporting Requirements

The Emergency Contingency Plan Control Officer/Designate must contact the Provincial Emergency Program (PEP).

1-800-663-3456

This is a 24-hour toll free number.

The Provincial Emergency Program staff will notify all concerned agencies, including the following, as appropriate:

The local PEP office.

The Williams Lake Police		1-250-392-6211
Fire		1-250-392-4242
Ambulance		1-250-392-5402
WLAP (Ministry of Environment)		1-250-398-4716 1-250-371-6220 1-250-398-4550
Ministry of Health.		1-866-847-4372
Environment Canada. Smithers, B.C.	Phone: Fax: Cell:	1-250-847-1879 1-250-847-1879 1-250-961-3040

MOUNT POLLEY MINING CORP.

STANDARD PROCEDURE

Subject: Potential Spill Materials

Spill Materials:

1. Gasoline.
2. Diesel Fuel.
3. Mill Tailings.
4. Propane.
5. Lime.
6. Mill Reagent PAX.
7. MIBC.
8. Ammonia Nitrate
9. NaHS
10. Concentrate /Sulphur Soil /Recycle Soil

MOUNT POLLEY MINING CORP.

STANDARD PROCEDURE

Subject: Spill Types and Locations

Spill Types:

1. Minor spills from equipment due to leaks.
2. Minor spills from containers being damaged or knocked over.
3. Minor/Major spills from fuelling stations.
4. Major spills from storage tanks outside the Mill.
5. Major spills from storage tanks inside the Mill.
6. Major spills form transportation and delivery vehicles.
7. Spills from slurry tailings line.

Spill Locations:

1. General Mine-site grounds.
2. Mill Building and surrounding areas.
3. Pipeline route to Tailings Pond.
4. Fuelling station.
5. Access road to mine site.
6. Access road around mine site.
7. Open Pit

Spill Gear Location

We have in stock an assortment of spill absorbent material like booms and pads stored in the **grey "C" can immediately North West of the Mine shifters office.**

MOUNT POLLEY MINING CORP.
STANDARD PROCEDURE

Subject: Spill Assessment Potential

Transportation:

The area of greatest vulnerability for spills are transport related incidents resulting from road conditions, and mechanical failures.

Contingency plans files by the Shipper with Transport Canada and requires to be in possession of the driver are intended to address these types of incidents.

Ensure that Shipping Papers are carried in the cabin of the transport vehicle.

The Company:

Undertakes to provide information to the Shipper on avoidance of poor road conditions and rescheduling of deliveries, if necessary.

Ensures to maintain the mine road conditions in as favorable condition as possible.

Provide the manpower and equipment required to control and minimize the affects on the environment.

Fuels:

Standard procedures are in effect for the safe unloading of fuels to storage tanks and safety berms are provided to contain spills at the storage facilities.

Emergency Contingency Plans for effective response to spills are addressed in this document.

Lime:

Unloading of granular quicklime from bulk tank trucks can result in spillage. These spillages, if any, will be cleaned up with a front-end loader and disposed of by recycling the material to the crusher.

Explosives:

Transport, handling and transfer of explosives are addressed within the Emergency Contingency plan of this document.

Explosive materials storage is in separate containers and conform to the Ministry of mines and transport Canada standards.

Tailings:

The tailings lines are protected against vehicle collision. The pipeline is also contained in a ditch along the access road to the tailings pond.

Other Consumables:

All consumables are contained within their original shipment containers prior to transfer to end user containers. End user spillage Emergency Contingency Plans are addressed in this document.

MOUNT POLLEY MINING CORP.

STANDARD PROCEDURE

Subject: Contact Group

Spills of chemicals, fuels and other substances may occur as isolated events or they may occur with other emergencies such as fire, explosion, natural causes or accident.

A number of response personnel may be involved to protect mine property and the health and safety of mine personnel and the public.

The key persons involved during a spill occurrence would be as follows:

The person discovering the spill, and his/her Supervisor.

The General Manager or his Designate.

The Area Superintendent.

The Environmental Superintendent.

The Safety Superintendent or his Designate.

The On-Scene Co-ordinator (OSC).

The Response Team Leader (RTL).

The Clean-up crews.

The responsibilities of key personnel are outlined in the General Emergency Contingency Plan Control Group section.

Applicable telephone numbers are kept current and posted at the mine-site.

MOUNT POLLEY MINING CORP.
STANDARD PROCEDURE

Subject: First-On-The-Scene Personnel Responsibilities

Person discovering the spill:

1) Assess the hazard to one's own health and safety and to others in the vicinity.
    - If fire or explosion hazards are perceived immediately retreat to a safe distance.
2) Notify your Supervisor IMMEDIATELY.
3) Stop the spill only as long as it is safe to do so.
4) Barricade or flag off the area to ensure the safety of others
5) If the risk of gas poisoning exists ensure qualified personnel conduct atmospheric testing with the appropriate equipment prior to entry.

Action Items:

- Ensure the Area Supervisor is notified IMMEDIATELY.
- Barricade/Flag the area.
- Place physical guards at a safe distance.
- Warn others in the immediate vicinity of the situation.
- Arrange for appropriate operating equipment to be shut down, if applicable, to minimize the extent of the spill.
- If warranted, notify on-site Industrial First Aid Attendant for first aid.
- Fire fighting response will be co-ordinated by Area Supervisor in attendance backed up by Emergency Response Team personnel.
- The Supervisor or the person discovering the spill with the following information must contact the General Manager or his designate IMMEDIATELY:
    - Name of person discovering the spill.
    - The time of the spill.
    - The location of the spill.
    - The type of substance spilled.
    - The quantity of the spill.
    - The cause of the spill.
    - The weather conditions.
    - Perceived potential for hazard, and any injury to aquatic systems, wildlife or people.
    - Actions already taken.
    - Whether a fire or explosion hazard is deemed to exist.
    - Personnel already notified.
    - Contained the spill?
    - Are there or could there be environmental effect?
    - Are there any injuries?

Note:

- Ensure every remedial action is taken safely and efficiently to stop and/or minimize the extent of the spill.
- The Supervisor must remain in place to direct personnel and equipment upon instructions from the Command Post.

MOUNT POLLEY MINING CORP.

STANDARD PROCEDURE

Subject: Level of Emergency

Levels of Emergency

Level 1- A spill that is **below the external reportable quantity** or an emergency where the **potential health and safety risks are low** (no employees are injured). Incidents that can be cleaned up or resolved with little impact on the mine and or environment. No command post is necessary in such an incident.

Level 2- A spill that is **above the external reportable quantity** or an emergency whereby the **health and safety of staff member(s) may be jeopardized**. It is a spill that requires the initiation of the emergency measures. No external help is needed in this situation but a command post may need to be established.

Level 3- A spill that is **above the external reportable quantity** or an emergency where there is **great potential health and safety risks**. There may be casualties. This type of emergency requires internal and (may required) external intervention. A command post may be set up both onsite and offsite.

Level	Is the spill above external report quantity?	**Potential Health and Safety Risk**	**Command Post**	**External Support**
1	No	Low	No	No
2	**Yes**	***Maybe***	***Maybe***	No
3	**Yes**	**Yes**	**Yes**	***Maybe* / yes**

MOUNT POLLEY MINING CORP.

STANDARD PROCEDURE

Subject: Main Response Elements

Find and Identify

Establish Communication System
Collect Information
Isolate the Emergency Scene

Notify

Notification of Employees
Notification to public, agencies and media

Ensure Public Health and Safety Protection

Search and Rescue
Medical Care

Environmental Protection

Establish Spill Plan
Manage spill response equipment and resources
Conduct Hazardous material clean up

Terminate the Incident

MOUNT POLLEY MINING CORP.
STANDARD PROCEDURE

Subject: Personnel Responsibilities

General Manager/Designate:

- Notifies Corporate, PEP and Media.
- Maintain responsibility for the activities at the site of the spill.
- Maintain contact with and co-ordinate work with the Environmental Superintendent, Terminates the Incident, conducts brief.

Environmental Superintendent:

- Notifies Government Agencies
- Monitors Environnemental Impact.
- Establishes decontamination measures with safety coordinator.
- Update the Spill Contingency Plan as required, for all potentially hazardous materials, accurate names of personnel and phone numbers.
- Plan and co-ordinate required skills.
- Be responsible for assessing new spill hazards as they develop and take preventative actions, whether covered in the manual or not.
- Check and maintain the operating status of required response equipment, which may be required at a spill.
- Train emergency response personnel with respect to their duties:

Superintendent of Affected Area:

- Has authority to direct response operations.
- Needs to clear incident action plan with manager
- Determines level of Incident
- Assigns Command Post if necessary
- Executes the incident action plan and enforces worker safety and environmental protection
- Briefs team/teams on specific assignments and deploys the necessary crews and equipment required for cleanup.

Communications:

- Responsible for the communication and emergency assistance
- Notifies emergency response personnel by telephone or radio in the event of an emergency
- Assigns scribe
- Records incident details and subsequent developments as they occur.
- Responsible for establishing communication and emergency assistance.
- Establishes external support system (if required)
- Assisting Safety Supervisor.

- Maintains communication contact with the work parties via walkie-talkies, signal horns, or other means

Health and Safety:

- Advises the incident commander on all aspects of health and safety on the site. Recommends stopping the work if any of the work operations threaten worker or public safety.
- Ensure proper PPE is used and maintained.
- Controls entry and exit at the access control points.
- Monitors onsite hazards and conditions.
- Enforces the Buddy system
- Control the decontamination of all equipment, personnel and samples from the contaminated areas.
- Assist In the disposal of contaminated clothing and materials.
- Advises medical personnel of potential exposures and consequences.

Emergency Response Team Members:

- Consult Appendix C of this manual, to review the site plan relative to building location of the spilled material and specific location of the material within the building/site.
- Consult the appropriate ACTION PLAN contained in this document, to review the properties of the spilled material and recommended response actions.
- If further information is required, contact one of the resource services listed in this document.
- Assess the spill requirements for manpower, equipment, materials, tools and protective gear to contain the spill, in consideration of the resources available.
- Mobilize these resources and take responsibility for implementation of the response actions in the spill site.
- If the spill is too large or complex to be handled entirely by the Company's resources, call an appropriate group or agency listed in this document.
- Contact the Environmental Superintendent to determine what, if any, sampling should be done and to discuss the spill and any environmental implications.
- Once the initial response action is underway, contact the General Manager or designate review the situation and strategy.

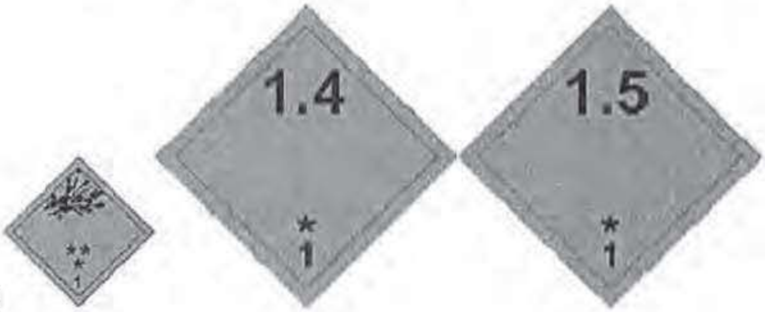
APPENDIX A

Product Classification

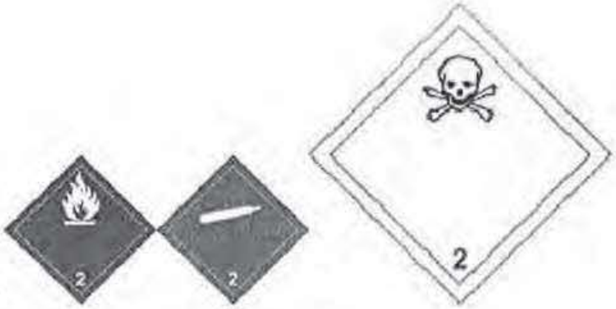
APPENDIX A

Product Classification…

Federal and provincial legislation provide for the regulation of an extensive list of products, substances or organisms classified as dangerous. The products fall into one of nine classes:



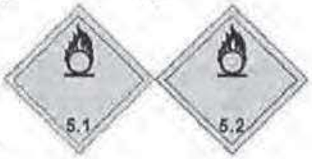
- Class 1 explosives



- Class 2 gases

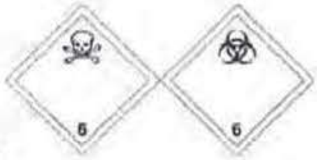
- Class 3 flammable liquids
- Class 4 flammable solids, spontaneously combustibles and substances that, on contact

with water, emit flammable gases



- Class 5 oxidizing substances and organic peroxides

- Class 6 poisonous (toxic) and infectious substances



- Class 7 radioactive materials

- Class 8 corrosives

- Class 9 miscellaneous products or substances
  - miscellaneous identified dangerous goods
  - certain specified goods considered dangerous to the environment
  - dangerous wastes

APPENDIX B

Hazardous Material Response Plan

APPENDIX B

Hazardous Material Response Plan

Hazardous Materials Checklist

1. Isolate the Area and Deny Entry
    - ☐ Determine the Hazard Area Involved
    - ☐ Establish Control of the Hazard Area
    - ☐ Determine Incident Control Zones (Hot, Warm, Cold)
    - ☐ Advise All Units of Area to be Isolated
2. Identify and Verify the Materials Involved
    - ☐ Obtain Shipping Papers or Facility Documents (*only if safely possible*)
    - ☐ Write Down All Information Obtained
    - ☐ Verify the Source and Accuracy of all Information
3. Hazard and Risk Assessment
    - ☐ Evaluate the Following Concerns
        - Health
        - Flammability
        - Reactivity
        - Physical Properties
        - Chemical Properties
    - ☐ Assess Container Integrity (Stress, Breach, Release, etc.)
    - ☐ Determine all Exposures
    - ☐ Estimate Likely Harm Without Intervention
4. Evaluate Protective Clothing and Equipment
    - ☐ Determine Proper Type and Level of Protective Clothing Required

      Note: Structural Fire-Fighting Clothing Will Not Provide Protection
5. Coordinate Information and Resources

☐ Coordinate Information Between All Branches/Divisions/Groups

☐ Conduct Briefing of All Division/Group Officers to Develop Tactical Options

☐ Advise Incident Commander of Tactical Options and Recommendations

6. Control, Containment and Confinement

☐ Review Tactical Options With Entry Personnel

☐ Coordinated All Operations With the Safety Officer

  ☐ Will Decontamination be Required After Entry Operations?

    ☐ Yes Implement **Decontamination Procedures Prior to Entry**

    ☐ No Continue

7. Decontamination Procedures

  ☐ Decontamination Procedures Determined and Verified

  ☐ Decontamination Area In Place and Fully Staffed

8. Entry Team Procedures

  (SOP's of the department supplying the hazardous materials technicians shall be used for all entries)

9. Termination Procedures

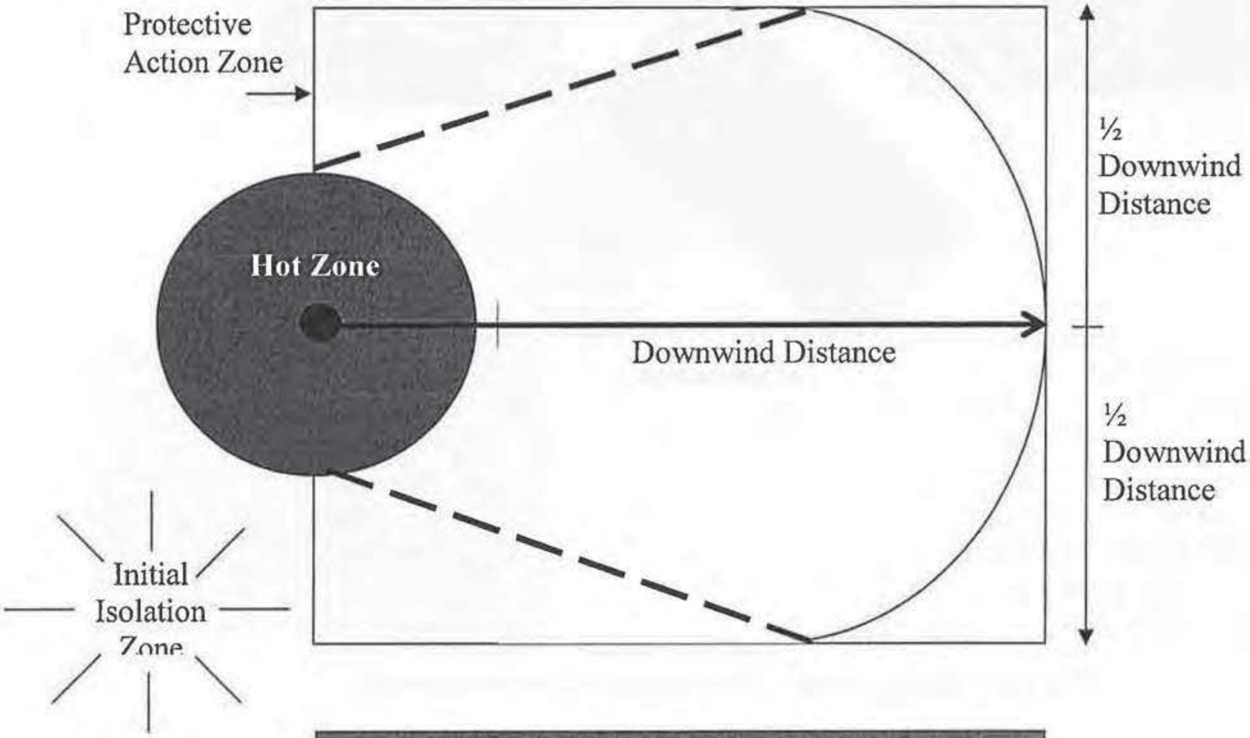
  ☐ Ensure All Personnel Are Briefed as Necessary

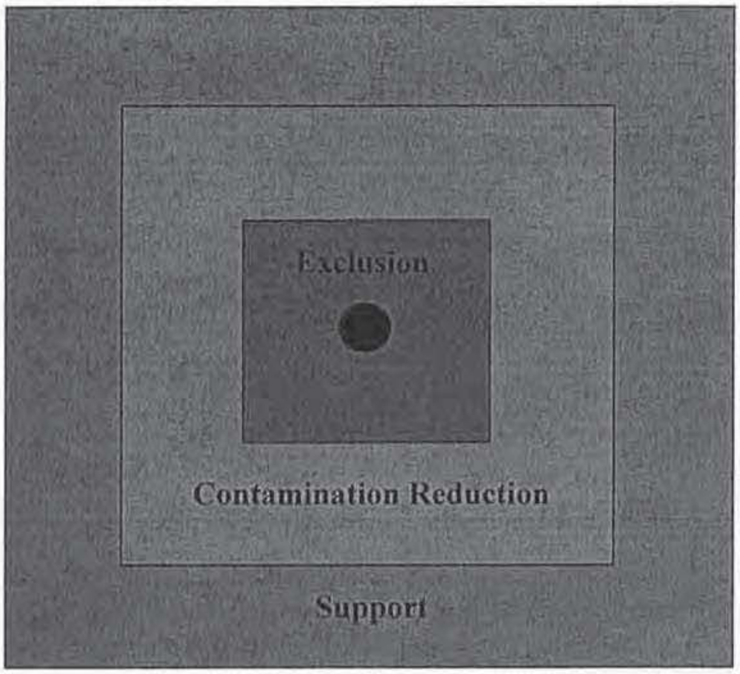
  ☐ Signs and Symptoms of Exposure Provided

  ☐ Personnel Exposures Documented

Initial Isolation/Protective Action

Hot- Exclusion Zone. Entry Team only
Warm- Decontamination, Properly trained & equipped personnel only
Cold- Staging & Operations

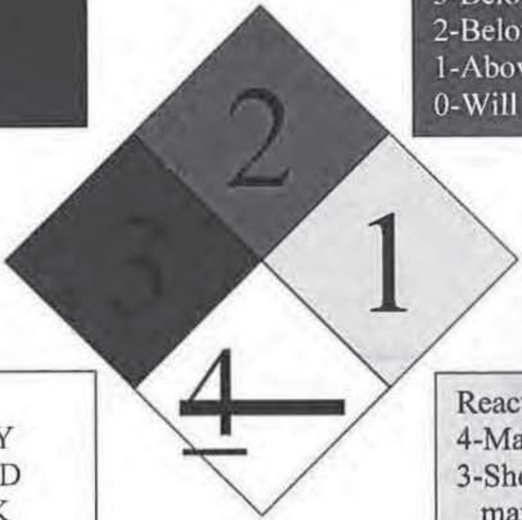




NFPA 704 HazMat* Classification

Health Hazard
4-Deadlly
3-Extreme danger
2-Hazardous
1-Slightly hazardous
0-Normal material

Fire Hazard
Flash Points
4-Below 73 F
3-Below 100 F
2-Below 200 F
1-Above 200 F
0-Will not burn

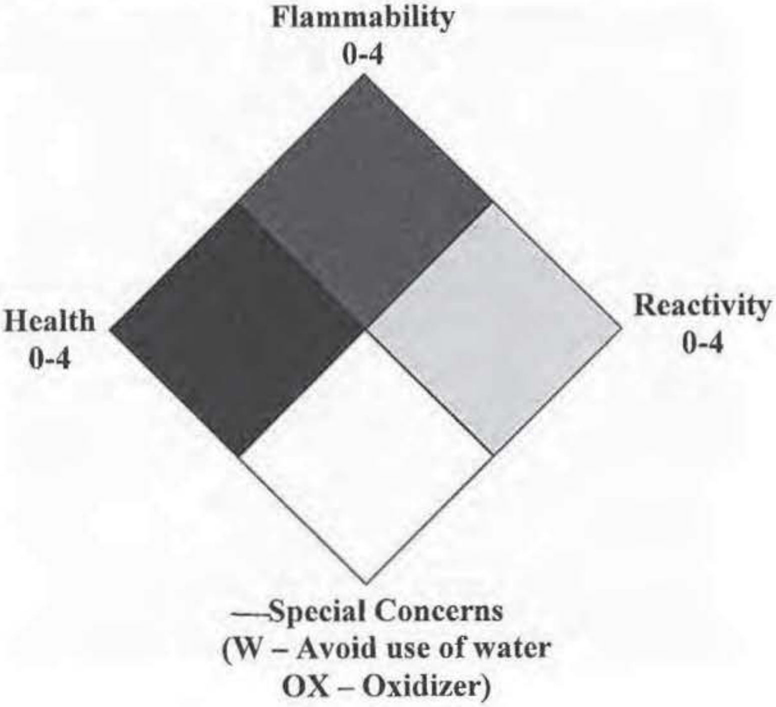


Specific Hazard

Oxidizer	OXY
Acid	ACID
Alkali	ALK
Corrosive	COR
Simple Asphyxiant	SA
Use NO WATER	W
Radiation Hazard	

Reactivity
4-May detonate
3-Shock and heat
may detonate
2-Violent Chemical change
1-Unstable if heated
0-Stable

(*Not intended to identify non-emergency health hazards)



Hazardous Materials Response Plan

Response Guide by TDG Hazardous Classification

Environmental Canada's Transportation of Dangerous Goods Act divides hazardous materials into nine major hazard classes. A hazard class is a group of materials that share a common major hazardous property, i.e., radioactivity, flammability, etc. These hazard classes include:

Class 1-Explosives
Class 2-Compressed Gases
Class 3-Flammable Liquids
Class 4-Flammable Solids
Class 5-Oxidizers
Class 6-Poisonous and Infectious Substances
Class 7-Radioactive Materials
Class 8-Corrosives
Class 9-Miscellaneous Hazardous Materials

Notes:

- In some emergency response procedures for TDG hazard classes, a distinction is made between bulk or package quantities. Packing Groups indicate the degree of danger of a product or substance, and are always shown in Roman Numerals: **I great danger, II moderate danger, III minor danger**

- Class 9, "Miscellaneous Hazardous Materials," refers to those materials that are hazardous but do not meet criteria for inclusion in the aforementioned classes.

Note: The material presented in this Response Guide has been written in accordance with industry standards. However, this guide cannot anticipate all possible emergency events or situations and emergency responses and therefore cannot be used without the competent review of the emergency response team and plant management. Conditions may develop in operations where standard methods will not suffice and nothing in this guide shall be interpreted as an obstacle to the experience, initiative, and ingenuity of the responders in overcoming the complexities that exist under actual emergency conditions. Responders should use all available resources to determine the appropriate strategies and tactics.

Class 1: Explosives

Definition

An explosive is any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion, e.g., with a substantial instantaneous release of gas and heat.

General Emergency Response Procedures

1. Identify the material involved.
2. Keep non-essential people away (includes non-essential emergency service personnel).
3. Establish control zones (isolate area and deny entry).
4. Extinguish all sources of ignition in the vicinity. Do not allow vehicles or other sources of ignition in the area.
5. Wear positive pressure SCBA and full protective clothing.
6. Avoid exposure to smoke, fumes, vapors, dust, or direct contact. The combustion products of some propellant explosives are poisonous.
7. Do not allow personnel to touch or move explosives. Explosives should be moved only under the advice and supervision of trained explosive personnel.
8. Contact local police or military bomb units.
9. When a HAZMAT team is requested to respond to a bomb threat involving hazardous materials, under no circumstances will the HAZMAT team conduct building or area searches even when hazardous materials are involved. The HAZMAT team will stage in a safe area, but not less than 200 metres feet from the incident scene.
10. The HAZMAT team will act as a technical resource for the bomb unit. This may involve the loaning of chemical protective clothing to bomb unit personnel, assistance in dressing, researching chemical data, etc.

Emergency Response Procedures-Fire

1. Do not fight fire in cargo or storage area containing explosives. Withdraw from the area and let the fire burn.

2. If a fire is near explosives, efforts should be taken to prevent the fire from reaching the explosives. For fires involving the motor, cab, or tires of vehicles transporting explosives, flood the area with water.

3. The application of water to burning Class A or B explosives may cause an explosion.

4. Evacuate the area:
   - Class A Explosives – 800 m in all directions.
   - Class B Explosives – 800 m in all directions.
   - Class C Explosives – 450 m in all directions.
   - Blasting Agents- 800 m in all directions.

5. Do not overhaul areas where explosives have burned or exploded.

6. Explosives that have been exposed to heat may be very shock sensitive. Keep all personnel away and do not move these containers.

7. When explosives are involved in fire or serious accidents on the roadways, Canutec (613) 996-6666 should be notified.

Class 2: Flammable Compressed Gases

Definition

A flammable material or mixture having a vapor pressure exceeding 40 psi absolute at 100° F.

General Emergency Response Procedures

1. Identify the material involved.
2. Keep non-essential people away (includes non-essential emergency service personnel.)
3. Establish control zones (isolate area and deny entry).
4. Stay upwind and keep out of low areas.
5. Ventilate confined areas before entering.
6. Wear positive pressure SCBA and full protective clothing. This is a minimum level of protective clothing and will not provide adequate protection for all incidents. In some cases, chemical protective clothing carried by the HAZMAT team will be required for the safe handling of the incident.
7. Avoid exposure to gas.
8. Since the application of water to pools of liquefied gas will increase the vaporization rate, this is not usually a recommended practice.
9. If a tank truck or tank car is involved in fire, isolate 800 m in all directions.
10. Determine and implement appropriate decontamination procedures for personnel and equipment.
11. Consult CANUTEC (1-613-996-6666) for product information and assistance.

Emergency Response Procedures-Fire

1. Do not extinguish the fire unless the flow of gas can be stopped. The recommended means of extinguishing is to stop the flow.
2. If a leaking tank is involved in fire, cooling the tank with water may reduce the internal pressure and the rate of leakage. If sufficient water is available, use water spray to cool the tanks and adjacent combustibles affected by the heat of the fire. For massive fires, use unmanned monitors. If this is not possible, withdraw from the area and let the fire burn.
3. Uninsulated pressure tanks may rupture violently if there is flame impingement on the vapor space at the top of the tank. If it can be done safely, remove all vehicles or containers not already burning.
4. Let tank, car, tank truck or storage tanks burn unless leak can be stopped.
5. Stay away from the ends of the tank exposed to heat or flame impingement.
6. Observe tanks for evidence of bulging or red hot spots in the metal, and listen for a rising sound from venting safety devices. These indicate that the tank may fail.

Emergency Response Procedures-Spill or Leak

1. Extinguish all sources of ignition in the vicinity (vehicles, traffic light control boxes, machinery, tar pots, etc.).
2. Flammable gases may be heavier or lighter than air. Determine the vapor density of the material from reference sources and use combustible gas detectors to determine the boundary of the gases. Survey the area where the gases are likely to accumulate. Common lighter-than-air flammable gases include:
    - Hydrogen
    - Acetylene
    - Hydrogen cyanide
    - Ammonia
    - Methane
    - Natural Gas
    - Carbon Monoxide
    - Ethylene (ethane)
    - Propane is heaver and will tend to migrate to low laying areas. (Density 1.5)
3. Flammable gases may ignite and flash back to the opening from which the gas originated.
4. Do not allow vehicles or other sources of ignition in the area as long as the combustible gas detector indicates the presence of flammable gases.
5. Do not enter the gas cloud. Be aware that the flammable gases extend beyond any visible cloud.
6. Water spray can be used to absorb water miscible gases, and water spray or explosion proof fans can be used to disperse gas clouds. Do not get water inside containers. Runoff must be contained for later analysis and possible disposal. Do not permit the runoff to enter storm, sewer, or water systems.
7. If it can be done safely, locate all leaks and close valves or otherwise reduce the amount of leakage.
8. If it can be done safely, move undamaged containers to a safe area, being careful to avoid sparks or friction.
9. Post guards and keep spectators at least 800 meters away from leaks from tank cars, tank trucks, or large storage tanks containing compressed gas, liquefied gas, and cryogenics.
10. Wrecking operations or transfer of product should not begin until all the gas is dispersed. Confirmation of gas dispersal should be done with a combustible gas detector.
11. To prevent the build up of static electricity, bond and ground the containers and equipment before product transfer.
12. Cutting torches or spark generating saws must not be used on the shell of empty or loaded cars or containers.
13. Empty tanks or tanks containing residue should be regarded as containing an ignitable gas-air mixture.

Class 3: Flammable Liquids

Definition

A liquid having a flash point below 140° F.

General Emergency Response Procedures

1. Identify the materials involved.
2. Keep non-essential people away (this includes non-essential emergency service personnel).
3. Establish control zones (isolate area and deny entry).
4. Stay upwind and keep out of low areas.
5. Eliminate ignition sources.
6. Ventilate confined areas before entering.
7. Wear positive pressure SCBA and full protective clothing. This is a minimum level of protective clothing and will not provide adequate protection for all flammable liquid incidents. In some cases, chemical protective clothing carried by the HAZMAT team will be required for the safe handling of the incident.
8. Avoid exposure to smoke, fumes, vapors, or direct contact.
9. If spilled material has entered storm, sewer, or water systems, notify the proper authority.
    - Maps should be used to determine the direction of flow and destination (outflow) of the system. Consideration should be given to diking the storm, sewer, or water system ahead of the flow.
    - It may be appropriate to apply foam not only at the spill site, but also into the storm, sewer, or water system.
    - To lessen the chances of ignition, it may be advisable to apply foam ahead of the flowing spill, either into storm drains or manholes down flow from the spill or down flow on the surface of an open storm, sewer, or water systems.

10. If a tank truck or tank car is involved in fire, isolate 800 m in all directions.
11. Most flammable liquids float on water. Therefore, the application of water to a spill area may enable the flammable liquid to spread beyond the boundaries of the original incident.
12. The vapors of all flammable liquids are heavier than air. Therefore, in addition to eliminating ignition sources in the immediate spill area, the downwind area and adjacent low areas should be checked for sources of ignition and accumulations of flammable vapors.
13. Consider the need for additional resources and equipment (diking material, absorbents, foam, over pack, containers, transfer equipment, private cleanup contractors, etc.).
14. Request sufficient foam supplies.
15. Determine and implement appropriate decontamination procedures for personnel and equipment.
16. Consult CANUTEC (1-613 996-6666) for product information and assistance.

Emergency Response Procedures-Fire

1. For small fires, use dry chemical, CO2, the appropriate foam or water spray.
2. For large fires use the appropriate foam or water spray. Water may be ineffective on low flash point flammable liquids.
3. If sufficient water is available, use water spray to cool tanks and adjacent combustibles affected by the heat of the fire. For massive fire, use unmanned monitors. If this is not possible, withdraw from the area and let the fire burn.
4. If it can be done safely, remove any vehicles or containers not already burning.
5. Dig trenches or build dikes in the path of the burning liquids to confine the fire and protect exposures.
6. If vapors are burning at the valves, do not extinguish the fire unless re-ignition can be prevented.
7. Observe tanks for evidence of bulging or red hot spots in the metal. Listen for pinging sounds or loud noises from the tank that increases in intensity. Withdraw immediately in case or rising sound from venting safety device or discoloration of tank. These indicate that the tank may fail.
8. Do not puncture or rupture the shell of a transport vehicle involved in a fire as this may liberate more flammable liquid and extend the fire.
9. If safety relief valves are obstructed, try to reposition the tank to allow the valves to function properly, but only if this can be done safely.

Emergency Response Procedures-Spill or Leak

1. Extinguish or eliminate all sources of ignition in the vicinity (traffic light control boxes, machinery, vehicles, tar pots, etc.). Use combustible gas detectors to determine the boundaries of the vapors.
2. Do not allow vehicles or other sources of ignition in the area as long as the combustible gas detector indicated the presence or flammable vapors.
3. Keep oxidizing materials away from spilled flammable liquids.
4. Post guards and keep spectators at least 800 m away for leaks from tank cars, tank trucks or large storage containers.
5. Dig trenches or build dikes ahead of the flow to confine the spill for later disposal or recovery.
6. Do not allow flammable liquids to enter storm, sewer, or water systems.
7. Cover flammable liquids with appropriate foam to blanket the surface and reduce the rate of evaporation. When ambient temperatures are less than 100° F, combustible liquids will usually not require blanketing to reduce vapors. Do not permit the runoff to enter storm, sewer, or water systems.
8. Water spray can be used to absorb water miscible vapors, and water spray or explosion-proof fans can be used to disperse vapors. Do not get water inside containers. Runoff must be contained for later analysis and possible disposal. Do not permit the runoff to enter storm, sewer, or water systems.
9. If it can be done safely, attempt to close valves or otherwise reduce the amount of leakage.
10. Since most flammable liquids float, for leaks near the bottom of the tank, water may be added to the tank to float the flammable liquid if the leak cannot be controlled or stopped. The water flow can be adjusted so that only water leaks out and the flammable liquid does not overflow the tank. This will provide time to offload the remaining flammable liquid.
11. Wrecking operations or transfer of product should not begin until the area is determined safe. A combustible gas detector should be used to check the area continually during the entire operation.
12. To prevent the buildup of static electricity, bond and ground containers and equipment before product transfer.
13. Empty tanks and tanks containing residue should be regarded as containing an ignitable vapor-air mixture.
14. Cutting torches or spark generating saws must not be used on the shell of empty or loaded cars or containers.
15. If it can be done safely, move undamaged containers to a safe area, being careful to avoid sparks or friction.
16. Do not separate tractor units from their trailer, as the support gear on the trailer may fail.

Class 4: Flammable Solids

Definition

Any solid material, other an explosive, which under conditions normally incident to transportation is likely to cause fires through friction or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently it creates a serious transportation hazard.

Included in this class are spontaneously combustible and water reactive materials. Two materials shipped in bulk that can cause major problems for responders are phosphorous and sodium.

General Emergency Response Procedures

1. Identify the materials involved.
2. Keep non-essential people away (this includes non-essential emergency service personnel).
3. Establish control zones (isolate area and deny entry).
4. Stay upwind and keep out of low areas.
5. Wear positive pressure SCBA and full protective clothing. This is a minimum level of protective clothing and will not provide adequate protection for all incidents. In some cases, chemical protective clothing carried by the HAZMAT team will be required for the safe handling of the incident.
6. Avoid exposure to smoke, fumes, vapors, or direct contact. Toxic products may be produced from contact with water, heat, and other substances.
7. Consider the need for additional resources and equipment (diking material, absorbents, foam, over pack containers, transfer equipment, private cleanup contractors, etc.).
8. If spilled material has entered storm or sewer systems, notify the proper authority.
9. Determine and implement appropriate decontamination procedures for personnel and equipment.
10. Consult CANUTEC (1-613 996-6666) for product information and assistance.

Emergency Response Procedures-Fire

1. Do not use water or foam on water-reactive materials.
2. If it can be done safely, remove containers from fire area.
3. Chemical reference sources will indicate appropriate extinguishing agents. Agents such as dry chemical, soda ash, lime, or sand may be appropriate for use on water-reactive materials, but they must be moisture-free.
4. Water may be used to cool containers exposed to fire, but if the water contacts water-reactive materials, the incident could escalate rapidly.

Emergency Response Procedures-Spill or Leak

1. Keep ignition sources away.
2. Extinguish all sources of ignition in the vicinity. Do not allow vehicles or other sources of ignition in the area.

3. If it can be done safely, attempt to close valves, plug, reposition containers, or otherwise reduce the amount of leakage.
4. Keep water-reactive materials dry and do not get water inside containers containing water-reactive materials.
5. Keep material out of storm, sewer, and water systems.
6. Dig trenches or build dikes around spills of water-reactive or environmentally damaging materials to prevent water from reaching them.
7. Powder spills can be covered with a plastic sheet or tarp to minimize spreading and prevent water/moisture contact.
   Warning: If the sun is shinning directly on the plastic sheeting, moisture may collect on the underside of the sheeting, producing a reaction with water reactive materials.

Class 5: Oxidizers and Organic Peroxides

Definition

An oxidizer is a substance that yields oxygen readily to stimulate the combustion of other material.

An organic peroxide is an organic derivative of the inorganic compound hydrogen peroxide where organic radicals have replaced one or more of the hydrogen atoms. Organic peroxides readily release oxygen to stimulate the combustion of other materials.

General Emergency Response Procedures

1. Identify the materials involved.
2. Keep non-essential people away (this includes non-essential emergency service personnel).
3. Establish control zones (isolate area and deny entry).
4. Stay upwind and keep out of low areas.
5. Wear positive pressure SCBA and full protective clothing. This is a minimum level of protective clothing and will not provide adequate protection for all incidents. In some cases, chemical protective clothing carried by the HAZMAT team will be required for the safe handling of the incident.
6. Ventilate confined areas before entering.
7. Avoid exposure to smoke, fumes, dust, vapors, or direct contact. Burning oxidizers frequently produces toxic products.
8. Caution should be exercised when water is used on oxidizers, as most oxidizers are water-soluble and will produce solutions that can impregnate wood and other organic combustibles. Upon drying, these materials can spontaneously ignite and burn vigorously.
9. In accidents involving chlorates and other oxidizing materials, care is necessary to prevent ignition by friction or contact with acids.
10. When chlorates are mixed with organic matter, or even dust, a flammable mixture is formed.

11. Chlorates mixed with finely divided combustible material may burn with explosive violence.
12. Leaking of nitric acid, perchloric acid, or hydrogen peroxide may cause fire. These materials are also corrosive.
13. Organic peroxides generally have the special property that if they are heated beyond their transportation temperatures; they are likely to detonate.
14. Consider the need for additional resources and equipment (diking materials, absorbents, foam, over pack containers, transfer equipment, private cleanup contractors, etc.)
15. If spilled material has entered storm or sewer systems, notify the proper authority.
16. Determine and implement appropriate decontamination procedures for personnel and equipment.
17. Consult CANUTEC (1-613-996-6666) for product information and assistance.

Emergency Response Procedures-Fire

1. If it can be done safely, remove any containers not already burning.
2. Cool affected containers with flooding quantities of water. For massive fires, use unmanned monitors. If this is not possible, withdraw and let the fire burn. Runoff water must be contained for later analysis and proper disposal.

Emergency Response Procedures-Spill or Leak

1. Keep flammables, combustibles and organic materials away from spilled material.
2. Avoid contact with spilled material.
3. Extinguish all sources of ignition in the vicinity. Do not allow vehicles or other sources of ignition in the area.
4. If it can be done safely, attempt to close valves, plug, or otherwise reduce the amount of leakage.
5. Water spray can be used to absorb water miscible vapors, and water spray or explosion-proof fans can be used to disperse vapors. Do not get water inside containers. Runoff must be contained for later analysis and possible disposal. Do not permit the runoff to enter storm, sewer, or water systems.
6. Keep material out of storm, sewer, and water systems.
7. Dig trenches or build dikes ahead of the flow to contain the spill for later disposal.
8. Powder spills can be covered with a plastic sheet or tarp to minimize spreading.

Class 6: Pesticides and Poisons

Definition

Pesticides are chemical agents used to destroy pests.
Poisons are substances that, through chemical action, usually kill, injure, or impair an organism.

General Emergency Response Procedures

1. Identify the materials involved.

2. Keep non-essential people away (this includes non-essential emergency personnel).
3. Establish control zones (isolate area and deny entry).
4. Wear positive pressure SCBA and full protective clothing. This is a minimum level of protective clothing and will not provide adequate protection for all incidents.
   - Due to the construction and materials used for firefighter turnout clothing, the clothing may actually absorb and hold the pesticide or poison if contact with the smoke, fumes, dust, vapors, or material occurs. The firefighter would be re-exposed each time the clothing were worn if proper decontamination operations were not performed.
   - In most incidents involving pesticides or poisons, the chemical protective clothing carried on the HAZMAT team will be required for safe handling of the incident.

5. Stay upwind and keep out of low area. If you can smell pesticide, you are too close and not sufficiently protected.
6. Avoid exposure to smoke, fumes, vapors, dust or direct contact.
7. Determine signs and symptoms of exposure and advise all personnel operating at the site. Some symptoms may not become present for up to 48 hours following exposure.
8. Ventilate confined areas before entering. It is not advisable for fire personnel to enter tanks or other confined spaces that contain or have contained pesticides and/or poisons.
9. If spilled material has entered storm, sewer, or water systems, notify the proper authority. Maps should be used to determine the direction of flow and destination (outflow) of the system. Consideration should be given to diking ahead of the flow.
10. Determine and implement appropriate decontamination procedures for personnel and equipment.
11. Flush any contacted material from skin or clothing immediately.
12. Remove and isolate any contaminated clothing at the site and avoid spreading contamination to non-contaminated areas.
13. Consult CANUTEC (1-416-996-6666) for product information and assistance.

Emergency Response Procedures-Fire

1. Consider protecting exposures and allow the fire to burn. This may create less of a hazard to people and the environment, especially if runoff cannot be confined.
2. For small fires, use dry chemical, CO2, water spray or the appropriate foam.
3. For large fires use the appropriate foam or water spray.
4. Do not extinguish fire unless the flow can be stopped.
5. If sufficient water is available, use water spray to cool containers exposed to the fire.
6. Dike fire control water for later analysis and/or disposal.

Emergency Response Procedures-Spill or Leak

1. For a liquid pesticide spill, extinguish or eliminate all sources of ignition in the vicinity as many pesticides have flammable liquids as the carrier of the poison. Use combustible gas detectors to determine the boundary of the vapors if the pesticide is a flammable.

2. Do not allow vehicles or other sources of ignition in the area as long as the combustible gas detector indicates the presence of flammable vapors.
3. If it can be done safely, attempt to close valves, plug, or otherwise reduce the amount of leakage.
4. Water spray can be used to absorb water miscible vapors, and water spray or explosion-proof fans can be used to disperse vapors. Do not get water inside containers. Runoff must be contained for later analysis and possible disposal. Do not permit the runoff to enter storm, sewer or water systems.
5. Keep material out of storm, sewer, and water systems.
6. Dig trenches or build dikes ahead of the flow to confine the spill for later disposal or recovery.
7. Powder spills can be covered with a plastic sheet or tarp to minimize spreading.

Class 6: Infectious Substances

Definition

Substances or materials hosting or contaminated by communicable pathogens. Examples include medical waste, laboratory samples, etc.

General Emergency Response Procedures

1. Identify the materials involved. Infectious substances include the red infectious waste bags and "sharps" containers from hospitals (sharps containers are used for the disposal of needles and other sharp instruments). Caution should be used if these containers are encountered.
2. Keep non-essential people away (this includes non-essential emergency service personnel).
3. Establish control zones (isolate area and deny entry).
4. Wear positive pressure SCBA and chemical protective clothing. Firefighter protective clothing will not provide adequate protection for all incidents involving infectious substances. The chemical protective clothing carried on the HAZMAT team may be required for safe handling of the incident.
5. Stay upwind and keep out of low areas.
6. Avoid exposure to smoke, fumes, vapors, or dust. Do not contact damaged containers or spilled material. Virus and disease-bearing substances are often present.
7. If leakage is discovered in transit, the vehicle must not be moved and the area must be isolated.
8. If spilled material has entered storm or sewer systems, notify the proper authority.
9. Implement appropriate decontamination procedures. A freshly mixed 10% or stronger bleach/water solution is an effective decontamination solution for most infectious substance exposures.

Emergency Response Procedures-Fire

1. If it can be done safely, remove containers from the fire area. Do not touch or move damaged containers.

2. Use dry chemical, soda ash, or lime for small fires.

Emergency Response Procedures-Spill or Leak

1. Cover damaged containers or spill area with dampened towel or rag, and keep wet with liquid bleach.
    - To decontaminate the area and equipment, a garden sprayer with a 10% bleach/water solution can used to spray exposed surfaces.
    - Recently mixed bleach/water solutions should be used, as premixed solutions lose their strength after a few days.

2. Dike spills for later disposal.
3. Keep material out of storm, sewer and water systems.

Class 7: Radioactive Materials

Definition

Radioactive materials contain charged particles (ions) and have a specific gravity greater than 0.002 microcuries per gram. These charged particles may cause damage to molecules, cells, or tissues. Atoms that emit ionizing radiation are said to be radioactive; radioactivity is the process whereby atomic changes, known as decay or disintegration, occur through the emission of ionizing radiation.

General Emergency Response Procedures

1. Identify the materials involved. Radioactive materials are often shipped in lead containers.
2. Keep people as far away as practical, at least 50 m upwind.
3. Establish control zones (isolate area and deny entry). Use radiation-monitoring devices to determine control zones and assess areas for contamination.
4. Wear positive pressure SCBA and full protective clothing. This is a minimum level of protective clothing and will not provide adequate protection for radioactive incidents.
5. Avoid exposure to smoke, fumes, vapors, dusts or direct contact.
6. All personnel should utilize dosimeters. Zero dosimeters prior to use.
7. Entry should not be made until appropriate radiological personnel are on scene and the degree of radiation is known.
8. Enter Exclusion Zone only to save a life, and limit entry into the Exclusion Zone to the shortest possible time.
9. If spilled material has entered storm, sewer, or water systems, notify the proper authority.
10. Implement appropriate decontamination procedures for personnel and equipment.
11. Delay clean up until arrival or instructions of qualified radiation personnel.
12. Equipment used in the Exclusion Zone shall not be removed until appropriate decontamination procedures have been performed and the equipment has been monitored and declared clean.
13. Contact a radiological team for assistance and equipment.
14. Consult CANUTEC (1-613-996-6666) for product information and assistance.

Emergency Response Procedures-Fire

1. Do not move damaged containers, but undamaged containers should be moved to a safe area if it can be done safely.
2. Assume the fire involves radioactive materials.
3. Avoid exposure to smoke, fumes, or dust. Airborne contamination is a great cause of concern for emergency responders. Stay upwind from the fire area.
4. Evacuate downwind area.
5. The fire should be extinguished as quickly as possible, with a minimum amount of water. Try not to disturb the radioactive containers.
6. Fight fire from a maximum distance. Do not allow personnel into the area after fire knockdown.
7. For massive fires, use unmanned monitors.
8. Dig trenches or build dikes ahead of the flow to contain the spill for later disposal.
9. The fire area should not be overhead.

Emergency Response Procedures-Spill or Leak

1. Do not touch damaged containers or contact the spilled material.
2. Prevent spread of spilled material and keep it out of water systems and sewers. Dike far ahead of large spills to confine the material for later disposal.

Class 8: Corrosives

Definition

Any liquid or solid, including powders, that can destroy tissue, or a liquid that has a severe corrosion rate on steel or aluminum.

General Emergency Response Procedures

1. Identify the materials involved.
2. Keep non-essential people away (this includes non-essential emergency service personnel).
3. Establish control zones (isolate area and deny entry).
4. Wear positive pressure SCBA and chemical protective clothing. This is a minimum level of protective clothing and will not provide adequate protection for corrosive incidents. The chemical protective clothing carried by the HAZMAT team may be required for the safe handling of most incidents involving corrosives.
5. Stay upwind and keep out of low areas.
6. Avoid exposure to smoke, fumes, vapors, dusts, or direct contact. Highly toxic fumes are often present.
7. Ventilate confined areas before entering.
8. Consider the need for additional resources and equipment (diking material, absorbents, over pack containers, transfer equipment, private cleanup contractors, etc.).
9. If spilled material has entered storm or sewer systems, notify the proper authority.
10. Determine and implement appropriate decontamination procedures for personnel and equipment.

11. Consult CANUTEC (1-613-996-6666) for product information and assistance.

Emergency Response Procedures-Fire

1. Many corrosive chemicals react violently with water, liberating heat and toxic gases.
2. If it can be done safely, remove undamaged containers from the fire area.
3. Do not get water inside the container.
4. Use water to cool containers that are exposed to flame until well after the fire is out. Do not allow water to get inside container.

Emergency Response Procedures-Spill or Leak

1. Avoid contact with spilled material.
2. Extinguish all sources of ignition in the vicinity. Do not allow vehicles or other sources of ignition into the area.
3. Do not apply water unless directed to do so. Contact with water may cause the generation of large quantities of vapors and heat.
4. Do not get water inside the container.
5. Water spray can be used to absorb water miscible vapors, and water spray or explosion-proof fans can be used to disperse vapors. Do not get water inside containers and do not put water on leak or spill area. Runoff must be contained for later analysis and possible disposal. Do not permit the runoff to enter storm, sewer, or water systems.
6. Keep combustibles (wood, paper, oil, etc.) away from spilled material.
7. If it can be done safely, attempt to close valves, plug, or otherwise reduce the amount of leakage.
8. Dig trenches or build dikes ahead of the flow to contain the spill for later disposal or recovery.
9. Powder spills can be covered with a plastic sheet or tarp to minimize spreading.
10. Keep material out of storm, sewer, or water systems.
11. Do not attempt neutralization. Neutralization may cause the production of vapors and heat, creating additional problems.
12. Do not attempt dilution. The quantity of water required to dilute one gallon of concentrated acid to a neutral pH of 7 is in the hundreds of thousands of gallons.

Subject: Specific Action Plan

LIME:

PROPERTIES:

- White powder to granular.
- Very alkaline; very corrosive to eye surfaces.
- Effects of acute exposure - corrosive.
- Effects of chronic exposure are burns, ulceration, and blindness.

ACTION STEPS:

- Report spill.
- Stop source if possible.
- Contain spill materials.
- Protect area.
- Remove material.
- Reclaim area.
- Complete spill report.

NOTIFICATION:

- Immediately notify the Area Supervisor.

INITIAL SPILL RESPONSE:

- Stop spill at source, if possible.
- Avoid dusting.
- Keep spilled lime dry.
- Prevent from entering watercourses.
- If mixed with water, dyke and contain the milk of lime.

HAZARDS and ENVIRONMENTAL THREATS:

- Heat generated when mixed with water.
- Strong alkaline - protect self from exposure, especially eyes.
- No environmental hazard.

ACTION FOR FIRE:

- Shovel and contain dry material in containers.

Dyke and contain milk of lime and pump into proper mill circuit.

DISPOSAL:

Dispose of recovered solids by recycling material through the crushing circuit to the mill process.

MOUNT POLLEY MINING CORP.
STANDARD PROCEDURE
Subject: Specific Action Plan

TAILINGS OR CONCENTRATES OR SULPHUR SOIL OR RECYCLED SOIL

PROPERTIES:
- Maybe toxic when ingested and or the fumes, if any, are inhaled from residual milling components.

HAZARDS and ENVIRONMENTAL THREATS:
- Will cover and kill vegetation.
- May exhibit ARD properties overtime.

ACTION STEPS:
- Report spill.
- Stop source, if possible.
- Contain spill, if possible.
- Protect area.

NOTIFICATION:
- Immediately notify your Area Supervisor.

INITIAL SPILL RESPONSE:
- Stop the flow, if possible.
- Prevent spills from entering watercourses
- Contain spilled liquid using sand, straw, or commercial absorbents.
- If raining cover with tarps

ACTION FOR FIRE:
- Slightly flammable

RECOVERY:
- Pump or scoop up material.
- If necessary, contaminated soil should be excavated.

DISPOSAL:
- Recovered spilled materials and contaminated soils should be disposed of in the tailing storage facility. (ONLY AFTER CONSULTATION WITH THE MOE)

Appendix C

MOUNT POLLEY MINING CORP.
STANDARD PROCEDURE

Subject: Specific Action Plan

A) Protocol for Corporate Reporting of an Environmental Incident:

1) Corporate reporting of an "environmental incident" is required when:

(a) Any environmental event occurs that:

- Poses a serious or imminent threat to human health or to the environment.
- Precipitates an immediate, external reporting requirement to regulatory authorities.
- Requires a minimum expenditure of $Cdn25, 000 in materials and/or offsite technical or legal support.
- Is subject of an inquiry from the media?

(b) Any environmental event occurs when:

- An administrative or judicial enforcement action is taken
- A notice of a citizen suit or other significant complaint from the public is received
- A private lawsuit premised on personal injury or property damage is filed
- A civil or criminal action is taken against any Barrick employee, manager, officer or Director.

2) Protocol for Report

(a) The Environmental Superintendent will immediately notify the General Manager (or his designate).
(b) The general manager will notify the Company President.(CP)
(c) Consultation with the general manager will determine the extent of legal counsel involvement.
(d) The environmental manager will prepare a " Preliminary Draft Incident Report for the general manager to authorize and fax as soon as possible to the CP. The "Final Incident Report" will be submitted once the investigation of the incident is complete.

B) Protocol for Communicating Environmental Issue

1) Corporate communication of an "environmental issue" is required when:

(a) A situation arises or an event occurs that has, in the opinion of the Environmental Superintendent, the potential to become an Environmental Incident as defined above.

2) Protocol for Communicating and Environmental Issue.

(a) When an issue becomes apparent, the environmental superintendent will inform the general manager.
(b) Actions plans to mitigate a possible incident will be developed and approved by the General Manager.
(c) The general manager will keep the CP informed of any issues with the potential to become ." Incidents".

APPENDIX D
PRELIMINARY INCIDENT REPORT

DATE:

OPERATION/PROPERTY:

CONTACT:

QUESTION:

ANSWER:

What is the preliminary assessment of the risk/exposure (high/medium/low)?

Describe the incident?

When and where did the incident occur?

Is the incident situation stopped or is it ongoing?

If the incident situation involves an accidental release:

- How much has been / continues to be released?
- Do you know if the substance may or is likely to cause an adverse effect?

Are containment/remedial measures being developed, being implemented, or completed? If yes, what is completed/planned? Timing?

Is a monitoring program intended, designed or implemented? If yes, what are the details?

At this stage, what, if any, external support is required?

Have the appropriate environmental regulators been notified? Who specifically was notified?

Are environmental regulators on site? If so, who? Are other Government agencies on site or intending responding?

Have others been notified (municipality, adjacent owners, Fisheries & Oceans Canada, other regulatory agencies)?

Currently, is there any media involvement? Who specifically?

Suggest that responsibility for management of the incident and dealing with Government regulators / the media be assigned to one person.

Obtain names of witnesses and individuals involved.

Obtain names, phone numbers and extensions of persons to be contacted if further information is required.

APPENDIX E

Reportable Levels for Certain Substances

	Column 1 Substance spilled	Column 2 Specified amount
Ammonium Nitrate 1	Explosives of Class 1 as defined in section 3.9 of the Federal Regulations	any
Propane 2 NaHS	Flammable gases, other than natural gas, of Division 1 of Class 2 as defined in section 3.11 (a) of the Federal Regulations	10 kg, if the spill results from equipment failure, error or deliberate action or inaction
3	Non-flammable gases of Division 2 of Class 2 as defined in section 3.11 (d) of the Federal Regulations	10 kg, where spill results from equipment failure, error or deliberate action or inaction
4	Poisonous gases of Division 3 of Class 2 as defined in section 3.11 (b) of the Federal Regulations	5 kg, where spill results from equipment failure, error or deliberate action or inaction
5	Corrosive gases of Division 4 of Class 2 as defined in section 3.11 (c) of the Federal Regulations	5 kg, where spill results from equipment failure, error or deliberate action or inaction
Diesel fuel, MIBC 6	Flammable liquids of Class 3 as defined in section 3.12 of the Federal Regulations	100 L
Pax 7	Flammable solids of Class 4 as defined in section 3.15 of the Federal Regulations	25 kg
8	Products or substances that are oxidizing substances of Division 1 of Class 5 as defined in section 3.17 (a) and 3.18 (a) of the Federal Regulations	50 kg
9	Products or substances that are organic compounds that contain the bivalent "-0-0-" structure of Division 2 of Class 5 as defined in sections 3.17 (b) and 3.18 (b) of the Federal Regulations	1 kg
10	Products or substances that are poisons of Division 1 of Class 6 as defined in section 3.19 (a) to (e) and 3.20 (a) of the Federal Regulations	5 kg

	11	Organisms that are infectious or that are reasonably believed to be infectious and the toxins of these organisms as defined in sections 3.19 (f) and 3.20 (b) of the Federal Regulations	any
	12	Radioactive materials of Class 7 as defined by section 3.24 of the Federal Regulations	All discharges or a radiation level exceeding 10 mSv/h at the package surface and 200 μSv/h at 1 m from the package surface
NaHS	13	Products or substances of Class 8 as defined by section 3.25 of the Federal Regulations	5 kg
	14	Miscellaneous products or substances of Division 1 of Class 9 as defined by section 3.27 (1) and (2) (a) of the Federal Regulations	50 kg
	15	Miscellaneous products or substances of Division 2 of Class 9 as defined in section 3.27 (1) and (2) (b) of the Federal Regulations	1 kg
	16	Miscellaneous products or substances of Division 3 of Class 9 as defined in section 3.27 (1) and (2) (c) of the Federal Regulations	5 kg
	17	Waste asbestos as defined in section 1 of the Special Waste Regulation	50 kg
	18	Waste oil as defined in section 1 of the Special Waste Regulation	100 L
	19	Waste containing a pest control product as defined in section 1 of the Special Waste Regulation	5 kg
Tailings, Concentrate, Contaminated soil and Sulphur	20	A substance not covered by items 1 to 19 that can cause pollution	200 kg
	21	Natural gas	10 kg, if there is a breakage in a pipeline or fitting operated above 100 psi that results in a sudden and uncontrolled release of natural gas

APPENDIX F

EQUIPMENT LISTING

Equip No:	Location	Description	Make	Model	Year	Serial Number
6306	Mine Operations	Front End Loader	Caterpillar	966		
6307	Mill Operations	Scooptram	Jarvis Clark	JS220		
6308		Skid Steer	New Holland			
6309	Mine Operations	Front End Loader	Caterpillar	992C	1980	42X588
6310		Skid Steer	Bobcat			
6311		Excavator	Hitachi	400		164-3954
Rental	Mine Operations	Front End Loader	Caterpillar	950		
6312	Mine Operations	Front End Loader	Letourneau	L1100		1049
6381	Mine Operations	Grader	Caterpillar	14G		096U04997
6382	Mine Operations	Grader	Caterpillar	16G		093UO1899
6403		Crane	American	125 Ton		G515916
6404		Crane	Drott			6223905
6405		Crane	B&E	50 Ton		127865C
6406		Crane	Grove	27 Ton		51420
6452		Forklift	Toyota		1981	403FGC15-10332
6453		Forklift	Blue Chip		1978	3058
6456	Warehouse	Forklift	Caterpillar	GP40	1996	AF2800041
6501	Mine Operations	Haul Truck	Caterpillar	777B	1989	4YC00833
6502	Mine Operations	Haul Truck	Caterpillar	777B	1989	4YC00850
6503	Mine (Rental)	Haul Truck	Caterpillar	777B		4YC00853
6504	Mine (Rental)	Haul Truck	Caterpillar	777B		
6505	Mine (Rental)	Haul Truck	Caterpillar	777B		
6506	Mine Operations	Haul Truck	Caterpillar	777B		4YC00677
6507	Mine (Rental)	Haul Truck	Caterpillar	777B		
6508	Mine (Rental)	Haul Truck	Caterpillar	777B		
6509	Mine (Rental)	Haul Truck	Caterpillar	777B		
6510	Mine (Rental)	Haul Truck	Caterpillar	777B		
6511	Mine Operations	Haul Truck	Caterpillar	785C		01HW00098
6512	Mine Operations	Haul Truck	Caterpillar	785C		01HW00099
6514	Mine Operations	Haul Truck	Caterpillar	785C		01HW00100
6515	Mine Operations	Haul Truck	Caterpillar	785C		
6516	Mine Operations	Haul Truck	Caterpillar	785C		
6517	Mine Operations	Haul Truck	Caterpillar	785C		
6518	Mine Operations	Haul Truck	Caterpillar	785C		
6519	Mine Operations	Haul Truck	Caterpillar	785C		
6520	Mine Operations	Haul Truck	Caterpillar	785C		
6521	Mine Operations	Haul Truck	Caterpillar	785C		
6522	Mine Operations	Haul Truck	Caterpillar	785C		

Equip No:	*Location*	*Description*	*Make*	*Model*	*Serial Number*
6602	Mine Operations	Shovel	P&H	2100 BL	E48335
6603	Mine Operations	Shovel	P&H	2100 BL	E42850
6604	Mine Operations	Shovel	P&H	2100 BL	E42855
6701	Mine Operations	Track Dozer	Caterpillar	D7G	092V01779
6702	Mine Operations	Track Dozer	Caterpillar	D10N	02YD00823
6705	Mine Operations	Rubber Tire Dozer	Caterpillar	824	036H00506
6706	Mine Operations	Track Dozer	Caterpillar	D10N	03SK00681
6707	Mine Operations	Track Dozer	Caterpillar	D10N	03SK01008
6708	Mine Operations	Track Dozer	Caterpillar	D10N	03SK01066
6802	Mine Operations	Port Compressor	Gardner Denver		W19990
6803	Mine Operations	Port Compressor			ARP681696
6850	Surface General	Diesel Water Pump	Caterpillar		67U12929
6871	Surface General	Diesel Generator	Detroit Diesel		L0443-005
6872	Surface General	Diesel Generator	Detroit Diesel		547
6873	Mine Operations	Port Light Plant	Kubota		CO14108/08
6874	Mine Operations	Port Light Plant			12VA072077
6875	Mine Operations	Port Light Plant			12VA0720696
6876	Mine Operations	Port Light Plant			
6883	Maintenance	Welder	Lincoln	DC400	
6884	Maintenance	Welder	Lincoln	DC400	
6885	Maintenance	Welder	Lincoln	DC400	
6886	Maintenance	Welder (Diesel)	Miller 600	600D	KF900675
6887	Maintenance	Welder (Diesel)	Miller 400	4612571	KG132516
6888	Maintenance	Welder (Diesel)		8215243	K04156038R
6889	Maintenance	Welder (Diesel)		ACK400	KC235856
6890	Maintenance	Welder (Diesel)	Lincoln	SAM650	U1981008538
6891	Maintenance	Welder (Diesel)	Lincoln	K1308-17	C1980900056
6892	Crushing Plant	Welder (Electric)	Lincoln	300/300	106684
6893	Crushing Plant	Welder (Electric)	Miller	SRH-555	CC5569
6894	Mill	Welder (Electric)	Acklands	4510-753	JC533683
6895	Mill	Welder	Lincoln		148111

		(Electric)			
6896	Mill	Welder (Electric)	Lincoln		104011
6897	Mill	Welder (Electric)	Hobart		82W505614
6898	Mill	Welder (Electric)	Lincoln	K1308-17	C1980900058
6899	Mill	Welder (Electric)	Lincoln	K1308-17	C1980900060
6901	Mine Operations	Primary Drill	B&E	45R	140346
6902	Mine Operations	Primary Drill	B&E	45R	139517
6903	Mine Operations	Primary Drill	B&E	45R	132182
6910	Mine Operations	Primary Drill	Drill Tech	C40K3H	731521
Equip No:	***Location***	***Description***	***Make***	***Model***	***Serial Number***
6602	Mine Operations	Shovel	P&H	2100 BL	E48335
6603	Mine Operations	Shovel	P&H	2100 BL	E42850
6604	Mine Operations	Shovel	P&H	2100 BL	E42855
Equip No:	***Location***	***Description***	***Make***	***Model***	***Serial Number***
6602	Mine Operations	Shovel	P&H	2100 BL	E48335
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6705	Mine Operations	Rubber Tire Dozer	Caterpillar	824	036H00506
6706	Mine Operations	Track Dozer	Caterpillar	D10N	03SK00681
6707	Mine Operations	Track Dozer	Caterpillar	D10N	03SK01008
6708	Mine Operations	Track Dozer	Caterpillar	D10N	03SK01066
6802	Mine Operations	Port Compressor	Gardner Denver		W19990
6803	Mine Operations	Port Compressor			ARP681696
6850	Surface General	Diesel Water Pump	Caterpillar		67U12929
6871	Surface General	Diesel Generator	Detroit Diesel		L0443-005
6872	Surface General	Diesel Generator	Detroit Diesel		547
6873	Mine Operations	Port Light Plant	Kubota		CO14108/08
6874	Mine Operations	Port Light Plant			12VA072077
6875	Mine Operations	Port Light Plant			12VA0720696
6876	Mine Operations	Port Light Plant			

6883	Maintenance	Welder	Lincoln	DC400	
6884	Maintenance	Welder	Lincoln	DC400	
6885	Maintenance	Welder	Lincoln	DC400	
6886	Maintenance	Welder (Diesel)	Miller 600	600D	KF900675
6887	Maintenance	Welder (Diesel)	Miller 400	4612571	KG132516
6888	Maintenance	Welder (Diesel)		8215243	K04156038R
6889	Maintenance	Welder (Diesel)		ACK400	KC235856
6890	Maintenance	Welder (Diesel)	Lincoln	SAM650	U1981008538
6891	Maintenance	Welder (Diesel)	Lincoln	K1308-17	C1980900056
6892	Crushing Plant	Welder (Electric)	Lincoln	300/300	106684
6893	Crushing Plant	Welder (Electric)	Miller	SRH-555	CC5569
6894	Mill	Welder (Electric)	Acklands	4510-753	JC533683
6895	Mill	Welder (Electric)	Lincoln		148111
6896	Mill	Welder (Electric)	Lincoln		104011
6897	Mill	Welder (Electric)	Hobart		82W505614
6898	Mill	Welder (Electric)	Lincoln	K1308-17	C1980900058
6899	Mill	Welder (Electric)	Lincoln	K1308-17	C1980900060
6901	Mine Operations	Primary Drill	B&E	45R	140346
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6910	Mine Operations	Primary Drill	Drill Tech	C40K3H	731521
Equip No:	***Location***	***Description***	***Make***	***Model***	***Serial Number***
6602	Mine Operations	Shovel	P&H	2100 BL	E48335
6603	Mine Operations	Shovel	P&H	2100 BL	E42850

Arrow Transportation Systems Inc.

Mount Polley Mining Corporation

GVRD

Highland Valley Copper

Spill Contingency Plan

SPILL CONTINGENCY PLAN

INTRODUCTION

Preparedness is the key to efficient remedial action where an accident is threatening some aspect of the receiving environment. Arrow Transportation Systems Inc. recognizes its responsibility with respect to safeguarding, protecting and minimizing the risk to the environment, harm or degradation and therefore is striving to gain the necessary preparation.

It should be realized that the complete understanding of ones allocated responsibility is necessary in order to prevent an accident from happening, and to be able to react quickly in the case of an unforeseen occurrence. This understanding must be complemented by common sense and a sincere desire to uphold the company principles to respect the Environment.

This contingency plan outlines the allotment of responsibility at a personal level with respect to environmentally threatening accidents and serves as a reference document for those who must understand the steps to be taken in the case of an accident.

A primary focus of the plan is to minimize impact of local water courses. Substances covered by this plan are required for the general operation of the company, the mine and concentrator complex.

ORGANIZATION AND RESPONSIBILITIES

Where a spill occurs, **the person** who immediately before the spill had possession, charge or control of the spilled substance shall take all reasonable and practical action, having due regard for the safety of the public and of himself or herself, to stop, contain, and minimize the effects of the spill. **(Further action, Section 3, SPILL REPORTING REGULATION, BC Reg 263/90, under the Waste Management Act.)**

It is the responsibility of the **ARROW TRANSPORTATION SYSTEMS INC.** and our employees to ensure that proper execution of the emergency is of utmost importance, and that any threats to the local environment, employees of Arrow or GVRD or local residents are thoroughly evaluated. However, this entire process depends on you to report any potential mishaps.

The person who is immediately on the scene will have the prime responsibility of coordinating and directing control efforts at the scene of a spill incident. The duties of this individual will be to immediately assess the situation, if fuel is flowing stop it, as well as any environmental threat situation, when the spill is contained and not in danger of damaging the environment to the best of your ability you must contact your supervisor, and the local RCMP. Arrow Transportation Systems Inc. personnel assume full responsibility for any and all recovery of their equipment and product being hauled at the time of the incident on the scene; therefore your supervisor has instructions to contact all relevant and key personnel unto the scene in order to gain control of and the ability to reclaim the area.

The Supervisor or his/her designate will:

1) Notify PEP and the Ministry of the Environment, Lands and Parks.
2) Assess the impact of the spill on the environment and direct the actions needed to reduce further impact.
3) Determine appropriate disposal techniques and restoration measure in cooperation with Government representatives.

The Safety Officer will ensure that personnel involved with spill containment and clean up are outfitting and properly trained with proper safety equipment. In addition, clean up personnel will be advised of the possible hazards and proper clean up procedures for the spill.

Action Steps

Report Spill, stop source if possible
Contain spill material
Protect area
Remove material
Reclaim area
Spill report
Arrow Transportation Incident Report

SPILL RESPONSE

Upon discovery of the spill we must:

- Assess the hazards to health and safety
- If danger exists, warn others of what the perceived danger is
- Immediately stop flow of spilling material if possible

SUPERVISOR

Upon notification of the spill the Supervisor will

- get the name of the person involved
- time of spill
- location of spill
- type of substance spilled
- quantity of substance spilled
- cause of the spill
- weather conditions
- perceived potential for hazard to personnel and the environment
- actions already taken
- persons already notified & further notify as required

THE PERSON IN CONTROL OF THE SCENE MUST REMAIN ON THE SCENE UNTIL THEY ARE RELIEVED BY THEIR SUPERVISOR OR AN AUTHORITY WITH ABILITY OR DESIGNATION TO TAKE OVER THE SCENE.

GASOLINE AND DIESEL FUEL

- Stop the flow - shut off valves and plug holes
- Eliminate fire danger - stop smoking, extinguish flames and shut off sources of ignition.
- Get help - contact supervisor who will ensure that again key personnel are contacted and are made aware of concerns or potential dangers to environment. Contact the Ministry of Environment, Lands and Parks and **PEP** (Provincial Emergency Program) **1-800-663-345624 hours per day, 7 days a week.**
- Contain spill by surrounding product with earth dykes or absorbent socks and pump product back into barrels, if possible, or absorb with floor dry and shovel into safe containers, **NOT INTO WATERCOURSES OR DRAINAGE AREAS.**

EMERGENCY TELEPHONE NUMBERS

Government Agencies

P.E.P.	(Provincial Emergency Program)	1-800-663-3456
M.E.LP.	(Ministry of the Environment)	1-250-398-4533
Poison Control Centre		1-800-567-8911
Crime Stoppers		1-250-374-8477
Forest Fire Reports ONLY		Zenith 5555
B.C. Provincial Ambulance Services		1-250-392-5402

R.C.M.P.	Ashcroft	1-250-453-2216
	Bumaby	1-604-294-7922
	Chilliwack	1-604-792-4611
	Delta	1-604-946-4411
	Hope	1-604-869-2432
	North Vancouver	1-604-985-1311
	Richmond	1-604-278-1212
	Surrey	1-604-599-0502
	Williams Lake	1-250-392-6211
	100 Mile House	1-250-395-2456

Personnel Arrow Transportation Systems Inc.

Rob Davies	Operations Manager	Office:	250-453-9411
		Residence:	s.22
		Cellular:	
Tim Bell	General Manager BC Operations	Direct:	250-571-7764
		Office:	250-374-3831
		Cellular	s.22
		Other Contact:	
Rick Viventi	Director of Safety	Direct:	250-571-7763
		Office:	250-374-3831
		Cellular:	s.22
		Residence	
Clive Gilray	Director of Maintenance	Office:	250-323-7410
		Residence:	s.22
		Cellular:	
Roy Taki	Vice President Trucking Operations	Direct:	250-571-7765
		Office:	250-374-3831
		Cellular:	s.22
		Residence	

EMERGENCY TELEPHONE NUMBERS cont'd

Arrow Personnel continued...

Nadine Illingworth	Administration/Ashcroft	Office:	250-453-2399
		Office:	s.22
		Residence	
Mitchell Zulinick	Vice President	Direct:	250-571-7760
		Office:	250-374-3831

Personnel-Greater Vancouver Regional District

Ken Lee	Senior Project Engineer	Office:	604-432-6452
		Cellular:	
		Cellular:	s.22

Personnel-Highland Valley Copper

Bruce Mulleny	Transportation Coordinator	Office:	604-688-0387
		Cellular:	s.22
		Residence	
Bob Hamaguchi	Senior Environmental Engineer	Office:	250-523-3237
		Cellular:	s.22
		Residence	
Mark Freberg	Superintendent of Environmental Services	Office:	250-523-3200
		Residence	s.22
Highland Valley Copper .Security	Security	Office:	250-523-3307
Mill Shift Foreman	Foreman	Office:	250-523-3322

For Specific Emergencies at the plants:

Annacis Main Switchboard Hour Line:		Operations Center 24	604-525-5681
Annacis Control Room (also monitor Lulu from here)		Hotline:	604-526-5948
Lulu switchboard (7 a.m. to 3:30 p.m. only)after 3:30 p.m. call 604-526-5948 (monitored by Annacis control room)		Office:	604-274-4511
Lions Gate	Vince Chiu	Office:	604-904-8315
		Cellular:	s.22
	Iain Sellars	Office:	604-985-8302
		Cellular:	s.22

CONTRACTORS

Argo Road Maintenance - Kamloops, B.C.	Tom Bone	24 Hour	
Line:	800-661-2025		
		Office:	250-374
Sambo Services - Vacuum Truck Services	Eric or Violet MacKenzie	24 Hour	
Line:	250-374-3600		
		Cellular:	s.22
Don' Towing - Kamloops, B.C.		24 Hour	
Line:	250-374-6281		
Advanced Hydro-Tech - Vacuum Truck Services	Bert	Office:	250-374
		Cellular:	s.22
		Or:	250-376
Cariboo Road Services (All services)		24 Hour	
Line:	250-392-6673		
		Office:	250-392
Triple P Sanitation of Wildwood	vacuum truck/water truck	24 Hour Line:	
	250-989-5533		
Peterson Contracting of Williams Lake	excavator, water trucks	24 Hour Line:	250-329
153 Mile Contracting	storage pit	Office:	250-296
		Autotel:	250-398
L.A. Fencing - Williams Lake	Wendel McKnight - Fencing	Office:	250-398
Ministry of Highways - Williams Lake	Nic Antisaoff	Office:	250-398
Capilano Highway Services	Steve Drummond - all equipment available	24 Hour	
Line:	800-665-3135		
		24 Hour	
Comm:	604-983-2551		
Payless Auto Towing - North Vancouver		24 Hour	
Line:	604-988-4176		
Main Road Contracting	Bob Neilson - all equipment available	24 Hour	
Line:	604-271-0337		
McRae Vacuum Service - Aldergrove	Dan - special waste facility available too	24 Hour	
Line:	604-856-8344		
		Or	888-894

Paul's Towing and Tractor Service - Richmond		24 Hour	
Line:	604-273-1232		
Clover Towing & Tractor Service - Surrey		24 Hour	
Line:	604-513-1900		
Emil Anderson Maintenance- Abbotsford to JackAss			
Roy Allan - all services available		24 Hour	
Line:		604-869-	
7171			
Coquihalla to Portia and Hwy 3 Manning Park		Residence:	s.22
		Weekends:	604-456
H.M.C. Maintenance - Merritt	Doug Scott	24 Hour	
Line:	800-665-7959		
		Office:	250-378
Tom's Towing - Merritt	2 large tandems & access to special serv.	24 Hour	
Line:	250-378-500		

THE SCENE OF THE CRIME

A Preliminary Analysis and History of the Mount Polley Mine Tailings Storage Facility

By Will Koop
December 1, 2014
BC Tap Water Alliance
(www.bctwa.org)

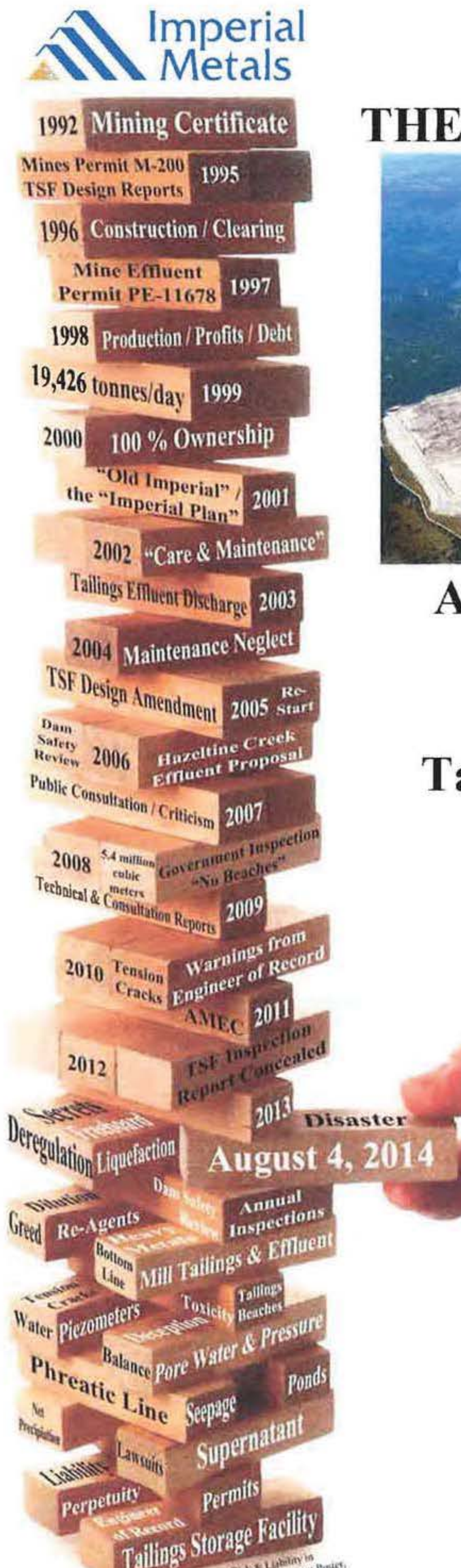
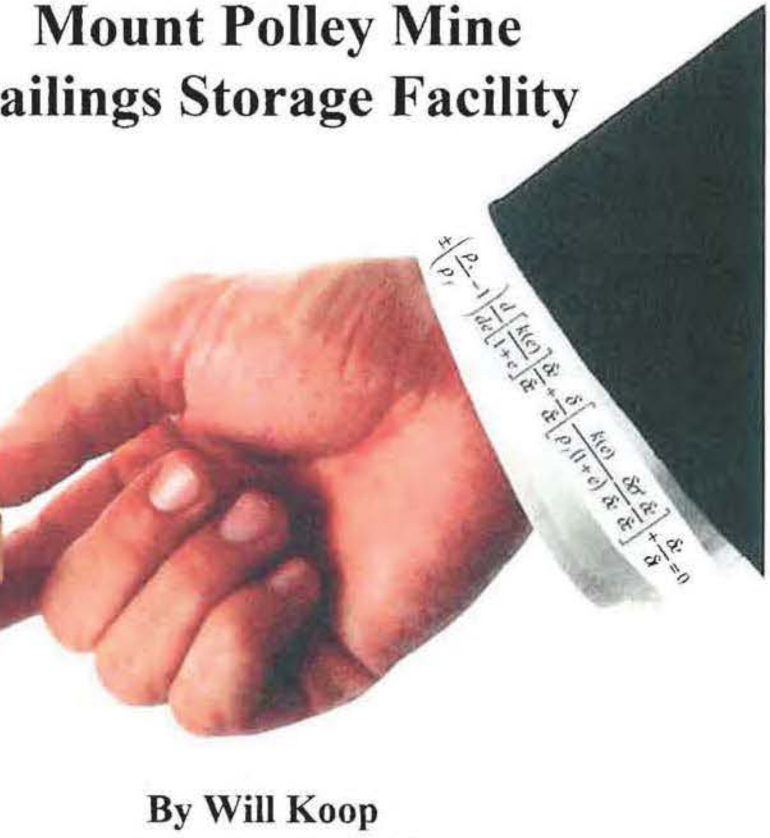


Image Source: Risk & Liability in Geotechnical Engineering Symposium Poster, May 30, 2008, Vancouver.



8. Those Piezometers: The Instrumentation Saga

One of the limitations of the present report is the restricted unavailability of published reports and relevant documents held by the provincial government. This is a main disadvantage for the topic of installed monitoring instrumentation at Mount Polley's Tailings Storage Facility (TSF). I.e.:

- the four types of piezometers used to monitor 'pore pressures' in the TSF's tailings mass, embankment fill materials and drains, and within the foundation materials;
- and inclinometers that detect physical movement or shift in the TSF's three slope structures.

As one of the physical engineered "components" of the TSF, these instruments monitor the critical internal workings of an artificial structure that professional engineers say is supposed to be designed and last for an eternity.

The documents that were retrieved only cover accounts for three annual TSF inspection reporting years, 2008, 2009 and 2010, with only summary comments found in annual reports for years 2011, 2012, and 2013. Despite the missing descriptive records before 2008 and those after 2010, the information contained in the three annual reporting years relate an ominous and disturbing tale about neglect and mismanagement.

2008 TSF Report

Knight Piésold, Mount Polley Mining Corporation's (MPMC's) former geotechnical consultants (1989 - February 2011), gave a short and a simple overview of the TSF instrumentation in the Executive Summary of its *TSF Report on 2008 Annual Inspection.*

> *The TSF instrumentation currently consists of four slope inclinometers installed at the Main Embankment and 68* [58] *operating vibrating wire piezometers installed in the Main, Perimeter and South Embankments. The piezometers monitor the pore pressures in the foundation materials, embankment fill materials, the tailings mass, and the embankment drains. There have been no significant deviations in the inclinometers and no unexpected or anomalous pore pressures reading in the vibrating wire piezometers.*

The next sentence in the same paragraph issued an "however" warning:

> *However, inclinometer SI01-02 is showing slight deviations at an approximate depth of 10 m below ground in the lacustrine silts. The short term recommended action is to increase the monitoring frequency of the instrumentation to weekly, with weekly reporting to Knight Piésold, and increasing the buttress at the Main Embankment.*

If all that a member of the public chose to read of the 97-page long, 2008 annual TSF inspection report was the *Executive Summary*, then one would walk away with an impression that all was rosy (a smiley face) on the Mount Polley TSF front. However, the Executive Summary's editor(s) wasn't forthcoming on very serious problems found in two pages of the main report.

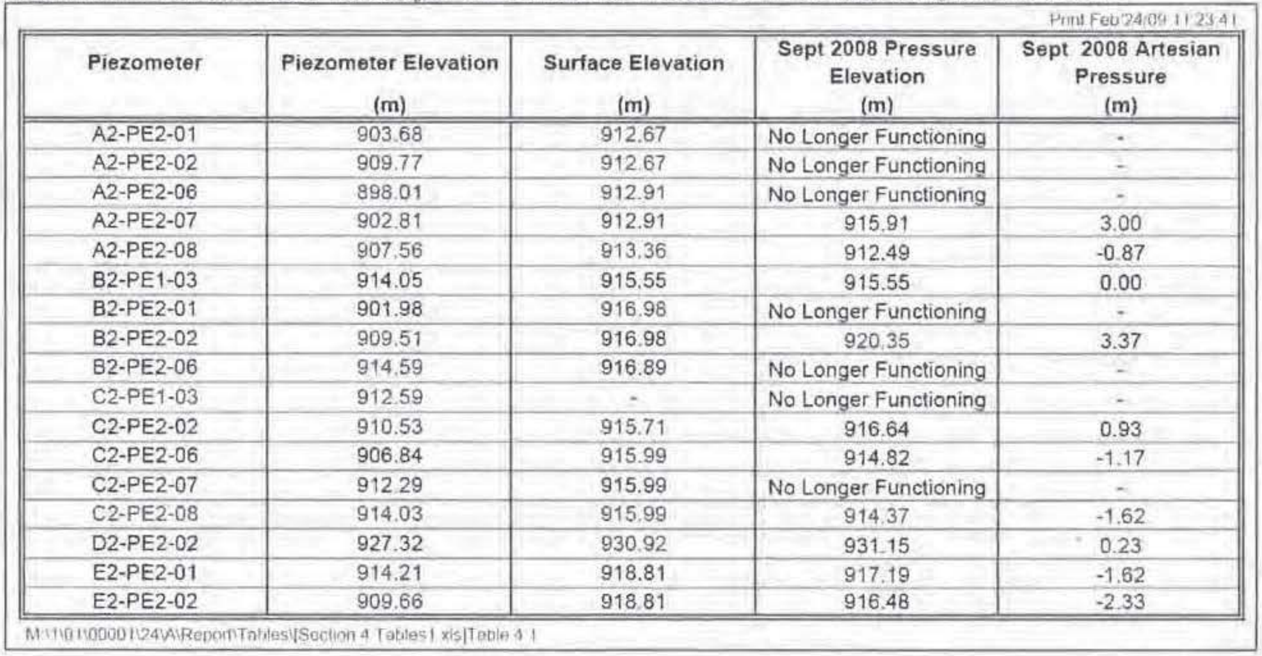
---

[58] The number given, 68, for operating piezometers, seems to be at odds with the numbers given in section 4.0 of the 2008 TSF report (see below), where only 60 are reported as operating, not 68.

Section 4.0 of the report concludes that 32 of the 92 piezometers installed throughout the TSF structure, or 35 percent, were no longer functioning, with a total of **65** located in the Main Embankment, **17** in the Perimeter Embankment, and **10** in the South Embankment. (See Appendix F for the list of the piezometers) It also states one of the five inclinometers was no longer functioning:

- only 11 out of 19 Tailings Piezometers installed throughout the "tailings mass" to measure pore pressure regimes are "in operation;"
- only 12 out of 21 Embankment Foundation Piezometers installed in the three embankment foundations "remain in operation;"
- only 22 out of 32 Embankment Fill Piezometers installed in the fill materials of the three embankments "remain in operation;"
- only 15 out of 20 Drain Piezometers installed in the drains of the three embankments "remain in operation."

Of the 32 non-functioning piezometers, only seven of them were specifically identified in Table 4.1, *Maximum Artesian Head Values for Embankment Foundation Piezometers*, shown below.



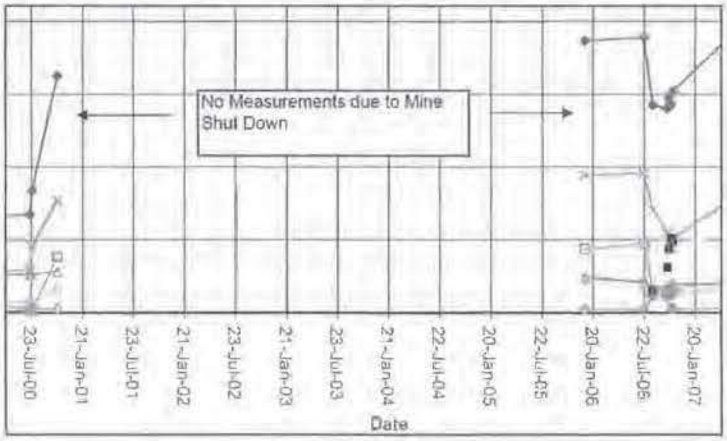
Print Feb/24/09 11:23:41

Piezometer	Piezometer Elevation (m)	Surface Elevation (m)	Sept 2008 Pressure Elevation (m)	Sept 2008 Artesian Pressure (m)
A2-PE2-01	903.68	912.67	No Longer Functioning	-
A2-PE2-02	909.77	912.67	No Longer Functioning	-
A2-PE2-06	898.01	912.91	No Longer Functioning	-
A2-PE2-07	902.81	912.91	915.91	3.00
A2-PE2-08	907.56	913.36	912.49	-0.87
B2-PE1-03	914.05	915.55	915.55	0.00
B2-PE2-01	901.98	916.98	No Longer Functioning	-
B2-PE2-02	909.51	916.98	920.35	3.37
B2-PE2-06	914.59	916.89	No Longer Functioning	-
C2-PE1-03	912.59	-	No Longer Functioning	-
C2-PE2-02	910.53	915.71	916.64	0.93
C2-PE2-06	906.84	915.99	914.82	-1.17
C2-PE2-07	912.29	915.99	No Longer Functioning	-
C2-PE2-08	914.03	915.99	914.37	-1.62
D2-PE2-02	927.32	930.92	931.15	0.23
E2-PE2-01	914.21	918.81	917.19	-1.62
E2-PE2-02	909.66	918.81	916.48	-2.33

M:\1\01\00001\24\A\Report\Tables\[Section 4 Tables1.xls]Table 4.1

The names and data for the remaining 25 non-functioning piezometers were not identified.

Another disturbing revelation contained in Figures 3.1 (*Foundation Drain Flows*) and 3.2 (*Upstream Toe Drain Flows*) was that for a period of 3 and a half years no measurements of piezometers installed to monitor the foundation drain flows and the upstream toe drain flows were taken from 2001 to 2005, "due to Mine Shut Down". The document fails to state why those measurements were not taken, or who was responsible for not doing so.



The 2008 TSF inspection report failed to properly contextualize or adequately describe in a devoted section of that report the instrumentation recording oversights and problems which had evidently been accumulating and occurring on Mount Polley's TSF from 2001 through to 2008, as they are only noted in isolated and disjointed sections of the annual report.

More of these accumulating problems were stated in Appendix C, Knight Piésold's *Overview of 2006 Dam Safety Review*, a formal dam review conducted by AMEC, the international professional engineering and design company:

> *A Dam Safety Review (DSR) for the Tailings Storage Facility at Mount Polley Mine was completed by AMEC in October 2006. The results of the DSR were issued in a report to Imperial Metals Corporation in December 2006.*
>
> *1. Operating criteria for pond and beach management are presently at odds with the optimal dam seepage performance and stated closure objectives, with the latter issue being of greatest concern.*
> *A beach width of at least 20 m is to be maintained along the abutments of the embankments (where the embankment contacts natural ground) and at least 10 m width elsewhere to keep the pond away from the embankments. Knight Piésold has recommended that MPMC develop a plan and schedule to enable the minimum target beach widths to be re-established within a 2 week period should they be infringed upon. MPMC shall increase the frequency of measurements to at least once per week for embankment instrumentation systems (piezometers and foundation drains - flow rate and turbidity) during any periods that ponded water encroaches within the minimum target beach widths.*
>
> *5. There were "about the right" number of piezometers installed in the embankment dams, however there is nothing in the way of much redundancy and any lost instrument locations need to be re-established with a new installation.*
> *A total of 57 vibrating wire piezometers have been installed at the TSF as of the end of the Stage 4 construction program. The piezometers are grouped into tailings, foundation, embankment fill and drain piezometers.* ***A total of 22 piezometers were accidentally destroyed*** *during the Stage 4 construction program, and* ***six additional piezometers have previously stopped functioning****. MPMC and Knight Piésold attempted to locate and splice the damaged piezometers and successfully repaired five of them.* ***The number of functioning piezometers at the end of the Stage 4 construction program was 34****. Additional piezometers will be installed in the tailings and embankment fill materials and tailings during the Stage 5 construction program, which is currently in progress.*
>
> ***Although a number of piezometers are no longer functioning at the TSF, replacing all of them is not practical nor considered necessary at this time*** *as there are functioning piezometers in the vicinity of most that were damaged. However,* ***five of the damaged piezometers were foundation piezometers at the Main Embankment, where there are slight artesian conditions (less than 3.0 m).*** *Additional piezometers will be installed in the Main Embankment foundation materials during Stage 6 to offset those that are no longer functioning. The foundation piezometers at the Main Embankment will have a trigger level of 15 m above ground, which corresponds to the elevated pore pressure that reduces the factor of safety to 1.1.* [Bold emphases]

> *installed in the embankment dams", but also noted that there was little redundancy with respect to the piezometers and lost instrument locations should be re-established with new installations. An instrumentation installation program has been proposed to MPMC to replace the lost instrumentation.* [61] *This program is expected to be carried out toward the end of 2010.*

The function and strategic placement of piezometers in a TSF play a critical role, as stated, for instance, in a 2002 paper by T.E. Martin:

> *Pressure piezometers, installed at various depths within the tailings deposit, are used to measure pore pressures and seepage gradients (horizontal and vertical components). These piezometers can also be used to assess the relative degrees of consolidation within the deposit profile, and to whether or not the deposit is responding in a drained or undrained manner to ongoing raising. This is a key consideration when considering ESA versus USA approaches to the stability analysis of the dam.* [62]

Knight Piésold reported that "there are currently 10 functioning tailings piezometers." In its 2008 report, the consultants stated that 11 out of 19 of these piezos were in operation, now one less in 2010.

> *The tailings piezometers are typically installed close to the embankments and the pore pressures are sensitive to the location of the tailings pond in relation to the embankments. The pore pressures observed in the tailings piezometers at the Main Embankment have shown slight fluctuations during the Stage 6b construction program in response to the development of the tailings beach and the subsequent re-location of the tailings pond away from the embankment.*

The "Stage 6b construction program," completed by August 2010, was the lifting of the TSF impoundment from elevation 954 meters to 958 meters. When the construction occurred, Knight Piésold also stated on page '8 of 16' that by June 2010, MPMC had somehow decreased the annual accumulation of supernatant water in the TSF - which had been constantly increasing by an average of 1.4 million cubic meters per year - down to a standing volume of 650,000 cubic meters.

Knight Piésold reported that there were four fewer Embankment Foundation piezometers in operation than there were in 2008. Now only 8 out of the 19 were functioning.

> *There are currently no functioning piezometers located in the Plane A foundation at the Main Embankment. Additional piezometers are planned for installation in this location in the upcoming piezometer installation program.*
>
> *It is recommended that no additional raises be completed on the TSF until the lost instrumentation has been established.*

---

[61] Knight Piésold Letter – Mount Polley Tailings Storage Facility – Instrumentation Repair, Productivity Upgrade and remote Monitoring Capacity, Ref VA10-01175. July 22, 2010.

[62] Page 10, *Characterization of pore pressure conditions in upstream tailings dams*, by T.E. Martin, February 2002.

Knight Piésold reported that there were now 23 out of 32 Embankment Fill Piezometers functioning. In 2008 there were 22 that were functioning.

> *Piezometer A2-PE2-03, located at the Main Embankment, showed a slight increase in pore pressures corresponding to fill placement during the Stage 6b construction program. This trend has been observed in the past with this piezometer and it is anticipated that the slightly elevated pore pressures will dissipate following the construction programs as they have previously.*

Knight Piésold reported that there were 15 out of 20 functioning Drain Piezometers, the same amount cited in its 2008 report.

Without having access to descriptive information found in Knight Piésold's initial two-volume, 1995 *Tailings Storage Facility Design Report*, and/or its updated revisionary March 2005 *Design of the Tailings Storage Facility to Ultimate Elevation*, [63] where criteria are no doubt provided on the limited physical design integrity of Mount Polley's TSF, the placement of 65 out of 92 piezometers in the Main Embankment denotes the importance and added emphasis that Knight Piésold had made on that section of the impoundment's structure. The engineers' attentive concern to the greatest number of piezometers on the Main Embankment was due to the Embankment's total construction height and base width, with the lowest elevation point of the Embankment at 913 meters. With Knight Piésold's design for a maximum TSF height at 965 meters, a final holding wall of the Main Embankment was to be **52 meters in total height**!

For most likely the same engineering design criteria, only 17 piezometers (74 percent fewer) were placed throughout three Planes within and alongside a much longer Perimeter Embankment. It's lowest construction base, where the August 4, 2014 breach occurred, began at elevation 931 meters with full build out to elevation 965 meters, a final holding wall of **34 meters in total height**.

The geotechnical engineers placed less piezometer attention and required less physical foundational strength (through the "modified centreline construction method") on the Perimeter Embankment section of the TSF because the engineers considered the Main Embankment as the most vulnerable over time due to its overall height. However, the engineers no doubt acutely understood the structural vulnerability of the Perimeter Embankment should the dam's crest rise beyond what they referred to as "the ultimate embankment crest elevation of 965 meters."

> *A preliminary design of the TSF, completed by Knight Piésold in 2005, considered an ultimate embankment crest elevation of 965 m and provided storage for approximately 85 Mt of tailings. The MPMC mine plan is evolving as new resources are discovered and it is possible that the ultimate mineable resource will exceed the ultimate storage capacity of the TSF as defined in the 2005 study.* ***It is recommended that the tailings storage requirements be re-evaluated to assess whether modifications are required to the TSF layout.*** [Bold emphasis] *Additionally, the closure and reclamation plan for the TSF should be updated to reflect the increased resource and tailings storage requirements. The TSF should be designed for closure and defining the ultimate storage requirements along with the closure and reclamation plan for the TSF are key considerations for future design phases.*

---

[63] See Appendix B.

Apparently, concerns about the Perimeter Embankment's structural integrity first became evident in 2010. When engineer Les Galbraith arrived for the annual TSF inspection on October 7, 2010, MPMC informed him of a "tension crack," which had initially been discovered by a grader operator two months previous. The tension crack was located on the crest of the eastern section of the Perimeter Embankment near corner "S6." When observed and reported by the grader operator to management in August 2010, management failed to report the disconcerting finding to its geotechnical engineers, and is therefore why Knight Piésold states in its report:

> *It should also be noted that the identification of a tension crack, or any other abnormal observation at the tailings dam,* ***should be reported to the design engineer immediately and prior to any remedial action being taken.*** [Bold emphasis]

✓ CWat
~~KJB~~;
JRK.

Knight Piésold
CONSULTING

RECORD OF TELEPHONE CONVERSATION

BETWEEN: JRK
AND: ERIC LENEVE
-MPMC

DATE: APRIL 19/01
TIME: 8:45a
FILE No.: 11162/14.01
RE: U/S SAND BERM.

- MPMC is building up u/s cycloned sand berm right now.
- Greg Smyth's updated water balance shows ~~a pond elevation of 942.~~ minimum crest requirement of 942.2 m by the end of July

Eric wants to ~~[illegible]~~ ① • Construct the berm to 942.25 right now instead of 942.5 m, based on supposition that a contractor will be working on the Perimeter Embankment in early - mid July.

② • Construct the narrowest crest width possible at 942.25 m at this time.

→ JRK to respond to ~~[illegible]~~ ② ASAP - email OK.

Note: fax 0/2205, sent Sept 22/00 recommends a 'minimum crest' width of 1.5 m when the cycloned sand berm is used as protection from wave run-up.

JRK

Signed: JRK.

Copy to:

FORM F - 09 Rev 0

KJB
[illegible]
JRK
FFK
HPO

Knight Piésold
CONSULTING

RECORD OF TELEPHONE CONVERSATION

BETWEEN: JRK

AND: Eric LeNeve, MPMC

DATE: **08-May-01**

TIME: **1:50 PM**

FILE No.: **11162/14.01**

RE: Tailings operations and closure

EL: MPMC has painted themselves into a corner with tailings deposition, due to:

- Filling up the NE corner at the dump valve
- Getting pipe fused late
- Operator problems

- Mine life scenario is looking grim at this point (possible closure in Fall 2001)
- Don Parsons wants to know if they can continue discharging from the NE corner and simply build up the Perimeter Embankment as needed. i.e. What are advantages to controlling the supernatant pond?
- Don wants Eric to put together a salvage closure plan - What are the minimum steps that they must take to control the supernatant pond.
- Plan may include not raising the Main Embankment.
- Eric also pointed out that they may have difficulty in raising the crest of the Perimeter Embankment at any rate, because they must discharge from the NE corner to do so.

JRK: Several advantages to maintaining a beach, particularly with an upstream toe drain.

- Also facilitates closure and reclamation.
- Floating spigots have been used on other projects and may provide temporary relief from the deposition problem during construction.

EL: This is all brainstorming at this point, but he would like KP to be aware of these potential developments. He will call to discuss further in the next couple of days.

Signed: JRK

Copy to:

FORM F - 09 Rev 0

11162/14.01
CWM ① CWM.
~~JRK ②~~
~~TEK ③~~
~~KJB ④~~

Knight Piésold Ltd.
CONSULTING ENGINEERS

Project: Mt. Polley
Calculations for: Phone Conversation with G. Smythe
Calculations by:
Checked by: Date:
Project No.: 11162/14.
Date: 30-Aug-01.
Sheet of

CWM told GS concerns that KP has over current form of OM&S Manual. KP feels that it is not necessary to update this manual at this time.

CWM suggested that KP write a fax with an outline for a OM&S Manual over the Care and Maintenance period. MPMC to write the manual - will save costs and sharpen focus.

GS agreeable to suggestion. GS to talk over with Don Parsons. D Parsons discussed current situation with George Headley. MPMC told Headley that MPMC plans to pump tailings water into pit in fall, will keep pumps at TSF operational through winter and pump fresh water into pit. Discussions with KP Re: spillway design for care and maintenance period are ongoing.

JRK ②
~~FRK~~ ~~③~~
~~KJB~~ 4

Knight Piésold
CONSULTING

Project/Assignment Name: Mt Polley
Area: Phone Call between E. LeNeve & Curtn.
Calculations for:
Calculations by: Reviewed by:
Input from: Date of review:

P/A No.: 1162/14
Task No.: ~~02~~00
Date: 1 Sept 5/01.
Calculation File No.:
Sheet: 1 of 1

- ELeneve to provide 3A quantities except PE.
- KP to produce 3B volumes and 3A from PE.
- KP to provide table of volumes between 942.5 and 945.
- KP to mention that as-builts to 942.5, but that design good to 945.
- MPMC to provide coords of MW's
- MPMC to install SM's at PE & SE, only one surveyor on site.
- OM&S Manual not acceptable to KP, but is acceptable to Ministry. E LeNeve not happy; Draft was good, just needed tweaking. MPMC promised OM&S to ministry, not done!!
- MPMC wants copy of OM&S As is. They will decide ~~o~~ to submit to ministry.
- MPMC wants to produce seperate ~~o~~ C&M manual. KP to provide Outline only, then review MPMC document.

Knight Piésold
CONSULTING

MEMORANDUM

To: Mr. Ron Martel
Copy To: Greg Johnston
From: Mark Smith
Re: Monitoring of Inclinometers

Date: April 23, 2010
File No.: VA101-1/29-A.01
Cont. No.: VA10-00687

This memorandum summarizes the most recent inclinometer information at the tailings storage facility. Inclinometer data is collected at four locations shown on Drawing 210R0 by Knight Piésold (KP) and Mount Polley Mining Corporation (MPMC). The recent inclinometer data survey was completed on April 14, 2010. Displacements have been observed in one of the inclinometers, SI01–02. Experience gained over the past three years has indicated that inclinometer SI01-02 displacements increase during construction. This is likely due to temporary reduction in strength due rapid loading of a low permeability soil. Inclinometer SI01-02 has been monitored weekly during the Stage 6b construction program (March 4 to April 14). The cumulative displacement since installation are shown on Figure 1. Figures 2 to 4 show the cumulative displacements for the remaining three inclinometers.

The largest displacement recorded is at inclinometer SI01-02. The displacement is isolated to a zone located 10m below original ground. The inclinometer survey on April 14 was completed while the haul road beside the survey site was in use. Haul road activity during the survey may have impacted the results. The inclinometer SI01-02 cumulative displacement at 10m depth is 2.8mm. Cumulative displacement has continuously increased since inclinometer installation. However, the five reading prior to the April 14 survey do not show movement. The inclinometer readings from April 14 should be revaluated when more data is available from the scheduled survey in the week of 19 April.

The data from the inclinometer survey shown on Figures 1 to 4 is generally consistent. Data from a survey conducted on January 11 has been removed from the data set. This January 11 survey data has been removed as it showed excessive displacements that are not seen in subsequent surveys.

The cumulative displacement for the zone of interest in inclinometer SI01-02 at 10m depth is shown on Figure 5. Figure 5 includes notes showing the time period of embankment construction and buttress construction. The available data indicate that embankment construction and increased displacement rates are correlated. The displacements are summarized as follows:

- The average displacement rate during the Stage 5 construction was 0.07mm/month.
- The average displacement rate between Stage 5 and Stage 6a was 0.01mm/month.
- The average displacement rate during Stage 6a construction was 0.2mm/month.
- The average displacement rate between Stage 6a and Stage 6b was 0.05mm/month.
- The average displacement rate during the Stage 6b construction is 0.01mm/mo (disregarding the April 14 survey).

The displacement rate is likely correlated to increased loading. This loading change may be rapid during embankment construction. Similarly the accreting tailings surface results in a slower increased loading condition. It is noted that the increases in displacement rate exhibited during the Stage 5 and Stage 6a construction have not been seen in Stage 6b. This is most likely due to the increased resistance provided by the buttress.

The one inclinometer SI01-02 indicates that embankment foundation deformation continues. The inclinometer survey to date show that the displacement rate is slowing. The expected increase in displacement rates during the Stage 6b construction program has not occurred. Knight Piésold recommends continued weekly surveys of the inclinometers during construction and biweekly surveys for the first month after construction. Monitoring frequency may be reduced to monthly, if the first month post construction data show the embankment displacement rate is stable and acceptable. A review of data from inclinometers SI06-01, SI06-02 and SI06-03 indicates that there have been no displacements measured in these inclinometers.

Signed: Mark AC Smith

Mark A C Smith, E.I.T – Staff Engineer

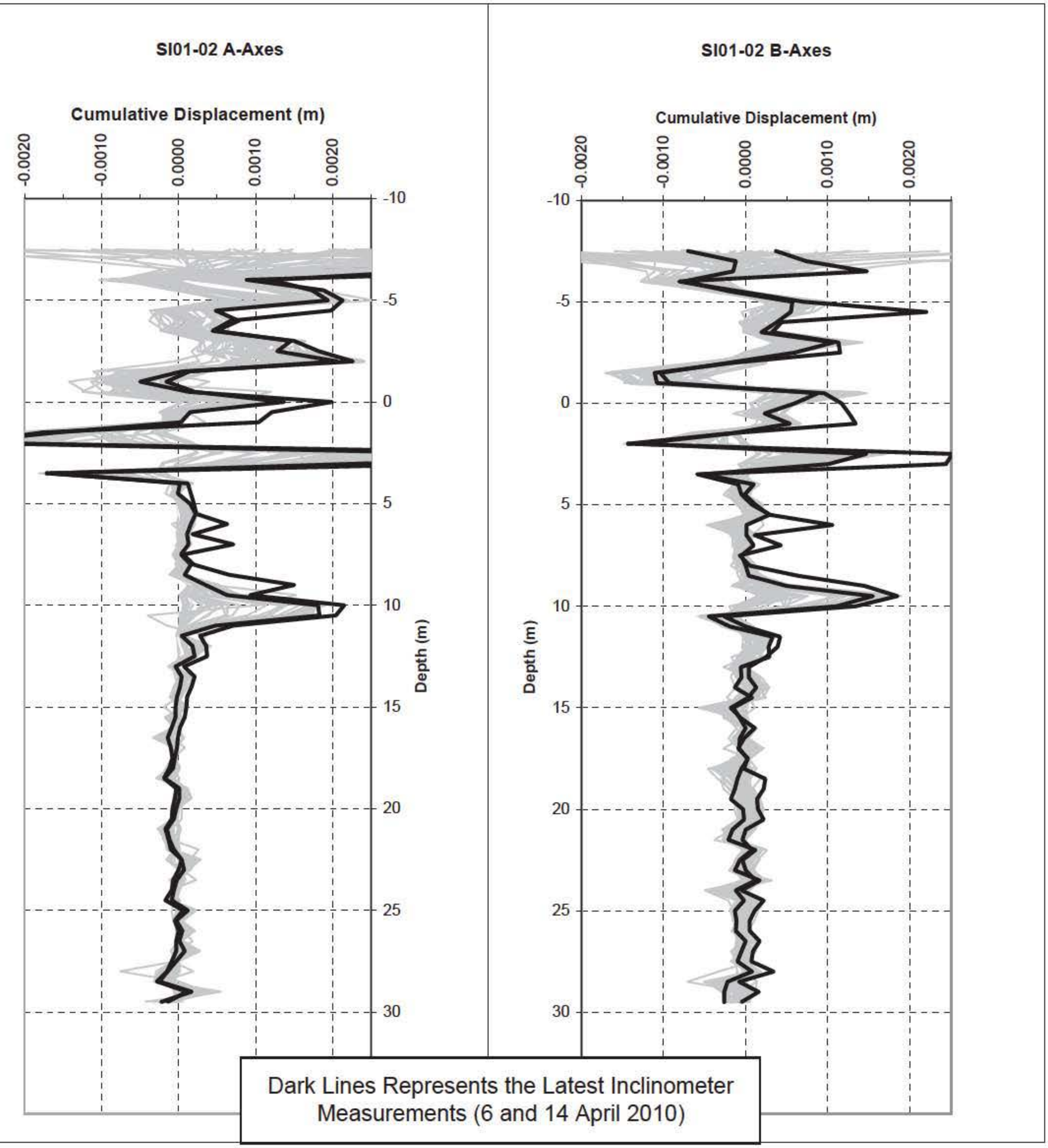
Approved: for

Ken Brouwer, P.Eng. – Managing Director

Attachments:

Figure 1 Rev 0	Down Hole Inclinometer Displacement SI01-02
Figure 2 Rev 0	Down Hole Inclinometer Displacement SI06-01
Figure 3 Rev 0	Down Hole Inclinometer Displacement SI06-02
Figure 4 Rev 0	Down Hole Inclinometer Displacement SI06-03
Figure 5 Rev 0	Cumulative Displacement Inclinometer SI01-02
Drawing 210 Rev 0	Tailings Storage Facility – Stage 6b Main Embankment Plan

/macs



Dark Lines Represents the Latest Inclinometer Measurements (6 and 14 April 2010)

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY MINE

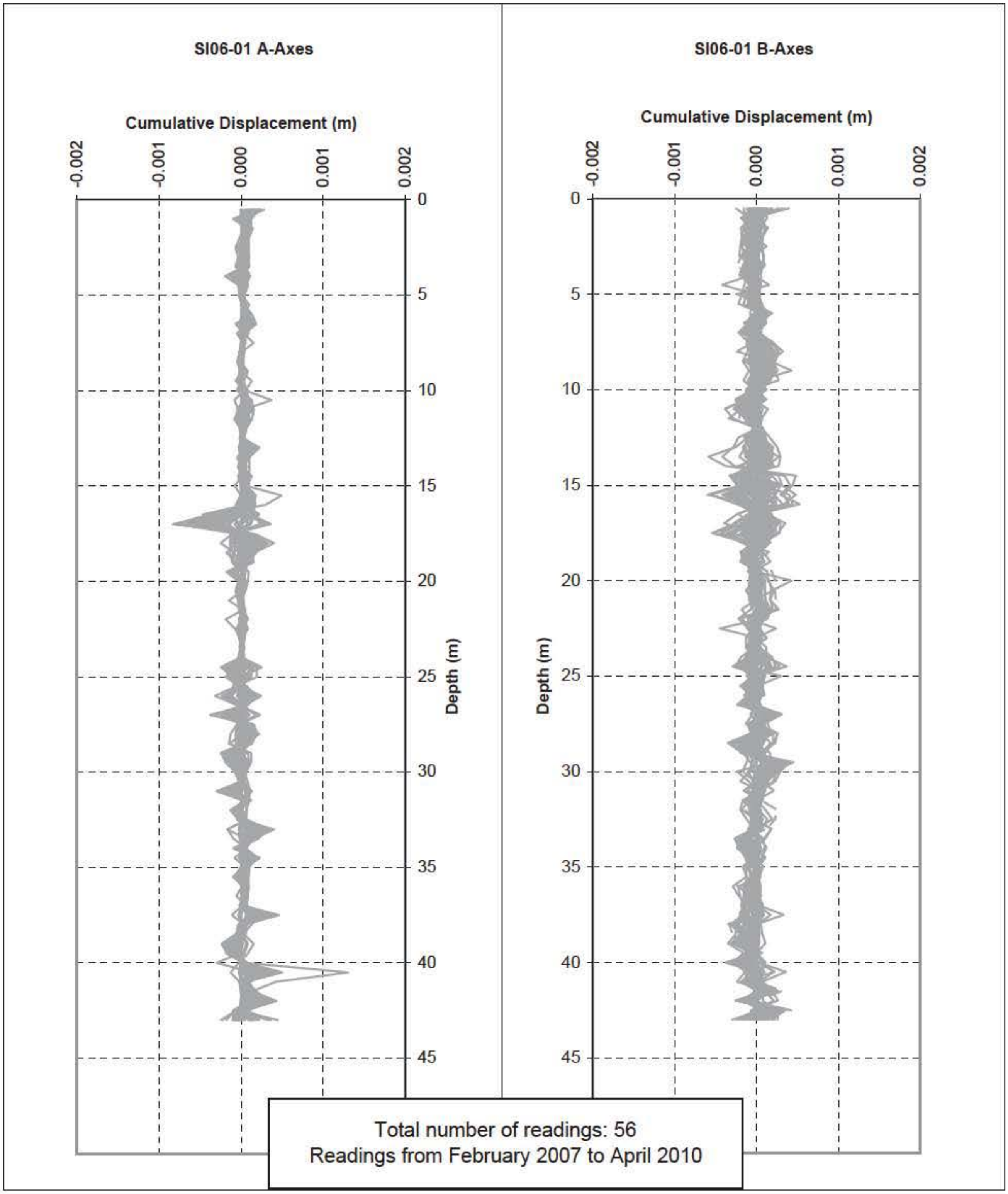
DOWN HOLE INCLINOMETER DISPLACEMENT SI01-02

Knight Piésold CONSULTING

P/A NO.	REF NO.	REV
VA101-1/29	VA10-00687	0

FIGURE 1

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	20APR'10	ISSUED WITH MEMO	MACS	GIJ	KJB



Total number of readings: 56
Readings from February 2007 to April 2010

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY MINE

DOWN HOLE INCLINOMETER DISPLACEMENT
SI06-01

Knight Piésold
CONSULTING

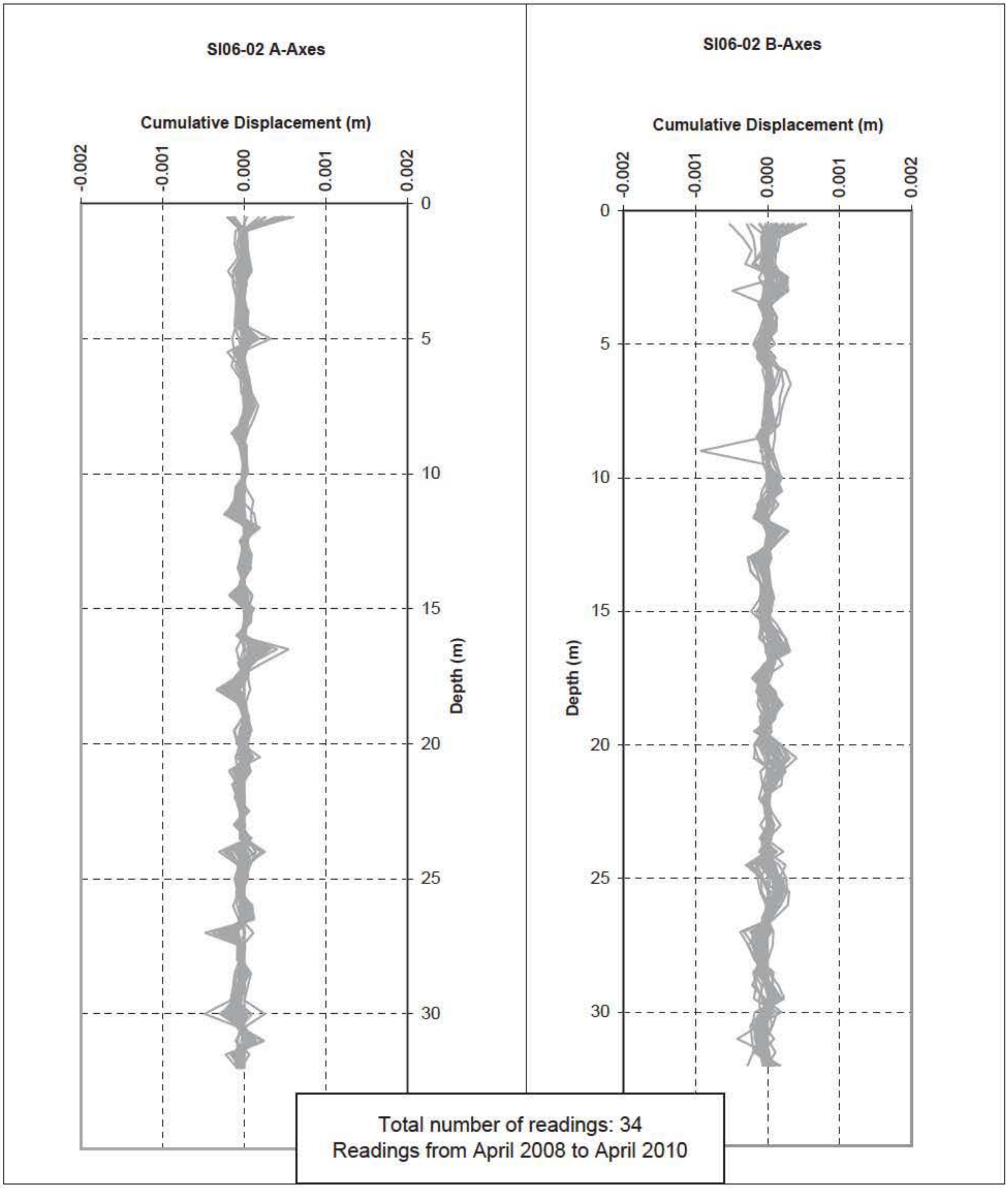
P/A NO.
VA101-1/29

REF NO.
VA10-00687

FIGURE 2

REV
0

0	20APR'10	ISSUED WITH MEMO	MACS	GIJ	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



Total number of readings: 34
Readings from April 2008 to April 2010

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY MINE

DOWN HOLE INCLINOMETER DISPLACEMENT
SI06-02

Knight Piésold
CONSULTING

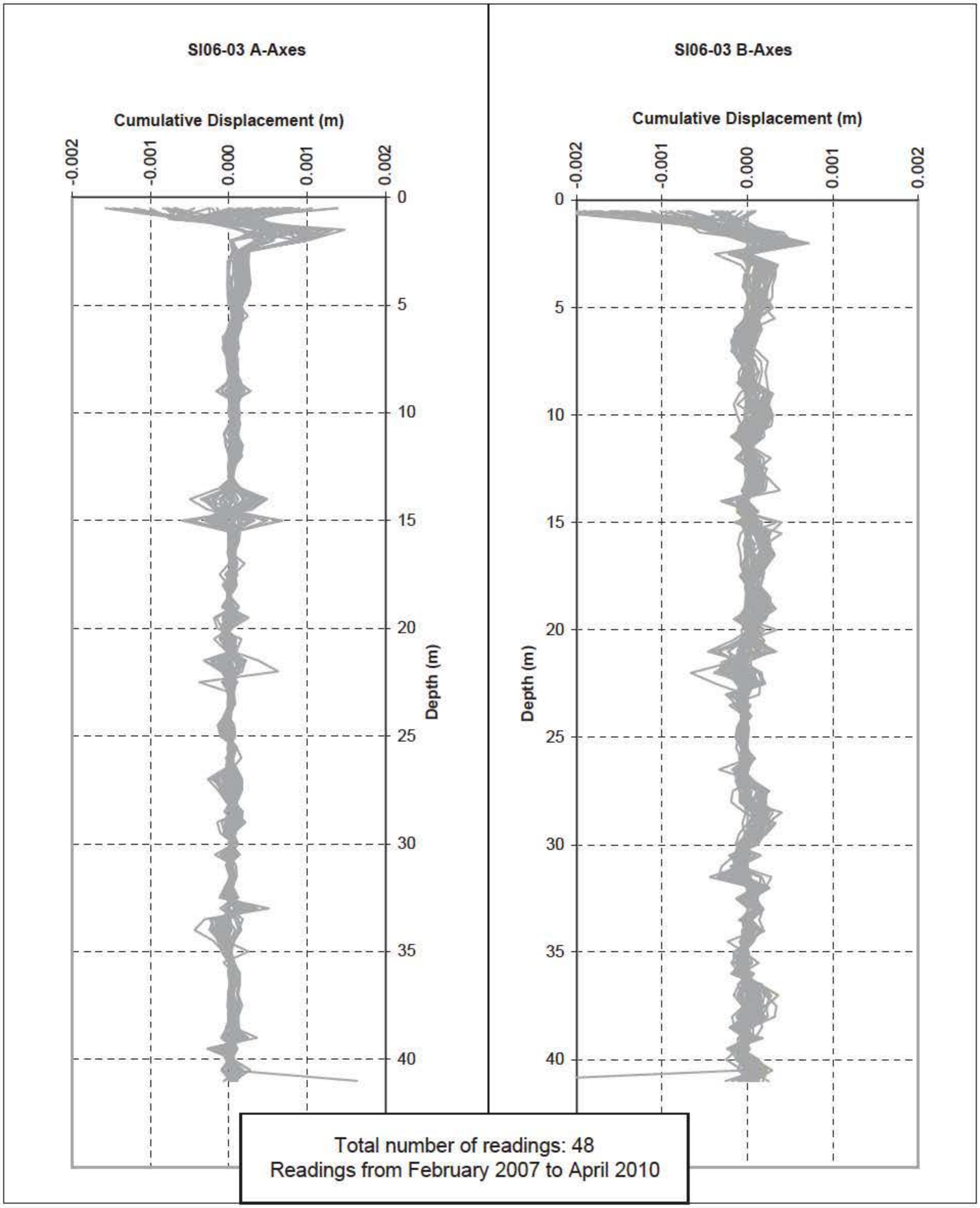
P/A NO. VA101-1/29

REF NO. VA10-00687

FIGURE 3

REV 0

0	20APR'10	ISSUED WITH MEMO	MACS	GIJ	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



SI06-03 A-Axes

SI06-03 B-Axes

Total number of readings: 48
Readings from February 2007 to April 2010

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY MINE

DOWN HOLE INCLINOMETER DISPLACEMENT
SI06-03

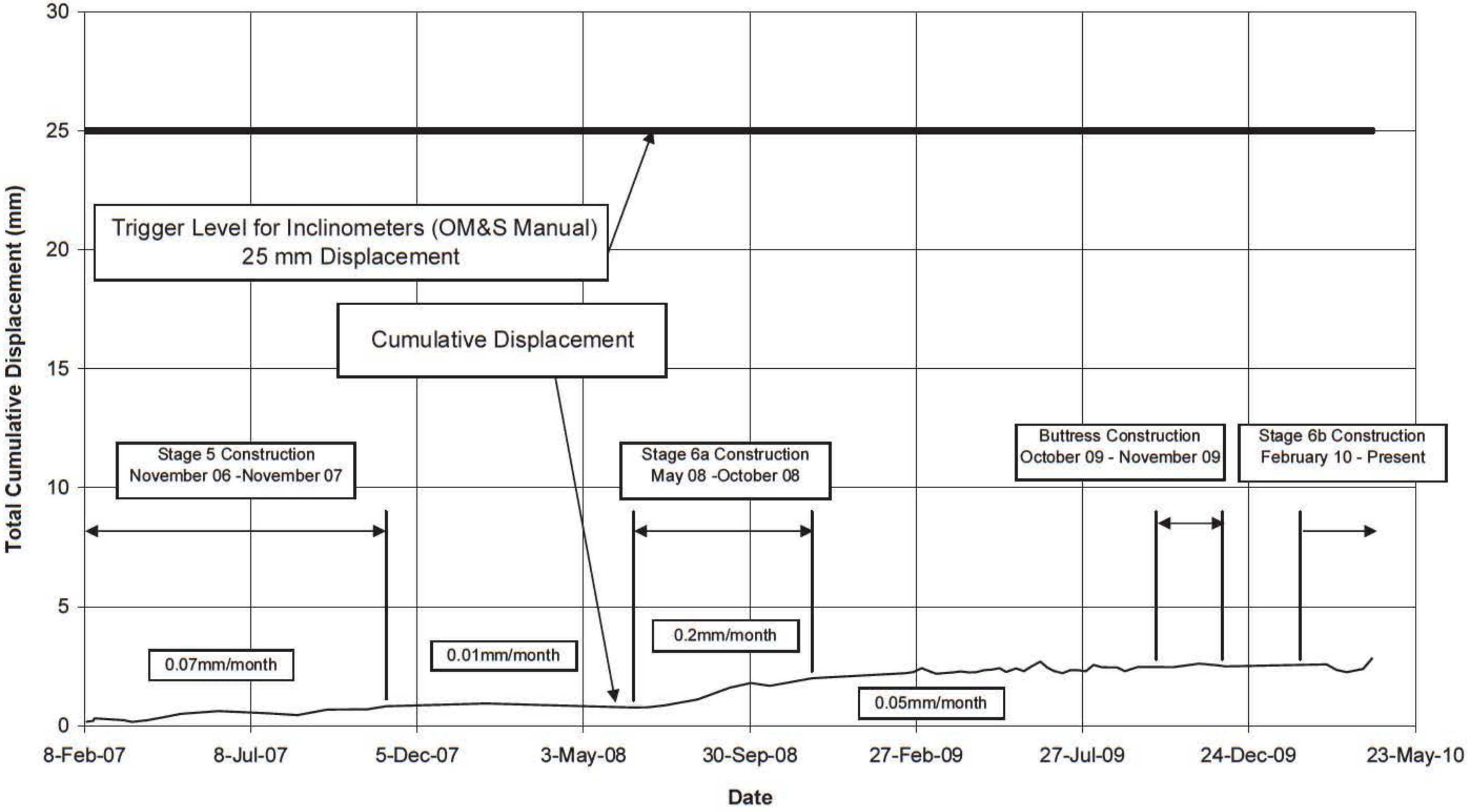
Knight Piésold
CONSULTING

P/A NO.	REF NO.
VA101-1/29	VA10-00687

FIGURE 4

REV
0

0	20APR'10	ISSUED WITH MEMO	MACS	GIJ	KJB
REV	DATE	DESCR PTION	PREP'D	CHK'D	APP'D



NOTES:

1. DISPLACEMENT SHOWN IS AT AN APPROXIMATE DEPTH OF 10 m IN THE LACUSTRINE SILTS.

0	20APR'10	ISSUED WITH MEMO	MACS	GIJ	KJB
REV	DATE	DESCR PTION	PREP'D	CHK'D	APP'D

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY MINE

CUMULATIVE DISPLACEMENT
INCLINOMETER SI01-02

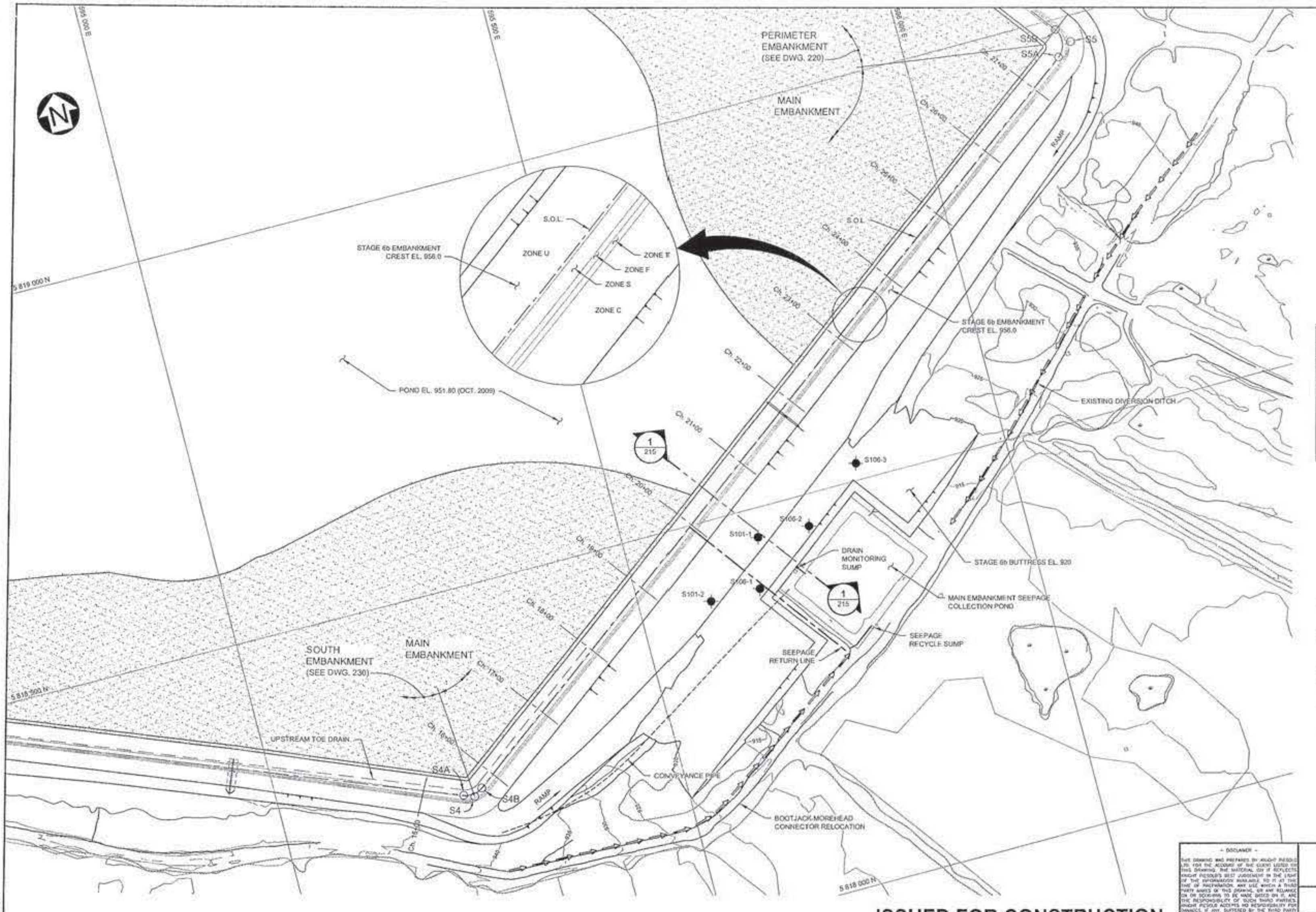
Knight Piésold
CONSULTING

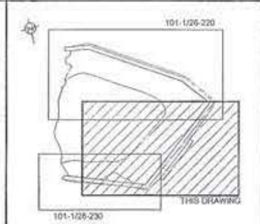
P/A NO.
VA101-1/29

REF NO.
VA10-00687

FIGURE 5

REV
0





KEY PLAN

EMBANKMENT SETTING OUT POINTS			
Point	Northing	Easting	Chainage
S1	5 818 626.103	594 249.565	5+00.00
S4A	5 818 243.821	595 227.361	15+49.97
S4B	5 818 246.923	595 231.497	15+77.87
S4	5 818 238.539	595 240.350	15+63.92
S5A	5 818 951.971	596 188.906	27+50.83
S5B	5 818 986.958	596 193.873	28+00.78
S5	5 818 966.983	596 208.866	27+75.80
S6	5 819 304.035	595 965.881	31+97.23
S7	5 819 939.748	595 010.249	43+36.69
S8	5 820 053.034	594 396.471	49+60.63

LEGEND:

● S106-3 EXISTING INCLINOMETER

NOTES:

1. TOPOGRAPHY FROM 2004 FLYOVER.
2. ALL DIMENSIONS ARE IN MILLIMETRES AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
3. THE STAGE 6b DESIGN OF THE TAILINGS STORAGE FACILITY IS PREDICATED ON APPROPRIATE CONSTRUCTION QA/QC THAT IS COMPLETED TO THE SATISFACTION OF KNIGHT PIESOLD LTD. AND THE REGULATORY AGENCIES.

ISSUED FOR CONSTRUCTION

SCALE A 50 25 0 50 100 150 200 250 m

DRG NO.	DESCRIPTION
230	STAGE 6b SOUTH EMBANKMENT - PLAN
220	STAGE 6b PERIMETER EMBANKMENT - PLAN
215	STAGE 6b MAIN EMBANKMENT - SECTION

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGN	DRAWN	CHK'D	APP'D

REVISIONS

REV	DATE	DESCRIPTION	DESIGN	DRAWN	CHK'D	APP'D
0	01FEB'10	ISSUED FOR CONSTRUCTION	LJG	TAM	GB	KJB

REVISIONS

L.J. GALBRAITH
25493

Knight Piésold
CONSULTING

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY MINE

TAILINGS STORAGE FACILITY STAGE 6b MAIN EMBANKMENT PLAN

P/A NO.	DRAWING NO.	REVISION
VA101-1/26	210	0

MEMORANDUM

To:	Mr. Greg Johnston	Date:	April 27, 2010
Copy To:	Mr. Les Galbraith	File No.:	VA101-1/29-A.01
From:	Mark Smith	Cont. No.:	VA10-00389
Re:	Mt. Polley TSF - Snow and ice in the Perimeter Embankment		

A large quantity of snow and ice was found in the Perimeter Embankment in early 2010. Snow was initially noticed on February 12 between Zone S and Zone U near to corner 2 (see attached sketches). The site engineer recommended the snow be removed, and later the same day the snow was removed with a hoe. As a result of the excavation the snow was observed to be between 0.1-0.2m thick, extended approximately 10-15m along the embankment and the full depth of the till - sand interface. Ice was discovered at the bottom of this excavation. A 12m trench was excavated perpendicular to the embankment to ascertain the extents of the ice. The ice was found to be a horizontal layer between the Stage 5 and Stage 6a sand cells; variable in thickness up to 1m, the ice was in contact with the till and extended beyond the test trench. After discussions with Mount Polley staff that stressed the importance of removing the ice it was decided to excavate the Zone U and attempt to find the boundaries of the ice.

Excavations started at the site of the original test trench and proceeded towards corner 1. The final excavation extended approximately from chainage 27+00 to chainage 31+00 and a minimum of 13m upstream from the setting out line. The excavation required 6 days to complete, all ice was removed and the hole was filled with waste rock over 2 days. The excavated sand was spread over the top of the hole and will now form the Stage 6b Zone U. The excavation did not remove all of the ice, the remaining ice is 13m or more upstream of the SOL and is therefore part of the tailings pond. Mount Polley has excavated additional test trenches at the approximate centre of all the sand cells constructed after freeze up, no snow or ice was found.

The ice is likely the result of pond water seeping into a low point in the Zone U. It was observed during the October construction that Zone U near corner 2 was lower that the surrounding tailings beach. This area of lower Zone U was limited to the area where ice has now been removed. Water was able to accumulate in this low area and come to rest against the Zone S till. The water eventually froze, and was then covered by snowfall. The ice and snow were then covered by rock to form the base of the sand cell. The rock provided insulation and prevented the ice from melting when the warmer tailings water was flowing into the sand cell. The Knight Piésold site engineer has discussed the origins of the snow and ice with both Mount Polley operators and management, all future sand cells will be cleared to competent material prior to rock or sand placement.

Signed:

Mark Smith, E.I.T. – Staff Engineer

Approved:

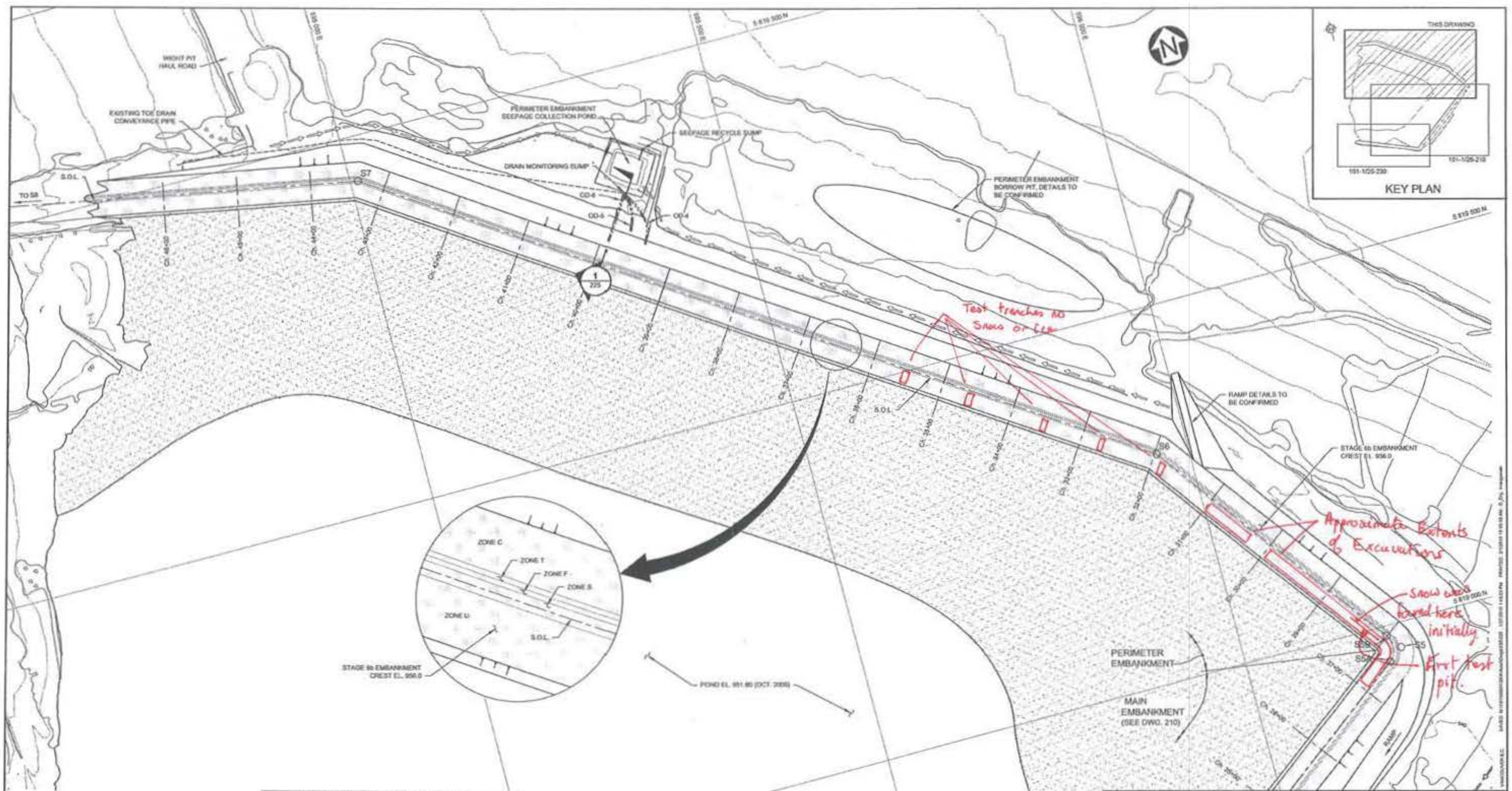
for Ken Brouwer, P.Eng. –Managing Director

Attachments:

Drawing 220 Rev0	Tailings storage Facility – Stage 6b Perimeter Embankment – Plan (modified by hand)
Drawing 226 Rev0	Tailings storage Facility – Stage 6b Perimeter Embankment – Detail (modified by hand)

Photo 1	Snow in Perimeter Embankment
Photo 2	Ice in Perimeter Embankment
Photo 3	Perimeter Embankment Excavation

/macs



EMBANKMENT SETTING OUT POINTS			
Point	Northing	Easting	Chainage
S1	5 818 626.163	594 249.555	5+00.00
S4A	5 818 243.621	595 227.361	15+49.97
S4B	5 818 246.923	595 251.497	15+77.87
S4	5 818 238.539	595 240.350	15+63.92
S5A	5 818 951.671	596 188.906	27+50.83
S5B	5 818 986.958	596 193.873	28+00.76
S5	5 818 966.083	596 208.866	27+75.80
S6	5 819 364.035	595 956.881	31+97.23
S7	5 819 939.746	595 010.249	43+36.69
S8	5 820 053.034	594 396.471	49+60.83

NOTES:

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ISSUED FOR CONSTRUCTION

SCALE A 50 25 0 50 100 150 200 250 m

DWG NO.	DESCRIPTION
230	STAGE 6b SOUTH EMBANKMENT - PLAN
225	STAGE 6b PERIMETER EMBANKMENT - SECTION
210	STAGE 6b MAIN EMBANKMENT - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGN	DRAWN	CHK'D	APP'D
0	01FEB'10	ISSUED FOR CONSTRUCTION	LJG	TAM		

REVISIONS

– DISCLAIMER –

GALBRAITH
25493
Feb 1/10

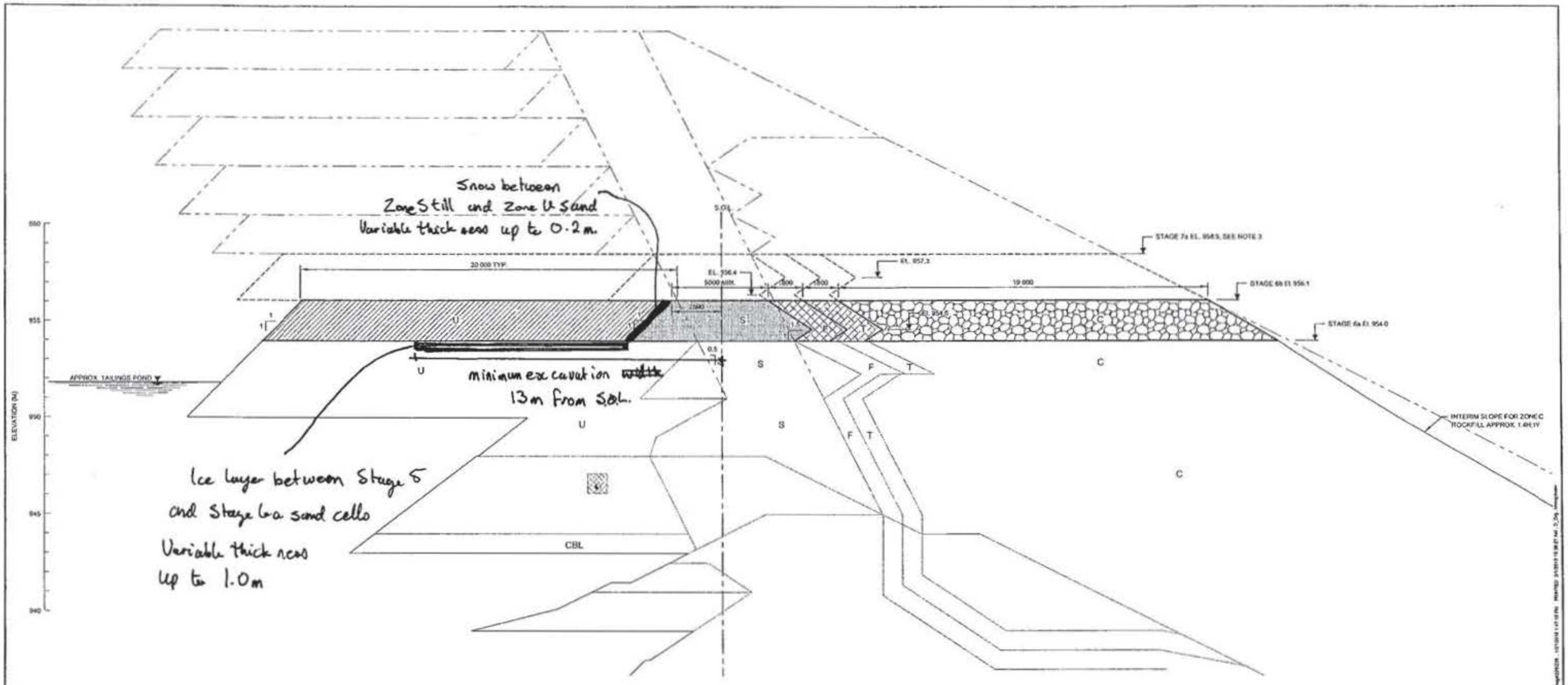
Knight Piésold
CONSULTING

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY MINE

TAILINGS STORAGE FACILITY
STAGE 6b PERIMETER EMBANKMENT
PLAN

P/A NO.	DRAWING NO.	REVISION
VA101-1/26	220	0



Snow between Zone S till and Zone U sand Variable thickness up to 0.2m.

minimum excavation ~~width~~ 13m from SOL.

Ice layer between Stage 5 and Stage 6a sand cells Variable thickness up to 1.0m

ISSUED FOR CONSTRUCTION

SCALE A 2 1 0 2 4 6 8 10 m

NOTES:

1. FOR MATERIAL SPECIFICATIONS AND LEGEND SEE DRG. 104.
2. ALL DIMENSIONS ARE IN MILLIMETRES AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
3. STAGE 7a CONSTRUCTION AT 958.5 m IS APPROXIMATE AND WILL BE CONFIRMED DURING THE STAGE 7 DESIGN OF THE TSF.
4. THE STAGE 6b DESIGN OF THE TAILINGS STORAGE FACILITY IS PREDICATED ON APPROPRIATE CONSTRUCTION QA/QC THAT IS COMPLETED TO THE SATISFACTION OF KNIGHT PIESOLD LTD. AND THE REGULATORY AGENCIES.

DRG NO	DESCRIPTION
225	STAGE 6b PERIMETER EMBANKMENT - SECTION
220	STAGE 6b PERIMETER EMBANKMENT - PLAN
104	MATERIAL SPECIFICATIONS

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGN	DRAWN	CHK'D	APP'D
0	01FEB'10	ISSUED FOR CONSTRUCTION	LJG	TAM	BB	

REVISIONS

GALBRAITH
25493
Feb 1/10

Knight Piésold
CONSULTING

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY MINE

TAILINGS STORAGE FACILITY
STAGE 6b PERIMETER EMBANKMENT DETAIL

P/A NO	DRAWING NO.	REVISION
VA101-1/26	226	0

PHOTO 1 – Snow in Perimeter Embankment

PHOTO 2 – Ice in Perimeter Embankment

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY MINE

PHOTO 3 – Perimeter Embankment Excavation

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY MINE

Knight Piésold
CONSULTING

Suite 1400 - 750 West Pender Street
Vancouver, BC Canada V6C 2T8

Tel: 604.685.0543
Fax: 604.685.0147
www.knightpiesold.com

File No.:VA101-1/29-A.01
Cont. No.:VA10-01175

July 22, 2010

Mr. Ron Martel
Environmental Superintendent
Mount Polley Mining Corporation
P.O. Box 12
Likely, BC V0L 1N0

Dear Ron,

Re: Mount Polley Tailings Storage Facility
Instrumentation Repair, Productivity Upgrade and Remote Monitoring Capacity

Introduction

The Mount Polley Mine Tailings Storage Facility is a large earth and rock fill embankment located in central British Columbia. The Tailings Storage Facility is monitored on a regular basis to ensure safety, as an early warning of undesirable conditions and to confirm the structure meets or exceeds regulatory requirements. The regulatory requirements include regular dam safety reviews by a suitably qualified and experienced engineer. The most recent dam safety review was completed by AMEC in late 2006. This review indicated that there is "about the right" amount of instrumentation in the embankment but there is little redundancy. The dam safety review recommended that lost instrumentation be re-established, Knight Piésold (KP) agrees with this recommendation.

The two major types of instrumentation in the Tailings Storage Facility (TSF) are piezometers and inclinometers. The piezometers provide information on the internal water pressure in various parts of the embankment and foundation. The piezometers are all vibrating wire (VW) type instruments. VW piezometers are widely used in geotechnical instrumentation, are generally robust and have a long life span. However, over time there have been failures of instrumentation and damage to data cables resulting in non-functional instrumentation. The inclinometers are industry standard slotted pipe that is read by a manually operated probe.

This letter summarizes the replacement of instrumentation and highlights two options for improving the TSF instrumentation, as follows:

- A **Base Case** to replace non-functional instrumentation to develop a satisfactory level of TSF instrumentation
- A **Productivity Improvement** to significantly reduce the amount of time required to complete routine monitoring of the TSF instrumentation, and
- The installation of **Remote Monitoring** capability for instrumentation on the TSF.

An estimated cost has been developed for the replacement and modifications to the TSF instrumentation. The estimated cost for instrumentation includes input from sole sourced suppliers for the major expense items. The cost estimate is to establish the approximate cost of each option and some efficiencies may be achieved by a soliciting a more detailed bid of the work required.

Current TSF Instrumentation Status

The installed instrumentation in the TSF includes a total of 91 piezometers and 5 inclinometers. Of these 48 piezometers are functional and 43 piezometers are not functional, 4 inclinometers are functional and 1 is not functional. The inclinometers are all installed in the main embankment. The functional inclinometers include 3 that are generally showing minimal movement and 1 inclinometer that shows localized movement.

The distribution of non-functioning piezometers is not random and a large portion of the Main Embankment foundation instruments have stopped functioning. In total 20 piezometers have been installed in the Main embankment foundation and 7 (35%) are functional. All 6 of the foundation piezometers in the A instrumentation plane have been damaged, 2 piezometers remain functional in the B instrumentation plane. This is the main area of concern due to a low strength glaciolacustrine unit that underlies a portion of the Main Embankment including the A and B instrumentation planes. The inclinometers and Main Embankment foundation piezometers are installed to monitor this glaciolacustrine unit. The TSF monitoring program is in part to confirm that the displacement and pore pressure in the glaciolacustrine unit are within acceptable limits.

The Ministry of Energy Resources, Petroleum and Mines (MEMPR) have previously expressed concerns about the characterization and behavior of the glaciolacustrine unit under the Main Embankment. A point of concern that has been raised by MEMPR is the amount of laboratory testing available to define the strength of the glaciolacustrine unit.

Base Case

The base case is to replace non-function VW piezometer instrumentation and install a level of redundancy in the VW piezometers. The collection of samples for laboratory testing can be completed at the same time as drilling the new instrumentation holes. This base case is a minimum level of replacement TSF instrumentation required. The base case includes the following:

- 5 holes in the TSF main embankment for replacement instrumentation. Of these drill holes, 2 holes 60 m deep will be drilled from the crest of the dam and 3 holes 25 m deep will be drilled from the dam buttress. A total drilling length of approximately 200 m is estimated.
- Install inclinometer casing in all holes.
- Install 4 VW piezometers in each hole (3 as replacement instruments and 1 for redundancy).
- Recovery of samples of the glaciolacustrine unit for laboratory testing.
- Laboratory testing of samples from the glaciolacustrine unit.

The drilling costs are based on a cost estimate by Geotech Drilling attached in Appendix A. The drilling cost estimate includes for inclinometer supply and installation, VW piezometer installation and soil sampling. The drilling cost estimate should be considered as an approximate cost as adjustments to the program are likely required. The KP costs and laboratory testing costs have been estimated by Knight Piésold.

Productivity Improvement

The productivity upgrade includes everything described in the Base Case and additional items to significantly reduce the time and complexity of instrumentation monitoring. The goal is to reduce the work load and time taken monitoring the TSF. An additional benefit is automation is expected to improve the accuracy of the data. Two additional items are proposed:

1. Centralize the location of VW piezometer reading points. This will include developing an upstream and downstream readout location on each embankment. The readout locations would collate the data collection for the instrumentation planes and provide a common interface. The piezometer cables would be extended and routed to the appropriate readout location. For example, on the Perimeter Embankment a downstream readout location would be installed in the vicinity of the seepage collection pumps house. The VW piezometer cables from the 3 instrumentation planes in the perimeter embankment would be routed to the readout location. The cost for establishing centralized readout locations has been estimated by KP.

2. Install a fixed inclinometer consisting of a ShapeAccelArray from Measurand in the existing inclinometer that is showing deflections. A ShapeAccelArray (SAA) is a comparatively new method in geotechnical engineering for monitoring deflections in inclinometers. The SAA is significantly faster and easier to read using a laptop computer. A SAA is cheaper to automate compared with traditional inclinometers. A brochure for the ShapeAccelArray is attached.

   The installation of an SAA will allow automation of the inclinometer. Automation will facilitate regular inclinometer readings collected remotely from the Mount Polley site office. The readings from a fixed inclinometer can be completed very rapidly in a small fraction of the time currently required to complete an inclinometer survey. A cost estimate for an inclinometer SAA and remote retrieval package from Measurand is attached. The cost of automation is approximately 60% of the quoted cost and savings could be made by electing to complete manual readings using a laptop. This cost estimate is approximate and may be adjusted based on the data retrieval method selected by Mount Polley Mine.

Remote Monitoring

The remote monitoring of all of the geotechnical instrumentation is possible. The remote monitoring would require the work described in the Base Case and Improved Productivity. In addition the VW piezometers would be monitored by a remote solar powered system and radio communications system. The current inclinometers would all have arrays installed and would be able to be remotely read. A cost estimate for the VW piezometer readout system has been provided by Measurand and is attached.

Summary

The instrumentation at the Mount Polley TSF has experienced damage over time. The replacement of some of the non-functional instrumentation is now necessary. This letter details the base cost to replace non-functional instrumentation and summarizes opportunities for reduced the difficulty and time required for TSF monitoring. The monitoring of the TSF instrumentation requires a reasonable time investment by Mount Polley Mine staff and/or KP staff. Two systems to reduce the time required to monitor the TSF and the setup cost to implement the systems are summarized.

It is recommended that the TSF instrumentation replacement be completed this year. To help satisfy concerns previously raised by MEMPR it is recommended that the replacement instrumentation should be either installed or at an advanced planning stage in time for the annual inspection of the Mount Polley TSF.

The estimated cost for the replacement of non-functional piezometers and installation of additional slope inclinometers is in total $195,000, the total cost for the alternative option to simplify the monitoring of the TSF is estimated to be $230,000. The total cost for a second alternative for remote monitoring of the TSF geotechnical instrumentation is estimated to be $310,000. A breakdown of the estimated costs is included on Table 1. We trust this information will assist you in planning for the TSF. Please contact us if you have any questions or would like additional information on the described systems.

Yours truly,
KNIGHT PIESOLD LTD.

for.

Prepared by:
Greg Johnston, M.Sc.
Engineering Geology and Geotechnical Specialist

Approved:
Ken Brouwer, P.Eng.
Managing Director

Attachments:

Table 1 Rev A	Cost Estimate

Geotech Drilling – Cost Estimate
Measurand – ShapeAccelArray (SAA) Brochure
Measurand – Quote 38 – Fixed Inclinometer
Measurand – Quote 40 – Remote Monitoring of VW Piezometers

/gj

Knight Piésold
CONSULTING

TABLE 1

MOUNT POLLEY MINING CORPORATION
TAILINGS STORAGE FACILITY

INSTRUMENTATION REPLACEMENT
COST ESTIMATE

Option	Item	Item Cost	Total
Base Cost			
	Drilling	$130,000	
	Replacement VW Piezometers	$15,000	
	Laboratory testing	$20,000	
	Knight Piesold site and office support	$30,000	
	Total		**$195,000**
Productivity Improvements			
	Base Cost plus the following	$195,000	
	Mount Polley Excavator for 3 days (NOTE 1)		
	VW piezometer cable and readout locations	$7,000	
	Fixed Inclinometer	$23,000	
	Knight Piesold site support	$5,000	
	Total		**$230,000**
Remote Monitoring			
	Productivity Improvements plus the following	$230,000	
	Additional fixed inclinometers	$28,000	
	Remote monitoring for VW Piezometers	$44,000	
	Knight Piesold site support	$8,000	
	Total		**$310,000**

M:\1\01\00001\29\A\Correspondence\VA10-01175 - Instrumentation Replacement\Tables\[Table 1 - Cost Est.xlsx]Sheet1

NOTES:

1. MOUNT POLLEY MINE EXCAVATOR TIME NOT INCLUDED

A	22JUL'10	ISSUED WITH LETTER VA10-01175	GL	GIJ	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Geotech
DRILLING

Cost Estimate

Bill to: **Knight Piesold Ltd.**

Care of: Knight Piesold Ltd.
1400 750 West Pender Street
Vancouver, BC V6C 2T8

ATTN: Mark Smith/Greg Lewsley
Tel: 1-604-685-6543
Email: msmith2@knightpiesold.com

Date: Tuesday, October 27, 2009
Revised No./Date: 5-Jul-10
Project Manager: Ryan Samis
Cost Estimate No.: 1KRS10-0043
Unit No. (Drill Rig): Odex/Mud Rotary Drill
Location: Mount Polley
Province: BC

Scope: This cost estimate is for 5 boreholes to 40 meters (130 ft) with 2 vibrating Wire installs per hole. 4 boreholes to 30 meters (100 ft) with 2.75" SI casing installed, and 3 boreholes to 30 meters (100 ft) with 2" monitoring wells installed. Soil coring (HQ3) will be required in the last 40 ft of the vibrating well installs, and the last 75 ft of the inclinometer holes. No sampling required in monitoring well holes.

Itm	Qty	Unit	Description	Price	Extended
1	190	hrs	Odex Drilling / Soil Coring	275.00	52,250.00
2	70	hrs	Overtime (after 8 hours, weekends, stats/two man crew)	65.00	4,550.00
3	1	L/S	Mob / Demob to Mount Polley	2750.00	2,750.00
4	54	hrs	Crew travel	149.00	8,046.00
5	19	shift	Support vehicle(truck mount)	249.00	4,731.00
6	19	shift	Crew subsistence (two man crew)	279.00	5,301.00
7	19	shift	Air compressor (300/200)	425.00	8,075.00
8	19	shift	Grout pump /Mud Pump Rental	199.00	3,781.00
9	9	hrs	Safety meeting	149.00	1,341.00
10	500	ft	Diamond Bit Wear Consumption	19.50	9,750.00
11	850	ft	Odex bit wear consumption	5.75	4,887.50
12	16	shift	High Pressure Diamond Pump Rental	249.00	3,984.00
13					-
14					-
15	27	10 ft	P - Solid 1", 1.5" or 2" p.v.c. well casing	36.87	995.49
16	3	10 ft	P - Slotted 1", 1.5" or 2" p.v.c. well casing	49.45	148.35
17	6	ea	P - 1", 1.5" or 2" slip caps	3.45	20.70
18	650	ft	P - 1" PVC (for Vibrating wire installs)	1.87	1,215.50
19	40	10 ft	P - 2.75" Slope Inclinometer	148.35	5,934.00
20	3	ea	P - 2.75" Slope Inclinometer Top Cap	6.90	20.70
21	3	ea	P -2.75" Slope Inclinometer Grout Anchor	417.00	1,251.00
22	60	bags	P - Bentonite Chips (Possible Option)	28.55	1,713.00
23	22	bags	P - Sand	15.52	341.44
24	105	5 ft	P - Acrylic Liners for Soil Coring	20.40	2,142.00
25	15	bags	P - Premix grout	34.44	516.60
26	12	bags	P - Fast Set Concrete	17.25	207.00
27	36	bags	P - Portland Cement	23.75	855.00
28	12	ea	P - Stand up casing protectors	109.25	1,311.00
29					-

Subtotal	$	126,118.28
P.S.T.	$	1,167.02
G.S.T.	$	6,305.91
TOTAL DUE	$	133,591.22

Terms & Conditions: E. & O.E. Cost Estimate valid for 60 days. Underground / Overhead utilities are the sole responsibility of the client. Lost, broken or unrecoverable tooling will be charged at cost plus 15%. Cancellation fees & restocking charges may apply if less than 48 hours notice. Invoice Payment terms: Upon Receipt. 2% interest charges will apply on past due accounts.. Invoice considered accepted and approved 15 days after receipt unless written notification is received.

Overtime is applicable after 8 hours, weekends, and statutory holidays

Line items beginning with P denote PST chargeable items

British Columbia

5052 Hartway Drive • Prince George • British Columbia • Canada • V2K 5B7

Tel: (250)962-9041 • **Fax**: (250)962-9046 • **Web: geotechdrilling.com**

Promotion Code:

Thank You for Your Business!

Frequently Asked Questions

How long is a typical SAA?

Most Field SAAs are near 32 m (104'). Most Research SAAs are 7.32m (24') long. Lengths up to 100m (300') are possible.

How long are the rigid segments in an array?

Standard joint-center to joint-center lengths are 305 mm (12") and 500 mm (19.7").

Do I need a casing for SAAs?

SAA should be installed in 27mm (1.05") ID casing (inexpensive PVC electrical conduit). The array and casing are flexible enough to survive deformations of tens of cm (feet). The 27 mm casing will fit into inclinometer casing, enabling recovery of some defunct SI sites.

Can I re-use an SAA?

After typical deformations, SAA may be removed from the casing and installed elsewhere.

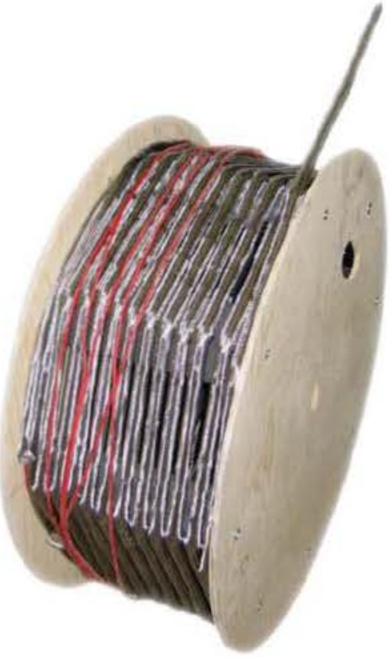
For more information on ShapeAccelArray and other Measurand products:

measurand
SHAPE ADVANTAGE

2111 Hanwell Rd
Fredericton, NB CANADA
E3C 1M7
(ph)506.462-9119
(fax)506.462-9095
www.MeasurandGeotechnical.com
www.measurand.com

measurand
SHAPE ADVANTAGE

ShapeAccelArray (SAA)



Introduction

SAA is an array of rigid segments separated by special joints. Triaxial MEMS gravity sensors in the segments measure tilt. SAA produces data equivalent to inclinometer data but over much larger deformations. SAA may be used vertically to track magnitude and direction of lateral deformation, and horizontally to track vertical deformation. In any pose, 3D vibration data are available from selected locations along the array.

There are two basic types: Field and Research. Each is available in increments of 8 segments, where standard segment lengths include 305 mm (12") and 500 mm (19.7").

The main distinctions are speed, number of segments, and power consumption.

SAAF
(Field Arrays)

SAAF is designed for solar-powered installations with wireless communication. SAAF may be up to 100 m long. Long-term accuracy for 30 m (96') SAAFs is 1.5 mm (0.06").

Vibration data are available from up to 3 segments along the array at 40 Hz sampling, and at 35 Hz from 4 segments.

All communication in the array is digital. Data are carried in a small cable to a digital logger. Most installations use solar power and provide wireless data over the internet.

SAAR
(Hi-Bandwidth Research Arrays)

SAAR is designed to collect high frequency data from all sensors continuously.

Each microprocessor in an SAAR (1 microprocessor per 8 segments) has a dedicated communication line.

SAAR can be supplied with up to 24 high-speed segments.

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Quotation

Quote Prepared For

Greg Lewsley
Knight Piesold
750 West Pender Street
Suite 1400
Vancouver, BC V6C 2T8 CAN
(604) 685-0543 Fax: (604) 685-0147

Quote Date Jun-24-2010
Quote Number 38
Sales Contact: **DJ Snodgrass**

Quote for 2 holes with remote data retrieval

Item	Description	Qty	Price	DD	Extended Price
SAAF500	SAA Field Octet (0.5 m segments)	4	$1,673.30		$6,693.20
Enclosure	Earth Station Enclosure	1	$993.25		$993.25
SAAReg	SAA Charge Regulator	1	$269.10		$269.10
SAA232	RS485 to RS232 converter w/Power switching	2	$450.15		$900.30
¶*ProSupport	Project Support Time Installation assistance cost (Inclusive)	1	$5,000.00		$5,000.00
Custom	Radio package for retreival of data (Includes Radios, Antennas and mounting Hardware)	1	$3,700.00		$3,700.00
SAAUSB	RS485 to USB PC connection kit for SAA	1	$596.90		$596.90
*CR1000	Campbell Scientific CR1000 Datalogger	1	$2,397.45		$2,397.45
CR1000IntPack	SAA-CR1000 Integration Package	1	$978.55		$978.55
Solar20W	20 Watt Solar Panel	1	$391.40		$391.40
SolarBracket	Solar Panel Bracket	1	$97.85		$97.85

Total Items	**$22,018.00**
Labor / Shipping	**$0.00**
Harmonized Sales Tax Exempt	**$0.00**
Total Quote	**$22,018.00**

All Quotes are valid for 60 Days. All Pricing are in USD unless otherwise specified.
*** Denotes Distributor discounts do not apply**
¶ Please contact Measurand Inc. Prior to ordering

NOTES:

(1) a) Unless otherwise specified, SAAs have no unsensorized segment at the far end;
b) Unless otherwise specified, SAAs have one unsensorized segment at the near end that provides an attachment point and junction to the cable. This segment and a stiffer portion of the cable occupy approximately 30 cm (1') "extra" beyond the length of sensorized segments. The cable can

be turned 90 degrees within this dimension. When planning installation depth, this "extra" length must be accounted for;

c) SAAFs are built in groups of 8 segments called octets. A SAAF may be ordered with a partial octet (example: 14 segments instead of the standard 2 x 8 = 16 segments). Because this entails a special production run, pricing is per fully populated octet. For the example above, this entails pricing for 2 octets (16 segments instead of 14).

(2)Payment Terms: Net 30 days from time of shipping. Overdue accounts will be subject to interest and penalties;
(3)Freight charges not included in total prices unless otherwise specified. Please indicate preferred shipping method on purchase order. Freight charges will be added at time of sale;
(4)Applicable taxes will be calculated and added at time of sale

Components Description:
See “Specification/Ordering List” and “Ordering Guide” at www.MeasurandGeotechncial.com/downloads” for assistance in interpreting the quoted components, dimensions, and installation variables.

Not included in the above:
Drilling
Casing
Excavation
Backfilling
Lift equipment
Security fencing
Electrical supply
Lightning protection

All quoted items are FOB Fredericton, New Brunswick, Canada. Any shipping and taxes due will be the responsibility of the customer
Prices: Prices are subject to change without notice.

Terms & Conditions Concerning Delivered Products

1. Warranty: Measurand Inc. Warrants that its products are free from defects in material and workmanship for a period of one (1) year from date of delivery unless otherwise specified by Measurand Inc. In writing. This warranty applies only if the products have not been opened and have not been subjected to misuse, neglect, accident or improper installation or care. Said improper care includes but is not limited to supply of power not as specified by Measurand Inc. If Measurand Inc. Products fail due to no fault of the Buyer, Measurand Inc. Will, at its option, either repair the defective product and restore it to normal operation without charge for parts and labor or will provide a new replacement product in exchange for the defective product. Repair work shall be warranted for the remainder of the original warranty period or for a period of 60 days, whichever is longer. Measurand Inc. Hereby disclaims any implied warranty of merchantability.

2. Limitations of Liability: In no event will Measurand Inc. Be liable for any indirect, incidental or consequential damages or any lost profits or like expectancy damages arising out of the delivery of its products. Measurand Inc.’s liability for personal injury and/or property damage shall not exceed its general liability insurance policy limitations.

3. Inspection and Rejection of Products: Buyer shall notify Measurand, Inc., within seven (7) business days after receipt, of the discovery of any defects in delivered products and/or its acceptance/non acceptance thereof; otherwise, it shall be deemed to have accepted the products.

4. Return Goods Authorization: Measurand Inc. Shall not accept returned or rejected products/parts unless first authorized with a return merchandise authorization (RMA) number. The Buyer is responsible for handling, insurance and transportation of unit to Measurand Inc. Measurand Inc. Shall be responsible for inspecting the unit and repair as necessary. Measurand Inc. Shall pay for the return of the repaired/new unit to the Buyer via Ground Transportation only.

5. Title & Delivery: Title/risk of loss or damaged goods shall pass to the Buyer upon Measurand Inc. Delivery of products. Measurand Inc. Shall retain a security interest with repossession rights for products shipped on open account until all obligations are met. The delivery date is an estimate only, based on a best forecast of conditions at time of order entry. Neither party shall be liable to the other party for any failure to perform any of its obligations under this Agreement during any period in which such performance is delayed by circumstances beyond its reasonable control including, but not limited to fire, flood, war, terrorism, embargo, strike, constrained markets, riot or the intervention of any governmental authority (“Force Majeure”). In such event, however, the delayed party must promptly provide the other party with written notice of the Force Majeure. The delayed party’s time for performance will be excused for the duration of the Force Majeure, but, if the Force Majeure event lasts longer than thirty (30) days, the other party may immediately terminate the Agreement by giving written notice to the delayed party.

6. Delivery Times/Expedited Delivery: Standard Delivery time is 3 4 weeks ARPO. In some cases, expedited delivery may be possible. Measurand Inc. Reserves the right to apply
an expedite fee of 10% of the total cost of the equipment purchased or a minimum charge of $200.00 USD, whichever is greater.

7. BIS: The US Bureau of Industry and Security (BIS) may limit exports of USA made goods to certain individuals and organizations. A license application may need to be completed and submitted to Measurand before equipment may be shipped.

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Quotation

Quote Prepared For

Greg Lewsley
Knight Piesold
750 West Pender Street
Suite 1400
Vancouver, BC V6C 2T8 CAN
(604) 685-0543 Fax: (604) 685-0147

Quote Date Jun-28-2010
Quote Number 40
Sales Contact: **DJ Snodgrass**

Quote for datalogging equipment for monitoring Peizometers around site.

Item	Description	Qty	Price	DD	Extended Price
Custom	10 installations for monitoring Peisometers. Can monitor multiple probes on each station Item includes logging equipment as well as radio communications to allow for one collection point via radio.	1	$38,733.00		$38,733.00
Solar20W	20 Watt Solar Panel	11	$391.40		$4,305.40
SolarBracket	Solar Panel Bracket	11	$97.85		$1,076.35

Total Items	**$44,114.75**
Labor / Shipping	**$0.00**
Harmonized Sales Tax Exempt	**$0.00**
Total Quote	**$44,114.75**

All Quotes are valid for 60 Days. All Pricing are in USD unless otherwise specified.
*** Denotes Distributor discounts do not apply**
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(4)**Applicable taxes will be calculated and added at time of sale**

Components Description:
See "Specification/Ordering List" and "Ordering Guide" at www.MeasurandGeotechncial.com/downloads" for assistance in interpreting the quoted

components, dimensions, and installation variables.

Not included in the above:
Drilling
Casing
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Lift equipment
Security fencing
Electrical supply
Lightning protection

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Prices: Prices are subject to change without notice.

Terms & Conditions Concerning Delivered Products

1. Warranty: Measurand Inc. Warrants that its products are free from defects in material and workmanship for a period of one (1) year from date of delivery unless otherwise specified by Measurand Inc. In writing. This warranty applies only if the products have not been opened and have not been subjected to misuse, neglect, accident or improper installation or care. Said improper care includes but is not limited to supply of power not as specified by Measurand Inc. If Measurand Inc. Products fail due to no fault of the Buyer, Measurand Inc. Will, at its option, either repair the defective product and restore it to normal operation without charge for parts and labor or will provide a new replacement product in exchange for the defective product. Repair work shall be warranted for the remainder of the original warranty period or for a period of 60 days, whichever is longer. Measurand Inc. Hereby disclaims any implied warranty of merchantability.

2. Limitations of Liability: In no event will Measurand Inc. Be liable for any indirect, incidental or consequential damages or any lost profits or like expectancy damages arising out of the delivery of its products. Measurand Inc.'s liability for personal injury and/or property damage shall not exceed its general liability insurance policy limitations.

3. Inspection and Rejection of Products: Buyer shall notify Measurand, Inc., within seven (7) business days after receipt, of the discovery of any defects in delivered products and/or its acceptance/non acceptance thereof; otherwise, it shall be deemed to have accepted the products.

4. Return Goods Authorization: Measurand Inc. Shall not accept returned or rejected products/parts unless first authorized with a return merchandise authorization (RMA) number. The Buyer is responsible for handling, insurance and transportation of unit to Measurand Inc. Measurand Inc. Shall be responsible for inspecting the unit and repair as necessary. Measurand Inc. Shall pay for the return of the repaired/new unit to the Buyer via Ground Transportation only.

5. Title & Delivery: Title/risk of loss or damaged goods shall pass to the Buyer upon Measurand Inc. Delivery of products. Measurand Inc. Shall retain a security interest with repossession rights for products shipped on open account until all obligations are met. The delivery date is an estimate only, based on a best forecast of conditions at time of order entry. Neither party shall be liable to the other party for any failure to perform any of its obligations under this Agreement during any period in which such performance is delayed by circumstances beyond its reasonable control including, but not limited to fire, flood, war, terrorism, embargo, strike, constrained markets, riot or the intervention of any governmental authority ("Force Majeure"). In such event, however, the delayed party must promptly provide the other party with written notice of the Force Majeure. The delayed party's time for performance will be excused for the duration of the Force Majeure, but, if the Force Majeure event lasts longer than thirty (30) days, the other party may immediately terminate the Agreement by giving written notice to the delayed party.

6. Delivery Times/Expedited Delivery: Standard Delivery time is 3 4 weeks ARPO. In some cases, expedited delivery may be possible. Measurand Inc. Reserves the right to apply
an expedite fee of 10% of the total cost of the equipment purchased or a minimum charge of $200.00 USD, whichever is greater.

7. BIS: The US Bureau of Industry and Security (BIS) may limit exports of USA made goods to certain individuals and organizations. A license application may need to be completed and submitted to Measurand before equipment may be shipped.

Knight Piésold
CONSULTING

Suite 1400 - 750 West Pender Street
Vancouver, BC Canada V6C 2T8

Tel: 604.685.0543
Fax: 604.685.0147
www.knightpiesold.com

File No.:VA101-1/29-A.01
Cont. No.:VA10-01620

November 23, 2010

Mr. Ron Martel
Environmental Superintendent
Mount Polley Mining Corporation
P.O. Box 12
Likely, BC V0L 1N0

Dear Ron,

Re: Tailings Storage Facility Instrumentation Replacement Program, Drilling Cost Estimates

Introduction

The Mount Polley Mine has several options for the instrumentation replacement program required at the Tailings Storage Facility. These options are described in the Knight Piésold Letter VA10-01175. The installation of the replacement instrumentation will include a drilling program; this drilling program is the largest cost item in the instrumentation replacement program. Mr. Ron Martel of Mount Polley Mine has requested Knight Piésold assist with the selection of a suitably qualified drilling contractor.

To assist Mount Polley in managing the drilling costs Knight Piésold has obtained three competitive quotes from qualified drilling contractors. Knight Piésold has experience working with all three contractors on similar programs and based on our experience, we believe that all are capable of completing the work.

Drilling Program

The drilling contractors were requested to provide cost estimates and comment on drill availability. The drilling program is summarized as:

- 5 drill holes in total, 2 drill holes to 60m and 3 drill holes to 25m
- Supply and install slope indicator casing in each drill hole
- Install 4 vibrating wire piezometers in each drill hole, (supply by others)
- Collect soil samples and evaluate geotechnical conditions encountered in the foundation soils, and
- All drill sites will be truck accessible (Mount Polley to provide suitable drill site access)

Cost Estimate

Three drilling contractors were requested to provide cost estimates. A copy of the cost estimates provided by each of the drilling contractors is attached. The cost estimate provided by Foundex Explorations Ltd. included for the supply of vibrating wire piezometers. To facilitate a cost comparison between the potential contractors the HST has been excluded and the Foundex Explorations Ltd. cost estimate has been adjusted to exclude supply of vibrating wire piezometer and cable. The summarized cost estimates excluding HST are:

1.	Mud Bay Drilling Co. Ltd.	$63,700
2.	Geotech Drilling	$69,700
3.	Foundex Explorations Ltd.	$81,300

All three contractors have verbally confirmed they have a drill available before the end of the year.

Summary

The selection of a drilling contractor from this short list is required by Mount Polley Mine. It is recommended that Mount Polley directly contract the drilling contractor in order to avoid any mark-ups that would be applied by Knight Piésold. Knight Piésold is available to assist Mount Polley with the drilling contract document review.

In addition to the drilling costs, the specified instrumentation will also need to be purchased. Knight Piésold is expecting cost estimates for the instrumentation purchase later this week, and will be reported in a separate letter.

We trust this will help your selection of a drilling contractor. This instrumentation replacement program is overdue and we recommend that it be initiated as soon as possible. Please call Greg or Ken if you have any questions.

Yours truly,
KNIGHT PIESOLD LTD.

Signed:
Greg Johnston, M.Sc.
Engineering Geology and Geotechnical Specialist

Approved:
Ken Brouwer, P.Eng.
Managing Director

Attachments:
Cost Estimates by:
Geotech Drilling (1 page)
Mud Bay Drilling Co. Ltd. (1 page)
Foundex Explorations Ltd. (3 pages)

Copy To: Luke Moger

/gj

Geotech DRILLING

Cost Estimate

Bill to: **Knight Piesold Ltd.**

Date: October 27, 2009

Care of: Knight Piesold Ltd.
1400 750 West Pender Street
Vancouver, BC V6C 2T8

Revised No./Date: 04-Nov-10
Project Manager: Ryan Samis
Cost Estimate No.: 1KRS10-0043
Unit No. (Drill Rig): Odex/Mud Rotary Drill
Location: Mount Polley Mine
Province:

ATTN: Mark Smith
Tel:
Email: msmith2@knightpiesold.com

Scope: This cost estimate is for 2 boreholes to 60 meters (200 ft) with 4 Vibrating Wire Installs per hole and 3 boreholes to 25 meters ('s (100 ft) with 2.75" Casing installed and 4 Vbrating Wires per hole,. Soil coring(HQ3) will be required in the last 65 ft of each hole.

Itm	Qty	Unit	Description	Price	Extended
1	96	hrs	Odex Drilling / Soil Coring	249.00	23,904.00
2	52	hrs	Overtime (after 8 hours, weekends, stats)(two man crew)	65.00	3,380.00
3	1	L/S	Mob/Demob to Mount Polley	2750.00	2,750.00
4	30	hrs	Crew travel	150.00	4,500.00
5	12	shift	Support vehicle(truck mount)	249.00	2,988.00
6	12	shift	Crew subsistence (two man crew)	279.00	3,348.00
7	12	shift	Air compressor rental (300/200)	425.00	5,100.00
8	12	shift	Grout/Mud pump rental	199.00	2,388.00
9	5	hrs	Safety meeting	149.00	745.00
10	311	ft	Diamond Bit Wear Consumption	19.75	6,142.25
11	590	ft	Odex bit wear consumption (Vibrating Wire BH's, Inclinometers and Monitoring Wells)	5.75	3,392.50
12	12	shift	High Pressure Diamond Pump Rental	175.00	2,100.00
13					-
14					-
15					-
16					-
17					-
18	400	ft	1" PVC (for Vibrating wire installs)	1.87	748.00
19	25	10 ft	2.75" Slope Inclinometer Pipe	148.35	3,708.75
20	3	ea	2.75" Slope Inclinometer Top Cap	6.90	20.70
21	3	ea	2.75" Slope Inclinometer Grout Anchor	58.69	176.07
22	40	bags	Bentonite chips (If grouting does not work, chips will be used as backfill material in rock fill)	21.84	873.60
23	12	bags	Sand (Vibrating Wire Installs if required)	15.52	186.24
24	5	ea	Stand up casing protectors	109.25	546.25
25	5	bags	Fast set pre-mix concrete	17.25	86.25
26	65	5 ft	Acrylic Liners for Soil Coring	28.75	1,868.75
27	7	bags	Premix Grout	34.44	241.08
28	21	bags	Portland cement	23.75	498.75
29					-

Terms & Conditions: E. & O.E. Cost Estimate valid for 60 days. Underground / Overhead utilities are the sole responsibility of the client. Lost, broken or unrecoverable tooling will be charged at cost plus 15%. Cancellation fees & restocking charges may apply if less than 48 hours notice. Invoice Payment terms: Upon Receipt. 2% interest charges will apply on past due accounts.. Invoice considered accepted and approved 15 days after receipt unless written notification is received.

Overtime is applicable after 8 hours, weekends, and statutory holidays

Subtotal	$	69,692.19
HST	$	8,363.06
TOTAL DU	$	78,055.25

British Columbia

5052 Hartway Drive • Prince George • British Columbia • Canada • V2K 5B7
Tel: (250)962-9041 • Fax: (250)962-9046 • **Web: geotechdrilling.com**

Promotion Code:

Thank You for Your Business!

MUD BAY DRILLING CO. LTD.
Unit A, 18509 96th Avenue, Surrey, BC V4N-3P7
Tel: (604) 888-2206 Fax: (604) 888-4206

Cost Estimate

Date: August 13 2010
Revised No./Date:

ATTN: Greg Johnston
Knight & Piesold Ltd.
Suite 1400 - 750 West Pender St.
Vancouver, B.C., V6C 2T8

Cost Estimate No.: 1
Unit No. (Drill Rig): Sonic Truck
Location: Mount Polley

Scope: 2 boreholes to 60m and 3 boreholes to 25m. Slope indicator casing to be installed in each hole. 4 VW piezometers in each hole. Piezometers to be supplied by client.

Itm	Qty	Unit	Description	Price	Extended
1	1	ls.	Mobilization (Surrey/Mount Polley/Surrey)	$ 6,500.00	$ 6,500.00
2	60	hrs	Drilling, sampling and installation	$ 550.00	$ 33,000.00
3		hrs	Crew overtime (1.5)		$ -
4		hrs	Crew overtime (2.0)		$ -
5	12	hrs	Crew Travel	$ 185.00	$ 2,220.00
6	6	days	Living allowance	$ 525.00	$ 3,150.00
7	195	m	Bit Wear	$ 35.00	$ 6,825.00
8		in.	Concrete coring (10 in dia.)		$ -
9	195	m	2.75"/70mm INCLINOMETER CASING SNAP SEAL	$ 37.00	$ 7,215.00
10		ft.	(2)" PVC blank		$ -
11	5	ea	INCLINOMETER TOP/BOTTOM CAP	$ 27.00	$ 135.00
12		ea	DCPT tips	$ 20.00	$ -
13		ea	Shelby tubes	$ 40.00	$ -
14		sacks	Silica sand	$ 16.00	$ -
15		sacks	Bentonite chips	$ 20.00	$ -
16	5	sacks	Concrete	$ 16.00	$ 80.00
17	195	m	Grouting of Boreholes	$ 11.00	$ 2,145.00
18		sacks	Quik-gel bentonite drilling mud	$ 20.00	$ -
19		sacks	Asphalt patch	$ 22.00	$ -
20		sacks	Portland cement	$ 20.00	$ -
21	6	days	Support /Decontamination Unit	$ 300.00	$ 1,800.00
22		days	Compressor rental for ODEX	$ 450.00	$ -
23		ea	45 gal. Drums with lids	$ 60.00	$ -
24	5	ea	Well covers (flush mounted, cast iron, above ground)	$ 135.00	$ 675.00
25		ea	Core boxes	$ 60.00	$ -
26					$ -
27					-
28					-
29					-
				Subtotal	**$ 63,745.00**
				H.S.T.	**$ 7,649.40**
				TOTAL DUE	**$ 71,394.40**

Notes:

Standby of rig and crew	*$550/hr*
Overtime greater than 8hrs onsite	*+$75/hr*
Client is responsible for contaminated soil/wast water removal	
Core boxes, if needed	*$60/ea*
45gal drums, if needed	*$60/ea*

FOUNDEX
Explorations Ltd.

Date:	Oct. 28, 2010
Client Job#:	N/A
Equipment:	CSR-1000

Proposal # **4385**

To:
Knight Piesold Consulting
Suite 1400 - 750 West Pender
Vancouver, BC
V6C 2T8
Tel: 604-

Project Details:

Site:	Mount Polley
Attention:	Mark Smith
Single shif / double	Single Shift
Estimate # of Shifts	15
Estimate # of Days	15

Hole #	Hole Depth (m)	Hole Depth (ft)	Move/Setup	Air Rotary Overburden (m)	Overburden (hrs)	Mud Rotary (m)	Mud Rotary (hrs)	Coring (m)	Coring (hrs)	Install/Backfill/Grout (hrs)	Total Hrs
60	60.00	196.80									
60	60.00	196.80									
25	35.00	114.80									
25	35.00	114.80									
25	35.00	114.80					s.21				
QUANTITY:	225.00	738.00									
UNITS:	Meters	Feet									
RATE:											
TOTAL:			$ 1,950.00		$ 16,250.00		$ 15,600.00		$ 15,600.00	$ 9,360.00	

Sub Total:	$58,760.00
Mobilization:	$8,500.00
Materials:	$26,086.51
Contingency:	$8,484.65
Sub Total:	$101,831.16
HST @ 12%:	$12,219.74
Total:	$114,050.90

* DENOTES WEEKEND OR HOLIDAY

Moving
Air Rotary
Mud Rotary
Travel
Holes
Work Week
Work Days
Contingency
Hours Per Day
Supervisor
Extra Helper
Crew
R&B Rate / Man
Rig Rate

s.21

Quantity	Description	Unit	Rate	Extension
40	HQ3 Coring	Per Meter	32.80	1,312.00
60	Mud Rotary Drilling	Per Meter	16.50	990.00
125	Air Rotary Drilling - 6' Symmetrix	Per Meter	50.00	6,250.00
40	Cement	Bags	15.15	606.00
10	X-Tra Gel Bentonite	Bags	12.50	125.00
5	Bentonite Chips	Bags	19.50	97.50
20	Time Release Pellets	Pails	103.80	2,076.00
40	Piezo Sand	Bags	10.17	406.80
250	3/4" PVC Pipe	Feet	0.55	137.50
18	2 3/4"x 10' Iinclinometer Casing	Each	98.50	1,773.00
2	2 3/4" Inclinometer Top Caps	Each	5.53	11.06
2	2 3/4" Inclinometer Grout Bottom Caps	Each	129.20	258.40
20	Vibrating Wire Piezometer	Each	550.00	11,000.00
321	Cable for VW	Per Meter	3.25	1,043.25
			TOTAL	**26,086.51**

PROJECT DETAILS

Water Availability	**Unknown**	Surface Casing	**Yes**	Accommodations	**Williams Lake**	Installation	**N/A**
Equipment Access	**Truck**	Casing Size	**Symmetrix 6"**	Fuel	**N/R**	PVC Size	**N/A**
Environmental Project	**No**	Drill Hole	**Yes**	Insurance certificate	**N/R**	Slot size	**N/A**
Any Permitting	**By Others**	Hole Size	**Symmetrix 6"**	Shipping Quote	**N/R**	Flush/Standup	**N/A**
Intended Driller	**Unknown**	Drill Method	**Air, Mud, Core**	Maps Required	**Yes**	Sand	**N/A**
Cutting Disposal	**Left on site**	Core Size	**HQ3**	Utility Locate Req.	**By Others**	Pellets	**N/A**
Drill Containment	**No**	SPT/Shelby	**SPT and Shelby**	Terms Sent	**Yes**	Grout	**N/A**
Rental Equipment	**No**	Wireline Samples	**N/A**	Start Date	**Unknown**	Backfill w/cuttings	**Yes**
Subcontractors	**No**	CPT / SCPT	**N/A**				
Service Vehicles	**Yes**	Development	**N/A**				
Grout Equipment	**Yes**	Packers	**N/A**				
Training Programs	**No**	BPT -Pull back	**N/A**			Pump lift	**Unknown**
Travel Arrangements	**No**	Piston Sampler	**N/A**			Hose Req'd	**Unknown**

' THIS IS A COST ESTIMATE ONLY ** ACTUAL CHARGES WILL BE BASED ON FIELD LOGS AND OUR STANDARD TERMS AND CONDITIONS*****

STANDARD TERMS & CONDITIONS OF
FOUNDEX EXPLORATIONS LTD.

1. General

1.1. Prices include a 2 man crew and all necessary drilling and sampling equipment.

1.2. FWA, regulated or Union wage rates would be at an additional charge.

1.3. Survey and layout of all drill locations to be the responsibility of others.

1.4. Authorized utility clearance to be provided to Foundex prior to drilling.

1.5. Suitable access for our equipment would be provided by others to the satisfaction of Foundex.

1.6. Removal of and transport of contaminated drilling and decontamination spoils from the drill sites to be the responsibility of others.

1.7. Foundex's minimum work schedule is 10 hours per day and 5 days per week along with being a continuous operation until the work is complete. Overtime rate is in effect for all hours after 8 hrs per day, and after 40 hours per week, and on weekends and holidays. Work schedule revisions will be at the discretion of Foundex Explorations Ltd. based on project specific situations.

1.8. Client will provide site specific Health and Safety Plan for environmental projects. Equipment spill containment systems would be at an additional cost and only be provided at the specific request of the client. Pricing assumes Level "D" personnel protection unless specifically indicated otherwise.

1.9. Any or all traffic control to be provided by others.

1.10. Security for our equipment to be the responsibility of others.

1.11. Potable water supply, utility permits, misc. permits etc to be provided by others.

2. Marine Work and Marine Transportation

2.1. When contracting Marine vessels, Foundex will flow thru to the client all the terms and conditions of the supplier.

2.2. Standby will apply to all time that the barge and drill are unable to work due to tides, weather, permits or anything else that is beyond the control of the drill crew and/or barge operator.

2.3. When required by Foundex the Client will provide suitable moorage for barge and work boats.

2.4. All Marine vessels supplied by the client shall meet Foundex's minimum requirements for offshore drilling.

2.5. Minimum day for all rigs is 10 hours. Standby due to weather will be charged at agreed rates for 10 hours per day.

2.6. Cargo insurance for FEL's equipment while being transported by non-scheduled marine transportation will be charged on a cost plus basis or be provided by the client.

3. Heliportable Work

3.1. When requested, contracting helicopter services, Foundex will flow thru to the client all the terms and conditions of the supplier.

3.2. Suitable Helipads and work platforms when required will be provided for by others.

3.3. All Permitting when required will be provided by the client

3.4. When requested, Fuel will be supplied at cost plus 10% to the client.

3.5. Cargo insurance for FEL'S equipment while in flight is to be provided for by the client and hen Foundex provides cargo insurance it would be at Cost plus 10%.

4. Technical

4.1. Any artesian water flows will be dealt with on a cost plus basis.

4.2. Standby at 80 % of our unit rates includes but is not limited to, site orientation, safety meetings, engineering, health & safety plan protocols, personal protection equipment upgrades, water sampling, and lab analysis. Client will be invoiced for actual time consumed.

4.3. Materials are based on identified scope of work and include materials and supplies required to complete the work. Additional materials and supplies can be made available provided as mutually agreed.

4.4. Estimate is subject to final scope of work, terms and conditions, health & safety plan and rig availability. Client will be invoiced for actual units consumed.

4.5. Reasonable drilling and sampling refusal based upon industry standard for applicable methodology. Refusal for Becker Drilling will be considered to be 200 blows per foot.

4.6. Foundex makes no guarantee desired maximum depths can be achieved. Potential for tool replacement if required by the client to drill or sample past the drill rig operators identified maximum safe depth. Potential for Becker pipe repair or replacement will be at cost plus 10% for any lost, damaged or bent pipe.

5. Financial

5.1. Any estimates offered by Foundex are for budgeting purposes only. Unless specifically indicated otherwise invoicing will be based upon actual time and quantities. Foundex does not guarantee that production rates used in the estimate will be achieved. Foundex reserves the right to modify our stated methodology to respond to differing site conditions. Should a not to exceed contract or footage rates be required Foundex requires this information prior to the bid date.

5.2. Sales tax or GST is not included in the above rates unless specifically indicated.

5.3. Upon prior approval of credit, payment terms are net 30 days from date of Invoice. All invoices issued by Foundex will be in digital format. All agreements that do not comply with these terms and conditions will be subject to a 5% mark-up on the total invoice. All invoices will also carry a 2% charge per month on any overdue balances.

5.4. Payment or performance bonds are not included in this proposal.

5.5. Any retention of funds due to Foundex shall be released in full within 30 days of completion of Foundex Explorations Ltd.’s Original scope of work.

5.6. Certificates of insurance will be submitted upon request only and any additional insurance requirements would be charged to the client at cost plus 10%.

5.7. When applicable a Fuel surcharge will be charged on Foundex projects.

5.8. Project cancellations after notice to proceed may incur costs payable by the client. Mobilization ends once the rig has arrived on site; set-up on the first borehole is per the terms of the proposal.

5.9. All proposals offered by Foundex are commercial in confidence and valid for 30 Days.

5.10. Upon Foundex receiving a purchase order or a verbal or written” notice to proceed”, the client shall be deemed to have accepted and agreed to these terms and conditions unless specifically indicated otherwise and agreed to in writing prior to the commencement of the project. These terms and conditions incorporate the entire agreement between Foundex and the client, and supersede all prior understandings and agreements with respect to the project. If this document is a subcontract, then Foundex will not be bound by any term of the head contract unless specifically included in this document, or an amendment signed by Foundex and the client. No modification of this agreement will be effective unless made in writing and signed by Foundex and the client. There are no representations, warranties, terms, conditions, undertakings or collateral agreements express, implied or statutory, between Foundex and the client other than as expressly set forth in these terms and conditions.

Section” A” (Site specific terms)

To be Determined

Section “B” (Foundex Proposal and Scope of Work)

See Attached

Section “C” (Miscellaneous attachments)

To be Determined

Foundex Explorations Ltd.
End of Terms and Conditions

Knight Piésold
CONSULTING

Suite 1400 - 750 West Pender Street
Vancouver, BC Canada V6C 2T8

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Fax: 604.685.0147
www.knightpiesold.com

File No.:VA101-1/29-A.01
Cont. No.:VA11-00252

February 3, 2011

Mr. Ron Martel
Environmental Superintendent
Mount Polley Mining Corporation
P.O. Box 12
Likely, BC V0L 1N0

Dear Ron,

Re: Mount Polley Mine – Site Water Management

Knight Piésold (KP) recently issued the 2010 annual inspection report for the Tailings Storage Facility (TSF) at the Mount Polley Mine. Although the primary focus of the annual inspection is to evaluate the performance of the TSF, the inspection also considers site water management practices, as these can have a significant impact on water accumulation at the mine and the storage requirements for the tailings impoundment.

KP previously assisted with assessing the operational water balance for the overall site. However, Mount Polley Mining Corporation (MPMC) has been managing the water balance in-house for the last two years and KP has had no involvement with it during this time. The water balance for the mine site was operating with a significant water surplus when KP last reviewed the information, with surplus water progressively accumulating within the TSF and the Cariboo and Wight Pits. KP understands that the quality of the water that is stored in the TSF and the pits is not suitable for discharge to the environment, and that MPMC does not yet have a permit to discharge excess water.

MPMC recently provided KP with a copy of an amendment (2009) to the mine operating permit that allows for the transfer of water from the TSF to the Cariboo Pit. This permit amendment allows for filling of the Cariboo Pit up to a designated maximum water level, and also stipulates that a minimum water cover be maintained over Potentially Acid Generating (PAG) waste rock that has been placed in the pit. KP has a general knowledge of the Cariboo Pit, but has not completed relevant geotechnical or hydrological studies for it. However, our overview assessment of the TSF operations, conducted as part of the 2010 Annual Inspection, suggests that a significant amount of water was transferred out of the TSF as the impounded supernatant water was considerably less than in previous years. MPMC site staff confirmed that tailings supernatant water had been transferred from the TSF to the Cariboo Pit to reduce the volume of water stored within the TSF.

The storage capacity for surplus water in the Cariboo Pit is limited by the geometry of the pit, the amount of PAG waste rock being stored in the pit, and the upper storage limit as defined in the operating mine permit. It is our opinion that the volume of water currently being stored in the Cariboo Pit is lower than would have been predicted by the site water balance, and it is possible that significant leakage may have occurred during filling of the Cariboo Pit, resulting in the discharge of poor quality water to adjacent water courses.

KP included a recommendation in the 2010 Annual Inspection report that the water balance and water management practices be reviewed to ensure compliance with the intent of the current permits. Our concern is that some of the water transferred from the TSF to the Cariboo Pit is not being contained, but rather is being discharged as seepage and/or overflow to adjacent receiving waters. KP therefore recommends that MPMC adopt a pro-active approach and have an experienced reviewer examine the overall site water management system, with particular focus on the hydrogeological characteristics of the Cariboo and Wight Pits, to evaluate the current practices for managing site surplus water to confirm compliance with existing storage and discharge permits.

We trust that this information will be of assistance to MPMC in their continuing operation of the Mount Polley Mine. Please contact the undersigned if you have any questions or comments.

Yours truly,

KNIGHT PIESOLD LTD.

L.J. GALBRAITH

Feb 3/11

Signed:
Les Galbraith, P. Eng.
Senior Engineer

Approved:
Ken Brouwer, P.Eng.
Managing Director

Copy To: Tim Fisch (MPMC), Bryan Kynoch (Imperial Metals Corporation)

/lg

Knight Piésold
CONSULTING

File No.:VA101-1/29-A.01
Cont. No.:VA11-00298

Suite 1400 - 750 West Pender Street
Vancouver, BC Canada V6C 2T8

Tel: 604.685.0543
Fax: 604.685.0147
www.knightpiesold.com

February 10, 2011

Mr. Brian Kynoch
Mount Polley Mining Corporation
Suite 200 - 580 Hornby Street
Vancouver, BC V6C 3B6

Dear Brian,

Re: Mount Polley Tailings Storage Facility Engineer of Record

We have completed all assignments and on January 25, 2011 issued to Mount Polley Mining Corporation (MPMC) the final versions of the 'Tailings Storage Facility - Report on the 2010 Annual Inspection' and 'Tailings Storage Facility – Report on Stage 6B Construction'.

We are currently assuming that MPMC will be retaining the services of a separate individual or organization to take over as the Engineer of Record for the tailings storage facility, as a result of Knight Piésold's decision to opt out of the bidding process implemented by MPMC late last year. We would like to facilitate a formal handover to the new individual/group, as it is essential that it be recognized that Knight Piésold will not have any responsibility for any aspects of the on-going operations, or of any modifications to the facilities that are undertaken from now onwards. To date, the tailings impoundment has been developed using the observational approach, wherein the design is modified as appropriate depending on actual performance and conditions. It must be understood that Knight Piésold will no longer have any responsibility for the performance of the tailings storage facility.

The embankments and the overall tailings impoundment are getting large and it is extremely important that they be monitored, constructed and operated properly to prevent problems in the future. Knight Piésold would be happy to assist in the formal handover to the new Engineer of Record.

As we have a long relationship with the Mines Branch and the Ministry of Energy, Mines and Petroleum Resources, we consider that it is prudent to notify them of the change in status. Therefore, we have copied them on this correspondence.

We would like to thank you for our long and constructive association at the Mount Polley Mine and look forward to working together again in the future.

Signed:
Ken Brouwer, P.Eng.
Managing Director

Approved:
Jeremy Haile, P.Eng.
President

Copy To: Don Parsons (IMC), Ron Martel (MPMC), Tim Fisch (MPMC)
Al Hoffman, Chief Inspector of Mines
/kjb

MOUNT POLLEY MINING CORPORATION

A DIVISION OF IMPERIAL METALS CORPORATION
Box 12, Likely B.C. V0L 1N0
Phone (250)-790-2215, Fax (250)-790-2268

March 3rd, 2011

Mr. Les Galbraith
Senior Engineer
Knight Piésold Consulting
#1400 – 750 West Pender Street
Vancouver, BC V6C 2T8

Re: Mount Polley Mine – Site Water Management

Dear Les:

We confirm that significant water leakage from the Cariboo pit has not taken place, and that the water balance continues to accurately predict the water levels at all locations at the site including the Cariboo pit. The water balance continues to work well; the negative accounts are the result of drought conditions we experienced over the last twelve months.

We were quite concerned about the opinion you expressed in your letter of February 3, 2011, "*that the volume of water stored in the Cariboo pit is lower than would have been predicted by the site water balance, and that it is possible that significant leakage may have occurred during the filling of the Cariboo pit, resulting in the discharge of poor quality water to adjacent water courses.*" Monitoring of ground water and surface water courses downstream confirm this is not the case, and as we noted above the water balance continues to accurately predict the level of water in the Cariboo pit.

Transfer of water between the open pits and the tailings impoundment facility was always contemplated, and each pit has a permitted water fill elevation. It is recommended in the operating plans that Knight Piesold helped develop that we fill the pits to these levels as quickly as possible to minimize the potential for mineral oxidation and metal leaching. The Cariboo pit was already filled to capacity once before, during the period of temporary suspension, the monitoring of wells and surface flows then also indicated that the water was well contained.

In your letter you acknowledge that you have not been involved in the management of the water balance at Mount Polley for the last two years. While we appreciate that you shared your concerns with us, it is important for you to ensure that such highly sensitive views take into account current information, such as in this case, recent drought conditions, together with all relevant historical data.

We at Mount Polley and Imperial Metals pay close attention and take our responsibility to manage water seriously. The water management plan is evaluated on a continual basis and adjustments made to avoid impacts to the environment. Mount Polley has taken a pro-active approach, working closely with engineers at head office as well as other consultants who provide an outside review of the water management practices at the site and ensure we are in compliance with our permits.

Yours truly
Mount Polley Mining Corporation

Ron Martel

cc: Brian Kynoch, Tim Fisch, Ken Brouwer

Knight Piésold
CONSULTING

TRANSMITTAL

Suite 1400 - 750 West Pender Street
Vancouver, BC V6C 2T8
Tel: 604.685.0543
Fax: 604.685.0147

TO:	Mount Polley Mining Corporation P.O. Box 12 Likely, British Columbia Canada, V0L 1N0	**DATE:** **FILE NO.:**	March 15, 2011 VA101-1/29-A.01
ATTENTION:	Mr. Denis Bernardi	**CONT. NO.:**	VA11-00470

RE: 2010 Engineering Support for Mount Polley Mine

ITEM NO.	DESCRIPTION
1.	Table 1 – Summary of Knight Piésold Letters to Mount Polley Mine for 2010 and 2011
2.	pdf copies of all letters in Table 1
3.	

REMARKS:

Signed:
Admin Staff

Approved:
Greg Johnston

Copy To: Ron Martel

TABLE 1

MONT POLLEY MINING CORP.
MOUNT POLLEY MINE

SUMMARY OF KNIGHT PIESOLD LETTERS (2010 & 2011)

PA Number	Assignment	Date	Continuity No.	Regarding	Sent to	From (KP)
VA101-1/26	TSF Stage 6B Construction	05-Feb-10	VA10-00286	South Embankment Seepage Recycle Pond	Ron Martel	Mark Smith
VA101-1/28	2010 Environmental Services	05-May-10	VA10-00709	Hydrology Site Visit	Ron Martel	Cameron Butt
VA101-1/28	2010 Environmental Services	20-May-10	VA10-00866	Hazeltine Creek Weir Design	Ron Martel	Jeff FitzGerald
VA101-1/29	2010 Engineering Support	22-Jul-10	VA10-01175	Tailings Storage Facility Instrumentation Repair - Productivity Upgrade & Remote Monitoring Capacity	Ron Martel	Greg Johnston
VA101-1/29	2010 Engineering Support	23-Nov-10	VA10-01620	Tailings Storage Facility Instrumentation Replacement Program - Drilling Cost Estimates	Ron Martel	Greg Johnston
VA101-1/29	2010 Engineering Support	03-Feb-11	VA11-00252	Mount Polley Mine - Site Water Management	Ron Martel	Les Galbraith
VA101-1/29	2010 Engineering Support	10-Feb-11	VA11-00298	Mount Polley Tailings Storage Facility Engineer of Record	Brian Kynoch	Ken Brouwer

C:\Users\gjohnston\AppData\Roaming\Microsoft\Excel\[Summary Table for Report Letters Issued in 2010 (version 1).xlsb]Sheet1

A	15MAR'11	ISSUED WITH VA11-00470	RW	GIJ	LJG
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

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File No.:VA101-1/26-A.01
Cont. No.:VA10-00286

February 5, 2010

Mr. Ron Martel
Environmental Superintendent
Mount Polley Mining Corporation
P.O. Box 12
Likely, BC V0L 1N0

Dear Ron,

Re: South Embankment Seepage Recycle Pond

The Tailings Storage Facility (TSF) at Mount Polley Mine currently has seepage recycle ponds located downstream of the Main and Perimeter Embankments and a seepage collection sump located downstream of the South Embankment. Mount Polley is planning on developing a seepage recycle pond at the South Embankment in 2010 and has requested Knight Piésold provide estimated flows and an approximate size for the seepage pond. Water collected in the pond will be pumped into the TSF.

The South Embankment seepage recycle pond receives water from two sources: embankment seepage routed to the sump via the longitudinal drain, and runoff from the TSF embankment. The majority of the water entering the sump at the South Embankment is from embankment runoff, which does not meet discharge requirements and must be managed on site. Mount Polley requested the pond be sized to contain 24-hours of storage from embankment runoff during average freshet conditions, which corresponds to approximately 200 m^3. A rectangular pond with approximate dimensions of 5 m x 20 m, with 2 m of live storage will provide storage for 24-hours of runoff from average freshet conditions. The actual daily runoff during the freshet varies and Mount Polley should therefore provide sufficient flexibility in the pumping system at the south dam to account for variations in runoff values as well as storm events.

Please do not hesitate to contact the undersigned if you have any questions on the seepage recycle pond at the South Embankment.

Yours truly,
KNIGHT PIESOLD LTD.

Signed:
Mark A C Smith, E.I.T.
Staff Engineer

Approved:
Ken Brouwer, P.Eng.
Managing Director

/macs

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File No.:VA101-1/28-A.01
Cont. No.:VA10-00709

May 5, 2010

Mr. Ron Martel
Environmental Superintendent
Mount Polley Mining Corporation
P.O. Box 12
Likely, BC V0L 1N0

Dear Ron,

Re: Hydrology Site Visit

A site visit was undertaken to the Mount Polley Mine from April 13 to April 14, 2010, by Cameron Butt, Project Scientist with Knight Piésold Limited (KPL). The purpose of the site visit was to;

- Install new staff gauge bridge mount at Hazeltine Creek
- Survey staff gauge to original 1994 gauge datum, and
- Estimate design requirements for upgrade of weir at Hazeltine Creek.

In addition to the above tasks, Cameron was also requested to;

- Review existing gauge network at various locations around the mine site and provide recommendations, and
- Undertake general training in hydrometric monitoring.

Colleen Hughes provided invaluable support to Cameron while on site, and has continued to be an invaluable resource.

Staff Gauge Installation at Hazeltine Creek

The requirement for reinstallation of the staff gauge mount at Hazeltine Creek came about because of progressive lifting of the existing staff gauge out of the bed. This was presumably resulting from processes similar to frost-jacking and/or ice-loading as has been discussed in detail in KPL Letter Report VA09-00317- Assessment of Hazeltine Creek Flows, April 14, 2009.

The reinstallation of the staff gauge was undertaken on April 13, 2010, and the final bench mark survey (which completed the installation) was undertaken on April 14, 2010. The design of the staff gauge was kept intentionally simple and robust. A flat metal plate was hung vertically from a large bridge beam directly into the gauge pool, as shown on Photos 1 and 2, in contrast to the original installation, as shown on Photo 3. The new mounting plate was designed so as to minimize bending or sagging by use of further reinforcement, and was constructed so as to facilitate removal prior to winter freezing, by unbolting the bottom portion of the mount, as shown on Photo 2. This seasonal removal will help to prevent any ice damage.

A one meter staff gauge was secured to the bottom, removal portion of the mount, and a full bench mark survey was undertaken to correctly (re)set the site gauge datum to the original site installation datum, established by Water Survey of Canada in 1994. For simplicity, the WSC bench mark values have been reduced by exactly 1.000 meter, such that bench mark 1 has a value of 0.981, not 1.981. This alteration was considered necessary and important for sustainable monitoring as the previous assigned values were not intuitive to field technicians. A full bench mark survey should be undertaken annually and/or whenever the staff gauge is removed and reinstalled, which is also consistent with permit conditions. The vertical positioning and stability of the staff gauge is of fundamental importance in maintaining a defensive dataset.

Site Survey for Weir Installation & Upgrade

A survey of the control cross-section was undertaken to determine construction requirements for the proposed weir upgrade. Site access for excavators was established to be possible while minimizing any environmental impact. A complete design and construction schedule for the installation of a new weir is to be provided to MPMC as soon as possible.

Hydrometric Network Review

Cameron and Colleen visited several of the site gauging stations, which included both recording (dataloggers) and non-recording (staff gauge only) stations. H8 includes a PT2X pressure transducer enclosed with an aluminum conduit and staff gauge. The station appeared to be in good working order. W4 and W4DS were also visited. The choice of instrumentation that should be adopted at these sites (whether recording or non-recording), is largely dependant on the resolution and accuracy required. If continual flow data are required at both of these sites, then recording instruments and construction of small weirs at both of these locations should be considered as both would greatly assist in the acquisition of accurate flow data. Conversely, if relative water levels are all that is required at these stations, then the existing non-recording instruments may be adequate. However, both are situated on mobile beds and as such relative water levels, over an extended period of data collection, may become less relevant as the bed alters.

General Training

Hydrometric data collection can be complicated and Hazeltine Creek is no exception. Cameron undertook training for Colleen on the fundamentals of hydrometric monitoring, and specifically discussed the history of the Hazeltine Creek gauging station. This was presented as a combination of on-site and office training, over the two day site visit.

Summary & Recommendations

The site staff gauge, from which all gauge height and instrumentation data is to be corrected, has been restored to its originally installed height above the gauge datum (less 1 meter), as established in 1994. Bench mark values are given below.

Name	Description	WSC Value	Current Value
Bench mark 1	Lag Bolt on bridge piling on Right Bank opposite Recorder	1.981	0.981
Bench mark 2	Carriage bolt on 1/2“ redi-rod, 11 m d/s & 2 m in-shore on R.B.	1.976	0.976
Bench mark 3	Carriage bolt on 1/2“ redi-rod, 5 m d/s & 30 m in-shore on R.B.	3.419	2.419

It is recommended that these bench marks be located and tagged with the **ID** and **Value**, for future hydrometric bench mark surveying. Tagging could involve a simple aluminum tag, stamped with the aforementioned values, and stapled adjacent to the bench mark for rapid identification.

Should you have any questions or concerns about the work undertaken on site, please do not hesitate to contact the undersigned.

Yours truly,
KNIGHT PIESOLD LTD.

Signed:
Cameron Butt, P.Geo., PMP
Project Scientist

Reviewed:
Greg Smyth
Senior Project Manager

Approved
for Ken Brouwer, P.Eng.
Managing Director

Attachments:

Photo 1	Hazeltine Creek Gauging Station Chart Recorder and New Staff Gauge
Photo 2	Hazeltine Creek Gauging Station, New Staff Gauge Installation Showing Removable Lower Portion
Photo 3	Hazeltine Creek Gauging Station Chart Recorder and Original Staff Gauge.

/cmb

PHOTO 1 – Hazeltine Creek Gauging Station Chart Recorder and New Staff Gauge. Photo taken in April 2010 following installation of new staff gauge support. Notice that the gauge Height is ~0.300, and water level is at the weir crest.

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT

PHOTO 2 – Hazeltine Creek Gauging Station, new staff gauge installation showing removable lower portion

PHOTO 3 – Hazeltine Creek Gauging Station Chart Recorder and Original Staff Gauge. Photo taken in 1994. Notice that the gauge Height is ~0.200, and water level is ~0.1 m below weir crest

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT

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File No.:VA101-1/28-A.01
Cont. No.:VA10-00866

May 20, 2010

Mr. Ron Martel
Environmental Superintendent
Mount Polley Mining Corporation
P.O. Box 12
Likely, BC V0L 1N0

Dear Ron,

Re: Hazeltine Creek Weir Design

Mount Polley Mining Corporation (MPMC) requested that Knight Piesold Ltd (KPL) redesign the existing weir structure at the Hazeltine Creek gauging station. The purpose of the weir redesign was to fulfill requirements for a water release permit.

The following letter provides a brief overview of the existing weir, the conceptual details of the proposed new weir design, and an approximate construction schedule. Construction of the new weir is tentatively scheduled for mid to late 2010.

EXISTING WEIR DESIGN

A detailed hydrological analysis of Hazeltine Creek and a description of the problems associated with the existing control weir are presented in KPL Letter VA09-00317 (April 14, 2009).

The Hazeltine Creek Gauging Station (H7) was installed by Environment Canada in 1994. The control structure consists of a low, broad-crested, compound weir constructed of 4” by 4” lumber. The notch of the weir is rectangular, sitting approximately 0.1 m above the downstream bed of the creek. A cross-section of the existing weir is shown on Figure 1 and pictures looking upstream are shown in Photo 1 and Photo 2.

A number of problems have been identified that adversely affect the accuracy of measuring discharge with this weir. These problems are outlined below;

- **Backwater:** During medium and high flow events, downstream water levels rise above the existing weir crest. This has been attributed to several factors including the low control notch in the weir sitting very close to the creek bed, the uncontrolled growth of downstream vegetation that encroaches on the stream channel, and the shallow channel slope of the creek.
- **Structural instability:** The existing compound weir structure is deforming and leaking. Ice-loading in the winter is causing the weir to deform downstream, creating gaps between the lumber and causing leaks.
- **Low flow accuracy:** The low flow control is inaccurate as a result of flow over the rough timber broad-crested surface, in conjunction with leaks and deformation as outlined above.

PROPOSED NEW WEIR DESIGN

The proposed new weir is shown on Figure 1 and an approximate outline is shown in Photo 2. The weir consists primarily of a reinforced concrete structure that would tie into the existing bridge abutments on either side of the creek. Discharge would occur in a series of three stages, with two lower thin plate overflow sections and one higher concrete broad-crested section. Aluminum plates will be bolted to the face of the concrete structure to form the low and mid levels of the compound weir.

Stage 1 – Low Flow Control

The lowest stage of the weir utilizes a thin aluminum plate to increase measurement accuracy, as shown on Figure 1. The thin plate section consists of a 5 mm aluminum plate bolted and sealed to the upstream face of the concrete structure. The overflow edges of the plate would be chamfered to at least 45 degrees below a 2 mm flat surface. The low flow weir width is approximately 1 m and is situated in the centre of the exiting stream with its notch level with the ground surface and 30 cm above the bed. Figure 3 illustrates that the lowest stage of the weir has the capacity to contain the majority of non-freshet flows up to discharges of 0.11 m^3/s. Previous studies indicate that the maximum monthly non-freshet flow is approximately 0.07 m^3/s.

Stage 2 – Freshet Flow Control

The Stage 2 weir is designed to entirely contain freshet peak flows. The weir dimensions are sized to pass 3.6 m^3/s through the Stage 1 and 2 sections (the highest recorded flow in 15 years of data collection is 1.7 m^3/s). The Stage 2 structure consists of a rectangular weir extending 2.5 m on each side of the Stage 1 weir, and with a crest 0.15 m above Stage 1 crest. It will be constructed as a continuation of the 5 mm aluminum plate used for the Stage 1 weir, as shown on Figure 1

Stage 3 – Flood Control

Should discharges exceed 3.6 m^3/s, excess flow will pass over the Stage 3 weir, which will be comprised of broad-crested rectangular concrete weir sections extending beyond each side of the Stage 2 weir and tying into the bridge abutments, as shown on Figure 1.

Theoretical Rating Curve

A theoretical rating curve for the weir is shown on Figure 2, with the three stages of the weir clearly identified. Figure 3 displays the capacity of each weir stage in reference to the average annual hydrograph developed for Hazeltine Creek and outlined in KPL Letter Report VA09-00317. This figure indicates that the majority of the flow will be contained in the lower stages of the control weir.

In order to allow the provision of accurate and defensible discharge data, the new weir design must overcome the deficits in the existing design.

New Weir Design Considerations:

- **Backwater:** The proposed Stage 1 weir crest is situated approximately 20 cm higher than the existing weir's control notch. The proposed weir crest level roughly corresponds to the normal backwater height during freshet flow periods. Some thinning of downstream vegetation may be recommended to minimize backwater levels. It is expected that minor backwatering may result from the downstream Fish Ladder during high flows, but the effects of this will be minimal.

- **Structural Stability:** The proposed weir will be constructed of reinforced concrete. This will eradicate leakage, and be able to withstand water and ice loading forces imposed by the creek, without deformation of the structure.
- **Competent foundation:** The proposed design will have a concrete footing with dowels anchoring it into the creek bed. In order to prevent any erosion and footing undermining as a result of weir overflow, a thin concrete apron will be constructed downstream of the weir.
- **low flow accuracy:** The proposed design utilizes a thin plate weir crest to increase measurement accuracy during the low flow periods
- **Fish migration:** The proposed design utilizes a small fish ladder downstream of the low flow section that has been sized to allow the passage of juvenile rainbow trout fish species. The design conservatively uses a step size of 15 cm. Various literature sources suggest a maximum step size of 30 cm for juvenile species.

CONSTRUCTION VOLUMES AND SCHEDULING

Concrete and grouted riprap is required to complete the main construction of the weir. Approximately 7.5 m^3 of concrete is required for the weir foundation and bulkheads. An additional 3 m^3 of grouted riprap will be required for the downstream apron and fish ladder. A 5 mm Aluminum plate be required to be fabricated and installed on the upstream edge of the weir bulkheads.

Construction is intended to take place in mid to late 2010, when flows are low and can be easily diverted via pumping for the duration of construction. It is intended that a temporary sand bag coffer dam be installed upstream to capture water for pumping. Once all necessary permits have been obtained, construction will be undertaken using the following approach;

1. Environmental construction works, flow diversion & sediment control
2. Foundation excavation
3. Dowel anchoring and reinforcement
4. Concrete weir pouring, shaping and smoothing
5. Fish ladder construction, and
6. Weir Plate placement, sealant and installation.

The total in-creek construction time has been conservatively estimated to be 4-5 days. However, efficiencies in construction can reduce this estimated time.

REMARKS

The proposed new weir design addresses the deficits in the previous design by elevating the weir crest level and creating a more robust structure to withstand the natural forces imposed by the creek. Elevating the weir crest will eliminate the backwater problems and the thin plated weir will increase discharge measurement accuracy for the non-freshet low flow periods.

Should you have any questions or comments on the proposed design, please do not hesitate to contact us.

Yours truly,
KNIGHT PIESOLD LTD.

Signed:
Jeff FitzGerald, E.I.T.
Staff Engineer

Reviewed:
Cameron Butt, P.Geo., PMP
Project Scientist

J. G. CATHCART
May 20, 2010

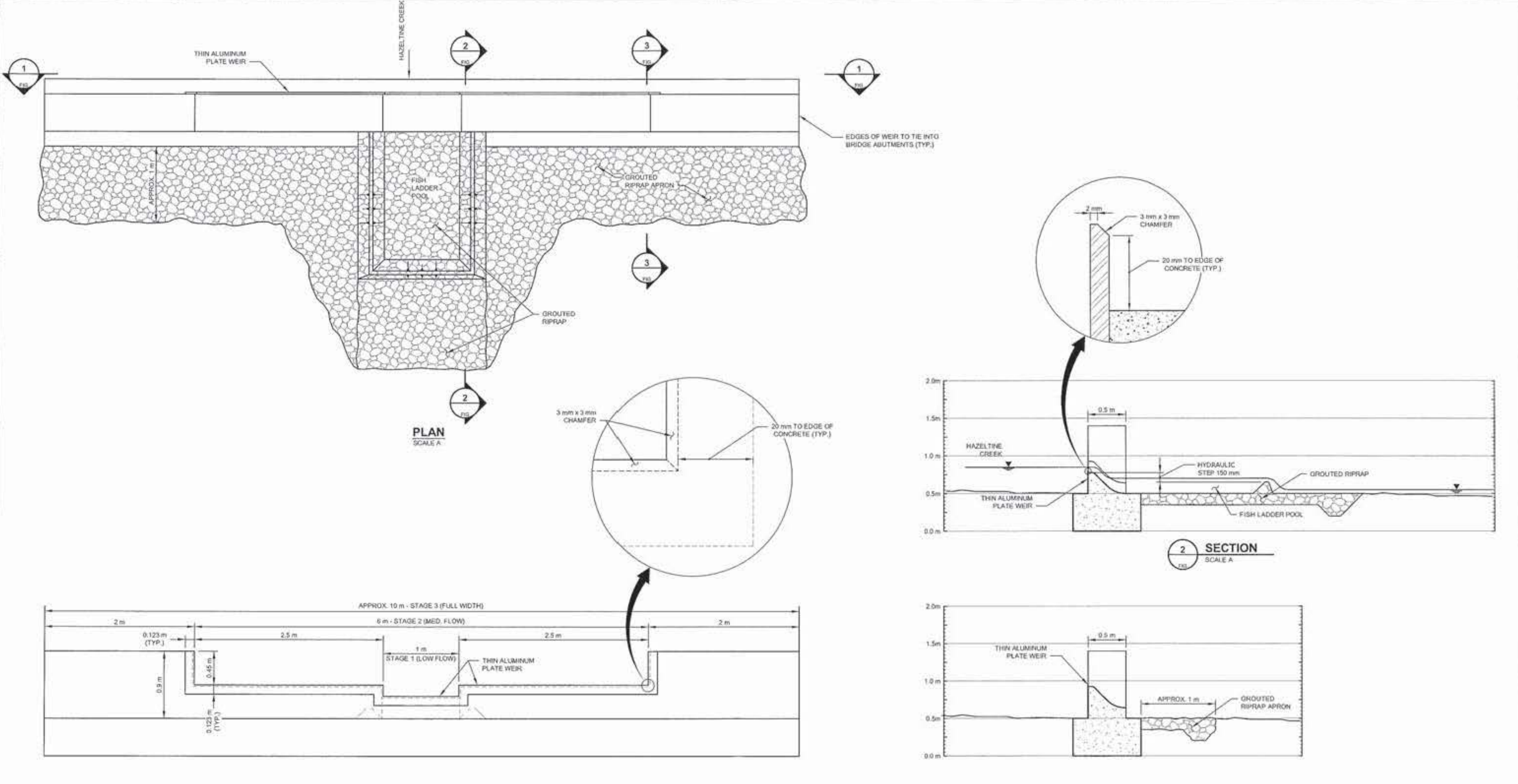
Reviewed:
Jaime Cathcart, PhD, P.Eng.
Specialist Hydrotechnical Engineer

Approved:
Ken Brouwer, P.Eng.
Managing Director

Attachments:

Figure 1 Rev 0	Proposed Compound Weir Plan and Sections
Figure 2 Rev 0	Theoretical Flow Over Proposed Hazeltine Creek Weir
Figure 3 Rev 0	Estimated Hazeltine Creek Hydrograph
Photo 1	Existing Weir
Photo 2	Existing Weir and Approximate Profile of New Weir Structure

/cmb



PLAN
SCALE A

1 SECTION
UPSTREAM ELEVATION
SCALE A

2 SECTION
SCALE A

3 SECTION
SCALE A

NOT FOR CONSTRUCTION

SCALE A 0.5 0.25 0 0.5 1.0 1.5 2.0 2.5 m

NOTES:

1. REINFORCEMENT STEEL AND ANCHOR DOWELS NOT SHOWN.
2. FOUNDATION CONDITRIONS ARE UNKNOWN, EXACT DIMENSIONS MAY BE SUBJECT TO CHANGE DURING FIELD INSTALLATION.
3. FISH LADDER HYDRAULIC STEP SIZE IS INTENDED TO BE 150 mm DURING LOW FLOW PERIODS.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	17MAY'10	ISSUED WITH LETTER	JMF	TAM	CMB	JGC

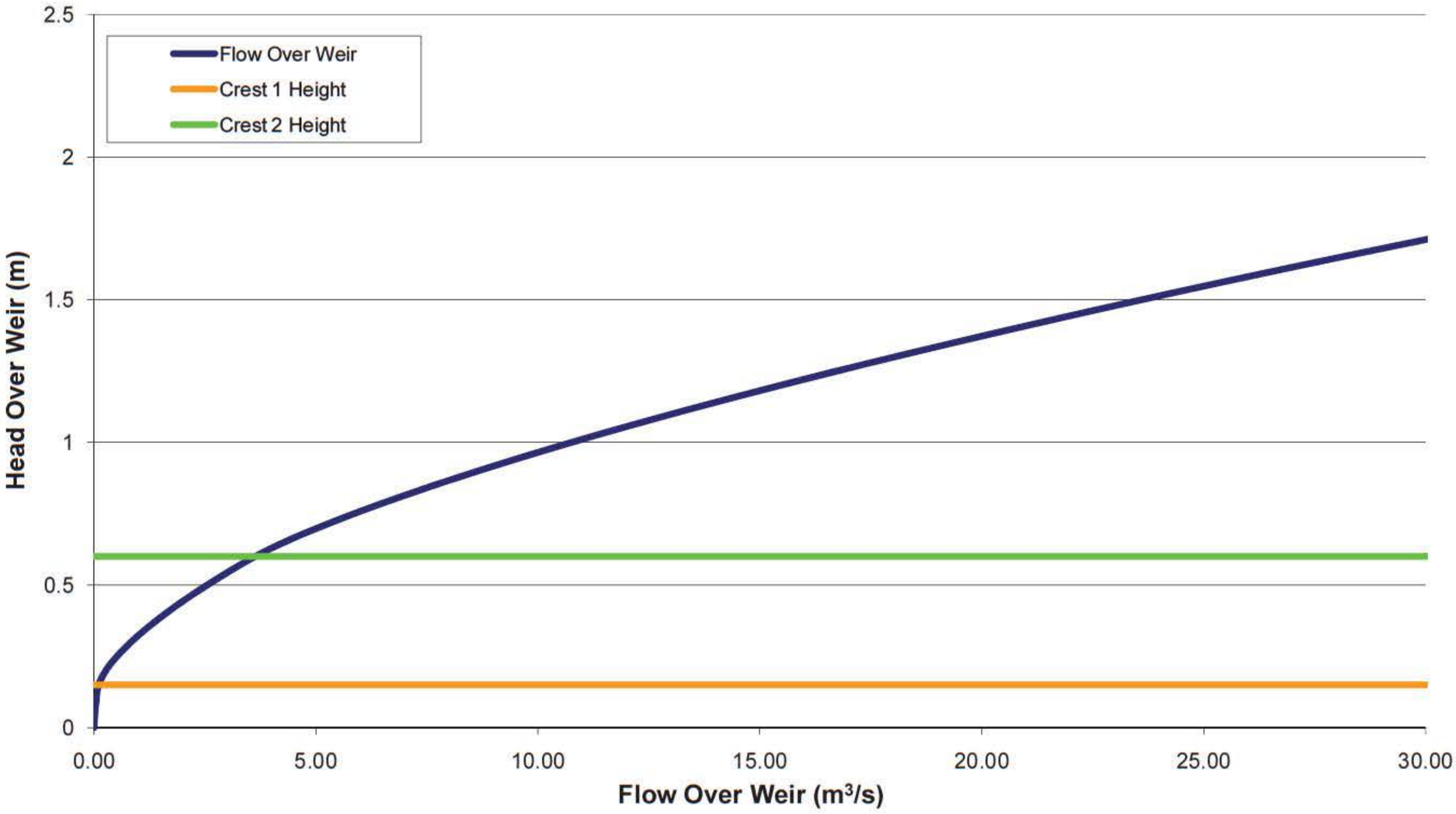
MOUNT POLLEY MINING CORPORATION

HAZELTINE CREEK WEIR DESIGN

PROPOSED COMPOUND WEIR
PLAN AND SECTIONS

Knight Piésold
CONSULTING

P/A NO. VA101-1/28
REF NO. VA10-00866
FIGURE 1
REV 0



MOUNT POLLEY MINING CORPORATION

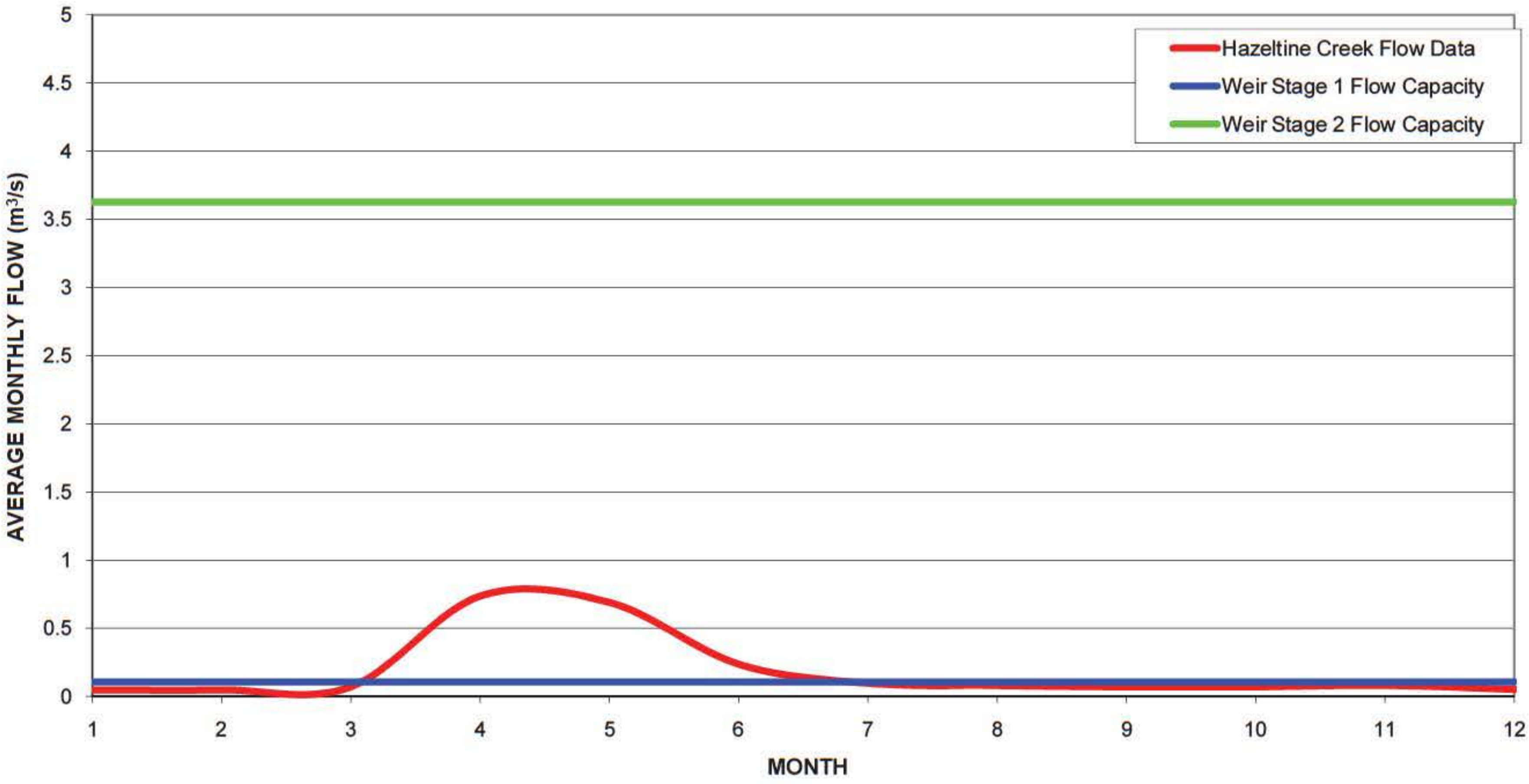
HAZELTINE CREEK WEIR DESIGN

THEORECTICAL FLOW
OVER PROPOSED HAZELTINE CREEK WEIR

Knight Piésold
CONSULTING

P/A NO. VA101-1/28	REF. NO. VA10-00866
FIGURE 2	REV 0

0	18MAY'10	ISSUED WITH LETTER	JF	CB	JGC
REV	DATE	DESCR PTION	PREP'D	CHK'D	APP'D



NOTES:

1. HAZELTINE CREEK FLOW DATA FROM PREVISOULY ISSUED LETTER VA09-00317.

MOUNT POLLEY MINING CORPORATION

HAZELTINE CREEK WEIR DESIGN

ESTIMATED HAZELTINE CREEK HYDROGRPAH

Knight Piésold
CONSULTING

P/A NO. VA101-1/28

REF. NO. VA10-00866

FIGURE 3

REV 0

0	18MAY'10	ISSUED WITH LETTER	JF	CB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

PHOTO 1 – Existing Weir

PHOTO 2 – Existing Weir and Approximate Profile of New Weir Structure.

MOUNT POLLEY MINING CORPORATION
HAZELTINE CREEK WEIR DESIGN

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File No.:VA101-1/29-A.01
Cont. No.:VA10-01175

July 22, 2010

Mr. Ron Martel
Environmental Superintendent
Mount Polley Mining Corporation
P.O. Box 12
Likely, BC V0L 1N0

Dear Ron,

Re: Mount Polley Tailings Storage Facility
Instrumentation Repair, Productivity Upgrade and Remote Monitoring Capacity

Introduction

The Mount Polley Mine Tailings Storage Facility is a large earth and rock fill embankment located in central British Columbia. The Tailings Storage Facility is monitored on a regular basis to ensure safety, as an early warning of undesirable conditions and to confirm the structure meets or exceeds regulatory requirements. The regulatory requirements include regular dam safety reviews by a suitably qualified and experienced engineer. The most recent dam safety review was completed by AMEC in late 2006. This review indicated that there is "about the right" amount of instrumentation in the embankment but there is little redundancy. The dam safety review recommended that lost instrumentation be re-established, Knight Piésold (KP) agrees with this recommendation.

The two major types of instrumentation in the Tailings Storage Facility (TSF) are piezometers and inclinometers. The piezometers provide information on the internal water pressure in various parts of the embankment and foundation. The piezometers are all vibrating wire (VW) type instruments. VW piezometers are widely used in geotechnical instrumentation, are generally robust and have a long life span. However, over time there have been failures of instrumentation and damage to data cables resulting in non-functional instrumentation. The inclinometers are industry standard slotted pipe that is read by a manually operated probe.

This letter summarizes the replacement of instrumentation and highlights two options for improving the TSF instrumentation, as follows:

- A **Base Case** to replace non-functional instrumentation to develop a satisfactory level of TSF instrumentation
- A **Productivity Improvement** to significantly reduce the amount of time required to complete routine monitoring of the TSF instrumentation, and
- The installation of **Remote Monitoring** capability for instrumentation on the TSF.

An estimated cost has been developed for the replacement and modifications to the TSF instrumentation. The estimated cost for instrumentation includes input from sole sourced suppliers for the major expense items. The cost estimate is to establish the approximate cost of each option and some efficiencies may be achieved by a soliciting a more detailed bid of the work required.

Current TSF Instrumentation Status

The installed instrumentation in the TSF includes a total of 91 piezometers and 5 inclinometers. Of these 48 piezometers are functional and 43 piezometers are not functional, 4 inclinometers are functional and 1 is not functional. The inclinometers are all installed in the main embankment. The functional inclinometers include 3 that are generally showing minimal movement and 1 inclinometer that shows localized movement.

The distribution of non-functioning piezometers is not random and a large portion of the Main Embankment foundation instruments have stopped functioning. In total 20 piezometers have been installed in the Main embankment foundation and 7 (35%) are functional. All 6 of the foundation piezometers in the A instrumentation plane have been damaged, 2 piezometers remain functional in the B instrumentation plane. This is the main area of concern due to a low strength glaciolacustrine unit that underlies a portion of the Main Embankment including the A and B instrumentation planes. The inclinometers and Main Embankment foundation piezometers are installed to monitor this glaciolacustrine unit. The TSF monitoring program is in part to confirm that the displacement and pore pressure in the glaciolacustrine unit are within acceptable limits.

The Ministry of Energy Resources, Petroleum and Mines (MEMPR) have previously expressed concerns about the characterization and behavior of the glaciolacustrine unit under the Main Embankment. A point of concern that has been raised by MEMPR is the amount of laboratory testing available to define the strength of the glaciolacustrine unit.

Base Case

The base case is to replace non-function VW piezometer instrumentation and install a level of redundancy in the VW piezometers. The collection of samples for laboratory testing can be completed at the same time as drilling the new instrumentation holes. This base case is a minimum level of replacement TSF instrumentation required. The base case includes the following:

- 5 holes in the TSF main embankment for replacement instrumentation. Of these drill holes, 2 holes 60 m deep will be drilled from the crest of the dam and 3 holes 25 m deep will be drilled from the dam buttress. A total drilling length of approximately 200 m is estimated.
- Install inclinometer casing in all holes.
- Install 4 VW piezometers in each hole (3 as replacement instruments and 1 for redundancy).
- Recovery of samples of the glaciolacustrine unit for laboratory testing.
- Laboratory testing of samples from the glaciolacustrine unit.

The drilling costs are based on a cost estimate by Geotech Drilling attached in Appendix A. The drilling cost estimate includes for inclinometer supply and installation, VW piezometer installation and soil sampling. The drilling cost estimate should be considered as an approximate cost as adjustments to the program are likely required. The KP costs and laboratory testing costs have been estimated by Knight Piésold.

Productivity Improvement

The productivity upgrade includes everything described in the Base Case and additional items to significantly reduce the time and complexity of instrumentation monitoring. The goal is to reduce the work load and time taken monitoring the TSF. An additional benefit is automation is expected to improve the accuracy of the data. Two additional items are proposed:

1. Centralize the location of VW piezometer reading points. This will include developing an upstream and downstream readout location on each embankment. The readout locations would collate the data collection for the instrumentation planes and provide a common interface. The piezometer cables would be extended and routed to the appropriate readout location. For example, on the Perimeter Embankment a downstream readout location would be installed in the vicinity of the seepage collection pumps house. The VW piezometer cables from the 3 instrumentation planes in the perimeter embankment would be routed to the readout location. The cost for establishing centralized readout locations has been estimated by KP.

2. Install a fixed inclinometer consisting of a ShapeAccelArray from Measurand in the existing inclinometer that is showing deflections. A ShapeAccelArray (SAA) is a comparatively new method in geotechnical engineering for monitoring deflections in inclinometers. The SAA is significantly faster and easier to read using a laptop computer. A SAA is cheaper to automate compared with traditional inclinometers. A brochure for the ShapeAccelArray is attached.

   The installation of an SAA will allow automation of the inclinometer. Automation will facilitate regular inclinometer readings collected remotely from the Mount Polley site office. The readings from a fixed inclinometer can be completed very rapidly in a small fraction of the time currently required to complete an inclinometer survey. A cost estimate for an inclinometer SAA and remote retrieval package from Measurand is attached. The cost of automation is approximately 60% of the quoted cost and savings could be made by electing to complete manual readings using a laptop. This cost estimate is approximate and may be adjusted based on the data retrieval method selected by Mount Polley Mine.

Remote Monitoring

The remote monitoring of all of the geotechnical instrumentation is possible. The remote monitoring would require the work described in the Base Case and Improved Productivity. In addition the VW piezometers would be monitored by a remote solar powered system and radio communications system. The current inclinometers would all have arrays installed and would be able to be remotely read. A cost estimate for the VW piezometer readout system has been provided by Measurand and is attached.

Summary

The instrumentation at the Mount Polley TSF has experienced damage over time. The replacement of some of the non-functional instrumentation is now necessary. This letter details the base cost to replace non-functional instrumentation and summarizes opportunities for reduced the difficulty and time required for TSF monitoring. The monitoring of the TSF instrumentation requires a reasonable time investment by Mount Polley Mine staff and/or KP staff. Two systems to reduce the time required to monitor the TSF and the setup cost to implement the systems are summarized.

It is recommended that the TSF instrumentation replacement be completed this year. To help satisfy concerns previously raised by MEMPR it is recommended that the replacement instrumentation should be either installed or at an advanced planning stage in time for the annual inspection of the Mount Polley TSF.

The estimated cost for the replacement of non-functional piezometers and installation of additional slope inclinometers is in total $195,000, the total cost for the alternative option to simplify the monitoring of the TSF is estimated to be $230,000. The total cost for a second alternative for remote monitoring of the TSF geotechnical instrumentation is estimated to be $310,000. A breakdown of the estimated costs is included on Table 1. We trust this information will assist you in planning for the TSF. Please contact us if you have any questions or would like additional information on the described systems.

Yours truly,
KNIGHT PIESOLD LTD.

Prepared by:
Greg Johnston, M.Sc.
Engineering Geology and Geotechnical Specialist

for
Approved:
Ken Brouwer, P.Eng.
Managing Director

Attachments:

Table 1 Rev A	Cost Estimate

Geotech Drilling – Cost Estimate
Measurand – ShapeAccelArray (SAA) Brochure
Measurand – Quote 38 – Fixed Inclinometer
Measurand – Quote 40 – Remote Monitoring of VW Piezometers

/gj

TABLE 1

MOUNT POLLEY MINING CORPORATION
TAILINGS STORAGE FACILITY

INSTRUMENTATION REPLACEMENT
COST ESTIMATE

Option	Item	Item Cost	Total
Base Cost			
	Drilling	$130,000	
	Replacement VW Piezometers	$15,000	
	Laboratory testing	$20,000	
	Knight Piesold site and office support	$30,000	
	Total		**$195,000**
Productivity Improvements			
	Base Cost plus the following	$195,000	
	Mount Polley Excavator for 3 days (NOTE 1)		
	VW piezometer cable and readout locations	$7,000	
	Fixed Inclinometer	$23,000	
	Knight Piesold site support	$5,000	
	Total		**$230,000**
Remote Monitoring			
	Productivity Improvements plus the following	$230,000	
	Additional fixed inclinometers	$28,000	
	Remote monitoring for VW Piezometers	$44,000	
	Knight Piesold site support	$8,000	
	Total		**$310,000**

M:\1\01\00001\29\A\Correspondence\VA10-01175 - Instrumentation Replacement\Tables\[Table 1 - Cost Est.xlsx]Sheet1

NOTES:

1. MOUNT POLLEY MINE EXCAVATOR TIME NOT INCLUDED

A	22JUL'10	ISSUED WITH LETTER VA10-01175	GL	GIJ	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Geotech DRILLING | Cost Estimate

Bill to: **Knight Piesold Ltd.**

Care of: Knight Piesold Ltd.
1400 750 West Pender Street
Vancouver, BC V6C 2T8

ATTN: Mark Smith/Greg Lewsley
Tel: 1-604-685-6543
Email: msmith2@knightpiesold.com

Date: Tuesday, October 27, 2009
Revised No./Date: 5-Jul-10
Project Manager: Ryan Samis
Cost Estimate No.: 1KRS10-0043
Unit No. (Drill Rig): Odex/Mud Rotary Drill
Location: Mount Polley
Province: BC

Scope: This cost estimate is for 5 boreholes to 40 meters (130 ft) with 2 vibrating Wire installs per hole. 4 boreholes to 30 meters (100 ft) with 2.75" SI casing installed, and 3 boreholes to 30 meters (100 ft) with 2" monitoring wells installed. Soil coring (HQ3) will be required in the last 40 ft of the vibrating well installs, and the last 75 ft of the inclinometer holes. No sampling required in monitoring well holes.

Itm	Qty	Unit	Description	Price	Extended
1	190	hrs	Odex Drilling / Soil Coring	275.00	52,250.00
2	70	hrs	Overtime (after 8 hours, weekends, stats/two man crew)	65.00	4,550.00
3	1	L/S	Mob / Demob to Mount Polley	2750.00	2,750.00
4	54	hrs	Crew travel	149.00	8,046.00
5	19	shift	Support vehicle(truck mount)	249.00	4,731.00
6	19	shift	Crew subsistence (two man crew)	279.00	5,301.00
7	19	shift	Air compressor (300/200)	425.00	8,075.00
8	19	shift	Grout pump /Mud Pump Rental	199.00	3,781.00
9	9	hrs	Safety meeting	149.00	1,341.00
10	500	ft	Diamond Bit Wear Consumption	19.50	9,750.00
11	850	ft	Odex bit wear consumption	5.75	4,887.50
12	16	shift	High Pressure Diamond Pump Rental	249.00	3,984.00
13					-
14					-
15	27	10 ft	P - Solid 1", 1.5" or 2" p.v.c. well casing	36.87	995.49
16	3	10 ft	P - Slotted 1", 1.5" or 2" p.v.c. well casing	49.45	148.35
17	6	ea	P - 1", 1.5" or 2" slip caps	3.45	20.70
18	650	ft	P - 1" PVC (for Vibrating wire installs)	1.87	1,215.50
19	40	10 ft	P - 2.75" Slope Inclinometer	148.35	5,934.00
20	3	ea	P - 2.75" Slope Inclinometer Top Cap	6.90	20.70
21	3	ea	P -2.75" Slope Inclinometer Grout Anchor	417.00	1,251.00
22	60	bags	P - Bentonite Chips (Possible Option)	28.55	1,713.00
23	22	bags	P - Sand	15.52	341.44
24	105	5 ft	P - Acrylic Liners for Soil Coring	20.40	2,142.00
25	15	bags	P - Premix grout	34.44	516.60
26	12	bags	P - Fast Set Concrete	17.25	207.00
27	36	bags	P - Portland Cement	23.75	855.00
28	12	ea	P - Stand up casing protectors	109.25	1,311.00
29					-

Terms & Conditions: E. & O.E. Cost Estimate valid for 60 days. Underground / Overhead utilities are the sole responsibility of the client. Lost, broken or unrecoverable tooling will be charged at cost plus 15%. Cancellation fees & restocking charges may apply if less than 48 hours notice. Invoice Payment terms: Upon Receipt. 2% interest charges will apply on past due accounts.. Invoice considered accepted and approved 15 days after receipt unless written notification is received.

Overtime is applicable after 8 hours, weekends, and statutory holidays

Subtotal	$	**126,118.28**
P.S.T.	$	**1,167.02**
G.S.T.	$	**6,305.91**
TOTAL DUE	$	**133,591.22**

Line items beginning with P denote PST chargeable items

British Columbia

5052 Hartway Drive • Prince George • British Columbia • Canada • V2K 5B7

Tel: (250)962-9041 • **Fax**: (250)962-9046 • **Web: geotechdrilling.com**

Promotion Code:

Thank You for Your Business!

Frequently Asked Questions

How long is a typical SAA?

Most Field SAAs are near 32 m (104'). Most Research SAAs are 7.32m (24') long. Lengths up to 100m (300') are possible.

How long are the rigid segments in an array?

Standard joint-center to joint-center lengths are 305 mm (12") and 500 mm (19.7").

Do I need a casing for SAAs?

SAA should be installed in 27mm (1.05") ID casing (inexpensive PVC electrical conduit). The array and casing are flexible enough to survive deformations of tens of cm (feet). The 27 mm casing will fit into inclinometer casing, enabling recovery of some defunct SI sites.

Can I re-use an SAA?

After typical deformations, SAA may be removed from the casing and installed elsewhere.

For more information on ShapeAccelArray and other Measurand products:

measurand
SHAPE ADVANTAGE

2111 Hanwell Rd
Fredericton, NB CANADA
E3C 1M7
(ph)506.462-9119
(fax)506.462-9095
www.MeasurandGeotechnical.com
www.measurand.com

measurand
SHAPE ADVANTAGE

ShapeAccelArray (SAA)

Introduction

SAA is an array of rigid segments separated by special joints. Triaxial MEMS gravity sensors in the segments measure tilt. SAA produces data equivalent to inclinometer data but over much larger deformations. SAA may be used vertically to track magnitude and direction of lateral deformation, and horizontally to track vertical deformation. In any pose, 3D vibration data are available from selected locations along the array.

There are two basic types: Field and Research. Each is available in increments of 8 segments, where standard segment lengths include 305 mm (12") and 500 mm (19.7").

The main distinctions are speed, number of segments, and power consumption.

SAAF
(Field Arrays)

SAAF is designed for solar-powered installations with wireless communication. SAAF may be up to 100 m long. Long-term accuracy for 30 m (96') SAAFs is 1.5 mm (0.06").

Vibration data are available from up to 3 segments along the array at 40 Hz sampling, and at 35 Hz from 4 segments.

All communication in the array is digital. Data are carried in a small cable to a digital logger. Most installations use solar power and provide wireless data over the internet.

SAAR
(Hi-Bandwidth Research Arrays)

SAAR is designed to collect high frequency data from all sensors continuously.

Each microprocessor in an SAAR (1 microprocessor per 8 segments) has a dedicated communication line.

SAAR can be supplied with up to 24 high-speed segments.

measurand
SHAPE ADVANTAGE

Quotation

Quote Prepared For

Greg Lewsley
Knight Piesold
750 West Pender Street
Suite 1400
Vancouver, BC V6C 2T8 CAN
(604) 685-0543 Fax: (604) 685-0147

Quote Date	Jun-24-2010
Quote Number	38
Sales Contact:	**DJ Snodgrass**

Quote for 2 holes with remote data retrieval

Item	Description	Qty	Price	DD	Extended Price
SAAF500	SAA Field Octet (0.5 m segments)	4	$1,673.30		$6,693.20
Enclosure	Earth Station Enclosure	1	$993.25		$993.25
SAAReg	SAA Charge Regulator	1	$269.10		$269.10
SAA232	RS485 to RS232 converter w/Power switching	2	$450.15		$900.30
¶*ProSupport	Project Support Time Installation assistance cost (Inclusive)	1	$5,000.00		$5,000.00
Custom	Radio package for retreival of data (Includes Radios, Antennas and mounting Hardware)	1	$3,700.00		$3,700.00
SAAUSB	RS485 to USB PC connection kit for SAA	1	$596.90		$596.90
*CR1000	Campbell Scientific CR1000 Datalogger	1	$2,397.45		$2,397.45
CR1000IntPack	SAA-CR1000 Integration Package	1	$978.55		$978.55
Solar20W	20 Watt Solar Panel	1	$391.40		$391.40
SolarBracket	Solar Panel Bracket	1	$97.85		$97.85

Total Items	**$22,018.00**
Labor / Shipping	**$0.00**
Harmonized Sales Tax Exempt	**$0.00**
Total Quote	**$22,018.00**

All Quotes are valid for 60 Days. All Pricing are in USD unless otherwise specified.
*** Denotes Distributor discounts do not apply**
¶ Please contact Measurand Inc. Prior to ordering

NOTES:

(1) a) Unless otherwise specified, SAAs have no unsensorized segment at the far end;
b) Unless otherwise specified, SAAs have one unsensorized segment at the near end that provides an attachment point and junction to the cable. This segment and a stiffer portion of the cable occupy approximately 30 cm (1') "extra" beyond the length of sensorized segments. The cable can

be turned 90 degrees within this dimension. When planning installation depth, this "extra" length must be accounted for;

c) SAAFs are built in groups of 8 segments called octets. A SAAF may be ordered with a partial octet (example: 14 segments instead of the standard 2 x 8 = 16 segments). Because this entails a special production run, pricing is per fully populated octet. For the example above, this entails pricing for 2 octets (16 segments instead of 14).

(2)Payment Terms: Net 30 days from time of shipping. Overdue accounts will be subject to interest and penalties;

(3)Freight charges not included in total prices unless otherwise specified. Please indicate preferred shipping method on purchase order. Freight charges will be added at time of sale;

(4)Applicable taxes will be calculated and added at time of sale

Components Description:
See “Specification/Ordering List” and “Ordering Guide” at www.MeasurandGeotechncial.com/downloads” for assistance in interpreting the quoted components, dimensions, and installation variables.

Not included in the above:
Drilling
Casing
Excavation
Backfilling
Lift equipment
Security fencing
Electrical supply
Lightning protection

All quoted items are FOB Fredericton, New Brunswick, Canada. Any shipping and taxes due will be the responsibility of the customer
Prices: Prices are subject to change without notice.

Terms & Conditions Concerning Delivered Products

1. Warranty: Measurand Inc. Warrants that its products are free from defects in material and workmanship for a period of one (1) year from date of delivery unless otherwise specified by Measurand Inc. In writing. This warranty applies only if the products have not been opened and have not been subjected to misuse, neglect, accident or improper installation or care. Said improper care includes but is not limited to supply of power not as specified by Measurand Inc. If Measurand Inc. Products fail due to no fault of the Buyer, Measurand Inc. Will, at its option, either repair the defective product and restore it to normal operation without charge for parts and labor or will provide a new replacement product in exchange for the defective product. Repair work shall be warranted for the remainder of the original warranty period or for a period of 60 days, whichever is longer. Measurand Inc. Hereby disclaims any implied warranty of merchantability.

2. Limitations of Liability: In no event will Measurand Inc. Be liable for any indirect, incidental or consequential damages or any lost profits or like expectancy damages arising out of the delivery of its products. Measurand Inc.’s liability for personal injury and/or property damage shall not exceed its general liability insurance policy limitations.

3. Inspection and Rejection of Products: Buyer shall notify Measurand, Inc., within seven (7) business days after receipt, of the discovery of any defects in delivered products and/or its acceptance/non acceptance thereof; otherwise, it shall be deemed to have accepted the products.

4. Return Goods Authorization: Measurand Inc. Shall not accept returned or rejected products/parts unless first authorized with a return merchandise authorization (RMA) number. The Buyer is responsible for handling, insurance and transportation of unit to Measurand Inc. Measurand Inc. Shall be responsible for inspecting the unit and repair as necessary. Measurand Inc. Shall pay for the return of the repaired/new unit to the Buyer via Ground Transportation only.

5. Title & Delivery: Title/risk of loss or damaged goods shall pass to the Buyer upon Measurand Inc. Delivery of products. Measurand Inc. Shall retain a security interest with repossession rights for products shipped on open account until all obligations are met. The delivery date is an estimate only, based on a best forecast of conditions at time of order entry. Neither party shall be liable to the other party for any failure to perform any of its obligations under this Agreement during any period in which such performance is delayed by circumstances beyond its reasonable control including, but not limited to fire, flood, war, terrorism, embargo, strike, constrained markets, riot or the intervention of any governmental authority (“Force Majeure”). In such event, however, the delayed party must promptly provide the other party with written notice of the Force Majeure. The delayed party’s time for performance will be excused for the duration of the Force Majeure, but, if the Force Majeure event lasts longer than thirty (30) days, the other party may immediately terminate the Agreement by giving written notice to the delayed party.

6. Delivery Times/Expedited Delivery: Standard Delivery time is 3 4 weeks ARPO. In some cases, expedited delivery may be possible. Measurand Inc. Reserves the right to apply
an expedite fee of 10% of the total cost of the equipment purchased or a minimum charge of $200.00 USD, whichever is greater.

7. BIS: The US Bureau of Industry and Security (BIS) may limit exports of USA made goods to certain individuals and organizations. A license application may need to be completed and submitted to Measurand before equipment may be shipped.

Quotation

Quote Prepared For

Greg Lewsley
Knight Piesold
750 West Pender Street
Suite 1400
Vancouver, BC V6C 2T8 CAN
(604) 685-0543 Fax: (604) 685-0147

Quote Date	Jun-28-2010
Quote Number	40
Sales Contact:	**DJ Snodgrass**

Quote for datalogging equipment for monitoring Peizometers around site.

Item	Description	Qty	Price	DD	Extended Price
Custom	10 installations for monitoring Peisometers. Can monitor multiple probes on each station Item includes logging equipment as well as radio communications to allow for one collection point via radio.	1	$38,733.00		$38,733.00
Solar20W	20 Watt Solar Panel	11	$391.40		$4,305.40
SolarBracket	Solar Panel Bracket	11	$97.85		$1,076.35

Total Items	**$44,114.75**
Labor / Shipping	**$0.00**
Harmonized Sales Tax Exempt	**$0.00**
Total Quote	**$44,114.75**

All Quotes are valid for 60 Days. All Pricing are in USD unless otherwise specified.

*** Denotes Distributor discounts do not apply**

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Electrical supply
Lightning protection

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2. Limitations of Liability: In no event will Measurand Inc. Be liable for any indirect, incidental or consequential damages or any lost profits or like expectancy damages arising out of the delivery of its products. Measurand Inc.'s liability for personal injury and/or property damage shall not exceed its general liability insurance policy limitations.

3. Inspection and Rejection of Products: Buyer shall notify Measurand, Inc., within seven (7) business days after receipt, of the discovery of any defects in delivered products and/or its acceptance/non acceptance thereof; otherwise, it shall be deemed to have accepted the products.

4. Return Goods Authorization: Measurand Inc. Shall not accept returned or rejected products/parts unless first authorized with a return merchandise authorization (RMA) number. The Buyer is responsible for handling, insurance and transportation of unit to Measurand Inc. Measurand Inc. Shall be responsible for inspecting the unit and repair as necessary. Measurand Inc. Shall pay for the return of the repaired/new unit to the Buyer via Ground Transportation only.

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From: Ken Brouwer
ent: Wednesday, October 20, 2010 4:12 PM
.o: Greg Johnston; Les Galbraith; Gregory Smyth
Cc: Jeremy Haile
Subject: FW: Request For Proposal #MP-100 - Tailings Impoundment Design Services, Mt. Polley
Attachments: 2005 TSF Capacity vs Elevation Curve (KP).pdf; 2006 Dam Safety Review (AMEC).pdf; 2008 Capacity of Existing Mine Tailings Line (KP).pdf; 2010 Mount Polley Flyover.jpg; 2010 Stage 6b IFC Drawings (KP).pdf; RFP #MP100 Tailings Design.pdf

FYI.
Due Nov 5th.
Cheers,
Ken

From: Denis Bernardi [mailto:DenisBernardi@imperialmetals.com]
Sent: October-20-10 4:05 PM
To: Denis Bernardi
Cc: Don Parsons
Subject: Request For Proposal #MP-100 - Tailings Impoundment Design Services, Mt. Polley

Please find our request for proposal attached for the above inquiry, along with the following attachments;

- 2005 TSF Capacity vs. Elevation Curve (KP)
- 2006 Dam Safety Review (AMEC)
- 2008 Capacity of Existing Mine Tailings Line (KP)
- 2010 TSF Stage 6b IFC Drawings (KP)
- 2010 Mount Polley Flyover (MPMC)
- 2009 TSF Report on 2009 Annual Inspection (KP) (due to its size, it will be forwarded upon acceptance to submit a proposal)

Kindly review and advise on your intent to submit a proposal.

Regards.

Denis Bernardi
Manager, Contracts & Purchasing

Imperial Metals Corporation
#200 - 580 Hornby Street
Vancouver, BC V6C 3B6
Direct: 604-488-2682

MOUNT POLLEY MINING CORPORATION
200 – 580 Hornby Street
Vancouver, B.C., Canada V6C 3B6
Tel: 604.669.8959 Fax: 604.687.4030

October 20, 2010

Subject: Request For Proposal #MP-100

You are hereby invited to submit your proposal for providing design services for the Tailings Impoundment at the Mount Polley mine in accordance with requirements contained in the following attachments:

ATTACHMENT A -	INSTRUCTION TO BIDDERS
ATTACHMENT B -	SCOPE OF SERVICES/GENERAL DESCRIPTION
ATTACHMENT C -	MEMORANDUM OF AGREEMENT (Sample)
ATTACHMENT D -	GENERAL CONDITIONS

Proposals shall be submitted IN DUPLICATE for receipt at Mount Polley's office **ON OR BEFORE 2:00 P.M., November 5, 2010**, TO THE ATTENTION OF DENIS BERNARDI. Proposals emailed to dbernardi@imperialmetals.com will be accepted. Proposals received after the time and date specified will not be considered.

Any and all costs incurred by the bidder in the preparation and submission of a proposal shall be the responsibility of the bidder.

The award decision is based upon a selective competitive bid process. The lowest, or any proposal, may not necessarily be accepted.

Please proceed with your evaluation of this package and confirm in writing your intention to submit a Tender or otherwise, on or before October 26, 2010.

If you would like to schedule a site visit, kindly contact Ron Martel, Environmental Superintendent at 250-790-2215 ext. 409 or email rmartel@mountpolley.com.

We thank you in advance for your interest in this Project. Feel free to contact me regarding any aspect of this inquiry.

Yours truly,

Mount Polley Mining Corporation
Denis Bernardi
Manager, Contracts & Purchasing

We confirm our intent to tender
Yes **No**

Company Name

Representative Name & Signature

ATTACHMENT "A"
Instructions To Bidders

1.0 Intent

This RFP is not an offer to enter into an agreement with any party, but rather a request to receive proposals from entities interested in providing the products and/or services outlined herein. Such proposals shall constitute offers to enter into an agreement.

Bidders are advised that an agreement may or may not result from this RFP. Mount Polley's standard Agreement and General Conditions will apply to these agreements and are attached below.

Any deviations from this Agreement and General Conditions should be explained in detail with suggested alternate contract language provided as an attachment.

1.1 Contact Person

Each bidder is requested to designate one individual as its authorized contact person for all matters relating to this RFP.

1.2 Notice of Intention

All Bidders are requested to advise on their intent to submit a proposal by completing and returning a copy of the cover letter prior to the date indicated.

1.3 Submission Requirements

Bidders are required to submit an electronic copy of their bid by the time and date shown on the cover letter above. When received, Mount Polley will send an E-mail to confirm receipt. This E-mail softcopy bid **must** be received within the bid deadline. In addition, bidders are requested to submit **two (2)** hard copies of their proposals to the individual identified above. These hard copies **must** be received within two working days of the bid deadline.

1.4 Late or Incomplete Bids

Late or incomplete bids will not be considered.

1.5 No Liability for Costs or Expenses

Mount Polley will not be liable for any costs or expenses incurred by any bidder including, without limitation, any expenses incurred in the preparation and submissions of the bid.

1.5 Irrevocable Bid

The bid submitted is irrevocable by the bidder.

1.6 Changes to Bid

Bidders will not be permitted to alter their proposals once they have been submitted.

1.7 Oral Information

Any information given orally by Mount Polley employees or other third parties will not be binding nor will it be construed as a change to the RFP requirements.

1.8 Confidential Bids

Bid documents and all other documents and information given, or made available to Bidder pursuant to these Instruction to Bidders ("Bidding Information") are confidential. Bidder must not disclose any Bidding Information to any other person and may use the Bidding Information only for the purpose of preparing and submitting a Bid.

1.9 Incomplete Bids

Mount Polley reserves the right to reject any bid, whether or not completed properly and whether or not it contains all required information. Without prejudice to this right, Mount Polley may request clarifications where the bidder's intent is unclear and may request amendments where, in the opinion of Mount Polley, there are minor errors, inconsistencies, or omissions in the bidder's proposal.

1.10 Clarification

Mount Polley reserves the right to clarify any information contained in a proposal.

1.11 Award

Mount Polley reserves the right to accept or reject any or all proposals in whole or in part (including, without limitation, any of the optional proposals). Mount Polley will have the right to make an award to one or more bidders or not to proceed with the project whatsoever.

2.0 Proposal Format

Bidders are requested to prepared and submitted their proposals in the following format:

.1 Task Description Sheets

The format for a task description sheet is given in Attachment I. Subdivide your work program into tasks corresponding to distinct groupings of deliverable products and services. Project management activities should be included for each task. (If the proposal is selected, these task description sheets once negotiated to the mutual satisfaction of the Consultant and Mount Polley will form part of the contract for consulting services).

.2 Bar Chart Schedule(s)

Show schedule of activities for each task. The time scale shall be on week or day intervals.

Each task must be divided into activities with distinct start and finish dates. In particular, the schedule must show the activities leading up to the milestone event dates for the Consultant's work program. Preliminary milestone event dates are provided in Attachment B, Scope of Services / General Description. These dates will be discussed and confirmed after contract award.

.3 Staff Workload Plan

For each task, forecast the chargeable time for each staff member (or job classification) by month.

.4 Dollar Budget

Present a budget of the cost to be charged to Mount Polley for each task by month. A single page may be used to display this information for all the tasks in the work program.

All the charges associated with providing the deliverable product and services in a task must be included in the budget for the task. Disbursements and expenses must be allocated to individual tasks. Such charges may include travel, equipment, communications and printing charges.

ATTACHMENT I
FORMAT FOR TASK DESCRIPTION SHEET

Contract No : (Supplied by Mount Polley)

Task No. : (by Consultant)

Consultant : (Name of Firm)

Task Title : (Descriptive title, by Consultant)

Purpose : (Summary statement, in one or two sentences, of the reason why the task is required)

Input Required : (In point form, list the information you require from Mount Polley or other consultants in order to proceed on this task.)

Work Steps : (In point form, list the detailed work steps or activities which make up the task. Use this section to describe methods or techniques which will be employed in the conduct of the work.)

Deliverables : (In point form, list the tangible products or services that will be provided from this task. The deliverables define the scope of the task. Make reference to other documents, such as your proposal or earlier reports, as needed to make the definition of deliverables as specific as possible.)

Resource and Budget : (List the total staff consulting time, and expenses that make up the total budget for the task.)

Assigned Staff : (List the personnel or classification who will perform the work, by name.)

ATTACHMENT "B"
Scope of Services / General Description

REQUEST FOR PROPOSAL

Tailings Impoundment Life of Mine Design Services

For
Mount Polley Mining Corporation
Tailings Dam Expansion Project

Proposal closing date and time: Proposals shall be submitted IN DUPLICATE for receipt at Mount Polley's office **ON OR BEFORE 2:00 P.M., NOVEMBER 5, 2010**, TO THE ATTENTION OF DENIS BERNARDI. Email proposals to dbernardi@imperialmetals.com will be accepted, with hard copies to follow. Proposals received after the time and date specified will not be considered.

Request to notify of intent to submit proposal: Respondents are requested to notify Denis Bernardi no later than noon, October 26, 2010 if you intend to submit a proposal.

Purpose

The purpose of this Request for Proposal (RFP) is to select a consultant who can provide the most cost effective solution for the storage of an additional 50 million metric tonnes of tailings at the Mount Polley mine.

Background

MPMC is seeking a company or individuals to provide tailings disposal design services to identify and select the most cost effective method, on a cost per ton basis for storing the expanded tailings disposal volumes. The mine is located in south central British Columbia, 8 km southwest of Likely and 100 km (by road) northeast of Williams Lake.

Scope

The MPMC current tailings impoundment stores 45 M cubic meters at the supernatant 953 m elevation. The crest was elevated to 958.5m during the recent 2010 construction season. The next planned lift is summer 2011. A previous design completed by Knight Piesold indicates an ultimate capacity of 73 M cubic meters by increasing the dam crest elevation to 968 m as currently designed. MPMC's revised ore body reserves have extended the life of mine plan to 2017 and increases the additional tailings storage requirements to 50 M metric tonnes.

We are seeking proposals from qualified companies to provide a conceptual design option to meet Mount Polley's additional tailing storage volume requirements.

Possible options identified by MPMC are:

1) Increase existing dam height to 970+m and dry stack additional tailings.

2) Extend the existing tailings storage facility either side of existing embankments.

3) Incorporate cyclone sand as a downstream construction material.

4) Increase the existing dam height to meet life of mine tailings volumes.

Permitting timelines as well as pipeline dynamics need to be considered in developing proposal options. Magnetite recovery from the tailings stream will begin in 2011, options to keep the old tailings separate from future tailings production should be considered.

To provide a basis for your recommended option the following capacity criteria should be considered:

ROM Plant Feed (April - Oct)	22,000 TPD
ROM Plant Feed (Nov-March)	20,000 TPD
Tailings Production Rate	7.7 MTPY
Current Tailings Stored	45 M cubic meters
Additional Storage Required	50 M metric tonnes (approx, 36 M cubic meters)
Current Pipeline; Mill to TSF	24" HDPE
Extended Mine Life	to 2017

Additional information:

The following documents, reports and drawings provide site-specific background on the project to assist with your proposal submission;

- 2005 TSF Capacity vs. Elevation Curve (KP)
- 2006 Dam Safety Review (AMEC)
- 2008 Capacity of Existing Mine Tailings Line (KP)
- 2009 TSF Report on 2009 Annual Inspection (KP)
- 2010 TSF Stage 6b IFC Drawings (KP)
- 2010 Mount Polley Flyover (MPMC)

Proposal:

Proposals should include the following as a minimum;

1. Your recommended tailings option(s) for life of mine operation, identifying advantages and disadvantages of the option(s).
2. Provide the preliminary capital cost estimate for construction.
3. Provide the estimated costs, including hourly rates, for developing construction level detail design, specifications and scope of work for the recommended option.
4. Provide resumes for key personnel, highlighting experience with northern interior sites, copper mining operations, Tailings Storage Facility management and design experience.

ATTACHMENT “C”
Memorandum of Agreement
(sample)

SAMPLE AGREEMENT

THIS AGREEMENT made in duplicate as of the __ day of _______, 2010.

BETWEEN: MOUNT POLLEY MINING CORPORATION, a company incorporated under the laws of the Province of British Columbia, with offices located at 200 – 580 HORNBY STREET Vancouver, B.C., V6C 3B6

("Owner")

AND: a company incorporated under the laws of the Province of British Columbia, with offices located at

("Consultant")

RECITALS: A. Consultant has expertise in providing certain professional services as set forth on the attached **Schedule "A"** (collectively, the "**Services**")

B. Owner desires that Consultant will provide the Services to be performed at Owner's Mount Polley Mine (the "Site"). Consultant agrees to provide the Services to Owner, in accordance with the terms and conditions of this Agreement. All capitalized terms not otherwise defined in this Agreement shall have the meanings set forth in GC1 – Definitions, below.

NOW, THEREFORE, in consideration of the foregoing and the mutual promises, covenants and conditions contained herein, the Parties agree as follows:

ARTICLE 1 ENTIRE AGREEMENT AND CONTRACT DOCUMENTS

1.1 The Contract sets forth the entire Agreement between the parties and supersedes all previous communications, agreements and commitments, whether written or oral, pertaining to the Work or the Contract. The provisions of the Contract may only be changed in writing executed by the parties to the Contract. Trade custom and trade usage are superseded by the Contract and shall not be applicable in the interpretation of the performance of the Contract.

1.2 The Form of Agreement together with the following documents:

- Schedule A - Scope of Services/General Description
- Schedule B - Pricing Schedule/Proposal
- Schedule C - General Conditions

form the Contract and together shall hereinafter be referred to as the Contract or Contract Documents.

ARTICLE 2 SCOPE OF SERVICES

2.1 Consultant shall furnish all supervision, tools, equipment, labour and materials and perform all Work necessary to fully complete the Work outlined in Scope of

Services (the "Work") and the other Contract Documents.

2.2 Any changes to the Work that will result in a change in the Contract Sum or the Contract Schedule requires prior written agreement of both parties. Any agreed change in the Contract Sum will be paid in accordance with the Contract Documents.

ARTICLE 3 SCHEDULE

3.1 Time shall be of the essence of the Contract and shall remain so notwithstanding any amendments to the schedule or adjustments to the completion date.

3.2 Consultant will schedule and coordinate the Work with the work of others.

3.3 Consultant will commence the work on _______, 2010 and shall complete the Work by _______, 2010, to be better defined as project progresses.

ARTICLE 4 CONTRACT SUM AND PAYMENT

4.1 Owner shall pay Consultant, in lawful money of Canada, the sum **NOT TO EXCEED** Dollars ($.00), as full and complete payment for the performance of the Work, subject to adjustments as may be provided for in the Contract Documents.

4.2 Consultant shall notify Owner upon the Contract value reaching **80%** of the Contracted amount, upon which time the projected costs to completion shall be reviewed.

4.2 GST not included and is extra.

ARTICLE 5 RECEIPT OF AND ADDRESSES FOR NOTICES

If either party desires to give notice to the other in connection with the Contract, such notice shall be sufficiently given if delivered by hand, if sent by registered mail, or if sent by facsimile or other electronic message system which provides a hard copy, to the

Consultant:

ATTN:
TEL: ( )
FAX: ( )

and to Owner:
MOUNT POLLEY MINING CORPORATION
200 – 580 Hornby Street
Vancouver, B.C. V6C 3B6
ATTN: Mr. Denis Bernardi
TEL: (604) 488-2682
FAX: (604) 687-4030
E-mail: dbernardi@imperialmetals.com

Gregory Smyth

From:	Ken Brouwer
ent:	Wednesday, October 27, 2010 7:58 AM
o:	Denis Bernardi; Don Parsons
Cc:	Jeremy Haile; Gregory Smyth; Greg Johnston
Subject:	RE: Request For Proposal #MP-100 - Tailings Impoundment Design Services, Mt. Polley - Knight Piesold

Dear Denis,

We have always made ourselves available to assist Imperial Metals and will continue to do so, but we confirm that we do not intend to submit a proposal for the specific scope of work outlined in RFP MP-100.

We agree that our long history on the project would be advantageous for the proposed study program. In fact many of our previous studies have considered various options for expansion and we would have a huge head start.

However, in this instance, it is presumed that our services are not essential and we therefore encourage you to continue to evaluate alternative options for the study program outlined in the proposal. A thorough review and evaluation by others may outline new opportunities, or provide refinements to the concepts that have already been developed.

We will be pleased to discuss this further, once you have had the opportunity to fully consider the alternatives.

Best Regards,
Ken.

From: Denis Bernardi [mailto:DenisBernardi@imperialmetals.com]
Sent: October-26-10 1:21 PM
To: Ken Brouwer
Cc: Don Parsons; Brian Kynoch; rmartel@mountpolley.com; tfisch@mountpolley.com; afrye@mountpolley.com; Jeremy Haile
Subject: RE: Request For Proposal #MP-100 - Tailings Impoundment Design Services, Mt. Polley - Knight Piesold

Ken, we are surprised in your decision on not intending to submit a proposal, as your history with this project would give you an advantage on developing a viable cost effective option.
Our intent with this proposal request, is to perform our due diligence and evaluate all possible options on a competitive nature, in an effort to reduce our overall annual capital and operating costs. It is of no reflection of the performance or capabilities that we are receiving or have received to date. That being said, we trust that you would reconsider your decision and participate in our RFP process.

We would be pleased to respond to any questions or concerns.

Regards.

Denis Bernardi
Manager, Contracts & Purchasing

nperial Metals Corporation
00 - 580 Hornby Street
Vancouver, BC V6C 3B6

Direct: 604-488-2682

From: Ken Brouwer [mailto:kbrouwer@knightpiesold.com]
Sent: Monday, October 25, 2010 1:59 PM
To: Denis Bernardi
Cc: Don Parsons; Brian Kynoch; rmartel@mountpolley.com; tfisch@mountpolley.com; afrye@mountpolley.com
Subject: RE: Request For Proposal #MP-100 - Tailings Impoundment Design Services, Mt. Polley - Knight Piesold

Dear Denis,

As requested in the RFP documents, we confirm that Knight Piésold is **NOT** intending to submit a proposal in response to RFP #MP-100- Tailings Impoundment Design Services without some prior clarifications. In general, we would welcome the updated protocols and contract management procedures outlined in the RFP documents but feel that there are some fundamental issues that must be resolved prior to proceeding with the development of a detailed scope and budget for the requested services.

As you know, Knight Piésold has a long history with Imperial Metals and the Mt Polley Mine. We have previously developed and evaluated various options for cost effective storage of tailings for the expanded mine plans outlined in the RFP. We have also assisted with long range planning for tailings, waste rock disposal, water management, closure planning, operational monitoring and permitting. Many of the options outlined in the RFP have been evaluated previously by KP and MPMC personnel, including completion of tailings impoundment expansion studies and full scale field trials for implementation of cyclone sand as a downstream construction material, etc.

Our long term relationships with all of our clients is very important to us and we are surprised and disturbed by the sudden change in our relationship with Imperial Metals. It has been suggested that one of the primary reasons that th RFP has been initiated is due to concerns about excessive costs relating to services provided by KP for the design/ construction of the tailings management systems at the Mount Polley Mine. Unfortunately, this message is also being communicated to our peers and clients within the Mining Industry and is a significant concern to us.

The following points are presented for your consideration:

- It has been indicated that expenditures in excess of $400,000 have been incurred by MPMC for KP engineering services relating to the tailings impoundment and it has been suggested that these costs are considered by Imperial Metals to be grossly excessive for services that were actually required.
- We are not sure where the $400,000 number comes from or what it includes for, but our detailed records indicate that it is far in excess of any KP billings for our 2010 Scope of Work.
- Greg Johnston, the KP Project Manager, has provided a brief summary of expenditures and contract status as outlined in the attached internal email. Knight Piésold has been diligent in controlling costs for engineering support at the Mt Polley Mine.
- We are concerned that Imperial Metals management may not have been adequately informed of the reasons for the extensions to the construction programs, and the specific requests for additional KP services that were required by MPMC. The reasoning for these additional services is also identified in the attached internal email from Greg Johnston.
- We will be pleased to provide copies of all signed contracts and the invoicing status for 2010 and/or previous years.
- Knight Piésold are very interested in any concerns that Imperial Metals/MPMC may have with respect to the services provided for Mt Polley or any other Imperial Metals project, and we would welcome the opportunity to discuss them.

It seems that a fundamental miscommunication may have occurred and it will be appropriate to resolve this prior to proceeding with the development of a scope of work and cost estimate for RFP MP-100.

Regards,

....
Ken Brouwer, P.Eng.
Managing Director
Knight Piésold Ltd.
....
Suite 1400 - 750 West Pender
Vancouver | British Columbia | Canada | V6C 2T8
phone: +1 604 685 0543 | **fax:** +1 604 685 0147
direct: +1 604 685 0543 ext 252 | **mobile:** +1 604 802 5128
email: kbrouwer@knightpiesold.com
web: http://www.knightpiesold.com

From: Denis Bernardi [mailto:DenisBernardi@imperialmetals.com]
Sent: October-20-10 4:05 PM
To: Denis Bernardi
Cc: Don Parsons
Subject: Request For Proposal #MP-100 - Tailings Impoundment Design Services, Mt. Polley

Please find our request for proposal attached for the above inquiry, along with the following attachments;

- 2005 TSF Capacity vs. Elevation Curve (KP)
- 2006 Dam Safety Review (AMEC)
- 2008 Capacity of Existing Mine Tailings Line (KP)
- 2010 TSF Stage 6b IFC Drawings (KP)
- 2010 Mount Polley Flyover (MPMC)
- 2009 TSF Report on 2009 Annual Inspection (KP) (due to its size, it will be forwarded upon acceptance to submit a proposal)

Kindly review and advise on your intent to submit a proposal.

Regards.

Denis Bernardi
Manager, Contracts & Purchasing

perial Metals Corporation
#200 - 580 Hornby Street
Vancouver, BC V6C 3B6

Direct: 604-488-2682

Knight Piésold
CONSULTING

Suite 1400 - 750 West Pender Street
Vancouver, BC Canada V6C 2T8

Tel: 604.685.0543
Fax: 604.685.0147
www.knightpiesold.com

File No.:VA101-1/29-A.01
Cont. No.:VA10-01620

November 23, 2010

Mr. Ron Martel
Environmental Superintendent
Mount Polley Mining Corporation
P.O. Box 12
Likely, BC V0L 1N0

Dear Ron,

Re: Tailings Storage Facility Instrumentation Replacement Program, Drilling Cost Estimates

Introduction

The Mount Polley Mine has several options for the instrumentation replacement program required at the Tailings Storage Facility. These options are described in the Knight Piésold Letter VA10-01175. The installation of the replacement instrumentation will include a drilling program; this drilling program is the largest cost item in the instrumentation replacement program. Mr. Ron Martel of Mount Polley Mine has requested Knight Piésold assist with the selection of a suitably qualified drilling contractor.

To assist Mount Polley in managing the drilling costs Knight Piésold has obtained three competitive quotes from qualified drilling contractors. Knight Piésold has experience working with all three contractors on similar programs and based on our experience, we believe that all are capable of completing the work.

Drilling Program

The drilling contractors were requested to provide cost estimates and comment on drill availability. The drilling program is summarized as:

- 5 drill holes in total, 2 drill holes to 60m and 3 drill holes to 25m
- Supply and install slope indicator casing in each drill hole
- Install 4 vibrating wire piezometers in each drill hole, (supply by others)
- Collect soil samples and evaluate geotechnical conditions encountered in the foundation soils, and
- All drill sites will be truck accessible (Mount Polley to provide suitable drill site access)

Cost Estimate

Three drilling contractors were requested to provide cost estimates. A copy of the cost estimates provided by each of the drilling contractors is attached. The cost estimate provided by Foundex Explorations Ltd. included for the supply of vibrating wire piezometers. To facilitate a cost comparison between the potential contractors the HST has been excluded and the Foundex Explorations Ltd. cost estimate has been adjusted to exclude supply of vibrating wire piezometer and cable. The summarized cost estimates excluding HST are:

1.	Mud Bay Drilling Co. Ltd.	$63,700
2.	Geotech Drilling	$69,700
3.	Foundex Explorations Ltd.	$81,300

All three contractors have verbally confirmed they have a drill available before the end of the year.

Summary

The selection of a drilling contractor from this short list is required by Mount Polley Mine. It is recommended that Mount Polley directly contract the drilling contractor in order to avoid any mark-ups that would be applied by Knight Piésold. Knight Piésold is available to assist Mount Polley with the drilling contract document review.

In addition to the drilling costs, the specified instrumentation will also need to be purchased. Knight Piésold is expecting cost estimates for the instrumentation purchase later this week, and will be reported in a separate letter.

We trust this will help your selection of a drilling contractor. This instrumentation replacement program is overdue and we recommend that it be initiated as soon as possible. Please call Greg or Ken if you have any questions.

Yours truly,
KNIGHT PIESOLD LTD.

Signed:
Greg Johnston, M.Sc.
Engineering Geology and Geotechnical Specialist

Approved:
Ken Brouwer, P.Eng.
Managing Director

Attachments:
Cost Estimates by:
Geotech Drilling (1 page)
Mud Bay Drilling Co. Ltd. (1 page)
Foundex Explorations Ltd. (3 pages)

Copy To: Luke Moger

/gj

Geotech DRILLING

Cost Estimate

Bill to: **Knight Piesold Ltd.**

Date: October 27, 2009

Care of: Knight Piesold Ltd.
1400 750 West Pender Street
Vancouver, BC V6C 2T8

Revised No./Date: 04-Nov-10
Project Manager: Ryan Samis
Cost Estimate No.: 1KRS10-0043
Unit No. (Drill Rig): Odex/Mud Rotary Drill
Location: Mount Polley Mine
Province:

ATTN: Mark Smith
Tel:
Email: msmith2@knightpiesold.com

Scope: This cost estimate is for 2 boreholes to 60 meters (200 ft) with 4 Vibrating Wire Installs per hole and 3 boreholes to 25 meters ('s (100 ft) with 2.75" Casing installed and 4 Vbrating Wires per hole,. Soil coring(HQ3) will be required in the last 65 ft of each hole.

Itm	Qty	Unit	Description	Price	Extended
1	96	hrs	Odex Drilling / Soil Coring	249.00	23,904.00
2	52	hrs	Overtime (after 8 hours, weekends, stats)(two man crew)	65.00	3,380.00
3	1	L/S	Mob/Demob to Mount Polley	2750.00	2,750.00
4	30	hrs	Crew travel	150.00	4,500.00
5	12	shift	Support vehicle(truck mount)	249.00	2,988.00
6	12	shift	Crew subsistence (two man crew)	279.00	3,348.00
7	12	shift	Air compressor rental (300/200)	425.00	5,100.00
8	12	shift	Grout/Mud pump rental	199.00	2,388.00
9	5	hrs	Safety meeting	149.00	745.00
10	311	ft	Diamond Bit Wear Consumption	19.75	6,142.25
11	590	ft	Odex bit wear consumption (Vibrating Wire BH's, Inclinometers and Monitoring Wells)	5.75	3,392.50
12	12	shift	High Pressure Diamond Pump Rental	175.00	2,100.00
13					-
14					-
15					-
16					-
17					-
18	400	ft	1" PVC (for Vibrating wire installs)	1.87	748.00
19	25	10 ft	2.75" Slope Inclinometer Pipe	148.35	3,708.75
20	3	ea	2.75" Slope Inclinometer Top Cap	6.90	20.70
21	3	ea	2.75" Slope Inclinometer Grout Anchor	58.69	176.07
22	40	bags	Bentonite chips (If grouting does not work, chips will be used as backfill material in rock fill)	21.84	873.60
23	12	bags	Sand (Vibrating Wire Installs if required)	15.52	186.24
24	5	ea	Stand up casing protectors	109.25	546.25
25	5	bags	Fast set pre-mix concrete	17.25	86.25
26	65	5 ft	Acrylic Liners for Soil Coring	28.75	1,868.75
27	7	bags	Premix Grout	34.44	241.08
28	21	bags	Portland cement	23.75	498.75
29					-

Terms & Conditions: E. & O.E. Cost Estimate valid for 60 days. Underground / Overhead utilities are the sole responsibility of the client. Lost, broken or unrecoverable tooling will be charged at cost plus 15%. Cancellation fees & restocking charges may apply if less than 48 hours notice. Invoice Payment terms: Upon Receipt. 2% interest charges will apply on past due accounts.. Invoice considered accepted and approved 15 days after receipt unless written notification is received.

"Overtime is applicable after 8 hours, weekends, and statutory holidays"

Subtotal	$	69,692.19
HST	$	8,363.06
TOTAL DU	$	78,055.25

British Columbia

5052 Hartway Drive • Prince George • British Columbia • Canada • V2K 5B7
Tel: (250)962-9041 • Fax: (250)962-9046 • **Web: geotechdrilling.com**

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Thank You for Your Business!

MUD BAY DRILLING CO. LTD.

Unit A, 18509 96th Avenue, Surrey, BC V4N-3P7
Tel: (604) 888-2206 Fax: (604) 888-4206

Cost Estimate

Date: August 13 2010
Revised No./Date:
Cost Estimate No.: 1
Unit No. (Drill Rig): Sonic Truck
Location: Mount Polley

ATTN: Greg Johnston
Knight & Piesold Ltd.
Suite 1400 - 750 West Pender St.
Vancouver, B.C., V6C 2T8

Scope: 2 boreholes to 60m and 3 boreholes to 25m. Slope indicator casing to be installed in each hole. 4 VW piezometers in each hole. Piezometers to be supplied by client.

Itm	Qty	Unit	Description	Price	Extended
1	1	ls.	Mobilization (Surrey/Mount Polley/Surrey)	$ 6,500.00	$ 6,500.00
2	60	hrs	Drilling, sampling and installation	$ 550.00	$ 33,000.00
3		hrs	Crew overtime (1.5)		$ -
4		hrs	Crew overtime (2.0)		$ -
5	12	hrs	Crew Travel	$ 185.00	$ 2,220.00
6	6	days	Living allowance	$ 525.00	$ 3,150.00
7	195	m	Bit Wear	$ 35.00	$ 6,825.00
8		in.	Concrete coring (10 in dia.)		$ -
9	195	m	2.75"/70mm INCLINOMETER CASING SNAP SEAL	$ 37.00	$ 7,215.00
10		ft.	(2)" PVC blank		$ -
11	5	ea	INCLINOMETER TOP/BOTTOM CAP	$ 27.00	$ 135.00
12		ea	DCPT tips	$ 20.00	$ -
13		ea	Shelby tubes	$ 40.00	$ -
14		sacks	Silica sand	$ 16.00	$ -
15		sacks	Bentonite chips	$ 20.00	$ -
16	5	sacks	Concrete	$ 16.00	$ 80.00
17	195	m	Grouting of Boreholes	$ 11.00	$ 2,145.00
18		sacks	Quik-gel bentonite drilling mud	$ 20.00	$ -
19		sacks	Asphalt patch	$ 22.00	$ -
20		sacks	Portland cement	$ 20.00	$ -
21	6	days	Support /Decontamination Unit	$ 300.00	$ 1,800.00
22		days	Compressor rental for ODEX	$ 450.00	$ -
23		ea	45 gal. Drums with lids	$ 60.00	$ -
24	5	ea	Well covers (flush mounted, cast iron, above ground)	$ 135.00	$ 675.00
25		ea	Core boxes	$ 60.00	$ -
26					$ -
27					-
28					-
29					-
				Subtotal	**$ 63,745.00**
				H.S.T.	**$ 7,649.40**
				TOTAL DUE	**$ 71,394.40**

Notes:
Standby of rig and crew *$550/hr*
Overtime greater than 8hrs onsite *+$75/hr*
Client is responsible for contaminated soil/wast water removal
Core boxes, if needed *$60/ea*
45gal drums, if needed *$60/ea*

FOUNDEX
Explorations Ltd.

Date:	Oct. 28, 2010
Client Job#:	N/A
Equipment:	CSR-1000

Proposal # **4385**

To:
Knight Piesold Consulting
Suite 1400 - 750 West Pender
Vancouver, BC
V6C 2T8
Tel: 604-

Project Details:

Site:	Mount Polley
Attention:	Mark Smith
Single shif / double	Single Shift
Estimate # of Shifts	15
Estimate # of Days	15

Hole #	Hole Depth (m)	Hole Depth (ft)	Move/Setup	Air Rotary Overburden (m)	Overburden (hrs)	Mud Rotary (m)	Mud Rotary (hrs)	Coring (m)	Coring (hrs)	Install/Backfill/Grout (hrs)	Total Hrs
60	60.00	196.80									
60	60.00	196.80									
25	35.00	114.80									
25	35.00	114.80									
25	35.00	114.80									
QUANTITY:	225.00	738.00									
UNITS:	Meters	Feet									
RATE:											
TOTAL:			$ 1,950.00		$ 16,250.00		$ 15,600.00		$ 15,600.00	$ 9,360.00	

s.21

Sub Total:	$58,760.00
Mobilization:	$8,500.00
Materials:	$26,086.51
Contingency:	$8,484.65
Sub Total:	$101,831.16
HST @ 12%:	$12,219.74
Total:	$114,050.90

* DENOTES WEEKEND OR HOLIDAY

Production Rates

Moving	**1**	Hours Per Hole
Air Rotary	**3**	Meters / hour
Mud Rotary	**1.5**	Meters / hour
Travel	**2**	Hours Per day
Holes	**5**	Project Total
Work Week	**70**	Hours Per Week
Work Days	**7**	Days Per Week
Contingency	**10.00%**	Per Job
Hours Per Day	**10.00**	Hours Per Day
Supervisor	**0.00**	Days Per week
Extra Helper	**0.00**	Hours Per Week
Crew	**2.00**	# of Men
R&B Rate / Man	**150.00**	Rate Per Man
Rig Rate	**$295.00**	Per Hour

Hourly Rate Calculator

s.21

Quantity	Description	Unit	Rate	Extension
40	HQ3 Coring	Per Meter	32.80	1,312.00
60	Mud Rotary Drilling	Per Meter	16.50	990.00
125	Air Rotary Drilling - 6' Symmetrix	Per Meter	50.00	6,250.00
40	Cement	Bags	15.15	606.00
10	X-Tra Gel Bentonite	Bags	12.50	125.00
5	Bentonite Chips	Bags	19.50	97.50
20	Time Release Pellets	Pails	103.80	2,076.00
40	Piezo Sand	Bags	10.17	406.80
250	3/4" PVC Pipe	Feet	0.55	137.50
18	2 3/4"x 10' Iinclinometer Casing	Each	98.50	1,773.00
2	2 3/4" Inclinometer Top Caps	Each	5.53	11.06
2	2 3/4" Inclinometer Grout Bottom Caps	Each	129.20	258.40
20	Vibrating Wire Piezometer	Each	550.00	11,000.00
321	Cable for VW	Per Meter	3.25	1,043.25
			TOTAL	**26,086.51**

PROJECT DETAILS

Water Availability	**Unknown**	Surface Casing	**Yes**	Accommodations	**Williams Lake**	Installation	**N/A**
Equipment Access	**Truck**	Casing Size	**Symmetrix 6"**	Fuel	**N/R**	PVC Size	**N/A**
Environmental Project	**No**	Drill Hole	**Yes**	Insurance certificate	**N/R**	Slot size	**N/A**
Any Permitting	**By Others**	Hole Size	**Symmetrix 6"**	Shipping Quote	**N/R**	Flush/Standup	**N/A**
Intended Driller	**Unknown**	Drill Method	**Air, Mud, Core**	Maps Required	**Yes**	Sand	**N/A**
Cutting Disposal	**Left on site**	Core Size	**HQ3**	Utility Locate Req.	**By Others**	Pellets	**N/A**
Drill Containment	**No**	SPT/Shelby	**SPT and Shelby**	Terms Sent	**Yes**	Grout	**N/A**
Rental Equipment	**No**	Wireline Samples	**N/A**	Start Date	**Unknown**	Backfill w/cuttings	**Yes**
Subcontractors	**No**	CPT / SCPT	**N/A**				
Service Vehicles	**Yes**	Development	**N/A**				
Grout Equipment	**Yes**	Packers	**N/A**				
Training Programs	**No**	BPT -Pull back	**N/A**			Pump lift	**Unknown**
Travel Arrangements	**No**	Piston Sampler	**N/A**			Hose Req'd	**Unknown**

' THIS IS A COST ESTIMATE ONLY ** ACTUAL CHARGES WILL BE BASED ON FIELD LOGS AND OUR STANDARD TERMS AND CONDITIONS*****

STANDARD TERMS & CONDITIONS OF FOUNDEX EXPLORATIONS LTD.

1. General

1.1. Prices include a 2 man crew and all necessary drilling and sampling equipment.

1.2. FWA, regulated or Union wage rates would be at an additional charge.

1.3. Survey and layout of all drill locations to be the responsibility of others.

1.4. Authorized utility clearance to be provided to Foundex prior to drilling.

1.5. Suitable access for our equipment would be provided by others to the satisfaction of Foundex.

1.6. Removal of and transport of contaminated drilling and decontamination spoils from the drill sites to be the responsibility of others.

1.7. Foundex’s minimum work schedule is 10 hours per day and 5 days per week along with being a continuous operation until the work is complete. Overtime rate is in effect for all hours after 8 hrs per day, and after 40 hours per week, and on weekends and holidays. Work schedule revisions will be at the discretion of Foundex Explorations Ltd. based on project specific situations.

1.8. Client will provide site specific Health and Safety Plan for environmental projects. Equipment spill containment systems would be at an additional cost and only be provided at the specific request of the client. Pricing assumes Level "D" personnel protection unless specifically indicated otherwise.

1.9. Any or all traffic control to be provided by others.

1.10. Security for our equipment to be the responsibility of others.

1.11. Potable water supply, utility permits, misc. permits etc to be provided by others.

2. Marine Work and Marine Transportation

2.1. When contracting Marine vessels, Foundex will flow thru to the client all the terms and conditions of the supplier.

2.2. Standby will apply to all time that the barge and drill are unable to work due to tides, weather, permits or anything else that is beyond the control of the drill crew and/or barge operator.

2.3. When required by Foundex the Client will provide suitable moorage for barge and work boats.

2.4. All Marine vessels supplied by the client shall meet Foundex’s minimum requirements for offshore drilling.

2.5. Minimum day for all rigs is 10 hours. Standby due to weather will be charged at agreed rates for 10 hours per day.

2.6. Cargo insurance for FEL’s equipment while being transported by non-scheduled marine transportation will be charged on a cost plus basis or be provided by the client.

3. Heliportable Work

3.1. When requested, contracting helicopter services, Foundex will flow thru to the client all the terms and conditions of the supplier.

3.2. Suitable Helipads and work platforms when required will be provided for by others.

3.3. All Permitting when required will be provided by the client

3.4. When requested, Fuel will be supplied at cost plus 10% to the client.

3.5. Cargo insurance for FEL’S equipment while in flight is to be provided for by the client and hen Foundex provides cargo insurance it would be at Cost plus 10%.

4. Technical

4.1. Any artesian water flows will be dealt with on a cost plus basis.

4.2. Standby at 80 % of our unit rates includes but is not limited to, site orientation, safety meetings, engineering, health & safety plan protocols, personal protection equipment upgrades, water sampling, and lab analysis. Client will be invoiced for actual time consumed.

4.3. Materials are based on identified scope of work and include materials and supplies required to complete the work. Additional materials and supplies can be made available provided as mutually agreed.

4.4. Estimate is subject to final scope of work, terms and conditions, health & safety plan and rig availability. Client will be invoiced for actual units consumed.

4.5. Reasonable drilling and sampling refusal based upon industry standard for applicable methodology. Refusal for Becker Drilling will be considered to be 200 blows per foot.

4.6. Foundex makes no guarantee desired maximum depths can be achieved. Potential for tool replacement if required by the client to drill or sample past the drill rig operators identified maximum safe depth. Potential for Becker pipe repair or replacement will be at cost plus 10% for any lost, damaged or bent pipe.

5. Financial

5.1. Any estimates offered by Foundex are for budgeting purposes only. Unless specifically indicated otherwise invoicing will be based upon actual time and quantities. Foundex does not guarantee that production rates used in the estimate will be achieved. Foundex reserves the right to modify our stated methodology to respond to differing site conditions. Should a not to exceed contract or footage rates be required Foundex requires this information prior to the bid date.

5.2. Sales tax or GST is not included in the above rates unless specifically indicated.

5.3. Upon prior approval of credit, payment terms are net 30 days from date of Invoice. All invoices issued by Foundex will be in digital format. All agreements that do not comply with these terms and conditions will be subject to a 5% mark-up on the total invoice. All invoices will also carry a 2% charge per month on any overdue balances.

5.4. Payment or performance bonds are not included in this proposal.

5.5. Any retention of funds due to Foundex shall be released in full within 30 days of completion of Foundex Explorations Ltd.'s Original scope of work.

5.6. Certificates of insurance will be submitted upon request only and any additional insurance requirements would be charged to the client at cost plus 10%.

5.7. When applicable a Fuel surcharge will be charged on Foundex projects.

5.8. Project cancellations after notice to proceed may incur costs payable by the client. Mobilization ends once the rig has arrived on site; set-up on the first borehole is per the terms of the proposal.

5.9. All proposals offered by Foundex are commercial in confidence and valid for 30 Days.

5.10. Upon Foundex receiving a purchase order or a verbal or written" notice to proceed", the client shall be deemed to have accepted and agreed to these terms and conditions unless specifically indicated otherwise and agreed to in writing prior to the commencement of the project. These terms and conditions incorporate the entire agreement between Foundex and the client, and supersede all prior understandings and agreements with respect to the project. If this document is a subcontract, then Foundex will not be bound by any term of the head contract unless specifically included in this document, or an amendment signed by Foundex and the client. No modification of this agreement will be effective unless made in writing and signed by Foundex and the client. There are no representations, warranties, terms, conditions, undertakings or collateral agreements express, implied or statutory, between Foundex and the client other than as expressly set forth in these terms and conditions.

Section" A" (Site specific terms)

To be Determined

Section "B" (Foundex Proposal and Scope of Work)

See Attached

Section "C" (Miscellaneous attachments)

To be Determined

Foundex Explorations Ltd.
End of Terms and Conditions

Knight Piésold
CONSULTING

Suite 1400 - 750 West Pender Street
Vancouver, BC Canada V6C 2T8

Tel: 604.685.0543
Fax: 604.685.0147
www.knightpiesold.com

File No.:VA101-1/29-A.01
Cont. No.:VA11-00252

February 3, 2011

Mr. Ron Martel
Environmental Superintendent
Mount Polley Mining Corporation
P.O. Box 12
Likely, BC V0L 1N0

Dear Ron,

Re: Mount Polley Mine – Site Water Management

Knight Piésold (KP) recently issued the 2010 annual inspection report for the Tailings Storage Facility (TSF) at the Mount Polley Mine. Although the primary focus of the annual inspection is to evaluate the performance of the TSF, the inspection also considers site water management practices, as these can have a significant impact on water accumulation at the mine and the storage requirements for the tailings impoundment.

KP previously assisted with assessing the operational water balance for the overall site. However, Mount Polley Mining Corporation (MPMC) has been managing the water balance in-house for the last two years and KP has had no involvement with it during this time. The water balance for the mine site was operating with a significant water surplus when KP last reviewed the information, with surplus water progressively accumulating within the TSF and the Cariboo and Wight Pits. KP understands that the quality of the water that is stored in the TSF and the pits is not suitable for discharge to the environment, and that MPMC does not yet have a permit to discharge excess water.

MPMC recently provided KP with a copy of an amendment (2009) to the mine operating permit that allows for the transfer of water from the TSF to the Cariboo Pit. This permit amendment allows for filling of the Cariboo Pit up to a designated maximum water level, and also stipulates that a minimum water cover be maintained over Potentially Acid Generating (PAG) waste rock that has been placed in the pit. KP has a general knowledge of the Cariboo Pit, but has not completed relevant geotechnical or hydrological studies for it. However, our overview assessment of the TSF operations, conducted as part of the 2010 Annual Inspection, suggests that a significant amount of water was transferred out of the TSF as the impounded supernatant water was considerably less than in previous years. MPMC site staff confirmed that tailings supernatant water had been transferred from the TSF to the Cariboo Pit to reduce the volume of water stored within the TSF.

The storage capacity for surplus water in the Cariboo Pit is limited by the geometry of the pit, the amount of PAG waste rock being stored in the pit, and the upper storage limit as defined in the operating mine permit. It is our opinion that the volume of water currently being stored in the Cariboo Pit is lower than would have been predicted by the site water balance, and it is possible that significant leakage may have occurred during filling of the Cariboo Pit, resulting in the discharge of poor quality water to adjacent water courses.

KP included a recommendation in the 2010 Annual Inspection report that the water balance and water management practices be reviewed to ensure compliance with the intent of the current permits. Our

BSI
ISO 9001, ISO 14001
OHSAS 18001

concern is that some of the water transferred from the TSF to the Cariboo Pit is not being contained, but rather is being discharged as seepage and/or overflow to adjacent receiving waters. KP therefore recommends that MPMC adopt a pro-active approach and have an experienced reviewer examine the overall site water management system, with particular focus on the hydrogeological characteristics of the Cariboo and Wight Pits, to evaluate the current practices for managing site surplus water to confirm compliance with existing storage and discharge permits.

We trust that this information will be of assistance to MPMC in their continuing operation of the Mount Polley Mine. Please contact the undersigned if you have any questions or comments.

Yours truly,
KNIGHT PIESOLD LTD.

L.J. GALBRAITH
25483
Feb 3/11

Signed:
Les Galbraith, P. Eng.
Senior Engineer

Approved:
Ken Brouwer, P.Eng.
Managing Director

Copy To: Tim Fisch (MPMC), Bryan Kynoch (Imperial Metals Corporation)

/lg

Gregory Smyth

From: Ken Brouwer
Sent: Monday, January 10, 2011 5:23 PM
To: Art Frye
Subject: RE: Request For Proposal #MP-100 - Tailings Impoundment Design Services, Mt. Polley - Knight Piesold
Attachments: FW: Request For Proposal #MP-100 - Tailings Impoundment Design Services, Mt. Polley - Knight Piesold

Hi Art,
Thanks for the note. I appreciate your comments and will follow up, but I suspect we won't get too far. We haven't had any luck discussing it with them either.

I was wondering what was happening and have been meaning to follow up again. Ron M. has also been in touch with us for some suggested revisions to some of the wording in the Annual Inspection Report which Greg J. is looking into as we speak. As you know, we have always tried to accommodate the clarifications, suggestions and comments provided by MPMC.

For the record, we did try and touch base with Don back in October, but he indicated was not interested or available to discuss the situation with us at that time. I must confess that the whole RFP process was quite confusing and it was far from clear what was wanted, needed or expected. I had indicated that we would be happy to discuss the options and would be pleased to follow up further as suggested in the attached email.

I will call Brian to attempt to get confirmation of his position as you suggest, and at the very least make sure we have set up appropriate procedures for the proper transfer of responsibilities to the new Engineer of Record.

I very much appreciate your suggestions and we will always keep the door open. We will always be happy to help you out.

Happy New Year and Best Regards,
Ken

From: Art Frye [mailto:afrye@mountpolley.com]
Sent: January-10-11 11:33 AM
To: Ken Brouwer
Subject: RE: Request For Proposal #MP-100 - Tailings Impoundment Design Services, Mt. Polley - Knight Piesold

Hi Ken,
I just wanted to send you a quick note between you and I regarding this. I have not been involved in any of these decisions and I agree that $400,000 is inaccurate. I have tried to discuss this with the guys in Vancouver but to no avail. I will be very sorry if you choose not to submit a proposal or in the very least contact Brian Kynoch to at least discuss it. I really don't feel that Brian is totally aware of what is going on here. We at Mount Polley are very aware of the service your company has provided us and appreciate the way you worked with us to reduce costs. I am also aware that we haven't always been the easiest clients. If you do choose to meet with Brian there are a few issues that he has a real problem with.
1) The buttress. I don't think KP has done a good enough job explaining the importance of the largely expanded buttress.
The water balance. BK feels that the water balance is something that we can and should maintain.

3) The comment about transferring water from the TSF to the Cariboo pit and possible ground water issues in the annual TSF report. This is covered in our permit with MOE and didn't need to appear in this document.
4) Construction supervision. BK thinks we could do more of it ourselves but I don't think he realizes how far we have come addressing this.
I have always enjoyed working with KP and I feel it would be a real shame if the relationship ended over misunderstanding and the failure on both sides to discuss the issues. Don is out of the office this week and the RFP closes on Friday so it might be a good time to call BK.
I am sorry that I haven't been able to assist more in this but it seems to be completely driven by head office.

Regards,
Art

From: Ken Brouwer [mailto:kbrouwer@knightpiesold.com]
Sent: October-25-10 1:59 PM
To: Denis Bernardi
Cc: Don Parsons; Brian Kynoch; Ron Martel; Tim Fisch; Art Frye
Subject: RE: Request For Proposal #MP-100 - Tailings Impoundment Design Services, Mt. Polley - Knight Piesold

Dear Denis,

As requested in the RFP documents, we confirm that Knight Piésold is **NOT** intending to submit a proposal in response to RFP #MP-100- Tailings Impoundment Design Services without some prior clarifications. In general, we would welcome the updated protocols and contract management procedures outlined in the RFP documents but feel that there are some fundamental issues that must be resolved prior to proceeding with the development of a detailed scope and budget for the requested services.

As you know, Knight Piésold has a long history with Imperial Metals and the Mt Polley Mine. We have previously developed and evaluated various options for cost effective storage of tailings for the expanded mine plans outlined in the RFP. We have also assisted with long range planning for tailings, waste rock disposal, water management, closure planning, operational monitoring and permitting. Many of the options outlined in the RFP have been evaluated previously by KP and MPMC personnel, including completion of tailings impoundment expansion studies and full scale field trials for implementation of cyclone sand as a downstream construction material, etc.

Our long term relationships with all of our clients is very important to us and we are surprised and disturbed by the sudden change in our relationship with Imperial Metals. It has been suggested that one of the primary reasons that this RFP has been initiated is due to concerns about excessive costs relating to services provided by KP for the design/ construction of the tailings management systems at the Mount Polley Mine. Unfortunately, this message is also being communicated to our peers and clients within the Mining Industry and is a significant concern to us.

The following points are presented for your consideration:

- It has been indicated that expenditures in excess of $400,000 have been incurred by MPMC for KP engineering services relating to the tailings impoundment and it has been suggested that these costs are considered by Imperial Metals to be grossly excessive for services that were actually required.
- We are not sure where the $400,000 number comes from or what it includes for, but our detailed records indicate that it is far in excess of any KP billings for our 2010 Scope of Work.
- Greg Johnston, the KP Project Manager, has provided a brief summary of expenditures and contract status as outlined in the attached internal email. Knight Piésold has been diligent in controlling costs for engineering support at the Mt Polley Mine.
- We are concerned that Imperial Metals management may not have been adequately informed of the reasons for the extensions to the construction programs, and the specific requests for additional KP services that were

required by MPMC. The reasoning for these additional services is also identified in the attached internal email from Greg Johnston.
- We will be pleased to provide copies of all signed contracts and the invoicing status for 2010 and/or previous years.
- Knight Piésold are very interested in any concerns that Imperial Metals/MPMC may have with respect to the services provided for Mt Polley or any other Imperial Metals project, and we would welcome the opportunity to discuss them.

It seems that a fundamental miscommunication may have occurred and it will be appropriate to resolve this prior to proceeding with the development of a scope of work and cost estimate for RFP MP-100.

Regards,

……………………………………………………
Ken Brouwer, P.Eng.
Managing Director
Knight Piésold Ltd.
……………………………………………………
Suite 1400 - 750 West Pender
Vancouver | British Columbia | Canada | V6C 2T8
phone: +1 604 685 0543 | **fax:** +1 604 685 0147
direct: +1 604 685 0543 ext 252 | **mobile:** +1 604 802 5128
email: kbrouwer@knightpiesold.com
web: http://www.knightpiesold.com

From: Denis Bernardi [mailto:DenisBernardi@imperialmetals.com]
Sent: October-20-10 4:05 PM
To: Denis Bernardi
Cc: Don Parsons
Subject: Request For Proposal #MP-100 - Tailings Impoundment Design Services, Mt. Polley

Please find our request for proposal attached for the above inquiry, along with the following attachments;
- 2005 TSF Capacity vs. Elevation Curve (KP)
- 2006 Dam Safety Review (AMEC)
- 2008 Capacity of Existing Mine Tailings Line (KP)
- 2010 TSF Stage 6b IFC Drawings (KP)
- 2010 Mount Polley Flyover (MPMC)
- 2009 TSF Report on 2009 Annual Inspection (KP) (due to its size, it will be forwarded upon acceptance to submit a proposal)

Kindly review and advise on your intent to submit a proposal.

Regards.

enis Bernardi
anager, Contracts & Purchasing

Imperial Metals Corporation
#200 - 580 Hornby Street
Vancouver, BC V6C 3B6
Direct: 604-488-2682

Knight Piésold
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File No.:VA101-1/29-A.01
Cont. No.:VA11-00298

February 10, 2011

Mr. Brian Kynoch
Mount Polley Mining Corporation
Suite 200 - 580 Hornby Street
Vancouver, BC V6C 3B6

Dear Brian,

Re: Mount Polley Tailings Storage Facility Engineer of Record

We have completed all assignments and on January 25, 2011 issued to Mount Polley Mining Corporation (MPMC) the final versions of the 'Tailings Storage Facility - Report on the 2010 Annual Inspection' and 'Tailings Storage Facility – Report on Stage 6B Construction'.

We are currently assuming that MPMC will be retaining the services of a separate individual or organization to take over as the Engineer of Record for the tailings storage facility, as a result of Knight Piésold's decision to opt out of the bidding process implemented by MPMC late last year. We would like to facilitate a formal handover to the new individual/group, as it is essential that it be recognized that Knight Piésold will not have any responsibility for any aspects of the on-going operations, or of any modifications to the facilities that are undertaken from now onwards. To date, the tailings impoundment has been developed using the observational approach, wherein the design is modified as appropriate depending on actual performance and conditions. It must be understood that Knight Piésold will no longer have any responsibility for the performance of the tailings storage facility.

The embankments and the overall tailings impoundment are getting large and it is extremely important that they be monitored, constructed and operated properly to prevent problems in the future. Knight Piésold would be happy to assist in the formal handover to the new Engineer of Record.

As we have a long relationship with the Mines Branch and the Ministry of Energy, Mines and Petroleum Resources, we consider that it is prudent to notify them of the change in status. Therefore, we have copied them on this correspondence.

We would like to thank you for our long and constructive association at the Mount Polley Mine and look forward to working together again in the future.

Signed:
Ken Brouwer, P.Eng.
Managing Director

Approved:
Jeremy Haile, P.Eng.
President

Copy To: Don Parsons (IMC), Ron Martel (MPMC), Tim Fisch (MPMC)
Al Hoffman, Chief Inspector of Mines
/kjb

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Greg Johnston

From: Ron Martel <rmartel@mountpolley.com>
Sent: Friday, March 25, 2011 4:28 PM
To: Greg Johnston; Denis Bernardi
Cc: Ken Brouwer
Subject: RE: Mount Polley Data for Handover

Thanks Greg...

Have a great weekend

RON M

From: Greg Johnston [mailto:gjohnston@knightpiesold.com]
Sent: Friday, March 25, 2011 4:24 PM
To: Denis Bernardi; Ron Martel
Cc: Ken Brouwer
Subject: Mount Polley Data for Handover

Hello Denis & Ron,

I have sent out all of the data requested for the handover. I have also posted a copy of the data on our FTP site, to access the FTP site please find the link below:

cp://10100001-29:js98lqtp@ftp.knightpiesold.com

This link allows both upload and download from our FTP server. To upload files, please copy and paste the above link directly into the address box of the Windows Explorer (not Internet Explorer).

If you use FTP client software, below please find the logon information:
Server address: ftp.knightpiesold.com
User name: 10100001-29
Password: js98lqtp

The data has been issued with the following Transmittals:
VA11-00514 – AutoCAD Drawings – 33 files (16 pdf, 16 dwg, 1 ctb) – via CD and on FTP site
VA11-00522 – Piezometer Data – 3 files (1 pdf, 1 .xlsx, 1zip) – via email and on FTP site
VA11-00526 – Inclinometer and Drain Data – 2 files (2 .xlsx) – via eail and on FTP site

Can you please let me know if you have received everything.

Cheers
Greg

Greg Johnston, M.Sc, P.Eng.
Senior Engineer
Knight Piésold Ltd.

Suite 1400 - 750 West Pender
Vancouver | British Columbia | Canada | V6C 2T8
phone: +1 604 685 0543 | **fax:** +1 604 685 0147

direct: +1 604 685 0543 ext 244
email: gjohnston@knightpiesold.com
web: http://www.knightpiesold.com

KNIGHT PIÉSOLD LTD.
MOUNT POLLEY TAILINGS BREACH

COMMUNICATIONS RELATING TO TRANSFER OF ENGINEER OF RECORD FROM KNIGHT PIÉSOLD LTD. TO AMEC

PREPARED BY:

Knight Piésold Ltd.
Suite 1400 – 750 West Pender Street
Vancouver, BC V6C 2T8 Canada
p. +1.604.685.0543 • f. +1.604.685.0147

VA101-1/34-1
Rev 0
October 3, 2014

Knight Piésold
CONSULTING
www.knightpiesold.com

COMMUNICATIONS RELATING TO TRANSFER OF ENGINEER OF RECORD FROM KNIGHT PIÉSOLD LTD. TO AMEC

TABLE OF CONTENTS

No.	Date	Continuty Number	Rev	Type	Details	Sent By	Sent To	Comments
1	August 25, 2014	VA14-01295	n/a	Letter	Re: Conservation Officer Service – Major Investigations Unit	Ken Brouwer	Mike Sanderson	
2	April 23, 2014	n/a	n/a	Letter Report (Incoming)	Phosphorus in Polley Lake (Minnow Environmental Report Jul 2, 2013)	Colleen Hughes (MPMC)	Violeta Martin	See External Reports List
3	April 23, 2014	n/a	n/a	Report (Incoming)	Water Quality Evaluation of Polley & Bootjack Lakes Jul 2010 by Minnow Environmental	Colleen Hughes (MPMC)	Violeta Martin	See External Reports List
4	March 26, 2014	n/a	n/a	Letter (Incoming)	Confirmation of Terms of Reference for Water Treatment	Brian Yamelst (MOE)	Colleen Hughes	
5	December 14, 2011	VA11-01234	n/a	Letter	Hazeltine Creek Flows - Response to Technical Review	Cameron Butt	Ron Martel	
6	December 14, 2011	VA11-01344	n/a	Letter	Sediment / Polishing Retention Pond Design	Violeta Martin	Ron Martel	
7	December 5, 2011	n/a	n/a	Memo Report (Incoming)	Hazeltine Creek Nov 2011 Results from Field Program	Fred Burgess (Minnow Environmental)	Ron Martel	See External Reports List
8	August 4, 2011	n/a	n/a	Report (Incoming)	Independent Review of Mount Polley Mine Technical Assmt Report for Proposed Discharge of Mine Effluent (2009) Final (June 2011)	Brian Olding & Associates in Association with LGL Ltd	First Nations & MPMC	See External Reports List
9	March 30, 2011	VA11-00571	n/a	Transmittal	.pdf of 'Stage 6 Design of the Tailings Storage Facility' report VA101-1/18-1 dated June 2007	Greg Johnston	Denis Bernardi	
10	March 25, 2011	n/a	n/a	Emails	Re: Mount Polley Data for Handover	Greg Johnston	Denis Bernardi, Ron Martel	cc: Ken Brouwer
11	March 25, 2011	VA11-00526	n/a	Transmittal	.xls file of inclinometer data .xls of drain flow data	Greg Johnston	Denis Bernardi	
12	March 25, 2011	VA11-00522	n/a	Transmittal	.pdf file of piezometer data sheets (calibration sheets) .xls file of vibrating wire piezometer installation data .xls file of vibrating wire piezometer readings	Greg Johnston	Denis Bernardi	
13	March 24, 2011	VA11-00514	n/a	Transmittal	Two CDs containing AutoCAD format drawings and .pdf copies of the drawings	Greg Johnston	Denis Bernardi	cc: Ron Martel
14	March 15, 2011	VA11-00470	n/a	Transmittal	Summary table and a copy of Knight Piésold letters sent to MPMC in 2010 and 2011	Greg Johnston	Denis Bernardi	cc: Ron Martel
15	March 8, 2011	n/a	0	Tables	Table 1 – Document Request Table 2 – Additional Information/Studies	n/a	n/a	Internal Tracking Tables
16	March 8, 2011	VA11-00444	n/a	Transmittal	.pdf of 'Design of the Tailings Storage Facility to Ultimate Elevation' report VA101-1/8-1 Rev 0 dated March 14, 2005	Greg Johnston	Denis Bernardi	
17	March 3, 2011	n/a	n/a	Letter (Incoming)	Site Water Management Letter	Ron Martel MPMC	Les Galbraith	
18	March 3, 2011	n/a	n/a	Letter	Re: Mount Polley Mine – Site Water Management	Ron Martel	Les Galbraith	cc: Brian Kynoch, Tim Fisch, Ken Brouwer
19	February 16, 2011	VA11-00288	n/a	Letter	2010 Hydrology of H7 (Flows in Hazeltine Creek)	Cameron Butt	Ron Martel	
20	February 16, 2011	VA11-00321	A	Table	.pdf table summarizing all Knight Piésold reports issued to Mount Polley	n/a	n/a	Internal Tracking Table
21	February 10, 2011	VA11-00298	n/a	Letter	Re: Mount Polley Tailings Storage Facility Engineer of Record	Ken Brouwer	Brian Kynoch	cc: Don Parsons, Ron Martel, Tim Fisch, Al Hoffman

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22	February 3, 2011	VA11-00252	n/a	Letter	Re: Mount Polley Mine – Site Water Management	Les Galbraith	Ron Martel	cc: Tim Fisch, Brian Kynoch
23	January 31, 2011	VA11-00257	n/a	Transmittal	1 CD containing PDF files of Report on Stage 6B Construction (VA101-1/29-1 Rev 1) and Report of 2010 Annual Inspection (VA101-1/29-2 Rev 1)	Greg Johnston	Ron Martel	
24	January 28, 2011	VA11-00249	n/a	Transmittal	7 hard copies of Report on Stage 6B Construction (VA101-1/29-1 Rev 1) 7 hard copies of Report of 2010 Annual Inspection (VA101-1/29-2 Rev 1)	Greg Johnston	Ron Martel	
25	January 25, 2011	VA101-1/29-2	1	Report	Report on 2010 Annual Inspection	Greg Johnston	Ron Martel	Sent via VA11-00249 and VA11-00257
26	January 10, 2011	n/a	n/a	Emails	Re: Request for Proposal #MP-100 – Tailings Impoundment Design Services, Mt. Polley – Knight Piésold	Ken Brouwer	Art Frye	
27	January 10, 2011	n/a	n/a	Emails	Re: Request for Proposal #MP-100 – Tailings Impoundment Design Services, Mt. Polley – Knight Piésold	Jeremy Haile	Ken Brouwer, Greg Smyth	Internal Communications
28	December 20, 2010	VA10-01952	n/a	Transmittal	.pdf of 'Report on 2010 Annual Inspection' (VA101-1/29-2 Rev 0)	Greg Johnston	Ron Martel	
29	December 17, 2010	VA10-01946	n/a	Transmittal	7 hard copies of Report on Stage 6B Construction (VA101-1/29-1 Rev 0) 6 hard copies of Report of 2010 Annual Inspection (VA101-1/29-2 Rev 0)	Les Galbraith	Ron Martel	
30	December 16, 2010	VA10-01883	n/a	Transmittal	.pdf copy of Report on Stage 6B Construction (VA101-29/1-1 Rev 0)	Greg Johnston	Ron Martel	
31	November 23, 2010	VA10-01620	n/a	Letter	Re: Tailings Storage Facility Instrumentation Replacement Program, Drilling Cost Estimates	Ron Martel	Greg Johnston, Ken Brouwer	cc: Luke Moger
32	October 27, 2010	n/a	n/a	Emails	Re: Request for Proposal #MP-100 – Tailings Impoundment Design Services, Mt. Polley – Knight Piésold	Denis Bernardi, Don Parsons	Ken Brouwer	cc: Jeremy Haile, Greg Smyth, Greg Johnston
33	October 20, 2010	n/a	n/a	Emails	Fwd: Request for Proposal #MP-100 – Tailings Impoundment Design Services, Mt. Polley	Ken Brouwer	Greg Johnston, Les Galbraith, Greg Smyth	Original email from Denis Bernardi
34	October 14, 2010	n/a	n/a	Article	The Williams Lake Tribune article "Mine Discharge Application Raises Concerns"	n/a	n/a	Published in Williams Lake Tribune
35	July 22, 2010	VA10-01175	n/a	Letter	Re: Instrumentation Repair, Productivity Upgrade and Remote Monitoring Capacity	Greg Johnston	Ron Martel	
36	May 20, 2010	VA10-00866	n/a	Letter	Hazeltine Creek Weir Design	Cameron Butt	Ron Martel	
37	May 5, 2010	VA10-00709	n/a	Letter	Hydrology Site Visit	Cameron Butt	Ron Martel	
38	April 27, 2010	VA10-00389	n/a	Memorandum	Re: Mt. Polley TSF - Snow and ice in the Perimeter Embankment	Mark Smith	Greg Johnston	cc: Les Galbraith
39	April 23, 2010	VA10-00687	n/a	Memorandum	Re: Monitoring of Inclinometers	Mark Smith	Ron Martel	cc: Greg Johnston
40	February 5, 2010	VA10-00286	n/a	Letter	South Embankment seepage recycle pond sizing	Mark Smith	Ron Martel	
41	January 5, 2010	VA101-1/27-1	1	Report	Report on 2009 Annual Inspection	Les Galbraith	Ron Martel	
42	November 25, 2009	VA09-01636	n/a	Letter	Site visit by Mark Smith 9-10 Nov., 2009	Mark Smith	Ron Martel	
43	November 6, 2009	VA09-01539	n/a	Letter	Construction Material Volumes for Upcoming Embankment Raises	Mark Smith	Ron Martel	
44	September 28, 2009	VA09-01329	n/a	Memo	Site visit record 15 September 2009 by Mark Smith	Mark Smith	Ron Martel	
45	September 17, 2009	VA09-01328	n/a	Memo	Monitoring displacement in inclinometer SI01-02	Mark Smith	Ron Martel	
46	September 15, 2009	VA09-01314	n/a	Letter	2009 TSF Inspection MPMC	Les Galbraith	Ron Martel	
47	September 9, 2009	VA09-01273	n/a	Memo	Toe Drain conveyance pipe location (Main Embankment)	Mark Smith	Ron Martel	
48	September 1, 2009	VA09-01236	n/a	Memo	Monitoring displacement inclinometer SI01-02 lacustrine layer Aug 27	Mark Smith	Ron Martel	

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49	August 26, 2009	VA09-01219	n/a	Memo	Monitoring displacement inclinometer SI01-02 Aug 20	Mark Smith	Ron Martel	
50	August 14, 2009	VA09-01160	n/a	Memo	Monitoring displacement inclinometer SI01-02 Aug 6	Mark Smith	Ron Martel	
51	August 13, 2009	VA09-01064	n/a	Letter	Filling Schedule & Construction Requirements for TSF	Mark Smith	Ron Martel	
52	August 6, 2009	VA09-00991	n/a	Memo	Monitoring displacement inclinometer SI01-02 Aug 6	Mark Smith	Ron Martel	
53	July 23, 2009	VA09-00609	n/a	Letter	Alternative Assessment for Discharge of Excess Water	Alexis McPherson	Ron Martel	
54	July 10, 2009	VA09-00961	n/a	Memo	Monitoring displacement inclinometer SI01-02 Jul 1	Mark Smith	Ron Martel	
55	July 3, 2009	VA09-00838	n/a	Letter	Buttress Requirement for the Main Embankment	Leila Morstabilini	Ron Martel	
56	June 25, 2009	VA09-00929	n/a	Letter	update to CORMIX letter VA09-00614	Erin Rainey	Ron Martel	
57	June 12, 2009	VA09-00867	n/a	Memo	Monitoring of displacement of inclinometer SI01-02 Jun 11	Mark Smith	Ron Martel	
58	June 10, 2009	VA09-00848	n/a	Memo	Monitoring of inclinometers SI01-02 displacement Jun 4	Mark Smith	Ron Martel	
59	June 3, 2009	VA09-00802	n/a	Memo	Displacement monitoring for inclinometers SI01-02 May 19	Mark Smith	Ron Martel	
60	June 3, 2009	VA09-00804	n/a	Memo	Monitoring displacement of inclinometers SI01-02 May 28	Mark Smith	Ron Martel	
61	May 28, 2009	VA09-00614	n/a	Letter	CORMIX water quality modelling at W7 - Effluent Plume Delineation Study & Mass Balance Model	Erin Rainey	Ron Martel	
62	May 19, 2009	VA09-00700	n/a	Memo	Inclinometer monitoring displacement in SI01-02	Mark Smith	Ron Martel	
63	May 15, 2009	VA09-00095	n/a	Letter	Chemical Characterization of Proposed Effluent for Discharge to Hazeltine Creek	Rosie Perrin	Ron Martel	
64	May 11, 2009	VA09-00617	n/a	Letter	Sediment / Polishing Retention Pond Revision	Amanda Strouth	Ron Martel	
65	May 6, 2009	VA09-00666	n/a	Memo	Monitoring of displacement Inclinometer SI01-02	Mark Smith	Ron Martel	
66	May 4, 2009	VA09-00646	n/a	Memo	Ongoing monitoring of displacement at 10m inclinometer SI01-02 April 29	Mark Smith	Ron Martel	
67	April 30, 2009	VA09-00584	n/a	Letter	Hazeltine Creek Geomorphology	Toby Perkins	Ron Martel	
68	April 28, 2009	VA09-00597	n/a	Memo	Assesment of inclinometer displacement Readings Apr 22, 2009	Mark Smith	Ron Martel	
69	April 23, 2009	VA08-01858	n/a	Letter	Recommended Maximum Discharges from Mount Polley TSF to Hazeltine Creek	Oscar Gustafson	Ron Martel	
70	April 22, 2009	VA09-00589	n/a	Memo	April 16 inclinometer reading	Les Galbraith	Ron Martel	
71	April 14, 2009	VA09-00482	n/a	Memo	Inclinometer reading SI01-02	Mark Smith	Ron Martel	
72	April 14, 2009	VA09-00317	n/a	Letter	Assessment of Hazelting Creek Flows - Regressive Analysis with Emphasis on Low Flows	Cameron Butt	Ron Martel	
73	April 9, 2009	VA09-00298	n/a	Letter	Mt Polley Closure Water Balances for Predicted Discharge Flows	Alexis McPherson	Ron Martel	
74	April 6, 2009	VA09-00461	n/a	Memo	Assesment of inclinometer readings from April 1 2009	Mark Smith	Ron Martel	
75	April 1, 2009	VA09-00434	n/a	Memo	Monitoring displacement in inclinometer SI01-02	Mark Smith	Ron Martel	
76	March 24, 2009	VA09-00381	n/a	Memo	Monitoring displacement in inclinometer SI01-02	Mark Smith	Ron Martel	
77	March 17, 2009	VA09-00360	n/a	Memo	Monitoring displacement in inclinometer SI01-02	Mark Smith	Ron Martel	
78	March 6, 2009	VA09-00304	n/a	Memo	Monitoring displacement in inclinometer SI01-02	Carolyn Grise	Ron Martel	

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79	February 27, 2009	VA09-00256	n/a	Letter	Site visit letter report February 2009 inclinometer shows possible dam displacement	Mark Smith	Ron Martel	
80	February 25, 2009	VA101-1/24-1	0	Report	Report on 2008 Annual Inspection	Les Galbraith	Ron Martel	
81	December 5, 2008	VA08-02223	n/a	Letter	Buttress Requirements for Main Embankment	Andre Gagnon	Ron Martel	
82	August 5, 2008	VA08-01436	n/a	Memo	RE: Geotechnical Inspection by MEMPR	Scott Rees	Ron Martel	
83	July 30, 2008	VA08-01502	n/a	Letter	Retrospective Review of Hazeltine Creek Flows	Cameron Butt	Ron Martel	
84	July 24, 2008	VA08-01473	n/a	Letter	Capacity of Existing Mine Tailings Pipeline	Harvey Dew	Don Parsons	
85	June 2, 2008	VA08-01200	n/a	Letter	Stage 6 instrumentation	Les Galbraith	Ron Martel	
86	April 22, 2008	n/a	n/a	Letter (Incoming)	RE: TSF 2007 Annual Inspection	Chris Carr (MEMPR)	General Manager MPMC	
87	March 27, 2008	VA101-1/14-1	0	Report	Report on Stage 5 Construction	Carolyn Grise	Ron Martel	
88	March 14, 2008	VA08-00612	n/a	Letter	Updated OM&S manual with piezometric and inclinometer trigger levels	Eric Coffin	Ron Martel	
89	March 4, 2008	VA08-00488	n/a	Letter	2007 Hydrology Review - Hazeltine Creek	Cameron Butt	Ron Martel	
90	December 19, 2007	VA07-01853	n/a	Letter	Response to Chris Carr comments	Les Galbraith	Chris Carr	
91	December 19, 2007	VA101-1/20-1	0	Report	Report on 2007 Annual Inspection	Les Galbraith	Ron Martel	
92	November 16, 2007	VA07-01589	n/a	Letter	Hazeltine CreeK Geomorphology - Regime Modeling to Predict Changes in Channel Characteristics	Toby Perkins	Ron Martel	
93	September 21, 2007	VA07-01221	n/a	Letter	Borrow area geotechnical site investigations	Josie Speed	Ron Martel	
94	June 29, 2007	VA07-00671	n/a	Memo	Hydrology Site Visit Summary May 2007	Cameron Butt	Ron Martel	
95	June 29, 2007	VA07-00676	n/a	Letter	Flow through pond downstream of Perimeter Embankment	Carolyn Grise	Ron Martel	
96	June 18, 2007	VA101-1/18-1	0	Report	Stage 6 Design of the Tailings Storage Facility	Greg Johnston	Denis Bernardi	Sent via VA11-00571
97	April 20, 2007	VA07-00416	n/a	Letter	Initial Effluent Plume Delineation Study for Hazeltine Creek - Updated (CORMIX)	Erin Rainey	Ron Martel	
98	April 1, 2007	n/a	n/a	Presentation	Mount Polley Project	Les Galbraith	KP Staff	Internal Presentation to Staff
99	March 15, 2007	VA07-00384	n/a	Letter	SOP for proper piezometer installations and recordings	Eric Coffin	Ron Martel	
100	March 14, 2007	VA07-00160	n/a	Letter	Effluent plume delineation of Hazeltine Creek at W7	Erin Rainey	Ron Martel	
101	March 14, 2007	VA07-00199	n/a	Letter	Chemical Analysis of Effluent	Rosie Perrin	Ron Martel	
102	March 14, 2007	VA07-00359	n/a	Letter	Hydrology Review for Hazeltine Creek Station W7	Erin Rainey	Ron Martel	
103	March 14, 2007	VA07-00362	n/a	Letter	Revised Seepage Estimate Letter	Eric Coffin	Ron Martel	
104	March 6, 2007	VA06-01778	n/a	Letter	Mt Polley Hydrology Review for Hazeltine Creek at W7	Erin Rainey	Ron Martel	
105	March 5, 2007	VA07-00328	n/a	Letter	revised Stage 6 scope	Les Galbraith	Ron Martel	
106	February 28, 2007	VA07-00322	n/a	Letter	Mt Polley - Responses to comments by Ministry of Energy	Brett Garland	Paul Sterling	
107	February 26, 2007	n/a	n/a	Presentation	Mount Polley Project – Tailings Facility Summary	Les Galbraith, Ken Brouwer, Greg Smyth	Art Frye, Ron Martel, Don Parsons	Presentation at MPMC Offices
108	February 6, 2007	VA07-00202	n/a	Letter	Upstream Toe Drain Seepage Estimations	Eric Coffin	Ron Martel	

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109	January 29, 2007	VA07-00172	n/a	Letter	Mt Polley Stage 6	Les Galbraith	Ron Martel	
110	December 18, 2006	n/a	n/a	Email	Suggestion that separate Annual Inspection Report may not be necessary and instead include content in the 2006 Construction Report	Ken Brouwer	Ron Martel	cc: Les Galbraith
111	December 1, 2006	n/a	n/a	Appendix	Reference Documents and Review Commentary	n/a	n/a	Taken from AMEC Dam Safety Review
112	November 20, 2006	VA06-01588	n/a	Memo	LJG Nov 2006 Site Visit Memo	Les Galbraith	Ron Martel	
113	September 22, 2006	n/a	n/a	Letter (Incoming Copy from MEMPR)	Report of Inspector of Mines Geotechnical (Aug 30, 2006)	Nick Rose MEMPR	Chris Carr MEMPR	
114	August 15, 2006	n/a	n/a	Fax	Amendment to Permit M-200 From F.W.Herman to Howard Bradley (MPMC) Aug 2-2006	Ron Martel MPMC	Les Galbraith	
115	July 26, 2006	VA06-01198	n/a	Letter	Formal Dam Safety Review of Tailings Dam	Graham Greenaway	Ron Martel	Proposal Correspondence
116	May 31, 2006	VA06-00833	n/a	Letter	ARCL - Inv. 12351 - 101-1/10	Suzanne Parsons	Accounts Payable MPMC	
117	February 10, 2006	VA06-00241	n/a	Letter	We have completed an analysis of the requirements for pumping and piping to dispose of water	Les Galbraith	Don Parsons	
118	March 14, 2005	VA101-1/8-1	0	Report	Design of the Tailings Storage Facility to Ultimate Elevation	Les Galbraith	MPMC	
119	February 3, 2005	n/a	n/a	Presentation	Mount Polley Project – Tailings Facility Summary	KP	MPMC	

From: Gregory Smyth
Sent: Tuesday, August 19, 2014 1:35 PM
To: Ken Brouwer
Subject: FW: Request For Proposal #MP-100 - Tailings Impoundment Design Services, Mt. Polley - Knight Piésold

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From: Jeremy Haile
Sent: Monday, January 10, 2011 1:28 PM
To: Ken Brouwer; Gregory Smyth
Subject: RE: Request For Proposal #MP-100 - Tailings Impoundment Design Services, Mt. Polley - Knight Piésold

Nice note from Art. He is obviously unaware that we did try and sit down with Brian and Don to clear the air, and I personally called Don after we received the RFP. Don was not prepared to meet with us and insisted that everything had to go through a formal "no contact" RFP process. We should point this out.

Jeremy

From: Ken Brouwer
Sent: January-10-11 12:52 PM
To: Jeremy Haile; Gregory Smyth
Subject: FW: Request For Proposal #MP-100 - Tailings Impoundment Design Services, Mt. Polley - Knight Piesold

FYI

From: Art Frye [mailto:afrye@mountpolley.com]
Sent: January-10-11 11:33 AM
To: Ken Brouwer
Subject: RE: Request For Proposal #MP-100 - Tailings Impoundment Design Services, Mt. Polley - Knight Piesold

Hi Ken,
I just wanted to send you a quick note between you and I regarding this. I have not been involved in any of these decisions and I agree that $400,000 is inaccurate. I have tried to discuss this with the guys in Vancouver but to no avail. I will be very sorry if you choose not to submit a proposal or in the very least contact Brian Kynoch to at least discuss it. I really don't feel that Brian is totally aware of what is going on here. We at Mount Polley are very aware of the service your company has provided us and appreciate the way you worked with us to reduce costs. I am also aware that we haven't always been the easiest clients. If you do choose to meet with Brian there are a few issues that he has a real problem with.
1) The buttress. I don't think KP has done a good enough job explaining the importance of the largely expanded buttress.
2) The water balance. BK feels that the water balance is something that we can and should maintain.
3) The comment about transferring water from the TSF to the Cariboo pit and possible ground water issues in the annual TSF report. This is covered in our permit with MOE and didn't need to appear in this document.
4) Construction supervision. BK thinks we could do more of it ourselves but I don't think he realizes how far we have come addressing this.
I have always enjoyed working with KP and I feel it would be a real shame if the relationship ended over misunderstanding and the failure on both sides to discuss the issues. Don is out of the office this week and the RFP closes on Friday so it might be a good time to call BK.
I am sorry that I haven't been able to assist more in this but it seems to be completely driven by head office.

Regards,
Art

From: Ken Brouwer [mailto:kbrouwer@knightpiesold.com]
Sent: October-25-10 1:59 PM
To: Denis Bernardi
Cc: Don Parsons; Brian Kynoch; Ron Martel; Tim Fisch; Art Frye
Subject: RE: Request For Proposal #MP-100 - Tailings Impoundment Design Services, Mt. Polley - Knight Piesold

Dear Denis,

As requested in the RFP documents, we confirm that Knight Piésold is **NOT** intending to submit a proposal in response to RFP #MP-100- Tailings Impoundment Design Services without some prior clarifications. In general, we would welcome the updated protocols and contract management procedures outlined in the RFP documents but feel that there are some fundamental issues that must be resolved prior to proceeding with the development of a detailed scope and budget for the requested services.

As you know, Knight Piésold has a long history with Imperial Metals and the Mt Polley Mine. We have previously developed and evaluated various options for cost effective storage of tailings for the expanded mine plans outlined in the RFP. We have also assisted with long range planning for tailings, waste rock disposal, water management, closure planning, operational monitoring and permitting. Many of the options outlined in the RFP have been evaluated previously by KP and MPMC personnel, including completion of tailings impoundment expansion studies and full scale field trials for implementation of cyclone sand as a downstream construction material, etc.

Our long term relationships with all of our clients is very important to us and we are surprised and disturbed by the sudden change in our relationship with Imperial Metals. It has been suggested that one of the primary reasons that this RFP has been initiated is due to concerns about excessive costs relating to services provided by KP for the design/ construction of the tailings management systems at the Mount Polley Mine. Unfortunately, this message is also being communicated to our peers and clients within the Mining Industry and is a significant concern to us.

The following points are presented for your consideration:

- It has been indicated that expenditures in excess of $400,000 have been incurred by MPMC for KP engineering services relating to the tailings impoundment and it has been suggested that these costs are considered by Imperial Metals to be grossly excessive for services that were actually required.
- We are not sure where the $400,000 number comes from or what it includes for, but our detailed records indicate that it is far in excess of any KP billings for our 2010 Scope of Work.
- Greg Johnston, the KP Project Manager, has provided a brief summary of expenditures and contract status as outlined in the attached internal email. Knight Piésold has been diligent in controlling costs for engineering support at the Mt Polley Mine.
- We are concerned that Imperial Metals management may not have been adequately informed of the reasons for the extensions to the construction programs, and the specific requests for additional KP services that were required by MPMC. The reasoning for these additional services is also identified in the attached internal email from Greg Johnston.
- We will be pleased to provide copies of all signed contracts and the invoicing status for 2010 and/or previous years.
- Knight Piésold are very interested in any concerns that Imperial Metals/MPMC may have with respect to the services provided for Mt Polley or any other Imperial Metals project, and we would welcome the opportunity to discuss them.

It seems that a fundamental miscommunication may have occurred and it will be appropriate to resolve this prior to proceeding with the development of a scope of work and cost estimate for RFP MP-100.

Regards,

……………………………………………………
Ken Brouwer, P.Eng.
Managing Director
Knight Piésold Ltd.
……………………………………………………
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Vancouver | British Columbia | Canada | V6C 2T8
phone: +1 604 685 0543 | **fax:** +1 604 685 0147
direct: +1 604 685 0543 ext 252 | **mobile:** +1 604 802 5128
email: kbrouwer@knightpiesold.com
web: http://www.knightpiesold.com

From: Denis Bernardi [mailto:DenisBernardi@imperialmetals.com]
Sent: October-20-10 4:05 PM
To: Denis Bernardi
Cc: Don Parsons
Subject: Request For Proposal #MP-100 - Tailings Impoundment Design Services, Mt. Polley

Please find our request for proposal attached for the above inquiry, along with the following attachments;

- 2005 TSF Capacity vs. Elevation Curve (KP)
- 2006 Dam Safety Review (AMEC)
- 2008 Capacity of Existing Mine Tailings Line (KP)
- 2010 TSF Stage 6b IFC Drawings (KP)
- 2010 Mount Polley Flyover (MPMC)
- 2009 TSF Report on 2009 Annual Inspection (KP) (due to its size, it will be forwarded upon acceptance to submit a proposal)

Kindly review and advise on your intent to submit a proposal.

Regards.

Denis Bernardi
Manager, Contracts & Purchasing

Imperial Metals Corporation
#200 - 580 Hornby Street
Vancouver, BC V6C 3B6
Direct: 604-488-2682

IMPERIAL METALS CORP.
MT. POLLEY PROJECT

REPORT ON PROJECT WATER MANAGEMENT
(REF. NO. 1624/1)

FEBRUARY 6, 1995

Suite 1400
750 West Pender Street
Vancouver, British Columbia
Canada V6C 2T8
Telephone (604) 685-0543
Telefax (604) 685-0147
CIS: 72360,477

Knight Piésold Ltd.
CONSULTING ENGINEERS

Knight Piésold Ltd.
CONSULTING ENGINEERS

IMPERIAL METALS CORP.
MT. POLLEY PROJECT

REPORT ON PROJECT WATER MANAGEMENT
(REF. NO. 1624/1)

"THIS REPORT HAS BEEN PREPARED EXCLUSIVELY FOR IMPERIAL METALS CORP. NO THIRD PARTY SHALL BE ENTITLED TO RELY ON ANY OF THE INFORMATION, CONCLUSIONS, OPINIONS OR ANY OTHER MATTER CONTAINED IN THIS REPORT".

IMPERIAL METALS CORP.
MT. POLLEY PROJECT

REPORT ON PROJECT WATER MANAGEMENT
(REF. NO. 1624/1)

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APPENDICES

IMPERIAL METALS CORP.
MT. POLLEY PROJECT

REPORT ON PROJECT WATER MANAGEMENT
(REF. NO. 1624/1)

SECTION 1.0 - INTRODUCTION

This report provides an overview of the source and fate of all water associated with the Mt. Polley Project. An overall project water balance was completed by integrating the water balances for the mine site with the tailings facility. The objectives of the water balance analyses are to demonstrate that the tailings facility and open pit can be operated to ensure that no surface discharge of excess water will be required, and by selective addition of surface runoff from waste dumps and undisturbed catchment areas, the make-up water requirements from Polley Lake can be minimized.

A probabilistic water balance analysis using @RISK was developed to describe the effects of a statistical range of precipitation conditions over the entire life of the project. From the corresponding results, estimates were made of the probable requirements for fresh make-up water, probable tailings pond volume and probable volumes of additional water to be diverted out of the project area.

The @RISK Analysis and Modelling program is a software package that allows the input of a statistical distribution to describe an uncertain quantity. Instead of using a finite value to describe a particular quantity, individual values are repeatedly selected from a specified statistical distribution describing that quantity. These selected values are then used in subsequent calculations to generate a distribution of results that accounts for the uncertainty in the initial quantity.

SECTION 2.0 - HYDROMETEOROLOGY

2.1 GENERAL

The hydrometeorological information used for the preparation of this report was taken from the most recent information incorporated in the Mine Development Certificate. A summary of the data is given in Table 2.1.

This section provides an overview of the applicable hydrometeorological information and how it was used to complete this analysis.

2.2 PRECIPITATION

A normal probability distribution was used to model the expected seasonal variability in precipitation data as shown in Figure 2.1. This distribution was chosen after using the software package BESTFIT to determine the underlying distribution of long term annual precipitation records for relevant AES stations in the region.

Since precipitation data at the site is limited, mean precipitation records for climatologically similar stations in the area were used to estimate a mean annual site precipitation of 755 mm. A coefficient of variation of 0.16 was determined for the standard deviation of 121 mm. These conditions were applied to the tailings facility and adjacent additional tailings catchment areas. To account for higher elevation, the waste dumps, pit area and mill site were modelled with a mean precipitation of 810 mm, a coefficient of variation of 0.16 and a standard deviation of 130 mm. The increased precipitation value is consistent with elevation correlations previously presented in the Stage I application documents. This data is summarized on Table 2.1.

2.3 SNOWMELT

Snowfall at the site was considered to melt only during the months of September, April and May. All snowfall in September was assumed to melt during the month and all snowfall accumulated during the remainder of the year was assumed to melt equally in April and May.

2.4 EVAPORATION

Evaporation data is consistent with previous analyses incorporated in the Mine Development Certificate (MDC). The annual evaporation rate of 423 mm at the site has been assumed to be constant for all years of operation and precipitation conditions.

2.5 RUNOFF

Runoff coefficients used in this analysis are consistent with values used in the Mine Development Certificate and included variable runoff coefficients based on dry, average and wet years. Dry years were defined as years when the total precipitation was less than or equal to 1.3 standard deviations below the mean (10 year dry), and wet years were defined as years when the total precipitation was at least 1.3 standard deviations above the mean (10 year wet). Runoff coefficients are presented in the following section.

SECTION 3.0 - PROJECT COMPONENTS

The overall project components and development sequence are described in previous documents incorporated in the MDC. The main mine components incorporated in the model are illustrated on Figure 3.1 and include disturbed and undisturbed areas at; open pits, waste dumps, mill site, tailings facility, and also the additional undisturbed catchment areas (Areas A and B) immediately upgradient from the tailings area.

The project water balances consider the staged development of the various components of the project as summarized in:

- Table 3.1 - Open Pit Development
- Table 3.2 - Waste Dump Development
- Table 3.3 - Tailings Storage Facility Development

In addition, specific assumptions incorporated in the water balance analyses are included in Table 3.4. These assumptions are consistent with those used in previous water balances for the tailings impoundment and mine site conducted in 1991.

SECTION 4.0 - WATER BALANCE AND MAKE-UP WATER SUPPLY

4.1 GENERAL

The updated Water Management Plan for the Mt. Polley Project includes the following objectives:

- To minimize the volume of fresh water abstracted from Polley Lake.
- To limit the period of water removal from the Polley Lake/Hazeltine Creek system to high flow periods.
- To regulate additional surface water runoff into the tailings pond.
- To prevent the accumulation of excess water within the tailings impoundment so that the impoundment and open pit can be operated as a closed system with no surface water release.
- To supply make-up water for the milling process from within the project catchment area.
- To minimize the requirement for regulated discharges of surface runoff from the waste dumps.

These objectives will be managed simultaneously during operations by provision of surface water collection ditches around the project perimeter and by judicious transfer of "fresh" surface runoff from designated undisturbed catchment areas adjacent to the tailings impoundment.

The Starter Dam for the tailings impoundment will be constructed approximately one year prior to mill start-up, and will entrap the freshet runoff so that adequate quantities of water are available for mill start-up and the first years of operation.

During on-going operations, the size of the tailings supernatant pond will be controlled, to a large extent by mine operators, by the annual precipitation and evaporation regime and by the water released from the settled tailings. Process fresh water make-up requirements from Polley Lake will be minimized by utilization of water sources in the following priority:

- Tailings supernatant.
- Open pit dewatering.
- Open pit groundwater depressurization wells.
- Mill site and waste dump runoff.
- Runoff diversion structures will be operated to provide supplementary water from diverted catchment areas A and B upslope of the tailings impoundment.
- Transfer of excess stream flow from Polley Lake/Hazeltine Creek during peak flow periods.

A series of water balances have been carried out to evaluate the annual process requirements for fresh make-up water and the overall water surpluses or deficits for the Mt. Polley Project. Water balances have been carried out for all 14 years of the project life, under a range of hydrometeorological conditions and for the various catchment areas.

The monthly water balance incorporates inflows from the open pit into the tailings storage facility. Additional surface runoff from the millsite, the various waste dump areas and additional undisturbed catchment areas have also been determined separately. Runoff collection ditches are assumed to control the addition of surface runoff into the system.

Linked water balances have been carried out for all 14 years of the mine life. An example of the linked water balances for average precipitation conditions are included in Appendices A and B. Appendix A includes the tailings facility and open pit as per the existing MDC, and Appendix B includes separate water balances for the mine site area plus the additional undisturbed catchment area A immediately upgradient from the tailings impoundment. The information in these two sets of tables is linked, and when the tailings pond volume drops below a minimum specified volume of 1.5 million m^3, all available surface runoff is diverted into the process. Catchment Area B is not included in the water balances and is therefore considered to represent a contingency source of additional water to compensate for any process shortfalls.

4.2 WATER BALANCE

The fundamental objective of the overall Water Management Plan is to operate the project so that surface discharge of excess water from the tailings impoundment and open pit will not be required. Table 4.1 summarizes the various components of the water balance for average precipitation conditions (as shown in Appendices A and B) over the life of the project assuming Catchment Area B will not be required. The main components of the water balances are illustrated graphically on Figure 4.1 for the Year 1 water balance previously presented in 1991 and on Figure 4.2 for the current 1995 Year 1 water balance which minimizes make-up water recovery from Polley Lake. The main difference between the two options is that in the 1995 water balance model, the make-up water requirements are reduced by incorporating additional runoff water collection from waste dumps and the additional catchment area at the tailings facility, plus it utilizes ponded water that is contained in the tailings impoundment at start-up.

The annual water balance summaries for Years 1 and 14 previously developed in 1991 are compared to results from the updated water management plan in Tables 4.2 and 4.3. The updated values presented in this table were developed using similar water balance tables to those in the MDC and were conducted separately from the linked water balance results included in Appendix A, in order to provide an independent check on the @RISK water balance results.

The variation in the volume of the tailings pond for average precipitation conditions is illustrated on Figure 4.3. The pond volume reaches a minimum during the winter months when there is little surface runoff and reaches a maximum volume in the summer after the freshet. Figure 4.3 also includes a smoothed average curve which tracks the tailings pond volume at the end of September in each year. The 50th percentile curve for September pond volumes, as determined in the @RISK analyses is also included for comparison.

The computer program @RISK was used to assess the risks of:

- accumulating too much water in the tailings impoundment over the life of the project,
- depleting the volume of water in the tailings pond so that an external source of make-up water would be required.

The @RISK program randomly selects separate annual precipitation values for each of the 14 years of operation and linked water balances are conducted. The water balances "link" the tailings facility and mine site water balances and also link the pond volumes from year to year. This process was repeated for 1000 iterations in order to provide estimates of the tailings pond volume, runoff water and make-up water requirements for various extreme combinations of wet and dry precipitation years. These results are illustrated on Figures 4.4, 4.5 and 4.6, and are discussed in the following section. It is evident that the updated water management strategy will achieve the permitted requirements for prevention of surface water discharge from the tailings facility and open pit, while minimizing the amount of make-up water removed from Polley Lake.

4.3 MAKE-UP WATER REQUIREMENTS

A fundamental requirement for the updated project water balances is that an adequate volume of water has to be stored at the tailings impoundment to compensate for low runoff periods during the cold winter months and during dry summer months. It has been estimated that a minimum volume of 1.5 million m^3 of water will need to be in storage prior to mill start-up. It is intended that this water will be obtained by constructing the tailings impoundment at least one year prior to mill start-up to allow capture of one year of direct surface runoff including the freshet. The amount of surface runoff which will be collected prior to start-up for various precipitation conditions is presented on Tables 4.4 to 4.7 and summarized as follows:

Summary of Water Available at Start-Up		
Precipitation Condition	Surface Runoff Water (m^3) Available	
	with Catchment Area A	with Catchment Areas A & B
Average Year	1,455,000	1,992,000
10 Year Dry	1,084,000	1,445,000
50 Year Dry	921,000	1,220,000
10 Year Wet	1,900,000	2,657,000

These results indicate that if extremely dry conditions are encountered, up to 300,000 m^3 of water may also need to be abstracted from either Polley Lake or Hazeltine Creek during peak freshet flows to supplement stored water in the first year of operation as 1.5 million m^3 of water must be stored prior to start-up.

The tailings pond volumes determined by the @RISK analyses for the linked water balances extending over the 14 year project life are shown on Figure 4.4. An initial pond volume of 1.5 million m^3 has been included at start-up and runoff from waste dumps and catchment Area A have been included when necessary to provide adequate water for milling. The monthly fluctuations in the volume of the tailings pond have not been included on this summary figure. Figure 4.5 illustrates the amount of excess surface runoff from all waste dumps plus the 240 ha of Catchment Area A that is not diverted into the mill process. It does not include for additional runoff available from Catchment Area B.

Comparison of Figures 4.4 and 4.5 illustrates that virtually all available runoff is diverted into the process under average and dry precipitation conditions for the first two to three years. The volume of stored water in the tailings impoundment is also reduced during this period. However, the analyses indicate that no additional make-up water will be required from Polley Lake except during the most extreme combinations of dry years. Figure 4.6 illustrates that there is about a 5% chance that some minor amount of additional make-up water will be required.

In practice, there is also a minimum pond volume which must be maintained in the tailings impoundment in order to compensate for ice accumulation in winter and to allow trouble free operation of the reclaim barge. Therefore, it will be necessary to include contingency provisions to transfer additional water into the tailings impoundment during operations. This additional water can be obtained from:

- selective diversion from Catchment Area B upgradient from the tailings impoundment, and/or
- transfer of excess flows from Polley Lake or Hazeltine Creek during peak flow periods. Minimum stream flows for fisheries releases would be maintained during any pumping period.

4.4 WATER MANAGEMENT PLAN

The objective of the project Water Management Plan in the early years will be to route all project water flows from disturbed areas into the process or into associated mine site activities such as dust suppression. An additional objective is to selectively route runoff from upslope Catchment Areas A and B into the tailings impoundment in order to eliminate the need for an external source of make-up water from Polley Lake. In the later years of operation the objective will be to monitor and release selected surface water inflow components which meet the required quality standards in order to manage the final volume of ponded water in the tailings impoundment at closure. The following activities will be incorporated in the Water Management Plan:

(i) Maximize the capture of surface and groundwater flows from within the project area.

(ii) Maximize the use of the poorest quality water recovered from within the project area in the milling process and in associated activities (such as dust suppression).

(iii) Minimize the deliberate introduction of excess clean fresh water from Polley Lake and Hazeltine Creek.

(iv) Monitor the quality of surface runoff from disturbed areas and groundwater flows within the project site.

(v) Release only the best quality water from within the project boundaries and in accordance with permitted requirements, as is necessary to maintain an overall project water balance under actual hydrometeorological conditions.

(vi) Manage the operation of the tailings supernatant pond to optimize the volume of water stored on the tailings surface during operations and at closure.

(vii) Develop and maintain a detailed data base to allow water balances for the site to be as accurate as possible and thereby become useful tools for predicting annual make-up water requirements and for scheduling releases of clean surface runoff water as appropriate.

SECTION 5.0 - SUMMARY AND CONCLUSIONS

A revised water management plan has been developed for the Mt. Polley project. Detailed water balances have been conducted for each year of the project using average precipitation conditions. Water balances have also been developed for 1000 different 14 year combinations of annual precipitation in order to assess the risk of either accumulating too much water in the system or increasing the make-up water requirements. These revised water balances indicate that:

(i) Discharge of excess water from the tailings facility and open pit will not be necessary. These results confirm the findings of the previous project water balances conducted in 1991.

(ii) It is possible to eliminate the requirement for a water supply dam on Polley Lake.

The updated water management plan requires early construction of a starter dam at the tailings impoundment in order to capture surface runoff for one year prior to the projected early start-up in October, 1996. Surface runoff from undisturbed catchment areas immediately adjacent to the tailings impoundment will be routed into the facility in order to provide a minimum pond volume of 1.5 million m^3 prior to start-up. This initial volume of water is projected to be drawn down during the first few years of operation, even if all mine site runoff and runoff from the additional Catchment Area A is routed into the mill process. However, the amount of surface runoff increases during the later years of operation when the waste dumps increase in area and surface runoff also increases. Therefore, the amount of surface runoff obtained from undisturbed catchment areas will decrease after the first few years of operation.

The water balance has been evaluated for each year of the 14 year project life and under various precipitation conditions. Water balances have been conducted for over 1000 different combinations of mine life precipitation conditions and the risks of significant water accumulation or depletion have been assessed. These probability analyses indicate that it is extremely unlikely that any additional makeup water, beyond the projected fresh water requirements of 24.9 m^3/hr, will be required from Polley Lake. However, it is recommended that a contingency water supply of about 300,000 m^3/yr be included in the revised permit application. It is anticipated that this volume of water would only be removed from either Polley Lake or Hazeltine Creek during high flow periods and would only remove water which is not required for minimum fisheries flow releases.

TABLE 2.1
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
PRECIPITATION DETAILS USED IN ANALYSIS

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DESCRIPTION	VALUE			
Lower Elevations (ie. TSF)				
Mean annual precipitation (mm)	755			
"Dry" annual precipitation (mm)	601			
"Wet" annual precipitation (mm)	909			
"Max." annual precipitation (mm)	1050			
"Min." annual precipitation (mm)	450			
Mean annual rainfall (mm)	451			
Mean annual snowfall (mm)	304			
Coefficient of variation	0.16			
Standard deviation (mm)	121			
Higher Elevations (ie. mill site, waste dumps, etc.)				
"Elevation" factor	1.07285			
Mean annual precipitation (mm)	810			
"Dry" annual precipitation (mm)	645			
"Wet" annual precipitation (mm)	975			
Coefficient of variation	0.16			
Standard deviation (mm)	130			
Proportions of Total Precipitation:				
Rainfall	0.60			
Snowfall	0.40			
Monthly Proportions of Precipitation:				
	Rainfall (mm)	Proportion as Rainfall	Snowfall (mm)	Proportion as Snowfall
Oct	48.3	0.11	12.1	0.04
Nov	17.3	0.04	40.0	0.13
Dec	7.6	0.02	67.2	0.22
Jan	6.8	0.02	68.7	0.23
Feb	6.0	0.01	52.1	0.17
Mar	6.0	0.01	38.5	0.13
Apr	24.2	0.05	18.9	0.06
May	45.3	0.10	5.3	0.02
Jun	81.5	0.18	0.0	0.00
Jul	65.7	0.15	0.0	0.00
Aug	83.1	0.18	0.0	0.00
Sep	58.9	0.13	1.5	0.00
Total (mm)	450.7		304.3	

TABLE 3.1
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
OPEN PIT DEVELOPMENT

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END OF YEAR	PIT CATCHMENT AREAS (ha)			TOTAL AREA (ha)
	CENTRAL	NORTH	WEST	
0	0.0	0.0	0.0	0.0
1	17.6	0.0	0.0	17.6
2	17.6	0.0	0.0	17.6
3	*25.5*	0.0	0.0	25.5
4	*25.5*	0.0	0.0	25.5
5	25.5	14.9	0.0	40.4
6	25.5	14.9	0.0	40.4
7	25.5	14.9	*24.3*	64.7
8	25.5	14.9	24.3	64.7
9	25.5	14.9	24.3	64.7
10	25.5	14.9	24.3	64.7
11	25.5	14.9	24.3	64.7
12	25.5	14.9	24.3	64.7
13	25.5	14.9	24.3	64.7
14	25.5	14.9	24.3	64.7

Notes:

1. Pit areas in italics are conservative estimates only.
2. Pit areas measured from mining sequence plans c/o Wright Engineers ("Feasibility Study", Vol. 1 of 5).

TABLE 3.2
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
WASTE DUMP DEVELOPMENT

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YEAR	WASTE (T x1000)	CUM. WASTE (T x1000)	DUMP CATCHMENT AREAS (ha)						TOTAL WASTE AREA (ha)
			EAST		NORTH		WEST		
			WASTE	UNDIST'BD	WASTE	UNDIST'BD	WASTE	UNDIST'BD	
0	1217.0	1217.0							
1	2774.9	3991.9	10.0	70.0	0.0	0.0	0.0	0.0	10.0
2	2720.2	6712.1	14.7	65.3	0.0	0.0	0.0	0.0	14.7
3	2342.2	9054.3	19.3	60.7	0.0	0.0	0.0	0.0	19.3
4	1812.7	10867.0	24.0	56.0	0.0	0.0	0.0	0.0	24.0
5	9496.2	20363.2	28.7	51.3	9.3	75.7	0.0	0.0	38.0
6	7649.2	28012.4	33.3	46.7	18.7	66.3	0.0	37.0	52.0
7	10839.3	38851.7	38.0	42.0	28.0	57.0	2.3	34.8	68.3
8	11103.3	49955.0	42.7	37.3	37.3	47.7	4.5	32.5	84.5
9	8591.8	58546.8	47.3	32.7	46.7	38.3	6.8	30.3	100.8
10	1152.4	59699.2	52.0	28.0	56.0	29.0	9.0	28.0	117.0
11	0.0	59699.2	52.0	28.0	56.0	29.0	9.0	28.0	117.0
12	0.0	59699.2	52.0	28.0	56.0	29.0	9.0	28.0	117.0
13	0.0	59699.2	52.0	28.0	56.0	29.0	9.0	28.0	117.0
14	0.0	59699.2	52.0	28.0	56.0	29.0	9.0	28.0	117.0

Notes: - dump areas for years 1 and 14 taken from Stage 1 Environmental and Socionomic Impact Assessment, Responses to Comments by the Agencies. All areas for intermediate years are interpolated linearly.

TABLE 3.3
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY DEVELOPMENT

Area of total impoundment = 230 ha

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END OF YEAR	AREAS (ha)					
	UNPREP'D BASIN	TOT. PREP'D BASIN	PREP'D BASIN	BEACH (incl. pond)	BEACH ONLY	POND
t=0	96	134	119	15	0	15
1	96	134	64	70	48.9	21.1
2	54	176	67	109	81.9	27.1
3	54	176	38	138	104.8	33.2
4	26	204	44	160	120.7	39.3
5	26	204	19	185	139.6	45.4
6	15	215	22	193	141.6	51.4
7	15	215	13	202	144.5	57.5
8	6	224	18	206	142.6	63.4
9	6	224	15	209	139.4	69.6
10	0	230	17	213	137.3	75.7
11	0	230	13	217	135.2	81.8
12	0	230	10	220	132.1	87.9
13	0	230	6	224	130.1	93.9
14	0	230	3	227	127	100

Notes:
1) Unprep'd Basin = Total Impoundment - Prep'd Basin.
2) Prep'd Basin taken from Filling Schedule and Staged Construction.
3) Prep'd Basin has been increased by 5% in order to equal total impoundment area after 10 years.
4) Beach (incl. pond) taken from D/A/C curve.
5) Pond volume varied linearly from 15ha at t=0 to 100ha at end of year 14.

TABLE 3.4
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
ASSUMPTIONS USED IN WATER BALANCE ANALYSIS

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DESCRIPTION		VALUE		
General Details:				
Daily ore throughput (tpd)			13,425	
Tailings % solids			35%	
Tailings S.G.			2.78	
Yr. 1 initial pond volume (m^3)			1,500,000	
Water content of ore			4%	
Min fresh water makeup (% of water in with slurry)			2.4%	
Initial tailings dry density (t/m^3)			0.9	
Final tailings dry density (t/m^3)	Yr.1		1.1	
	Yr.2		1.2	
	Yr.3 - 14		1.3	
Pit g/w infiltration (m^3/month)			39,818	
Beach evaporation factor			0.8	
Dust control (m^3/month)			25,000	
Runoff Coefficients:		dry	ave	wet
Unprepared basin		20%	24%	29%
Prepared basin		90%	90%	90%
Tailings beach		90%	90%	90%
Pit area		45%	50%	55%
Waste rock		58%	60%	62%
Undisturbed catchment		20%	24%	29%
Mill site		65%	70%	75%

TABLE 4.1
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
ANNUAL WATER BALANCES FOR AVERAGE CONDITIONS - CATCHMENT AREA "A"

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YEAR	WATER AVAILABLE (m^3)	TAILINGS POND VOL. (m^3)		MAKEUP WATER REQ'D (m^3)	EXCESS DIVERTED WATER (m^3)
		MIN.	MAX.		
0	1,500,000	1,500,000	1,500,000		
1	1,136,187	765,590	1,432,777	0	0
2	1,233,138	610,223	1,341,963	0	0
3	1,440,914	866,681	1,663,887	0	150,014
4	1,441,040	1,090,844	1,760,095	0	435,218
5	1,507,113	1,120,791	1,861,307	0	549,537
6	1,491,361	1,136,205	1,929,259	0	770,682
7	1,603,921	1,181,655	2,032,575	0	756,609
8	1,674,549	1,215,669	2,100,044	0	876,349
9	1,735,786	1,276,298	2,172,620	0	922,218
10	1,824,823	1,341,827	2,264,337	0	957,312
11	1,889,491	1,420,501	2,343,190	0	967,572
12	1,933,176	1,474,927	2,398,170	0	977,832
13	1,652,895	1,518,504	2,132,030	0	1,287,699
14	1,703,906	1,270,389	2,194,337	0	945,683

Note : Excess Diverted Water is surplus runoff not diverted into tailings impoundment.

TABLE 4.2

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT

WATER BALANCE SUMMARY - ANNUAL WATER SURPLUS

	Annual Surplus in Tailings Facility (m^3)				
	Initial Case (1991)		New Case (1995)		
	Year 1	Year 14	Year 1	Year 7	Year 14
50 Year Dry	0	0	0	0	0
10 Year Dry	0	0	0	0	0
Average Year	0	3,856(1)	0	0	0
10 Year Wet	0	440,148(1)	0	87,098	74,626
50 Year Wet	0	680,032(1)	0	311,451	309,400

Note:

1. The Initial Case (1991) does not include water usage for dust control or enhanced evaporation losses (approximately 400,000 m^3/yr). The New Case (1995) includes for dust control (150,000 m^3/year) but not enhanced evaporation (250,000 m^3/year).

TABLE 4.3

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT

ADDITIONAL MAKE-UP WATER REQUIREMENTS

Precipitation Conditions	**Permitted Option: Scenario 2 - Total Pit Inflow to Tailings Area or to Process**	
	1991 Model (m^3/year)	**1995 Model (m^3/year)**
Year 1 - 50 Year Dry	1,580,709	0
Year 1 - 10 Year Dry	1,490,936	0
Year 1 - Average Year	1,259,725	0
Year 1 - 10 Year Wet	973,150	0
Year 1 - 50 Year Wet	861,263	0
Year 14 - 50 Year Dry	646,609	0
Year 14 - 10 Year Dry	415,057	0
Year 14 - Average Year	0	0
Year 14 - 10 Year Wet	0	0
Year 14 - 50 Year Wet	0	0

Notes:

1. The additional make-up water required is in addition to the 4.6 percent minimum fresh make-up water required (418,611 m^3/yr) to the mill. Of this, 200,000 m^3/yr is water in ore, and the remainder is for fresh water requirements (ie: potable water, etc.)
2. The new 1995 water balance model assumes that approximately 1.5 million m^3 of water is stored in the tailings impoundment in October of each year.
3. Year 1 water balances indicate that ponded water in the tailings facility may need to be supplemented with additional make-up water if the tailings pond volume becomes too low for practical operations. Therefore, a contingency make-up water allowance of 300,000 m^3 may need to be extracted during freshet from the Polley Lake system under extreme dry start-up conditions during the first few years of operations.

TABLE 4.4

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY

WATER AVAILABLE AT START-UP
Average Year Precipitation

Catchment Areas		Runoff Coeff.
Stage I Tailings Facility Basin =	134 ha	90%
Tailings Facility Unprepared Basin =	96 ha	24%
Diverted Catchment Area A =	240 ha	24%
Diverted Catchment Area B =	310 ha	24%

Total annual precipitation = 755 mm

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.1	58.9	450.7
B	Snowfall (mm/month - water equivalent)	12.1	40.0	67.2	68.7	52.1	38.5	18.9	5.3	0.0	0.0	0.0	1.5	304.3
C	Lake evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m³)													
1	Tailings Facility Catchment Area Runoff	58,250	20,864	9,166	8,201	7,236	7,236	29,185	421,618	98,289	79,234	100,219	71,033	910,530
2	Diverted Catchment Area A Runoff	27,821	9,965	4,378	3,917	3,456	3,456	13,939	201,370	46,944	37,843	47,866	33,926	434,880
3	Diverted Catchment Area B Runoff	35,935	12,871	5,654	5,059	4,464	4,464	18,005	260,102	60,636	48,881	61,826	43,822	561,720
4	Unprepared Basin Runoff	11,128	3,986	1,751	1,567	1,382	1,382	5,576	80,548	18,778	15,137	19,146	13,571	173,952
5	Total Monthly Precipitation Runoff	133,134	47,686	20,949	18,744	16,538	16,538	66,705	963,637	224,647	181,095	229,057	162,352	**2,081,082**
6	Cumulative Monthly Precipitation Runoff	133,134	180,820	201,768	220,512	237,050	253,589	320,294	1,283,931	1,508,578	1,689,673	1,918,730	2,081,082	
	<WATER OUT> (m³)													
	Surface Area of Start-up Pond (ha)	5	5	5	5	5	5	5	13	21	21	21	34	
7	Evaporation from Start-up Pond	750	0	0	0	0	0	0	6,110	23,520	22,470	19,320	17,000	**89,170**
	<AVAILABLE WATER IN TSF> (m³)													
8	Total Monthly Available Water	132,384	47,686	20,949	18,744	16,538	16,538	66,705	957,527	201,127	158,625	209,737	145,352	**1,991,912**
9	Cumulative Monthly Available Water	132,384	180,070	201,018	219,762	236,300	252,839	319,544	1,277,071	1,478,198	1,636,823	1,846,560	1,991,912	

Assumptions:

1. Snowfall is given in equivalent depth of rainfall and is assumed to accumulate on catchment areas until May when it melts with 90% recovery in the tailings facility and 24% recovery from the diverted catchment areas.

TABLE 4.5

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY

WATER AVAILABLE AT START-UP
10 Year Dry Precipitation

Catchment Areas		Runoff Coeff.
Stage I Tailings Facility Basin =	134 ha	90%
Tailings Facility Unprepared Basin =	96 ha	20%
Diverted Catchment Area A =	240 ha	20%
Diverted Catchment Area B =	310 ha	20%

Total annual precipitation = 601.3 mm

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	38.5	13.8	6.1	5.4	4.8	4.8	19.3	36.1	64.9	52.3	66.2	46.9	359.1
B	Snowfall (mm/month - water equivalent)	9.6	31.8	53.5	54.7	41.5	30.7	15.0	4.2	0.0	0.0	0.0	1.2	242.2
C	Lake evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	Tailings Facility Catchment Area Runoff	46,431	16,643	7,357	6,512	5,789	5,789	23,276	335,630	78,269	63,074	79,837	56,561	725,168
2	Diverted Catchment Area A Runoff	18,480	6,624	2,928	2,592	2,304	2,304	9,264	133,584	31,152	25,104	31,776	22,512	288,624
3	Diverted Catchment Area B Runoff	23,870	8,556	3,782	3,348	2,976	2,976	11,966	172,546	40,238	32,426	41,044	29,078	372,806
4	Unprepared Basin Runoff	7,392	2,650	1,171	1,037	922	922	3,706	53,434	12,461	10,042	12,710	9,005	115,450
5	Total Monthly Precipitation Runoff	96,173	34,472	15,238	13,489	11,990	11,990	48,211	695,193	162,120	130,645	165,368	117,156	**1,502,047**
6	Cumulative Monthly Precipitation Runoff	96,173	130,645	145,883	159,372	171,363	183,353	231,565	926,758	1,088,878	1,219,524	1,384,891	1,502,047	
	<WATER OUT> (m^3)													
	Surface Area of Start-up Pond (ha)	0	5	5	5	5	5	5	13	13	13	13	21	
7	Evaporation from Start-up Pond	0	0	0	0	0	0	0	6,110	14,560	13,910	11,960	10,500	**57,040**
	<AVAILABLE WATER IN TSF> (m^3)													
8	Total Monthly Available Water	96,173	34,472	15,238	13,489	11,990	11,990	48,211	689,083	147,560	116,735	153,408	106,656	**1,445,007**
9	Cumulative Monthly Available Water	96,173	130,645	145,883	159,372	171,363	183,353	231,565	920,648	1,068,208	1,184,944	1,338,351	1,445,007	

Assumptions:
1. Snowfall is given in equivalent depth of rainfall and is assumed to accumulate on catchment areas until May when it melts with 90% recovery in the tailings facility and 20% recovery from the diverted catchment areas.

TABLE 4.6

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY

WATER AVAILABLE AT START-UP
50 Year Dry Precipitation

Catchment Areas		Runoff Coeff.
Stage I Tailings Facility Basin =	134 ha	90%
Tailings Facility Unprepared Basin =	96 ha	20%
Diverted Catchment Area A =	240 ha	20%
Diverted Catchment Area B =	310 ha	20%

Total annual precipitation = 508.9 mm

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	32.6	11.7	5.1	4.6	4.0	4.0	16.3	30.5	54.9	44.3	56.0	39.7	303.7
B	Snowfall (mm/month - water equivalent)	8.2	27.0	45.3	46.3	35.1	26.0	12.7	3.6	0.0	0.0	0.0	1.0	205.2
C	Lake evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m³)													
1	Tailings Facility Catchment Area Runoff	39,316	14,110	6,151	5,548	4,824	4,824	19,658	284,254	66,209	53,426	67,536	47,878	613,733
2	Diverted Catchment Area A Runoff	15,648	5,616	2,448	2,208	1,920	1,920	7,824	113,136	26,352	21,264	26,880	19,056	244,272
3	Diverted Catchment Area B Runoff	20,212	7,254	3,162	2,852	2,480	2,480	10,106	146,134	34,038	27,466	34,720	24,614	315,518
4	Unprepared Basin Runoff	6,259	2,246	979	883	768	768	3,130	45,254	10,541	8,506	10,752	7,622	97,709
5	Total Monthly Precipitation Runoff	81,435	29,227	12,740	11,491	9,992	9,992	40,717	588,779	137,140	110,661	139,888	99,171	**1,271,232**
6	Cumulative Monthly Precipitation Runoff	81,435	110,661	123,401	134,892	144,884	154,876	195,593	784,372	921,512	1,032,174	1,172,062	1,271,232	
	<WATER OUT> (m³)													
	Surface Area of Start-up Pond (ha)	0	5	5	5	5	5	5	8	13	13	13	13	
7	Evaporation from Start-up Pond	0	0	0	0	0	0	0	3,760	14,560	13,910	11,960	6,500	**50,690**
	<AVAILABLE WATER IN TSF> (m³)													
8	Total Monthly Available Water	81,435	29,227	12,740	11,491	9,992	9,992	40,717	585,019	122,580	96,751	127,928	92,671	**1,220,542**
9	Cumulative Monthly Available Water	81,435	110,661	123,401	134,892	144,884	154,876	195,593	780,612	903,192	999,944	1,127,872	1,220,542	

Assumptions:

1. Snowfall is given in equivalent depth of rainfall and is assumed to accumulate on catchment areas until May when it melts with 90% recovery in the tailings facility and 20% recovery from the diverted catchment areas.

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE 4.7

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY

WATER AVAILABLE AT START-UP
10 Year Wet Precipitation

Catchment Areas		Runoff Coeff.
Stage I Tailings Facility Basin =	134 ha	90%
Tailings Facility Unprepared Basin =	96 ha	29%
Diverted Catchment Area A =	240 ha	29%
Diverted Catchment Area B =	310 ha	29%

Total annual precipitation = 908.7 mm

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	58.1	20.8	9.1	8.2	7.2	7.2	29.1	54.5	98.1	79.1	100.0	70.9	542.3
B	Snowfall (mm/month - water equivalent)	14.6	48.2	80.9	82.7	62.7	46.3	22.8	6.4	0.0	0.0	0.0	1.8	366.4
C	Lake evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	Tailings Facility Catchment Area Runoff	70,069	25,085	10,975	9,889	8,683	8,683	35,095	507,605	118,309	95,395	120,600	85,505	1,095,892
2	Diverted Catchment Area A Runoff	40,438	14,477	6,334	5,707	5,011	5,011	20,254	292,946	68,278	55,054	69,600	49,346	632,455
3	Diverted Catchment Area B Runoff	52,232	18,699	8,181	7,372	6,473	6,473	26,161	378,389	88,192	71,111	89,900	63,739	816,921
4	Unprepared Basin Runoff	16,175	5,791	2,533	2,283	2,004	2,004	8,101	117,179	27,311	22,021	27,840	19,739	252,982
5	Total Monthly Precipitation Runoff	178,913	64,052	28,023	25,251	22,172	22,172	89,611	1,296,119	302,089	243,581	307,940	218,329	**2,798,251**
6	Cumulative Monthly Precipitation Runoff	178,913	242,965	270,987	296,238	318,410	340,582	430,192	1,726,312	2,028,401	2,271,981	2,579,921	2,798,251	
	<WATER OUT> (m^3)													
	Surface Area of Start-up Pond (ha)	5	5	5	5	5	5	5	21	34	34	34	50	
7	Evaporation from Start-up Pond	750	0	0	0	0	0	0	9,870	38,080	36,380	31,280	25,000	**141,360**
	<AVAILABLE WATER IN TSF> (m^3)													
8	Total Monthly Available Water	178,163	64,052	28,023	25,251	22,172	22,172	89,611	1,286,249	264,009	207,201	276,660	193,329	**2,656,891**
9	Cumulative Monthly Available Water	178,163	242,215	270,237	295,488	317,660	339,832	429,442	1,715,692	1,979,701	2,186,901	2,463,561	2,656,891	

Assumptions:

1. Snowfall is given in equivalent depth of rainfall and is assumed to accumulate on catchment areas until May when it melts with 90% recovery in the tailings facility and 29% recovery from the diverted catchment areas.

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CONSULTING ENGINEERS

Feb. 3, 1995

IMPERIAL METALS CORP.
MT. POLLEY PROJECT
ANNUAL PRECIPITATION DISTRIBUTION

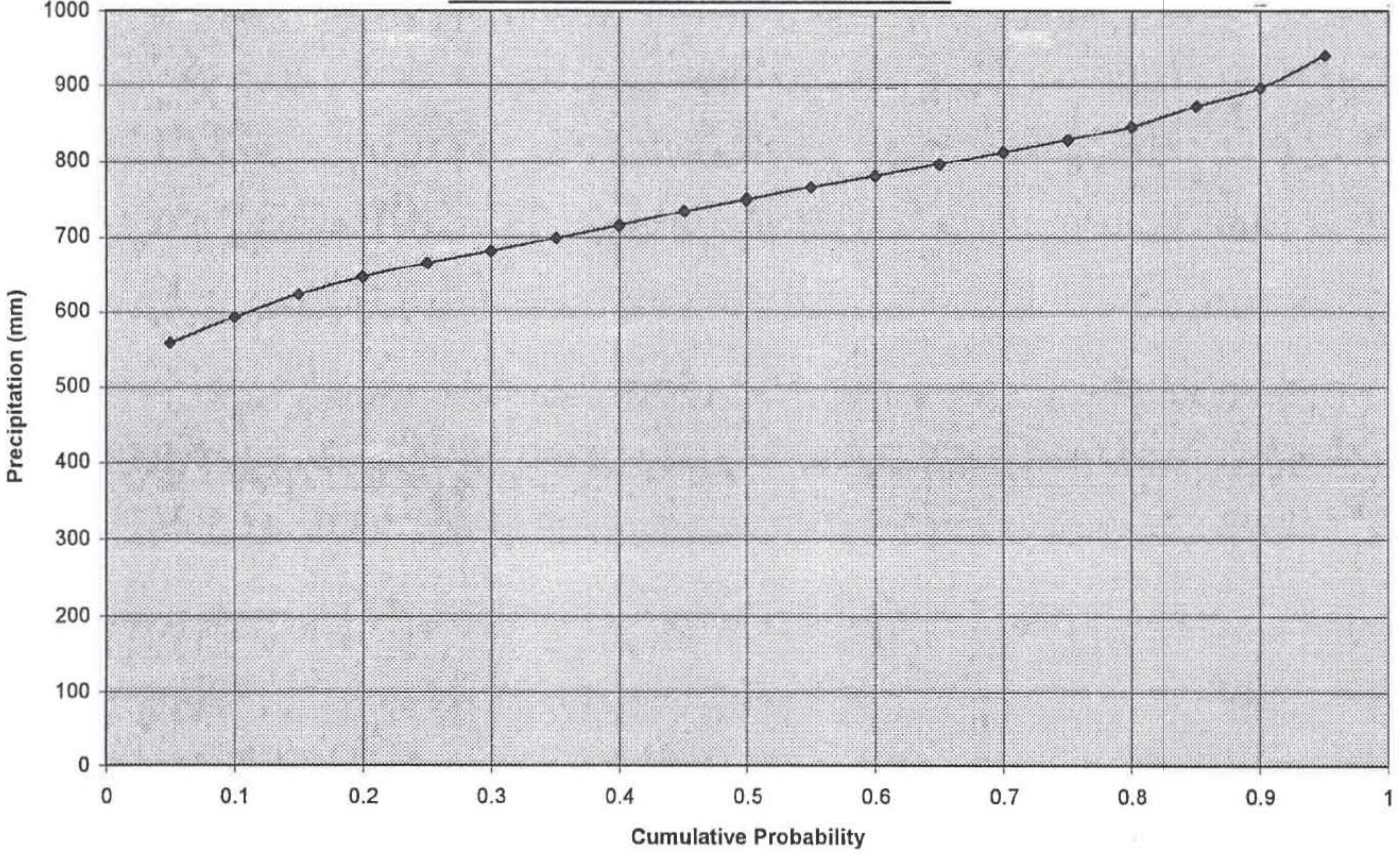
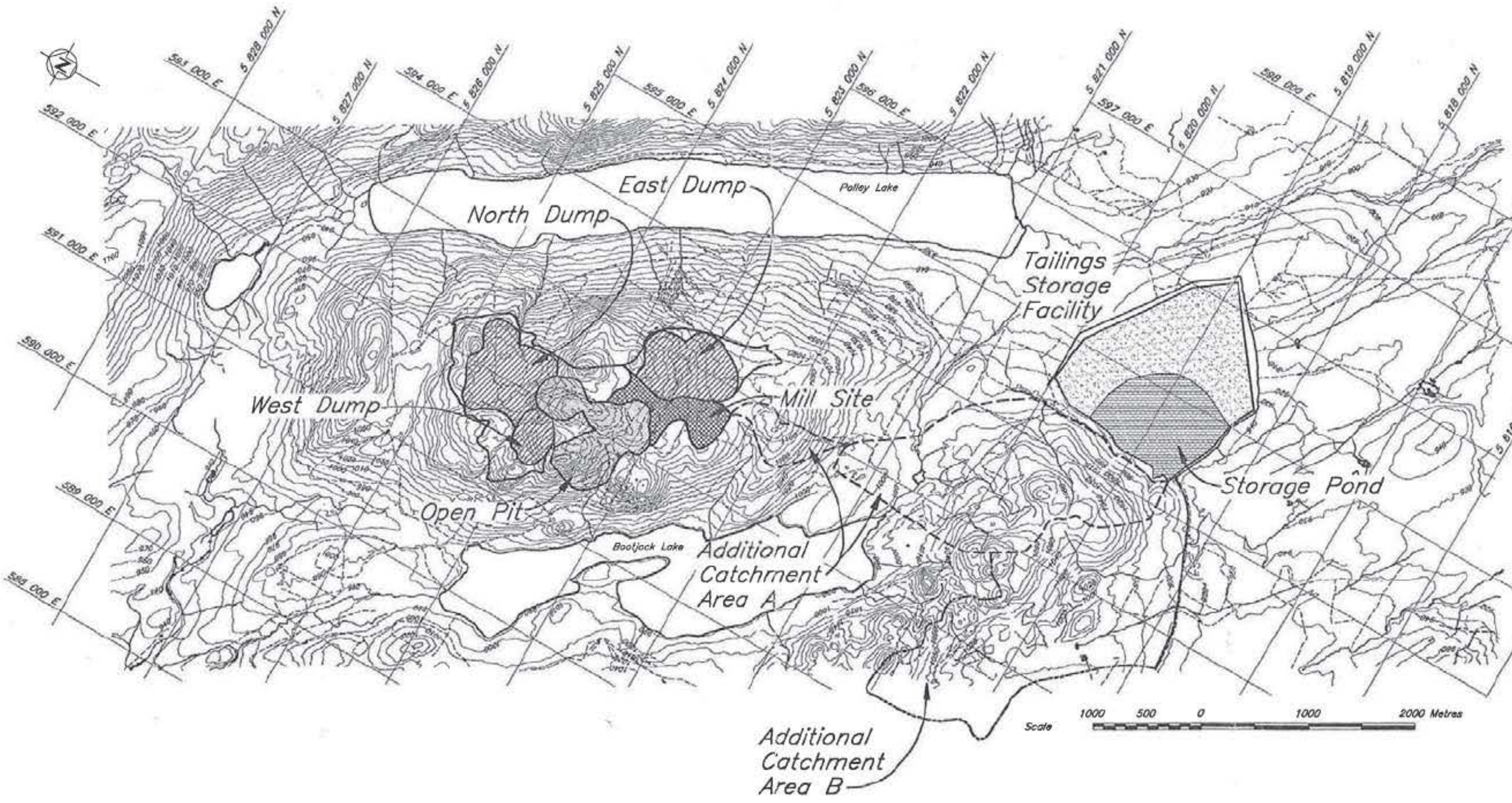


FIGURE 2.1

1624.A1

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
OVERVIEW OF WATER BALANCE COMPONENTS



CAD FILE \PROJECT\1624\FIG\81 Plot scale 1=40 STD. 1 PLOT USER 2

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FIGURE 3.1

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
WATER BALANCE FLOW VOLUMES - AVERAGE CONDITIONS: YEAR 1
EXISTING PERMIT

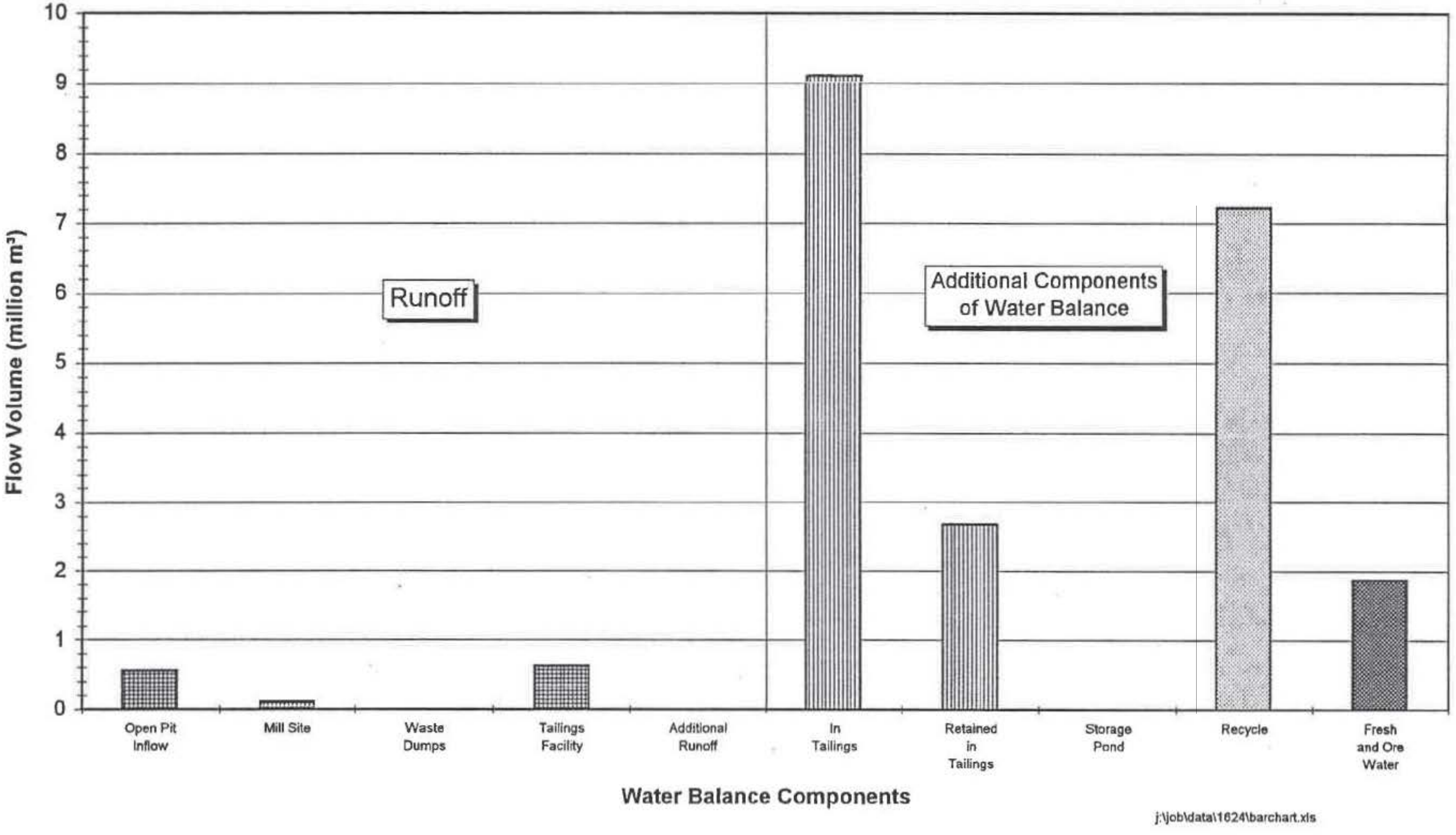

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FIGURE 4.1

1624.A7

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IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
WATER BALANCE FLOW VOLUMES - AVERAGE CONDITIONS : YEAR 1
NEW OPTION

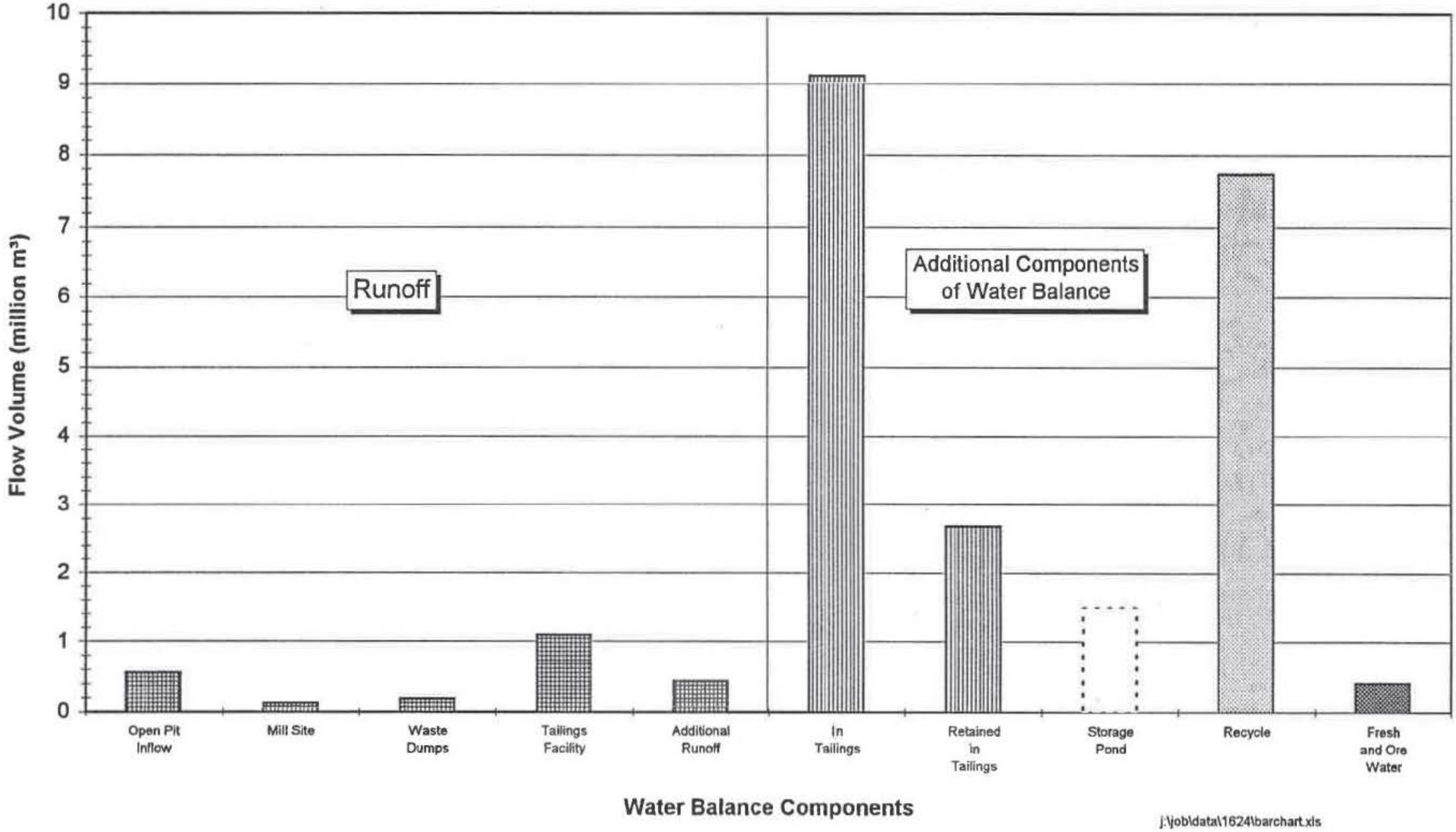

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FIGURE 4.2

1624.A8

IMPERIAL METALS CORP.
MT. POLLEY PROJECT
VARIATION IN TAILINGS POND VOLUME FOR AVERAGE PRECIPITATION CONDITIONS

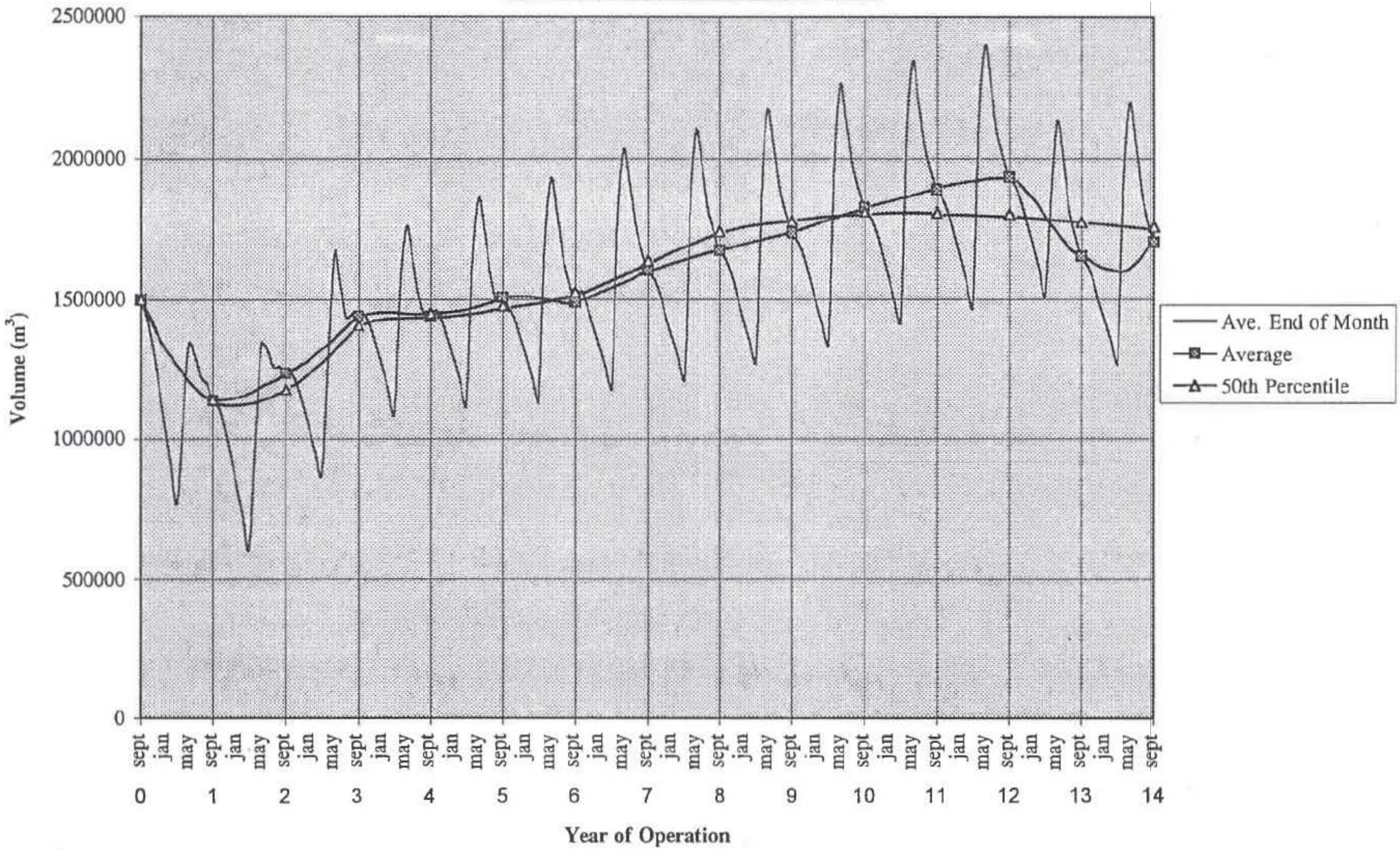

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FIGURE 4.3

1624.A5

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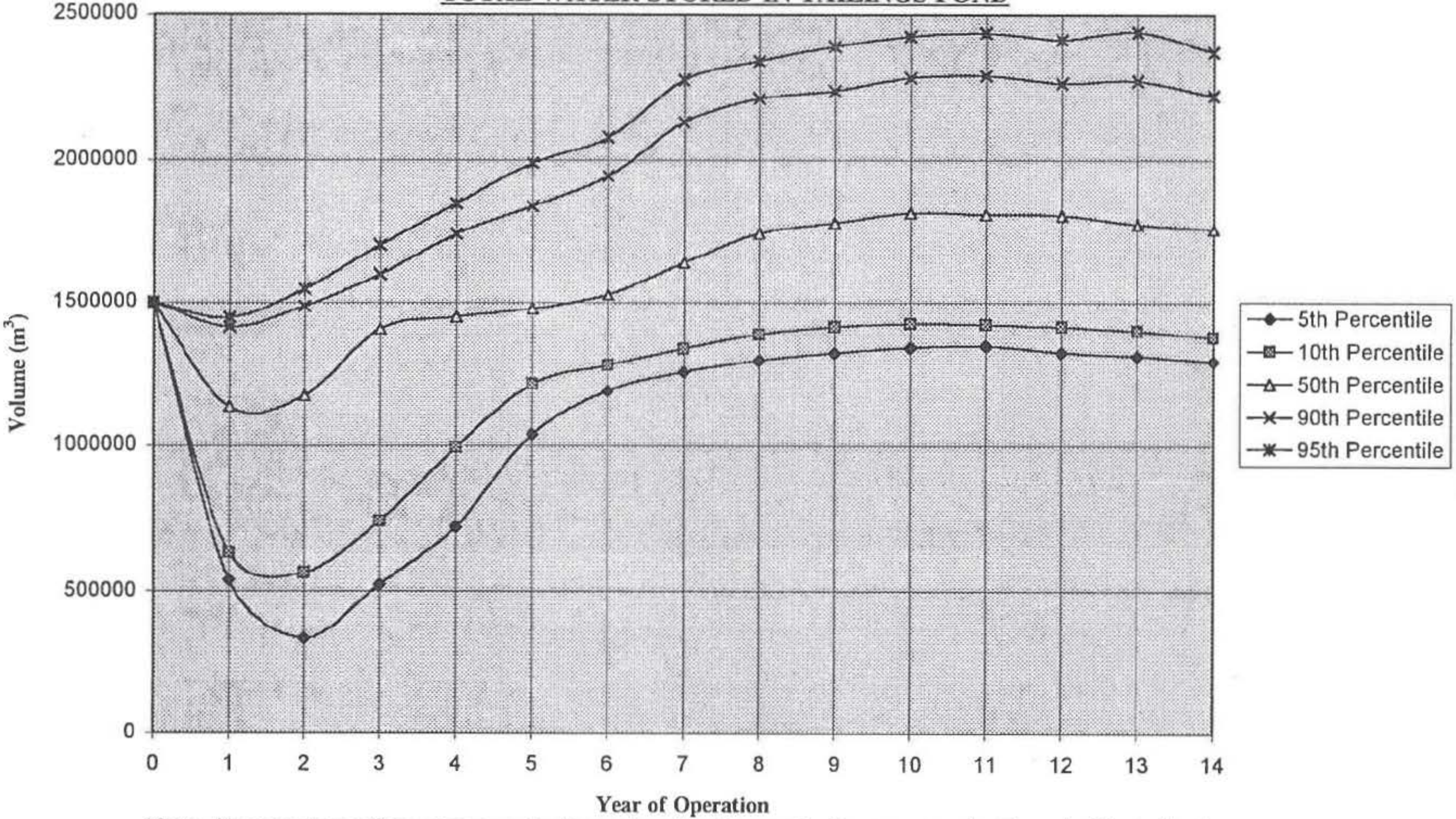
IMPERIAL METALS CORP.
MT. POLLEY PROJECT
TOTAL WATER STORED IN TAILINGS POND



Note: Above curves are for average annual values and are based on pond volumes measured at the end of September in each year. Actual pond volumes fluctuate during each year.

FIGURE 4.4

1624.A6

KNIGHT PIESOLD LTD.
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IMPERIAL METALS CORP.
MT. POLLEY PROJECT
EXCESS DIVERTED WATER

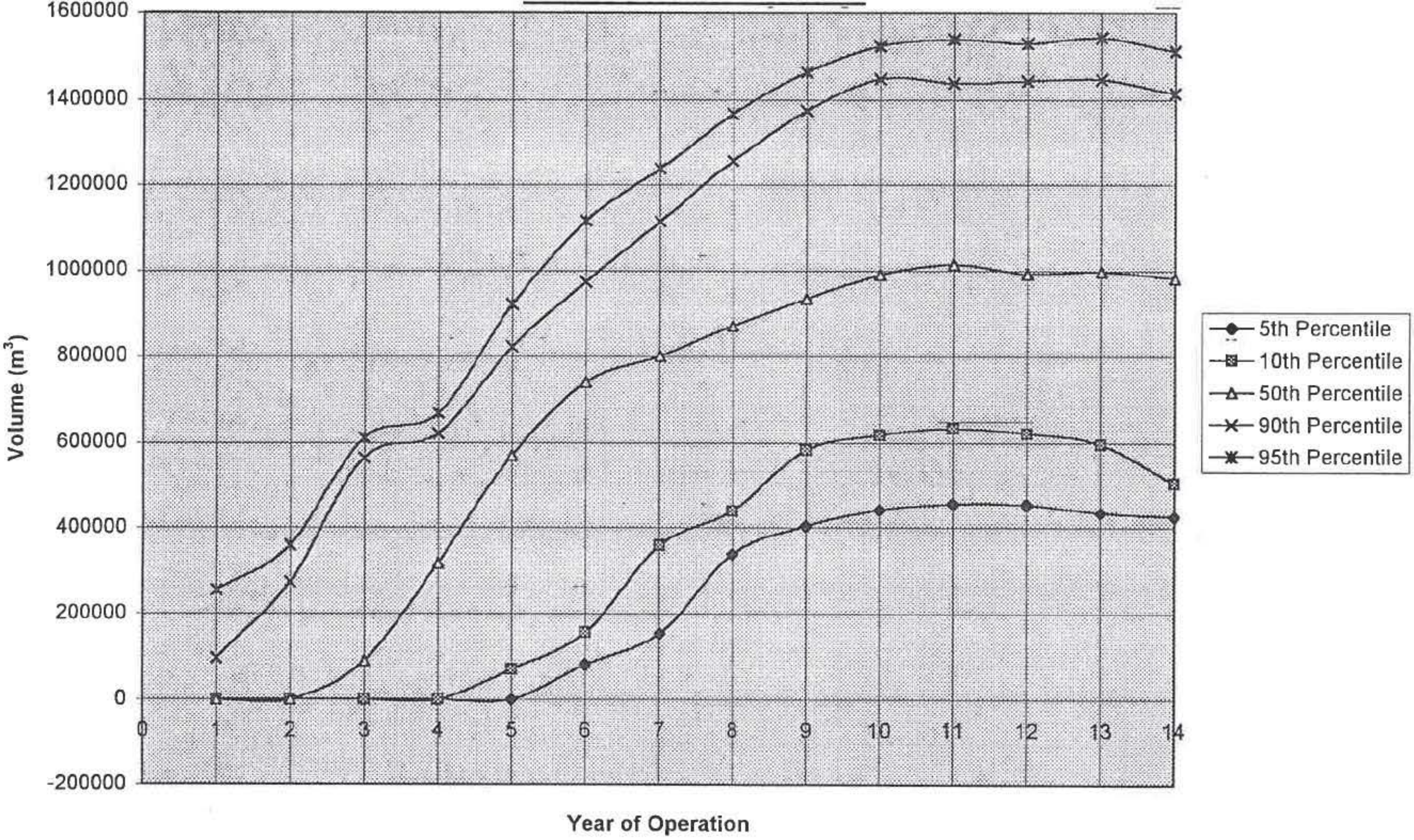

FIGURE 4.5

1624.A3

Feb. 3, 1995
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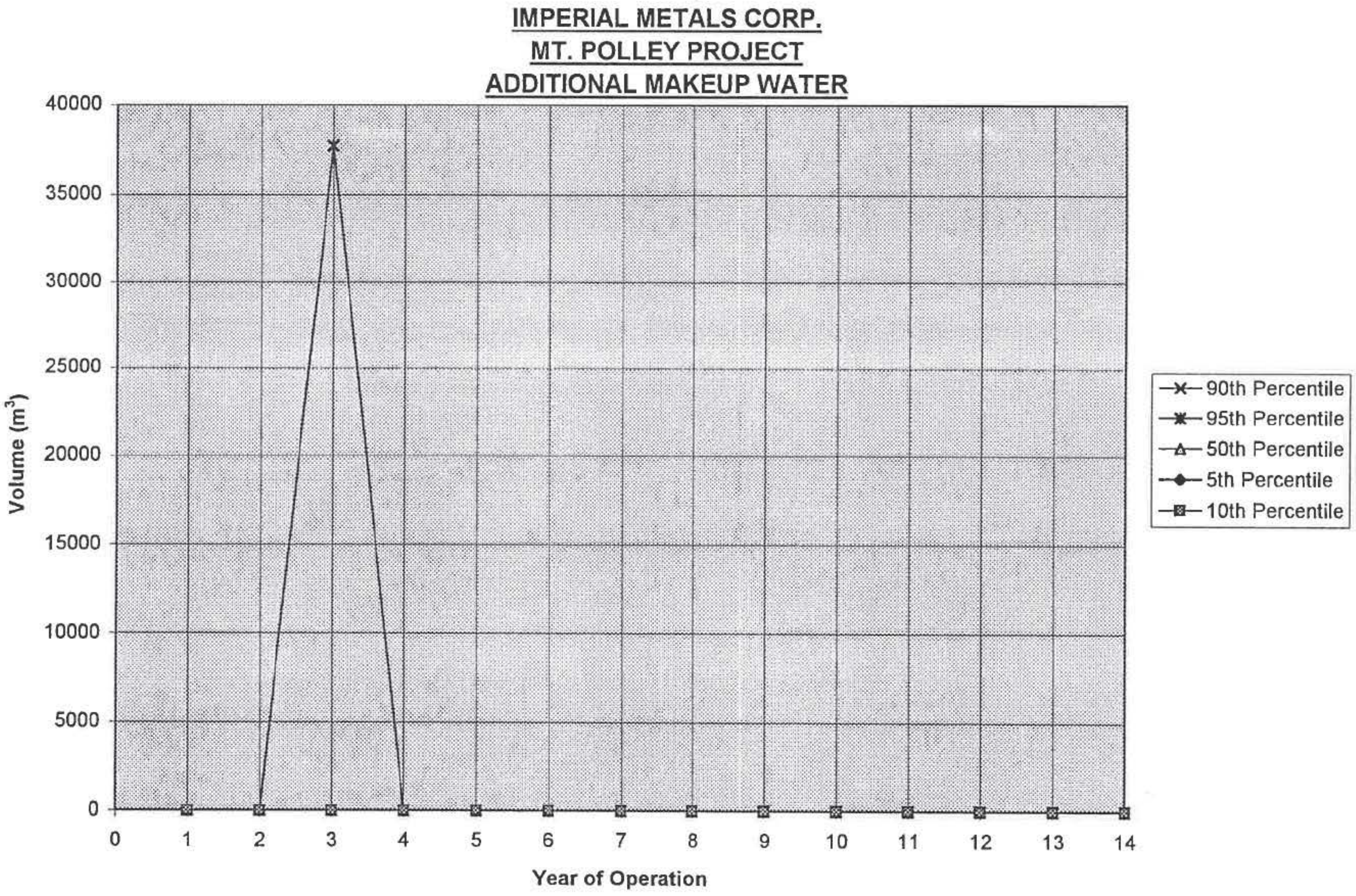

FIGURE 4.6

1624.A4

APPENDIX A

TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCES
FOR AVERAGE PRECIPITATION

TABLE A.1
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 1

Knight Piésold Ltd.
CONSULTING ENGINEERS

assumptions:

daily ore throughput (tpd) = 13,425
tails % solids = 35%
tails S.G. = 2.78
initial pond volume (m^3) = 1,500,000
water content of ore = 4%

min. fresh water makeup (%) = 2%
initial dry density (t/m^3) = 0.9
final dry density (t/m^3) = 1.1
total pit area (ha) = 18
pit g/w infiltration (m^3/mo) = 39,818

unprepared basin area (ha) = 96
prepared basin area (ha) = 64
beach area (ha) = 49
pond area (ha) = 21
beach evaporation factor = 0.80

	dry	ave.	wet
unprep'd basin runoff coeff. =	20%	24%	29%
prep'd basin runoff coeff. =	90%	90%	90%
beach runoff coeff. =	90%	90%	90%
pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	10,185	3,648	1,603	1,434	1,265	1,265	38,211	39,814	17,186	13,854	17,524	12,734	158,724
3	Beach runoff	21,244	7,609	3,343	2,991	2,639	2,639	79,700	83,044	35,847	28,897	36,550	26,561	331,063
4	Unprep'd basin runoff	11,122	3,984	1,750	1,566	1,382	1,382	41,724	43,475	18,766	15,128	19,135	13,905	173,317
5	Prep'd basin runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
6	Recovery from open pit: precipitation	4,557	1,632	717	642	566	566	17,097	17,815	7,690	6,199	7,841	5,698	71,020
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input	873,083	825,003	809,958	808,717	807,477	807,477	1,079,214	1,091,006	924,575	900,070	927,057	891,832	10,745,467
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	114,730	66,650	51,605	50,365	49,124	49,124	320,861	332,653	166,222	141,717	168,704	133,479	1,645,234
12	(-) Evaporation from pond	3,165	0	0	0	0	0	0	9,917	23,632	22,577	19,412	10,550	89,253
13	(-) Evaporation from beach	5,868	0	0	0	0	0	0	18,386	43,814	41,858	35,990	19,560	165,478
14	(+) Consolidation to final density	82,494	82,494	82,494	82,494	82,494	82,494	82,494	82,494	82,494	82,494	82,494	82,494	989,924
15	Sub-total (Water recovered as S/N)	581,614	542,567	527,523	526,282	525,041	525,041	796,779	780,267	574,693	553,199	589,219	579,287	7,101,512
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	224,335	224,335	224,335	224,335	224,335	224,335	224,335	224,335	224,335	224,335	224,335	224,335	2,692,024
20	Evaporation from beach and pond	9,033	0	0	0	0	0	0	28,303	67,446	64,435	55,402	30,110	254,731
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	239,208	230,175	230,175	230,175	230,175	230,175	230,175	258,479	297,622	294,611	285,578	260,285	3,016,835
23	>>> Total Water Output	873,083	825,003	809,958	808,717	807,477	807,477	1,079,214	1,091,006	924,575	900,070	927,057	891,832	10,745,467
24	Monthly water available (excluding stored water in TSF)	633,874	594,827	579,783	578,542	577,301	577,301	849,039	832,527	626,953	605,459	641,479	631,547	7,728,632
25	Available stored water in TSF at beginning of month	1,500,000	1,432,777	1,321,031	1,184,705	1,046,351	905,971	765,590	1,069,188	1,339,298	1,297,793	1,219,260	1,193,853	
26	*Total Monthly Water Available*	2,133,874	2,027,604	1,900,814	1,763,247	1,623,653	1,483,272	1,614,628	1,901,715	1,966,252	1,903,252	1,860,739	1,825,400	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-114,706	-128,753	-143,798	-145,039	-146,279	-146,279	125,458	83,946	-121,627	-143,122	-107,102	-117,034	-1,104,334
34	Annual cumulative precipitation surplus/deficit	-114,706	-243,459	-387,257	-532,296	-678,575	-824,854	-699,396	-615,450	-737,077	-880,199	-987,300	-1,104,334	
35	Total water in TSF at end of month (incl. mine site runoff)	1,432,777	1,321,031	1,184,705	1,046,351	905,971	765,590	1,069,188	1,339,298	1,297,793	1,219,260	1,193,853	1,136,187	
36	Excess runoff not diverted into tailings pond	0	0	0	0	0	0	0	0	0	0	0	0	0

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE A.2
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 2

assumptions:

daily ore throughput (tpd) = 13,425
tails % solids = 35%
tails S.G. = 2.78
initial pond volume (m^3) = 1,136,187
water content of ore = 4%

min. fresh water makeup (%) = 2%
initial dry density (t/m^3) = 0.9
final dry density (t/m^3) = 1.2
total pit area (ha) = 18
pit g/w infiltration (m^3/mo) = 39,818

unprepared basin area (ha) = 54
prepared basin area (ha) = 67
beach area (ha) = 82
pond area (ha) = 27
beach evaporation factor = 0.80

	dry	ave.	wet
unprep'd basin runoff coeff. =	20%	24%	29%
prep'd basin runoff coeff. =	90%	90%	90%
beach runoff coeff. =	90%	90%	90%
pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)		48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)		12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)		15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)														
1	With slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond		13,081	4,685	2,058	1,842	1,625	1,625	49,077	51,136	22,073	17,794	22,507	16,355	203,859
3	Beach runoff		35,580	12,744	5,599	5,009	4,420	4,420	133,485	139,086	60,037	48,398	61,216	44,486	554,480
4	Unprep'd basin runoff		6,256	2,241	984	881	777	777	23,470	24,455	10,556	8,510	10,763	7,822	97,491
5	Prep'd basin runoff		29,107	10,426	4,580	4,098	3,616	3,616	109,200	113,782	49,115	39,593	50,079	36,392	453,604
6	Recovery from open pit:	precipitation	4,557	1,632	717	642	566	566	17,097	17,815	7,690	6,199	7,841	5,698	71,020
7		g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input		886,753	829,899	812,109	810,642	809,175	809,175	1,130,500	1,144,443	947,642	918,665	950,576	908,924	10,958,503
	<WATER OUT> (m^3)														
	Supernatant Recovery														
9	(+) Recovery from tailings		451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff		128,400	71,546	53,756	52,289	50,822	50,822	372,147	386,091	189,289	160,312	192,224	150,571	1,858,270
12	(-) Evaporation from pond		4,065	0	0	0	0	0	0	12,737	30,352	28,997	24,932	13,550	114,633
13	(-) Evaporation from beach		9,828	0	0	0	0	0	0	30,794	73,382	70,106	60,278	32,760	277,150
14	(+) Consolidation to final density		113,429	113,429	113,429	113,429	113,429	113,429	113,429	113,429	113,429	113,429	113,429	113,429	1,361,146
15	Sub-total (Water recovered as S/N)		621,360	578,399	560,609	559,142	557,674	557,674	879,000	849,412	592,407	568,061	613,866	611,113	7,548,717
	Underdrainage recovery														
16	(+) Underdrainage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)		52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water														
19	Water retained in tailings		193,400	193,400	193,400	193,400	193,400	193,400	193,400	193,400	193,400	193,400	193,400	193,400	2,320,803
20	Evaporation from beach and pond		13,893	0	0	0	0	0	0	43,531	103,734	99,103	85,210	46,310	391,783
21	Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)		213,133	199,240	199,240	199,240	199,240	199,240	199,240	242,772	302,975	298,344	284,451	245,550	2,782,665
23	>>> Total Water Output		886,753	829,899	812,109	810,642	809,175	809,175	1,130,500	1,144,443	947,642	918,665	950,576	908,924	10,958,503
24	Monthly water available (excluding stored water in TSF)		673,620	630,659	612,869	611,402	609,934	609,934	931,260	901,672	644,667	620,321	666,126	663,373	8,175,837
25	Available stored water in TSF at beginning of month		1,136,187	1,109,579	1,033,977	930,874	825,502	717,863	610,223	999,307	1,341,963	1,319,640	1,257,153	1,257,890	
26	*Total Monthly Water Available*		1,809,807	1,740,238	1,646,846	1,542,275	1,435,437	1,327,797	1,541,483	1,900,978	1,986,630	1,939,961	1,923,279	1,921,263	
27	Water included with slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill		18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore		16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads		25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*		748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required		0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit		-74,961	-92,922	-110,712	-112,179	-113,646	-113,646	207,679	153,091	-103,913	-128,259	-82,455	-85,207	-657,129
34	Annual cumulative precipitation surplus/deficit		-74,961	-167,882	-278,594	-390,773	-504,419	-618,065	-410,386	-257,294	-361,208	-489,467	-571,922	-657,129	
35	Total water in TSF at end of month (incl. mine site runoff)		1,109,579	1,033,977	930,874	825,502	717,863	610,223	999,307	1,341,963	1,319,640	1,257,153	1,257,890	1,233,138	
36	Excess runoff not diverted into tailings pond		0	0	0	0	0	0	0	0	0	0	0	0	0

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE A.3
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 3

assumptions:

daily ore throughput (tpd) = 13,425
tails % solids = 35%
tails S.G. = 2.78
initial pond volume (m^3) = 1,233,138
water content of ore = 4%

min. fresh water makeup (%) = 2%
initial dry density (t/m^3) = 0.9
final dry density (t/m^3) = 1.3
total pit area (ha) = 26
pit g/w infiltration (m^3/mo) = 39,818

unprepared basin area (ha) = 54
prepared basin area (ha) = 38
beach area (ha) = 105
pond area (ha) = 33
beach evaporation factor = 0.80

	dry	ave.	wet
unprep'd basin runoff coeff. =	20%	24%	29%
prep'd basin runoff coeff. =	90%	90%	90%
beach runoff coeff. =	90%	90%	90%
pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	16,026	5,740	2,522	2,256	1,991	1,991	60,124	62,646	27,042	21,799	27,573	20,037	249,746
3	Beach runoff	45,529	16,308	7,164	6,410	5,656	5,656	170,809	177,975	76,824	61,931	78,333	56,924	709,518
4	Unprep'd basin runoff	6,256	2,241	984	881	777	777	23,470	24,455	10,556	8,510	10,763	7,822	97,491
5	Prep'd basin runoff	16,509	5,913	2,598	2,324	2,051	2,051	61,934	64,533	27,856	22,456	28,403	20,640	257,268
6	Recovery from open pit: precipitation	6,603	2,365	1,039	930	820	820	24,772	25,811	11,142	8,982	11,360	8,255	102,898
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input	889,093	830,737	812,477	810,971	809,465	809,465	1,139,279	1,153,591	951,590	921,848	954,602	911,849	10,994,970
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	130,740	72,384	54,125	52,619	51,113	51,113	380,926	395,238	193,238	163,495	196,250	153,497	1,894,737
12	(-) Evaporation from pond	4,980	0	0	0	0	0	0	15,604	37,184	35,524	30,544	16,600	140,436
13	(-) Evaporation from beach	12,576	0	0	0	0	0	0	39,405	93,901	89,709	77,133	41,920	354,643
14	(+) Consolidation to final density	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)	646,213	605,413	587,153	585,647	584,141	584,141	913,955	873,258	595,181	571,291	621,601	628,005	7,795,998
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond	17,556	0	0	0	0	0	0	55,009	131,085	125,233	107,677	58,520	495,079
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	190,620	173,064	173,064	173,064	173,064	173,064	173,064	228,073	304,149	298,297	280,741	231,584	2,571,851
23	>>> Total Water Output	889,093	830,737	812,477	810,971	809,465	809,465	1,139,279	1,153,591	951,590	921,848	954,602	911,849	10,994,970
24	Monthly water available (excluding stored water in TSF)	698,473	657,673	639,413	637,907	636,401	636,401	966,215	925,518	647,441	623,551	673,861	680,265	8,423,118
25	Available stored water in TSF at beginning of month	1,233,138	1,232,253	1,183,976	1,107,554	1,028,811	947,746	866,681	1,293,983	1,663,887	1,562,747	1,437,718	1,447,687	
26	*Total Monthly Water Available*	1,931,611	1,889,926	1,823,389	1,745,461	1,665,212	1,584,147	1,832,896	2,219,501	2,311,328	2,186,298	2,111,579	2,127,952	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-50,108	-65,908	-84,168	-85,673	-87,179	-87,179	242,634	176,937	-101,139	-125,030	-74,719	-68,315	-409,848
34	Annual cumulative precipitation surplus/deficit	-50,108	-116,016	-200,183	-285,857	-373,036	-460,215	-217,581	-40,644	-141,783	-266,813	-341,532	-409,848	
35	Total water in TSF at end of month (incl. mine site runoff)	1,232,253	1,183,976	1,107,554	1,028,811	947,746	866,681	1,293,983	1,663,887	1,562,747	1,437,718	1,447,687	1,440,914	
36	Excess runoff not diverted into tailings pond	0	0	0	0	0	0	0	0	83,058	66,956	0	0	150,014

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE A.4
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 4

assumptions:

daily ore throughput (tpd) = 13,425
tails % solids = 35%
tails S.G. = 2.78
initial pond volume (m^3) = 1,440,914
water content of ore = 4%

min. fresh water makeup (%) = 2%
initial dry density (t/m^3) = 0.9
final dry density (t/m^3) = 1.3
total pit area (ha) = 26
pit g/w infiltration (m^3/mo) = 39,818

unprepared basin area (ha) = 26
prepared basin area (ha) = 44
beach area (ha) = 121
pond area (ha) = 39
beach evaporation factor = 0.80

	dry	ave.	wet
unprep'd basin runoff coeff. =	20%	24%	29%
prep'd basin runoff coeff. =	90%	90%	90%
beach runoff coeff. =	90%	90%	90%
pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)		48.3	17.3	7.6	6.8	6.0	6,0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)		12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)		15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)														
1	With slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond		18,970	6,795	2,985	2,671	2,357	2,357	71,170	74,156	32,010	25,805	32,639	23,718	295,633
3	Beach runoff		52,437	18,782	8,251	7,382	6,514	6,514	196,723	204,977	88,480	71,327	90,217	65,561	817,165
4	Unprep'd basin runoff		3,012	1,079	474	424	374	374	11,300	11,774	5,083	4,097	5,182	3,766	46,940
5	Prep'd basin runoff		19,115	6,847	3,008	2,691	2,375	2,375	71,714	74,722	32,255	26,002	32,888	23,899	297,889
6	Recovery from open pit:	precipitation	6,603	2,365	1,039	930	820	820	24,772	25,811	11,142	8,982	11,360	8,255	102,898
7		g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input		898,308	834,038	813,927	812,269	810,610	810,610	1,173,850	1,189,612	967,139	934,382	970,457	923,371	11,138,573
	<WATER OUT> (m^3)														
	Supernatant Recovery														
9	(+) Recovery from tailings		451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff		139,955	75,685	55,575	53,916	52,257	52,257	415,497	431,260	208,787	176,030	212,104	165,018	2,038,341
12	(-) Evaporation from pond		5,895	0	0	0	0	0	0	18,471	44,016	42,051	36,156	19,650	166,239
13	(-) Evaporation from beach		14,484	0	0	0	0	0	0	45,383	108,147	103,319	88,835	48,280	408,449
14	(+) Consolidation to final density		139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)		652,605	608,713	588,603	586,944	585,286	585,286	948,526	900,434	589,652	563,688	620,141	630,116	7,859,993
	Underdrainage recovery														
16	(+) Underdrainage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)		52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water														
19	Water retained in tailings		167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond		20,379	0	0	0	0	0	0	63,854	152,163	145,370	124,991	67,930	574,688
21	Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)		193,443	173,064	173,064	173,064	173,064	173,064	173,064	236,919	325,228	318,435	298,056	240,994	2,651,460
23	>>> Total Water Output		898,308	834,038	813,927	812,269	810,610	810,610	1,173,850	1,189,612	967,139	934,382	970,457	923,371	11,138,573
24	Monthly water available (excluding stored water in TSF)		704,865	660,973	640,863	639,204	637,546	637,546	1,000,786	952,694	641,912	615,948	672,401	682,376	8,487,113
25	Available stored water in TSF at beginning of month		1,440,914	1,447,292	1,402,627	1,327,792	1,250,468	1,170,656	1,090,844	1,555,981	1,760,095	1,653,426	1,520,793	1,444,614	
26	*Total Monthly Water Available*		2,145,779	2,108,265	2,043,490	1,966,996	1,888,014	1,808,202	2,091,630	2,508,675	2,402,007	2,269,374	2,193,194	2,126,990	
27	Water included with slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill		18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore		16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads		25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*		748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required		0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit		-43,716	-62,607	-82,718	-84,376	-86,035	-86,035	277,205	204,113	-106,669	-132,633	-76,179	-66,204	-345,853
34	Annual cumulative precipitation surplus/deficit		-43,716	-106,323	-189,041	-273,417	-359,451	-445,486	-168,281	35,832	-70,836	-203,469	-279,648	-345,853	
35	Total water in TSF at end of month (incl. mine site runoff)		1,447,292	1,402,627	1,327,792	1,250,468	1,170,656	1,090,844	1,555,981	1,760,095	1,653,426	1,520,793	1,444,614	1,441,040	
36	Excess runoff not diverted into tailings pond		0	0	0	0	0	0	0	196,367	84,526	68,139	86,185	0	435,218

TABLE A.5
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 5

Knight Piésold Ltd.
CONSULTING ENGINEERS

assumptions:

daily ore throughput (tpd) = 13,425
tails % solids = 35%
tails S.G. = 2.78
initial pond volume (m^3) = 1,441,040
water content of ore = 4%

min. fresh water makeup (%) = 2%
initial dry density (t/m^3) = 0.9
final dry density (t/m^3) = 1.3
total pit area (ha) = 40
pit g/w infiltration (m^3/mo) = 39,818

unprepared basin area (ha) = 26
prepared basin area (ha) = 19
beach area (ha) = 140
pond area (ha) = 45
beach evaporation factor = 0.80

	dry	ave.	wet
unprep'd basin runoff coeff. =	20%	24%	29%
prep'd basin runoff coeff. =	90%	90%	90%
beach runoff coeff. =	90%	90%	90%
pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	21,915	7,849	3,448	3,085	2,722	2,722	82,217	85,667	36,979	29,810	37,705	27,400	341,520
3	Beach runoff	60,648	21,723	9,543	8,538	7,534	7,534	227,528	237,074	102,335	82,496	104,344	75,827	945,122
4	Unprep'd basin runoff	3,012	1,079	474	424	374	374	11,300	11,774	5,083	4,097	5,182	3,766	46,940
5	Prep'd basin runoff	8,254	2,957	1,299	1,162	1,025	1,025	30,967	32,267	13,928	11,228	14,202	10,320	128,634
6	Recovery from open pit: precipitation	10,461	3,747	1,646	1,473	1,300	1,300	39,246	40,893	17,652	14,230	17,998	13,079	163,023
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input	902,461	835,525	814,581	812,853	811,126	811,126	1,189,429	1,205,845	974,146	940,031	977,601	928,563	11,203,287
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	144,108	77,172	56,228	54,501	52,773	52,773	431,076	447,492	215,794	181,678	219,249	170,210	2,103,055
12	(-) Evaporation from pond	6,810	0	0	0	0	0	0	21,338	50,848	48,578	41,768	22,700	192,042
13	(-) Evaporation from beach	16,752	0	0	0	0	0	0	52,490	125,082	119,498	102,746	55,840	472,406
14	(+) Consolidation to final density	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)	653,574	610,201	589,256	587,529	585,802	585,802	964,105	906,693	572,893	546,631	607,763	624,698	7,834,947
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond	23,562	0	0	0	0	0	0	73,828	175,930	168,076	144,514	78,540	664,448
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	196,626	173,064	173,064	173,064	173,064	173,064	173,064	246,892	348,994	341,140	317,578	251,604	2,741,220
23	>>> Total Water Output	902,461	835,525	814,581	812,853	811,126	811,126	1,189,429	1,205,845	974,146	940,031	977,601	928,563	11,203,287
24	Monthly water available (excluding stored water in TSF)	705,834	662,461	641,516	639,789	638,062	638,062	1,016,365	958,953	625,153	598,891	660,023	676,958	8,462,067
25	Available stored water in TSF at beginning of month	1,441,040	1,461,562	1,423,104	1,350,995	1,276,111	1,198,451	1,120,791	1,650,935	1,861,307	1,737,879	1,588,190	1,499,633	
26	*Total Monthly Water Available*	2,146,875	2,124,023	2,064,620	1,990,784	1,914,172	1,836,513	2,137,156	2,609,888	2,486,460	2,336,770	2,248,213	2,176,591	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-42,746	-61,120	-82,064	-83,792	-85,519	-85,519	292,784	210,373	-123,428	-149,690	-88,557	-71,622	-370,900
34	Annual cumulative precipitation surplus/deficit	-42,746	-103,866	-185,930	-269,722	-355,241	-440,760	-147,975	62,397	-61,031	-210,720	-299,277	-370,900	
35	Total water in TSF at end of month (incl. mine site runoff)	1,461,562	1,423,104	1,350,995	1,276,111	1,198,451	1,120,791	1,650,935	1,861,307	1,737,879	1,588,190	1,499,633	1,507,113	
36	Excess runoff not diverted into tailings pond	0	0	0	0	0	0	0	247,868	106,757	86,060	108,852	0	549,537

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE A.6
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 6

assumptions:

daily ore throughput (tpd) = 13,425
tails % solids = 35%
tails S.G. = 2.78
initial pond volume (m^3) = 1,507,113
water content of ore = 4%

min. fresh water makeup (%) = 2%
initial dry density (t/m^3) = 0.9
final dry density (t/m^3) = 1.3
total pit area (ha) = 40
pit g/w infiltration (m^3/mo) = 39,818

unprepared basin area (ha) = 15
prepared basin area (ha) = 22
beach area (ha) = 142
pond area (ha) = 51
beach evaporation factor = 0.80

	dry	ave.	wet
unprep'd basin runoff coeff. =	20%	24%	29%
prep'd basin runoff coeff. =	90%	90%	90%
beach runoff coeff. =	90%	90%	90%
pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	24,811	8,887	3,904	3,493	3,082	3,082	93,083	96,988	41,866	33,749	42,688	31,021	386,654
3	Beach runoff	61,516	22,034	9,680	8,661	7,642	7,642	230,787	240,471	103,801	83,678	105,839	76,913	958,662
4	Unprep'd basin runoff	1,738	622	273	245	216	216	6,519	6,793	2,932	2,364	2,990	2,173	27,081
5	Prep'd basin runoff	9,558	3,423	1,504	1,346	1,187	1,187	35,857	37,361	16,127	13,001	16,444	11,950	148,945
6	Recovery from open pit: precipitation	10,461	3,747	1,646	1,473	1,300	1,300	39,246	40,893	17,652	14,230	17,998	13,079	163,023
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input	906,255	836,884	815,178	813,387	811,597	811,597	1,203,663	1,220,676	980,548	945,192	984,129	933,306	11,262,414
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	147,902	78,531	56,825	55,035	53,245	53,245	445,311	462,324	222,196	186,839	225,776	174,954	2,162,181
12	(-) Evaporation from pond	7,710	0	0	0	0	0	0	24,158	57,568	54,998	47,288	25,700	217,422
13	(-) Evaporation from beach	16,992	0	0	0	0	0	0	53,242	126,874	121,210	104,218	56,640	479,174
14	(+) Consolidation to final density	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)	656,228	611,560	589,853	588,063	586,273	586,273	978,339	917,953	570,783	543,660	607,299	625,642	7,861,925
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond	24,702	0	0	0	0	0	0	77,400	184,442	176,208	151,506	82,340	696,596
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	197,766	173,064	173,064	173,064	173,064	173,064	173,064	250,464	357,506	349,272	324,570	255,404	2,773,368
23	>>> Total Water Output	906,255	836,884	815,178	813,387	811,597	811,597	1,203,663	1,220,676	980,548	945,192	984,129	933,306	11,262,414
24	Monthly water available (excluding stored water in TSF)	708,488	663,820	642,113	640,323	638,533	638,533	1,030,599	970,213	623,043	595,920	659,559	677,902	8,489,045
25	Available stored water in TSF at beginning of month	1,507,113	1,467,021	1,432,504	1,362,126	1,288,791	1,212,498	1,136,205	1,707,627	1,929,259	1,803,721	1,651,061	1,562,039	
26	*Total Monthly Water Available*	2,215,602	2,130,841	2,074,617	2,002,449	1,927,324	1,851,031	2,166,804	2,677,840	2,552,302	2,399,641	2,310,620	2,239,941	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-40,092	-59,761	-81,467	-83,257	-85,048	-85,048	307,018	221,632	-125,538	-152,661	-89,022	-70,679	-343,921
34	Annual cumulative precipitation surplus/deficit	-40,092	-99,853	-181,320	-264,578	-349,625	-434,673	-127,654	93,978	-31,560	-184,221	-273,242	-343,921	
35	Total water in TSF at end of month (incl. mine site runoff)	1,467,021	1,432,504	1,362,126	1,288,791	1,212,498	1,136,205	1,707,627	1,929,259	1,803,721	1,651,061	1,562,039	1,491,361	
36	Excess runoff not diverted into tailings pond	70,477	0	0	0	0	0	0	276,047	118,921	95,866	121,255	88,116	770,682

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE A.7
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 7

assumptions:

daily ore throughput (tpd) = 13,425
tails % solids = 35%
tails S.G. = 2.78
initial pond volume (m^3) = 1,491,361
water content of ore = 4%

min. fresh water makeup (%) = 2%
initial dry density (t/m^3) = 0.9
final dry density (t/m^3) = 1.3
total pit area (ha) = 65
pit g/w infiltration (m^3/mo) = 39,818

unprepared basin area (ha) = 15
prepared basin area (ha) = 13
beach area (ha) = 145
pond area (ha) = 58
beach evaporation factor = 0.80

	dry	ave.	wet
unprep'd basin runoff coeff. =	20%	24%	29%
prep'd basin runoff coeff. =	90%	90%	90%
beach runoff coeff. =	90%	90%	90%
pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	27,756	9,941	4,367	3,908	3,448	3,448	104,130	108,499	46,834	37,755	47,754	34,703	432,541
3	Beach runoff	62,776	22,485	9,878	8,838	7,798	7,798	235,514	245,395	105,927	85,391	108,006	78,488	978,296
4	Unprep'd basin runoff	1,738	622	273	245	216	216	6,519	6,793	2,932	2,364	2,990	2,173	27,081
5	Prep'd basin runoff	5,648	2,023	889	795	702	702	21,188	22,077	9,530	7,682	9,717	7,061	88,013
6	Recovery from open pit: precipitation	16,753	6,001	2,636	2,359	2,081	2,081	62,852	65,489	28,269	22,789	28,824	20,946	261,080
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input	912,841	839,243	816,214	814,315	812,415	812,415	1,228,374	1,246,424	991,663	954,151	995,461	941,541	11,365,058
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	154,489	80,891	57,861	55,962	54,063	54,063	470,021	488,071	233,310	195,799	237,108	183,189	2,264,826
12	(-) Evaporation from pond	8,625	0	0	0	0	0	0	27,025	64,400	61,525	52,900	28,750	243,225
13	(-) Evaporation from beach	17,340	0	0	0	0	0	0	54,332	129,472	123,692	106,352	57,800	488,988
14	(+) Consolidation to final density	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)	661,552	613,919	590,890	588,990	587,091	587,091	1,003,049	939,743	572,466	543,610	610,885	629,667	7,928,953
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond	25,965	0	0	0	0	0	0	81,357	193,872	185,217	159,252	86,550	732,213
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	199,029	173,064	173,064	173,064	173,064	173,064	173,064	254,421	366,936	358,281	332,316	259,614	2,808,985
23	>>> Total Water Output	912,841	839,243	816,214	814,315	812,415	812,415	1,228,374	1,246,424	991,663	954,151	995,461	941,541	11,365,058
24	Monthly water available (excluding stored water in TSF)	713,812	666,179	643,150	641,250	639,351	639,351	1,055,309	992,003	624,726	595,870	663,145	681,927	8,556,073
25	Available stored water in TSF at beginning of month	1,491,361	1,530,099	1,472,697	1,403,832	1,331,851	1,256,753	1,181,655	1,789,153	2,032,575	1,908,721	1,756,010	1,670,575	
26	*Total Monthly Water Available*	2,205,173	2,196,277	2,115,847	2,045,083	1,971,202	1,896,104	2,236,964	2,781,156	2,657,302	2,504,591	2,419,155	2,352,502	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-34,769	-57,402	-80,431	-82,330	-84,229	-84,229	331,729	243,422	-123,854	-152,711	-85,436	-66,653	-276,893
34	Annual cumulative precipitation surplus/deficit	-34,769	-92,170	-172,601	-254,931	-339,160	-423,390	-91,661	151,761	27,907	-124,804	-210,239	-276,893	
35	Total water in TSF at end of month (incl. mine site runoff)	1,530,099	1,472,697	1,403,832	1,331,851	1,256,753	1,181,655	1,789,153	2,032,575	1,908,721	1,756,010	1,670,575	1,603,921	
36	Excess runoff not diverted into tailings pond	0	26,328	0	0	0	0	0	287,890	124,033	99,987	126,468	91,904	756,609

TABLE A.8
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 8

Knight Piésold Ltd.
CONSULTING ENGINEERS

assumptions:

daily ore throughput (tpd) = 13,425
tails % solids = 35%
tails S.G. = 2.78
initial pond volume (m^3) = 1,603,921
water content of ore = 4%

min. fresh water makeup (%) = 2%
initial dry density (t/m^3) = 0.9
final dry density (t/m^3) = 1.3
total pit area (ha) = 65
pit g/w infiltration (m^3/mo) = 39,818

unprepared basin area (ha) = 6
prepared basin area (ha) = 18
beach area (ha) = 143
pond area (ha) = 63
beach evaporation factor = 0.80

	dry	ave.	wet
unprep'd basin runoff coeff. =	20%	24%	29%
prep'd basin runoff coeff. =	90%	90%	90%
beach runoff coeff. =	90%	90%	90%
pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)		48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)		12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)		15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)														
1	With slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond		30,604	10,962	4,815	4,309	3,802	3,802	114,814	119,631	51,640	41,629	52,654	38,263	476,924
3	Beach runoff		61,951	22,189	9,748	8,722	7,696	7,696	232,417	242,169	104,534	84,269	106,586	77,456	965,432
4	Unprep'd basin runoff		695	249	109	98	86	86	2,608	2,717	1,173	946	1,196	869	10,832
5	Prep'd basin runoff		7,820	2,801	1,230	1,101	971	971	29,337	30,568	13,195	10,637	13,454	9,777	121,864
6	Recovery from open pit:	precipitation	16,753	6,001	2,636	2,359	2,081	2,081	62,852	65,489	28,269	22,789	28,824	20,946	261,080
7		g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input		915,993	840,372	816,710	814,759	812,807	812,807	1,240,199	1,258,746	996,981	958,439	1,000,884	945,482	11,414,180
	<WATER OUT> (m^3)														
	Supernatant Recovery														
9	(+) Recovery from tailings		451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff		157,641	82,020	58,357	56,406	54,454	54,454	481,847	500,393	238,629	200,086	242,532	187,130	2,313,948
12	(-) Evaporation from pond		9,510	0	0	0	0	0	0	29,798	71,008	67,838	58,328	31,700	268,182
13	(-) Evaporation from beach		17,112	0	0	0	0	0	0	53,618	127,770	122,066	104,954	57,040	482,558
14	(+) Consolidation to final density		139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)		664,047	615,048	591,386	589,434	587,483	587,483	1,014,875	950,006	572,879	543,211	612,278	631,418	7,959,548
	Underdrainage recovery														
16	(+) Underdrainage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)		52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water														
19	Water retained in tailings		167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond		26,622	0	0	0	0	0	0	83,416	198,778	189,904	163,282	88,740	750,740
21	Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)		199,686	173,064	173,064	173,064	173,064	173,064	173,064	256,480	371,842	362,968	336,346	261,804	2,827,512
23	>>> Total Water Output		915,993	840,372	816,710	814,759	812,807	812,807	1,240,199	1,258,746	996,981	958,439	1,000,884	945,482	11,414,180
24	Monthly water available (excluding stored water in TSF)		716,307	667,308	643,646	641,694	639,743	639,743	1,067,135	1,002,266	625,139	595,471	664,538	683,678	8,586,668
25	Available stored water in TSF at beginning of month		1,603,921	1,571,648	1,515,375	1,435,440	1,364,329	1,289,999	1,215,669	1,846,359	2,100,044	1,976,603	1,823,493	1,739,451	
26	*Total Monthly Water Available*		2,320,228	2,238,956	2,159,021	2,077,135	2,004,072	1,929,742	2,282,804	2,848,624	2,725,183	2,572,074	2,488,032	2,423,129	
27	Water included with slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill		18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore		16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads		25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*		748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required		0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit		-32,273	-56,273	-79,935	-81,886	-83,838	-83,838	343,554	253,685	-123,441	-153,110	-84,042	-64,902	-246,298
34	Annual cumulative precipitation surplus/deficit		-32,273	-88,546	-168,481	-250,367	-334,205	-418,043	-74,488	179,197	55,756	-97,354	-181,396	-246,298	
35	Total water in TSF at end of month (incl. mine site runoff)		1,571,648	1,515,375	1,435,440	1,364,329	1,289,999	1,215,669	1,846,359	2,100,044	1,976,603	1,823,493	1,739,451	1,674,549	
36	Excess runoff not diverted into tailings pond		76,536	27,413	12,043	0	0	0	0	299,733	129,145	104,108	131,680	95,692	876,349

TABLE A.9
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 9

Knight Piésold Ltd.
CONSULTING ENGINEERS

assumptions:

daily ore throughput (tpd) = 13,425
tails % solids = 35%
tails S.G. = 2.78
initial pond volume (m^3) = 1,674,549
water content of ore = 4%

min. fresh water makeup (%) = 2%
initial dry density (t/m^3) = 0.9
final dry density (t/m^3) = 1.3
total pit area (ha) = 65
pit g/w infiltration (m^3/mo) = 39,818

unprepared basin area (ha) = 6
prepared basin area (ha) = 15
beach area (ha) = 139
pond area (ha) = 70
beach evaporation factor = 0.80

	dry	ave.	wet
unprep'd basin runoff coeff. =	20%	24%	29%
prep'd basin runoff coeff. =	90%	90%	90%
beach runoff coeff. =	90%	90%	90%
pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	33,597	12,034	5,286	4,730	4,173	4,173	126,042	131,330	56,690	45,700	57,803	42,005	523,563
3	Beach runoff	60,561	21,691	9,529	8,526	7,523	7,523	227,202	236,734	102,188	82,377	104,194	75,718	943,768
4	Unprep'd basin runoff	695	249	109	98	86	86	2,608	2,717	1,173	946	1,196	869	10,832
5	Prep'd basin runoff	6,517	2,334	1,025	917	810	810	24,448	25,474	10,996	8,864	11,212	8,148	101,553
6	Recovery from open pit: precipitation	16,753	6,001	2,636	2,359	2,081	2,081	62,852	65,489	28,269	22,789	28,824	20,946	261,080
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input	916,293	840,479	816,757	814,801	812,844	812,844	1,241,322	1,259,915	997,486	958,846	1,001,399	945,857	11,418,844
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	157,940	82,127	58,404	56,448	54,492	54,492	482,969	501,563	239,134	200,493	243,047	187,504	2,318,612
12	(-) Evaporation from pond	10,440	0	0	0	0	0	0	32,712	77,952	74,472	64,032	34,800	294,408
13	(-) Evaporation from beach	16,728	0	0	0	0	0	0	52,414	124,902	119,326	102,598	55,760	471,730
14	(+) Consolidation to final density	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)	663,800	615,155	591,433	589,476	587,520	587,520	1,015,998	949,465	569,308	539,723	609,445	629,972	7,948,814
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond	27,168	0	0	0	0	0	0	85,126	202,854	193,798	166,630	90,560	766,138
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	200,232	173,064	173,064	173,064	173,064	173,064	173,064	258,191	375,919	366,863	339,695	263,624	2,842,910
23	>>> Total Water Output	916,293	840,479	816,757	814,801	812,844	812,844	1,241,322	1,259,915	997,486	958,846	1,001,399	945,857	11,418,844
24	Monthly water available (excluding stored water in TSF)	716,060	667,415	643,693	641,736	639,780	639,780	1,068,258	1,001,725	621,568	591,983	661,705	682,232	8,575,934
25	Available stored water in TSF at beginning of month	1,674,549	1,642,028	1,585,863	1,505,975	1,424,131	1,350,214	1,276,298	1,919,476	2,172,620	2,045,607	1,889,010	1,802,134	
26	*Total Monthly Water Available*	2,390,609	2,309,444	2,229,556	2,147,712	2,063,911	1,989,994	2,344,556	2,921,201	2,794,188	2,637,591	2,550,715	2,484,366	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-32,520	-56,165	-79,888	-81,844	-83,801	-83,801	344,677	253,144	-127,013	-156,597	-86,876	-66,348	-257,032
34	Annual cumulative precipitation surplus/deficit	-32,520	-88,686	-168,573	-250,417	-334,218	-418,019	-73,341	179,803	52,790	-103,808	-190,684	-257,032	
35	Total water in TSF at end of month (incl. mine site runoff)	1,642,028	1,585,863	1,505,975	1,424,131	1,350,214	1,276,298	1,919,476	2,172,620	2,045,607	1,889,010	1,802,134	1,735,786	
36	Excess runoff not diverted into tailings pond	79,566	28,499	12,520	11,202	0	0	0	311,575	134,256	108,229	136,892	99,479	922,218

TABLE A.10
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 10

Knight Piésold Ltd.
CONSULTING ENGINEERS

assumptions:

daily ore throughput (tpd) = 13,425
tails % solids = 35%
tails S.G. = 2.78
initial pond volume (m^3) = 1,735,786
water content of ore = 4%

min. fresh water makeup (%) = 2%
initial dry density (t/m^3) = 0.9
final dry density (t/m^3) = 1.3
total pit area (ha) = 65
pit g/w infiltration (m^3/mo) = 39,818

unprepared basin area (ha) = 0
prepared basin area (ha) = 17
beach area (ha) = 137
pond area (ha) = 76
beach evaporation factor = 0.80

	dry	ave.	wet
unprep'd basin runoff coeff. =	20%	24%	29%
prep'd basin runoff coeff. =	90%	90%	90%
beach runoff coeff. =	90%	90%	90%
pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	36,541	13,088	5,750	5,144	4,539	4,539	137,089	142,841	61,658	49,705	62,869	45,687	569,450
3	Beach runoff	59,648	21,365	9,386	8,398	7,410	7,410	223,779	233,168	100,649	81,137	102,625	74,577	929,550
4	Unprep'd basin runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Prep'd basin runoff	7,385	2,645	1,162	1,040	917	917	27,708	28,870	12,462	10,046	12,707	9,234	115,094
6	Recovery from open pit: precipitation	16,753	6,001	2,636	2,359	2,081	2,081	62,852	65,489	28,269	22,789	28,824	20,946	261,080
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input	918,499	841,270	817,104	815,111	813,118	813,118	1,249,598	1,268,539	1,001,209	961,847	1,005,195	948,615	11,453,222
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	160,146	82,917	58,752	56,759	54,766	54,766	491,245	510,186	242,856	203,494	246,842	190,262	2,352,990
12	(-) Evaporation from pond	11,355	0	0	0	0	0	0	35,579	84,784	80,999	69,644	37,850	320,211
13	(-) Evaporation from beach	16,476	0	0	0	0	0	0	51,625	123,021	117,529	101,053	54,920	464,623
14	(+) Consolidation to final density	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)	665,343	615,945	591,780	589,787	587,794	587,794	1,024,274	956,011	568,079	537,995	609,173	630,520	7,964,495
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond	27,831	0	0	0	0	0	0	87,204	207,805	198,528	170,697	92,770	784,834
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	200,895	173,064	173,064	173,064	173,064	173,064	173,064	260,268	380,869	371,592	343,761	265,834	2,861,606
23	>>> Total Water Output	918,499	841,270	817,104	815,111	813,118	813,118	1,249,598	1,268,539	1,001,209	961,847	1,005,195	948,615	11,453,222
24	Monthly water available (excluding stored water in TSF)	717,603	668,205	644,040	642,047	640,054	640,054	1,076,534	1,008,271	620,339	590,255	661,433	682,780	8,591,615
25	Available stored water in TSF at beginning of month	1,735,786	1,704,809	1,649,433	1,569,893	1,488,359	1,415,093	1,341,827	2,004,647	2,264,337	2,136,096	1,977,770	1,890,623	
26	*Total Monthly Water Available*	2,453,389	2,373,014	2,293,473	2,211,940	2,128,413	2,055,147	2,418,360	3,012,918	2,884,676	2,726,350	2,639,203	2,573,403	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-30,977	-55,375	-79,541	-81,534	-83,527	-83,527	352,953	259,690	-128,241	-158,326	-87,147	-65,800	-241,351
34	Annual cumulative precipitation surplus/deficit	-30,977	-86,352	-165,893	-247,427	-330,953	-414,480	-61,527	198,164	69,922	-88,404	-175,551	-241,351	
35	Total water in TSF at end of month (incl. mine site runoff)	1,704,809	1,649,433	1,569,893	1,488,359	1,415,093	1,341,827	2,004,647	2,264,337	2,136,096	1,977,770	1,890,623	1,824,823	
36	Excess runoff not diverted into tailings pond	82,595	29,584	12,996	11,628	0	0	0	323,418	139,368	112,350	142,105	103,267	957,312

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE A.11
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 11

assumptions:

daily ore throughput (tpd) = 13,425
tails % solids = 35%
tails S.G. = 2.78
initial pond volume (m^3) = 1,824,823
water content of ore = 4%

min. fresh water makeup (%) = 2%
initial dry density (t/m^3) = 0.9
final dry density (t/m^3) = 1.3
total pit area (ha) = 65
pit g/w infiltration (m^3/mo) = 39,818

unprepared basin area (ha) = 0
prepared basin area (ha) = 13
beach area (ha) = 135
pond area (ha) = 82
beach evaporation factor = 0.80

	dry	ave.	wet
unprep'd basin runoff coeff. =	20%	24%	29%
prep'd basin runoff coeff. =	90%	90%	90%
beach runoff coeff. =	90%	90%	90%
pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0,0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	39,486	14,143	6,213	5,559	4,905	4,905	148,136	154,351	66,627	53,710	67,935	49,368	615,337
3	Beach runoff	58,736	21,038	9,242	8,269	7,296	7,296	220,356	229,602	99,109	79,896	101,055	73,437	915,333
4	Unprep'd basin runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Prep'd basin runoff	5,648	2,023	889	795	702	702	21,188	22,077	9,530	7,682	9,717	7,061	88,013
6	Recovery from open pit: precipitation	16,753	6,001	2,636	2,359	2,081	2,081	62,852	65,489	28,269	22,789	28,824	20,946	261,080
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input	918,793	841,375	817,151	815,153	813,155	813,155	1,250,703	1,269,690	1,001,705	962,247	1,005,701	948,983	11,457,810
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	160,440	83,022	58,798	56,800	54,802	54,802	492,350	511,337	243,353	203,894	247,349	190,630	2,357,578
12	(-) Evaporation from pond	12,270	0	0	0	0	0	0	38,446	91,616	87,526	75,256	40,900	346,014
13	(-) Evaporation from beach	16,224	0	0	0	0	0	0	50,835	121,139	115,731	99,507	54,080	457,517
14	(+) Consolidation to final density	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)	664,975	616,051	591,826	589,828	587,830	587,830	1,025,378	955,084	563,626	533,666	605,614	628,679	7,950,388
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond	28,494	0	0	0	0	0	0	89,281	212,755	203,257	174,763	94,980	803,531
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	201,558	173,064	173,064	173,064	173,064	173,064	173,064	262,346	385,820	376,322	347,828	268,044	2,880,303
23	>>> Total Water Output	918,793	841,375	817,151	815,153	813,155	813,155	1,250,703	1,269,690	1,001,705	962,247	1,005,701	948,983	11,457,810
24	Monthly water available (excluding stored water in TSF)	717,235	668,311	644,086	642,088	640,090	640,090	1,077,638	1,007,344	615,886	585,926	657,874	680,939	8,577,508
25	Available stored water in TSF at beginning of month	1,824,823	1,793,477	1,738,207	1,658,713	1,577,221	1,493,731	1,420,501	2,084,426	2,343,190	2,210,495	2,047,840	1,957,133	
26	*Total Monthly Water Available*	2,542,058	2,461,788	2,382,293	2,300,801	2,217,311	2,133,821	2,498,140	3,091,770	2,959,076	2,796,421	2,705,714	2,638,072	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-31,346	-55,270	-79,494	-81,492	-83,490	-83,490	354,058	258,764	-132,695	-162,655	-90,707	-67,642	-255,459
34	Annual cumulative precipitation surplus/deficit	-31,346	-86,616	-166,110	-247,602	-331,092	-414,582	-60,524	198,240	65,545	-97,110	-187,817	-255,459	
35	Total water in TSF at end of month (incl. mine site runoff)	1,793,477	1,738,207	1,658,713	1,577,221	1,493,731	1,420,501	2,084,426	2,343,190	2,210,495	2,047,840	1,957,133	1,889,491	
36	Excess runoff not diverted into tailings pond	82,595	29,584	12,996	11,628	10,260	0	0	323,418	139,368	112,350	142,105	103,267	967,572

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE A.12
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 12

assumptions:

daily ore throughput (tpd) = 13,425
tails % solids = 35%
tails S.G. = 2.78
initial pond volume (m^3) = 1,889,491
water content of ore = 4%

min. fresh water makeup (%) = 2%
initial dry density (t/m^3) = 0.9
final dry density (t/m^3) = 1.3
total pit area (ha) = 65
pit g/w infiltration (m^3/mo) = 39,818

unprepared basin area (ha) = 0
prepared basin area (ha) = 10
beach area (ha) = 132
pond area (ha) = 88
beach evaporation factor = 0.80

	dry	ave.	wet
unprep'd basin runoff coeff. =	20%	24%	29%
prep'd basin runoff coeff. =	90%	90%	90%
beach runoff coeff. =	90%	90%	90%
pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	42,430	15,198	6,676	5,974	5,271	5,271	159,182	165,861	71,595	57,715	73,001	53,050	661,224
3	Beach runoff	57,389	20,556	9,030	8,080	7,129	7,129	215,304	224,337	96,837	78,064	98,738	71,753	894,345
4	Unprep'd basin runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Prep'd basin runoff	4,344	1,556	684	612	540	540	16,299	16,982	7,331	5,909	7,474	5,432	67,702
6	Recovery from open pit: precipitation	16,753	6,001	2,636	2,359	2,081	2,081	62,852	65,489	28,269	22,789	28,824	20,946	261,080
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input	919,088	841,480	817,197	815,194	813,191	813,191	1,251,807	1,270,841	1,002,202	962,648	1,006,208	949,351	11,462,399
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	160,735	83,128	58,844	56,841	54,839	54,839	493,455	512,488	243,850	204,295	247,855	190,998	2,362,167
12	(-) Evaporation from pond	13,185	0	0	0	0	0	0	41,313	98,448	94,053	80,868	43,950	371,817
13	(-) Evaporation from beach	15,852	0	0	0	0	0	0	49,670	118,362	113,078	97,226	52,840	447,026
14	(+) Consolidation to final density	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)	664,726	616,156	591,873	589,870	587,867	587,867	1,026,483	954,534	560,068	530,193	602,790	627,237	7,939,664
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond	29,037	0	0	0	0	0	0	90,983	216,810	207,131	178,094	96,790	818,843
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	202,101	173,064	173,064	173,064	173,064	173,064	173,064	264,047	389,874	380,195	351,158	269,854	2,895,615
23	>>> Total Water Output	919,088	841,480	817,197	815,194	813,191	813,191	1,251,807	1,270,841	1,002,202	962,648	1,006,208	949,351	11,462,399
24	Monthly water available (excluding stored water in TSF)	716,986	668,416	644,133	642,130	640,127	640,127	1,078,743	1,006,794	612,328	582,453	655,050	679,497	8,566,784
25	Available stored water in TSF at beginning of month	1,889,491	1,857,897	1,802,733	1,723,285	1,641,834	1,558,381	1,474,927	2,139,957	2,398,170	2,261,918	2,095,790	2,002,260	
26	*Total Monthly Water Available*	2,606,478	2,526,313	2,446,865	2,365,415	2,281,961	2,198,508	2,553,671	3,146,751	3,010,499	2,844,371	2,750,840	2,681,757	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-31,594	-55,164	-79,448	-81,451	-83,453	-83,453	355,163	258,213	-136,252	-166,128	-93,531	-69,084	-266,183
34	Annual cumulative precipitation surplus/deficit	-31,594	-86,759	-166,207	-247,657	-331,111	-414,564	-59,401	198,812	62,560	-103,568	-197,099	-266,183	
35	Total water in TSF at end of month (incl. mine site runoff)	1,857,897	1,802,733	1,723,285	1,641,834	1,558,381	1,474,927	2,139,957	2,398,170	2,261,918	2,095,790	2,002,260	1,933,176	
36	Excess runoff not diverted into tailings pond	82,595	29,584	12,996	11,628	10,260	10,260	0	323,418	139,368	112,350	142,105	103,267	977,832

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE A.13
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 13

assumptions:

daily ore throughput (tpd) = 13,425
tails % solids = 35%
tails S.G. = 2.78
initial pond volume (m^3) = 1,933,176
water content of ore = 4%

min. fresh water makeup (%) = 2%
initial dry density (t/m^3) = 0.9
final dry density (t/m^3) = 1.3
total pit area (ha) = 65
pit g/w infiltration (m^3/mo) = 39,818

unprepared basin area (ha) = 0
prepared basin area (ha) = 6
beach area (ha) = 130
pond area (ha) = 94
beach evaporation factor = 0.80

	dry	ave.	wet
unprep'd basin runoff coeff. =	20%	24%	29%
prep'd basin runoff coeff. =	90%	90%	90%
beach runoff coeff. =	90%	90%	90%
pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)		48.3	17.3	7.6	6,8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)		12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0,0	0.0	0,0	1.5	301.8
C	Evaporation (mm/month)		15.0	0.0	0.0	0,0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)														
1	With slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond		45,326	16,235	7,132	6,381	5,631	5,631	170,048	177,183	76,482	61,655	77,984	56,671	706,359
3	Beach runoff		56,520	20,244	8,893	7,957	7,021	7,021	212,044	220,941	95,371	76,882	97,243	70,666	880,805
4	Unprep'd basin runoff		0	0	0	0	0	0	0	0	0	0	0	0	0
5	Prep'd basin runoff		2,607	934	410	367	324	324	9,779	10,189	4,398	3,546	4,485	3,259	40,621
6	Recovery from open pit:	precipitation	16,753	6,001	2,636	2,359	2,081	2,081	62,852	65,489	28,269	22,789	28,824	20,946	261,080
7		g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input		919,377	841,584	817,243	815,235	813,227	813,227	1,252,894	1,271,973	1,002,691	963,042	1,006,706	949,713	11,466,913
	<WATER OUT> (m^3)														
	Supernatant Recovery														
9	(+) Recovery from tailings		451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff		161,025	83,232	58,890	56,882	54,875	54,875	494,541	513,620	244,338	204,689	248,353	191,360	2,366,680
12	(-) Evaporation from pond		14,085	0	0	0	0	0	0	44,133	105,168	100,473	86,388	46,950	397,197
13	(-) Evaporation from beach		15,612	0	0	0	0	0	0	48,918	116,570	111,366	95,754	52,040	440,258
14	(+) Consolidation to final density		139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)		664,356	616,260	591,918	589,911	587,903	587,903	1,027,570	953,598	555,629	525,879	599,240	625,399	7,925,565
	Underdrainage recovery														
16	(+) Underdrainage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)		52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water														
19	Water retained in tailings		167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond		29,697	0	0	0	0	0	0	93,051	221,738	211,839	182,142	98,990	837,455
21	Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)		202,761	173,064	173,064	173,064	173,064	173,064	173,064	266,115	394,802	384,903	355,206	272,054	2,914,227
23	>>> Total Water Output		919,377	841,584	817,243	815,235	813,227	813,227	1,252,894	1,271,973	1,002,691	963,042	1,006,706	949,713	11,466,913
24	Monthly water available (excluding stored water in TSF)		716,616	668,520	644,178	642,171	640,163	640,163	1,079,830	1,005,858	607,889	578,139	651,500	677,659	8,552,685
25	Available stored water in TSF at beginning of month		1,933,176	1,901,211	1,846,151	1,766,748	1,685,338	1,601,921	1,518,504	1,874,753	2,132,030	1,991,339	1,820,897	1,723,817	
26	*Total Monthly Water Available*		2,649,792	2,569,731	2,490,329	2,408,919	2,325,502	2,242,084	2,598,333	2,880,611	2,739,919	2,569,478	2,472,397	2,401,475	
27	Water included with slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill		18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore		16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads		25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*		748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required		0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit		-31,965	-55,061	-79,402	-81,410	-83,417	-83,417	356,249	257,277	-140,691	-170,442	-97,080	-70,922	-280,281
34	Annual cumulative precipitation surplus/deficit		-31,965	-87,025	-166,428	-247,838	-331,255	-414,672	-58,423	198,854	58,163	-112,279	-209,359	-280,281	
35	Total water in TSF at end of month (incl. mine site runoff)		1,901,211	1,846,151	1,766,748	1,685,338	1,601,921	1,518,504	1,874,753	2,132,030	1,991,339	1,820,897	1,723,817	1,652,895	
36	Excess runoff not diverted into tailings pond		82,595	29,584	12,996	11,628	10,260	10,260	309,867	323,418	139,368	112,350	142,105	103,267	1,287,699

TABLE A.14
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 14

Knight Piésold Ltd.
CONSULTING ENGINEERS

assumptions:

daily ore throughput (tpd) = 13,425
tails % solids = 35%
tails S.G. = 2.78
initial pond volume (m^3) = 1,652,895
water content of ore = 4%

min. fresh water makeup (%) = 2%
initial dry density (t/m^3) = 0.9
final dry density (t/m^3) = 1.3
total pit area (ha) = 65
pit g/w infiltration (m^3/mo) = 39,818

unprepared basin area (ha) = 0
prepared basin area (ha) = 3
beach area (ha) = 127
pond area (ha) = 100
beach evaporation factor = 0.80

	dry	ave.	wet
unprep'd basin runoff coeff. =	20%	24%	29%
prep'd basin runoff coeff. =	90%	90%	90%
beach runoff coeff. =	90%	90%	90%
pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	48,271	17,290	7,595	6,796	5,996	5,996	181,095	188,693	81,451	65,660	83,050	60,352	752,246
3	Beach runoff	55,174	19,762	8,682	7,768	6,854	6,854	206,992	215,676	93,098	75,050	94,926	68,983	859,817
4	Unprep'd basin runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Prep'd basin runoff	1,303	467	205	183	162	162	4,890	5,095	2,199	1,773	2,242	1,630	20,311
6	Recovery from open pit: precipitation	16,753	6,001	2,636	2,359	2,081	2,081	62,852	65,489	28,269	22,789	28,824	20,946	261,080
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input	919,672	841,690	817,289	815,276	813,264	813,264	1,253,999	1,273,124	1,003,188	963,442	1,007,213	950,081	11,471,501
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	161,319	83,337	58,936	56,924	54,911	54,911	495,646	514,771	244,835	205,090	248,860	191,729	2,371,269
12	(-) Evaporation from pond	15,000	0	0	0	0	0	0	47,000	112,000	107,000	92,000	50,000	423,000
13	(-) Evaporation from beach	15,240	0	0	0	0	0	0	47,752	113,792	108,712	93,472	50,800	429,768
14	(+) Consolidation to final density	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)	664,107	616,365	591,965	589,952	587,940	587,940	1,028,674	953,048	552,072	522,406	596,416	623,957	7,914,841
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond	30,240	0	0	0	0	0	0	94,752	225,792	215,712	185,472	100,800	852,768
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	203,304	173,064	173,064	173,064	173,064	173,064	173,064	267,816	398,856	388,776	358,536	273,864	2,929,540
23	>>> Total Water Output	919,672	841,690	817,289	815,276	813,264	813,264	1,253,999	1,273,124	1,003,188	963,442	1,007,213	950,081	11,471,501
24	Monthly water available (excluding stored water in TSF)	716,367	668,625	644,225	642,212	640,200	640,200	1,080,934	1,005,308	604,332	574,666	648,676	676,217	8,541,961
25	Available stored water in TSF at beginning of month	1,652,895	1,620,682	1,565,727	1,486,371	1,416,630	1,343,510	1,270,389	1,937,610	2,194,337	2,050,088	1,876,174	1,776,269	
26	*Total Monthly Water Available*	2,369,262	2,289,307	2,209,951	2,128,583	2,056,830	1,983,709	2,351,324	2,942,918	2,798,669	2,624,754	2,524,850	2,452,486	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-32,213	-54,955	-79,356	-81,368	-83,381	-83,381	357,354	256,727	-144,249	-173,915	-99,904	-72,364	-291,005
34	Annual cumulative precipitation surplus/deficit	-32,213	-87,168	-166,524	-247,893	-331,274	-414,655	-57,301	199,426	55,177	-118,737	-218,641	-291,005	
35	Total water in TSF at end of month (incl. mine site runoff)	1,620,682	1,565,727	1,486,371	1,416,630	1,343,510	1,270,389	1,937,610	2,194,337	2,050,088	1,876,174	1,776,269	1,703,906	
36	Excess runoff not diverted into tailings pond	82,595	29,584	12,996	0	0	0	0	323,418	139,368	112,350	142,105	103,267	945,683

APPENDIX B

MINE SITE - MONTHLY WATER BALANCES FOR AVERAGE PRECIPITATION

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE B.1
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 1

catchment areas (ha):

	dist'bd	undist'bd
East dump:	10	70
West dump:	0	0
North dump:	0	0
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	3,107	1,113	489	437	386	386	11,657	12,146	5,243	4,227	5,346	3,885	48,423
2	Undisturbed catchment runoff	8,700	3,116	1,369	1,225	1,081	1,081	32,640	34,010	14,681	11,835	14,969	10,878	135,584
	West Waste Dump													
3	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	North Waste Dump													
5	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	11,808	4,229	1,858	1,662	1,467	1,467	44,298	46,156	19,924	16,061	20,315	14,763	184,007
10	North waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
11	West waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	19,679	7,049	3,097	2,771	2,445	2,445	73,829	77,477	33,206	26,769	33,858	24,605	307,228
15	Grand Total (including additional tails catchment)	47,483	17,007	7,471	6,685	5,899	5,899	178,140	186,164	80,122	64,589	81,695	59,367	740,521

TABLE B.2
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 2

catchment areas (ha):

	dist'bd	undist'bd
East dump:	15	65
West dump:	0	0
North dump:	0	0
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	4,557	1,632	717	642	566	566	17,097	17,815	7,690	6,199	7,841	5,698	71,020
2	Undisturbed catchment runoff	8,120	2,908	1,278	1,143	1,009	1,009	30,464	31,743	13,702	11,046	13,971	10,153	126,545
	West Waste Dump													
3	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	North Waste Dump													
5	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	12,678	4,541	1,995	1,785	1,575	1,575	47,562	49,557	21,392	17,245	21,812	15,851	197,565
10	North waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
11	West waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	20,549	7,360	3,233	2,893	2,553	2,553	77,093	80,878	34,674	27,952	35,355	25,692	320,786
15	Grand Total (including additional tails catchment)	48,353	17,319	7,608	6,807	6,007	6,007	181,404	189,565	81,590	65,772	83,192	60,455	754,080

TABLE B.3
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 3

catchment areas (ha):

	dist'bd	undist'bd
East dump:	19	61
West dump:	0	0
North dump:	0	0
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	6,007	2,152	945	846	746	746	22,537	23,483	10,137	8,171	10,336	7,511	93,617
2	Undisturbed catchment runoff	7,540	2,701	1,186	1,062	937	937	28,288	29,475	12,723	10,257	12,973	9,427	117,506
	West Waste Dump													
3	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	North Waste Dump													
5	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	13,548	4,852	2,132	1,907	1,683	1,683	50,826	52,958	22,860	18,428	23,309	16,938	211,123
10	North waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
11	West waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	21,419	7,672	3,370	3,016	2,661	2,661	80,357	84,279	36,142	29,136	36,852	26,780	334,345
15	Grand Total (including additional tails catchment)	49,223	17,631	7,745	6,930	6,115	6,115	184,668	192,966	83,058	66,956	84,688	61,543	767,638

TABLE B.4
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 4

catchment areas (ha):

	dist'bd	undist'bd
East dump:	24	56
West dump:	0	0
North dump:	0	0
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	7,457	2,671	1,173	1,050	926	926	27,977	29,151	12,583	10,144	12,830	9,324	116,215
2	Undisturbed catchment runoff	6,960	2,493	1,095	980	865	865	26,112	27,208	11,744	9,468	11,975	8,702	108,467
	West Waste Dump													
3	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	North Waste Dump													
5	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	14,418	5,164	2,269	2,030	1,791	1,791	54,090	56,359	24,328	19,612	24,805	18,026	224,682
10	North waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
11	West waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	22,289	7,984	3,507	3,138	2,769	2,769	83,621	87,680	37,610	30,319	38,349	27,868	347,903
15	Grand Total (including additional tails catchment)	50,093	17,942	7,882	7,052	6,223	6,223	187,932	196,367	84,526	68,139	86,185	62,631	781,197

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TABLE B.5
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 5

catchment areas (ha):

	dist'bd	undist'bd
East dump:	29	51
West dump:	0	0
North dump:	9	76
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6,4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0,0	0.0	0.0	0,0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	8,907	3,190	1,402	1,254	1,107	1,107	33,417	34,820	15,030	12,116	15,325	11,137	138,812
2	Undisturbed catchment runoff	6,380	2,285	1,004	898	793	793	23,936	24,941	10,766	8,679	10,977	7,977	99,428
	West Waste Dump													
3	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	North Waste Dump													
5	Waste rock runoff	2,900	1,039	456	408	360	360	10,880	11,337	4,894	3,945	4,990	3,626	45,195
6	Undisturbed catchment runoff	9,405	3,369	1,480	1,324	1,168	1,168	35,283	36,763	15,869	12,793	16,181	11,758	146,560
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	15,288	5,476	2,406	2,152	1,899	1,899	57,354	59,760	25,796	20,795	26,302	19,114	238,240
10	North waste dump	12,305	4,407	1,936	1,732	1,529	1,529	46,163	48,100	20,763	16,737	21,170	15,384	191,754
11	West waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	35,464	12,702	5,580	4,993	4,405	4,405	133,048	139,180	59,841	48,240	61,016	44,340	553,216
15	Grand Total (including additional tails catchment)	63,268	22,661	9,955	8,907	7,859	7,859	237,359	247,868	106,757	86,060	108,852	79,103	986,509

TABLE B.6
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 6

catchment areas (ha):

	dist'bd	undist'bd
East dump:	33	47
West dump:	0	37
North dump:	19	66
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	10,357	3,710	1,630	1,458	1,287	1,287	38,858	40,488	17,477	14,089	17,820	12,950	161,409
2	Undisturbed catchment runoff	5,800	2,077	913	817	721	721	21,760	22,673	9,787	7,890	9,979	7,252	90,389
	West Waste Dump													
3	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Undisturbed catchment runoff	4,599	1,647	724	647	571	571	17,253	17,977	7,760	6,255	7,912	5,750	71,666
	North Waste Dump													
5	Waste rock runoff	5,800	2,077	913	817	721	721	21,760	22,673	9,787	7,890	9,979	7,252	90,389
6	Undisturbed catchment runoff	8,245	2,953	1,297	1,161	1,024	1,024	30,931	32,228	13,912	11,215	14,185	10,308	128,482
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	16,158	5,787	2,542	2,275	2,007	2,007	60,618	63,161	27,264	21,978	27,799	20,202	251,799
10	North waste dump	14,045	5,031	2,210	1,977	1,745	1,745	52,691	54,902	23,699	19,104	24,164	17,560	218,871
11	West waste dump	4,599	1,647	724	647	571	571	17,253	17,977	7,760	6,255	7,912	5,750	71,666
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	42,673	15,284	6,715	6,008	5,301	5,301	160,093	167,360	72,005	58,046	73,418	53,353	665,557
15	Grand Total (including additional tails catchment)	70,477	25,243	11,090	9,922	8,755	8,755	264,404	276,047	118,921	95,866	121,255	88,116	1,098,850

TABLE B.7
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 7

catchment areas (ha):

	dist'bd	undist'bd
East dump:	38	42
West dump:	2	35
North dump:	28	57
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	11,808	4,229	1,858	1,662	1,467	1,467	44,298	46,156	19,924	16,061	20,315	14,763	184,007
2	Undisturbed catchment runoff	5,220	1,870	821	735	648	648	19,584	20,406	8,808	7,101	8,981	6,527	81,350
	West Waste Dump													
3	Waste rock runoff	699	250	110	98	87	87	2,623	2,733	1,180	951	1,203	874	10,895
4	Undisturbed catchment runoff	4,319	1,547	680	608	537	537	16,204	16,883	7,288	5,875	7,431	5,400	67,308
	North Waste Dump													
5	Waste rock runoff	8,700	3,116	1,369	1,225	1,081	1,081	32,640	34,010	14,681	11,835	14,969	10,878	135,584
6	Undisturbed catchment runoff	7,085	2,538	1,115	997	880	880	26,579	27,694	11,954	9,637	12,189	8,858	110,404
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	17,028	6,099	2,679	2,397	2,115	2,115	63,882	66,562	28,732	23,162	29,296	21,289	265,357
10	North waste dump	15,785	5,654	2,484	2,222	1,961	1,961	59,219	61,704	26,635	21,471	27,158	19,735	245,988
11	West waste dump	5,018	1,797	790	706	623	623	18,826	19,616	8,468	6,826	8,634	6,274	78,203
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	45,702	16,370	7,191	6,434	5,677	5,677	171,459	179,203	77,117	62,167	78,631	57,141	712,769
15	Grand Total (including additional tails catchment)	73,506	26,328	11,566	10,349	9,131	9,131	275,770	287,890	124,033	99,987	126,468	91,904	1,146,062

TABLE B.8
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 8

catchment areas (ha):

	dist'bd	undist'bd
East dump:	43	37
West dump:	5	33
North dump:	37	48
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	13,258	4,749	2,086	1,866	1,647	1,647	49,738	51,824	22,370	18,034	22,810	16,576	206,604
2	Undisturbed catchment runoff	4,640	1,662	730	653	576	576	17,408	18,139	7,830	6,312	7,983	5,801	72,311
	West Waste Dump													
3	Waste rock runoff	1,398	501	220	197	174	174	5,246	5,466	2,359	1,902	2,406	1,748	21,790
4	Undisturbed catchment runoff	4,039	1,447	636	569	502	502	15,154	15,790	6,816	5,495	6,950	5,050	62,950
	North Waste Dump													
5	Waste rock runoff	11,600	4,155	1,825	1,633	1,441	1,441	43,520	45,346	19,574	15,779	19,958	14,504	180,779
6	Undisturbed catchment runoff	5,924	2,122	932	834	736	736	22,227	23,159	9,997	8,059	10,193	7,407	92,326
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	17,898	6,411	2,816	2,520	2,223	2,223	67,146	69,963	30,200	24,345	30,793	22,377	278,915
10	North waste dump	17,525	6,277	2,758	2,467	2,177	2,177	65,747	68,506	29,571	23,838	30,151	21,911	273,105
11	West waste dump	5,438	1,948	856	766	675	675	20,400	21,256	9,175	7,397	9,356	6,799	84,740
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	48,732	17,455	7,668	6,861	6,054	6,054	182,825	191,045	82,229	66,288	83,843	60,929	759,981
15	Grand Total (including additional tails catchment)	76,536	27,413	12,043	10,775	9,508	9,508	287,135	299,733	129,145	104,108	131,680	95,692	1,193,275

TABLE B.9
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 9

catchment areas (ha):

	dist'bd	undist'bd
East dump:	47	33
West dump:	7	30
North dump:	47	38
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	14,708	5,268	2,314	2,071	1,827	1,827	55,178	57,493	24,817	20,006	25,304	18,389	229,201
2	Undisturbed catchment runoff	4,060	1,454	639	572	504	504	15,232	15,871	6,851	5,523	6,985	5,076	63,272
	West Waste Dump													
3	Waste rock runoff	2,097	751	330	295	261	261	7,869	8,199	3,539	2,853	3,609	2,622	32,685
4	Undisturbed catchment runoff	3,760	1,347	592	529	467	467	14,105	14,697	6,344	5,114	6,469	4,701	58,592
	North Waste Dump													
5	Waste rock runoff	14,500	5,194	2,282	2,041	1,801	1,801	54,401	56,683	24,468	19,724	24,948	18,130	225,973
6	Undisturbed catchment runoff	4,764	1,707	750	671	592	592	17,874	18,624	8,039	6,481	8,197	5,957	74,248
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	18,768	6,722	2,953	2,642	2,331	2,331	70,410	73,364	31,668	25,529	32,290	23,465	292,474
10	North waste dump	19,265	6,900	3,031	2,712	2,393	2,393	72,275	75,307	32,507	26,205	33,145	24,087	300,221
11	West waste dump	5,857	2,098	922	825	728	728	21,974	22,896	9,883	7,967	10,077	7,323	91,277
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	51,761	18,540	8,145	7,287	6,430	6,430	194,191	202,888	87,341	70,408	89,055	64,717	807,193
15	Grand Total (including additional tails catchment)	79,566	28,499	12,520	11,202	9,884	9,884	298,501	311,575	134,256	108,229	136,892	99,479	1,240,487

TABLE B.10
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 10

catchment areas (ha):

	dist'bd	undist'bd
East dump:	52	28
West dump:	9	28
North dump:	56	29
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	16,158	5,787	2,542	2,275	2,007	2,007	60,618	63,161	27,264	21,978	27,799	20,202	251,799
2	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	West Waste Dump													
3	Waste rock runoff	2,797	1,002	440	394	347	347	10,492	10,932	4,719	3,804	4,811	3,496	43,581
4	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	North Waste Dump													
5	Waste rock runoff	17,401	6,232	2,738	2,450	2,162	2,162	65,281	68,020	29,361	23,669	29,938	21,756	271,168
6	Undisturbed catchment runoff	3,604	1,291	567	507	448	448	13,522	14,090	6,082	4,903	6,201	4,507	56,170
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	19,638	7,034	3,090	2,765	2,439	2,439	73,674	76,765	33,136	26,712	33,787	24,553	306,032
10	North waste dump	21,005	7,524	3,305	2,957	2,609	2,609	78,803	82,109	35,443	28,572	36,139	26,262	327,338
11	West waste dump	6,277	2,248	988	884	780	780	23,548	24,536	10,591	8,538	10,799	7,848	97,814
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	54,791	19,625	8,621	7,714	6,806	6,806	205,556	214,731	92,453	74,529	94,268	68,504	854,406
15	Grand Total (including additional tails catchment)	82,595	29,584	12,996	11,628	10,260	10,260	309,867	323,418	139,368	112,350	142,105	103,267	1,287,699

TABLE B.11
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 11

catchment areas (ha):

	dist'bd	undist'bd
East dump:	52	28
West dump:	9	28
North dump:	56	29
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	16,158	5,787	2,542	2,275	2,007	2,007	60,618	63,161	27,264	21,978	27,799	20,202	251,799
2	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	West Waste Dump													
3	Waste rock runoff	2,797	1,002	440	394	347	347	10,492	10,932	4,719	3,804	4,811	3,496	43,581
4	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	North Waste Dump													
5	Waste rock runoff	17,401	6,232	2,738	2,450	2,162	2,162	65,281	68,020	29,361	23,669	29,938	21,756	271,168
6	Undisturbed catchment runoff	3,604	1,291	567	507	448	448	13,522	14,090	6,082	4,903	6,201	4,507	56,170
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	19,638	7,034	3,090	2,765	2,439	2,439	73,674	76,765	33,136	26,712	33,787	24,553	306,032
10	North waste dump	21,005	7,524	3,305	2,957	2,609	2,609	78,803	82,109	35,443	28,572	36,139	26,262	327,338
11	West waste dump	6,277	2,248	988	884	780	780	23,548	24,536	10,591	8,538	10,799	7,848	97,814
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	54,791	19,625	8,621	7,714	6,806	6,806	205,556	214,731	92,453	74,529	94,268	68,504	854,406
15	Grand Total (including additional tails catchment)	82,595	29,584	12,996	11,628	10,260	10,260	309,867	323,418	139,368	112,350	142,105	103,267	1,287,699

TABLE B.12
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 12

catchment areas (ha):

	dist'bd	undist'bd
East dump:	52	28
West dump:	9	28
North dump:	56	29
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	16,158	5,787	2,542	2,275	2,007	2,007	60,618	63,161	27,264	21,978	27,799	20,202	251,799
2	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	West Waste Dump													
3	Waste rock runoff	2,797	1,002	440	394	347	347	10,492	10,932	4,719	3,804	4,811	3,496	43,581
4	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	North Waste Dump													
5	Waste rock runoff	17,401	6,232	2,738	2,450	2,162	2,162	65,281	68,020	29,361	23,669	29,938	21,756	271,168
6	Undisturbed catchment runoff	3,604	1,291	567	507	448	448	13,522	14,090	6,082	4,903	6,201	4,507	56,170
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	19,638	7,034	3,090	2,765	2,439	2,439	73,674	76,765	33,136	26,712	33,787	24,553	306,032
10	North waste dump	21,005	7,524	3,305	2,957	2,609	2,609	78,803	82,109	35,443	28,572	36,139	26,262	327,338
11	West waste dump	6,277	2,248	988	884	780	780	23,548	24,536	10,591	8,538	10,799	7,848	97,814
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	54,791	19,625	8,621	7,714	6,806	6,806	205,556	214,731	92,453	74,529	94,268	68,504	854,406
15	Grand Total (including additional tails catchment)	82,595	29,584	12,996	11,628	10,260	10,260	309,867	323,418	139,368	112,350	142,105	103,267	1,287,699

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE B.13
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 13

catchment areas (ha):

	dist'bd	undist'bd
East dump:	52	28
West dump:	9	28
North dump:	56	29
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	16,158	5,787	2,542	2,275	2,007	2,007	60,618	63,161	27,264	21,978	27,799	20,202	251,799
2	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	West Waste Dump													
3	Waste rock runoff	2,797	1,002	440	394	347	347	10,492	10,932	4,719	3,804	4,811	3,496	43,581
4	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	North Waste Dump													
5	Waste rock runoff	17,401	6,232	2,738	2,450	2,162	2,162	65,281	68,020	29,361	23,669	29,938	21,756	271,168
6	Undisturbed catchment runoff	3,604	1,291	567	507	448	448	13,522	14,090	6,082	4,903	6,201	4,507	56,170
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	19,638	7,034	3,090	2,765	2,439	2,439	73,674	76,765	33,136	26,712	33,787	24,553	306,032
10	North waste dump	21,005	7,524	3,305	2,957	2,609	2,609	78,803	82,109	35,443	28,572	36,139	26,262	327,338
11	West waste dump	6,277	2,248	988	884	780	780	23,548	24,536	10,591	8,538	10,799	7,848	97,814
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	54,791	19,625	8,621	7,714	6,806	6,806	205,556	214,731	92,453	74,529	94,268	68,504	854,406
15	Grand Total (including additional tails catchment)	82,595	29,584	12,996	11,628	10,260	10,260	309,867	323,418	139,368	112,350	142,105	103,267	1,287,699

TABLE B.14
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 14

catchment areas (ha):

	dist'bd	undist'bd
East dump:	52	28
West dump:	9	28
North dump:	56	29
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	16,158	5,787	2,542	2,275	2,007	2,007	60,618	63,161	27,264	21,978	27,799	20,202	251,799
2	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	West Waste Dump													
3	Waste rock runoff	2,797	1,002	440	394	347	347	10,492	10,932	4,719	3,804	4,811	3,496	43,581
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10	North waste dump	21,005	7,524	3,305	2,957	2,609	2,609	78,803	82,109	35,443	28,572	36,139	26,262	327,338
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14	Total Waste Dumps and Mill Site	54,791	19,625	8,621	7,714	6,806	6,806	205,556	214,731	92,453	74,529	94,268	68,504	854,406
15	Grand Total (including additional tails catchment)	82,595	29,584	12,996	11,628	10,260	10,260	309,867	323,418	139,368	112,350	142,105	103,267	1,287,699

IMPERIAL METALS CORP.
MT. POLLEY PROJECT

REPORT ON
1995 GEOTECHNICAL INVESTIGATIONS
FOR MILL SITE AND TAILINGS STORAGE FACILITY
(REF. NO. 1623/1)

MARCH 14, 1995

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CONSULTING ENGINEERS

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT

REPORT ON
1995 GEOTECHNICAL INVESTIGATIONS FOR MILL SITE AND TAILINGS STORAGE FACILITY
(REF. NO. 1623/1)

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1

SECTION 1.0 - INTRODUCTION

1.1 PROJECT DESCRIPTION

The Mt. Polley project site is located in central British Columbia approximately 56 kilometres north-west of Williams Lake, as shown on Figure 1.1. The site is situated on a topographic ridge located between Polley Lake and Bootjack Lake.

The Mt. Polley project involves open pit mining of an estimated 48.8 million tonnes of copper and gold ore contained in three adjacent ore bodies. The ore will be hauled from the open pit to the primary and secondary crushers where it will be crushed and transported to the nearby concentrator for processing. The ore will be processed by select flotation to produce a copper-gold concentrate at a production rate of approximately 13,425 tonnes per day. An additional 26.2 million tonnes of low grade ore will be stockpiled during operations for processing in the later stages of the mine life.

After processing of the ore to produce the copper/gold concentrate, the tailings will be discharged as a slurry into the tailings storage facility which has been designed to provide environmentally secure storage of the solids waste. As the solids settle out of the slurry, the solution is collected and recycled back to the mill for re-use in the milling process. No surface discharge of any process solution from the tailings facility is required or anticipated.

1.2 SCOPE OF WORK

A geotechnical site investigation program was carried out by Knight Piésold Ltd. between January 11 and 17, 1995. The program comprised excavating a total of thirty-nine (39) test pits to investigate the geotechnical characteristics and foundation conditions at each of the proposed project component sites and to evaluate the geologic factors affecting the design of these components. The following project components were investigated:

- Mill site

- Main access road
- Tailings storage facility, including the tailings basin and embankment foundations, tailings/reclaim pipeline route, and potential borrow areas
- Polley Lake dam site (no longer included in mine plan)

The scope of work for the investigation program included the following:

- Pioneering of access trails with a Cat D5 dozer.
- Excavation of the test pits with a Hitachi X200 backhoe.
- Detailed geotechnical logging of each test pit, including photographs.
- Bulk sampling of the various strata.
- Backfilling and reclamation work for all of the disturbed areas.

The test pit locations and the overall site plan are shown on Drawing 1623.100. Geological logs of each test pit are included in Appendix A. and detailed laboratory test work results on select bulk test pit samples are included in Appendix B.

This report addresses the outstanding geotechnical issues from previous work carried out at the Mt. Polley project site. The results of the previous geotechnical program are presented in the following documents:

- 1989 tailings area test pits (also included in Appendix A)
- 1990 mill site test pits (also included in Appendix A)
- Knight Piésold Ltd. "Report on Geotechnical Investigations and Design of Open Pit, Waste Dumps and Tailings Storage Facility (Ref. No. 1621/1)", dated February 19, 1990.

Test pit logs from the 1989 and 1990 geotechnical investigation programs have been included in Appendix A. In addition, applicable laboratory test work results from the 1989 tailings storage facility investigation program have also been included.

2

SECTION 2.0 - GEOTECHNICAL RESULTS

2.1 GENERAL

A total of thirty-nine (39) test pits were excavated during the geotechnical site investigation program to evaluate the type and distribution of surficial materials and the near surface foundation conditions at the mill site, along access roads and pipeline routes, at potential borrow areas, within the tailings basin and at the Polley Lake dam site.

2.2 MILL SITE AND ACCESS ROADS

2.2.1 Mill Site

Eight test pits (TP95-1 to 8) were excavated in select locations at the proposed mill site to provide additional information from the February, 1990 test pit program (TPMS90-1 to 4). Dense, brown glacial till comprising silty sand with some gravel and clay was encountered overlying lapilli tuff bedrock throughout the mill site area. The bedrock was typically heavily fractured for approximately 0.5 to 1.0 meters depth before becoming more competent, which precluded excavation with the backhoe.

TP95-1, located at the fine ore stockpile site, encountered 5.5 metres of glacial till overlying bedrock. Similar ground conditions were encountered to the north and south in test pits TPMS90-1 to 3.

Test pits TP95-2,3,4,7 and 8 were located in the vicinity of the concentrator site and encountered a variable thickness (1.2 to 3.6 metres) of glacial till overlying bedrock. Bedrock was typically encountered at shallow depths except in test pit TP95-7 where bedrock was not encountered.

TP95-5, located at the crusher site, revealed a thin, 0.5 meter thick layer of glacial till overlying bedrock. Test pit TPMS90-4, located to the north, encountered a thick, 6.1+ metre layer of till at a higher elevation.

TP95-6 was located at the coarse ore stockpile site and encountered 5.0+ metres of glacial till. Although bedrock was not exposed during excavation, angular rock fragments were present at the bottom of the pit which typically indicate a close proximity to bedrock.

2.2.2 Bootjack Lake Road

Five test pits (TP95-9 to 13) were excavated along the side slope of an existing access road above the west shore of Bootjack Lake. Test pits TP95-9, 10 and 11 encountered coarser-grained, sand and gravel glacial till at lower elevations, which became more silty and less gravel with increasing elevation. The till encountered in TP95-12 and 13 was similar to the material identified at the mill site. TP95-9 also encountered softer till, due to a higher in-situ moisture content, at 2.5 metres depth. TP95-12 encountered a thin, 1.2 metre thick layer of till overlying bedrock.

2.2.3 Main access road

Two test pits (TP95-14 and 15) were excavated to examine the regional ground conditions along the existing Main access road and to identify potential sand and gravel deposits. Test pit TP95-14 encountered 4.1 metres of sandy silt glacial till adjacent to Morehead Creek at kilometre 7.1. Test pit TP95-15, located on top of a narrow ridge at kilometre 4.3, did not encounter sand and gravel deposits as anticipated, rather 4.5 metres of sandy, gravelly silt glacial till to depth.

2.3 TAILINGS STORAGE FACILITY

2.3.1 Tailings and Reclaim Pipeline Route

Four test pits (TP95-16 to 19) were located north of the proposed tailings storage facility and partially along the proposed tailings and reclaim pipeline route. All four test pits encountered glacial till comprising silty sand to gravel and sand. TP95-17 encountered the water table at 3 metres depth. TP95-19, located along the steep hill slope, encountered angular rock fragments at the bottom of the pit (6.4 metres), indicating a close proximity to bedrock, and indicates that a thinner covering of till exists at higher elevations.

2.3.2 Borrow Areas

Three test pits (TP95-29 to 31) were located on the ridge east of the tailings facility to investigate potential borrow sources for future embankment construction. All three pits encountered glacial till comprising silty sandy gravel with trace clay to depths of 5.7, 5.5 and 5.8 metres, respectively. The till in TP95-29 was drier than typically encountered in the other two pits, and the water table was not encountered in any of the pits.

2.3.3 Embankment and Basin Foundations

Eleven test pits (TP95-26 to 29, 32 to 39) were excavated within the proposed tailings storage facility. Glacial till was typically encountered in the northern portion of the facility, whereas glaciofluvial/glaciolacustrine deposits of silt, sand and clay were encountered in the south.

Test pits TP95-26, 27, 28 and 32, located in the northern portion of the tailings basin and in the Perimeter Embankment footprint, encountered very stiff to hard, low permeability glacial till to depths of over 6.2 metres. TP95-28, excavated in a swamp, encountered dry till below 1.9 metres of soft, saturated organics and silt/clay layers. Only localized, very low flow seeps were encountered in TP95-27, and a perched water table was observed in the lacustrine deposits overlying the till in TP95-28.

Test pits TP95-33 to 39 were excavated in the southern portion of the tailings basin and in the Main Embankment footprint. TP95-33, 34 and 35 encountered a 3 to 4 metre thick layer of low permeability, sandy silt glacial till overlying layered silt and very fine-grained sand glaciofluvial/

glaciolacustrine deposits. Localized, very low flow seeps were visible at the contact between these deposits. TP95-33 also encountered 0.9 metres of soft organics and silt/clay deposits at surface due to the close proximity to a pond. A similar glacial till cap overlying very stiff to hard, low permeability silt deposits interbedded with fine-grained sand was identified in test pits TP95-36 and 38. A 0.6 metre thick layer of clean, saturated, coarse-grained sand was encountered between the glacial till and the interbedded silts and sands in TP95-36. TP95-39, located in close proximity to TP95-36 and 38, encountered a 2.2 meter thick cap of low permeability glacial till overlying a more permeable silt and fine-grained sand deposit to 7.5+ meters depth. The water table was encountered at the contact of these two deposits, and the silt and sand displayed very limited cohesion due to a high moisture content. TP95-37, located up slope from TP95-39, encountered 1.5 meters of glacial till overlying bedrock. Geological sections through the tailings basin and along the Main Embankment alignment are shown on Drawing No. 1623.103.

2.4 POLLEY LAKE DAM

Six test pits (TP95-20 to 25) were excavated along the south shore of Polley Lake to investigate the foundation conditions for a potential dam site. Typical materials encountered in these test pits were soft, saturated organics overlying lacustrine deposits of fine-grained sand, silt and clays. Fresh water shells were typically found in the silt layers. TP95-20 and 25, located at the east and west ends of the lake, encountered hard, low permeability silty, clayey glacial till at 2.5 and 5 metre depths, respectively. A geological section along the proposed Polley Lake Dam alignment is shown on Drawing No. 1623.103.

3

SECTION 3.0 - LABORATORY TEST WORK

3.1 GENERAL

Overburden materials comprising glacial till and glaciofluvial/glaciolacustrine deposits were sampled at the mill site, along access roads, along the tailings and reclaim pipeline route, in the tailings basin and borrow areas, and at the Polley Lake dam site. Index testing was performed to characterize these materials, followed by specialized testing to evaluate the various materials for suitability in specific end uses. All test work was carried out by Golder Associates' Testing Laboratory using ASTM standard procedures for routine tests and procedures specified by Knight Piésold Ltd.

A total of twelve (12) representative samples were selected from the various project areas and were submitted for the following Index test work:

- Natural Moisture Content
- Atterberg Limits
- Specific Gravity
- Grain Size Distribution

Of these samples, eight (8) were selected for additional effective strength, compaction and permeability test work as follows:

- C-U Triaxial Tests
- Modified Proctor Tests
- Falling Head Permeameter Tests

This section describes the test work performed and summarizes the results obtained. Index test results are summarized in Table 3.1, and effective strength parameters, compaction and permeability test results are summarized in Table 3.2. Detailed test results are included in Appendix B.

3.2 MILL SITE AND ACCESS ROADS

3.2.1 Mill Site

Two representative samples (TP95-1 and 7) of glacial till were selected from the mill site test pits for Index test work. The tills varied between a silty sand with some gravel and clay to a coarser silty, gravelly sand with trace clay. The moisture content ranged from 10.4 to 10.9 percent, and the specific gravity test on the fine fraction was 2.78.

Laboratory compaction tests performed on a sample of glacial till from TP95-7 yielded a Modified Proctor maximum dry density of 2192 kg/m^3 at an optimum moisture content of 8.9 percent. The Modified Proctor optimum moisture content is 2.5 percent below the natural moisture content of the till.

3.2.2 Bootjack Lake Road

One sample of glacial till (TP95-10) was selected from the Bootjack Lake access road test pit for Index test work. The till comprised sand and gravel with some silt and trace clay, and was representative of the coarser-grained tills encountered along the road alignment. A natural moisture content of 12.6 percent was measured, which is slightly greater than measured in the finer-grained tills encountered at higher elevations at the mill site.

3.2.3 Main access road

Due to the similarity of materials identified during the test pit program, no samples from the Main access road were selected for Index test work.

3.3 TAILINGS STORAGE FACILITY

3.3.1 Tailings and Reclaim Pipeline Route

One representative sample (TP95-18) of glacial till was selected from the tailings and reclaim pipeline route test pits for Index test work. The till comprised sand and gravel with some silt and trace clay, and was similar to the coarser-grained tills encountered at similar elevations along the Bootjack Lake road alignment. However, the natural moisture content of 13.8 percent was slightly greater.

Laboratory compaction tests performed on this sample yielded a Modified Proctor maximum dry density of 2130 kg/m^3 at an optimum moisture content of 10.1 percent. The optimum moisture content is approximately 3.7 percent below the natural moisture content of the till. The maximum dry density was the lowest of all the till samples tested from the various project areas.

3.3.2 Borrow Areas

One sample of glacial till (TP95-31) was selected from the potential borrow area on the ridge east of the tailings facility for Index test work. The till comprised silty, sandy gravel with trace clay, with a moisture content of 11.0 percent.

Laboratory compaction tests performed on this sample yielded a Modified Proctor maximum dry density of 2200 kg/m^3 at an optimum moisture content of 7.6 percent. The optimum moisture content is approximately 3.4 percent below the natural moisture content of the till. The overall compaction characteristics are very similar to the tills encountered in the Perimeter Embankment foundation (TP95-27) and at the mill site (TP95-7).

3.3.3 Embankment and Basin Foundations

(i) Glacial Till Samples

Two representative samples of glacial till (TP95-27 and 37) were selected from test pits located in the Perimeter Embankment foundation footprint and within the tailings basin for Index test work. The tills comprised sand and silt with some gravel and clay, with moisture contents ranging from 11.1 to 18.8 percent. The higher moisture content in TP95-37 may be attributed to the close proximity to fractured bedrock where seeps were identified. The moisture content of the till in TP95-27 is typical of the fine-grained tills encountered at the mill site and the potential borrow area. Specific gravity tests on the fine fraction of TP95-27 yielded 2.73.

Laboratory compaction tests performed on the till sample from TP95-27 yielded a Modified Proctor maximum dry density of 2200 kg/m^3 at an optimum moisture content of 8.0 percent. The optimum moisture content is approximately 3.1 percent below the natural moisture content of the till. The overall compaction characteristics are very similar to the till encountered in the potential borrow area (TP95-31).

Laboratory derived effective strength parameters were determined on glacial till samples from TP95-27 and 37 using consolidated-undrained (C-U) triaxial test work. The samples were compacted to a minimum 95 percent Modified Proctor maximum dry density at the natural moisture content, and confining pressures of 250 and 750 kPa for TP95-27 and 500 and 1000 kPa for TP95-37 were applied in stages until failure developed. The triaxial test was done on both samples and the results were combined to obtain a more representative result of the shear strength properties of the glacial till. The tests resulted in the following shear strength parameters:

- $\varnothing' = 35°$
- $c' = 0$ kPa

The effective strength parameters were determined from the maximum deviator stresses and principal stress ratios at failure, and are shown as p' vs. q plots on Figure 3.3.

A detailed summary of the consolidated-undrained triaxial test results is shown in Table 3.3.

Falling head permeameter test work was performed on sample TP95-27 and yielded a permeability of 4×10^{-8} cm/sec. The permeability was similar to the measured permeabilities on glacial till samples from test pits TP95-31 ($k=6 \times 10^{-8}$ cm/sec) and TPB-13, 14 and 16 ($k=2 \times 10^{-8}$ cm/sec).

(ii) Glaciofluvial/Glaciolacustrine Samples

Three representative samples of glaciofluvial/glaciolacustrine materials (TP95-35, 38 and 39) were selected from test pits located within the southern tailings basin for Index test work. The materials varied from interbedded sandy silt to very stiff silt with some clay to saturated silt and fine-grained sand. Moisture contents ranged from 16.5 percent for the interbedded sandy silt to 28.5 percent for the dense silt and the saturated silt and sand. Specific gravity ranged between 2.76 and 2.79.

Laboratory derived effective strength parameters were determined on the silt and fine-grained sand sample from TP95-39 using consolidated-undrained (C-U) triaxial test work.. The sample was compacted to a minimum 95 percent Modified Proctor maximum dry density at the natural moisture content, and confining pressures of 300, 600 and 1000 kPa were applied in stages until failure developed. The tests resulted in the following shear strength parameters:

- $\varnothing' = 33°$
- $c' = 0$ kPa

The effective strength parameters are determined from the maximum deviator stresses and principal stress ratios at failure, and are shown as p' vs. q on Figure 3.4.

A detailed summary of the consolidated-undrained triaxial test results is shown in Table 3.4.

Falling head permeameter test work was performed on samples TP95-35, 38 and 39 and yielded permeabilities of 7×10^{-7}, 3×10^{-7} and 2×10^{-6} cm/sec, respectively.

3.4 POLLEY LAKE DAM

Two samples (TP95-20 and 25) were selected from test pits located at the south end of Polley Lake for Index test work. The dense glacial till sample from TP95-20 comprised silty, clayey sand with a trace to some gravel and a moisture content of 14.5 percent. This till sample has a higher clay content than typically encountered tills, and the higher moisture content is attributed to the close proximity to Polley Lake. TP95-25 encountered lacustrine layers comprising sand and silt with some clay and gravel, with a natural moisture content of 17.1 percent.

4

SECTION 4.0 - GEOLOGICAL FACTORS AFFECTING DESIGN

4.1 GENERAL

The results of the investigation program were used to evaluate the geotechnical factors which may affect the design of the various project components. A summary of results, conclusions and recommendations is provided below with respect to each project component.

4.2 MILL SITE AND ACCESS ROADS

4.2.1 Mill Site

Glacial till was encountered in all eight test pits (TP95-1 to 8) at the proposed mill site location. The glacial till ranges in thickness from 0.5 to 5.8+ metres and overlies lapilli tuff bedrock. The top 1 metre of bedrock is typically very fractured and weathered near surface, however, it becomes fresh and increasingly competent with depth.

An allowable bearing capacity pressure (q_a) of 250 kPa has been estimated for the basal till, based on an assumed Standard Penetration Test (SPT) value of $(N_1)_{60} = 25$. The SPT value was estimated from excavation conditions in the dense to hard glacial till. Therefore, the glacial till will provide a suitable dense foundation material for footings supporting general buildings and less settlement sensitive components. However, heavy structures with dynamic loads should be founded on competent bedrock. The allowable bearing pressure for competent rock (RQD>25 or as approved by the Engineer) is 1500 kPa. For both cases, the allowable bearing pressure will result in less than 25 mm (1 inch) of settlement in the foundation, assuming the groundwater table is located below the base of the footings.

The foundation must be stripped and grubbed and all organic material removed prior to footing excavation. The exposed till surface must be inspected to ensure the material is competent and will support the design loads. Any soft soils or saturated areas must be excavated to expose either competent till or bedrock.

Foundations for heavy and/or vibratory structures such as at the crusher and concentrator must be excavated to competent bedrock to support the loads. The investigation program revealed a thin, 0.5 metre thick layer of glacial till covering most of the proposed crusher site location, and a thicker, up to 3.6 metres thick, layer of till over the majority of the concentrator site. This till cover and the upper fractured bedrock must be removed to expose competent bedrock. Nearby drill holes indicate that competent bedrock is present below the upper fractured rock. Any anchor systems that are required for the mills or crusher can be designed to suit the projected dynamic loadings.

Foundations for the crusher and concentrator must include provisions to accommodate seasonal freeze/thaw while minimizing potential differential settlement. Based on meteorological data, the depth of freeze is estimated to be 1.25 metres (4 feet). Consequently, the foundations for all structures must be covered with a 1.25 metre thick layer of free-draining, non-frost susceptible (NFS) material such as clean gravel or coarse sand, as required, to enhance drainage and prevent frost heave from occurring. The NFS material required for frost protection will provide drainage around foundation footings thereby depressing the water table and greatly reducing the potential for the development of ice lenses which cause frost heaving. It is recommended that 100 mm diameter corrugated polyethylene tubing (CPT) be included to further enhance foundation drainage.

The crusher and concentrator sites must be well drained during construction and operations to prevent standing water from ponding in the vicinity of the foundations. The NFS drainage material and CPT pipework will provide post-construction drainage at the sites. Surface runoff from building roofs and access roads, etc. must also be diverted or directed well away from the foundations to minimize seepage and infiltration into the foundation soils.

Foundation conditions at the proposed coarse and fine ore stockpile locations encountered 5.0+ and 5.5 metres of till overlying bedrock, respectively. This till will provide competent foundation support for the stockpiles as the amount of allowable settlement will be much higher than for the crusher and concentrator.

4.2.2 Bootjack Lake Road

Glacial till was encountered in all five test pits (TP95-9 to 13) along the proposed Bootjack Lake access road alignment. The glacial till ranges in thickness from 1.2 to 6.3+ metres and overlies bedrock. Due to the high water encountered in TP95-9 and 11, the softer material encountered at 2.5 metres depth in TP95-9, and the shallow depth to bedrock in TP95-12, it is recommended that the road excavation does not exceed 1 metre, otherwise difficulties may be encountered during construction. The surficial, coarse-grained till will be suitable for both excavation and use as fill for widening the existing road.

4.2.3 Main Access Road

Glacial till was encountered in both test pits (TP95-14 and 15) along the existing Main access road. This material will be suitable for both excavation and use as fill for widening the existing road. The entire road alignment should be inspected to identify any problem areas such as exposed bedrock outcrops, seeps, etc. prior to construction.

4.3 TAILINGS STORAGE FACILITY

4.3.1 Tailings and Reclaim Pipeline Route

Glacial till was encountered in all four test pits (TP95-16 to 19) near and along the proposed tailings and reclaim pipeline route. The till will be suitable for use as fill in access roads and will provide a competent foundation for the pipelines. Excavations at lower elevations should not exceed 3 metres depth due to the high water table near Bootjack Creek.

4.3.2 Borrow Areas

Laboratory test work on the glacial till sample from test pit TP95-31 confirmed that the till encountered along the ridge east of the tailings storage facility will be suitable for use as embankment fill. Delineation of the borrow area extents and calculation of the available quantities of material is required.

4.3.3 Embankment and Basin Foundations

A 5 metre minimum thick cover of dense, low permeability glacial till blankets the majority of the tailings basin and the Perimeter Embankment footprint as encountered in test pits TP95-26 to 28, 32 and in existing test pits. However, in the southern portion of the basin, the till becomes thinner (3 to 4 metres thick) and is non-existent over a portion of the Main Embankment footprint. A low permeability glacial till liner will be required in the tailings basin where the in-situ glacial till is less than approximately 3 metres thick. The till liner will act as a seepage barrier to prevent the migration of water out of the tailings facility and into the foundation. In addition, this liner will be thick enough to provide frost protection for the glacial till. The till liner will tie into the low permeability glacial till core of the Main Embankment, thereby providing a continuous seepage barrier for the facility.

4.4 POLLEY LAKE DAM

The foundation conditions at the south end of Polley Lake comprise saturated, soft organics and lacustrine deposits overlying low permeability, very stiff glacial till as encountered in test pits TP95-20 to 25. At the south-east and south-west ends of the lake, the soft organics and lacustrine deposits vary in thickness between 2.5 and 5 metres, respectively. In between these pits, the deposits increased to more than 6.5

metres thick. During the excavation of the test pits, significant seepage was observed from the organics and the sandy layers of the lacustrine deposits, due to the close proximity to Polley Lake.

TABLES

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE 3.1

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT

SUMMARY OF LABORATORY TESTS
INDEX TEST RESULTS

J:\JOB\DATA\1623\LAB_TEST.XLS

Feb 27 '95 10:28 am

Test Pit Sample No.	Location	Specific Gravity	Natural Moisture Content (%)	Atterberg Limits (%)				Grain Size Distribution				Soil Description
				LL	PL	PI	LI	+#4 % Gravel	#4 - #200 % Sand	#200 - 0.002mm % Silt	-0.002mm %Clay	
TP95-1	Mill Site	-	10.4	21	13	8	-0.3	21	46	27	6	Silty, gravelly SAND, trace clay
TP95-7	Mill Site	2.78	10.9	24	14	11	-0.2	16	39	35	10	Silty SAND, some gravel and clay
TP95-10	Bootjack Lake Road	-	12.6	25	17	9	-0.4	38	36	19	7	GRAVEL and SAND, some silt, trace clay
TP95-18	Tailings/Reclaim Pipeline Route	-	13.8	27	13	14	0.0	38	36	19	7	GRAVEL and SAND, some silt, trace clay
TP95-20	Polley Lake	-	14.5	26	13	13	0.1	10	39	25	26	Silty, clayey SAND, trace to some gravel
TP95-25	Polley Lake	-	17.1	24	12	13	0.4	15	37	33	15	SAND and SILT, some gravel and clay
TP95-27	Perimeter Embankment Foundation	2.73	11.1	22	14	9	-0.3	19	37	33	11	SAND and SILT, some gravel and clay
TP95-31	East Ridge Borrow Area	-	11.0	22	14	8	-0.4	41	27	25	7	Silty, sandy GRAVEL, trace clay
TP95-35	South Basin	2.78	16.5	21	14	7	0.4	2	22	65	11	Sandy SILT, some clay, trace gravel
TP95-37	South Basin	-	18.8	27	16	11	0.2	14	40	35	11	SAND and SILT, some gravel and clay
TP95-38	Main Embankment Foundation	2.79	28.4	33	19	14	0.7	3	6	73	18	SILT, some clay, trace sand and gravel
TP95-39	Main Embankment Foundation	2.76	28.5	-	-	-	-	0	40	46	14	SILT and fine SAND, some clay
TPB-1	Main Embankment Foundation	-	13.7	29	19	10	-0.5	3	14	67	16	SILT, some clay and sand, trace gravel
TPB-13,14,16	Embankment & Pond Foundations	2.76	25.1	30	16	14	0.6	1	17	61	21	Clayey SILT, some sand, trace gravel

Note:

1. Samples TPB-1 and TPB-13,14,16 were selected for laboratory testwork in 1989 and have been reported for comparison.

TABLE 3.2

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT

SUMMARY OF LABORATORY TESTS
EFFECTIVE STRENGTH PARAMETERS, COMPACTION AND PERMEABILITY TEST RESULTS

I:\JOB\DATA\1623\LAB_TEST.XLS

Mar 13 '95 2:07 pm

Test Pit Sample No.	Location	EFFECTIVE STRENGTH PARAMETERS		COMPACTION			PERMEABILITY	Soil Description
		Friction Angle, Ø' (degrees)	Cohesion, c' (kPa)	Natural Moisture Content (%)	Optimum Moisture Content (%)	Maximum Dry Density (kg/m^3)	Permeameter Falling Head Test (cm/sec)	
TP95-7	Mill Site	-	-	10.9	8.4	2192	-	Silty SAND, some gravel and clay
TP95-18	Tailings/Reclaim Pipeline Route	-	-	13.8	10.1	2130	-	GRAVEL and SAND, some silt, trace clay
TP95-27	Perimeter Embankment Foundation	35	0	11.1	8.0	2200	4 x 10^{-8}	SAND and SILT, some gravel and clay
TP95-31	East Ridge Borrow Area	-	-	11.0	7.6	2200	6 x 10^{-8}	Silty, sandy GRAVEL, trace clay
TP95-35	South Basin	-	-	-	-	-	7 x 10^{-7}	Sandy SILT, some clay, trace gravel
TP95-37	South Basin	35	0	-	-	-	-	SAND and SILT, some gravel and clay
TP95-38	Main Embankment Foundation	-	-	-	-	-	3 x 10^{-7}	SILT, some clay, trace sand and gravel
TP95-39	Main Embankment Foundation	33	0	-	-	-	2 x 10^{-6}	SILT and fine SAND, some clay
TPB-13.14.16	Embankment & Pond Foundations	-	-	25.1	13.3	1935	2 x 10^{-8}	Clayey SILT, some sand, trace gravel

Notes:

1. Triaxial tests results from samples TP95-27 and 37 were combined to determine average strength pearameters for the glacial till material.
2. Compaction tests performed as per ASTM D1557 Modified Proctor tests.
3. Permeability tests carried out on samples compacted with standard proctor energy and at natural moisture content.
4. Sample TPB-13.14.16 was selected for laboratory testwork in 1989 and has been reported for comparison.

TABLE 3.3

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY

RESULTS OF CONSOLIDATED-UNDRAINED TRIAXIAL TESTS ON GLACIAL TILL SAMPLES

Triaxial Testing Stages and Soil Parameters	Units	Sample No.			
		TP95-27 (Test 1)	TP95-37 (Test 2)	TP95-27 (Test 3)	TP95-37 (Test 4)
Initial Parameters					
Sample diameter	(cm)	3.77	3.72	3.75	3.72
Sample length	(cm)	14.68	15.35	15.21	15.35
Moisture content, w	(%)	7.9	9.3	7.6	9.1
Dry density, γ_{dry}	(kg/m^3)	2168	2072	2079	2063
Bulk density, γ_{bulk}	(kg/m^3)	2339	2265	2237	2251
Void ratio, e		0.259	0.342	0.313	0.348
B-value		0.965	0.985	0.954	0.997
Consolidation Stage					
Cell pressure	(kPa)	772	979	1220	1374
Back Pressure	(kPa)	484	481	476	412
Final effective consolidation pressure, σ_{3c}'	(kPa)	287	498	745	962
Final moisture content, w	(%)	9.7	9.8	9.8	9.9
Final dry density, γ_{dry}	(kg/m^3)	2207	2183	2161	2180
Final bulk density, γ_{bulk}	(kg/m^3)	2421	2397	2373	2396
Final void ratio, e		0.237	0.274	0.264	0.275
Coefficient of consolidation, c_v	(cm^2/s)	2.7×10^{-2}	7.4×10^{-4}	2.3×10^{-2}	1.1×10^{-3}
Shearing Stage					
Effective consolidation pressure, σ_{3c}'	(kPa)	287	498	745	962
Principal stress ratio, P.S.R. $(\sigma_1'/\sigma_3')_{max}$		4.25	3.74	3.60	3.38
Strain at maximum P.S.R.	(%)	1.85	2.09	11.67	7.42
σ_1' at maximum P.S.R.	(kPa)	823	1202	1012	2216
σ_3' at maximum P.S.R.	(kPa)	194	321	282	657
ΔU at maximum P.S.R.	(kPa)	94	177	463	305
A_f at maximum P.S.R.		0.15	0.20	0.63	0.20
Maximum deviator stress, $(\sigma_d')_{max}$	(kPa)	1416	1268	812	1624
Strain at $(\sigma_d')_{max}$	(%)	17.66	21.14	21.04	20.02
σ_1' at $(\sigma_d')_{max}$	(kPa)	1946	1843	1135	2354
σ_3' at $(\sigma_d')_{max}$	(kPa)	531	575	323	730
ΔU at $(\sigma_d')_{max}$	(kPa)	-243	-77	422	232
A_f at $(\sigma_d')_{max}$		-0.17	-0.06	0.52	0.14

TABLE 3.4

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY

RESULTS OF CONSOLIDATED-UNDRAINED TRIAXIAL TESTS ON SILT AND FINE-GRAINED SAND SAMPLES

Triaxial Testing Stages and Soil Parameters	Units	Sample No. TP95-39		
		(Test 1)	(Test 2)	(Test 3)
Initial Parameters				
Sample diameter	(cm)	3.75	3.72	3.69
Sample length	(cm)	14.81	14.94	14.86
Moisture content, w	(%)	16.3	16.6	16.7
Dry density, γ_{dry}	(kg/m^3)	1693	1639	1558
Bulk density, γ_{bulk}	(kg/m^3)	1969	1911	1818
Void ratio, e		0.630	0.684	0.772
B-value		0.955	0.953	0.963
Consolidation Stage				
Cell pressure	(kPa)	779	1077	1306
Back Pressure	(kPa)	483	482	415
Final effective consolidation pressure, σ_{3c}'	(kPa)	296	595	891
Final moisture content, w	(%)	19.2	18.6	19.9
Final dry density, γ_{dry}	(kg/m^3)	1803	1807	1756
Final bulk density, γ_{bulk}	(kg/m^3)	2149	2143	2105
Final void ratio, e		0.531	0.528	0.571
Coefficient of consolidation, c_v	(cm^2/s)	2.2×10^{-2}	5.9×10^{-2}	3.8×10^{-2}
Shearing Stage				
Effective consolidation pressure, σ_{3c}'	(kPa)	296	595	891
Principal stress ratio, P.S.R. $(\sigma_1'/\sigma_3')_{max}$		4.06	3.60	3.43
Strain at maximum P.S.R.	(%)	9.62	7.72	11.95
σ_1' at maximum P.S.R.	(kPa)	293	502	858
σ_3' at maximum P.S.R.	(kPa)	72	140	250
ΔU at maximum P.S.R.	(kPa)	224	455	641
A_f at maximum P.S.R.		1.01	1.25	1.06
Maximum deviator stress, $(\sigma_d')_{max}$	(kPa)	228	364	615
Strain at $(\sigma_d')_{max}$	(%)	6.63	12.10	3.96
σ_1' at $(\sigma_d')_{max}$	(kPa)	303	507	1008
σ_3' at $(\sigma_d')_{max}$	(kPa)	75	143	393
ΔU at $(\sigma_d')_{max}$	(kPa)	221	452	498
A_f at $(\sigma_d')_{max}$		0.97	1.24	0.81

FIGURES

1623.A1

IMPERIAL METALS CORPORATION

MT. POLLEY PROJECT

PROJECT LOCATION MAP

CAD FILE: \PROJECT\1623\FIG\A1 Plot scale 1=1

Jan. 31, 1995

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

FIGURE 1.1

CAD FILE: \PROJECT\1623\FIG\A3 Plot scale 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

UNIFIED SOIL CLASSIFICATION SYSTEM

PROJECT No. 1623
SAMPLE No. As Shown
DATE Feb. 9-11, 1995

PROJECT: *Imperial Metals Corporation – Mt. Polley Project – Geotechnical Investigation*
Glacial Till – Particle Size Distributions

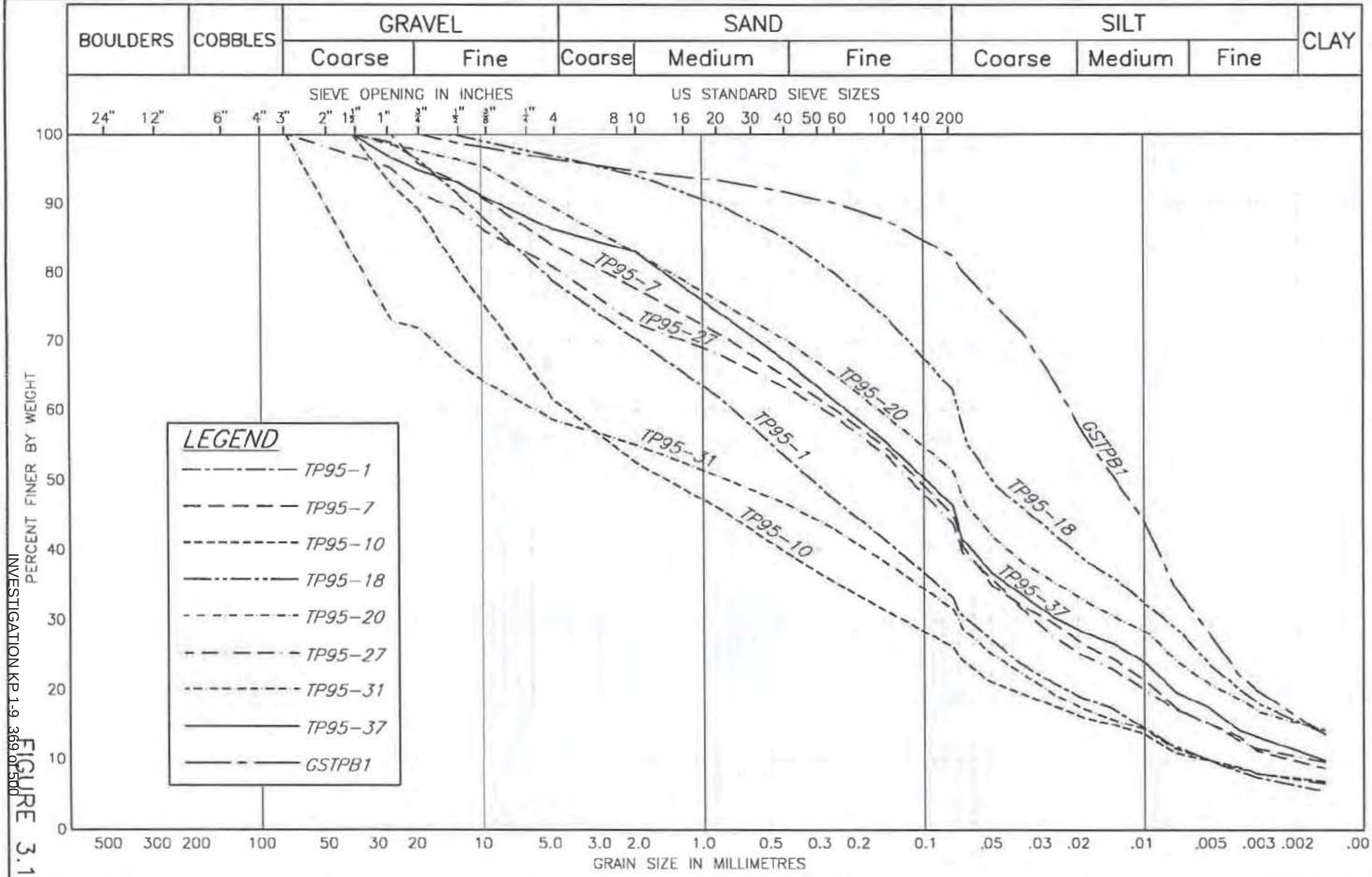


FIGURE 3.1

1623.A3

CAD FILE: \PROJECT\1623\FIG\A2 Plot scale 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

UNIFIED SOIL CLASSIFICATION SYSTEM

PROJECT No. 1623
SAMPLE No. As Shown
DATE March 2, 1995

PROJECT: *Imperial Metals Corporation – Mt. Polley Project – Geotechnical Investigation*
Glaciofluvial / Glaciolacustrine Deposits – Particle Size Distributions

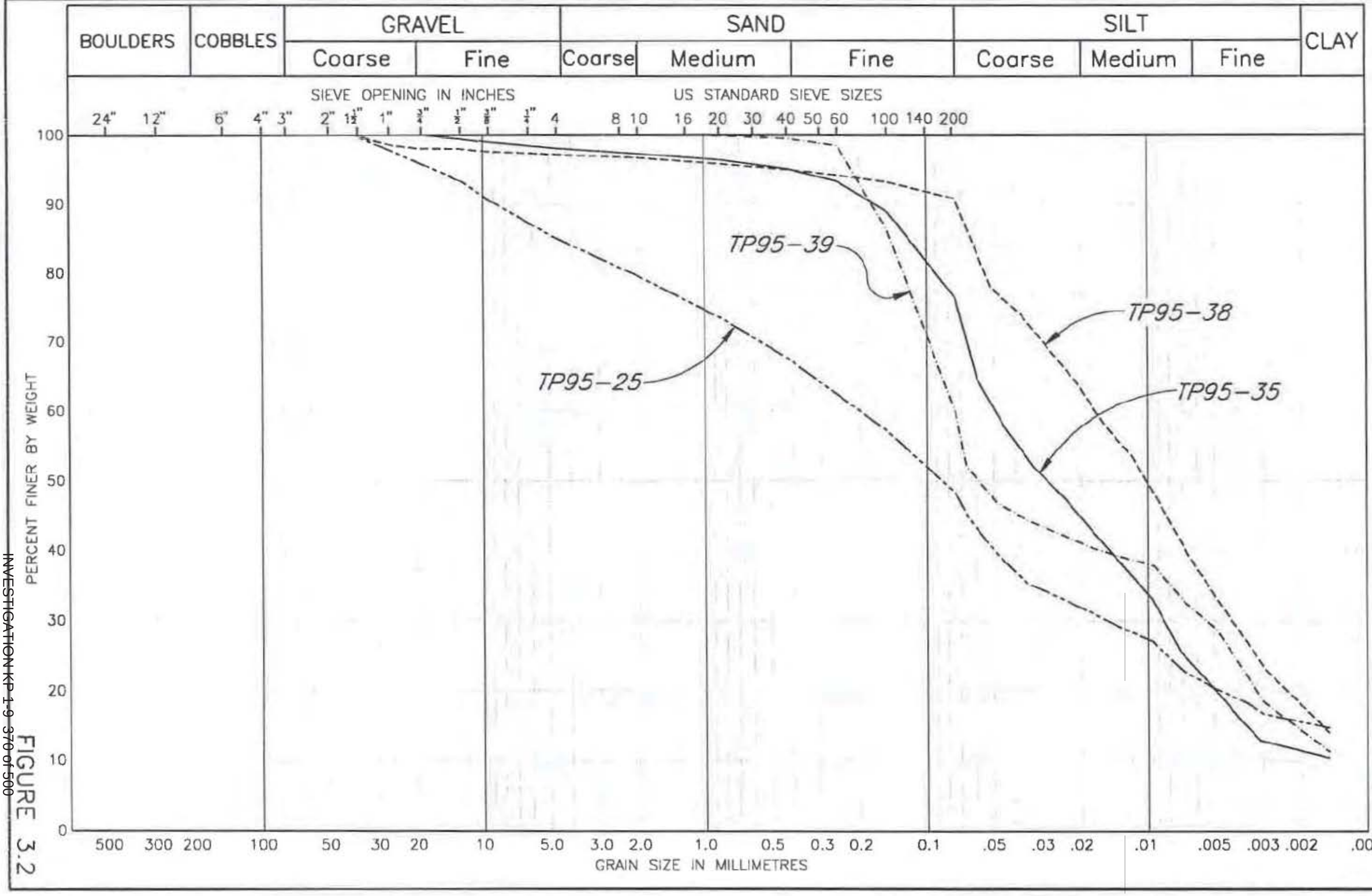


FIGURE 3.2

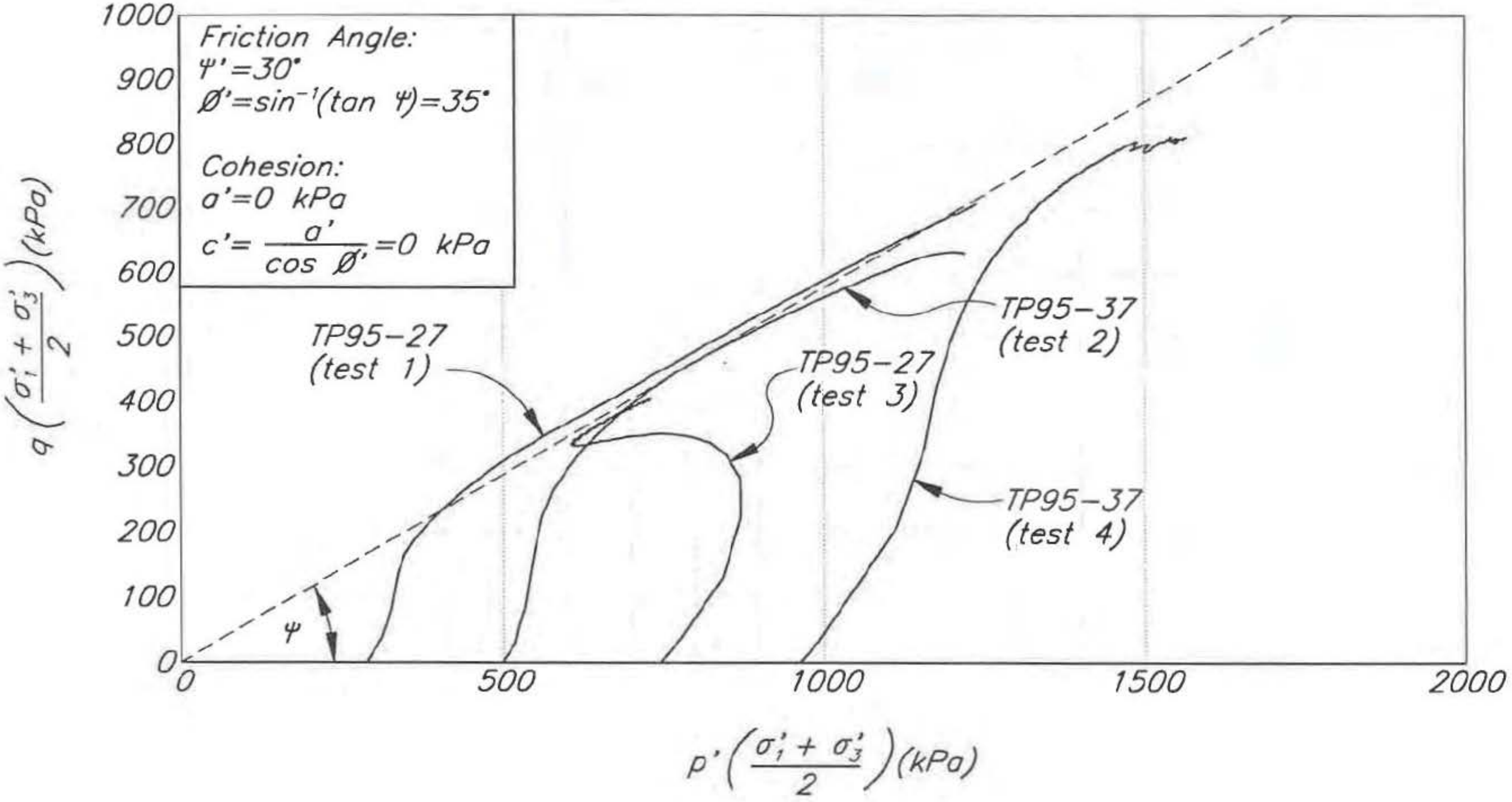
1623.A2

CAD FILE: \PROJECT\1623\FIG\A4 Plot scale 1=1

IMPERIAL METALS CORPORATION

MT. POLLEY PROJECT

STRESS PATH PLOTS FROM SINGLE STAGE CONSOLIDATED-UNDRAINED TRIAXIAL TESTS ON GLACIAL TILL SAMPLES



Mar. 2, 1995

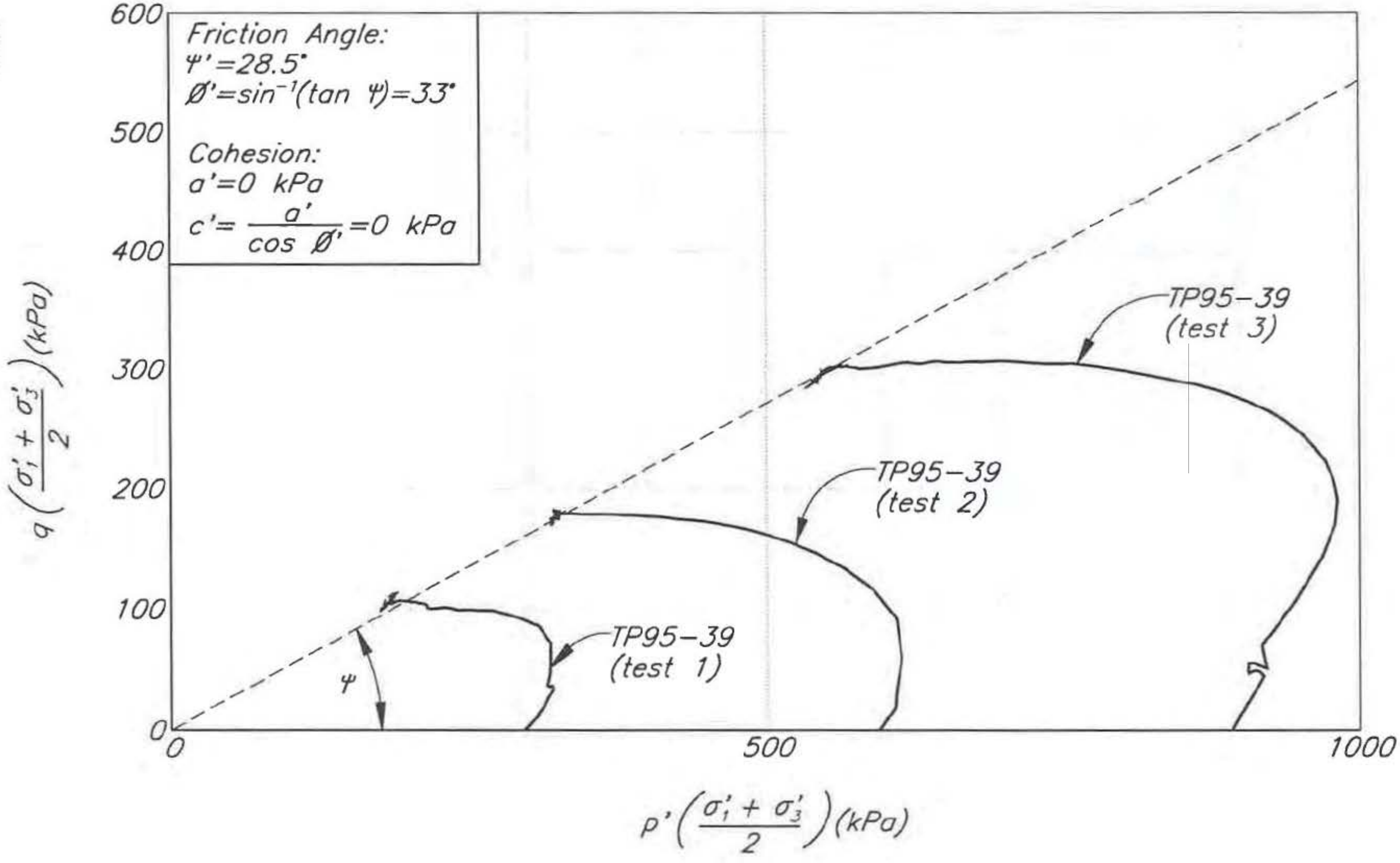
KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

FIGURE 3.3

1623.A4

CAD FILE: \PROJECT\1623\FIG\A5 Plot scale 1=1

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
STRESS PATH PLOTS FROM MULTI-STAGE CONSOLIDATED-UNDRAINED TRIAXIAL TESTS ON SILT AND FINE-GRAINED SAND SAMPLES

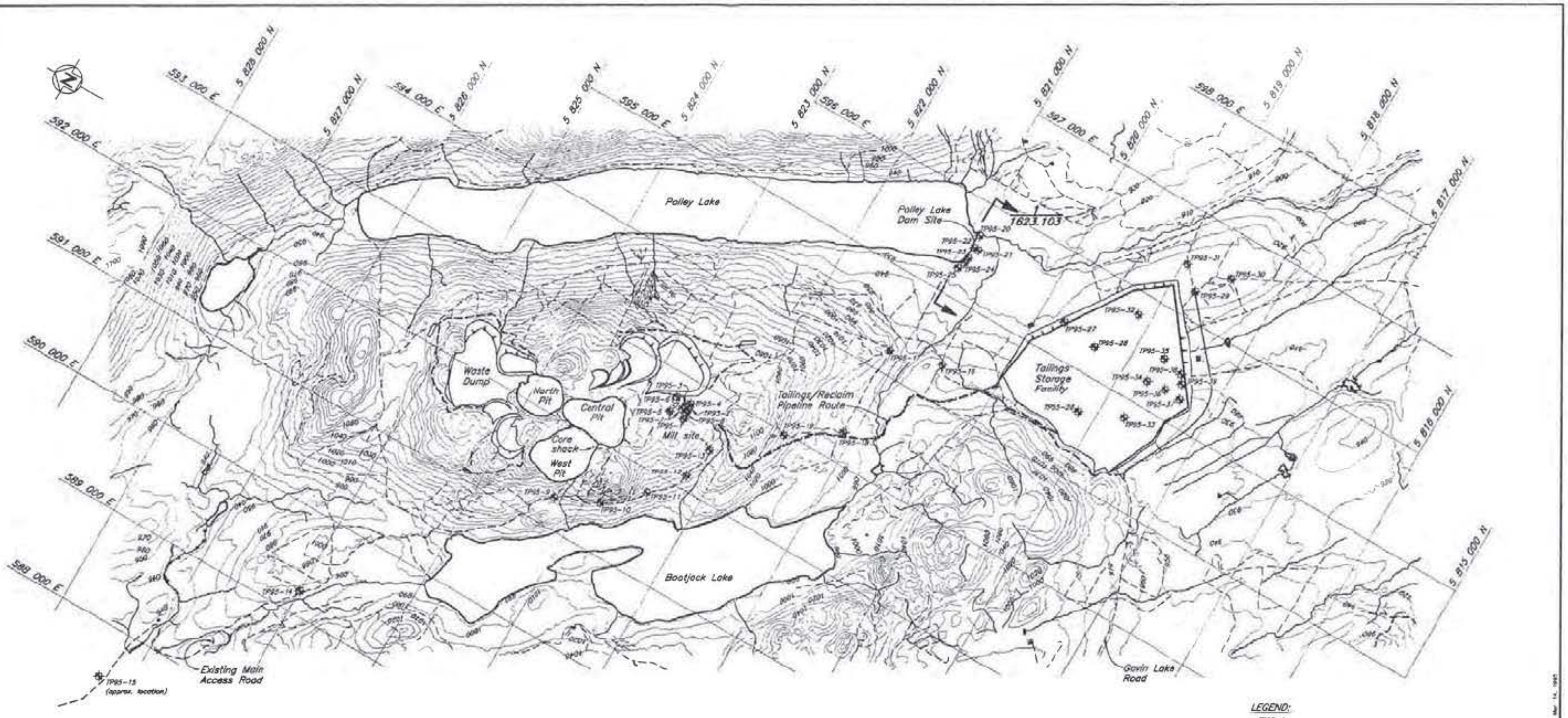


Mar. 13, 1995
KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

FIGURE 3.4

1623.A5

DRAWINGS



LEGEND:

TP95-1 ✦ 1995 Test Pit

NOTES:

1. Mill site layout as per CSFM Engineering (Jan. 6/95).
2. Test pit locations are field located and have not been surveyed. Test pits TP95-1 to TP95-8 have been surveyed for relative positions but have not been tied into the site grid.

Scale 1000 500 0 1000 2000 Metres

REV.	DATE	DESCRIPTION	APPROVED
0	MAR. 14/95	ISSUED FOR REPORT	KJB

DRG. NO. | DESCRIPTION — REFERENCE DRAWINGS

REV. | DATE | DESCRIPTION | APPROVED — REVISIONS

KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS – VANCOUVER, B.C.

K. BROUWER
ENGINEER

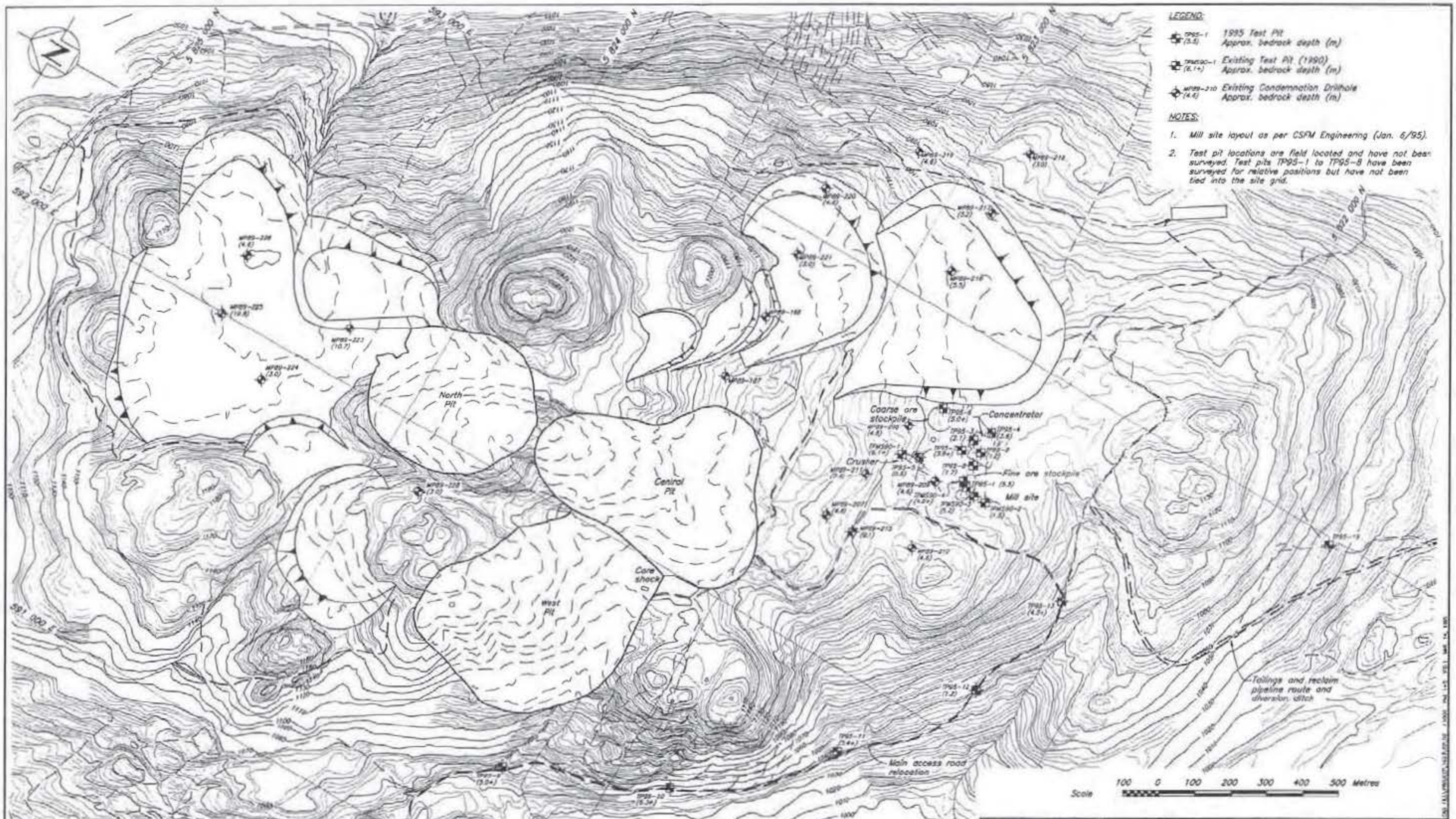
DESIGNED KCB
DRAWN RDT
CHECKED KGB
APPROVED KJB

IMPERIAL METALS CORPORATION

MT. POLLEY PROJECT

OVERALL SITE PLAN
GEOTECHNICAL INVESTIGATION PROGRAM

DATE MARCH 14, 1995 | SCALE AS SHOWN | DRG. NO. 1623.100 | REV. 0



LEGEND:

- TP95-1 (3.5) — 1995 Test Pit; Approx. bedrock depth (m)
- TPMC90-1 (6.1+) — Existing Test Pit (1990); Approx. bedrock depth (m)
- MP89-210 (4.6) — Existing Condemnation Drillhole; Approx. bedrock depth (m)

NOTES:

1. Mill site layout as per CSFM Engineering (Jan. 6/95).
2. Test pit locations are field located and have not been surveyed. Test pits TP95-1 to TP95-8 have been surveyed for relative positions but have not been tied into the site grid.

DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			

REV.	DATE	DESCRIPTION	APPROVED
0	MAR. 14/95	ISSUED FOR REPORT	KJB
REVISIONS			

KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

K. J. BROUWER
BRITISH COLUMBIA
ENGINEER

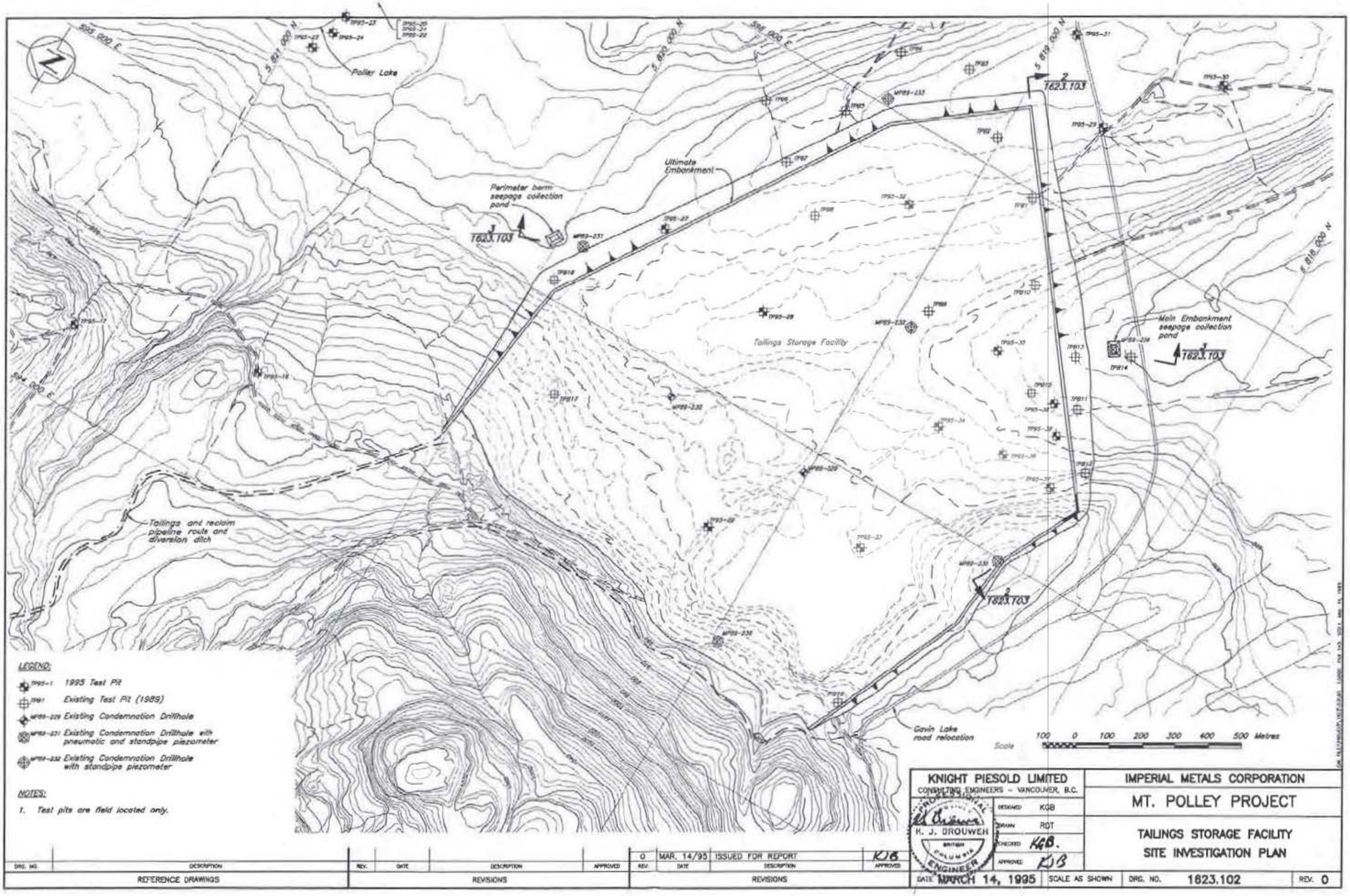
DESIGNED KGB
DRAWN RDT
CHECKED KGB.
APPROVED KJB

IMPERIAL METALS CORPORATION

MT. POLLEY PROJECT

MILL SITE AND MAIN ACCESS ROAD
SITE INVESTIGATION PLAN

DATE MARCH 14, 1995 | SCALE AS SHOWN | DRG. NO. 1623.101 | REV. 0



LEGEND:

- TP95-1 1995 Test Pit
- TP89-1 Existing Test Pit (1989)
- MP89-229 Existing Condemnation Drillhole
- MP89-231 Existing Condemnation Drillhole with pneumatic and standpipe piezometer
- MP89-232 Existing Condemnation Drillhole with standpipe piezometer

NOTES:

1. Test pits are field located only.

DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			

REV.	DATE	DESCRIPTION	APPROVED
0	MAR. 14/95	ISSUED FOR REPORT	KJB
REVISIONS			

KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS – VANCOUVER, B.C.

PROFESSIONAL ENGINEER
K. J. BROUWER
BRITISH COLUMBIA

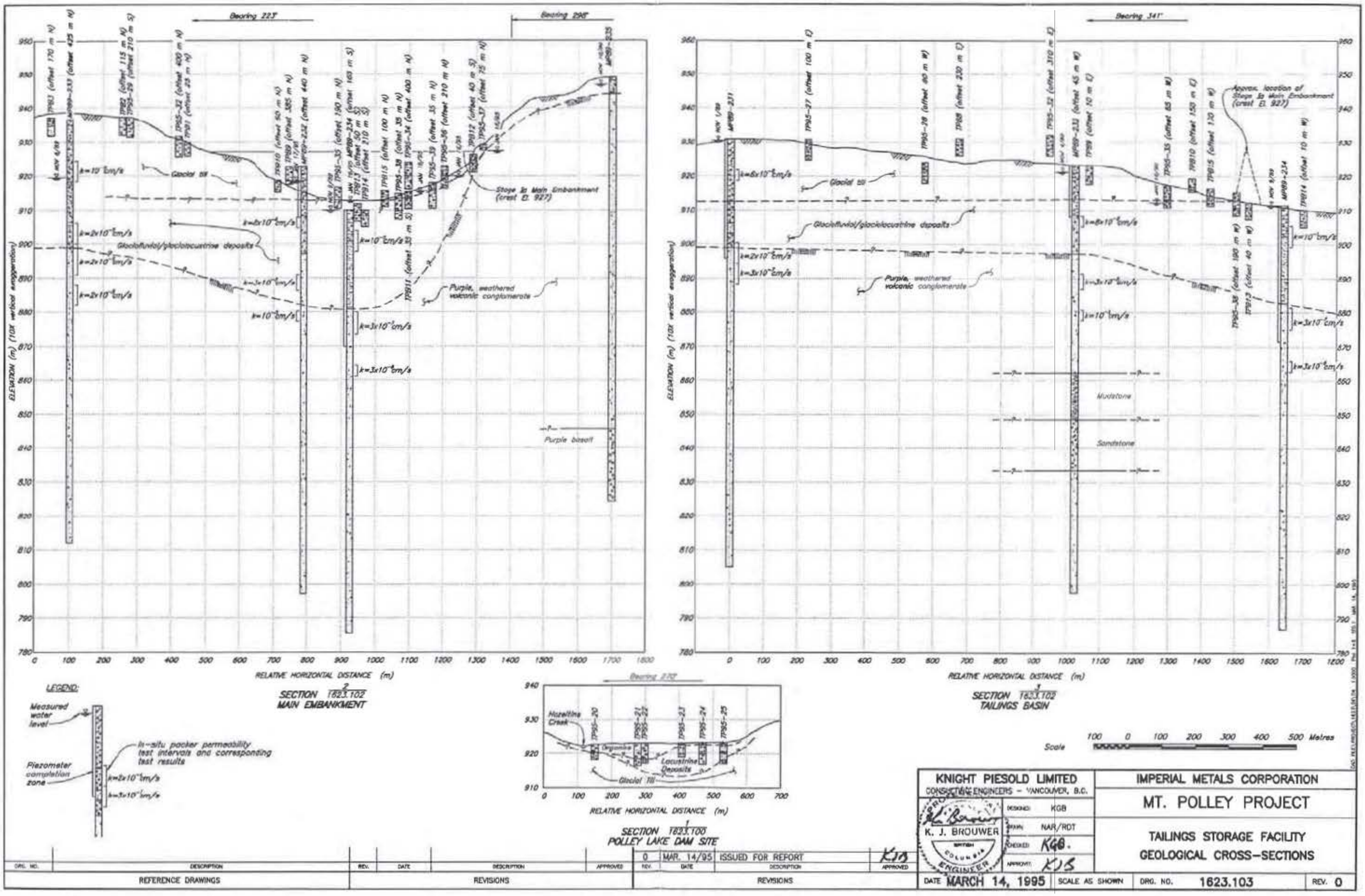
DESIGNED KGB
DRAWN RDT
CHECKED KGB.
APPROVED KJB
DATE MARCH 14, 1995
SCALE AS SHOWN

IMPERIAL METALS CORPORATION

MT. POLLEY PROJECT

TAILINGS STORAGE FACILITY
SITE INVESTIGATION PLAN

DRG. NO. 1623.102
REV. 0



SECTION 2/1623.102 MAIN EMBANKMENT

SECTION 1/1623.100 POLLEY LAKE DAM SITE

SECTION 3/1623.102 TAILINGS BASIN

KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS – VANCOUVER, B.C.

K. J. BROUWER
BRITISH COLUMBIA
ENGINEER

DESIGNED: KGB
DRAWN: NAR/RDT
CHECKED: KGB.
APPROVED: KJB

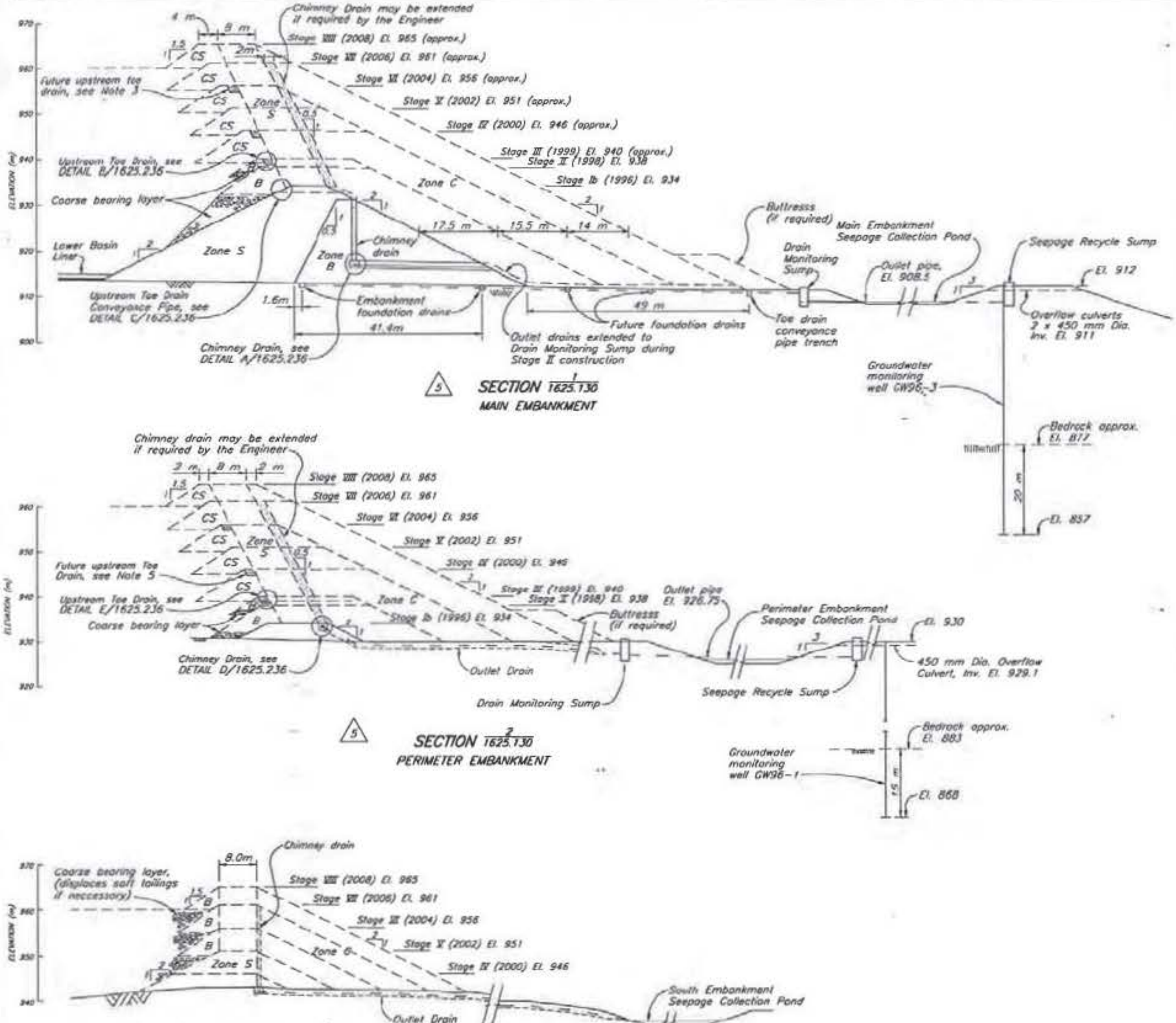
IMPERIAL METALS CORPORATION

MT. POLLEY PROJECT

TAILINGS STORAGE FACILITY
GEOLOGICAL CROSS–SECTIONS

DATE MARCH 14, 1995 | SCALE AS SHOWN | DRG. NO. 1623.103 | REV. 0

DRG. NO.	DESCRIPTION	REV.	DATE	DESCRIPTION	APPROVED	REV.	DATE	DESCRIPTION	APPROVED
						0	MAR. 14/95	ISSUED FOR REPORT	KJB
REFERENCE DRAWINGS		REVISIONS				REVISIONS			



5 SECTION $\frac{1}{1625.130}$
MAIN EMBANKMENT

5 SECTION $\frac{2}{1625.130}$
PERIMETER EMBANKMENT

5 SECTION $\frac{3}{1625.130}$
SOUTH EMBANKMENT

ZONE	MATERIAL TYPE	PLACEMENT AND COMPACTION REQUIREMENTS
Coarse Bearing Layer	Free draining durable waste rock fill or coarse sandy gravel	Placed and spread in maximum 1000 mm thick layers. Compaction as directed by the Engineer.
Chimney/Toe Drain	Filter sand	Placed and spread in maximum 1000 mm thick layers. Vibratory compaction as directed by the Engineer.
Foundation Drain	Drain Gravel	Placed and compacted as shown on the Drawings
S	Glacial till	Placed, moisture conditioned and spread in maximum 300 mm thick layers (after compaction). Compaction to 98% of std. proctor maximum dry density.
B	Glacial till	Placed, moisture conditioned and spread in maximum 600 mm thick layers (after compaction). Compaction to 98% of std. proctor maximum dry density.
C	Random fill (See Note 7)	Glacial till or other approved material placed in maximum 600 mm thick layers (after compaction). Vibratory compaction as required by the Engineer.
CS	Cycloned sand or sandy gravel alluvium	Placed and spread in maximum 1000 mm thick layers. Vibratory compaction as directed by the Engineer.

NOTES

1. Additional outlet pipework to seepage ponds will be included if required.
2. Upstream toe Drains to be installed during Stage III construction. Conveyance pipework for Main Embankment to be installed prior to Stage II Construction, with pipe invert El. 932.5 at abutments.
3. Future toe drains, shown for Stages IV and VI will be added if required.
4. Dashed lines imply preliminary design. Ongoing design and crest elevations will be modified as required based on filling records and monitoring information.
5. Tailings elevations include provision for 2.5 million cubic metres of reclaim water.
6. Chimney Drain to be extended to El. 940 for Main and Perimeter Embankments, with contingency for on-going extension. Elevation of Longitudinal Drain varies for Main Embankment, see Drg. No. 1625.207.
7. A transition zone may be required if rockfill is incorporated in Zone C.

NOT FOR CONSTRUCTION

Scale 10 5 0 10 20 30 40 50 m

DWG. NO.	DESCRIPTION
1625.202	TSF – FOUNDATION PREPARATION AND BASIN LINER
1625.236	TSF – TAILINGS EMBANKMENT – SECTIONS AND DETAILS – SHEET 2 OF 2
1625.207	TSF – TAILINGS DAM CHIMNEY DRAIN
1625.130	TSF – FINAL ARRANGEMENT

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	APPROVED
5	MAY 30/97	REVISED DRAIN DETAILS – DETAILS NOW ON SHEET 2 OF 2 (1625.236)	KJB
4	SEP 4/96	REVISED DRAINAGE DETAILS	

REVISIONS

REV.	DATE	DESCRIPTION	APPROVED
3	JUN 12/96	REVISED EMBANKMENT AND TOE DRAIN	
2	APR 10/96	REVISED EMBANKMENT STAGES	
1	MAY 26/95	ISSUED FOR DESIGN REPORT	
0	APR 6/95	ISSUED FOR REVIEW	

REVISIONS

KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS – VANCOUVER, B.C.

PROVINCE OF BRITISH COLUMBIA
K. J. BROUWER
ENGINEER

DESIGNED KJB/KDE
DRAWN VAL/VT
CHECKED KDE
APPROVED KJB

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

TAILINGS STORAGE FACILITY
TAILINGS EMBANKMENT
SECTIONS AND DETAILS
SHEET 1 OF 2

DATE APRIL 6, 1995 | SCALE AS SHOWN | DRG. NO. 1625.111 | REV. 5

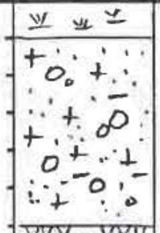
APPENDIX A

APPENDIX A

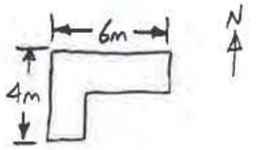
TEST PIT LOGS

KNIGHT AND PIESOLD LTD. CONSULTING ENGINEERS	# TEST PIT LOG	TEST PIT No. TP95-2 SHEET 1 of 1

PROJECT Mt Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5,822,560 N, 592,730 E
GROUND ELEVATION ~1110 m
DATE Jan 11/95 Concentrator
LOGGED BY KGB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe	0		Dark brown/black, saturated, ORGANICS.
	1		Orange brown/brown, dense, moist to very moist, fine-grained sandy SILT with some gravel and clay. Organics sometimes encountered to 1m depth. Sandy SILT Glacial Till
Water table encountered at 1.2 m No samples taken.	▽	E.O.P.	Bedrock encountered at 1.2m depth. Angular fragments, typically 10cm dia. Wet due to water table.
	2		

<u>Note</u>: This trench was excavated approx. 10m long:



- The north-south portion typically had 1m of organics, a thin layer of till overlying bedrock.
- The east-west portion is described above.
- Both limbs encountered bedrock at shallow depths.

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CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-3
SHEET 1 of 1

PROJECT Mt. Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5,822,560 N, 592,765 E
Concentrator
GROUND ELEVATION ~1110 m
DATE Jan 11/95
LOGGED BY KGB

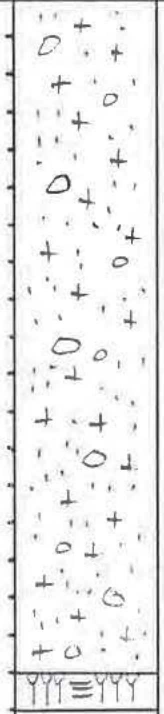
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe Moderate digging conditions No samples taken!	0 1		Brown, dense, fine-grained sandy SILT with some gravel and clay. Slightly moist to moist. Similar to material encountered in TP95-1 Sandy Silt Glacial Till
Water table encountered. at 2.1 m Water ponded in pit to 2m depth after 18hrs.	▽ 2 3 4	E.O.P.	Bedrock encountered at 2.1 m. Angular fragments 10 to 20 cm dia. typically. Very broken at surface, and becomes more competant with depth. Backhoe rips through 1m of bedrock, and could continue, indicating the contact is very fractured.

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-4
SHEET 1 of 1

PROJECT Mt. Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5,822,510N, 592,765E
" South end of Concentrator
GROUND ELEVATION ~ 1109 m
DATE Jan 11/95
LOGGED BY KGB.

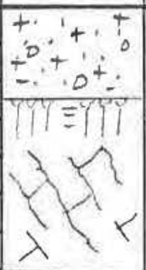
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe	0		Orange-brown (near surface) to brown, dense fine-grained sandy SILT with some gravel and clay (similar to TP95-1). slightly moist. Cohesive in-situ, especially at depth where chunks of material is ripped from pit. Fine to moderate-grained gravel.
Moderate digging conditions	1		
Sample TP95-4 taken 2 to 3.6m	2		<u>Sandy Silt Glacial Till</u>
	3		↓ Basal till
Water table encountered at 3.6m. water ponded to approx 2 to 2.5m depth after 18hrs			Bedrock encountered at 3.6m depth. Angular fragments encountered.
	4	E.O.P.	

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-5
SHEET 1 of 1

PROJECT Mt Polley
LOCATION OF TEST PIT Approx 5,822,720 N , 592,600E Crusher
DATE Jan 12/95
PROJECT No. 1623
GROUND ELEVATION ~1120 m
LOGGED BY KGB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	0		Oxidized silty SAND with some gravel, trace clay. Coarser grained than tills in TP95-1, 3 and 4. Lots of roots throughout. Silty Sand Glacial Till
No seeps encountered.	1		Bedrock encountered at 0.5m. Lapilli Tuff (volcanics). Oxidized (iron stained) on exposed outcrop. Fractured.
No samples taken.	2	E.O.P.	

Note: Test pit is 10 m long, and varies in depth up to 1.4m.

KNIGHT AND PIESOLD LTD.
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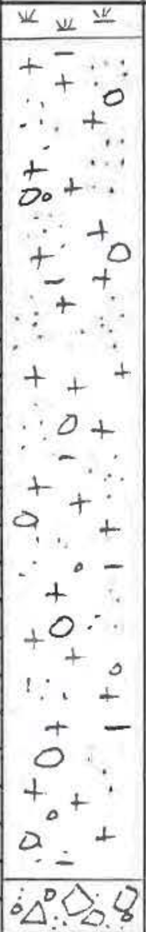
TEST PIT LOG

TEST PIT No. TP95-6
SHEET 1 of 1

PROJECT Mt Polley
LOCATION OF TEST PIT Approx 5,822,720 N; 592,740 E
" Coarse ore stockpile.
DATE Jan 12/95

PROJECT No. 1623
GROUND ELEVATION ~1117 m.
LOGGED BY KGB.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	0		ORGANICS
Moderate digging conditions.	1		Brown, dense, fine-grained sandy SILT with some fine-grained gravel, trace to some clay. Slightly moist. Becomes very dense (hard) near bottom of pit as backhoe rips chunks of till (very cohesive, acts like gravelly clay with some sand and silt. Probably a basal till layer). Sandy Silt Glacial Till
Sample TP95-6 from 0 to 4m ←	2		
Digging becomes more difficult.	3		
	4		Till becomes oxidized at 4m.
No seeps encountered.	5	E.O.P.	Oxidized coarse-grained sand and angular rock fragments encountered. No large rock fragments or visible outcrop encountered.
	6		

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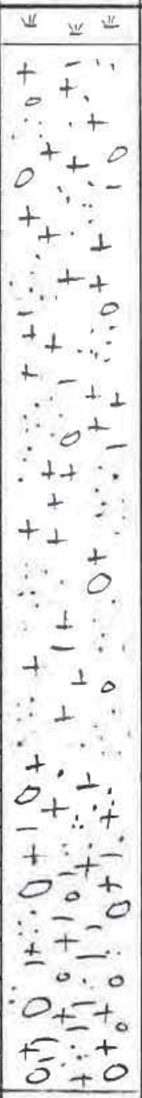
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-7
SHEET 1 of 1

PROJECT Mt Polley
LOCATION OF TEST PIT Approx 5,822,610 N; 592,730 E.
DATE Jan 12/95 Concentrator
PROJECT No. 1623
GROUND ELEVATION ~1112 m
LOGGED BY KGB

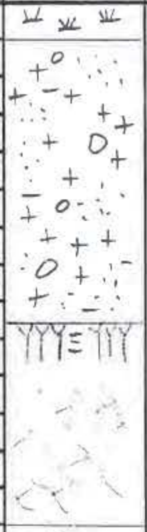
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	0		Organics
	1		Brown, dense, slightly moist, fine-grained sandy SILT with some gravel, clay. Similar to material encountered in surrounding test pits. Hard, gray coloured till encountered at depth (~4.4m). Rips in extremely cohesive, large chunks from pit. Gravel is round and fine to medium sized. Typically, this more dense till is encountered near the till / bedrock contact in previous test pits. Sandy Silt Glacial Till
Moderate digging conditions.	2		
	3		
	4		
Seep encountered at 4.4m.	▽		
Sample TP95-7 (4.4 to 5.8m)	←		
Difficult digging conditions		E.O.P.	
	6		

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-8
SHEET 1 of 1

PROJECT Mt. Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5,822,560 N ; 592,690 E.
" Concentrator
GROUND ELEVATION ~1110m
DATE Jan 12/95
LOGGED BY KG/B.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	0		Organics, black + brown colour.
Moderate digging conditions.	1		Dense, brown, fine-grained sandy SILT with some fine-grained gravel and clay. Loose once excavated. Similar till as majority of millsite pits. No hard basal till encountered. Sandy Silt Glacial Till
Water quickly ponding at bottom of hole.	∇ ? 2		Bedrock encountered at 1.7m. Lapilli Tuff (volcanics). Angular fragments up to 30cm dia. Backhoe tears through approx 1.1m with difficulty. Becomes extremely difficult to excavate at 2.8m depth.
No samples taken.	3	E.O.P	

KNIGHT AND PIESOLD LTD. CONSULTING ENGINEERS	TEST PIT LOG	TEST PIT No. TP95-9 SHEET 1 of 1

PROJECT Mt. Polley

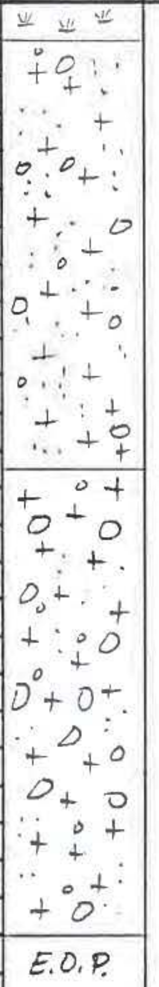
LOCATION OF TEST PIT Approx 5,823,280 N; 591,300 E " East side Bootjack Lake

DATE Jan 12/95

PROJECT No. 1623

GROUND ELEVATION ~1052m

LOGGED BY KGB.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	0		Organics.
Moderate digging conditions	1		Brown, dense, moist, sandy gravelly SILT with trace to some clay. Medium sized gravel. Poorly sorted, well graded. Coarser than till at mill site.
Sample TP95-9A ← (0.2 to 2.5m)	2		Sandy Gravelly Silt Glacial Till
Sample TP95-9B ← (2.5 to 5.0m)	3		Grey, slight to moderately dense (firm), very moist → sat'd, (sticky and cohesive) sandy SILT with some clay, trace to some gravel, trace cobbles. Gravel is fine to coarse grained. Moderate resistance when indented with finger. Very plastic. Backhoe creates suction when excavating material. This is very wet material!
Seep @ 4m.	∇ ? 4		
	5		Sandy Silt Glacial Till
		E.O.P.	

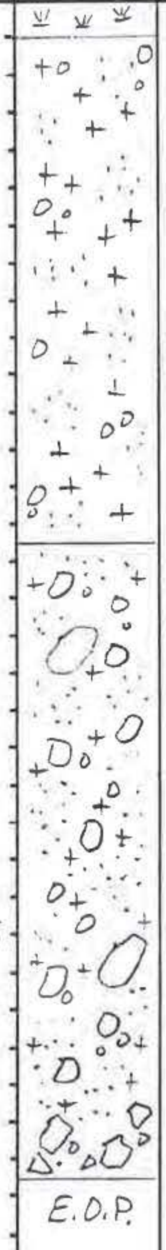
KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-10
SHEET 1 of 1

PROJECT Mt. Polley
LOCATION OF TEST PIT Approx 5,822,850N : 591 480E (East side Bootjack Lake)
DATE Jan 12/95

PROJECT No. 1623
GROUND ELEVATION ~1048m
LOGGED BY KGB

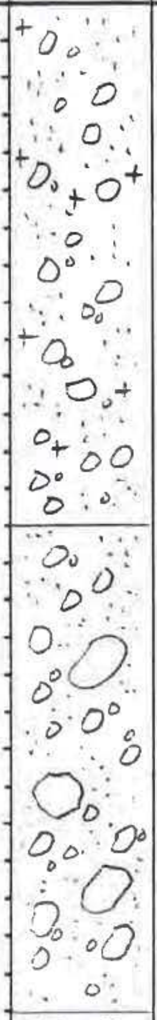
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	0		Organics.
Moderate digging conditions.	1		Oxidized, dense sandy SILT with some gravel and clay. Slightly moist. Same material as encountered at mill site. Loose once excavated. Sandy Silt Glacial Till
	2		
Sample TP95-10 ←	3		Brown, dense, moist, silty gravelly SAND with trace cobbles and clay. Non-plastic. Loose once excavated. Moderate to coarse gravel. Denser material at bottom of pit. Coarser than till encountered in TP95-9. Silty Gravelly Sand Glacial Till
More difficult digging (due to coarse rocks)	4 5		
No seeps encountered.	6		Rock fragments encounted (up to 20 cm dia.) at base of pit -- possible bedrock ?
		E.O.P.	
	7		

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-11
SHEET 1 of 1

PROJECT Mt. Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5,822,500 N; 591,800 E
GROUND ELEVATION ~ 1040 m
DATE Jan 12/95 (East side of Bootjack Lake)
LOGGED BY KGB.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe. Moderate digging conditions Sample TP95-11	0 1 2		Brown, dense, slightly moist (near surface) to very moist (to 2.8m depth), gravelly SAND with some silt. Non-plastic. Poorly sorted, moderately graded. Slightly oxidized near surface. Gravelly Sand Glacial Till
Seep encountered @ 2.8m. Difficult digging due to coarse material	∇ 3 4 5 6	E.O.P.	Saturated sandy GRAVEL with some cobbles, trace to some silt. Moderately dense. Angular cobbles and gravel. Very coarse material. Noticable water in material when excavated. Sandy Gravel Glacial Till

KNIGHT AND PIESOLD LTD. CONSULTING ENGINEERS	# TEST PIT LOG	TEST PIT No. TP95-12 SHEET 1 of 1

PROJECT Mt. Polley

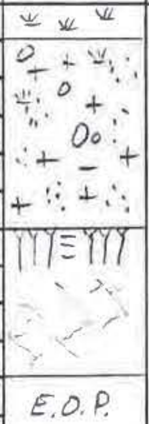
LOCATION OF TEST PIT Appro 5 822 250 N ; 592 140 E

DATE Jan 13/95 (East side of Bootjack Lake)

PROJECT No. 1623

GROUND ELEVATION ~1050 m

LOGGED BY KGB.

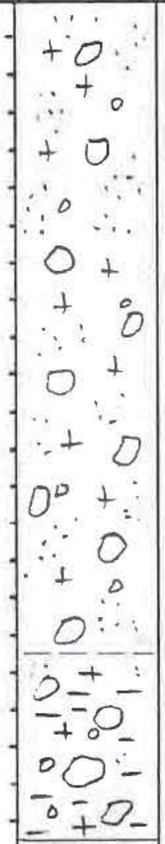


NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	0		Organics
Sample TP95-12	←		Brown, moderately oxidized, moist to very moist, moderately dense, fine-grained sandy SILT with some fine-grained gravel and clay, trace organics. Poorly sorted, moderately graded. Slightly plastic. Sandy Silt Glacial Till
	1		
Moderate digging to 2m.			
	2	E.O.P.	Bedrock encountered at 2m depth. Fractured, typically 20 cm dia sizes. Slightly wet at contact.
	3		

1

KNIGHT AND PIESOLD LTD. CONSULTING ENGINEERS	TEST PIT LOG	TEST PIT No. TP95-13 SHEET 1 of 1

PROJECT Mt Polley
LOCATION OF TEST PIT Approx 5 822 170 N; 592 470 E (East side of Bootjack Lake)
DATE Jan 13/95
PROJECT No. 1623
GROUND ELEVATION ~1076 m
LOGGED BY KWB.

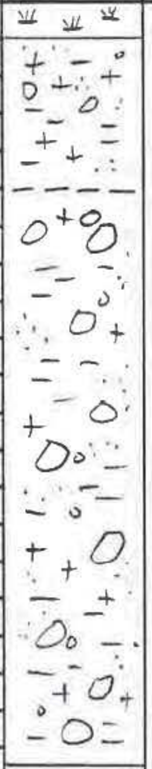
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe. Moderate digging conditions Sample TP95-13 ← (0 to 3.5m)	0 1 2 3		Brown, dense, moist, silty SAND with some gravel, trace to some clay. Gravel is typically medium sized. well graded, poorly sorted. slightly plastic. Coarser than material encountered at millsite. Good construction material. Silty Sand Glacial Till
Difficult digging conditions No seeps.	4 5	E.O.P.	Till becomes denser and more difficult to excavate. Grey-brown, hard, slightly moist sandy SILT with some gravel and clay. Rounded gravel; variable sizes. Extremely cohesive (rips in chunks from pit). Looks like a basal till. Sandy Silt Basal Till
	6		

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-14
SHEET 1 of 1

PROJECT Mt. Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5 825 000N; 589 230E (7.1km along Main Access Road)
GROUND ELEVATION ~975m
DATE Jan 13/95
LOGGED BY KGB.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe	0		Organics
Moderate digging conditions	1		Oxidized-brown near surface (becoming grey-brown coloured with depth), dense, slightly moist, sandy SILT and CLAY with some gravel and trace cobbles. Gravel and cobbles are rounded. Material becomes denser below 1m:
Sample TP95-14. ←	2		Hard, slightly moist, sandy SILT with some gravel and clay. Moderate to well graded, poorly sorted. Plastic when wet.
No seeps.	3		Good construction material. Sandy Silt Glacial Till
Difficult digging with depth.	4	E.O.P.	
	5		

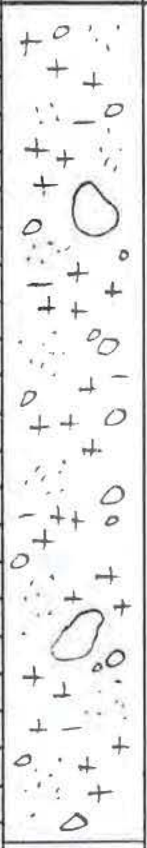
KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-15
SHEET 1 of 1

PROJECT Mt. Polley
LOCATION OF TEST PIT Approx 5826 300 N; 587 500 E
DATE Jan 13/95 (4.35 km along Main Access Road)

PROJECT No. 1623
GROUND ELEVATION ~930 m
LOGGED BY KGB.

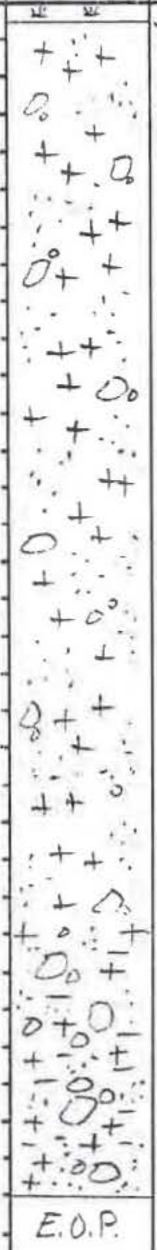
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe Moderate digging conditions. Sample TP95-15 No seeps.	0 1 2 ← 3 4 5	 E.O.P.	No organics (on top of clear-cut hill). Brown, dense, slightly moist, sandy gravelly SILT with trace to some clay, trace cobbles. Poorly sorted, well graded. Rounded cobbles and gravel. Dense basal-till like appearance when excavated in hard chunks, although majority of material is loose once excavated. Good construction material. (Similar till as TP95-14, only coarser.) Sandy Gravelly Silt Glacial Till

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-16
SHEET 1 of 1

PROJECT Mt. Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5 820 580N; 594 370E
(TSF Access Road)
GROUND ELEVATION ~980m
DATE Jan 13/95
LOGGED BY KGB.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	0		Organics
Easy to moderate digging conditions.	1		Brown, dense, slightly moist, sandy SILT with trace to some gravel and clay. Occasional rounded cobble or boulder. Moderately graded, poorly sorted. Plastic. No oxidation evident. In-situ material is 'very stiff'.
Sample TP95-16 ← (0 to 5m)	2		Sandy Silt Glacial Till
	3		
	4		
Seep at 5.0m.	∇ 5		Grey, hard, slightly moist sandy SILT with some gravel and clay, trace cobbles. Material is ripped from ground in extremely cohesive chunks. Slightly moist.
Very difficult digging conditions.	6		Note: Some local coarse areas of gravel and sand exist and water seeps through.
		E.O.P.	
	7		

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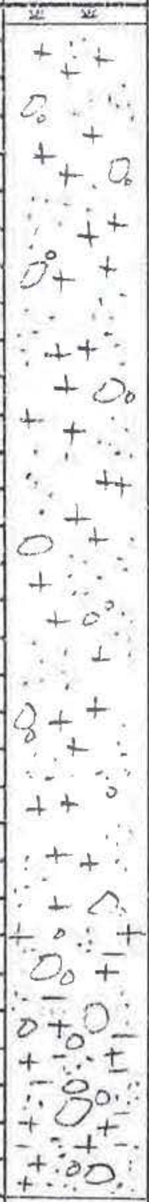
TEST PIT LOG

TEST PIT No. TP95-16
SHEET 1 of 1

PROJECT Mt. Polley
LOCATION OF TEST PIT Approx 5820580N; 594 370E
DATE Jan 13/95 (TSF Access Road)

PROJECT No. 1623
GROUND ELEVATION ~980m
LOGGED BY KGB.

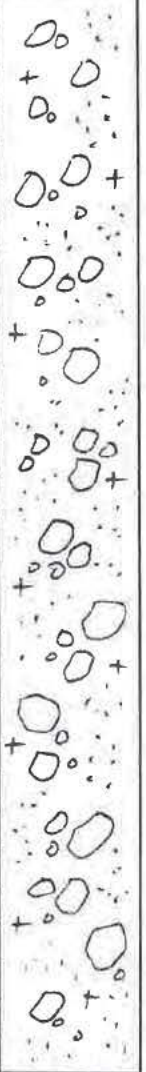
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	0		Organics
Easy to moderate digging conditions.	1		Brown, dense, slightly moist, sandy SILT with trace to some gravel and clay. Occasional rounded cobble or boulder. Moderately graded, poorly sorted. Plastic. No oxidation evident. In-situ material is 'very stiff'. Sandy Silt Glacial Till
Sample TP95-16 ← (0 to 5m)	2		
	3		
	4		
Seep at 5.0m.	∇ 5		Grey, hard, slightly moist sandy SILT with some gravel and clay, trace cobbles. Material is ripped from ground in extremely cohesive chunks. Slightly moist. Note: Some local coarse areas of gravel and sand exist and water seeps through.
Very difficult digging conditions.	6	E.O.P.	
	7		

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-17
SHEET 1 of 1

PROJECT Mt. Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5 821 110 N; 594 230 E (TSF Access Road).
GROUND ELEVATION ~ 980 m
DATE Jan 13/95
LOGGED BY KGB.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	0		
	1		Brown, moderately dense, moist, GRAVEL and SAND with some fine cobbles and silt. Poorly sorted, moderately graded. Non-plastic. Sub-angular gravel and cobbles.
Moderate digging conditions.	2		Gravel and Sand Glacial Till
Sample TP95-17	←		
Water level rises to 3m depth after 15 hrs.	▽ 3 ↑		
Water table encountered at 4.3m.	4 ▽		Material is saturated below 4.3m.
	5		
	6	E.O.P.	

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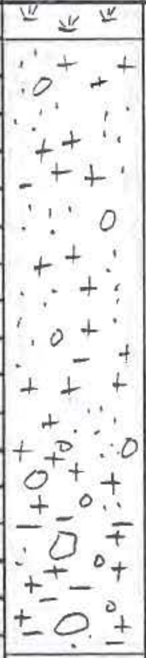
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-18
SHEET 1 of 1

PROJECT Mt Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5821100 N; 593 295 E
GROUND ELEVATION ~ 992m
DATE Jan 14/95 (Along tailings/reclaim pipeline route)
LOGGED BY KGB.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	0		Organics
Moderate digging conditions. Sample TP95-18	1 ←		Brown, dense, slightly moist sandy SILT with some gravel and trace clay. Occasional rounded cobble. Plastic. Poorly sorted, moderately graded. Approx. top 20cm is oxidized; the remainder is fresh. Sandy Silt Glacial Till
	2		
Difficult digging conditions. No seeps encountered.	3		Gray-brown, hard, slightly moist sandy SILT with some gravel and clay, and trace cobbles. Very dense and cohesive (rips out of pit in chunks). Poorly sorted, well graded. Gravel and cobbles are round to sub-rounded.
		E.O.P.	
	4		

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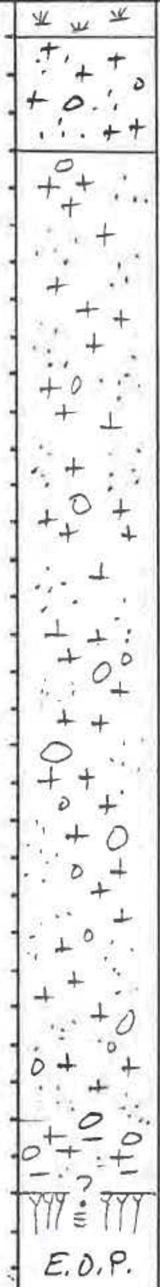
TEST PIT LOG

TEST PIT No. TP95-19
SHEET 1 of 1

PROJECT Mt. Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5821600N; 592980E
" (Along tailings/reclaim pipeline route)
GROUND ELEVATION ~1042m
DATE Jan 14/95
LOGGED BY KGB.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe. *Seepage from 0.2 to 0.8m only.	▽* 0		Organics. Brown, dense, moist gravelly SAND and SILT with trace cobbles and clay. Oxidized near surface. Plastic. Very well graded, poorly sorted. Sub-angular to sub-rounded particles. Visible seepage. Gravelly Sand and Silt Till (Note: This may be a layer of material developed from road construction.)
	1		
Moderate digging conditions	2		Brown, dense, slightly moist, silty fine-grained SAND with some gravel, trace cobbles (with depth). Plastic. Poorly sorted, moderately graded. Becomes moister with depth. Material becomes sandy SILT with some gravel and clay, trace cobbles. All gravel is sub-round to sub-angular. Silty Sand/Sandy Silt Glacial Till
Sample TP95-19 ← (0.8 to 6.0m)	3		
	4		
	5		approximate depth.
Difficult digging conditions.	6		Becomes grey and hard. Rounded gravel and cobbles.
	7		Note: Angular rock fragments encountered at bottom of hole. Fine-grained, mafic with white (>1mm) flecs. (Possible bedrock contact?)

KNIGHT AND PIESOLD LTD. CONSULTING ENGINEERS	TEST PIT LOG	TEST PIT No. TP95-20 SHEET 1 of 1

PROJECT Mt. Polley

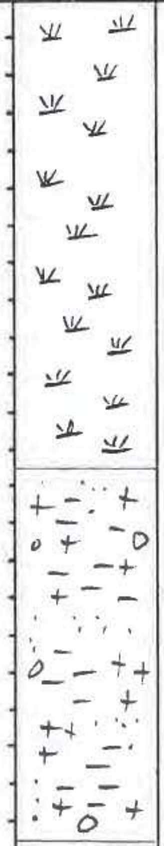
PROJECT No. 1623

LOCATION OF TEST PIT Approx 5 820 900N ; 595 670 E (South-east corner of Polley Lake)

GROUND ELEVATION ~ 922 m

DATE Jan 14/95

LOGGED BY KGB.

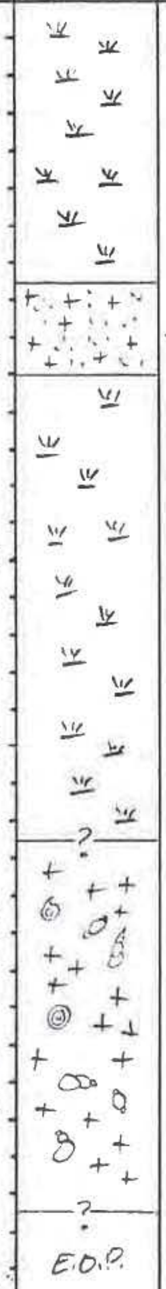
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe * Perched water table above dense till. Very easy digging (0-2.5m)	▽* 0 1 2		Black/brown ORGANICS. Completely saturated. Side walls continuously slough into pit. Very smelly! Very soft. Water continuously seeps into pit.
More difficult digging conditions. Sample TP95-20 ←	3 4		Grey, very stiff ⇒ hard, slightly moist → moist, sandy SILT with some gravel and clay. Plastic. Poorly sorted, moderately graded. Very cohesive. Looks like basal till encountered in local pits, only more in-situ moisture. Sandy Silt Basal Till
	5	E.O.P.	Approximate depth. Difficult to measure due to pit constantly collapsing and filling with water.

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP85-21
SHEET 1 of 1

PROJECT Mt Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5 820 840N ; 595 540E (60m south of Polley Lake)
GROUND ELEVATION ~922 m
DATE Jan 14/85
LOGGED BY KGB.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres) ∇	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	0		
Visible seeps from peat from 0 to 1m depth. Pit is saturated.	1		Black/brown, saturated, very soft ORGANICS. Very strong odour. Minimal strength.
Very soft digging throughout.	2		Layer of gray, saturated, very soft, silty fine-grained SAND. Varves of grey and brown colours. Easily indented with finger.
No samples taken.	3		
	4		
	5		Tan and grey, saturated, very soft SILT and ORGANICS. Varved silt layers. Tan layers contain yellow grass and small (up to 1cm, ave 0.5cm long) white fresh water shells. Well sorted, poorly graded. Very plastic and cohesive. Strong odour.
	6		SILT and ORGANICS
	7		

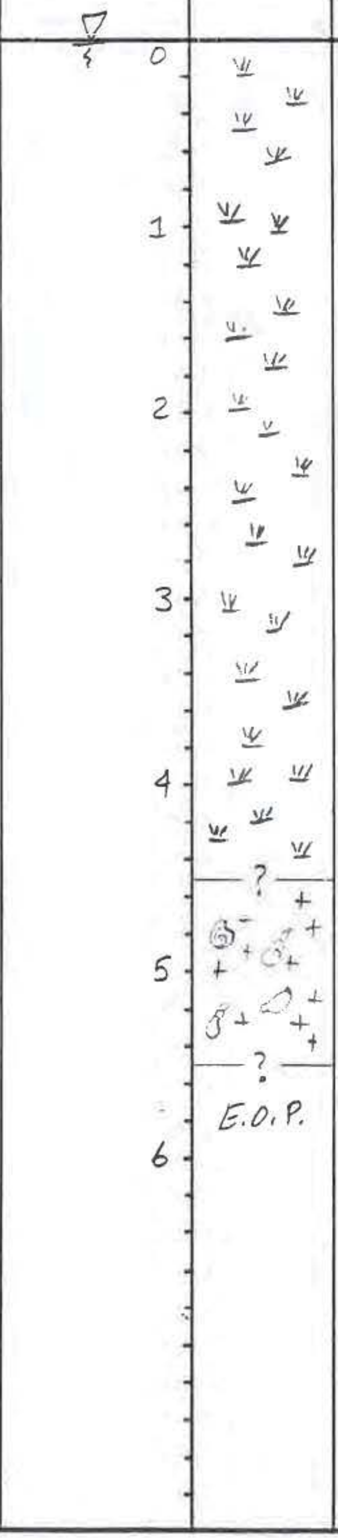
Note: Depths are approximate only, due to pit constantly collapsing and filling with water.

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-22
SHEET 1 of 1

PROJECT Mt Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5820 890 N; 585 540 E (South end of Polley Lake)
GROUND ELEVATION ~922m
DATE Jan 14/95
LOGGED BY KGB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe Visible seeps from peat layer. Pit is saturated Very easy digging throughout test pit. No samples taken.			Black/brown, saturated, very soft ORGANICS. Side walls continuously collapse into pit. Very strong odour. Minimal strength. Tan/grey, saturated, very soft SILT and ORGANICS. Varved layers. Same material as encountered in TP95-21. SILT and ORGANICS Note: Depths are approximate only due to pit walls continuously collapsing and pit filling with water.

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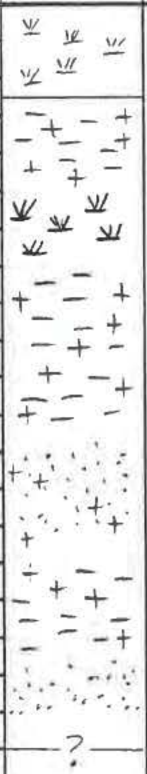
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-23
SHEET 1 of 1

PROJECT Mt Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5820 890 N; 595 420 E (south west corner of Polley Lake)
GROUND ELEVATION ~922m
DATE Jan 14/95
LOGGED BY KGB.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	▽ 3 0		Black/brown, saturated, very soft ORGANICS.
Soft digging conditions. Pit is saturated.	1		Grey, saturated, very soft CLAY and SILT. Well sorted, poorly graded. Varved. Very plastic. Strong odour. Very cohesive.
No samples taken.	2		
	3		Layers of darkgrey/black, saturated, very soft fine-grained SAND and SILT. Some sand is coarse grained and of quartz composition. Cohesive. LACUSTRINE LAYERS
	4	E.D.P.	

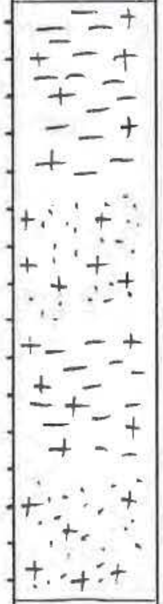
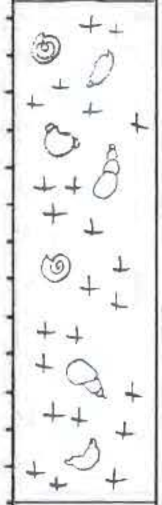
Note: Depths are approximate only due to pit walls continuously collapsing and the pit filling with water.

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-24
SHEET 1 of 1

PROJECT Mt. Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5 820 900N; 595 360E
GROUND ELEVATION ~922 m
DATE Jan 14/95 (south-west corner of Polley Lake)
LOGGED BY KGB.

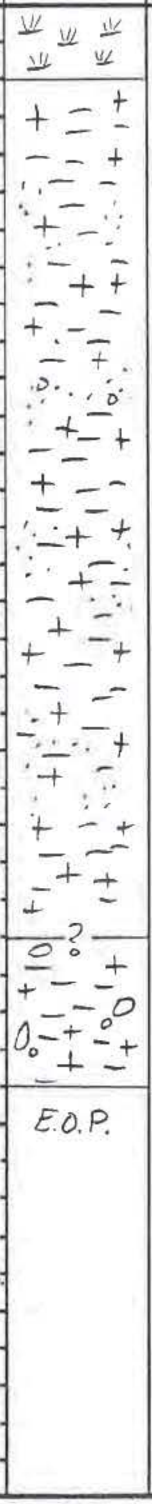
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	∇ 0		Black-brown, saturated, very soft ORGANICS.
Very soft digging conditions. Pit walls are more competent than in earlier test pits (TP95-20 to 23) No samples taken.	1 2 3		Lacustrine sequences of the following: • Dark grey, very soft, saturated CLAY and SILT with some organics. Varved. Well sorted, poorly graded. • Dark grey, very soft, saturated silty fine-grained SAND. Both are plastic due to high silt/clay content. Strong odour. LACUSTRINE LAYERS
	4 5 6		Tan/grey, saturated, very soft SILT and ORGANICS. Varved layers containing white fresh-water shells and yellow grass. Well sorted, poorly graded. Very plastic and cohesive. Strong odour. SILT and ORGANICS
	7	E.O.P.	

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-25
SHEET 1 of 1

PROJECT Mt. Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5 820 930 N; 595 250 E
GROUND ELEVATION ~922
DATE Jan 14/95 (On access road to Polley Lake)
LOGGED BY KGB.



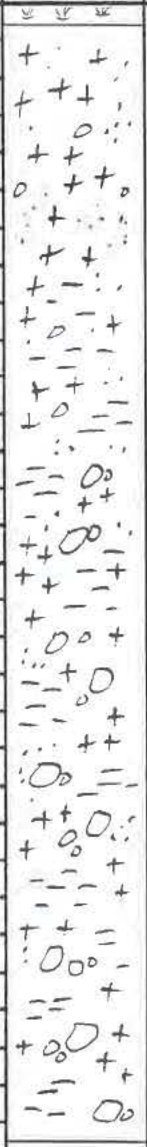
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe	∇ 0		Black/brown, saturated, very soft ORGANICS.
Very soft digging conditions. Sample TP95-25 (0.4 to 5m) ←	1 2 3 4		Dark grey, saturated, very soft (and sticky) CLAY and SILT with some sand, coarsening with depth to sandy CLAY and SILT with trace gravel. Very plastic. Strong odour. Moderate to well sorted, poorly graded. Layers of sand and gravel at local intervals. LACUSTRINE LAYERS
Difficult digging conditions at 5 to 5.8m	5		Brown, hard, slightly moist, sandy SILT with some gravel and clay, trace cobbles. Very dense chunks are ripped from pit. Poorly sorted, well graded. Plastic (when wet). Looks similar to basal till encountered locally, only brown in colour. Sandy Silt Basal Till
	6	E.O.P.	

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

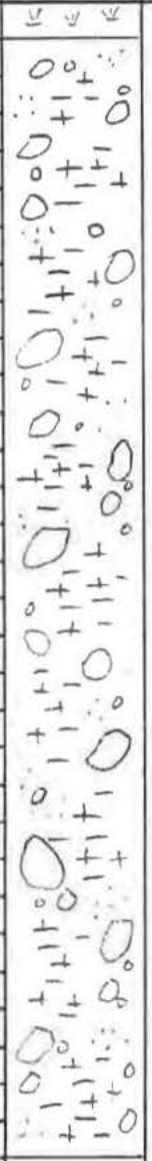
TEST PIT No. TP95-26
SHEET 1 of 1

PROJECT Mt. Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5819 180 N; 594 645 E (Tailings Basin)
GROUND ELEVATION ~938m
DATE Jan 15/95
LOGGED BY KGB.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	0		ORGANICS
	1		Brown, dense, slightly moist → moist, sandy SILT with some fine gravel and clay, trace cobbles. Very plastic. Poorly sorted, well graded. With depth, material becomes grey coloured and increases in gravel content. Looks very much like a typical basal till. Very cohesive, hard chunks of material is ripped out of pit. This material is more moist than usually encountered.
Moderate digging conditions	2		
No seeps encountered.	3		Sandy Silt Glacial Till
Sample TP95-26	←		
	4		
	5		Material at approx 5.5m becomes very plastic due to higher moisture content (behaves like plasticene when remoulded). Material remains the same well graded nature, only more moist.
	6	E.O.P.	
	7		

KNIGHT AND PIESOLD LTD. CONSULTING ENGINEERS	TEST PIT LOG	TEST PIT No. TP95-27 SHEET 1 of 1

PROJECT Mt Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5 819 740 N; 595 350E
GROUND ELEVATION ~530 m
DATE Jan 15/95 (North embankment alignment)
LOGGED BY KGB.

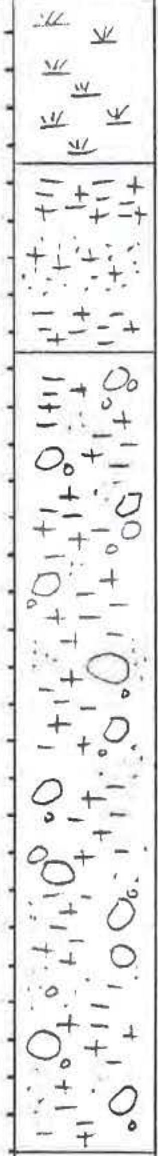
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe	0		ORGANICS
	1		Brown (grey at depth), hard, slightly moist sandy SILT with some gravel and clay, trace cobbles. Poorly sorted, well graded. Very cohesive (rips in dense chunks from pit). Gravel and cobbles are sub-rounded. Cobble content increases with depth to "some cobbles." Top 0.5m of material is oxidized. Plastic when wetted.
*Local seeps at 2.7m and 4m only. The remainder of the pit is dry.	2		
	▽*		Sandy Silt Basal Till
	3		
Sample TP95-27 ←	▽* 4		
Moderate to difficult digging conditions.	5		
	6		
		E.O.P.	
	7		

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-28
SHEET 1 of 1

PROJECT Mt. Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5819 360 N; 595 285 E (Tailings Basin)
GROUND ELEVATION ~923.4m
DATE Jan 15/95
LOGGED BY KGB.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe	0		Brown, soft, saturated ORGANKS.
Ponded water at surface.			Grey-green, soft, very moist layers of CLAY and SILT and silty SAND. Well sorted, poorly graded layers. Clay and silt are very plastic due to high moisture. Sand layer is visibly wet on pit walls.
Easy digging conditions (0 to 1.5m)	1		
	2		Brown-gray, hard, slightly moist, sandy SILT with some gravel and clay, trace cobbles. Very cohesive, dense chunks of material. Plastic when wet. Poorly sorted, well graded. **Sandy Silt Glacial Till**
Moderate to difficult digging conditions (1.9 to 6.2m).	3		
Sample TP95-28 (1.9 to 6.2m) ←	4		
	5		Material becomes moist at 5m depth. Clay and silt matrix materials become sticky and are easily remoulded (like plasticene). Bedrock and possible water table nearby.
	6		
		E.O.P.	
	7		

KNIGHT AND PIESOLD LTD. CONSULTING ENGINEERS	TEST PIT LOG	TEST PIT No. TP95-29 SHEET 1 of 1

PROJECT Mt. Polley

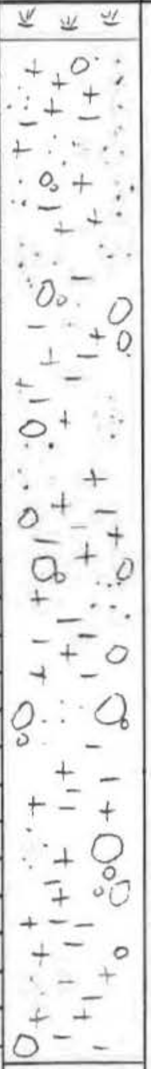
LOCATION OF TEST PIT Apprx 5 818 745 N; 596 270E

DATE Jan 15/95 (Potential East Ridge Borrow Area)

PROJECT No. 1623

GROUND ELEVATION ~ 936m

LOGGED BY KGB.

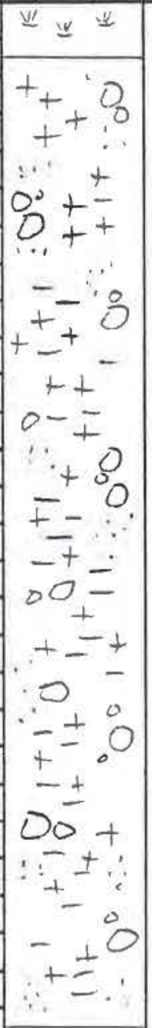
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	0		ORGANICS.
Dry soil to 1m depth!			Brown, dense (firm to hard), dry to slightly moist, sandy SILT with some gravel, trace clay and cobbles. Material is drier than usually encountered. Poorly sorted, well graded. Plastic when wet, otherwise at plastic limit with natural moisture content. Becomes very hard with depth, and excavates in dense, cohesive chunks.
Moderate digging conditions	1		
No seeps.	2		
Sample TP95-29	←		Good construction material.
	3		Sandy Silt Glacial Till
	4		
	5		
	6	E.O.P.	

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-30
SHEET 1 of 1

PROJECT Mt. Polley
LOCATION OF TEST PIT Approx 5818 495 N; 596 560 E
DATE Jan 15/95 (Potential East Ridge Borrow Area)
PROJECT No. 1623
GROUND ELEVATION ~938m
LOGGED BY KGB.

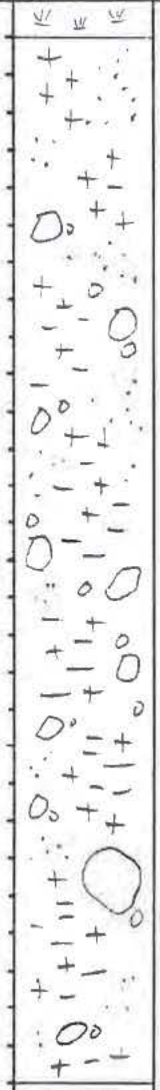
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	0		Bright orange ORGANICS (rotten wood).
No seeps encountered. Moderate digging conditions	1		Brown, dense (firm to hard), slightly moist, sandy SILT with some gravel, trace clay and cobbles. Poorly sorted, well graded. Becomes more cohesive, grey coloured and hard with depth as material is ripped out of pit in chunks. Gravel and cobbles are sub-rounded to round. Good construction material (similar to TP95-29).
	2		
Sample TP95-30 ←	3		Sandy Silt Glacial Till
	4		
	5		
		E.O.P.	
	6		

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-31
SHEET 1 of 1

PROJECT Mt. Polley
LOCATION OF TEST PIT Approx 5 816 955 N; 596 470 E
" (Potential East Ridge Borrow Area)
DATE Jan 15/95
PROJECT No. 1623
GROUND ELEVATION ~ 939 m.
LOGGED BY KGB.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe	0		ORGANICS.
No seeps encountered.			
Moderate digging conditions	1		
Sample TP95-31 ←	2		Brown, dense (firm to hard), slightly moist, sandy SILT with some gravel, trace clay and cobbles. Occasional boulder at depth. Poorly sorted, well graded. Same material as encountered in TP95-29 and 30 (same natural moisture content as TP95-30). Good construction material.
	3		
	4		Sandy Silt Glacial Till
	5		
	6	E.O.P.	

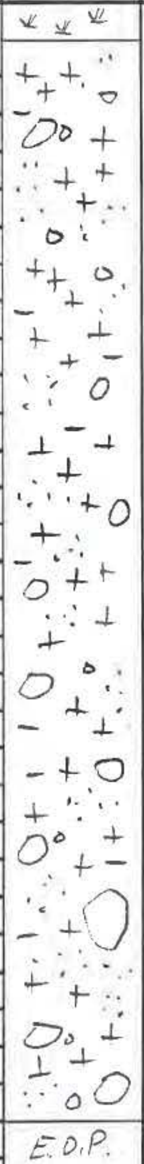
KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-32
SHEET 1 of 1

PROJECT Mt. Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5 819 140 N; 595 780 E
GROUND ELEVATION ~932m
DATE Jan 16/95 (East Tailings Basin)
LOGGED BY KGB.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe	0		ORGANICS, black/brown/orange
Moderate to difficult digging. No seeps encountered	1 2 3		Brown, dense (very stiff), slightly moist, sandy SILT with some gravel and clay, trace cobbles. Becomes grey in colour and increases in density to hard with depth. Poorly sorted, well graded. No oxidized zone near surface. Gravel and cobbles are sub-round to round. Becomes very basal-like with depth. Very low permeability. Sandy Silt Glacial Till
Sample TP95-32 ←	4 5		
	6	E.O.P.	



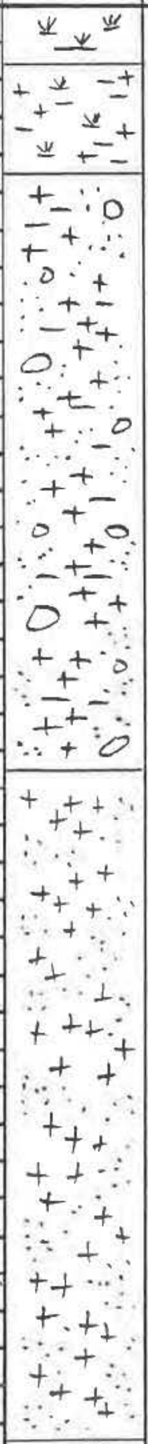
KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-33
SHEET 1 of 1

PROJECT Mt. Polley
LOCATION OF TEST PIT Approx 5818750N; 594820E
DATE Jan 16/95 (SW Tailings Basin)

PROJECT No. 1673
GROUND ELEVATION ~932m
LOGGED BY KGB.

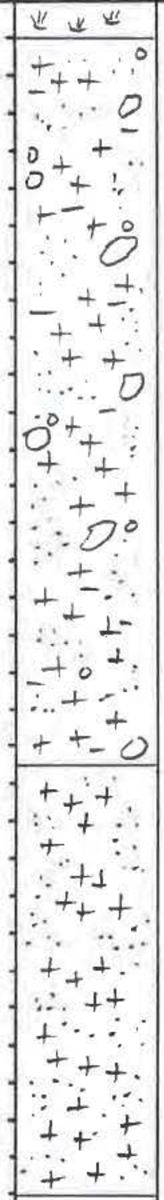
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe	∇ 0		Black, soft, saturated ORGANICS. Swamp. Willows + swamp spruce.
Ponded water at surface (perched water table).	1		Grey-black, oxidized, stiff, moist SILT and CLAY with some organics (grass and roots). Very plastic. Well sorted, poorly graded. Low permeability SILT and CLAY
Smooth, easy digging (0 to 0.9m.) Moderate digging (0.9 to 4.1m)	2 3 4		Brown, dense (v. stiff), slightly moist sandy SILT with some gravel and clay, trace cobbles. Poorly sorted, well graded. Oxidized at contact with overlying silt + clay. Slightly plastic. Low permeability Sandy Silt Glacial Till
Smooth, easy digging (4.1 to 7.7m) Sample TP95-33 (4.1 to 7.7m)	5 ← 6 7		Grey, stiff to very stiff, moist, SILT and fine-grained SAND. Very thin laminated layers (<<1mm) which can be carefully peeled apart by hand. Plastic. Well sorted, poorly graded. No varves evident. Low permeability. Cohesive. SILT and SAND
	8	E.O.P.	

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-34
SHEET 1 of 1

PROJECT Mt. Polley
LOCATION OF TEST PIT Approx 5 818 730 N; 595 250 E (South Basin)
DATE Jan 16/95
PROJECT No. 1623
GROUND ELEVATION ~ 924 m.
LOGGED BY KGB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe	0		Black, soft ORGANICS.
Moderate digging conditions.	1		Brown, dense (hard), slightly moist, sandy SILT with some gravel and clay, trace cobbles. Top 30cm is oxidized. Rounded gravel and cobbles. Material is just below plastic limit. Poorly sorted, well graded. Similar material as encountered in TP95-33. Low permeability. Sandy Silt Glacial Till.
Sample TP95-34A ← (0.2 to 4.1m)	2		
* Only local, low flow seeps visible at contact.	3		
	∇* 4		
Smooth, easy digging (4.1 to 6.4m)	5		Dark grey / black, stiff → very stiff, slightly moist, SILT and fine-grained SAND. Well sorted, poorly graded. Does not have layering like TP95-33 did. At plastic limit. Cohesive. Low permeability. Drier than TP95-33 silt and sand layers. SILT and SAND
Sample TP95-34B ← (4.1 to 6.4m)	6		
		E.O.P.	
	7		

KNIGHT AND PIESOLD LTD. CONSULTING ENGINEERS	TEST PIT LOG	TEST PIT No. TP95-35 SHEET 1 of 1

PROJECT Mt. Polley

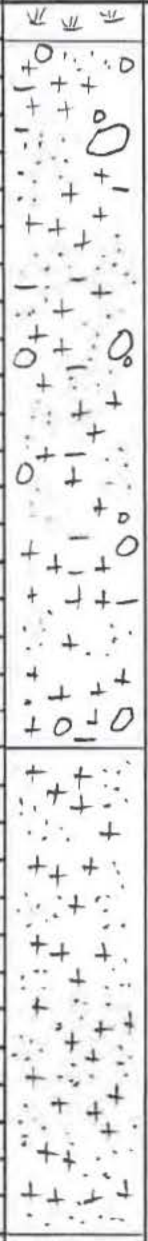
PROJECT No. 1623

LOCATION OF TEST PIT Approx 5 818 690 N; 595 535 E. (South Basin).

GROUND ELEVATION ~917m

DATE Jan 16/95

LOGGED BY KGB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe	0		ORGANICS, black/orange.
Moderate digging conditions. (0.2 to 4.0m).	1 2		Brown, dense (v. stiff → hard), slightly moist sandy SILT with some gravel and clay, trace cobbles. Poorly sorted, well graded. Slightly plastic (at P.L.) Rounded gravel + cobbles. Dense, very cohesive chunks of material encountered with depth when ripped out of pit. Becomes grey-colour with depth. Very low permeability. Sandy Silt Glacial Till
* Seep at contact. Very localized and low flow rate.	3 ▽* 4		
Smooth, easy digging (4.0 to 6.6m)	5		Dark grey, slightly moist, stiff, SILT and fine-grained SAND. Sand is visible as white qtz. flecks in silt. Well sorted, poorly graded. Below plastic limit. Cohesive chunks when excavated, and cohesive overall. Low permeability. Same material as encountered in TP95-34 pit. Silt and Sand.
Sample TP95-35 (4.0 to 6.6m)	←		
	6		
	7	E.D.P.	

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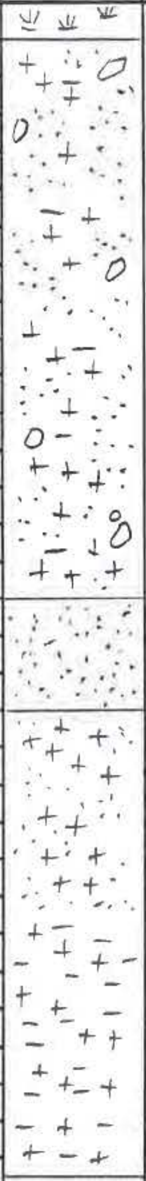
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-36
SHEET 1 of 1

PROJECT Mt. Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5 818 520 N; 595 275 E (South Basin)
GROUND ELEVATION ~924 m
DATE Jan 16/95
LOGGED BY KGB.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	0		ORGANICS.
Moderate digging. Sides slough into pit. Sample TP95-36A ← (0.2 to 3.2m)	1 2		Brown to grey, very stiff → hard, moist, silty SAND with trace to some gravel and clay. No coarse gravel or cobbles in this material. Poorly sorted, moderately graded. Moister than most tills. Rounded gravel. Cohesive. Coarser than most tills, also. Silty Sand Glacial Till
Moderate flow from sand layer.	3 ▽		Black, medium to coarse-grained SAND with trace (to none) of silt. Not cohesive. Well sorted, poorly graded. Saturated. Approx 60 cm thick. SAND
Smooth digging (3.2 → 6.3m) Sample TP95-36B ← (3.8 to 6.3m)	4 5		Creamy brown, very stiff → hard, slightly moist SILT and CLAY. No coarse material. Layered. Well sorted, poorly graded. Very cohesive. Low permeability. SILT and CLAY
	6		Brown, soft, moist to very moist SILT and fine-grained SAND. Well sorted, poorly graded. Slightly cohesive (probably due to high moisture content). Sides of pit continuously cave-in. Difficult to tell where this layer exists due to instability of test pit walls. SILT and SAND
	7	E.O.P.	

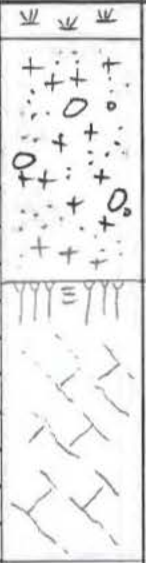
KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-37
SHEET 1 of 1

PROJECT Mt. Polley
LOCATION OF TEST PIT Approx 5 818 345 N; 595 260 E
DATE Jan 16/95 (SW Tailings Basin).

PROJECT No. 1623
GROUND ELEVATION ~938m
LOGGED BY KGB.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe	0		ORGANICS.
Moderate digging (0 to 1.5m) Sample TP95-37 ←	1		Brown, very stiff, moist sandy SILT with some gravel and clay. Poorly sorted, well graded. Plastic. Contains more moisture than usual (probably due to close proximity to surface and bedrock). Sandy Silt Glacial Till
Seep below till/ bedrock contact.			
Difficult digging rock.	2 ▽		Bedrock encountered at 1.5m depth. Very fractured, purple volcanic conglomerate (friable). Fragments are typically 30cm size. and very angular.
	3	E.O.P.	

KNIGHT AND PIESOLD LTD. CONSULTING ENGINEERS	# TEST PIT LOG	TEST PIT No. TP95-38 SHEET 1 of 1

PROJECT Mt. Polley

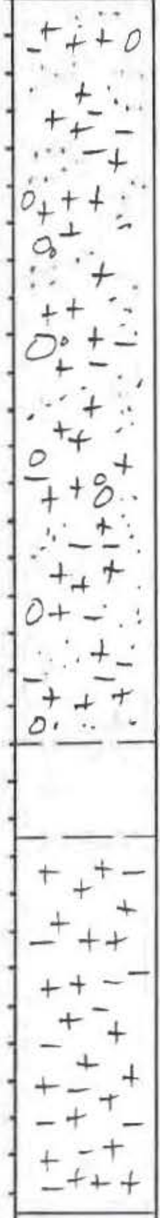
LOCATION OF TEST PIT Approx 5 818 460 N; 585 495E

DATE Jan 16/95

PROJECT No. 1623

GROUND ELEVATION ~915m

LOGGED BY KGB.

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe.	0		ORGANICS.
Moderate digging (0 to 4.7m) No seepage encountered.	1 2 3		Brown to grey, hard, slightly moist sandy SILT with some gravel and clay. Poorly sorted, well graded. Rounded gravel. Very dense, cohesive chunks ripped out of pit. Plastic. Grey colour on face of some chunks (along cracks in till?). Occasional cobble near surface and becoming "trace cobbles" with depth. Low permeability. Sandy Silt Glacial Till
	4		Dark gray, stiff to very stiff, moist SILT with some clay, trace to some sand, trace gravel. Very plastic. Looks like above till, although some material is layered (and peels apart on layers). (Probable transition where till has been mixed with underlying layers)
Moderate, yet smooth digging (~4.5 to 6.7m) Sample TP95-38 ←	5 6		Creamy brown to grey, very stiff → hard, slightly moist SILT with some clay. Very cohesive and dense. Well sorted, poorly graded. Obvious layers in grey silt. Till-like feel for density of this material. Similar to silt/clay encountered in TP95-36. Low permeability. SILT and CLAY
	7	E.O.P.	

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TP95-39
SHEET 1 of 1

PROJECT Mt. Polley
PROJECT No. 1623
LOCATION OF TEST PIT Approx 5 818 405 N; 595 405 E (south tailings basin)
GROUND ELEVATION ~918 m
DATE Jan 16/95
LOGGED BY KGB.

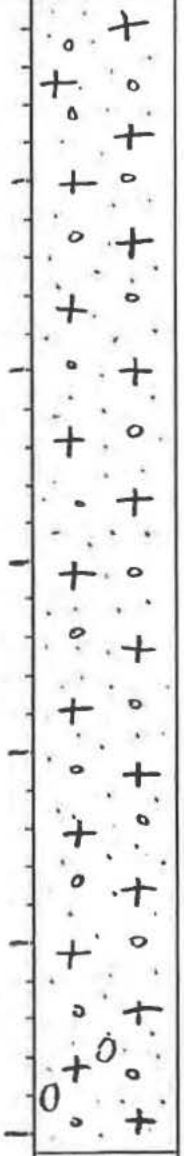
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (metres)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Hitachi 200 hoe	0		Black, saturated, soft ORGANICS.
Moderate digging (0 to 2.5m)	1 2		Brown to grey, hard, slightly moist → moist, sandy SILT with some gravel and clay. Poorly sorted, well graded. More moist on surface of dense, cohesive chunks of till (from surface inflow?). Typical till. Sandy Silt Glacial Till
Water table at contact.	▽		
Easy digging (2.5 to 7.5m) Sides of pit continuously slough.	3 4 5 6		Brown, soft, saturated, fine-grained SAND and SILT. No cohesion (pit walls continuously cave-in). Very well sorted, poorly graded. Becomes more dense with depth. Sand and Silt
Sample TP95-39 (at bottom of pit).	← 7		Note: Bottom of pit is estimated only as continuous sloughing of side walls made accurate measurements impossible.
	8	E.O.P.	

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPMS90-1
SHEET 1 of 1

PROJECT Mt POLLEY
PROJECT No. 1621
LOCATION OF TEST PIT PRIMARY CRUSHER
GROUND ELEVATION
DATE FEB 21, 1990
5822755 N
592600 E
LOGGED BY KJB

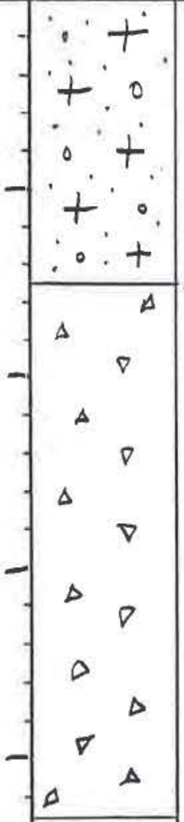
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225 BACKHOE			
	1		
- moderately hard digging	2		SANDY SILT, some gravel, trace clay, trace cobbles and boulders, very well graded, medium dense, brown, moist glacial till. - slightly more cobbles for last 1 meter.
	3		
	4		
∇	5		
	6	EOH	
	7		

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPMS90-2
SHEET 1 of 1

PROJECT Mt Polley
LOCATION OF TEST PIT NEAR BALL MILLS
DATE FEB 21, 1990
5822490 N
592600 E
PROJECT No. 1621
GROUND ELEVATION
LOGGED BY KJB

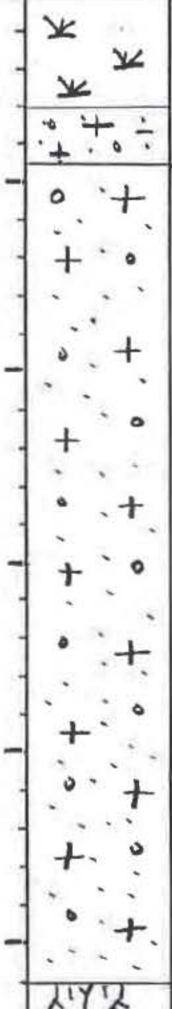
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225 BACKHOE	1		SANDY SILT, some gravel, trace cobbles, trace clay, very well graded, medium dense, brown, glacial till.
		1.5m	
▽ pprox. 50gpm inflow.	2 3 4		BEDROCK, highly fractured, iron staining, groundwater inflow.
		4.3m	
	5	EOH	

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPMS90-3
SHEET 1 of 1

PROJECT Mount Polley
PROJECT No. 1621
LOCATION OF TEST PIT Near SAG Mill
GROUND ELEVATION
DATE Feb 21, 1990
5822 525 N
592 600 E
LOGGED BY KJB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225 Backhoe			Topsoil and Organics, black
	1		Sandy silt, some gravel, trace to some clay, wet, medium soft, green grey. glacial till.
- moderate to hard digging.	2		
	3		Sandy silt, some gravel, trace clay, moist, medium dense, very well graded, brown, glacial till.
	4		
▽	5		
broken rock can be excavated with backhoe	6	EOH	Bedrock, highly fractured, groundwater inflow

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPMS90-4
SHEET 1 of 1

PROJECT Mt POLLEY

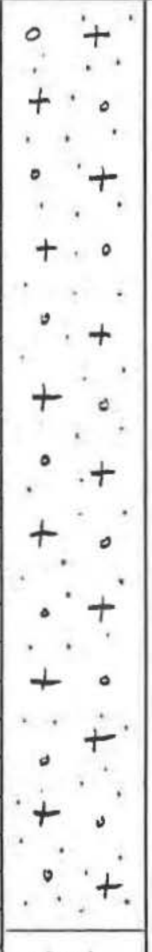
PROJECT No. 1621

LOCATION OF TEST PIT NEAR PEBBLE CRUSHER
5822 570 N
592 620 E

GROUND ELEVATION

DATE FEB 21, 1990

LOGGED BY KJB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225 BACKHOE			
	1		
- hard digging	2		SILTY SAND, some gravel, trace clay, moist, dense to very dense, very well graded, brown, glacial till
	3		
	4		
- no groundwater encountered.	5	EOH	
	6		

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPB 12
SHEET 1 of

PROJECT Mount Polley
LOCATION OF TEST PIT AREA B, main embankment west abutment
DATE Aug 27, 1989
PROJECT No. 1621
GROUND ELEVATION
LOGGED BY KJB

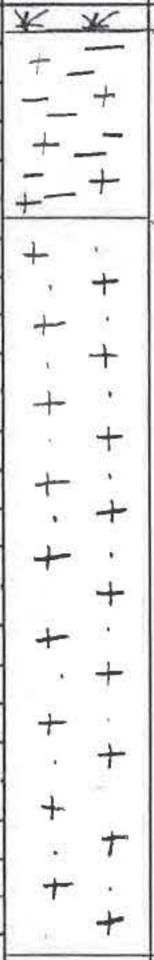
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
			ORGANICS and forest litter, reddish brown.
CAT 225	1		SILTY SAND, some gravel, trace cobbles and boulders, well graded, dark green-brown, glacial till
	2 3		SAND, trace silt, fine, uniform, trace gravel, pale reddish brown, cross bedding, moist
GSTPB12	4		SAND, medium to fine, clean, uniform, brown
	5	EOH@ 4.9m	

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPB13
SHEET 1 of

PROJECT Mount Polley
LOCATION OF TEST PIT Area B, main embankment center line
DATE Aug 28, 1989
PROJECT No. 1621
GROUND ELEVATION
LOGGED BY KJB



NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225	1		Peat, organics, dark reddish brown to black
			Clayey silt, fissured, moist, pale green-brown, firm, moist
GSTPB13	2 3 4		Silt, trace to some sand, fine, dense, trace gravel, trace clay, pale brown, fissured with fine sand in fissures, moist, low permeability, appears to be remoulded
	5	EOH @ 4.9m	Ponded water on surface

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPB14
SHEET 1 of

PROJECT Mount Polley

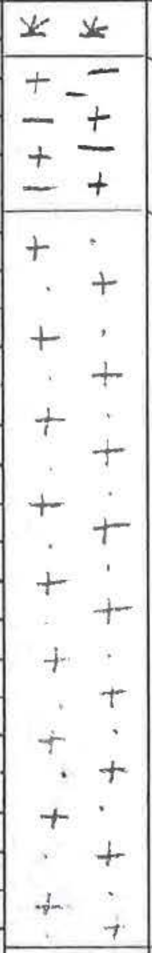
PROJECT No. 1621

LOCATION OF TEST PIT Area B, downstream of main embankment

GROUND ELEVATION

DATE Aug 28 1989

LOGGED BY KJB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225			PEAT, and organics, dark reddish brown to black
	1		CLAYEY SILT, pale green brown, firm, fissured, wet for top 60 cm.
SSTPB 14	2 3 4		SILT, some sand to Sandy, fine dense, fissured, fine sand laminations moist
	5		ponded water on surface

KNIGHT AND PIESOLD LTD. CONSULTING ENGINEERS	TEST PIT LOG	TEST PIT No. TPB15 SHEET 1 of

PROJECT Mount Polley

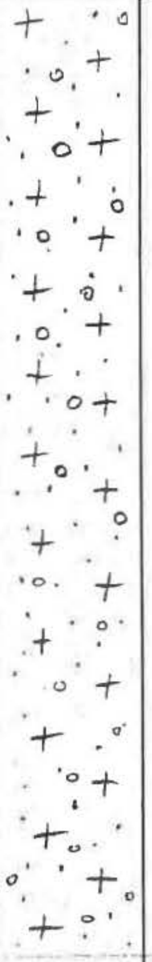
LOCATION OF TEST PIT Area B, upstream of main dam

DATE Aug 28, 1989

PROJECT No. 1621

GROUND ELEVATION

LOGGED BY KJB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225	1		SILTY SAND, some gravel, trace clay, trace cobbles and boulders to 55 cm, very well graded, dense, brown, low permeability, glacial till
	2		
GSTPB15	3		
	4		
	5	EOH @ 4.9m	

KNIGHT AND PIESOLD LTD. CONSULTING ENGINEERS	TEST PIT LOG	TEST PIT No. TPB16 SHEET 1 of

PROJECT Mount Polley

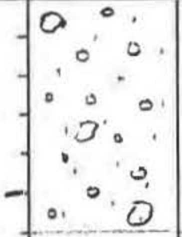
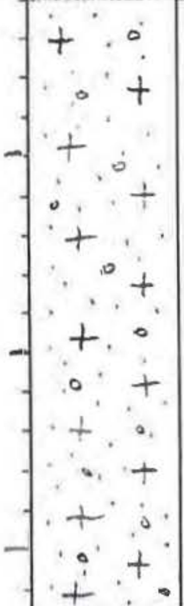
PROJECT No. 1621

LOCATION OF TEST PIT Area B, northwest corner by road

GROUND ELEVATION

DATE Aug 28, 1989

LOGGED BY KJB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225	1		Gravelly sand, some cobbles, trace boulders, poorly sorted, reddish brown, colluvium and road fill
#STPB16	2 3 4		Silty sand, some gravel, trace cobbles, trace clay, very well graded, dense, low permeability, glacial till
	5	EOH @ 4.3 m	NB - Some water running in at top of glacial till

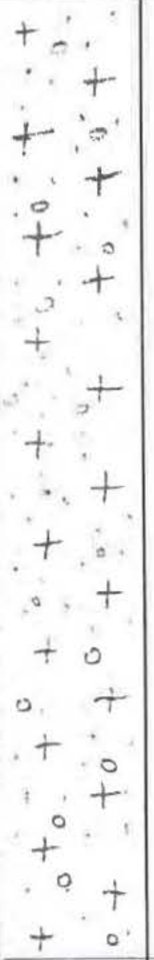
KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPB17
SHEET 1 of

PROJECT Mount Polley
LOCATION OF TEST PIT Area B north central basin
DATE Aug 28 1987

PROJECT No. 1621
GROUND ELEVATION
LOGGED BY KJB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225 GSTPB17	1 2 3 4 5		SILTY SAND, some gravel, trace cobbles and boulders to 35 cm, trace clay, very well graded, dense, brown, low permeability, glacial till
		EOH 4.9m	

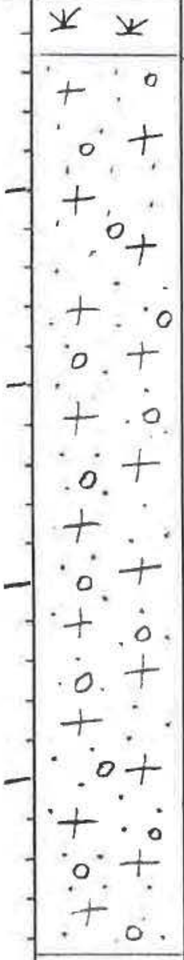
KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPB18
SHEET 1 of

PROJECT Mount Polley
PROJECT No. 1621
LOCATION OF TEST PIT Area B, low point of north berm
GROUND ELEVATION
DATE Aug 23, 1989
LOGGED BY KJB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
			PEAT, organics and forest litter, reddish brown to black
CAT 225	1		
	2		SILTY SAND, some gravel, trace cobbles and boulders, trace clay, brown, very well graded, dense, low permeability [illegible]
STPB18	3		
	4		
	5	EOH @ 4.9 m	NB Ponded water on surface and no groundwater encountered



KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPB1
SHEET 1 of

PROJECT Mount Polley
LOCATION OF TEST PIT Area B, east abutment near road
DATE Aug 27, 1999

PROJECT No. 1621
GROUND ELEVATION
LOGGED BY KJB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225 GSTFB1	1 2 3 4 5	 EOH @ 4.1 m	SANDY SILT, trace gravel, trace [illegible], trace [illegible], green-brown, well graded, fissured, dense, low permeability, glacial till [illegible] spoil [illegible] water on surface

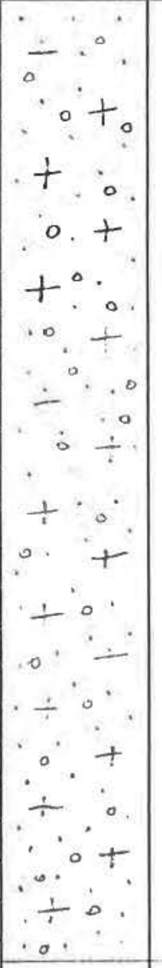
KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPB2
SHEET 1 of

PROJECT Mount Polley
LOCATION OF TEST PIT Area E crest of north east ridge
DATE Aug 27, 1989

PROJECT No. 1621
GROUND ELEVATION
LOGGED BY KJB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
[illegible] 225 ([illegible])	1 2 3 4 5	 EOH @ 4.9 m	SILTY SAND, trace to some gravel, trace clay, trace cobbles and boulders to 60 cm, green-brown, well graded, [illegible] dense, less permeable [illegible] glacial till

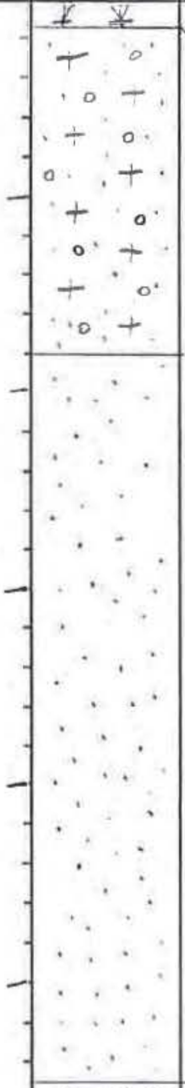
KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPB3
SHEET 1 of

PROJECT Mount Polley
PROJECT No. 1621
LOCATION OF TEST PIT Area B, northeast ridge
GROUND ELEVATION
DATE Aug 27 1987
LOGGED BY KJB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225			Topsoil, forest litter, black to dark brown
	1		SILTY SAND, some gravel trace cobbles and boulders to 45cm, brown, very well graded dense, glacial till [illegible])
	2		
[illegible]	3		SAND, trace gravel clean, medium to fine, moderately sorted, brown grading [illegible] uniform clean SAND with depth
	4		
	5		
		EOH @ 5.5m	
	6		



KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

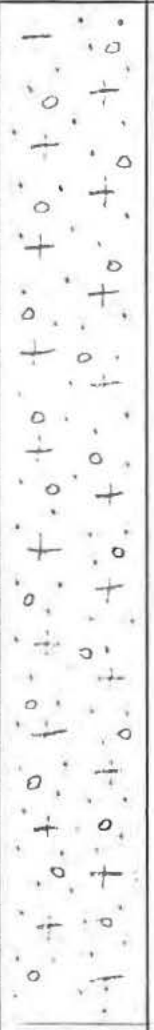
TEST PIT LOG

TEST PIT No. TPB 4
SHEET 1 of

PROJECT Mount Polley
LOCATION OF TEST PIT Area B north-east ridge
DATE Aug 27 1989

PROJECT No. 1621
GROUND ELEVATION
LOGGED BY KJB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225			
	1		
			SILTY SAND, some gravel, trace cobbles, occasional boulder, brown, [illegible]
	2		
SSTPB 4	3		
	4		
	5		
		EOH @ 5.2 m	
	6		



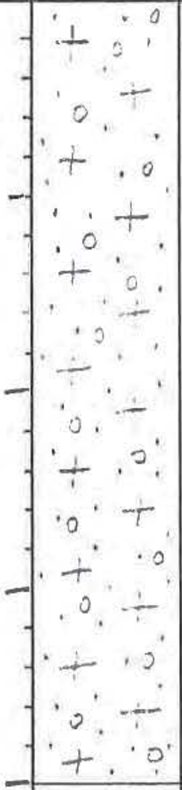
KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPB5
SHEET 1 of

PROJECT Mount Polley
LOCATION OF TEST PIT Area C, northeast ridge
DATE Aug 27, 1989

PROJECT No. 1621
GROUND ELEVATION
LOGGED BY KJB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225 TF65	1 2 3 4		SILTY SAND, some gravel, trace cobbles and boulders, rounded, trace clay, dense, brown, very wet [illegible]
	5	EOH @ 4.0 m	

KNIGHT AND PIESOLD LTD. CONSULTING ENGINEERS	TEST PIT LOG	TEST PIT No. TPB6 SHEET 1 of

PROJECT Mount Polley

LOCATION OF TEST PIT Area B, northeast ridge

DATE Aug 27/1989

PROJECT No. 1621

GROUND ELEVATION

LOGGED BY KJB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225	1		SILTY SAND, trace gravel, brown, well graded and permeable, glacial till
	2 3		SAND [illegible]
SS TPB6	4 5		SAND, trace silt [illegible] [illegible] and [illegible] layers, grading to GRAVELLY SAND at bottom clean, coarse, moderately graded.
	6	EOH @ 5.2m	

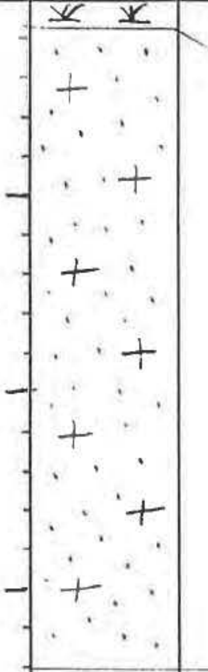
KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPB7
SHEET / of

PROJECT Mount Polley
LOCATION OF TEST PIT Area B, centerline of NE dam
DATE Aug 27, 1989

PROJECT No. 1621
GROUND ELEVATION
LOGGED BY KJB

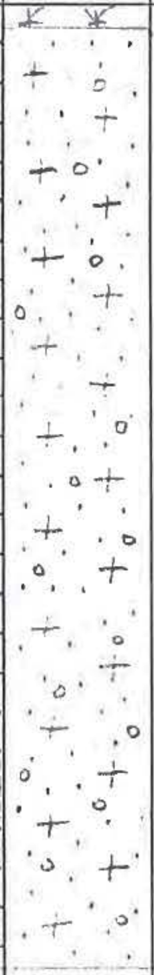
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225	1 2 3		Topsoil, clayey, brown SAND, some silt some gravel, trace cobbles, very dense, very well graded glacial till
	4	EOH @ 3.4 m	

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPB8
SHEET / of

PROJECT Mount Polley
LOCATION OF TEST PIT Area B, northeast ridge at timber
DATE Aug 27 1989
PROJECT No. 1621
GROUND ELEVATION
LOGGED BY KJB

NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225			Organics and forest litter.
SSTPB8	1 2 3 4		SILTY SAND, some gravel, trace cobbles green brown, [illegible] well graded low permeability, dense, glacial till, slightly wet.
	5	EOH @ 4.9m	

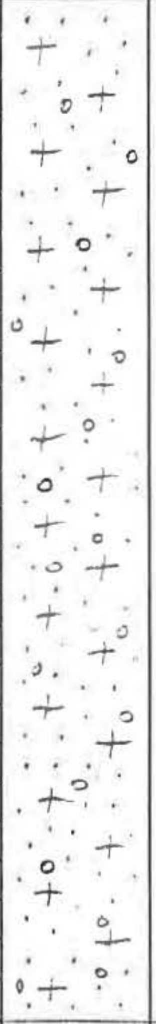
KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPB9
SHEET 1 of

PROJECT Mount Polley
LOCATION OF TEST PIT AREA B, south east basin
DATE Aug 27, 1989

PROJECT No. 1621
GROUND ELEVATION
LOGGED BY KJC

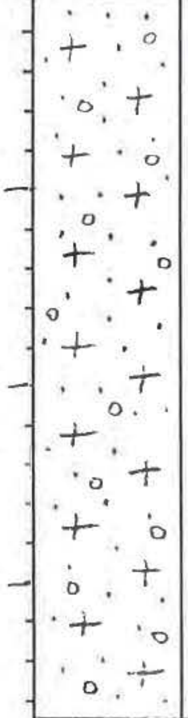
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225	1		SILTY SAND, some gravel, trace cobbles, green-brown, very well graded, low permeability, dense, colour changes to pale brown below 2m; glacial till
[illegible]	2		
	3		
	4		
	5		
		EOH @ 5.2 m	
	6		

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPB10
SHEET 1 of

PROJECT Mount Polley
PROJECT No. 1621
LOCATION OF TEST PIT Area B, main embankment center line.
GROUND ELEVATION
DATE Aug 27, 1989
LOGGED BY KJB

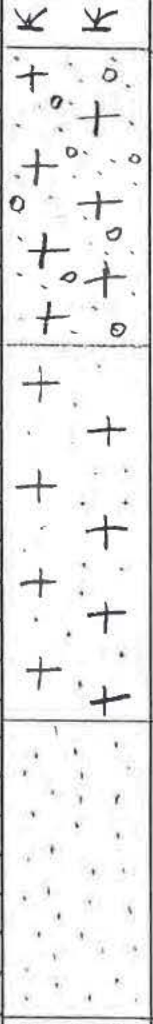
NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225 GSTPB10	1 2 3		SILTY SAND, some gravel, trace cobbles and boulders to 45 cm, green-brown, dense to very dense, well graded, fissured, glacial till
	4	EOH @ 3.7m	

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST PIT LOG

TEST PIT No. TPB 11
SHEET 1 of

PROJECT Mount Polley
PROJECT No. 1621
LOCATION OF TEST PIT Area B, main embankment center line
GROUND ELEVATION
DATE Aug 27, 1989
LOGGED BY KJB



NOTES Groundwater level, difficulty in digging, equipment used, etc.	DEPTH (m)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
CAT 225			ORGANICS and forest litter, reddish brown
	1		SILTY SAND, some gravel, trace cobbles, green-brown, firm to dense, very well graded, low permeability, glacial till!
GSTPB 11	2 3		SILT, some sand, pale brown, dense, fissured, well sorted, low permeability
	4 5		SAND, medium to fine, moderately sorted, clean, moist, pale brown, some silt layers.
	6	EOH @ 5.2 m	

APPENDIX B

Knight Piésold Ltd.
CONSULTING ENGINEERS

APPENDIX B

DETAILED LABORATORY TEST WORK RESULTS

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

Project No. 9521018
Date : 1/26/95

Laboratory Determination of Water Content of Soil and Rock
ASTM D 2216-92

BOREHOLE NUMBER	TP95-1	TP95-7	TP95-10	TP95-18	TP95-20	TP95-25
SAMPLE NUMBER						
DEPTH OF SAMPLE (m)						
CONTAINER NUMBER						
MASS WET SOIL + TARE	8547.7	9217.5	6633.9	3836.5	8948.7	7546.4
MASS DRY SOIL + TARE	7876.2	8452.1	6049.8	3537.7	7961.0	6650.8
MASS OF WATER	671.5	765.4	584.1	298.8	987.7	895.6
MASS OF CONTAINER	1426.5	1414.0	1427.8	1378.4	1130.6	1414.3
MASS OF DRY SOIL	6449.7	7038.1	4622.0	2159.3	6830.4	5236.5
WATER CONTENT W (%)	10.4	10.9 ✓	12.6	13.8	14.5	17.1

BOREHOLE NUMBER	TP95-27	TP95-31	TP95-35	TP95-37	TP95-38	TP95-39
SAMPLE NUMBER						
DEPTH OF SAMPLE (m)						
CONTAINER NUMBER						
MASS WET SOIL + TARE	5937.6	8386.3	7978.9	7623.2	8130.7	7168.1
MASS DRY SOIL + TARE	5481.6	7669.7	7036.9	6654.4	6637.4	5794.5
MASS OF WATER	456.0	716.6	942.0	968.8	1493.3	1373.6
MASS OF CONTAINER	1380.1	1177.8	1344.6	1494.2	1383.6	974.9
MASS OF DRY SOIL	4101.5	6491.9	5692.3	5160.2	5253.8	4819.6
WATER CONTENT W (%)	11.1	11.0	16.5	18.8 ✓	28.4	28.5

BOREHOLE NUMBER						
SAMPLE NUMBER						
DEPTH OF SAMPLE (m)						
CONTAINER NUMBER						
MASS WET SOIL + TARE						
MASS DRY SOIL + TARE						
MASS OF WATER						
MASS OF CONTAINER						
MASS OF DRY SOIL						
WATER CONTENT W (%)						

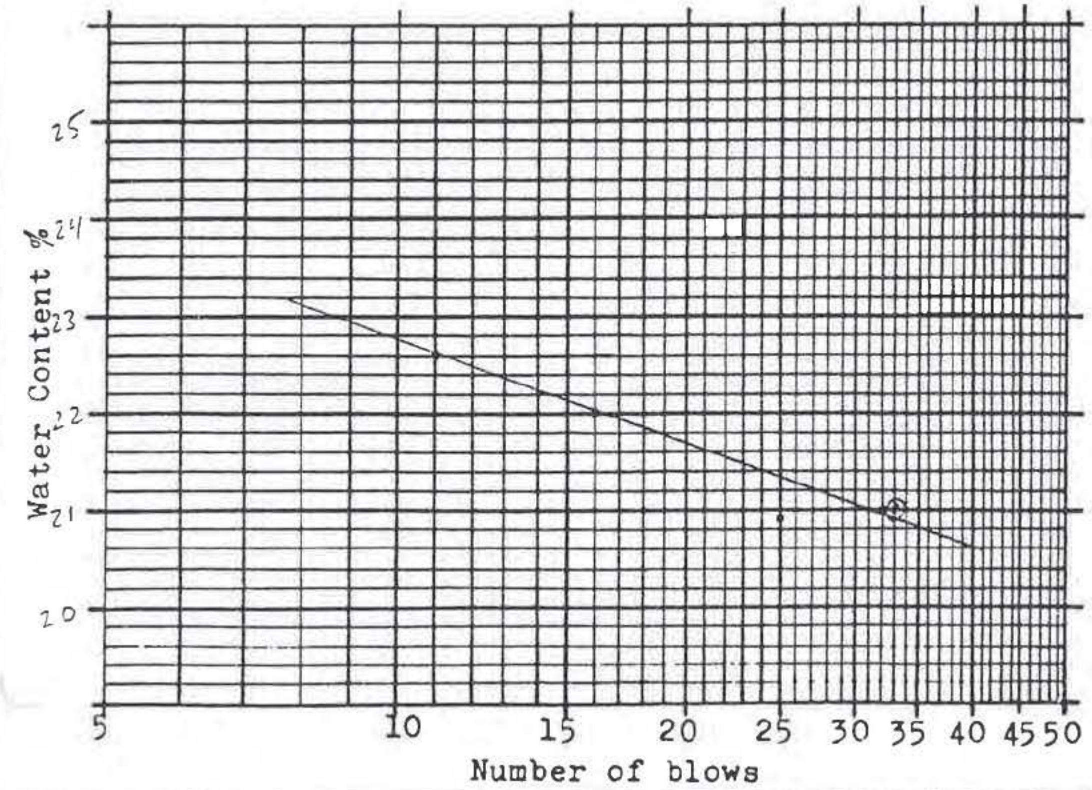
LABORATORY TEST SHEET – ATTERBERG LIMITS

ab Work M.O Project # 952/018 Date Jan. 31-95

✓KGB Feb 14/95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	#15	#3	#82	#27		
Number of blows	25	16	11	33		
Wt.sample wet + tar	31.68	30.60	34.29	31.47		
Wt.sample dry + tar	28 70	27.57	30 70	28.57		
Weight of water	2 98	3.03	3.59	2.9		
Tare	14.44	13.74	14.81	14.72		
Wt. of dry soil	14 26	13.83	15 89	13.85		
Water content %	20.9 ✓	22.0 ✓	22.6 ✓	21.0 ✓		

Type of Test	PL	PL	Borehole #	TP95-1
Container #	#2	#51	Sample #	—
Wt.sample wet + tar	27.55	27.00	Depth	—
Wt.sample dry + tar	26 07	25.52	Liquid Limit	~~21.3~~ 21.4
Wt. of water	1 48	1 48	Plastic Limit	13.0
Tare	14.54	14.29	Plasticity index	~~8.3~~ 8.4
ight of dry soil	11 53	11 23	Moisture content	10 4
Water content	12 8 ✓	13.1 ✓	Liquidity Index	− 0.31



SAMPLE DESCRIPTION

CL

Golder Associates

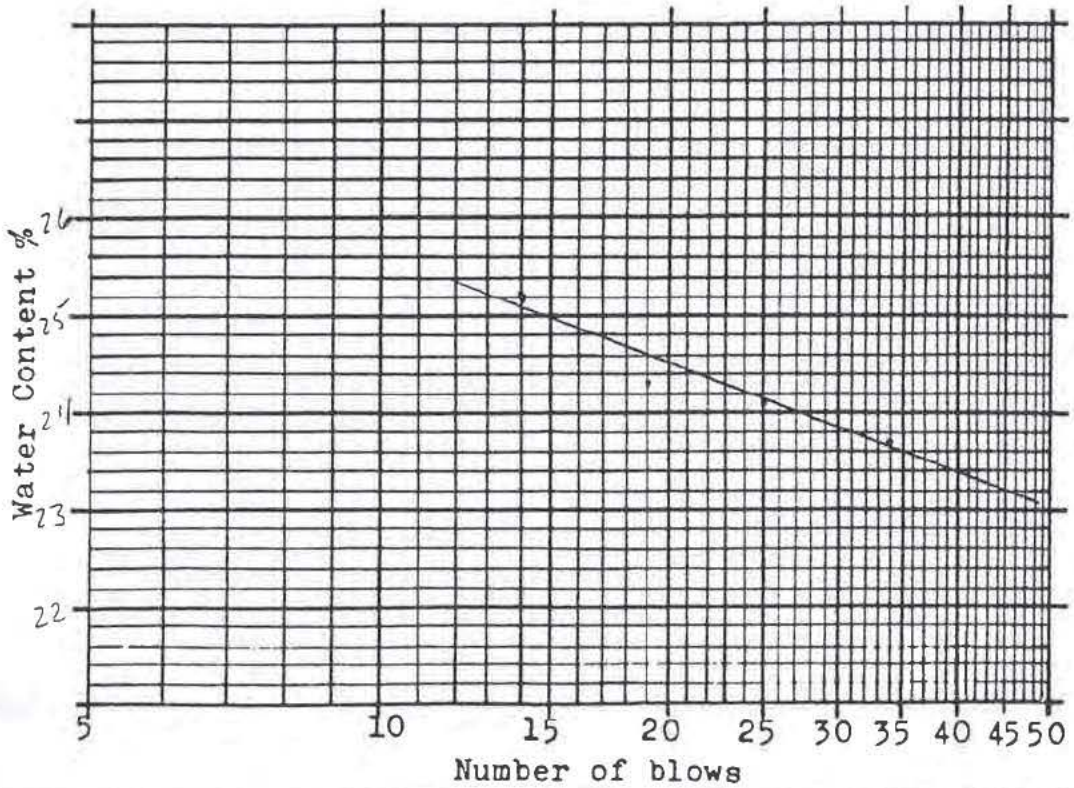
LABORATORY TEST SHEET – ATTERBERG LIMITS

Lab Work M.O Project # 9521018 Date Jan. 31-95

VKG3 Feb 4/95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	#5	#18	#26	#3		
Number of blows	14	19	25	34		
Wt.sample wet + tar	31.76	31.83	31.38	34.23		
Wt.sample dry + tar	28 26	28.42	28.09	30 41		
Weight of water	3 5	3 41	3 29	3 82		
Tare	14.35	14.40	14.42	14.32		
Wt. of dry soil	13 91	14 02	13 67	16.09		
Water content %	25.2 ✓	24 3 ✓	24 1 ✓	23.7 ✓		

Type of Test	PL	PL	Borehole #	TP 95-9
Container #	#14	#12	Sample #	—
Wt.sample wet + tar	28.53	25.50	Depth	—
Wt.sample dry + tar	26.75	24 19	Liquid Limit	24.1 ✓
Wt. of water	1 78	1 31	Plastic Limit	13.5 ✓
Tare	13.23	14.72	Plasticity index	10.6 ✓
Weight of dry soil	13 52	9 47	Moisture content	10 9
Water content	13 2 ✓	13 8 ✓	Liquidity Index	-0.25 ✓



SAMPLE DESCRIPTION

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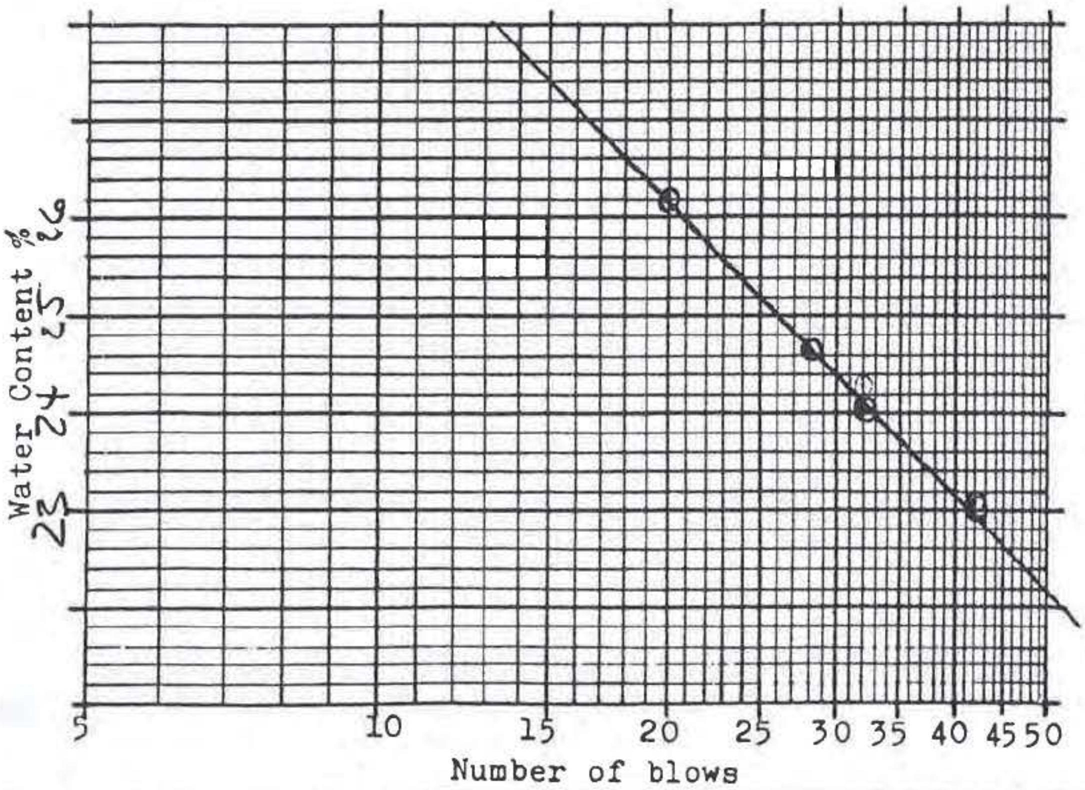
LABORATORY TEST SHEET – ATTERBERG LIMITS

ab Work___________ Project # 952-1018 Date FEB 3/95

✓KGB Feb 14/95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	49	9	B2 2	E2		
Number of blows	42	32	28	20		
Wt.sample wet + tar	37.30	36.36	35.87	42.76		
Wt.sample dry + tar	31.04	29.92	29.47	34.60		
Weight of water	6.26	6.44	6.40	8.16		
Tare	3.90	3.38	3.56	3.50		
Wt. of dry soil	27.14	26.54	25.91	31.10		
Water content %	23.1 ✓	24.3 ✓	24.7 ✓	26.2 ✓		12.6

Type of Test	PL	PL	Borehole #	TP 95-10
Container #	C4	87	Sample #	
Wt.sample wet + tar	11.47	13.14	Depth	
Wt.sample dry + tar	10.38	11.80	Liquid Limit	~~25.2~~ ⇒ 25.3 ✓
Wt. of water	1.09	1.34	Plastic Limit	16.5 ✓
Tare	3.60	3.85	Plasticity index	~~8.7~~ ⇒ 8.8 ✓
ght of dry soil	6.78	7.95	Moisture content	12.6
Water content	16.1 ✓	16.9 ✓	Liquidity Index	~~-0.45~~ ⇒ -0.44 ✓



SAMPLE DESCRIPTION

BROWN CLAYEY SILT

LITTLE [illegible]

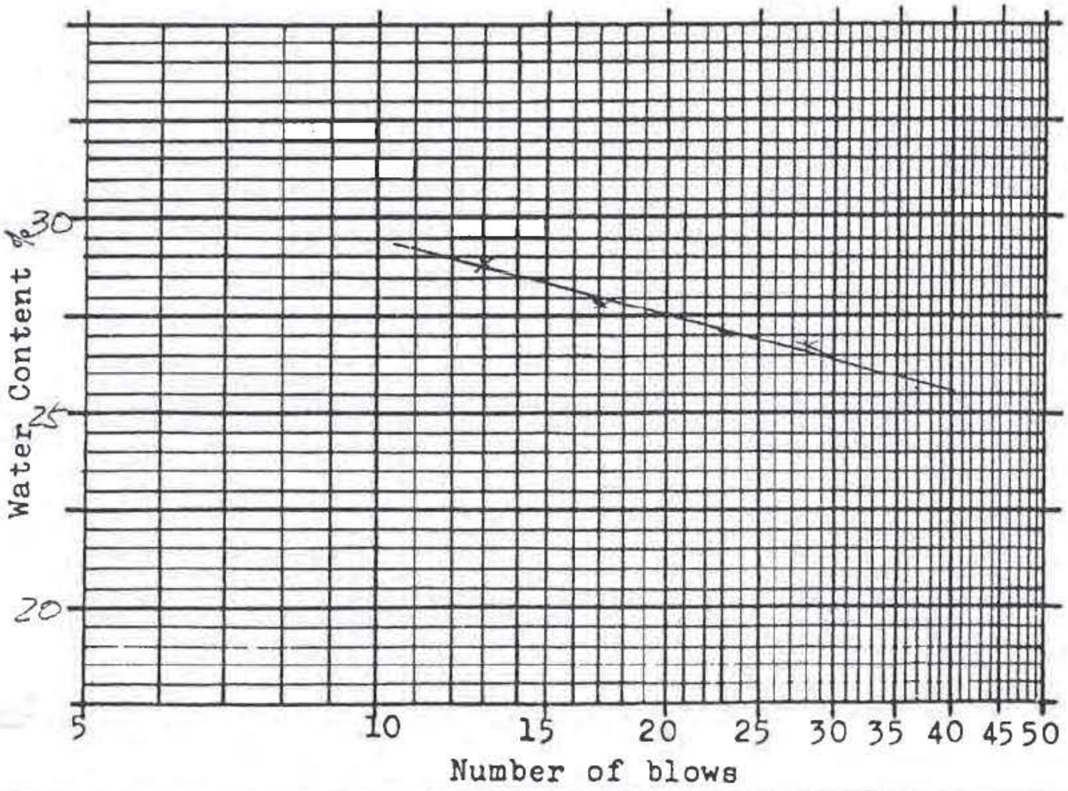
LABORATORY TEST SHEET – ATTERBERG LIMITS

ab Work M.O Project # 9521018 Date Jan-30-94
✓ KHB Feb14/95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	#24	#1	#16	#21		
Number of blows	28	17	23	13		
Wt.sample wet + tare	28.39	30.13	34.05	29.66		
Wt.sample dry + tare	25.38	26.54	29.85	26.24		
Weight of water	3.01	3.59	4.20	3.42		
Tare	13.67	13.67	14.36	14.41		
Wt. of dry soil	11.71	12.87	15.49	11.83		
Water content %	25.7 ✓	27.9 ✓	27.1 ✓	28.9 ✓		

Type of Test	PL	PL	Borehole #	TP95-18
Container #	#29	#22	Sample #	—
Wt.sample wet + tare	24.11	25.75	Depth	—
Wt.sample dry + tare	22.97	24.38	Liquid Limit	26.9 ✓
Wt. of water	1.14	1.37	Plastic Limit	13.3 ✓
Tare	14.55	13.86	Plasticity index	13.6 ✓
ght of dry soil	8.42	10.52	Moisture content	13.8 ✓
Water content	13.5 ✓	13.0 ✓	Liquidity Index	0.04 ✓

$\frac{13.8-13.3}{13.6}$



SAMPLE DESCRIPTION

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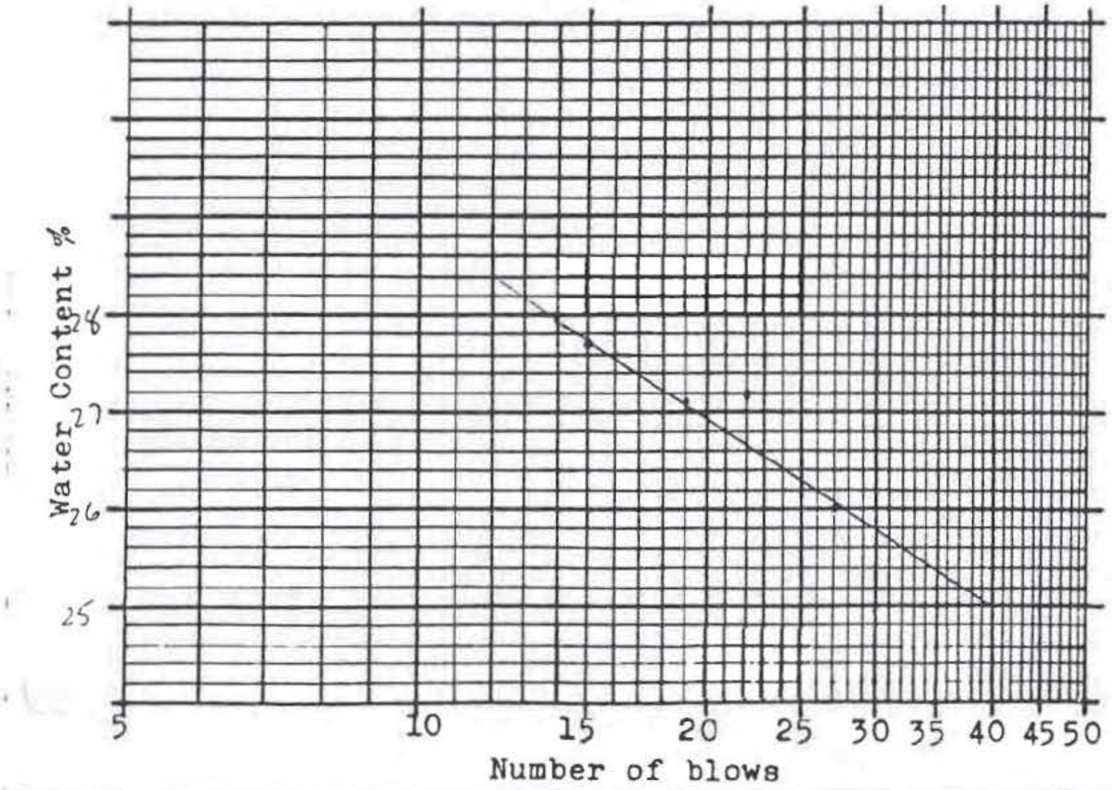
LABORATORY TEST SHEET – ATTERBERG LIMITS

ab Work M.O Project # 952/017 Date Jan 31-95
JLLG Feb 14/95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	#11A	#10	#33	#35		
Number of blows	15	19	22	27		
Wt.sample wet + tare	28.78	30.94	30.51	31.77		
Wt.sample dry + tare	25.62	27.39	27.04	28.16		
Weight of water	3.16	3.55	3.47	3.61		
Tare	14.22	14.31	14.27	14.26		
Wt. of dry soil	11.4	13.08	12.76	13.9		
Water content %	27.7 ✓	27.1 ✓	27.2 ✓	26.0 ✓		

Type of Test	PL	PL	Borehole #	TP95-20
Container #	#70	#30	Sample #	—
Wt.sample wet + tare	36.36	23.44	Depth	—
Wt.sample dry + tare	34.53	22.35	Liquid Limit	26.3 ✓
Wt. of water	1.83	1.09	Plastic Limit	13.1 ✓
Tare	20.60	14.04	Plasticity index	13.2 ✓
ght of dry soil	13.93	8.31	Moisture content	14.5 ✓
Water content	13.1 ✓	13.1 ✓	Liquidity Index	0.11 ✓



SAMPLE DESCRIPTION

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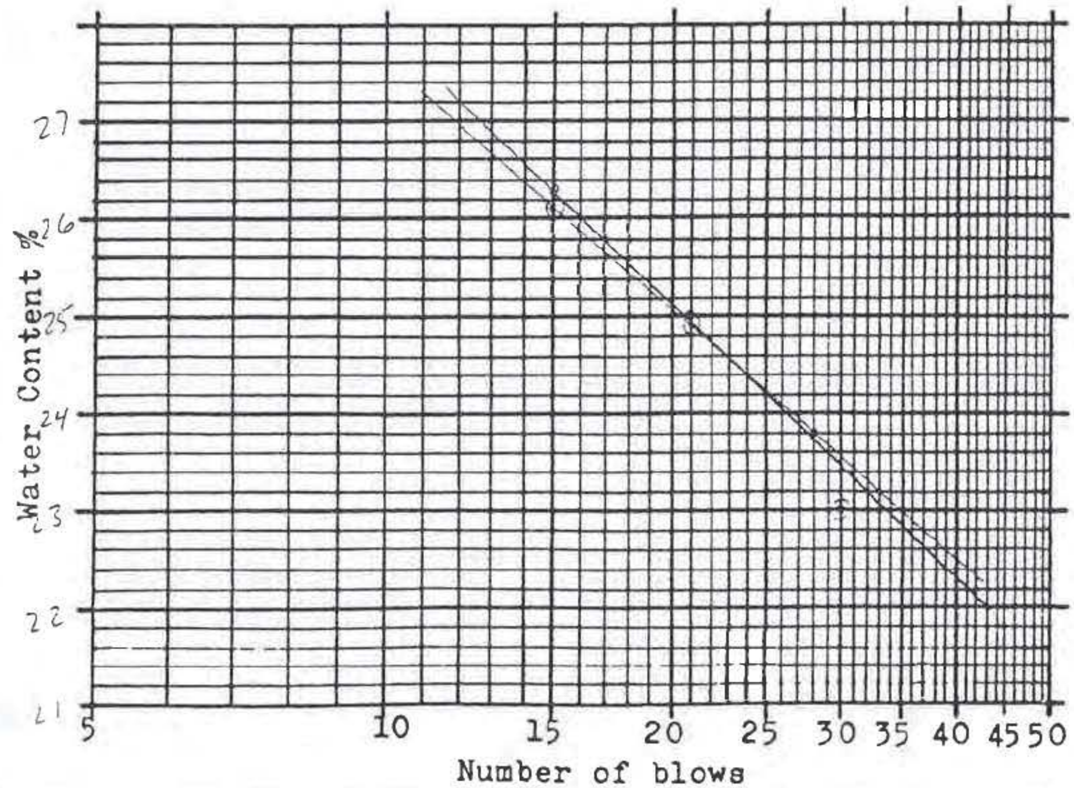
LABORATORY TEST SHEET – ATTERBERG LIMITS

ab Work MO Project # 952/018 Date Jan. 31-95

✓KB Feb 14/95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	#22	#21	#16	#24		
Number of blows	30	28	21	15		
Wt.sample wet + tare	27.58	31.20	32.85	34.28		
Wt.sample dry + tare	26.64	27.97	28.83	29.98		
Weight of water	2.94	3.23	3.62	4.3		
Tare	13.84	14.39	14.33	13.64		
Wt. of dry soil	12.8	13.58	14.5	16.34		
Water content %	23.0 ✓	23.8 ✓	24.9 ✓	~~26.3~~ 26.1		

Type of Test	PL	PL	Borehole #	TP 95-25
Container #	#29	#1	Sample #	—
Wt.sample wet + tare	27.08	23.30	Depth	—
Wt.sample dry + tare	25.80	22.30	Liquid Limit	24.2 ✓
Wt. of water	1.28	1.0	Plastic Limit	~~11.3~~ 11.5
Tare	14.52	13.67	Plasticity index	~~12.9~~ 12.7
ight of dry soil	11.28	8.63	Moisture content	17.1 ✓
Water content	~~11.3~~ 11.4	~~11.2~~ 11.6	Liquidity Index	~~0.45~~ 0.44



SAMPLE DESCRIPTION

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Golder Associates

LABORATORY TEST SHEET – ATTERBERG LIMITS

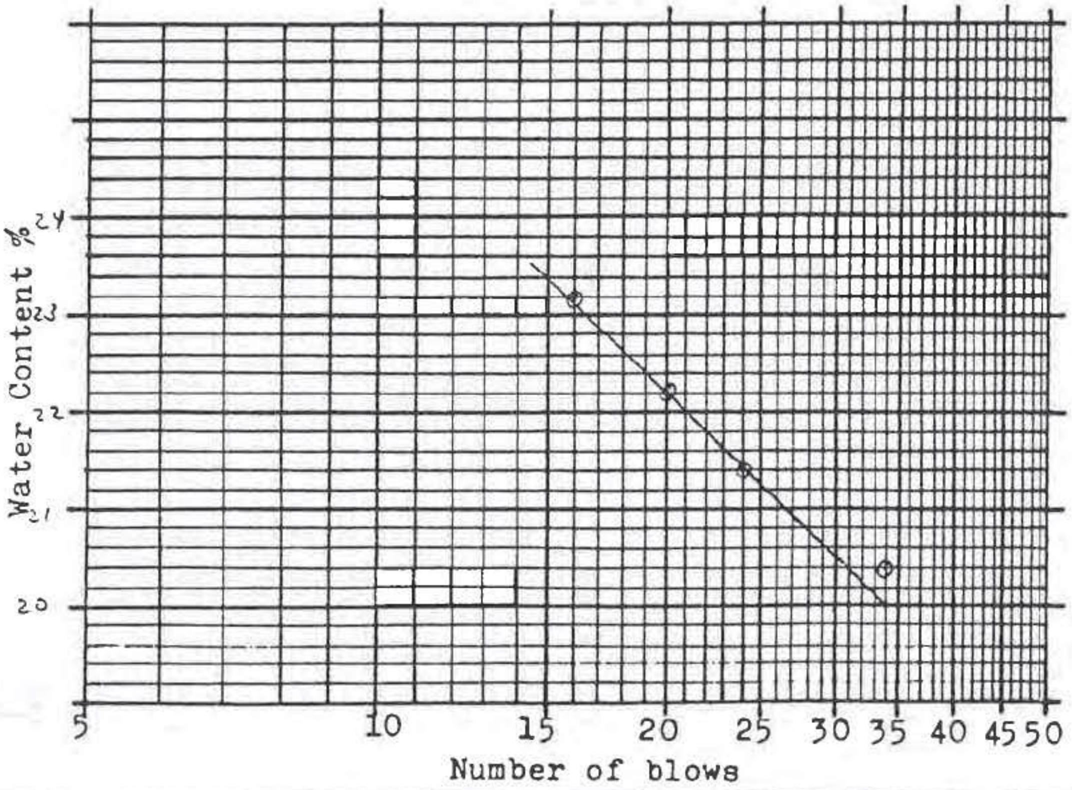
ab Work 19 Project # 952-1018 Date Jan. 26/95

/ VuB Feb 14/95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	32	2	8	12		
Number of blows	34	24	20	16		
Wt.sample wet + tare	51.86	57.86	57.51	58.77		
Wt.sample dry + tare	45.57	50.22	49.55	50.31		
Weight of water	6.29	7.64	7.96	8.46		
Tare	14.75	14.50	13.62	13.89		
Wt. of dry soil	30.82	35.72	35.93	36.42		
Water content %	20.4 ✓	21.4 ✓	22.2 ✓	23.2 ✓		

Type of Test	PL	PL	Borehole #	TP 95-27
Container #	15	51	Sample #	
Wt.sample wet + tare	24.90	25.53	Depth	
Wt.sample dry + tare	23.70	24.25	Liquid Limit	21.20 ✓
Wt. of water	1.20	1.28	Plastic Limit	~~12.87~~ 12.9 ✓
Tare	14.41	14.26	Plasticity index	8.33 ✓
ght of dry soil	9.29	9.99	Moisture content	11.1
Water content	12.92 ✓	12.81 ✓	Liquidity Index	~~-0.21~~ -0.22

$$\frac{11.1 - 12.87}{8.33}$$



SAMPLE DESCRIPTION

TILL-LIKE SOILS

SAMPLE - MINUS #40

SIEVE. BROWN

CLAYEY SILT. TRACE ->

LITTLE SAND

CL

Golder Associates

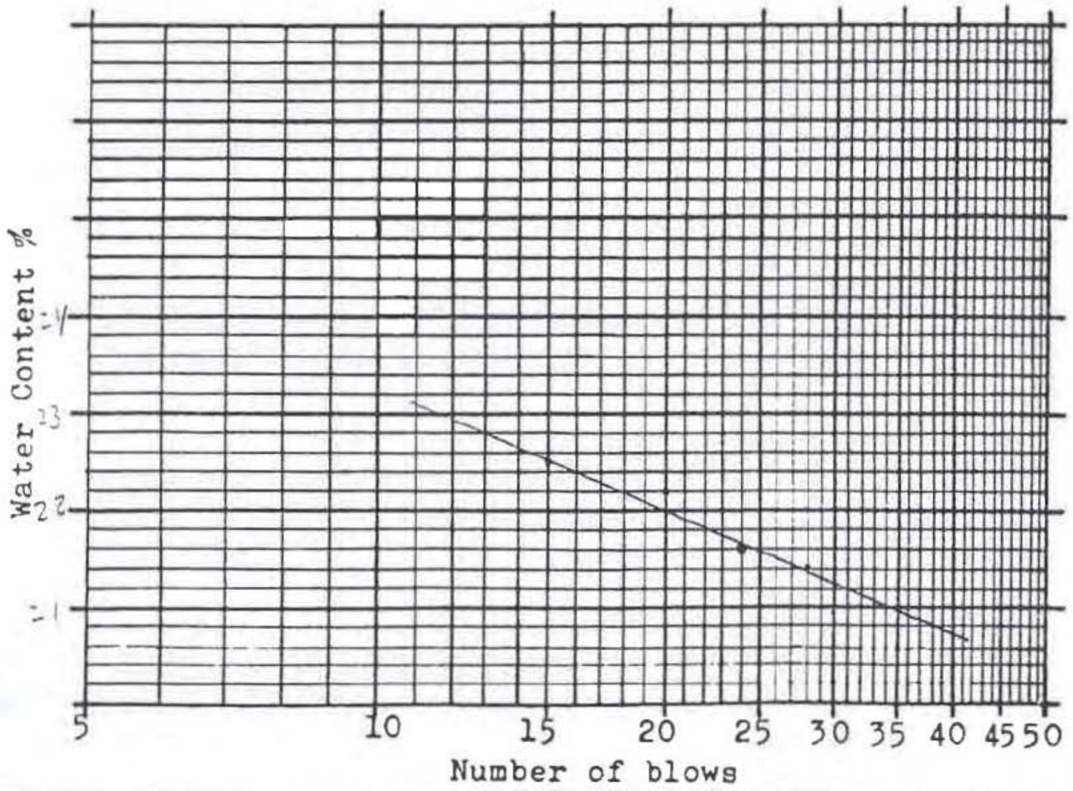
LABORATORY TEST SHEET – ATTERBERG LIMITS

ab Work M.O Project # 95[illegible]1013 Date Jan. 31-95

✓ [illegible] Fe. 2/95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	#102	#30	#42	#74		
Number of blows	15	20	24	28		
Wt.sample wet + tare	30.63	32.90	40.59	40.41		
Wt.sample dry + tare	27 58	29 54	37.00	36.93		
Weight of water	3.05	3 36	3 59	3 48		
Tare	14.05	14.40	20.37	20.69		
Wt. of dry soil	13 53	15.14	16 63	16.24		
Water content %	22.5 ✓	22 2 ✓	21 6 ✓	21.4 ✓		

Type of Test	PL	PL	Borehole #	TP95-31
Container #	#82	#51	Sample #	—
Wt.sample wet + tare	34.07	37.00	Depth	—
Wt.sample dry + tare	32 45	35 04	Liquid Limit	21 6 ✓
Wt. of water	1 62	1 96	Plastic Limit	14 0 ✓
Tare	20.92	20.83	Plasticity index	7 6 ✓
Weight of dry soil	11 53	14.21	Moisture content	11 0 ✓
Water content	14 1 ✓	13 8 ✓	Liquidity Index	- 0.40 ✓



SAMPLE DESCRIPTION

CL/ML

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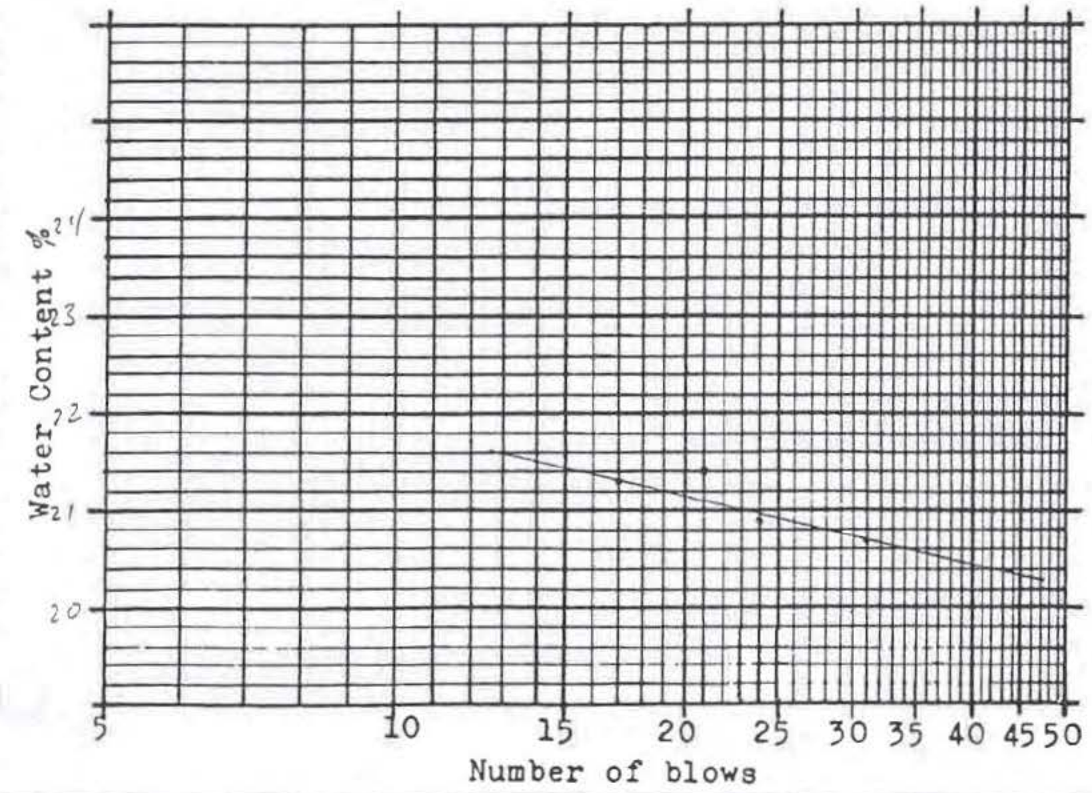
LABORATORY TEST SHEET – ATTERBERG LIMITS

ab Work M.O Project # 952 1018 Date Jan. 31-95 ✓ KAB Feb 14 95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	#31	#14	#12A	#3		
Number of blows	17	24	21	31		
Wt.sample wet + tare	31.74	31.10	32.26	32.24		
Wt.sample dry + tare	2473	2824	2906	29.21		
Weight of water	3 01	2 86	3 2	3 03		
Tare	14.59	14.55	14.11	14.59		
Wt. of dry soil	1414	1369	1495	1462		
Water content %	21 3 ✓	20.9 ✓	21.4 ✓	20.7 ✓		

Type of Test	PL	PL	Borehole #	TP95-35
Container #	#12	#9	Sample #	—
Wt.sample wet + tare	25.83	23.80	Depth	—
Wt.sample dry + tare	2435	2261	Liquid Limit	20 9 ✓
Wt. of water	1 48	1 19	Plastic Limit	14 1 ✓
Tare	13.91	14.08	Plasticity index	6 8 ✓
ight of dry soil	10 44	8 53	Moisture content	16 5 ✓
Water content	14 2 ✓	14 0 ✓	Liquidity Index	0 35 ✓



SAMPLE DESCRIPTION

CL/ML

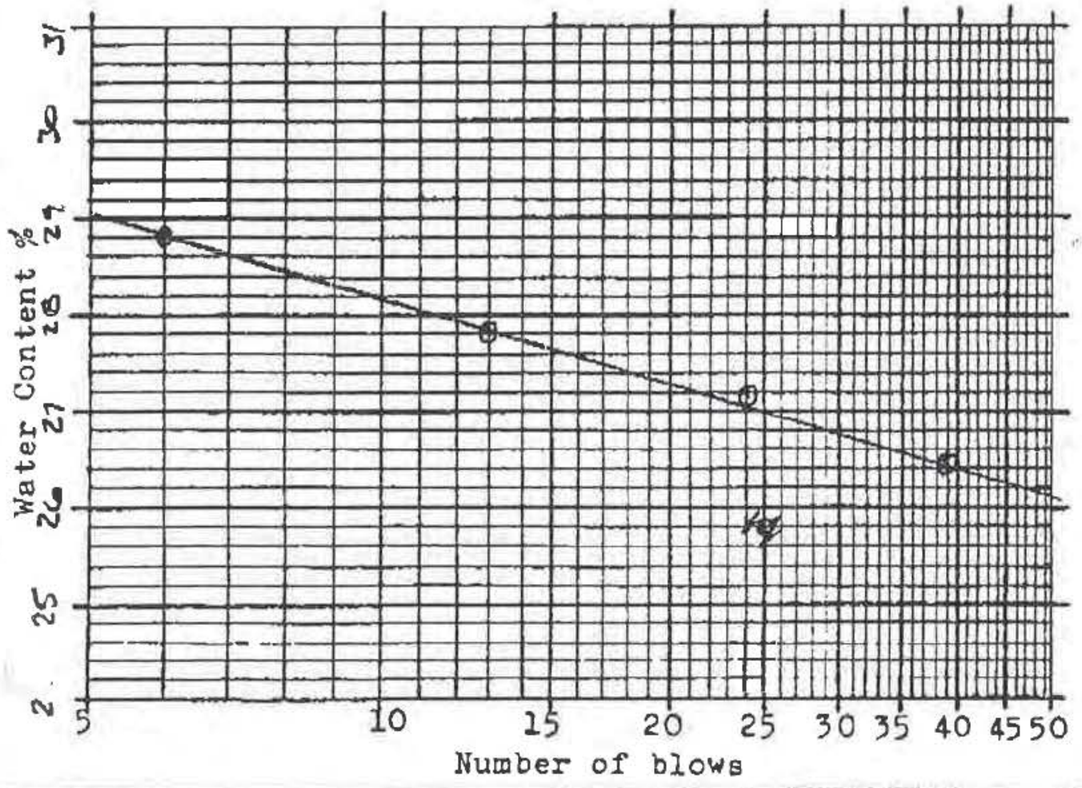
Golder Associates

LABORATORY TEST SHEET – ATTERBERG LIMITS

Lab Work________ Project # 952-1018 Date Feb 3/95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	36	4	91	cc	4	
Number of blows	13	25	24	6	39	
Wt.sample wet + tare	22.69	18.83	31.27	20.33	35.20	
Wt.sample dry + tare	18.75	15.70	25.39	16.57	30.88	
Weight of water	3.94	3.13	5.88	3.76	4.32	
Tare	4.55	3.57	3.76	3.50	14.57	
Wt. of dry soil	14.20	12.13	21.63	13.07	16.31	
Water content %	27.8	25.8	27.2	28.8	26.5	18.8%

Type of Test	PL	PL	Borehole #	TP 95-37
Container #	A8	B13	Sample #	
Wt.sample wet + tare	17.80	17.14	Depth	
Wt.sample dry + tare	15.81	15.26	Liquid Limit	27.0 %
Wt. of water	1.99	1.88	Plastic Limit	16.3 %
Tare	3.59	3.67	Plasticity index	10.7 %
Weight of dry soil	12.22	11.59	Moisture content	18.8 %
Water content	16.3	16.2	Liquidity Index	0.23



SAMPLE DESCRIPTION

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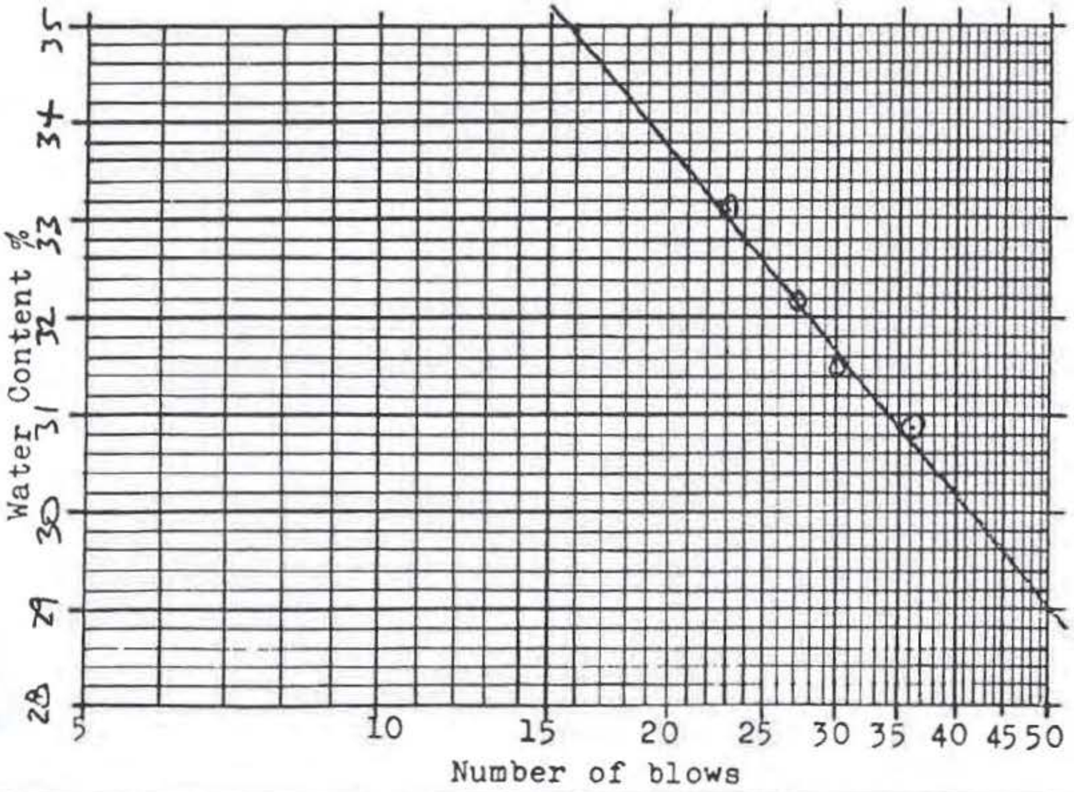
LABORATORY TEST SHEET – ATTERBERG LIMITS

ab Work ________ Project # 952 1018 Date Feb 3 /95 VGB Feb 14/95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	61	78	65	69		
Number of blows	36	30	27	23		
Wt.sample wet + tare	49.50	50.11	51.16	61.30		
Wt.sample dry + tare	42.74	43.08	43.70	51.05		
Weight of water	6.76	7.03	7.46	10.25		
Tare	20.84	20.75	20.53	20.05		
Wt. of dry soil	21.90	22.33	23.17	31.00		
Water content %	30.9 ✓	31.5 ✓	32.2 ✓	33.1 ✓		28.4

Type of Test	PL	PL	Borehole #	TP 95-38
Container #	6	25	Sample #	
Wt.sample wet + tare	25.14	30.91	Depth	
Wt.sample dry + tare	23.97	29.81	Liquid Limit	32.6 ✓
Wt. of water	1.17	1.10	Plastic Limit	18.7 ✓
Tare	17.77	23.84	Plasticity index	13.9 ✓
ight of dry soil	6.20	5.97	Moisture content	28.4 ✓
Water content	18.9 ✓	18.4 ✓	Liquidity Index	0.70 ✓



SAMPLE DESCRIPTION

BROWN CLAYEY SILT

TRACE SAND

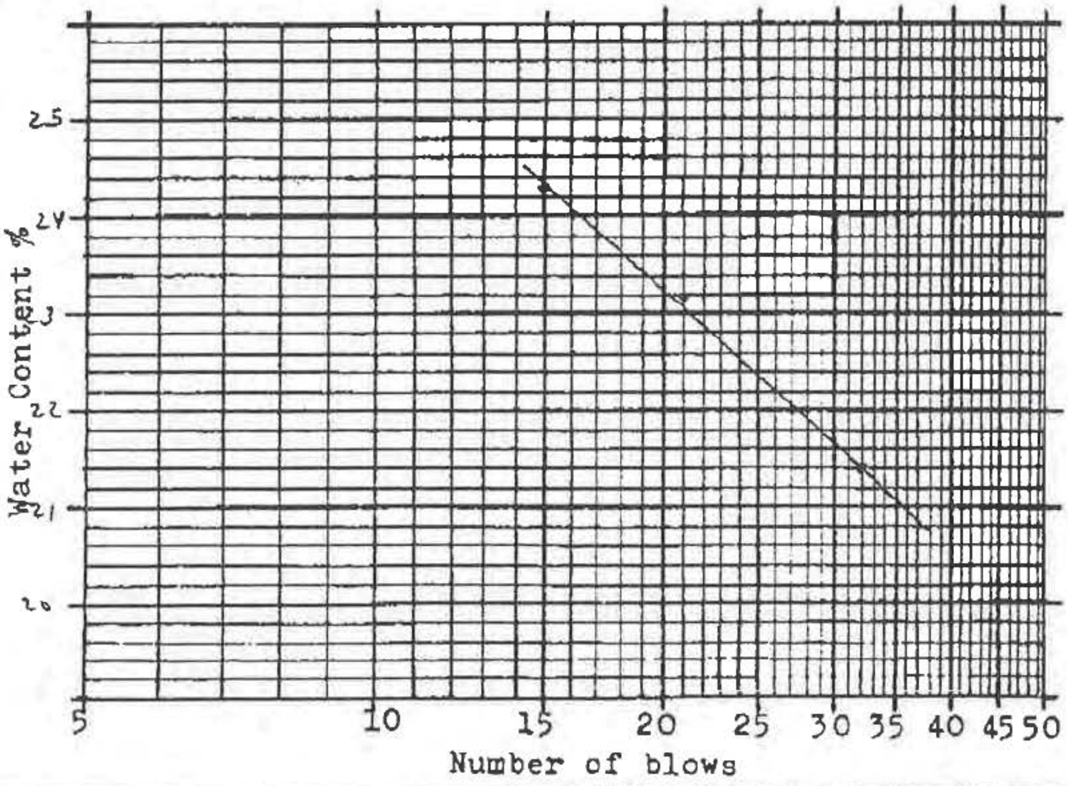
Golder Associates

LABORATORY TEST SHEET – ATTERBERG LIMITS

Lab Work ______ Project # 952-1018 Date Feb 14/95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	B2	12	12A	14		
Number of blows	32	27	21	15		
Wt.sample wet + tare	46.53	49.52	48.06	51.84		
Wt.sample dry + tare	40.93	43.09	41.78	44.47		
Weight of water	5.60	6.43	6.28	7.37		
Tare	14.79	13.89	14.73	14.19		
Wt. of dry soil	26.14	29.20	27.05	30.28		
Water content %	21.4	22.0	23.2	24.3		11.1

Type of Test	PL	PL	Borehole #	TP 95-27
Container #	30	102	Sample #	
Wt.sample wet + tare	25.60	24.04	Depth	
Wt.sample dry + tare	24.24	22.80	Liquid Limit	22.4
Wt. of water	1.36	1.24	Plastic Limit	13.9
Tare	14.39	13.95	Plasticity index	8.5
Weight of dry soil	9.85	8.85	Moisture content	11.1
Water content	13.8	14.0	Liquidity Index	-0.32

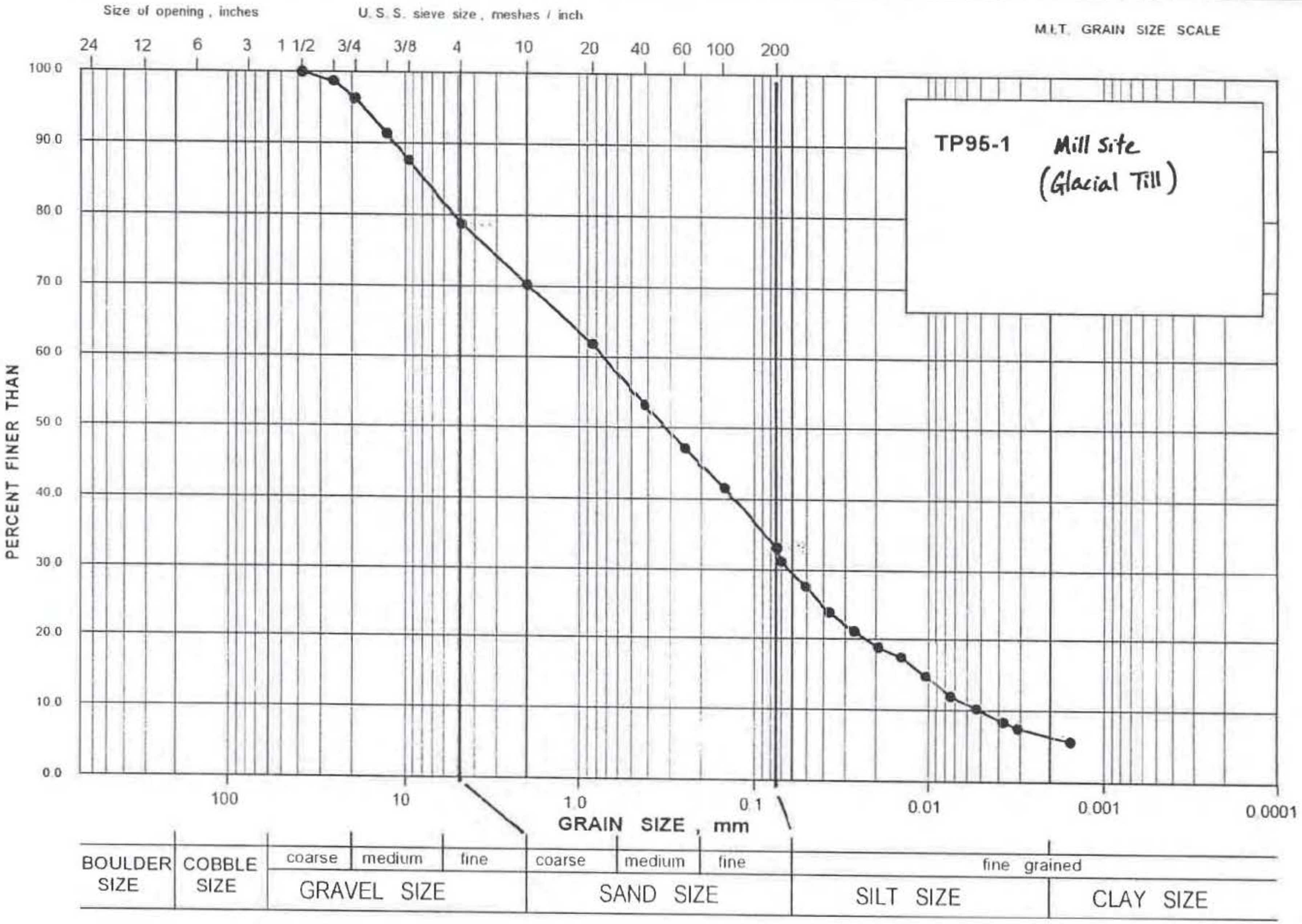


SAMPLE DESCRIPTION

BROWN CLAYEY SILT

TRACE SAND

CL

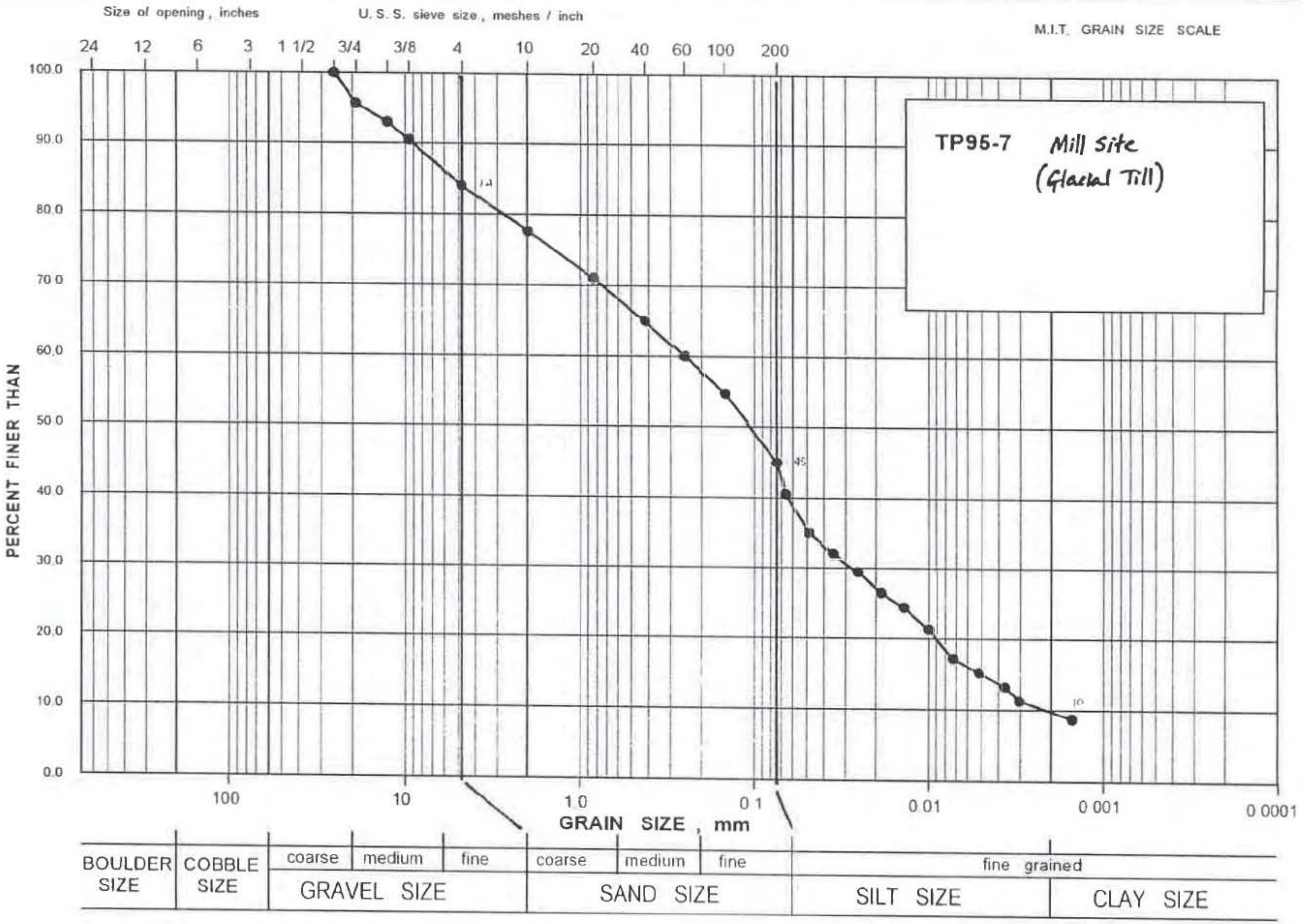


Project No. 9521018
Drawn LL
Reviewed
Date 02/09/95

Golder Associates

GRAIN SIZE DISTRIBUTION

Figure

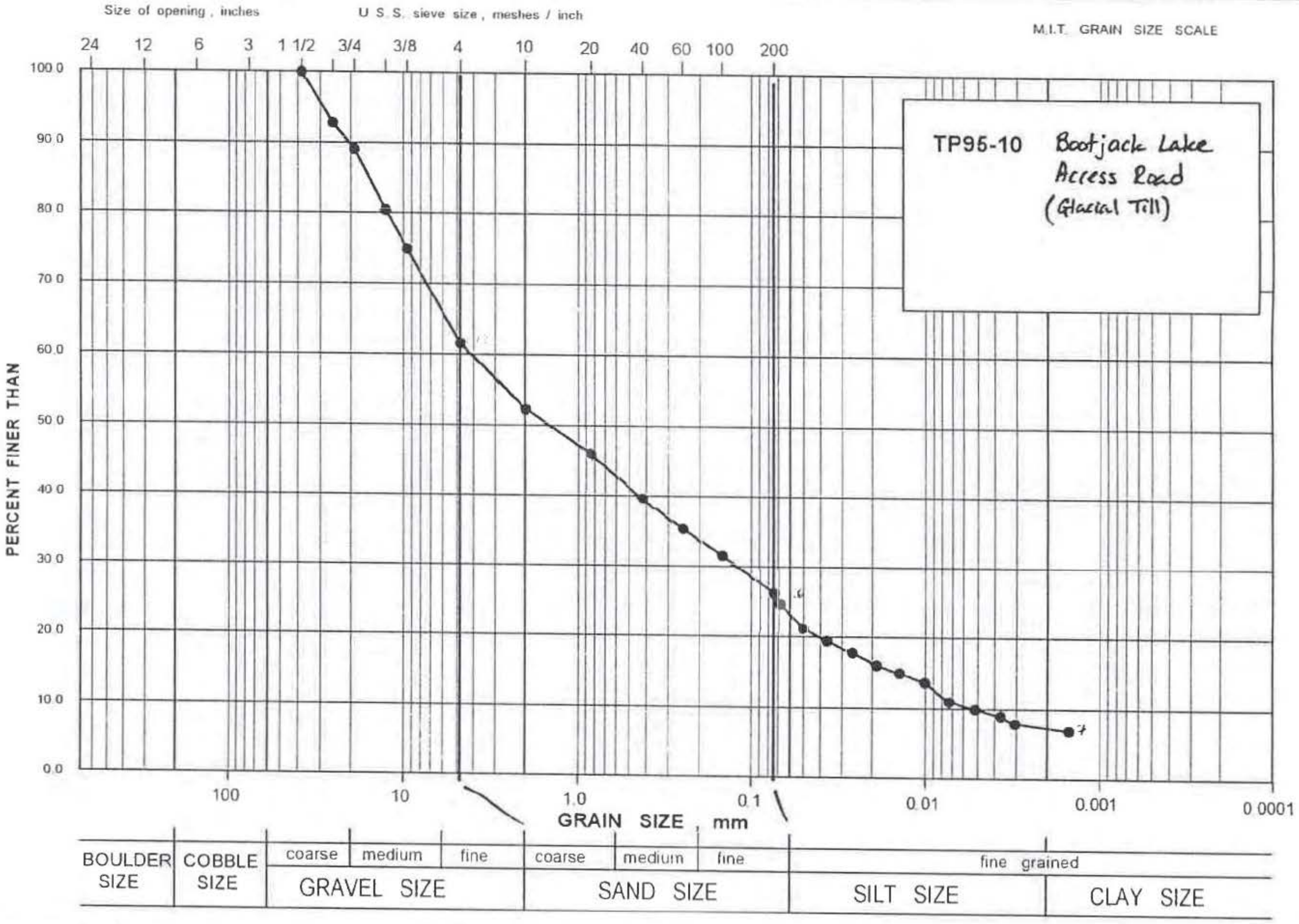


Project No. ..9521018......
Drawn ....LL..........
Reviewed ....
Date ....02/09/95......

Golder Associates

GRAIN SIZE DISTRIBUTION

Figure

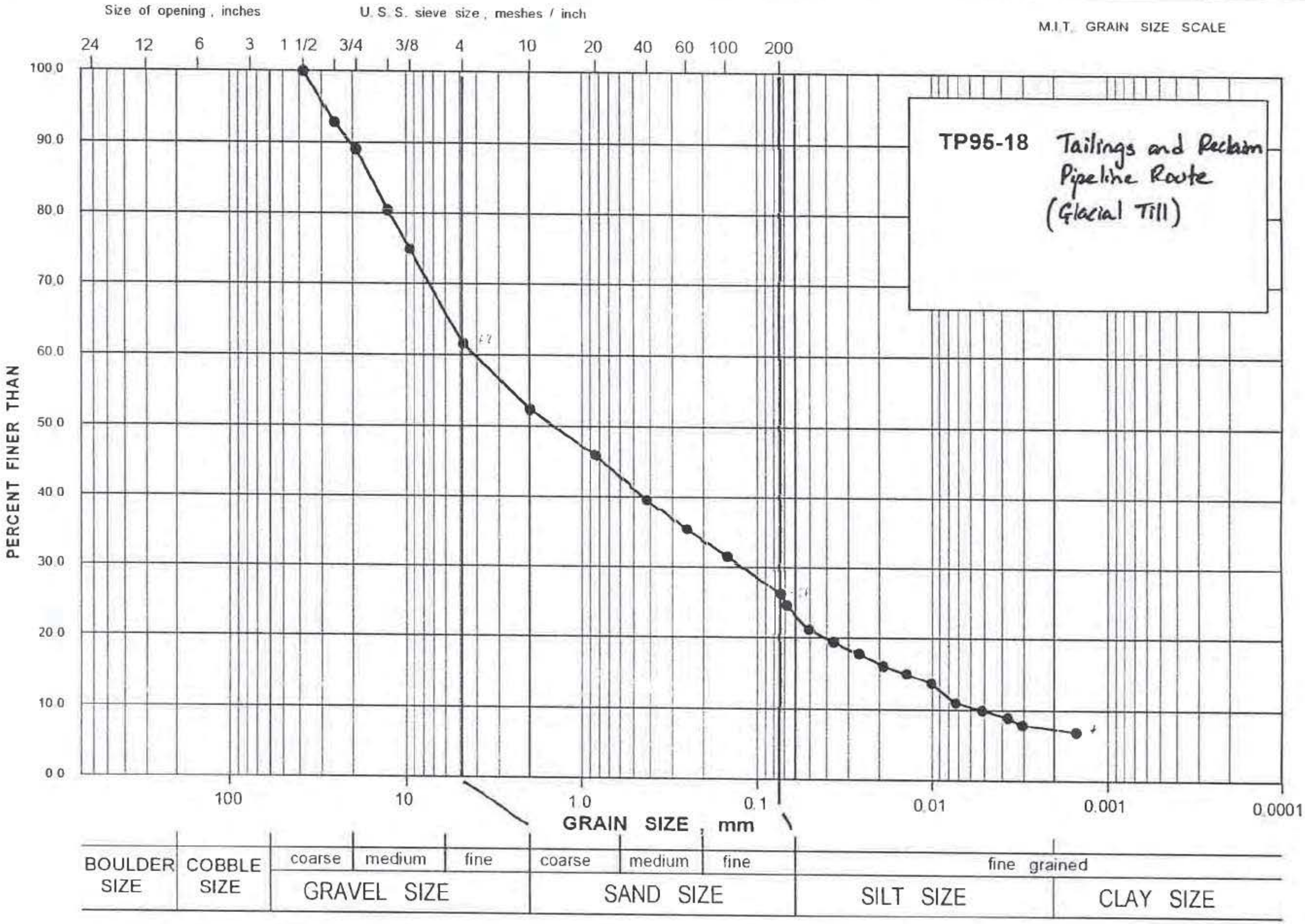


Project No. 9521018
Drawn LL
Reviewed
Date 02/09/95

Golder Associates

GRAIN SIZE DISTRIBUTION

Figure



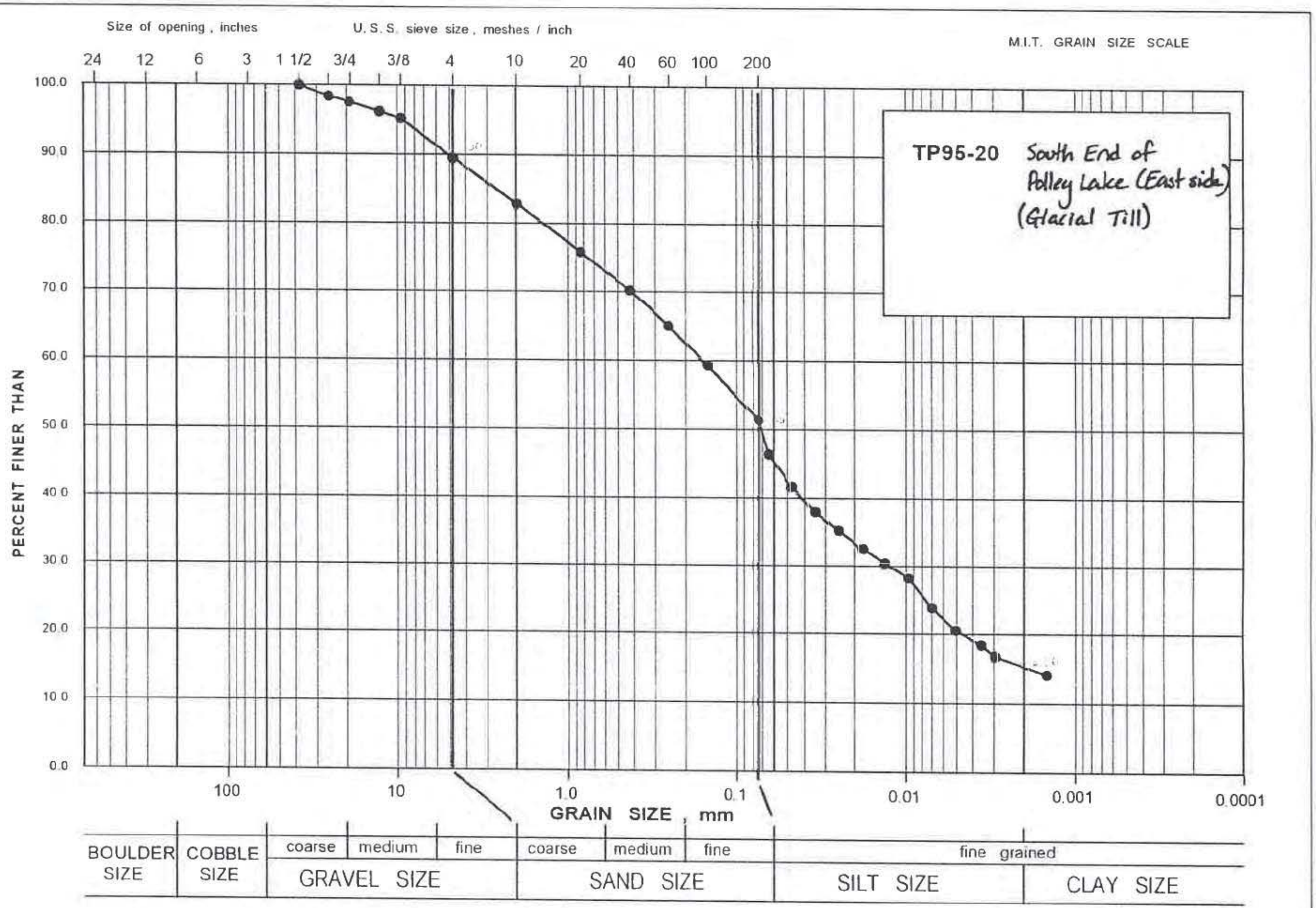
TP95-18 Tailings and Reclaim Pipeline Route (Glacial Till)

Project No. 9521018
Drawn LL
Reviewed
Date 02/09/95

Golder Associates

GRAIN SIZE DISTRIBUTION

Figure



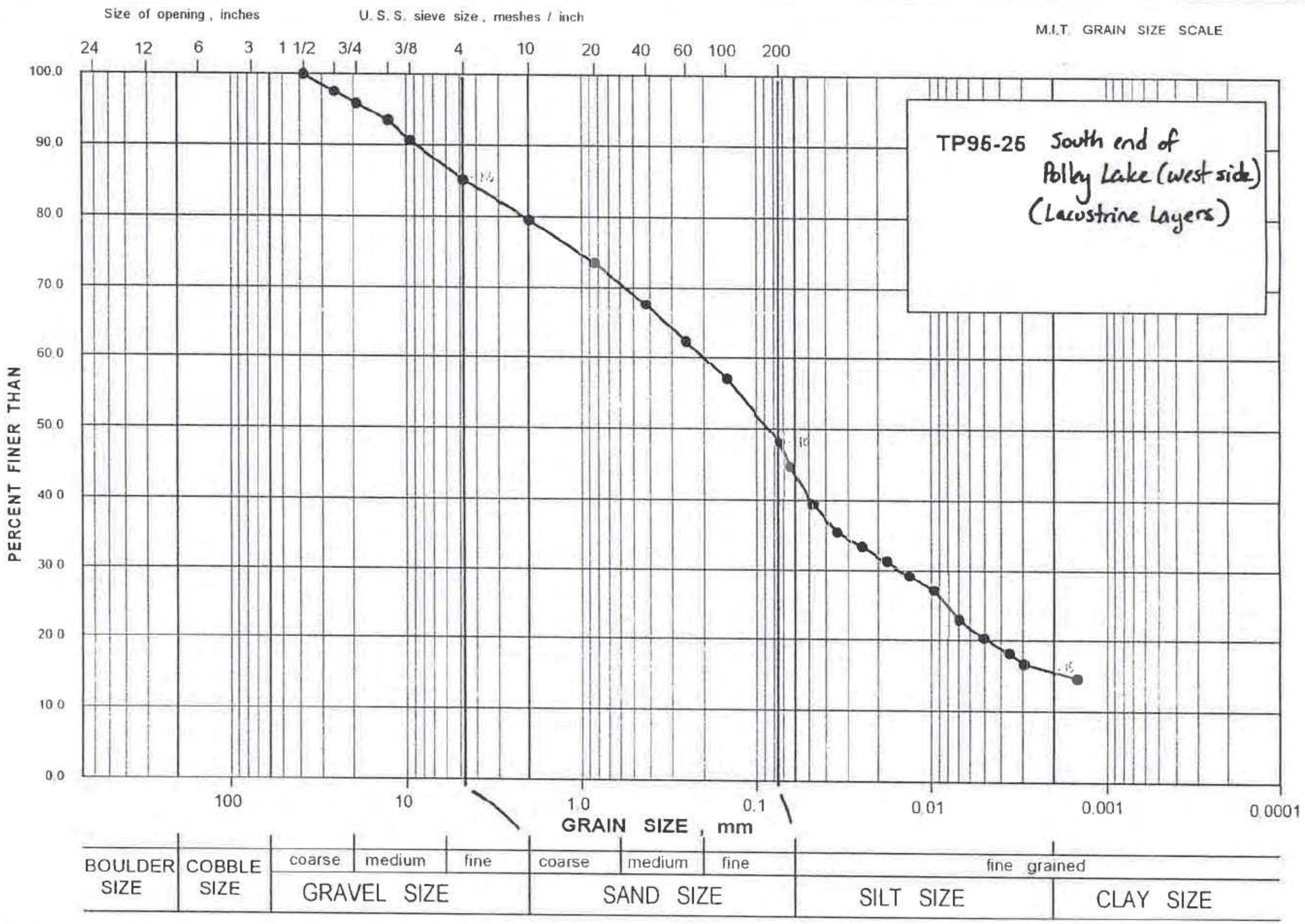
TP95-20 South End of Polley Lake (East side) (Glacial Till)

Project No. 9521018
Drawn LL
Reviewed
Date 02/09/95

Golder Associates

GRAIN SIZE DISTRIBUTION

Figure



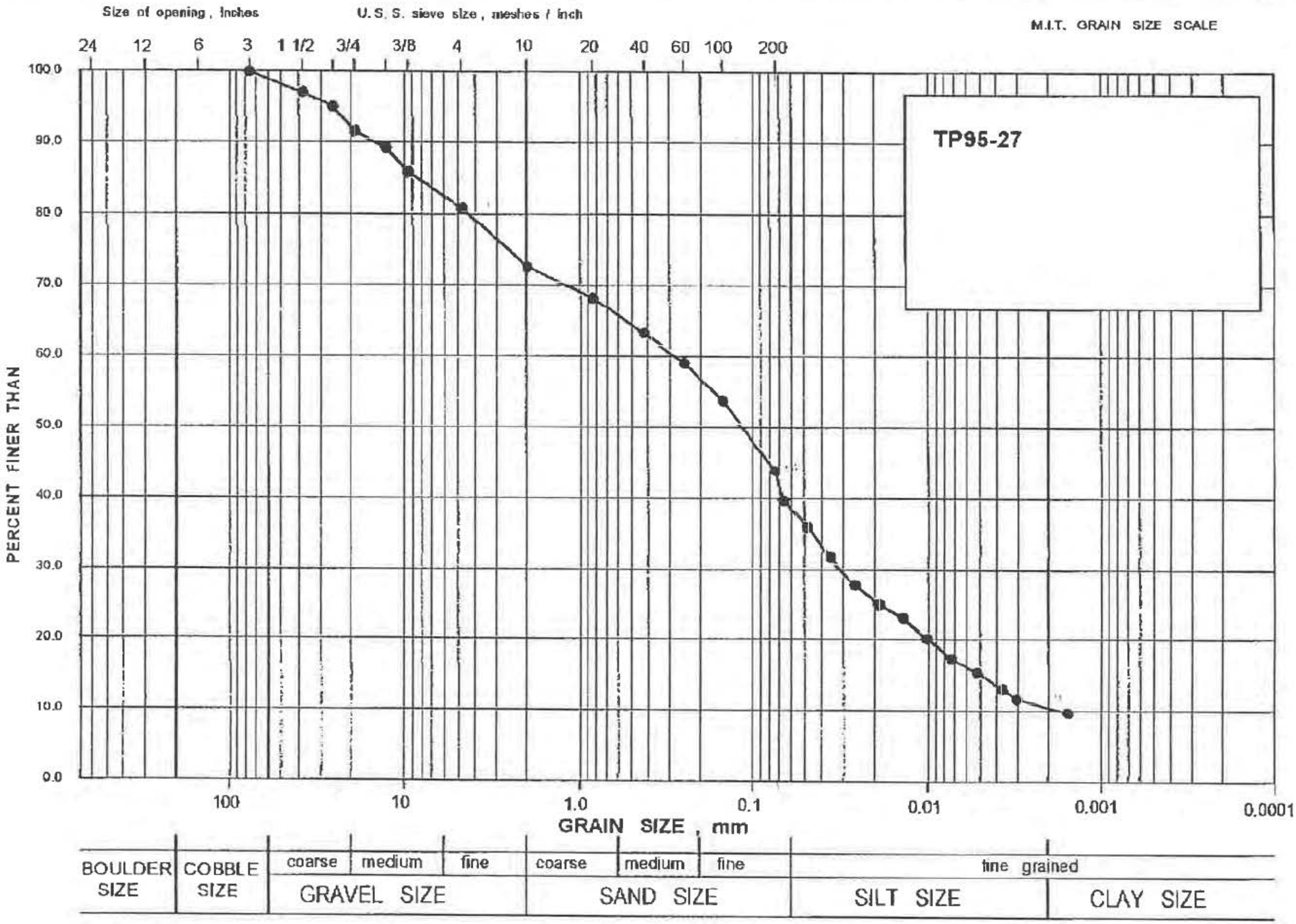
TP95-25 South end of Polley Lake (west side) (Lacustrine Layers)

Project No. ..9521018......
Drawn ....LL..........
Reviewed ....
Date ....02/09/95......

Golder Associates

GRAIN SIZE DISTRIBUTION

Figure

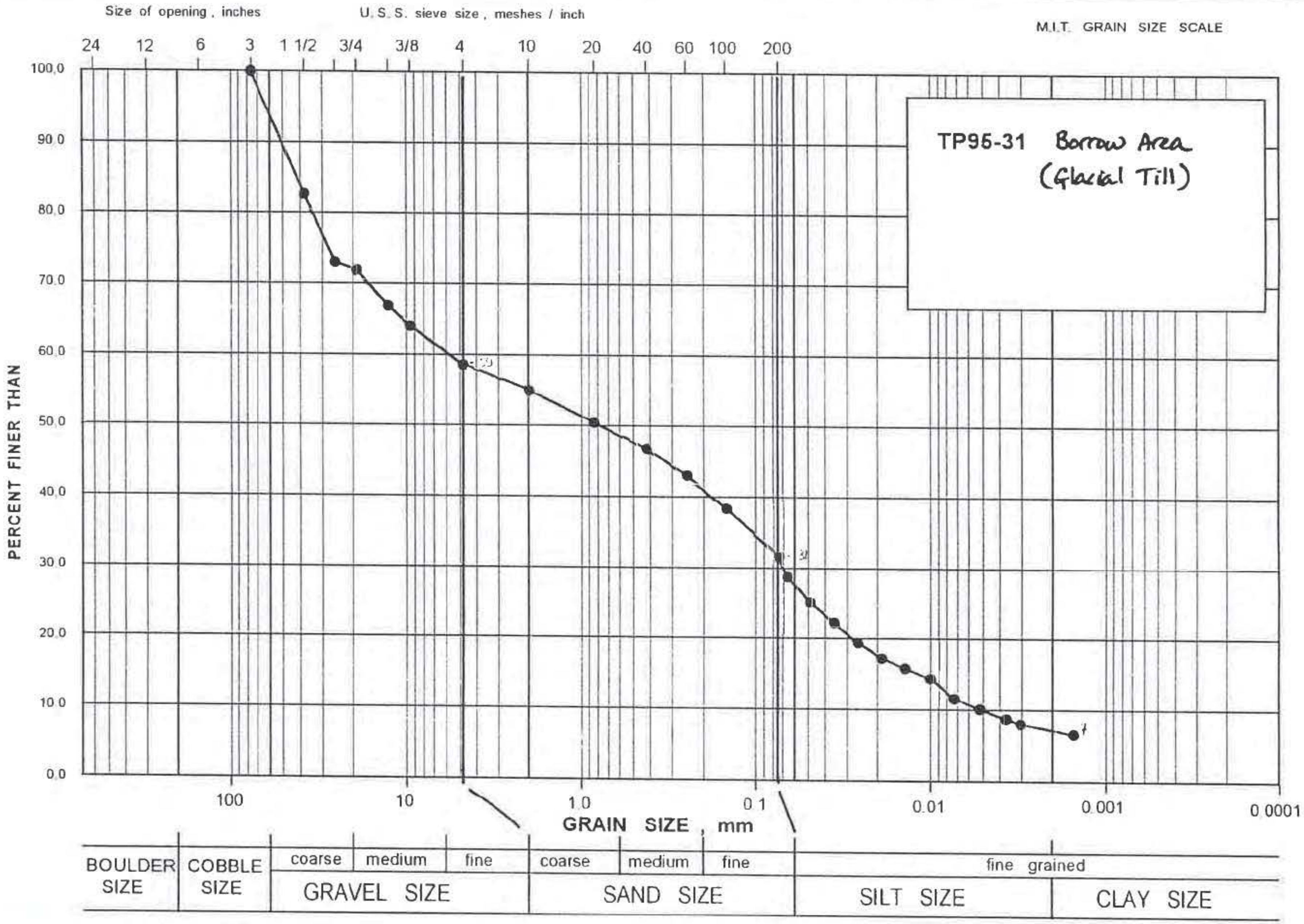


Project No. ..9521018......
Drawn ....LL..........
Reviewed ....
Date ....02/11/95......

Golder Associates

GRAIN SIZE DISTRIBUTION

Figure



Project No. 9521018

Drawn LL

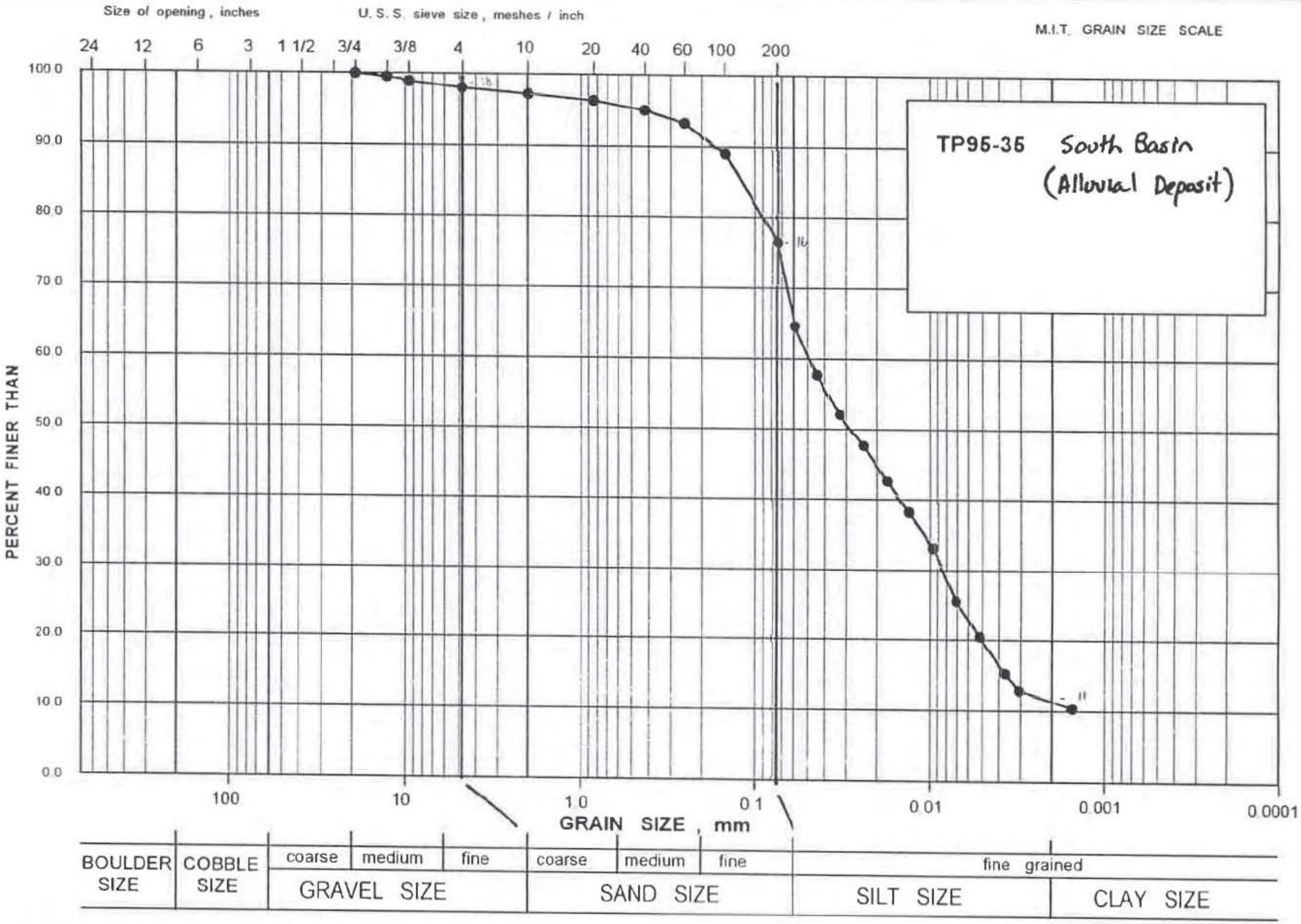
Reviewed

Date 02/09/95

Golder Associates

GRAIN SIZE DISTRIBUTION

Figure

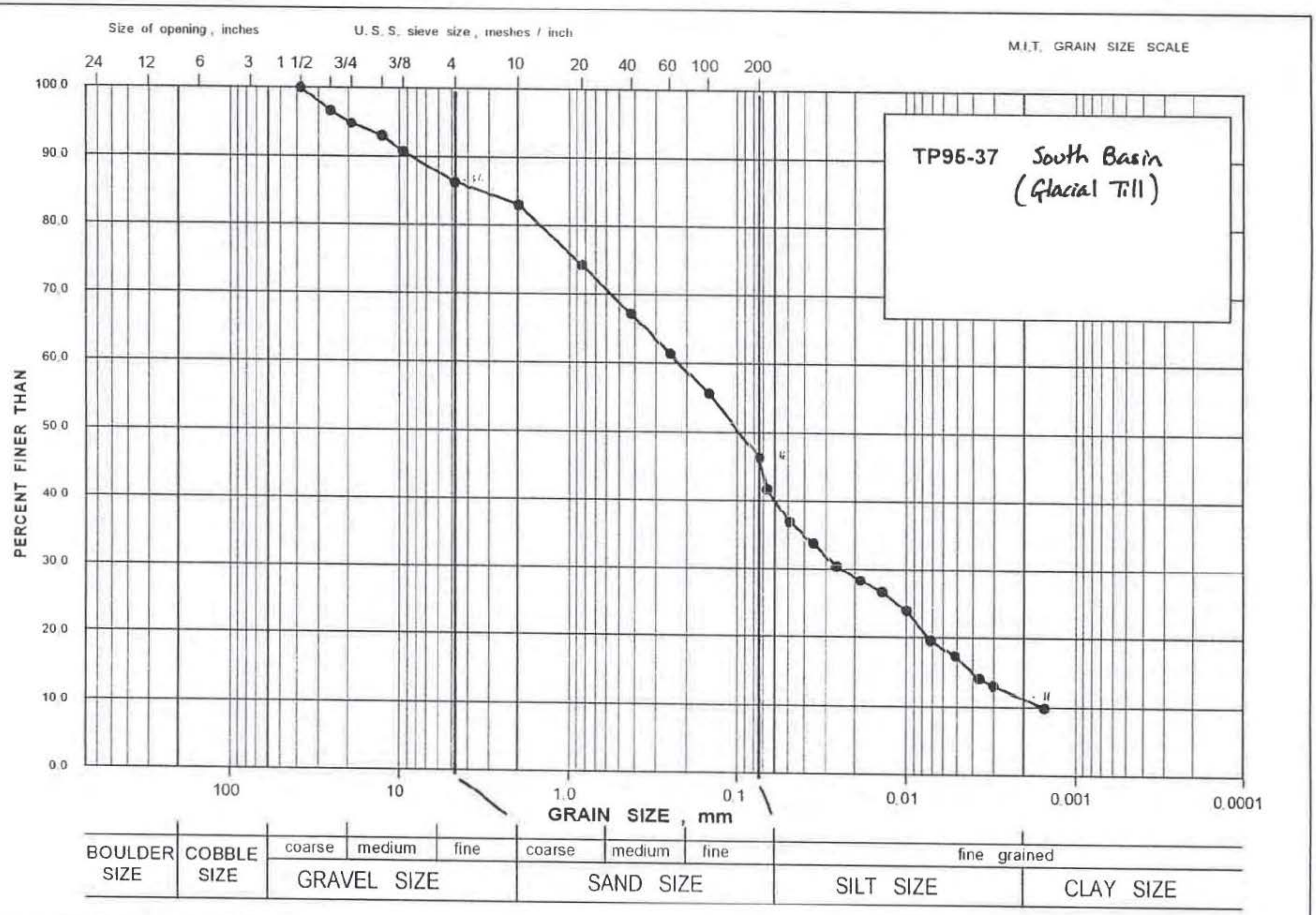


Project No. ..9521018......
Drawn ....LL..........
Reviewed ....
Date ....02/09/95......

Golder Associates

GRAIN SIZE DISTRIBUTION

Figure



Project No. 9521018

Drawn LL

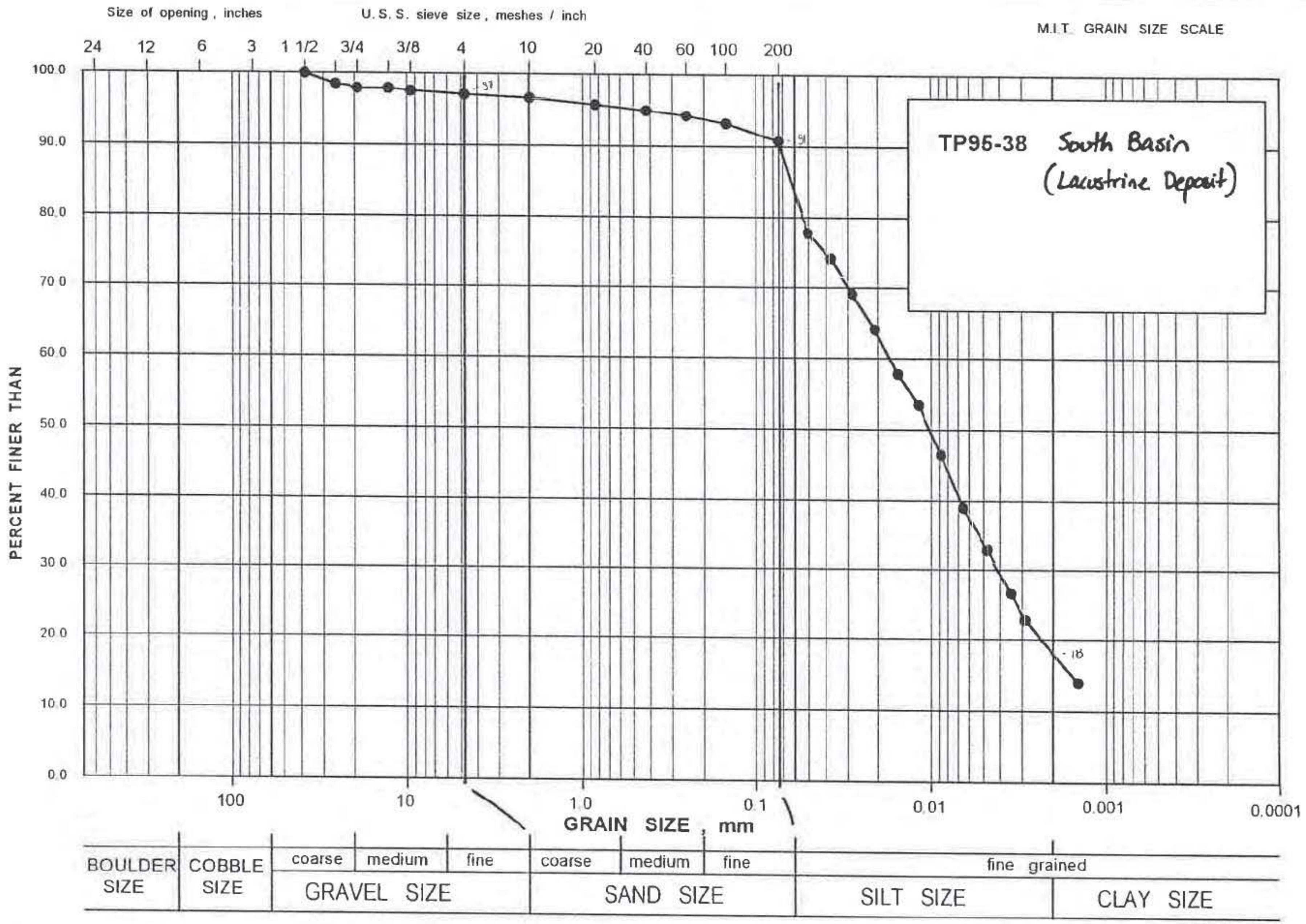
Reviewed

Date 02/09/95

Golder Associates

GRAIN SIZE DISTRIBUTION

Figure

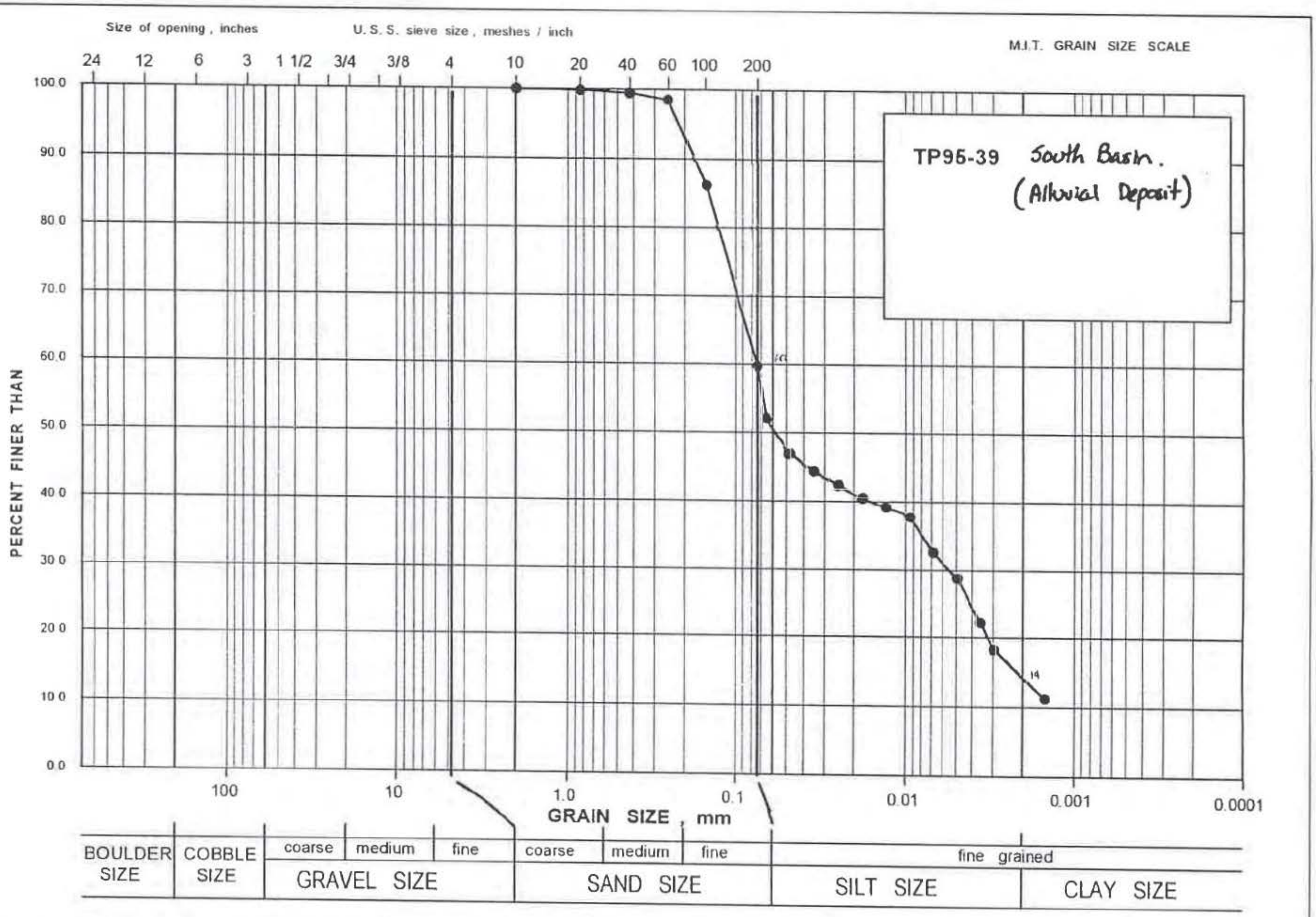


Project No. ..9521018......
Drawn ....LL..........
Reviewed ....
Date ....02/09/95......

Golder Associates

GRAIN SIZE DISTRIBUTION

Figure



Project No. 9521018
Drawn LL
Reviewed
Date 02/09/95

Golder Associates

GRAIN SIZE DISTRIBUTION

Figure

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	Client :	Knight Piesold Ltd.		Test Pit :	TP95-1	
Date :	02/09/95	Project :	Job No. 1623/1		Sample :		
Lab Work:	LL	Location:	Burnaby		Depth :		
	1ST SIEVING		Hydrometer: (Minus #10)		Residual #200	0.7	
	Total Weight	3468.7	Before Wash	75.0	Total -200	38.0	
			After Wash	37.7	Gs	2.78	

Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	41.8	1.2			1.2	25.4	98.8
3/4"	87.4	2.5			2.5	19.1	96.3
1/2"	172.3	5.0			5.0	12.7	91.3
3/8"	127.0	3.7			3.7	9.52	87.6
#4	308.0	8.9			8.9	4.76	78.8
#10	294.9	8.5			8.5	2.00	70.3
#20			8.9	11.9	8.3	0.840	61.9
#40			9.3	12.4	8.7	0.420	53.2
#60			6.6	8.8	6.2	0.250	47.0
#100			5.9	7.9	5.5	0.149	41.5
#200			8.9	11.9	8.3	0.074	33.2
Pan			38.0	50.7	35.6		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	38.0	20.1		-3.76	34.2	0.0700	31.2
1	34.0	20.1		-3.76	30.2	0.0511	27.6
2	30.0	20.1		-3.76	26.2	0.0372	23.9
4	27.0	20.1		-3.76	23.2	0.0269	21.2
8	24.5	20.1		-3.76	20.7	0.0194	18.9
15	23.0	20.0		-3.77	19.2	0.0143	17.5
30	20.0	20.0		-3.77	16.2	0.0103	14.8
60	17.0	20.0		-3.77	13.2	0.0074	12.0
120	15.0	20.0		-3.77	11.2	0.0053	10.2
240	13.0	20.0		-3.77	9.2	0.0038	8.4
360	12.0	20.0		-3.77	8.2	0.0031	7.5
1440	10.0	19.9		-3.77	6.2	0.0016	5.7

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	Client :	Knight Piesold Ltd.	Test Pit :	TP95-7
Date :	02/09/95	Project :	Job No. 1623/1	Sample :	
Lab Work:	LL	Location:	Burnaby	Depth :	

	1ST SIEVING		Hydrometer: (Minus #10)		Residual #200	0.1	
	Total Weight	2807.3	Before Wash	75.0	Total -200	43.3	
			After Wash	31.8	Gs	2.78	
Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	0.0					25.4	100.0
3/4"	120.2	4.3			4.3	19.1	95.7
1/2"	74.8	2.7			2.7	12.7	93.1
3/8"	71.4	2.5			2.5	9.52	90.5
#4	182.0	6.5			6.5	4.76	84.0
#10	177.5	6.3			6.3	2.00	77.7
#20			6.4	8.5	6.6	0.840	71.1
#40			5.9	7.9	6.1	0.420	65.0
#60			4.8	6.4	5.0	0.250	60.0
#100			5.1	6.8	5.3	0.149	54.7
#200			9.3	12.4	9.6	0.074	45.1
Pan			43.3	57.7	44.9		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	44.0	20.1		-3.76	40.2	0.0664	40.5
1	38.5	20.1		-3.76	34.7	0.0493	35.0
2	35.5	20.1		-3.76	31.7	0.0357	32.0
4	33.0	20.1		-3.76	29.2	0.0257	29.5
8	30.0	20.1		-3.76	26.2	0.0186	26.4
15	28.0	20.0		-3.77	24.2	0.0138	24.4
30	25.0	20.0		-3.77	21.2	0.0100	21.4
60	21.0	20.0		-3.77	17.2	0.0072	17.4
120	19.0	20.0		-3.77	15.2	0.0052	15.3
240	17.0	20.0		-3.77	13.2	0.0037	13.3
360	15.0	20.0		-3.77	11.2	0.0031	11.3
1440	12.5	19.9		-3.77	8.7	0.0015	8.8

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	Client :	Knight Piesold Ltd.		Test Pit :	TP95-10	
Date :	02/09/95	Project :	Job No. 1623/1		Sample :		
Lab Work:	LL	Location:	Burnaby		Depth :		
	1ST SIEVING		Hydrometer: (Minus #10)		Residual #200	0.1	
	Total Weight	2183.6	Before Wash	75.0	Total -200	37.2	
			After Wash	37.9	Gs	2.78	

Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	158.4	7.3			7.3	25.4	92.7
3/4"	79.7	3.6			3.6	19.1	89.1
1/2"	190.4	8.7			8.7	12.7	80.4
3/8"	119.2	5.5			5.5	9.52	74.9
#4	290.9	13.3			13.3	4.76	61.6
#10	201.3	9.2			9.2	2.00	52.4
#20			9.3	12.4	6.5	0.840	45.9
#40			9.0	12.0	6.3	0.420	39.6
#60			6.2	8.3	4.3	0.250	35.3
#100			5.5	7.3	3.8	0.149	31.4
#200			7.5	10.0	5.2	0.074	26.2
Pan			37.2	49.6	26.0		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	40.0	20.1		-3.76	36.2	0.0688	24.6
1	35.0	20.1		-3.76	31.2	0.0507	21.2
2	32.5	20.1		-3.76	28.7	0.0366	19.5
4	30.0	20.1		-3.76	26.2	0.0263	17.8
8	27.5	20.1		-3.76	23.7	0.0190	16.1
15	26.0	20.0		-3.77	22.2	0.0140	15.1
30	24.0	20.0		-3.77	20.2	0.0100	13.7
60	20.0	20.0		-3.77	16.2	0.0073	11.0
120	18.5	20.0		-3.77	14.7	0.0052	10.0
240	17.0	20.0		-3.77	13.2	0.0037	9.0
360	15.5	20.0		-3.77	11.7	0.0031	8.0
1440	14.0	19.9		-3.77	10.2	0.0015	6.9

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	Client :	Knight Piesold Ltd.	Test Pit :	TP95-18
Date :	02/09/95	Project :	Job No. 1623/1	Sample :	
Lab Work:	LL	Location:	Burnaby	Depth :	

	1ST SIEVING		Hydrometer: (Minus #10)		Residual #200	0.2	
	Total Weight	2189.2	Before Wash	75.0	Total -200	50.0	
			After Wash	25.2	Gs	2.78	
Size (USS)	**Weight Retained**	**% Retained**	**Weight Retained**	**% Retained**	**% Retained Total**	**Diameter (mm)**	**% Passing**
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	0.0					25.4	100.0
3/4"	0.0					19.1	100.0
1/2"	5.1	0.2			0.2	12.7	99.8
3/8"	19.5	0.9			0.9	9.52	98.9
#4	44.0	2.0			2.0	4.76	96.9
#10	59.5	2.7			2.7	2.00	94.1
#20			3.5	4.7	4.4	0.840	89.8
#40			3.8	5.1	4.8	0.420	85.0
#60			4.1	5.5	5.1	0.250	79.8
#100			4.9	6.5	6.2	0.149	73.7
#200			8.4	11.2	10.5	0.074	63.1
Pan			50.0	66.7	62.8		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	49.0	20.1		-3.76	45.2	0.0633	55.2
1	44.0	20.1		-3.76	40.2	0.0470	49.1
2	41.0	20.1		-3.76	37.2	0.0341	45.5
4	38.0	20.1		-3.76	34.2	0.0247	41.8
8	35.0	20.1		-3.76	31.2	0.0179	38.1
15	33.0	20.0		-3.77	29.2	0.0133	35.7
30	30.0	20.0		-3.77	26.2	0.0096	32.0
60	27.0	20.0		-3.77	23.2	0.0069	28.4
120	23.0	20.0		-3.77	19.2	0.0050	23.5
240	20.0	20.0		-3.77	16.2	0.0036	19.8
360	18.5	20.0		-3.77	14.7	0.0030	18.0
1440	15.0	19.9		-3.77	11.2	0.0015	13.7

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	**Client :**	Knight Piesold Ltd.	**Test Pit :**	TP95-20
Date :	02/09/95	**Project :**	Job No. 1623/1	**Sample :**	
Lab Work:	LL	**Location:**	Burnaby	**Depth :**	

	1ST SIEVING		Hydrometer: (Minus #10)		Residual #200	0.2	
	Total Weight	3344.7	Before Wash	75.0	Total -200	46.6	
			After Wash	28.6	Gs	2.78	
Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	0.0					**38.1**	**100.0**
1"	51.7	1.5			1.5	**25.4**	**98.5**
3/4"	26.8	0.8			0.8	**19.1**	**97.7**
1/2"	46.0	1.4			1.4	**12.7**	**96.3**
3/8"	34.6	1.0			1.0	**9.52**	**95.2**
#4	192.4	5.8			5.8	**4.76**	**89.5**
#10	221.1	6.6			6.6	**2.00**	**82.9**
#20			6.3	8.4	7.0	**0.840**	**75.9**
#40			5.2	6.9	5.7	**0.420**	**70.2**
#60			4.6	6.1	5.1	**0.250**	**65.1**
#100			5.2	6.9	5.7	**0.149**	**59.3**
#200			7.2	9.6	8.0	**0.074**	**51.4**
Pan			46.6	62.1	51.5		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	47.0	20.1		-3.76	43.2	**0.0645**	**46.5**
1	42.5	20.1		-3.76	38.7	**0.0476**	**41.6**
2	39.0	20.1		-3.76	35.2	**0.0347**	**37.9**
4	36.5	20.1		-3.76	32.7	**0.0250**	**35.2**
8	34.0	20.1		-3.76	30.2	**0.0181**	**32.5**
15	32.0	20.0		-3.77	28.2	**0.0134**	**30.3**
30	30.0	20.0		-3.77	26.2	**0.0096**	**28.2**
60	26.0	20.0		-3.77	22.2	**0.0070**	**23.9**
120	23.0	20.0		-3.77	19.2	**0.0050**	**20.7**
240	21.0	20.0		-3.77	17.2	**0.0036**	**18.5**
360	19.5	20.0		-3.77	15.7	**0.0030**	**16.9**
1440	17.0	19.9		-3.77	13.2	**0.0015**	**14.2**

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	**Client :**	Knight Piesold Ltd.	**Test Pit :**	TP95-25
Date :	02/09/95	**Project :**	Job No. 1623/1	**Sample :**	
Lab Work:	LL	**Location:**	Burnaby	**Depth :**	

	1ST SIEVING		Hydrometer: (Minus #10)		Residual #200	0.1	
	Total Weight	2733.1	Before Wash	75.0	Total -200	45.4	
			After Wash	29.7	Gs	2.78	
Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	66.5	2.4			2.4	25.4	97.6
3/4"	46.3	1.7			1.7	19.1	95.9
1/2"	66.4	2.4			2.4	12.7	93.4
3/8"	74.6	2.7			2.7	9.52	90.7
#4	151.9	5.6			5.6	4.76	85.2
#10	152.9	5.6			5.6	2.00	79.6
#20			5.7	7.6	6.0	0.840	73.5
#40			5.5	7.3	5.8	0.420	67.7
#60			5.0	6.7	5.3	0.250	62.4
#100			5.1	6.8	5.4	0.149	57.0
#200			8.3	11.1	8.8	0.074	48.2
Pan			45.4	60.5	48.2		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	47.0	20.1		-3.76	43.2	0.0645	44.6
1	42.0	20.1		-3.76	38.2	0.0478	39.4
2	38.0	20.1		-3.76	34.2	0.0350	35.3
4	36.0	20.1		-3.76	32.2	0.0251	33.3
8	34.0	20.1		-3.76	30.2	0.0181	31.2
15	32.0	20.0		-3.77	28.2	0.0134	29.1
30	30.0	20.0		-3.77	26.2	0.0096	27.1
60	26.0	20.0		-3.77	22.2	0.0070	22.9
120	23.5	20.0		-3.77	19.7	0.0050	20.3
240	21.5	20.0		-3.77	17.7	0.0036	18.3
360	20.0	20.0		-3.77	16.2	0.0030	16.7
1440	18.0	19.9		-3.77	14.2	0.0015	14.7

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	**Client :**	Knight Plesold Ltd		**Test Pit :**	TP95-27	
Date :	02/11/95	**Project :**	Job No. 1623/1		**Sample :**		
Lab Work:	LL	**Location:**	Burnaby		**Depth :**		
	1ST SIEVING		Hydrometer (Minus #10)		Residual #200	1.5	
	Total Weight	4128.7	Before Wash	75.0	Total -200	45.3	
			After Wash	31.2	Gs	2.73	
Size (USS)	**Weight Retained**	**% Retained**	**Weight Retained**	**% Retained**	**% Retained Total**	**Diameter (mm)**	**% Passing**
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	122.4	3.0			3.0	**38.1**	**97.0**
1"	81.1	2.0			2.0	**25.4**	**95.1**
3/4"	146.7	3.6			3.6	**19.1**	**91.5**
1/2"	97.9	2.4			2.4	**12.7**	**89.1**
3/8"	134.4	3.3			3.3	**9.52**	**85.9**
#4	204.6	5.0			5.0	**4.76**	**80.9**
#10	344.3	8.3			8.3	**2.00**	**72.6**
#20			4.5	6.0	4.4	**0.840**	**68.2**
#40			5.0	6.7	4.8	**0.420**	**63.4**
#60			4.5	6.0	4.4	**0.250**	**59.0**
#100			5.6	7.5	5.4	**0.149**	**53.6**
#200			10.1	13.5	9.8	**0.074**	**43.8**
Pan			45.3	60.4	43.8		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	45.5	19.5		-3.84	41.7	**0.0665**	**39.6**
1	41.5	19.5		-3.84	37.7	**0.0488**	**35.8**
2	37.0	19.5		-3.84	33.2	**0.0358**	**31.5**
4	33.0	19.5		-3.84	29.2	**0.0261**	**27.7**
8	30.0	19.5		-3.84	26.2	**0.0189**	**24.9**
15	28.0	19.5		-3.84	24.2	**0.0140**	**23.0**
30	25.0	19.5		-3.84	21.2	**0.0101**	**20.1**
60	22.0	19.6		-3.83	18.2	**0.0073**	**17.3**
120	20.0	19.8		-3.80	16.2	**0.0052**	**15.4**
240	17.5	19.8		-3.80	13.7	**0.0038**	**13.0**
360	16.0	19.8		-3.80	12.2	**0.0031**	**11.6**
1440	14.0	20.0		-3.80	10.2	**0.0015**	**9.7**

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	**Client :**	Knight Piesold Ltd.		**Test Pit :**	TP95-31	
Date :	02/09/95	**Project :**	Job No. 1623/1		**Sample :**		
Lab Work:	LL	**Location:**	Burnaby		**Depth :**		
	1ST SIEVING		Hydrometer: (Minus #10)		Residual #200	0.5	
	Total Weight	2916.2	Before Wash	75.0	Total -200	42.9	
			After Wash	32.6	Gs	2.78	
Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	505.7	17.3			17.3	**38.1**	**82.7**
1"	284.0	9.7			9.7	**25.4**	**72.9**
3/4"	31.2	1.1			1.1	**19.1**	**71.9**
1/2"	148.2	5.1			5.1	**12.7**	**66.8**
3/8"	79.5	2.7			2.7	**9.52**	**64.0**
#4	158.8	5.4			5.4	**4.76**	**58.6**
#10	105.9	3.6			3.6	**2.00**	**55.0**
#20			6.1	8.1	4.5	**0.840**	**50.5**
#40			5.3	7.1	3.9	**0.420**	**46.6**
#60			5.0	6.7	3.7	**0.250**	**42.9**
#100			6.3	8.4	4.6	**0.149**	**38.3**
#200			9.2	12.3	6.7	**0.074**	**31.6**
Pan			42.9	57.2	31.4		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	44.0	20.1		-3.76	40.2	**0.0664**	**28.7**
1	39.0	20.1		-3.76	35.2	**0.0491**	**25.1**
2	35.0	20.1		-3.76	31.2	**0.0359**	**22.3**
4	31.0	20.1		-3.76	27.2	**0.0261**	**19.4**
8	28.0	20.1		-3.76	24.2	**0.0189**	**17.3**
15	26.0	20.0		-3.77	22.2	**0.0140**	**15.8**
30	24.0	20.0		-3.77	20.2	**0.0100**	**14.4**
60	20.0	20.0		-3.77	16.2	**0.0073**	**11.6**
120	18.0	20.0		-3.77	14.2	**0.0052**	**10.1**
240	16.0	20.0		-3.77	12.2	**0.0037**	**8.7**
360	15.0	20.0		-3.77	11.2	**0.0031**	**8.0**
1440	13.0	19.9		-3.77	9.2	**0.0015**	**6.6**

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	Client :	Knight Piesold Ltd.		Test Pit :	TP95-35	
Date :	02/09/95	Project :	Job No. 1623/1		Sample :		
Lab Work:	LL	Location:	Burnaby		Depth :		
	1ST SIEVING		Hydrometer: (Minus #10)		Residual #200	0.5	
	Total Weight	2546.3	Before Wash	75.0	Total -200	59.3	
			After Wash	16.2	Gs	2.78	
Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	**Diameter (mm)**	**% Passing**
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	0.0					**38.1**	**100.0**
1"	0.0					**25.4**	**100.0**
3/4"	0.0					**19.1**	**100.0**
1/2"	12.9	0.5			0.5	**12.7**	**99.5**
3/8"	13.2	0.5			0.5	**9.52**	**99.0**
#4	22.7	0.9			0.9	**4.76**	**98.1**
#10	19.2	0.8			0.8	**2.00**	**97.3**
#20			0.7	0.9	0.9	**0.840**	**96.4**
#40			1.0	1.3	1.3	**0.420**	**95.1**
#60			1.4	1.9	1.8	**0.250**	**93.3**
#100			3.4	4.5	4.4	**0.149**	**88.9**
#200			9.6	12.8	12.5	**0.074**	**76.4**
Pan			59.3	79.1	77.0		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	**Diameter (mm)**	% Passing
0.5	55.0	20.1		-3.76	51.2	**0.0593**	**64.7**
1	49.5	20.1		-3.76	45.7	**0.0445**	**57.7**
2	45.0	20.1		-3.76	41.2	**0.0329**	**52.0**
4	41.5	20.1		-3.76	37.7	**0.0240**	**47.6**
8	37.5	20.1		-3.76	33.7	**0.0176**	**42.6**
15	34.0	20.0		-3.77	30.2	**0.0132**	**38.1**
30	30.0	20.0		-3.77	26.2	**0.0096**	**33.1**
60	24.0	20.0		-3.77	20.2	**0.0071**	**25.5**
120	20.0	20.0		-3.77	16.2	**0.0051**	**20.5**
240	16.0	20.0		-3.77	12.2	**0.0037**	**15.4**
360	14.0	20.0		-3.77	10.2	**0.0031**	**12.9**
1440	12.0	19.9		-3.77	8.2	**0.0015**	**10.4**

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	**Client :**	Knight Piesold Ltd.		**Test Pit :**	TP95-37	
Date :	02/09/95	**Project :**	Job No. 1623/1		**Sample :**		
Lab Work:	LL	**Location:**	Burnaby		**Depth :**		
	1ST SIEVING		Hydrometer: (Minus #10)		Residual #200	0.2	
	Total Weight	1926.0	Before Wash	75.0	Total -200	41.9	
			After Wash	33.3	Gs	2.78	

Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	65.0	3.4			3.4	25.4	96.6
3/4"	35.1	1.8			1.8	19.1	94.8
1/2"	34.7	1.8			1.8	12.7	93.0
3/8"	43.1	2.2			2.2	9.52	90.8
#4	86.5	4.5			4.5	4.76	86.3
#10	63.2	3.3			3.3	2.00	83.0
#20			7.9	10.5	8.7	0.840	74.2
#40			6.4	8.5	7.1	0.420	67.2
#60			5.3	7.1	5.9	0.250	61.3
#100			5.2	6.9	5.8	0.149	55.5
#200			8.3	11.1	9.2	0.074	46.4
Pan			41.9	55.9	46.4		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	42.5	20.1		-3.76	38.7	0.0673	41.7
1	38.0	20.1		-3.76	34.2	0.0495	36.8
2	35.0	20.1		-3.76	31.2	0.0359	33.6
4	32.0	20.1		-3.76	28.2	0.0259	30.4
8	30.0	20.1		-3.76	26.2	0.0186	28.2
15	28.5	20.0		-3.77	24.7	0.0137	26.6
30	26.0	20.0		-3.77	22.2	0.0099	23.9
60	22.0	20.0		-3.77	18.2	0.0072	19.6
120	20.0	20.0		-3.77	16.2	0.0051	17.5
240	17.0	20.0		-3.77	13.2	0.0037	14.2
360	16.0	20.0		-3.77	12.2	0.0030	13.2
1440	13.0	19.9		-3.77	9.2	0.0015	9.9

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	**Client :**	Knight Piesold Ltd	**Test Pit :**	TP95-38
Date :	02/09/95	**Project :**	Job No. 1623/1	**Sample :**	
Lab Work:	LL	**Location:**	Burnaby	**Depth :**	

	1ST SIEVING		Hydrometer: (Minus #10)		Residual #200	0.1	
	Total Weight	2160.0	Before Wash	75.0	Total -200	70.3	
			After Wash	4.8	Gs	2.79	
Size (USS)	**Weight Retained**	**% Retained**	**Weight Retained**	**% Retained**	**% Retained Total**	**Diameter (mm)**	**% Passing**
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	0.0					**38.1**	**100.0**
1"	32.3	1.5			1.5	**25.4**	**98.5**
3/4"	11.4	0.5			0.5	**19.1**	**98.0**
1/2"	0.0					**12.7**	**98.0**
3/8"	7.4	0.3			0.3	**9.52**	**97.6**
#4	9.4	0.4			0.4	**4.76**	**97.2**
#10	11.0	0.5			0.5	**2.00**	**96.7**
#20			0.7	0.9	0.9	**0.840**	**95.8**
#40			0.6	0.8	0.8	**0.420**	**95.0**
#60			0.6	0.8	0.8	**0.250**	**94.2**
#100			0.8	1.1	1.0	**0.149**	**93.2**
#200			1.9	2.5	2.4	**0.074**	**90.8**
Pan			70.3	93.7	90.6		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	66.0	20.1		-3.76	62.2	**0.0511**	**77.9**
1	63.0	20.1		-3.76	59.2	**0.0377**	**74.1**
2	59.0	20.1		-3.76	55.2	**0.0282**	**69.1**
4	55.0	20.1		-3.76	51.2	**0.0209**	**64.1**
8	50.0	20.1		-3.76	46.2	**0.0156**	**57.9**
15	46.5	20.0		-3.77	42.7	**0.0118**	**53.5**
30	41.0	20.0		-3.77	37.2	**0.0088**	**46.6**
60	35.0	20.0		-3.77	31.2	**0.0065**	**39.1**
120	30.0	20.0		-3.77	26.2	**0.0048**	**32.8**
240	25.0	20.0		-3.77	21.2	**0.0035**	**26.6**
360	22.0	20.0		-3.77	18.2	**0.0029**	**22.8**
1440	15.0	19.9		-3.77	11.2	**0.0015**	**14.0**

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	**Client :**	Knight Piesold Ltd.		**Test Pit :**	TP95-39	
Date :	02/09/95	**Project :**	Job No. 1623/1		**Sample :**		
Lab Work:	LL	**Location:**	Burnaby		**Depth :**		
	1ST SIEVING		Hydrometer: (Minus #10)		Residual #200	0.7	
	Total Weight	1001.4	Before Wash	75.0	Total -200	44.3	
			After Wash	31.4	Gs	2.79	

Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	0.0					25.4	100.0
3/4"	0.0					19.1	100.0
1/2"	0.0					12.7	100.0
3/8"	0.0					9.52	100.0
#4	0.0					4.76	100.0
#10	0.0					2.00	100.0
#20			0.1	0.1	0.1	0.840	99.9
#40			0.3	0.4	0.4	0.420	99.5
#60			0.7	0.9	0.9	0.250	98.5
#100			9.3	12.4	12.4	0.149	86.1
#200			19.8	26.4	26.4	0.074	59.7
Pan			44.3	59.1	59.1		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	44.0	20.1		-3.76	40.2	0.0662	52.1
1	40.0	20.1		-3.76	36.2	0.0485	46.9
2	38.0	20.1		-3.76	34.2	0.0349	44.3
4	36.5	20.1		-3.76	32.7	0.0250	42.4
8	35.0	20.1		-3.76	31.2	0.0179	40.4
15	34.0	20.0		-3.77	30.2	0.0132	39.1
30	33.0	20.0		-3.77	29.2	0.0094	37.8
60	29.0	20.0		-3.77	25.2	0.0068	32.6
120	26.0	20.0		-3.77	22.2	0.0049	28.8
240	21.0	20.0		-3.77	17.2	0.0036	22.3
360	18.0	20.0		-3.77	14.2	0.0030	18.4
1440	12.5	19.9		-3.77	8.7	0.0015	11.3

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

Project No. 9521018
Date : 2/9/95

SPECIFIC GRAVITY OF SOILS
ASTM D 854-92

DETERMINATION NUMBER		1	2	3	4
BOTTLE NUMBER		1	3		
AIR REMOVAL METHOD		Vacuum	Vacuum		
WEIGHT OF BOTTLE , gm.		179.54	173.97		
INITIAL WEIGHT OF BOTTLE + SOIL, gm.		279.54	273.94		
INITIAL WEIGHT OF SOIL, gm		100.00	99.97		
WEIGHT OF BOTTLE + SOIL + WATER, gm.	W_1	741.29	735.22		
TEMPERATURE, °C	T	19.6	19.5		
WEIGHT OF BOTTLE + WATER, gm.	W_2	678.08	672.43		
EVAPORATING DISH NUMBER		7	17		
WEIGHT OF DISH + DRY SOIL, gm.		468.58	457.71		
WEIGHT OF DISH, gm.		370.20	359.46		
WEIGHT OF SOIL, gm.	W_s	98.38	98.25		
SPECIFIC GRAVITY OF WATER	G_T	0.9994	0.9994		
$G_T W_s$		98.32	98.19		
$W_1 - W_2$		63.21	62.80		
$W_s-(W_1-W_2)$		35.17	35.45		
SPECIFIC GRAVITY OF SOIL	**G_s**	**2.796**	**2.769**		

$G_S = (G_T \cdot W_S)/((W_S-(W_1-W_2))$ = 2.78 (average value)

REMARKS :
(1) Method A - Oven Dried Procedure
(2) Passing the #10 sieve (2.00 mm)

Test Pit: 95-7
Sample :
Depth :

Tested By : LL
Calculated By : LL
Checked By : LL

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

Project No. 9521018
Date : 2/14/95

SPECIFIC GRAVITY OF SOILS
ASTM D 854-92

DETERMINATION NUMBER		1	2	3	4
BOTTLE NUMBER		1	3		
AIR REMOVAL METHOD		Vacuum	Vacuum		
WEIGHT OF BOTTLE , gm.		179.54	173.97		
INITIAL WEIGHT OF BOTTLE + SOIL, gm.		279.54	273.97		
INITIAL WEIGHT OF SOIL, gm		100.00	100.00		
WEIGHT OF BOTTLE + SOIL + WATER, gm.	W_1	741.35	735.58		
TEMPERATURE, °C	T	19.9	19.4		
WEIGHT OF BOTTLE + WATER, gm.	W_2	678.06	672.43		
EVAPORATING DISH NUMBER		9	38		
WEIGHT OF DISH + DRY SOIL, gm.		470.84	457.10		
WEIGHT OF DISH, gm.		371.13	357.40		
WEIGHT OF SOIL, gm.	W_S	99.71	99.70		
SPECIFIC GRAVITY OF WATER	G_T	0.99825	0.99835		
$G_T W_s$		99.54	99.54		
$W_1 - W_2$		63.29	63.16		
$W_s-(W_1-W_2)$		36.42	36.55		
SPECIFIC GRAVITY OF SOIL	G_s	2.733	2.724		

$G_S = (G_T \cdot W_S)/((W_S-(W_1-W_2))$ = 2.73 (average value)

REMARKS :

(1) Method A - Oven Dried Procedure
(2) Passing the #10 sieve (2.00 mm)

Test Pit : TP95-27
Sample :
Depth :

Tested By : LL
Calculated By : LL
Checked By : LL

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

Project No. 9521018
Date : 2/9/95

SPECIFIC GRAVITY OF SOILS
ASTM D 854-92

DETERMINATION NUMBER		1	2	3	4
BOTTLE NUMBER		1	3		
AIR REMOVAL METHOD		Vacuum	Vacuum		
WEIGHT OF BOTTLE . gm.		179.54	173.97		
INITIAL WEIGHT OF BOTTLE + SOIL, gm.		279.54	273.97		
INITIAL WEIGHT OF SOIL, gm		100.00	100.00		
WEIGHT OF BOTTLE + SOIL + WATER, gm.	W_1	741.45	735.71		
TEMPERATURE,°C	T	20.3	20.4		
WEIGHT OF BOTTLE + WATER, gm.	W_2	678.02	672.33		
EVAPORATING DISH NUMBER		18	27		
WEIGHT OF DISH + DRY SOIL, gm.		464.33	451.53		
WEIGHT OF DISH, gm.		365.41	352.61		
WEIGHT OF SOIL, gm.	W_s	98.92	98.92		
SPECIFIC GRAVITY OF WATER	G_T	0.9994	0.9994		
G_TW_s		98.86	98.86		
$W_1 - W_2$		63.43	63.38		
$W_s-(W_1-W_2)$		35.49	35.54		
SPECIFIC GRAVITY OF SOIL	**G_s**	**2.786**	**2.782**		

$G_S = (G_T \cdot W_S)/((W_S-(W_1-W_2))$ = 2.78 (average value)

REMARKS :

(1) Method A - Oven Dried Procedure
(2) Passing the #10 sieve (2.00 mm)

Test Pit: 95-35
Sample :
Depth :

Tested By : LL
Calculated By : LL
Checked By : LL

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

Project No. 9521018
Date : 2/9/95

SPECIFIC GRAVITY OF SOILS
ASTM D 854-92

DETERMINATION NUMBER		1	2	3	4
BOTTLE NUMBER		1	3		
AIR REMOVAL METHOD		Vacuum	Vacuum		
WEIGHT OF BOTTLE , gm.		179.54	173.97		
INITIAL WEIGHT OF BOTTLE + SOIL, gm.		279.54	273.97		
INITIAL WEIGHT OF SOIL, gm		100.00	100.00		
WEIGHT OF BOTTLE + SOIL + WATER, gm.	W_1	740.95	735.26		
TEMPERATURE, °C	T	20.3	20.0		
WEIGHT OF BOTTLE + WATER, gm.	W_2	678.01	672.38		
EVAPORATING DISH NUMBER		C	23		
WEIGHT OF DISH + DRY SOIL, gm.		292.50	458.26		
WEIGHT OF DISH, gm.		194.42	360.28		
WEIGHT OF SOIL, gm.	W_s	98.08	97.98		
SPECIFIC GRAVITY OF WATER	G_T	0.9994	0.9994		
G_TW_s		98.02	97.92		
$W_1 - W_2$		62.94	62.88		
$W_s-(W_1-W_2)$		35.14	35.10		
SPECIFIC GRAVITY OF SOIL	**G_s**	**2.789**	**2.790**		

$G_S = (G_T \cdot W_S)/((W_S-(W_1-W_2))$ = 2.79 (average value)

REMARKS :
(1) Method A - Oven Dried Procedure
(2) Passing the #10 sieve (2.00 mm)

Test Pit: 95-38
Sample :
Depth :

Tested By : LL
Calculated By : LL
Checked By : LL

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

Project No. **9521018**
Date : 2/9/95

SPECIFIC GRAVITY OF SOILS
ASTM D 854-92

DETERMINATION NUMBER		1	2	3	4
BOTTLE NUMBER		1	3		
AIR REMOVAL METHOD		Vacuum	Vacuum		
WEIGHT OF BOTTLE , gm.		179.54	173.97		
INITIAL WEIGHT OF BOTTLE + SOIL, gm.		279.54	273.97		
INITIAL WEIGHT OF SOIL, gm		100.00	100.00		
WEIGHT OF BOTTLE + SOIL + WATER, gm.	W_1	740.86	735.04		
TEMPERATURE, °C	T	20.0	20.0		
WEIGHT OF BOTTLE + WATER, gm.	W_2	678.05	672.38		
EVAPORATING DISH NUMBER		5	31		
WEIGHT OF DISH + DRY SOIL, gm.		220.97	209.10		
WEIGHT OF DISH, gm.		122.61	110.71		
WEIGHT OF SOIL, gm.	W_s	98.36	98.39		
SPECIFIC GRAVITY OF WATER	G_T	0.9994	0.9994		
G_TW_s		98.30	98.33		
$W_1 - W_2$		62.82	62.66		
$W_s-(W_1-W_2)$		35.54	35.73		
SPECIFIC GRAVITY OF SOIL	G_s	**2.766**	**2.752**		

$G_S = (G_T \cdot W_S)/((W_S-(W_1-W_2))$ = **2.76** (average value)

REMARKS :
(1) Method A - Oven Dried Procedure
(2) Passing the #10 sieve (2.00 mm)

Test Pit: 95-39
Sample :
Depth :

Tested By : LL
Calculated By : LL
Checked By : LL

Golder Associates

PROJECT No. 9521018 LAB No. 19

SITE LOCATION:
TP95-7

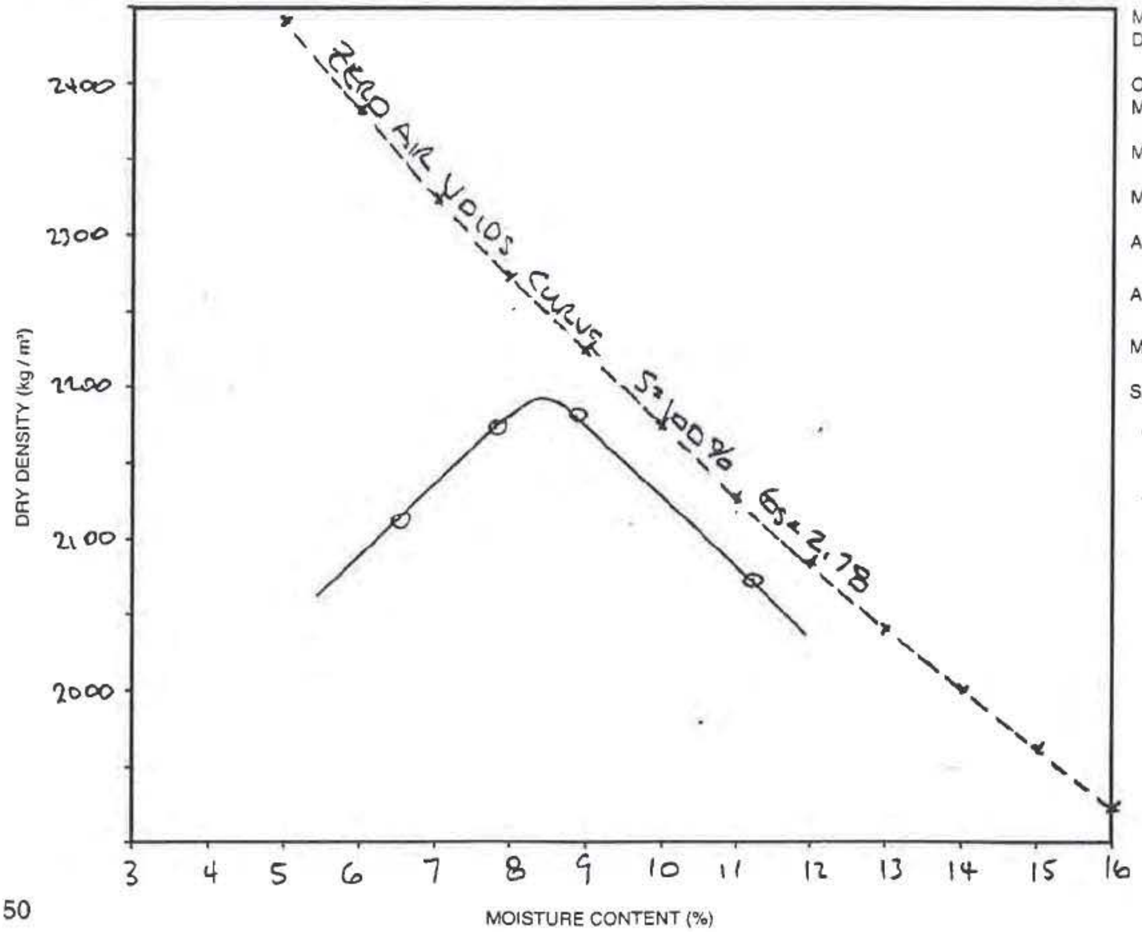
SOURCE:

DATE TESTED: JAN-25-95 BY: LC

MOISTURE DENSITY RELATIONSHIP (Modified)

DENSITY	TRIAL NO.	1	2	3	4	5	
	WT. OF SAMPLE WET + MOLD	10,517.7	10,394.6	10,598.0	10,660.7		
	WEIGHT OF MOLD	5618.4	5618.4	5618.4	5618.4	5618.4	
	WT. OF SAMPLE WET	4899.3	4776.2	4979.6	5042.3		
	WET DENSITY (kg / m³)	2306.6	2248.7	2344.4	2373.9		
	DRY DENSITY (kg / m³)	2074.3 ✓	2112.0 ✓	2175.2 ✓	2180.8 ✓		

MOISTURE CONTENT	MOISTURE ADDED	NAT	-	+	+		
	CONTAINER No.	23	17	7	23		
	WT. OF WET SOIL + TARE	1531.9	1083.4	1433.6	1710.3		
	WT. OF DRY SOIL + TARE	1414.4	1039.4	1356.9	1600.4		
	WEIGHT OF WATER	117.5	44.0	76.8	109.9		
	TARE WEIGHT	360.3	359.7	370.2	360.2		
	WEIGHT OF DRY SOIL	1054.1	679.7	986.6	1240.2		
	MOISTURE CONTENT (%)	11.2 ✓	6.47 ✓	7.78 ✓	8.86 ✓		



MAX. DRY DENSITY 2192 kg / m³

OPTIMUM MOISTURE 8.4 %

MOLD DIA. 15.24 cm

MOLD VOL. .002124 m³

ASTM D 698 ☐

ASTM D1557 ☑

METHOD C

SAMPLE DESCRIPTION:

% + 19 mm = 4.3 %

Gs = 2.78

✓ KGS Feb 14/95

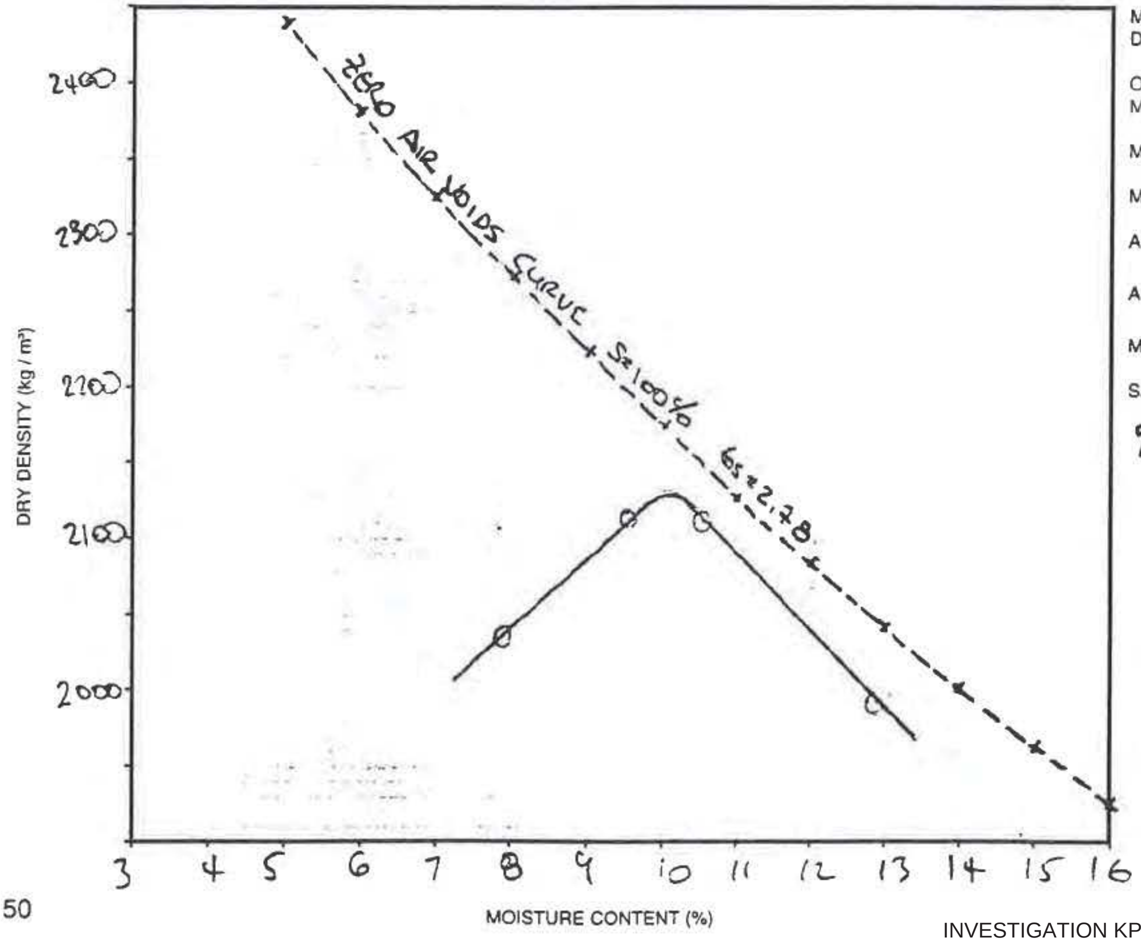
Golder Associates

PROJECT No. 9521018 LAB No. 19
SITE LOCATION:
TP95-18
SOURCE:
DATE TESTED: Feb-01-95 BY: L. Lee

MOISTURE DENSITY RELATIONSHIP (MODIFIED)

DENSITY	TRIAL NO.	1	2	3	4			
	WT. OF SAMPLE WET + MOLD	10,396.7	10,281.3	10,539.5	10,578.3			
	WEIGHT OF MOLD	5618.4	5618.4	5618.4	5618.4			
	WT. OF SAMPLE WET	4778.3	4662.9	4921.1	4959.9			
	WET DENSITY (kg / m³)	2249.7	2195.3	2316.9	2335.2			
	DRY DENSITY (kg / m³)	1992.6 ✓	2036.3 ✓	2114.5 ✓	2112.4 ✓			

MOISTURE CONTENT	MOISTURE ADDED	NAT	—					
	CONTAINER No.	148	191	232	110			
	WT. OF WET SOIL + TARE	412.4	312.1	376.6	400.7			
	WT. OF DRY SOIL + TARE	367.5	290.8	345.3	364.2			
	WEIGHT OF WATER	44.9	21.3	31.3	36.5			
	TARE WEIGHT	18.2	18.1	18.4	18.2			
	WEIGHT OF DRY SOIL	349.3	272.7	326.9	346.0			
	MOISTURE CONTENT (%)	12.9 ✓	7.81 ✓	9.57 ✓	10.55 ✓			



MAX. DRY DENSITY 2130 kg / m³
OPTIMUM MOISTURE 10.1 %
MOLD DIA. 15.24 cm
MOLD VOL. .002124 m³
ASTM D 698 ☐
ASTM D1557 ☑
METHOD C
SAMPLE DESCRIPTION:
% +19 mm = 0 %

Golder Associates

√ 1/24 Feb 14/95

PROJECT No. 9521018 LAB No. 19

SITE LOCATION: TP95-27

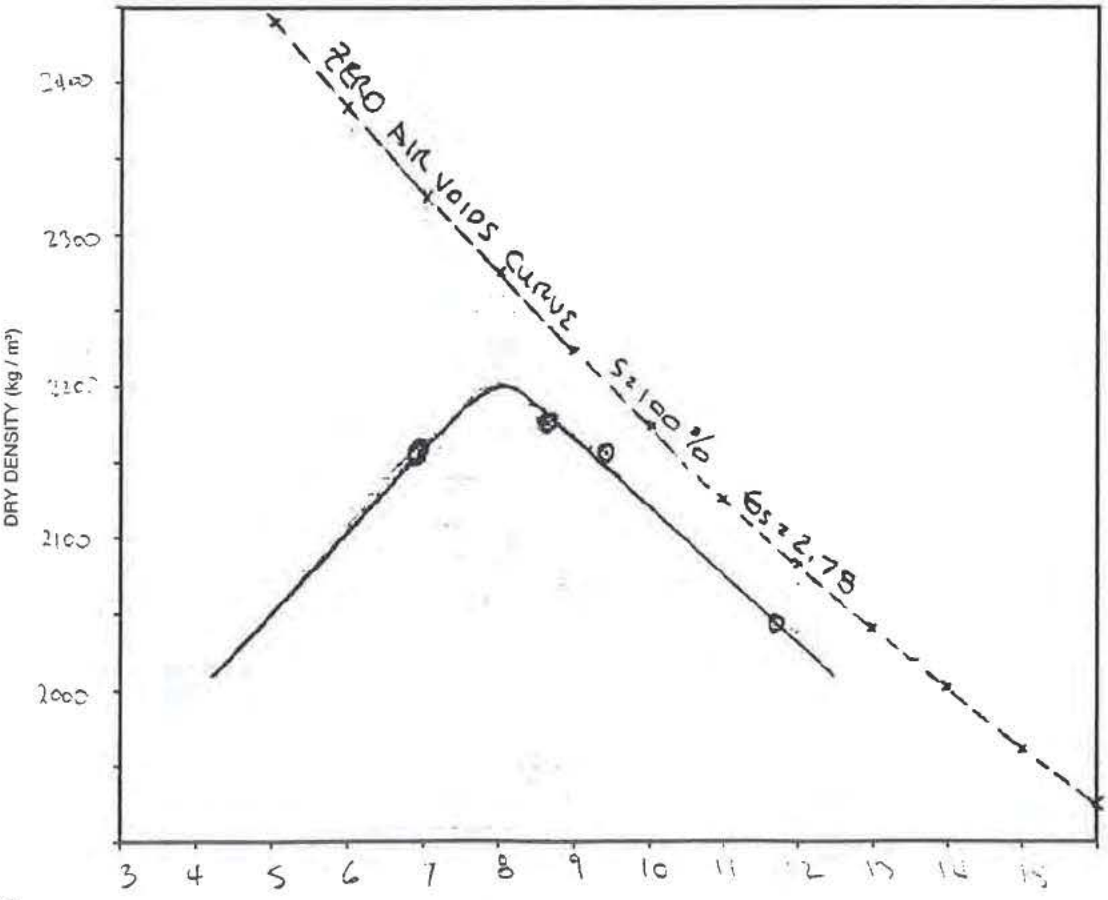
MOISTURE DENSITY RELATIONSHIP (MODIFIED)

SOURCE:

DATE TESTED: ~~JAN~~-23/95 BY: LL

DENSITY	TRIAL NO.	1	2	3	4	5		
	WT. OF SAMPLE WET + MOLD	10,473.6	10,637.8	10,633.3	10,520.4			
	WEIGHT OF MOLD	5618.4	5618.4	5618.4	5618.4			
	WT. OF SAMPLE WET	4855.2	5019.4	5014.9	4902.0			
	WET DENSITY (kg / m³)	2285.9	2363.2	2361.1	2307.9			
	DRY DENSITY (kg / m³)	2046.4 ✓	2176.1 ✓	2158.2 ✓	2158.9 ✓			

MOISTURE CONTENT	MOISTURE ADDED	NAT	- -	—				
	CONTAINER No.	13	25	34	7			
	WT. OF WET SOIL + TARE	1483.3	1312.2	1295.4	1287.2			
	WT. OF DRY SOIL + TARE	1366.1	1237.0	1214.7	1228.0			
	WEIGHT OF WATER	117.2	75.2	80.7	59.2			
	TARE WEIGHT	364.7	362.4	353.5	370.1			
	WEIGHT OF DRY SOIL	1001.4	874.6	861.2	857.9			
	MOISTURE CONTENT (%)	11.7 ✓	8.60 ✓	9.4 ✓	6.9 ✓			



MAX. DRY DENSITY 2200 kg / m³

OPTIMUM MOISTURE 8.0 %

MOLD DIA. 15.24 cm

MOLD VOL. .002124 m³

ASTM D 698 ☐

ASTM D1557 ☑

METHOD C

SAMPLE DESCRIPTION:

% + 19mm = ______

Golder Associates

Typed Feb 14/95

PROJECT No. 9521018 LAB No. ______

SITE LOCATION: TP95-31

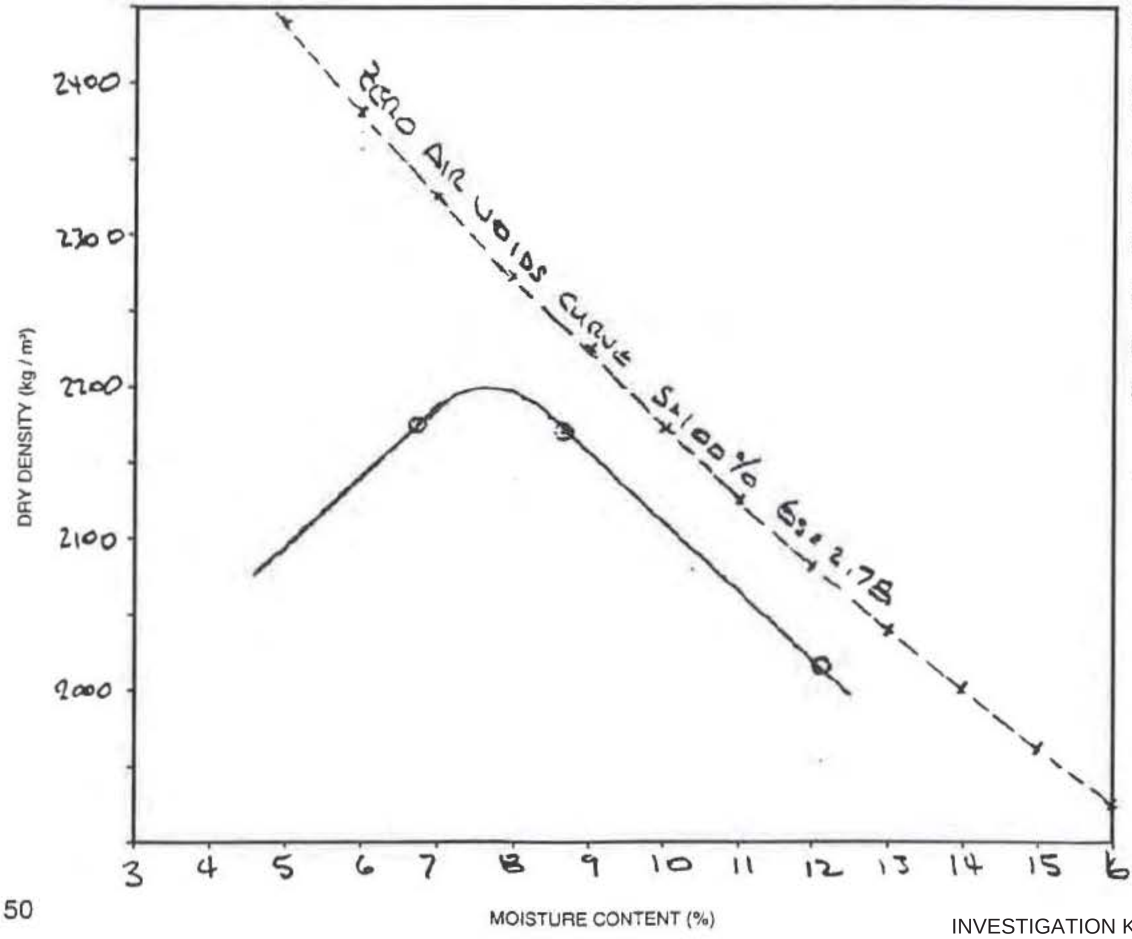
SOURCE: ______

DATE TESTED: Feb-02-95 BY: LC

MOISTURE DENSITY RELATIONSHIP (Modified)

DENSITY	TRIAL NO.	1	2	3	4			
	WT. OF SAMPLE WET + MOLD	10,424.6	10,631.1	10,551.5				
	WEIGHT OF MOLD	5618.4	5618.4	5618.4	5618.4			
	WT. OF SAMPLE WET	4806.2	5012.7	4933.1				
	WET DENSITY (kg / m³)	2262.8	2360.0	2322.6				
	DRY DENSITY (kg / m³)	2018.6	2172.7	2178.1				

MOISTURE CONTENT	MOISTURE ADDED	NAT	-	- -				
	CONTAINER No.	399	250	250				
	WT. OF WET SOIL + TARE	595.9	768.3	1075.8				
	WT. OF DRY SOIL + TARE	533.4	715.6	1015.4				
	WEIGHT OF WATER	62.5	52.7	60.4				
	TARE WEIGHT	17.6	104.1	104.1				
	WEIGHT OF DRY SOIL	515.8	611.5	911.3				
	MOISTURE CONTENT (%)	12.1 ✓	8.62 ✓	6.63 ✓				



MAX. DRY DENSITY 2200 kg / m³

OPTIMUM MOISTURE 7.6 %

MOLD DIA. 15.24 cm

MOLD VOL. .002124 m³

ASTM D 698 ☐

ASTM D1557 ☑

METHOD C

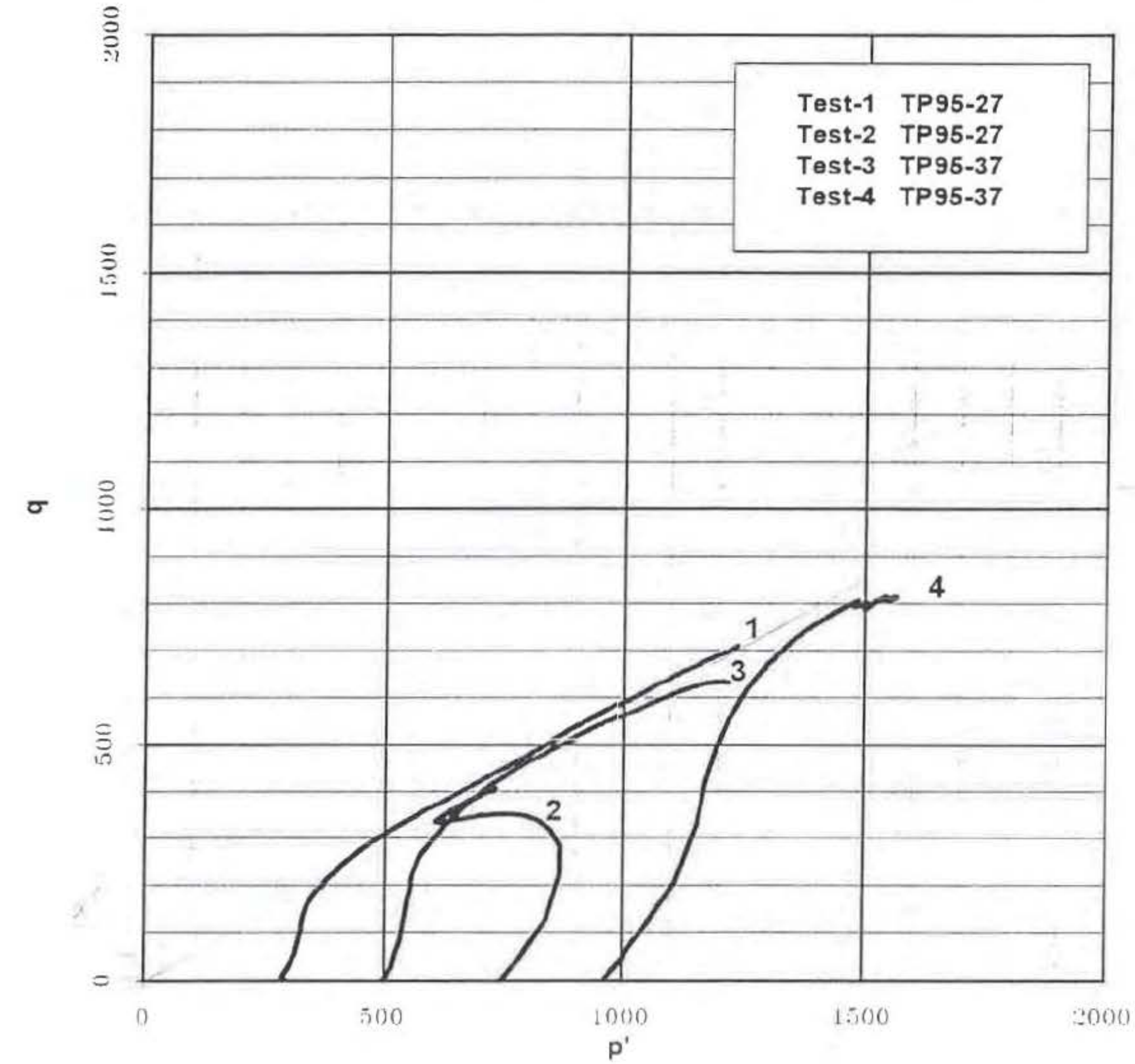
SAMPLE DESCRIPTION:

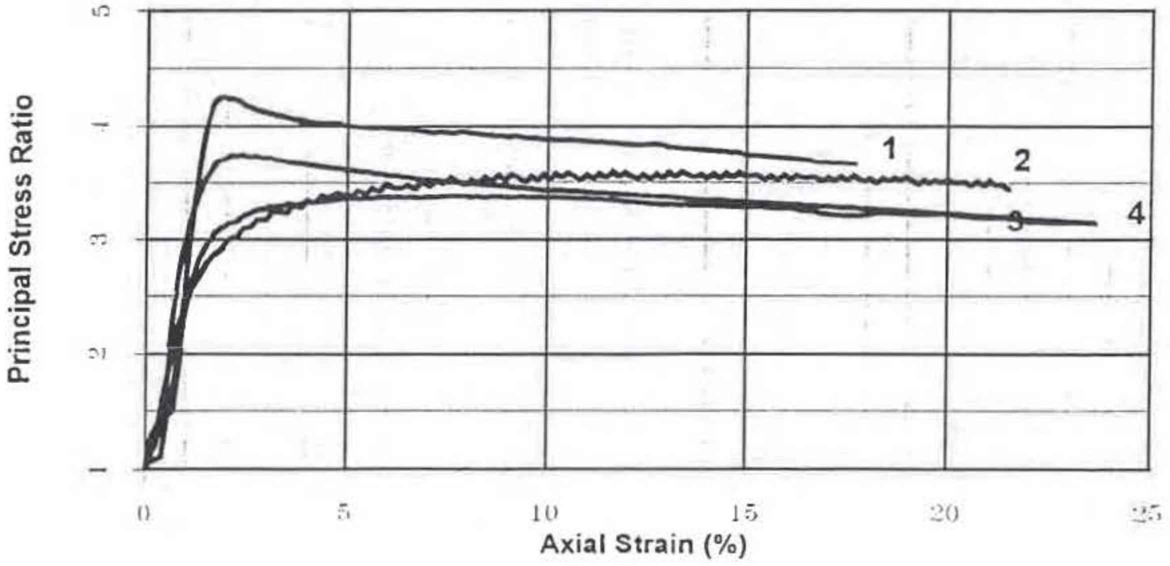
% + 19 mm = 28.1 %

γ_{dry} corrected: 2337 kg

Consolidated Undrained Triaxial Compression Test on Cohesive Soils
ASTM D 4767-88

Figure



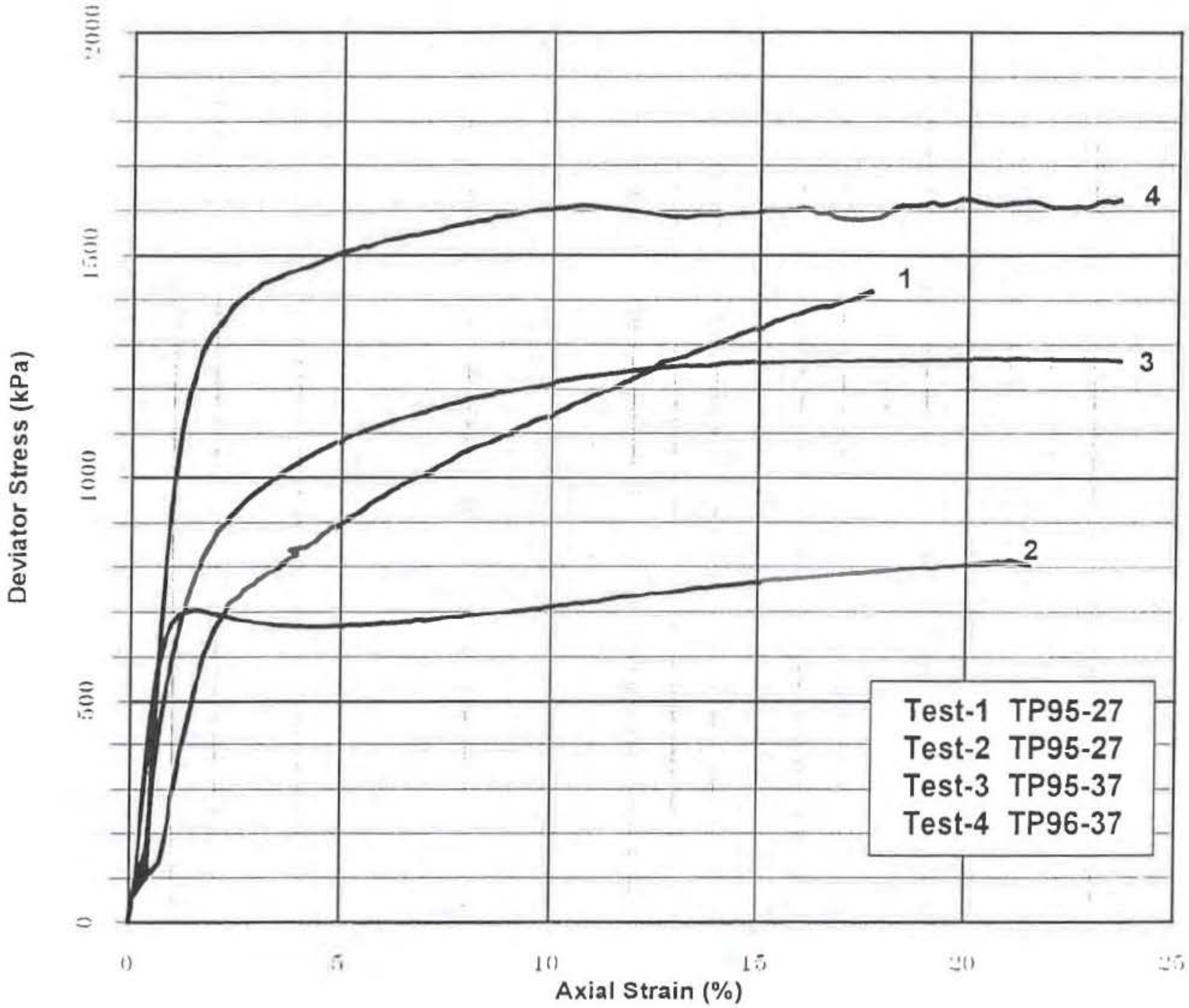


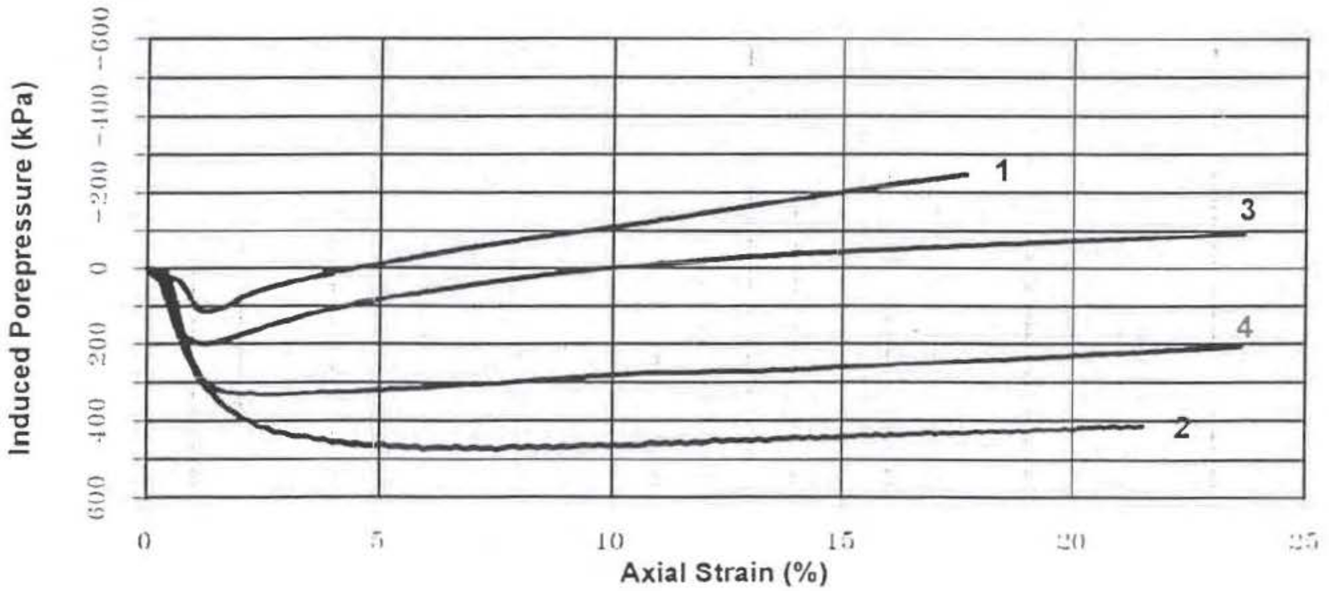
PROJECT No. 95210 DRAWN LL REVIEWED DATE 02/27/95

Golder Associates

Consolidated Undrained Triaxial Compression Test on Cohesive Soils
ASTM D 4767-88

Figure





PROJECT No 95210 DRAWN LL REVIEWED DATE 02/27/95

Golder Associates

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

Consolidated Undrained Triaxial Compression Test on Cohesive Soils

ASTM D 4767 - 88

								Strength Results:				**Density: (Kg/M³)**	
PROJECT#	9421897-5040	L_o =	14.68	cm	DATE:	20-Feb-95		Max.σ_D' =	1415.6	kPa		γ_i =	2168
Test Pit	TP95-27	A_o =	44.76	cm²	FILE:	3+250.XLS		Strain @ =	17.66	%		γ_f =	2207
Sample		V_o =	657.1	cm³	TEST#	CIU-1		**Max. PSR =**	4.25			E_i =	0.259
Depth								Strain @ =	1.85	%		E_f =	0.237
REMARKS:		Consolidation Pressure:			CALIBRATIONS:			Consolidation Results:				Water Contents:	
- Failure Mode Bulging		CP =	771.3	kPa	LOAD =	0.0036	kN/mV	δV_c =	11.8	cc		W_i =	7.9
- Minus 19.5 mm material		BP =	484.4	kPa	PORE =	0.6895	kPa/mV	T_{100} =	26.0	min		W_f =	9.7
- Corrections applied for membrane		σ_{3c}' =	287.4	kPa	LVDT =	0.0285	mm/mV	C_v =	2.7E-02	cm²/s			
		B_{VALUE} =	0.965		Feed Rate =	0.010	mm/min						

δL	LOAD	δU	ε	LOAD	A_c	σ_D	δU	σ_3'	σ_1'	PSR	A	p'	q
(mV)	(mV)	(mV)	(%)	(kN)	(cm²)	(kPa)	(kPa)	(kPa)	(kPa)			(kPa)	(kPa)
139.4	108.7	-702.2	0.00	0.00	44.76	0.0	0.0	287.4	287.4	1.00		287.4	0.0
143.2	169.1	-715.2	0.07	0.22	44.79	48.6	9.0	278.4	327.0	1.17	0.18	302.7	24.3
147.9	205.0	-723.3	0.16	0.35	44.83	77.3	14.5	272.9	350.1	1.28	0.19	311.5	38.6
153.4	231.1	-733.1	0.27	0.44	44.88	98.1	21.3	266.1	364.2	1.37	0.22	315.1	49.0
158.9	242.6	-738.3	0.38	0.48	44.93	107.1	24.9	262.5	369.6	1.41	0.23	316.1	53.6
164.1	244.8	-737.8	0.48	0.49	44.97	108.8	24.5	262.9	371.6	1.41	0.23	317.2	54.4
169.2	258.4	-742.0	0.58	0.54	45.02	119.4	27.4	260.0	379.4	1.46	0.23	319.7	59.7
175.4	276.8	-750.8	0.70	0.61	45.07	134.0	33.5	253.9	387.9	1.53	0.25	320.9	67.0
179.6	315.2	-765.7	0.78	0.74	45.11	164.5	43.8	243.6	408.1	1.68	0.27	325.9	82.2
185.3	378.8	-796.2	0.89	0.97	45.16	214.9	64.8	222.6	437.5	1.97	0.30	330.1	107.5
189.2	452.9	-830.2	0.97	1.24	45.19	273.8	88.3	199.1	472.9	2.37	0.32	336.0	136.9
195.7	526.6	-857.8	1.09	1.50	45.25	322.0	107.3	180.1	512.1	2.84	0.32	346.1	166.0
200.4	590.0	-869.3	1.18	1.73	45.29	382.1	115.2	172.2	554.3	3.22	0.30	363.2	191.0
206.1	650.8	-872.6	1.29	1.95	45.34	429.8	117.5	169.9	599.7	3.53	0.27	384.8	214.9
211.5	708.5	-871.7	1.40	2.16	45.39	475.1	116.9	170.5	645.6	3.79	0.25	408.1	237.6
216.7	764.5	-866.0	1.50	2.36	45.44	518.9	112.9	174.5	693.4	3.97	0.22	433.9	259.5
223.1	820.1	-858.4	1.62	2.56	45.50	562.2	107.7	179.7	741.9	4.13	0.19	460.8	281.1
228.3	868.5	-848.1	1.73	2.74	45.54	599.9	100.6	186.8	786.7	4.21	0.17	486.7	299.9
234.7	907.3	-833.0	1.85	2.88	45.60	629.7	93.6	193.8	823.4	4.25	0.15	508.6	314.8
240.0	938.8	-826.7	1.95	2.99	45.65	653.8	85.9	201.5	855.4	4.24	0.13	528.5	326.9
245.2	964.9	-816.2	2.05	3.08	45.69	673.7	78.6	208.8	882.5	4.23	0.12	545.6	336.8
251.1	989.1	-807.9	2.17	3.17	45.75	691.9	72.9	214.5	906.4	4.23	0.11	560.4	345.9
256.3	1009.3	-799.5	2.27	3.24	45.80	707.0	67.2	220.2	927.2	4.21	0.09	573.7	353.5
261.3	1023.9	-793.4	2.37	3.29	45.84	717.7	62.9	224.5	942.2	4.20	0.09	583.4	358.8
267.2	1036.0	-786.6	2.48	3.34	45.89	726.3	58.2	229.2	955.5	4.17	0.08	592.4	363.1
272.9	1047.3	-781.4	2.59	3.38	45.95	734.3	54.6	232.8	967.1	4.15	0.07	599.9	367.1
277.5	1060.3	-775.6	2.68	3.43	45.99	742.7	50.7	236.7	980.4	4.14	0.07	608.5	371.3
283.6	1071.5	-770.5	2.80	3.47	46.05	751.5	47.1	240.3	991.8	4.13	0.06	616.1	375.8
289.6	1081.3	-766.1	2.91	3.50	46.10	758.2	44.1	243.3	1001.6	4.12	0.06	622.5	379.1
294.6	1093.0	-761.0	3.01	3.54	46.15	766.5	40.5	246.9	1013.4	4.11	0.05	630.1	383.3
300.8	1103.7	-757.2	3.13	3.58	46.20	773.9	37.9	249.5	1023.3	4.10	0.05	636.4	386.9
304.9	1113.5	-752.4	3.21	3.62	46.24	780.8	34.6	252.8	1033.6	4.09	0.04	643.2	390.4
312.7	1123.4	-749.0	3.36	3.65	46.31	787.2	32.3	255.1	1042.4	4.09	0.04	648.7	393.6
317.3	1132.3	-744.3	3.45	3.69	46.36	793.4	29.0	258.4	1051.7	4.07	0.04	655.1	396.7
322.6	1144.0	-739.8	3.56	3.73	46.41	801.6	25.9	261.5	1063.0	4.07	0.03	662.3	400.8
327.6	1152.3	-736.3	3.65	3.76	46.45	807.1	23.5	263.9	1071.0	4.06	0.03	667.5	403.6
332.7	1162.4	-731.8	3.75	3.79	46.50	814.1	20.4	267.0	1081.1	4.05	0.03	674.0	407.0
339.6	1172.6	-728.5	3.89	3.83	46.57	820.8	18.1	269.3	1090.0	4.05	0.02	679.7	410.4
344.0	1180.9	-723.8	3.97	3.86	46.61	826.4	14.9	272.5	1098.9	4.03	0.02	685.7	413.2
348.6	1190.0	-720.6	4.06	3.89	46.65	834.9	12.7	274.7	1109.6	4.04	0.02	692.2	417.5
353.8	1201.4	-716.2	4.16	3.93	46.70	840.5	9.7	277.7	1118.2	4.03	0.01	698.0	420.2
359.7	1212.6	-711.8	4.28	3.97	46.76	848.1	6.6	280.8	1128.8	4.02	0.01	704.8	424.0
365.1	1222.0	-708.5	4.38	4.01	46.81	854.3	4.3	283.1	1137.4	4.02	0.01	710.2	427.2
370.7	1235.0	-704.5	4.49	4.05	46.86	863.3	1.6	285.8	1149.1	4.02	0.00	717.4	431.6
375.9	1247.1	-701.1	4.59	4.10	46.91	871.6	-0.8	288.2	1159.8	4.02	0.00	724.0	435.8
380.7	1255.8	-697.0	4.68	4.13	46.96	877.4	-3.6	291.0	1168.4	4.02	0.00	729.7	438.7
385.5	1268.1	-693.7	4.78	4.17	47.00	885.9	-5.8	293.2	1179.1	4.02	-0.01	736.2	442.9
390.7	1276.0	-689.4	4.88	4.20	47.05	890.9	-8.8	296.2	1187.2	4.01	-0.01	741.7	445.5
395.7	1284.5	-685.5	4.97	4.23	47.10	896.5	-11.5	298.9	1195.4	4.00	-0.01	747.2	448.2
403.0	1293.0	-682.5	5.12	4.26	47.17	901.8	-13.5	300.9	1202.5	4.00	-0.01	751.7	450.9
407.6	1302.6	-678.5	5.21	4.30	47.21	908.0	-16.3	303.7	1211.7	3.99	-0.02	757.7	454.0
412.3	1309.8	-675.4	5.30	4.32	47.26	912.6	-18.5	305.9	1218.4	3.98	-0.02	762.2	456.3
418.3	1318.7	-671.7	5.41	4.36	47.32	918.2	-21.0	308.4	1226.6	3.98	-0.02	767.5	459.1
423.2	1325.5	-669.0	5.51	4.39	47.37	924.6	-22.9	310.3	1234.9	3.98	-0.02	772.6	462.3
428.4	1338.4	-665.0	5.61	4.43	47.42	931.1	-25.6	313.0	1244.2	3.97	-0.03	778.6	465.6
432.2	1348.4	-661.1	5.68	4.46	47.45	937.9	-28.3	315.7	1253.7	3.97	-0.03	784.7	469.0
437.9	1359.3	-658.4	5.79	4.50	47.51	945.0	-30.2	317.6	1262.6	3.98	-0.03	790.1	472.5
443.9	1368.2	-654.8	5.91	4.53	47.57	950.6	-32.7	320.1	1270.6	3.97	-0.03	795.4	475.3
449.2	1376.8	-652.1	6.01	4.57	47.62	956.0	-34.5	321.9	1277.9	3.97	-0.04	799.9	478.0
454.5	1386.6	-648.6	6.12	4.60	47.67	962.4	-37.0	324.4	1286.8	3.97	-0.04	805.6	481.2
459.5	1395.4	-646.1	6.21	4.63	47.72	967.9	-38.7	326.1	1294.0	3.97	-0.04	810.0	483.9
464.9	1404.3	-642.5	6.32	4.66	47.78	973.4	-41.2	328.6	1302.0	3.96	-0.04	815.3	486.7
469.7	1414.7	-639.1	6.41	4.70	47.82	980.3	-43.5	330.9	1311.2	3.96	-0.04	821.0	490.1
475.3	1422.9	-636.3	6.52	4.73	47.88	985.2	-45.1	332.5	1317.7	3.96	-0.05	825.1	492.6
479.7	1428.8	-633.4	6.61	4.75	47.92	988.7	-47.4	334.8	1323.6	3.95	-0.05	829.2	494.4
484.1	1438.1	-630.9	6.69	4.79	47.97	994.8	-49.2	336.6	1331.3	3.96	-0.05	833.9	497.4
489.8	1445.4	-627.7	6.80	4.81	48.02	999.0	-51.4	338.8	1337.8	3.95	-0.05	838.3	499.5
495.3	1450.2	-625.5	6.91	4.83	48.08	1001.4	-52.9	340.3	1341.7	3.94	-0.05	841.0	500.7
500.2	1459.1	-622.2	7.00	4.86	48.13	1007.0	-55.2	342.6	1349.5	3.94	-0.05	846.1	503.5

δL	LOAD	δU	E	LOAD	A_c	σ_D'	δU	σ_3'	σ_1'	PSR	A	p'	q
(mV)	(mV)	(mV)	(%)	(kN)	(cm^2)	(kPa)	(kPa)	(kPa)	(kPa)			(kPa)	(kPa)
505.7	1466.6	-619.0	7.11	4.89	48.18	1011.4	-57.4	344.8	1356.1	3.93	-0.06	850.5	505.7
510.6	1475.2	-616.8	7.21	4.92	48.23	1016.7	-58.9	346.3	1363.0	3.94	-0.06	854.6	508.4
515.7	1484.7	-613.8	7.30	4.95	48.28	1022.7	-61.0	348.4	1371.0	3.94	-0.06	859.7	511.3
521.0	1492.2	-611.9	7.41	4.98	48.34	1027.1	-62.3	349.7	1376.7	3.94	-0.06	863.2	513.5
526.6	1500.2	-608.9	7.52	5.01	48.39	1031.6	-64.3	351.7	1383.5	3.93	-0.06	867.5	515.8
531.1	1507.7	-605.8	7.60	5.04	48.44	1036.2	-66.5	353.9	1390.2	3.93	-0.06	872.0	518.1
536.7	1517.7	-603.9	7.71	5.07	48.50	1042.5	-67.8	355.2	1397.6	3.94	-0.07	876.4	521.2
541.2	1527.9	-600.9	7.80	5.11	48.54	1049.0	-69.8	357.2	1406.2	3.94	-0.07	881.7	524.5
546.2	1536.6	-598.5	7.90	5.14	48.59	1054.2	-71.5	358.9	1413.1	3.94	-0.07	886.0	527.1
551.8	1541.8	-595.9	8.01	5.16	48.65	1056.8	-73.3	360.7	1417.5	3.93	-0.07	889.1	528.4
556.5	1550.5	-592.5	8.10	5.19	48.70	1062.2	-75.6	363.0	1425.2	3.93	-0.07	894.1	531.1
562.1	1557.2	-590.8	8.21	5.21	48.76	1065.8	-76.8	364.2	1430.0	3.93	-0.07	897.1	532.9
567.5	1564.1	-587.7	8.31	5.24	48.81	1069.6	-78.9	366.3	1436.0	3.92	-0.07	901.1	534.8
572.1	1568.5	-585.6	8.40	5.26	48.86	1071.8	-80.4	367.8	1439.6	3.91	-0.08	903.7	535.9
577.9	1575.5	-582.6	8.51	5.28	48.92	1075.6	-82.5	369.9	1445.4	3.91	-0.08	907.7	537.8
583.1	1583.4	-580.7	8.61	5.31	48.97	1080.1	-83.8	371.2	1451.3	3.91	-0.08	911.2	540.1
588.4	1591.4	-577.5	8.72	5.34	49.03	1084.8	-86.0	373.4	1458.1	3.91	-0.08	915.8	542.4
592.4	1599.8	-574.7	8.79	5.37	49.07	1089.8	-87.9	375.3	1465.1	3.90	-0.08	920.2	544.9
599.2	1607.3	-572.7	8.93	5.40	49.14	1093.8	-89.3	376.7	1470.5	3.90	-0.08	923.5	546.9
603.8	1615.3	-569.5	9.01	5.42	49.19	1098.5	-91.5	378.9	1477.4	3.90	-0.08	928.2	549.3
609.0	1623.5	-567.6	9.12	5.45	49.25	1103.3	-92.7	380.1	1483.4	3.90	-0.08	931.7	551.7
614.4	1633.0	-564.8	9.22	5.49	49.30	1108.9	-94.7	382.1	1491.0	3.90	-0.09	936.6	554.4
619.2	1639.9	-562.3	9.31	5.51	49.35	1112.7	-96.5	383.9	1496.6	3.90	-0.09	940.2	556.4
624.2	1645.7	-559.7	9.41	5.53	49.41	1115.7	-98.3	385.7	1501.4	3.89	-0.09	943.5	557.9
629.4	1653.6	-556.7	9.51	5.56	49.46	1120.2	-100.2	387.7	1507.9	3.89	-0.09	947.8	560.1
634.0	1662.6	-554.6	9.60	5.59	49.51	1125.6	-101.8	389.2	1514.7	3.89	-0.09	952.0	562.8
639.9	1669.0	-551.7	9.72	5.62	49.57	1128.7	-103.8	391.2	1519.9	3.89	-0.09	955.5	564.4
651.1	1681.5	-546.5	9.93	5.68	49.69	1135.0	-107.4	394.8	1529.7	3.88	-0.09	962.2	567.5
661.8	1697.2	-542.3	10.14	5.72	49.81	1143.6	-110.3	397.7	1541.2	3.88	-0.10	969.4	571.8
671.7	1711.4	-536.8	10.33	5.77	49.91	1151.3	-114.0	401.4	1552.7	3.87	-0.10	977.1	575.6
682.5	1729.6	-532.7	10.54	5.84	50.03	1161.6	-116.9	404.3	1565.9	3.87	-0.10	985.1	580.8
692.9	1745.4	-527.1	10.74	5.89	50.14	1170.2	-120.7	408.1	1578.3	3.87	-0.10	993.2	585.1
702.6	1761.2	-522.4	10.93	5.95	50.25	1179.0	-124.0	411.4	1590.3	3.87	-0.11	1000.9	589.5
712.6	1775.5	-516.5	11.13	6.00	50.36	1186.5	-128.0	415.4	1601.9	3.86	-0.11	1008.7	593.2
723.2	1791.0	-512.5	11.33	6.06	50.48	1194.7	-130.5	418.2	1612.9	3.86	-0.11	1015.6	597.4
733.0	1804.8	-507.0	11.52	6.11	50.59	1201.9	-134.6	422.0	1623.9	3.85	-0.11	1022.9	600.9
743.5	1821.0	-502.4	11.72	6.15	50.70	1210.5	-137.8	425.2	1635.7	3.85	-0.11	1030.4	605.3
753.4	1834.5	-497.0	11.92	6.21	50.81	1217.3	-141.5	428.9	1646.2	3.84	-0.12	1037.6	608.7
762.4	1849.7	-492.0	12.09	6.27	50.91	1225.6	-144.9	432.3	1657.9	3.83	-0.12	1045.1	612.8
773.4	1866.0	-486.6	12.31	6.33	51.04	1234.0	-148.7	436.1	1670.0	3.83	-0.12	1053.1	617.0
782.6	1884.2	-482.1	12.49	6.39	51.14	1244.2	-151.8	439.2	1683.4	3.83	-0.12	1061.3	622.1
792.0	1909.3	-476.7	12.67	6.48	51.25	1259.1	-155.5	442.9	1702.0	3.84	-0.12	1072.5	629.6
802.3	1917.8	-471.7	12.87	6.51	51.37	1262.1	-158.9	446.3	1708.4	3.83	-0.13	1077.4	631.1
811.5	1928.0	-466.0	13.05	6.55	51.47	1266.5	-162.9	450.3	1716.8	3.81	-0.13	1083.5	633.3
822.1	1940.4	-461.7	13.25	6.59	51.59	1272.1	-165.8	453.2	1725.3	3.81	-0.13	1089.3	636.1
831.6	1955.0	-455.8	13.44	6.65	51.70	1279.5	-169.9	457.3	1736.8	3.80	-0.13	1097.0	639.7
841.6	1968.8	-451.5	13.63	6.70	51.82	1286.1	-172.9	460.3	1746.4	3.79	-0.13	1103.3	643.0
850.9	1983.2	-445.9	13.81	6.75	51.93	1293.3	-176.7	464.1	1757.4	3.79	-0.14	1110.8	646.6
860.7	1998.8	-441.3	14.00	6.80	52.04	1301.1	-179.9	467.3	1768.4	3.78	-0.14	1117.9	650.6
870.6	2014.3	-436.0	14.19	6.86	52.16	1308.8	-183.5	470.9	1779.8	3.78	-0.14	1125.4	654.4
880.5	2027.8	-431.1	14.39	6.91	52.28	1315.1	-186.9	474.3	1789.4	3.77	-0.14	1131.9	657.6
889.9	2042.4	-425.5	14.57	6.96	52.39	1322.2	-190.8	478.2	1800.4	3.77	-0.14	1139.3	661.1
899.9	2056.9	-420.6	14.76	7.01	52.51	1329.1	-194.2	481.6	1810.6	3.76	-0.15	1146.1	664.5
909.7	2070.0	-415.3	14.95	7.06	52.63	1334.9	-197.8	485.2	1820.2	3.75	-0.15	1152.7	667.5
918.8	2080.5	-410.5	15.13	7.10	52.74	1339.2	-201.1	488.5	1827.8	3.74	-0.15	1158.1	669.6
928.5	2098.8	-405.4	15.32	7.16	52.85	1348.6	-204.6	492.0	1840.7	3.74	-0.15	1166.4	674.3
939.1	2112.4	-400.4	15.52	7.21	52.98	1354.5	-208.1	495.5	1850.0	3.73	-0.15	1172.7	677.2
948.9	2127.4	-395.8	15.71	7.27	53.10	1361.5	-211.3	498.7	1860.2	3.73	-0.16	1179.4	680.8
958.5	2139.1	-390.6	15.90	7.31	53.22	1366.3	-214.8	502.2	1868.6	3.72	-0.16	1185.4	683.2
968.1	2151.4	-386.2	16.05	7.35	53.34	1371.5	-217.9	505.3	1876.8	3.71	-0.16	1191.0	685.7
978.4	2167.3	-381.2	16.29	7.41	53.46	1378.8	-221.3	508.7	1887.5	3.71	-0.16	1198.1	689.4
988.6	2177.6	-376.8	16.48	7.45	53.59	1382.4	-224.4	511.8	1894.1	3.70	-0.16	1202.9	691.2
998.8	2183.5	-372.1	16.66	7.47	53.72	1382.9	-227.8	515.0	1897.9	3.69	-0.16	1206.5	691.5
1008.4	2196.8	-366.7	16.87	7.52	53.84	1388.6	-231.3	518.7	1907.4	3.68	-0.17	1213.0	694.3
1018.7	2213.1	-363.0	17.07	7.58	53.97	1396.1	-233.9	521.3	1917.3	3.68	-0.17	1219.3	698.0
1028.9	2228.6	-357.9	17.27	7.63	54.10	1403.1	-237.4	524.8	1927.9	3.67	-0.17	1226.3	701.5
1038.7	2243.9	-354.1	17.46	7.69	54.22	1409.8	-240.0	527.4	1937.2	3.67	-0.17	1232.3	704.9
1049.0	2258.1	-349.4	17.66	7.74	54.35	1415.5	-243.3	530.8	1946.3	3.67	-0.17	1238.5	707.8

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

Consolidated Undrained Triaxial Compression Test on Cohesive Soils
ASTM D 4767 - 88

PROJECT# 9421897-5040
Test Pit TP95-27
Sample
Depth

REMARKS :
- Failure Mode Bulging
- Minus 19.5 mm material
- Corrections applied for membrane
- Corrections applied for filter paper

L_c = 15.21 cm
A_c = 44.20 cm^2
V_c = 672.4 cm^3

Consolidation Pressure :
CP = 1220.2 kPa
BP = 475.5 kPa
σ_{3c}' = 744.7 kPa
B_{VALUE} = 0.954

DATE : 27-Feb-95
FILE : 3i-750.XLS
TEST# CIU-2

CALIBRATIONS :
LOAD = 0.0423 kN/mV
PORE = 0.6895 kPa/mV
LVDT = 0.0285 mm/mV
Feed Rate = 0.024 mm/min

Strength Results :
Max.σ_c' = 812.3 kPa
Strain @ = 4.60 %
Max. PSR = 3.60
Strain @ = 3.66 %

Consolidation Results:
δV_c = 26.5 cc
T_{100} = 1.32 min
C_v = 2.3E-02 cm^2/s

Density: (Kg/M³)
γ_i = 2079
γ_f = 2161
E_i = 0.313
E_f = 0.264

Water Contents:
W_i = 7.6
W_f = 9.8

δL	LOAD	δU	E	LOAD	A_c	σ_D	δU	σ_3'	σ_1'	PSR	A	p'	q
(mV)	(mV)	(mV)	(%)	(kN)	(cm^2)	(kPa)	(kPa)	(kPa)	(kPa)			(kPa)	(kPa)
-174.3	14.3	-689.3	0.00	0.00	44.20	0.0	0.0	744.7	744.7	1.00		744.7	0.0
-166.5	22.4	-698.0	0.15	0.34	44.26	77.1	5.7	735.0	816.2	1.10	0.07	777.6	38.6
-157.6	41.9	-728.7	0.31	1.17	44.34	263.1	33.7	711.0	974.1	1.37	0.13	842.5	131.5
-148.8	61.3	-831.3	0.48	1.99	44.41	446.9	97.6	647.1	1094.0	1.69	0.22	870.6	223.4
-140.7	73.9	-918.5	0.63	2.52	44.48	566.1	157.7	587.0	1153.1	1.96	0.28	870.1	283.1
-130.9	81.6	-1003.1	0.81	2.84	44.56	637.5	216.0	528.7	1166.3	2.21	0.34	847.5	318.8
-121.4	85.6	-1064.9	0.99	3.01	44.64	674.5	258.6	486.1	1160.9	2.39	0.38	823.5	337.4
-112.5	87.7	-1123.2	1.16	3.10	44.72	693.5	298.8	445.9	1139.4	2.56	0.43	792.6	346.8
-102.3	88.6	-1160.3	1.35	3.14	44.80	700.4	324.4	420.3	1120.7	2.67	0.46	770.5	350.2
-93.1	89.1	-1197.7	1.52	3.16	44.88	703.4	350.2	394.5	1097.9	2.78	0.50	746.2	351.7
-83.8	88.9	-1222.2	1.69	3.15	44.96	700.5	367.1	377.6	1078.2	2.85	0.52	727.9	350.3
-73.7	88.5	-1239.3	1.88	3.14	45.05	695.7	379.2	365.5	1061.2	2.90	0.55	713.5	347.9
-64.9	88.5	-1264.6	2.05	3.13	45.12	693.7	356.3	348.4	1042.1	2.99	0.57	695.2	346.9
-54.7	88.1	-1274.8	2.24	3.12	45.21	689.2	403.2	341.5	1030.7	3.02	0.59	686.1	344.6
-46.1	87.8	-1294.8	2.40	3.11	45.28	685.1	417.1	327.6	1012.6	3.09	0.61	670.1	342.5
-36.0	87.5	-1300.4	2.59	3.09	45.37	680.5	421.0	323.7	1004.2	3.10	0.62	663.9	340.3
-27.5	87.5	-1317.4	2.75	3.09	45.45	679.3	432.7	312.0	991.3	3.18	0.64	651.6	339.7
-17.1	87.2	-1320.2	2.94	3.08	45.54	675.0	434.7	310.0	985.0	3.18	0.64	647.5	337.5
-7.4	87.2	-1333.0	3.13	3.08	45.62	674.4	443.5	301.2	975.6	3.24	0.66	638.4	337.2
1.2	87.0	-1335.2	3.29	3.07	45.70	671.1	445.0	299.7	970.7	3.24	0.66	635.2	335.5
11.5	86.8	-1335.6	3.46	3.07	45.79	668.0	445.3	299.4	967.4	3.23	0.67	633.4	334.0
20.3	87.0	-1347.1	3.65	3.07	45.87	668.5	453.2	291.5	960.0	3.29	0.68	625.7	334.2
30.5	86.9	-1345.5	3.84	3.07	45.96	666.3	452.1	292.6	958.9	3.28	0.68	625.7	333.1
39.4	87.1	-1356.7	4.00	3.08	46.04	666.9	459.8	284.9	951.7	3.34	0.69	618.3	333.4
49.5	87.0	-1354.1	4.19	3.07	46.13	664.4	458.0	286.7	951.0	3.32	0.69	618.8	332.2
58.7	87.4	-1364.6	4.36	3.09	46.21	666.2	465.3	279.4	945.6	3.38	0.70	612.5	333.1
67.2	87.4	-1361.0	4.52	3.09	46.29	665.0	462.8	281.9	946.9	3.36	0.70	614.4	332.5
77.8	87.6	-1369.0	4.72	3.10	46.39	666.2	468.3	276.4	942.6	3.41	0.70	609.5	333.1
87.4	87.8	-1366.3	4.90	3.11	46.48	666.0	466.8	277.9	943.9	3.40	0.70	610.9	333.0
96.8	87.8	-1362.3	5.08	3.11	46.56	665.3	464.0	280.7	946.0	3.37	0.70	613.3	332.7
105.4	88.3	-1371.4	5.24	3.13	46.64	667.8	470.0	274.7	942.6	3.43	0.70	608.7	333.9
115.8	88.3	-1366.5	5.43	3.13	46.74	667.0	466.7	278.0	945.0	3.40	0.70	611.5	333.5
124.9	88.7	-1374.8	5.60	3.14	46.82	668.7	472.3	272.4	941.1	3.45	0.71	606.7	334.4
134.5	88.8	-1369.8	5.78	3.15	46.91	668.5	468.9	275.8	944.4	3.42	0.70	610.1	334.3
143.5	89.3	-1378.4	5.95	3.17	47.00	671.7	474.8	269.9	941.6	3.49	0.71	605.8	335.9
153.5	89.4	-1373.0	6.14	3.18	47.09	671.5	471.1	273.6	945.3	3.45	0.70	609.5	335.8
162.4	89.7	-1372.4	6.31	3.19	47.17	672.5	470.7	274.0	946.6	3.45	0.70	610.3	336.3
172.3	90.0	-1375.8	6.49	3.20	47.27	674.2	473.0	271.7	945.9	3.48	0.70	608.8	337.1
181.9	90.2	-1370.0	6.67	3.21	47.36	674.2	469.0	275.7	949.9	3.45	0.70	612.8	337.1
191.0	90.8	-1378.0	6.84	3.23	47.44	678.6	474.5	270.2	948.8	3.51	0.70	609.5	339.3
200.3	90.8	-1371.8	7.02	3.23	47.53	677.0	470.2	274.5	951.4	3.47	0.69	612.9	338.5
209.6	91.2	-1379.6	7.19	3.25	47.62	679.6	475.6	269.1	948.7	3.53	0.70	608.9	339.8
218.8	91.5	-1373.6	7.36	3.26	47.71	680.9	471.5	273.2	954.1	3.49	0.69	613.7	340.5
228.5	92.0	-1380.4	7.55	3.29	47.81	684.0	476.2	268.5	952.5	3.55	0.70	610.5	342.0
237.2	92.2	-1374.6	7.71	3.29	47.89	684.0	472.3	272.4	956.3	3.51	0.69	614.4	342.0
247.0	92.4	-1368.8	7.89	3.30	47.98	684.8	468.2	276.5	961.3	3.48	0.68	618.9	342.4
256.4	93.1	-1375.6	8.07	3.33	48.08	688.8	472.9	271.8	960.6	3.53	0.69	616.2	344.4
265.1	93.3	-1369.2	8.23	3.34	48.16	689.4	468.4	276.3	965.6	3.50	0.68	621.0	344.7
274.6	93.8	-1376.4	8.41	3.36	48.26	692.7	473.4	271.3	964.0	3.55	0.68	617.6	346.3
282.7	94.0	-1369.8	8.56	3.37	48.34	692.7	468.9	275.8	968.5	3.51	0.68	622.2	346.3
292.5	94.6	-1376.6	8.74	3.39	48.43	696.5	473.5	271.2	967.6	3.57	0.68	619.4	348.2
301.4	94.7	-1370.0	8.91	3.40	48.52	696.4	469.0	275.7	972.1	3.53	0.67	623.9	348.2
310.4	95.3	-1375.2	9.08	3.42	48.61	700.1	472.6	272.1	972.2	3.57	0.68	622.2	350.0
318.8	95.5	-1370.4	9.24	3.43	48.70	701.0	469.3	275.4	976.5	3.55	0.67	625.9	350.5
328.7	95.8	-1364.2	9.42	3.44	48.80	701.7	465.0	279.7	981.4	3.51	0.66	630.5	350.8
337.0	96.3	-1370.4	9.58	3.47	48.88	704.9	469.3	275.4	980.3	3.56	0.67	627.9	352.4
345.5	96.5	-1363.4	9.74	3.48	48.97	705.6	464.4	280.3	985.8	3.52	0.66	633.0	352.8
354.2	97.1	-1370.2	9.90	3.50	49.05	709.0	469.1	275.6	984.6	3.57	0.66	630.1	354.5
363.0	97.4	-1363.4	10.07	3.51	49.14	709.8	464.4	280.3	990.1	3.53	0.65	635.2	354.9
371.0	97.9	-1369.8	10.22	3.53	49.23	712.8	468.9	275.8	988.7	3.58	0.66	632.3	356.4
380.1	98.0	-1363.2	10.39	3.54	49.32	712.9	464.3	280.4	993.2	3.54	0.65	636.8	356.4
388.4	98.7	-1366.2	10.54	3.57	49.41	717.2	467.8	276.9	994.1	3.59	0.65	635.5	358.6
397.1	98.8	-1363.2	10.70	3.57	49.50	716.8	464.3	280.4	997.2	3.56	0.65	638.8	358.4
405.2	99.1	-1356.7	10.86	3.59	49.58	718.3	459.8	284.9	1003.2	3.52	0.64	644.0	359.2
414.3	99.6	-1362.8	11.03	3.61	49.68	720.9	464.0	280.7	1001.6	3.57	0.64	641.1	360.4
422.7	100.0	-1355.7	11.18	3.62	49.76	722.6	459.1	285.6	1008.2	3.53	0.64	646.9	361.3
430.5	100.5	-1362.2	11.34	3.64	49.85	725.7	463.6	281.1	1006.8	3.58	0.64	643.9	362.8
439.2	100.7	-1355.1	11.49	3.65	49.94	726.4	458.7	286.0	1012.4	3.54	0.63	649.2	363.2
448.4	101.4	-1361.5	11.67	3.68	50.03	730.6	463.2	281.5	1012.1	3.60	0.63	646.8	365.1

δL	LOAD	δU	E	LOAD	A_c	σ_D'	δU	σ_3'	σ_1'	PSR	A	p'	q
(mV)	(mV)	(mV)	(%)	(kN)	(cm²)	(kPa)	(kPa)	(kPa)	(kPa)			(kPa)	(kPa)
456.7	101.6	-1354.9	11.82	3.69	50.12	730.8	458.6	286.1	1016.9	3.55	0.63	651.5	365.4
465.2	102.1	-1359.9	11.98	3.71	50.21	733.5	462.0	282.7	1016.1	3.59	0.63	649.4	366.7
472.6	102.3	-1354.5	12.12	3.72	50.29	734.3	458.3	286.4	1020.7	3.56	0.62	653.6	367.2
482.1	102.7	-1347.9	12.30	3.74	50.39	735.7	453.8	290.9	1026.6	3.53	0.62	658.8	367.9
490.1	103.3	-1353.7	12.45	3.76	50.48	739.6	457.8	286.9	1026.5	3.58	0.62	656.7	369.8
498.5	103.4	-1346.9	12.60	3.77	50.57	738.8	453.1	291.6	1030.5	3.53	0.61	661.0	369.4
507.3	103.9	-1353.1	12.77	3.79	50.67	741.5	457.3	287.4	1028.9	3.58	0.62	658.1	370.8
514.7	104.1	-1346.3	12.91	3.80	50.75	742.0	452.7	292.0	1034.1	3.54	0.61	663.0	371.0
523.9	104.6	-1352.7	13.08	3.82	50.85	745.1	457.1	287.6	1032.7	3.59	0.61	660.2	372.6
532.1	105.0	-1345.9	13.23	3.83	50.94	746.7	452.4	292.3	1039.0	3.55	0.61	665.7	373.4
540.7	105.5	-1351.1	13.35	3.86	51.03	749.7	456.0	288.7	1038.4	3.60	0.61	663.6	374.9
548.8	105.9	-1345.5	13.55	3.87	51.12	751.5	452.1	292.6	1044.1	3.57	0.60	668.4	375.8
557.2	106.2	-1341.4	13.70	3.89	51.22	752.6	449.3	295.4	1048.1	3.55	0.60	671.7	376.3
566.0	106.6	-1344.9	13.87	3.90	51.31	753.9	451.7	293.0	1046.9	3.57	0.60	670.0	377.0
574.3	107.0	-1338.0	14.02	3.92	51.41	755.5	446.9	297.8	1053.3	3.54	0.59	675.5	377.8
582.7	107.4	-1344.2	14.18	3.93	51.50	757.6	451.2	293.5	1051.1	3.58	0.60	672.3	378.8
591.3	107.5	-1337.2	14.34	3.94	51.60	756.7	446.4	298.3	1055.1	3.54	0.59	676.7	378.4
599.4	108.1	-1343.6	14.49	3.96	51.69	760.1	450.9	293.9	1054.0	3.59	0.59	674.0	380.1
608.3	108.3	-1337.0	14.66	3.98	51.79	760.9	446.2	298.5	1059.3	3.55	0.59	678.9	380.4
616.6	108.8	-1342.6	14.82	4.00	51.89	763.5	450.1	294.6	1058.1	3.59	0.59	676.3	381.7
624.9	109.1	-1336.4	14.97	4.01	51.98	764.1	445.8	298.9	1063.0	3.56	0.58	680.9	382.1
633.9	109.4	-1336.8	15.14	4.02	52.08	764.8	446.1	298.6	1063.4	3.56	0.58	681.0	382.4
642.2	109.9	-1335.8	15.30	4.04	52.18	767.4	445.4	299.3	1066.7	3.56	0.58	683.0	383.7
650.6	110.0	-1329.0	15.45	4.05	52.28	767.0	440.7	304.0	1070.9	3.52	0.57	687.5	383.5
659.3	110.5	-1335.2	15.62	4.07	52.38	769.1	445.0	299.7	1068.8	3.57	0.58	684.2	384.6
667.3	110.7	-1328.0	15.77	4.07	52.47	769.4	440.0	304.7	1074.1	3.53	0.57	689.4	384.7
676.2	111.2	-1334.4	15.93	4.10	52.57	771.8	444.5	300.2	1072.0	3.57	0.58	686.1	385.9
684.3	111.4	-1327.4	16.08	4.10	52.67	772.0	439.6	305.1	1077.1	3.53	0.57	691.1	386.0
691.9	111.8	-1333.2	16.23	4.12	52.76	773.9	443.6	301.1	1074.9	3.57	0.57	688.0	386.9
701.2	112.2	-1327.4	16.40	4.14	52.87	775.0	439.6	305.1	1080.0	3.54	0.57	692.6	387.5
709.6	112.5	-1327.8	16.56	4.15	52.97	776.3	439.9	304.8	1081.1	3.55	0.57	692.9	388.1
717.7	112.9	-1327.2	16.71	4.17	53.07	778.0	439.5	305.2	1083.2	3.55	0.56	694.2	389.0
725.7	113.1	-1320.2	16.86	4.18	53.16	778.3	434.7	310.0	1088.3	3.51	0.56	699.2	389.1
734.4	113.6	-1326.2	17.02	4.20	53.27	780.4	438.3	305.9	1086.4	3.55	0.56	696.1	390.2
742.4	113.9	-1319.4	17.17	4.21	53.36	781.4	434.1	310.6	1092.0	3.52	0.56	701.3	390.7
750.4	114.5	-1325.6	17.32	4.24	53.46	784.4	438.4	306.3	1090.7	3.56	0.56	698.5	392.2
758.1	114.5	-1319.2	17.47	4.24	53.55	783.0	434.0	310.7	1093.7	3.52	0.55	702.2	391.5
766.7	115.1	-1324.9	17.63	4.26	53.66	786.3	437.7	307.0	1093.3	3.56	0.56	700.2	393.2
774.6	115.4	-1319.2	17.78	4.27	53.75	786.8	434.0	310.7	1097.5	3.53	0.55	704.1	393.4
782.5	115.7	-1315.5	17.92	4.29	53.85	787.6	431.4	313.3	1100.9	3.51	0.55	707.1	393.8
790.4	116.1	-1318.8	18.07	4.30	53.95	789.2	433.7	311.0	1100.2	3.54	0.55	705.6	394.6
798.7	116.3	-1311.9	18.22	4.31	54.05	789.3	428.9	315.8	1105.1	3.50	0.54	710.4	394.7
806.0	116.8	-1318.2	18.36	4.33	54.14	792.2	433.3	311.4	1103.6	3.54	0.55	707.5	396.1
814.3	117.1	-1311.7	18.52	4.35	54.24	793.0	428.8	315.9	1108.9	3.51	0.54	712.4	396.5
822.0	117.7	-1317.4	18.66	4.37	54.34	795.7	432.7	312.0	1107.7	3.55	0.54	709.8	397.9
829.5	117.9	-1311.3	18.80	4.36	54.43	795.8	428.5	316.2	1112.0	3.52	0.54	714.1	397.9
837.7	118.3	-1315.5	18.94	4.39	54.54	797.2	431.4	313.3	1110.5	3.54	0.54	711.9	398.6
845.8	118.4	-1311.1	19.11	4.40	54.64	796.8	428.4	316.3	1113.1	3.52	0.54	714.7	398.4
853.5	118.6	-1304.7	19.25	4.41	54.74	797.0	424.0	320.7	1117.7	3.49	0.53	719.2	398.5
861.1	119.3	-1310.5	19.40	4.44	54.83	800.3	428.0	316.7	1117.0	3.53	0.53	716.9	400.2
869.1	119.4	-1304.1	19.55	4.44	54.94	800.0	423.6	321.1	1121.1	3.49	0.53	721.1	400.0
876.6	119.7	-1310.1	19.69	4.46	55.03	801.0	427.7	317.0	1118.0	3.53	0.53	717.5	400.5
884.8	120.0	-1303.7	19.84	4.47	55.14	801.4	423.3	321.4	1122.8	3.49	0.53	722.1	400.7
893.0	120.5	-1309.3	19.99	4.49	55.24	803.7	427.1	317.6	1121.2	3.53	0.53	719.4	401.8
900.7	120.7	-1303.5	20.14	4.50	55.34	803.5	423.1	321.6	1125.0	3.50	0.53	723.3	401.7
908.7	121.1	-1302.2	20.29	4.52	55.45	805.3	422.2	322.5	1127.7	3.50	0.52	725.1	402.6
916.7	121.6	-1303.1	20.44	4.54	55.55	807.4	422.9	321.8	1129.2	3.51	0.52	725.5	403.7
924.2	121.7	-1296.8	20.58	4.54	55.65	806.6	418.5	326.2	1132.8	3.47	0.52	729.5	403.3
932.6	122.3	-1302.9	20.74	4.57	55.76	809.3	422.7	322.0	1131.3	3.51	0.52	726.6	404.7
940.8	122.4	-1296.4	20.89	4.57	55.87	808.3	418.3	326.4	1134.8	3.48	0.52	730.6	404.2
948.6	123.1	-1302.0	21.04	4.60	55.97	812.3	422.1	322.6	1134.9	3.52	0.52	728.8	406.2
956.8	123.0	-1296.0	21.19	4.59	56.08	809.4	418.0	326.7	1136.1	3.48	0.52	731.4	404.7
964.9	122.7	-1299.8	21.34	4.58	56.19	805.9	420.6	324.1	1130.0	3.49	0.52	727.0	402.9
972.9	122.5	-1295.4	21.49	4.57	56.30	802.4	417.5	327.2	1129.6	3.45	0.52	728.4	401.2

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

Consolidated Undrained Triaxial Compression Test on Cohesive Soils
ASTM D 4767 - 88

									Strength Results :			**Density: (Kg/M³)**	
PROJECT#	9421897-5040	L_c =	15.35	cm	DATE :	27-Feb-95			Max. σ_d' =	1267.6	kPa	γ_t =	2072
Test Pit	TP95-37	A_c =	43.57	cm²	FILE :	3x-500.XLS			Strain @ =	21.14	%	γ_f =	2183
Sample		V_c =	669.0	cm³	TEST#	CIU-3			Max. PSR =	3.74		E_i =	0.342
Depth									Strain @ =	2.09	%	E_f =	0.274
REMARKS :		**Consolidation Pressure :**			**CALIBRATIONS :**				**Consolidation Results:**			**Water Contents:**	
- Failure Mode Bulging		CP =	979.0	kPa	LOAD =	0.0423	kN/mV		δV_c =	35.9	cc	W_i =	9.3
- Minus 19.5 mm material		BP =	480.6	kPa	PORE =	0.6895	kPa/mV		T_{100} =	40.3	min	W_f =	9.8
- Corrections applied for membrane		σ_{3c}' =	498.4	kPa	LVDT =	0.0285	mm/mV		C_v =	7.4E-04	cm²/s		
- Corrections applied for filter paper		B_{VALUE} =	0.985		Feed Rate =	0.024	mm/min						

δL (mV)	LOAD (mV)	δU (mV)	ε (%)	LOAD (kN)	A_c (cm²)	σ_d (kPa)	δU (kPa)	σ_3' (kPa)	σ_1' (kPa)	PSR	A	p' (kPa)	q (kPa)
-1225.0	11.2	-697.0	0.00	0.00	43.57	0.0	0.0	498.4	498.4	1.00		498.4	0.0
-1219.4	17.6	-713.6	0.10	0.27	43.62	62.2	11.4	487.0	549.2	1.13	0.18	518.1	31.1
-1210.5	22.4	-738.9	0.27	0.47	43.69	108.4	28.9	469.5	577.9	1.23	0.27	523.7	54.2
-1202.5	28.7	-768.5	0.42	0.74	43.76	169.2	49.6	448.8	618.1	1.38	0.29	533.5	84.6
-1194.8	46.6	-872.9	0.56	1.50	43.82	341.4	121.3	377.1	718.5	1.91	0.36	547.8	170.7
-1187.2	57.4	-930.5	0.70	1.95	43.88	445.0	161.0	337.4	782.4	2.32	0.36	559.9	222.5
-1179.2	66.2	-965.7	0.85	2.32	43.95	528.4	185.3	313.1	841.5	2.69	0.35	577.3	264.2
-1170.8	73.6	-980.6	1.01	2.64	44.02	598.8	195.5	302.9	901.7	2.98	0.33	602.3	299.4
-1162.5	79.8	-990.1	1.16	2.90	44.08	657.5	202.1	296.3	953.8	3.22	0.31	625.1	328.8
-1154.4	85.5	-987.9	1.31	3.14	44.15	710.5	200.6	297.8	1008.4	3.39	0.28	653.1	355.3
-1146.0	90.3	-986.2	1.47	3.35	44.22	756.0	199.4	299.0	1055.0	3.53	0.26	677.0	378.0
-1137.5	94.7	-977.2	1.62	3.53	44.29	796.4	193.2	305.2	1101.6	3.61	0.24	703.4	398.2
-1129.6	98.3	-971.7	1.77	3.68	44.36	829.7	189.4	309.0	1138.7	3.69	0.23	723.8	414.8
-1120.2	101.4	-960.6	1.95	3.81	44.44	857.0	181.8	316.6	1173.6	3.71	0.21	745.1	428.5
-1112.3	104.0	-953.8	2.09	3.92	44.50	880.5	177.1	321.3	1201.9	3.74	0.20	761.6	440.3
-1103.5	106.2	-942.3	2.26	4.02	44.58	899.6	169.1	329.3	1228.9	3.73	0.19	779.1	449.8
-1095.2	108.1	-935.5	2.41	4.10	44.65	916.2	164.4	334.0	1250.1	3.74	0.18	792.0	458.1
-1086.7	109.8	-923.9	2.57	4.17	44.72	931.0	156.4	342.0	1273.0	3.72	0.17	807.5	465.5
-1078.4	111.6	-917.7	2.72	4.24	44.79	946.1	152.2	346.2	1292.3	3.73	0.16	819.3	473.1
-1069.8	113.1	-906.9	2.88	4.31	44.87	959.1	144.7	353.7	1312.8	3.71	0.15	833.2	479.5
-1060.2	114.6	-900.9	3.06	4.37	44.95	971.2	140.6	357.8	1329.0	3.71	0.14	843.4	485.6
-1051.9	115.9	-890.8	3.21	4.43	45.02	982.2	133.5	364.9	1347.0	3.69	0.14	855.9	491.1
-1043.3	117.4	-884.8	3.37	4.49	45.09	994.0	129.5	368.9	1363.0	3.69	0.13	865.9	497.0
-1034.8	118.6	-875.9	3.53	4.54	45.17	1004.1	123.4	375.0	1379.1	3.68	0.12	877.1	502.0
-1026.2	119.9	-869.4	3.69	4.60	45.24	1014.1	118.9	379.5	1393.6	3.67	0.12	886.6	507.0
-1017.4	121.2	-862.0	3.85	4.65	45.32	1024.5	113.8	384.6	1409.1	3.66	0.11	896.9	512.3
-1008.6	122.4	-854.6	4.02	4.70	45.40	1034.0	108.7	389.7	1423.7	3.65	0.11	906.7	517.0
-1000.1	123.6	-849.1	4.17	4.75	45.47	1042.8	104.9	393.5	1436.3	3.65	0.10	914.9	521.4
-991.2	124.7	-841.4	4.34	4.80	45.55	1051.6	99.6	398.8	1450.4	3.64	0.09	924.6	525.8
-982.5	125.7	-836.6	4.50	4.84	45.63	1059.2	96.3	402.1	1461.4	3.63	0.09	931.8	529.6
-973.6	126.7	-829.2	4.67	4.88	45.71	1066.5	91.2	407.2	1473.8	3.62	0.09	940.5	533.3
-964.5	127.8	-824.8	4.84	4.93	45.79	1074.4	88.1	410.3	1484.7	3.62	0.08	947.5	537.2
-955.9	128.8	-817.6	4.99	4.97	45.86	1081.6	83.2	415.2	1496.8	3.60	0.08	956.0	540.8
-947.0	129.7	-813.7	5.16	5.01	45.94	1088.3	80.5	417.9	1506.2	3.60	0.07	962.1	544.1
-938.0	130.7	-806.7	5.33	5.05	46.02	1095.7	75.6	422.8	1518.5	3.59	0.07	970.6	547.9
-929.2	131.7	-803.0	5.49	5.08	46.10	1102.3	73.1	425.3	1527.6	3.59	0.07	976.5	551.2
-920.0	132.6	-796.2	5.66	5.13	46.19	1108.5	68.4	430.0	1538.5	3.58	0.06	984.2	554.2
-911.0	133.4	-792.7	5.83	5.17	46.27	1114.0	66.0	432.4	1546.4	3.58	0.06	989.4	557.0
-901.8	134.2	-785.8	6.00	5.20	46.35	1119.6	61.2	437.2	1556.8	3.56	0.05	997.0	559.8
-892.3	135.2	-783.1	6.18	5.24	46.44	1125.8	59.4	439.0	1564.8	3.56	0.05	1001.9	562.9
-883.7	135.9	-775.7	6.33	5.27	46.52	1130.6	55.0	443.4	1574.0	3.55	0.05	1008.7	565.3
-874.6	136.7	-774.0	6.50	5.31	46.60	1135.8	53.1	445.3	1581.1	3.55	0.05	1013.2	567.9
-865.3	137.4	-767.6	6.68	5.34	46.69	1140.1	48.7	449.7	1589.8	3.54	0.04	1019.8	570.0
-856.4	138.2	-764.1	6.84	5.37	46.77	1145.3	46.3	452.1	1597.4	3.53	0.04	1024.8	572.6
-847.7	139.0	-759.4	7.00	5.40	46.85	1149.7	43.0	455.4	1605.1	3.52	0.04	1030.2	574.9
-838.4	139.9	-754.3	7.18	5.44	46.94	1155.7	39.5	458.9	1614.6	3.52	0.03	1036.7	577.9
-829.4	140.5	-751.4	7.34	5.47	47.03	1159.0	37.5	460.9	1619.9	3.51	0.03	1040.4	579.5
-820.6	141.2	-746.2	7.51	5.50	47.11	1163.2	33.9	464.5	1627.7	3.50	0.03	1046.1	581.6
-811.8	141.9	-744.0	7.67	5.53	47.19	1167.6	32.4	466.0	1633.6	3.51	0.03	1049.8	583.9
-802.5	142.6	-738.6	7.84	5.56	47.28	1171.5	28.7	469.7	1641.2	3.49	0.02	1055.5	585.7
-793.6	143.4	-736.9	8.00	5.59	47.36	1176.1	27.5	470.9	1647.0	3.50	0.02	1059.0	588.1
-784.3	144.1	-731.7	8.18	5.62	47.45	1180.2	23.9	474.5	1654.7	3.49	0.02	1064.6	590.1
-775.8	144.7	-729.9	8.34	5.64	47.54	1183.4	22.7	475.7	1659.1	3.49	0.02	1067.4	591.7
-766.5	145.2	-724.6	8.51	5.66	47.63	1185.5	19.0	479.4	1664.9	3.47	0.02	1072.1	592.7
-757.8	146.0	-723.4	8.67	5.70	47.71	1190.7	18.2	480.2	1670.9	3.48	0.02	1075.5	595.3
-748.7	146.6	-718.5	8.84	5.72	47.80	1193.2	14.8	483.6	1676.8	3.47	0.01	1080.2	596.6
-739.3	147.2	-716.7	9.02	5.75	47.89	1196.7	13.6	484.8	1681.5	3.47	0.01	1083.2	598.4
-730.8	147.7	-712.4	9.17	5.77	47.97	1198.8	10.6	487.8	1686.6	3.46	0.01	1087.2	599.4
-721.7	148.3	-710.0	9.34	5.80	48.06	1201.8	9.0	489.4	1691.3	3.46	0.01	1090.4	600.9
-712.9	148.9	-706.6	9.51	5.82	48.15	1204.5	6.6	491.8	1696.3	3.45	0.01	1094.0	602.3
-703.9	149.4	-703.3	9.67	5.84	48.24	1207.2	4.3	494.1	1701.2	3.44	0.00	1097.7	603.6
-695.0	150.0	-700.8	9.84	5.87	48.33	1209.8	2.6	495.8	1705.6	3.44	0.00	1100.7	604.9
-686.1	150.6	-696.7	10.00	5.90	48.42	1213.0	-0.2	498.6	1711.6	3.43	0.00	1105.1	606.5
-677.1	151.2	-695.4	10.17	5.92	48.51	1215.8	-1.1	499.5	1715.3	3.43	0.00	1107.4	607.9
-668.5	151.8	-691.4	10.33	5.94	48.59	1218.5	-3.9	502.3	1720.8	3.43	0.00	1111.5	609.3
-659.0	152.4	-690.2	10.51	5.97	48.69	1221.7	-4.7	503.1	1724.8	3.43	0.00	1113.9	610.8
-650.2	153.0	-686.4	10.67	5.99	48.78	1224.0	-7.3	505.7	1729.8	3.42	-0.01	1117.7	612.0
-641.0	153.5	-685.3	10.84	6.02	48.87	1226.2	-8.1	506.5	1732.7	3.42	-0.01	1119.6	613.1
-631.8	153.9	-681.4	11.01	6.03	48.96	1227.0	-10.8	509.2	1736.1	3.41	-0.01	1122.6	613.5

δL (mV)	LOAD (mV)	δU (mV)	E (%)	LOAD (kN)	A_c (cm^2)	σ_0' (kPa)	δU (kPa)	σ_3' (kPa)	σ_1' (kPa)	PSR	A	p' (kPa)	q (kPa)
-622.4	154.5	-680.5	11.19	6.06	49.06	1229.7	-11.4	509.8	1739.5	3.41	-0.01	1124.5	614.9
-613.5	155.0	-676.8	11.35	6.08	49.15	1231.7	-13.9	512.3	1744.1	3.40	-0.01	1128.2	615.9
-604.3	155.6	-675.9	11.52	6.10	49.25	1234.3	-14.5	512.9	1747.2	3.41	-0.01	1130.1	617.1
-595.2	156.0	-672.1	11.69	6.12	49.34	1235.8	-17.2	515.6	1751.3	3.40	-0.01	1133.4	617.9
-585.9	156.6	-671.2	11.86	6.15	49.44	1237.9	-17.8	516.2	1754.1	3.40	-0.01	1135.1	618.9
-576.5	157.1	-667.8	12.04	6.17	49.54	1239.8	-20.1	518.5	1758.3	3.39	-0.02	1138.4	619.9
-566.9	157.7	-666.0	12.22	6.19	49.64	1242.1	-21.4	519.8	1761.9	3.39	-0.02	1140.8	621.1
-557.6	158.2	-663.5	12.39	6.21	49.73	1243.7	-23.1	521.5	1765.2	3.38	-0.02	1143.4	621.9
-547.9	158.7	-661.0	12.57	6.24	49.84	1245.4	-24.8	523.2	1768.6	3.38	-0.02	1145.9	622.7
-538.4	159.2	-659.2	12.74	6.26	49.94	1247.1	-26.1	524.5	1771.6	3.38	-0.02	1148.0	623.6
-528.8	159.7	-656.1	12.92	6.28	50.04	1248.3	-28.2	526.6	1775.4	3.37	-0.02	1151.0	624.4
-519.0	160.1	-655.4	13.10	6.30	50.14	1248.8	-28.7	527.1	1776.5	3.37	-0.02	1151.9	624.8
-509.0	160.5	-652.2	13.29	6.31	50.25	1249.7	-30.9	529.3	1779.0	3.36	-0.02	1154.2	624.9
-499.2	160.8	-651.5	13.47	6.33	50.36	1249.9	-31.4	529.8	1779.5	3.36	-0.03	1154.7	624.9
-489.2	161.1	-648.3	13.66	6.34	50.47	1249.4	-33.6	532.0	1781.4	3.35	-0.03	1156.7	624.7
-479.2	161.5	-647.9	13.84	6.36	50.57	1250.6	-33.9	532.3	1782.8	3.35	-0.03	1157.5	625.3
-469.2	162.2	-644.7	14.03	6.38	50.68	1253.0	-36.1	534.5	1787.5	3.34	-0.03	1161.0	626.5
-458.8	162.9	-644.2	14.22	6.41	50.80	1256.1	-36.4	534.8	1790.9	3.35	-0.03	1162.9	628.1
-448.7	163.3	-641.3	14.41	6.43	50.91	1256.5	-38.4	536.8	1793.6	3.34	-0.03	1165.2	628.4
-438.6	163.8	-640.4	14.60	6.45	51.02	1257.5	-39.0	537.4	1795.1	3.34	-0.03	1166.2	628.8
-428.6	164.2	-637.6	14.78	6.47	51.13	1258.1	-41.0	539.4	1797.5	3.33	-0.03	1168.4	629.1
-417.8	164.6	-636.7	14.96	6.49	51.25	1258.6	-41.6	540.0	1798.8	3.33	-0.03	1169.3	629.3
-407.5	165.1	-634.3	15.17	6.51	51.37	1259.9	-43.2	541.6	1801.5	3.33	-0.03	1171.6	629.9
-397.0	165.5	-632.0	15.37	6.52	51.49	1259.8	-44.8	543.2	1803.0	3.32	-0.04	1173.1	629.9
-387.4	166.0	-631.0	15.55	6.54	51.59	1261.2	-45.5	543.9	1805.1	3.32	-0.04	1174.5	630.6
-376.0	166.3	-628.5	15.76	6.56	51.72	1261.0	-47.2	545.6	1806.6	3.31	-0.04	1176.1	630.5
-365.9	166.8	-627.9	15.95	6.58	51.84	1262.2	-47.6	546.0	1808.2	3.31	-0.04	1177.1	631.1
-355.0	167.2	-625.3	16.15	6.60	51.96	1261.8	-49.4	547.8	1809.6	3.30	-0.04	1178.7	630.9
-344.8	167.6	-625.1	16.34	6.61	52.08	1262.5	-49.6	548.0	1810.5	3.30	-0.04	1179.2	631.2
-334.3	168.0	-622.2	16.53	6.63	52.20	1262.4	-51.6	550.0	1812.4	3.30	-0.04	1181.2	631.2
-323.4	168.5	-621.5	16.73	6.65	52.33	1263.4	-51.8	550.2	1813.6	3.30	-0.04	1181.9	631.7
-313.5	168.9	-619.0	16.92	6.67	52.45	1263.2	-53.8	552.2	1815.4	3.29	-0.04	1183.8	631.6
-303.2	169.2	-618.5	17.11	6.68	52.57	1263.1	-54.1	552.5	1815.8	3.29	-0.04	1184.1	631.6
-293.0	169.8	-616.4	17.30	6.70	52.69	1264.6	-55.6	554.0	1818.8	3.28	-0.04	1186.3	632.3
-282.1	170.1	-614.9	17.50	6.72	52.82	1264.2	-56.6	555.0	1819.3	3.28	-0.04	1187.2	632.2
-272.0	170.6	-613.4	17.69	6.74	52.94	1264.9	-57.5	556.0	1821.0	3.27	-0.05	1188.5	632.5
-262.7	170.9	-610.7	17.86	6.75	53.05	1264.5	-59.5	557.9	1822.4	3.27	-0.05	1190.1	632.2
-252.0	171.4	-610.7	18.06	6.77	53.18	1265.6	-59.5	557.9	1823.3	3.27	-0.05	1190.7	632.8
-241.5	171.7	-607.8	18.26	6.79	53.30	1264.5	-61.5	559.9	1824.5	3.26	-0.05	1192.2	632.3
-231.7	172.3	-607.8	18.44	6.81	53.42	1266.5	-61.5	559.9	1826.4	3.26	-0.05	1193.2	633.3
-221.3	172.4	-605.2	18.63	6.82	53.55	1264.6	-63.3	561.7	1825.2	3.25	-0.05	1194.0	632.3
-211.8	173.0	-605.0	18.81	6.84	53.67	1265.8	-63.4	561.8	1827.6	3.25	-0.05	1194.7	632.9
-202.7	173.3	-602.3	18.98	6.85	53.78	1265.4	-65.3	563.7	1829.1	3.24	-0.05	1196.4	632.7
-191.4	173.8	-602.2	19.18	6.88	53.92	1266.5	-65.4	563.8	1830.3	3.25	-0.05	1197.0	633.3
-182.1	174.1	-599.5	19.36	6.89	54.03	1265.6	-67.2	565.6	1831.3	3.24	-0.05	1198.4	632.8
-171.2	174.6	-598.6	19.56	6.91	54.17	1266.7	-67.8	566.2	1833.0	3.24	-0.05	1199.6	633.4
-163.1	174.9	-596.8	19.71	6.92	54.27	1266.7	-69.1	567.5	1834.2	3.23	-0.05	1200.8	633.4
-151.5	175.3	-595.1	19.93	6.94	54.42	1265.9	-70.3	568.7	1834.6	3.23	-0.06	1201.6	633.0
-142.3	175.8	-594.2	20.10	6.96	54.53	1266.8	-70.9	569.3	1836.0	3.23	-0.06	1202.7	633.4
-132.8	176.0	-591.7	20.27	6.97	54.65	1266.0	-72.6	571.0	1837.0	3.22	-0.06	1204.0	633.0
-123.7	176.5	-591.3	20.44	6.99	54.77	1266.6	-72.9	571.3	1837.9	3.22	-0.06	1204.6	633.3
-113.5	176.9	-589.2	20.63	7.00	54.90	1266.4	-74.3	572.7	1839.1	3.21	-0.06	1205.9	633.2
-103.8	177.2	-589.0	20.81	7.02	55.02	1265.9	-74.5	572.9	1838.8	3.21	-0.06	1205.8	633.0
-93.8	177.5	-586.6	21.00	7.03	55.15	1265.6	-76.1	574.5	1840.1	3.20	-0.06	1207.3	632.6
-86.0	178.1	-585.9	21.14	7.06	55.25	1267.6	-76.6	575.0	1842.5	3.20	-0.06	1208.8	633.8
-74.6	178.2	-583.9	21.35	7.06	55.40	1265.0	-78.0	576.4	1841.4	3.19	-0.06	1208.9	632.5
-65.4	178.8	-583.0	21.52	7.09	55.52	1266.5	-78.6	577.0	1843.5	3.19	-0.06	1210.3	633.3
-55.1	179.0	-581.3	21.72	7.10	55.66	1264.8	-79.8	578.2	1842.9	3.19	-0.06	1210.6	632.4
-47.6	179.4	-579.9	21.86	7.11	55.76	1265.8	-80.7	579.1	1844.9	3.19	-0.06	1212.0	632.9
-36.4	179.9	-578.8	22.06	7.13	55.91	1265.4	-81.5	579.9	1845.3	3.18	-0.06	1212.6	632.7
-27.4	180.0	-576.3	22.23	7.14	56.03	1263.6	-83.2	581.6	1845.3	3.17	-0.07	1213.4	631.8
-17.1	180.5	-576.2	22.42	7.16	56.17	1264.0	-83.3	581.7	1845.7	3.17	-0.07	1213.7	632.0
-8.7	180.8	-573.7	22.58	7.17	56.28	1263.7	-85.0	583.4	1847.2	3.17	-0.07	1215.3	631.9
1.7	181.4	-573.6	22.77	7.20	56.42	1264.5	-84.5	583.3	1848.2	3.17	-0.07	1215.8	632.4
9.7	181.7	-571.2	22.92	7.21	56.53	1264.5	-86.7	585.1	1849.6	3.16	-0.07	1217.4	632.2
21.4	182.1	-571.2	23.14	7.22	56.69	1263.5	-86.7	585.1	1849.0	3.16	-0.07	1217.1	631.9
31.1	182.4	-569.1	23.32	7.24	56.82	1263.2	-88.2	586.6	1849.3	3.15	-0.07	1218.2	631.6
40.2	182.7	-568.5	23.48	7.25	56.95	1262.7	-88.6	587.0	1849.7	3.15	-0.07	1218.4	631.4
48.5	183.0	-566.2	23.64	7.26	57.06	1261.8	-90.2	588.5	1850.4	3.14	-0.07	1219.5	630.9

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

Consolidated Undrained Triaxial Compression Test on Cohesive Soils
ASTM D 4767 - 88

PROJECT# 9421897-5040
Test Pit TP95-37
Sample
Depth

L_i = 15.35 cm
A_i = 43.46 cm^2
V_i = 667.1 cm^3

DATE: 27-Feb-95
FILE: 34-950.XLS
TEST# CIU-4

Strength Results:
Max. σ_D' = 1624.3 kPa
Strain @ = 8.88 %
Max. PSR = 3.38
Strain @ = 7.34 %

Density: (Kg/M³)
γ_i = 2063
γ_f = 2180
E_i = 0.348
E_f = 0.275

REMARKS:
- Failure Mode Bulging
- Minus 19.5 mm material
- Corrections applied for membrane
- Corrections applied for filter paper

Consolidation Pressure:
CP = 1373.8 kPa
BP = 412.2 kPa
σ_{3c}' = 961.6 kPa
B_{value} = 0.997

CALIBRATIONS:
LOAD = 0.0423 kN/mV
PORE = 0.6895 kPa/mV
LVDT = 0.0285 mm/mV
Feed Rate = 0.026 mm/min

Consolidation Results:
δV_c = 37.9 cc
T_{100} = 27.0 min
C_v = 1.1E-03 cm²/s

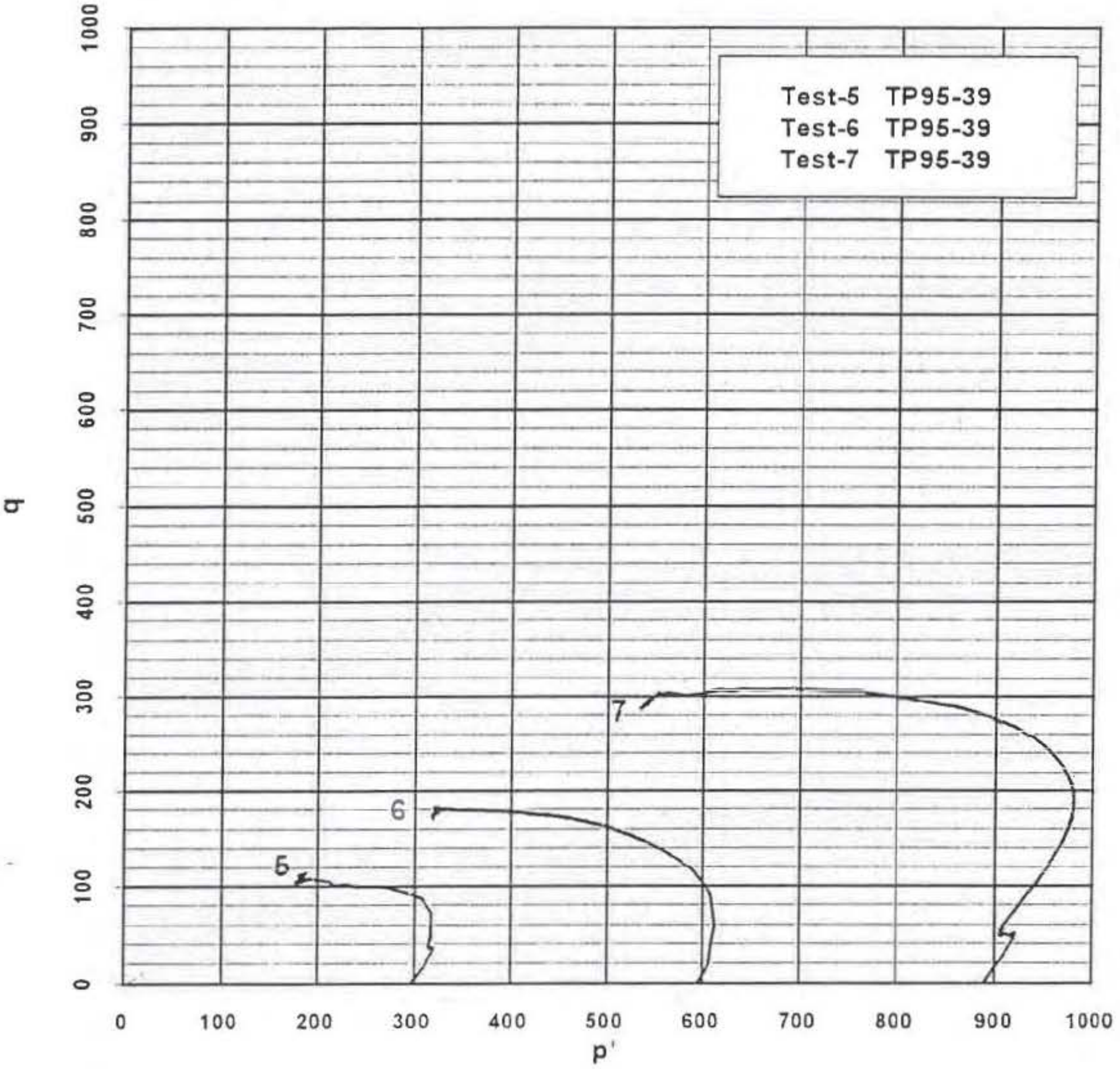
Water Contents:
W_i = 9.1
W_f = 9.9

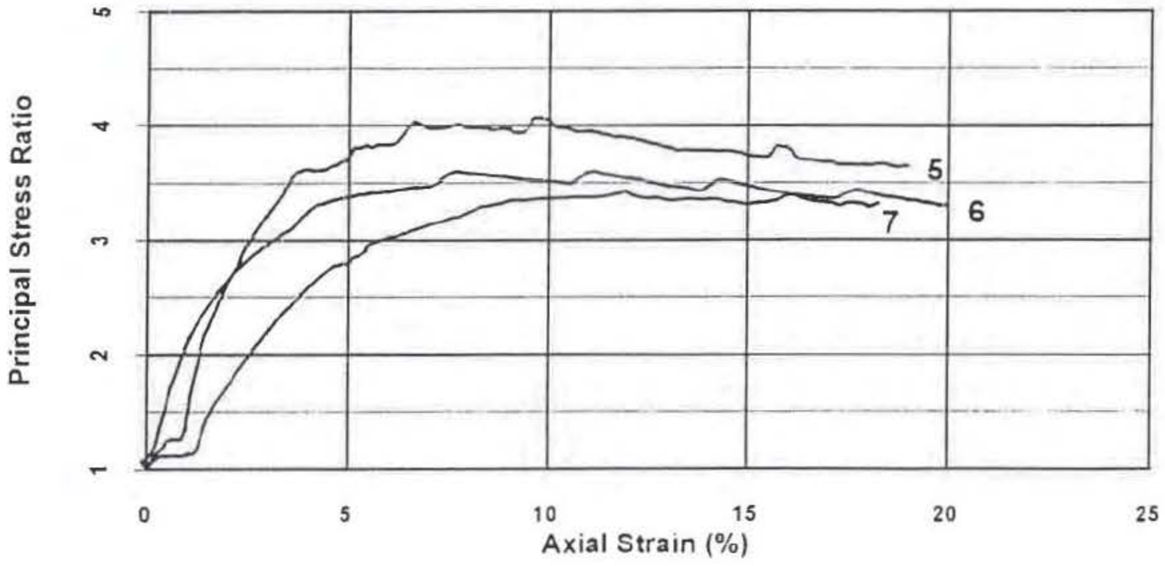
δL (mV)	LOAD (mV)	δU (mV)	E (%)	LOAD (kN)	A_c (cm²)	σ_D (kPa)	δU (kPa)	σ_3' (kPa)	σ_1' (kPa)	PSR	A	p' (kPa)	q (kPa)
510.0	16.3	-597.8	0.00	0.00	43.46	0.0	0.0	961.6	961.6	1.00		961.6	0.0
513.9	21.7	-601.4	0.07	0.23	43.49	52.2	2.5	959.1	1011.4	1.05	0.05	985.2	26.1
523.3	24.2	-605.3	0.26	0.33	43.57	75.8	5.2	956.4	1032.2	1.08	0.07	994.3	37.9
533.1	26.8	-611.7	0.43	0.44	43.65	101.6	9.6	952.0	1053.6	1.11	0.09	1002.8	50.8
540.1	59.6	-681.2	0.56	1.83	43.70	418.5	57.5	904.1	1322.6	1.46	0.14	1113.4	209.3
548.5	84.8	-794.0	0.71	2.89	43.77	660.7	135.3	826.3	1487.0	1.80	0.20	1156.6	330.3
557.3	103.7	-899.5	0.88	3.69	43.84	842.1	208.0	753.6	1595.7	2.12	0.25	1174.7	421.1
566.1	119.0	-971.6	1.04	4.34	43.92	987.4	257.7	703.9	1691.3	2.40	0.26	1197.6	493.7
574.9	131.5	-1022.6	1.21	4.87	43.99	1106.3	292.9	668.7	1775.0	2.65	0.26	1221.9	553.2
583.4	140.4	-1049.0	1.36	5.24	44.06	1189.6	311.1	650.5	1840.1	2.83	0.26	1245.3	594.8
593.2	146.8	-1066.2	1.54	5.51	44.14	1248.7	323.0	638.6	1887.3	2.96	0.26	1263.0	624.3
600.8	151.4	-1072.9	1.69	5.71	44.20	1290.9	327.6	634.0	1924.9	3.04	0.25	1279.5	645.4
610.4	154.9	-1076.6	1.86	5.86	44.29	1321.6	330.1	631.5	1953.1	3.09	0.25	1292.3	660.8
620.0	157.5	-1080.4	2.04	5.97	44.37	1344.0	332.8	628.8	1972.8	3.14	0.25	1300.8	672.0
629.3	159.8	-1075.8	2.22	6.07	44.44	1364.1	329.6	632.0	1996.1	3.16	0.24	1314.1	682.0
637.8	162.1	-1082.1	2.37	6.16	44.52	1383.4	333.9	627.7	2011.1	3.20	0.24	1319.4	691.7
647.3	164.1	-1079.4	2.55	6.25	44.60	1399.9	332.1	629.5	2029.5	3.22	0.24	1329.5	700.0
657.0	166.1	-1081.9	2.73	6.33	44.68	1415.5	333.8	627.8	2043.4	3.25	0.24	1335.6	707.8
666.3	167.4	-1079.8	2.90	6.39	44.76	1425.7	332.3	629.3	2055.0	3.27	0.23	1342.1	712.9
674.2	168.6	-1080.2	3.05	6.44	44.83	1434.4	332.6	629.0	2063.4	3.28	0.23	1346.2	717.2
684.2	169.5	-1079.3	3.23	6.48	44.91	1440.8	332.0	629.6	2070.4	3.29	0.23	1350.0	720.4
694.1	170.5	-1076.6	3.42	6.52	45.00	1447.2	330.1	631.5	2078.7	3.29	0.23	1355.1	723.6
702.1	171.7	-1077.3	3.57	6.57	45.07	1455.6	330.6	631.0	2086.6	3.31	0.23	1358.8	727.8
712.3	172.5	-1071.7	3.76	6.60	45.16	1460.9	326.8	634.8	2095.7	3.30	0.22	1365.3	730.4
721.9	173.5	-1074.9	3.93	6.64	45.24	1467.0	329.0	632.6	2099.6	3.32	0.22	1366.1	733.5
731.2	174.4	-1071.5	4.11	6.68	45.32	1472.5	326.6	635.0	2107.5	3.32	0.22	1371.2	736.2
740.0	175.3	-1072.3	4.27	6.72	45.40	1478.3	327.2	634.4	2112.7	3.33	0.22	1373.6	739.1
749.1	176.2	-1069.8	4.44	6.76	45.48	1484.2	325.4	636.2	2120.4	3.33	0.22	1378.3	742.1
758.6	177.2	-1068.8	4.62	6.80	45.56	1490.2	324.8	636.8	2127.1	3.34	0.22	1382.0	745.1
766.5	178.3	-1067.1	4.78	6.85	45.63	1498.5	323.6	638.0	2136.5	3.35	0.22	1387.3	749.3
776.2	179.2	-1063.1	4.94	6.89	45.72	1504.3	320.8	640.8	2145.1	3.35	0.21	1392.9	752.1
785.6	180.0	-1064.8	5.12	6.92	45.80	1508.4	322.0	639.6	2148.0	3.36	0.21	1393.8	754.2
794.2	180.6	-1058.9	5.28	6.95	45.88	1511.6	317.9	643.7	2155.3	3.35	0.21	1399.5	755.8
803.5	181.6	-1061.2	5.45	6.99	45.96	1517.7	319.6	642.1	2159.8	3.36	0.21	1400.9	758.9
812.6	182.0	-1057.6	5.62	7.00	46.05	1518.7	317.0	644.6	2163.3	3.36	0.21	1403.9	759.3
820.7	182.9	-1057.6	5.77	7.04	46.12	1524.2	317.0	644.6	2168.7	3.36	0.21	1406.7	762.1
829.8	183.8	-1055.0	5.94	7.08	46.20	1530.1	315.2	646.4	2176.5	3.37	0.21	1411.4	765.1
837.5	184.4	-1052.7	6.08	7.11	46.27	1532.9	313.7	647.9	2180.8	3.37	0.20	1414.4	766.4
847.1	185.3	-1051.7	6.26	7.14	46.36	1538.1	313.0	648.6	2186.7	3.37	0.20	1417.7	769.0
855.2	185.8	-1045.8	6.41	7.17	46.44	1540.5	308.9	652.7	2193.2	3.36	0.20	1422.9	770.2
864.4	186.5	-1048.1	6.58	7.20	46.52	1543.8	310.5	651.1	2195.0	3.37	0.20	1423.0	771.9
874.3	187.0	-1042.9	6.76	7.22	46.61	1544.9	306.9	654.7	2199.6	3.36	0.20	1427.1	772.4
886.1	188.0	-1044.3	6.98	7.26	46.72	1550.6	307.9	653.7	2204.4	3.37	0.20	1429.1	775.3
899.7	188.8	-1040.8	7.24	7.29	46.85	1553.2	305.4	656.2	2209.3	3.37	0.20	1432.7	776.6
909.4	189.9	-1040.3	7.42	7.34	46.94	1559.6	305.1	656.5	2216.1	3.38	0.20	1436.3	779.8
917.8	190.6	-1037.6	7.57	7.37	47.02	1563.7	302.2	658.4	2222.0	3.38	0.19	1440.2	781.8
927.2	191.3	-1035.9	7.75	7.40	47.11	1566.5	302.1	659.5	2226.1	3.38	0.19	1442.8	783.3
935.5	191.8	-1034.2	7.90	7.42	47.19	1568.9	300.9	660.7	2229.6	3.37	0.19	1445.1	784.4
945.3	192.5	-1030.2	8.08	7.45	47.28	1571.8	298.1	663.5	2235.2	3.37	0.19	1449.3	785.9
953.9	193.2	-1030.6	8.24	7.48	47.36	1574.7	298.4	663.2	2237.9	3.37	0.19	1450.6	787.4
963.4	193.7	-1025.4	8.42	7.50	47.45	1576.1	294.8	666.8	2242.9	3.36	0.19	1454.8	788.0
972.1	194.7	-1027.0	8.58	7.54	47.54	1582.6	295.9	665.7	2248.2	3.38	0.19	1456.9	791.3
980.9	195.2	-1022.9	8.74	7.56	47.62	1583.9	293.1	668.5	2252.4	3.37	0.19	1460.5	792.0
990.6	195.7	-1023.1	8.92	7.58	47.72	1585.3	293.2	668.4	2253.7	3.37	0.18	1461.0	792.7
998.9	196.3	-1019.8	9.08	7.61	47.80	1588.1	291.0	670.6	2258.7	3.37	0.18	1464.7	794.1
1008.6	197.2	-1018.7	9.26	7.65	47.89	1592.5	290.2	671.4	2263.9	3.37	0.18	1467.6	796.2
1016.6	198.0	-1016.6	9.41	7.68	47.97	1596.5	288.8	672.8	2269.3	3.37	0.18	1471.1	798.2
1026.1	198.7	-1012.6	9.58	7.71	45.07	1599.5	286.0	675.6	2275.2	3.37	0.18	1475.4	799.8
1036.0	199.2	-1013.4	9.77	7.73	48.16	1601.2	286.8	675.0	2276.2	3.37	0.18	1475.6	800.6
1045.6	199.6	-1008.5	9.94	7.75	48.26	1601.3	283.2	678.4	2279.7	3.36	0.18	1479.1	800.6
1054.9	200.5	-1009.8	10.12	7.79	48.35	1605.5	284.1	677.5	2283.1	3.37	0.18	1480.3	802.8
1063.8	200.9	-1006.0	10.28	7.80	48.44	1606.4	281.5	680.1	2286.5	3.36	0.18	1483.3	803.2
1073.5	201.5	-1005.8	10.46	7.83	48.54	1605.4	281.3	680.3	2286.7	3.36	0.17	1484.5	804.2
1083.8	202.2	-1003.1	10.65	7.86	48.64	1611.1	279.5	682.1	2293.2	3.36	0.17	1487.7	805.5
1106.0	202.8	-1001.3	11.07	7.86	48.87	1608.5	278.2	683.4	2291.8	3.35	0.17	1487.6	804.2
1152.6	203.5	-999.7	11.93	7.91	49.35	1598.2	277.1	684.5	2282.7	3.33	0.17	1483.6	799.1
1200.5	203.9	-994.6	12.82	7.93	49.85	1584.6	273.6	688.0	2272.6	3.30	0.17	1480.3	792.3
1225.0	204.6	-996.3	13.28	7.96	50.11	1582.2	274.5	686.5	2269.0	3.30	0.17	1477.9	791.1
1234.2	205.4	-992.6	13.45	8.00	50.21	1586.2	272.2	689.4	2275.5	3.30	0.17	1482.5	793.1

δL	LOAD	δU	E	LOAD	A_c	σ_D'	δU	σ_3'	σ_1'	PSR	A	p'	q
(mV)	(mV)	(mV)	(%)	(kN)	(cm^2)	(kPa)	(kPa)	(kPa)	(kPa)			(kPa)	(kPa)
1244.7	206.1	-992.7	13.64	8.02	50.32	1588.3	272.3	689.3	2277.6	3.30	0.17	1483.5	794.1
1263.4	206.8	-990.1	13.99	8.05	50.53	1587.2	270.5	691.1	2278.3	3.30	0.17	1484.7	793.6
1272.7	207.7	-988.5	14.16	8.09	50.63	1591.3	269.4	692.2	2283.5	3.30	0.17	1487.9	795.6
1283.1	208.0	-987.0	14.35	8.10	50.74	1590.4	268.4	693.2	2283.6	3.29	0.17	1488.4	795.2
1292.8	208.5	-983.4	14.53	8.13	50.85	1591.4	265.9	695.7	2287.1	3.29	0.17	1491.4	795.7
1302.4	209.2	-983.6	14.71	8.16	50.96	1593.9	266.0	695.6	2289.5	3.29	0.17	1492.5	796.9
1311.7	209.7	-978.5	14.89	8.18	51.06	1594.3	262.5	699.1	2293.4	3.28	0.16	1496.3	797.1
1321.7	210.4	-980.4	15.07	8.21	51.17	1596.9	263.8	697.8	2294.7	3.29	0.17	1496.3	798.5
1332.5	210.9	-977.2	15.27	8.23	51.29	1597.0	261.6	700.0	2297.0	3.28	0.16	1498.5	798.5
1342.4	211.5	-976.0	15.46	8.25	51.40	1598.0	260.8	700.8	2298.9	3.28	0.16	1499.8	799.0
1352.6	212.0	-974.5	15.64	8.27	51.52	1598.8	259.7	701.9	2300.5	3.28	0.16	1501.3	799.4
1362.6	212.5	-971.7	15.83	8.30	51.63	1599.4	257.8	703.8	2303.2	3.27	0.16	1503.5	799.7
1372.8	213.5	-971.5	16.02	8.33	51.75	1603.2	257.7	703.9	2307.1	3.28	0.16	1505.5	801.6
1382.4	213.6	-966.8	16.20	8.34	51.86	1600.5	254.4	707.2	2308.0	3.26	0.16	1507.6	800.4
1393.5	212.7	-967.9	16.40	8.30	51.99	1589.1	255.2	706.4	2295.5	3.25	0.16	1501.0	794.6
1404.3	213.5	-964.9	16.60	8.34	52.11	1591.8	253.1	708.5	2300.3	3.25	0.16	1504.4	795.9
1414.4	212.6	-964.4	16.79	8.30	52.23	1581.4	252.8	708.8	2290.3	3.23	0.16	1499.5	790.7
1423.8	212.8	-962.1	16.97	8.31	52.34	1579.1	251.2	710.4	2289.5	3.22	0.16	1499.9	789.5
1433.7	213.0	-960.6	17.15	8.31	52.46	1577.0	250.2	711.4	2288.5	3.22	0.16	1500.0	788.5
1443.2	213.2	-959.1	17.33	8.33	52.57	1575.8	249.1	712.5	2288.3	3.21	0.16	1500.4	787.9
1452.1	213.9	-955.5	17.49	8.35	52.67	1578.0	246.6	715.0	2293.0	3.21	0.16	1504.0	789.0
1462.1	214.5	-956.3	17.68	8.38	52.79	1576.3	247.2	714.4	2293.7	3.21	0.16	1504.1	789.7
1471.7	215.3	-951.7	17.86	8.41	52.91	1582.2	244.0	717.6	2299.8	3.20	0.15	1508.7	791.1
1480.7	216.9	-952.8	18.02	8.48	53.01	1591.5	244.8	716.8	2308.3	3.22	0.15	1512.6	795.7
1490.8	219.0	-950.2	18.21	8.57	53.14	1604.1	243.0	718.6	2322.7	3.23	0.15	1520.6	802.0
1500.1	220.0	-949.2	18.38	8.61	53.25	1609.0	242.3	719.3	2328.3	3.24	0.15	1523.8	804.5
1510.3	220.5	-947.5	18.57	8.63	53.37	1608.5	241.1	720.5	2329.0	3.23	0.15	1524.8	804.3
1520.0	221.0	-944.2	18.75	8.65	53.45	1609.3	238.8	722.8	2332.1	3.23	0.15	1527.4	804.7
1530.0	221.7	-944.0	18.94	8.68	53.61	1610.8	238.7	722.9	2333.7	3.23	0.15	1528.3	805.4
1538.9	222.8	-939.5	19.10	8.73	53.72	1616.4	235.6	726.0	2342.4	3.23	0.15	1534.2	808.2
1549.3	222.4	-941.3	19.30	8.71	53.85	1608.9	236.8	724.8	2333.7	3.22	0.15	1529.2	804.5
1558.3	223.3	-937.8	19.46	8.75	53.96	1612.3	234.4	727.2	2339.5	3.22	0.15	1533.3	806.2
1568.4	224.3	-937.8	19.65	8.79	54.09	1616.7	234.4	727.2	2343.9	3.22	0.15	1535.5	808.4
1578.4	225.7	-935.3	19.84	8.85	54.21	1622.4	232.7	728.9	2352.3	3.23	0.14	1540.6	811.7
1588.0	226.3	-933.7	20.02	8.88	54.34	1624.3	231.6	730.0	2354.3	3.23	0.14	1542.1	812.2
1598.1	226.0	-932.6	20.20	8.87	54.46	1618.8	230.8	730.8	2349.6	3.21	0.14	1540.2	809.4
1607.6	226.1	-929.2	20.38	8.87	54.58	1615.7	228.5	733.1	2348.8	3.20	0.14	1540.9	807.8
1617.6	226.3	-929.2	20.57	8.86	54.71	1612.8	228.5	733.1	2345.9	3.20	0.14	1539.5	806.4
1627.1	226.6	-924.3	20.74	8.89	54.83	1612.2	225.1	736.5	2348.6	3.19	0.14	1542.6	806.1
1637.4	227.5	-926.0	20.93	8.93	54.97	1614.5	226.3	735.3	2349.8	3.20	0.14	1542.6	807.3
1646.7	228.2	-922.8	21.11	8.96	55.09	1616.6	224.1	737.5	2354.3	3.19	0.14	1545.9	808.4
1656.9	228.8	-922.3	21.30	8.99	55.22	1617.4	223.7	737.9	2355.3	3.19	0.14	1546.6	808.7
1666.2	229.6	-920.2	21.47	9.02	55.34	1619.7	222.3	739.3	2359.0	3.19	0.14	1549.1	809.8
1676.2	229.7	-918.8	21.65	9.02	55.47	1616.7	221.3	740.3	2357.0	3.18	0.14	1548.6	808.4
1686.0	229.4	-917.3	21.84	9.01	55.60	1610.3	220.3	741.3	2351.6	3.17	0.14	1546.4	805.1
1655.0	229.3	-913.6	22.00	9.01	55.72	1606.0	217.7	743.9	2349.9	3.16	0.14	1546.5	803.0
1705.1	229.9	-914.5	22.19	9.03	55.85	1606.2	218.4	743.2	2349.5	3.16	0.14	1546.4	803.1
1714.8	230.4	-910.2	22.37	9.05	55.98	1606.7	215.4	746.2	2352.9	3.15	0.13	1549.6	803.4
1724.4	231.3	-911.3	22.55	9.09	56.11	1609.7	216.2	745.4	2355.1	3.16	0.13	1550.3	804.9
1734.1	231.4	-908.3	22.73	9.09	56.24	1606.3	214.1	747.5	2353.8	3.15	0.13	1550.7	803.2
1743.8	232.4	-906.0	22.90	9.13	56.37	1609.8	213.9	747.7	2357.5	3.15	0.13	1552.6	804.9
1752.5	234.0	-905.7	23.07	9.20	56.49	1618.6	212.3	749.3	2367.9	3.16	0.13	1558.6	809.3
1762.3	234.9	-902.9	23.25	9.24	56.62	1621.2	211.1	750.5	2371.8	3.16	0.13	1561.2	810.6
1772.2	234.8	-902.9	23.44	9.24	56.76	1616.6	210.4	751.2	2367.8	3.15	0.13	1559.5	808.3
1780.7	236.1	-898.8	23.59	9.29	56.88	1622.6	207.5	754.1	2376.7	3.15	0.13	1565.4	811.3

Consolidated Undrained Triaxial Compression Test on Cohesive Soils
ASTM D 4767-88

Figure





PROJECT No 95
DRAWN LL
REVIEWED
DATE 03/13/95

Golder Associates